Set

Max. Marks: 70

## Seat No.

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory. It should be solved in first 30 minutes in the Answer book.

2) All the sub-questions in Q.No.1 are compulsory for one mark each and every question has only one correct answer.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - The layer at the center of gravity of the beam as shown in the below 1) figure, will be 6

Gi

d



a)

d) None of these

In tension

C.

- 2) If the value of Poisson's ratio is zero, then it means that \_\_\_\_\_.
  - The material is rigid a)
  - The material is perfectly plastic b)
  - There is no longitudinal strain in the material C)
  - The longitudinal strain in the material is infinity d)
- 3) Which one of the following is correct? When a nut is tightened by placing a washer below it, the bolt will be subjected to
  - Compression only Tension a) b)
  - Shear only d) Compression and shear C)
- If at a section distant from one of the ends of the beam, M represents the 4) bending moment. V the shear force and w the intensity of loading, then \_\_\_\_\_.
  - i) dM/dx = V
  - ii) dV/dx = w

ii) and iii)

- dw/dx = y (the deflection of the beam at the section) iii) Select the correct answer using the codes given below: \_\_\_\_\_.
- i) and iii) a)

c)

- i) and ii) b)
- i), ii) and iii) d)

Marks: 14

14

- 5) A point, along the length of a beam subjected to loads, where bending moment changes its sign, is known as the point of \_\_\_\_\_.
  - a) Inflexion

b) Maximum stress Contra flexure

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Set P

- c) Zero shear force
- 6) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by .

d)

- The diameter of the Mohr's circle a)
- Half the diameter of the Mohr's circle b)
- One-third the diameter of the Mohr's circle C)
- One-fourth the diameter of the Mohr's circle d)
- For a circular shaft of diameter d subjected to torque T, the maximum 7) value of the shear stress is \_\_\_\_\_.
  - $32T/\tau D^3$  $64T/\tau D^3$ b) a)
  - $16T/\tau D^3$  $8T/\tau D^3$ C) d)
- 8) In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to \_ \_\_\_\_\_•
  - The sum of the normal stresses a)
  - Difference of the normal stresses b)
  - C) Half the sum of the normal stresses
  - Half the difference of the normal stresses d)
- 9) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed
  - At the centre of the web a)
  - b) At the top edge of the top flange
  - At the bottom edge of the top flange C)
  - None of the above d)

Slope

a)

- 10) If one end of a hinged column is made fixed and the other free, how much is the critical load compared to the original value?
  - 1/2 1⁄4 a) b)
  - C) Twice d) Four times
- For which one of the following columns, Euler buckling load  $4\pi^2 EI / L^2$ . 11)
  - Column with both hinged ends a)
  - Column with one end fixed and other end free b)
  - Column with both ends fixed c)
  - Column with one end fixed and other hinged d)
- The property by which an amount of energy is absorbed by a material 12) without plastic deformation, is called
  - Toughness Impact strength b) a)
  - Ductility Resilience C) d)
- In double integration method, third integration will be value of 13)
  - Bending moment b)
  - C) Deflection d) shear force
- A simply supported beam is of a rectangular section. It carries a uniformly 14) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - 2y a) b) 4y
  - c) y/2 d) y/8

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.

C

D

4) Assume additional suitable data if necessary and state it clearly.

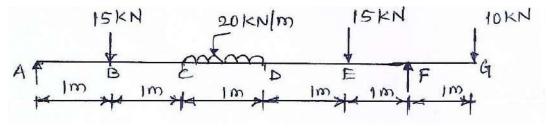
#### Section – I

Two planes AB and BC which are at right angles are acted upon by tensile 07 Q.2 a) stress of 140 N/mm<sup>2</sup> and a compressive stress of 70 N/mm<sup>2</sup> respectively and also by stress 35 N/mm<sup>2</sup>. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.

A copper rod of 40 mm diameter is surrounded tightly by a cast iron tube of b) 07 external diameter 80 mm & internal diameter 40mm, the ends being firmly fastened together. When it is subjected to a compressive load of 30 kN, what will be the load shared by each? Also determine the amount by which a compound bar shortens if it is 2 meter long.  $Eci = 175 \text{ GN/m}^2$ ,  $Ec = 75 \text{ GN/m}^2$ 

B

- A simply supported beam of span length 6m and 75mm diameter carries a Q.3 a) 04 uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - Calculate maximum intensity of shear stress induced and angle of twist b) 06 produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
  - For a given material E = 110GN/m<sup>2</sup> and C = 42 GN/m<sup>2</sup>. Find the bulk 04 c) modulus and lateral contraction of a round bar of 37.5 mm diameter and 2.4 m long when stretched by 2.5 mm.
- Draw SF & BM diagrams for the beam as shown in the fig. and mark the Q.4 a) 80 silent points. Find the position of point of Cotraflexure and maximum bending moment.



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40N/mm2

**ANALYSIS OF MECHANICAL ELEMENTS** 

Max. Marks: 56

Set

|     |    | SLR-FM-1  | 07       |
|-----|----|---|----------|
|     |    | Set   | Ρ        |
|     | b) | <ul> <li>Explain the following</li> <li>1) Assumption in torsion theory</li> <li>2) Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>  | 03<br>03 |
| Q.5 | a) | A cantilever I section bean carries u.d.l. of 20 KN/m over its entire span 3m. the beam section carries its upper flange 90mm *10 mm, web 120mm *10mm and lower flange 120 mm* 15mm. determine shear stress distribution at important locations of cross section and show shear stress distribution diagram.                                      | 07       |
|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = 1 *10 <sup>5</sup> N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and $f_c = 550N/mm^2$ | 07       |
| Q.6 | a) | A simply supported beam has a span of 4 m and rectangular cross-section 100mm * 200mm. Find uniformly distributed it can carry, if maximum bending stress & shear stress are not to exceed 10N/mm <sup>2</sup> & 0.6 N/mm <sup>2</sup>  | 06       |
|     | b) | What will be the instantaneous stress and elongation of a 25 mm diameter bar, 2.6 m long, suspended vertically, if a mass of 10 kg falls through a height of 300 mm onto a collar which is rigidly attached to the bottom end of the bar? Take $E = 200$ GPa.   | 04       |
|     | c) | <ul> <li>Define the following</li> <li>1) Equivalent length</li> <li>2) Strain energy</li> <li>3) Section Modulus</li> <li>4) Proof resilience</li> </ul>   | 04       |
| Q.7 | a) | A beam of length 5 m and uniform rectangular section is simply supported at its ends. It carries u.d.l. of 9 KN/m run over its entire span. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm <sup>2</sup> and central deflection 1 cm. $E=1*10^4$ N/mm <sup>2</sup>  | 06       |
|     | b) | Derive the expression for maximum shear stress in rectangular section is equal to 1.5 times average shear stress.   | 04       |
|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.   | 04       |

#### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ANALYSIS OF MECHANICAL ELEMENTS

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## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

a)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to
  - The sum of the normal stresses a)
  - b) Difference of the normal stresses
  - Half the sum of the normal stresses c)
  - Half the difference of the normal stresses d)
- 2) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed
  - At the centre of the web a)
  - At the top edge of the top flange b)
  - At the bottom edge of the top flange c)
  - None of the above d)
- If one end of a hinged column is made fixed and the other free, how much 3) is the critical load compared to the original value?
  - 1/4 a) b) 1/2 Twice
  - c) d)
- 4) For which one of the following columns, Euler buckling load  $4\pi^2 EI / L^2$ .
  - Column with both hinged ends a)
  - Column with one end fixed and other end free b)
  - Column with both ends fixed c)
  - Column with one end fixed and other hinged d)
- The property by which an amount of energy is absorbed by a material 5) without plastic deformation, is called
  - Toughness b) Impact strength
  - Ductility d) C)
- 6) In double integration method, third integration will be value of \_\_\_\_\_.
  - Slope b) Bending moment a)
  - shear force c) Deflection d)
- A simply supported beam is of a rectangular section. It carries a uniformly 7) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - a) 2y b) 4y d) y/8 C)
    - y/2





Marks: 14

Max. Marks: 70

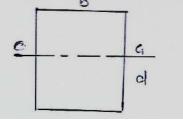
Resilience

Four times

ravity of the beam as shown in the below

SLR-FM-107

The layer at the center of gravity of the beam as shown in the below figure, will be \_\_\_\_\_.



- a) In tension
- b) In compression
- c) Neither in tension nor in compression
- d) None of these
- 9) If the value of Poisson's ratio is zero, then it means that \_\_\_\_\_.
  - a) The material is rigid
  - b) The material is perfectly plastic
  - c) There is no longitudinal strain in the material
  - d) The longitudinal strain in the material is infinity
- 10) Which one of the following is correct?When a nut is tightened by placing a washer below it, the bolt will be subjected to \_\_\_\_\_.
  - a) Compression only
- b) Tension
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- 11) If at a section distant from one of the ends of the beam, M represents the bending moment. V the shear force and w the intensity of loading, then \_\_\_\_\_.
  - i) dM/dx = V

a)

- ii) dV/dx = w
- iii) dw/dx = y (the deflection of the beam at the section)

Select the correct answer using the codes given below: \_\_\_\_\_.

- a) i) and iii) b) i) and ii)
- c) ii) and iii) d) i), ii) and iii)
- 12) A point, along the length of a beam subjected to loads, where bending moment changes its sign, is known as the point of \_\_\_\_\_.
  - Inflexion b) Maximum stress
  - c) Zero shear force d) Contra flexure
- 13) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by \_\_\_\_\_.
  - a) The diameter of the Mohr's circle
  - b) Half the diameter of the Mohr's circle
  - c) One-third the diameter of the Mohr's circle
  - d) One-fourth the diameter of the Mohr's circle
- 14) For a circular shaft of diameter d subjected to torque T, the maximum value of the shear stress is \_\_\_\_\_.
  - a)  $64T/\tau D^3$  b)  $32T/\tau D^3$
  - c)  $16T/\tau D^3$  d)  $8T/\tau D^3$

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ANALYSIS OF MECHANICAL ELEMENTS

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C

D

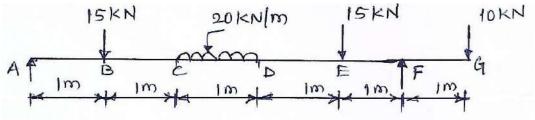
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#### Section – I

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B

- A simply supported beam of span length 6m and 75mm diameter carries a Q.3 04 a) uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - Calculate maximum intensity of shear stress induced and angle of twist b) 06 produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
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Max. Marks: 56

Seat

No.



|     |    | SLR-FM-1  | 07       |
|-----|----|---|----------|
|     |    | Set   | Q        |
|     | b) | <ul> <li>Explain the following</li> <li>1) Assumption in torsion theory</li> <li>2) Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>  | 03<br>03 |
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|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = 1 *10 <sup>5</sup> N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and $f_c = 550N/mm^2$ | 07       |
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|     | c) | Define the following<br>1) Equivalent length<br>2) Strain energy<br>3) Section Modulus<br>4) Proof resilience   | 04       |
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  - 1/4 b) 1/2 a)
  - Twice Four times c) d)

R

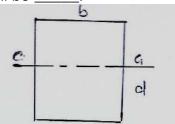
Max. Marks: 70

Marks: 14

Maximum stress

- Contra flexure
- d)

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  - dM/dx = Vi) ii) dV/dx = w

  - dw/dx = y (the deflection of the beam at the section) iii)
  - Select the correct answer using the codes given below: \_\_\_\_\_.
  - a) i) and iii) b) i) and ii) C) ii) and iii)
    - d) i), ii) and iii)

Set | R

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering ANALYSIS OF MECHANICAL ELEMENTS**

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each section.

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C

D

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#### Section – I

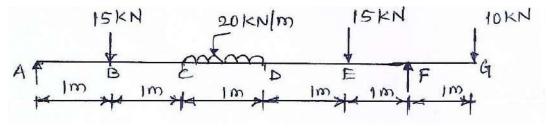
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B

40N/mm2

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Max. Marks: 56

07

|     |    | SLR-FM-1   | 07       |
|-----|----|--|----------|
|     |    | Set  | R        |
|     | b) | <ul> <li>Explain the following</li> <li>1) Assumption in torsion theory</li> <li>2) Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>   | 03<br>03 |
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|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.  | 04       |

S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

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- Instructions: 1) Q.No.1 is compulsory. It should be solved in first 30 minutes in the Answer book.
  - 2) All the sub-questions in Q.No.1 are compulsory for one mark each and every question has only one correct answer.

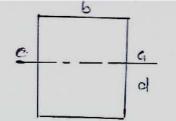
## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - If one end of a hinged column is made fixed and the other free, how much 1) is the critical load compared to the original value? b) 1/2
    - a) 1/4 Twice c)
- Four times d)
- For which one of the following columns, Euler buckling load  $4\pi^2 EI$  /  $L^2$  . 2)
  - Column with both hinged ends a)
  - Column with one end fixed and other end free b)
  - Column with both ends fixed c)
  - Column with one end fixed and other hinged d)
- The property by which an amount of energy is absorbed by a material 3) without plastic deformation, is called
  - Toughness b) Impact strength a) Ductility C)
    - Resilience d)
- In double integration method, third integration will be value of \_\_\_\_\_. 4) **Bending moment** 
  - Slope a) Deflection C)
- b) shear force d)
- A simply supported beam is of a rectangular section. It carries a uniformly 5) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - a) 2y b) 4y y/2 d) c) v/8
- 6) The layer at the center of gravity of the beam as shown in the below figure, will be



- a) In tension
- b) In compression
- Neither in tension nor in compression c)
- None of these d)

Max. Marks: 70

Set

S



14

Marks: 14

- Set S 7) If the value of Poisson's ratio is zero, then it means that The material is rigid a) b) The material is perfectly plastic There is no longitudinal strain in the material C) The longitudinal strain in the material is infinity d) 8) Which one of the following is correct? When a nut is tightened by placing a washer below it, the bolt will be subjected to \_\_\_\_\_ Compression only Tension a) b) Shear only d) Compression and shear C) 9) If at a section distant from one of the ends of the beam, M represents the bending moment. V the shear force and w the intensity of loading, then . dM/dx = Vi) ii) dV/dx = wiii) dw/dx = y (the deflection of the beam at the section) Select the correct answer using the codes given below: \_\_\_\_\_. a) i) and iii) b) i) and ii) ii) and iii) i), ii) and iii) c) d) A point, along the length of a beam subjected to loads, where bending 10) moment changes its sign, is known as the point of \_\_\_\_\_. a) Inflexion b) Maximum stress d) c) Zero shear force Contra flexure 11) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by \_\_\_\_\_. The diameter of the Mohr's circle a) Half the diameter of the Mohr's circle b) One-third the diameter of the Mohr's circle c) One-fourth the diameter of the Mohr's circle d) For a circular shaft of diameter d subjected to torque T, the maximum 12) value of the shear stress is \_\_\_\_\_. a)  $64T/\tau D^3$ b)  $32T/\tau D^3$  $16T/\tau D^3$  $8T/\tau D^3$ C) d) 13) In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to . The sum of the normal stresses a) Difference of the normal stresses b) Half the sum of the normal stresses C) Half the difference of the normal stresses d)
- 14) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed \_\_\_\_\_.
  - a) At the centre of the web
  - b) At the top edge of the top flange
  - c) At the bottom edge of the top flange
  - d) None of the above

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

## ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
  - 3) Figures to right indicate full marks.

0

D

4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

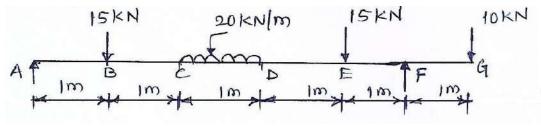
Q.2 a) Two planes AB and BC which are at right angles are acted upon by tensile of stress of 140 N/mm<sup>2</sup> and a compressive stress of 70 N/mm<sup>2</sup> respectively and also by stress 35 N/mm<sup>2</sup>. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.

b) A copper rod of 40 mm diameter is surrounded tightly by a cast iron tube of external diameter 80 mm & internal diameter 40mm, the ends being firmly fastened together. When it is subjected to a compressive load of 30 kN, what will be the load shared by each? Also determine the amount by which a compound bar shortens if it is 2 meter long. Eci = 175 GN/m<sup>2</sup>, Ec = 75 GN/m<sup>2</sup>

B

140N/mm2 N/mm2

- Q.3 a) A simply supported beam of span length 6m and 75mm diameter carries a uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - b) Calculate maximum intensity of shear stress induced and angle of twist produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
  - c) For a given material  $E = 110 \text{GN/m}^2$  and  $C = 42 \text{ GN/m}^2$ . Find the bulk 04 modulus and lateral contraction of a round bar of 37.5 mm diameter and 2.4 m long when stretched by 2.5 mm.
- Q.4 a) Draw SF & BM diagrams for the beam as shown in the fig. and mark the silent points. Find the position of point of Cotraflexure and maximum bending moment.



Max. Marks: 56

Seat No.

Set S

|     |    | SLR-FM-1   | 07       |
|-----|----|--|----------|
|     |    | Set  | S        |
|     | b) | <ul> <li>Explain the following</li> <li>1) Assumption in torsion theory</li> <li>2) Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>   | 03<br>03 |
| Q.5 | a) | A cantilever I section bean carries u.d.l. of 20 KN/m over its entire span 3m. the beam section carries its upper flange 90mm *10 mm, web 120mm *10mm and lower flange 120 mm* 15mm. determine shear stress distribution at important locations of cross section and show shear stress distribution diagram.   | 07       |
|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = $1 \times 10^5$ N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and f <sub>c</sub> = 550N/mm <sup>2</sup> | 07       |
| Q.6 | a) | A simply supported beam has a span of 4 m and rectangular cross-section 100mm * 200mm. Find uniformly distributed it can carry, if maximum bending stress & shear stress are not to exceed 10N/mm <sup>2</sup> & 0.6 N/mm <sup>2</sup>   | 06       |
|     | b) | What will be the instantaneous stress and elongation of a 25 mm diameter bar, 2.6 m long, suspended vertically, if a mass of 10 kg falls through a height of 300 mm onto a collar which is rigidly attached to the bottom end of the bar? Take $E = 200$ GPa.  | 04       |
|     | c) | Define the following<br>1) Equivalent length<br>2) Strain energy<br>3) Section Modulus<br>4) Proof resilience  | 04       |
| Q.7 | a) | A beam of length 5 m and uniform rectangular section is simply supported at its ends. It carries u.d.l. of 9 KN/m run over its entire span. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm <sup>2</sup> and central deflection 1 cm. $E=1*10^4$ N/mm <sup>2</sup>   | 06       |
|     | b) | Derive the expression for maximum shear stress in rectangular section is equal to 1.5 times average shear stress.  | 04       |
|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.  | 04       |

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Use of Steam tables and Mollier diagram is allowed.

- 2) Use of Scientific calculator is allowed.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 minutes.

**Mechanical Engineering** APPLIED THERMODYNAMICS

- 4) Assume suitable data If required and state it clearly.
- 5) Neat diagrams must be drawn wherever necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

4)

Seat

No.

#### Q.1 Choose the correct alternative from the options and rewrite the sentence. 14

- Kelvin-Planks Law deals with 1)
  - conversion of work b) conversion of heat a) C)
    - conversion of mass d) conversion of heat into work
- 2) The value of latent heat at a critical point for water-steam phase transformation is \_\_\_\_\_.
  - b) 1 a) 0 d) None of these c) Either 0 or 1

3) Coefficient of performance for heat pump may have value

- Slightly more than 0 Equal to 1 b) a) Greater than 1 None of these
  - C) d)
- Reversible adiabatic process has \_\_\_\_\_ b) ds > 0ds = 0a)
  - ds < 0 ds = dhc) d)
- 5) A device used to increase the temperature of saturated steam without raising its pressure, is called \_\_\_\_\_
  - a) fusible plug b) stop valve
  - c) superheater d) economizer
- 6) Carnot cycle comprises of \_\_\_\_\_
  - a) two isentropic processes and two constant volume processes
  - two isentropic processes and two isothermal processes b)
  - two isothermal processes and two cont. pressure processes C)
  - none of the above d)
- 7) The steam is superheated in boiler at
  - Isothermal process b) Isobaric process a) Isochoric process d) None of these c)
- Effect of friction in nozzle \_\_\_\_\_ dryness fraction of steam. 8)
  - a) increases b) decreases
  - no change none of the above c) d)



Max. Marks: 70

**SLR-FM-108** 

Marks: 14

- 9) The ratio of exit pressure to inlet pressure for maximum mass flow rate per unit area of steam through nozzle when steam is initially superheated is
  - 0.555 a) b) d)
  - 0.5457 c)

10)

a)

- Evaporative type of condenser has steam in pipes surrounded by water
  - a) water in pipes surrounded by steam b)
  - either (a) and (b) c)
  - none of these d)
- 11) Enthalpy drops in impulse turbine in \_\_\_\_\_.
  - Moving blades a)
  - Both in fixed and moving blades b)
  - Only in fixed blades c)
  - d) None of the above
- 12) For maximum blade efficiency for single stage impulse turbine, speed ratio  $(\rho)$  is
  - a)  $\rho = \overline{\cos^2 \alpha}$ b)  $\rho = \cos \alpha$  $\rho = \frac{\cos \alpha}{2}$ d)  $\rho = \cos^2 \alpha / 2$ c)
- 13) The compression work requirement is minimum in case of the compression following process of .
  - Adiabatic type a)
    - Isochoric type b) Hyperbolic type
  - c) Isothermal type d)
- 14) Intercooling in between the compression process of multistage compression cycle causes.
  - b) Increase in compression work
  - Increase in expansion work c)

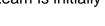
Reduction in expansion work

Reduction in compression work d)

Set

**SLR-FM-108** 

0.578 0.6



## Seat No.

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMICS

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Use of Steam tables and Mollier diagram is allowed.

- 2) Use of Scientific calculator is allowed.
- 3) Out of remaining questions solve any two questions from each Section.
- 4) Assume suitable data If required and state it clearly.
- 5) Neat diagrams must be drawn wherever necessary.

## Section – I

## Q.2 Attempt the following questions.

- a) State first law of thermodynamics. What are its limitations?
- **b)** Calculate the standard enthalpy at 298.15 K for the reaction.  $4NH_3(g) + 50_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

Given that standard enthalpies of formation for as.  $NH_3(_{\sigma})$  = -46.055 KJ/mole

NO(g) = 90.435 KJ/mole

 $H_2O(_g) = -24.997 \text{ KJ/mol.}$ 

 $O_2(g) = 0$  KJ/mol

- c) Heat engine receives reversibly 420 KJ/cycle of heat from a source at 327°C
   05 and rejected heat reversibly to a sink at 27°C. There is no other heat transfer. Show which of following cases the cycle is irreversible, reversible and impossible.
  - 1) 210 KJ/cycle is rejected
  - 2) 105 KJ/cycle is rejected
  - 3) 315 KJ/ cycle is rejected

## Q.3 Attempt the following questions.

- a) Derive an expression for entropy change for Isobaric process.
- b) Two Carnot engines A and B are connected in series between thermal reservoirs maintained at 1500K and 300K respectively. Engine A receives 1000 kJ of heat from the high temp reservoir and rejects heat to Carnot engine B. Engine B takes heat rejected by engine A and rejects heat to low temp reservoir. If engine A and B have equal thermal efficiencies, determine.
  - i) the heat rejected by engine B
  - ii) the temp at which heat is rejected by engine A
  - iii) the amount of heat taken by engine
  - iv) work done by engine A and B

Max. Marks: 56

Set

05

04

04 05

|     |           | Set  | Ρ  |
|-----|-----------|--|----|
|     | c)        | The following data were obtained during the boiler trial for one hour<br>Feed water supplied = 1520 kg<br>Temperature of feed water = 30°C<br>Steam pressure and quality = 8.5 bar, 0.95 dryness fraction,<br>Coal burnt = 200 kg<br>Calorific Value of coal = 30000 KJ/kg<br>Unburnt coal with collected = 16 kg<br>Calorific Value of unburnt coal with ash = 2730 kJ/kg<br>Mass of flue gases = 17.3 kg/kg of coal<br>Take Specific heat of flue gas = 1.1 kJ/kg K<br>Boiler room temperature = 34°C<br>Temperature of flue gas = 325°C<br>Determine.<br>i) Boiler efficiency<br>ii) Heat balance sheet per kg of coal basis. | 05 |
| Q.4 | Att<br>a) | empt the following questions.<br>Explain the following terms<br>i) Equivalent evaporation<br>ii) Boiler efficiency   | 04 |
|     | b)        | Explain idea Reheat Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.  | 05 |
|     | c)        | <ul> <li>In a Rankine cycle dry and saturated steam is entering the turbine at 20 bar pressure. The exhaust pressure of steam from turbine is 0.1 bar. By considering all the processes reversible, find:</li> <li>i) Cycle thermal efficiency</li> <li>ii) Work ratio</li> <li>iii) Steam rate</li> </ul>   | 05 |
|     |           | Section – II   |    |
| Q.5 |           | empt the following questions.  | 04 |
|     | a)        | Derive an expression for maximum discharge through the nozzle.   | 04 |

- b) Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150 m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine theoretical and actual exit velocity.
- c) Explain construction and working of low level jet condensers with neat sketch. 05

## Q.6 Attempt the following questions.

- a) What do you mean by compounding of steam turbines? Discuss pressure 04 velocity compounding steam turbines.
- b) In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.
  - i) The resultant thrust on the blade
  - ii) Power Developed
  - iii) Blade efficiency
- c) Define the terms Vacuum Efficiency and Condenser Efficiency with appropriate formulae.



#### Q.7 Attempt the following questions.

- a) Write equation for work done/cycle for single stage single acting reciprocating 04 compressor with clearance and without clearance. Explain the effect of clearance on work done.
  - i) per kg of air
  - ii) per cycle
- b) Derive the equation for optimum interstage pressure for 2 stage reciprocating 05 compressor with prefect intercooling.
- c) A two-stage reciprocating air compressor with perfect intercooling takes in air **05** at 1 bar pressure and 27°C. The law of compression in both the stages is  $PV^{1.3}$  = Constant. The compressed air is delivered at 9 bar from the H.P. cylinder to an air receiver. Calculate per kg of air,
  - i) The minimum work done
  - ii) The heat rejected to the intercooler, If  $C_p$  for air = 1.005 kj/kgK

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

#### APPLIED THERMODYNAMICS Day & Date: Tuesday, 10-12-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Use of Steam tables and Mollier diagram is allowed.

- 2) Use of Scientific calculator is allowed.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 minutes.
- 4) Assume suitable data If required and state it clearly.
- 5) Neat diagrams must be drawn wherever necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

C)

#### Q.1 Choose the correct alternative from the options and rewrite the sentence. 14

- Effect of friction in nozzle \_\_\_\_\_ dryness fraction of steam. 1)
  - a) increases no change
- 2) The ratio of exit pressure to inlet pressure for maximum mass flow rate per unit area of steam through nozzle when steam is initially superheated is
  - 0.555 b) 0.578 a)
  - C) 0.5457 d) 0.6
- 3) Evaporative type of condenser has \_
  - a) steam in pipes surrounded by water
  - water in pipes surrounded by steam b)
  - either (a) and (b) C)
  - d) none of these
- Enthalpy drops in impulse turbine in \_\_\_\_\_. 4)
  - Moving blades a)
  - Both in fixed and moving blades b)
  - Only in fixed blades c)
  - None of the above d)

#### 5) For maximum blade efficiency for single stage impulse turbine, speed ratio (*ρ*) is \_\_\_\_\_.

a) 
$$\rho = \cos^2 \alpha$$
  
b)  $\rho = \cos \alpha$   
c)  $\rho = \frac{\cos \alpha}{2}$   
d)  $\rho = \cos^2 \alpha / 2$ 

- 6) The compression work requirement is minimum in case of the compression following process of \_\_\_\_\_.
  - Adiabatic type a)

c)

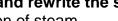
Isothermal type

- b) Isochoric type
- Hyperbolic type d)

Marks: 14

Max. Marks: 70





- decreases
- none of the above
- d)
- b)

|     |  |   |                     | Set  | Q |
|-----|--|---|---------------------|--|---|
| 7)  |  | ercooling in between the comprese<br>npression cycle causes.<br>Reduction in expansion work<br>Increase in expansion work |                     | process of multistage<br>Increase in compression work<br>Reduction in compression work |   |
| 8)  | Kel<br>a)<br>c)  | vin-Planks Law deals with<br>conversion of work<br>conversion of mass   |                     | conversion of heat<br>conversion of heat into work                                     |   |
| 9)  |  | e value of latent heat at a critical p<br>nsformation is<br>0<br>Either 0 or 1  | boint f<br>b)<br>d) | or water-steam phase<br>1<br>None of these   |   |
| 10) |  | efficient of performance for heat p<br>Slightly more than 0<br>Greater than 1   | b)                  | may have value<br>Equal to 1<br>None of these  |   |
| 11) |  | versible adiabatic process has<br>ds = 0<br>ds < 0  |                     | <br>ds > 0<br>ds = dh  |   |
| 12) | rais   | evice used to increase the tempe<br>ing its pressure, is called<br>fusible plug<br>superheater                            |                     |  |   |
| 13) | <ul> <li>Carnot cycle comprises of</li> <li>a) two isentropic processes and two constant volume processes</li> <li>b) two isentropic processes and two isothermal processes</li> <li>c) two isothermal processes and two cont. pressure processes</li> <li>d) none of the above</li> </ul> |   |                     |  |   |
| 14) | The<br>a)  | e steam is superheated in boiler a<br>Isothermal process  | t<br>b)             |  |   |

- c) Isochoric process
- b) Isobaric processd) None of these

Page **7** of **20** 

## Seat No.

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMICS

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Use of Steam tables and Mollier diagram is allowed.

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## Section – I

## Q.2 Attempt the following questions.

- a) State first law of thermodynamics. What are its limitations?
- **b)** Calculate the standard enthalpy at 298.15 K for the reaction.  $4NH_3(g) + 50_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

Given that standard enthalpies of formation for as.  $NH_3(_g)$ = -46.055 KJ/mole

 $NO(_g) = 90.435 \text{ KJ/mole}$ 

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 $O_2(g) = 0 \text{ KJ/mol}$ 

- c) Heat engine receives reversibly 420 KJ/cycle of heat from a source at 327°C
   05 and rejected heat reversibly to a sink at 27°C. There is no other heat transfer. Show which of following cases the cycle is irreversible, reversible and impossible.
  - 1) 210 KJ/cycle is rejected
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  - 3) 315 KJ/ cycle is rejected

## Q.3 Attempt the following questions.

- a) Derive an expression for entropy change for Isobaric process.
- b) Two Carnot engines A and B are connected in series between thermal reservoirs maintained at 1500K and 300K respectively. Engine A receives 1000 kJ of heat from the high temp reservoir and rejects heat to Carnot engine B. Engine B takes heat rejected by engine A and rejects heat to low temp reservoir. If engine A and B have equal thermal efficiencies, determine.
  - i) the heat rejected by engine B
  - ii) the temp at which heat is rejected by engine A
  - iii) the amount of heat taken by engine
  - iv) work done by engine A and B

Max. Marks: 56

Set

04

05

04 05

|          |                  | Set  | Q        |
|----------|------------------|--|----------|
|          | с)               | The following data were obtained during the boiler trial for one hour<br>Feed water supplied = 1520 kg<br>Temperature of feed water = 30°C<br>Steam pressure and quality = 8.5 bar, 0.95 dryness fraction,<br>Coal burnt = 200 kg<br>Calorific Value of coal = 30000 KJ/kg<br>Unburnt coal with collected = 16 kg<br>Calorific Value of unburnt coal with ash = 2730 kJ/kg<br>Mass of flue gases = 17.3 kg/kg of coal<br>Take Specific heat of flue gas = 1.1 kJ/kg K<br>Boiler room temperature = 34°C<br>Temperature of flue gas = 325°C<br>Determine.<br>i) Boiler efficiency<br>ii) Heat balance sheet per kg of coal basis. | 05       |
| Q.4      | Δtt              | empt the following questions.  | 04       |
| <b>_</b> | a)               | Explain the following terms<br>i) Equivalent evaporation<br>ii) Boiler efficiency  |          |
|          | b)               | Explain idea Reheat Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.  | 05       |
|          | c)               | <ul> <li>In a Rankine cycle dry and saturated steam is entering the turbine at 20 bar pressure. The exhaust pressure of steam from turbine is 0.1 bar. By considering all the processes reversible, find:</li> <li>i) Cycle thermal efficiency</li> <li>ii) Work ratio</li> <li>iii) Steam rate</li> </ul>   | 05       |
|          |                  | Section – II   |          |
| Q.5      | Atte<br>a)<br>b) | empt the following questions.<br>Derive an expression for maximum discharge through the nozzle.<br>Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150 m/s<br>and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine  | 04<br>05 |

- theoretical and actual exit velocity.
- c) Explain construction and working of low level jet condensers with neat sketch. 05

## Q.6 Attempt the following questions.

- a) What do you mean by compounding of steam turbines? Discuss pressure 04 velocity compounding steam turbines.
- b) In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.
  - i) The resultant thrust on the blade
  - ii) Power Developed
  - iii) Blade efficiency
- c) Define the terms Vacuum Efficiency and Condenser Efficiency with appropriate formulae.

05



#### Q.7 Attempt the following questions.

- a) Write equation for work done/cycle for single stage single acting reciprocating 04 compressor with clearance and without clearance. Explain the effect of clearance on work done.
  - i) per kg of air
  - ii) per cycle
- b) Derive the equation for optimum interstage pressure for 2 stage reciprocating 05 compressor with prefect intercooling.
- c) A two-stage reciprocating air compressor with perfect intercooling takes in air 05 at 1 bar pressure and 27°C. The law of compression in both the stages is PV<sup>1.3</sup> = Constant. The compressed air is delivered at 9 bar from the H.P. cylinder to an air receiver. Calculate per kg of air,
  - i) The minimum work done
  - ii) The heat rejected to the intercooler, If  $C_p$  for air = 1.005 kj/kgK

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

## APPLIED THERMODYNAMICS

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Use of Steam tables and Mollier diagram is allowed.

- 2) Use of Scientific calculator is allowed.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 minutes.
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## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternative from the options and rewrite the sentence. 14

- A device used to increase the temperature of saturated steam without 1) raising its pressure, is called \_\_\_\_\_
  - a) fusible plug b) stop valve
  - superheater d) economizer C)
- 2) Carnot cycle comprises of
  - a) two isentropic processes and two constant volume processes
  - two isentropic processes and two isothermal processes b)
  - c) two isothermal processes and two cont. pressure processes
  - none of the above d)
- 3) The steam is superheated in boiler at
  - Isothermal process b) Isobaric process a)
  - Isochoric process None of these c) d)
- Effect of friction in nozzle \_\_\_\_\_ dryness fraction of steam. 4)
  - a) increases decreases b)
  - c) no change d) none of the above
- The ratio of exit pressure to inlet pressure for maximum mass flow rate per 5) unit area of steam through nozzle when steam is initially superheated is

| a) | 0.555  | b) | 0.578 |
|----|--------|----|-------|
| c) | 0.5457 | d) | 0.6   |

- 6) Evaporative type of condenser has
  - a) steam in pipes surrounded by water
  - b) water in pipes surrounded by steam
  - c) either (a) and (b)
  - none of these d)
- Enthalpy drops in impulse turbine in \_\_\_\_\_. 7)
  - Moving blades a)
  - Both in fixed and moving blades b)
  - Only in fixed blades C)
  - None of the above d)

## **SLR-FM-108**

# Max. Marks: 70

Set R

Marks: 14

|     |  |        | Set R                              |
|-----|--|--------|------------------------------------|
| 8)  | For maximum blade efficiency for sin $(\rho)$ is         | ngle s | stage impulse turbine, speed ratio |
|     | ( $\rho$ ) is<br>a) $\rho = \cos^2 \alpha$               | b)     | $\rho = \cos \alpha$               |
|     | c) $\rho = \frac{\cos \alpha}{2}$                        | d)     | $\rho = \cos^2 \alpha / 2$         |
| 9)  | The compression work requirement following process of    | is mir | nimum in case of the compression   |
|     | a) Adiabatic type  | b)     | Isochoric type                     |
|     | c) Isothermal type                                       | d)     | Hyperbolic type                    |
| 10) | Intercooling in between the compression cycle causes.    |        | -                                  |
|     | a) Reduction in expansion work                           |        |                                    |
|     | c) Increase in expansion work                            |        | Reduction in compression work      |
| 11) | Kelvin-Planks Law deals with                             | ·      |                                    |
|     | a) conversion of work                                    | ,      |                                    |
|     | c) conversion of mass                                    | d)     | conversion of heat into work       |
| 12) | The value of latent heat at a critical transformation is | point  | for water-steam phase              |
|     | a) 0   | b)     | 1                                  |
|     | c) Either 0 or 1   | d)     | None of these                      |
| 13) | Coefficient of performance for heat p                    | oump   | may have value                     |
|     | a) Slightly more than 0                                  |        | Equal to 1                         |
|     | c) Greater than 1  | d)     | None of these                      |
| 14) | Reversible adiabatic process has                         |        |                                    |
|     | a) ds = 0  | b)     | ds > 0                             |
|     |  | 1)     |                                    |

a) ds = 0b) ds > 0c) ds < 0d) ds = dh

| Seat |  |
|------|--|
| No.  |  |

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMICS

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Use of Steam tables and Mollier diagram is allowed.

- 2) Use of Scientific calculator is allowed.
- 3) Out of remaining questions solve any two questions from each Section.
- 4) Assume suitable data If required and state it clearly.
- 5) Neat diagrams must be drawn wherever necessary.

## Section – I

## Q.2 Attempt the following questions.

- a) State first law of thermodynamics. What are its limitations?
- **b)** Calculate the standard enthalpy at 298.15 K for the reaction.  $4NH_3(r) + 50_2(r) \rightarrow 4NO(r) + 6H_2O(r)$

Given that standard enthalpies of formation for as.  $NH_3(_{\sigma})$  = -46.055 KJ/mole

 $NO(_g) = 90.435 \text{ KJ/mole}$ 

 $H_2O(_g) = -24.997 \text{ KJ/mol}.$ 

 $O_2(g) = 0$  KJ/mol

- c) Heat engine receives reversibly 420 KJ/cycle of heat from a source at 327°C 05 and rejected heat reversibly to a sink at 27°C. There is no other heat transfer. Show which of following cases the cycle is irreversible, reversible and impossible.
  - 1) 210 KJ/cycle is rejected
  - 2) 105 KJ/cycle is rejected
  - 3) 315 KJ/ cycle is rejected

## Q.3 Attempt the following questions.

- a) Derive an expression for entropy change for Isobaric process.
- b) Two Carnot engines A and B are connected in series between thermal reservoirs maintained at 1500K and 300K respectively. Engine A receives 1000 kJ of heat from the high temp reservoir and rejects heat to Carnot engine B. Engine B takes heat rejected by engine A and rejects heat to low temp reservoir. If engine A and B have equal thermal efficiencies, determine.
  - i) the heat rejected by engine B
  - ii) the temp at which heat is rejected by engine A
  - iii) the amount of heat taken by engine
  - iv) work done by engine A and B

Max. Marks: 56

Set

04 05

> 04 05

|     |            | Set  | R  |
|-----|------------|--|----|
|     | <b>c</b> ) | The following data were obtained during the boiler trial for one hour<br>Feed water supplied = 1520 kg<br>Temperature of feed water = 30°C<br>Steam pressure and quality = 8.5 bar, 0.95 dryness fraction,<br>Coal burnt = 200 kg<br>Calorific Value of coal = 30000 KJ/kg<br>Unburnt coal with collected = 16 kg<br>Calorific Value of unburnt coal with ash = 2730 kJ/kg<br>Mass of flue gases = 17.3 kg/kg of coal<br>Take Specific heat of flue gas = 1.1 kJ/kg K<br>Boiler room temperature = 34°C<br>Temperature of flue gas = 325°C<br>Determine.<br>i) Boiler efficiency<br>ii) Heat balance sheet per kg of coal basis. | 05 |
| Q.4 | Atte<br>a) | empt the following questions.<br>Explain the following terms<br>i) Equivalent evaporation<br>ii) Boiler efficiency   | 04 |
|     | b)         | Explain idea Reheat Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.  | 05 |
|     | c)         | <ul> <li>In a Rankine cycle dry and saturated steam is entering the turbine at 20 bar pressure. The exhaust pressure of steam from turbine is 0.1 bar. By considering all the processes reversible, find:</li> <li>i) Cycle thermal efficiency</li> <li>ii) Work ratio</li> <li>iii) Steam rate</li> </ul>   | 05 |
|     |            | Section – II   |    |
| Q.5 | Atte<br>a) | empt the following questions.<br>Derive an expression for maximum discharge through the nozzle.  | 04 |

- b) Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150 m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine theoretical and actual exit velocity.
- c) Explain construction and working of low level jet condensers with neat sketch. 05

## Q.6 Attempt the following questions.

- a) What do you mean by compounding of steam turbines? Discuss pressure 04 velocity compounding steam turbines.
- b) In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.
  - i) The resultant thrust on the blade
  - ii) Power Developed
  - iii) Blade efficiency
- c) Define the terms Vacuum Efficiency and Condenser Efficiency with appropriate formulae.

05



#### Q.7 Attempt the following questions.

- a) Write equation for work done/cycle for single stage single acting reciprocating 04 compressor with clearance and without clearance. Explain the effect of clearance on work done.
  - i) per kg of air
  - ii) per cycle
- b) Derive the equation for optimum interstage pressure for 2 stage reciprocating 05 compressor with prefect intercooling.
- c) A two-stage reciprocating air compressor with perfect intercooling takes in air 05 at 1 bar pressure and 27°C. The law of compression in both the stages is PV<sup>1.3</sup> = Constant. The compressed air is delivered at 9 bar from the H.P. cylinder to an air receiver. Calculate per kg of air,
  - i) The minimum work done
  - ii) The heat rejected to the intercooler, If  $C_p$  for air = 1.005 kj/kgK

# Set

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** APPLIED THERMODYNAMICS

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Use of Steam tables and Mollier diagram is allowed.

- 2) Use of Scientific calculator is allowed.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 minutes.
- 4) Assume suitable data If required and state it clearly.
- 5) Neat diagrams must be drawn wherever necessary.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

1)

6)

Seat

No.

#### Q.1 Choose the correct alternative from the options and rewrite the sentence. 14

- Evaporative type of condenser has .
  - steam in pipes surrounded by water a)
  - b) water in pipes surrounded by steam
  - either (a) and (b) c)
  - none of these d)
- 2) Enthalpy drops in impulse turbine in \_\_\_\_\_.
  - Moving blades a)
  - Both in fixed and moving blades b)
  - Only in fixed blades c)
  - None of the above d)
- For maximum blade efficiency for single stage impulse turbine, speed ratio 3) (ρ) is \_\_\_\_\_
  - a)  $\rho = \cos^2 \alpha$ b)  $\rho = \cos \alpha$  $\rho = \frac{\cos \alpha}{2}$ d)  $\rho = \cos^2 \alpha / 2$ c)
- The compression work requirement is minimum in case of the compression 4) following process of \_\_\_\_\_.
  - a) Adiabatic type b) Isochoric type c) Isothermal type d) Hyperbolic type
- Intercooling in between the compression process of multistage 5)
  - compression cycle causes.

a) conversion of work c) conversion of mass

- Reduction in expansion work a)
- Increase in expansion work c)

Kelvin-Planks Law deals with

- b) conversion of heat d)
- The value of latent heat at a critical point for water-steam phase 7) transformation is \_\_\_\_\_.
  - a) 0 b)
  - C) Either 0 or 1 d) None of these

Max. Marks: 70

Marks: 14





b)

d)

- conversion of heat into work

Increase in compression work

Reduction in compression work

|     |  |                   | <b>SLR-FM-108</b>  |  |
|-----|--|-------------------|--|--|
|     |  |                   | Set S  |  |
| 8)  | Coefficient of performance for heat<br>a) Slightly more than 0<br>c) Greater than 1  |                   | Equal to 1   |  |
| 9)  | Reversible adiabatic process has _<br>a) ds = 0<br>c) ds < 0   | b)                | <br>ds > 0<br>ds = dh                                    |  |
| 10) | A device used to increase the temp<br>raising its pressure, is called<br>a) fusible plug<br>c) superheater   |                   | e of saturated steam without<br>stop valve<br>economizer |  |
| 11) | <ul> <li>Carnot cycle comprises of</li> <li>a) two isentropic processes and two constant volume processes</li> <li>b) two isentropic processes and two isothermal processes</li> <li>c) two isothermal processes and two cont. pressure processes</li> <li>d) none of the above</li> </ul> |                   |  |  |
| 12) | The steam is superheated in boiler<br>a) Isothermal process<br>c) Isochoric process  |                   | Isobaric process   |  |
| 13) | Effect of friction in nozzle dr<br>a) increases<br>c) no change  | yness<br>b)<br>d) | decreases  |  |
| 14) | The ratio of exit pressure to inlet pressure for maximum mass flow rate per<br>unit area of steam through nozzle when steam is initially superheated is  |                   |  |  |
|     | a) 0.555   | b)                | 0.578  |  |

- a) 0.555 c) 0.5457
- 0.578
- b) d) 0.6

## Seat No.

## S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMICS

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

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## Section – I

## Q.2 Attempt the following questions.

- a) State first law of thermodynamics. What are its limitations?
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Given that standard enthalpies of formation for as.

NH<sub>3</sub>(<sub>g</sub>)= -46.055 KJ/mole

 $NO(_g) = 90.435 \text{ KJ/mole}$ 

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- b) Two Carnot engines A and B are connected in series between thermal reservoirs maintained at 1500K and 300K respectively. Engine A receives 1000 kJ of heat from the high temp reservoir and rejects heat to Carnot engine B. Engine B takes heat rejected by engine A and rejects heat to low temp reservoir. If engine A and B have equal thermal efficiencies, determine.
  - i) the heat rejected by engine B
  - ii) the temp at which heat is rejected by engine A
  - iii) the amount of heat taken by engine
  - iv) work done by engine A and B

Max. Marks: 56

Set

04 05

> 04 05

|              |            | Set  | S  |
|--------------|------------|--|----|
|              | c)         | The following data were obtained during the boiler trial for one hour<br>Feed water supplied = 1520 kg<br>Temperature of feed water = 30°C<br>Steam pressure and quality = 8.5 bar, 0.95 dryness fraction,<br>Coal burnt = 200 kg<br>Calorific Value of coal = 30000 KJ/kg<br>Unburnt coal with collected = 16 kg<br>Calorific Value of unburnt coal with ash = 2730 kJ/kg<br>Mass of flue gases = 17.3 kg/kg of coal<br>Take Specific heat of flue gas = 1.1 kJ/kg K<br>Boiler room temperature = 34°C<br>Temperature of flue gas = 325°C<br>Determine.<br>i) Boiler efficiency<br>ii) Heat balance sheet per kg of coal basis. | 05 |
| Q.4          | Atte<br>a) | empt the following questions.<br>Explain the following terms<br>i) Equivalent evaporation<br>ii) Boiler efficiency   | 04 |
|              | b)         | Explain idea Reheat Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.  | 05 |
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| Section – II |            |  |    |
| Q.5          | Atte<br>a) | empt the following questions.<br>Derive an expression for maximum discharge through the nozzle.  | 04 |

- b) Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150 m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine theoretical and actual exit velocity.
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## Q.6 Attempt the following questions.

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- b) In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.
  - i) The resultant thrust on the blade
  - ii) Power Developed
  - iii) Blade efficiency
- c) Define the terms Vacuum Efficiency and Condenser Efficiency with appropriate formulae.

05



#### Q.7 Attempt the following questions.

- a) Write equation for work done/cycle for single stage single acting reciprocating 04 compressor with clearance and without clearance. Explain the effect of clearance on work done.
  - i) per kg of air
  - ii) per cycle
- b) Derive the equation for optimum interstage pressure for 2 stage reciprocating 05 compressor with prefect intercooling.
- c) A two-stage reciprocating air compressor with perfect intercooling takes in air 05 at 1 bar pressure and 27°C. The law of compression in both the stages is PV<sup>1.3</sup> = Constant. The compressed air is delivered at 9 bar from the H.P. cylinder to an air receiver. Calculate per kg of air,
  - i) The minimum work done
  - ii) The heat rejected to the intercooler, If  $C_p$  for air = 1.005 kj/kgK

## Set S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**ENGINEERING METHAMATICS - III** 

Day & Date: Thursday, 12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- Use of calculator is allowed.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Choose the correct alternatives from the options and rewrite the sentence. Q.1 14

- 1) The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_.
  - b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ c)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$

2) The value of 
$$\frac{1}{D-a} X =$$
\_\_\_\_\_.  
a)  $e^{-ax} \int e^{-ax} X dx$  b)  $e^{-ax} \int e^{ax} X dx$ 

C) 
$$e^{ax} \int e^{-ax} X dx$$
 d)  $e^{ax} \int e^{ax} X dx$ 

3) On putting  $(1 + x) = e^t$  the differential equation  $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} = y = 2 \sin[\log(1+x)]$  is transformed to \_\_\_\_\_. b)  $(D^2 + 1)Y = 2\sin t \log t$ a)  $(D^2 + 1)Y = 2\sin t$ c)  $(D^2 + D)Y = 2 \sin t$ d)  $(D^2 + 2D + 1)Y = 2 \sin e^t$ The  $L(e^{2t} \sin t)$  is \_\_\_\_\_. a)  $\frac{1}{s^2-4}$ 4) b)  $\frac{1}{s^2 - 4s + 5}$ c)  $\frac{1}{s^2 - 4s + 1}$ d)  $\frac{1}{s^2 - 1}$  $L^{-1}\left[\frac{1}{(s+2)^2}\right] = \underline{\qquad}.$ a)  $e^{-2t} t$ 5) b) c)  $e^{-2t} t$ None of these d) The value of integral  $\int_{0}^{\infty} e^{-st} t^{5} dt$  is 6)

a) 
$$\frac{1}{s^5}$$
  
c)  $\frac{5}{s^6}$   
b)  $\frac{1}{s^6}$   
c)  $\frac{5}{s^6}$   
b)  $\frac{1}{s^6}$   
c)  $\frac{5}{s^6}$ 

7) 
$$L^{-1}[\phi(s+a)] =$$
  
a)  $e^{-at}L^{-1}[\phi(s)]$   
b)  $e^{t}L^{-1}[\phi(s)]$   
c)  $t L^{-1}[\phi(s)]$   
d)  $e^{at}L^{-1}[\phi(s)]$ 

## SLR-FM-109

Ρ

Max. Marks: 70

Marks: 14

|     |   | Set P                       |
|-----|---|-----------------------------|
| 8)  | The solution of $p^2q^3 = 1$ is<br>a) $x^2y^3 = 1$ b) $x^2$<br>c) $y^3 = 1 - x^2$ d) no   | $= 1 - y^3$<br>one of these |
| 9)  | The area under std. normal curve from $z = -$ a) 1b) 0c) 0.5d) 1.5  |                             |
| 10) | For a poisson distribution, which of the followa) Mean < Variance   | ean = Variance              |
| 11) |   | $=-v_r, u_	heta=v_	heta$    |
|     | c) $u_{\theta} = -rv_r, ru_r = v_{\theta}$ d) $u_{\theta}$  | 1 0 0                       |
| 12) | The value of integral $\int_{0}^{2+i} \bar{z}^2 dz$ along $x = 2y$<br>a) $\frac{1}{3}(10+5i)$ b) $\frac{1}{3}(10+5i)$ c) $(10+5i)$ d) $(10+5i)$ | 10 - 5i)                    |
| 13) | The Fourier series of $f(x) = 1 - x^2$ in (-1,1)<br>a) only sine series b) on<br>c) both sine & cosine series d) no                             | ly cosine series            |
| 14) | Which of the following functions can not be exthe interval $(-\pi, \pi)$ a) $e^x$ b) $ x $ c) cosecxd) $x^2$                                    |                             |

|        |                | Mechanical Engineering<br>ENGINEERING METHAMATICS- III   |                |
|--------|----------------|--|----------------|
|        |                | e: Thursday,12-12-2019<br>0 AM To 01:00 PM   | Max. Marks: 56 |
| Instru | uctio          | <ul> <li>ns: 1) All questions are compulsory.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>   |                |
|        |                | Section – I  |                |
| Q.2    | a)<br>b)<br>c) | mpt any Three.<br>Solve $(D^3 - 1)y = (1 + e^x)^2$<br>Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$<br>Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$<br>Solve $(x^2D^2 - 3xD + 5)y = x^2 \sin(\log x)$ | 09             |
| Q.3    |                | mpt any Three.   | 09             |
|        |                | Prove that $\int_0^\infty e^{-2t} \cosh^5 t  dt = \frac{2}{7}$<br>Evaluate $L[(t + \sin t)^2]$   |                |
|        | c)             | Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$   |                |
|        | d)             | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2-1)}$  | +9)            |
|        | e)             | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$   |                |
| Q.4    | Atte<br>a)     | <b>mpt any Two.</b><br>Find:<br>1) $L[t^2H(t-3)]$  | 10             |
|        | b)             | 2) $L[\sin 2 t  \delta(t-2)]$<br>A body executes damped forced vibration given by the equation $(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the owner<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$   | cases          |

c) Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

**SLR-FM-109** 

Set P

## Seat No.

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019

#### C

#### C

#### C

#### Section-II

#### Q.5 Attempt any Three.

- a) Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- c) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- **d)** Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$
- **e)** Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ .

#### Q.6 Attempt any Three.

- **a)** Solve (z y)p (z x)q = y x
- **b)** Solve  $p^3 + q^3 = 27 z$
- c) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

e) Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ 

#### Q.7 Attempt any Two.

a) In a normal distribution 31% items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].

**b)** Evaluate. 
$$c \oint \frac{4z-1}{z^2-3z-4} dz$$
 where c is a elliose  $x^2 + 4y^2 = 4$ 

**c)** Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$ 

09

**SLR-FM-109** 

Set

10

Page 5 of 16

book. 2) Figures to the right indicate full marks. Use of calculator is allowed. MCQ/Objective Type Questions Marks: 14 Choose the correct alternatives from the options and rewrite the sentence. 14 The solution of  $p^2q^3 = 1$  is \_\_\_\_\_. 1) a)  $x^2y^3 = 1$ c)  $y^3 = 1 - x^2$ b)  $x^2 = 1 - y^3$ d) none of these The area under std. normal curve from  $z = -\infty$  to z = 0 is \_\_\_\_\_. 2) a) 1 b) 0 c) 0.5 d) 1.5 For a poisson distribution, which of the following is true? 3) a) Mean < Variance Mean = Variance b) c) Mean  $\times$  Variance = 1 Mean > Variance d) Cauchy- Riemann equations for  $f(re^{i\theta})$  to be analytic are \_\_\_\_\_. 4) a)  $u_r = v_r$ ,  $u_\theta = -v_\theta$ b)  $u_r = -v_r, u_\theta = v_\theta$ c)  $u_{\theta} = -rv_r, ru_r = v_{\theta}$ d)  $u_{ heta}=r\,v_r$  ,  $u_{ heta}=rv_{ heta}$ 

- The value of integral  $\int_0^{2+i} \bar{z}^2 dz$  along x = 2y is \_\_\_\_\_. a)  $\frac{1}{2}(10+5i)$  b)  $\frac{1}{3}(10-5i)$ . 5) a)  $\frac{1}{2}(10+5i)$
- c) (10 + 5i)(10 - 5i)d) The Fourier series of  $f(x) = 1 - x^2$  in (-1,1) contains \_\_\_\_\_. 6)
  - only cosine series only sine series b) a) both sine & cosine series d) none of these c)
- 7) Which of the following functions can not be expanded in Fourier series in the interval  $(-\pi, \pi)$ 
  - a)  $e^x$ b) |x| $\chi^2$ d) c) cosecx

#### 8) The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_.

b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ c)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$  d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ 

S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING METHAMATICS - III** 

Day & Date: Thursday, 12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer

**Duration: 30 Minutes** 

SLR-FM-109



Max. Marks: 70

Seat No.

Q.1

Set Q The value of  $\frac{1}{D-a} X =$ \_\_\_\_\_. 9) a)  $e^{-ax} \int e^{-ax} X dx$ b)  $e^{-ax} \int e^{ax} X dx$ c)  $e^{ax} \int e^{-ax} X dx$ d)  $e^{ax} \int e^{ax} X dx$ On putting  $(1 + x) = e^t$  the differential equation 10)  $(1+x)^{2} \frac{d^{2}y}{dx^{2}} + (1+x)\frac{dy}{dx} = y = 2\sin[\log(1+x)] \text{ is transformed to } \_\_\_\_.$ a)  $(D^{2}+1)Y = 2\sin t$  b)  $(D^{2}+1)Y = 2\sin t\log t$ c)  $(D^{2}+D)Y = 2\sin t$  d)  $(D^{2}+2D+1)Y = 2\sin e^{t}$ The  $L(e^{2t} \sin t)$  is \_\_\_\_\_. 11) a) <u>1</u>  $\frac{1}{s^2 - 4s + 5}$ b)  $s^2 - 4$ c)  $\frac{1}{s^2 - 4s + 1}$  $\frac{1}{s^2 - 1}$ d) 12)  $L^{-1}\left[\frac{1}{(s+2)^2}\right] =$ \_\_\_\_\_. a)  $e^{-2t} t$  $\frac{e^{-2t}}{t}$ b) c)  $e^{-2t} t$ d) None of these The value of integral  $\int_0^\infty e^{-st} t^5 dt$  is \_\_\_\_\_ 13)  $\frac{1}{s^6}$ b) a)  $\frac{1}{s^5}$ c)  $\frac{5}{s^6}$  $\frac{5!}{s^6}$ d) 14)  $L^{-1}[\phi(s+a)] =$ a)  $e^{-at}L^{-1}[\phi(s)]$ b)  $e^{t}L^{-1}[\phi(s)]$ c)  $t L^{-1}[\phi(s)]$ d)  $e^{at}L^{-1}[\phi(s)]$ 

**SLR-FM-109** 

|       | S              | S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec<br>Mechanical Engineering<br>ENGINEERING METHAMATICS- III  | c-2019         |
|-------|----------------|---|----------------|
|       |                | te: Thursday,12-12-2019<br>00 AM To 01:00 PM  | Max. Marks: 56 |
| Instr | uctio          | <ul> <li>ans: 1) All questions are compulsory.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>   |                |
|       |                | Section – I   |                |
| Q.2   | a)<br>b)<br>c) | <b>Example any Three.</b><br>Solve $(D^3 - 1)y = (1 + e^x)^2$<br>Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$<br>Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$<br>Solve $(x^2D^2 - 3xD + 5)y = x^2 \sin(\log x)$ | 09             |
| Q.3   | Atte           | empt any Three.   | 09             |
|       | a)             | Prove that $\int_0^\infty e^{-2t} \cosh^5 t  dt = \frac{2}{7}$  |                |
|       | b)             | Evaluate $L[(t + \sin t)^2]$  |                |
|       | c)             | Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$  |                |
|       | d)             | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2+4)}$   | +9)            |
|       | e)             | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$  |                |
| Q.4   |                | empt any Two.   | 10             |
|       | a)             | Find:<br>1) $L[t^2H(t-3)]$  |                |
|       | b)             | 2) $L[\sin 2t \delta(t-2)]$<br>A body executes damped forced vibration given by the equation<br>$(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the<br>when<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$           | cases          |
|       |                |   |                |

c) Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

Seat

No.

SLR-FM-109

Set Q

#### Section-II

#### Q.5 Attempt any Three.

- a) Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- C) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$ d)
- Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ . e)

#### Attempt any Three. Q.6

- Solve (z y)p (z x)q = y xa)
- Solve  $p^3 + q^3 = 27 z$ b)
- C) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ e)

#### Q.7 Attempt any Two.

- In a normal distribution 31% items are under 45 and 8% are over 64. Find a) the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].
- **b)** Evaluate.  $c \oint \frac{4z-1}{z^2-3z-4} dz$  where c is a elliose  $x^2 + 4y^2 = 4$
- Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$ C)

SLR-FM-109

Set

10

09

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

**ENGINEERING METHAMATICS - III** 

Day & Date: Thursday,12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

| Q.1 | Choose the correct alternatives from the options and rewrite the sentence. | 14 |
|-----|--|----|
|     |  |    |

| 1) | $L^{-1}\left[\frac{1}{(s+2)^2}\right] = \underline{\qquad}.$        | L )                 | . –2 <i>t</i>                              |
|----|---|---------------------|--|
|    | a) $e^{-2t} t$  | b)                  | $\frac{e^{-2t}}{t}$                        |
|    | c) $e^{-2t} t$  | d)                  | None of these                              |
| 2) | The value of integral $\int_0^\infty e^{-st} t^5 dt$ is             | S                   | ·  |
|    | a) $\frac{1}{s^5}$  | b)                  | $\frac{1}{s^6}$                            |
|    | C) $\frac{5}{s^6}$  | d)                  | $\frac{5!}{s^6}$                           |
| 3) | $L^{-1}[\phi(s+a)] =$   |                     |  |
| -  | L <sup>-1</sup> [ $\phi(s + a)$ ] =<br>a) $e^{-at} L^{-1}[\phi(s)]$ | b)                  | $e^t L^{-1}[\phi(s)]$                      |
|    | c) $t L^{-1}[\phi(s)]$  | d)                  | $e^{at}L^{-1}[\phi(s)]$                    |
| 4) | The solution of $p^2q^3 = 1$ is                                     |                     |  |
|    | a) $x^2 y^3 = 1$  | ,                   | $x^2 = 1 - y^3$                            |
|    | c) $y^3 = 1 - x^2$  | d)                  | none of these                              |
| 5) | The area under std. normal curve f                                  |                     | -  |
|    | a) 1<br>c) 0.5  | b)<br>d)            | 0<br>1.5                                   |
| 6) | For a poisson distribution, which of                                | ,                   |  |
| 0) | a) Mean < Variance  | b)                  | Mean = Variance                            |
|    | c) Mean $\times$ Variance = 1                                       | d)                  |  |
| 7) | Cauchy- Riemann equations for $f($                                  | re <sup>iθ</sup> )1 | to be analytic are                         |
| ,  | a) $u_r = v_r, u_\theta = -v_\theta$                                |                     | $u_r = -v_r$ , $u_	heta = v_	heta$         |
|    | c) $u_{	heta} = -rv_r$ , $ru_r = v_{	heta}$                         | d)                  | $u_	heta = r  v_r$ , $u_	heta = r v_	heta$ |
| 8) | The value of integral $\int_0^{2+i} \bar{z}^2 dz$ alor              | ng $x =$            | = 2 <i>y</i> is                            |
|    | a) $\frac{1}{2}(10+5i)$   |                     | $\frac{1}{2}(10-5i)$                       |
|    | c) $(10 + 5i)$  |                     | (10-5i)                                    |
| 9) | The Fourier series of $f(x) = 1 - x^2$                              | <sup>2</sup> in (–  | 1,1) contains                              |
| ,  | <ul> <li>a) only sine series</li> </ul>                             | b)                  | only cosine series                         |
|    | c) both sine & cosine series  | d)                  | none of these                              |

## **SLR-FM-109**

Set

R

Max. Marks: 70

Marks: 14

Which of the following functions can not be expanded in Fourier series in 10) the interval  $(-\pi, \pi)$ a)  $e^x$ b) |x|d)  $x^2$ c) cosecx The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_. 11) a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ C)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ 12) The value of  $\frac{1}{D-a} X =$ \_\_\_\_\_. b)  $e^{-ax} \int e^{ax} X dx$ a)  $e^{-ax} \int e^{-ax} X dx$ c)  $e^{ax} \int e^{-ax} X dx$ d)  $e^{ax} \int e^{ax} X dx$ 13) On putting  $(1 + x) = e^t$  the differential equation  $(1+x)^{2} \frac{d^{2}y}{dx^{2}} + (1+x)\frac{dy}{dx} = y = 2\sin[\log(1+x)] \text{ is transformed to } \_\_\_\_.$ a)  $(D^{2}+1)Y = 2\sin t$  b)  $(D^{2}+1)Y = 2\sin t\log t$ c)  $(D^{2}+D)Y = 2\sin t$  d)  $(D^{2}+2D+1)Y = 2\sin e^{t}$ 14) The  $L(e^{2t} \sin t)$  is \_\_\_\_\_. a)  $\frac{1}{2}$ b)  $\frac{1}{s^2 - 4s + 5}$ d)  $\frac{1}{r^2 + 1}$ 

c) 
$$\frac{1}{s^2 - 4s + 1}$$

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**SLR-FM-109** 

Set | R

|       | S              | S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec<br>Mechanical Engineering<br>ENGINEERING METHAMATICS- III   | -2019          |
|-------|----------------|--|----------------|
| -     |                | te: Thursday,12-12-2019<br>00 AM To 01:00 PM   | Max. Marks: 56 |
| Instr | uctio          | <ul> <li>ans: 1) All questions are compulsory.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>  |                |
|       |                | Section – I  |                |
| Q.2   | a)<br>b)<br>c) | Example any Three.<br>Solve $(D^3 - 1)y = (1 + e^x)^2$<br>Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$<br>Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$<br>Solve $(x^2D^2 - 3xD + 5)y = x^2 \sin(\log x)$ | 09             |
| Q.3   | Atte           | empt any Three.  | 09             |
|       | a)             | Prove that $\int_0^\infty e^{-2t} \cosh^5 t  dt = \frac{2}{7}$   |                |
|       | b)             | Evaluate $L[(t + \sin t)^2]$   |                |
|       | c)             | Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$   |                |
|       | d)             | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2+3)}$  | <b>⊦</b> 9)    |
|       | e)             | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$   |                |
| Q.4   | Atte           | empt any Two.  | 10             |
|       | a)             | Find:<br>1) $L[t^2H(t-3)]$   |                |
|       | b)             | 2) $L[\sin 2t \delta(t-2)]$<br>A body executes damped forced vibration given by the equation<br>$(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the c<br>when<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$  | cases          |

c) Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

Seat

No.

**SLR-FM-109** 

Set R

#### Section-II

#### Q.5 Attempt any Three.

- a) Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- c) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- **d)** Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$
- e) Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ .

#### Q.6 Attempt any Three.

- **a)** Solve (z y)p (z x)q = y x
- **b)** Solve  $p^3 + q^3 = 27 z$
- c) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

e) Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ 

#### Q.7 Attempt any Two.

a) In a normal distribution 31% items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].

**b)** Evaluate. 
$$c \oint \frac{4z-1}{z^2-3z-4} dz$$
 where c is a elliose  $x^2 + 4y^2 = 4$ 

**c)** Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$ 

Set R

09

09

SLR-FM-109

| Seat |  |
|------|--|
| No.  |  |

### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING METHAMATICS - III**

Day & Date: Thursday, 12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Choose the correct alternatives from the options and rewrite the sentence. Q.1 14

- 1) For a poisson distribution, which of the following is true?
  - a) Mean < Variance Mean = Variance b)
  - c) Mean  $\times$  Variance = 1 d) Mean > Variance
- Cauchy- Riemann equations for  $f(re^{i\theta})$  to be analytic are \_\_\_\_\_. 2)
  - a)  $u_r = v_r, u_{\theta} = -v_{\theta}$ b)  $u_r = -v_r, u_\theta = v_\theta$ c)  $u_{\theta} = -rv_r, ru_r = v_{\theta}$ d)  $u_{\theta} = r v_r, u_{\theta} = r v_{\theta}$
- 3)
  - The value of integral  $\int_{0}^{2+i} \bar{z}^2 dz$  along x = 2y is \_\_\_\_\_. a)  $\frac{1}{3}(10+5i)$  b)  $\frac{1}{3}(10-5i)$ d) (10 - 5i)c) (10 + 5i)
- The Fourier series of  $f(x) = 1 x^2$  in (-1,1) contains \_\_\_\_\_. 4) a) only sine series b) only cosine series
  - c) both sine & cosine series none of these d)
- 5) Which of the following functions can not be expanded in Fourier series in the interval  $(-\pi, \pi)$ 
  - a)  $e^x$ b) |x|d)  $x^2$ c) cosecx

#### The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_. 6)

- b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ C)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$
- The value of  $\frac{1}{D-a} X =$ \_\_\_\_\_. 7)
  - b)  $e^{-ax}\int e^{ax} X dx$ a)  $e^{-ax} \int e^{-ax} X dx$
  - c)  $e^{ax} \int e^{-ax} X dx$ d)  $e^{ax} \int e^{ax} X dx$

On putting  $(1 + x) = e^t$  the differential equation 8)  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} = y = 2\sin[\log(1+x)]$  is transformed to \_\_\_\_\_. a)  $(D^2 + 1)Y = 2\sin t$ b)  $(D^2 + 1)Y = 2 \sin t \log t$ d)  $(D^2 + 2D + 1)Y = 2 \sin e^t$ c)  $(D^2 + D)Y = 2 \sin t$ 

# Max. Marks: 70

Marks: 14

Set

Set S The  $L(e^{2t} \sin t)$  is \_\_\_\_\_. 9) a)  $\frac{1}{s^2-4}$ b)  $\frac{1}{s^2 - 4s + 5}$ c)  $\frac{1}{s^2 - 4s + 1}$ d) 10)  $L^{-1}\left[\frac{1}{(s+2)^2}\right] =$ \_\_\_\_\_. a)  $e^{-2t} t$  $\frac{e^{-2t}}{t}$ b) c)  $e^{-2t} t$ None of these d) The value of integral  $\int_0^\infty e^{-st} t^5 dt$  is \_\_\_\_ 11)  $\frac{1}{s^6}$ a)  $\frac{1}{s^5}$ b) c)  $\frac{5}{s^6}$  $\frac{5!}{s^6}$ d) 12)  $L^{-1}[\phi(s+a)] =$ \_\_\_\_\_ a)  $e^{-at}L^{-1}[\phi(s)]$ b)  $e^{t}L^{-1}[\phi(s)]$ d)  $e^{at}L^{-1}[\phi(s)]$ c)  $t L^{-1}[\phi(s)]$ The solution of  $p^2q^3 = 1$  is \_\_\_\_\_. 13) a)  $x^2y^3 = 1$ b)  $x^2 = 1 - y^3$ c)  $y^3 = 1 - x^2$ d) none of these 14) The area under std. normal curve from  $z = -\infty$  to z = 0 is \_\_\_\_\_. a) 1 b) 0 c) 0.5 d) 1.5

**SLR-FM-109** 

|       |                              | ENGINEERING METHAMATICS- III   |               |
|-------|------------------------------|--|---------------|
| -     |                              | te: Thursday,12-12-2019 M<br>00 AM To 01:00 PM   | ax. Marks: 56 |
| Instr | uctio                        | <ul> <li>All questions are compulsory.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>  |               |
|       |                              | Section – I  |               |
| Q.2   | a)<br>b)<br>c)               | empt any Three.<br>Solve $(D^3 - 1)y = (1 + e^x)^2$<br>Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$<br>Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$<br>Solve $(x^2D^2 - 3xD + 5)y = x^2 \sin(\log x)$  | 09            |
| Q.3   | Atte<br>a)<br>b)<br>c)<br>d) | <b>Example any Three.</b><br>Prove that $\int_0^{\infty} e^{-2t} \cosh^5 t  dt = \frac{2}{7}$<br>Evaluate $L[(t + \sin t)^2]$<br>Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$<br>Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2+9)}$ | 09            |
|       | e)                           | Solve the following equation using Laplace transform<br>$(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$  |               |
| Q.4   | Atte<br>a)<br>b)             | Find:<br>1) $L[t^2H(t-3)]$<br>2) $L[\sin 2t \delta(t-2)]$<br>A body executes damped forced vibration given by the equation<br>$(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the cas<br>when<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$                          | 10<br>Ses     |
|       |                              |  |               |

c) Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

**SLR-FM-109** 

Set S

## Seat No.

S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

#### Section-II

#### Q.5 Attempt any Three.

- **a)** Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- c) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- **d)** Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$
- e) Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ .

#### Q.6 Attempt any Three.

- **a)** Solve (z y)p (z x)q = y x
- **b)** Solve  $p^3 + q^3 = 27 z$
- c) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

e) Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ 

#### Q.7 Attempt any Two.

a) In a normal distribution 31% items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].

**b)** Evaluate. 
$$c \oint \frac{4z-1}{z^2-3z-4} dz$$
 where c is a elliose  $x^2 + 4y^2 = 4$ 

**c)** Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$ 

09

Set S

**SLR-FM-109** 

09

| me  | 9: 10:C  |                            | / TO 01:00 PM   |                                    |   |
|-----|----------|----------------------------|---|------------------------------------|---|
| str | uctio    | ns: ´                      | <ol> <li>Q. No. 1 is compulsory and sh<br/>book.</li> </ol>   | nould b                            | be solved in first 30 minut                               |
|     |          |                            | ) Please mention Set (PQRS) in<br>B) Figures to the right indicates fu  |                                    |   |
|     |          |                            | MCQ/Objective T   | ype Q                              | uestions  |
| ura | ition: 3 | 30 M                       | inutes  |                                    |   |
| .1  |          | e -1 (                     | e types questions<br>( One Marks Each)<br>manent mould casting is used fo<br>Carburetor of Two wheeler<br>Electric motor body   |                                    | ufacturing of<br>Turbine Blades<br>6 cylinder Engine body |
|     | 2)       | scra<br>a)<br>c)           | refractory coating is used in<br>ap rich in S & P.<br>Magnesite<br>Graphite   | Direct<br>b)<br>d)                 | arc furnace for melting th<br>Silica<br>None of above     |
|     | 3)       | i)<br>a)<br>b)<br>c)<br>d) | Semi Centrifugal casting does<br>True centrifugal casting uses c<br>Both statements (i) & (ii) are inc<br>Both statements (i) & (ii) are co<br>Statement (i) is correct, (ii) is in<br>Statement (ii) is correct, (i) is in | ore.<br>correct<br>rrect<br>correc | t   |
|     | 4)       | Whi<br>a)<br>c)            | ich of the following is a casting d<br>scab<br>drop   | efect;<br>b)<br>d)                 | mis-run<br>all above                                      |
|     |          |                            |   |                                    |   |

#### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** MANUFACTURING PROCESSES

Day & Date: Saturday, 14-12-2019 Time: 10:00 AM To 01:00 PM

ed in first 30 minutes in answer Ins

#### ns

Du

Seat

No.

## Q.'

#### ing of \_\_\_\_\_.

- rnace for melting the
  - of above
- .

- Piercing is \_\_\_\_\_ operation. 5)
  - a) Cold working Hot working b)
  - All above c) Heat treatment d)
- Following is the backward type extrusion \_ 6)
  - Hydro static Extrusion Impact extrusion a) b)
    - c) Direct d) None of above
- 7) The arc of the welding is hidden in case of \_ .
  - TIG SMAW b) a) C) MIG d) All above
- Process is carried out below recrystalization temperature. 8) a) rolling of Ingots
  - b) rolling of blooms
  - heading c)

- Piercing d)

Marks: 14

80

**SLR-FM-110** 



Max. Marks: 70

#### Type -2 (Two Marks Each)

- 1) Effective gating system \_\_\_\_\_
  - a) solidify at the earliest
  - b) consumes least metal
  - c) increase turbulence of metal
  - d) provides directional solidification
- 2) Following points are true for Thermosetting plastics \_\_\_\_\_.

\_.

- More load carrying capacity b) Reversible
- c) used for Electrical switches d) Le
  - d) Less load carrying capacity
- 3) I Section Aluminum bar can be manufactured by \_\_\_\_\_.
  - a) Extrusion

Rod drawing

a)

C)

- b) Rolling
- d) Open die forging

SLR-FM-110 Set P

|             |                | SLR-FM-1   | 10             |
|-------------|----------------|--|----------------|
| Seat<br>No. | t              | Set  | Ρ              |
|             | ļ              | S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019  |                |
|             |                | Mechanical Engineering<br>MANUFACTURING PROCESSES  |                |
|             |                | ate: Saturday, 14-12-2019 Max. Marks<br>:00 AM To 01:00 PM   | 56 56          |
| Instr       | ucti           | <ul> <li>ons: 1) Solve any two questions from each Section.</li> <li>2) Neat sketches must be drawn wherever necessary.</li> <li>3) Assume additional suitable data wherever necessary and mention it clearly</li> <li>4) Figure to the right indicates full marks.</li> </ul>   |                |
|             |                | Section – I  |                |
| Q.2         | a)             | Explain the following in brief:  | 05             |
|             | b)             | <ol> <li>Pattern Materials</li> <li>Types of Gating systems based on Gating Ratio</li> <li>What is significance of Allowances used in Pattern? Explain any two<br/>allowances.</li> </ol>  | 05             |
|             | c)             | <ul> <li>Explain the significance of following terms used in casting:</li> <li>1) Undercut</li> <li>2) Directional Solidification</li> </ul>   | 04             |
| Q.3         | a)<br>b)<br>c) | <ul> <li>Explain the Lost Wax Process with neat sketch.</li> <li>Explain the working of Core type Induction Furnace with neat sketch.</li> <li>Select the suitable casting technique for manufacturing of: <ol> <li>Agricultural Heavy Equipments</li> <li>Drainage pipes</li> <li>Gear Blank</li> <li>Medals</li> </ol> </li> </ul> | 05<br>05<br>04 |
| Q.4         | a)             | What are the required properties of molding sand? Explain Oil sand cores in brief.   | 05             |
|             | b)<br>c)       | Explain the process of continuous casting with neat sketch.<br>How Modern Foundries are Better than old age foundries? Write a brief<br>note.  | 05<br>04       |
|             |                | Section – II   |                |
| Q.5         | a)<br>b)<br>c) | Discuss the process of closed die forging with neat sketch.<br>Discuss classification of Rolling Mills and their application.<br>Give classification of forming processes.   | 05<br>05<br>04 |
| Q.6         | a)<br>b)<br>c) | Discuss the process of blow moulding with neat sketch.<br>Discuss the drawing of bar and draw neat sketch of draw bench.<br>Compare between direct and indirect extrusion.   | 05<br>05<br>04 |
| Q.7         | a)<br>b)<br>c) | Compare between welding and brazing.<br>Discuss the process of submerged arc welding with its application.<br>Discuss various gas welding equipments in brief.   | 05<br>05<br>04 |

| :          | S.E. (Part – I) (New/Old) (CBCS<br>Mechanical E<br>MANUFACTURIN  | Éngineering  |
|------------|--|--|
|            | te: Saturday, 14-12-2019<br>00 AM To 01:00 PM  | Max. Marks: 70   |
| Instructio | ons: 1) Q. No. 1 is compulsory and sh<br>book.<br>2) Please mention Set (PQRS) in<br>3) Figures to the right indicates fu  |  |
|            | MCQ/Objective T  | ype Questions  |
| Duration:  | 30 Minutes   | Marks: 14  |
|            | jective types questions<br>be -1 ( One Marks Each)<br>Piercing is operation.<br>a) Cold working<br>c) Heat treatment   | <ul><li>b) Hot working</li><li>d) All above</li></ul>                  |
| 2)         | Following is the backward type extru<br>a) Hydro static Extrusion<br>c) Direct   | usion<br>b) Impact extrusion<br>d) None of above                       |
| 3)         | The arc of the welding is hidden in c<br>a) SMAW<br>c) MIG   | case of<br>b) TIG<br>d) All above                                      |
| 4)         | Process is carried out below<br>a) rolling of Ingots<br>c) heading   | w recrystalızation temperature.<br>b) rolling of blooms<br>d) Piercing |
| 5)         | Permanent mould casting is used fo<br>a) Carburetor of Two wheeler<br>c) Electric motor body   | or manufacturing of<br>b) Turbine Blades<br>d) 6 cylinder Engine body  |
| 6)         | refractory coating is used in<br>scrap rich in S & P.<br>a) Magnesite<br>c) Graphite   | n Direct arc furnace for melting the<br>b) Silica<br>d) None of above  |
| 7)         | <ul> <li>i) Semi Centrifugal casting does</li> <li>ii) True centrifugal casting uses c</li> <li>a) Both statements (i) &amp; (ii) are ind</li> <li>b) Both statements (i) &amp; (ii) are co</li> <li>c) Statement (i) is correct, (ii) is in</li> <li>d) Statement (ii) is correct, (i) is in</li> </ul> | core.<br>correct<br>orrect<br>ncorrect                                 |
| 8)         | Which of the following is a casting d<br>a) scab<br>c) drop  | defect;<br>b) mis-run<br>d) all above                                  |

S.E. (Part – I) (New/Old) (CBCS) Exa

Set Q

#### Type -2 (Two Marks Each)

a) Extrusion

c) Rod drawing

- 1) Following points are true for Thermosetting plastics \_\_\_\_\_.
  - a) More load carrying capacity
  - c) used for Electrical switches
- b) Reversibled) Less load carrying capacity
- 2) I Section Aluminum bar can be manufactured by \_\_\_\_\_.
  - b) Rolling
    - d) Open die forging
- 3) Effective gating system \_\_\_\_\_.
  - a) solidify at the earliest
  - b) consumes least metal
  - c) increase turbulence of metal
  - d) provides directional solidification

## SLR-FM-110

# Set Q

| No.   | τ              |  |   | Set        | Q              |
|-------|----------------|--|---|------------|----------------|
|       |                |  | New/Old) (CBCS) Examination Nov/De<br>Mechanical Engineering<br>IANUFACTURING PROCESSES   | c-2019     |                |
|       |                | ate: Saturday, 14-1<br>:00 AM To 01:00 F |   | Max. Marks | 3: 56          |
| Instr | ucti           | 2) Neat sketo<br>3) Assume a<br>clearly  | two questions from each Section.<br>ches must be drawn wherever necessary.<br>dditional suitable data wherever necessary and<br>the right indicates full marks. | mention it |                |
|       |                | 4) Tigure to t                           | Section – I   |            |                |
| Q.2   | a)             | Explain the follow                       |   |            | 05             |
|       | -              | 1) Pattern Mat                           | erials  |            |                |
|       | b)             |  | ating systems based on Gating Ratio<br>nce of Allowances used in Pattern? Explain any   | two        | 05             |
|       | -              | allowances.                              |   |            |                |
|       | C)             | 1) Undercut                              | ficance of following terms used in casting:<br>Solidification   |            | 04             |
| Q.3   | a)<br>b)<br>c) | Explain the work<br>Select the suitab    |   | etch.      | 05<br>05<br>04 |
| Q.4   | a)             | •  | uired properties of molding sand? Explain Oil sa  | and cores  | 05             |
|       | b)<br>c)       |  | ess of continuous casting with neat sketch.<br>undries are Better than old age foundries? Write   | a brief    | 05<br>04       |
|       |                |  | Section – II  |            |                |
| Q.5   | a)<br>b)<br>c) | Discuss classification                   | ess of closed die forging with neat sketch.<br>ation of Rolling Mills and their application.<br>n of forming processes.   |            | 05<br>05<br>04 |
| Q.6   | a)<br>b)<br>c) | Discuss the draw                         | ess of blow moulding with neat sketch.<br>/ing of bar and draw neat sketch of draw bench.<br>en direct and indirect extrusion.                                  |            | 05<br>05<br>04 |
| Q.7   | a)<br>b)<br>c) | Discuss the proc                         | en welding and brazing.<br>ess of submerged arc welding with its applicatic<br>gas welding equipments in brief.   | n.         | 05<br>05<br>04 |

Seat

|              | MANUFACTURING PROCESSES  |                         |
|--------------|--|-------------------------|
|              | Saturday, 14-12-2019<br>AM To 01:00 PM   | Max. Marks: 70          |
| Instructions | <ul> <li>s: 1) Q. No. 1 is compulsory and should be solved in fir book.</li> <li>2) Please mention Set (PQRS) in the answer sheet.</li> <li>3) Figures to the right indicates full marks.</li> </ul> | st 30 minutes in answer |
|              | MCQ/Objective Type Questions   |                         |
| Duration: 30 | Minutes  | Marks: 14               |
| •            | ,  | 08                      |

Seat

No.

- Both statements (i) & (ii) are correct b)
- Statement (i) is correct, (ii) is incorrect C)
- d) Statement (ii) is correct, (i) is incorrect

#### Which of the following is a casting defect; 2)

- a) scab b) mis-run c) drop d) all above
- Piercing is \_\_\_\_\_ operation. 3)

4)

- Cold working Hot working b) a) Heat treatment All above C) d)
- Following is the backward type extrusion
  - Hydro static Extrusion Impact extrusion a) b) None of above c) Direct d)

S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

#### 5) The arc of the welding is hidden in case of \_ a) SMAW b) TIG

MIG c) d) All above

Process is carried out below recrystalization temperature. 6)

- rolling of Ingots b) a) d)
- c) heading

a)

- 7) Permanent mould casting is used for manufacturing of
  - Carburetor of Two wheeler **Turbine Blades** b) 6 cylinder Engine body
  - Electric motor body d) C)
- refractory coating is used in Direct arc furnace for melting the 8) scrap rich in S & P. Silica
  - Magnesite b) a)
  - Graphite d) C)

**SLR-FM-110** Set R

None of above

#### Type -2 (Two Marks Each)

- I Section Aluminum bar can be manufactured by \_\_\_\_\_. 1)
  - a) Extrusion
  - c) Rod drawing

- Rolling b)
- Open die forging d)
- 2) Effective gating system \_\_\_\_\_.
  - solidify at the earliest a)
  - consumes least metal b)
  - increase turbulence of metal C)
  - provides directional solidification d)
- Following points are true for Thermosetting plastics \_\_\_\_\_. 3) b) Reversible
  - More load carrying capacity a)
  - used for Electrical switches C)
- Less load carrying capacity d)

Set R

**SLR-FM-110** 

| Sea <sup>-</sup><br>No. | t              | Set  | R              |
|-------------------------|----------------|--|----------------|
|                         | :              | S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MANUFACTURING PROCESSES   |                |
|                         |                | ate: Saturday, 14-12-2019 Max. Marks<br>:00 AM To 01:00 PM   | 56 ::          |
| Instr                   | ucti           | <ul> <li>ons: 1) Solve any two questions from each Section.</li> <li>2) Neat sketches must be drawn wherever necessary.</li> <li>3) Assume additional suitable data wherever necessary and mention it clearly</li> <li>4) Figure to the right indicates full marks.</li> </ul>   |                |
|                         |                | Section – I  |                |
| Q.2                     | a)             | Explain the following in brief:<br>1) Pattern Materials  | 05             |
|                         | b)             | 2) Types of Gating systems based on Gating Ratio   | 05             |
|                         | c)             | <ul><li>Explain the significance of following terms used in casting:</li><li>1) Undercut</li><li>2) Directional Solidification</li></ul>   | 04             |
| Q.3                     | a)<br>b)<br>c) | <ul> <li>Explain the Lost Wax Process with neat sketch.</li> <li>Explain the working of Core type Induction Furnace with neat sketch.</li> <li>Select the suitable casting technique for manufacturing of: <ol> <li>Agricultural Heavy Equipments</li> <li>Drainage pipes</li> <li>Gear Blank</li> <li>Medals</li> </ol> </li> </ul> | 05<br>05<br>04 |
| Q.4                     | a)             | What are the required properties of molding sand? Explain Oil sand cores in brief.   | 05             |
|                         | b)<br>c)       | Explain the process of continuous casting with neat sketch.<br>How Modern Foundries are Better than old age foundries? Write a brief<br>note.  | 05<br>04       |
|                         |                | Section – II   |                |
| Q.5                     | a)<br>b)<br>c) | Discuss the process of closed die forging with neat sketch.<br>Discuss classification of Rolling Mills and their application.<br>Give classification of forming processes.   | 05<br>05<br>04 |
| Q.6                     | a)<br>b)<br>c) | Discuss the process of blow moulding with neat sketch.<br>Discuss the drawing of bar and draw neat sketch of draw bench.<br>Compare between direct and indirect extrusion.   | 05<br>05<br>04 |
| Q.7                     | a)<br>b)<br>c) | Compare between welding and brazing.<br>Discuss the process of submerged arc welding with its application.<br>Discuss various gas welding equipments in brief.   | 05<br>05<br>04 |

## **Mechanical Engineering** MANUFACTURING PROCESSES Day & Date: Saturday, 14-12-2019 Max. Marks: 70

Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Please mention Set (PQRS) in the answer sheet.
- 3) Figures to the right indicates full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

Q.1

## Type -1 (One Marks Each)

**Objective types questions** 

- The arc of the welding is hidden in case of \_ 1)
  - TIG a) SMAW b) C) MIG
    - d) All above
- 2) Process is carried out below recrystalization temperature. rolling of blooms
  - a) rolling of Ingots b)
  - heading d) Piercing C)
- Permanent mould casting is used for manufacturing of 3)
  - Carburetor of Two wheeler a)
  - Electric motor body 6 cylinder Engine body C) d)
- 4) refractory coating is used in Direct arc furnace for melting the scrap rich in S & P.
  - Magnesite a)
  - Graphite C) d)
- 5) Semi Centrifugal casting does not uses core. i)
  - True centrifugal casting uses core. ii)
  - Both statements (i) & (ii) are incorrect a)
  - Both statements (i) & (ii) are correct b)
  - Statement (i) is correct, (ii) is incorrect c)
  - Statement (ii) is correct, (i) is incorrect d)
- Which of the following is a casting defect; 6)
  - scab mis-run a) b)
  - C) drop d) all above
- Piercing is \_\_\_\_\_ operation. 7)
  - Cold working b) Hot working a)
  - Heat treatment c)
- 8) Following is the backward type extrusion \_
  - Hydro static Extrusion a) Direct C)

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019

**SLR-FM-110** 



Marks: 14

**08** 

b)

- b) Silica
- None of above

**Turbine Blades** 

Set S

06

#### Type -2 (Two Marks Each)

- Effective gating system \_\_\_\_\_. 1)
  - solidify at the earliest a)
  - b) consumes least metal
  - C) increase turbulence of metal
  - provides directional solidification d)
- Following points are true for Thermosetting plastics \_\_\_\_\_. 2)
  - More load carrying capacity b) a)
  - Reversible used for Electrical switches d) Less load carrying capacity C)
- I Section Aluminum bar can be manufactured by \_\_\_\_\_. 3)
  - a) Extrusion

Rolling b)

Rod drawing C)

Open die forging d)

|            |                | SLR-FM-1   | 10             |
|------------|----------------|--|----------------|
| Sea<br>No. | t              | Set  | S              |
|            | ł              | S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MANUFACTURING PROCESSES   |                |
|            |                | ate: Saturday, 14-12-2019 Max. Marks<br>:00 AM To 01:00 PM   | s: 56          |
| Instr      | ucti           | <ul> <li>ons: 1) Solve any two questions from each Section.</li> <li>2) Neat sketches must be drawn wherever necessary.</li> <li>3) Assume additional suitable data wherever necessary and mention it clearly</li> <li>4) Figure to the right indicates full marks.</li> </ul> |                |
| Q.2        | <b>ə</b> )     | Section – I<br>Explain the following in brief:   | 05             |
| Q.2        | aj             | 1) Pattern Materials   | 05             |
|            | b)             | <ol> <li>Types of Gating systems based on Gating Ratio</li> <li>What is significance of Allowances used in Pattern? Explain any two<br/>allowances.</li> </ol>   | 05             |
|            | c)             | <ul> <li>Explain the significance of following terms used in casting:</li> <li>1) Undercut</li> <li>2) Directional Solidification</li> </ul>   | 04             |
| Q.3        | a)<br>b)<br>c) | •  | 05<br>05<br>04 |
| Q.4        | a)             | What are the required properties of molding sand? Explain Oil sand cores in brief.   | 05             |
|            | b)<br>c)       | Explain the process of continuous casting with neat sketch.<br>How Modern Foundries are Better than old age foundries? Write a brief<br>note.  | 05<br>04       |
|            |                | Section – II   |                |
| Q.5        | a)<br>b)<br>c) | Discuss the process of closed die forging with neat sketch.<br>Discuss classification of Rolling Mills and their application.<br>Give classification of forming processes.   | 05<br>05<br>04 |
| Q.6        | a)<br>b)<br>c) | Discuss the process of blow moulding with neat sketch.<br>Discuss the drawing of bar and draw neat sketch of draw bench.<br>Compare between direct and indirect extrusion.   | 05<br>05<br>04 |
| Q.7        | a)<br>b)<br>c) | Compare between welding and brazing.<br>Discuss the process of submerged arc welding with its application.<br>Discuss various gas welding equipments in brief.   | 05<br>05<br>04 |

|                | S.E. (Part – I) (New/Old) (C<br>Mechani<br>MACH  | ical En                       | gine               | eering   |
|----------------|--|-------------------------------|--------------------|--|
|                | te: Tuesday, 17-12-2019<br>00 AM To 02:00 PM   |                               |                    | Max. Marks: 70   |
| Instructio     | · · · ·  | and sho                       | ould b             | be solved in first 30 minutes in answer                              |
|                | book.<br>2) Assume suitable dimen<br>3) Use first angle Method<br>4) Figures to the right indic  | of projec                     | ctions             | S.   |
| Duration       | MCQ/Object   | tive Ty                       | pe C               |  |
|                | 30 Minutes oose the correct alternatives   | from the                      | e oni              | tions. 03  |
|                | e:1 Match the pairs (One ma  | rks for                       | each               | correct answer)  |
| 1)             | Geometrical Tolerance<br>Concentricity   | a)                            | Sym                | bol  |
| 2)             | Circularity  | с,<br>b)                      | $\bigcirc$         |  |
| ,<br>3)        | Cylindricity   | c)                            | Õ                  |  |
| 1)<br>2)<br>3) | <b>be: 2 Correct or Incorrect (Atte</b><br>A shaft whose upper deviatio<br>The size across flats in hexag<br>Woodruff key is self aligning | n is zero<br>gonal nu<br>key. | o is c<br>ut is 2  | alled as basic shaft.<br>D.  |
| Typ<br>ma      | e: 3 Multiple correct answer :<br>rk)  | type.(So                      | olve               | any two) (Each correct bit 2 04                                      |
| 1)             | Which of the following symbol<br>a) M<br>c) R  | ols indica                    | ate ty<br>b)<br>d) | pe of lay pattern?<br>C<br>Y   |
| 2)             | Which of the following pairs of  | defines c                     |                    |  |
|                | a) ф40H <sub>8</sub> d <sub>6</sub><br>c) ф40H <sub>7</sub> p <sub>6</sub>   |                               | b)<br>d)           | φ40H <sub>7</sub> f <sub>6</sub><br>φ40H <sub>7</sub> r <sub>6</sub> |
| 3)             | Which of the following are sta<br>a) A2<br>c) A4   | andard s                      | sheet<br>b)<br>d)  |  |
|                | e: 4 Straight Objective Type   | e/Classi                      | cal N              | ICQ.(Each bit 1 mark each) 05  |
| 1)             | This symbol is used in c   | drawing                       |                    | 0  |
|                | a) Taper<br>c) Depth of hole   |                               | b)<br>d)           | Countersunk<br>Counter bore  |
| 2)             | This symbol is used to s   | show                          |                    |  |
|                | a) Internal threading<br>c) Symmetry   |                               | b)<br>d)           | External threading<br>Concentricity                                  |

#### Seat No.

Set P

# 3) Represents which type of section?

a) Removed c) Partial

- b) Halfd) Revolved
- 4) Which of the following is used for high speed reduction ratio?
  - a) Spur gear assembly b) Bevel gear assembly
    - c) Worm and worm wheel
- d) Rack and pinion

#### 5) In half section how much part of object is imagined to be removed?

a) Half

- b) Full
- c) Quarter d) Can't predict

## Seat No.

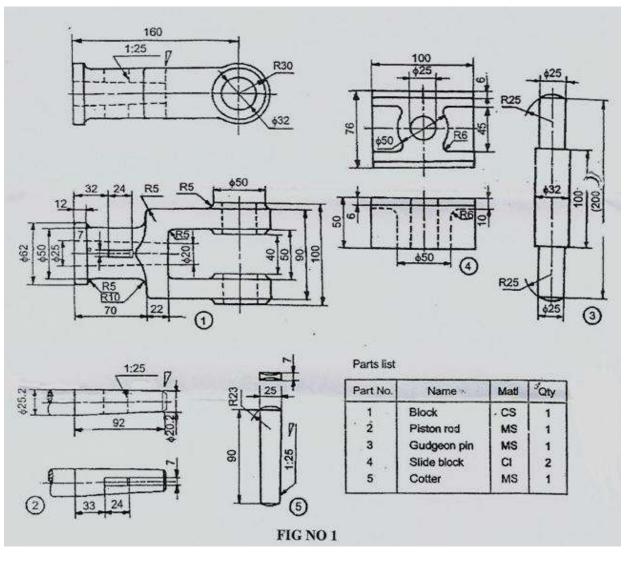
#### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- **Q.2** Figure No. 1 shows the details of steam engine cross head. Assemble the given parts and draw :
  - 1) Front View
  - 2) Top View

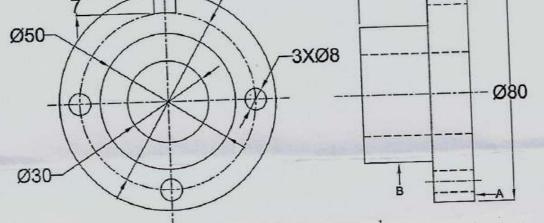
Prepare bill of material and give all the dimensions.



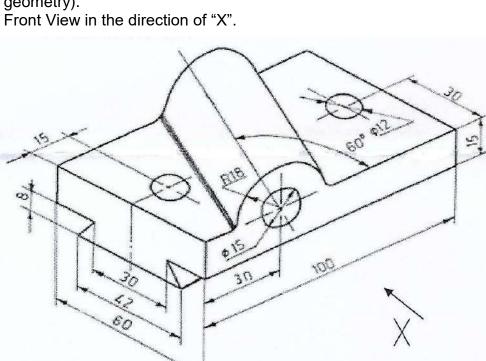
Set P

Max. Marks: 56

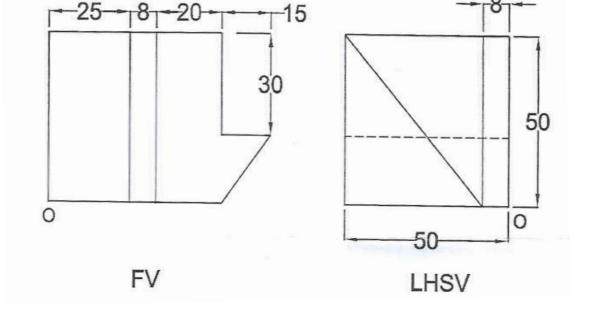
|     |                              | Set   | Ρ        |
|-----|------------------------------|---|----------|
| Q.3 | Solv<br>a)                   | <b>The any three out of four. (Every bit has 03 marks)</b><br>Draw BIS Conventions of<br>1) Splined shaft<br>2) Bearing   | 09       |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut  |          |
|     | c)                           | <ul><li>Draw BIS Conventions of</li><li>1) Cylindrical compression spring</li><li>2) Glass material</li></ul>   |          |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud   |          |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | <b>Te any three out of four (Every bit has 03 marks)</b><br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling.  | 09       |
| Q.5 | Solv<br>a)                   | <ul> <li>the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) \$\phi_30H_7g_6\$</li> <li>2) \$\phi_50H_8p_6\$</li> <li>Also support the answer by writing the calculations and draw diagram for the same.</li> </ul>  | 09<br>04 |
|     | b)                           | <ul> <li>Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm.</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> | 05       |
|     |                              |   |          |



- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



8



Set P

|                      |          |          | ()        | alues i   |            |              |              |               |            |            |
|----------------------|----------|----------|-----------|-----------|------------|--------------|--------------|---------------|------------|------------|
|                      | toleran  | ces of   | holes     |           |            |              | Toleran      | ces of        | shafts     |            |
| Nominal              | H7       | на       | H9        | H10       | H11        | ¢Ь           | e8           | 17            | g6         | h6         |
| From 1<br>Upto 3     | +10      | +14      | + 25      | + 40      | + 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 3 | - 0<br>- 6 |
| Over 3<br>Upto 6     | +12<br>D | +18      | + 30<br>0 | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | 4<br>-12   | - 8        |
| Over 6<br>Upto 10    | +15      | +22      | + 36      | + 58      | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | - 9        |
| Over 10<br>Upto 1B   | +18      | +27      | + 43<br>0 | + 70<br>0 | +110<br>U  | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0<br>-11   |
| Over 18<br>Upto 30   | +21<br>0 | +33      | + 52      | 4 84<br>0 | +130<br>0  | - 65         | - 40<br>- 73 | - 20<br>- 41  | - 7<br>-20 | 0<br>-13   |
| Over 30<br>Upto 50   | +25      | +39      | + 62      | +100      | +160<br>0  | -80<br>-142  | - 50<br>- 59 | - 25<br>- 50  | - 9        | 0<br>-16   |
| Over 50<br>Upto 80   | +30      | +46      | + 76      | +120      | +190       | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0<br>-19   |
| Over 80<br>Upto 120  | +35      | +54      | + 87      | +140      | +220       | -120<br>-207 | - 72<br>-126 | - 36          | -12<br>-34 | 0<br>-22   |
| Over 120<br>Upto 180 | +40<br>0 | +63      | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0<br>-25   |
| Over 180<br>Upto 250 | +45      | +72      | +115      | +185      | +290       | -170<br>-285 | -100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0          |
| Over 250<br>Upto 315 | +52      | +81      | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56          | -17        | 0-32       |
| Over 315<br>Upto 400 | +57      | +89      | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-35   |
| Over 400<br>Upto 500 | +63      | +97<br>0 | +155      | +250      | 4 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0          |

| 1   | 1.1. | 1.0.5 | in  | mi | cror | 14 |
|-----|------|-------|-----|----|------|----|
| 1.1 | all  | 162   | 111 |    | CIUI | 15 |

| (Values in microns)  |              |               |              |            |                |              |                    |            |            |             |
|----------------------|--------------|---------------|--------------|------------|----------------|--------------|--------------------|------------|------------|-------------|
|                      | Tol          | erance        | s of ho      | les        | And the second |              | Toler              | ances      | of sha     | ftş.        |
| Nominal<br>sizes     | D10          | E 9           | F8           | G7         | JS7            | К7           | j 6                | k6         | n6         | рб          |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14  | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10     | + 3<br>- 3         | + 6<br>0   | +10<br>+ 4 | + 12<br>+ ( |
| Over 3<br>Upto 6     | +78<br>+30   | + 50<br>+ 20  | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9   | + 4<br>- 4         | + 9<br>+ 1 | +16<br>+ 8 | + 2         |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25  | + 35<br>+ 13 | +20<br>+ 5 | + 7.5          | + 5<br>-10   | + 4.5              | +10<br>+ 1 | +19<br>+10 | + 2 + 1     |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32  | + 43<br>+ 16 | +24 + 6    | + 9<br>- 9     | + 6<br>-12   | + 5.5 - 5.5        | +12<br>+ 1 | +23<br>+12 | + 2<br>+ 1  |
| Over 18<br>Upto 30   | +149 + 65    | + 92<br>+ 40  | +53<br>+20   | +28<br>+7  | +10.5<br>-10.5 | +6<br>-15    | + 6.5 - 6.5        | +15<br>+ 2 | +28<br>+15 | + 3 + 2     |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112<br>+ 50  | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18   | + 8<br>- 8         | +18<br>+ 2 | +33<br>+17 | + 4 + 2     |
| Over 50<br>Upto 80   | +220<br>+100 | + 134<br>+ 60 | + 76<br>+ 30 | +40 + 10   | +15<br>-15     | + 9<br>-21   | $\pm 9.5$<br>- 9.5 | +21<br>+ 2 | +39 + 20   | + 5<br>+ 3  |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72  | +90<br>+36   | +47<br>+12 | +17.5          | $+10 \\ -25$ | +11<br>-11         | +25 + 3    | +45<br>+23 | + 5+3       |
| Over 120<br>Upto 180 | +305<br>+145 | +185<br>+ 85  | +106<br>+ 43 | +54<br>+14 | +20<br>-20     | +12<br>-28   | +12.5<br>-12.5     | +28 + 3    | +52<br>+27 | + 6 + 4     |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100      | +122<br>+ 50 | +61<br>+15 | +23<br>-23     | +13<br>+33   | +14.5<br>-14.5     | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5  |
| Over 250<br>Upto 315 | +400+190     | +240<br>+110  | +135 + 55    | +69<br>+17 | +26<br>-26     | +16<br>-36   | +16 - 16           | +36 + 4    | +66 + 34   | + 8 5       |
| Over 315<br>Upto 400 | +440<br>+210 | +265<br>+125  | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40   | +18<br>-18         | +40<br>+ 4 | +73<br>+37 | + 9 + 6     |
| Over 400<br>Upto 500 | +480+230     | +290+135      | +165<br>+ 68 | +83 +20    | +31.5          | +18<br>-45   | +20<br>-20         | +45 + 5    | +80<br>+40 | +10         |

| S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DRAWING   |  |                           |   |
|--|--|---------------------------|---|
| Day & Date: Tuesday, 17-12-2019         Max. Marks: 70           Time: 10:00 AM To 02:00 PM         Max. Marks: 70   |  |                           |   |
| <ul> <li>Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.</li> <li>2) Assume suitable dimensions if not given</li> <li>3) Use first angle Method of projections.</li> <li>4) Figures to the right indicates full marks.</li> </ul> |  |                           |   |
| MCQ/Objective Type Questions   |  |                           |   |
| Duration: 30 Minutes Marks: 14   |  |                           |   |
|  | ose the correct alternatives file:<br>1 Match the pairs (One mar<br>Geometrical Tolerance<br>Concentricity<br>Circularity  |                           | n correct answer)   |
| 3)   | Cylindricity   | c) Ŏ                      |   |
| <ul> <li>Type: 2 Correct or Incorrect (Attempt any two) (Each bit one mark each)</li> <li>1) A shaft whose upper deviation is zero is called as basic shaft.</li> <li>2) The size across flats in hexagonal nut is 2D.</li> <li>3) Woodruff key is self aligning key.</li> </ul>   |  |                           |   |
| Type: 3 Multiple correct answer type.(Solve any two) (Each correct bit 2 04 mark)  |  |                           |   |
| 1)   | <b>κ)</b><br>Which of the following pairs de<br>a) φ40H <sub>8</sub> d <sub>6</sub><br>c) φ40H <sub>7</sub> p <sub>6</sub> | efines cleara<br>b)<br>d) | ance type of fit?<br>φ40H <sub>7</sub> f <sub>6</sub><br>φ40H <sub>7</sub> r <sub>6</sub> |
| 2)   | Which of the following are star<br>a) A2<br>c) A4  | b)<br>d)                  | A3<br>A5  |
| 3)   | Which of the following symbol<br>a) M<br>c) R  | s indicate ty<br>b)<br>d) | /pe of lay pattern?<br>C<br>Y   |
| Type: 4 Straight Objective Type/Classical MCQ.(Each bit 1 mark each)051) Which of the following is used for high speed reduction ratio?a) Spur gear assemblyb) Bevel gear assemblya) Spur gear assemblyb) Bevel gear assemblyc) Worm and worm wheeld) Rack and pinion              |  |                           |   |
| 2)   | <ul> <li>In half section how much part</li> <li>a) Half</li> <li>c) Quarter</li> </ul>                                     | ,                         | •   |
| 3) This symbol is used in drawing for showing  |  |                           |   |
|  | <ul><li>a) Taper</li><li>c) Depth of hole</li></ul>  | b)<br>d)                  | Countersunk<br>Counter bore   |

Seat No.

# Set Q

# **SLR-FM-111** Set Q

- 4) This symbol is used to show \_\_\_\_\_.
  - Internal threading a) Symmetry

External threading b)

- Concentricity d)
- c) - magigan 5) Represents which type of section? 122.24 1.10 Removed b) a)
  - c) Partial

- Half
- d) Revolved

## Seat No.

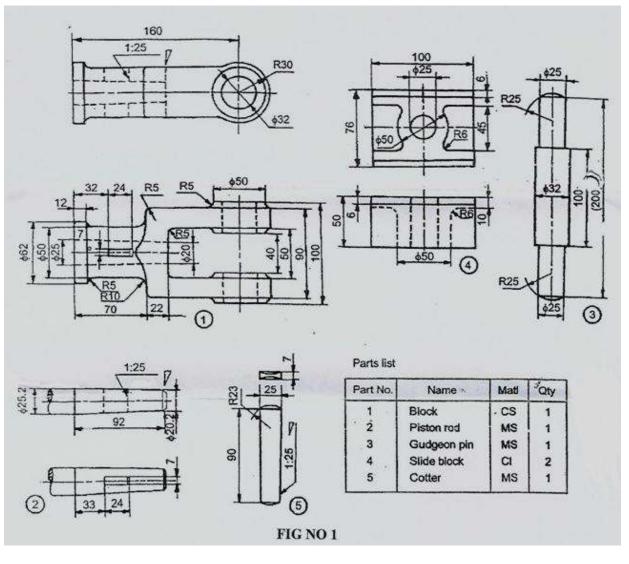
#### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- Q.2Figure No. 1 shows the details of steam engine cross head. Assemble the<br/>given parts and draw :20
  - 1) Front View
  - 2) Top View

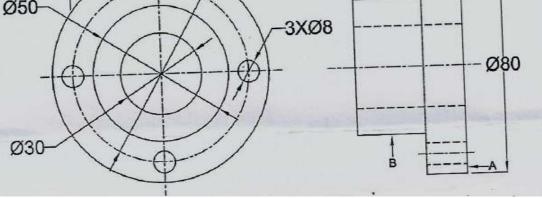
Prepare bill of material and give all the dimensions.



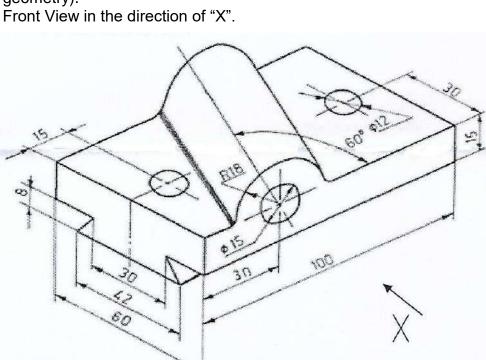
Set Q



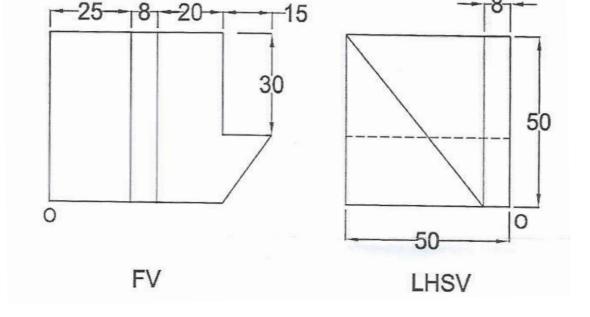
|     |                              | SLR-FM-   | 111      |
|-----|------------------------------|---|----------|
|     |                              | Set   | Q        |
| Q.3 | Solv<br>a)                   | <b>ve any three out of four. (Every bit has 03 marks)</b><br>Draw BIS Conventions of<br>1) Splined shaft<br>2) Bearing  | 09       |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut  |          |
|     | c)                           | <ul><li>Draw BIS Conventions of</li><li>1) Cylindrical compression spring</li><li>2) Glass material</li></ul>   |          |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud   |          |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | <b>ve any three out of four (Every bit has 03 marks)</b><br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling.  | 09       |
| Q.5 | Solv<br>a)                   | <ul> <li>ve the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) \$\phi_30H_7g_6\$</li> <li>2) \$\phi_50H_8p_6\$</li> <li>Also support the answer by writing the calculations and draw diagram for the same.</li> </ul>   | 09<br>04 |
|     | b)                           | <ul> <li>Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm.</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> | 05       |
|     |                              |   |          |



- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



09



Set Q

| (Values in microns)  |           |        |           |           |            |              |              |               |            |            |  |
|----------------------|-----------|--------|-----------|-----------|------------|--------------|--------------|---------------|------------|------------|--|
|                      | Toleran   | ces of | holes     |           |            |              | Toleran      | ces. uf       | shafts     |            |  |
| Nominal              | Н7        | на     | H9        | H10       | H11        | ¢Ь           | e8           | 17            | g6         | <b>h</b> 6 |  |
| from 1<br>Upto 3     | +10       | +14    | + 25      | + 40<br>0 | ÷ 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 3 | - 6        |  |
| Over 3<br>Upto 6     | +12<br>D  | +18    | + 30<br>0 | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | - 4<br>-12 | - 8        |  |
| Over 6<br>Upto 10    | +15       | +22    | + 36<br>0 | + 58      | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5        | ~ 9        |  |
| Over 10<br>Upto 1B   | +18       | +27    | + 43<br>0 | + 70<br>0 | +110<br>U  | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6        | 0<br>-11   |  |
| Over 18<br>Upto 30   | +21<br>0  | +33    | + 52      | 4 84<br>0 | +130<br>0  | - 65<br>-117 | - 40<br>- 73 | - 20<br>- 41  | - 7        | 0<br>-13   |  |
| Over 30<br>Upto 50   | +25       | +39    | + 62      | +100      | +160<br>0  | -80<br>-142  | - 50<br>- 59 | - 25<br>- 50  | - 9<br>-25 | 0          |  |
| Over 50<br>Upto 80   | +30       | +46    | + 76      | +120      | +190       | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0          |  |
| Over 80<br>Upto 120  | +35       | +54    | + 87      | +140      | +220       | -120         | - 72<br>-126 | - 36<br>- 71  | -12<br>-34 | 0<br>-2:   |  |
| Over 120<br>Upto 180 | +40       | +63    | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0          |  |
| Over 180<br>Upto 250 | +45       | +72    | +115      | +185      | +290       | -170<br>-285 | -100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0          |  |
| Over 250<br>Upto 315 | +52       | +81    | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56<br>-108  | -17        | 0-33       |  |
| Over 315<br>Upto 400 | +57       | +89    | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3    |  |
| Over 400<br>Upto 500 | -+G3<br>0 | +97    | +155      | +250      | 4 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0          |  |

| 1000 |     |    |   |        |
|------|-----|----|---|--------|
| (Val | ues | in | m | icrons |

|                      |              |              | (V           | alues i    | n micro        | ns)          |                      |            |            |              |  |
|----------------------|--------------|--------------|--------------|------------|----------------|--------------|----------------------|------------|------------|--------------|--|
|                      | Tol          | erance       | s of ho      | les        | and and        |              | Tolerances of shafts |            |            |              |  |
| Nominal<br>sizes     | D10          | E9           | F8           | G7         | JS7            | К7           | j 6                  | k6         | nG         | рБ           |  |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14 | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10     | + 3<br>- 3           | + 6<br>0   | +10+4      | + 12 + 6     |  |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20    | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3 - 9      | + 4<br>- 4           | + 9<br>+ 1 | +16<br>+ 8 | + 20 + 12    |  |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25 | + 35<br>+ 13 | +20 + 5    | + 7.5<br>- 7.5 | + 5<br>-10   |                      | +10<br>+ 1 | +19<br>+10 | + 24<br>+ 15 |  |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32 | + 43<br>+ 16 | +24<br>+ 6 | + 9<br>- 9     | + 6<br>-12   | + 5.5 - 5.5          | +12+1      | +23<br>+12 | + 29<br>+ 18 |  |
| Over 18<br>Upto 30   | +149 + 65    | + 92<br>+ 40 | + 53 + 20    | +28<br>+7  | +10.5<br>-10.5 | +6<br>-15    | + 6.5<br>- 6.5       | +15<br>+ 2 | +28<br>+15 | + 31<br>+ 23 |  |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112<br>+ 50 | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18   | + 8<br>- 8           | +18<br>+ 2 | +33<br>+17 | + 4.<br>+ 2  |  |
| Over 50<br>Upto 80   | +220<br>+100 | +134<br>+ 60 | +76 + 30     | +40 + 10   | +15 - 15       | + 9<br>-21   | ± 9.5<br>- 9.5       | +21-+2     | +39 + 20   | + 5 + 3      |  |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72 | + 90 + 36    | +47<br>+12 | +17.5          | $+10 \\ -25$ | +11<br>-11           | +25 + 3    | +45<br>+23 | + 5 + 3      |  |
| Over 120<br>Upto 180 | +305<br>+145 | +185<br>+ 85 | +106 + 43    | +54<br>+14 | +20<br>-20     | +12<br>-28   | +12.5<br>-12.5       | +28 + 3    | +52<br>+27 | + 6 + 4      |  |
| Over 180<br>Upto 250 | +355<br>+170 | +215<br>+100 | +122<br>+ 50 | +61<br>+15 | +23<br>-23     | +13<br>+33   | +14.5<br>-14.5       | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5   |  |
| Over 250<br>Upto 315 | +400+190     | +240<br>+110 | +135<br>+ 55 | +69<br>+17 | +26<br>-26     | +16<br>-36   | +16 - 16             | +36 + 4    | +66 + 34   | + 8<br>+ 5   |  |
| Over 315<br>Upto 400 | +440+210     | +265<br>+125 | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40   | +18<br>-18           | +40<br>+ 4 | +73<br>+37 | +9 + 6       |  |
| Over 400<br>Upto 500 | +480+230     | +290+135     | +165<br>+ 68 | +83 +20    | +31.5<br>-31.5 | +18<br>-45   | +20<br>-20           | +45 + 5    | +80<br>+40 | +10<br>+ 6   |  |

|                             | S.E. (Part – I) (New/Old) (<br>Mechar<br>MACH   |                       | ngine               | eering                                  |
|-----------------------------|---|-----------------------|---------------------|---|
|                             | ate: Tuesday, 17-12-2019<br>):00 AM To 02:00 PM   |                       |                     | Max. Marks: 70                          |
| Instruct                    | ions: 1) Q. No. 1 is compulsor<br>book.   | y and sh              | ould b              | be solved in first 30 minutes in answer |
|                             | <ul><li>2) Assume suitable dime</li><li>3) Use first angle Method</li><li>4) Figures to the right ind</li></ul> | l of proje            | ections             | i.                                      |
|                             | MCQ/Objec   | ctive Ty              | ype C               |   |
| Duration                    | a: 30 Minutes   |                       |                     | Marks: 14                               |
| Ту                          | noose the correct alternatives<br>pe:1 Match the pairs (One m<br>Geometrical Tolerance                          | arks for              | each<br>Sym         | correct answer)                         |
| 1)                          | •   | a)                    | Ø                   |   |
| 2)                          | •   | b)                    | O                   |   |
| 3)                          | Cylindricity  | c)                    | 0                   |   |
| <b>Ty</b><br>1)<br>2)<br>3) | The size across flats in hexa   | on is zei<br>agonal n | ro is c             | alled as basic shaft.                   |
| -                           | vpe: 3 Multiple correct answe   | r type.(S             | Solve               | any two) (Each correct bit 2 04         |
| <b>m</b><br>1)<br>2)        | ark)<br>Which of the following are s<br>a) A2<br>c) A4<br>Which of the following symb<br>a) M<br>c) R           | ols indic             | b)<br>d)<br>cate ty | A3<br>A5                                |
| 3)                          | Which of the following pairs  | defines               | cleara              | ance type of fit?                       |
| ,                           | a) $\phi 40H_8d_6$  |                       | b)                  | $\phi 40H_7f_6$                         |
|                             | c) $\phi 40 H_7 p_6$  |                       | d)                  | φ40H <sub>7</sub> r <sub>6</sub>        |
| Ту                          | vpe: 4 Straight Objective Typ   | e/Class               | ical N              | ICQ.(Each bit 1 mark each) 05           |
| 1)                          | This symbol is used to  | show _                | •                   |   |
|                             | <ul><li>a) Internal threading</li><li>c) Symmetry</li></ul>   |                       | b)<br>d)            | External threading<br>Concentricity     |
| 2)                          | Represents which  | n type of             | sectio              | on?                                     |
|                             | a) Removed<br>c) Partial  |                       | b)<br>d)            | Half<br>Revolved                        |

## Seat No.

- 3) Which of the following is used for high speed reduction ratio?
  - a) Spur gear assembly
- b) Bevel gear assembly

Set R

- c) Worm and worm wheel
- d) Rack and pinion
- 4) In half section how much part of object is imagined to be removed?
  - a) Half c) Quarter
- b) Fulld) Can't predict
- c) Quarter d) Can't predic
- 5) This symbol is used in drawing for showing \_\_\_\_\_.
  - a) Taper

c)

- b) Countersunk
- Depth of hole
- d) Countersunkd) Counter bore

## Seat No.

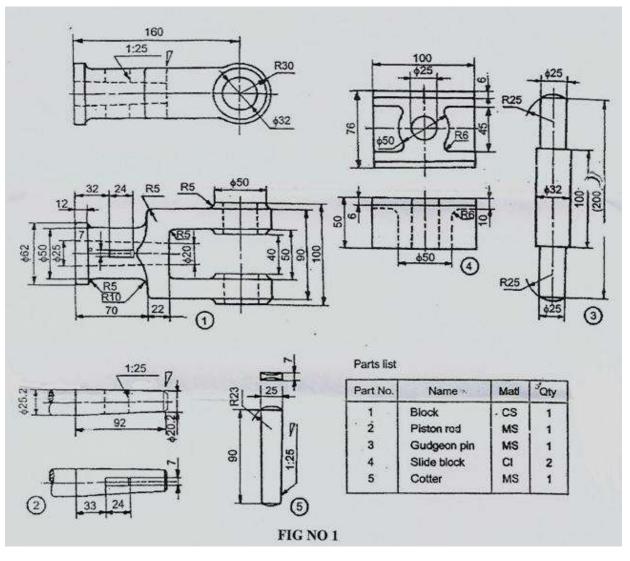
#### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- Q.2 Figure No. 1 shows the details of steam engine cross head. Assemble the given parts and draw :
  - 1) Front View
  - 2) Top View

Prepare bill of material and give all the dimensions.



Set R

|     | SLR-FM-1                     |   |          |  |  |  |  |  |  |  |  |  |  |
|-----|------------------------------|---|----------|--|--|--|--|--|--|--|--|--|--|
|     |                              | Set   | R        |  |  |  |  |  |  |  |  |  |  |
| Q.3 | Solv<br>a)                   | <b>ve any three out of four. (Every bit has 03 marks)</b><br>Draw BIS Conventions of<br>1) Splined shaft<br>2) Bearing  | 09       |  |  |  |  |  |  |  |  |  |  |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut  |          |  |  |  |  |  |  |  |  |  |  |
|     | c)                           | <ul><li>Draw BIS Conventions of</li><li>1) Cylindrical compression spring</li><li>2) Glass material</li></ul>   |          |  |  |  |  |  |  |  |  |  |  |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud   |          |  |  |  |  |  |  |  |  |  |  |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | ve any three out of four (Every bit has 03 marks)<br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling.   | 09       |  |  |  |  |  |  |  |  |  |  |
| Q.5 | Solv<br>a)                   | <ul> <li>ve the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) \$\phi30H_7g_6\$</li> <li>2) \$\phi50H_8p_6\$</li> <li>Also support the answer by writing the calculations and draw diagram for the same.</li> </ul>   | 09<br>04 |  |  |  |  |  |  |  |  |  |  |
|     | b)                           | <ul> <li>Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm.</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> | 05       |  |  |  |  |  |  |  |  |  |  |
|     | ø                            |   |          |  |  |  |  |  |  |  |  |  |  |

-3XØ8

B

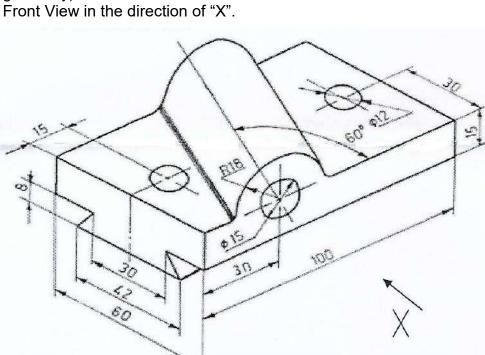
Y

Ø30-

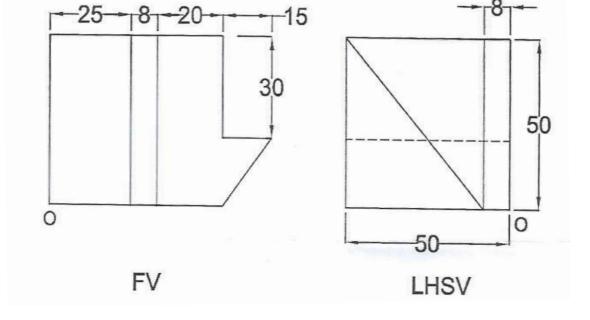
Ø80

A

- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



Set R

| (Values in microns)  |           |          |           |           |            |              |              |               |            |          |  |
|----------------------|-----------|----------|-----------|-----------|------------|--------------|--------------|---------------|------------|----------|--|
|                      | Toleran   | ces of   | holes     |           |            |              | Toleran      | ces. uf       | shafts     |          |  |
| Nominal              | Н7        | на       | H9        | H10       | H11        | бÞ           | e8           | 17            | g6         | h6       |  |
| From 1<br>Upto 3     | +10       | +14      | + 25      | + 40<br>0 | + 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 3 | - 6      |  |
| Over 3<br>Upto 6     | +12<br>D  | +18      | + 30<br>0 | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | - 4<br>-12 | - 8      |  |
| Over 6<br>Upto 10    | +15       | +22<br>0 | + 36<br>0 | + 58<br>0 | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | - 9      |  |
| Over 10<br>Upto 1B   | +18       | +27      | + 43<br>0 | + 70<br>0 | +110<br>U  | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0<br>-11 |  |
| Over 18<br>Upto 30   | +21<br>0  | +33      | + 52      | 4 84<br>0 | +130<br>0  | - 65         | - 40<br>- 73 | - 20<br>- 41  | - 7        | 0<br>-13 |  |
| Over 30<br>Upto 50   | +25       | +39      | + 62      | +100      | +160<br>0  | -80<br>-142  | - 50<br>- 59 | - 25<br>- 50  | - 9        | -16      |  |
| Over 50<br>Upto 80   | +30       | +46      | + 76      | +120      | +190       | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0        |  |
| Over 80<br>Upto 120  | +35       | +54      | + 87      | +140      | +220       | -120<br>-207 | - 72<br>-126 | - 36          | -12<br>-34 | 0<br>-2: |  |
| Over 120<br>Upto 180 | +40       | +63      | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0        |  |
| Over 180<br>Upto 250 | +45       | +72<br>0 | +115      | +185      | +290       | -170<br>-285 | -100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0        |  |
| Over 250<br>Upto 315 | +52       | +81      | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56          | -17<br>-49 | 0        |  |
| Over 315<br>Upto 400 | +57       | +89      | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3  |  |
| Over 400<br>Upto 500 | -+G3<br>0 | +97      | +155      | +250      | 4 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0        |  |

| {Val | ues | in | m | icrons |
|------|-----|----|---|--------|

|                      |              |                      | (V           | alues i    | n micro        | ns)          |                |            |            |              |
|----------------------|--------------|----------------------|--------------|------------|----------------|--------------|----------------|------------|------------|--------------|
|                      | Tol          | Tolerances of shafts |              |            |                |              |                |            |            |              |
| Nominal<br>sizes     | D10          | E 9                  | F8           | G7         | JS7            | K7           | j6             | k6         | n6         | рБ           |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14         | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10     | + 3<br>- 3     | + 6<br>0   | +10<br>+ 4 | + 12<br>+ 6  |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20            | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9   | + 4<br>- 4     | + 9<br>+ 1 | +16<br>+ 8 | + 20         |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25         | + 35<br>+ 13 | +20 + 5    | + 7.5<br>- 7.5 | + 5<br>-10   | + 4.5 - 4.5    | +10<br>+ 1 | +19<br>+10 | + 24<br>+ 1  |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32         | + 43<br>+ 16 | +24 + 6    | + 9<br>- 9     | + 6<br>-12   | + 5.5 - 5.5    | +12<br>+ 1 | +23<br>+12 | + 29<br>+ 19 |
| Over 18<br>Upto 30   | +149<br>+ 65 | + 92<br>+ 40         | + 53 + 20    | +28<br>+7  | +10.5          | +6<br>-15    | + 6.5 - 6.5    | +15<br>+ 2 | +28<br>+15 | + 31 + 23    |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112 + 50            | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18   | + 8<br>- 8     | +18<br>+ 2 | +33<br>+17 | + 4 + 2      |
| Over 50<br>Upto 80   | +220<br>+100 | +134<br>+ 60         | + 76<br>+ 30 | +40 + 10   | +15 - 15       | + 9<br>-21   | ± 9.5<br>- 9.5 | +21-+2     | +39 +20    | + 5 + 3      |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72         | +90<br>+36   | +47<br>+12 | +17.5          | $+10 \\ -25$ | +11<br>-11     | +25 + 3    | +45<br>+23 | + 5 + 3      |
| Over 120<br>Upto 180 | +305<br>+145 | +185<br>+ 85         | +106<br>+ 43 | +54<br>+14 | +20<br>-20     | +12<br>-28   | +12.5<br>-12.5 | +28 + 3    | +52<br>+27 | + 6 + 4      |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100             | +122<br>+ 50 | +61<br>+15 | +23<br>-23     | +13<br>+33   | +14.5<br>-14.5 | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5   |
| Over 250<br>Upto 315 | +400+190     | +240                 | +135<br>+ 55 | +69<br>+17 | +26<br>-26     | +16<br>-36   | +16<br>-16     | +36 + 4    | +66<br>+34 | + 8<br>+ 5   |
| Over 315<br>Upto 400 | +440+210     | +265<br>+125         | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40   | +18<br>-18     | +40<br>+ 4 | +73<br>+37 | + 9 + 6      |
| Over 400<br>Upto 500 | +480<br>+230 | +290+135             | +165<br>+ 68 | +83 +20    | +31.5<br>-31.5 | +18<br>-45   | +20<br>-20     | +45 + 5    | +80<br>+40 | +10+6        |

|       | J                              | Mochanical Engineering   |    |
|-------|--------------------------------|--|----|
|       |                                | Mechanical Engineering<br>MACHINE DRAWING  |    |
| Dev   | 0 Dat                          |  | 20 |
|       |                                | te: Tuesday, 17-12-2019 Max. Marks: 7<br>00 AM To 02:00 PM   | 0  |
| Instr | uctio                          | ons: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answe<br>book.  | ər |
|       |                                | 2) Assume suitable dimensions if not given   |    |
|       |                                | 3) Use first angle Method of projections.  |    |
|       |                                | 4) Figures to the right indicates full marks.  |    |
| _     |                                | MCQ/Objective Type Questions   |    |
|       |                                | 30 Minutes Marks: 1  |    |
| Q.1   |                                | oose the correct alternatives from the options. 0<br>e:1 Match the pairs (One marks for each correct answer)<br>Geometrical Tolerance Symbol   | )3 |
|       | 1)                             | Concentricity a)   |    |
|       | 2)                             | Circularity b)   |    |
|       | 3)                             | Cylindricity c) Ŏ  |    |
|       | <b>Typ</b> (<br>1)<br>2)<br>3) | e: 2 Correct or Incorrect (Attempt any two) (Each bit one mark each) 0<br>A shaft whose upper deviation is zero is called as basic shaft.<br>The size across flats in hexagonal nut is 2D.<br>Woodruff key is self aligning key. | )2 |
|       | Type<br>mar                    |  | )4 |
|       | 1)                             | Which of the following symbols indicate type of lay pattern?   |    |
|       |                                | a) M b) C  |    |
|       | - )                            | c) R d) Y  |    |
|       | 2)                             | Which of the following pairs defines clearance type of fit?<br>a) $\phi 40H_8d_6$ b) $\phi 40H_7f_6$   |    |
|       |                                | a) $\phi 40H_8d_6$ b) $\phi 40H_7f_6$<br>c) $\phi 40H_7p_6$ d) $\phi 40H_7r_6$   |    |
|       | 3)                             | Which of the following are standard sheet sizes?   |    |
|       | 0)                             | a) A2 b) A3  |    |
|       |                                | c) A4 d) A5  |    |
|       | Тур                            | e: 4 Straight Objective Type/Classical MCQ.(Each bit 1 mark each) 05   | 5  |
|       | 1)                             | In half section how much part of object is imagined to be removed?   |    |
|       |                                | a) Half b) Full<br>c) Quarter d) Can't predict   |    |
|       | 2)                             | This symbol is used in drawing for showing   |    |
|       |                                | a) Taper b) Countersunk  |    |
|       |                                | c) Depth of hole d) Counter bore   |    |
|       | 3)                             | This symbol is used to show  |    |
|       |                                | a) Internal threading b) External threading  |    |
|       |                                | c) Symmetry d) Concentricity   |    |
|       |                                |  |    |

# S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019

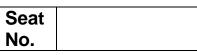
Seat No.

Set S

# 4) Represents which type of section?

a) Removed c) Partial

- b) Halfd) Revolved
- 5) Which of the following is used for high speed reduction ratio?
  - a) Spur gear assembly b) Bevel gear assembly
    - c) Worm and worm wheel
- d) Rack and pinion



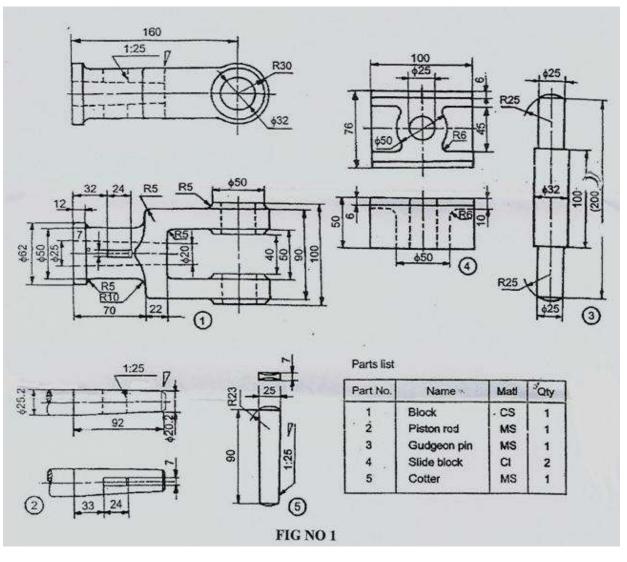
#### S.E. (Part – I) (New/Old) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- **Q.2** Figure No. 1 shows the details of steam engine cross head. Assemble the given parts and draw :
  - 1) Front View
  - 2) Top View

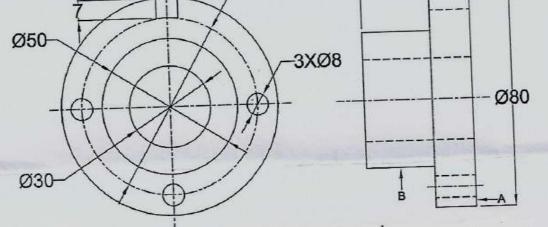
Prepare bill of material and give all the dimensions.



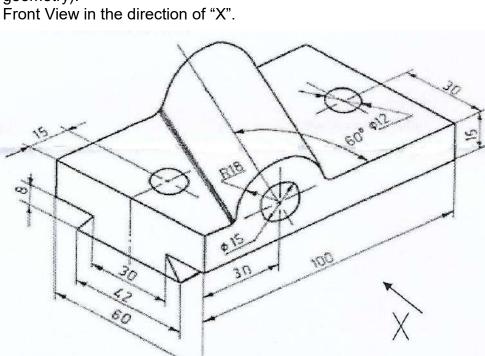
Set S

Max. Marks: 56

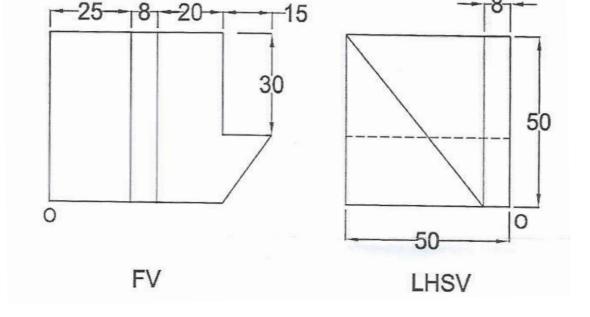
|     |                              | Set   | S        |
|-----|------------------------------|---|----------|
| Q.3 | Solv<br>a)                   | <ul> <li>any three out of four. (Every bit has 03 marks)</li> <li>Draw BIS Conventions of</li> <li>1) Splined shaft</li> <li>2) Bearing</li> </ul>  | 09       |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut  |          |
|     | c)                           | <ul> <li>Draw BIS Conventions of</li> <li>1) Cylindrical compression spring</li> <li>2) Glass material</li> </ul>   |          |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud   |          |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | <b>The any three out of four (Every bit has 03 marks)</b><br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling.   | 09       |
| Q.5 | Solv<br>a)                   | <ul> <li>the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) \$\phi_30H_7g_6\$</li> <li>2) \$\phi_50H_8p_6\$</li> <li>Also support the answer by writing the calculations and draw diagram for the same.</li> </ul>  | 09<br>04 |
|     | b)                           | <ul> <li>Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm.</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> | 05       |
|     |                              |   |          |



- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



**SLR-FM-111** 

Set S

09

09

Set S

|                      | (Values in microns) |        |           |           |            |              |              |               |            |          |  |  |
|----------------------|---------------------|--------|-----------|-----------|------------|--------------|--------------|---------------|------------|----------|--|--|
|                      | toleran             | ces of | holes     |           |            |              | Toleran      | ces of        | shalls     |          |  |  |
| Nominal              | Н7                  | на     | H9        | H10       | H11        | dЭ           | e8           | 17            | g6         | h6       |  |  |
| From 1<br>Upto 3     | +10                 | +14    | + 25      | + 40<br>0 | ÷ 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 3 | - 6      |  |  |
| Over 3<br>Upto 6     | +12                 | +18    | + 30<br>0 | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | 4<br>-12   | - 8      |  |  |
| Over 6<br>Upto 10    | +15                 | +22    | + 36      | + 58      | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | 9        |  |  |
| Over 10<br>Upto 1B   | +18                 | +27    | + 43<br>0 | + 70<br>0 | +110<br>U  | - 50<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0<br>-11 |  |  |
| Over 18<br>Upto 30   | +21                 | +33    | + 52      | 4 84<br>0 | +130<br>0  | - 65         | - 40<br>- 73 | - 20<br>- 41  | -20        | 0<br>-13 |  |  |
| Over 30<br>Upto 50   | +25                 | +39    | + 62      | +100      | +160       | -80<br>-142  | - 50<br>- 89 | - 25          | - 9        | 0-16     |  |  |
| Over 50<br>Upto 80   | +30                 | +46    | + 76      | +120      | +190<br>0  | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0        |  |  |
| Over 80<br>Upto 120  | +35                 | +54    | + 87      | +140      | +220       | -120         | - 72         | - 36          | -12<br>-34 | 0        |  |  |
| Over 120<br>Upto 180 | +40                 | +63    | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0<br>-25 |  |  |
| Over 180<br>Upto 250 | +45                 | +72    | +115      | +185      | +290       | -170<br>-285 | -100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0        |  |  |
| Over 250<br>Upto 315 | +52                 | +81    | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56<br>-108  | -17<br>-49 | 0        |  |  |
| Over 315<br>Upto 400 | +57                 | +89    | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3  |  |  |
| Over 400<br>Uptu 500 | +63                 | +97    | +155      | +250      | 4 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0        |  |  |

| (Values in micro | ns |
|------------------|----|

| (Values in microns)  |              |              |                  |            |                |              |                    |                      |            |              |  |
|----------------------|--------------|--------------|------------------|------------|----------------|--------------|--------------------|----------------------|------------|--------------|--|
|                      | Tol          | erance       | erances of holes |            |                |              |                    | Tolerances of shafts |            |              |  |
| Nominal<br>sizes     | D10          | E 9          | F8               | G7         | JS7            | K7           | j6                 | k6                   | n6         | рБ           |  |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14 | + 20<br>+ 6      | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10     | + 3<br>- 3         | + 6<br>0             | +10<br>+ 4 | + 12 + 6     |  |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20    | + 28<br>+ 10     | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9   | + 4<br>- 4         | + 9<br>+ 1           | +16<br>+ 8 | + 20<br>+ 12 |  |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25 | + 35<br>+ 13     | +20 + 5    | + 7.5          | + 5<br>-10   | + 4.5 - 4.5        | +10<br>+ 1           | +19<br>+10 | + 24<br>+ 15 |  |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32 | + 43<br>+ 16     | +24 + 6    | + 9<br>- 9     | + 6<br>-12   | + 5.5 - 5.5        | +12<br>+ 1           | +23<br>+12 | + 29<br>+ 18 |  |
| Over 18<br>Upto 30   | +149<br>+ 65 | + 92<br>+ 40 | + 53 + 20        | +28<br>+7  | +10.5          | +6<br>-15    | + 6.5 - 6.5        | +15<br>+ 2           | +28<br>+15 | + 3!<br>+ 2: |  |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112<br>+ 50 | + 64 + 25        | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18   | + 8<br>- 8         | $^{+18}_{+2}$        | +33<br>+17 | + 4.         |  |
| Over 50<br>Upto 80   | +220<br>+100 | +134<br>+ 60 | +76 + 30         | +40 + 10   | +15<br>-15     | +9<br>-21    | $\pm 9.5$<br>- 9.5 | +21-+2               | +39 +20    | + 5 + 3      |  |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72 | +90<br>+36       | +47<br>+12 | +17.5          | $+10 \\ -25$ | +11<br>-11         | +25 + 3              | +45<br>+23 | + 5<br>+ 3   |  |
| Over 120<br>Upto 180 | +305<br>+145 | +185<br>+ 85 | +106<br>+ 43     | +54<br>+14 | +20<br>-20     | +12<br>-28   | +12.5<br>-12.5     | +28 + 3              | +52<br>+27 | + 6 + 4      |  |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100     | +122 + 50        | +61<br>+15 | +23<br>-23     | +13<br>+33   | +14.5<br>-14.5     | +33<br>+ 4           | +60<br>+31 | + 7<br>+ 5   |  |
| Over 250<br>Upto 315 | +400<br>+190 | +240<br>+110 | +135<br>+ 55     | +69<br>+17 | +26<br>-26     | +16<br>-36   | +16 - 16           | +36 + 4              | +66 + 34   | + 8<br>+ 5   |  |
| Over 315<br>Upto 400 | +440<br>+210 | +265<br>+125 | +151 + 69        | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40   | +18<br>-18         | +40 + 4              | +73<br>+37 | + 9 + 6      |  |
| Over 400<br>Upto 500 | +480+230     | +290+135     | +165<br>+ 68     | +83 +20    | +31.5<br>-31.5 | +18<br>-45   | +20<br>-20         | +45 + 5              | +80<br>+40 | +10<br>+ 6   |  |

|                  | S.E. (Part – II) (New) (CBCS<br>Mechanical<br>THEORY OF  | Éngin               | eering  | 2019            |
|------------------|--|---------------------|---|-----------------|
|                  | e: Friday, 22-11-2019<br>30 PM To 05:30 PM   |                     |   | Max. Marks: 70  |
| ictio            | <ul><li>ns: 1) Q. No. 1 is compulsory and book.</li><li>2) Figure to the right indicates</li></ul>   |                     |   | nutes in answer |
|                  | MCQ/Objective  | e Type Q            | uestions  |                 |
| ion: :           | 30 Minutes   |                     |   | Marks: 14       |
| <b>Chc</b><br>1) | A ball and a socket joint forms a _<br>a) turning pair<br>c) sliding pair  | b)<br>d)            | rolling pair<br>spherical pair                    | 14              |
| 2)               | <ul> <li>The motion of a piston in the cylin of</li> <li>a) completely constrained motion</li> <li>b) incompletely constrained motion</li> <li>c) successfully constrained motion</li> <li>d) none of these</li> </ul> | on<br>otion         | steam engine is an e>                             | kample          |
| 3)               | When a slider moves on a fixed li instantaneous centre liesa) on their point of contact  | ink havin<br><br>b) | g curved surface, their<br>at the centre of curva |                 |

- d) C) at the centre of circle
- According to Aronhold Kennedy's theorem, if three bodies move relatively 4) to each other, their instantaneous centres will lie on a \_\_\_\_\_.
  - straight line a) C) ellipse
- b) parabolic curve d) none of these
- 5) The coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - slider crank mechanism a)
  - b) four bar chain mechanism
  - c) quick return motion mechanism
  - none of these d)
- In a mechanism, the fixed instantaneous centers are those centers which 6)
  - remain in the same place for all configurations of the mechanism a)
  - vary with the configuration of the mechanism b)
  - moves as the mechanism moves, but joints are of permanent nature c)
  - none of the above d)

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#### Q.1 С

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- at the centre of curvature
- at the pin joint
- D)

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| 7)  | <ul> <li>A rigid body, under the action of external forces, can be replaced by two masses placed at a fixed distance apart. The two masses form an equivalent dynamical system, if</li> <li>a) the sum of two masses is equal to the total mass of the body</li> <li>b) the centre of gravity of the two masses coincides with that of the body</li> <li>c) the sum of mass moment of inertia of the masses about their centre of gravity is equal to the mass moment of inertia of the body</li> <li>d) all of the above</li> </ul> |
| 8)  | The size of a cam depends upona) base circleb) pitch circlec) prime circled) pitch curve   |
| 9)  | Path described by the trace point is known as thea) pitch curveb) pitch circlec) prime circled) prime curve  |
| 10) | The efficiency of a screw jack depends ona) pitch of threadsb) loadc) both pitch and loadd) neither pitch nor load   |
| 11) | The frictional torque transmitted by a cone clutch is same as that ofa) flat pivot bearingb) flat collar bearingc) conical pivot bearingd) trapezoidal pivot bearing   |
| 12) | When the frictional force helps the applied force in applying the brake, the<br>brake isa) self-lockingb) automatic<br>c) self-energizingd) overhauling  |
| 13) | A hunting governor isa) More stableb) Less sensitivec) More sensitived) None of these  |
| 14) | Which of the following is a spring controlled governor?a) Hartnellb) Hartungc) Pickeringd) All of these  |

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#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Solve any two questions from each Section.

- 2) Use of calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Draw neat sketches wherever necessary.
- 5) Assume suitable data if necessary and state it clearly.

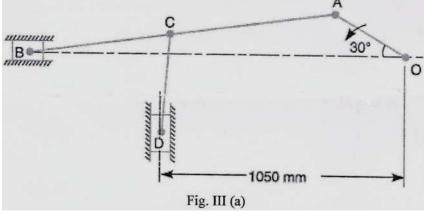
#### Section – I

- Q.2 a) Explain any two inversions of four bar chain with neat sketch.
  - b) The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find with the help of Klein's construction.
    - 1) Velocity and acceleration of the piston.
    - 2) Velocity and acceleration of the mid point of the connecting rod,
    - Angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to I.D.C. (inner dead centre).

Q.3 a) In the mechanism, as shown in Fig. III (a), the crank OA rotates at 20 r.p.m. 10 anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm.

For the given configuration, determine :

- 1) velocities of sliding at B and D
- 2) Angular velocity of CD
- 3) linear acceleration of D

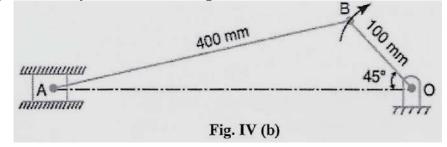


- **b)** Define kinematic link and explain types of links.
- Q.4 a) Explain Inertia force, Inertia Torque and D-Alembert's Principle.
  - b) Locate all the instantaneous centers of the slider crank mechanism as shown in Fig. IV (b). The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find:

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Page **3** of **16** 

- 1) Velocity of the slider A
- 2) Angular velocity of the connecting rod AB



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#### Section – II

- Q.5 a) A cam, with a minimum radius of 40 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below :
  - 1) To move outwards through 40 mm during 90° rotation of the cam
  - 2) To dwell for next 30°
  - 3) To return to its starting position during next 60°
  - 4) To dwell for the rest period of a revolution i.e. 90°

Draw the profile of the cam when the line of stroke of the follower passes through the centre of the cam shaft, and the displacement of the follower is to take place with simple harmonic motion.

- **b)** Define the following:
  - 1) Base Circle
  - 2) Trace point
  - 3) Pitch point
  - 4) Sleeve lift
  - 5) Height of Governor
  - 6) Radius of rotation of Governor
- Q.6 a) A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300 mm internal diameter. The total thrust from the propeller is 100 kN. If the coefficient of friction is 0.12 and speed of the engine 90 r.p.m., find the power absorbed in friction at the thrust block, assuming
  - 1) uniform pressure
  - 2) Uniform wear
  - b) Explain with neat sketch internal expanding brake.
- Q.7 a) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the central load on the sleeve is 15 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.
  - b) The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine.

|     | self-energizing  | d)                 | overhauling  |
|-----|--|--------------------|--|
|     | unting governor is<br>More stable<br>More sensitive  | b)<br>d)           | Less sensitive<br>None of these                              |
| ′hi | ch of the following is a spring con<br>Hartnell<br>Pickering   | trolle<br>b)<br>d) | d governor?<br>Hartung<br>All of these                       |
|     | all and a socket joint forms a<br>turning pair<br>sliding pair<br>motion of a piston in the cylinder                 | b)<br>d)           | rolling pair<br>spherical pair<br>steam engine is an example |
|     | completely constrained motion<br>incompletely constrained motion<br>successfully constrained motion<br>none of these |                    | steam engine is an example                                   |

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#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figure to the right indicates full marks.

**MCQ/Objective Type Questions** 

Q.1 Choose the correct answer. The size of a cam depends upon \_\_\_\_\_ 1) a) base circle b) pitch circle prime circle d) pitch curve C) 2) Path described by the trace point is known as the \_ pitch curve pitch circle b) a) C) prime curve prime circle d) 3) The efficiency of a screw jack depends on \_ a) pitch of threads load b) c) both pitch and load d) neither pitch nor load 4) The frictional torgue transmitted by a cone clutch is same as that of . flat pivot bearing b) flat collar bearing a) conical pivot bearing d) trapezoidal pivot bearing c) When the frictional force helps the applied force in applying the brake, the 5) brake is a) self-locking b) automatic c) 6) Αh a) C) 7) Wh a) C) 8) Ab a) c) 9) Th of a) b) c) d)

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- 10) When a slider moves on a fixed link having curved surface, their instantaneous centre lies \_\_\_\_\_.
  - a) on their point of contact
- b) at the centre of curvature

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- c) at the centre of circle
- d) at the pin joint
- 11) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a \_\_\_\_\_.
  - b) parabolic curve
  - c) ellipse d) none of these
- 12) The coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - a) slider crank mechanism
  - b) four bar chain mechanism
  - c) quick return motion mechanism
  - d) none of these

straight line

a)

- 13) In a mechanism, the fixed instantaneous centers are those centers which
  - a) remain in the same place for all configurations of the mechanism
  - b) vary with the configuration of the mechanism
  - c) moves as the mechanism moves, but joints are of permanent nature
  - d) none of the above
- 14) A rigid body, under the action of external forces, can be replaced by two masses placed at a fixed distance apart. The two masses form an equivalent dynamical system, if \_\_\_\_\_.
  - a) the sum of two masses is equal to the total mass of the body
  - b) the centre of gravity of the two masses coincides with that of the body
  - c) the sum of mass moment of inertia of the masses about their centre of gravity is equal to the mass moment of inertia of the body
  - d) all of the above

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## Seat No.

#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

- 2) Use of calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Draw neat sketches wherever necessary.
- 5) Assume suitable data if necessary and state it clearly.

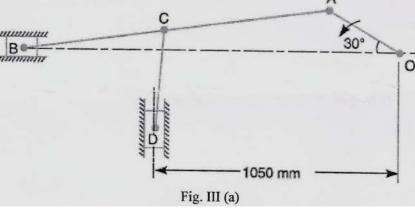
#### Section – I

- Q.2 a) Explain any two inversions of four bar chain with neat sketch.
  - b) The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find with the help of Klein's construction.
    - 1) Velocity and acceleration of the piston.
    - 2) Velocity and acceleration of the mid point of the connecting rod,
    - 3) Angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to I.D.C. (inner dead centre).

Q.3 a) In the mechanism, as shown in Fig. III (a), the crank OA rotates at 20 r.p.m. 10 anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm.

For the given configuration, determine :

- 1) velocities of sliding at B and D
- 2) Angular velocity of CD
- 3) linear acceleration of D



- **b)** Define kinematic link and explain types of links.
- **Q.4 a)** Explain Inertia force, Inertia Torque and D-Alembert's Principle.
  - b) Locate all the instantaneous centers of the slider crank mechanism as shown in Fig. IV (b). The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find:

Max. Marks: 56

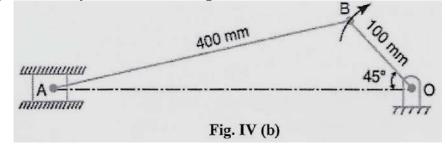
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1) Velocity of the slider A

Angular velocity of the connecting rod AB 2)



#### Section – II

- A cam, with a minimum radius of 40 mm, rotating clockwise at a uniform 08 Q.5 a) speed, is required to give a knife edge follower the motion as described below:
  - To move outwards through 40 mm during 90° rotation of the cam 1)
  - To dwell for next 30° 2)
  - To return to its starting position during next 60° 3)
  - To dwell for the rest period of a revolution i.e. 90° 4)

Draw the profile of the cam when the line of stroke of the follower passes through the centre of the cam shaft, and the displacement of the follower is to take place with simple harmonic motion.

#### Define the following: b)

- 1) **Base Circle**
- 2) Trace point
- 3) Pitch point
- 4) Sleeve lift
- Height of Governor 5)
- Radius of rotation of Governor 6)
- A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300 **08** Q.6 a) mm internal diameter. The total thrust from the propeller is 100 kN. If the coefficient of friction is 0.12 and speed of the engine 90 r.p.m., find the power absorbed in friction at the thrust block, assuming
  - 1) uniform pressure
  - 2) Uniform wear
  - b) Explain with neat sketch internal expanding brake.
- Q.7 a) A Porter governor has equal arms each 250 mm long and pivoted on the 80 axis of rotation. Each ball has a mass of 5 kg and the central load on the sleeve is 15 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.
  - The pitch of 50 mm mean diameter threaded screw of a screw jack is 06 b) 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN. assuming the load to rotate with the screw. Determine the ratio of the torgue required to raise the load to the torgue required to lower the load and also the efficiency of the machine.

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Max. Marks: 70

#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figure to the right indicates full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Q.1 Choose the correct answer.

- 1) The coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - a) slider crank mechanism
  - b) four bar chain mechanism
  - c) quick return motion mechanism
  - d) none of these
- 2) In a mechanism, the fixed instantaneous centers are those centers which
  - a) remain in the same place for all configurations of the mechanism
  - b) vary with the configuration of the mechanism
  - c) moves as the mechanism moves, but joints are of permanent nature
  - d) none of the above
- A rigid body, under the action of external forces, can be replaced by two masses placed at a fixed distance apart. The two masses form an equivalent dynamical system, if \_\_\_\_\_.
  - a) the sum of two masses is equal to the total mass of the body
  - b) the centre of gravity of the two masses coincides with that of the body
  - c) the sum of mass moment of inertia of the masses about their centre of gravity is equal to the mass moment of inertia of the body
  - d) all of the above
- 4) The size of a cam depends upon \_\_\_\_\_
  - a) base circle b) pitch circle
  - c) prime circle d) pitch curve

5) Path described by the trace point is known as the \_\_\_\_\_

- a) pitch curve b) pitch circle
- c) prime circle d) prime curve

6) The efficiency of a screw jack depends on \_

- a) pitch of threadsb) loadboth pitch and loadd) neither
  - d) neither pitch nor load
- 7) The frictional torque transmitted by a cone clutch is same as that of \_\_\_\_\_.
  - a) flat pivot bearingc) conical pivot bearing
- b) flat collar bearing
   d) trapazaidal pivot boar
- d) trapezoidal pivot bearing

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Marks: 14

8) When the frictional force helps the applied force in applying the brake, the brake is

self-locking a)

Hartnell

a)

- c) self-energizing
- b) automatic
- overhauling d)

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- 9) A hunting governor is \_\_\_\_\_.
  - More stable b) Less sensitive a) c)
    - More sensitive d) None of these
- 10) Which of the following is a spring controlled governor?
  - b) Hartung
  - Pickering d) All of these C)
- 11) A ball and a socket joint forms a \_\_\_\_\_
  - b) rolling pair turning pair a) C)
    - sliding pair spherical pair d)
- 12) The motion of a piston in the cylinder of a steam engine is an example of \_
  - completely constrained motion a)
  - incompletely constrained motion b)
  - successfully constrained motion C)
  - none of these d)
- 13) When a slider moves on a fixed link having curved surface, their instantaneous centre lies
  - on their point of contact a)
- b) at the centre of curvature
- at the centre of circle C)
- d) at the pin joint
- 14) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a \_\_\_\_\_.
  - straight line a)

b) parabolic curve

C) ellipse d) none of these

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## Seat No.

#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

- 2) Use of calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Draw neat sketches wherever necessary.
- 5) Assume suitable data if necessary and state it clearly.

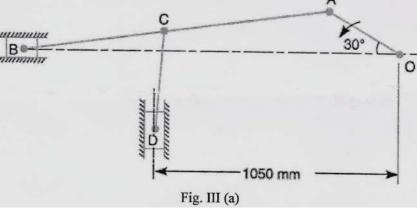
#### Section – I

- **Q.2** a) Explain any two inversions of four bar chain with neat sketch.
  - b) The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find with the help of Klein's construction.
    - 1) Velocity and acceleration of the piston.
    - 2) Velocity and acceleration of the mid point of the connecting rod,
    - 3) Angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to I.D.C. (inner dead centre).

Q.3 a) In the mechanism, as shown in Fig. III (a), the crank OA rotates at 20 r.p.m. 10 anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm.

For the given configuration, determine :

- 1) velocities of sliding at B and D
- 2) Angular velocity of CD
- 3) linear acceleration of D



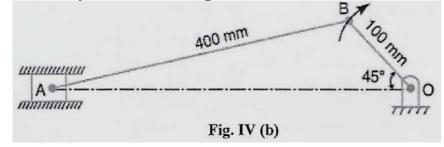
- **b)** Define kinematic link and explain types of links.
- **Q.4 a)** Explain Inertia force, Inertia Torque and D-Alembert's Principle.
  - b) Locate all the instantaneous centers of the slider crank mechanism as shown in Fig. IV (b). The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find:

Max. Marks: 56

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1) Velocity of the slider A

2) Angular velocity of the connecting rod AB



#### Section – II

- Q.5 a) A cam, with a minimum radius of 40 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below :
  - 1) To move outwards through 40 mm during 90° rotation of the cam
  - 2) To dwell for next  $30^{\circ}$
  - 3) To return to its starting position during next  $60^{\circ}$
  - 4) To dwell for the rest period of a revolution i.e.  $90^{\circ}$

Draw the profile of the cam when the line of stroke of the follower passes through the centre of the cam shaft, and the displacement of the follower is to take place with simple harmonic motion.

#### **b)** Define the following:

- 1) Base Circle
- 2) Trace point
- 3) Pitch point
- 4) Sleeve lift
- 5) Height of Governor
- 6) Radius of rotation of Governor
- Q.6 a) A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300 mm internal diameter. The total thrust from the propeller is 100 kN. If the coefficient of friction is 0.12 and speed of the engine 90 r.p.m., find the power absorbed in friction at the thrust block, assuming
  - 1) uniform pressure
  - 2) Uniform wear
  - b) Explain with neat sketch internal expanding brake.
- Q.7 a) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the central load on the sleeve is 15 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.
  - b) The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine.

06

06

SLR-FM-112

Set R

# S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

# **THEORY OF MACHINES – I**

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figure to the right indicates full marks.

#### **MCQ/Objective Type Questions**

#### Q.1 Choose the correct answer.

**Duration: 30 Minutes** 

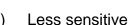
- The efficiency of a screw jack depends on \_\_\_\_\_ 1)
  - pitch of threads a)
    - c) both pitch and load d) neither pitch nor load

#### 2) The frictional torque transmitted by a cone clutch is same as that of \_\_\_\_\_. flat collar bearing

- flat pivot bearing a)
- C) conical pivot bearing
- 3) When the frictional force helps the applied force in applying the brake, the brake is
  - self-locking a) b)
  - self-energizing d) C)
- 4) A hunting governor is
  - a) More stable c)
    - More sensitive d)
- Which of the following is a spring controlled governor? 5)
  - a) Hartnell b) Hartung
  - All of these Pickering d) c)
- 6) A ball and a socket joint forms a \_
  - b) a) turning pair rolling pair
    - c) sliding pair d) spherical pair
- 7) The motion of a piston in the cylinder of a steam engine is an example of \_
  - a) completely constrained motion
  - incompletely constrained motion b)
  - successfully constrained motion c)
  - none of these d)

#### When a slider moves on a fixed link having curved surface, their 8) instantaneous centre lies

- on their point of contact a)
- at the centre of circle C)
- b) at the centre of curvature
- d) at the pin joint



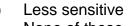
- None of these

trapezoidal pivot bearing

### automatic

### overhauling

### b)



b) load

b)

d)

Seat

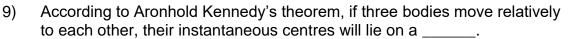
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Max. Marks: 70

Marks: 14



a) straight line

b) parabolic curve

SLR-FM-112

Set

c) ellipse

- d) none of these
- 10) The coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - a) slider crank mechanism
  - b) four bar chain mechanism
  - c) quick return motion mechanism
  - d) none of these
- 11) In a mechanism, the fixed instantaneous centers are those centers which
  - a) remain in the same place for all configurations of the mechanism
  - b) vary with the configuration of the mechanism
  - c) moves as the mechanism moves, but joints are of permanent nature
  - d) none of the above
- 12) A rigid body, under the action of external forces, can be replaced by two masses placed at a fixed distance apart. The two masses form an equivalent dynamical system, if \_\_\_\_\_.
  - a) the sum of two masses is equal to the total mass of the body
  - b) the centre of gravity of the two masses coincides with that of the body
  - c) the sum of mass moment of inertia of the masses about their centre of gravity is equal to the mass moment of inertia of the body
     d) all of the above
  - d) all of the above
- 13) The size of a cam depends upon \_\_\_\_\_
  - base circle b) pitch circle
  - c) prime circle d) pitch curve
- 14) Path described by the trace point is known as the \_\_\_\_\_.
  - a) pitch curve

a)

b) pitch circle

c) prime circle

d) prime curve

Set

## Seat No.

#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

- 2) Use of calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Draw neat sketches wherever necessary.
- 5) Assume suitable data if necessary and state it clearly.

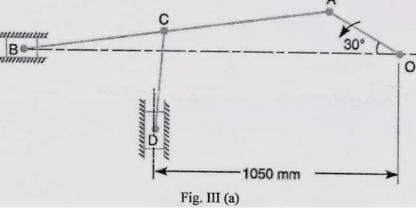
#### Section – I

- **Q.2** a) Explain any two inversions of four bar chain with neat sketch.
  - b) The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find with the help of Klein's construction.
    - 1) Velocity and acceleration of the piston.
    - 2) Velocity and acceleration of the mid point of the connecting rod,
    - 3) Angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to I.D.C. (inner dead centre).

Q.3 a) In the mechanism, as shown in Fig. III (a), the crank OA rotates at 20 r.p.m. 10 anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm.

For the given configuration, determine :

- 1) velocities of sliding at B and D
- 2) Angular velocity of CD
- 3) linear acceleration of D



- **b)** Define kinematic link and explain types of links.
- **Q.4 a)** Explain Inertia force, Inertia Torque and D-Alembert's Principle.
  - b) Locate all the instantaneous centers of the slider crank mechanism as shown in Fig. IV (b). The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find:

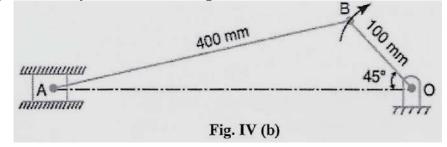
Max. Marks: 56

06

**08** 

04 06

- 1) Velocity of the slider A
- 2) Angular velocity of the connecting rod AB



#### Section – II

- Q.5 a) A cam, with a minimum radius of 40 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below :
  - 1) To move outwards through 40 mm during 90° rotation of the cam
  - 2) To dwell for next 30°
  - 3) To return to its starting position during next 60°
  - 4) To dwell for the rest period of a revolution i.e. 90°

Draw the profile of the cam when the line of stroke of the follower passes through the centre of the cam shaft, and the displacement of the follower is to take place with simple harmonic motion.

- **b)** Define the following:
  - 1) Base Circle
  - 2) Trace point
  - 3) Pitch point
  - 4) Sleeve lift
  - 5) Height of Governor
  - 6) Radius of rotation of Governor
- Q.6 a) A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300 mm internal diameter. The total thrust from the propeller is 100 kN. If the coefficient of friction is 0.12 and speed of the engine 90 r.p.m., find the power absorbed in friction at the thrust block, assuming
  - 1) uniform pressure
  - 2) Uniform wear
  - b) Explain with neat sketch internal expanding brake.
- Q.7 a) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the central load on the sleeve is 15 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.
  - b) The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine.

06

06

SLR-FM-112

Set S

|          | book.   |                                      |
|----------|---|--------------------------------------|
|          | <ol> <li>Figures to the right indicate full marks.</li> <li>MCQ/Objective Type Questions</li> </ol>   |                                      |
| ation: ( | : 30 Minutes  | Marks: 14                            |
|          | noose the correct alternatives from the options and   |                                      |
| 1)       | For thread cutting, mechanism is used on la   | athe machine.<br>Jear Mechanism      |
| 2)       | The back gear mechanism is used fora) increase speedb) reducec) automatic speedd) all of the  | e speed<br>ne above                  |
| 3)       |   | e pre drilled hole<br>xternal thread |
| 4)       | <ul> <li>In case of shaper</li> <li>a) tool is reciprocating and work is rotary</li> <li>b) tool is rotary and work is reciprocating</li> <li>c) tool is reciprocating and work is stationary</li> <li>d) tool is stationary and work is reciprocating</li> </ul> |                                      |
| 5)       | Key way operation can be performed onma<br>a) slotting b) drilling<br>c) lathe d) grindin   |                                      |
| 6)       | What is the material removal mechanism in ECM p<br>a) electrolysis b) Indenta<br>c) melting and vaporization d) electro   | ation                                |
| 7)       | Forging dies accurately manufactured by pr<br>a) EDM b) ECM<br>c) USM d) None of  | ocess.<br>of these                   |
| 8)       | The chips are maximum at the initial and minimum terminates in<br>a) Down Milling b) Form N   |                                      |
| 9)       | c) Side Milling d) Conve<br>The gang milling operation can be performed on<br>a) Horizontal b) Vertica  | ntional Milling<br>milling machine.  |
| 10)      | <ul> <li>In case of cylindrical grinding</li> <li>a) tool is reciprocating and work is rotary</li> <li>b) tool is rotary and work is rotary</li> <li>c) tool is reciprocating and work is stationary</li> </ul>   |                                      |

Time: 02:30 PM To 05:30 PM Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

Dura

Day & Date: Saturday, 23-11-2019

Seat

No.

#### 4 Q.1 4

S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** MACHINE TOOLS & PROCESSES

- tool is stationary and work is reciprocating d)

# **SLR-FM-113**

Set P

|     |                  |   |                    | SLR-   | FM-1 | 13 |
|-----|------------------|---|--------------------|--|------|----|
|     |                  |   |                    |  | Set  | Ρ  |
| 11) | A gi<br>a)<br>c) | rinding wheel A24K7V is specified<br>Abrasive<br>Grade                    | l in w<br>b)<br>d) | hich A stands for <u>.</u><br>Grainsize<br>Structure |      |    |
| 12) | The<br>a)<br>c)  | main purpose of Boring operation<br>finish the drilled hole<br>both a & b | n is _<br>b)<br>d) | <br>Enlarge pre drilled hole<br>None of above        |      |    |
| 13) |                  | mass production, the external spi<br>cess.<br>Gear hobbling               | rue ge<br>b)       | ears are manufactured by _<br>Gear broaching         |      |    |

- Gear milling c)
- Gear casting d)
- 14)Point to point (PTP) in CNC machines is the type of \_\_\_\_\_\_a)CNC drillingb)CNC turningc)CNC millingd)CNC grinding

| Seat |  |
|------|--|
| No.  |  |

#### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Question no. 2 and Question no. 6 are compulsory.

- 2) Solve any two questions from remaining in Section I and Section II.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions wherever necessary and state them clearly.
- 5) Draw neat diagram wherever necessary.

#### Section – I

| Q.2 | a)<br>b)                   | Draw neat sketch of Center Lathe and explain Specification of lathe.<br>List different operations performed on lathe machine and Explain any five<br>with neat sketch.  | 05<br>05 |
|-----|----------------------------|---|----------|
| Q.3 | <b>a</b> )                 | Calculate set over distance for taper turning when job has a large dia. is 40 mm and small dia. of 34 mm and 200 mm length. Also draw neat sketch of set-up.  | 04       |
|     | b)                         | Explain work and tool holding devices used on drilling machine.   | 05       |
| Q.4 | a)<br>b)                   | Differentiate between shaper and plainer.<br>Explain Ultrasonic Machining (USM) with its working, advantages,<br>limitations and applications   | 04<br>05 |
| Q.5 | a)<br>b)<br>c)             | ite short notes on any three:<br>Differentiate between steady rest & follower rest<br>Shaper operations<br>Back gear mechanism<br>Abrasive Water Jet Machining (AWJM)   | 09       |
|     |                            | Section – II  |          |
| Q.6 | a)                         | List different operations performed on milling and Explain any five with neat sketch.   | 05       |
|     | b)                         | Index work piece for 241 divisions using dividing head by differential<br>indexing method.<br>Use Indexing plate 1-15,16,17,18,19,20<br>Indexing plate 2- 21,23, 27, 29, 31, 33<br>Indexing plate 3- 37, 39, 41, 43, 47, 49<br>And Change gears-24 (2nos), 28, 32, 40, 44, 48, 56, 64, 72, 86, 100, 140 | 05       |
| Q.7 | a)<br>b)                   | Explain center less grinding process with neat sketch.<br>Explain different boring bars and tools.  | 05<br>04 |
| Q.8 | a)<br>b)                   | To mill 60 teeth on spur gear set the dividing head by simple indexing.<br>Explain Gear hobbing process.  | 04<br>05 |
| Q.9 | Wr<br>a)<br>b)<br>c)<br>d) | <b>ite short notes (Any Three)</b><br>Classification of CNC machine<br>Mounting of grinding wheel<br>Gear shaving<br>Lapping process  | 09       |

Set

Ρ



form external thread

d)

|      | MCQ/Objective Type Questions   |  |  |  |  |  |  |
|------|--------------------------------|--|--|--|--|--|--|
| Dura | Duration: 30 Minutes Marks: 14 |  |  |  |  |  |  |
| Q.1  | <b>Cho</b><br>1)               | <b>Dise the correct alternatives from the options and rewrite the sentence. 14</b><br>The chips are maximum at the initial and minimum at end when cut terminates in   |  |  |  |  |  |
|      | 2)                             | a)Down Millingb)Form Millingc)Side Millingd)Conventional Milling   |  |  |  |  |  |
|      | 2)                             | The gang milling operation can be performed onmilling machine.a) Horizontalb) Verticalc) Bothd) None of these  |  |  |  |  |  |
|      | 3)                             | <ul> <li>In case of cylindrical grinding</li> <li>a) tool is reciprocating and work is rotary</li> <li>b) tool is rotary and work is rotary</li> <li>c) tool is reciprocating and work is stationary</li> <li>d) tool is stationary and work is reciprocating</li> </ul> |  |  |  |  |  |
|      | 4)                             | A grinding wheel A24K7V is specified in which A stands for<br>a) Abrasive b) Grainsize<br>c) Grade d) Structure  |  |  |  |  |  |
|      | 5)                             | The main purpose of Boring operation isa) finish the drilled holeb) Enlarge pre drilled holec) both a & bd) None of above  |  |  |  |  |  |
|      | 6)                             | For mass production, the external sprue gears are manufactured byProcess.a)Gear hobblingb)Gear broachingc)Gear millingd)Gear casting   |  |  |  |  |  |
|      | 7)                             | Point to point (PTP) in CNC machines is the type ofa)CNC drillingb)CNC turningc)CNC millingd)CNC grinding  |  |  |  |  |  |
|      | 8)                             | For thread cutting, mechanism is used on lathe machine.a) Apron Mechanismb) Back gear Mechanismc) Tumbler Mechanismd) Half nut   |  |  |  |  |  |
|      | 9)                             | The back gear mechanism is used fora) increase speedb) reduce speedc) automatic speedd) all of the above   |  |  |  |  |  |
|      | 10)                            | The reaming is an operation which<br>a) finish the drilled hole b) enlarge pre drilled hole  |  |  |  |  |  |

S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 23-11-2019

Internal thread

C)

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

Seat

No.

**SLR-FM-113** 

Set | Q

## In case of shaper \_\_\_\_\_.

- a) tool is reciprocating and work is rotary
- b) tool is rotary and work is reciprocating
- c) tool is reciprocating and work is stationary
- d) tool is stationary and work is reciprocating
- 12) Key way operation can be performed on \_\_\_\_\_ machine.
  - a) slotting b) drilling
  - c) lathe d) grinding
- 13) What is the material removal mechanism in ECM process?
  - electrolysis b) Indentation
  - c) melting and vaporization d) electrode position
  - Forging dies accurately manufactured by \_\_\_\_\_ process.
  - a) EDM

a)

11)

14)

b) ECM

**SLR-FM-113** 

Set Q

c) USM

d) None of these

Page **5** of **12** 

| Seat |  |
|------|--|
| No.  |  |

### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Question no. 2 and Question no. 6 are compulsory.

- 2) Solve any two questions from remaining in Section I and Section II.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions wherever necessary and state them clearly.
- 5) Draw neat diagram wherever necessary.

#### Section - I

| Q.2 | a)<br>b)                    | Draw neat sketch of Center Lathe and explain Specification of lathe.<br>List different operations performed on lathe machine and Explain any five<br>with neat sketch.  | 05<br>05 |
|-----|-----------------------------|---|----------|
| Q.3 | a)                          | Calculate set over distance for taper turning when job has a large dia. is 40 mm and small dia. of 34 mm and 200 mm length. Also draw neat sketch of set-up.  | 04       |
|     | b)                          | Explain work and tool holding devices used on drilling machine.   | 05       |
| Q.4 | a)<br>b)                    | Differentiate between shaper and plainer.<br>Explain Ultrasonic Machining (USM) with its working, advantages,<br>limitations and applications   | 04<br>05 |
| Q.5 | Wr<br>a)<br>b)<br>c)<br>d)  | ite short notes on any three:<br>Differentiate between steady rest & follower rest<br>Shaper operations<br>Back gear mechanism<br>Abrasive Water Jet Machining (AWJM)   | 09       |
|     |                             | Section - II  |          |
| Q.6 | a)                          | List different operations performed on milling and Explain any five with neat sketch.   | 05       |
|     | b)                          | Index work piece for 241 divisions using dividing head by differential<br>indexing method.<br>Use Indexing plate 1-15,16,17,18,19,20<br>Indexing plate 2- 21,23, 27, 29, 31, 33<br>Indexing plate 3- 37, 39, 41, 43, 47, 49<br>And Change gears-24 (2nos), 28, 32, 40, 44, 48, 56, 64, 72, 86, 100, 140 | 05       |
| Q.7 | a)<br>b)                    | Explain center less grinding process with neat sketch.<br>Explain different boring bars and tools.  | 05<br>04 |
| Q.8 | a)<br>b)                    | To mill 60 teeth on spur gear set the dividing head by simple indexing.<br>Explain Gear hobbing process.  | 04<br>05 |
| Q.9 | Wri<br>a)<br>b)<br>c)<br>d) | ite short notes (Any Three)<br>Classification of CNC machine<br>Mounting of grinding wheel<br>Gear shaving<br>Lapping process   | 09       |

Set

Q

Max. Marks: 56

|             | -             |                              | 1                                     |                        |            | UEIX                                 | -1 141-1   |      |
|-------------|---------------|------------------------------|---------------------------------------|------------------------|------------|--------------------------------------|------------|------|
| Seat<br>No. |               |                              |                                       |                        |            |                                      | Set        | R    |
|             | S.E           | -                            | Mechanic                              | al Engi                | ne         | -                                    | 9          |      |
|             |               |                              | ACHINE TO                             | OLS & F                | PRO        |                                      |            |      |
|             |               | turday, 23-′<br>1 To 05:30 F |                                       |                        |            | Ma                                   | ax. Marks  | : 70 |
| Instru      | ctions: 1     | ) Q. No. 1 is<br>book.       | s compulsory a                        | nd should              | l be       | solved in first 30 minute            | es in ansv | ver  |
|             | 2             | ) Figures to                 | the right indica                      |                        |            |                                      |            |      |
| Duratio     | on: 30 Mi     | nutes                        | -                                     |                        |            |                                      | Marks      | : 14 |
|             |               |                              |                                       |                        | -          | ons and rewrite the ser              | ntence.    | 14   |
| 1           | ) Key<br>a)   | slotting                     | tion can be perf                      |                        | ו <u> </u> | machine.<br>drilling                 |            |      |
|             | c)            | lathe                        |                                       |                        | 3)         | grinding                             |            |      |
| 2           | 2) Wha        | at is the mai                | terial removal n                      | nechanisr              | n in       | ECM process?                         |            |      |
|             | a)            | electrolysi                  |                                       | b                      | ,          | Indentation                          |            |      |
| 0           | c)            | •                            | nd vaporization                       |                        | l)         | electrode position                   |            |      |
| 3           | s) ⊢orę<br>a) |                              | curately manuf                        |                        | 9 _<br>5)  |                                      |            |      |
|             | c)            | USM                          |                                       |                        | ))<br>(k   | None of these                        |            |      |
| 4           | l) The        | chips are n                  | naximum at the                        | initial and            | d m        | inimum at end when cut               | t          |      |
|             |               | ninates in                   |                                       | Ŀ                      | `          |                                      |            |      |
|             | a)<br>c)      | Down Mill<br>Side Millir     | •                                     | b<br>d                 | ,          | Form Milling<br>Conventional Milling |            |      |
| 5           | ,             | gang millin                  | g operation car                       |                        | <i>'</i>   | ed onmilling mad                     | chine.     |      |
|             | a)            | Horizontal                   |                                       | b                      | ,          | Vertical<br>None of these            |            |      |
| 0           | c)            | Both                         |                                       | d                      | 1)         | None of these                        |            |      |
| 6           | a) in c       |                              | drical grinding _<br>iprocating and \ | <u>.</u><br>work is ro | tar∖       | 1                                    |            |      |
|             | b)            | tool is rota                 | ary and work is                       | rotary                 | -          |                                      |            |      |
|             | c)            |                              | iprocating and w                      |                        |            |                                      |            |      |
| -           | d)            |                              | tionary and wor                       | •                      |            | -                                    |            |      |
| 7           | a) Agr        | Abrasive                     | el AZ4K7V is sp                       |                        | i wr<br>5) | hich A stands for                    |            |      |
|             | c)            | Grade                        |                                       |                        | d)         | Structure                            |            |      |
| 8           | B) The        | main purpo                   | ose of Boring op                      | peration is            | S          |                                      |            |      |
|             | a)            |                              | drilled hole                          |                        | )          | • •                                  | •          |      |
|             | c)            | both a & b                   |                                       |                        | d)         | None of above                        |            |      |
| 9           |               | mass produ<br>cess.          | iction, the exter                     | mal sprue              | e ge       | ars are manufactured by              | У          |      |
|             | a)            | Gear hob                     | oling                                 | b                      | )          | Gear broaching                       |            |      |
|             | c)            | Gear milli                   | •                                     | d                      | ,          | Gear casting                         |            |      |
| 1           |               |                              |                                       |                        |            | e type of <u></u>                    |            |      |
|             | a)            | CNC drillin                  |                                       |                        | -          | CNC turning                          |            |      |
|             | c)            | CNC millir                   | ig                                    | d                      | 1)         | CNC grinding                         |            |      |

- 11) For thread cutting, \_\_\_\_\_ mechanism is used on lathe machine.
  - Apron Mechanism a)
- Back gear Mechanism b)

Set | R

- C) Tumbler Mechanism
- d) Half nut
- The back gear mechanism is used for 12)
  - a) increase speed automatic speed
- b) reduce speed
- all of the above d)

d)

- The reaming is an operation which \_ 13) finish the drilled hole
- b) enlarge pre drilled hole form external thread
- Internal thread c)
- 14) In case of shaper \_

C)

a)

- tool is reciprocating and work is rotary a)
- b) tool is rotary and work is reciprocating
- tool is reciprocating and work is stationary c)
- d) tool is stationary and work is reciprocating

R

| S | LF | R-P | =N | <b>I-1</b> | 1 | 3 |
|---|----|-----|----|------------|---|---|
|   |    |     |    |            |   |   |

Set

Max. Marks: 56

| Seat |  |
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| No.  |  |
|      |  |

### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Question no. 2 and Question no. 6 are compulsory.

- 2) Solve any two questions from remaining in Section I and Section II.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions wherever necessary and state them clearly.
- 5) Draw neat diagram wherever necessary.

#### Section - I

| Q.2 | a)<br>b)                    | Draw neat sketch of Center Lathe and explain Specification of lathe.<br>List different operations performed on lathe machine and Explain any five<br>with neat sketch.  | 05<br>05 |
|-----|-----------------------------|---|----------|
| Q.3 | a)                          | Calculate set over distance for taper turning when job has a large dia. is 40 mm and small dia. of 34 mm and 200 mm length. Also draw neat sketch of set-up.  | 04       |
|     | b)                          | Explain work and tool holding devices used on drilling machine.   | 05       |
| Q.4 | a)<br>b)                    | Differentiate between shaper and plainer.<br>Explain Ultrasonic Machining (USM) with its working, advantages,<br>limitations and applications   | 04<br>05 |
| Q.5 | Wri<br>a)<br>b)<br>c)<br>d) | ite short notes on any three:<br>Differentiate between steady rest & follower rest<br>Shaper operations<br>Back gear mechanism<br>Abrasive Water Jet Machining (AWJM)   | 09       |
|     |                             | Section - II  |          |
| Q.6 | a)                          | List different operations performed on milling and Explain any five with neat sketch.   | 05       |
|     | b)                          | Index work piece for 241 divisions using dividing head by differential<br>indexing method.<br>Use Indexing plate 1-15,16,17,18,19,20<br>Indexing plate 2- 21,23, 27, 29, 31, 33<br>Indexing plate 3- 37, 39, 41, 43, 47, 49<br>And Change gears-24 (2nos), 28, 32, 40, 44, 48, 56, 64, 72, 86, 100, 140 | 05       |
| Q.7 | a)<br>b)                    | Explain center less grinding process with neat sketch.<br>Explain different boring bars and tools.  | 05<br>04 |
| Q.8 | a)<br>b)                    | To mill 60 teeth on spur gear set the dividing head by simple indexing.<br>Explain Gear hobbing process.  | 04<br>05 |
| Q.9 | Wri<br>a)<br>b)<br>c)<br>d) | ite short notes (Any Three)<br>Classification of CNC machine<br>Mounting of grinding wheel<br>Gear shaving<br>Lapping process   | 09       |

| 110.  |   |                                 |  |             |  |          |  |
|---|---|---------------------------------|--|-------------|--|----------|--|
| S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE TOOLS & PROCESSES |   |                                 |  |             |  |          |  |
|   |   | e: Saturday, 23                 | -11-2019   | • • • •     |  | arks: 70 |  |
|   |   | 0 PM To 05:30                   |  |             |  |          |  |
| Instr   | uctio   | book.                           |  |             | e solved in first 30 minutes in              | answer   |  |
|   |   | 2) Figures t                    | to the right indicate full i                       |             |  |          |  |
| Dura  | tion: 3   | 0 Minutes                       | MCQ/Objective Typ                                  |             |  | arks: 14 |  |
|   |   |                                 | t alternatives from the                            | onti        | ons and rewrite the sentend                  |          |  |
| <b>Q</b> .11  | 1)  | In case of cylir                | ndrical grinding                                   | -           |  |          |  |
|   | ·   | a) tool is re                   | ciprocating and work is                            | rotar       | У  |          |  |
|   |   |                                 | tary and work is rotary<br>ciprocating and work is | etatio      | an an u                                      |          |  |
|   |   | ,                               | ationary and work is rec                           |             |  |          |  |
|   | 2)  | ,                               | •  | •           | hich A stands for                            |          |  |
|   | <i>_</i> )                                      | a) Abrasive                     | •  | b)          | Grainsize                                    |          |  |
|   |   | c) Grade                        |  | d)          | Structure                                    |          |  |
|   | 3)  | The main purp                   | oose of Boring operation                           | n is _      |  |          |  |
|   |   | ,                               | e drilled hole                                     | ,           | Enlarge pre drilled hole                     |          |  |
|   |   | c) both a &                     |  | d)          | None of above                                |          |  |
|   | 4)  | For mass proc<br>Process.       | luction, the external spr                          | ue ge       | ears are manufactured by                     |          |  |
|   |   | a) Gear hot                     | bling  | b)          | Gear broaching                               |          |  |
|   |   | c) Gear mill                    |  | d)          | Gear casting                                 |          |  |
|   | 5)  | Point to point (                | (PTP) in CNC machines                              | s is th     | ne type of                                   |          |  |
|   |   | a) CNC drill                    | 0  | b)          | CNC turning                                  |          |  |
|   |   | c) CNC mill                     | U U  | d)          | CNC grinding                                 |          |  |
|   | 6)  |                                 | ting, mechanism<br>echanism                        | is us<br>b) | sed on lathe machine.<br>Back gear Mechanism |          |  |
|   |   | , ,                             | Mechanism  | d)          | Half nut                                     |          |  |
|   | 7)  | /                               | mechanism is used for                              | ,           |  |          |  |
|   | .,  | a) increase                     |  | b)          | <br>reduce speed                             |          |  |
|   |   | c) automati                     | c speed  | d)          | all of the above                             |          |  |
|   | 8) The reaming is an operation which            |                                 |  |             |  |          |  |
|   |   | ,                               | e drilled hole                                     | b)          | enlarge pre drilled hole                     |          |  |
|   | 0)  | c) Internal t                   |  | d)          | form external thread                         |          |  |
|   | 9)  | In case of sha<br>a) tool is re | per <u>.</u><br>ciprocating and work is            | rotar       | W  |          |  |
|   |   |                                 | tary and work is recipro                           |             | -  |          |  |
|   | c) tool is reciprocating and work is stationary |                                 |  |             |  |          |  |

Seat

No.

## **SLR-FM-113**

Set S

- tool is reciprocating and work is stationary tool is stationary and work is reciprocating c)
- d)

- 10) Key way operation can be performed on \_\_\_\_\_ machine. drilling
  - slotting a) b)
    - d) grinding
- What is the material removal mechanism in ECM process? 11)
  - a) electrolysis C)
    - b) Indentation melting and vaporization electrode position d)
- Forging dies accurately manufactured by \_\_\_\_\_ process. 12)
  - a) EDM USM
- ECM b) d) None of these

Set S

- 13) The chips are maximum at the initial and minimum at end when cut terminates in .
  - Down Milling a)

- b) Form Milling
- Side Milling c)
- **Conventional Milling** d)
- 14) The gang milling operation can be performed on \_\_\_\_\_milling machine.
  - Horizontal a)
  - Both c)

C)

C)

lathe

- Vertical b)
- None of these d)

Page **12** of **12** 

### SLR-FM-113

Set

Max. Marks: 56

S

| Seat |  |
|------|--|
| No.  |  |
|      |  |

### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

| Instructions: 1 | ) Question no. | 2 and Question n | o. 6 are compulsory. |
|-----------------|----------------|------------------|----------------------|
|-----------------|----------------|------------------|----------------------|

- 2) Solve any two questions from remaining in Section I and Section II.
- 3) Figures to the right indicate full marks.
- 4) Make suitable assumptions wherever necessary and state them clearly.
- 5) Draw neat diagram wherever necessary.

#### Section - I

| Q.2 | a)<br>b)                    | Draw neat sketch of Center Lathe and explain Specification of lathe.<br>List different operations performed on lathe machine and Explain any five<br>with neat sketch.  | 05<br>05 |
|-----|-----------------------------|---|----------|
| Q.3 | <b>a</b> )                  | Calculate set over distance for taper turning when job has a large dia. is 40 mm and small dia. of 34 mm and 200 mm length. Also draw neat sketch of set-up.  | 04       |
|     | b)                          | Explain work and tool holding devices used on drilling machine.   | 05       |
| Q.4 | a)<br>b)                    | Differentiate between shaper and plainer.<br>Explain Ultrasonic Machining (USM) with its working, advantages,<br>limitations and applications   | 04<br>05 |
| Q.5 | Wri<br>a)<br>b)<br>c)<br>d) | ite short notes on any three:<br>Differentiate between steady rest & follower rest<br>Shaper operations<br>Back gear mechanism<br>Abrasive Water Jet Machining (AWJM)   | 09       |
|     |                             | Section - II  |          |
| Q.6 | a)                          | List different operations performed on milling and Explain any five with neat sketch.   | 05       |
|     | b)                          | Index work piece for 241 divisions using dividing head by differential<br>indexing method.<br>Use Indexing plate 1-15,16,17,18,19,20<br>Indexing plate 2- 21,23, 27, 29, 31, 33<br>Indexing plate 3- 37, 39, 41, 43, 47, 49<br>And Change gears-24 (2nos), 28, 32, 40, 44, 48, 56, 64, 72, 86, 100, 140 | 05       |
| Q.7 | a)<br>b)                    | Explain center less grinding process with neat sketch.<br>Explain different boring bars and tools.  | 05<br>04 |
| Q.8 | a)<br>b)                    | To mill 60 teeth on spur gear set the dividing head by simple indexing.<br>Explain Gear hobbing process.  | 04<br>05 |
| Q.9 | Wri<br>a)<br>b)<br>c)<br>d) | <b>ite short notes (Any Three)</b><br>Classification of CNC machine<br>Mounting of grinding wheel<br>Gear shaving<br>Lapping process  | 09       |

S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

> book. 2) Figures to the right indicate full marks.

- 3) Marks suitable assumptions if necessary and state it clearly.
- 4) Don't forget to mention Question Paper set (P/Q/R/S) on top of page.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

8)

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - In case of stable equilibrium of floating bodies 1) b) M lies above G
    - a) M & G coincide
    - M lies below G d) B lies above G C)
  - Centre of gravity of a plane surface immersed in liquid at an angle to free 2) surface of liquid lies \_\_\_\_\_ Centre of pressure.
    - a) above b) below c) at d) none of the above
  - 3) Pitot tube is used for measurement of
    - Pressure Velocity a) b)
      - Flow d) Discharge c)
  - Relation between hydraulic coefficients is \_ 4)
    - $1/C_{d} = 1/(C_{v} \times C_{c})$ a)  $C_d = C_v / C_c$ b)
    - $C_d = C_v \times C_c$ d)  $C_c = C_d / C_v$ c)
  - 5) If the velocity in a fluid flow does not change with respect to length of direction of flow, it is called .
    - steady flow b) uniform flow a)
    - incompressible flow rotational flow C) d)
  - 6) Streamline, pathline and streakline are identical when the flow is \_\_\_\_\_.
    - steady flow uniform flow b) a)
    - Incompressible flow c) d) Rotational flow
  - For a viscous flow through circular pipe, the ratio of maximum velocity of 7) fluid to average velocity of fluid is \_\_\_\_
    - b) 3/2 a) 2 2/3 C) d) 1/2
    - Power transmitted through pipe will be maximum when Head loss due to
      - friction = x Total head at the inlet of pipe. a) 0.5 0.66 b)
      - 0.33 d) 3 C)

SLR-FM-114

## Set

Max. Marks: 70

Marks: 14

Set 9) Three pipes of diameter 20 cm, 30 cm & 40 cm are connected in series. Discharge through 30 cm diameter pipe will be \_\_\_\_\_. least of the three discharges a) b) medium of the three discharges same as in 20 cm & 40 cm dia. Pipe c) highest of the three discharges d) Hydraulic Gradient Line is always \_\_\_\_\_ Total Energy Line. 10) Above b) Parallel to a) None of the above C) Below d) 11) The drag force exerted by a fluid on a body immersed in the fluid is due to . pressure & viscous force a) b) pressure & gravity force pressure & turbulence force d) none of the above c) 12) Models are than actual size. smaller b) larger a) C) smaller or larger d) same size Laminar sub-layer exists in \_\_\_\_\_. 13) laminar boundary layer region b) turbulent boundary layer region a) C) transition zone d) None of the above The hydraulic mean depth is given by \_\_\_\_\_ where A = Area & P = 14) Wetted perimeter  $P^2/A$ P/A b) a) (A/P)<sup>0.5</sup> A/P C) d)

**SLR-FM-114** 

### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering FLUID MECHANICS**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from Section-I & Section-II.

- 2) Figures to right indicate full marks.
- 3) Marks suitable assumptions if necessary and state it clearly.

### Section – I

- Q.2 a) Derive an expression for total pressure & position of center of pressure for 05 an inclined plane surface immersed in liquid. **b)** A fluid flow field is given by  $V = x^2y i + y^2z j - (2xyz+yz^2) k$ . Prove that it is a 05 case of possible steady, incompressible fluid flow. Calculate the Velocity at the point P(2,1,3). State Bernoulli's theorem along with its assumptions 04 C) Q.3 A crude oil of viscosity 0.97 poise & relative density 0.9 is flowing through a 05 a) horizontal circular pipe of diameter 100 mm & of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. **b)** A vertical wall is of 8 m in height. A jet of water is coming out from a nozzle 05 with a velocity of 20 m/s. the nozzle is situated at a distance of 20 m from the vertical wall. Find the angle of projection of the nozzle to the horizontal so that the jet of water just clears the top of the wall. Explain principle of buoyancy, Archimedes principle. 04 C) Q.4 a) The stream function for a two-dimensional flow is given by  $\Psi = 2xy$ , 05 calculate the velocity at the point P(2,3). Find the velocity potential function φ. **b)** A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm 05 5 respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. c) Explain different types of fluid flows. 04 Section – II What is equivalent pipe? Derive Dupuifs equation. (Relation between length Q.5 a) 05 & diameters of compound pipes & equivalent pipe) b) Determine the difference in the elevations between the water surfaces in 05 the two tanks which are connected by a horizontal pipe of diameter 300 mm and length 400 m. The rate of flow of water through the pipe is 300 liters/sec. Consider all losses and take the value of coefficient of friction =0.008.
  - What is siphon? What are applications of siphon? C)

04

Max. Marks: 56

Seat No.

Set

**SLR-FM-114** Set Ρ The frictional torque 'T' of a disc of diameter 'D' rotating at a speed 'N' in a 05 fluid of viscosity  $'\mu'$  and density  $'\rho'$  is given by  $T = D^5 N^2 \rho \varphi \left[ \frac{\mu}{D^2 N \rho} \right]$ Prove this by the method of dimensions. **b)** What is boundary layer separation? Explain methods to reduce boundary 05 layer separation. Write a note on Computational Fluid Dynamics. 04 a) A kite weighing 7.848 N has an effective area of 0.8 m<sup>2</sup>. It is maintained in 05

Q.7 an air at an angle of 10° to the horizontal. The string attached to the kite makes an angle of 45° to the horizontal and at this position the value of coefficient of drag and lift are 0.6 and 0.8 respectively. Find the speed of the wind and the tension in the string. Take density of air as  $1.25 \text{ kg/m}^3$ . b) What is aerofoil? What is stall on an aerofoil? 05

Q.6 a)

c)

c) Explain hydraulic gradient line & total energy line. 04

### Set S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

| Instructions: 1) Q. No. 1 is compulsory and should be solved in first | : 30 minutes in answer |
|---|------------------------|
| book.   |                        |

FLUID MECHANICS

- 2) Figures to the right indicate full marks.
- 3) Marks suitable assumptions if necessary and state it clearly.
- 4) Don't forget to mention Question Paper set (P/Q/R/S) on top of page.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - Power transmitted through pipe will be maximum when Head loss due to 1) x Total head at the inlet of pipe. friction =

|    | -    | <br> | <br> |      |
|----|------|------|------|------|
| a) | 0.5  |      | b)   | 0.66 |
| c) | 0.33 |      | d)   | 3    |

- 2) Three pipes of diameter 20 cm, 30 cm & 40 cm are connected in series. Discharge through 30 cm diameter pipe will be .
  - least of the three discharges a)
  - medium of the three discharges b)
  - same as in 20 cm & 40 cm dia. Pipe C)
  - highest of the three discharges d)
- Hydraulic Gradient Line is always \_\_\_\_\_ Total Energy Line. 3)
  - b) Parallel to a) Above
  - Below d) None of the above C)
- 4) The drag force exerted by a fluid on a body immersed in the fluid is due to .

b)

d)

pressure & gravity force

none of the above

M lies above G

- a) pressure & viscous force
- pressure & turbulence force c)
- 5) Models are than actual size.
  - smaller b) a) larger
  - smaller or larger C) d) same size
- 6) Laminar sub-layer exists in \_\_\_\_
  - laminar boundary layer region b) turbulent boundary layer region a) None of the above
  - C) transition zone d)
- The hydraulic mean depth is given by \_\_\_\_\_ where A = Area & P = 7) Wetted perimeter
  - $P^2/A$ P/A b) a) (A/P)<sup>0.5</sup> A/P d) C)
- In case of stable equilibrium of floating bodies 8)
  - M & G coincide b) a)
  - M lies below G d) B lies above G c)

Seat No.

SLR-FM-114

Max. Marks: 70

Marks: 14

|     | Set Q  |
|-----|--|
| 9)  | Centre of gravity of a plane surface immersed in liquid at an angle to free<br>surface of liquid lies Centre of pressure.<br>a) above b) below<br>c) at d) none of the above   |
| 10) | Pitot tube is used for measurement of<br>a) Pressure b) Velocity<br>c) Flow d) Discharge   |
| 11) | $ \begin{array}{lll} \mbox{Relation between hydraulic coefficients is } \_\_\ \\ \mbox{a)} & C_d = C_v  / C_c & b) & 1 / C_d = 1 /  (C_v  x  C_c) \\ \mbox{c)} & C_d = C_v  x  C_c & d) & C_c = C_d  /  C_v \\ \end{array} $ |
| 12) | If the velocity in a fluid flow does not change with respect to length of direction of flow, it is called<br>a) steady flow b) uniform flow<br>c) incompressible flow d) rotational flow                                     |
| 13) | Streamline, pathline and streakline are identical when the flow is<br>a) steady flow b) uniform flow<br>c) Incompressible flow d) Rotational flow  |
| 14) | For a viscous flow through circular pipe, the ratio of maximum velocity of fluid to average velocity of fluid is   |

| a) | 2   | b) | 3/2 |
|----|-----|----|-----|
| c) | 2/3 | d) | 1⁄2 |

### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering FLUID MECHANICS**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from Section-I & Section-II.

- 2) Figures to right indicate full marks.
- 3) Marks suitable assumptions if necessary and state it clearly.

#### Section – I

Q.2 a) Derive an expression for total pressure & position of center of pressure for 05 an inclined plane surface immersed in liquid. **b)** A fluid flow field is given by  $V = x^2y i + y^2z j - (2xyz+yz^2) k$ . Prove that it is a 05 case of possible steady, incompressible fluid flow. Calculate the Velocity at the point P(2,1,3). State Bernoulli's theorem along with its assumptions 04 C) Q.3 A crude oil of viscosity 0.97 poise & relative density 0.9 is flowing through a 05 a) horizontal circular pipe of diameter 100 mm & of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. **b)** A vertical wall is of 8 m in height. A jet of water is coming out from a nozzle 05 with a velocity of 20 m/s. the nozzle is situated at a distance of 20 m from the vertical wall. Find the angle of projection of the nozzle to the horizontal so that the jet of water just clears the top of the wall. Explain principle of buoyancy, Archimedes principle. 04 C) Q.4 a) The stream function for a two-dimensional flow is given by  $\Psi = 2xy$ , 05 calculate the velocity at the point P(2,3). Find the velocity potential function φ. **b)** A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm 05 5 respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. c) Explain different types of fluid flows. 04 Section – II What is equivalent pipe? Derive Dupuifs equation. (Relation between length Q.5 a) 05 & diameters of compound pipes & equivalent pipe) b) Determine the difference in the elevations between the water surfaces in 05 the two tanks which are connected by a horizontal pipe of diameter 300 mm and length 400 m. The rate of flow of water through the pipe is 300 liters/sec. Consider all losses and take the value of coefficient of friction =0.008. What is siphon? What are applications of siphon? 04 C)

Seat No.

SLR-FM-114

Set Q

Max. Marks: 56

Set Q

| Q.6 | a) | The frictional torque 'T' of a disc of diameter 'D' rotating at a speed 'N' in a fluid of viscosity ' $\mu$ ' and density ' $\rho$ ' is given by<br>$T = D^5 N^2 \rho \varphi \left[ \frac{\mu}{D^2 N \rho} \right]$   | 05 |
|-----|----|--|----|
|     |    | Prove this by the method of dimensions.  |    |
|     | b) | What is boundary layer separation? Explain methods to reduce boundary  | 05 |
|     |    | layer separation.  |    |
|     | C) | Write a note on Computational Fluid Dynamics.  | 04 |
| Q.7 | a) | A kite weighing 7.848 N has an effective area of $0.8 \text{ m}^2$ . It is maintained in an air at an angle of $10^\circ$ to the horizontal. The string attached to the kite makes an angle of $45^\circ$ to the horizontal and at this position the value of coefficient of drag and lift are 0.6 and 0.8 respectively. Find the speed of the wind and the tension in the string. Take density of air as 1.25 kg/m <sup>3</sup> . | 05 |
|     | b) | What is aerofoil? What is stall on an aerofoil?  | 05 |
|     | c) | Explain hydraulic gradient line & total energy line.   | 04 |

### Set S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

FLUID MECHANICS

- 2) Figures to the right indicate full marks.
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b)

uniform flow

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

c)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- If the velocity in a fluid flow does not change with respect to length of 1) direction of flow, it is called \_\_\_\_\_.
  - a) steady flow incompressible flow
    - rotational flow d)
- 2) Streamline, pathline and streakline are identical when the flow is \_\_\_\_\_.
  - steady flow uniform flow b) a)
  - Incompressible flow c) d) Rotational flow
- 3) For a viscous flow through circular pipe, the ratio of maximum velocity of fluid to average velocity of fluid is \_\_\_\_
  - b) 3/2 a) 2 c) 2/3 d) 1/2
- 4) Power transmitted through pipe will be maximum when Head loss due to friction = x Total head at the inlet of pipe.
  - 0.5 a) 0.66 b)
  - d) 0.33 3 c)
- Three pipes of diameter 20 cm, 30 cm & 40 cm are connected in series. 5) Discharge through 30 cm diameter pipe will be \_\_\_\_\_.
  - least of the three discharges a)
  - medium of the three discharges b)
  - same as in 20 cm & 40 cm dia. Pipe C)
  - highest of the three discharges d)

Hydraulic Gradient Line is always \_\_\_\_\_ Total Energy Line. 6)

- Above b) Parallel to a)
- None of the above C) Below d)
- 7) The drag force exerted by a fluid on a body immersed in the fluid is due to
  - a) pressure & viscous force
  - pressure & turbulence force C)
- pressure & gravity force b) none of the above d)
- 8) Models are than actual size.
  - a) smaller C)
- b) larger smaller or larger d) same size

SLR-FM-114



Max. Marks: 70

Marks: 14

|     |                 |  |              | Set   | R |
|-----|-----------------|--|--------------|---|---|
| 9)  | Lam<br>a)<br>c) |  |              | turbulent boundary layer region<br>None of the above                          |   |
| 10) | Wet<br>a)       | hydraulic mean depth is given b<br>ted perimeter<br>P/A<br>A/P                   | b)           | where A = Area & P =<br>P <sup>2</sup> /A<br>(A/P) <sup>0.5</sup>             |   |
| 11) | a)              | ase of stable equilibrium of floati<br>M & G coincide<br>M lies below G          | b)           | odies<br>M lies above G<br>B lies above G                                     |   |
| 12) | surfa           | tre of gravity of a plane surface<br>ace of liquid lies Centre o<br>above<br>at  | f pres<br>b) |   |   |
| 13) |                 | t tube is used for measurement of<br>Pressure<br>Flow                            |              | <br>Velocity<br>Discharge   |   |
| 14) | a)              | ation between hydraulic coefficie<br>$C_d = C_v / C_c$<br>$C_d = C_v \times C_c$ | b)           | $\frac{1}{C_{d}} = \frac{1}{(C_{v} \times C_{c})}$<br>$C_{c} = C_{d} / C_{v}$ |   |

Set

### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering FLUID MECHANICS**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from Section-I & Section-II.

- 2) Figures to right indicate full marks.
- 3) Marks suitable assumptions if necessary and state it clearly.

#### Section – I

Q.2 a) Derive an expression for total pressure & position of center of pressure for 05 an inclined plane surface immersed in liquid. **b)** A fluid flow field is given by  $V = x^2y i + y^2z j - (2xyz+yz^2) k$ . Prove that it is a 05 case of possible steady, incompressible fluid flow. Calculate the Velocity at the point P(2,1,3). State Bernoulli's theorem along with its assumptions 04 C) Q.3 A crude oil of viscosity 0.97 poise & relative density 0.9 is flowing through a 05 a) horizontal circular pipe of diameter 100 mm & of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. **b)** A vertical wall is of 8 m in height. A jet of water is coming out from a nozzle 05 with a velocity of 20 m/s. the nozzle is situated at a distance of 20 m from the vertical wall. Find the angle of projection of the nozzle to the horizontal so that the jet of water just clears the top of the wall. Explain principle of buoyancy, Archimedes principle. 04 C) Q.4 a) The stream function for a two-dimensional flow is given by  $\Psi = 2xy$ , 05 calculate the velocity at the point P(2,3). Find the velocity potential function φ. **b)** A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm 05 5 respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. c) Explain different types of fluid flows. 04 Section – II What is equivalent pipe? Derive Dupuifs equation. (Relation between length Q.5 a) 05 & diameters of compound pipes & equivalent pipe) b) Determine the difference in the elevations between the water surfaces in 05 the two tanks which are connected by a horizontal pipe of diameter 300 mm and length 400 m. The rate of flow of water through the pipe is 300 liters/sec. Consider all losses and take the value of coefficient of friction =0.008. What is siphon? What are applications of siphon? 04 C)

Seat No.

Max. Marks: 56

Set R

| Q.6 | a) | The frictional torque 'T' of a disc of diameter 'D' rotating at a speed 'N' in a fluid of viscosity ' $\mu$ ' and density ' $\rho$ ' is given by<br>$T = D^5 N^2 \rho \varphi \left[ \frac{\mu}{D^2 N \rho} \right]$   | 05 |
|-----|----|--|----|
|     |    | Prove this by the method of dimensions.  |    |
|     | b) | What is boundary layer separation? Explain methods to reduce boundary  | 05 |
|     |    | layer separation.  |    |
|     | c) | Write a note on Computational Fluid Dynamics.  | 04 |
| Q.7 | a) | A kite weighing 7.848 N has an effective area of $0.8 \text{ m}^2$ . It is maintained in an air at an angle of $10^\circ$ to the horizontal. The string attached to the kite makes an angle of $45^\circ$ to the horizontal and at this position the value of coefficient of drag and lift are 0.6 and 0.8 respectively. Find the speed of the wind and the tension in the string. Take density of air as 1.25 kg/m <sup>3</sup> . | 05 |
|     | b) | What is aerofoil? What is stall on an aerofoil?  | 05 |
|     | c) | Explain hydraulic gradient line & total energy line.   | 04 |

Instructions: 1) O No. 1 is compulsory and should be solved in first 20 minutes in answer **MCQ/Objective Type Questions Duration: 30 Minutes** Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 Hydraulic Gradient Line is always Total Energy Line. 1) a) Above b) Parallel to Below d) None of the above C) 2) The drag force exerted by a fluid on a body immersed in the fluid is due to pressure & viscous force pressure & gravity force a) b) c) pressure & turbulence force d) none of the above 3) Models are \_\_\_\_\_ than actual size. a) smaller b) larger smaller or larger c) d) same size Laminar sub-layer exists in \_\_\_\_ 4) laminar boundary layer region a) b) turbulent boundary layer region transition zone d) None of the above C)

#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

| instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer |  |
|--|--|
| book.  |  |
| <ol><li>Figures to the right indicate full marks.</li></ol>                                |  |
| <ol> <li>Marks suitable assumptions if necessary and state it clearly.</li> </ol>          |  |
|  |  |

4) Don't forget to mention Question Paper set (P/Q/R/S) on top of page.

#### (A/P)<sup>0.5</sup> A/P C) d) 6) In case of stable equilibrium of floating bodies \_\_\_\_\_

- M & G coincide b) M lies above G a) M lies below G c) d) B lies above G
- Centre of gravity of a plane surface immersed in liquid at an angle to free 7) surface of liquid lies \_\_\_\_\_ Centre of pressure.

The hydraulic mean depth is given by \_\_\_\_\_ where A = Area & P =

b)

- a) above b) below none of the above c) at d)
- 8) Pitot tube is used for measurement of Velocity a) Pressure b)
  - d) Discharge C) Flow

#### 9) Relation between hydraulic coefficients is \_\_\_\_\_

 $C_{d} = C_{v} / C_{c}$ a)

Wetted perimeter

P/A

a)

 $C_d = C_v \times C_c$ c)

 $1/C_{d} = 1/(C_{v} \times C_{c})$ b)

 $C_c = C_d / C_v$ d)

 $P^2/A$ 

SLR-FM-114

Seat No.

5)

Max. Marks: 70

Marks: 14

If the velocity in a fluid flow does not change with respect to length of 10) direction of flow, it is called \_\_\_\_\_. uniform flow

- steady flow b) a) C)
  - incompressible flow d) rotational flow
- 11) Streamline, pathline and streakline are identical when the flow is \_\_\_\_\_.
  - steady flow b) uniform flow a)
  - Incompressible flow Rotational flow C) d)
- For a viscous flow through circular pipe, the ratio of maximum velocity of 12) fluid to average velocity of fluid is .

|    |     | , |    |     |
|----|-----|---|----|-----|
| a) | 2   |   | b) | 3/2 |
| c) | 2/3 |   | d) | 1⁄2 |

- Power transmitted through pipe will be maximum when Head loss due to 13) friction = \_\_\_\_\_ x Total head at the inlet of pipe.
  - 0.5 0.66 a) b)
    - 0.33 C) d) 3
- 14) Three pipes of diameter 20 cm, 30 cm & 40 cm are connected in series. Discharge through 30 cm diameter pipe will be \_\_\_\_\_.
  - a) least of the three discharges
  - b) medium of the three discharges
  - same as in 20 cm & 40 cm dia. Pipe C)
  - highest of the three discharges d)

**SLR-FM-114** 

Set | S

# Set

### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from Section-I & Section-II.

- 2) Figures to right indicate full marks.
- 3) Marks suitable assumptions if necessary and state it clearly.

#### Section – I

- Q.2 a) Derive an expression for total pressure & position of center of pressure for 05 an inclined plane surface immersed in liquid. **b)** A fluid flow field is given by  $V = x^2y i + y^2z j - (2xyz+yz^2) k$ . Prove that it is a 05 case of possible steady, incompressible fluid flow. Calculate the Velocity at the point P(2,1,3). State Bernoulli's theorem along with its assumptions 04 C) Q.3 A crude oil of viscosity 0.97 poise & relative density 0.9 is flowing through a 05 a) horizontal circular pipe of diameter 100 mm & of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. **b)** A vertical wall is of 8 m in height. A jet of water is coming out from a nozzle 05 with a velocity of 20 m/s. the nozzle is situated at a distance of 20 m from the vertical wall. Find the angle of projection of the nozzle to the horizontal so that the jet of water just clears the top of the wall. Explain principle of buoyancy, Archimedes principle. 04 C) Q.4 a) The stream function for a two-dimensional flow is given by  $\Psi = 2xy$ , 05 calculate the velocity at the point P(2,3). Find the velocity potential function φ. **b)** A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm 05 5 respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. c) Explain different types of fluid flows. 04 Section – II What is equivalent pipe? Derive Dupuifs equation. (Relation between length Q.5 a) 05 & diameters of compound pipes & equivalent pipe) b) Determine the difference in the elevations between the water surfaces in 05 the two tanks which are connected by a horizontal pipe of diameter 300 mm and length 400 m. The rate of flow of water through the pipe is 300 liters/sec. Consider all losses and take the value of coefficient of friction =0.008.
  - c) What is siphon? What are applications of siphon?

04

Max. Marks: 56

Seat No. SLR-FM-114

Set S

| Q.6 | a) | The frictional torque 'T' of a disc of diameter 'D' rotating at a speed 'N' in a fluid of viscosity ' $\mu$ ' and density ' $\rho$ ' is given by<br>$T = D^5 N^2 \rho \varphi \left[ \frac{\mu}{D^2 N \rho} \right]$  | 05 |
|-----|----|---|----|
|     |    | Prove this by the method of dimensions.   |    |
|     | b) | What is boundary layer separation? Explain methods to reduce boundary   | 05 |
|     |    | layer separation.   |    |
|     | c) | Write a note on Computational Fluid Dynamics.   | 04 |
| Q.7 | a) | A kite weighing 7.848 N has an effective area of $0.8 \text{ m}^2$ . It is maintained in an air at an angle of $10^\circ$ to the horizontal. The string attached to the kite makes an angle of $45^\circ$ to the horizontal and at this position the value of coefficient of drag and lift are 0.6 and 0.8 respectively. Find the speed of the wind and the tension in the string. Take density of air as $1.25 \text{ kg/m}^3$ . | 05 |
|     | b) | What is aerofoil? What is stall on an aerofoil?   | 05 |
|     | c) | Explain hydraulic gradient line & total energy line.  | 04 |

### Set S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONIC TECHNOLOGY Day & Date: Tuesday, 26-11-2019 Max. Marks: 70 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No.1 is compulsory. It should be solved in the first 30 minutes in answer book.

- 2) Assume suitable data if necessary.
- 3) Draw neat diagrams whenever necessary.

#### **MCQ/Objective Type Questions**

Q.1 Choose the correct alternatives from the options and rewrite the sentence.

- 1) No-load speed of which of the following motor will be highest?
  - Shunt motor a)
  - Series motor b)

**Duration: 30 Minutes** 

C)

Seat

No.

- c) Long shunt compound motor
- d) Short shunt compound motor
- Which of the following application requires high starting torque? 2)
  - Lathe machine b) Centrifugal pump a) C) Locomotive d) Air blower
- 3) A dc servomotor is similar to a regular d. c. motor except that its design is modified to cope with \_\_\_\_\_. b) slow speeds
  - electronic switching a)
    - static conditions d) both (b) and (c)
- Slip rings are usually made of \_\_\_\_\_ 4)
  - a) copper b) carbon
  - phosphor bronze d) aluminium C)
- In a 3-phase power measurement by two wattmeter method the reading of 5) one of the wattmeter's was zero. The power factor of the load must be
  - a) Unity b) 0.5
  - 0.3 d) Zero c)
- 6) Heat transfer by condition will not occur when .
  - bodies are kept in vacuum a)
  - bodies are immersed in water b)
  - bodies are exposed to thermal radiations c)
  - d) temperatures of the two bodies are identical
- 7) The welding electric circuit is \_\_\_\_\_
  - Never earthed b) Always earthed a)
  - Trough cables only d) None c)

### **SLR-FM-115**

Marks: 14

14

- a) a.c. signals only b) d.c. signals only c) both a.c. and d.c. signals 9) In op amp block diagram level shifting stage works such as \_\_\_\_\_. a) output stage b) input stage d) collector follower c) emitter follower The address bus is \_\_\_\_\_. 10) unidirectional b) bidirectional a) d) serial parallel C) The flip-flop which is free from race around problem is \_\_\_\_\_. 11) **RS FF** b) JK FF a) C) Master Slave JK FF d) All of above 12) The input stage of an Op-amp is usually a \_\_\_\_ differential amplifier a) **CE** amplifier c) d) None of these CMRR for an op-amp should be \_\_\_\_\_ 13) as large as possible b) as small as possible a) d) close to unity close to zero c) The number of I/O pins of 8051 is \_\_\_\_\_ 14) \_. b) 32
  - 16 a) d) 4 8 C)

d) neither d.c. nor a.c signals

- - b) class B push-pull amplifier

- Op-amp can amplify \_\_\_\_\_.

8)

- **SLR-FM-115** 
  - Set P

### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONIC TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsorv.

- 2) Figure to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Draw neat diagrams whenever necessary.

#### Section – I

#### Q.2 Attempt any four.

- With the help of neat sketch explain working of three-point starter. a)
- With the help of neat sketch explain brushless DC motor. b)
- Derive the running torque equation of Three Phase Induction Motor. Also c) derive the maximum running torque condition.
- d) With the help of neat sketch explain dielectric heating.
- A 500V shunt motor runs at its normal speed of 250 r.p.m. when the e) armature current is 200A. The resistance of the armature is  $0.12\Omega$ . Calculate the speed when a resistance is inserted in the field reducing the shunt field to 80% of normal value and armature current is 100A.
- With the help of neat sketch explain working of direct online starter (DOL) **f**) for three phase induction motor.

#### Attempt any two. Q.3

- Explain the speed control methods of. a)
  - 1) DC shunt motor 2) DC series motor
- A 30kW three phase 400V resistance oven is to employ nickel –chrome b) strip of 0.025cm thick for a three-phase star connected heating element. If the wire temperature is to be  $1100^{\circ}$ C & that of charge is to be  $700^{\circ}$ C, estimate a suitable width for a strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the alloy is  $1.03*10^{-6}$  ohm-m.
- With neat sketch explain: c)
  - 1) Variable reluctance stepper motor
    - 2) Permanent magnet stepper motor

#### Section – II

#### Q.4 Attempt any four.

- Explain interfacing of temperature sensor LM 35 using microcontroller. a)
- Explain the ideal characteristics of operational amplifier. b)
- C) Explain working of J-K flip flop with neat sketch.
- d) Explain the comparison between microprocessor and microcontroller.
- With the help of neat sketch explain successive approximation type ADC. e)
- Explain the interrupts of microcontroller 8051. **f**)

#### Q.5 Attempt any two.

- Explain in detail architecture of microcontroller 8051. a)
- With neat sketch explain op-amp as. b) 1) Adder 2) Integrator
- Explain working of basic 4-bit register with wave forms using D flipflop. C)

16

12

Max. Marks: 56

16

12



SLR-FM-115

Seat No.

|             | S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>ELECTRICAL AND ELECTRONIC TECHNOLOGY   |                        |  |  |  |
|-------------|--|------------------------|--|--|--|
|             | te: Tuesday, 26-11-2019<br>30 PM To 05:30 PM   | Max. Marks: 70         |  |  |  |
| Instructio  | <ul> <li>ons: 1) Q. No.1 is compulsory. It should be solved in the answer book.</li> <li>2) Assume suitable data if necessary.</li> <li>3) Draw neat diagrams whenever necessary.</li> </ul>                 | ne first 30 minutes in |  |  |  |
|             | MCQ/Objective Type Questions   |                        |  |  |  |
| Duration: 3 | 30 Minutes   | Marks: 14              |  |  |  |
|             | noose the correct alternatives from the options and rewrntence.Op-amp can amplifya) a.c. signals onlyb) d.c. signals onlyc) both a.c. and d.c. signalsd) neither d.c. nor a                                  |                        |  |  |  |
| 2)          | In op amp block diagram level shifting stage works such a<br>a) output stage b) input stage<br>c) emitter follower d) collector follower   |                        |  |  |  |
| 3)          | The address bus isa) unidirectionalb) bidirectionalc) paralleld) serial  |                        |  |  |  |
| 4)          | The flip-flop which is free from race around problem isa)RS FFb)JK FFc)Master Slave JK FFd)All of above  |                        |  |  |  |
| 5)          | The input stage of an Op-amp is usually a<br>a) differential amplifier b) class B push-pul<br>c) CE amplifier d) None of these   | ll amplifier           |  |  |  |
| 6)          | CMRR for an op-amp should bea) as large as possibleb) as small as possiblec) close to zerod) close to unity  | sible                  |  |  |  |
| 7)          | The number of I/O pins of 8051 is<br>a) 16 	 b) 32<br>c) 8 	 d) 4  |                        |  |  |  |
| 8)          | <ul> <li>No-load speed of which of the following motor will be high</li> <li>a) Shunt motor</li> <li>b) Series motor</li> <li>c) Long shunt compound motor</li> <li>d) Short shunt compound motor</li> </ul> | est?                   |  |  |  |
| 9)          | Which of the following application requires high starting toa)Lathe machineb)Centrifugal pumpc)Locomotived)Air blower  | -                      |  |  |  |

Seat

Set Q

**SLR-FM-115** 

No. C E /D ort

- Set Q
- 10) A dc servomotor is similar to a regular d. c. motor except that its design is modified to cope with
  - a) electronic switching
- b) slow speeds
- static conditions c)
- d) both (b) and (c)
- 11) Slip rings are usually made of \_\_\_\_\_.
  - b) carbon a) copper phosphor bronze c)
    - d) aluminium
- 12) In a 3-phase power measurement by two wattmeter method the reading of one of the wattmeter's was zero. The power factor of the load must be \_\_\_\_\_.
  - b) 0.5 a) Unity
  - d) Zero c) 0.3
- 13) Heat transfer by condition will not occur when \_\_\_\_\_.
  - bodies are kept in vacuum a)
  - bodies are immersed in water b)
  - bodies are exposed to thermal radiations c)
  - d) temperatures of the two bodies are identical
- 14) The welding electric circuit is \_\_\_\_\_
  - Never earthed a)
- b) Always earthed
- d) None c) Trough cables only

# Seat No.

### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONIC TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Figure to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Draw neat diagrams whenever necessary.

#### Section – I

#### Q.2 Attempt any four.

- a) With the help of neat sketch explain working of three-point starter.
- **b)** With the help of neat sketch explain brushless DC motor.
- c) Derive the running torque equation of Three Phase Induction Motor. Also derive the maximum running torque condition.
- d) With the help of neat sketch explain dielectric heating.
- e) A 500V shunt motor runs at its normal speed of 250 r.p.m. when the armature current is 200A. The resistance of the armature is 0.12Ω. Calculate the speed when a resistance is inserted in the field reducing the shunt field to 80% of normal value and armature current is 100A.
- **f)** With the help of neat sketch explain working of direct online starter (DOL) for three phase induction motor.

#### Q.3 Attempt any two.

- a) Explain the speed control methods of.
  - 1) DC shunt motor 2) DC series motor
- b) A 30kW three phase 400V resistance oven is to employ nickel –chrome strip of 0.025cm thick for a three-phase star connected heating element. If the wire temperature is to be 1100°C & that of charge is to be 700°C, estimate a suitable width for a strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the alloy is 1.03\*10<sup>-6</sup> ohm-m.
- c) With neat sketch explain:
  - 1) Variable reluctance stepper motor
    - 2) Permanent magnet stepper motor

#### Section – II

#### Q.4 Attempt any four.

- a) Explain interfacing of temperature sensor LM 35 using microcontroller.
- **b)** Explain the ideal characteristics of operational amplifier.
- c) Explain working of J-K flip flop with neat sketch.
- d) Explain the comparison between microprocessor and microcontroller.
- e) With the help of neat sketch explain successive approximation type ADC.
- f) Explain the interrupts of microcontroller 8051.

#### Q.5 Attempt any two.

- a) Explain in detail architecture of microcontroller 8051.
- b) With neat sketch explain op-amp as.
  1) Adder
  2) Integrator
- c) Explain working of basic 4-bit register with wave forms using D flipflop.

16

16



Max. Marks: 56

**SLR-FM-115** 

12

12

| Seat |  |
|------|--|
| No.  |  |

### S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONIC TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No.1 is compulsory. It should be solved in the first 30 minutes in answer book.

- 2) Assume suitable data if necessary.
- 3) Draw neat diagrams whenever necessary.

**MCQ/Objective Type Questions** 

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- In a 3-phase power measurement by two wattmeter method the reading of 1) one of the wattmeter's was zero. The power factor of the load must be \_\_\_\_\_.
  - b) 0.5 Unity a)
  - c) 0.3 d) Zero
- 2) Heat transfer by condition will not occur when \_\_\_\_\_.
  - bodies are kept in vacuum a)
  - bodies are immersed in water b)
  - bodies are exposed to thermal radiations C)
  - temperatures of the two bodies are identical d)
- 3) The welding electric circuit is \_\_\_\_\_
  - a) Never earthed
  - Trough cables only c)
- 4) Op-amp can amplify \_\_\_\_\_.
  - a) a.c. signals only
  - both a.c. and d.c. signals c)
- b) d.c. signals only d) neither d.c. nor a.c signals

In op amp block diagram level shifting stage works such as \_\_\_\_\_. 5)

a) output stage

a)

c)

- c) emitter follower
- The address bus is \_\_\_\_\_ 6)

CE amplifier

- a) unidirectional
  - c) parallel d) serial
- 7) The flip-flop which is free from race around problem is \_\_\_\_\_.
  - a) RS FF b) JK FF
  - Master Slave JK FF d) All of above c)
- The input stage of an Op-amp is usually a \_\_\_\_ 8) differential amplifier
  - b) class B push-pull amplifier
    - d) None of these
- CMRR for an op-amp should be \_\_\_\_ 9)
  - as large as possible a) close to zero c)
- b) as small as possible
  - d) close to unity

Max. Marks: 70

Marks: 14

Set

R



b) Always earthed

## d) None

- b) input stage
- d) collector follower

b) bidirectional

Set R

| 10) | The number of I/O pins of 8051 is |    |    |
|-----|-----------------------------------|----|----|
| - / | a) 16                             |    | 32 |
|     |                                   | 1) |    |

- c) 8 d) 4
- 11) No-load speed of which of the following motor will be highest?
  - Shunt motor a)
  - b) Series motor
  - c) Long shunt compound motor
  - d) Short shunt compound motor
- 12) Which of the following application requires high starting torque?
  - b) Centrifugal pump a) Lathe machine
  - c) Locomotive d) Air blower
- 13) A dc servomotor is similar to a regular d. c. motor except that its design is modified to cope with \_\_\_\_\_.
  - a) electronic switching
- b) slow speeds
- c) static conditions
- d) both (b) and (c)
- 14) Slip rings are usually made of \_\_\_\_\_.
  - a) copper
  - c) phosphor bronze
- b) carbon
- d) aluminium

### Seat No.

### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONIC TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsorv.

- 2) Figure to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Draw neat diagrams whenever necessary.

#### Section – I

#### Q.2 Attempt any four.

- With the help of neat sketch explain working of three-point starter. a)
- With the help of neat sketch explain brushless DC motor. b)
- Derive the running torque equation of Three Phase Induction Motor. Also c) derive the maximum running torque condition.
- d) With the help of neat sketch explain dielectric heating.
- A 500V shunt motor runs at its normal speed of 250 r.p.m. when the e) armature current is 200A. The resistance of the armature is  $0.12\Omega$ . Calculate the speed when a resistance is inserted in the field reducing the shunt field to 80% of normal value and armature current is 100A.
- With the help of neat sketch explain working of direct online starter (DOL) **f**) for three phase induction motor.

#### Attempt any two. Q.3

- Explain the speed control methods of. a)
  - 1) DC shunt motor 2) DC series motor
- A 30kW three phase 400V resistance oven is to employ nickel –chrome b) strip of 0.025cm thick for a three-phase star connected heating element. If the wire temperature is to be  $1100^{\circ}$ C & that of charge is to be  $700^{\circ}$ C, estimate a suitable width for a strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the alloy is  $1.03*10^{-6}$  ohm-m.
- With neat sketch explain: c)
  - 1) Variable reluctance stepper motor
    - 2) Permanent magnet stepper motor

#### Section – II

#### Q.4 Attempt any four.

- Explain interfacing of temperature sensor LM 35 using microcontroller. a)
- Explain the ideal characteristics of operational amplifier. b)
- C) Explain working of J-K flip flop with neat sketch.
- d) Explain the comparison between microprocessor and microcontroller.
- With the help of neat sketch explain successive approximation type ADC. e)
- Explain the interrupts of microcontroller 8051. **f**)

#### Q.5 Attempt any two.

- Explain in detail architecture of microcontroller 8051. a)
- With neat sketch explain op-amp as. b) 1) Adder 2) Integrator
- Explain working of basic 4-bit register with wave forms using D flipflop. C)

16

12

16

Set

Max. Marks: 56

**SLR-FM-115** 

12

| Гіте: 02:30 РМ То 05:30 РМ   |                  |                 |  |          |  |  |
|------------------------------|------------------|-----------------|--|----------|--|--|
| nstructions:                 |                  |                 | <ol> <li>Q. No.1 is compulsory. It should be solved in the first 3 answer book.</li> <li>Assume suitable data if necessary.</li> </ol> |          |  |  |
|                              |                  |                 | <ol><li>Draw neat diagrams whenever necessary.</li></ol>   |          |  |  |
| MCQ/Objective Type Questions |                  |                 |  |          |  |  |
| Duration: 30 Minutes         |                  |                 |  |          |  |  |
| Q.1                          | <b>Cho</b><br>1) | The<br>a)       | the correct alternatives from th<br>address bus is<br>unidirectional<br>parallel   | b)<br>d) | ptions and rewrite the se<br>bidirectional<br>serial |  |
|                              | 2)               | a)              | flip-flop which is free from race a<br>RS FF<br>Master Slave JK FF   | b)       | nd problem is<br>JK FF<br>All of above               |  |
|                              | 3)               | a)              | input stage of an Op-amp is usu<br>differential amplifier<br>CE amplifier  | b)       | a<br>class B push-pull amplifie<br>None of these     |  |
|                              | 4)               | CMI<br>a)<br>c) | RR for an op-amp should be<br>as large as possible<br>close to zero  | b)       | as small as possible<br>close to unity               |  |
|                              | 5)               | The<br>a)<br>c) | number of I/O pins of 8051 is<br>16<br>8   | b)<br>d) | <br>32<br>4  |  |
|                              | 6)               | a)<br>b)        | load speed of which of the follow<br>Shunt motor<br>Series motor<br>Long shunt compound motor<br>Short shunt compound motor            | ring r   | motor will be highest?                               |  |

h 0 minutes in

S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONIC TECHNOLOGY

Day & Date: Tuesday, 26-11-2019

Seat

No.

#### C entence. 14

- Which of the following application requires high starting torque? 7)
  - b) Centrifugal pump a) Lathe machine c)
    - d) Air blower Locomotive
- A dc servomotor is similar to a regular d. c. motor except that its design is 8) modified to cope with
  - electronic switching b) slow speeds a) C)
    - static conditions both (b) and (c) d)
- Slip rings are usually made of \_\_\_\_ 9)
  - copper b) carbon a)
  - phosphor bronze d) aluminium c)

**SLR-FM-115** 



Max. Marks: 70

Marks: 14

## Set S

- 10) In a 3-phase power measurement by two wattmeter method the reading of one of the wattmeter's was zero. The power factor of the load must be \_\_\_\_\_. Unity a)
  - b) 0.5
  - d) Zero C) 0.3
- 11) Heat transfer by condition will not occur when \_\_\_\_\_.
  - bodies are kept in vacuum a)
  - b) bodies are immersed in water
  - bodies are exposed to thermal radiations c)
  - d) temperatures of the two bodies are identical
- The welding electric circuit is \_\_\_\_\_ 12)
  - Never earthed b) Always earthed a)
  - c) Trough cables only
- 13) Op-amp can amplify \_\_\_\_\_.
  - a) a.c. signals only
  - c) both a.c. and d.c. signals
- b) d.c. signals only

d) None

- d) neither d.c. nor a.c signals
- 14) In op amp block diagram level shifting stage works such as \_\_\_\_\_.
  - a) output stage
  - c) emitter follower
- b) input stage
- d) collector follower

# Seat No.

### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONIC TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Figure to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Draw neat diagrams whenever necessary.

### Section – I

### Q.2 Attempt any four.

- a) With the help of neat sketch explain working of three-point starter.
- **b)** With the help of neat sketch explain brushless DC motor.
- c) Derive the running torque equation of Three Phase Induction Motor. Also derive the maximum running torque condition.
- d) With the help of neat sketch explain dielectric heating.
- e) A 500V shunt motor runs at its normal speed of 250 r.p.m. when the armature current is 200A. The resistance of the armature is 0.12Ω. Calculate the speed when a resistance is inserted in the field reducing the shunt field to 80% of normal value and armature current is 100A.
- **f)** With the help of neat sketch explain working of direct online starter (DOL) for three phase induction motor.

#### Q.3 Attempt any two.

- a) Explain the speed control methods of.
  - 1) DC shunt motor 2) DC series motor
- b) A 30kW three phase 400V resistance oven is to employ nickel –chrome strip of 0.025cm thick for a three-phase star connected heating element. If the wire temperature is to be 1100°C & that of charge is to be 700°C, estimate a suitable width for a strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the alloy is 1.03\*10<sup>-6</sup> ohm-m.
- c) With neat sketch explain:
  - 1) Variable reluctance stepper motor
    - 2) Permanent magnet stepper motor

#### Section – II

#### Q.4 Attempt any four.

- a) Explain interfacing of temperature sensor LM 35 using microcontroller.
- **b)** Explain the ideal characteristics of operational amplifier.
- c) Explain working of J-K flip flop with neat sketch.
- d) Explain the comparison between microprocessor and microcontroller.
- e) With the help of neat sketch explain successive approximation type ADC.
- f) Explain the interrupts of microcontroller 8051.

#### Q.5 Attempt any two.

- a) Explain in detail architecture of microcontroller 8051.
- b) With neat sketch explain op-amp as.
  1) Adder
  2) Integrator
- c) Explain working of basic 4-bit register with wave forms using D flipflop.

16

12

16



Max. Marks: 56

SLR-FM-115

12

# Set

#### S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS**

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of Non-programmable calculator is allowed.
- 4) Assume additional suitable data if necessary and state it clearly.

#### MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

C)

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- As soon as a new value of a variable is found by iteration, it is used 1) immediately in the following equations, this method is called Gauss - Elimination method
  - a) Jacobi's method b) Gauss - seidal method c)
    - d) Gauss - Jordan method
- 2) In solving simultaneous equation by Gauss-Jordan method, the coefficient matrix is reduced \_\_\_\_\_ matrix.
  - a) Lower triangular matrix

Scalar Matrix

- Upper triangular matrix b) d) **Diagonal Matrix**
- 3) To fit the straight line y = a + bx to n observations, the normal equations are
  - $\sum y = na + b\sum x$ ,  $\sum xy = a\sum x + b\sum x^2$ a)
  - $\overline{\Sigma}y = a\Sigma x + \overline{b}\Sigma x^2$ ,  $\Sigma xy = a\Sigma x^2 + b\Sigma x^3$ b)
  - $\sum y = a \sum x + b \sum n, \sum xy = a \sum x^2 + b \sum x$ C)
  - d) None of these
- *x*: 0 1 Given  $\begin{array}{c} x \\ y \\ y \\ z \end{array} = \begin{array}{c} 0 \\ 2 \\ z \\ z \end{array}$ 3 4) 0

Using Lagrange's formula, a polynomial that can be fitted to the data is

a) 
$$\frac{x^2}{2} + 3x$$
  
b)  $x^2 - \frac{3x}{2}$   
c)  $3x - x^2$   
d)  $\frac{x^2}{2} - 3x$ 

The Newton-Raphson method fails when \_ 5)

- a) f'(x) is negative f(x) is too large b)
- Never fails c) f'(x) is zero d)
- The real root of the equation  $x^3 x 11 = 0$  lies between . 6) a) 0 and 1 b) 3 and 4
  - 2 and 3 1 and 2 C) d)
- 7) The order of convergence in Newton-Raphson method is.
  - 1.64 2 b) a) c) d) 4
    - 3

**SLR-FM-116** 

Max. Marks: 70

Marks: 14

SLR-FM-116 Set The partial diff. equation  $u_{xx}+3u_{xy}+u_{yy}=0$  is classified on \_\_\_\_\_. 8) Parabolic b) a) Hyperbolic Elliptic d) None of these c) In solving Laplace equation  $\nabla^2 u = 0$ , the formula used 9)  $u i, j = \frac{1}{4} [u_{i-1,j} + u_{i+1,j} + u_{i,j+1} + u_{i,j-1}]$  is called \_\_\_\_\_ a) Diagonal five point formula b) Standard 5-point formula Crank-Nicholson formula d) None of these c) 10) If  $\frac{dy}{dx} = -y$  and y(0) = 1, then by Euler's method, The value of y(0.01) is 0.99 a) 0.999 b) c) 0.981 d) 0.9 11) f(x) is given by \_\_\_\_ 0 0.5 1 x: f(x): 1 0.8 0.5 The using Trapezoidal rule, the value of  $\int_0^1 f(x) dx$  is \_\_\_\_\_. a) 0.0075 b) 1.55 0.155 0.775 d) c) 12) Gaussian 2-point formula states that  $\int_{-1}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$ a) b)  $\int_{-1}^{1} f(x) dx = f(-\sqrt{3}) + f(\sqrt{3})$ c)  $\int_{0}^{1} f(x) dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$ d) None of these The number of strips required in Simpson's  $\frac{3}{8}th$  rule is multiple of \_\_\_\_\_. 13) a) 2 1 d) 3 6 C) Taylor's series solution of first order ordinary diff. equation is \_\_\_\_\_. 14) a)  $y = y_0 + (x - x_0)y'_{(0)} + (x - x_0)^2y''_{(0)} + \cdots$ b)  $y = (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''_{(0)} + \cdots$ c)  $y = y_0 + (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''^{(0)} + \cdots$ 

d) None of these

### No. S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Use of scientific calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

#### Q.2 Attempt any three.

Seat

- a) Solve the following equations by Gauss-Elimination method. x + 2y + z = 8, 2x + 3y + 4z = 20, 4x + 3y + 2z = 16
- b) Solve the following equations by Gauss-Jawbi method. (carry out three iteration)
- 5x + 2y + z = 12, x + 4y + 2z = 15, x + 2y + 5z = 20
- c) Fit a curve of the form  $y = ae^{bx}$  for the following data. x: 0 2 4
  - *y*: 8.12 10 31.82
- **d)** Find the positive root of  $xe^x = 2$ , by the method of false position (take three iterations)
- e) Find the root of  $x^3 x 4 = 0$ , by Bisection method (take three iterations)

#### Q.3 Attempt any three.

- a) Using Lagrange's interpolation formula find y(x = 1)
  x: -1 0 2 3
  y: -8 3 1 12
  b) Find a root of the equation u<sup>3</sup> 2u = 5 0 uping Ca
- **b)** Find a root of the equation  $x^3 2x 5 = 0$ , using Secant Method correct to three decimal places.
- c) Solve the following equations by Gauss-Seidal method (take three itermations)
- 28x + 4y z = 32, x + 3y + 10z = 24, 2x + 17y + 4z = 35d) From the following table find f(x) using Newton's divided difference

formula.  

$$x: -1 \quad 1 \quad 2 \quad 3$$
  
 $y: -21 \quad 15 \quad 12 \quad 3$ 

e) By the method of least squares, find the straight line y = a + bx to the following data.

*x*: 5 10 15 20 25 *y*: 15 19 23 26 30 SLR-FM-116

Set P

Max. Marks: 56

09

#### Q.4 Attempt any two.

a) Solve the following equations by LU-decomposition method.

2x - 6y + 8z = 24, 5x + 4y - 3z = 2, 3x + y + 2z = 16

b) Fit a Parabola  $y = a + bx + cx^2$  by the method of least squares for the data. x: -2 -1 = 0 = 1 = 2

c) Use Newton-Raphson method to solve the following system of equations (take Two iterations)  $x^2 + 3xy + 8 = 0$  and y - 3x - 3 = 0

Starting with initial values  $x_0 = -2$ ,  $y_0 = -2$ 

#### Section – II

#### Q.5 Attempt any three

- a) Evaluate  $\int_{0.5}^{0.7} \sqrt{x} e^{-x} dx$ , using Simpson's  $\frac{1}{3}rd$  rule. Dividing the range in to 4 equal parts.
- **b)** Solve  $\frac{dy}{dx} = x y^2$ , y(0) = 1, by Taylor's series method. Hence find the value of y at x = 0.1
- value of y at x = 0.1c) Find  $\frac{dy}{dx}$  at x = 1.1, from the following table. x: 1 1.2 1.4 1.6 1.8 2.0

d) Evaluate  $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^{2}} dx dy$ , using Trapezoidal rule (h = k = 0.5)e) Classify the following equations.

1) 
$$\frac{\partial^2 u}{\partial x^2} + 2\frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$$
  
2) 
$$(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x \partial y} + (x+3)\frac{\partial^2 u}{\partial y^2} = 0$$

#### Q.6 Attempt any three

- **a)** Evaluate  $\int_{-2}^{2} e^{\frac{-x}{2}} dx$ , using Gaussian two-point formula.
- b) Apply Runge-Kutta method of fourth order to find approximate value of y for x = 1.1 n one step. If  $\frac{dy}{dx} = 3x + y^2$ , with initial condition y(1) = 1.2.

c) Using Euler's method, find an approximate value of y for x = 1.3 by taking h = 0.1, given that  $\frac{dx}{dy} = y^2 - \frac{y}{x}$ , y(1) = 1

- **d)** Using Crank-Nicholson's method, solve  $Uxx = 16u_t$ , 0 < x < 1, t > 0, given u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t. Compute u for one step in t direction, taking  $h = \frac{1}{4}$ .
- e) Solve  $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ , by Schmidt method, given u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x), assume h = k 1. Find the value of u up to t = 5.

09

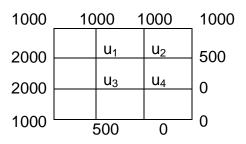
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SLR-FM-116 Set P

#### Q.7 Attempt any Two.

- Evaluate  $\int_{0.2}^{1.4} (\sin x \log x + e^x) dx$ , using Simpson's  $\frac{3}{8}$  *th* rule by taking 6 intervals. a)
- b) Using modified Euler's method, find an approximate value of y when
- x = 1.2, given that  $\frac{dy}{dx} = 2 + \sqrt{xy} \& y = 1$  when x = 1, with h = 0.1. Solve the equation  $\nabla^2 u = 0$  for the following mesh, with boundary values as shown in fig. by Leibmann's method. (Per form 4 iterations) c)



**SLR-FM-116** 

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# S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS** 

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of Non-programmable calculator is allowed.
- 4) Assume additional suitable data if necessary and state it clearly.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

1)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The partial diff. equation  $u_{xx}+3u_{xy}+u_{yy}=0$  is classified on \_\_\_\_\_.
  - a) Parabolic

- None of these
- In solving Laplace equation  $\nabla^2 u = 0$ , the formula used 2)
  - $u i, j = \frac{1}{4} [u_{i-1,j} + u_{i+1,j} + u_{i,j+1} + u_{i,j-1}]$  is called \_\_\_\_\_.
  - a) Diagonal five point formula

b) Standard 5-point formula d) None of these

- 3) If  $\frac{dy}{dx} = -y$  and y(0) = 1, then by Euler's method, The value of y(0.01) is
  - 0.99 b) 0.999 a) 0.981 d) 0.9 C)
- 4) f(x) is given by \_\_\_\_\_ 0 0.5 1 x:  $f(x): 1 \quad 0.8 \quad 0.5$ The using Trapezoidal rule, the value of  $\int_0^1 f(x) dx$  is \_\_\_\_\_. 0.0075 1.55 a) b) c) 0.775 d) 0.155 Gaussian 2-point formula states that \_ 5)  $\int_{-1}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$ a)  $\int_{-1}^{1} f(x) dx = f(-\sqrt{3}) + f(\sqrt{3})$ b)  $\int_{0}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$ c) d) None of these

The number of strips required in Simpson's  $\frac{3}{8}th$  rule is multiple of \_\_\_\_\_. 6)

- 1 2 a) b)
- c) 6 d) 3

SLR-FM-116

Max. Marks: 70

Marks: 14

Set

- Hyperbolic
- b)
- d)
- c) Elliptic
- c) Crank-Nicholson formula

#### a) $y = y_0 + (x - x_0)y'_{(0)} + (x - x_0)^2y''_{(0)} + \cdots$ b) $y = (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''_{(0)} + \cdots$ c) $y = y_0 + (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''^{(0)} + \cdots$ None of these d) As soon as a new value of a variable is found by iteration, it is used 8) immediately in the following equations, this method is called . Jacobi's method Gauss - Elimination method a) b) Gauss - seidal method d) Gauss - Jordan method c) 9) In solving simultaneous equation by Gauss-Jordan method, the coefficient matrix is reduced \_\_\_\_\_ matrix. a) Lower triangular matrix b) Upper triangular matrix c) Scalar Matrix d) **Diagonal Matrix** 10) To fit the straight line y = a + bx to n observations, the normal equations are \_\_\_\_\_ $\sum y = na + b\sum x$ , $\sum xy = a\sum x + b\sum x^2$ a) b) $\sum y = a\sum x + b\sum x^2$ , $\sum xy = a\sum x^2 + b\sum x^3$ c) $\sum y = a\sum x + b\sum n$ , $\sum xy = a\sum x^2 + b\sum x$ d) None of these Given $\begin{array}{cccc} x: & 0 & 1 & 3 \\ y: & 0 & 2 & 0 \end{array}$ 11) Using Lagrange's formula, a polynomial that can be fitted to the data is b) $x^2 - \frac{3x}{2}$ a) $\frac{x^2}{2} + 3x$ $\frac{1}{3x} - x^2$ d) $\frac{x^2}{2} - 3x$ c) 12) The Newton-Raphson method fails when \_ a) f'(x) is negative b) f(x) is too large c) f'(x) is zero Never fails d) The real root of the equation $x^3 - x - 11 = 0$ lies between \_\_\_\_\_. 13) a) 0 and 1 b) 3 and 4 1 and 2 d) 2 and 3 c) The order of convergence in Newton-Raphson method is. 14) 1.64 a) 2 b) 3 C) d) 4

Taylor's series solution of first order ordinary diff. equation is \_\_\_\_\_.

7)

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Set | Q

### No. S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Use of scientific calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

#### Q.2 Attempt any three.

Seat

- a) Solve the following equations by Gauss-Elimination method. x + 2y + z = 8, 2x + 3y + 4z = 20, 4x + 3y + 2z = 16
- b) Solve the following equations by Gauss-Jawbi method. (carry out three iteration)
- 5x + 2y + z = 12, x + 4y + 2z = 15, x + 2y + 5z = 20
- c) Fit a curve of the form  $y = ae^{bx}$  for the following data. x: 0 2 4
  - *y*: 8.12 10 31.82
- **d)** Find the positive root of  $xe^x = 2$ , by the method of false position (take three iterations)
- e) Find the root of  $x^3 x 4 = 0$ , by Bisection method (take three iterations)

#### Q.3 Attempt any three.

- a) Using Lagrange's interpolation formula find y(x = 1)
  x: -1 0 2 3
  y: -8 3 1 12
  b) Find a root of the equation u<sup>3</sup> 2u = 5 0 uping Ca
- **b)** Find a root of the equation  $x^3 2x 5 = 0$ , using Secant Method correct to three decimal places.
- c) Solve the following equations by Gauss-Seidal method (take three itermations)

28x + 4y - z = 32, x + 3y + 10z = 24, 2x + 17y + 4z = 35d) From the following table find f(x) using Newton's divided difference

formula.  $x: -1 \ 1 \ 2 \ 3$ 

y: -21 15 12 3 e) By the method of least squares, find the straight line y = a + bx to the

following data.

x: 5 10 15 20 25

*y*: 15 19 23 26 30

**SLR-FM-116** 

Set Q

Max. Marks: 56

09

#### Q.4 Attempt any two.

- Solve the following equations by LU-decomposition method. a)
  - 2x 6y + 8z = 24, 5x + 4y - 3z = 2, 3x + y + 2z = 16
- **b)** Fit a Parabola  $y = a + bx + cx^2$  by the method of least squares for the data. -2-1 0 x:

1 2 *y*: -3.150 -1.390 0.620 2.880 5.378

c) Use Newton-Raphson method to solve the following system of equations (take Two iterations)  $x^{2} + 3xy + 8 = 0$  and y - 3x - 3 = 0

Starting with initial values  $x_0 = -2$ ,  $y_0 = -2$ 

#### Section – II

#### Q.5 Attempt any three

- Evaluate  $\int_{0.5}^{0.7} \sqrt{x} e^{-x} dx$ , using Simpson's  $\frac{1}{3}rd$  rule. a) Dividing the range in to 4 equal parts.
- Solve  $\frac{dy}{dx} = x y^2$ , y(0) = 1, by Taylor's series method. Hence find the b) value of y at x = 0.1
- c) Find  $\frac{dy}{dx}$  at x = 1.1, from the following table.  $\begin{array}{c} x: & 1 & 1.2 & 1.4 & 1.6 & 1.8 & 2.0 \\ y: & 0 & 0.128 & 0.544 & 1.296 & 2.432 & 4 \end{array}$
- d) Evaluate  $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^{2}} dx dy$ , using Trapezoidal rule (h = k = 0.5)Classify the following equations. e)

1) 
$$\frac{\partial^2 u}{\partial x^2} + 2 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$$
  
2)  $(x+1) \frac{\partial^2 u}{\partial x^2} - 2(x+2) \frac{\partial^2 u}{\partial x \partial y} + (x+3) \frac{\partial^2 u}{\partial y^2} = 0$ 

#### Q.6 Attempt any three

- **a)** Evaluate  $\int_{-2}^{2} e^{\frac{-x}{2}} dx$ , using Gaussian two-point formula.
- **b)** Apply Runge-Kutta method of fourth order to find approximate value of y for x = 1.1 n one step. If  $\frac{dy}{dx} = 3x + y^2$ , with initial condition y(1) = 1.2.
- c) Using Euler's method, find an approximate value of y for x = 1.3 by taking h = 0.1, given that  $\frac{dx}{dy} = y^2 - \frac{y}{x}$ , y(1) = 1
- Using Crank-Nicholson's method, solve  $Uxx = 16u_t$ , 0 < x < 1, t > 0, given d) u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t. Compute u for one step in t direction, taking  $h = \frac{1}{4}$ .
- e) Solve  $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ , by Schmidt method, given u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x), assume h = k - 1. Find the value of u up to t = 5.

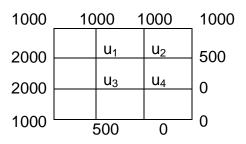
09

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SLR-FM-116 Set |

#### Q.7 Attempt any Two.

- Evaluate  $\int_{0.2}^{1.4} (\sin x \log x + e^x) dx$ , using Simpson's  $\frac{3}{8}$  *th* rule by taking 6 intervals. a)
- **b)** Using modified Euler's method, find an approximate value of y when
- x = 1.2, given that  $\frac{dy}{dx} = 2 + \sqrt{xy} \& y = 1$  when x = 1, with h = 0.1. Solve the equation  $\nabla^2 u = 0$  for the following mesh, with boundary values as shown in fig. by Leibmann's method. (Per form 4 iterations) c)



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# S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS** 

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of Non-programmable calculator is allowed.
- 4) Assume additional suitable data if necessary and state it clearly.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Choose the correct alternatives from the options and rewrite the sentence. 14 Q.1

- The Newton-Raphson method fails when 1)
- a) f'(x) is negative b) c) f'(x) is zero d) Never fails 2) The real root of the equation  $x^3 - x - 11 = 0$  lies between \_\_\_\_\_. 0 and 1 b) 3 and 4 a) 1 and 2 C) d) 2 and 3 3) The order of convergence in Newton-Raphson method is. a) 2 b) 1.64 3 C) 4 d) The partial diff. equation  $u_{xx}+3u_{xy}+u_{yy}=0$  is classified on \_\_\_\_\_. 4) Hyperbolic a) Parabolic b) c) Elliptic d) None of these 5) In solving Laplace equation  $\nabla^2 u = 0$ , the formula used  $u i, j = \frac{1}{4} [u_{i-1,j} + u_{i+1,j} + u_{i,j+1} + u_{i,j-1}]$  is called \_\_\_\_\_. a) Diagonal five point formula b) Standard 5-point formula C) Crank-Nicholson formula d) None of these 6) 0.99 a) b) 0.999 0.981 c) d) 0.9 7) f(x) is given by \_\_\_\_\_ 0 0.5 1 x:  $f(x): 1 \quad 0.8 \quad 0.5$ The using Trapezoidal rule, the value of  $\int_0^1 f(x) dx$  is \_\_\_\_\_. 0.0075 b) 1.55 a) C) 0.775 d) 0.155

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Max. Marks: 70

- Marks: 14
- f(x) is too large

If  $\frac{dy}{dx} = -y$  and y(0) = 1, then by Euler's method, The value of y(0.01) is

SLR-FM-116 Set R

8) Gaussian 2-point formula states that \_\_\_\_\_.  
a) 
$$\int_{-1}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$$
  
b)  $\int_{-1}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$   
d) None of these  
9) The number of strips required in Simpson's  $\frac{3}{8}th$  rule is multiple of \_\_\_\_\_.  
a) 1 b) 2  
c) 6 d) 3  
10) Taylor's series solution of first order ordinary diff. equation is \_\_\_\_\_.  
a)  $y = y_0 + (x - x_0)y'_{(0)} + (x - x_0)^2y'_{(0)} + \cdots$   
b)  $y = (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''^{(0)} + \cdots$   
c)  $y = y_0 + (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''^{(0)} + \cdots$   
d) None of these  
11) As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called \_\_\_\_\_.  
a) Jacobi's method b) Gauss - Elimination method  
c) Gauss - seidal method d) Gauss - Jordan method  
12) In solving simultaneous equation by Gauss-Jordan method, the coefficient matrix is reduced \_\_\_\_\_\_ matrix.  
a) Lower triangular matrix b) Upper triangular matrix  
c) Scalar Matrix d) Diagonal Matrix  
13) To fit the straight line  $y = a + bx$  to n observations, the normal equations are  $\frac{1}{2y} = na + b\Sigma x, \Sigma xy = a\Sigma x + b\Sigma x^2$   
b)  $\Sigma y = a\Sigma x + b\Sigma x^2, \Sigma xy = a\Sigma x^2 + b\Sigma x^3$   
c)  $\Sigma y = a\Omega x + b\Sigma x^2, \Sigma xy = a\Sigma x^2 + b\Sigma x^3$   
d) None of these  
14) Given  $\frac{x^2}{2} + 3x$  b)  $x^2 - \frac{3x}{2}$   
c)  $\frac{3x - x^2}{2}$  d)  $\frac{x^2}{2} - 3x$ 

### Seat No. S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019

Mechanical Engineering COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Use of scientific calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

#### Q.2 Attempt any three.

- a) Solve the following equations by Gauss-Elimination method. x + 2y + z = 8, 2x + 3y + 4z = 20, 4x + 3y + 2z = 16
- b) Solve the following equations by Gauss-Jawbi method. (carry out three iteration)
- 5x + 2y + z = 12, x + 4y + 2z = 15, x + 2y + 5z = 20
- **c)** Fit a curve of the form  $y = ae^{bx}$  for the following data. x: 0 2 4
  - *y*: 8.12 10 31.82
- **d)** Find the positive root of  $xe^x = 2$ , by the method of false position (take three iterations)
- e) Find the root of  $x^3 x 4 = 0$ , by Bisection method (take three iterations)

#### Q.3 Attempt any three.

- a) Using Lagrange's interpolation formula find y(x = 1)
  x: -1 0 2 3
  y: -8 3 1 12
  b) Find a root of the equation u<sup>3</sup> 2u = 5 0 uning Ca
- **b)** Find a root of the equation  $x^3 2x 5 = 0$ , using Secant Method correct to three decimal places.
- c) Solve the following equations by Gauss-Seidal method (take three itermations)
- 28x + 4y z = 32, x + 3y + 10z = 24, 2x + 17y + 4z = 35**d)** From the following table find f(x) using Newton's divided difference formula

$$x: -1 \quad 1 \quad 2 \quad 3$$
  
 $y: -21 \quad 15 \quad 12 \quad 3$ 

e) By the method of least squares, find the straight line y = a + bx to the following data.

*x*: 5 10 15 20 25 *y*: 15 19 23 26 30 SLR-FM-116

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Max. Marks: 56

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#### Q.4 Attempt any two.

a) Solve the following equations by LU-decomposition method.

2x - 6y + 8z = 24, 5x + 4y - 3z = 2, 3x + y + 2z = 16

b) Fit a Parabola  $y = a + bx + cx^2$  by the method of least squares for the data. x: -2 -1 = 0 = 1 = 2

c) Use Newton-Raphson method to solve the following system of equations (take Two iterations)  $x^2 + 3xy + 8 = 0$  and y - 3x - 3 = 0

Starting with initial values  $x_0 = -2$ ,  $y_0 = -2$ 

#### Section – II

#### Q.5 Attempt any three

- a) Evaluate  $\int_{0.5}^{0.7} \sqrt{x} e^{-x} dx$ , using Simpson's  $\frac{1}{3}rd$  rule. Dividing the range in to 4 equal parts.
- **b)** Solve  $\frac{dy}{dx} = x y^2$ , y(0) = 1, by Taylor's series method. Hence find the value of y at x = 0.1
- value of y at x = 0.1c) Find  $\frac{dy}{dx}$  at x = 1.1, from the following table. x: 1 1.2 1.4 1.6 1.8 2.0

d) Evaluate  $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^{2}} dx dy$ , using Trapezoidal rule (h = k = 0.5)e) Classify the following equations.

1) 
$$\frac{\partial^2 u}{\partial x^2} + 2 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$$
  
2)  $(x+1) \frac{\partial^2 u}{\partial x^2} - 2(x+2) \frac{\partial^2 u}{\partial x \partial y} + (x+3) \frac{\partial^2 u}{\partial y^2} = 0$ 

#### Q.6 Attempt any three

- **a)** Evaluate  $\int_{-2}^{2} e^{\frac{-x}{2}} dx$ , using Gaussian two-point formula.
- b) Apply Runge-Kutta method of fourth order to find approximate value of y for x = 1.1 n one step. If  $\frac{dy}{dx} = 3x + y^2$ , with initial condition y(1) = 1.2.

c) Using Euler's method, find an approximate value of y for x = 1.3 by taking h = 0.1, given that  $\frac{dx}{dy} = y^2 - \frac{y}{x}$ , y(1) = 1

- **d)** Using Crank-Nicholson's method, solve  $Uxx = 16u_t$ , 0 < x < 1, t > 0, given u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t. Compute u for one step in t direction, taking  $h = \frac{1}{4}$ .
- e) Solve  $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ , by Schmidt method, given u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x), assume h = k 1. Find the value of u up to t = 5.

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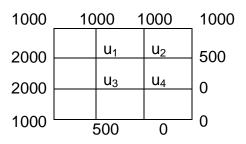
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#### Q.7 Attempt any Two.

- Evaluate  $\int_{0.2}^{1.4} (\sin x \log x + e^x) dx$ , using Simpson's  $\frac{3}{8}$  *th* rule by taking 6 intervals. a)
- **b)** Using modified Euler's method, find an approximate value of y when
- x = 1.2, given that  $\frac{dy}{dx} = 2 + \sqrt{xy} \& y = 1$  when x = 1, with h = 0.1. Solve the equation  $\nabla^2 u = 0$  for the following mesh, with boundary values as shown in fig. by Leibmann's method. (Per form 4 iterations) c)



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# S.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019

**Mechanical Engineering** 

**COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS** 

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of Non-programmable calculator is allowed.
- 4) Assume additional suitable data if necessary and state it clearly.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) If 
$$\frac{dy}{dx} = -y$$
 and  $y(0) = 1$ , then by Euler's method, The value of  $y(0.01)$  is

- a) 0.99 0.981 d) 0.9 c) 2) f(x) is given by \_ x: 0 0.5 1  $f(x): 1 \quad 0.8 \quad 0.5$ The using Trapezoidal rule, the value of  $\int_0^1 f(x) dx$  is \_\_\_\_\_. 0.0075 1.55 a) b) 0.775 d) 0.155 c)
- 3) Gaussian 2-point formula states that \_\_\_\_

a) 
$$\int_{-1}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$$
  
b)  $\int_{-1}^{1} f(x)dx = f\left(-\sqrt{3}\right) + f(\sqrt{3})$   
c)  $\int_{0}^{1} f(x)dx = f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$   
d) None of these

The number of strips required in Simpson's  $\frac{3}{8}th$  rule is multiple of \_\_\_\_\_. 4)

- 1 2 a) b) 6 d) 3 c)
- Taylor's series solution of first order ordinary diff. equation is \_\_\_\_\_. 5)

a) 
$$y = y_0 + (x - x_0)y'_{(0)} + (x - x_0)^2y''_{(0)} + \cdots$$
  
b)  $y = (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{y''_{(0)}}y''_{(0)} + \cdots$ 

c) 
$$y = y_0 + (x - x_0)y'_{(0)} + \frac{(x - x_0)^2}{2!}y''^{(0)} + \cdots$$

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b) 0.999

Max. Marks: 70

Marks: 14

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| 6)  | As soon as a new value of a variable is found by iteration, it is used<br>immediately in the following equations, this method is called<br>a) Jacobi's method b) Gauss - Elimination method<br>c) Gauss - seidal method d) Gauss - Jordan method   |
| 7)  | In solving simultaneous equation by Gauss-Jordan method, the coefficient<br>matrix is reduced matrix.<br>a) Lower triangular matrix b) Upper triangular matrix<br>c) Scalar Matrix d) Diagonal Matrix  |
| 8)  | To fit the straight line $y = a + bx$ to n observations, the normal equations<br>are<br>a) $\sum y = na + b\sum x, \sum xy = a\sum x + b\sum x^2$<br>b) $\sum y = a\sum x + b\sum x^2, \sum xy = a\sum x^2 + b\sum x^3$<br>c) $\sum y = a\sum x + b\sum n, \sum xy = a\sum x^2 + b\sum x$<br>d) None of these                    |
| 9)  | Given $\begin{array}{cccc} x: & 0 & 1 & 3 \\ y: & 0 & 2 & 0 \\ \end{array}$<br>Using Lagrange's formula, a polynomial that can be fitted to the data is<br>$\overline{a}$ ) $\begin{array}{c} \frac{x^2}{2} + 3x \\ c \end{array}$ b) $x^2 - \frac{3x}{2} \\ d \end{array}$ d) $\begin{array}{c} \frac{x^2}{2} - 3x \end{array}$ |
| 10) | The Newton-Raphson method fails when<br>a) $f'(x)$ is negative b) $f(x)$ is too large<br>c) $f'(x)$ is zero d) Never fails   |
| 11) | The real root of the equation $x^3 - x - 11 = 0$ lies between<br>a) 0 and 1 b) 3 and 4<br>c) 1 and 2 d) 2 and 3  |
| 12) | The order of convergence in Newton-Raphson method is.a) 2b) 1.64c) 3d) 4   |
| 13) | The partial diff. equation $u_{xx}+3u_{xy}+u_{yy}=0$ is classified ona) Parabolicb) Hyperbolicc) Ellipticd) None of these  |
| 14) | In solving Laplace equation $\nabla^2 u = 0$ , the formula used<br>$u \ i, j = \frac{1}{4} [u_{i-1,j} + u_{i+1,j} + u_{i,j+1} + u_{i,j-1}]$ is called<br>a) Diagonal five point formula b) Standard 5-point formula<br>c) Crank-Nicholson formula d) None of these   |

# S.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**COMPUTATIONAL TECHNIQUES & NUMERICAL METHODS** 

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Use of scientific calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

#### Q.2 Attempt any three.

- a) Solve the following equations by Gauss-Elimination method. 2x + 3y + 4z = 20. x + 2v + z = 8. 4x + 3y + 2z = 16
- **b)** Solve the following equations by Gauss-Jawbi method. (carry out three iteration)
- 5x + 2y + z = 12, x + 4y + 2z = 15, x + 2y + 5z = 20
- c) Fit a curve of the form  $y = ae^{bx}$  for the following data. 0 2 4 x:
  - *v*: 8.12 10 31.82
- **d)** Find the positive root of  $xe^x = 2$ , by the method of false position (take three iterations)
- e) Find the root of  $x^3 x 4 = 0$ , by Bisection method (take three iterations)

#### Q.3 Attempt any three.

- a) Using Lagrange's interpolation formula find y(x = 1) $x: -1 \quad 0 \quad 2 \quad 3$ y: -8 3 1 12
- **b)** Find a root of the equation  $x^3 2x 5 = 0$ , using Secant Method correct to three decimal places.
- Solve the following equations by Gauss-Seidal method (take three C) itermations)
- 28x + 4v z = 32. x + 3y + 10z = 24, 2x + 17y + 4z = 35**d)** From the following table find f(x) using Newton's divided difference

formula.  

$$x: -1 \quad 1 \quad 2 \quad 3$$

e) By the method of least squares, find the straight line y = a + bx to the following data.

x: 5 10 15 20 25 19 y: 1523 26 30

 $y: -21 \ 15 \ 12 \ 3$ 

09

09



Max. Marks: 56

Seat No.

#### Q.4 Attempt any two.

a) Solve the following equations by LU-decomposition method.

2x - 6y + 8z = 24, 5x + 4y - 3z = 2, 3x + y + 2z = 16

b) Fit a Parabola  $y = a + bx + cx^2$  by the method of least squares for the data. x: -2 -1 = 0 = 1 = 2

c) Use Newton-Raphson method to solve the following system of equations (take Two iterations)  $x^2 + 3xy + 8 = 0$  and y - 3x - 3 = 0

Starting with initial values  $x_0 = -2$ ,  $y_0 = -2$ 

#### Section – II

#### Q.5 Attempt any three

- a) Evaluate  $\int_{0.5}^{0.7} \sqrt{x} e^{-x} dx$ , using Simpson's  $\frac{1}{3}rd$  rule. Dividing the range in to 4 equal parts.
- **b)** Solve  $\frac{dy}{dx} = x y^2$ , y(0) = 1, by Taylor's series method. Hence find the value of y at x = 0.1
- value of y at x = 0.1c) Find  $\frac{dy}{dx}$  at x = 1.1, from the following table. x: 1 1.2 1.4 1.6 1.8 2.0

d) Evaluate  $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^{2}} dx dy$ , using Trapezoidal rule (h = k = 0.5)e) Classify the following equations.

1) 
$$\frac{\partial^2 u}{\partial x^2} + 2 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$$
  
2)  $(x+1) \frac{\partial^2 u}{\partial x^2} - 2(x+2) \frac{\partial^2 u}{\partial x \partial y} + (x+3) \frac{\partial^2 u}{\partial y^2} = 0$ 

#### Q.6 Attempt any three

- **a)** Evaluate  $\int_{-2}^{2} e^{\frac{-x}{2}} dx$ , using Gaussian two-point formula.
- b) Apply Runge-Kutta method of fourth order to find approximate value of y for x = 1.1 n one step. If  $\frac{dy}{dx} = 3x + y^2$ , with initial condition y(1) = 1.2.

c) Using Euler's method, find an approximate value of y for x = 1.3 by taking h = 0.1, given that  $\frac{dx}{dy} = y^2 - \frac{y}{x}$ , y(1) = 1

- **d)** Using Crank-Nicholson's method, solve  $Uxx = 16u_t$ , 0 < x < 1, t > 0, given u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t. Compute u for one step in t direction, taking  $h = \frac{1}{4}$ .
- e) Solve  $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ , by Schmidt method, given u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x), assume h = k 1. Find the value of u up to t = 5.

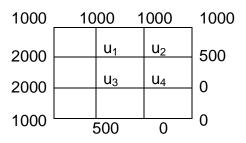
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09

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#### Q.7 Attempt any Two.

- Evaluate  $\int_{0.2}^{1.4} (\sin x \log x + e^x) dx$ , using Simpson's  $\frac{3}{8}$  *th* rule by taking 6 intervals. a)
- **b)** Using modified Euler's method, find an approximate value of y when
- x = 1.2, given that  $\frac{dy}{dx} = 2 + \sqrt{xy} \& y = 1$  when x = 1, with h = 0.1. Solve the equation  $\nabla^2 u = 0$  for the following mesh, with boundary values as shown in fig. by Leibmann's method. (Per form 4 iterations) c)



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Set

# SLR-FM-118

Seat No.

#### T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No.1 is compulsory should be solved solve is first 30 minutes in answer book.

- 2) Use of calculator is allowed.
- 4) Figures to the right indicates full marks.
- 5) Assume additional data, if necessary and mention it clearly.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 1)

- Length of path of contact is \_\_\_\_\_
  - a) distance between pitch point to point of approach
  - b) sum of path of approach & arc of recess
  - length of arc of contact multiplied by cosine of pressure angle c)
  - d) length of arc contact divided by circular pitch  $\pi$
- 2) The difference between tooth space & tooth thickness measured along pitch circle is called as \_\_\_\_
  - a) pitch circle
  - c) tooth thickness d) Backlash
- 3) Direction of rotation of planet gear & annalus is \_
  - a) opposite b) same
  - c) clockwise d) can't say
- 4) Main difference in reverted GT & epicyclic GT is
  - b) direction of first & last gear a) speed ratio factor
  - c) shaft position
- d) no difference

b) circular pitch

- 5) A disc spinning at 20 rad/s will undergo precession when a torque 100 Nm is applied about an axis normal to it at an angular speed if the mass moment of inertia of disc is  $1 \text{ kgm}^2$ 
  - a) 5 rad/s b) 2 rad/s 10 rad/s c)
    - d) 20 rad/s
- In pitching, movement of ship is about 6)
  - b) Longitudinal axis a) transverse axis
  - d) horizontal axis spinning axis C)
- The relation between Fp max & Fs max is \_\_\_\_ 7)
  - $F_p max = 1/n F_s max$ a)  $F_p max = 2n$ .  $F_s max$
- b)  $F_p max = \frac{1}{2} F_s max$ d)  $F_s max = 1/n F_p max$
- 8) The partial balancing means \_\_\_\_\_
  - a) Balancing partially the revolving masses
  - b) Balancing partially the reciprocating masses
  - c) net balancing of engine
  - d) all of the above

C)

Marks: 14

Max. Marks: 70

Set

- 9) Damping factor is \_\_\_\_\_
  - a) ratio of critical damping to damping coefficient of damping
  - b) ratio of logarithmic decrement to critical damping
  - c) ratio of coefficient of damping to critical damping
  - d) ratio of critical damping to logarithmic decrement
- 10) Natural frequency of shaft with both ends fixed & UDL is .
  - a)  $f_n = 0.751/\sqrt{\delta_s}$
  - b)  $f_n = 0.571/\sqrt{\delta_s}$ d) none of the above c)  $f_n = 0.4985 / \sqrt{\delta}$
- The ratio of maximum displacement of forced vibration to deflection due 11) to static force is \_\_\_\_\_.
  - damping factor a)
  - logarithmic decrement c)
- b) damping coefficient
- d) magnification factor
- 12) A shaft carrying 3 rotors will have \_
  - a) one or two nodes c) two nodes
- b) no node d) three nodes
- 13) Max fluctuation of energy can be calculated as \_\_\_\_\_.
  - a)  $l^2 \omega^2 C_s$

c)  $l\omega^2 C_s$ 

- b)  $l^2 \omega^2 C_E$
- d)  $l\omega^2 C_F$
- 14) In IC engine during suction stroke \_
  - a) Excess energy is developed
- b) Flywheel absorbs energy d) Flywheel supplies energy

c) Both a & b

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### **SLR-FM-118**

| Seat |  |
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| No.  |  |

#### T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section.

- 2) Use of calculator is allowed.
- 3) Figures to the right indicates full marks.
- 4) Assume additional data, if necessary and mention it clearly.

#### Section – I

- Q.2 a) Explain with neat sketch construction and working of differential gear train. 06 Use tabular method to show difference in the speed of inner and outer wheels of vehicles.
  - b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.
- Q.3 a) State law of gearing. Derive an equation for condition for constant velocity of ratio.
   b) In an epicyclic gear train, the internal wheels A and B and compound 08
  - **b)** In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. Gear E meshes with A and C. The gear F meshes with B and D. All the wheels have the same module and the number of teeth are:  $T_c = 28$ ;  $T_D = 26$ ;  $T_E = T_F = 18$ .
    - i) Sketch the arrangement
    - ii) Find the number of teeth on A and B
    - iii) If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B.
- Q.4 a) Explain the effect of gyroscopic couple on a four wheeler while taking a left 06 turn.
  - b) The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm<sup>2</sup>. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

#### Section – II

- **Q.5** a) Explain clearly the terms static balancing and dynamic balancing.
  - b) A,B,C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.

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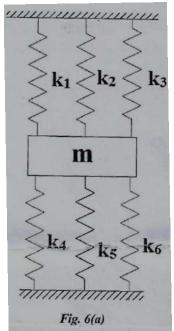
Max. Marks: 56

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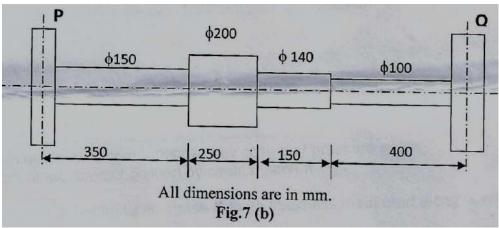
Page **3** of **16** 

## SLR-FM-118 Set P

**Q.6** a) For the system shown in Fig. 6(a) Find the mass m such that natural frequency 20 Hz. Take  $K_1 = K_2 = K_3 = K_4 = K_5 = K_6 = 2500 \text{ N/m}.$ 



- b) A vibrating system consists of a mass of 65 kg, a spring with a stiffness of 25 kN/m and a damper. The damping provided is only 40% of the critical value. Determine the
  - i) Damping factor
  - ii) Critical damping coefficient
  - iii) Natural frequency of damped vibrations
  - iv) Logarithmic decrement
  - v) Ratio of two consecutive amplitudes
- **Q.7** a) Write a short note on vibration isolation and transmissibility.
  - b) A shaft as shown in Fig.7 (b) carries two masses namely P & Q. The mass
     P is 600 kg with radius of gyration of 0.6 m and mass Q is 900 kg with a radius of gyration of 0.80 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) = 80 GN/m<sup>2</sup>



06

### SLR-FM-118

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#### T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No.1 is compulsory should be solved solve is first 30 minutes in answer book.

- 2) Use of calculator is allowed.
- 4) Figures to the right indicates full marks.
- 5) Assume additional data, if necessary and mention it clearly.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The partial balancing means \_\_\_\_\_.
  - a) Balancing partially the revolving masses
  - b) Balancing partially the reciprocating masses
  - c) net balancing of engine
  - d) all of the above

#### 2) Damping factor is \_\_\_\_\_

- a) ratio of critical damping to damping coefficient of damping
- b) ratio of logarithmic decrement to critical damping
- c) ratio of coefficient of damping to critical damping
- d) ratio of critical damping to logarithmic decrement
- 3) Natural frequency of shaft with both ends fixed & UDL is \_\_\_\_\_.
  - a)  $f_n = 0.751/\sqrt{\delta_s}$  b)
- b)  $f_n = 0.571/\sqrt{\delta_s}$ d) none of the above
- 4) The ratio of maximum displacement of forced vibration to deflection due to static force is .
  - a) damping factor

c)  $f_n = 0.4985 / \sqrt{\delta}$ 

- b) damping coefficientd) magnification factor
- c) logarithmic decrement
- 5) A shaft carrying 3 rotors will have \_\_\_\_\_
  - a) one or two nodes b) no node
    - c) two nodes d) three nodes
- 6) Max fluctuation of energy can be calculated as \_\_\_\_\_.
  - a)  $l^2 \omega^2 C_s$  b)  $l^2 \omega^2 C_E$
  - c)  $l\omega^2 C_s$  d)  $l\omega^2 C_E$
- 7) In IC engine during suction stroke \_
  - a) Excess energy is developed b) Flywheel absorbs energy
  - c) Both a & b d) Flywheel supplies energy

### 8) Length of path of contact is \_\_\_\_\_

- a) distance between pitch point to point of approach
- b) sum of path of approach & arc of recess
- c) length of arc of contact multiplied by cosine of pressure angle
- d) length of arc contact divided by circular pitch  $\pi$

Max. Marks: 70

Set

Marks: 14

- 9) The difference between tooth space & tooth thickness measured along pitch circle is called as \_\_\_\_\_. b) circular pitch
  - a) pitch circle
  - c) tooth thickness

10)

- Direction of rotation of planet gear & annalus is \_\_\_\_\_.
- a) opposite
- c) clockwise d) can't say
- Main difference in reverted GT & epicyclic GT is \_\_\_\_ 11)
  - speed ratio factor a)
- b) direction of first & last gear
- c) shaft position
- d) no difference
- 12) A disc spinning at 20 rad/s will undergo precession when a torque 100 Nm is applied about an axis normal to it at an angular speed if the mass moment of inertia of disc is 1 kgm<sup>2</sup>.
  - a) 5 rad/s
- b) 2 rad/s

d) Backlash

b) same

- d) 20 rad/s
- 13) In pitching, movement of ship is about \_
  - a) transverse axis c) spinning axis

c) 10 rad/s

- b) Longitudinal axis d) horizontal axis
- 14) The relation between F<sub>p</sub> max & F<sub>S</sub> max is \_
  - a)  $F_p max = 1/n F_s max$
  - c)  $F_p max = 2n$ .  $F_s max$
- b)  $F_p max = \frac{1}{2} F_s max$
- d)  $F_s max = 1/n F_p max$

Set Q

**SLR-FM-118** 

Page 7 of 16

04

10

### **SLR-FM-118**

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#### T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of calculator is allowed.
- 3) Figures to the right indicates full marks.
- 4) Assume additional data, if necessary and mention it clearly.

#### Section – I

- Q.2 a) Explain with neat sketch construction and working of differential gear train.O6 Use tabular method to show difference in the speed of inner and outer wheels of vehicles.
  - b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.
- Q.3 a) State law of gearing. Derive an equation for condition for constant velocity ratio.
   b) In an epicyclic gear train, the internal wheels A and B and compound 08
  - **b)** In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. Gear E meshes with A and C. The gear F meshes with B and D. All the wheels have the same module and the number of teeth are:  $T_c = 28$ ;  $T_D = 26$ ;  $T_E = T_F = 18$ .
    - i) Sketch the arrangement
    - ii) Find the number of teeth on A and B
    - iii) If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B.
- **Q.4 a)** Explain the effect of gyroscopic couple on a four wheeler while taking a left **06** turn.
  - b) The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm<sup>2</sup>. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

#### Section – II

- Q.5 a) Explain clearly the terms static balancing and dynamic balancing.
  - b) A,B,C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.

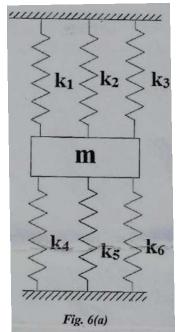
Max. Marks: 56

Set Q

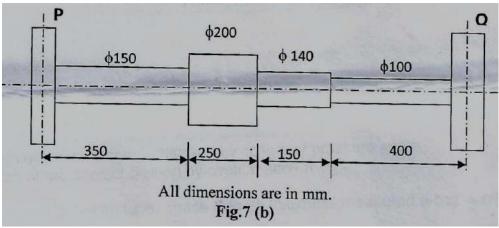
## SLR-FM-118 Set Q

04

**Q.6** a) For the system shown in Fig. 6(a) Find the mass m such that natural frequency 20 Hz. Take  $K_1 = K_2 = K_3 = K_4 = K_5 = K_6 = 2500 \text{ N/m}.$ 



- b) A vibrating system consists of a mass of 65 kg, a spring with a stiffness of 25 kN/m and a damper. The damping provided is only 40% of the critical value. Determine the
  - i) Damping factor
  - ii) Critical damping coefficient
  - iii) Natural frequency of damped vibrations
  - iv) Logarithmic decrement
  - v) Ratio of two consecutive amplitudes
- **Q.7** a) Write a short note on vibration isolation and transmissibility.
  - **b**) A shaft as shown in Fig.7 (b) carries two masses namely P & Q. The mass **08** P is 600 kg with radius of gyration of 0.6 m and mass Q is 900 kg with a radius of gyration of 0.80 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) = 80 GN/m<sup>2</sup>



# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No.1 is compulsory should be solved solve is first 30 minutes in answer book.

- 2) Use of calculator is allowed.
- Figures to the right indicates full marks.
- 5) Assume additional data, if necessary and mention it clearly.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- A disc spinning at 20 rad/s will undergo precession when a torque 100 1) Nm is applied about an axis normal to it at an angular speed if the mass moment of inertia of disc is  $1 \text{ kgm}^2$ 
  - a) 5 rad/s 2 rad/s b)
  - c) 10 rad/s d) 20 rad/s
- 2) In pitching, movement of ship is about
  - a) transverse axis b) Longitudinal axis
  - d) horizontal axis c) spinning axis
- 3) The relation between F<sub>p</sub> max & F<sub>s</sub> max is \_\_\_\_
  - b)  $F_p max = \frac{1}{2} F_s max$ a)  $F_p max = 1/n F_s max$ d)  $F_s max = 1/n F_p max$ c)  $F_p max = 2n$ .  $F_s max$
- 4)
  - The partial balancing means \_\_\_\_
    - a) Balancing partially the revolving masses
    - b) Balancing partially the reciprocating masses
    - c) net balancing of engine
    - d) all of the above

#### 5) Damping factor is

- a) ratio of critical damping to damping coefficient of damping
- ratio of logarithmic decrement to critical damping b)
- ratio of coefficient of damping to critical damping C)
- ratio of critical damping to logarithmic decrement
- Natural frequency of shaft with both ends fixed & UDL is \_\_\_\_\_. 6)
  - a)  $f_n = 0.751/\sqrt{\delta_s}$ b)  $f_n = 0.571 / \sqrt{\delta_s}$
  - d) none of the above c)  $f_n = 0.4985 / \sqrt{\delta}$
- 7) The ratio of maximum displacement of forced vibration to deflection due to static force is
  - a) damping factor
- damping coefficient b) d) magnification factor
- c) logarithmic decrement
- 8) A shaft carrying 3 rotors will have \_
  - a) one or two nodes c) two nodes
- b) no node
- d) three nodes

SLR-FM-118



Max. Marks: 70

Marks: 14

- 9) Max fluctuation of energy can be calculated as \_\_\_\_\_.
  - a)  $l^2 \omega^2 C_s$

b)  $l^2 \omega^2 C_E$ 

- c)  $l\omega^2 C_s$
- In IC engine during suction stroke \_ 10)
  - a) Excess energy is developed
  - c) Both a & b
- 11) Length of path of contact is \_\_\_\_\_
  - a) distance between pitch point to point of approach
  - b) sum of path of approach & arc of recess
  - c) length of arc of contact multiplied by cosine of pressure angle
  - d) length of arc contact divided by circular pitch  $\pi$
- The difference between tooth space & tooth thickness measured along 12) pitch circle is called as \_\_\_\_\_.
  - a) pitch circle
  - c) tooth thickness
- b) circular pitch
- d) Backlash
- Direction of rotation of planet gear & annalus is \_\_\_\_\_. 13)
  - a) opposite c) clockwise

- b) same
- d) can't say
- Main difference in reverted GT & epicyclic GT is \_\_\_\_ 14)
  - a) speed ratio factor
  - c) shaft position

- b) direction of first & last gear
- d) no difference

- **SLR-FM-118** Set R

b) Flywheel absorbs energy

d) Flywheel supplies energy

- d)  $l\omega^2 C_E$

### LR-FM-118

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#### T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of calculator is allowed.
- 3) Figures to the right indicates full marks.
- 4) Assume additional data, if necessary and mention it clearly.

#### Section – I

- Q.2 a) Explain with neat sketch construction and working of differential gear train. 06 Use tabular method to show difference in the speed of inner and outer wheels of vehicles.
  - b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.
- Q.3 a) State law of gearing. Derive an equation for condition for constant velocity ratio.
   b) In an epicyclic gear train, the internal wheels A and B and compound 08
  - **b)** In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. Gear E meshes with A and C. The gear F meshes with B and D. All the wheels have the same module and the number of teeth are:  $T_c = 28$ ;  $T_D = 26$ ;  $T_E = T_F = 18$ .
    - i) Sketch the arrangement
    - ii) Find the number of teeth on A and B
    - iii) If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B.
- **Q.4 a)** Explain the effect of gyroscopic couple on a four wheeler while taking a left **06** turn.
  - b) The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm<sup>2</sup>. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

#### Section – II

- **Q.5** a) Explain clearly the terms static balancing and dynamic balancing.
  - b) A,B,C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.

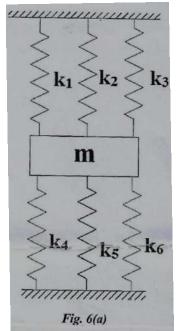
Max. Marks: 56

Set R

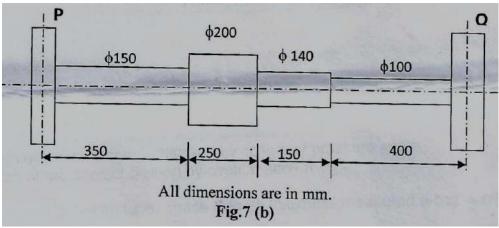
# SLR-FM-118 Set R

04

**Q.6** a) For the system shown in Fig. 6(a) Find the mass m such that natural frequency 20 Hz. Take  $K_1 = K_2 = K_3 = K_4 = K_5 = K_6 = 2500 \text{ N/m}.$ 



- b) A vibrating system consists of a mass of 65 kg, a spring with a stiffness of 25 kN/m and a damper. The damping provided is only 40% of the critical value. Determine the
  - i) Damping factor
  - ii) Critical damping coefficient
  - iii) Natural frequency of damped vibrations
  - iv) Logarithmic decrement
  - v) Ratio of two consecutive amplitudes
- **Q.7** a) Write a short note on vibration isolation and transmissibility.
  - **b**) A shaft as shown in Fig.7 (b) carries two masses namely P & Q. The mass **08** P is 600 kg with radius of gyration of 0.6 m and mass Q is 900 kg with a radius of gyration of 0.80 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) = 80 GN/m<sup>2</sup>



# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No.1 is compulsory should be solved solve is first 30 minutes in answer book.

- 2) Use of calculator is allowed.
- 4) Figures to the right indicates full marks.
- 5) Assume additional data, if necessary and mention it clearly.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

1)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 Natural frequency of shaft with both ends fixed & UDL is \_\_\_\_\_.

- a)  $f_n = 0.751/\sqrt{\delta_s}$ b)  $f_n = 0.571/\sqrt{\delta_s}$ d) none of the above c)  $f_n = 0.4985 / \sqrt{\delta}$
- The ratio of maximum displacement of forced vibration to deflection due 2)
  - to static force is . a) damping factor
    - c) logarithmic decrement
    - d) magnification factor
- 3) A shaft carrying 3 rotors will have \_\_\_\_
  - a) one or two nodes b) no node c) two nodes d) three nodes
- 4) Max fluctuation of energy can be calculated as \_\_\_\_\_.
  - a)  $l^2 \omega^2 C_s$ b)  $l^2 \omega^2 C_F$
  - c)  $l\omega^2 C_s$ d)  $l\omega^2 C_F$
- 5) In IC engine during suction stroke \_ b) Flywheel absorbs energy
  - a) Excess energy is developed
    - d) Flywheel supplies energy c) Both a & b
- Length of path of contact is \_\_\_\_\_ 6)
  - a) distance between pitch point to point of approach
  - b) sum of path of approach & arc of recess
  - c) length of arc of contact multiplied by cosine of pressure angle
  - d) length of arc contact divided by circular pitch  $\pi$
- 7) The difference between tooth space & tooth thickness measured along pitch circle is called as \_\_\_\_\_. b) circular pitch
  - a) pitch circle
  - c) tooth thickness d) Backlash
- Direction of rotation of planet gear & annalus is 8)
  - a) opposite b) same
    - c) clockwise d) can't say
- Main difference in reverted GT & epicyclic GT is \_\_\_\_ 9)
  - speed ratio factor a) shaft position c)
- b) direction of first & last gear
- d) no difference

Marks: 14

Max. Marks: 70

b) damping coefficient

Set

Set

S

- 10) A disc spinning at 20 rad/s will undergo precession when a torque 100 Nm is applied about an axis normal to it at an angular speed if the mass moment of inertia of disc is 1 kgm<sup>2</sup>
  - a) 5 rad/s c)
- b) 2 rad/s
  - 10 rad/s
- d) 20 rad/s
- 11) In pitching, movement of ship is about
  - b) Longitudinal axis
  - a) transverse axis c) spinning axis

- horizontal axis d)
- 12) The relation between F<sub>p</sub> max & F<sub>S</sub> max is
  - $F_p max = 1/n F_s max$ a)
- b)  $F_p max = \frac{1}{2} F_s max$
- c)  $F_p max = 2n$ .  $F_s max$
- d)  $F_s max = 1/n F_p max$
- 13) The partial balancing means \_\_\_\_\_
  - a) Balancing partially the revolving masses
  - b) Balancing partially the reciprocating masses
  - c) net balancing of engine
  - d) all of the above
- 14) Damping factor is
  - ratio of critical damping to damping coefficient of damping a)
  - ratio of logarithmic decrement to critical damping b)
  - ratio of coefficient of damping to critical damping C)
  - d) ratio of critical damping to logarithmic decrement

### **SLR-FM-118**

04

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### T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

#### THEORY OF MACHINE - II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of calculator is allowed.
- 3) Figures to the right indicates full marks.
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#### Section – I

- Q.2 a) Explain with neat sketch construction and working of differential gear train. 06 Use tabular method to show difference in the speed of inner and outer wheels of vehicles.
  - b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the 80 gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.
- Q.3 a) State law of gearing. Derive an equation for condition for constant velocity 06 ratio. 80
  - In an epicyclic gear train, the internal wheels A and B and compound b) wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. Gear E meshes with A and C. The gear F meshes with B and D. All the wheels have the same module and the number of teeth are:  $T_c = 28$ ;  $T_D = 26$ ;  $T_E = T_F = 18$ .
    - i) Sketch the arrangement
    - ii) Find the number of teeth on A and B
    - If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed iii) of B.
- Explain the effect of gyroscopic couple on a four wheeler while taking a left Q.4 06 a) turn.
  - **b)** The turning moment diagram for a petrol engine is drawn to the following **08** scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm<sup>2</sup>. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

#### Section – II

- a) Explain clearly the terms static balancing and dynamic balancing. Q.5
  - **b)** A.B.C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.

Set

Max. Marks: 56

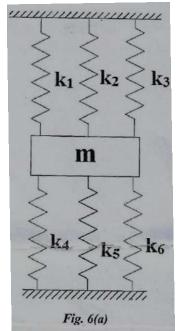


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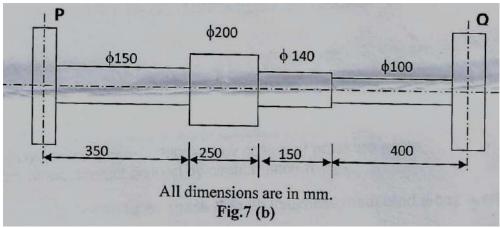
# SLR-FM-118 Set S

04

**Q.6** a) For the system shown in Fig. 6(a) Find the mass m such that natural frequency 20 Hz. Take  $K_1 = K_2 = K_3 = K_4 = K_5 = K_6 = 2500 \text{ N/m}.$ 



- b) A vibrating system consists of a mass of 65 kg, a spring with a stiffness of 25 kN/m and a damper. The damping provided is only 40% of the critical value. Determine the
  - i) Damping factor
  - ii) Critical damping coefficient
  - iii) Natural frequency of damped vibrations
  - iv) Logarithmic decrement
  - v) Ratio of two consecutive amplitudes
- **Q.7** a) Write a short note on vibration isolation and transmissibility.
  - **b**) A shaft as shown in Fig.7 (b) carries two masses namely P & Q. The mass **08** P is 600 kg with radius of gyration of 0.6 m and mass Q is 900 kg with a radius of gyration of 0.80 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) = 80 GN/m<sup>2</sup>



## Seat No. T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

METROLOGY AND MECHANICAL MEASUREMENT Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
  - 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary and mention it clearly.

### PART – A **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

**Instructions:** 1) All questions from objective type question paper are compulsory.

2) There is no negative and partial marking system for objective type questions.

### Q.1 A) Match the pairs.

- Measurement of angle 1)
- Screw thread measurement 2)
- 3) Comparators

- a) Solex Pneumatic gauge
- Sine instrument b)
- c) Floating carriage micrometer
- d) Clinometer

### B) State whether the following statements are true or false.

- 1) In limits and fits system basic shaft system is one whose lower deviation is zero.
- 2) The gas in MecLeod gauge should obey the Boyle's law over required range of compression.
- 3) Sine bar is specified by its total length.
- Choose the correct alternatives from the options and rewrite the C) 04 sentence. (1 marks each)

Fundamental deviation for hole basis system is \_\_\_\_\_. 1)

- a) -ve
- b) +ve
- c) Zero
- d) depends upon the design engineer
- The least count of metric vernier caliper having 25 Vernier scale divisions 2) matching with 24 main scale divisions of 0.5mm each is \_\_\_\_\_.
  - a) 0.05mm b) 0.02mm
  - c) 0.002mm d) 0.01mm
- The dead weight pressure tester is used for \_\_\_\_\_. 3)
  - a) Producing high pressure
  - b) Accurate measurement of load
  - c) Calibrating pressure measuring instrument
  - d) Testing the magnitude of given weight

### The average angular speed is measured by \_\_\_\_ 4)

- Centrifugal tachometer b) Drag cup tachometer a) Stroboscope c)
  - d) Revolution counter



Set

Max. Marks: 70

**SLR-FM-119** 

03

03

Set P

04

# D) Choose the correct alternatives from the options and rewrite the sentence. (2 marks each)

- 1) The static characteristics of the instrument are \_\_\_\_\_.
  - a) Fidelity

b) Drift

c) Resolution

- d) Overshoot
- 2) As per the Taylor's principle of gauging \_\_\_\_\_.
  - a) Go gauge should be full form gauge
    - b) Go gauge should check all the related dimensions simultaneously
    - c) No Go gauge should the full form
    - d) No Go gauge should check only one dimension at a time

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METROLOGY AND MECHANICAL MEASUREMENT

Max. Marks: 56

Set

Ρ

Day & Date: Monday, 09-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Attempt any two questions from each Section - I & Section - II.

2) Figure to the right indicates full marks.

3) Assume suitable data if necessary and state it clearly.

## PART – B

# (Descriptive Type Question Paper)

### Section – I

|     |                | Section – I  |                |
|-----|----------------|--|----------------|
| Q.2 | a)<br>b)<br>c) | <ul> <li>Write a note on imperial standard yard.</li> <li>Explain the following terms used in measurements.</li> <li>1) Calibration</li> <li>2) Precision</li> <li>3) Accuracy</li> <li>4) Sensitivity</li> <li>Explain measuring principle of Vernier Caliper.</li> </ul>   | 05<br>05<br>04 |
| Q.3 | a)             | What are the sine centers? With a simple sketch, explain working principle   | 04             |
|     | b)             | of anyone of the sine center.<br>Tabulate the details of contents of anyone slip gauge box. Select minimum<br>number of slip-gauges in order to construct a pile of height 46.635 mm.<br>Draw the pile schematically.  | 06             |
|     | c)             | State and explain Taylor's principle of limit gauging.   | 04             |
| Q.4 | a)             | Describe in brief construction, working and application of sigma mechanical comparator.  | 04             |
|     | b)<br>c)       | The following points hold good in connection with a fit between a hole and<br>shaft of the nominal size 80 mm:<br>Width of hole tolerance zone = 0.100 mm<br>Width of shaft tolerance zone = 0.150 mm<br>Allowance = 0.050 mm,<br>Draw the fit graphically adopting shaft Base System of limits fits and<br>tolerances. Calculate the upper and lower limits of shaft and hole sizes.<br>Name the fit. Also calculate maximum clearance/interference.<br>Explain with neat sketch Angle Measurement using Clinometers. | 06             |
|     |                | Section – II   |                |
| Q.5 | a)<br>b)       | Explain the function of each element in the generalized measurement system with suitable example. Distinguish between thermistors and RTD.   | 08<br>06       |
| Q.6 | a)<br>b)       | Explain construction and working of Dead weight pressure gauge tester.<br>Explain with neat sketch working of turbine meter.   | 08<br>06       |
| Q.7 | a)<br>b)       | Derive an expression for the gauge factor.<br>Explain with neat sketch drag cup tachometer.  | 08<br>06       |

# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

# METROLOGY AND MECHANICAL MEASUREMENT

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
  - 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary and mention it clearly.

### PART – A **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat No.

**Instructions:** 1) All questions from objective type question paper are compulsory.

2) There is no negative and partial marking system for objective type questions.

### Q.1 A) Match the pairs.

- 1) Measurement of angle
- Screw thread measurement 2)
- 3) Comparators

- a) Solex Pneumatic gauge
- b) Sine instrument
- c) Floating carriage micrometer
- d) Clinometer

### B) State whether the following statements are true or false.

- 1) In limits and fits system basic shaft system is one whose lower deviation is zero.
- 2) The gas in MecLeod gauge should obey the Boyle's law over required range of compression.
- 3) Sine bar is specified by its total length.
- Choose the correct alternatives from the options and rewrite the C) sentence. (1 marks each)
  - The dead weight pressure tester is used for \_\_\_\_\_. 1)
    - a) Producing high pressure
    - b) Accurate measurement of load
    - c) Calibrating pressure measuring instrument
    - d) Testing the magnitude of given weight
  - The average angular speed is measured by 2)
    - a) Centrifugal tachometer b) Drag cup tachometer
    - Stroboscope d) Revolution counter c)
  - 3) Fundamental deviation for hole basis system is .
    - a) -ve
    - b) +ve
    - c) Zero
    - d) depends upon the design engineer
  - 4) The least count of metric vernier caliper having 25 Vernier scale divisions matching with 24 main scale divisions of 0.5mm each is .
    - a) 0.05mm b) 0.02mm
    - c) 0.002mm d) 0.01mm





- Marks: 14
  - 03
  - - 03

04

- Max. Marks: 70

Set Q

04

# D) Choose the correct alternatives from the options and rewrite the sentence. (2 marks each)

1) The static characteristics of the instrument are \_\_\_\_\_.

a) Fidelity

b) Drift

c) Resolution

d) Overshoot

- 2) As per the Taylor's principle of gauging \_\_\_\_\_.
  - a) Go gauge should be full form gauge
    - b) Go gauge should check all the related dimensions simultaneously
    - c) No Go gauge should the full form
    - d) No Go gauge should check only one dimension at a time

| Seat |  |
|------|--|
| No.  |  |

# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METROLOGY AND MECHANICAL MEASUREMENT

Max. Marks: 56

Set Q

Day & Date: Monday, 09-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Attempt any two questions from each Section – I & Section - II.

2) Figure to the right indicates full marks.

3) Assume suitable data if necessary and state it clearly.

## PART – B

# (Descriptive Type Question Paper)

### Section – I

| Q.2 | a)<br>b)<br>c) | <ul> <li>Write a note on imperial standard yard.</li> <li>Explain the following terms used in measurements.</li> <li>1) Calibration</li> <li>2) Precision</li> <li>3) Accuracy</li> <li>4) Sensitivity</li> <li>Explain measuring principle of Vernier Caliper.</li> </ul>  | 05<br>05<br>04 |
|-----|----------------|---|----------------|
| Q.3 | ,<br>а)        | What are the sine centers? With a simple sketch, explain working principle  | 04             |
|     | b)             | of anyone of the sine center.<br>Tabulate the details of contents of anyone slip gauge box. Select minimum<br>number of slip-gauges in order to construct a pile of height 46.635 mm.<br>Draw the pile schematically.   | 06             |
|     | C)             | State and explain Taylor's principle of limit gauging.  | 04             |
| Q.4 | a)             | Describe in brief construction, working and application of sigma mechanical   | 04             |
|     | b)<br>c)       | comparator.<br>The following points hold good in connection with a fit between a hole and<br>shaft of the nominal size 80 mm:<br>Width of hole tolerance zone = 0.100 mm<br>Width of shaft tolerance zone = 0.150 mm<br>Allowance = 0.050 mm,<br>Draw the fit graphically adopting shaft Base System of limits fits and<br>tolerances. Calculate the upper and lower limits of shaft and hole sizes.<br>Name the fit. Also calculate maximum clearance/interference.<br>Explain with neat sketch Angle Measurement using Clinometers. | 06             |
|     |                | Section – II  |                |
| Q.5 | a)<br>b)       | Explain the function of each element in the generalized measurement system with suitable example. Distinguish between thermistors and RTD.  | 08<br>06       |
| 0.0 |                | <b>.</b>  |                |
| Q.6 | a)<br>b)       | Explain construction and working of Dead weight pressure gauge tester.<br>Explain with neat sketch working of turbine meter.  | 08<br>06       |
| Q.7 | a)<br>b)       | Derive an expression for the gauge factor.<br>Explain with neat sketch drag cup tachometer.   | 08<br>06       |

# Seat No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** METROLOGY AND MECHANICAL MEASUREMENT

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
  - 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary and mention it clearly.

### PART – A **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

**Instructions:** 1) All questions from objective type question paper are compulsory.

2) There is no negative and partial marking system for objective type questions.

### Q.1 A) Match the pairs.

- Measurement of angle 1)
- Screw thread measurement 2)
- 3) Comparators

a) Solex Pneumatic gauge

- Sine instrument b)
- C) Floating carriage micrometer
- Clinometer d)

### B) State whether the following statements are true or false.

- 1) In limits and fits system basic shaft system is one whose lower deviation is zero.
- 2) The gas in MecLeod gauge should obey the Boyle's law over required range of compression.
- 3) Sine bar is specified by its total length.
- Choose the correct alternatives from the options and rewrite the C) 04 sentence. (1 marks each)
  - The least count of metric vernier caliper having 25 Vernier scale divisions 1) matching with 24 main scale divisions of 0.5mm each is \_\_\_\_\_.
    - a) 0.05mm b) 0.02mm
    - c) 0.002mm d) 0.01mm
  - The dead weight pressure tester is used for \_\_\_\_\_. 2)
    - a) Producing high pressure
    - Accurate measurement of load b)
    - Calibrating pressure measuring instrument c)
    - d) Testing the magnitude of given weight

### The average angular speed is measured by \_\_\_\_\_. 3) a)

- Centrifugal tachometer b) Drag cup tachometer c) Stroboscope
  - d) Revolution counter

### Fundamental deviation for hole basis system is \_\_\_\_\_. 4)

- a) -ve
- b) +ve
- c) Zero
- d) depends upon the design engineer

Max. Marks: 70

**SLR-FM-119** 

Marks: 14

03

- 03

Set R

04

# D) Choose the correct alternatives from the options and rewrite the sentence. (2 marks each)

1) The static characteristics of the instrument are \_\_\_\_\_.

a) Fidelity

b) Drift

c) Resolution

d) Overshoot

- 2) As per the Taylor's principle of gauging \_\_\_\_\_.
  - a) Go gauge should be full form gauge
    - b) Go gauge should check all the related dimensions simultaneously
    - c) No Go gauge should the full form
    - d) No Go gauge should check only one dimension at a time

| of | 4 |   |
|----|---|---|
| a  |   | Б |
| a  | L |   |

What are the sine centers? With a simple sketch, explain working principle

Tabulate the details of contents of anyone slip gauge box. Select minimum

Describe in brief construction, working and application of sigma mechanical

The following points hold good in connection with a fit between a hole and

number of slip-gauges in order to construct a pile of height 46.635 mm.

Draw the fit graphically adopting shaft Base System of limits fits and tolerances. Calculate the upper and lower limits of shaft and hole sizes.

Name the fit. Also calculate maximum clearance/interference. Explain with neat sketch Angle Measurement using Clinometers. C)

### Section – II

| Q.5 | a)<br>b) | Explain the function of each element in the generalized measurement system with suitable example. Distinguish between thermistors and RTD. | 08<br>06 |
|-----|----------|--|----------|
| Q.6 | a)       | Explain construction and working of Dead weight pressure gauge tester.   | 08       |
|     | b)       | Explain with neat sketch working of turbine meter.   | 06       |
| Q.7 | a)       | Derive an expression for the gauge factor.   | 08       |
|     | b)       | Explain with neat sketch drag cup tachometer.  | 06       |

### Seat No.

Q.2

Q.3

Q.4

a)

b)

C)

a)

b)

C)

a)

b)

1) 2)

3)

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** METROLOGY AND MECHANICAL MEASUREMENT

Instructions: 1) Attempt any two questions from each Section – I & Section - II.

3) Assume suitable data if necessary and state it clearly.

PART – B (Descriptive Type Question Paper) Section – I

2) Figure to the right indicates full marks.

Explain the following terms used in measurements.

Explain measuring principle of Vernier Caliper.

State and explain Taylor's principle of limit gauging.

Write a note on imperial standard yard.

Max. Marks: 56

05

05

04

04

06

04

04

06

04

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

Calibration

Precision

Accuracy 4) Sensitivity

comparator.

of anyone of the sine center.

Draw the pile schematically.

shaft of the nominal size 80 mm:

Allowance = 0.050 mm,

Width of hole tolerance zone = 0.100 mmWidth of shaft tolerance zone = 0.150 mm

Page **9** of **12** 



# Seat No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** METROLOGY AND MECHANICAL MEASUREMENT

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
  - 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary and mention it clearly.

### PART – A **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

**Instructions:** 1) All questions from objective type question paper are compulsory.

2) There is no negative and partial marking system for objective type questions.

### Q.1 A) Match the pairs.

- Measurement of angle 1)
- Screw thread measurement 2)
- 3) Comparators

- a) Solex Pneumatic gauge Sine instrument b)
- c) Floating carriage micrometer
- d) Clinometer

### B) State whether the following statements are true or false.

- 1) In limits and fits system basic shaft system is one whose lower deviation is zero.
- 2) The gas in MecLeod gauge should obey the Boyle's law over required range of compression.
- 3) Sine bar is specified by its total length.
- Choose the correct alternatives from the options and rewrite the C) 04 sentence. (1 marks each)

Fundamental deviation for hole basis system is \_\_\_\_\_. 1)

- a) -ve
- b) +ve
- C) Zero
- d) depends upon the design engineer
- The least count of metric vernier caliper having 25 Vernier scale divisions 2) matching with 24 main scale divisions of 0.5mm each is \_\_\_\_\_.
  - a) 0.05mm b) 0.02mm
  - c) 0.002mm d) 0.01mm
- The dead weight pressure tester is used for \_\_\_\_\_. 3)
  - a) Producing high pressure
  - b) Accurate measurement of load
  - c) Calibrating pressure measuring instrument
  - d) Testing the magnitude of given weight

### The average angular speed is measured by \_\_\_\_ 4)

- a) Centrifugal tachometer b) Drag cup tachometer Stroboscope c)
  - d) Revolution counter

Marks: 14

03

03

Max. Marks: 70

**SLR-FM-119** 



04

# D) Choose the correct alternatives from the options and rewrite the sentence. (2 marks each)

- 1) The static characteristics of the instrument are \_\_\_\_\_.
  - a) Fidelity

b) Drift

c) Resolution

- d) Overshoot
- 2) As per the Taylor's principle of gauging \_\_\_\_\_.
  - a) Go gauge should be full form gauge
    - b) Go gauge should check all the related dimensions simultaneously
    - c) No Go gauge should the full form
    - d) No Go gauge should check only one dimension at a time

| Seat |  |
|------|--|
| No.  |  |

# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METROLOGY AND MECHANICAL MEASUREMENT

Max. Marks: 56

Day & Date: Monday, 09-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Attempt any two questions from each Section – I & Section - II.

2) Figure to the right indicates full marks.

3) Assume suitable data if necessary and state it clearly.

## PART – B

# (Descriptive Type Question Paper)

### Section – I

| Q.2 | a)<br>b)<br>c) | <ul> <li>Write a note on imperial standard yard.</li> <li>Explain the following terms used in measurements.</li> <li>1) Calibration</li> <li>2) Precision</li> <li>3) Accuracy</li> <li>4) Sensitivity</li> <li>Explain measuring principle of Vernier Caliper.</li> </ul>  | 05<br>05<br>04 |
|-----|----------------|---|----------------|
| Q.3 | с)<br>а)       | What are the sine centers? With a simple sketch, explain working principle  | 04             |
|     | b)             | of anyone of the sine center.<br>Tabulate the details of contents of anyone slip gauge box. Select minimum<br>number of slip-gauges in order to construct a pile of height 46.635 mm.<br>Draw the pile schematically.   | 06             |
|     | c)             | State and explain Taylor's principle of limit gauging.  | 04             |
| Q.4 | a)             | Describe in brief construction, working and application of sigma mechanical   | 04             |
|     | b)<br>c)       | comparator.<br>The following points hold good in connection with a fit between a hole and<br>shaft of the nominal size 80 mm:<br>Width of hole tolerance zone = 0.100 mm<br>Width of shaft tolerance zone = 0.150 mm<br>Allowance = 0.050 mm,<br>Draw the fit graphically adopting shaft Base System of limits fits and<br>tolerances. Calculate the upper and lower limits of shaft and hole sizes.<br>Name the fit. Also calculate maximum clearance/interference.<br>Explain with neat sketch Angle Measurement using Clinometers. | 06             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain the function of each element in the generalized measurement system with suitable example.   | 80             |
|     | b)             | Distinguish between thermistors and RTD.  | 06             |
| Q.6 | a)<br>b)       | Explain construction and working of Dead weight pressure gauge tester.<br>Explain with neat sketch working of turbine meter.  | 08<br>06       |
| Q.7 | a)<br>b)       | Derive an expression for the gauge factor.<br>Explain with neat sketch drag cup tachometer.   | 08<br>06       |



T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering METALLURGY** Max. Marks: 70

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Question 1 is compulsory. It should be solved in first 30 minutes in answer book.

Figures to the indicate full marks.

### **MCQ/Objective Type Questions**

### **Duration: 30 Minutes**

Seat

No.

Q.1

- Which of the following system shows complete solubility in each other at 1) any temperature? Cu-Sn a) b) Au-Cu
  - c) Au-C d) Cu-Zn
- 2) Which of the following treatment is given to Measuring instruments & Bearing races?
  - Annealing a)
  - Carburising c) d) Induction Hardening

b)

b)

Sub zero treatment

True toughness

Austenite

### 3) Which of the following properties are determined by Impact test?

- Relative toughness a) b)
- c) Elongation d) Ductility

### 4) Which of the following HT processes gives Martensite?

- Austempering b) Martempering a)
- Normalising c) d) Patenting
- 5) Which of the following constituent is observed as pro eutectic as well as proeutectoid constituent in Fe- Fe<sub>3</sub>C diagram?
  - Ferrite a)
  - c) Delta iron d) Cementite

Which of the following is not a solid solution? 6)

- a) Alpha in Brass Gamma in steel b)
- Cementite in steel d) c) Delta in steel
- 7) Which of the following cast iron has higher tensile strength?
  - White iron Grey iron a) b) Motteled Iron c) SG iron d)
- Which of the following is two phase brass? 8)
  - Cartridge brass Admiralty brass a) b)
  - Naval Brass c) d) Cap copper
- 9) Al-Si alloys are given Treatment.
  - Modification Solution a) b) Stabiling d) Malleabilizing C)
- 10) Magnetic particle test can be done on
  - Brass b) Duralimin a) c) Bronze d) Plain carbon steel

SLR-FM-120

Set Ρ

Marks: 14 Choose the correct alternatives from the options and rewrite the sentence. 14

- Principle of following test is related to depth of indentation \_\_\_\_\_. 11) Vicker's test
  - b) Polidi Hardness test

Set P

a) c) Brinell test

- d) Rockwell test
- Deformation of material under constant load & constant temp with respect 12) to time is determined in \_\_\_\_\_test. a) Fatique test
  - Tensile test b)
  - **Creep Test** d) Hardness test
- 13) Powders of metal like Zn, Sn are manufactured by \_\_\_\_\_ method.
  - Atomisation a)

C)

- b) Electro deposition
- Reduction C)
- **Condensation of Metal Vapours** d)
- 14) Following test is never applicable for sub-surface cracks \_\_\_\_
  - Dye Penetrant test Magnetic particle test a) b)
  - Radiography test d) Ultrasonic test c)

|   | Set |
|---|-----|
| T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 |     |
| Mechanical Engineering                                |     |
| METALLURGY  |     |

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

| rinc.  | 02.0                         |   |                      |
|--------|------------------------------|---|----------------------|
| Instru | ctior                        | <ul> <li>1) Objective Question is Compulsory, Attempt any two questions from each section.</li> <li>2) Neat sketches must be drawn wherever necessary.</li> <li>3) Figures to the right indicate full marks.</li> </ul> |                      |
|        |                              | Section I   |                      |
| Q.2    | a)                           | Draw Fe-Fe <sub>3</sub> equilibrium diagram, Label all the temperatures & constituents correctly.<br>Explain Eutectic & Eutectoid transformations with respect to above   | 05<br>05             |
|        | b)<br>c)                     | diagram.<br>Draw microstructures of 0.7% C steel & 1.0% C steel.  | 03                   |
| Q.3    | <b>a</b> )                   | <ul> <li>Give typical composition, properties &amp; applications of following.(Any 3)</li> <li>1) HCHC steel</li> <li>2) OHNS</li> <li>3) Dual Phase Steel</li> <li>4) Mild Steel</li> </ul>                            | 06                   |
|        | b)<br>c)                     | Compare between Alpha brass & Alpha beta brass.<br>Write a note on Gray Cast Iron with neat microstructure.   | 04<br>04             |
| Q.4    | Ans<br>a)                    | wer the following (Any three):<br>Explain Gibb's Phase rule. Apply it to find degree of freedom for Binary<br>eutectic alloy.   | 05                   |
|        | b)<br>c)<br>d)               | Explain the properties and applications of Nano materials in brief.<br>Compare between SG Iron & Malleable Iron<br>Explain modification treatment given to AI-Si System.  | 04<br>04<br>05       |
|        |                              | Section –II   |                      |
| Q.5    | a)                           | Draw TTT diagram for eutectoid steel & superimpose CCR & Normalising heat treatment on it.  | 05                   |
|        | b)<br>c)                     | Explain the process of Austempering & Martempering in brief.<br>Why Hardening of Hyper eutectoid steels is carried out above Al<br>temperature?   | 05<br>04             |
| Q.6    | a)                           | Explain flow chart for Manufacturing of sintered friction material by powder metallurgy.  | 05                   |
|        | b)<br>c)                     | Compare between Carburising & nitriding.<br>Explain Rockwell Hardness test with its advantages and limitations.   | 05<br>04             |
| Q.7    | Writ<br>a)<br>b)<br>c)<br>d) | te short note (Any Three):<br>Charpy Impact test & Izod Impact test<br>What is significance of Sub zero treatment? What are its applications?<br>Magnetic particle test & Eddy current test<br>Polidi Hardness test     | 05<br>04<br>05<br>04 |

Seat No.

# SLR-FM-120

Ρ

Max. Marks: 56

| Day & Date: Wednesday, 11-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70 |  |              |   |          |                                  |
|--|--|--------------|---|----------|----------------------------------|
| Insti  | Instructions: 1) Question 1 is compulsory. It should be solved in first 30 minutes in answer book. |              |   |          |                                  |
|  |  | Z            | ) Figures to the indicate full marks        |          |                                  |
| Dura   | ition: 3   | RO Mir       | MCQ/Objective Typ                           | e Qu     | estions<br>Marks: 14             |
| Q.1  |  |              | he correct alternatives from the            | ontio    |                                  |
|  | 1)   |              | ch of the following is two phase bi         | -        |                                  |
|  |  | a)<br>c)     | Cartridge brass<br>Naval Brass              | b)<br>d) | Admiralty brass<br>Cap copper    |
|  | 2)   | AI-S         | i alloys are given Treatme                  | nt.      |                                  |
|  |  | a)           | Modification                                | b)       | Solution                         |
|  |  | c)           | Stabiling                                   | d)       | Malleabilizing                   |
|  | 3)   | Mag<br>a)    | netic particle test can be done on<br>Brass | b)       | <br>Duralimin                    |
|  |  | а)<br>С)     | Bronze                                      | d)       | Plain carbon steel               |
|  | 4)   | Prin         | ciple of following test is related to       | depth    | of indentation                   |
|  | ,  | a)           | Vicker's test                               | b)       | Polidi Hardness test             |
|  |  | c)           | Brinell test                                | d)       | Rockwell test                    |
| 5) Deformation of material under constant load & constant temp with respect  |  |              | d & constant temp with respect              |          |                                  |
|  |  | to tir<br>a) | me is determined intest.<br>Tensile test    | b)       | Fatigue test                     |
|  |  | c)           | Creep Test                                  | d)       | Hardness test                    |
|  | 6)   | Pow          | ders of metal like Zn, Sn are man           | ufact    | ured by method.                  |
|  | ·  | a)           | Atomisation                                 |          |                                  |
|  |  | b)<br>c)     | Electro deposition<br>Reduction             |          |                                  |
|  |  | d)           | Condensation of Metal Vapours               |          |                                  |
|  | 7)   |              | owing test is never applicable for s        | sub-s    | urface cracks                    |
|  | - /  | a)           | Dye Penetrant test                          | b)       | Magnetic particle test           |
|  |  | c)           | Radiography test                            | d)       | Ultrasonic test                  |
|  | 8)   |              | ch of the following system shows            | comp     | lete solubility in each other at |
|  |  | any<br>a)    | temperature?<br>Cu-Sn                       | b)       | Au-Cu                            |
|  |  | c)           | Au-C  | d)       | Cu-Zn                            |
|  | 9)   | Whi          | ch of the following treatment is giv        | /en to   | Measuring instruments &          |
|  | ,  | Bea          | ring races?                                 |          |                                  |
|  |  | a)           | Annealing                                   | b)       | Sub zero treatment               |
|  |  | c)           | Carburising                                 | d)       | Induction Hardening              |

T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METALLURGY

SLR-FM-120

Set | Q

Seat No.

- 10) Which of the following properties are determined by Impact test? Relative toughness
  - True toughness b)
  - Elongation C)

a)

a)

C)

c)

d) Ductility **SLR-FM-120** 

Set | Q

- 11) Which of the following HT processes gives Martensite? Austempering
  - b) Martempering
  - d) C) Normalising Patenting
- 12) Which of the following constituent is observed as pro eutectic as well as proeutectoid constituent in Fe- Fe<sub>3</sub>C diagram?
  - Ferrite a)

- b) Austenite
- d) Delta iron Cementite
- Which of the following is not a solid solution? 13)
  - Alpha in Brass a)

Cementite in steel

- Gamma in steel b)
- d) Delta in steel
- Which of the following cast iron has higher tensile strength? 14)
  - White iron a) c)

Grey iron b) Motteled Iron d)

SG iron

# T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METALLURGY

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

| Instru | ictior                       | <ul> <li>1) Objective Question is Compulsory, Attempt any two questions from each section.</li> <li>2) Neat sketches must be drawn wherever necessary.</li> </ul>   |                      |
|--------|------------------------------|---|----------------------|
|        |                              | 3) Figures to the right indicate full marks.  |                      |
|        |                              | Section I   |                      |
| Q.2    | a)                           | Draw Fe-Fe <sub>3</sub> equilibrium diagram, Label all the temperatures & constituents correctly.   | 05                   |
|        | b)                           | Explain Eutectic & Eutectoid transformations with respect to above diagram.   | 05                   |
|        | c)                           | Draw microstructures of 0.7% C steel & 1.0% C steel.  | 04                   |
| Q.3    | a)                           | <ul> <li>Give typical composition, properties &amp; applications of following.(Any 3)</li> <li>1) HCHC steel</li> <li>2) OHNS</li> <li>3) Dual Phase Steel</li> <li>4) Mild Steel</li> </ul>                        | 06                   |
|        | b)<br>c)                     | Compare between Alpha brass & Alpha beta brass.<br>Write a note on Gray Cast Iron with neat microstructure.   | 04<br>04             |
| Q.4    |                              | wer the following (Any three):  |                      |
|        | a)                           | Explain Gibb's Phase rule. Apply it to find degree of freedom for Binary eutectic alloy.  | 05                   |
|        | b)<br>c)<br>d)               | Explain the properties and applications of Nano materials in brief.<br>Compare between SG Iron & Malleable Iron<br>Explain modification treatment given to AI-Si System.  | 04<br>04<br>05       |
|        |                              | Section –II   |                      |
| Q.5    | a)                           | Draw TTT diagram for eutectoid steel & superimpose CCR & Normalising heat treatment on it.  | 05                   |
|        | b)<br>c)                     | Explain the process of Austempering & Martempering in brief.<br>Why Hardening of Hyper eutectoid steels is carried out above Al<br>temperature?   | 05<br>04             |
| Q.6    | a)                           | Explain flow chart for Manufacturing of sintered friction material by powder metallurgy.  | 05                   |
|        | b)<br>c)                     | Compare between Carburising & nitriding.<br>Explain Rockwell Hardness test with its advantages and limitations.   | 05<br>04             |
| Q.7    | Writ<br>a)<br>b)<br>c)<br>d) | te short note (Any Three):<br>Charpy Impact test & Izod Impact test<br>What is significance of Sub zero treatment? What are its applications?<br>Magnetic particle test & Eddy current test<br>Polidi Hardness test | 05<br>04<br>05<br>04 |

Seat No.



Set Q

Max. Marks: 56

| U) D                 |   | u)     | RUCKWEII IESI              |
|----------------------|---|--------|----------------------------|
| to time              | nation of material under constar<br>is determined intest.   |        |                            |
| ,                    | ensile test   | b)     | Fatigue test               |
| c) C                 | Creep Test  | d)     | Hardness test              |
| a) A<br>b) E<br>c) R | ers of metal like Zn, Sn are man<br>Atomisation<br>Electro deposition<br>Reduction<br>Condensation of Metal Vapours | ufactu | ired by method.            |
| Follow               | ing test is never applicable for s  | sub-su | Irface cracks .            |
|                      | Dye Penetrant test  | b)     | Magnetic particle test     |
| c) R                 | Radiography test  | d)     | Ultrasonic test            |
|                      |   |        | Page <b>7</b> of <b>12</b> |

Time: 02:30 PM To 05:30 PM book. Figures to the indicate full marks. **MCQ/Objective Type Questions Duration: 30 Minutes** Marks: 14 Choose the correct alternatives from the options and rewrite the sentence. Q.1 14 1) Which of the following constituent is observed as pro eutectic as well as proeutectoid constituent in Fe- Fe<sub>3</sub>C diagram? Ferrite a) b) Austenite Delta iron d) Cementite c) Which of the following is not a solid solution? 2) Alpha in Brass Gamma in steel a) b) Cementite in steel d) Delta in steel c) Which of the following cast iron has higher tensile strength? 3) White iron Grey iron b) a) SG iron Motteled Iron d) C) 4) Which of the following is two phase brass? Cartridge brass Admiralty brass a) b) Naval Brass d) Cap copper C) Al-Si alloys are given \_\_\_\_\_ Treatment. 5) Modification Solution a) b) c) Stabiling d) Malleabilizing Magnetic particle test can be done on 6) Brass b) Duralimin a) Bronze Plain carbon steel c) d) 7) Principle of following test is related to depth of indentation Vicker's test Polidi Hardness test b) a) d) Rockwell test Brinell test c) 8) Deformation of to time is deterr Tensile te a) Creep Tes c) Powders of met 9) Atomisatic a) b) Electro de Reduction C) d) Condensa

Instructions: 1) Question 1 is compulsory. It should be solved in first 30 minutes in answer

10)

## **METALLURGY** Max. Marks: 70 Day & Date: Wednesday, 11-12-2019

T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

**SLR-FM-120** 

Set | R

Seat No.

11) Which of the following system shows complete solubility in each other at any temperature?

- a) Cu-Sn b) Au-Cu c) Au-C d) Cu-Zn
- 12) Which of the following treatment is given to Measuring instruments & Bearing races?
  - a) Annealing

C)

b) Sub zero treatment

**SLR-FM-120** 

Set | R

- Carburising
- d) Induction Hardening
- 13) Which of the following properties are determined by Impact test?
  - a) Relative toughness
- b) True toughness
- c) Elongation d) Ductility
- 14) Which of the following HT processes gives Martensite?
  - a) Austemperingc) Normalising
- b) Martemperingd) Patenting

Page **8** of **12** 

Page **9** of **12** 

# SLR-FM-120

Set R

Max. Marks: 56

Seat No.

# T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METALLURGY

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

| Instr | uctio                       | <b>ns:</b> 1) Objective Question is Compulsory, Attempt any two questions from each section.  |                      |
|-------|-----------------------------|---|----------------------|
|       |                             | <ul><li>2) Neat sketches must be drawn wherever necessary.</li><li>3) Figures to the right indicate full marks.</li></ul>   |                      |
|       |                             | Section I   |                      |
| Q.2   | a)                          | Draw Fe-Fe <sub>3</sub> equilibrium diagram, Label all the temperatures & constituents correctly.   | 05                   |
|       | b)                          | Explain Eutectic & Eutectoid transformations with respect to above diagram.   | 05                   |
|       | c)                          | Draw microstructures of 0.7% C steel & 1.0% C steel.  | 04                   |
| Q.3   | a)                          | <ul> <li>Give typical composition, properties &amp; applications of following.(Any 3)</li> <li>1) HCHC steel</li> <li>2) OHNS</li> <li>3) Dual Phase Steel</li> <li>4) Mild Steel</li> </ul>                        | 06                   |
|       | b)<br>c)                    | Compare between Alpha brass & Alpha beta brass.<br>Write a note on Gray Cast Iron with neat microstructure.   | 04<br>04             |
| Q.4   |                             | swer the following (Any three):   |                      |
|       | a)                          | Explain Gibb's Phase rule. Apply it to find degree of freedom for Binary eutectic alloy.  | 05                   |
|       | b)<br>c)<br>d)              | Explain the properties and applications of Nano materials in brief.<br>Compare between SG Iron & Malleable Iron<br>Explain modification treatment given to AI-Si System.  | 04<br>04<br>05       |
|       |                             | Section –II   |                      |
| Q.5   | a)                          | Draw TTT diagram for eutectoid steel & superimpose CCR & Normalising<br>heat treatment on it.   | 05                   |
|       | b)<br>c)                    | Explain the process of Austempering & Martempering in brief.<br>Why Hardening of Hyper eutectoid steels is carried out above Al<br>temperature?   | 05<br>04             |
| Q.6   | a)                          | Explain flow chart for Manufacturing of sintered friction material by powder metallurgy.  | 05                   |
|       | b)<br>c)                    | Compare between Carburising & nitriding.<br>Explain Rockwell Hardness test with its advantages and limitations.   | 05<br>04             |
| Q.7   | Wri<br>a)<br>b)<br>c)<br>d) | te short note (Any Three):<br>Charpy Impact test & Izod Impact test<br>What is significance of Sub zero treatment? What are its applications?<br>Magnetic particle test & Eddy current test<br>Polidi Hardness test | 05<br>04<br>05<br>04 |

### Max. Marks: 70 book. Figures to the indicate full marks. **MCQ/Objective Type Questions** Marks: 14 Magnetic particle test can be done on Brass b) Duralimin a) c) Bronze d) Plain carbon steel Principle of following test is related to depth of indentation Vicker's test Polidi Hardness test a) b) Rockwell test c) Brinell test d) Deformation of material under constant load & constant temp with respect to time is determined in test. **Tensile test** Fatique test a) b) Hardness test C) Creep Test d) Powders of metal like Zn, Sn are manufactured by method. Atomisation a) b) Electro deposition Reduction c) **Condensation of Metal Vapours** d) Following test is never applicable for sub-surface cracks \_ Dye Penetrant test b) Magnetic particle test a) Radiography test Ultrasonic test c) d) Which of the following system shows complete solubility in each other at any temperature? Cu-Sn a) b) Au-Cu c) Au-C d) Cu-Zn Which of the following treatment is given to Measuring instruments & Bearing races? Annealing Sub zero treatment a) b) Carburising Induction Hardening d) C) Which of the following properties are determined by Impact test? Relative toughness True toughness a) b)

Ductility

Patenting

Martempering

d)

b)

d)

Which of the following HT processes gives Martensite?

**METALLURGY** Day & Date: Wednesday, 11-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Question 1 is compulsory. It should be solved in first 30 minutes in answer

T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

### **Duration: 30 Minutes**

3)

4)

5)

6)

7)

8)

9)

C)

a)

c)

Elongation

Austempering

Normalising

Choose the correct alternatives from the options and rewrite the sentence. Q.1 14

1)

2)

SLR-FM-120

Set

S

No.

Seat

Which of the following constituent is observed as pro eutectic as well as 10) proeutectoid constituent in Fe- Fe<sub>3</sub>C diagram?

- Ferrite a) b) c) Delta iron
  - Austenite d) Cementite
- 11) Which of the following is not a solid solution?
  - Alpha in Brass Gamma in steel a) b)
    - Cementite in steel d) Delta in steel
- 12) Which of the following cast iron has higher tensile strength?
  - White iron Grey iron b)
  - Motteled Iron SG iron d) C)
- Which of the following is two phase brass? 13)
  - Cartridge brass a)

c)

a)

Naval Brass c)

Admiralty brass

**SLR-FM-120** 

Set S

- Al-Si alloys are given \_\_\_\_\_ Treatment. 14)
  - Modification Solution b) a) Stabiling Malleabilizing c) d)
- d) Cap copper

b)

Seat No.

## T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering METALLURGY e: Wednesday, 11-12-2019 Max. Marks: 56

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

| 1 1110 | 02.0                        |   |                      |
|--------|-----------------------------|---|----------------------|
| Instr  | uctio                       | <b>ns:</b> 1) Objective Question is Compulsory, Attempt any two questions from each section.  |                      |
|        |                             | <ul><li>2) Neat sketches must be drawn wherever necessary.</li><li>3) Figures to the right indicate full marks.</li></ul>   |                      |
|        |                             | Section I   |                      |
| Q.2    | a)                          | Draw Fe-Fe $_3$ equilibrium diagram, Label all the temperatures & constituents correctly.   | 05                   |
|        | b)                          | Explain Eutectic & Eutectoid transformations with respect to above<br>diagram.  | 05                   |
|        | C)                          | Draw microstructures of 0.7% C steel & 1.0% C steel.  | 04                   |
| Q.3    | a)                          | <ul> <li>Give typical composition, properties &amp; applications of following.(Any 3)</li> <li>1) HCHC steel</li> <li>2) OHNS</li> <li>3) Dual Phase Steel</li> <li>4) Mild Steel</li> </ul>                        | 06                   |
|        | b)<br>c)                    | Compare between Alpha brass & Alpha beta brass.<br>Write a note on Gray Cast Iron with neat microstructure.   | 04<br>04             |
| Q.4    |                             | swer the following (Any three):   |                      |
|        | a)                          | Explain Gibb's Phase rule. Apply it to find degree of freedom for Binary eutectic alloy.  | 05                   |
|        | b)<br>c)<br>d)              | Explain the properties and applications of Nano materials in brief.<br>Compare between SG Iron & Malleable Iron<br>Explain modification treatment given to AI-Si System.  | 04<br>04<br>05       |
|        |                             | Section –II   |                      |
| Q.5    | a)                          | Draw TTT diagram for eutectoid steel & superimpose CCR & Normalising<br>heat treatment on it.   | 05                   |
|        | b)<br>c)                    | Explain the process of Austempering & Martempering in brief.<br>Why Hardening of Hyper eutectoid steels is carried out above Al<br>temperature?   | 05<br>04             |
| Q.6    | a)                          | Explain flow chart for Manufacturing of sintered friction material by powder metallurgy.  | 05                   |
|        | b)<br>c)                    | Compare between Carburising & nitriding.<br>Explain Rockwell Hardness test with its advantages and limitations.   | 05<br>04             |
| Q.7    | Wri<br>a)<br>b)<br>c)<br>d) | te short note (Any Three):<br>Charpy Impact test & Izod Impact test<br>What is significance of Sub zero treatment? What are its applications?<br>Magnetic particle test & Eddy current test<br>Polidi Hardness test | 05<br>04<br>05<br>04 |

Set S

|       |       | T.   | .E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DESIGN – I  |           |
|-------|-------|------|---|-----------|
|       |       |      | Friday, 13-12-2019 Max.<br>PM To 05:30 PM   | Marks: 70 |
| Instr | uctio | ons: | 1) Q. No. 1 is compulsory and should be solved in first 30 minutes book.  | in answer |
|       |       | 2    | 2) Figures to the right indicate full marks.  |           |
| _     |       |      | MCQ/Objective Type Questions  |           |
|       |       |      |   | Marks: 14 |
| Q.1   | A)    |      | olve multiple correct answers. (2 marks each)   | 08        |
|       |       | 1)   | Stress concentration is due to<br>a) Abrupt changes in section b) Material<br>c) Machining scratches d) Stiffness   |           |
|       |       | 2)   | In a design of casting the following factors must be taken into   |           |
|       |       |      | consideration.<br>a) Economy in production b) Maximum production<br>c) Strength of casting d) None of above   |           |
|       |       | 3)   | a) 8% Chromium b) 18% chromium  |           |
|       |       | 4)   | c) 18% Nickel d) 8% Nickel  |           |
|       |       | 4)   | Springs in parallela) $W = W1 + W2$ b) $\delta k = \delta k1 + \delta k2$ c) $K = K1 - K2$ d) none of above   |           |
|       | B)    | So   | blve multiple choice questions. i. e. MCQ: (1 marks each)   | 06        |
|       |       |      | The Major stress produced in the belts isa) Compressiveb) Tensilec) Sheard) Torsional shear   |           |
|       |       | 2)   | Guest's theory is used for<br>a) Brittle materials b) Ductile materials<br>c) Elastic material d) Plastic materials   |           |
|       |       | 3)   | <ul> <li>A bolt of M20x2 means that</li> <li>a) Pitch of thread is 20mm &amp; depth is 2mm</li> <li>b) Effective diameter of bolt is 20mm &amp; 2 threads per cm</li> <li>c) Cross sectional area of thread 20 mm2</li> <li>d) The nominal diameter of bolt is 20mm &amp; pitch is 2mm</li> </ul> |           |
|       |       | 4)   | Knuckle pin is designed for<br>a) Torsion and bending b) Crushing<br>c) Bending d) Torsion  |           |
|       |       | 5)   | A rivet is specified by<br>a) Shank diameter b) Length of rivet<br>c) Type of head d) Length of tail  |           |
|       |       | 6)   | The method of manufacturing usually adopted for levers is<br>a) Casting b) Fabrication<br>c) Forging d) Machining   |           |

# Seat No.

SLR-FM-121

Set P

03

03

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - I**

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

### Section – I

- Explain design consideration used in machine design. Q.2 a)
  - Define factor of safety. Explain its physical significance and factor affecting b) 04 on selection of factor of safety.
  - Explain design procedure of Knulcke joint with necessary sketches. 07 c)
- Explain stress concentration. Explain the methods with diagrams to reduce Q.3 a) 06 the stress concentration.
  - A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is b) 08 subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt =  $380 \text{ N/mm}^2$ ), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - The yield strength in compression is twice of the tensile yield strength 1) and
  - The yield strength in shear is 50% of the tensile yield strength. The 2) factor of safety is 6.
  - It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor 07 b) to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - Diameters of motor and compressor pulleys; 1)
    - The specifications of the belt: 2)
    - The correct centre distance 3)
    - 4) The number of belts.

(Refer table No. 1 to 6 and fig. No. 1 and 2)

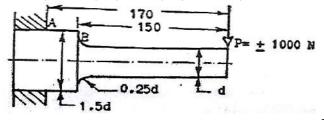
## Section – II

How you are differentiation the rigid and flexible couplings? Q.5 a) Explain ASME code Used in shaft design. b)

Max. Marks: 56

Set

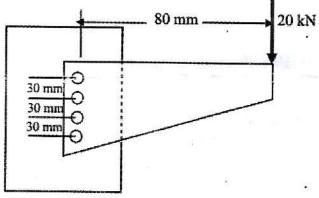
**SLR-FM-121** 



07

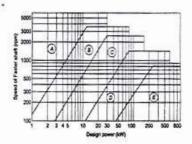
03

|     |                | Set  | Ρ              |
|-----|----------------|--|----------------|
|     | <b>c)</b>      | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



# Set F

### Design data for Selection of V-Belt Selection of cross-section of V-belt



### Dimensions of Standard Crosssection

Belt

Section

A B C D E

### Conversion of inside length to pitch length of the belt

| Minimum pitch<br>diameter of pulley<br>(mm) |  |
|---|--|
| 125   | t  |
| 200   | Ī  |
| 300   | Ī  |
| 500   | Ī  |
| 630   | Ī  |
|   | diameter of pulley<br>(mm)<br>125<br>200<br>300<br>500 |

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| С               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |  |
|-----|---|------------------------------|-------|-------|--|--|
| No  |   | 0-10                         | 10-16 | 16-24 |  |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |  |

Correction factor (Fa) for industrial services

### Power rating of V-belts

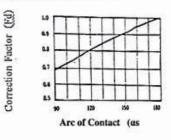
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section      | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118         | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|-------------|-------|
| A            | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81        | 2.00  |
| Section      | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190         | 200   |
| В            | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77        | 5.23  |
| Section      | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300         | 315   |
| C            | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10       | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0.000000000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |             |       |

### Preferred pitch diameters of pulleys

| Pitch | i diame    | ters ( | n mm | ): 125 | 132  | 140 | 150  | 160     | 170 |
|-------|------------|--------|------|--------|------|-----|------|---------|-----|
| 180   | 190        | 200    | 212  | 224    | 236  | 250 | 265  | 280     | 300 |
| 315   | 190<br>355 | 375    | 400  | 425    | 450  | 475 | 500  | 530     | 560 |
| 600   | 630        | 670    | 710  | 750    | \$00 | 900 | 1000 | a vener |     |

### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

| Li   |      | Be   | elt Secti | ion  | 100  |  |
|------|------|------|-----------|------|------|--|
| Ц    | A    | B    | C         | D    | E    |  |
| 1905 | 1.02 | 0.97 | 0.87      | -    | -    |  |
| 1981 | 1.03 | 0.98 | -         | -    |      |  |
| 2032 | 1.04 | -    | -         | -    | ÷    |  |
| 2057 | 1.04 | 0.98 | 0.89      | -    |      |  |
| 2159 | 1.05 | 0.99 | 0.90      |      | -    |  |
| 2286 | 1.06 | 1.00 | 0.91      | -    | -    |  |
| 2438 | 1.08 | -    | 0.92      | -    | -    |  |
| 2464 | -    | 1.02 | -         | -    |      |  |
| 2540 | -    | 1.03 | -         | -    | -    |  |
| 2667 | 1.10 | 1.04 | 0.94      | -    |      |  |
| 2845 | 1.11 | 1.05 | 0.95      | -    | -    |  |
| 3048 | 1.13 | 1.07 | 0.97      | 0.86 |      |  |
| 3150 | -    | -    | 0.97      | -    |      |  |
| 3251 | 1.14 | 1.03 | 0.98      | 0.87 |      |  |
| 3404 | -    | -    | 0.99      | -    | •    |  |
| 3658 |      | 1.11 | 1.00      | 0.90 | -    |  |
| 4013 |      | 1.13 | 1.02      | 0.92 | -    |  |
| 4115 | -    | 1.14 | 1.03      | 0.92 | -    |  |
| 4394 | -    | 1.15 | 1.04      | 0.93 | -    |  |
| 4572 | -    | 1.16 | 1.05      | 0.94 |      |  |
| 4953 | -    | 1.18 | 1.07      | 0.96 | -    |  |
| 5334 | -    | 1.19 | 1.08      | 0.96 | 0.94 |  |
| 6045 |      | -    | 1.11      | 1.00 | 0.96 |  |
| 6807 | -    | - 1  | 1.14      | 1.03 | 0.99 |  |
| 7569 | -    | -    | 1.16      | 1.05 | 1.01 |  |

|             |       |                 |   |                                       | •=  |          |       |
|-------------|-------|-----------------|---|---------------------------------------|---|----------|-------|
| Seat<br>No. |       |                 |   |                                       |   | Set      | Q     |
|             |       | T.              |   | CS) Exami<br>ical Engine<br>NE DESIGI | ering   |          |       |
|             |       |                 | iday, 13-12-2019<br>И To 05:30 PM   |                                       | Max   | . Marks  | s: 70 |
| Instru      | ctio  | ns:             | 1) Q. No. 1 is compulsory   | and should b                          | e solved in first 30 minutes                        | s in ans | swer  |
|             |       | 2               | book.<br>) Figures to the right indica  | te full marks.                        |   |          |       |
|             |       | -               | , .   | tive Type Qu                          | lestions  |          |       |
| Durati      | on: : | 30 N            | •   |                                       |   | Marks    | s: 14 |
| Q.1         | A)    | So              | ve multiple correct answe   | ers. (2 marks                         | each)   |          | 08    |
|             | ,     | 1)              | 18/8 steel contains   |                                       |   |          |       |
|             |       |                 | <ul><li>a) 8% Chromium</li><li>c) 18% Nickel</li></ul>                          | b)<br>d)                              | 18% chromium<br>8% Nickel                           |          |       |
|             |       | 2)              | Springs in parallel   |                                       |   |          |       |
|             |       |                 | a) $W = W1 + W2$<br>c) $K = K1 - K2$  | b)<br>d)                              | $\delta k = \delta k1 + \delta k2$<br>none of above |          |       |
|             |       | 3)              | Stress concentration is due   | ,                                     |   |          |       |
|             |       | 5)              | a) Abrupt changes in sec  |                                       | Material  |          |       |
|             |       |                 | c) Machining scratches  | d)                                    | Stiffness   |          |       |
|             |       | 4)              | In a design of casting the f consideration.                                     | ollowing facto                        | ors must be taken into                              |          |       |
|             |       |                 | a) Economy in production  | ,                                     | •   |          |       |
|             | Β,    | •               | c) Strength of casting  | d)                                    | None of above                                       |          |       |
|             | B)    | <b>So</b><br>1) | ve multiple choice questi<br>Knuckle pin is designed fo                         |                                       | Q: (1 marks each)                                   |          | 06    |
|             |       | ''              | a) Torsion and bending  | '<br>b)                               | Crushing  |          |       |
|             |       |                 | c) Bending  | d)                                    | Torsion   |          |       |
|             |       | 2)              | A rivet is specified by   |                                       |   |          |       |
|             |       |                 | a) Shank diameter   | b)                                    | Length of rivet                                     |          |       |
|             |       | 2)              | c) Type of head   | d)<br>dipananaliya                    | Length of tail                                      |          |       |
|             |       | 3)              | The method of manufactur<br>a) Casting  | b)                                    | Fabrication   | ·        |       |
|             |       |                 | c) Forging  | d)                                    | Machining   |          |       |
|             |       | 4)              | The Major stress produced   | d in the belts i                      | S.  |          |       |
|             |       | ,               | a) Compressive  | b)                                    |   |          |       |
|             |       |                 | c) Shear  | d)                                    | Torsional shear                                     |          |       |
|             |       | 5)              | Guest's theory is used for  |                                       |   |          |       |
|             |       |                 | <ul><li>a) Brittle materials</li><li>c) Elastic material</li></ul>              | b)<br>d)                              | Ductile materials<br>Plastic materials              |          |       |
|             |       | 6)              | A bolt of M20x2 means that  | ,                                     |   |          |       |
|             |       | 5)              | a) Pitch of thread is 20m   |                                       | 2mm   |          |       |
|             |       |                 | b) Effective diameter of b  | oolt is 20mm &                        | & 2 threads per cm                                  |          |       |
|             |       |                 | <ul> <li>c) Cross sectional area of</li> <li>d) The nominal diameter</li> </ul> |                                       |   |          |       |
|             |       |                 | d) The nominal diameter   |                                       |   |          |       |

03

03

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DESIGN - I

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

### Section – I

- **Q.2** a) Explain design consideration used in machine design.
  - b) Define factor of safety. Explain its physical significance and factor affecting 04 on selection of factor of safety.
  - c) Explain design procedure of Knulcke joint with necessary sketches. 07
- **Q.3 a)** Explain stress concentration. Explain the methods with diagrams to reduce **06** the stress concentration.

170

0.25d

-1.5d

b) A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

P= + 1000 N

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt = 380 N/mm<sup>2</sup>), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - 1) The yield strength in compression is twice of the tensile yield strength and
  - 2) The yield strength in shear is 50% of the tensile yield strength. The factor of safety is 6.
  - b) It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - 1) Diameters of motor and compressor pulleys;
    - 2) The specifications of the belt;
    - 3) The correct centre distance
    - 4) The number of belts.

(Refer table No. 1 to 6 and fig. No. 1 and 2)

## Section – II

Q.5 a) How you are differentiation the rigid and flexible couplings?b) Explain ASME code Used in shaft design.

Max. Marks: 56

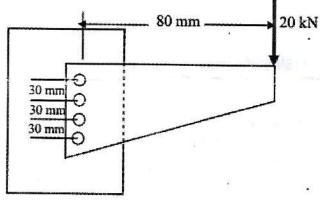
07

03

SLR-FM-121

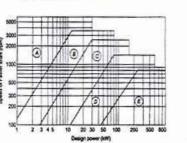
Seat No.

|     |                | Set  | Q              |
|-----|----------------|--|----------------|
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



# SLR-FM-121 Set Q

### Design data for Selection of V-Belt Selection of cross-section of V-belt



### Dimensions of Standard Crosssection

Belt

Section

A B C D E

### Conversion of inside length to pitch length of the belt

| Minimum pitch<br>diameter of pulley<br>(mm) | Belt<br>Section |
|---|-----------------|
| 125   | A               |
| 200   | B               |
| 300   | C               |
| 500   | D               |
| 630   | E               |
|   |                 |

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| С               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Opera | Operational hours per<br>day |       |  |
|-----|---|-------|------------------------------|-------|--|
| No  |   | 0-10  | 10-16                        | 16-24 |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1   | 1.2                          | 1.3   |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2   | 1.3                          | 1.4   |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3   | 1.4                          | 1.5   |  |

Correction factor (Fa) for industrial services

### Power rating of V-belts

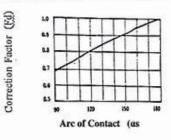
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section      | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118     | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|---------|-------|
| A            | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81    | 2.00  |
| Section      | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190     | 200   |
| B            | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77    | 5.23  |
| Section      | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300     | 315   |
| C            | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10   | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0-0.000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |         |       |

### Preferred pitch diameters of pulleys

| Pitch | i diame    | ters ( | n mm | ): 125 | 132  | 140 | 150  | 160     | 170 |
|-------|------------|--------|------|--------|------|-----|------|---------|-----|
| 180   | 190        | 200    | 212  | 224    | 236  | 250 | 265  | 280     | 300 |
| 315   | 190<br>355 | 375    | 400  | 425    | 450  | 475 | 500  | 530     | 560 |
| 600   | 630        | 670    | 710  | 750    | \$00 | 900 | 1000 | a vener |     |

### **Correction Factor for Arc of Contact**



Correction Factor F<sub>1</sub> for belt length

|      | Belt Section |      |      |      |      |  |  |  |  |
|------|--------------|------|------|------|------|--|--|--|--|
| Li   | A            | B    | C    | D    | E    |  |  |  |  |
| 1905 | 1.02         | 0.97 | 0.87 | -    | -    |  |  |  |  |
| 1981 | 1.03         | 0.98 | -    | -    |      |  |  |  |  |
| 2032 | 1.04         | -    | -    | -    | ÷    |  |  |  |  |
| 2057 | 1.04         | 0.98 | 0.89 | -    |      |  |  |  |  |
| 2159 | 1.05         | 0.99 | 0.90 |      | -    |  |  |  |  |
| 2286 | 1.06         | 1.00 | 0.91 | -    | -    |  |  |  |  |
| 2438 | 1.08         | -    | 0.92 | -    | -    |  |  |  |  |
| 2464 | -            | 1.02 | -    | -    |      |  |  |  |  |
| 2540 | -            | 1.03 | -    | -    | -    |  |  |  |  |
| 2667 | 1.10         | 1.04 | 0.94 | -    |      |  |  |  |  |
| 2845 | 1.11         | 1.05 | 0.95 | -    | -    |  |  |  |  |
| 3048 | 1.13         | 1.07 | 0.97 | 0.86 |      |  |  |  |  |
| 3150 | -            | -    | 0.97 | -    |      |  |  |  |  |
| 3251 | 1.14         | 1.03 | 0.98 | 0.87 |      |  |  |  |  |
| 3404 |              | -    | 0.99 | -    | •    |  |  |  |  |
| 3658 |              | 1.11 | 1.00 | 0.90 | -    |  |  |  |  |
| 4013 |              | 1.13 | 1.02 | 0.92 | -    |  |  |  |  |
| 4115 | -            | 1.14 | 1.03 | 0.92 | -    |  |  |  |  |
| 4394 | -            | 1.15 | 1.04 | 0.93 | -    |  |  |  |  |
| 4572 | -            | 1.16 | 1.05 | 0.94 |      |  |  |  |  |
| 4953 | -            | 1.18 | 1.07 | 0.96 | -    |  |  |  |  |
| 5334 | -            | 1.19 | 1.08 | 0.96 | 0.94 |  |  |  |  |
| 6045 |              | -    | 1.11 | 1.00 | 0.96 |  |  |  |  |
| 6807 | -            | -    | 1.14 | 1.03 | 0.99 |  |  |  |  |
| 7569 | -            | -    | 1.16 | 1.05 | 1.01 |  |  |  |  |

|       |         | Т.               | E. (      | Part – I) (New) (CBCS) Exa  |                    |   |           |
|-------|---------|------------------|-----------|---|--------------------|---|-----------|
|       |         |                  |           | Mechanical Eng  |                    |   |           |
| _     |         | _                |           | MACHINE DES   | SIGN               |   |           |
|       |         |                  |           | r, 13-12-2019<br>₀ 05:30 PM   |                    | Max.  | Marks: 70 |
| Instr | uctio   | ns:              |           | . No. 1 is compulsory and shou  | ıld be             | e solved in first 30 minutes                    | in answer |
|       |         | _                |           | ook.  |                    |   |           |
|       |         | 2                | 2) ⊢iç    | gures to the right indicate full ma   |                    |   |           |
|       |         |                  |           | MCQ/Objective Type  | e Qu               | estions   |           |
| Dura  | tion: 3 | 30 M             | linute    | es  |                    |   | Marks: 14 |
| Q.1   | A)      | <b>Sol</b><br>1) | In a      | nultiple correct answers. (2 ma<br>design of casting the following<br>sideration.   |                    | -   | 08        |
|       |         |                  | a)        | Economy in production<br>Strength of casting  | b)<br>d)           | Maximum production<br>None of above             |           |
|       |         | 2)               | a)        | 8 steel contains<br>8% Chromium<br>18% Nickel   | b)<br>d)           | 18% chromium<br>8% Nickel                       |           |
|       |         | 3)               | Spr<br>a) | ings in parallel<br>W = W1 + W2<br>K = K1 - K2  | b)<br>d)           |   |           |
|       |         | 4)               | ,         | ess concentration is due to   | α)                 |   |           |
|       |         | 4)               | a)        | Abrupt changes in section<br>Machining scratches  | <br>b)<br>d)       | Material<br>Stiffness                           |           |
|       | B)      | Sol              | ve n      | nultiple choice questions. i. e.  | MCC                | Q: (1 marks each)                               | 06        |
|       |         | 1)               |           | est's theory is used for<br>Brittle materials<br>Elastic material   | b)<br>d)           | Ductile materials<br>Plastic materials          |           |
|       |         | 2)               | a)<br>b)  | olt of M20x2 means that<br>Pitch of thread is 20mm & dept<br>Effective diameter of bolt is 20r<br>Cross sectional area of thread<br>The nominal diameter of bolt is | nm &<br>20 m       | 2 threads per cm<br>m2                          |           |
|       |         | 3)               | a)        | uckle pin is designed for<br>Torsion and bending<br>Bending   | b)<br>d)           | Crushing<br>Torsion                             |           |
|       |         | 4)               | a)        | vet is specified by<br>Shank diameter<br>Type of head   | b)<br>d)           | Length of rivet<br>Length of tail               |           |
|       |         | 5)               |           | e method of manufacturing usua<br>Casting<br>Forging  | lly ad<br>b)<br>d) | opted for levers is<br>Fabrication<br>Machining |           |
|       |         | 6)               |           | Major stress produced in the b<br>Compressive<br>Shear  | ,                  | U U   |           |

# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019

No.

Seat

# SLR-FM-121

Set R

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - I**

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

### Section – I

- Explain design consideration used in machine design. Q.2 a)
  - Define factor of safety. Explain its physical significance and factor affecting b) 04 on selection of factor of safety.
  - Explain design procedure of Knulcke joint with necessary sketches. 07 C)
- Explain stress concentration. Explain the methods with diagrams to reduce Q.3 a) 06 the stress concentration.
  - A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is b) **08** subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt =  $380 \text{ N/mm}^2$ ), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - The yield strength in compression is twice of the tensile yield strength 1) and
  - The yield strength in shear is 50% of the tensile yield strength. The 2) factor of safety is 6.
  - It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor 07 b) to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - Diameters of motor and compressor pulleys; 1)
    - The specifications of the belt: 2)
    - The correct centre distance 3)
    - 4) The number of belts.

(Refer table No. 1 to 6 and fig. No. 1 and 2)

## Section – II

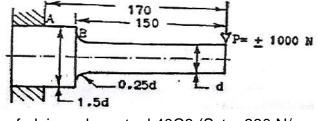
How you are differentiation the rigid and flexible couplings? Q.5 a) Explain ASME code Used in shaft design. b)

Max. Marks: 56

Set

SLR-FM-121

Seat

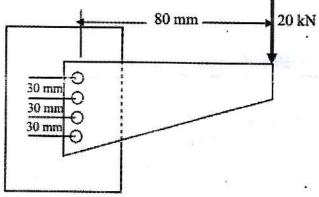


07

03

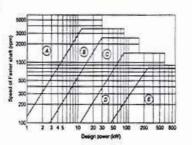
03 03

|     |                | Set  | R              |
|-----|----------------|--|----------------|
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



## **SLR-FM-121** Set R

### Design data for Selection of V-Belt Selection of cross-section of V-belt



### **Dimensions of Standard Cross**section

### Conversion of inside length to pitch length of the belt

| Belt<br>Section | Minimum pitch<br>diameter of pulley<br>(mm) | Be<br>Se |
|-----------------|---|----------|
| A               | 125   | -        |
| В               | 200   |          |
| C               | 300   | -        |
| D               | 500   |          |
| E               | 630   | -        |

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| C               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |
|-----|---|------------------------------|-------|-------|--|
| No  |   | 0-10                         | 10-16 | 16-24 |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |

Correction factor (Fa) for industrial services

### Power rating of V-belts

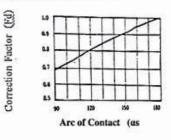
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section<br>A | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118         | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|-------------|-------|
|              | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81        | 2.00  |
| Section<br>B | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190         | 200   |
|              | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77        | 5.23  |
| Section<br>C | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300         | 315   |
|              | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10       | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      |       | 0     | 0.000000000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |             |       |

### Preferred pitch diameters of pulleys

| Pitch | i diame    | ters ( | n mm | ): 125 | 132  | 140 | 150  | 160     | 170 |
|-------|------------|--------|------|--------|------|-----|------|---------|-----|
| 180   | 190        | 200    | 212  | 224    | 236  | 250 | 265  | 280     | 300 |
| 315   | 190<br>355 | 375    | 400  | 425    | 450  | 475 | 500  | 530     | 560 |
| 600   | 630        | 670    | 710  | 750    | \$00 | 900 | 1000 | a vener |     |

### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

|      | Belt Section |      |      |      |      |  |  |  |
|------|--------------|------|------|------|------|--|--|--|
| Li   | A            | B    | C    | D    | E    |  |  |  |
| 1905 | 1.02         | 0.97 | 0.87 | -    | -    |  |  |  |
| 1981 | 1.03         | 0.98 | -    | -    |      |  |  |  |
| 2032 | 1.04         | -    | -    | -    | ÷    |  |  |  |
| 2057 | 1.04         | 0.98 | 0.89 | -    |      |  |  |  |
| 2159 | 1.05         | 0.99 | 0.90 | -    | -    |  |  |  |
| 2286 | 1.06         | 1.00 | 0.91 | -    | -    |  |  |  |
| 2438 | 1.08         | -    | 0.92 | -    | -    |  |  |  |
| 2464 | -            | 1.02 | -    | -    | •    |  |  |  |
| 2540 |              | 1.03 | -    | -    |      |  |  |  |
| 2667 | 1.10         | 1.04 | 0.94 | -    |      |  |  |  |
| 2845 | 1.11         | 1.05 | 0.95 | -    | -    |  |  |  |
| 3048 | 1.13         | 1.07 | 0.97 | 0.86 |      |  |  |  |
| 3150 | -            | -    | 0.97 | -    |      |  |  |  |
| 3251 | 1.14         | 1.03 | 0.98 | 0.87 |      |  |  |  |
| 3404 | -            | -    | 0.99 | -    | •    |  |  |  |
| 3658 |              | 1.11 | 1.00 | 0.90 | -    |  |  |  |
| 4013 |              | 1.13 | 1.02 | 0.92 | -    |  |  |  |
| 4115 | -            | 1.14 | 1.03 | 0.92 | -    |  |  |  |
| 4394 | -            | 1.15 | 1.04 | 0.93 | -    |  |  |  |
| 4572 | -            | 1.16 | 1.05 | 0.94 |      |  |  |  |
| 4953 | -            | 1.18 | 1.07 | 0.96 | -    |  |  |  |
| 5334 | -            | 1.19 | 1.08 | 0.96 | 0.94 |  |  |  |
| 6045 | -            |      | 1.11 | 1.00 | 0.96 |  |  |  |
| 6807 | -            | -    | 1.14 | 1.03 | 0.99 |  |  |  |
| 7569 |              | -    | 1.16 | 1.05 | 1.01 |  |  |  |

| T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DESIGN – I |         |      |        |  |          |                                    |             |  |  |
|---|---------|------|--------|--|----------|------------------------------------|-------------|--|--|
|   |         |      |        | v, 13-12-2019<br>o 05:30 PM  |          | Max                                | . Marks: 70 |  |  |
| Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in a                 |         |      |        |  |          |                                    |             |  |  |
|   |         |      |        | ook.   |          |                                    |             |  |  |
|   |         | 2    | 2) Fig | gures to the right indicate full ma<br>MCQ/Objective Typ           |          | estions                            |             |  |  |
| Durat   | tion: 3 | 30 M | linut  | es   |          |                                    | Marks: 14   |  |  |
| Q.1   | A)      | Sol  | ve n   | nultiple correct answers. (2 m                                     | arks     | each)                              | 08          |  |  |
|   |         | 1)   |        | ess concentration is due to  |          | •• • • •                           |             |  |  |
|   |         |      |        | Abrupt changes in section<br>Machining scratches                   |          |                                    |             |  |  |
|   |         | 2)   | In a   | a design of casting the following                                  | facto    | rs must be taken into              |             |  |  |
|   |         |      |        | sideration.  |          |                                    |             |  |  |
|   |         |      |        | Economy in production  | '        | •                                  |             |  |  |
|   |         | 2)   | ,      | Strength of casting  | d)       | None of above                      |             |  |  |
|   |         | 3)   |        | 8 steel contains<br>8% Chromium                                    | b)       | 18% chromium                       |             |  |  |
|   |         |      |        | 18% Nickel   | d)       | 8% Nickel                          |             |  |  |
|   |         | 4)   | '      | ings in parallel   |          |                                    |             |  |  |
|   |         | -)   |        | W = W1 + W2  | b)       | $\delta k = \delta k1 + \delta k2$ |             |  |  |
|   |         |      | C)     | K = K1 - K2  | d)       | none of above                      |             |  |  |
|   | B)      | Sol  |        | nultiple choice questions. i. e                                    |          |                                    | 06          |  |  |
|   |         | 1)   |        | e method of manufacturing usua                                     | -        |                                    |             |  |  |
|   |         |      |        | Casting<br>Forging   | b)<br>d) | Fabrication<br>Machining           |             |  |  |
|   |         | 2)   | ,      | 0 0  | ,        | 0                                  |             |  |  |
|   |         | Z)   |        | e Major stress produced in the b<br>Compressive                    | b)       | Tensile                            |             |  |  |
|   |         |      | c)     | Shear  | d)       | Torsional shear                    |             |  |  |
|   |         | 3)   | ,      | est's theory is used for   | ,        |                                    |             |  |  |
|   |         | - /  | a)     | Brittle materials  | b)       | Ductile materials                  |             |  |  |
|   |         |      | C)     | Elastic material   | d)       | Plastic materials                  |             |  |  |
|   |         | 4)   |        | olt of M20x2 means that  |          |                                    |             |  |  |
|   |         |      |        | Pitch of thread is 20mm & dept                                     |          |                                    |             |  |  |
|   |         |      |        | Effective diameter of bolt is 20<br>Cross sectional area of thread |          | •                                  |             |  |  |
|   |         |      | '      | The nominal diameter of bolt is                                    |          |                                    |             |  |  |
|   |         | 5)   |        | uckle pin is designed for  |          |                                    |             |  |  |
|   |         | •,   |        | Torsion and bending  | b)       | Crushing                           |             |  |  |
|   |         |      | c)     | -  | d)       | Torsion                            |             |  |  |
|   |         | 6)   |        | vet is specified by  |          |                                    |             |  |  |
|   |         |      |        | Shank diameter   | b)       | Length of rivet                    |             |  |  |
|   |         |      | C)     | Type of head   | d)       | Length of tail                     |             |  |  |

Set S

## Seat No.

03

03

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - I**

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

## Section – I

- Explain design consideration used in machine design. Q.2 a)
  - Define factor of safety. Explain its physical significance and factor affecting b) 04 on selection of factor of safety.
  - Explain design procedure of Knulcke joint with necessary sketches. 07 C)
- Explain stress concentration. Explain the methods with diagrams to reduce Q.3 a) 06 the stress concentration.

170 150

0.25d

-1.5d

A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is b) **08** subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

P= + 1000 N

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt =  $380 \text{ N/mm}^2$ ), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - The yield strength in compression is twice of the tensile yield strength 1) and
  - The yield strength in shear is 50% of the tensile yield strength. The 2) factor of safety is 6.
  - It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor 07 b) to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - Diameters of motor and compressor pulleys; 1)
    - The specifications of the belt: 2)
    - The correct centre distance 3)
    - 4) The number of belts.

(Refer table No. 1 to 6 and fig. No. 1 and 2)

## Section – II

How you are differentiation the rigid and flexible couplings? Q.5 a) Explain ASME code Used in shaft design. b)

Max. Marks: 56

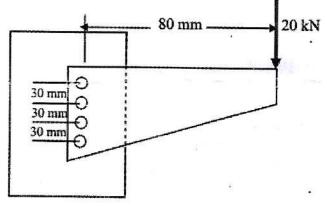
03

07

Set

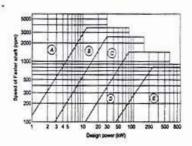


|     |                | Set  | S              |
|-----|----------------|--|----------------|
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



## Set S

### Design data for Selection of V-Belt Selection of cross-section of V-belt



| Dimensio        | Dimensions of Standard Cross-<br>section    |  |  |  |  |  |  |  |
|-----------------|---|--|--|--|--|--|--|--|
| Belt<br>Section | Minimum pitch<br>diameter of pulley<br>(mm) |  |  |  |  |  |  |  |

125

200

300

500

630

A

В

C

D

E

### Conversion of inside length to pitch length of the belt

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| С               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |  |
|-----|---|------------------------------|-------|-------|--|--|
| No  |   | 0-10                         | 10-16 | 16-24 |  |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |  |

Correction factor (Fa) for industrial services

### Power rating of V-belts

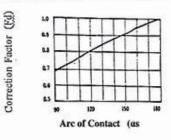
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section      | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118         | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|-------------|-------|
|              | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81        | 2.00  |
| Section<br>B | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190         | 200   |
|              | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77        | 5.23  |
| Section      | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300         | 315   |
| C            | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10       | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0.000000000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |             |       |

### Preferred pitch diameters of pulleys

| Pite | h diame    | ters ( | in mm | ): 125 | 132 | 140 | 150 | 160 | 170 |
|------|------------|--------|-------|--------|-----|-----|-----|-----|-----|
| 180  | 190        | 200    | 212   | 224    | 236 | 250 | 265 | 280 | 300 |
| 315  | 190<br>355 | 375    | 400   | 425    | 450 | 475 | 500 | 530 | 560 |
|      | 630        |        |       |        |     |     |     |     |     |

### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

|      | Belt Section |      |      |      |      |  |  |  |  |
|------|--------------|------|------|------|------|--|--|--|--|
| Li   | A            | B    | C    | D    | E    |  |  |  |  |
| 1905 | 1.02         | 0.97 | 0.87 | -    | -    |  |  |  |  |
| 1981 | 1.03         | 0.98 | -    | -    |      |  |  |  |  |
| 2032 | 1.04         | -    | -    | -    | ÷    |  |  |  |  |
| 2057 | 1.04         | 0.98 | 0.89 | -    |      |  |  |  |  |
| 2159 | 1.05         | 0.99 | 0.90 |      | -    |  |  |  |  |
| 2286 | 1.06         | 1.00 | 0.91 | -    | -    |  |  |  |  |
| 2438 | 1.08         | -    | 0.92 | -    | -    |  |  |  |  |
| 2464 | -            | 1.02 | -    | -    |      |  |  |  |  |
| 2540 | -            | 1.03 | -    | -    |      |  |  |  |  |
| 2667 | 1.10         | 1.04 | 0.94 | -    |      |  |  |  |  |
| 2845 | 1.11         | 1.05 | 0.95 | -    | -    |  |  |  |  |
| 3048 | 1.13         | 1.07 | 0.97 | 0.86 |      |  |  |  |  |
| 3150 | -            | -    | 0.97 | -    |      |  |  |  |  |
| 3251 | 1.14         | 1.03 | 0.98 | 0.87 |      |  |  |  |  |
| 3404 | -            | -    | 0.99 | -    | •    |  |  |  |  |
| 3658 |              | 1.11 | 1.00 | 0.90 | -    |  |  |  |  |
| 4013 |              | 1.13 | 1.02 | 0.92 | -    |  |  |  |  |
| 4115 | -            | 1.14 | 1.03 | 0.92 | -    |  |  |  |  |
| 4394 | -            | 1.15 | 1.04 | 0.93 | -    |  |  |  |  |
| 4572 | -            | 1.16 | 1.05 | 0.94 |      |  |  |  |  |
| 4953 | -            | 1.18 | 1.07 | 0.96 | -    |  |  |  |  |
| 5334 | -            | 1.19 | 1.08 | 0.96 | 0.94 |  |  |  |  |
| 6045 |              | -    | 1.11 | 1.00 | 0.96 |  |  |  |  |
| 6807 | -            | -    | 1.14 | 1.03 | 0.99 |  |  |  |  |
| 7569 | -            | -    | 1.16 | 1.05 | 1.01 |  |  |  |  |

| Time  | : 02:3  | 0 PM To 05:30 PM  |  |  |  |  |  |  |  |  |
|---|---------|---|--|--|--|--|--|--|--|--|
| Instr   | uctio   | ns: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer<br>Book.   |  |  |  |  |  |  |  |  |
| 2) Figures to the right indicates full marks. |         |   |  |  |  |  |  |  |  |  |
| Dura  | tion: 2 | MCQ/Objective Type Questions Marks: 14  |  |  |  |  |  |  |  |  |
|   |         |   |  |  |  |  |  |  |  |  |
| Q.1   | 1)      | ose the correct alternatives from the options.14The forming and auxiliary feed motions in machine tools are automatedprimarily with the aim of achievinga) Higher productivityb) Higher productionc) Higher use of speed stepsd) Higher use of feed |  |  |  |  |  |  |  |  |
|   | 2)      |   |  |  |  |  |  |  |  |  |
|   | 2)      | A hand wheel can be operated by the handle in the machine tool onlywhen the torque required isa) Lowb) Highc) Mediumd) Zero   |  |  |  |  |  |  |  |  |
|   | 3)      | <ul> <li>The basic points to be considered while designing machine tool structures</li> <li>a) Cutting force</li> <li>b) Friction force</li> <li>c) Force due to mass of structures</li> <li>d) All of these</li> </ul>                             |  |  |  |  |  |  |  |  |
|   | 4)      | Design for strength is done on the basis of<br>a) Shear stress b) Principal stress<br>c) Bending stress d) Tensile stress   |  |  |  |  |  |  |  |  |
|   | 5)      | The commonly used shape of slide ways in shaping machine is<br>a) Flat b) V<br>c) Dovetail d) Double V  |  |  |  |  |  |  |  |  |
|   | 6)      | Which of the following material has greater damping property?a) Grey Cast Ironb) Alloy steelc) Plain Carbon steeld) Aluminum alloys   |  |  |  |  |  |  |  |  |
|   | 7)      | What is the function of cone pulley drive in the lathe machines?a) Drive the lead screwb) Change the spindle speedc) Drive the tailstockd) All of these   |  |  |  |  |  |  |  |  |
|   | 8)      | Which of the following is a positive drive?a) V belt driveb) Rope drivec) Chain drived) Flat belt drive   |  |  |  |  |  |  |  |  |
|   | 9)      | The most commonly used value of $\Phi$ in geometric progression ratio is<br>a) 1.26 b) 2.3  |  |  |  |  |  |  |  |  |

| Seat |  |
|------|--|
| No   |  |

# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

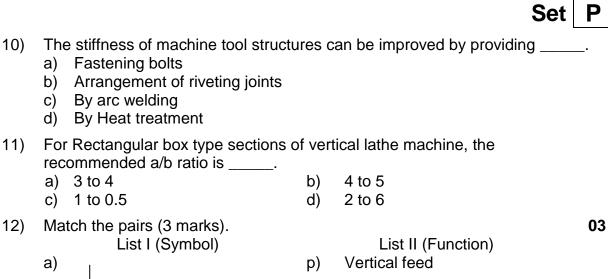
Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

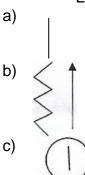
- Max. Marks: 70
- Set Ρ

**SLR-FM-122** 

d) 2.0 c) 3.2







10)

12)

On-off q)

**SLR-FM-122** 

On r)

## Seat No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

## Section – I

| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes.  | 07<br>07 |
|-----|------------------|---|----------|
| Q.3 | a)<br>b)         | Explain different factors affecting the material selection for the machine tool structures.<br>What are the functions and major requirements of guide ways? Also, | 07<br>07 |
|     |                  | explain types of guide ways.  |          |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design   | 14       |
|     |                  | Section – II  |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members.  | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.  | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.   | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear  | 14       |

SLR-FM-122

Set P

Max. Marks: 56

|  | -  |   |  |                     | ULI  | · · · · · · · · · · · · · · · · · · · | - 4 |  |  |  |
|--|--|---|--|---------------------|--|---------------------------------------|-----|--|--|--|
| Seat<br>No.  |  |   |  |                     |  | Set                                   | Q   |  |  |  |
| T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE TOOL DESIGN |  |   |  |                     |  |                                       |     |  |  |  |
|  | Day & Date: Monday,16-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70 |   |  |                     |  |                                       |     |  |  |  |
| Instruc  | Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer<br>Book.              |   |  |                     |  |                                       |     |  |  |  |
|  | 2  |   | the right indicates f                      |                     |  |                                       |     |  |  |  |
| Duratia  |  |   | CQ/Objective T                             | ype (               | Questions  | Marka                                 | 4.4 |  |  |  |
|  | on: 30 Mi  |   |  |                     |  | Marks:                                |     |  |  |  |
|  |  |   | alternatives from t<br>owing is a positive | -                   | tions.   |                                       | 14  |  |  |  |
| ·  | a)<br>c)   | V belt drive                                  |  | b)<br>d)            | Rope drive<br>Flat belt drive                                      |                                       |     |  |  |  |
| 2  | 2) The<br>a)<br>c)   | e most comm<br>1.26<br>3.2                    | only used value of                         | Φ in g<br>b)<br>d)  | eometric progression rati<br>2.3<br>2.0                            | io is                                 | ļ   |  |  |  |
| 3  | 3) The<br>a)<br>b)<br>c)<br>d)   | Fastening b                                   | olts<br>nt of riveting joints<br>ing       | ures c              | an be improved by provid   | ding                                  |     |  |  |  |
| 4  | rece<br>rece   | •   | box type sections //b ratio is             | of vert<br>b)<br>d) | ical lathe machine, the<br>4 to 5<br>2 to 6                        |                                       |     |  |  |  |
| 5  |  | narily with the<br>Higher prod                | e aim of achieving                         | b)                  | machine tools are auton<br>Higher production<br>Higher use of feed | nated                                 |     |  |  |  |
| 6  | ,  |   | an be operated by t<br>required is         |                     | ndle in the machine tool o<br>High<br>Zero                         | only                                  |     |  |  |  |
| 7  | ,  | Cutting force                                 | <br>e                                      |                     | esigning machine tool  |                                       |     |  |  |  |
| 8  | 3) Des<br>a)<br>c)   | sign for stren<br>Shear stres<br>Bending stre |  | basis d<br>b)<br>d) | of<br>Principal stress<br>Tensile stress                           |                                       |     |  |  |  |

- 9) The commonly used shape of slide ways in shaping machine is \_\_\_\_\_.
  - a) Flat

- b) V
- c) Dovetail d) Double V
- 10) Which of the following material has greater damping property? Alloy steel b)
  - a) Grey Cast Iron
  - Plain Carbon steel c)
- Aluminum alloys d)

d)

p)

- What is the function of cone pulley drive in the lathe machines? 11) Drive the lead screw a)
  - Change the spindle speed b)

All of these

- c) Drive the tailstock
- 12) Match the pairs (3 marks). List I (Symbol)

List II (Function) Vertical feed

On-off q)

On r)

a) b)

c)

03

**SLR-FM-122** 

Set Q

## Seat No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

## Section – I

| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes. | 07<br>07 |
|-----|------------------|--|----------|
| Q.3 | a)               | Explain different factors affecting the material selection for the machine tool structures.                          | 07       |
|     | b)               | What are the functions and major requirements of guide ways? Also, explain types of guide ways.                      | 07       |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design            | 14       |
|     |                  | Section – II   |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members. | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.                           | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.        | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear         | 14       |

## SLR-FM-122

Max. Marks: 56

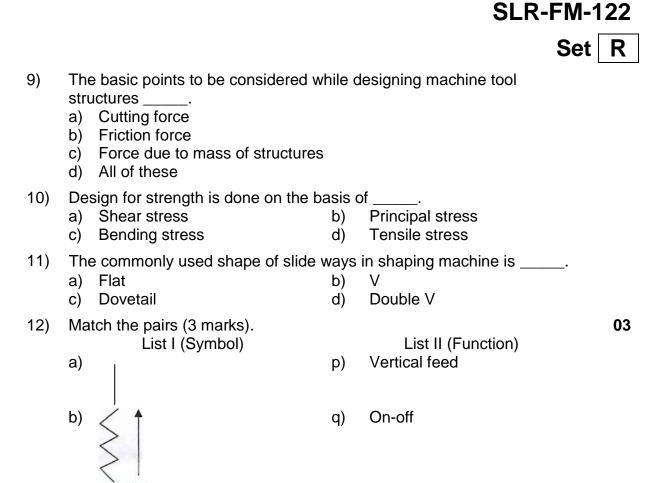
Set

Q

| No.    |        |  |   |                      |  | Set       | R     |
|--------|--------|--|---|----------------------|--|-----------|-------|
|        | -      | T.E. (Part – I)  | (New) (CBCS) E<br>Mechanical E<br>MACHINE TOO | ngine                | -  | 9         |       |
|        |        | : Monday,16-12-<br>) PM To 05:30 P                     |   |                      | Ma   | ax. Marks | s: 70 |
| Instru | iction | <b>s:</b> 1) Q. No. 1 is<br>Book.                      | compulsory and sho                            | buld b               | e solved in first 30 minute  | s in ans  | wer   |
|        |        | 2) Figures to  | the right indicates fu                        | ıll mar              | ks.  |           |       |
|        |        |  | ICQ/Objective Ty                              | ype (                | Questions  |           |       |
|        |        | ) Minutes  |   |                      |  | Marks     |       |
|        | 1)     |  | ron   |                      | t <b>ions.</b><br>Fr damping property?<br>Alloy steel<br>Aluminum alloys |           | 14    |
|        | -      | What is the func<br>a) Drive the le<br>c) Drive the ta | ad screw                                      | drive ii<br>b)<br>d) | n the lathe machines?<br>Change the spindle spee<br>All of these         | эd        |       |
|        | ·      | Which of the fol<br>a) V belt drive<br>c) Chain drive  |   | drive?<br>b)<br>d)   | Rope drive<br>Flat belt drive  |           |       |
|        | -      | The most comm<br>a) 1.26<br>c) 3.2                     | nonly used value of Q                         | ⊅ in g<br>b)<br>d)   | eometric progression ratio<br>2.3<br>2.0                                 | ) is      | ·     |
| :      | ,      | a) Fastening b   | oolts<br>nt of riveting joints<br>ling        | ires ca              | an be improved by provid   | ng        | ·     |
|        |        | -  | r box type sections c<br>a/b ratio is         | bf vert<br>b)<br>d)  | ical lathe machine, the<br>4 to 5<br>2 to 6                              |           |       |
|        |        | primarily with th<br>a) Higher proc                    | e aim of achieving _                          | <br>b)               | machine tools are autom<br>Higher production<br>Higher use of feed       | ated      |       |
| i      | ·      |  | an be operated by the required is             | b)<br>d)             | idle in the machine tool of<br>High<br>Zero                              | רוץ       |       |

Seat

## Set R



r) On

c)

## Seat No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

## Section – I

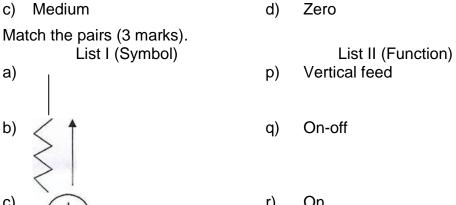
| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes.  | 07<br>07 |
|-----|------------------|---|----------|
| Q.3 | a)<br>b)         | Explain different factors affecting the material selection for the machine tool structures.<br>What are the functions and major requirements of guide ways? Also, | 07<br>07 |
|     | ,                | explain types of guide ways.  | 07       |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design   | 14       |
|     |                  | Section – II  |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members.  | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.  | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.   | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear  | 14       |

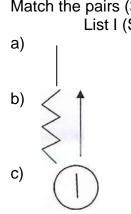
SLR-FM-122

Set R

Max. Marks: 56

|             | 1   |  | 1  |                     |   |           |  |
|-------------|---|--|--|---------------------|---|-----------|--|
| Seat<br>No. |   |  |  |                     |   | Set S     |  |
|             | T.E   | E. (Part – I)  | (New) (CBCS) I<br>Mechanical E<br>MACHINE TO           | Engin               | -   | 019       |  |
|             | Day & Date: Monday,16-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70                                    |  |  |                     |   |           |  |
| Instruc     | nstructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer<br>Book.<br>2) Figures to the right indicates full marks. |  |  |                     |   |           |  |
|             |   | N  | ICQ/Objective T  | vne (               | Questions   |           |  |
| Duratio     | n: 30 M   |  |  | Jbc .               |   | Marks: 14 |  |
| Q.1 C       | hoose   | the correct a  | alternatives from t                                    | he on               | tions   | 14        |  |
| 1           | ) Th  | e basic points<br>uctures<br>Cutting forc<br>Friction forc | s to be considered v<br><br>ce<br>co mass of structure | while d             | lesigning machine tool  | 14        |  |
| 2           | 2) De<br>a)<br>c)   |  |  | basis d<br>b)<br>d) | of<br>Principal stress<br>Tensile stress                      |           |  |
| 3           | 5) Th<br>a)<br>c)   | e commonly<br>Flat<br>Dovetail                             | used shape of slide                                    | ways<br>b)<br>d)    | in shaping machine is<br>V<br>Double V                        |           |  |
| 4           | a)  | nich of the fol<br>Grey Cast I<br>Plain Carbo              | ron  | b)                  | er damping property?<br>Alloy steel<br>Aluminum alloys        |           |  |
| 5           | 5) Wł<br>a)<br>c)   |  | ad screw   | drive i<br>b)<br>d) | n the lathe machines?<br>Change the spindle s<br>All of these | peed      |  |
| 6           | ,   | nich of the fol<br>V belt drive<br>Chain drive             |  | drive?<br>b)<br>d)  | Rope drive<br>Flat belt drive                                 |           |  |
| 7           | ′) Thé<br>a)<br>c)  | 1.26   | nonly used value of                                    | Φ in g<br>b)<br>d)  | eometric progression r<br>2.3<br>2.0                          | atio is   |  |
| 8           | a)  | Fastening b  | oolts<br>nt of riveting joints<br>ling                 | ures c              | an be improved by pro   | viding    |  |
| 9           | rec   | -  | r box type sections<br>a/b ratio is                    | of vert<br>b)<br>d) | ical lathe machine, the<br>4 to 5<br>2 to 6                   |           |  |





a) Low

when the torque required is \_\_\_\_\_.

10)

11)

12)

primarily with the aim of achieving a) Higher productivity b) Higher production c) Higher use of speed steps

b)

The forming and auxiliary feed motions in machine tools are automated

A hand wheel can be operated by the handle in the machine tool only

Higher use of feed d)

High

Set S

03

r) On

## Seat No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

## Section – I

| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes.  | 07<br>07 |
|-----|------------------|---|----------|
| Q.3 | a)<br>b)         | Explain different factors affecting the material selection for the machine tool structures.<br>What are the functions and major requirements of guide ways? Also, | 07<br>07 |
|     | •                | explain types of guide ways.  |          |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design   | 14       |
|     |                  | Section – II  |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members.  | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.  | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.   | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear  | 14       |

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Max. Marks: 56

| Seat<br>No.  |   |  |                                      |   | Set    | Ρ      |  |  |
|--------------|---|--|--------------------------------------|---|--------|--------|--|--|
|              | T.E. (Par   | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,  | cal Engin                            | •   | )      |        |  |  |
|              | Day & Date: Monday,16-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM                              |  |                                      |   |        |        |  |  |
| Instruc      | <b>Instructions:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book. |  |                                      |   |        |        |  |  |
|              | 2) Figur  | es t the right indica  | te full marks                        | ).  |        |        |  |  |
| Duratio      | n: 30 Minutes   | MCQ/Object   | ive Type (                           | Questions   | Marks  | o• 1∕I |  |  |
|              |   | root alternatives f  | rom the on                           | tions   | IVIAIN | -      |  |  |
| <b>Q.1 C</b> | ) Flat belt co<br>a) Bulk +<br>b) Unit +<br>c) Unit +   | rect alternatives f<br>onveyor are charac<br>On-Floor + No Acc<br>Overhead + Accun<br>On Floor + No Acc<br>Overhead + No Acc | terized by<br>cumulation<br>nulation |   |        | 14     |  |  |
| 2            | a) Transp<br>b) Positic<br>c) Storag  | oning  |                                      | equipment.  |        |        |  |  |
| 3            | a) maxim<br>b) minimi   | n material handling<br>nizing distance and<br>izing distance and t<br>al material handling<br>above                          | time of trave                        | el  |        |        |  |  |
| 4            | ) Interlock is<br>service the<br>a) Electri<br>c) Chemi   | e area.<br>c safety  | bls of<br>b)<br>d)                   | so that worker can Safely<br>Robotics safety<br>Radiation safety    |        |        |  |  |
| 5            | ) Symbol ⊏<br>a) Opera<br>c) Inspec   |  | <br>b)<br>d)                         | Store<br>Transport  |        |        |  |  |
| 6            | Performing  | g a task is known as<br>diagram  | -                                    | men and materials while<br>Flow process chart<br>Flow diagram       |        |        |  |  |
| 7            | i) Equipment<br>and<br>a) Safety<br>c) Flexibi  | <u>.</u><br>,  | consist of eq<br>b)<br>d)            | uipment characteristic Utili<br>Vendor characteristics<br>Unit load | zation |        |  |  |

SLR-FM-123

Set P 8) Flow process chart gives \_\_\_\_\_. a) To reduce the distance travelled by men and material b) Assembly line c) Relationship between product d) None of these 9) From to chart shows \_\_\_\_\_ a) Relative location of activities b) Operation in the product None of these c) Inspection stages d) Instead of hoist, \_\_\_\_\_ crane uses a mast with forks or a platform to 10) handle unit loads. a) Jib crane b) Bridge crane Stacker crane c) Gantry crane d) 11) A good plant layout ensures a) Maximum material handling b) Minimum material handling c) Exact MH None of these d) For automation flow of \_\_\_\_\_ materials are required. 12) a) Low volume b) Medium volume c) High volume d) All of these Hoisting equipments works in conjection with \_\_\_\_\_ and work station 13) cranes. a) Roller Industrial trucks b) c) Elevator d) **Overhead crane** 

- 14) \_\_\_\_\_ common fork lift truck accidents are considered in material handling system.
  - a) Five b) Seven c) One d) Ten

Max. Marks: 56

## No.

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1)     | Draw neat diagram where necessary. |
|---------------|--------|------------------------------------|
|               | $\sim$ |                                    |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

## Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 04             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |





|             | 1         |                              |                                     |          |  |
|-------------|-----------|------------------------------|-------------------------------------|----------|--|
| Seat<br>No. |           |                              |                                     |          | Set Q                                      |
|             | T.E       | . (Part – I) (               |                                     |          | ination Nov/Dec-2019                       |
|             |           | M V.                         | Mechanical E<br>TERIAL HAND         | •        | -  |
| Dav &       | Date: Mo  | nday,16-12-2                 |                                     |          | Max. Marks: 70                             |
|             |           | I To 05:30 PM                |                                     |          | max marier re                              |
| Instruc     | ctions: 1 | •                            | ompulsory and sl                    | hould b  | e solved in first 30 minutes in answer     |
|             | 2         | Book.<br>) Figures t the     | right indicate full                 | l marks  |  |
|             |           |                              | Q/Objective 1                       |          |  |
| Duratio     | on: 30 Mi |                              | •                                   | ,        | Marks: 14                                  |
|             |           |                              | ternatives from t                   | the opt  | tions. 14                                  |
| I           |           |                              | rt gives<br>e distance travelle     | ed by m  | nen and material                           |
|             | ,         | Assembly line                | e<br>between product                |          |  |
|             | d)        | None of these                |                                     |          |  |
| 2           | ,         | m to chart sho               |                                     |          |  |
|             | ,         | Relative locat               | tion of activities                  | b)<br>d) | Operation in the product<br>None of these  |
| 3           | ,         | •                            | 0                                   | ,        | t with forks or a platform to              |
|             |           | dle unit loads.<br>Jib crane |                                     | b)       | Bridge crane                               |
|             | ,         | Gantry crane                 |                                     | d)       | Stacker crane                              |
| Z           |           |                              | ut ensures                          | _•       |  |
|             | ,         | Maximum ma<br>Exact MH       | iterial handling                    | b)<br>d) | Minimum material handling<br>None of these |
| 5           | •         |                              | ow of mate                          |          | •  |
|             | ,         | Low volume<br>High volume    |                                     | b)<br>d) | Medium volume<br>All of these              |
| 6           | ,         | •                            | nts works in conj                   | ,        | with and work station                      |
|             | crar      | nes.                         |                                     |          |  |
|             | ,         | Roller<br>Elevator           |                                     | b)<br>d) | Industrial trucks<br>Overhead crane        |
| 7           | /         |                              | ork lift truck accid                | ents ar  | e considered in material                   |
|             |           | dling system.<br>Five        |                                     | b)       | Seven                                      |
|             | ,         | One                          |                                     | d)       | Ten  |
| 8           | •         | •                            | r are characterize                  | -        |  |
|             | ,         |                              | oor + No Accumu<br>ead + Accumulati |          |  |
|             | ,         |                              | or + No Accumul                     |          |  |
|             | u)        | Duik + Ovem                  | ead + No Accum                      | uiatiON  |  |

- 9) Conveyors and industrial trucks are the \_\_\_\_\_ equipment.
  - a) Transport
  - b) Positioning
  - c) Storage
  - d) Identification and control equipment
- 10) Economy in material handling can be achieved by \_\_\_\_\_.
  - a) maximizing distance and time of travel
  - b) minimizing distance and time of travel
  - c) manual material handling
  - d) All of above
- 11) Interlock is available in controls of \_\_\_\_\_ so that worker can Safely service the area.
  - a) Electric safety
  - c) Chemical safety d) Radiation safety
- 12) Symbol <sup>→</sup> represents for \_\_\_\_.
  - a) Operation b) Store
  - c) Inspection d) Transport
- A diagram showing the path followed by men and materials while Performing a task is known as \_\_\_\_\_.
  - b) Flow process chart

b)

- c) Travel chart d) Flow diagram
- 14) Equipment evaluation sheet consist of equipment characteristic Utilization and \_\_\_\_\_.
  - a) Safety
  - c) Flexibility

a) String diagram

b) Vendor characteristics

Robotics safety

**SLR-FM-123** 

Set Q

d) Unit load

| Seat |  |
|------|--|
| No.  |  |

# T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

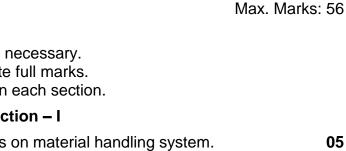
Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1) Draw neat diagram where necessary.         |
|---------------|---|
|               | 0) Figure a ta tha might indicate full manufe |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

## Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 04             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |



Set

|             | 1           |                      |  |                                 |           |          |   |
|-------------|-------------|----------------------|--|---------------------------------|-----------|----------|---|
| Seat<br>No. |             |                      |  |                                 |           |          | Set R   |
|             | Т           | Г.Е. (               |  | Mechar                          | nical Er  | ngino    | ination Nov/Dec-2019<br>eering<br>SYSTEMS                       |
|             |             |                      | day,16-12-<br>Го 05:30 Pl                                |                                 |           |          | Max. Marks: 70  |
| Instru      | ctions      | É                    | Book.  | compulsory                      |           |          | be solved in first 30 minutes in answer                         |
|             |             |                      | M  | CQ/Objec                        | tive Tv   | ne (     | Questions   |
| Duratio     | on: 30      | Minu                 |  |                                 |           |          | Marks: 14   |
|             |             |                      |  | alternatives<br>presents for    |           | e opi    | tions. 14   |
|             | , a         | a) C                 | Operation<br>Inspection                                  |                                 |           | b)<br>d) | Store<br>Transport  |
| 2           |             |                      |  | ing the path<br>sk is known a   |           |          | men and materials while   |
|             | a           | a) S                 | String diagra  | am                              |           | b)<br>d) | Flow process chart<br>Flow diagram                              |
|             | ,           |                      | oment evalu  | uation sheet                    | consist   | of eq    | uipment characteristic Utilization                              |
|             |             | ,                    | Safety<br>lexibility                                     |                                 |           | b)<br>d) | Vendor characteristics<br>Unit load                             |
|             | é<br>k<br>c | a) T<br>b) A<br>c) R | o reduce tl<br>ssembly lin                               | ne<br>o between pi              | travelled | by m     | nen and material  |
| ł           | , a         | a) R                 | Relative loc   | iows<br>ation of activ<br>tages | /ities    |          | Operation in the product<br>None of these                       |
| (           | ŕ<br>r      | handl<br>a) J        | ad of hoist,<br>le unit load<br>lib crane<br>Gantry cran | S.                              | e uses a  |          | at with forks or a platform to<br>Bridge crane<br>Stacker crane |
|             | 7) A        | A goo<br>a) M        | od plant lay   | out ensures<br>naterial hanc    |           | ,        | Minimum material handling                                       |
| 8           | a           | a) L                 | utomation<br>ow volume<br>ligh volume                    |                                 | _ materia |          | re required.<br>Medium volume<br>All of these                   |
| ę           | ,           | Hoisti<br>crane      | • • •  | ents works i                    | n conjec  | tion v   | with and work station   |
|             |             | a) R<br>c) E         | Roller<br>Elevator                                       |                                 |           | b)<br>d) | Industrial trucks<br>Overhead crane                             |

## Page **7** of **12**

## SLR-FM-123

## Seat

- c) Elevator
- Overhead crane a)

Set R

- 10) \_\_\_\_\_ common fork lift truck accidents are considered in material handling system.
  - a) Five b) Seven
  - c) One d) Ten
- 11) Flat belt conveyor are characterized by \_\_\_\_\_.
  - a) Bulk + On-Floor + No Accumulation
  - b) Unit + Overhead + Accumulation
  - c) Unit + On Floor + No Accumulation
  - d) Bulk + Overhead + No Accumulation
- 12) Conveyors and industrial trucks are the \_\_\_\_\_ equipment.
  - a) Transport
  - b) Positioning
  - c) Storage
  - d) Identification and control equipment
- 13) Economy in material handling can be achieved by \_\_\_\_\_.
  - a) maximizing distance and time of travel
  - b) minimizing distance and time of travel
  - c) manual material handling
  - d) All of above
- 14) Interlock is available in controls of \_\_\_\_\_ so that worker can Safely service the area.
  - a) Electric safety
- b) Robotics safety
- c) Chemical safety
- d) Radiation safety

Set

R

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

**Instructions:** 1) Draw neat diagram where necessary.

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

## Section – I

| Q.2 | a)<br>b)<br>c) | Explain the productivity depends on material handling system.<br>Explain concepts of unit load, containerization and palletisation.<br>Give the classification of material handling equipments.                           | 05<br>05<br>04             |
|-----|----------------|---|----------------------------|
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04             |
| Q.4 | -              | te short notes (any three)<br>Industrial Robot<br>Hoisting Equipments<br>Industrial truck<br>Need of MHS in Industry.   | 14<br>05<br>05<br>05<br>04 |
|     |                | Section – II  |                            |
| Q.5 | a)<br>b)<br>c) | Explain with figure procedure chart.<br>Explain with figure Flow diagram.<br>Explain in brief selection of material handling equipment.   | 05<br>05<br>04             |
| Q.6 | a)<br>b)<br>c) | Explain material handling equation.<br>Explain with Fig. Flow chart.<br>Discuss the important of material handling safety.  | 05<br>05<br>04             |
| Q.7 | Writ           | te short notes (any three)  | 14                         |
|     | a)<br>b)<br>c) | Material Handling equipments Accidents<br>Material handling equipment in Foundry<br>Material flow patterns  | 05<br>05<br>05             |
|     | d)             | From TO chart   | 04                         |

| Seat<br>No. | t       | Set S  |
|-------------|---------|--|
|             |         | T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering                        |
|             |         | MATERIAL HANDLING SYSTEMS  |
| Day 8       | & Date  | e: Monday,16-12-2019 Max. Marks: 70  |
| Time        | : 02:3  | 0 PM To 05:30 PM   |
| Instr       | uctio   | <b>ns:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.          |
|             |         | 2) Figures t the right indicate full marks.  |
|             |         | MCQ/Objective Type Questions   |
| Durat       | tion: 3 | 30 Minutes Marks: 14   |
| Q.1         |         | ose the correct alternatives from the options . 14   |
|             | 1)      | Instead of hoist, crane uses a mast with forks or a platform to handle unit loads.                     |
|             |         | a) Jib crane b) Bridge crane   |
|             |         | c) Gantry crane d) Stacker crane   |
|             | 2)      | A good plant layout ensures<br>a) Maximum material handling b) Minimum material handling               |
|             |         | c) Exact MH d) None of these   |
|             | 3)      | For automation flow of materials are required.   |
|             |         | a) Low volume b) Medium volume<br>c) High volume d) All of these                                       |
|             | 4)      | Hoisting equipments works in conjection with and work station  |
|             | ')      | cranes.  |
|             |         | a) Roller b) Industrial trucks   |
|             | E)      | c) Elevator d) Overhead crane  |
|             | 5)      | common fork lift truck accidents are considered in material<br>handling system.                        |
|             |         | a) Five b) Seven   |
|             | $\sim$  | c) One d) Ten  |
|             | 6)      | Flat belt conveyor are characterized by<br>a) Bulk + On-Floor + No Accumulation                        |
|             |         | b) Unit + Overhead + Accumulation  |
|             |         | <ul> <li>c) Unit + On Floor + No Accumulation</li> <li>d) Bulk + Overhead + No Accumulation</li> </ul> |
|             | 7)      | Conveyors and industrial trucks are the equipment.   |
|             | ')      | a) Transport   |
|             |         | b) Positioning   |
|             |         | <ul><li>c) Storage</li><li>d) Identification and control equipment</li></ul>                           |
|             | 8)      | Economy in material handling can be achieved by  |
|             |         | a) maximizing distance and time of travel  |
|             |         | b) minimizing distance and time of travel  |

- c) manual material handlingd) All of above

- Interlock is available in controls of \_\_\_\_\_ so that worker can Safely 9) service the area.
  - a) Electric safety b) Robotics safety
  - c) Chemical safety d) Radiation safety
- Symbol  $\implies$  represents for \_\_\_\_\_. 10)
  - b) Operation Store a)
  - Inspection d) Transport C)
- 11) A diagram showing the path followed by men and materials while Performing a task is known as \_\_\_\_\_. b) Flow process chart
  - a) String diagram
  - c) Travel chart d) Flow diagram
- 12) Equipment evaluation sheet consist of equipment characteristic Utilization and
  - a) Safety c) Flexibility
    - b) Vendor characteristics d) Unit load
- 13) Flow process chart gives \_\_\_\_\_.
  - a) To reduce the distance travelled by men and material
  - b) Assembly line
  - c) Relationship between product
  - d) None of these
- 14) From to chart shows
  - Relative location of activities a)
  - c) Inspection stages
- Operation in the product b)
- None of these d)



Set

Max. Marks: 56

S

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1)      | Draw neat diagram where necessary.                   |  |
|---------------|---------|--|--|
|               | $\circ$ | Elemente de de contrale d'analise de de de la contra |  |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

## Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 05             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |



| Seat<br>No. |  |              | Set P                                |  |  |  |  |  |
|-------------|--|--------------|--------------------------------------|--|--|--|--|--|
|             | T.E. (Part - I) (New) (CBCS) Ex  |              |                                      |  |  |  |  |  |
|             | Mechanical Engineering<br>FLUID MACHINERY AND FLUID POWER  |              |                                      |  |  |  |  |  |
|             | Date: Monday, 16-12-2019   |              | Max. Marks: 70                       |  |  |  |  |  |
|             | 02:30 PM To 05:30 PM<br><b>ctions:</b> 1) Q. No. 1 is compulsory and shou                              | ıld be       | solved in first 30 minutes in answer |  |  |  |  |  |
| monu        | book.  |              |                                      |  |  |  |  |  |
|             | 2) Figures to the right indicates full   |              |                                      |  |  |  |  |  |
|             | <ol> <li>Draw suitable diagrams whereve<br/>MCQ/Objective Typ</li> </ol>                               |              | •                                    |  |  |  |  |  |
| Duratio     | on: 30 Minutes   |              | Marks: 14                            |  |  |  |  |  |
|             | choose the correct alternatives from the   | e opti       | ons. 14                              |  |  |  |  |  |
| 1           | <ul> <li>Pelton wheel is</li> <li>a) Reaction water turbine</li> <li>c) Impulse gas turbine</li> </ul> | b)<br>d)     | •                                    |  |  |  |  |  |
| 2           | Priming is done in case of   | ч)           |                                      |  |  |  |  |  |
|             | a) Water turbines  | b)           | Gas turbines                         |  |  |  |  |  |
|             | c) Centrifugal pump  | d)           | All of the above                     |  |  |  |  |  |
| 3           | B) For very low head, turbine is s   |              |                                      |  |  |  |  |  |
|             | a) Pelton<br>c) Kaplan   | d)           | Francis<br>All the above             |  |  |  |  |  |
| 4           |  | let of       | the Francis turbine is               |  |  |  |  |  |
|             | a) Only kinetic energy   | b)           | Only pressure energy                 |  |  |  |  |  |
| _           | c) Kinetic and pressure energy   | d)           | Heat energy                          |  |  |  |  |  |
| 5           | <ul> <li>Gas turbine works on</li> <li>a) Otto cycle</li> </ul>  | b)           | Diesel cycle                         |  |  |  |  |  |
|             | c) Rankine cycle   | d)           | Joule's cycle                        |  |  |  |  |  |
| 6           | S) Speed ratio of Pelton wheel varies from   | om           |                                      |  |  |  |  |  |
|             | a) $0.45 \text{ to } 0.5$  | b)           | 0.6 to 0.7                           |  |  |  |  |  |
| 7           | <ul> <li>c) 0.3 to 0.4</li> <li>Models are in size than the ac</li> </ul>                              | d)<br>o leut | 0.8 to 0.9                           |  |  |  |  |  |
| ,           | a) Large   | b)           | Smaller                              |  |  |  |  |  |
|             | c) Smaller or larger   | d)           | Same                                 |  |  |  |  |  |
| 8           |  | rom t        | he actuator to the reservoir is      |  |  |  |  |  |
|             | controlled.<br>a) Meter in   | b)           | Meter out                            |  |  |  |  |  |
|             | c) Both (a) & (b)  | d)           | None of the above                    |  |  |  |  |  |
| 9           | ,  |              |                                      |  |  |  |  |  |
|             | a) Compressors<br>b) Electric motors   |              |                                      |  |  |  |  |  |
|             | c) Used to run the fluid power syst  | em u         | sing pressurized air                 |  |  |  |  |  |
|             | d) None of the above   |              |                                      |  |  |  |  |  |

Г

SLR-FM-124

- 10) Accumulators are \_\_\_\_\_.
  - a) Intensifiers
  - b) Actuators
  - C) Only Storage reservoirs
  - Devices which receive, store & supply pressurized liquids d)
- 11) In case of spring loaded accumulator, pressure of oil supplied by accumulator \_\_\_\_\_.
  - Remains constant Varies a) b)
  - May remain constant or vary None of the above c) d)
- Cushioning effect is concerned with \_ 12)
  - Pneumatic system a) Hydraulic system b)
  - Both (a) & (b) None of the above C) d)
- The principle on which intensifier works is \_\_\_\_\_ where 'P' & 'A' indicate 13) pressure & cross sectional areas of two sides of intensifier.
  - $\frac{P_1}{A_1} = \frac{P_2}{A_2} \\ \frac{A_2}{A_1} = \frac{P_2}{P_1}$  $\frac{A_1}{P_1} = \frac{A_2}{P_2}$ a) b) d)  $P_1 A_1 = P_2 A_2$ c)
- 14) Pressure relief valve is normally \_\_\_\_\_ valve.
  - Open b) Closed a) None of the above
  - C) (a) or (b) d)

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1) Answer any two questions from each section |
|---------------|---|
|               | 2) Figures to the right indicate full marks.  |

## Section I

|     | b)<br>b)       | Derive an expression for maximum suction height of centrifugal pump.<br>A Kaplan turbine is to be designed to develop 9100 KW. The net<br>available head is 5.6 m. If the speed ratio=2.09, flow ratio = 0.68, overall<br>efficiency = 86 % and the diameter of the boss is $1/3^{rd}$ diameter of the<br>runner. Find the speed of the runner and diameter of the runner.<br>Give classification of gas turbines. List down merits of gas turbines. | 05<br>05<br>04 |
|-----|----------------|--|----------------|
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45° & reduce the circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power?  | 05             |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?  | 05             |
|     | c)             | Discuss operating characteristics of centrifugal pumps.  | 04             |
| Q.4 | a)             | <ul> <li>A gas turbine plant works on Joule cycle. Its compressor takes air at 101 KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine</li> <li>i) Thermal efficiency of the cycle</li> <li>ii) Work ratio</li> <li>ii) Power output</li> </ul>   | 05             |
|     |                | Take $\gamma = 1.4 \& C_p = 1.005 \frac{\text{KJ}}{\text{K}\sigma} \text{K}$   |                |
|     | b)             | Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20 m/s. The net head on the turbine is 50 m & discharge through the jet water is 0.03 m <sup>3</sup> /s. The side clearance angle is $15^{\circ}$ . take C <sub>v</sub> = 0.975.  | 05             |
|     | c)             | Compare impulse & reaction water turbines.   | 04             |
|     |                | Section – II   |                |
| Q.5 | a)<br>b)<br>c) | Differentiate between Pneumatic motor and Electric Motor.<br>Explain various pneumatic power tools.<br>Explain with neat sketch of Pressure Reducing Valve./ Integrated FCV<br>with Check valve.   | 05<br>04<br>05 |

Set P

Max. Marks: 56

## SLR-FM-124 Set Ρ a) Explain with neat sketch Of Lubricator unit used in pneumatic system. 04

| b) | Explain construction and working of Sequencing Valve used in hydraulic     | 05 |
|----|--|----|
| c) | system.<br>Explain with neat sketch of Meter out circuit.                  | 05 |
|    | ·  |    |
| a) | Explain with neat sketch of cushioning effects of hydraulic cylinder.      | 05 |
| b) | Explain with symbol of Vane type compressor.                               | 05 |
| c) | Explain with symbols of spool centre positions of direction control valve. | 04 |

Q.6

Q.7

Explain with symbols of spool centre positions of direction control valve. C)

### book. 2) Figures to the right indicates full marks. 3) Draw suitable diagrams wherever necessary. **MCQ/Objective Type Questions Duration: 30 Minutes** Choose the correct alternatives from the options. 1) controlled. a) Meter in b) Meter out None of the above c) Both (a) & (b) d) 2) Air motors are \_\_\_\_\_. Compressors a) b) Electric motors Used to run the fluid power system using pressurized air c) None of the above d) Accumulators are \_\_\_\_\_. 3) Intensifiers a) b) Actuators Only Storage reservoirs c) Devices which receive, store & supply pressurized liquids d) 4) accumulator . a) Remains constant b) Varies May remain constant or vary d) None of the above c) 5) Cushioning effect is concerned with \_ Hydraulic system b) Pneumatic system a) Both (a) & (b) d) c) 6) pressure & cross sectional areas of two sides of intensifier. a) b) $\overline{A_2}$ $\overline{P_2}$ d) $P_1A_1 = P_2A_2$ C) Pressure relief valve is normally \_\_\_\_ 7) \_ valve. Closed

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

Instructions:1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

**Mechanical Engineering** FLUID MACHINERY AND FLUID POWER

## Q.1

In circuit, only the oil returning from the actuator to the reservoir is

- In case of spring loaded accumulator, pressure of oil supplied by
  - None of the above
- The principle on which intensifier works is \_\_\_\_\_ where 'P' & 'A' indicate
  - a) Open b) (a) or (b) d) None of the above c)
- Pelton wheel is 8)
  - Reaction water turbine a)
  - Impulse gas turbine c)
- Impulse water turbine b)
- Reaction gas turbine d)

Marks: 14

14

SLR-FM-124

Set Q

Max. Marks: 70

Seat No.

T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019

|     |   | SLR-FM-124<br>Set Q              | 24<br>Q |
|-----|---|----------------------------------|---------|
| 9)  | Priming is done in case of<br>a) Water turbines<br>c) Centrifugal pump  | Gas turbines<br>All of the above |         |
| 10) | ) For very low head, turbine is<br>a) Pelton<br>c) Kaplan   | Francis<br>All the above         |         |
| 11) | <ul> <li>The type of energy available at the</li> <li>a) Only kinetic energy</li> <li>c) Kinetic and pressure energy</li> </ul> | Only pressure energy             |         |
| 12) | ) Gas turbine works on<br>a) Otto cycle<br>c) Rankine cycle   | Diesel cycle<br>Joule's cycle    |         |
| 13) | <ul> <li>Speed ratio of Pelton wheel varies</li> <li>a) 0.45 to 0.5</li> <li>c) 0.3 to 0.4</li> </ul>                           | <br>0.6 to 0.7<br>0.8 to 0.9     |         |
| 14) | Models are in size than the a) Large  | e.<br>Smaller                    |         |

c) Smaller or larger d) Same

T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Answer any two questions from each section 2) Figures to the right indicate full marks.

## Section I

|     |                | Content  |                |
|-----|----------------|--|----------------|
| Q.2 | a)<br>b)<br>b) | Derive an expression for maximum suction height of centrifugal pump.<br>A Kaplan turbine is to be designed to develop 9100 KW. The net<br>available head is 5.6 m. If the speed ratio=2.09, flow ratio = 0.68, overall<br>efficiency = 86 % and the diameter of the boss is $1/3^{rd}$ diameter of the<br>runner. Find the speed of the runner and diameter of the runner.<br>Give classification of gas turbines. List down merits of gas turbines. | 05<br>05<br>04 |
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45° & reduce the circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power?  | 05             |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?  | 05             |
|     | c)             | Discuss operating characteristics of centrifugal pumps.  | 04             |
| Q.4 | a)             | A gas turbine plant works on Joule cycle. Its compressor takes air at 101<br>KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle<br>temperature is limited to 1200°K and heat input rate is 100 MW,<br>determine<br>i) Thermal efficiency of the cycle<br>ii) Work ratio<br>ii) Power output<br>Take $\gamma = 1.4 \& C_p = 1.005 \frac{KJ}{Kg} K$  | 05             |
|     | b)             | Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20 m/s. The net head on the turbine is 50 m & discharge through the jet water is 0.03 m <sup>3</sup> /s. The side clearance angle is $15^{\circ}$ . take C <sub>v</sub> = 0.975.  | 05             |
|     | c)             | Compare impulse & reaction water turbines.   | 04             |
|     |                | Section – II   |                |
| Q.5 | a)<br>b)<br>c) | Differentiate between Pneumatic motor and Electric Motor.<br>Explain various pneumatic power tools.<br>Explain with neat sketch of Pressure Reducing Valve./ Integrated FCV<br>with Check valve.   | 05<br>04<br>05 |
|     |                |  |                |

## SLR-FM-124 Set | Q

Max. Marks: 56

Seat No.

|     |                | SLR-FM-124  |                |
|-----|----------------|---|----------------|
|     |                | Set   | Q              |
| Q.6 | a)<br>b)       | Explain with neat sketch Of Lubricator unit used in pneumatic system.<br>Explain construction and working of Sequencing Valve used in hydraulic system.   | 04<br>05       |
|     | c)             | Explain with neat sketch of Meter out circuit.  | 05             |
| Q.7 | a)<br>b)<br>c) | Explain with neat sketch of cushioning effects of hydraulic cylinder.<br>Explain with symbol of Vane type compressor.<br>Explain with symbols of spool centre positions of direction control valve. | 05<br>05<br>04 |

| Sea<br>No. | t   |   |              | Set R                                |  |  |  |  |  |  |
|------------|---|---|--------------|--------------------------------------|--|--|--|--|--|--|
| 110.       |   | T.E. (Part - I) (New) (CBCS) E  |              |                                      |  |  |  |  |  |  |
|            |   | Mechanical Er<br>FLUID MACHINERY A  |              |                                      |  |  |  |  |  |  |
|            | Day & Date: Monday, 16-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM |   |              |                                      |  |  |  |  |  |  |
|            |   | ns:1) Q. No. 1 is compulsory and sho  | uld be       | solved in first 30 minutes in answer |  |  |  |  |  |  |
|            |   | book.<br>2) Figures to the right indicates full                                   |              |                                      |  |  |  |  |  |  |
|            |   | <ol> <li>Draw suitable diagrams whereve<br/>MCQ/Objective Ty</li> </ol>           |              | -                                    |  |  |  |  |  |  |
|            |   | 30 Minutes  | -            | Marks: 14                            |  |  |  |  |  |  |
| Q.1        | <b>Cho</b><br>1)  | ose the correct alternatives from the<br>Gas turbine works on                     | e opti       | ons. 14                              |  |  |  |  |  |  |
|            | • )   | a) Otto cycle   | b)           | Diesel cycle                         |  |  |  |  |  |  |
|            | 2)  | c) Rankine cycle  | d)           | Joule's cycle                        |  |  |  |  |  |  |
|            | 2)  | Speed ratio of Pelton wheel varies fr<br>a) 0.45 to 0.5                           | b)           | 0.6 to 0.7                           |  |  |  |  |  |  |
|            |   | c) 0.3 to 0.4   | d)           | 0.8 to 0.9                           |  |  |  |  |  |  |
|            | 3)  | Models are in size than the ac<br>a) Large  | tual o<br>b) | ne.<br>Smaller                       |  |  |  |  |  |  |
|            |   | c) Smaller or larger  | d)           | Same                                 |  |  |  |  |  |  |
|            | 4)  | In circuit, only the oil returning  | from th      | he actuator to the reservoir is      |  |  |  |  |  |  |
|            |   | controlled.<br>a) Meter in  | b)           | Meter out                            |  |  |  |  |  |  |
|            |   | c) Both (a) & (b)   | d)           | None of the above                    |  |  |  |  |  |  |
|            | 5)  | Air motors are<br>a) Compressors  |              |                                      |  |  |  |  |  |  |
|            |   | b) Electric motors  |              |                                      |  |  |  |  |  |  |
|            |   | <ul><li>c) Used to run the fluid power sys</li><li>d) None of the above</li></ul> | tem us       | sing pressurized air                 |  |  |  |  |  |  |
|            | 6)  | Accumulators are  |              |                                      |  |  |  |  |  |  |
|            | ,   | a) Intensifiers   |              |                                      |  |  |  |  |  |  |
|            |   | <ul><li>b) Actuators</li><li>c) Only Storage reservoirs</li></ul>                 |              |                                      |  |  |  |  |  |  |
|            | d) Devices which receive, store & supply pressurized liquids                |   |              |                                      |  |  |  |  |  |  |
|            | 7)  | In case of spring loaded accumulator<br>accumulator                               | r, pres      | sure of oil supplied by              |  |  |  |  |  |  |
|            |   | a) Remains constant   | b)           | Varies                               |  |  |  |  |  |  |
|            |   | c) May remain constant or vary  | d)           | None of the above                    |  |  |  |  |  |  |
|            | 8)  | Cushioning effect is concerned with .<br>a) Hydraulic system                      | b)           | Pneumatic system                     |  |  |  |  |  |  |
|            |   |   | ~,           |                                      |  |  |  |  |  |  |

| 9)  | The principle on which intensifier wo<br>pressure & cross sectional areas of t<br>a) $\frac{P_1}{A_1} = \frac{P_2}{A_2}$<br>c) $\frac{A_2}{A_1} = \frac{P_2}{P_1}$ |  |
|-----|--|--|
| 10) | Pressure relief valve is normally<br>a) Open<br>c) (a) or (b)  | valve.<br>b) Closed<br>d) None of the above                                |
| 11) | Pelton wheel is<br>a) Reaction water turbine<br>c) Impulse gas turbine   | <ul><li>b) Impulse water turbine</li><li>d) Reaction gas turbine</li></ul> |
| 12) | Priming is done in case of<br>a) Water turbines<br>c) Centrifugal pump   | <ul><li>b) Gas turbines</li><li>d) All of the above</li></ul>              |
| 13) | For very low head, turbine is a<br>a) Pelton<br>c) Kaplan  | suitable.<br>b) Francis<br>d) All the above                                |
| 14) | <ul><li>The type of energy available at the in</li><li>a) Only kinetic energy</li><li>c) Kinetic and pressure energy</li></ul>                                     | b) Only pressure energy  |

Set R

## Seat No.

## T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Answer any two questions from each section

2) Figures to the right indicate full marks.

## Section I

| Q.2 | a)<br>b)<br>b) | Derive an expression for maximum suction height of centrifugal pump.<br>A Kaplan turbine is to be designed to develop 9100 KW. The net 05<br>available head is 5.6 m. If the speed ratio=2.09, flow ratio = 0.68, overall<br>efficiency = 86 % and the diameter of the boss is 1/3 <sup>rd</sup> diameter of the<br>runner. Find the speed of the runner and diameter of the runner.<br>Give classification of gas turbines. List down merits of gas turbines. 04 |                |  |  |  |  |
|-----|----------------|---|----------------|--|--|--|--|
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45° & reduce the circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power?   | 05             |  |  |  |  |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?   | 05             |  |  |  |  |
|     | C)             | Discuss operating characteristics of centrifugal pumps.   | 04             |  |  |  |  |
| Q.4 | a)             | A gas turbine plant works on Joule cycle. Its compressor takes air at 101 KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine<br>i) Thermal efficiency of the cycle  |                |  |  |  |  |
|     |                | ii) Work ratio<br>ii) Power output<br>Take $\gamma = 1.4 \& C_p = 1.005 \frac{KJ}{Kg} K$  |                |  |  |  |  |
|     | b)             | Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20 m/s. The net head on the turbine is 50 m & discharge through the jet water is 0.03 m <sup>3</sup> /s. The side clearance angle is 15 <sup>0</sup> . take $C_v = 0.975$ .  | 05             |  |  |  |  |
|     | c)             | Compare impulse & reaction water turbines.  | 04             |  |  |  |  |
|     |                | Section – II  |                |  |  |  |  |
| Q.5 | a)<br>b)<br>c) | Differentiate between Pneumatic motor and Electric Motor.<br>Explain various pneumatic power tools.<br>Explain with neat sketch of Pressure Reducing Valve./ Integrated FCV<br>with Check valve.  | 05<br>04<br>05 |  |  |  |  |

Set R

Max. Marks: 56

SLR-FM-124

|     |                | SLR-FM-1  | 24             |
|-----|----------------|---|----------------|
|     |                | Set   | R              |
| Q.6 | a)<br>b)       | Explain with neat sketch Of Lubricator unit used in pneumatic system.<br>Explain construction and working of Sequencing Valve used in hydraulic system.   | 04<br>05       |
|     | C)             | Explain with neat sketch of Meter out circuit.  | 05             |
| Q.7 | a)<br>b)<br>c) | Explain with neat sketch of cushioning effects of hydraulic cylinder.<br>Explain with symbol of Vane type compressor.<br>Explain with symbols of spool centre positions of direction control valve. | 05<br>05<br>04 |

| Seat<br>No. |   |                                     |   |                        |   | Set    | S   |  |  |  |
|-------------|---|-------------------------------------|---|------------------------|---|--------|-----|--|--|--|
|             | T.E   | E. (Part - I)                       |   |                        | nation Nov/Dec-2019   |        |     |  |  |  |
|             |   | FLUI                                | Mechanical Ei<br>D MACHINERY A                    | -                      | -   |        |     |  |  |  |
|             | Day & Date: Monday, 16-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM |                                     |   |                        |   |        |     |  |  |  |
| -           |   | ) Q. No. 1 is                       |   | uld be                 | solved in first 30 minutes in   | n answ | /er |  |  |  |
|             | 2)  | book.<br>Figures to t               | the right indicates full                          | marks                  | s.  |        |     |  |  |  |
|             | 3)  | Draw suital                         | ble diagrams whereve<br>MCQ/Objective Ty          |                        | -   |        |     |  |  |  |
|             | on: 30 Mi   |                                     |   | -                      |   | Marks  |     |  |  |  |
|             |   | he correct<br>cumulators a          | alternatives from th                              | e opti                 | ons.  |        | 14  |  |  |  |
|             | ́a)   | Intensifier                         |   |                        |   |        |     |  |  |  |
|             | b)<br>c)  | Actuators<br>Only Stora             | age reservoirs                                    |                        |   |        |     |  |  |  |
|             | d)  |                                     | which receive, store &                            | supply                 | y pressurized liquids   |        |     |  |  |  |
| 2           | •   | ase of sprin<br>umulator            | -   | r, pres                | sure of oil supplied by   |        |     |  |  |  |
|             | a)  | Remains                             | constant  | b)                     | Varies  |        |     |  |  |  |
|             | c)  | •                                   | in constant or vary                               | d)                     | None of the above   |        |     |  |  |  |
| 3           | B) Cus<br>a)  | Hydraulic                           | ect is concerned with system                      | b)                     | Pneumatic system  |        |     |  |  |  |
|             | c)  | Both (a) &                          |   | d)                     | None of the above   |        |     |  |  |  |
| 4           |   |                                     | n which intensifier wo<br>ss sectional areas of t |                        | where 'P' & 'A' indica<br>les of intensifier.                                 | te     |     |  |  |  |
|             | a)  | $P_1 - P_2$                         |   | b)                     | $A_1  A_2$  |        |     |  |  |  |
|             | c)  | $\frac{A_1}{A_2} = \frac{A_2}{P_1}$ |   | d)                     | $\frac{\overline{P_1}}{P_1} = \frac{\overline{P_2}}{P_2}$ $P_1 A_1 = P_2 A_2$ |        |     |  |  |  |
|             | ,   | $\overline{A_1} = \overline{P_1}$   |   | ,                      | 1 1 2 2   |        |     |  |  |  |
| 5           | 5) Pre<br>a)  | ssure relief<br>Open                | valve is normally                                 | val <sup>,</sup><br>b) | ve.<br>Closed   |        |     |  |  |  |
|             | c)  | (a) or (b)                          |   | d)                     |   |        |     |  |  |  |
| 6           |   | ton wheel is                        |   |                        | The second states   |        |     |  |  |  |
|             | a)<br>c)  | Impulse g                           | water turbine<br>as turbine                       | b)<br>d)               | Impulse water turbine<br>Reaction gas turbine                                 |        |     |  |  |  |
| 7           |   | -                                   | in case of  | -                      |   |        |     |  |  |  |
|             | a)<br>c)  | Water turk<br>Centrifuga            |   | b)<br>d)               | Gas turbines<br>All of the above  |        |     |  |  |  |
| 8           | ,   | -                                   | ad, turbine is a                                  | ,                      |   |        |     |  |  |  |
|             | a)<br>c)  | Pelton<br>Kaplan                    |   | b)<br>d)               | Francis<br>All the above  |        |     |  |  |  |
| c           | ,   |                                     | ergy available at the in                          | ,                      | the Francis turbine is  |        |     |  |  |  |
|             | a)  | Only kinet                          | ic energy   | b)                     | Only pressure energy  |        |     |  |  |  |
|             | c)  | Kinetic an                          | d pressure energy                                 | d)                     | Heat energy   |        |     |  |  |  |

- 10) Gas turbine works on \_\_\_\_\_.
  - a) Otto cycle b)
  - c) Rankine cycle d) Joule's cycle
- 11) Speed ratio of Pelton wheel varies from \_\_\_\_
  - a) 0.45 to 0.5 b) 0.6 to 0.7
  - c) 0.3 to 0.4 d) 0.8 to 0.9
- 12) Models are \_\_\_\_\_ in size than the actual one.
  - b) Smaller
  - c) Smaller or larger d) Same
- 13) In \_\_\_\_\_ circuit, only the oil returning from the actuator to the reservoir is controlled.
  - a) Meter in

Large

a)

c) Both (a) & (b)

- b) Meter out
- d) None of the above

Diesel cycle

**SLR-FM-124** 

Set S

- 14) Air motors are \_\_\_\_\_.
  - a) Compressors
  - b) Electric motors
  - c) Used to run the fluid power system using pressurized air
  - d) None of the above

KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine Thermal efficiency of the cycle Work ratio ii) Power output ii) Take  $\gamma = 1.4 \& C_p = 1.005 \frac{KJ}{Kg} K$ Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20 m/s. The net head on the turbine is 50 m & discharge through the jet water is 0.03 m<sup>3</sup>/s. The side clearance angle is  $15^{\circ}$ . take C<sub>v</sub> = 0.975. Compare impulse & reaction water turbines. Section - II Differentiate between Pneumatic motor and Electric Motor. Explain various pneumatic power tools. Explain with neat sketch of Pressure Reducing Valve./ Integrated FCV with Check valve.

runner. Find the speed of the runner and diameter of the runner. b) Give classification of gas turbines. List down merits of gas turbines. 04 Q.3 A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm 05 a) wide at outlet. The vanes are curved back at 45° & reduce the circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power?

A turbine develops 500 KW power under a head of 100 meters at

Discuss operating characteristics of centrifugal pumps.

200 rpm. What would be its normal speed & output under a head of

A gas turbine plant works on Joule cycle. Its compressor takes air at 101

# FLUID MACHINERY AND FLUID POWER Max. Marks: 56

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

Q.2

a)

b)

b)

c)

a)

b)

c)

a)

b)

c)

Q.5

i)

Q.4

81 meters?

| Instructions: | 1) | Answer  | any   | two   | questions    | from | each  | section |
|---------------|----|---------|-------|-------|--------------|------|-------|---------|
|               | 2) | Eiguroo | to th | o rio | ubt indicato | full | norka |         |

## SLR-FM-124

Set

05

05

05

04

05

04

05

04

05

Figures to the right indicate full marks. Derive an expression for maximum suction height of centrifugal pump. A Kaplan turbine is to be designed to develop 9100 KW. The net available head is 5.6 m. If the speed ratio=2.09, flow ratio = 0.68, overall efficiency = 86 % and the diameter of the boss is  $1/3^{rd}$  diameter of the

# T.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### Section I

Set S

| Q.6 | a) | Explain with neat sketch Of Lubricator unit used in pneumatic system.          | 04 |
|-----|----|--|----|
|     | b) | Explain construction and working of Sequencing Valve used in hydraulic system. | 05 |
|     | c) | Explain with neat sketch of Meter out circuit.                                 | 05 |
| Q.7 | a) | Explain with neat sketch of cushioning effects of hydraulic cylinder.          | 05 |
|     | b) | Explain with symbol of Vane type compressor.                                   | 05 |
|     | c) | Explain with symbols of spool centre positions of direction control valve.     | 04 |

# T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

HEAT AND MASS TRANSFER Day & Date: Friday, 22-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.

4) Neat diagrams must be drawn wherever necessary.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Solve the following MCQ/Objective type questions.

- Heat transfer from higher temperature to low temperature takes place 1) according to \_
  - Fourier law a)
  - b) First law of thermodynamics
  - Second law of thermodynamics C)
  - Zeroth law of thermodynamics d)
- 2) For a given volume and specified heat input which material will have the smallest temperature rise \_\_\_\_\_.
  - water b) mild steel a)
  - c) aluminum d) copper
- In which of the following cases most unsteady heat flow occurs? 3)
  - Through the walls of a furnace a)
  - Through lagged pipes carrying steam b)
  - Through the wall of a refrigerator C)
  - During annealing of castings d)
- A composite plane wall is made of two different materials of same 4) thickness with thermal conductivities k<sub>1</sub> and k<sub>2</sub> respectively. The equivalent thermal conductivity of the slab is
  - $k_1 + k_2$ a)
  - b)  $(2k_1.k_2)/(k_1+k_2)$ d) None of these C)
- If a square fin is split longitudinally and is used as two fins on a surface, 5) then the heat flow rate will \_\_\_\_\_.
  - decrease a) b) increase
  - c) remain constant d) may decrease or increase
- The thickness of thermal boundary layer is equal to that of hydrodynamic 6) boundary layer when Prandtl number is
  - 0.1 a) 0 b) c) 0.5 1.0 d)
- 7) \_ number is generally associated with natural convection heat transfer.
  - Prandtl b) Weber a) C) Nusselt d) Grashoff

Set

Max. Marks: 70

SLR-FM-125

Marks: 14

- $\mathbf{k}_1 \mathbf{k}_2$

With increasing temperature, the wave length for maximum monochromatic 8) emission.

- decreases and then increases a)
- increases continuously c)
- b) increases and then decreases

**SLR-FM-125** 

Set

- d) decreases continuously
- 9) Α\_\_\_ \_\_\_\_ body reflects entire radiation incident on it.
  - transparent black a) b)
  - white gray d) C)

The correction factor for condensers is 10)

- 1 less than 1 b) a) greater than 1
- d) C) zero
- An automobile radiator is \_\_\_\_\_ type of heat exchanger. 11)
  - cross-flow b) regenerator a)
  - c) counter-flow d) recuperator
- 12) In pool boiling, the heat flux becomes maximum towards the end of \_\_\_\_\_.
  - free convection boiling regime b) nucleate boiling regime a)
  - c) unstable film boiling regime d) stable film boiling regime
- 13) Which one of the following heat exchangers gives parallel straight line pattern of temperature distribution for both cold and hot fluids?
  - Parallel flow with unequal heat capacities a)
  - Parallel flow with equal heat capacities b)
  - c) Counter flow with equal heat capacities
  - Counter flow with unequal heat capacities d)
- An effective radiation shield should have the highest possible value of \_\_\_\_\_. 14)
  - emissivity a)

- absorptivity b)
- reflectivity transmissivity d) c)

Seat No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering HEAT AND MASS TRANSFER

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) All questions are compulsory.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.
- 4) Figures to the right indicate full marks.
- 5) Neat diagrams must be drawn wherever necessary.

## Section I

## Q.2 Attempt the following questions.

- a) Define thermal conductivity. What are its units? Explain the effect of temperature on conductivity of solids, liquids and gases?
- b) Derive an expression for steady state one dimensional heat flow through 05 the hollow cylinder without heat generation?
- c) An electrical cable of 20 mm diameter is insulated with rubber which is exposed to atmosphere at 30 °C, Calculate the most economical thickness of insulation of K= 0.175 W/mK, when cable surface temperature with and without insulation is 70 °C. Also calculate % increase in heat dissipation and current carrying capacity when more economical thickness of insulation is provided. Take h=9.3 W/m<sup>2</sup>K.

## **Q.3** Attempt the following questions.

- a) Define fin efficiency and fin effectiveness and explain the effect of Biot
   04 number on the effectiveness of fin?
- b) Derive an expression for temperature distribution in a cylinder of radius R with uniformly distributed heat sources and constant thermal conductivity K.
- c) A solid steel ball of 5 cm in diameter and initially at 450 °C is quenched in controlled environment in which the temperature is maintained at 100 °C with convection coefficient of 10 W / m<sup>2</sup>K. Determine the time taken by the ball to attain a temperature of 150 °C. Take following properties for steel

C = 460 J/kg K K = 35 W/mK  $\rho$  = 7800 Kg/m<sup>3</sup>

## Q.4 Attempt the following questions.

- a) Using the dimensional analysis, for natural convection heat transfer, show 04 that  $N_u = f(G_r, Pr)$ .
- b) Water at 50 °C enters a 1.5 cm diameter and 3 m long tube with a velocity of 1 m/s .The tube wall is maintained at a constant temperature of 90 °C. Calculate the heat transfer coefficient and total amount of heat transferred if exit water temperature is 64 °C.

Use the following relation

Nu =0.023 Re<sup>0.8</sup> Pr<sup>04</sup>

The properties of water at mean bulk temperature of 57  $^{\circ}$ C are  $v = 0.517 \times 10^{-6} \text{ m}^2 \text{ / s}$ 

Pr = 3.15  $C_p$  = 4184 J/kg K K = 0.65 W/m K  $\rho$  = 990 Kg/m<sup>3</sup> Max. Marks: 56

Set

c) Explain the concept of velocity boundary layer and thermal boundary layer **05** with the help of neat sketch.

### Section – II

## Q.5 Attempt the following questions.

- a) What is a significance shape factor in radiation heat transfer? Explain04 properties of shape factor.
- b) State Plancks law of radiation and hence derive Wiens displacement law. 05
- c) Two large parallel plates at temperature 1000 K and 600 K have emissivity 05 of 0.5 and 0.8 respectively. A radiation shield having emissivity 0.1 on one side and 0.05 on the other side is placed between the plates. Calculate the heat transfer rate by radiation per square meter with and without radiation shield. Also calculate % reduction in heat transfer by radiation.

### Q.6 Attempt the following questions.

a) Write a short note on classification of heat exchangers.

04

04

- b) Saturated steam at 120  $^{\circ}$ C is condensing on the outer tube surface of a **05** single pass heat exchanger. The overall heat transfer coefficient is U<sub>o</sub> = 1800 W/m<sup>2</sup>K. Determine the surface area of a heat exchanger capable of heating 1000 kg/h of water from 20<sup>o</sup>C to 90<sup>o</sup>C. Also compute the rate of condensation of steam, if h<sub>fg</sub> = 2200 kJ/kg.
- c) Derive the relation for logarithmic mean temperature difference (LMTD) for 05 counter flow heat exchanger. Why LMTD is used rather than AMTD for calculating heat transfer rate through heat exchanger.

## Q.7 Attempt the following questions.

- a) State and Explain various modes of mass transfer in detail.
- b) Explain the pool boiling curve with the help of neat sketch. 05
- c) Explain the application of finite difference method to solve conduction and 05 convection problem.

T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** HEAT AND MASS TRANSFER

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

**Duration: 30 Minutes** 

a)

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.
- 4) Neat diagrams must be drawn wherever necessary.

### **MCQ/Objective Type Questions**

#### Q.1 Solve the following MCQ/Objective type questions.

- With increasing temperature, the wave length for maximum monochromatic 1) emission.
  - a) decreases and then increases b) increases and then decreases
  - increases continuously c)
- 2) Α body reflects entire radiation incident on it.
  - transparent a)
  - C) gray
- 3) The correction factor for condensers is
  - less than 1 1 a) b)
  - c) greater than 1
- 4) An automobile radiator is \_\_\_\_\_ type of heat exchanger.
  - cross-flow b) regenerator
  - counter-flow d) recuperator c)
- 5) In pool boiling, the heat flux becomes maximum towards the end of
  - free convection boiling regime nucleate boiling regime b) a) stable film boiling regime
  - unstable film boiling regime d) C)
- Which one of the following heat exchangers gives parallel straight line 6) pattern of temperature distribution for both cold and hot fluids?
  - Parallel flow with unequal heat capacities a)
  - b) Parallel flow with equal heat capacities
  - Counter flow with equal heat capacities c)
  - Counter flow with unequal heat capacities d)
- 7) An effective radiation shield should have the highest possible value of \_\_\_\_\_.
  - emissivity b) absorptivity a) c)
    - reflectivity d) transmissivity
- Heat transfer from higher temperature to low temperature takes place 8) according to
  - Fourier law a)
  - First law of thermodynamics b)
  - Second law of thermodynamics c)
  - Zeroth law of thermodynamics d)

Max. Marks: 70

**SLR-FM-125** 

Marks: 14

14

- b) black white d)

- - d) zero

- d) decreases continuously



Set

For a given volume and specified heat input which material will have the 9) smallest temperature rise \_\_\_\_\_.

- water b) mild steel a) c)
  - aluminum d) copper
- 10) In which of the following cases most unsteady heat flow occurs?
  - Through the walls of a furnace a)
  - Through lagged pipes carrying steam b)
  - Through the wall of a refrigerator c)
  - During annealing of castings d)
- 11) A composite plane wall is made of two different materials of same thickness with thermal conductivities  $k_1$  and  $k_2$  respectively. The equivalent thermal conductivity of the slab is

b)

b)

 $\mathbf{k}_1 \mathbf{k}_2$ 

- $k_1 + k_2$ a)
- $(2k_1.k_2)/(k_1+k_2)$ d) None of these c)
- 12) If a square fin is split longitudinally and is used as two fins on a surface, then the heat flow rate will \_\_\_\_\_.
  - decrease a)

remain constant

b) increase d) may decrease or increase

**SLR-FM-125** 

Set

- 13) The thickness of thermal boundary layer is equal to that of hydrodynamic boundary layer when Prandtl number is \_
  - a) 0 b) 0.1
  - c) 0.5 d) 1.0
- \_ number is generally associated with natural convection heat 14) transfer.
  - Prandtl a)

c)

Weber Nusselt d) Grashoff c)

## Seat No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering HEAT AND MASS TRANSFER

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) All questions are compulsory.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.
- 4) Figures to the right indicate full marks.
- 5) Neat diagrams must be drawn wherever necessary.

## Section I

## Q.2 Attempt the following questions.

- a) Define thermal conductivity. What are its units? Explain the effect of temperature on conductivity of solids, liquids and gases?
- b) Derive an expression for steady state one dimensional heat flow through 05 the hollow cylinder without heat generation?
- c) An electrical cable of 20 mm diameter is insulated with rubber which is exposed to atmosphere at 30 °C, Calculate the most economical thickness of insulation of K= 0.175 W/mK, when cable surface temperature with and without insulation is 70 °C. Also calculate % increase in heat dissipation and current carrying capacity when more economical thickness of insulation is provided. Take h=9.3 W/m<sup>2</sup>K.

## Q.3 Attempt the following questions.

- a) Define fin efficiency and fin effectiveness and explain the effect of Biot04number on the effectiveness of fin?
- b) Derive an expression for temperature distribution in a cylinder of radius R with uniformly distributed heat sources and constant thermal conductivity K.
- c) A solid steel ball of 5 cm in diameter and initially at 450 °C is quenched in controlled environment in which the temperature is maintained at 100 °C with convection coefficient of 10 W/m²K. Determine the time taken by the ball to attain a temperature of 150 °C. Take following properties for steel

C = 460 J/kg K K = 35 W/mK  $\rho$  = 7800 Kg/m<sup>3</sup>

## Q.4 Attempt the following questions.

- a) Using the dimensional analysis, for natural convection heat transfer, show 04 that  $N_u = f(G_r, Pr)$ .
- b) Water at 50 °C enters a 1.5 cm diameter and 3 m long tube with a velocity of 1 m/s .The tube wall is maintained at a constant temperature of 90 °C. Calculate the heat transfer coefficient and total amount of heat transferred if exit water temperature is 64 °C.

Use the following relation

Nu =0.023 Re<sup>0.8</sup> Pr<sup>04</sup>

The properties of water at mean bulk temperature of 57  $^{\circ}$ C are  $v = 0.517 \times 10^{-6} \text{ m}^2 \text{ / s}$ 

 $\begin{array}{ll} \mbox{Pr} = 3.15 & \mbox{C}_{p} = 4184 \mbox{ J/kg K} \\ \mbox{K} = 0.65 \mbox{ W/m K} \mbox{ } \rho = 990 \mbox{ Kg/m}^{3} \end{array}$ 

Max. Marks: 56

Set

Q

- Set | Q
- c) Explain the concept of velocity boundary layer and thermal boundary layer **05** with the help of neat sketch.

### Section – II

## Q.5 Attempt the following questions.

- a) What is a significance shape factor in radiation heat transfer? Explain04 properties of shape factor.
- b) State Plancks law of radiation and hence derive Wiens displacement law. 05
- c) Two large parallel plates at temperature 1000 K and 600 K have emissivity 05 of 0.5 and 0.8 respectively. A radiation shield having emissivity 0.1 on one side and 0.05 on the other side is placed between the plates. Calculate the heat transfer rate by radiation per square meter with and without radiation shield. Also calculate % reduction in heat transfer by radiation.

### Q.6 Attempt the following questions.

a) Write a short note on classification of heat exchangers.

04

04

- **b)** Saturated steam at 120  $^{\circ}$ C is condensing on the outer tube surface of a **05** single pass heat exchanger. The overall heat transfer coefficient is U<sub>o</sub> = 1800 W/m<sup>2</sup>K. Determine the surface area of a heat exchanger capable of heating 1000 kg/h of water from 20<sup>o</sup>C to 90<sup>o</sup>C. Also compute the rate of condensation of steam, if h<sub>fg</sub> = 2200 kJ/kg.
- c) Derive the relation for logarithmic mean temperature difference (LMTD) for 05 counter flow heat exchanger. Why LMTD is used rather than AMTD for calculating heat transfer rate through heat exchanger.

## Q.7 Attempt the following questions.

- a) State and Explain various modes of mass transfer in detail.
- b) Explain the pool boiling curve with the help of neat sketch. 05
- c) Explain the application of finite difference method to solve conduction and 05 convection problem.

|  |                            | T.E.          | (Part - II) (New) (CBCS) Ex   |          |   |  |  |  |  |  |
|--|----------------------------|---------------|---|----------|---|--|--|--|--|--|
|  |                            |               | Mechanical En<br>HEAT AND MASS  | -        | •   |  |  |  |  |  |
| Day &  | & Date                     | e: Fric       | lay, 22-11-2019   |          | Max. Marks: 70                                      |  |  |  |  |  |
| Time   | Time: 10:00 AM To 01:00 PM |               |   |          |   |  |  |  |  |  |
| Instr  | uctio                      | <b>ns:</b> 1) |   | uld b    | e solved in first 30 minutes in answer              |  |  |  |  |  |
|  |                            |               | book.   |          |   |  |  |  |  |  |
|  |                            | ,             | Use of Scientific calculator is all   |          |   |  |  |  |  |  |
|  |                            |               | Assume suitable data if required Neat diagrams must be drawn w                                  |          | -   |  |  |  |  |  |
|  |                            | 4)            | Ū   |          | •   |  |  |  |  |  |
| Durat  | ion: 3                     |               | MCQ/Objective Typ   | e Q      | uestions<br>Marks: 14                               |  |  |  |  |  |
|  |                            | -             |   | ~~~~     |   |  |  |  |  |  |
| Q.1  | <b>301v</b><br>1)          | lf a s        | following MCQ/Objective type<br>quare fin is split longitudinally an<br>the heat flow rate will |          |   |  |  |  |  |  |
|  |                            | a)            | decrease  | b)       | increase  |  |  |  |  |  |
|  |                            | c)            | remain constant   | d)       | may decrease or increase                            |  |  |  |  |  |
|  | 2)                         |               | thickness of thermal boundary lag<br>dary layer when Prandtl number<br>0                        | is       |   |  |  |  |  |  |
|  |                            | a)<br>C)      | 0.5   |          | 1.0   |  |  |  |  |  |
|  | 3)                         | trans         | _ number is generally associated  | ,        |   |  |  |  |  |  |
|  |                            | a)            | Prandtl   | b)       | Weber   |  |  |  |  |  |
|  |                            | c)            | Nusselt   | d)       | Grashoff  |  |  |  |  |  |
|  | 4)                         | With<br>emis  | sion.   |          | gth for maximum monochromatic                       |  |  |  |  |  |
|  |                            | a)<br>c)      | decreases and then increases increases continuously   | b)<br>d) | increases and then decreases decreases continuously |  |  |  |  |  |
| <ol><li>A body reflects entire radiation incident on it.</li></ol> |                            |               |   |          |   |  |  |  |  |  |
|  |                            | a)<br>c)      | transparent<br>gray   | b)<br>d) | black<br>white                                      |  |  |  |  |  |
|  | 6)                         |               | correction factor for condensers i  |          |   |  |  |  |  |  |
|  |                            | a)<br>c)      | less than 1<br>greater than 1   | b)<br>d) | 1<br>zero   |  |  |  |  |  |
|  |                            |               |   |          |   |  |  |  |  |  |

Seat

No.

## Q.1

- An automobile radiator is \_\_\_\_\_ type of heat exchanger. 7)
  - cross-flow b) regenerator a)
  - C) counter-flow d) recuperator
- 8) In pool boiling, the heat flux becomes maximum towards the end of \_\_\_\_\_. b) nucleate boiling regime
  - free convection boiling regime a) unstable film boiling regime C)
    - d) stable film boiling regime

Set R

**SLR-FM-125** 

# 9) Which one of the following heat exchangers gives parallel straight line pattern of temperature distribution for both cold and hot fluids?

- a) Parallel flow with unequal heat capacities
- b) Parallel flow with equal heat capacities
- c) Counter flow with equal heat capacities
- d) Counter flow with unequal heat capacities
- 10) An effective radiation shield should have the highest possible value of \_\_\_\_\_.
  - a) emissivity

b) absorptivity

**SLR-FM-125** 

Set

- c) reflectivity d) transmissivity
- 11) Heat transfer from higher temperature to low temperature takes place according to \_\_\_\_\_.
  - a) Fourier law
  - b) First law of thermodynamics
  - c) Second law of thermodynamics
  - d) Zeroth law of thermodynamics
- 12) For a given volume and specified heat input which material will have the smallest temperature rise \_\_\_\_\_.
  - a) water b) mild steel
  - c) aluminum d) copper
- 13) In which of the following cases most unsteady heat flow occurs?
  - a) Through the walls of a furnace
  - b) Through lagged pipes carrying steam
  - c) Through the wall of a refrigerator
  - d) During annealing of castings
- A composite plane wall is made of two different materials of same thickness with thermal conductivities k<sub>1</sub> and k<sub>2</sub> respectively. The equivalent thermal conductivity of the slab is \_\_\_\_\_.
  - a) k<sub>1</sub> + k<sub>2</sub>

b) k<sub>1</sub> k<sub>2</sub>

c)  $(2k_1.k_2)/(k_1+k_2)$ 

d) None of these

Seat No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering HEAT AND MASS TRANSFER

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) All questions are compulsory.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.
- 4) Figures to the right indicate full marks.
- 5) Neat diagrams must be drawn wherever necessary.

## Section I

## Q.2 Attempt the following questions.

- a) Define thermal conductivity. What are its units? Explain the effect of temperature on conductivity of solids, liquids and gases?
- b) Derive an expression for steady state one dimensional heat flow through 05 the hollow cylinder without heat generation?
- c) An electrical cable of 20 mm diameter is insulated with rubber which is exposed to atmosphere at 30 °C, Calculate the most economical thickness of insulation of K= 0.175 W/mK, when cable surface temperature with and without insulation is 70 °C. Also calculate % increase in heat dissipation and current carrying capacity when more economical thickness of insulation is provided. Take h=9.3 W/m<sup>2</sup>K.

## Q.3 Attempt the following questions.

- a) Define fin efficiency and fin effectiveness and explain the effect of Biot
   04 number on the effectiveness of fin?
- b) Derive an expression for temperature distribution in a cylinder of radius R with uniformly distributed heat sources and constant thermal conductivity K.
- c) A solid steel ball of 5 cm in diameter and initially at 450 °C is quenched in controlled environment in which the temperature is maintained at 100 °C with convection coefficient of 10 W / m<sup>2</sup>K. Determine the time taken by the ball to attain a temperature of 150 °C. Take following properties for steel

C = 460 J/kg K K = 35 W/mK  $\rho$  = 7800 Kg/m<sup>3</sup>

## Q.4 Attempt the following questions.

- a) Using the dimensional analysis, for natural convection heat transfer, show 04 that  $N_u = f(G_r, Pr)$ .
- b) Water at 50 °C enters a 1.5 cm diameter and 3 m long tube with a velocity of 1 m/s .The tube wall is maintained at a constant temperature of 90 °C. Calculate the heat transfer coefficient and total amount of heat transferred if exit water temperature is 64 °C.

Use the following relation

Nu =0.023 Re<sup>0.8</sup> Pr<sup>04</sup>

The properties of water at mean bulk temperature of 57  $^{\circ}$ C are  $v = 0.517 \times 10^{-6} \text{ m}^2 \text{ / s}$ Pr = 3.15 C<sub>p</sub> = 4184 J/kg K

K = 0.65 W/m K  $\rho = 990$  Kg/m<sup>3</sup>

Max. Marks: 56

Set R

- Set R
- c) Explain the concept of velocity boundary layer and thermal boundary layer **05** with the help of neat sketch.

### Section – II

## Q.5 Attempt the following questions.

- a) What is a significance shape factor in radiation heat transfer? Explain
   04 properties of shape factor.
- b) State Plancks law of radiation and hence derive Wiens displacement law. 05
- c) Two large parallel plates at temperature 1000 K and 600 K have emissivity 05 of 0.5 and 0.8 respectively. A radiation shield having emissivity 0.1 on one side and 0.05 on the other side is placed between the plates. Calculate the heat transfer rate by radiation per square meter with and without radiation shield. Also calculate % reduction in heat transfer by radiation.

### Q.6 Attempt the following questions.

a) Write a short note on classification of heat exchangers.

04

04

- **b)** Saturated steam at 120  $^{\circ}$ C is condensing on the outer tube surface of a **05** single pass heat exchanger. The overall heat transfer coefficient is U<sub>o</sub> = 1800 W/m<sup>2</sup>K. Determine the surface area of a heat exchanger capable of heating 1000 kg/h of water from 20<sup>o</sup>C to 90<sup>o</sup>C. Also compute the rate of condensation of steam, if h<sub>fg</sub> = 2200 kJ/kg.
- c) Derive the relation for logarithmic mean temperature difference (LMTD) for 05 counter flow heat exchanger. Why LMTD is used rather than AMTD for calculating heat transfer rate through heat exchanger.

## Q.7 Attempt the following questions.

- a) State and Explain various modes of mass transfer in detail.
- b) Explain the pool boiling curve with the help of neat sketch. 05
- c) Explain the application of finite difference method to solve conduction and 05 convection problem.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** HEAT AND MASS TRANSFER

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.

4) Neat diagrams must be drawn wherever necessary.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Solve the following MCQ/Objective type questions.

- The correction factor for condensers is 1)
  - less than 1 b) 1 a)
  - C) greater than 1 d) zero
- 2) An automobile radiator is \_\_\_\_\_ type of heat exchanger.
  - cross-flow b) regenerator a)
  - counter-flow d) recuperator c)

#### 3) In pool boiling, the heat flux becomes maximum towards the end of \_\_\_\_\_.

free convection boiling regime nucleate boiling regime b) a)

d)

stable film boiling regime

- unstable film boiling regime C)
- 4) Which one of the following heat exchangers gives parallel straight line pattern of temperature distribution for both cold and hot fluids?
  - Parallel flow with unequal heat capacities a)
  - Parallel flow with equal heat capacities b)
  - Counter flow with equal heat capacities c)
  - Counter flow with unequal heat capacities d)

#### An effective radiation shield should have the highest possible value of \_\_\_\_\_. 5) absorptivity

- emissivity b) a)
- reflectivity transmissivity d) C)
- Heat transfer from higher temperature to low temperature takes place 6) according to \_\_\_\_
  - Fourier law a)
  - b) First law of thermodynamics
  - Second law of thermodynamics c)
  - Zeroth law of thermodynamics d)
- 7) For a given volume and specified heat input which material will have the smallest temperature rise \_\_\_\_\_.
  - water b) mild steel a) c)
    - aluminum d) copper
- In which of the following cases most unsteady heat flow occurs? 8)
  - Through the walls of a furnace a)
  - Through lagged pipes carrying steam b)
  - c) Through the wall of a refrigerator
  - During annealing of castings d)

Max. Marks: 70

S Set

Marks: 14

14

## SLR-FM-125

|     |   |            | Set S   | \$ |
|-----|---|------------|---|----|
| 9)  | A composite plane wall is made of<br>thickness with thermal conductivity<br>thermal conductivity of the slab is<br>a) $k_1 + k_2$ | ties k₁ ar |   |    |
|     | c) $(2k_1.k_2)/(k_1+k_2)$   |            | None of these                                       |    |
| 10) | If a square fin is split longitudinall then the heat flow rate will   | •          | used as two fins on a surface,                      |    |
|     | a) decrease   | b)         | increase  |    |
|     | c) remain constant  | d)         | may decrease or increase                            |    |
| 11) | The thickness of thermal boundar<br>boundary layer when Prandtl num   | nber is _  | <br>  |    |
|     | a) 0  | ,          | 0.1   |    |
|     | c) 0.5  | d)         | 1.0   |    |
| 12) | number is generally assoc transfer.   | iated wit  | n natural convection heat                           |    |
|     | a) Prandtl  | b)         | Weber   |    |
|     | c) Nusselt  | d)         | Grashoff  |    |
| 13) | With increasing temperature, the emission.  | wave ler   | igth for maximum monochromatic                      |    |
|     | <ul><li>a) decreases and then increas</li><li>c) increases continuously</li></ul>   | ,          | increases and then decreases decreases continuously |    |
| 14) | A body reflects entire radia  | ation inci | dent on it.   |    |

b) black d) white

\_\_\_ body reflects entire radiation incident on it. 14) A\_ transparent

a)

C)

gray

SLR-FM-125

# Seat

No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** HEAT AND MASS TRANSFER

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) All questions are compulsory.

- 2) Use of Scientific calculator is allowed.
- 3) Assume suitable data if required and state it clearly.
- 4) Figures to the right indicate full marks.
- 5) Neat diagrams must be drawn wherever necessary.

## Section I

#### Q.2 Attempt the following questions.

- Define thermal conductivity. What are its units? Explain the effect of 04 a) temperature on conductivity of solids, liquids and gases?
- Derive an expression for steady state one dimensional heat flow through 05 b) the hollow cylinder without heat generation?
- An electrical cable of 20 mm diameter is insulated with rubber which is 05 c) exposed to atmosphere at 30 °C, Calculate the most economical thickness of insulation of K= 0.175 W/mK, when cable surface temperature with and without insulation is 70 °C. Also calculate % increase in heat dissipation and current carrying capacity when more economical thickness of insulation is provided. Take h=9.3 W/m<sup>2</sup>K.

#### Q.3 Attempt the following questions.

- Define fin efficiency and fin effectiveness and explain the effect of Biot 04 a) number on the effectiveness of fin?
- Derive an expression for temperature distribution in a cylinder of radius R b) 05 with uniformly distributed heat sources and constant thermal conductivity Κ.
- A solid steel ball of 5 cm in diameter and initially at 450 <sup>0</sup>C is quenched in C) 05 controlled environment in which the temperature is maintained at 100 °C with convection coefficient of 10 W/m<sup>2</sup>K. Determine the time taken by the ball to attain a temperature of 150 °C. Take following properties for steel

C = 460 J/kg K K = 35 W/mK  $\rho = 7800 \text{ Kg/m}^3$ 

#### **Q.4** Attempt the following questions.

- Using the dimensional analysis, for natural convection heat transfer, show 04 a) that  $N_u = f (G_r, Pr)$ .
- Water at 50 <sup>o</sup>C enters a 1.5 cm diameter and 3 m long tube with a velocity b) 05 of 1 m/s. The tube wall is maintained at a constant temperature of 90  $^{0}$ C. Calculate the heat transfer coefficient and total amount of heat transferred if exit water temperature is 64 °C.

Use the following relation

 $Nu = 0.023 \text{ Re}^{0.8} \text{ Pr}^{04}$ 

The properties of water at mean bulk temperature of 57 °C are  $v = 0.517 \times 10^{-6} \text{ m}^2 / \text{ s}$ 

 $C_{p} = 4184 \text{ J/kg K}$ Pr = 3.15 $K = 0.65 W/m K \rho = 990 Kg/m^3$  Max. Marks: 56

Set

Page 16 of 16

Explain the concept of velocity boundary layer and thermal boundary layer **05** with the help of neat sketch.

SLR-FM-125

04

### Section – II

## Q.5 Attempt the following questions.

c)

- a) What is a significance shape factor in radiation heat transfer? Explain04 properties of shape factor.
- b) State Plancks law of radiation and hence derive Wiens displacement law. 05
- c) Two large parallel plates at temperature 1000 K and 600 K have emissivity 05 of 0.5 and 0.8 respectively. A radiation shield having emissivity 0.1 on one side and 0.05 on the other side is placed between the plates. Calculate the heat transfer rate by radiation per square meter with and without radiation shield. Also calculate % reduction in heat transfer by radiation.

### Q.6 Attempt the following questions.

- a) Write a short note on classification of heat exchangers.
- b) Saturated steam at 120  $^{\circ}$ C is condensing on the outer tube surface of a **05** single pass heat exchanger. The overall heat transfer coefficient is U<sub>o</sub> = 1800 W/m<sup>2</sup>K. Determine the surface area of a heat exchanger capable of heating 1000 kg/h of water from 20<sup>o</sup>C to 90<sup>o</sup>C. Also compute the rate of condensation of steam, if h<sub>fg</sub> = 2200 kJ/kg.
- c) Derive the relation for logarithmic mean temperature difference (LMTD) for 05 counter flow heat exchanger. Why LMTD is used rather than AMTD for calculating heat transfer rate through heat exchanger.

## Q.7 Attempt the following questions.

- a) State and Explain various modes of mass transfer in detail. 04
- b) Explain the pool boiling curve with the help of neat sketch. 05
- c) Explain the application of finite difference method to solve conduction and 05 convection problem.

T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

MCQ/Objective Type Questions

4) Use of non-programmable calculator is allowed.

**Duration: 30 Minutes** Marks: 14 Q.1 Choose the correct alternatives from the options and rewrite the sentence.

- Mechanical efficiency is the ratio of 1)
  - BP to heat input b) IP to heat input a)
  - BP to IP c) d) IP to BP
- 2) Theoretically correct air – fuel ratio for petrol engine is approximately .

| a) | 0:1  | b) | 10:1 |
|----|------|----|------|
| c) | 12:1 | d) | 15:1 |

- 3) Scavenging is usually done to increase which of the following parameter?
  - power output fuel consumption a) b) c) thermal efficiency d) speed
- 4)
  - Lean mixture is required during \_\_\_\_ b) stating a) idling
  - C) accelerating d) crusing
- In SI engines, with increase in compression ratio, the flame speed \_\_\_\_\_. 5)
  - increases decreases a) b)
  - C) remains same d) none of above
- 6) If N is rpm, number of power strokes per minute in a two stroke engine is \_\_\_\_\_. N L- \ 0.1 **a**)

| a) | N  |      |  |  | D) | 2N  |
|----|----|------|--|--|----|-----|
| c) | 3N |      |  |  | d) | N/2 |
|    |    | <br> |  |  |    | • . |

- 7) When the throttle is suddenly opened, the mixture from the simple carburretor tends to become
  - b) a) rich lean c) stochiometric d) not affected
- A Carnot engine working between 400 °C and 40 °C produces 130 kJ 8) of work. How much heat is added?
  - a) 100 kJ b) 150 kJ 200 kJ c) d) 243 kJ
- For SI engine, the range of compression ratio is \_\_\_\_\_ 9) 6 to 10 11 to 15 b) a)
  - c) 16 to 20 d) 21 to 30

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Set

Max. Marks: 70

10) In IC Engine, camshaft controls \_\_\_\_\_ valve closing valve opening b) a) valve timing all of above C) d) 11) Injected power is directly proportional to \_ air consumption speed b) a) c) cylinder peak pressure d) all of above 12) A carburretor is used in: \_\_\_\_\_. a) CI engine b) SI engine all of above c) steam engine d) 13) Nozzles for injecting fuel are widely used in \_ CI engine SI engine a) b) SI and CI engines all of above C) d) 14) Hydrogen is the best source of energy because \_\_\_\_\_. higher cetane number low emission, b) a) C) higher octane number d) None of these

**SLR-FM-126** 

Set P

04

## SLR-FM-126

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.
- 4) Use of non-programmable calculator is allowed.

## Section I

- Q.2 a) Why the actual cycle efficiency is much lower than air standard cycle 05 efficiency? List major losses in actual engine and air standard cycle?
  - Define with neat sketch different engine nomenclatures. Mention the units b) 04 in which they are normally measured.
  - Draw neat sketch of valve timing diagram for two stroke SI engine and c) 05 explain scavenging process.
- Q.3 a) Derive an expression for air fuel ratio of carburettor by exact analysis. 06
  - Describe with suitable sketch economizer system and acceleration system 04 b) used in modified carburettor.
  - 04 c) Briefly explain the various methods of supercharging in an IC engine?
- Q.4 a) What is the purpose of using a governor in CI engines? State two types of 05 governors used and explain any one from them with neat sketch.
  - Discuss merits and demerits of pintle and pintaux nozzles. b)
  - A six cylinder, four stroke diesel engine develops a power of 200 kW at c) 05 2000 rpm. The bsfc is 0.2 kg/kW.h. At the beginning of injection pressure is 35 bar and maximum cylinder pressure is 55 bar. The injection is expected to be at 180 bar and maximum pressure at injector is set to be about 520 bar. Assuming the following:

Cd for injector 0.75, specific gravity of fuel 0.85, atmospheric pressure 1 bar and effective pressure difference as average pressure difference over the injection period. Determine the total orifice area required per injector if the injection takes place over 16<sup>0</sup> crank angles.

### Section – II

- List the different methods of measuring frictional power of I. C. Engines. Q.5 a) 05 Explain Morse test in detail. Explain physical and chemical delay period on P-Theta diagram. 05 b) 04
  - With schematic diagram explain EGR system. C)

Max. Marks: 56

Set

### Set Ρ

- Q.6 The air flow to a four cylinder four stroke petrol engine is measured by 05 a) means of a 7.5 cm diameter sharp edged orifice, coefficient of discharge is 0.6. During a test on the engine following data were recorded. Bore = 11cm, stroke = 13 cm, engine speed = 2250 rpm, brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000 kJ/kg, pressure drop across the orifice = 4.1 cm of water, atmospheric temperature and pressure are 15°C, and 1.013 bar. Calculate:
  - Thermal efficiency on BP basis, 1)
  - 2) Brake mean effective pressure
  - 3) Volumetric efficiency based on free air conditions.
  - How to control abnormal combustion in Cl engine? 05 b) 04
  - Write a note on 'Octane number'. C)
- Q.7 05 a) Write a note on exhaust emission control methods of SI engine. Draw and explain heat balance sheet used to measure performance I.C. 05 b) Engines.
  - c) Write a note on soot and particulate matters.

# T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

## INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.
- 4) Use of non-programmable calculator is allowed.

# MCQ/Objective Type Questions Duration: 30 Minutes

## Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- A Carnot engine working between 400 <sup>o</sup>C and 40 <sup>o</sup>C produces 130 kJ of work. How much heat is added?
  - a) 100 kJ b) 150 kJ c) 200 kJ d) 243 kJ
- 2) For SI engine, the range of compression ratio is \_\_\_\_\_\_
  a) 6 to 10
  b) 11 to 15
  - c) 16 to 20 d) 21 to 30
- 3) In IC Engine, camshaft controls \_\_\_\_\_.
  a) valve opening b) valve closing
  c) valve timing d) all of above
- 4) Injected power is directly proportional to \_\_\_\_\_.
  - a)Speedb)air consumptionc)cylinder peak pressured)all of above

## 5) A carburretor is used in: \_\_\_\_\_.

- a) Cl engine b) Sl engine c) steam engine d) all of above
- 6) Nozzles for injecting fuel are widely used in \_\_\_\_\_.
  - a) CI engine b) SI engine c) SI and CI engines d) all of above
- 7) Hydrogen is the best source of energy because \_\_\_\_\_.
  - a) higher cetane number
     b) low emission,
     c) higher octane number
     d) None of these
- c) higher octane numberd) None of these8) Mechanical efficiency is the ratio of .
  - a) BP to heat input c) BP to IP b) IP to heat input d) IP to BP
  - c) BP to IP d) IP to BP

# 9) Theoretically correct air – fuel ratio for petrol engine is approximately \_\_\_\_\_. a) 0:1 b) 10:1

| a) | 0:1  | - | b) | 10:1 |
|----|------|---|----|------|
| c) | 12:1 |   | d) | 15:1 |

Max. Marks: 70

Marks: 14

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Q

|     |                  |   |                   | -  |     | - |
|-----|------------------|---|-------------------|--|-----|---|
|     |                  |   |                   |  | Set | Q |
| 10) |                  | venging is usually done to increas<br>ameter?                   | se wh             | ich of the following                                   |     |   |
|     | a)<br>c)         | power output<br>thermal efficiency                              | b)<br>d)          | fuel consumption<br>speed                              |     |   |
| 11) | Leai<br>a)<br>c) | n mixture is required during<br>idling<br>accelerating          | <br>b)<br>d)      | stating<br>crusing                                     |     |   |
| 12) | In S<br>a)<br>c) | I engines, with increase in compre<br>increases<br>remains same | essio<br>b)<br>d) | n ratio, the flame speed<br>decreases<br>none of above |     |   |
| 13) | engi             | is rpm, number of power strokes  <br>ine is                     |                   |  |     |   |
|     | a)<br>c)         | N<br>3N   | b)<br>d)          | 2N<br>N/2  |     |   |
| 14) |                  | en the throttle is suddenly opened<br>ourretor tends to become  | , the             | mixture from the simple                                |     |   |
|     | a)               | rich  | b)                | lean   |     |   |

c) stochiometric d) not affected

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04

## SLR-FM-126

| Seat |  |
|------|--|
| No   |  |

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.
- 4) Use of non-programmable calculator is allowed.

### Section I

- Q.2 a) Why the actual cycle efficiency is much lower than air standard cycle 05 efficiency? List major losses in actual engine and air standard cycle?
  - Define with neat sketch different engine nomenclatures. Mention the units b) 04 in which they are normally measured.
  - Draw neat sketch of valve timing diagram for two stroke SI engine and C) 05 explain scavenging process.
- Q.3 a) Derive an expression for air fuel ratio of carburettor by exact analysis. 06
  - Describe with suitable sketch economizer system and acceleration system 04 b) used in modified carburettor.
  - 04 c) Briefly explain the various methods of supercharging in an IC engine?
- Q.4 a) What is the purpose of using a governor in CI engines? State two types of 05 governors used and explain any one from them with neat sketch.
  - Discuss merits and demerits of pintle and pintaux nozzles. b)
  - A six cylinder, four stroke diesel engine develops a power of 200 kW at c) 05 2000 rpm. The bsfc is 0.2 kg/kW.h. At the beginning of injection pressure is 35 bar and maximum cylinder pressure is 55 bar. The injection is expected to be at 180 bar and maximum pressure at injector is set to be about 520 bar. Assuming the following:

Cd for injector 0.75, specific gravity of fuel 0.85, atmospheric pressure 1 bar and effective pressure difference as average pressure difference over the injection period. Determine the total orifice area required per injector if the injection takes place over 16<sup>0</sup> crank angles.

### Section – II

- List the different methods of measuring frictional power of I. C. Engines. Q.5 a) 05 Explain Morse test in detail. Explain physical and chemical delay period on P-Theta diagram. 05 b) 04
  - With schematic diagram explain EGR system. C)

Max. Marks: 56

Set Q

### Set Q

- Q.6 The air flow to a four cylinder four stroke petrol engine is measured by 05 a) means of a 7.5 cm diameter sharp edged orifice, coefficient of discharge is 0.6. During a test on the engine following data were recorded. Bore = 11cm, stroke = 13 cm, engine speed = 2250 rpm, brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000 kJ/kg, pressure drop across the orifice = 4.1 cm of water, atmospheric temperature and pressure are 15°C, and 1.013 bar. Calculate:
  - Thermal efficiency on BP basis, 1)
  - 2) Brake mean effective pressure
  - 3) Volumetric efficiency based on free air conditions.
  - How to control abnormal combustion in Cl engine? 05 b) 04
  - Write a note on 'Octane number'. C)
- Q.7 05 a) Write a note on exhaust emission control methods of SI engine. Draw and explain heat balance sheet used to measure performance I.C. 05 b) Engines.
  - c) Write a note on soot and particulate matters.

| INTERNAL COMBUSTION ENGINE   |   |        |                                     |        |                                   |
|--|---|--------|-------------------------------------|--------|-----------------------------------|
| Day & Date: Saturday, 23-11-2019         Max. Marks: 70           Time: 10:00 AM To 01:00 PM         Max. Marks: 70  |   |        |                                     |        |                                   |
| Instr  | <b>Instructions:</b> 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.                      |        |                                     |        |                                   |
| <ul> <li>2) Figures to the right indicate full marks.</li> <li>3) Make suitable assumptions if necessary and state them clearly.</li> <li>4) Use of non-programmable calculator is allowed.</li> </ul> |   |        |                                     |        |                                   |
|  |   |        | MCQ/Objective Typ                   | be Qu  | lestions                          |
| Dura   | tion: 3   | 30 Mii |                                     |        | Marks: 14                         |
| Q.1  | Cho   | ose t  | he correct alternatives from the    | e opti | ions and rewrite the sentence. 14 |
|  | 1)  |        | I engines, with increase in compre  |        |                                   |
|  |   | a)     | increases                           | b)     | decreases                         |
|  |   | c)     | remains same                        | d)     | none of above                     |
|  | 2)  | lf N   | is rpm, number of power strokes p   | ber m  | inute in a two stroke             |
|  |   | •      | ne is                               |        |                                   |
|  |   | a)     | N                                   | b)     | 2N                                |
|  | - )   | c)     | 3N                                  | d)     | N/2                               |
|  | <ol> <li>When the throttle is suddenly opened, the mixture from the simple<br/>carburretor tends to become</li> </ol>           |        |                                     |        |                                   |
|  |   | a)     | rich                                | b)     | lean                              |
|  |   | c)     | stochiometric                       | d)     | not affected                      |
|  | 4) A Carnot engine working between 400 <sup>0</sup> C and 40 <sup>0</sup> C produces 130 kJ<br>of work. How much heat is added? |        |                                     |        |                                   |
|  |   | a)     | 100 kJ                              | b)     | 150 kJ                            |
|  |   | c)     | 200 kJ                              | d)     | 243 kJ                            |
|  | 5) For SI engine, the range of compression ratio is   |        |                                     |        |                                   |
|  |   | a)     | 6 to 10                             | b)     | 11 to 15                          |
|  |   | c)     | 16 to 20                            | d)     | 21 to 30                          |
|  | 6)  | In IC  | Engine, camshaft controls           |        |                                   |
|  |   | a)     | valve opening                       | b)     | valve closing                     |
|  |   | c)     | valve timing                        | d)     | all of above                      |
|  | 7)  | Injed  | cted power is directly proportional | to     |                                   |
|  |   | a)     | Speed                               | b)     | air consumption                   |
|  |   | c)     | cylinder peak pressure              | d)     | all of above                      |

b)

d)

b)

d)

SI engine

SI engine

all of above

all of above

A carburretor is used in: \_\_\_\_\_.

SI and CI engines

Nozzles for injecting fuel are widely used in \_

CI engine

CI engine

steam engine

8)

9)

a)

C)

a)

c)

# T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering INTERNAL COMBUSTION ENGINE

Seat

No.

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Set | R

| 10) | Hyd<br>a)<br>c) | rogen is the best source of energ<br>higher cetane number<br>higher octane number | b)                 | ause<br>low emission,<br>None of these |
|-----|-----------------|---|--------------------|--|
| 11) |                 | hanical efficiency is the ratio of _<br>BP to heat input<br>BP to IP              |                    | IP to heat input<br>IP to BP           |
| 12) |                 | oretically correct air – fuel ratio fo<br>roximately<br>0:1<br>12:1               | r petr<br>b)<br>d) | ol engine is<br>10:1<br>15:1           |
| 13) | Sca             | venging is usually done to increas<br>meter?                                      | ,                  |  |
| 14) | Lear<br>a)      | n mixture is required during  | <br>b)             | stating                                |

a)Idlingb)statingc)acceleratingd)crusing

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Set R

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04

## SLR-FM-126

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.
- 4) Use of non-programmable calculator is allowed.

## Section I

- Q.2 a) Why the actual cycle efficiency is much lower than air standard cycle 05 efficiency? List major losses in actual engine and air standard cycle?
  - Define with neat sketch different engine nomenclatures. Mention the units b) 04 in which they are normally measured.
  - Draw neat sketch of valve timing diagram for two stroke SI engine and c) 05 explain scavenging process.
- Q.3 a) Derive an expression for air fuel ratio of carburettor by exact analysis. 06
  - Describe with suitable sketch economizer system and acceleration system 04 b) used in modified carburettor.
  - 04 c) Briefly explain the various methods of supercharging in an IC engine?
- Q.4 a) What is the purpose of using a governor in CI engines? State two types of 05 governors used and explain any one from them with neat sketch.
  - Discuss merits and demerits of pintle and pintaux nozzles. b)
  - A six cylinder, four stroke diesel engine develops a power of 200 kW at c) 05 2000 rpm. The bsfc is 0.2 kg/kW.h. At the beginning of injection pressure is 35 bar and maximum cylinder pressure is 55 bar. The injection is expected to be at 180 bar and maximum pressure at injector is set to be about 520 bar. Assuming the following:

Cd for injector 0.75, specific gravity of fuel 0.85, atmospheric pressure 1 bar and effective pressure difference as average pressure difference over the injection period. Determine the total orifice area required per injector if the injection takes place over 16<sup>0</sup> crank angles.

### Section – II

- List the different methods of measuring frictional power of I. C. Engines. Q.5 a) 05 Explain Morse test in detail. Explain physical and chemical delay period on P-Theta diagram. 05 b) 04
  - With schematic diagram explain EGR system. C)

Max. Marks: 56

Set R

### Set R

- Q.6 The air flow to a four cylinder four stroke petrol engine is measured by 05 a) means of a 7.5 cm diameter sharp edged orifice, coefficient of discharge is 0.6. During a test on the engine following data were recorded. Bore = 11cm, stroke = 13 cm, engine speed = 2250 rpm, brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000 kJ/kg, pressure drop across the orifice = 4.1 cm of water, atmospheric temperature and pressure are 15°C, and 1.013 bar. Calculate:
  - Thermal efficiency on BP basis, 1)
  - 2) Brake mean effective pressure
  - 3) Volumetric efficiency based on free air conditions.
  - How to control abnormal combustion in Cl engine? 05 b) 04
  - Write a note on 'Octane number'. C)
- Q.7 05 a) Write a note on exhaust emission control methods of SI engine. Draw and explain heat balance sheet used to measure performance I.C. 05 b) Engines.
  - c) Write a note on soot and particulate matters.

### Set T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.
- 4) Use of non-programmable calculator is allowed.

### **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

MCQ/Objective Type Questions

- In IC Engine, camshaft controls 1)
  - valve opening b) valve closing a)
  - c) valve timing all of above d)
- 2) Injected power is directly proportional to Speed
  - air consumption a) b) cylinder peak pressure all of above c) d)
- 3) A carburretor is used in: .
  - a) CI engine b) SI engine steam engine all of above c) d)
- 4) Nozzles for injecting fuel are widely used in
  - CI engine SI engine a) b) SI and CI engines all of above c) d)

#### 5) Hydrogen is the best source of energy because \_\_\_\_\_

- higher cetane number b) low emission, a) higher octane number C) d) None of these

#### 6) Mechanical efficiency is the ratio of \_\_\_\_\_ BP to heat input b) IP to heat input a) BP to IP IP to BP d) c)

- 7) Theoretically correct air – fuel ratio for petrol engine is approximately .
  - a) 0:1 b) 10:1 12:1 d) 15:1 c)
- 8) Scavenging is usually done to increase which of the following parameter?
  - power output fuel consumption a) b) thermal efficiency C) d) speed
- 9) Lean mixture is required during Idling a) b) stating
  - accelerating d) crusing C)

S

Max. Marks: 70

Marks: 14

|     |  |                     | SLR-FM-126   |
|-----|--|---------------------|--|
|     |  |                     | Set S  |
| 10) | In SI engines, with increase in compre<br>a) increases<br>c) remains same  | essior<br>b)<br>d)  | n ratio, the flame speed<br>decreases<br>none of above |
| 11) | If N is rpm, number of power strokes p<br>engine is<br>a) N<br>c) 3N   | ber m<br>b)<br>d)   | inute in a two stroke<br>2N<br>N/2                     |
| 12) | When the throttle is suddenly opened<br>carburretor tends to become<br>a) rich<br>c) stochiometric                             | , the i<br>b)<br>d) | nixture from the simple<br>lean<br>not affected        |
| 13) | <ul> <li>A Carnot engine working between 400 of work. How much heat is added?</li> <li>a) 100 kJ</li> <li>c) 200 kJ</li> </ul> | ,                   |  |
| 14) | For SI engine, the range of compress<br>a) 6 to 10   | ion ra<br>b)        | tio is<br>11 to 15                                     |

c) 16 to 20 d) 21 to 30

04

## SLR-FM-126

| Seat |  |
|------|--|
| No.  |  |

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Solve any two questions from each section.

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- 3) Make suitable assumptions if necessary and state them clearly.
- 4) Use of non-programmable calculator is allowed.

### Section I

- Q.2 a) Why the actual cycle efficiency is much lower than air standard cycle 05 efficiency? List major losses in actual engine and air standard cycle?
  - Define with neat sketch different engine nomenclatures. Mention the units b) 04 in which they are normally measured.
  - Draw neat sketch of valve timing diagram for two stroke SI engine and c) 05 explain scavenging process.
- Q.3 a) Derive an expression for air fuel ratio of carburettor by exact analysis. 06
  - Describe with suitable sketch economizer system and acceleration system 04 b) used in modified carburettor.
  - 04 c) Briefly explain the various methods of supercharging in an IC engine?
- Q.4 a) What is the purpose of using a governor in CI engines? State two types of 05 governors used and explain any one from them with neat sketch.
  - Discuss merits and demerits of pintle and pintaux nozzles. b)
  - A six cylinder, four stroke diesel engine develops a power of 200 kW at c) 05 2000 rpm. The bsfc is 0.2 kg/kW.h. At the beginning of injection pressure is 35 bar and maximum cylinder pressure is 55 bar. The injection is expected to be at 180 bar and maximum pressure at injector is set to be about 520 bar. Assuming the following:

Cd for injector 0.75, specific gravity of fuel 0.85, atmospheric pressure 1 bar and effective pressure difference as average pressure difference over the injection period. Determine the total orifice area required per injector if the injection takes place over 16<sup>0</sup> crank angles.

### Section – II

- List the different methods of measuring frictional power of I. C. Engines. Q.5 a) 05 Explain Morse test in detail. Explain physical and chemical delay period on P-Theta diagram. 05 b) 04
  - With schematic diagram explain EGR system. C)

Max. Marks: 56

Set

#### Set S

- Q.6 The air flow to a four cylinder four stroke petrol engine is measured by 05 a) means of a 7.5 cm diameter sharp edged orifice, coefficient of discharge is 0.6. During a test on the engine following data were recorded. Bore = 11cm, stroke = 13 cm, engine speed = 2250 rpm, brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000 kJ/kg, pressure drop across the orifice = 4.1 cm of water, atmospheric temperature and pressure are 15°C, and 1.013 bar. Calculate:
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  - 3) Volumetric efficiency based on free air conditions.
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  - Write a note on 'Octane number'. C)
- Q.7 05 a) Write a note on exhaust emission control methods of SI engine. Draw and explain heat balance sheet used to measure performance I.C. 05 b) Engines.
  - c) Write a note on soot and particulate matters.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering CAD-CAM & CAE

Day & Date: Monday, 25-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

### **MCQ/Objective Type Questions**

Duration: 30 Minutes

Seat

No.

### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) G 71 preparatory code is used for \_\_\_\_\_
  - a) Absolute presettingc) Metric unit setting
- b) Absolute co-ordinate settingd) None of these
- d) None of the

CAM

b)

### 2) Miscellaneous function used for Coolant off is \_\_\_\_\_

- a) M 07 b) M 01
- c) M 03 d) All of the above
- 3) ANSYS is \_\_\_\_\_ software.
  - a) CAD
  - c) CAE d) None of these
- 4) Listing of relative cutter and workpiece a positions in manual part programming is \_\_\_\_\_.
  - a) Manuscript b) Programming
  - c) Automation d) All of above
- 5) Common language developed for computer assisted part programming is
  - a) WAF b) MDI c) APT d) All of above
- 6) A comparator is required in \_\_\_\_\_.
  - a) Open loop system b) Closed loop system
  - c) Both A & B d) None
- Zoom in and zoom out of an object and any portion of an object between the edges is \_\_\_\_\_.
  - a) Translation b) Rotation
  - c) Scaling d) None of these
- 8) Milling operation is an example \_\_\_\_\_.
  a) Contouring NC b) Point to point NC
  - c) Straight cut d) All of above
- 9) In turning operation Z-axis refers to \_\_\_\_\_.
  - a) Spindle axisb) Depth of cutc) Plane designationd) None of these

Set P

Max. Marks: 70

Marks: 14

#### 10) Adaptive control system reduces \_\_\_\_

Machining time a)

a)

C)

C)

- Non productive time b)
- Power output c)
- None of these d)

**SLR-FM-127** 

Set P

- Integration of all business function of enterprise is \_ 11)
  - CAD-CAM b)
  - CIM CAE
- d) None of these
- Among these which is Drawing interchange file format \_\_\_\_\_. 12) a) DXF
  - b) UCS

d)

- CAD None of these C) d)
- In computer graphics GKS stands for \_ 13)
  - General Knowledge system a)
- b) Graphics kernel system

None of above

- Graphics Knowledge system C)
- Basic transformation of rotation of an image takes place about \_\_\_\_\_. 14)
  - Origin a)

Centre of image

- Corner of image b)
- d) Top plane

06

## Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** CAD-CAM & CAE

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section - I.

- 2) Q. No.5 is compulsory from Section II and solve any one form remaining.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

### Section - I

| Q.2 | a) | Explain Design process using CAD/CAM. |
|-----|----|---------------------------------------|
|     | b) | Discuss Graphic standards in CAD.     |

- Explain solid modeling schemes. Q.3 a)
  - A triangle PQR has its vertices at P(0,0), Q(4,0) and R(2,3). It is to be b) translated by 4 units in X direction and 2 units in Y direction then it is to be rotated in anticlockwise direction about the new position of point R through 90 degrees. Find the new position of the triangle. Explain your answer with a neat sketch.

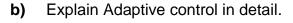
#### Answer the following questions. (Any Four) Q.4

- ERP a)
- b) **Automations**
- Parametric representation of curves c)
- CAPP & its type d)
- e) General steps used in FEM

### Section - II

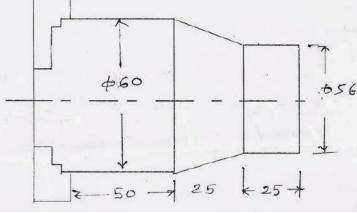
Q.5 a) Prepare a part program for stepped component given below. The various **08** detail are:

Speed:400 rpm Work material: Mild steel Work piece size :  $\phi$  60 x 100 **Tool Material: HSS** 



Feed rate: 200 mm/min

Tool type: Right hand facing tool





07 07

07

07

Max. Marks: 56

|     |           | SLR-FM-1   | 27 |
|-----|-----------|--|----|
|     |           | Set  | Ρ  |
| Q.6 | a)        | What is Part Programming? Explain the procedure associated with NC part programming. | 07 |
|     | b)        | List and Explain basic components of an NC system.                                   | 07 |
| Q.7 | Wri<br>a) | t <b>e short notes. (Any Four)</b><br>Pallests                                       | 14 |
|     | h)        | Compare CNC & DNC Machine Tools  |    |

- b) Compare CNC & DNC Machine Tools
  c) Canned cycles in part programming
  d) Open and closed loop system
  e) Word Address Format

Assume suitable data if necessary and mention it clearly. **MCQ/Objective Type Questions** Choose the correct alternatives from the options and rewrite the sentence. Milling operation is an example \_\_\_\_ 1) Contouring NC b) Point to point NC a) All of above C) Straight cut d) 2) In turning operation Z-axis refers to \_ Spindle axis Depth of cut a) b) Plane designation d) None of these c) Adaptive control system reduces 3) Machining time Non productive time b) a) Power output None of these C) d) Integration of all business function of enterprise is \_ 4) CAD-CAM CIM a) b) c) CAE d) None of these

Among these which is Drawing interchange file format \_\_\_\_\_. 5)

DXF b) UCS a) CAD None of these c) d) In computer graphics GKS stands for

C) Graphics Knowledge system None of above d) Basic transformation of rotation of an image takes place about \_\_\_\_\_. 7) Corner of image a) Origin b) Centre of image d) Top plane C) 8) G 71 preparatory code is used for \_\_\_\_

Absolute presetting b) Absolute co-ordinate setting a) Metric unit setting None of these c) d) Miscellaneous function used for Coolant off is M 07 M 01

b)

Graphics kernel system

9)

General Knowledge system

- a) b) M 03 d) All of the above C)
- 10) ANSYS is software.
  - CAD b) CAM a)
  - CAE C) d) None of these

T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** CAD-CAM & CAE

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. 2) Figures to the right indicate full marks. **Duration: 30 Minutes** 

### SLR-FM-127

Max. Marks: 70

Set | Q

Day & Date: Monday, 25-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Q.1

6)

a)

Marks: 14

- 11) Listing of relative cutter and workpiece a positions in manual part programming is \_ \_\_\_·
  - Manuscript a)

Programming b)

**SLR-FM-127** 

Set Q

- Automation d) All of above C)
- 12) Common language developed for computer assisted part programming is
  - WAF a)
- b) MDI
- APT All of above C) d)
- 13) A comparator is required in \_\_\_\_\_.
- b) Closed loop system
- Open loop system Both A & B None C) d)
- Zoom in and zoom out of an object and any portion of an object between 14) the edges is \_\_\_\_\_.
  - a) Translation
  - Scaling C)

a)

- b) Rotation
- None of these d)

06

## Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** CAD-CAM & CAE

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section - I.

- 2) Q. No.5 is compulsory from Section II and solve any one form remaining.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

### Section - I

| Q.2 | a) | Explain Design process using CAD/CAM. |
|-----|----|---------------------------------------|
|     | b) | Discuss Graphic standards in CAD.     |

- Explain solid modeling schemes. Q.3 a)
  - A triangle PQR has its vertices at P(0,0), Q(4,0) and R(2,3). It is to be b) translated by 4 units in X direction and 2 units in Y direction then it is to be rotated in anticlockwise direction about the new position of point R through 90 degrees. Find the new position of the triangle. Explain your answer with a neat sketch.

#### Answer the following questions. (Any Four) Q.4

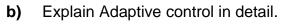
- ERP a)
- b) **Automations**
- Parametric representation of curves c)
- CAPP & its type d)
- e) General steps used in FEM

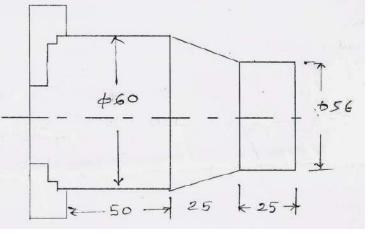
### Section - II

Q.5 a) Prepare a part program for stepped component given below. The various **08** detail are:

Speed:400 rpm Work material: Mild steel Work piece size :  $\phi$  60 x 100

Feed rate: 200 mm/min **Tool Material: HSS** Tool type: Right hand facing tool







**SLR-FM-127** 

14

Max. Marks: 56

07 07

07

|     |                 | SLR-FM-1   | 27 |
|-----|-----------------|--|----|
|     |                 | Set  | Q  |
| Q.6 | a)              | What is Part Programming? Explain the procedure associated with NC part programming. | 07 |
|     | b)              | List and Explain basic components of an NC system.                                   | 07 |
| Q.7 | Wri<br>a)<br>b) | <b>te short notes. (Any Four)</b><br>Pallests<br>Compare CNC & DNC Machine Tools     | 14 |

- b) Compare CNC & DNC Machine Tools
  c) Canned cycles in part programming
  d) Open and closed loop system
  e) Word Address Format

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** CAD-CAM & CAE Day & Date: Monday, 25-11-2019 Max. Marks: 70 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- Assume suitable data if necessary and mention it clearly.

### **MCQ/Objective Type Questions**

### **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence.

- Common language developed for computer assisted part programming is 1)
  - WAF a) b) MDI APT All of above C) d)
  - A comparator is required in \_\_\_\_\_. 2)
    - Open loop system a)
      - b) Closed loop system Both A & B C) None d)

#### 3) Zoom in and zoom out of an object and any portion of an object between the edges is

- Translation a) b) Rotation
- c) Scaling d) None of these
- Milling operation is an example \_\_\_\_ 4)
  - Contouring NC b) Point to point NC a) Straight cut d) All of above c)
- In turning operation Z-axis refers to \_\_\_\_ 5) Depth of cut b) Spindle axis a)
  - Plane designation None of these C) d)
- Adaptive control system reduces \_\_\_\_ 6) Machining time Non productive time b) a)
  - Power output None of these c) d)

Integration of all business function of enterprise is \_\_\_\_ 7)

- CAD-CAM a) CIM b) CAE None of these C) d)
- Among these which is Drawing interchange file format \_\_\_\_\_. 8)
  - DXF UCS a) b) CAD
  - None of these C) d)
- In computer graphics GKS stands for 9)
  - General Knowledge system b) Graphics kernel system a)
  - Graphics Knowledge system d) None of above C)
- Basic transformation of rotation of an image takes place about \_\_\_\_\_. 10)
  - Corner of image a) Origin b) Centre of image c)
    - Top plane d)

SLR-FM-127

Set | R

Seat No.

Marks: 14

- 11) G 71 preparatory code is used for \_\_\_\_\_.
  - a) Absolute presetting
  - c) Metric unit setting
- b) Absolute co-ordinate setting

Set | R

d) None of these

- 12) Miscellaneous function used for Coolant off is \_\_\_\_\_.
  - M 07 b)
  - M 03
- d) All of the above

M 01

- 13) ANSYS is \_\_\_\_\_ software.
  - a) CAD c) CAE

a)

C)

- b) CAMd) None of these
- 14) Listing of relative cutter and workpiece a positions in manual part programming is \_\_\_\_\_.
  - a) Manuscript
  - c) Automation

- b) Programming
- d) All of above

### Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering CAD-CAM & CAE

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Answer any two questions from Section -I.

- 2) Q. No.5 is compulsory from Section II and solve any one form remaining.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

### Section - I

| Q.2 | a)   | Explain Design process using CAD/CAM. |
|-----|------|---------------------------------------|
|     | I- \ | Discuss Onerhis standards in OAD      |

- **b)** Discuss Graphic standards in CAD.
- **Q.3 a**) Explain solid modeling schemes.
  - b) A triangle PQR has its vertices at P(0,0), Q(4,0) and R(2,3). It is to be translated by 4 units in X direction and 2 units in Y direction then it is to be rotated in anticlockwise direction about the new position of point R through 90 degrees. Find the new position of the triangle. Explain your answer with a neat sketch.

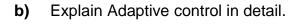
### Q.4 Answer the following questions. (Any Four)

- a) ERP
- **b)** Automations
- c) Parametric representation of curves
- d) CAPP & its type
- e) General steps used in FEM

### Section – II

Q.5 a) Prepare a part program for stepped component given below. The various 08 detail are:

Speed:400 rpm Work material: Mild steel Work piece size :  $\phi$  60 x 100 Feed rate: 200 mm/min Tool Material: HSS Tool type: Right hand facing tool



 $\begin{array}{c} & & & \\ & & & & \\ & & & \\ & &$ 



07 07

07

07

)

Max. Marks: 56

SLR-FM-127



|     |                 | SLR-FM-1   | 27 |
|-----|-----------------|--|----|
|     |                 | Set  | R  |
| Q.6 | a)              | What is Part Programming? Explain the procedure associated with NC part programming. | 07 |
|     | b)              | List and Explain basic components of an NC system.                                   | 07 |
| Q.7 | Wri<br>a)<br>b) | <b>te short notes. (Any Four)</b><br>Pallests<br>Compare CNC & DNC Machine Tools     | 14 |

- b) Compare CNC & DNC Machine Tools
  c) Canned cycles in part programming
  d) Open and closed loop system
  e) Word Address Format

|      | MCQ/Objective Type Questions  |   |  |  |  |  |
|------|---|---|--|--|--|--|
| Dura | Duration: 30 Minutes Marks: 14  |   |  |  |  |  |
| Q.1  | 0.1 Choose the correct alternatives from the options and rewrite the sentence. 14 |   |  |  |  |  |
| _    | 1)  | Adaptive control system reducesa) Machining timeb) Non productive timec) Power outputd) None of these   |  |  |  |  |
|      | 2)  | Integration of all business function of enterprise isa) CIMb) CAD-CAMc) CAEd) None of these   |  |  |  |  |
|      | 3)  | Among these which is Drawing interchange file formata) DXFb) UCSc) CADd) None of these  |  |  |  |  |
|      | 4)  | In computer graphics GKS stands for<br>a) General Knowledge system b) Graphics kernel system<br>c) Graphics Knowledge system d) None of above |  |  |  |  |
|      | 5)  | Basic transformation of rotation of an image takes place abouta) Originb) Corner of imagec) Centre of imaged) Top plane                       |  |  |  |  |
|      | 6)  | G 71 preparatory code is used fora) Absolute presettingb) Absolute co-ordinate settingc) Metric unit settingd) None of these                  |  |  |  |  |
|      | 7)  | Miscellaneous function used for Coolant off isa) M 07b) M 01c) M 03d) All of the above  |  |  |  |  |
|      | 8)  | ANSYS is software.a) CADb) CAMc) CAEd) None of these  |  |  |  |  |
|      | 9)  | Listing of relative cutter and workpiece a positions in manual partprogramming isa) Manuscriptb) Programmingc) Automationd) All of above      |  |  |  |  |
|      | 10)   | Common language developed for computer assisted part programming is   |  |  |  |  |

b)

d)

MDI

All of above

WAF

APT

a)

c)

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. 2) Figures to the right indicate full marks. 3) Assume suitable data if necessary and mention it clearly. MCO/Objective Type Questions Dur

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** CAD-CAM & CAE

Seat No.

Max. Marks: 70

Set

S

| 11) | A comparator is required in |     |
|-----|-----------------------------|-----|
| ••• |                             | - · |

- Open loop system a) C)
- Closed loop system b) None d)

Set S

- Both A & B
- Zoom in and zoom out of an object and any portion of an object between
- the edges is \_\_\_\_\_. Translation a)

Scaling

c)

12)

- b) Rotation
  - d) None of these
- Milling operation is an example \_\_\_\_\_. 13)
  - Contouring NC a)
  - C) Straight cut
- b) Point to point NC
- d) All of above
- In turning operation Z-axis refers to \_\_\_\_ 14)
  - Spindle axis a)
  - Plane designation C)
- \_\_\_\_. b) Depth of cut
- None of these d)

06

# Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** CAD-CAM & CAE

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section - I.

- 2) Q. No.5 is compulsory from Section II and solve any one form remaining.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

### Section - I

| Q.2 | a) | Explain Design process using CAD/CAM. |
|-----|----|---------------------------------------|
|     | b) | Discuss Graphic standards in CAD.     |

- Explain solid modeling schemes. Q.3 a)
  - A triangle PQR has its vertices at P(0,0), Q(4,0) and R(2,3). It is to be b) translated by 4 units in X direction and 2 units in Y direction then it is to be rotated in anticlockwise direction about the new position of point R through 90 degrees. Find the new position of the triangle. Explain your answer with a neat sketch.

#### Answer the following questions. (Any Four) Q.4

- ERP a)
- b) **Automations**
- Parametric representation of curves c)
- CAPP & its type d)
- e) General steps used in FEM

### Section – II

Q.5 a) Prepare a part program for stepped component given below. The various **08** detail are:

Speed:400 rpm Work material: Mild steel Work piece size :  $\phi$  60 x 100

Feed rate: 200 mm/min **Tool Material: HSS** Tool type: Right hand facing tool

Explain Adaptive control in detail. b)

25-

660 556

25

50

Max. Marks: 56



Set

S

07 07

07

07

|     |                 | Set  | S  |
|-----|-----------------|--|----|
| Q.6 | a)              | What is Part Programming? Explain the procedure associated with NC part programming. | 07 |
|     | b)              | List and Explain basic components of an NC system.                                   | 07 |
| Q.7 | Wri<br>a)<br>b) | <b>te short notes. (Any Four)</b><br>Pallests<br>Compare CNC & DNC Machine Tools     | 14 |

- c) Canned cycles in part programming
  d) Open and closed loop system
  e) Word Address Format

| Don't forget to mention Q. P. Set (P/Q/R/S) on Top of Page. |                   |  |  |  |  |
|---|-------------------|--|--|--|--|
| MCQ/Objective Type Questions                                |                   |  |  |  |  |
| Dura  | ition: 3          | Minutes Marks: 14  |  |  |  |
| Q.1   | <b>Choo</b><br>1) | The the correct alternatives from the options and rewrite the sentence. 14<br>f Z and Z' are actual and virtual number of teeth for a helical gear with $\psi$<br>as a helix angle then<br>a) Z' = Z/tan <sup>3</sup> $\psi$ b) Z' = Z/cos $\psi$<br>c) Z' = Z/cos <sup>2</sup> $\psi$ d) Z' = Z/cos <sup>3</sup> $\psi$ |  |  |  |
|   | 2)                | The Diametral pitch of gears is given by<br>a) m b) 1/m<br>c) πm d) Mz   |  |  |  |
|   | 3)                | f the lead angle of worm is $6^{\circ}$ , then the helix angle will be<br>a) $84^{\circ}$ b) $78^{\circ}$<br>c) $6^{\circ}$ d) $12^{\circ}$  |  |  |  |
|   | 4)                | For designing thick cylinder made of Cast Iron, the equation used is<br>a) Clavarino's equation b) Birnie's equation<br>c) Lame's equation d) Buckingham equation  |  |  |  |
|   | 5)                | When the diameter of journal is equal to the length of bearing, it is calledasa) Short bearingb) Long bearingc) Equal bearingd) Square bearing   |  |  |  |
|   | 6)                | The number of starts on the worm depends upon<br>a) Speed of the worm<br>b) Speed of the worm wheel<br>c) Velocity ratio<br>d) Number of teeth on worm wheel   |  |  |  |
|   | 7)                | Two equal bevel gears mounted on perpendicular shafts are called asa) Spiral bevel gearsb) Crown gearsb) Miter gearsd) Hypoid gears  |  |  |  |
|   | 8)                | Objective of optimum design of mechanical element can bea)Maximization of weightb)Minimization of lifeb)Maximization of spaced)Minimization of cost  |  |  |  |
|   | 9)                | Autofrettage is obtained by  |  |  |  |

b)

d)

Decreasing the wall thickness

Increasing the wall thickness

- 3) Q. No. 1 is compulsory. It should be solved in first 30
- 2) Assume suitable data if necessary and mention it clearly.

T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019

- Minute. 4) Answer Objective type questions on Page No. 3 only.
- Mechanical Engineering

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 01:00 PM

Welding

Overloading the cylinder

a)

c)

Seat

No.

Instructions: 1) Figures to the right indicate full marks.

MACHINE DEŠIGN – II

Set

Max. Marks: 70



- 10) In hydrodynamic journal bearings \_\_\_\_\_.
  - a) Running friction is high
  - b) Starting friction is high
  - c) Both running & starting friction is higher
  - d) None of the above
- 11) In a bearing number 6215 the inner diameter of the bearing is \_\_\_\_\_.
  - a) 75 mm b) 15 mm
  - c) 1.5 mm d) 25 mm
- 12) The thickness of thin cylinder is determined on the basis of \_\_\_\_\_.
  - a) circumferential stress
- b) longitudinal stress

Set P

- c) radial stress d) principal shear stress
- 13) The angular contact ball bearing can take \_\_\_\_\_.
  - a) only radial load
  - b) Only thrust load
  - c) Combined radial and thrust load
  - d) None of these
- Weld joint efficiency for Class II pressure vessels according to IS 2825 1969 is \_\_\_\_\_.
  - a) 100% b) 50% c) 75% d) 85%

## Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN -II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

### Section I

- Q.2 What are the various types of gear tooth failures? State their causes and a) 06 remedies.
  - b) A pair of mating spur gears with 20° pressure angle, consists of 18 teeth 08 pinion supplied with 5KW power at 1440 rpm from an electric motor. The gear shaft rotates at 500 rpm. Both the gears are made of plain carbon steel having ultimate tensile strength of 600 N/mm<sup>2</sup>. The face width of the gears is ten times its module. The starting torque is 150% of rated torque. The service factor is 2. Assume the dynamic load is accounted by means of the velocity factor.

Use  $C_v = [3/(3+v)]$ . Y for 18 teeth = 0.308 Determine:

- 1) Module and select 1st preference module
- 2) Effective tooth load
- 3) Surface hardness required if factor of safety is 2.
- Q.3 Explain the various types of parameters used in optimum design. 03 a)
  - Develop PDE, SDE and LE and Material selection factor(MSF) for a rod 04 b) subjected to a tensile load P for the minimization of weight.
  - A pair of parallel helical gears consists of 20 right hand teeth pinion 07 C) meshing with 72 left hand teeth gear. The pinion rotates at 1000 rpm. The normal module is 5mm and the face width is 50mm. The normal pressure angle is  $20^{\circ}$  while the helix angle is  $23^{\circ}$ . Both the gears are made of steel (Sut =  $600 \text{ N/mm}^2$ ) and heat treated to surface hardness of 280 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Face width is ten times the normal module. Assume velocity factor to account for the dynamic load.

Use  $Cv = [5.6/(5.6 + \sqrt{v})]$ . Lewis form factor for formative number of teeth on pinion = 0.3475

Calculate :

- 1) Beam strength
- 2) Wear strength
- Safe power transmitting capacity of gears 3)
- Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 03 a) 04
  - Discuss the various types of end covers used in pressure vessels. b)

Max. Marks: 56



Set P

- c) A cylindrical shell of internal diameter of 2 meters is subjected to an operating pressure of 1N/mm<sup>2</sup>. The allowable tensile strength of plate material is 150 N/mm<sup>2</sup> and corrosion allowance is 2mm. The welded joint efficiency is 85%. Torispherical end closures are used having crown radius of 1.8 meters. Determine:
  - i) Thickness of cylindrical shell
  - ii) Thickness of torispherical end closure

#### Section – II

- Q.5 a) A pair of straight teeth bevel gears has a speed ratio 2:1. The pitch circle 07 diameter of the pinion is 80 mm at the large end of the tooth. 5 kW power is supplied to the pinion that rotates at 800 rpm. The face width is 40 mm and the pressure angle is 20°. Calculate the tangential, radial and axial components of the resultant tooth force acting on the pinion and gear meshing teeth
  - b) A pair of worm and worm wheel is designated as 3/60/10/6 The worm is transmitting 10 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the pressure angle is 20<sup>0</sup>. Determine the components of the gear tooth force acting on the worm and worm wheel.
- **Q.6** a) Derive the expression for formative number of teeth for bevel gears.
  - b) What are the materials used for sliding contact bearing?
  - c) A pair of worm gears designated as 1/40/10/4 is enclosed in a gear box having effective surface area of 0.30 m<sup>2</sup>. A fan is mounted on the worm shaft to circulate air over the surface of the fins. The coefficient of heat transfer can be taken as 25 W/m<sup>2</sup> °C. The permissible temperature rise of the lubricating oil above atmospheric temperature is 50°C. The coefficient of friction is 0.035 and normal pressure angle is 20°. Calculate the power transmitting capacity based on thermal considerations.

### **Q.7** a) Define the following terms used for rolling contact bearings.

- 1) Static load capacity
- 2) dynamic load capacity
- b) In a particular application, the radial load acting on a ball bearing is 2200N and the axial load acting is 1000N. X and Y factors are 0.56 and 1.08 respectively. If the dynamic load carrying capacity of the bearing is 5590 N, Calculate the expected life of the bearing
- c) Following data is given for a 360° hydrodynamic bearing: radial load = 4.6 kN; journal speed = 1490 rpm; journal diameter = 60 mm; bearing length = 60mm; radial clearance = 0.06mm; viscosity of lubricant = 25 cP;

Assuming the total heat generated in bearing is carried by the total oil flow in the bearing,

calculate:

- 1) Sommerfeld number
- 2) Coefficient of friction
- 3) Power lost in the friction

For (1/d) = 1, use (r/c)\*f = 3.22; S = 0.121;  $(h_0/c) = 0.4$ ;

04

07

06

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** MACHINE DESIGN - II

Day & Date: Tuesday, 26-11-2019

Time: 10:00 AM To 01:00 PM

**Duration: 30 Minutes** 

Seat

No.

**Instructions:** 1) Figures to the right indicate full marks.

- 2) Assume suitable data if necessary and mention it clearly.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 Minute.
- 4) Answer Objective type questions on Page No. 3 only. Don't forget to mention Q. P. Set (P/Q/R/S) on Top of Page.

### MCQ/Objective Type Questions

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence.

Objective of optimum design of mechanical element can be 1)

b)

d)

- Maximization of weight a)
- Maximization of space C)
- Autofrettage is obtained by \_\_\_\_\_. 2)
  - Welding a)

b) Decreasing the wall thickness Increasing the wall thickness d)

Minimization of life

Minimization of cost

- Overloading the cylinder C)
- 3) In hydrodynamic journal bearings \_\_\_\_\_.
  - Running friction is high a)
  - Starting friction is high b)
  - Both running & starting friction is higher c)
  - None of the above d)

4) In a bearing number 6215 the inner diameter of the bearing is \_\_\_\_\_.

- 75 mm 15 mm a) b)
  - 1.5 mm C) d) 25 mm

The thickness of thin cylinder is determined on the basis of \_\_\_\_\_. 5)

- a) circumferential stress b) longitudinal stress c)
  - radial stress d) principal shear stress
- 6) The angular contact ball bearing can take .
  - only radial load a)
  - Only thrust load b)
  - Combined radial and thrust load C)
  - None of these d)
- 7) Weld joint efficiency for Class II pressure vessels according to IS 2825 -1969 is
  - a) 100% b) 50% 75% d) 85% c)
- If Z and Z' are actual and virtual number of teeth for a helical gear with  $\psi$ 8) as a helix angle then \_\_\_\_\_.

| a) | Ζ' = Ζ/tan <sup>3</sup> ψ | b) | Z' = Z/cosψ               |
|----|---------------------------|----|---------------------------|
| c) | Z' = Z/cos²ψ              | d) | Z' = Z/cos <sup>3</sup> ψ |

Max. Marks: 70

Marks: 14

14

Set Q

Set Q

- 9) The Diametral pitch of gears is given by \_\_\_\_\_
  - a) M b) 1/m c) πm d) Mz
- 10) If the lead angle of worm is  $6^{\circ}$ , then the helix angle will be \_\_\_\_\_.
  - a) 84° b) 78°
  - c) 6° d) 12°

11) For designing thick cylinder made of Cast Iron, the equation used is \_\_\_\_\_.

- Clavarino's equation b) Birnie's equation
- c) Lame's equation d) Buckingham equation
- 12) When the diameter of journal is equal to the length of bearing, it is called as \_\_\_\_\_.
  - a) Short bearing
- b) Long bearing
- Equal bearing d) Square bearing
- 13) The number of starts on the worm depends upon \_\_\_\_\_.
  - a) Speed of the worm
  - b) Speed of the worm wheel
  - c) Velocity ratio

a)

C)

- d) Number of teeth on worm wheel
- 14) Two equal bevel gears mounted on perpendicular shafts are called as \_\_\_\_\_.
  - a) Spiral bevel gears
- b) Crown gears

c) Miter gears

d) Hypoid gears

# Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN -II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

### Section I

- Q.2 What are the various types of gear tooth failures? State their causes and 06 a) remedies.
  - b) A pair of mating spur gears with 20° pressure angle, consists of 18 teeth 08 pinion supplied with 5KW power at 1440 rpm from an electric motor. The gear shaft rotates at 500 rpm. Both the gears are made of plain carbon steel having ultimate tensile strength of 600 N/mm<sup>2</sup>. The face width of the gears is ten times its module. The starting torque is 150% of rated torque. The service factor is 2. Assume the dynamic load is accounted by means of the velocity factor.

Use  $C_v = [3/(3+v)]$ . Y for 18 teeth = 0.308 Determine:

- 1) Module and select 1st preference module
- 2) Effective tooth load
- 3) Surface hardness required if factor of safety is 2.
- Q.3 Explain the various types of parameters used in optimum design. 03 a)
  - Develop PDE, SDE and LE and Material selection factor(MSF) for a rod 04 b) subjected to a tensile load P for the minimization of weight.
  - A pair of parallel helical gears consists of 20 right hand teeth pinion 07 C) meshing with 72 left hand teeth gear. The pinion rotates at 1000 rpm. The normal module is 5mm and the face width is 50mm. The normal pressure angle is  $20^{\circ}$  while the helix angle is  $23^{\circ}$ . Both the gears are made of steel (Sut =  $600 \text{ N/mm}^2$ ) and heat treated to surface hardness of 280 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Face width is ten times the normal module. Assume velocity factor to account for the dynamic load.

Use  $Cv = [5.6/(5.6 + \sqrt{v})]$ . Lewis form factor for formative number of teeth on pinion = 0.3475

Calculate :

- 1) Beam strength
- 2) Wear strength
- Safe power transmitting capacity of gears 3)
- Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 03 a) 04
  - Discuss the various types of end covers used in pressure vessels. b)

Max. Marks: 56

Set

Set Q

07

04

03

04

- c) A cylindrical shell of internal diameter of 2 meters is subjected to an operating pressure of 1N/mm<sup>2</sup>. The allowable tensile strength of plate material is 150 N/mm<sup>2</sup> and corrosion allowance is 2mm. The welded joint efficiency is 85%. Torispherical end closures are used having crown radius of 1.8 meters. Determine:
  - i) Thickness of cylindrical shell
  - ii) Thickness of torispherical end closure

### Section – II

- Q.5 a) A pair of straight teeth bevel gears has a speed ratio 2:1. The pitch circle 07 diameter of the pinion is 80 mm at the large end of the tooth. 5 kW power is supplied to the pinion that rotates at 800 rpm. The face width is 40 mm and the pressure angle is 20°. Calculate the tangential, radial and axial components of the resultant tooth force acting on the pinion and gear meshing teeth
  - b) A pair of worm and worm wheel is designated as 3/60/10/6 The worm is transmitting 10 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the pressure angle is 20<sup>0</sup>. Determine the components of the gear tooth force acting on the worm and worm wheel.
- **Q.6** a) Derive the expression for formative number of teeth for bevel gears.
  - b) What are the materials used for sliding contact bearing?
  - c) A pair of worm gears designated as 1/40/10/4 is enclosed in a gear box having effective surface area of 0.30 m<sup>2</sup>. A fan is mounted on the worm shaft to circulate air over the surface of the fins. The coefficient of heat transfer can be taken as 25 W/m<sup>2</sup> °C. The permissible temperature rise of the lubricating oil above atmospheric temperature is 50°C. The coefficient of friction is 0.035 and normal pressure angle is 20°. Calculate the power transmitting capacity based on thermal considerations.

### **Q.7** a) Define the following terms used for rolling contact bearings.

- 1) Static load capacity
- 2) dynamic load capacity
- b) In a particular application, the radial load acting on a ball bearing is 2200N and the axial load acting is 1000N. X and Y factors are 0.56 and 1.08 respectively. If the dynamic load carrying capacity of the bearing is 5590 N, Calculate the expected life of the bearing
   c) Following data is given for a 360° hydrodynamic bearing: 06
- c) Following data is given for a 360° hydrodynamic bearing: radial load = 4.6 kN; journal speed = 1490 rpm; journal diameter = 60 mm; bearing length = 60mm; radial clearance = 0.06mm; viscosity of lubricant = 25 cP;

Assuming the total heat generated in bearing is carried by the total oil flow in the bearing,

calculate:

- 1) Sommerfeld number
- 2) Coefficient of friction
- 3) Power lost in the friction

For (1/d) = 1, use (r/c)\*f = 3.22; S = 0.121;  $(h_0/c) = 0.4$ ;

Page **8** of **16** 

# T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### MACHINE DESIGN - II

Day & Date: Tuesday, 26-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

**Instructions:** 1) Figures to the right indicate full marks.

- 2) Assume suitable data if necessary and mention it clearly.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 Minute.
- 4) Answer Objective type questions on Page No. 3 only. Don't forget to mention Q. P. Set (P/Q/R/S) on Top of Page.

### **MCQ/Objective Type Questions**

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

When the diameter of journal is equal to the length of bearing, it is called 1)

b)

as

**Duration: 30 Minutes** 

- Short bearing a) C)
  - Equal bearing Square bearing d)
- 2) The number of starts on the worm depends upon \_\_\_\_\_.
  - Speed of the worm a)
  - Speed of the worm wheel b)
  - c) Velocity ratio
  - Number of teeth on worm wheel d)
- 3) Two equal bevel gears mounted on perpendicular shafts are called as \_\_\_\_\_.
  - Spiral bevel gears a) Miter gears C)
    - b) Crown gears Hypoid gears d)
- Objective of optimum design of mechanical element can be \_ 4)
  - Maximization of weight a)
  - Maximization of space C)
- b) Minimization of life Minimization of cost

Long bearing

- d)
- 5) Autofrettage is obtained by \_\_\_\_\_.
  - Welding a)
  - Overloading the cylinder C)
- In hydrodynamic journal bearings \_\_\_\_\_. 6)
  - Running friction is high a)
  - b) Starting friction is high
  - Both running & starting friction is higher c)
  - None of the above d)
- In a bearing number 6215 the inner diameter of the bearing is \_\_\_\_\_. 7)
  - 75 mm 15 mm a) b)
  - 1.5 mm C) d) 25 mm
- 8) The thickness of thin cylinder is determined on the basis of \_\_\_\_\_.
  - circumferential stress longitudinal stress a) b)
  - C) radial stress d) principal shear stress

b) Decreasing the wall thickness

Increasing the wall thickness d)

SLR-FM-128

Set R

Max. Marks: 70

Marks: 14

|     |  |                    | Set R   |
|-----|--|--------------------|---|
| 9)  | <ul> <li>The angular contact ball bearing can</li> <li>a) only radial load</li> <li>b) Only thrust load</li> <li>c) Combined radial and thrust load</li> <li>d) None of these</li> </ul> |                    |   |
| 10) | Weld joint efficiency for Class II pres<br>1969 is<br>a) 100%<br>c) 75%  | sure v<br>b)<br>d) | vessels according to IS 2825 –<br>50%<br>85%                                  |
| 11) | If Z and Z' are actual and virtual num<br>as a helix angle then<br>a) Z' = Z/tan <sup>3</sup> $\psi$<br>c) Z' = Z/cos <sup>2</sup> $\psi$  |                    | f teeth for a helical gear with ψ<br>Z' = Z/cosψ<br>Z' = Z/cos <sup>3</sup> ψ |
| 12) | The Diametral pitch of gears is given<br>a) m<br>c) πm   | by<br>b)<br>d)     | <br>1/m<br>Mz   |
| 13) | If the lead angle of worm is 6°, then t<br>a) 84°<br>c) 6°   | he he<br>b)<br>d)  | lix angle will be<br>78°<br>12°   |
| 14) | <ul><li>For designing thick cylinder made of</li><li>a) Clavarino's equation</li><li>c) Lame's equation</li></ul>  | Cast<br>b)<br>d)   | Birnie's equation   |

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN -II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

### Section I

- Q.2 What are the various types of gear tooth failures? State their causes and a) 06 remedies.
  - b) A pair of mating spur gears with 20° pressure angle, consists of 18 teeth 08 pinion supplied with 5KW power at 1440 rpm from an electric motor. The gear shaft rotates at 500 rpm. Both the gears are made of plain carbon steel having ultimate tensile strength of 600 N/mm<sup>2</sup>. The face width of the gears is ten times its module. The starting torque is 150% of rated torque. The service factor is 2. Assume the dynamic load is accounted by means of the velocity factor.

Use  $C_v = [3/(3+v)]$ . Y for 18 teeth = 0.308 Determine:

- 1) Module and select 1st preference module
- 2) Effective tooth load
- 3) Surface hardness required if factor of safety is 2.
- Q.3 Explain the various types of parameters used in optimum design. 03 a)
  - Develop PDE, SDE and LE and Material selection factor(MSF) for a rod 04 b) subjected to a tensile load P for the minimization of weight.
  - A pair of parallel helical gears consists of 20 right hand teeth pinion 07 C) meshing with 72 left hand teeth gear. The pinion rotates at 1000 rpm. The normal module is 5mm and the face width is 50mm. The normal pressure angle is  $20^{\circ}$  while the helix angle is  $23^{\circ}$ . Both the gears are made of steel (Sut =  $600 \text{ N/mm}^2$ ) and heat treated to surface hardness of 280 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Face width is ten times the normal module. Assume velocity factor to account for the dynamic load.

Use  $Cv = [5.6/(5.6 + \sqrt{v})]$ . Lewis form factor for formative number of teeth on pinion = 0.3475

Calculate :

- 1) Beam strength
- 2) Wear strength
- Safe power transmitting capacity of gears 3)
- Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 03 a) 04
  - Discuss the various types of end covers used in pressure vessels. b)

Max. Marks: 56

Set

R

Set R

- c) A cylindrical shell of internal diameter of 2 meters is subjected to an operating pressure of 1N/mm<sup>2</sup>. The allowable tensile strength of plate material is 150 N/mm<sup>2</sup> and corrosion allowance is 2mm. The welded joint efficiency is 85%. Torispherical end closures are used having crown radius of 1.8 meters. Determine:
  - i) Thickness of cylindrical shell
  - ii) Thickness of torispherical end closure

#### Section – II

- Q.5 a) A pair of straight teeth bevel gears has a speed ratio 2:1. The pitch circle 07 diameter of the pinion is 80 mm at the large end of the tooth. 5 kW power is supplied to the pinion that rotates at 800 rpm. The face width is 40 mm and the pressure angle is 20°. Calculate the tangential, radial and axial components of the resultant tooth force acting on the pinion and gear meshing teeth
  - b) A pair of worm and worm wheel is designated as 3/60/10/6 The worm is transmitting 10 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the pressure angle is 20<sup>0</sup>. Determine the components of the gear tooth force acting on the worm and worm wheel.
- **Q.6** a) Derive the expression for formative number of teeth for bevel gears.
  - b) What are the materials used for sliding contact bearing?
  - c) A pair of worm gears designated as 1/40/10/4 is enclosed in a gear box having effective surface area of 0.30 m<sup>2</sup>. A fan is mounted on the worm shaft to circulate air over the surface of the fins. The coefficient of heat transfer can be taken as 25 W/m<sup>2</sup> °C. The permissible temperature rise of the lubricating oil above atmospheric temperature is 50°C. The coefficient of friction is 0.035 and normal pressure angle is 20°. Calculate the power transmitting capacity based on thermal considerations.

### **Q.7** a) Define the following terms used for rolling contact bearings.

- 1) Static load capacity
- 2) dynamic load capacity
- b) In a particular application, the radial load acting on a ball bearing is 2200N and the axial load acting is 1000N. X and Y factors are 0.56 and 1.08 respectively. If the dynamic load carrying capacity of the bearing is 5590 N, Calculate the expected life of the bearing
   c) Following data is given for a 360° hydrodynamic bearing: 06
- c) Following data is given for a 360° hydrodynamic bearing: radial load = 4.6 kN; journal speed = 1490 rpm; journal diameter = 60 mm; bearing length = 60mm; radial clearance = 0.06mm; viscosity of lubricant = 25 cP;

Assuming the total heat generated in bearing is carried by the total oil flow in the bearing,

calculate:

- 1) Sommerfeld number
- 2) Coefficient of friction
- 3) Power lost in the friction

For (1/d) = 1, use (r/c)\*f = 3.22; S = 0.121;  $(h_0/c) = 0.4$ ;

04 03

04

# T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

### MACHINE DEŠIGN – II

Day & Date: Tuesday, 26-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

**Instructions:** 1) Figures to the right indicate full marks.

- 2) Assume suitable data if necessary and mention it clearly.
- 3) Q. No. 1 is compulsory. It should be solved in first 30 Minute.
- 4) Answer Objective type questions on Page No. 3 only. Don't forget to mention Q. P. Set (P/Q/R/S) on Top of Page.

### MCQ/Objective Type Questions

### Duration: 30 Minutes

### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) In hydrodynamic journal bearings \_\_\_\_\_.
  - a) Running friction is high
  - b) Starting friction is high
  - c) Both running & starting friction is higher
  - d) None of the above
- 2) In a bearing number 6215 the inner diameter of the bearing is \_\_\_\_\_.
  - a) 75 mm b) 15 mm
  - c) 1.5 mm d) 25 mm

3) The thickness of thin cylinder is determined on the basis of \_\_\_\_\_.

- a) circumferential stress b) longitudinal stress
- c) radial stress d) principal shear stress

### 4) The angular contact ball bearing can take \_\_\_\_\_.

- a) only radial load
- b) Only thrust load
- c) Combined radial and thrust load
- d) None of these

# 5) Weld joint efficiency for Class II pressure vessels according to IS 2825 – 1969 is \_\_\_\_\_.

| a) | 100% | b) | 50% |
|----|------|----|-----|
| c) | 75%  | d) | 85% |

 If Z and Z' are actual and virtual number of teeth for a helical gear with ψ as a helix angle then \_\_\_\_\_.

| a) | Ζ' = Ζ/tan <sup>3</sup> ψ | b) | Z' = Z/cosψ               |
|----|---------------------------|----|---------------------------|
| c  | $Z' = Z/\cos^2 \Psi$      | d) | Z' = Z/cos <sup>3</sup> ψ |

| C) | $Z' = Z/\cos^2 \psi$ | a) | $Z' = Z/\cos^{\circ}\psi$ |
|----|----------------------|----|---------------------------|
|    |                      |    |                           |

7) The Diametral pitch of gears is given by \_\_\_\_\_.

| a) | m  | b) | 1/m |
|----|----|----|-----|
| c) | πm | d) | Mz  |

8) If the lead angle of worm is 6°, then the helix angle will be \_\_\_\_\_.

| a) | 84 <sup>°</sup> | b) | 78°             |
|----|-----------------|----|-----------------|
| C) | 6°              | d) | 12 <sup>°</sup> |



SLR-FM-128

Max. Marks: 70

Marks: 14

|     |  | SLR-FM-128  |
|-----|--|---|
|     |  | Set S   |
| 9)  |  | Cast Iron, the equation used is<br>b) Birnie's equation<br>d) Buckingham equation           |
| 10) | -  | to the length of bearing, it is called<br>b) Long bearing<br>d) Square bearing              |
| 11) | <ul> <li>The number of starts on the worm deperation</li> <li>a) Speed of the worm</li> <li>b) Speed of the worm wheel</li> <li>c) Velocity ratio</li> <li>d) Number of teeth on worm wheel</li> </ul> |   |
| 12) | a) Spiral bevel gears  | erpendicular shafts are called as<br>b) Crown gears<br>d) Hypoid gears                      |
| 13) | Objective of optimum design of mechan<br>a) Maximization of weight<br>c) Maximization of space   | b) Minimization of life   |
| 14) | ,  | <ul><li>b) Decreasing the wall thickness</li><li>d) Increasing the wall thickness</li></ul> |

# Seat No.

### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN -II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

### Section I

- Q.2 What are the various types of gear tooth failures? State their causes and a) 06 remedies.
  - b) A pair of mating spur gears with 20° pressure angle, consists of 18 teeth 08 pinion supplied with 5KW power at 1440 rpm from an electric motor. The gear shaft rotates at 500 rpm. Both the gears are made of plain carbon steel having ultimate tensile strength of 600 N/mm<sup>2</sup>. The face width of the gears is ten times its module. The starting torque is 150% of rated torque. The service factor is 2. Assume the dynamic load is accounted by means of the velocity factor.

Use  $C_v = [3/(3+v)]$ . Y for 18 teeth = 0.308 Determine;

- 1) Module and select 1st preference module
- 2) Effective tooth load
- 3) Surface hardness required if factor of safety is 2.
- Q.3 Explain the various types of parameters used in optimum design. 03 a)
  - Develop PDE, SDE and LE and Material selection factor(MSF) for a rod 04 b) subjected to a tensile load P for the minimization of weight.
  - A pair of parallel helical gears consists of 20 right hand teeth pinion 07 C) meshing with 72 left hand teeth gear. The pinion rotates at 1000 rpm. The normal module is 5mm and the face width is 50mm. The normal pressure angle is  $20^{\circ}$  while the helix angle is  $23^{\circ}$ . Both the gears are made of steel (Sut =  $600 \text{ N/mm}^2$ ) and heat treated to surface hardness of 280 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Face width is ten times the normal module. Assume velocity factor to account for the dynamic load.

Use  $Cv = [5.6/(5.6 + \sqrt{v})]$ . Lewis form factor for formative number of teeth on pinion = 0.3475

Calculate :

- 1) Beam strength
- 2) Wear strength
- Safe power transmitting capacity of gears 3)
- Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 03 a) 04
  - Discuss the various types of end covers used in pressure vessels. b)

Max. Marks: 56



Set S

- c) A cylindrical shell of internal diameter of 2 meters is subjected to an operating pressure of 1N/mm<sup>2</sup>. The allowable tensile strength of plate material is 150 N/mm<sup>2</sup> and corrosion allowance is 2mm. The welded joint efficiency is 85%. Torispherical end closures are used having crown radius of 1.8 meters. Determine:
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#### Section – II

- Q.5 a) A pair of straight teeth bevel gears has a speed ratio 2:1. The pitch circle 07 diameter of the pinion is 80 mm at the large end of the tooth. 5 kW power is supplied to the pinion that rotates at 800 rpm. The face width is 40 mm and the pressure angle is 20°. Calculate the tangential, radial and axial components of the resultant tooth force acting on the pinion and gear meshing teeth
  - b) A pair of worm and worm wheel is designated as 3/60/10/6 The worm is transmitting 10 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the pressure angle is 20<sup>0</sup>. Determine the components of the gear tooth force acting on the worm and worm wheel.
- **Q.6** a) Derive the expression for formative number of teeth for bevel gears.
  - b) What are the materials used for sliding contact bearing?
  - c) A pair of worm gears designated as 1/40/10/4 is enclosed in a gear box having effective surface area of 0.30 m<sup>2</sup>. A fan is mounted on the worm shaft to circulate air over the surface of the fins. The coefficient of heat transfer can be taken as 25 W/m<sup>2</sup> °C. The permissible temperature rise of the lubricating oil above atmospheric temperature is 50°C. The coefficient of friction is 0.035 and normal pressure angle is 20°. Calculate the power transmitting capacity based on thermal considerations.

### **Q.7** a) Define the following terms used for rolling contact bearings.

- 1) Static load capacity
- 2) dynamic load capacity
- b) In a particular application, the radial load acting on a ball bearing is 2200N and the axial load acting is 1000N. X and Y factors are 0.56 and 1.08 respectively. If the dynamic load carrying capacity of the bearing is 5590 N, Calculate the expected life of the bearing
- c) Following data is given for a 360° hydrodynamic bearing: radial load = 4.6 kN; journal speed = 1490 rpm; journal diameter = 60 mm; bearing length = 60mm; radial clearance = 0.06mm; viscosity of lubricant = 25 cP;

Assuming the total heat generated in bearing is carried by the total oil flow in the bearing,

calculate:

- 1) Sommerfeld number
- 2) Coefficient of friction
- 3) Power lost in the friction

For (1/d) = 1, use (r/c)\*f = 3.22; S = 0.121;  $(h_0/c) = 0.4$ ;

04

07

| ura | tion: 3 | 30 N                 | linutes  | Marks: 14  |
|-----|---------|----------------------|--|--|
| .1  | A)      |                      | ve the objective question.<br>tch the appropriate pairs.<br>Column (1)           | <b>04</b><br>Column (2)  |
|     |         | a)<br>b)<br>c)<br>d) | Photo elastic analysisp)FriStrain Gaugesq)MidFoil strain gaugesr)SePolarizers)Un | nge order<br>cro strain<br>ensitive to cross-axis sensitivity<br>nique axis for passing light<br>sensitive to cross-axis sensitivity |
|     | B)      | Ma                   | tch the appropriate pairs  | <b>04</b>  |
|     |         | a)<br>b)<br>c)<br>d) | Zero order Isochromaticsq)BlaA.C. Bridger)CoD.C. Bridges)Ea                      | Column (2)<br>place Equation<br>ack in white light<br>plored in white light<br>isy to balance<br>fficult to balance                  |
|     | C)      |                      | oose the correct alternatives from   | the options and rewrite the 06   |
|     |         | ser<br>1)            | Itence.Monochromatic light hasa) Single wavelengthbc) Zero wavelengthd           | ,  |
|     |         | 2)                   | Strain gauges directly measuresa) Stressbc) Weightd                              | o) Strain  |
|     |         | 3)                   | Figure of merit for photo elastic maa)Lowb)c)Mediumd)                            | ) High   |
|     |         | 4)                   | One of the Principal stress, at the f<br>a) Maximum b                            | •  |

d)

Negative

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** EXPERIMENTAL STRESS ANALYSIS

- 2) Use of non-programmable calculator is allowed.
- 3) Figures to the right indicate full marks.
- 4) Make necessary assumption, if required and mention it clearly.

#### **MCQ/Objective Type Questions**

Du

Seat

No.

## Q.1

Zero

C)

**SLR-FM-129** 

Set Ρ

Max. Marks: 70

### **SLR-FM-129**



5) Output voltage in case of four arm sensitive bridge as compared with one arm sensitive is \_\_\_\_\_.

d)

- a) Same
- b) Double
- c) Tripple d)
- Four times (quadruplicated)
- Babinet Soleil Method is known as \_ 6) b)
  - Compensation a)
  - Stressed c)

- Theoretical None

06

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

### EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly.

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a) Explain the measurement of stresses at large number of location using 04 b)
  - strain gauges.
    c) Derive the equation of output voltage for.
    1) 4 arm consisting (2 linear and 2 lateral) combination
    - 1) 4-arm sensitive (2 linear and 2 lateral) combination.
    - 2) 2-arm sensitive (1 linear and 1 lateral) combination

Max. Marks: 56

SLR-FM-129

Seat

No.



| məti | uctio   | /13.                 | book.   |                            |                         |  |
|------|---------|----------------------|---|----------------------------|-------------------------|--|
|      |         | :                    | <ul><li>2) Use of non-programmable</li><li>3) Figures to the right indicate</li></ul> | e fu                       | ll marks                |  |
|      |         | -                    | MCQ/Objecti   |                            |                         | •  |
| Dura | tion: : | 30 N                 | linutes   |                            | <b>)</b>                | Ma   |
| Q.1  | A)      |                      | lve the objective question.<br>tch the appropriate pairs.<br>Column (1)               |                            |                         | Column (2)   |
|      |         | a)<br>b)<br>c)<br>d) | Photo elastic analysis  | p)<br>q)<br>r)<br>s)<br>t) | Micro<br>Sensi<br>Uniqu | e order<br>strain<br>tive to cross-axis sensitivity<br>le axis for passing light<br>sitive to cross-axis sensitivity |
|      | B)      | Ma<br>a)             | tch the appropriate pairs<br>Column (1)<br>Electrical analogy                         | p)                         | Lapla                   | Column (2)<br>ce Equation  |
|      |         | b)<br>c)<br>d)       | Zero order Isochromatics<br>A.C. Bridge<br>D.C. Bridge                                |                            | Black<br>Color<br>Easy  | in white light<br>ed in white light<br>to balance<br>ult to balance  |
|      | C)      |                      | oose the correct alternativ<br>ntence.  | es f                       | rom th                  | e options and rewrite the  |
|      |         | 1)                   | One of the Principal stress,<br>a) Maximum<br>c) Zero                                 | at t                       | he free<br>b)<br>d)     | boundary is<br>Minimum<br>Negative   |
|      |         | 2)                   | one arm sensitive is  |                            |                         | nsitive bridge as compared with  |
|      |         |                      | a) Same<br>c) Tripple   |                            | b)<br>d)                | Double<br>Four times (quadruplicated)  |

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

- uplicated)
- 3) Babinet Soleil Method is known as
  - a) Compensation Theoretical b) c) Stressed d) None
- Monochromatic light has \_ 4)
  - a) Single wavelength b) Different wavelength
  - c) Zero wavelength d) none
- 5) Strain gauges directly measures
  - Stress b) Strain a)
  - c) Weight d) None

**SLR-FM-129** 

#### Set Q

Max. Marks: 70

Marks: 14

04

04

06



- 6) Figure of merit for photo elastic material should be \_\_\_\_\_.
  - a) Low

- High
- b) d) not related to

c) Medium

06

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### **EXPERIMENTAL STRESS ANALYSIS**

Day & Date: Wednesday, 27-11-2019

Seat

No.

Time: 10:00 AM To 01:00 PM

strain gauges.

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly.

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a) Explain the measurement of stresses at large number of location using 04 b)
  - Derive the equation of output voltage for. c) 1) 4-arm sensitive (2 linear and 2 lateral) combination.
    - 2) 2-arm sensitive (1 linear and 1 lateral) combination

SLR-FM-129



Max. Marks: 56

| Instr | <b>Instructions:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. |           |  |          |  |      |
|-------|---|-----------|--|----------|--|------|
|       |   | :         | <ol> <li>2) Use of non-programmable</li> <li>3) Figures to the right indica</li> <li>4) Make necessary assump</li> </ol> | te fu    |  |      |
|       |   |           | MCQ/Object   | ive T    | Type Questions   |      |
| Dura  | tion:   | 30 N      | linutes  |          | Marks  | : 14 |
| Q.1   | A)  |           | ve the objective question tch the appropriate pairs.   | •        |  | 04   |
|       |   | 2)        | Column (1)   | 5)       | Column (2)   |      |
|       |   | a)<br>b)  | Photo elastic analysis<br>Strain Gauges  | p)<br>q) | -  |      |
|       |   | c)        | Foil strain gauges   | r)       | -  |      |
|       |   | d)        | Polarizer  | s)       | •  |      |
|       |   |           |  | t)       | Insensitive to cross-axis sensitivity                              |      |
|       | B)  | Ма        | tch the appropriate pairs  |          |  | 04   |
|       | -   |           | Column (1)   |          | Column (2)   |      |
|       |   | a)        | Electrical analogy   | • •      | Laplace Equation   |      |
|       |   | b)        | Zero order Isochromatics   |          |  |      |
|       |   | c)<br>d)  | A.C. Bridge<br>D.C. Bridge   | r)<br>s) | Colored in white light<br>Easy to balance                          |      |
|       |   | u)        | D.C. Bridge  | 5)<br>t) | Difficult to balance   |      |
|       | C)  |           | oose the correct alternativ  | ,        | from the options and rewrite the                                   | 06   |
|       |   | 3ei<br>1) | Strain gauges directly mea   | sure     | 85   |      |
|       |   | •,        | a) Stress  |          | b) Strain  |      |
|       |   |           | c) Weight  |          | d) None  |      |
|       |   | 2)        | Figure of merit for photo el<br>a) Low<br>c) Medium  | astic    | c material should be<br>b) High<br>d) not related to               |      |
|       |   | 3)        | One of the Principal stress<br>a) Maximum<br>c) Zero   | , at t   | the free boundary is<br>b) Minimum<br>d) Negative                  |      |
|       |   | 4)        | one arm sensitive is   |          | arm sensitive bridge as compared with                              |      |
|       |   |           | a) Same<br>c) Tripple  |          | <ul><li>b) Double</li><li>d) Four times (quadruplicated)</li></ul> |      |

b)

d)

5) Babinet Soleil Method is known as

a) Compensation

Stressed

C)

Max. Marks: 70

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019

**Mechanical Engineering** EXPERIMENTAL STRESS ANALYSIS Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

Seat No.

### **SLR-FM-129**

Set | R



- 6) Monochromatic light has \_\_\_\_\_.
  a) Single wavelength b)
  c) Zero wavelength d)
- Different wavelength
- none

# T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019

#### Mechanical Engineering

### EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly .

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a)
  - b) Explain the measurement of stresses at large number of location using 04 strain gauges.
    c) Derive the equation of output voltage for.
    - c) Derive the equation of output voltage for.
      1) 4-arm sensitive (2 linear and 2 lateral) combination.
      - 2) 2-arm sensitive (2 linear and 2 lateral) combination.

**SLR-FM-129** 



Max. Marks: 56

|    |         | (                    | <ol> <li>2) Use of non-programmable calculator is allowed.</li> <li>3) Figures to the right indicate full marks.</li> <li>4) Make necessary assumption, if required and me</li> </ol> | ntion it clearly.    |  |
|----|---------|----------------------|---|----------------------|--|
|    |         |                      | MCQ/Objective Type Questions  |                      |  |
| ra | tion: ( | 30 N                 | Minutes   | Marks: 14            |  |
| ĺ  | A)      | Ма                   |   | <b>04</b><br>Imn (2) |  |
|    |         |                      |   | sing light           |  |
|    | B)      | Ма                   | atch the appropriate pairs  | 04                   |  |
|    |         | a)<br>b)<br>c)<br>d) | Zero order Isochromatics q) Black in white light<br>A.C. Bridge r) Colored in white light   |                      |  |
|    | C)      |                      | hoose the correct alternatives from the options and<br>entence.Babinet Soleil Method is known asa) Compensationb) Theoretical<br>c) Stressedc) Stressedd) None                        | rewrite the 06       |  |
|    |         | 2)                   | Monochromatic light has<br>a) Single wavelength b) Different wave<br>c) Zero wavelength d) none   | elength              |  |
|    |         | 3)                   | Strain gauges directly measures<br>a) Stress b) Strain<br>c) Weight d) None   |                      |  |
|    |         | 4)                   | Figure of merit for photo elastic material should be _<br>a) Low b) High<br>c) Medium d) not related to   | ·                    |  |
|    |         | 5)                   | One of the Principal stress, at the free boundary is _  |                      |  |
|    |         |                      |   |                      |  |

Minimum

Negative

b)

d)

book. 2) Use of non-programmable calculator is allowed

EXPERIMENTAL STRESS ANALYSIS

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

Dura

# Q.1

Maximum

Zero

a)

c)

Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

**SLR-FM-129** 

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

Seat No.

#### Set S

Max. Marks: 70



# 6) Output voltage in case of four arm sensitive bridge as compared with one arm sensitive is \_\_\_\_\_.

- a) Same
- c) Tripple

- b) Double
- d) Four times (quadruplicated)

06

# T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019

#### **Mechanical Engineering**

#### **EXPERIMENTAL STRESS ANALYSIS**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly.

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a) Explain the measurement of stresses at large number of location using 04 b) strain gauges.
  - Derive the equation of output voltage for. c) 1) 4-arm sensitive (2 linear and 2 lateral) combination.
    - 2) 2-arm sensitive (1 linear and 1 lateral) combination

SLR-FM-129



Max. Marks: 56

Seat

No.

### SLR-FM-130

Set

Max. Marks: 70

| Seat |  |
|------|--|
| No.  |  |

#### T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering MECHANICAL VIBRATION**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Marks: 14

Ρ

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The Fourier component of a periodic function have . 1)
  - a) same frequencies
  - b) frequencies which are integral multiples
  - different frequencies bearing no relationship with each other C)
  - frequencies which are functional multiples d)
- A crank slider mechanism is an example of \_\_\_\_\_ degree of freedom 2) system.
  - a) single b)
  - three c) d)
- Beating motion is \_\_\_\_\_. 3)
  - a) harmonic aperiodic c)

b) Periodic

Two

Four

- d) none of the above
- 4) In under damped vibrating system, if  $x_1$  and  $x_2$  are the successive values of the amplitude on the same side of the mean position, then the logarithmic decrement is equal to \_
  - a) b)  $\log (x_1/x_2)$  $x_{1}/x_{2}$ d) c)  $\log_{e}(x_{1}/x_{2})$  $\log(x_1, x_2)$
- When the length of the spring is doubled, its stiffness . 5)
  - a) reduces to 50% b) Doubles
  - remains same d) none of the above c)
- 6) In case of gun used for firing bullets, vibrations are \_
  - over-damped under-damped b) a)
  - not damped d) critically damped c)
- In case of damped forced vibrations with constant harmonic excitation, 7) transient vibrations \_ b) die out after some time
  - a) remain constant permanently c)
    - increase with time d)
- All the moving parts of the system oscillating in the same frequency and 8) phase are known as
  - a) principal coordinates
  - generalized coordinates c)
- b) first principle mode of vibration
- d) principal mode of vibration

none of the above

|     | SLR-FM-130   |
|-----|--|
|     | Set P  |
| 9)  | According to which method, maximum kinetic energy at mean position is<br>equal to maximum potential energy at extreme position?<br>a) Energy method b) Rayleigh's method<br>c) Equilibrium method d) All of the above  |
| 10) | Holzer method is particularly used for calculating frequenciesa) fixed free systemb) free-free systemc) fixed-fixed systemd) all of above  |
| 11) | <ul> <li>Matrix iteration method is used to determine</li> <li>a) analysis of problem in natural frequency</li> <li>b) analysis of problem in structures, vibration, fluid dynamics</li> <li>c) large number of mathematical equations</li> <li>d) all of above</li> </ul> |
| 12) | Which instrument integrates sound pressure as a function of time over aperiod of time?a) Noise dosimeterb) FFT analyzerc) Both a & bd) None  |
| 13) | For shaft having two discs, the critical speed is<br>a) one b) Two<br>c) more than one d) None   |
| 14) | <ul> <li>An accelerometer is used to measure acceleration</li> <li>a) because of its natural frequency is high compared to that of vibration to be measured</li> <li>b) because of its natural frequency is low compared to that of vibration to be measured</li> </ul>    |
|     | c) because of its natural frequency is peak value compared to that of  |

- c) because of its natural frequency is peak value compared to that of vibration to be measured
- d) all of above

# T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**MECHANICAL VIBRATION** 

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from Section-I & Section-II.

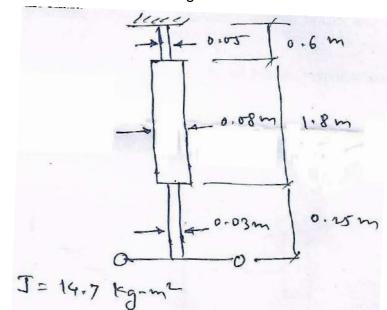
2) Figures to the right indicate full marks.

3) Make suitable assumptions if necessary and state them clearly.

#### Section – I

- Explain different types of vibrations based on the direction of movement of Q.2 a) 07 the particles of the body. Give examples of each type.
  - Find the natural frequency of torsional vibration for the system shown in 07 b) figure. Take G=0.83 x  $10^{11}$  N/m<sup>2</sup>. Neglect the inertia effect of the shaft.

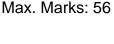
- Q.3 Write a note on vibration isolation and transmissibility. 07 a) Derive an expression for logarithmic decrement. 07 b) Derive an expression for natural frequency of longitudinal vibration Q.4 07 a) considering mass of the shaft.
  - Define the terms amplitude, period, frequency, resonance and damping, b) 07 simple harmonic motion and degrees of freedom system.



| Set | Ρ |
|-----|---|
|-----|---|



**SLR-FM-130** 



### SLR-FM-130 Set P

#### Section – II

| Q.5 | a)<br>b) | <ul> <li>Explain the role of</li> <li>Sensor and Actuators</li> <li>X-Y plotter in vibration analysis</li> <li>Derive an expression for amplitude of whirling shafts with air damping.</li> </ul> | 07<br>07 |
|-----|----------|---|----------|
|     | ,        |   | •••      |
| Q.6 | a)       | Derive the expression static and dynamic coupling of car body moving on uneven road and subjected to suddenly applied breaks and also determine natural frequency.                                | 07       |
|     | b)       | Explain the concept of frequency based human response and sound based human response to sound.  | 07       |
| Q.7 | a)       | Find the lowest natural frequency of vibration for the system as shown in figure by Rayleigh's method. E=1.96 x $10^{11}$ N/m <sup>2</sup> , I=4 x $10^{-7}$ m <sup>4</sup>                       | 07       |
|     |          | $m_1 = 100 \text{ Kg}$ $m_2 = 50 \text{ Kg}$  |          |
|     |          |   |          |

b) Explain the relation among sound power, Sound intensity & sound pressure 07 level.

18(m-

300m

# T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

**MECHANICAL VIBRATION** 

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

2)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- All the moving parts of the system oscillating in the same frequency and 1) phase are known as \_\_\_\_\_
  - a) principal coordinates
  - generalized coordinates C)
  - According to which method, maximum kinetic energy at mean position is equal to maximum potential energy at extreme position?

b)

- a) Energy method
- All of the above Equilibrium method c) d)

#### Holzer method is particularly used for calculating frequencies \_\_\_\_\_. 3)

- fixed free system free-free system a) b)
- C) fixed-fixed system d) all of above
- Matrix iteration method is used to determine \_\_\_\_ 4)
  - analysis of problem in natural frequency a)
  - analysis of problem in structures, vibration, fluid dynamics b)
  - large number of mathematical equations c)
  - d) all of above
- Which instrument integrates sound pressure as a function of time over a 5) period of time?
  - Noise dosimeter FFT analyzer a) b)
  - Both a & b d) None c)
- 6) For shaft having two discs, the critical speed is \_\_\_\_\_.
  - b) Two a) one
  - C) more than one d) None
- An accelerometer is used to measure acceleration \_ 7)
  - because of its natural frequency is high compared to that of vibration a) to be measured
  - because of its natural frequency is low compared to that of vibration b) to be measured
  - because of its natural frequency is peak value compared to that of C) vibration to be measured
  - d) all of above

**SLR-FM-130** 



Marks: 14

Max. Marks: 70

Set

- b) first principle mode of vibration
- principal mode of vibration d)

Rayleigh's method

|     |  |                     | SLR-FM-130                                    |
|-----|--|---------------------|---|
|     |  |                     | Set Q   |
| 8)  | <ul> <li>The Fourier component of a periodic</li> <li>a) same frequencies</li> <li>b) frequencies which are integral in</li> <li>c) different frequencies bearing no</li> <li>d) frequencies which are functional</li> </ul> | nultip<br>o relat   | les<br>ionship with each other                |
| 9)  | A crank slider mechanism is an example<br>system.<br>a) single<br>c) three   | mple<br>b)<br>d)    | of degree of freedom<br>Two<br>Four           |
| 10) | Beating motion is<br>a) harmonic<br>c) aperiodic   | b)<br>d)            | Periodic<br>none of the above                 |
| 11) | In under damped vibrating system, i<br>of the amplitude on the same side o<br>logarithmic decrement is equal to<br>a) $x_1/x_2$<br>c) $\log_e(x_1/x_2)$  | f the r             | mean position, then the                       |
| 12) | When the length of the spring is dou<br>a) reduces to 50%<br>c) remains same   | bled,<br>b)<br>d)   | its stiffness<br>Doubles<br>none of the above |
| 13) | In case of gun used for firing bullets<br>a) over-damped<br>c) not damped  | , vibra<br>b)<br>d) |   |
| 14) | In case of damped forced vibrations<br>transient vibrations<br>a) remain constant permanently  | b)                  | die out after some time                       |

- c) increase with time
- d) none of the above

07

07

# T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**MECHANICAL VIBRATION** 

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from Section-I & Section-II.

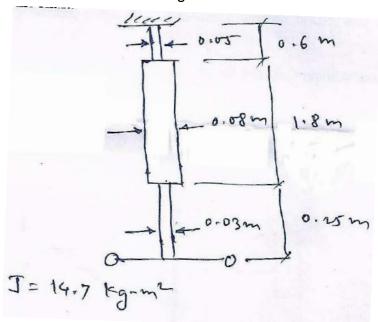
2) Figures to the right indicate full marks.

3) Make suitable assumptions if necessary and state them clearly.

#### Section – I

- Explain different types of vibrations based on the direction of movement of Q.2 a) 07 the particles of the body. Give examples of each type.
  - Find the natural frequency of torsional vibration for the system shown in 07 b) figure. Take G=0.83 x  $10^{11}$  N/m<sup>2</sup>. Neglect the inertia effect of the shaft.

- Q.3 Write a note on vibration isolation and transmissibility. a) Derive an expression for logarithmic decrement. b)
- Derive an expression for natural frequency of longitudinal vibration Q.4 07 a) considering mass of the shaft.
  - Define the terms amplitude, period, frequency, resonance and damping, b) 07 simple harmonic motion and degrees of freedom system.





Max. Marks: 56

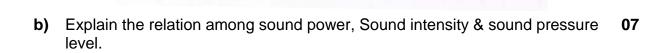
**SLR-FM-130** 

### SLR-FM-130 Set Q

M2 = 50Kq

#### Section – II

| Q.5 |    | <ul> <li>Explain the role of</li> <li>1) Sensor and Actuators</li> <li>2) X-Y plotter in vibration analysis</li> <li>Derive an expression for amplitude of whirling shefts with air domaing</li> </ul> | 07 |  |  |
|-----|----|--|----|--|--|
|     | b) | Derive an expression for amplitude of whirling shafts with air damping.  | 07 |  |  |
| Q.6 | a) | Derive the expression static and dynamic coupling of car body moving on<br>uneven road and subjected to suddenly applied breaks and also determine<br>natural frequency.                               |    |  |  |
|     | b) | Explain the concept of frequency based human response and sound based human response to sound.   | 07 |  |  |
| Q.7 | a) | Find the lowest natural frequency of vibration for the system as shown in figure by Rayleigh's method. E=1.96 x $10^{11}$ N/m <sup>2</sup> , I=4 x $10^{-7}$ m <sup>4</sup>                            | 07 |  |  |
|     |    | $m_1 = 100 \text{ Kg}$   |    |  |  |



18(m-

300m

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

### **MECHANICAL VIBRATION**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

#### **MCQ/Objective Type Questions**

#### **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

b)

- When the length of the spring is doubled, its stiffness . 1)
  - a) reduces to 50%
    - c) remains same d) none of the above
- In case of gun used for firing bullets, vibrations are \_ 2)
  - over-damped a)
  - not damped C)
- In case of damped forced vibrations with constant harmonic excitation, 3) transient vibrations
- remain constant permanently a) b) C) increase with time d) none of the above
- All the moving parts of the system oscillating in the same frequency and 4) phase are known as \_\_\_\_ b) first principle mode of vibration
  - a) principal coordinates
  - generalized coordinates c) d)
- According to which method, maximum kinetic energy at mean position is 5) equal to maximum potential energy at extreme position?
  - a) Energy method Rayleigh's method b)
  - Equilibrium method All of the above C) d)
- Holzer method is particularly used for calculating frequencies \_\_\_\_\_. 6)
  - a) fixed free system free-free system b)
  - C) fixed-fixed system d) all of above
- 7) Matrix iteration method is used to determine \_
  - analysis of problem in natural frequency a)
  - analysis of problem in structures, vibration, fluid dynamics b)
  - large number of mathematical equations c)
  - all of above d)
- Which instrument integrates sound pressure as a function of time over a 8) period of time?
  - Noise dosimeter a)
  - Both a & b C)

- FFT analyzer b)
- d) None

### **SLR-FM-130**



Seat

Max. Marks: 70

Marks: 14

- under-damped b)

Doubles

- d) critically damped
- die out after some time

principal mode of vibration

- 9) For shaft having two discs, the critical speed is \_\_\_\_\_.
  - a) one

b) Two

**SLR-FM-130** 

Set R

- c) more than one d) None
- 10) An accelerometer is used to measure acceleration \_\_\_\_
  - a) because of its natural frequency is high compared to that of vibration to be measured
  - b) because of its natural frequency is low compared to that of vibration to be measured
  - c) because of its natural frequency is peak value compared to that of vibration to be measured
  - d) all of above
- 11) The Fourier component of a periodic function have \_\_\_\_\_.
  - a) same frequencies
  - b) frequencies which are integral multiples
  - c) different frequencies bearing no relationship with each other
  - d) frequencies which are functional multiples
- 12) A crank slider mechanism is an example of \_\_\_\_\_ degree of freedom system.
  - a) single b) Two
  - c) three d) Four
- 13) Beating motion is \_\_\_\_\_.
  - a) harmonic b) c) aperiodic d)
    - aperiodic d) none of the above

Periodic

- 14) In under damped vibrating system, if x<sub>1</sub> and x<sub>2</sub> are the successive values of the amplitude on the same side of the mean position, then the logarithmic decrement is equal to \_\_\_\_\_.
  - a)  $x_1/x_2$ b)  $\log (x_1/x_2)$ c)  $\log_e(x_1/x_2)$ d)  $\log (x_1.x_2)$

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**MECHANICAL VIBRATION** 

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

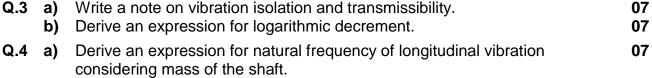
Instructions: 1) Solve any two questions from Section-I & Section-II.

2) Figures to the right indicate full marks.

3) Make suitable assumptions if necessary and state them clearly.

#### Section – I

- Explain different types of vibrations based on the direction of movement of Q.2 a) 07 the particles of the body. Give examples of each type.
  - Find the natural frequency of torsional vibration for the system shown in 07 b) figure. Take G=0.83 x  $10^{11}$  N/m<sup>2</sup>. Neglect the inertia effect of the shaft.

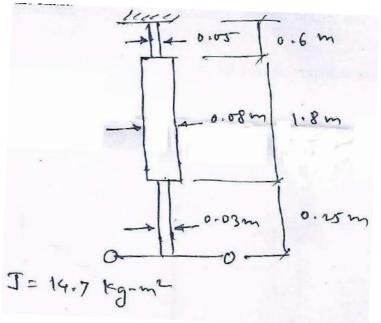


Define the terms amplitude, period, frequency, resonance and damping, b) 07 simple harmonic motion and degrees of freedom system.



Max. Marks: 56

**SLR-FM-130** 





### SLR-FM-130 Set R

M2 = 50Kq

#### Section – II

| Q.5 |    | <ul> <li>Explain the role of</li> <li>1) Sensor and Actuators</li> <li>2) X-Y plotter in vibration analysis</li> </ul>  | 07 |  |  |
|-----|----|---|----|--|--|
|     | b) | Derive an expression for amplitude of whirling shafts with air damping.   | 07 |  |  |
| Q.6 | a) | Derive the expression static and dynamic coupling of car body moving on<br>uneven road and subjected to suddenly applied breaks and also determine<br>natural frequency.    |    |  |  |
|     | b) | Explain the concept of frequency based human response and sound based human response to sound.  | 07 |  |  |
| Q.7 | a) | Find the lowest natural frequency of vibration for the system as shown in figure by Rayleigh's method. E=1.96 x $10^{11}$ N/m <sup>2</sup> , I=4 x $10^{-7}$ m <sup>4</sup> | 07 |  |  |
|     |    | $m_1 = 100 \text{ Kg}$  |    |  |  |

b) Explain the relation among sound power, Sound intensity & sound pressure 07 level.

18(m-

300m

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

**MECHANICAL VIBRATION** 

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

#### **MCQ/Objective Type Questions**

#### **Duration: 30 Minutes**

c)

Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

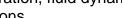
- Holzer method is particularly used for calculating frequencies . 1)
  - a) fixed free system
    - free-free system b) fixed-fixed system d) all of above
  - Matrix iteration method is used to determine 2)
    - analysis of problem in natural frequency a)
    - analysis of problem in structures, vibration, fluid dynamics b)
    - c) large number of mathematical equations
    - all of above d)
  - 3) Which instrument integrates sound pressure as a function of time over a period of time?
    - a) Noise dosimeter b)
    - Both a & b d) None c)
  - 4) For shaft having two discs, the critical speed is .
    - a) one b) Two
    - more than one d) None c)
  - An accelerometer is used to measure acceleration 5)
    - because of its natural frequency is high compared to that of vibration a) to be measured
    - because of its natural frequency is low compared to that of vibration b) to be measured
    - because of its natural frequency is peak value compared to that of C) vibration to be measured
    - all of above d)
  - The Fourier component of a periodic function have 6)
    - same frequencies a)
    - b) frequencies which are integral multiples
    - different frequencies bearing no relationship with each other C)
    - frequencies which are functional multiples d)
  - A crank slider mechanism is an example of \_\_\_\_\_ degree of freedom 7) system.
    - a) Single b) Two Three d) Four c)

**SLR-FM-130** 



Set

Max. Marks: 70



FFT analyzer

Set Beating motion is . Harmonic b) Periodic a) C) Aperiodic d) none of the above In under damped vibrating system, if  $x_1$  and  $x_2$  are the successive values of the amplitude on the same side of the mean position, then the logarithmic decrement is equal to b) a)  $x_1/x_2$  $\log (x_1/x_2)$ d) C)  $\log_{e}(x_{1}/x_{2})$  $\log(x_1, x_2)$ When the length of the spring is doubled, its stiffness \_\_\_\_\_ reduces to 50% Doubles a) b) c) remains same d) none of the above 11) In case of gun used for firing bullets, vibrations are \_ over-damped under-damped a) b) d) critically damped C) not damped In case of damped forced vibrations with constant harmonic excitation, 12) transient vibrations remain constant permanently b) die out after some time a) increase with time none of the above d) C) 13) All the moving parts of the system oscillating in the same frequency and phase are known as principal coordinates b) first principle mode of vibration a) C) generalized coordinates d) principal mode of vibration

- According to which method, maximum kinetic energy at mean position is 14) equal to maximum potential energy at extreme position?
  - a) Energy method

- b) Rayleigh's method
- Equilibrium method c)
- All of the above d)

- 8)
- 9)
- 10)

**SLR-FM-130** 

07

07

07

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

**MECHANICAL VIBRATION** 

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from Section-I & Section-II.

2) Figures to the right indicate full marks.

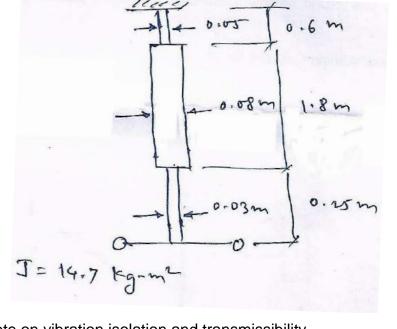
3) Make suitable assumptions if necessary and state them clearly.

#### Section – I

- Explain different types of vibrations based on the direction of movement of Q.2 a) 07 the particles of the body. Give examples of each type.
  - Find the natural frequency of torsional vibration for the system shown in 07 b) figure. Take G=0.83 x  $10^{11}$  N/m<sup>2</sup>. Neglect the inertia effect of the shaft.

- Q.3 Write a note on vibration isolation and transmissibility. a) Derive an expression for logarithmic decrement. b) Derive an expression for natural frequency of longitudinal vibration Q.4 a)
  - considering mass of the shaft. Define the terms amplitude, period, frequency, resonance and damping, b) 07 simple harmonic motion and degrees of freedom system.









Max. Marks: 56

**SLR-FM-130** 

### SLR-FM-130 Set S

#### Section – II

| Q.5 | a) | Explain the role of <ol> <li>Sensor and Actuators</li> <li>X-Y plotter in vibration analysis</li> </ol>   | 07 |
|-----|----|---|----|
|     | b) | Derive an expression for amplitude of whirling shafts with air damping.   | 07 |
| Q.6 | a) | Derive the expression static and dynamic coupling of car body moving on uneven road and subjected to suddenly applied breaks and also determine natural frequency.          | 07 |
|     | b) | Explain the concept of frequency based human response and sound based human response to sound.  | 07 |
| Q.7 | a) | Find the lowest natural frequency of vibration for the system as shown in figure by Rayleigh's method. E=1.96 x $10^{11}$ N/m <sup>2</sup> , I=4 x $10^{-7}$ m <sup>4</sup> | 07 |
|     |    | $m_1 = 100 \text{ Kg}$<br>$m_2 = 50 \text{ Kg}$   |    |

b) Explain the relation among sound power, Sound intensity & sound pressure 07 level.

18(m-

300m

| tion: 3 | so iviir  | nutes  |   |          | Marks                      | 5: 1 |  |  |
|---------|---|--|---|----------|----------------------------|------|--|--|
| A)      | Attempt the following single correct answer type questions.<br>(One marks each) |  |   |          |                            |      |  |  |
|         | 1)  | In an ASA system if tool signature is 8°-14°-5°-6°-10°-16°-3° mm the back racke angle is |   |          |                            |      |  |  |
|         |   | a)<br>c)   | 16<br>5°  | b)<br>d) | 3°<br>8°                   |      |  |  |
|         | 2)  |  | netal cutting if the shear angle is rter hence the required will be   |          | the plane of shear will be |      |  |  |
|         |   | a)   | less  | b)       | more                       |      |  |  |
|         |   | c)   | fixed   | d)       | not predict                |      |  |  |
|         | 3)  | a)<br>b)<br>c)   | ress tool combination die is used<br>Two cutting operation<br>Two bending operation<br>One cutting and one forming op<br>Both forming operation |          |                            |      |  |  |
|         | 4)  | In d   | eep draw, drawing force is equal  |          |                            |      |  |  |
|         |   | a)   | $\pi$ dt 6 <sub>v</sub> (D/d – C)   | b)       | $\pi d 6_y (D/d - C)$      |      |  |  |
|         |   | c)   |   |          | $\pi d (D/d - C)$          |      |  |  |
|         |   |  | ere d = shell dia t = thickness D<br>constant   |          |                            |      |  |  |
|         | 5)  | a)   | is normally used for<br>Drilling and reaming<br>Milling   | b)<br>d) | Turning<br>Shaping         |      |  |  |
|         | 6)  | At b<br>a)   | preak-even point there is<br>no profit  | b)       | no loss                    |      |  |  |

d)

more profit

### **MCQ/Objective Type Questions Duration: 30 Minutes**

Book Page No. 3. Each

# Q.1

mention, Q. P. set (P/Q/R/S) on top of page

Instructions: 1) Q. No.1 is compulsory. It should be solve in first 30 minutes in Answer

2) Answer MCQ/Objective type questions on page no. 3 only. Don't forget is

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

Seat

No.

Time: 10:00 AM To 02:00 PM

C)

no profit and no loss

**TOOL ENGINEERING** Day & Date: Wednesday, 27-11-2019

**SLR-FM-131** 

Set Ρ

Marks: 14

06

Max. Marks: 70

### **SLR-FM-131**



80

#### B) Attempt the following multiple choice correct answer type question. (Two marks each)

- In jig fixture V locator is used for \_\_\_\_ 7) Clamping round job
- b) Locate the flat job
- Locating round job C)

a)

- d) No use of V locater
- In metal cutting while drawing merchant circle number of assumptions 8) as follows
  - The cutting velocity remains constant a)
  - b) Continuous chip without built up edge
  - No constant cutting velocity c)
  - d) Continuous chip with built up edge
- 9) In Jig or fixture diamond pin locator is used when
  - There is two already machined parallel holes in work piece a)
  - Two or more than two parallel holes in work piece b)
  - One hole is already machined in work piece C)
  - d) No hole is exist in the work piece
- 10) In press tool the main purpose of stripper \_\_\_\_\_.
  - a) to guide punch
  - to guide strip b)
  - C) to strip out the material
  - d) no use of stripper in press tool

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

### TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Seat

No.

Instructions: 1) Question No-2 and 6 are compulsory.

2) Solve any two questions from section-I (from Q.3, 4 and 5) and section-II (from Q.7, 8 and 9).

#### Section – I

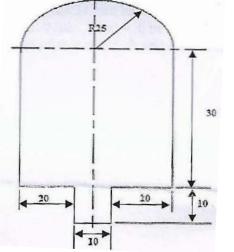
- **Q.2** Design a press tool for the component shown in fig-I giving following details.
  - a) Cutting force
  - b) Clearance between punch and die
  - c) Stripping force and no of bolts and bolt size need for die clamping
  - d) Strip layout and % material utilization.

Material:- EN8 Thickness = 5mm Shear strength = 49 kg/ mm<sup>2</sup>

Also draw one sectional view of assembly of press tool and part name.

OR

- **Q.2** Design a draw tool for given component Fig-II also calculate the following (draw one sectional view of assembly)
  - 1) Blank size
  - 2) No of draws
  - 3) draw ratio
  - 4) Drawing force
  - 5) Blank force
  - 6) Die and punch clearance



etails.

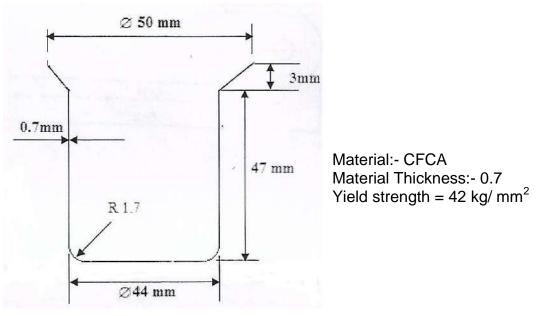
14

### **SLR-FM-131**

Set

Max. Marks: 56

### **SLR-FM-131** Set P



- Q.3 a) The following observations were made during on orthogonal cutting 04 operation.
  - 1) Rake angle - 20°
  - 2) Shear angle - 29.54°
  - Cutting force 300N 3)
  - Feed force 120N 4)
  - Cutting velocity = 102 m/min 5)

Determine

- Shear strain 1)
- 2) Work done in shear

| b) | Sketch and explain in brief about velocity relat | on in orthogonal cutting. 03 |
|----|--|------------------------------|
|----|--|------------------------------|

- **Q.4** a) While turning die 24 mm bar at 300 rpm. With H.S.S. tool a tool life of 9 03 min. when same bar was turned at 250 rpm. When will be tool life at same speed? Where n = 0.10804
  - b) List types of tool materials and explain in brief any two materials.

#### Q.5 Write a short notes on (Any Two)

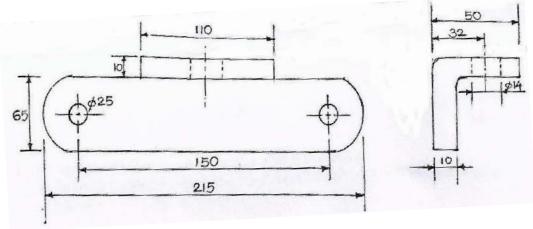
- Press tool stripper a)
- Types of chips b)
- **Tool dynamometers** C)

07

### SLR-FM-131 Set P

#### Section – II

Q.6 a) Design drill jig for drilling die 14 hole draw one view of sectional assembly14 with parts name.



OR

**b)** Design milling fixture for milling 110 x 10 face draw one view of sectional assembly with parts name.

| Q.7 | a)<br>b) | Explain in brief about Economic order quantity for batch production.<br>Explain in brief about geometry of plain milling cutter. | 04<br>03 |
|-----|----------|--|----------|
| Q.8 | a)       | With neat sketch explain in brief about any two indexing devices used in jig or fixture.   | 04       |
|     | b)       | List type of bush (drill bush) used in jig and explain in brief used of each drill bush.   | 03       |
| Q.9 | Wr<br>a) | ite short notes on (Any Two)<br>Fool Proofing of jig or fixture  | 07       |

- b) Effect of tool geometry on tool life
- c) Setting block in fixture

| wo cutting operation                 |  |
|--------------------------------------|--|
| wo bending operation                 |  |
| ne cutting and one forming operation |  |
| oth forming operation                |  |
|                                      |  |
|                                      |  |
|                                      |  |
|                                      |  |
|                                      |  |
|                                      |  |
|                                      |  |
|                                      |  |
|                                      |  |

mention, Q. P. set (P/Q/R/S) on top of page **MCQ/Objective Type Questions** Attempt the following single correct answer type questions. (One marks each)

In deep draw, drawing force is equal to \_ 1)

> Jig is normally used for \_\_\_\_\_. Drilling and reaming

> > no profit and no loss

At break-even point there is \_\_\_\_\_.

- $\pi$  dt 6<sub>v</sub> (D/d C)  $\pi d 6_v (D/d - C)$ a) b)  $\pi$  dt (D/d – C)  $\pi d (D/d - C)$ c) d)
- Where d = shell dia t = thickness D = blank dia  $6_v$  = yield strength

b)

d)

b)

d)

Turning

Shaping

no loss

more profit

A)

**Duration: 30 Minutes** 

2)

3)

4)

a)

c)

a)

c)

#### **Mechanical Engineering** TOOL ENGINEERING Max. Marks: 70

2) Answer MCQ/Objective type questions on page no. 3 only. Don't forget is

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019

Instructions: 1) Q. No.1 is compulsory. It should be solve in first 30 minutes in Answer

Book Page No. 3. Each

C = constant

Milling

no profit

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

**SLR-FM-131** 

- In an ASA system if tool signature is 8°-14°-5°-6°-10°-16°-3° mm the back racke angle is \_\_\_\_\_.
- 3° 16 a) b)
- 5° d) 8° c)

#### 5) In metal cutting if the shear angle is larger the plane of shear will be shorter hence the required will be

- less b) more a) c)
  - fixed d) not predict
- In press tool combination die is used for 6) .
  - a) Τv
  - Τv b)
  - O C)
  - d) Bo



Marks: 14

06

Seat No.

Q.1

### **SLR-FM-131**

Set

#### Attempt the following multiple choice correct answer type question. 80 B) (Two marks each)

- In Jig or fixture diamond pin locator is used when \_\_\_\_ 7)
  - There is two already machined parallel holes in work piece a)
  - Two or more than two parallel holes in work piece b)
  - One hole is already machined in work piece c)
  - No hole is exist in the work piece d)
- 8) In press tool the main purpose of stripper \_\_\_\_\_.
  - to guide punch a)
  - to guide strip b)

C)

- C) to strip out the material
- no use of stripper in press tool d)
- 9) In jig fixture V locator is used for
  - a) Clamping round job Locating round job
- b) Locate the flat job d) No use of V locater
- 10) In metal cutting while drawing merchant circle number of assumptions as follows
  - The cutting velocity remains constant a)
  - b) Continuous chip without built up edge
  - No constant cutting velocity C)
  - Continuous chip with built up edge d)

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Instructions: 1) Question No-2 and 6 are compulsory.

2) Solve any two questions from section-I (from Q.3, 4 and 5) and section-II (from Q.7, 8 and 9).

#### Section – I

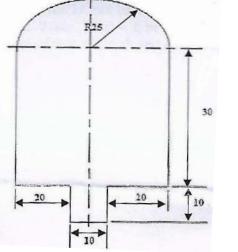
- **Q.2** Design a press tool for the component shown in fig-I giving following details. **14** 
  - a) Cutting force
  - b) Clearance between punch and die
  - c) Stripping force and no of bolts and bolt size need for die clamping
  - d) Strip layout and % material utilization.

Material:- EN8 Thickness = 5mm Shear strength = 49 kg/ mm<sup>2</sup>

Also draw one sectional view of assembly of press tool and part name.

OR

- **Q.2** Design a draw tool for given component Fig-II also calculate the following (draw one sectional view of assembly)
  - 1) Blank size
  - 2) No of draws
  - 3) draw ratio
  - 4) Drawing force
  - 5) Blank force
  - 6) Die and punch clearance



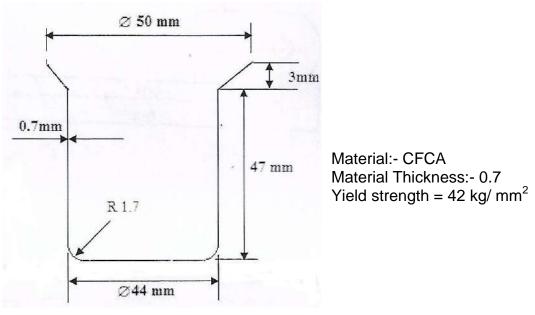
Max. Marks: 56

Set Q

**SLR-FM-131** 

Seat No.

## **SLR-FM-131** Set Q



- Q.3 a) The following observations were made during on orthogonal cutting 04 operation.
  - 1) Rake angle - 20°
  - 2) Shear angle - 29.54°
  - Cutting force 300N 3)
  - Feed force 120N 4)
  - Cutting velocity = 102 m/min 5)

Determine

- Shear strain 1)
- 2) Work done in shear

| b) | Sketch and explain in brief about veloci | relation in orthogonal cutting. <b>0</b> | 3 |
|----|--|--|---|
|----|--|--|---|

- **Q.4** a) While turning die 24 mm bar at 300 rpm. With H.S.S. tool a tool life of 9 03 min. when same bar was turned at 250 rpm. When will be tool life at same speed? Where n = 0.10804
  - b) List types of tool materials and explain in brief any two materials.

#### Q.5 Write a short notes on (Any Two)

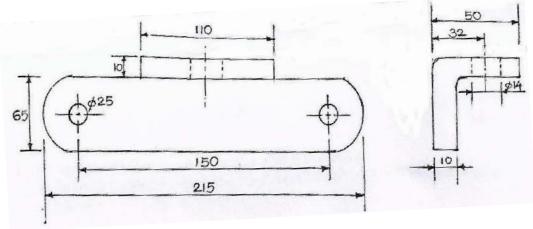
- Press tool stripper a)
- Types of chips b)
- **Tool dynamometers** C)

07

## SLR-FM-131 Set Q

### Section – II

Q.6 a) Design drill jig for drilling die 14 hole draw one view of sectional assembly14 with parts name.



OR

**b)** Design milling fixture for milling 110 x 10 face draw one view of sectional assembly with parts name.

| Q.7 | a)<br>b) | Explain in brief about Economic order quantity for batch production.<br>Explain in brief about geometry of plain milling cutter. | 04<br>03 |
|-----|----------|--|----------|
| Q.8 | a)       | With neat sketch explain in brief about any two indexing devices used in jig or fixture.   | 04       |
|     | b)       | List type of bush (drill bush) used in jig and explain in brief used of each drill bush.   | 03       |
| Q.9 | Wr<br>a) | <b>ite short notes on (Any Two)</b><br>Fool Proofing of jig or fixture   | 07       |

- b) Effect of tool geometry on tool life
- c) Setting block in fixture

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** TOOL ENGINEERING Max. Marks: 70

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Instructions: 1) Q. No.1 is compulsory. It should be solve in first 30 minutes in Answer Book Page No. 3. Each

2) Answer MCQ/Objective type questions on page no. 3 only. Don't forget is mention, Q. P. set (P/Q/R/S) on top of page

### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 A) Attempt the following single correct answer type questions. (One marks each)

- In metal cutting if the shear angle is larger the plane of shear will be 1) shorter hence the required will be \_\_\_\_
  - a) less b) more
  - fixed not predict d) c)
- 2) In press tool combination die is used for .
  - a) Two cutting operation
  - Two bending operation b)
  - c) One cutting and one forming operation
  - Both forming operation d)

#### In deep draw, drawing force is equal to 3)

- $\pi$  dt 6<sub>v</sub> (D/d C)  $\pi d 6_v (D/d - C)$ a) b)
  - $\pi$  dt (D/d C) d)  $\pi d (D/d - C)$ c) Where d = shell dia t = thickness D = blank dia  $6_v$  = yield strength C = constant
- 4) Jig is normally used for \_\_\_\_\_.
  - Turning Drilling and reaming b) a)
  - Milling d) C) Shaping
- At break-even point there is \_\_\_\_\_. 5)

no profit and no loss

no profit a)

C)

- b) no loss d) more profit
- In an ASA system if tool signature is 8°-14°-5°-6°-10°-16°-3° mm the 6) back racke angle is \_\_\_\_\_.
  - 16 b) 3° a) 8°
  - 5° d) C)

**SLR-FM-131** 

## Set

R

Marks: 14

06

Set R

## B) Attempt the following multiple choice correct answer type question. 08 (Two marks each)

- 7) In press tool the main purpose of stripper \_\_\_\_\_.
  - a) to guide punch
  - b) to guide strip
  - c) to strip out the material
  - d) no use of stripper in press tool
- 8) In jig fixture V locator is used for \_\_\_\_\_
  - a) Clamping round job
- b) Locate the flat job
- c) Locating round job
- d) No use of V locater
- 9) In metal cutting while drawing merchant circle number of assumptions as follows \_\_\_\_\_.
  - a) The cutting velocity remains constant
  - b) Continuous chip without built up edge
  - c) No constant cutting velocity
  - d) Continuous chip with built up edge
- 10) In Jig or fixture diamond pin locator is used when \_\_\_\_
  - a) There is two already machined parallel holes in work piece
  - b) Two or more than two parallel holes in work piece
  - c) One hole is already machined in work piece
  - d) No hole is exist in the work piece

# S

T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Instructions: 1) Question No-2 and 6 are compulsory.

2) Solve any two questions from section-I (from Q.3, 4 and 5) and section-II (from Q.7, 8 and 9).

### Section – I

- **Q.2** Design a press tool for the component shown in fig-I giving following details. **14** 
  - a) Cutting force
  - b) Clearance between punch and die

R25

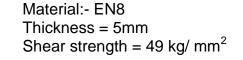
10

c) Stripping force and no of bolts and bolt size need for die clamping

30

20

d) Strip layout and % material utilization.



Also draw one sectional view of assembly of press tool and part name.

OR

- **Q.2** Design a draw tool for given component Fig-II also calculate the following (draw one sectional view of assembly)
  - 1) Blank size
  - 2) No of draws

20

- 3) draw ratio
- 4) Drawing force
- 5) Blank force
- 6) Die and punch clearance

Max. Marks: 56

Set R

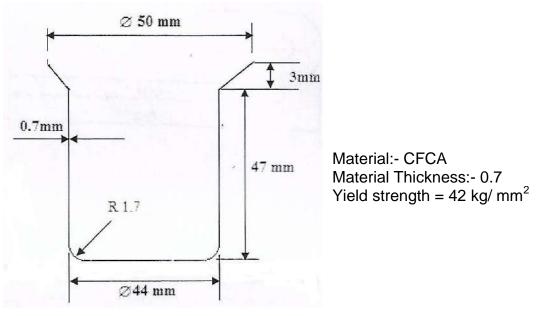
**SLR-FM-131** 

Seat No.

## **SLR-FM-131** Set R

04

07



- Q.3 a) The following observations were made during on orthogonal cutting operation.
  - 1) Rake angle - 20°
  - 2) Shear angle - 29.54°
  - Cutting force 300N 3)
  - Feed force 120N 4)
  - Cutting velocity = 102 m/min 5)

Determine

- Shear strain 1)
- 2) Work done in shear

| b) | Sketch and explain in brief about veloci | relation in orthogonal cutting. <b>0</b> | 3 |
|----|--|--|---|
|----|--|--|---|

- **Q.4** a) While turning die 24 mm bar at 300 rpm. With H.S.S. tool a tool life of 9 03 min. when same bar was turned at 250 rpm. When will be tool life at same speed? Where n = 0.10804
  - b) List types of tool materials and explain in brief any two materials.

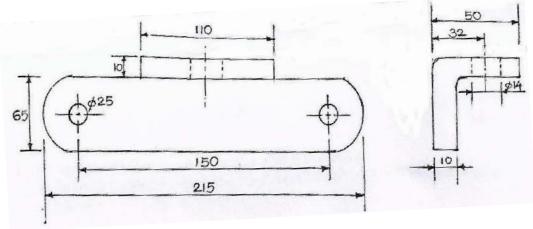
#### Q.5 Write a short notes on (Any Two)

- Press tool stripper a)
- Types of chips b)
- **Tool dynamometers** C)

## SLR-FM-131 Set R

### Section – II

Q.6 a) Design drill jig for drilling die 14 hole draw one view of sectional assembly14 with parts name.



OR

**b)** Design milling fixture for milling 110 x 10 face draw one view of sectional assembly with parts name.

| Q.7 | a)<br>b) | Explain in brief about Economic order quantity for batch production.<br>Explain in brief about geometry of plain milling cutter. | 04<br>03 |
|-----|----------|--|----------|
| Q.8 | a)       | With neat sketch explain in brief about any two indexing devices used in jig or fixture.   | 04       |
|     | b)       | List type of bush (drill bush) used in jig and explain in brief used of each drill bush.   | 03       |
| Q.9 | Wr<br>a) | ite short notes on (Any Two)<br>Fool Proofing of jig or fixture  | 07       |

- b) Effect of tool geometry on tool life
- c) Setting block in fixture

|                                  | TOOL ENGINEE  |                     | -   |
|----------------------------------|---|---------------------|---|
| Day & Date: We<br>Time: 10:00 AM | dnesday, 27-11-2019<br>To 02:00 PM  |                     | Max. Marks: 70                                    |
|                                  | Q. No.1 is compulsory. It should<br>Book Page No. 3. Each<br>Answer MCQ/Objective type quest<br>mention, Q. P. set (P/Q/R/S) on top   | ions o              | n page no. 3 only. Don't forget is                |
|                                  | MCQ/Objective Type (  | Questi              | ons   |
| Duration: 30 Min                 | utes  |                     | Marks: 14   |
| -                                | mpt the following single correct a<br>e marks each)<br>At break-even point there is<br>a) no profit<br>c) no profit and no loss   | b)                  | no loss   |
| 2)                               | In an ASA system if tool signature i<br>back racke angle is<br>a) 16<br>c) 5°   | s 8°-14<br>b)<br>d) |   |
| 3)                               | In metal cutting if the shear angle is<br>shorter hence the required will be _<br>a) less<br>c) fixed   | -                   | the plane of shear will be<br>more<br>not predict |
| 4)                               | <ul> <li>In press tool combination die is use</li> <li>a) Two cutting operation</li> <li>b) Two bending operation</li> <li>c) One cutting and one forming operation</li> <li>d) Both forming operation</li> </ul> |                     |   |
| 5)                               | In deep draw, drawing force is equal<br>a) $\pi dt 6_y (D/d - C)$<br>c) $\pi dt (D/d - C)$<br>Where d = shell dia t = thickness I<br>C = constant   | b)<br>d)            |   |
| 6)                               | Jig is normally used for<br>a) Drilling and reaming<br>c) Milling   | b)<br>d)            | Turning<br>Shaping                                |

# T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

Seat

No.

## **SLR-FM-131**

Set S

## Set S

## B) Attempt the following multiple choice correct answer type question. 08 (Two marks each)

- 7) In metal cutting while drawing merchant circle number of assumptions as follows \_\_\_\_\_.
  - a) The cutting velocity remains constant
  - b) Continuous chip without built up edge
  - c) No constant cutting velocity
  - d) Continuous chip with built up edge
- 8) In Jig or fixture diamond pin locator is used when \_\_\_\_
  - a) There is two already machined parallel holes in work piece
  - b) Two or more than two parallel holes in work piece
  - c) One hole is already machined in work piece
  - d) No hole is exist in the work piece
- 9) In press tool the main purpose of stripper \_\_\_\_\_.
  - a) to guide punch
  - b) to guide strip
  - c) to strip out the material
  - d) no use of stripper in press tool
- 10) In jig fixture V locator is used for \_\_\_\_\_.
  - a) Clamping round job
  - c) Locating round job
- b) Locate the flat job
- d) No use of V locater

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

## TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Seat

No.

Instructions: 1) Question No-2 and 6 are compulsory.

2) Solve any two questions from section-I (from Q.3, 4 and 5) and section-II (from Q.7, 8 and 9).

### Section – I

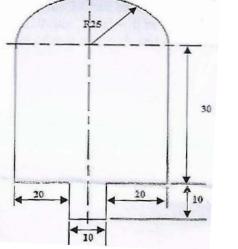
- **Q.2** Design a press tool for the component shown in fig-I giving following details. **14** 
  - a) Cutting force
  - b) Clearance between punch and die
  - c) Stripping force and no of bolts and bolt size need for die clamping
  - d) Strip layout and % material utilization.

Material:- EN8 Thickness = 5mm Shear strength = 49 kg/ mm<sup>2</sup>

Also draw one sectional view of assembly of press tool and part name.

OR

- **Q.2** Design a draw tool for given component Fig-II also calculate the following (draw one sectional view of assembly)
  - 1) Blank size
  - 2) No of draws
  - 3) draw ratio
  - 4) Drawing force
  - 5) Blank force
  - 6) Die and punch clearance

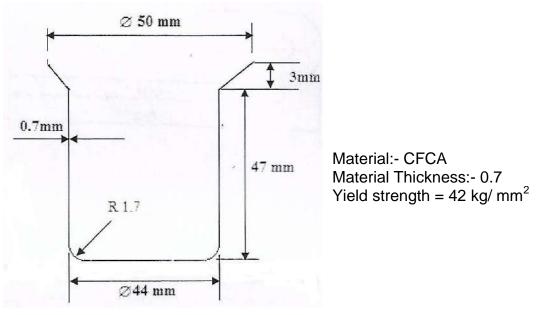


Max. Marks: 56

S

SLR-FM-131

## **SLR-FM-131** Set S



- Q.3 a) The following observations were made during on orthogonal cutting 04 operation.
  - 1) Rake angle - 20°
  - 2) Shear angle - 29.54°
  - Cutting force 300N 3)
  - Feed force 120N 4)
  - Cutting velocity = 102 m/min 5)

Determine

- Shear strain 1)
- 2) Work done in shear

| b) | Sketch and explain in brief about velocity relation in the second sec | n orthogonal cutting. | 03 |
|----|---|-----------------------|----|
|----|---|-----------------------|----|

- **Q.4** a) While turning die 24 mm bar at 300 rpm. With H.S.S. tool a tool life of 9 03 min. when same bar was turned at 250 rpm. When will be tool life at same speed? Where n = 0.10804
  - b) List types of tool materials and explain in brief any two materials.

#### Q.5 Write a short notes on (Any Two)

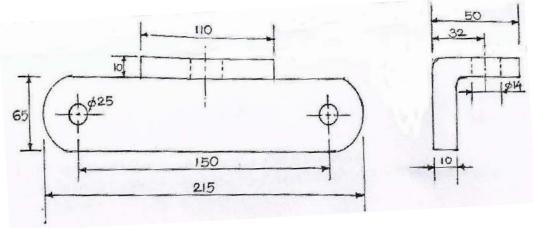
- Press tool stripper a)
- Types of chips b)
- **Tool dynamometers** C)

07

## SLR-FM-131 Set S

### Section – II

Q.6 a) Design drill jig for drilling die 14 hole draw one view of sectional assembly14 with parts name.



OR

**b)** Design milling fixture for milling 110 x 10 face draw one view of sectional assembly with parts name.

| Q.7 | a)<br>b) | Explain in brief about Economic order quantity for batch production.<br>Explain in brief about geometry of plain milling cutter. | 04<br>03 |
|-----|----------|--|----------|
| Q.8 | a)       | With neat sketch explain in brief about any two indexing devices used in jig or fixture.   | 04       |
|     | b)       | List type of bush (drill bush) used in jig and explain in brief used of each drill bush.   | 03       |
| Q.9 | Wr<br>a) | <b>ite short notes on (Any Two)</b><br>Fool Proofing of jig or fixture   | 07       |

- b) Effect of tool geometry on tool life
- c) Setting block in fixture

Seat No.

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering RENEWABLE ENERGY SOURCES**

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

4)

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10
  - Coal is an example of 1)
    - a) Conventional source of energy b) Non-conventional source of energy
    - c) Renewable energy source
  - 2) Solar Energy can be directly converted into thermal energy by using .
    - a) Photovoltaic cell c) Solar Collector
- Rechargeable cell b) Dry Cell d)

d) None of these

- 3) Which gas is the major constituent of Biogas?
  - a) Ethane Methane b) c) Nitrogen d) Carbon Monoxide
  - Which of the following is not a renewable source of energy?
    - a) Wind Tidal b)
    - c) Solar d) Coal
- Wind turbine converts \_\_\_\_\_ of wind into Mechanical energy. 5)
  - a) Potential scale b) Kinetic energy
  - c) Chemical energy d) Thermal energy
- 6) axis wind turbine works irrespective of wind direction.
  - a) Horizontal Vertical b)
  - All of the above c) Inclined d)
- 7) Solar collectors are coated with Black colour for the purpose of \_\_\_\_\_.
  - For minimum absorbtion of energy a)
  - For maximum absorbtion of energy b)
  - c) For maximum reflection of energy
  - d) None of above
- Solar still is used to obtain \_\_\_\_\_ 8)
  - a) Crude oil b) Natural gas
  - **Distilled** water c) Coal d)
- Agro-generator can be used to \_\_\_\_ 9)
  - a) Generate electricity b) Operate flour mill
  - c) Draw underground water All of the above d)
- Solar Power plant use \_\_\_\_\_ type of Collectors. 10)
  - a) Concentrating
  - c) Evacuated tube
- b) Flat plate
- None of the above d)

Set

Max. Marks: 50

Marks: 10

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering RENEWABLE ENERGY SOURCES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Attempt any two questions from Section - I and Section - II.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Write a short note on Beam and Diffuse radiation.  | 05       |
|-----|----------|--|----------|
|     | b)       | Explain with neat sketch the construction & working of Pyranometer.  | 05       |
| Q.3 | a)       | Enumerate different types of concentrating type solar collector.   | 05       |
|     | b)       | Explain construction and working of solar water heater.  | 05       |
| Q.4 | a)<br>b) | Explain construction and working of solar cooker<br>What are the disadvantages of conventional energy sources? and also<br>explain the need of non-convolitional energy sources. | 05<br>05 |
|     |          | Section – II   |          |
| Q.5 | a)       | What are the advantages and disadvantages of wind energy conversion system?  | 05       |
|     | b)       | Explain with neat sketch Bio gas plant.  | 05       |
| Q.6 | a)       | Write a short note on resources of geothermal thermal energy.  | 05       |
|     | b)       | What are advantages and limitations of tidal power generation?   | 05       |
| Q.7 | a)       | Explain the potential of tidal power in India.   | 05       |
|     | b)       | Explain construction and working of horizontal axis wind turbine.  | 05       |

Max. Marks: 40

SLR-FM-132

Set

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## Set T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019

**Mechanical Engineering RENEWABLE ENERGY SOURCES** 

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10

- axis wind turbine works irrespective of wind direction. 1)
  - Horizontal a) c) Inclined
- 2) Solar collectors are coated with Black colour for the purpose of .
  - a) For minimum absorbtion of energy
  - b) For maximum absorbtion of energy
  - c) For maximum reflection of energy
  - d) None of above

#### 3) Solar still is used to obtain \_\_\_\_\_.

- a) Crude oil b) Natural gas
- c) Coal d) **Distilled water**
- 4) Agro-generator can be used to \_\_\_\_
  - a) Generate electricity
- b) Operate flour mill All of the above

None of the above

b) Non-conventional source of energy

- c) Draw underground water d)
- Solar Power plant use \_\_\_\_\_ type of Collectors. 5) Flat plate
  - a) Concentrating
  - c) Evacuated tube
- Coal is an example of 6)
  - a) Conventional source of energy
  - c) Renewable energy source d) None of these

7) Solar Energy can be directly converted into thermal energy by using \_\_\_\_\_.

a) Photovoltaic cell Rechargeable cell b)

b)

d)

- c) Solar Collector Dry Cell d)
- Which gas is the major constituent of Biogas? 8)
  - a) Ethane b) Methane
  - c) Nitrogen d) Carbon Monoxide
- Which of the following is not a renewable source of energy? 9)
  - a) Wind b) Tidal
  - c) Solar Coal d)
- Wind turbine converts \_\_\_\_\_ of wind into Mechanical energy. 10) b) Kinetic energy
  - a) Potential scale
  - Thermal energy c) Chemical energy d)

SLR-FM-132



- Marks: 10

- b) Vertical
- d) All of the above

Max. Marks: 50

Q

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering RENEWABLE ENERGY SOURCES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) Attempt any two questions from Section - I and Section - II.

2) Assume Suitable data if necessary and mention it clearly.

3) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Write a short note on Beam and Diffuse radiation.  | 05       |
|-----|----------|--|----------|
|     | b)       | Explain with neat sketch the construction & working of Pyranometer.  | 05       |
| Q.3 | a)       | Enumerate different types of concentrating type solar collector.   | 05       |
|     | b)       | Explain construction and working of solar water heater.  | 05       |
| Q.4 | a)<br>b) | Explain construction and working of solar cooker<br>What are the disadvantages of conventional energy sources? and also<br>explain the need of non-convolitional energy sources. | 05<br>05 |
|     |          | Section – II   |          |
| Q.5 | a)       | What are the advantages and disadvantages of wind energy conversion system?  | 05       |
|     | b)       | Explain with neat sketch Bio gas plant.  | 05       |
| Q.6 | a)       | Write a short note on resources of geothermal thermal energy.  | 05       |
|     | b)       | What are advantages and limitations of tidal power generation?   | 05       |
| Q.7 | a)       | Explain the potential of tidal power in India.   | 05       |
|     | b)       | Explain construction and working of horizontal axis wind turbine.  | 05       |





Max. Marks: 40

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

## **RENEWABLE ENERGY SOURCES**

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10

b)

d)

d)

- Agro-generator can be used to \_\_\_\_ 1)
  - a) Generate electricity
  - c) Draw underground water
- Solar Power plant use \_\_\_\_\_ type of Collectors. 2)
  - a) Concentrating
  - c) Evacuated tube
- 3) Coal is an example of
  - Conventional source of energy a)
  - Renewable energy source C)
- 4) Solar Energy can be directly converted into thermal energy by using \_\_\_\_\_. Rechargeable cell
  - Photovoltaic cell a) b) d)
  - Solar Collector C)
- 5) Which gas is the major constituent of Biogas? b) Methane
  - a) Ethane
  - d) Nitrogen c)
- 6) Which of the following is not a renewable source of energy? Tidal
  - a) Wind b)
  - Solar Coal d) c)
- Wind turbine converts \_\_\_\_\_ of wind into Mechanical energy. 7)
  - Potential scale b) Kinetic energy a)
  - c) Chemical energy Thermal energy d)
  - axis wind turbine works irrespective of wind direction.
  - Vertical Horizontal b) a)
  - c) Inclined All of the above d)
- 9) Solar collectors are coated with Black colour for the purpose of .
  - a) For minimum absorbtion of energy
  - b) For maximum absorbtion of energy
  - c) For maximum reflection of energy
  - d) None of above
- 10) Solar still is used to obtain
  - a) Crude oil
  - c) Coal

8)

- b) Natural gas
- **Distilled** water d)

- b) Non-conventional source of energy

d) None of these

Drv Cell

b) Flat plate

None of the above

Carbon Monoxide

Operate flour mill All of the above



Seat No.

Marks: 10

Max. Marks: 50

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering RENEWABLE ENERGY SOURCES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Attempt any two questions from Section - I and Section - II.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Write a short note on Beam and Diffuse radiation.  | 05       |
|-----|----------|--|----------|
|     | b)       | Explain with neat sketch the construction & working of Pyranometer.  | 05       |
| Q.3 | a)       | Enumerate different types of concentrating type solar collector.   | 05       |
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|     |          | Section – II   |          |
| Q.5 | a)       | What are the advantages and disadvantages of wind energy conversion system?  | 05       |
|     | b)       | Explain with neat sketch Bio gas plant.  | 05       |
| Q.6 | a)       | Write a short note on resources of geothermal thermal energy.  | 05       |
|     | b)       | What are advantages and limitations of tidal power generation?   | 05       |
| Q.7 | a)       | Explain the potential of tidal power in India.   | 05       |
|     | b)       | Explain construction and working of horizontal axis wind turbine.  | 05       |

Seat No.

## SLR-FM-132

Set

Max. Marks: 40

.\_\_\_\_ A

R

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

## **RENEWABLE ENERGY SOURCES**

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

1)

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10

- Which gas is the major constituent of Biogas? a) Ethane Methane b)
- c) Nitrogen d) Carbon Monoxide
- Which of the following is not a renewable source of energy? 2)
  - a) Wind Tidal b)
  - c) Solar d) Coal
- Wind turbine converts \_\_\_\_\_ of wind into Mechanical energy. 3) b) Kinetic energy

a) Potential scale

- c) Chemical energy d) Thermal energy
- axis wind turbine works irrespective of wind direction. 4)
  - a) Horizontal b) Vertical
  - c) Inclined d) All of the above

5) Solar collectors are coated with Black colour for the purpose of \_\_\_\_\_.

- a) For minimum absorbtion of energy
- b) For maximum absorbtion of energy
- c) For maximum reflection of energy
- d) None of above

#### 6) Solar still is used to obtain \_\_\_\_\_

- a) Crude oil b) Natural gas
- **Distilled water** c) Coal d)
- Agro-generator can be used to \_\_\_\_ 7)
  - a) Generate electricity b) Operate flour mill
    - c) Draw underground water d) All of the above
- Solar Power plant use \_\_\_\_\_ type of Collectors. 8) Flat plate
  - a) Concentrating
  - c) Evacuated tube
- 9) Coal is an example of

c) Solar Collector

- a) Conventional source of energy b) d) None of these
- c) Renewable energy source
- Solar Energy can be directly converted into thermal energy by using \_\_\_\_\_. 10) Photovoltaic cell a)

b)

d)

Rechargeable cell b)

None of the above

Non-conventional source of energy

d) Dry Cell

## Max. Marks: 50

Set



Marks: 10

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering RENEWABLE ENERGY SOURCES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Attempt any two questions from Section - I and Section - II.

- 2) Assume Suitable data if necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Write a short note on Beam and Diffuse radiation.  | 05       |
|-----|----------|--|----------|
|     | b)       | Explain with neat sketch the construction & working of Pyranometer.  | 05       |
| Q.3 | a)       | Enumerate different types of concentrating type solar collector.   | 05       |
|     | b)       | Explain construction and working of solar water heater.  | 05       |
| Q.4 | a)<br>b) | Explain construction and working of solar cooker<br>What are the disadvantages of conventional energy sources? and also<br>explain the need of non-convolitional energy sources. | 05<br>05 |
|     |          | Section – II   |          |
| Q.5 | a)       | What are the advantages and disadvantages of wind energy conversion system?  | 05       |
|     | b)       | Explain with neat sketch Bio gas plant.  | 05       |
| Q.6 | a)       | Write a short note on resources of geothermal thermal energy.  | 05       |
|     | b)       | What are advantages and limitations of tidal power generation?   | 05       |
| Q.7 | a)       | Explain the potential of tidal power in India.   | 05       |
|     | b)       | Explain construction and working of horizontal axis wind turbine.  | 05       |

## Seat No.



Set S

Max. Marks: 40

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

## INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

2) Figures to right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - 1) Which of the following is (are) closely related to the INTRODUCTION stage of the Product?
    - Demand is high a)
    - b) Advertisement and promotion are required
    - c) Both A and B
    - d) None of these
  - 2) The following is (are) the source(s) for developing new or improved product
    - a) Research and development department of the enterprise
    - b) Consumer suggestions and complaints
    - Other competitive products in the market c)
    - d) All of the above
  - 3) Which of the following is majorly related to the appearance of the product?
    - a) Functional aspect b) **Operational aspect** c) Aesthetic aspect
      - d) **Durability aspect**

Weak and breakable

- 4) The product cost can be reduced by considering the following aspect (s) at the design
  - a) Maximum number of operations
  - b) Unnecessary tight tolerance should be provided
  - c) Design should consist of standard parts
  - d) None of these
- Which of the following is (are) recommendation (s) of design for 5) assembly?
  - Design parts with self-locating features a)
  - b) Maximize the fasteners
  - c) Use modular design
  - d) Both A and C
- When a product is robust, it is 6) ?
  - a) Non-sensitive to environment b)
  - Bendable and small d) All of these C)

Set

Max. Marks: 50

Marks: 10

10



- 7) The following subject(s) is (are) related to Ergonomics' \_\_\_\_\_.
  - a) Anthropology

b) Physiology

c) Psychology

- d) All of the above
- 8) The qualitative information is one which concerns the \_\_\_\_\_.
  - a) value of some variable
  - b) Rate of change
  - c) Condition or status of a system
  - d) Presence or absence of some specific object
- 9) The following aspect of product is concerned with the ease and efficiency of the product performance \_\_\_\_\_.
  - a) Functional aspect b) Operational aspect
  - c) Durability aspect d) Aesthetic aspect
- 10) The cost reduction technique in comparison to the worth of a product is known as \_\_\_\_\_.
  - a) Reverse engineering

Material engineering

c)

- b) Value engineering
- d) Quality engineering

## Seat No.

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) Figures to right indicate full marks.

- 2) Solve any two questions from remaining Q.2 to Q.4.
- 3) Draw neat, suitable diagrams whenever required

| Q.2 | a)             | Explain the steps in design and development process of industrial<br>products.  | 06             |
|-----|----------------|---|----------------|
|     | b)             | What is creativity? Explain the role of creativity in the product design with example.  | 06             |
|     | c)             | Discuss the aspect of ergonomic design of radial drilling machine.  | 08             |
| Q.3 | a)<br>b)<br>c) | Explain generation, selection and evaluation of concepts in product design<br>Explain the concept of symmetry, balance and stability in aesthetic design.<br>Discuss the visual effect of line and form for cars and sport vehicles | 06<br>06<br>08 |
| Q.4 | Wri<br>a)      | <b>te short-note ( Any Four)</b><br>Product Life Cycle  | 20             |
|     | b)             | Design for Manufacturing  |                |

- Challenges in Product development c)
- Anthropometry d)
- e) Product study and market study

Ρ



Max. Marks: 40

| No.    |  | Oct                          | Q     |
|--------|--|------------------------------|-------|
|        | T.E. (Part – II) (New) (CBCS) Examinatic<br>Mechanical Engineering<br>INDUSTRIAL PRODUCT DES | J                            |       |
|        | Date: Thursday, 28-11-2019<br>10:00 AM To 12:00 PM   | Max. Mark                    | s: 50 |
| Inctru | ations: 1) O. No. 1 is compulsory and should be calve  | d in first 20 minutes in one | Nuor  |

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.
  - 2) Figures to right indicate full marks.

#### MCQ/Objective Type Questions **Duration: 20 Minutes** Marks: 10 Choose the correct alternatives from the options and rewrite the sentence. 1) When a product is robust, it is ? a) Non-sensitive to environment Weak and breakable b) c) Bendable and small All of these d)

#### The following subject(s) is (are) related to Ergonomics' \_ 2) .

- Physiology a) Anthropology b)
- c) Psychology d) All of the above

The qualitative information is one which concerns the \_\_\_\_\_. 3)

- a) value of some variable
- b) Rate of change

Seat No.

Q.1

- c) Condition or status of a system
- d) Presence or absence of some specific object
- 4) The following aspect of product is concerned with the ease and efficiency of the product performance \_\_\_\_\_.
  - a) Functional aspect **Operational aspect** b)
  - c) Durability aspect d) Aesthetic aspect
- The cost reduction technique in comparison to the worth of a product is 5) known as \_\_\_\_\_.
  - a) Reverse engineering Value engineering b) c)
    - Quality engineering Material engineering d)
- Which of the following is (are) closely related to the INTRODUCTION 6) stage of the Product?
  - a) Demand is high
  - b) Advertisement and promotion are required
  - c) Both A and B
  - d) None of these
- The following is (are) the source(s) for developing new or improved 7) product \_\_\_\_\_.
  - a) Research and development department of the enterprise
  - b) Consumer suggestions and complaints
  - c) Other competitive products in the market
  - d) All of the above

SLR-FM-133

10

- 8) Which of the following is majorly related to the appearance of the product?
  - a) Functional aspect
- b) Operational aspect

Set Q

- c) Aesthetic aspect d)
- d) Durability aspect
- 9) The product cost can be reduced by considering the following aspect (s) at the design
  - a) Maximum number of operations
  - b) Unnecessary tight tolerance should be provided
  - c) Design should consist of standard parts
  - d) None of these
- 10) Which of the following is (are) recommendation (s) of design for assembly?
  - a) Design parts with self-locating features
  - b) Maximize the fasteners
  - c) Use modular design
  - d) Both A and C

| Seat |  |
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| No.  |  |

### T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) Figures to right indicate full marks.

- 2) Solve any two questions from remaining Q.2 to Q.4.
- 3) Draw neat, suitable diagrams whenever required

| Q.2 | a)             | Explain the steps in design and development process of industrial<br>products.  | 06             |
|-----|----------------|---|----------------|
|     | b)             | What is creativity? Explain the role of creativity in the product design with example.  | 06             |
|     | c)             | Discuss the aspect of ergonomic design of radial drilling machine.  | 08             |
| Q.3 | a)<br>b)<br>c) | Explain generation, selection and evaluation of concepts in product design<br>Explain the concept of symmetry, balance and stability in aesthetic design.<br>Discuss the visual effect of line and form for cars and sport vehicles | 06<br>06<br>08 |
| Q.4 | Wri            | te short-note ( Any Four)   | 20             |
|     | a)<br>b)       | Product Life Cycle<br>Design for Manufacturing  |                |

- Challenges in Product development c)
- Anthropometry d)
- e) Product study and market study

Q



Max. Marks: 40

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

2) Figures to right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - 1) The following aspect of product is concerned with the ease and efficiency of the product performance \_
    - Functional aspect b) **Operational aspect** a)
    - c) Durability aspect d) Aesthetic aspect
  - 2) The cost reduction technique in comparison to the worth of a product is known as \_\_\_\_\_. Value engineering
    - a) Reverse engineering b)
    - Material engineering d) Quality engineering c)
  - Which of the following is (are) closely related to the INTRODUCTION 3) stage of the Product?
    - a) Demand is high
    - b) Advertisement and promotion are required
    - c) Both A and B
    - d) None of these
  - 4) The following is (are) the source(s) for developing new or improved product .
    - a) Research and development department of the enterprise
    - b) Consumer suggestions and complaints
    - c) Other competitive products in the market
    - d) All of the above
  - Which of the following is majorly related to the appearance of the 5) product?
    - a) Functional aspect **Operational aspect** b)
    - c) Aesthetic aspect **Durability** aspect d)
  - 6) The product cost can be reduced by considering the following aspect (s) at the design
    - Maximum number of operations a)
    - Unnecessary tight tolerance should be provided b)
    - Design should consist of standard parts c)
    - d) None of these

Max. Marks: 50

R

Marks: 10

10

- 7) Which of the following is (are) recommendation (s) of design for assembly?
  - a) Design parts with self-locating features
  - b) Maximize the fasteners
  - c) Use modular design
  - d) Both A and C

### 6) When a product is robust, it is \_\_\_\_\_?

- a) Non-sensitive to environment b) Weak and breakable
- c) Bendable and small d) All of these
- 7) The following subject(s) is (are) related to Ergonomics' \_\_\_\_\_.
  - a) Anthropology b) Physiology
  - c) Psychology d) All of the above
- 8) The qualitative information is one which concerns the \_\_\_\_\_.
  - a) value of some variable
  - b) Rate of change
  - c) Condition or status of a system
  - d) Presence or absence of some specific object

**SLR-FM-133** 

Set R

## Seat No.

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) Figures to right indicate full marks.

- 2) Solve any two questions from remaining Q.2 to Q.4.
- 3) Draw neat, suitable diagrams whenever required

| Q.2 | a)             | Explain the steps in design and development process of industrial products.   | 06             |
|-----|----------------|---|----------------|
|     | b)             | What is creativity? Explain the role of creativity in the product design with example.  | 06             |
|     | c)             | Discuss the aspect of ergonomic design of radial drilling machine.  | 08             |
| Q.3 | a)<br>b)<br>c) | Explain generation, selection and evaluation of concepts in product design Explain the concept of symmetry, balance and stability in aesthetic design. Discuss the visual effect of line and form for cars and sport vehicles | 06<br>06<br>08 |
| Q.4 | Wri            | te short-note ( Any Four)   | 20             |
|     | a)<br>b)       | Product Life Cycle<br>Design for Manufacturing  |                |

- Challenges in Product development C)
- Anthropometry d)
- e) Product study and market study

R



Max. Marks: 40

## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

2) Figures to right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 20 Minutes** 

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - 1) Which of the following is majorly related to the appearance of the product?
    - a) Functional aspect b) **Operational aspect** C)
      - Aesthetic aspect d) **Durability aspect**
  - 2) The product cost can be reduced by considering the following aspect (s) at the design
    - a) Maximum number of operations
    - b) Unnecessary tight tolerance should be provided
    - c) Design should consist of standard parts
    - d) None of these
  - 3) Which of the following is (are) recommendation (s) of design for assembly?
    - a) Design parts with self-locating features
    - b) Maximize the fasteners
    - c) Use modular design
    - d) Both A and C
  - When a product is robust, it is \_\_\_\_\_ 4) ?
    - Non-sensitive to environment Weak and breakable b) a)
      - Bendable and small All of these c) d)
  - 5) The following subject(s) is (are) related to Ergonomics' \_\_\_\_\_.
    - Anthropology Physiology a) b)
    - Psychology d) All of the above c)
  - The qualitative information is one which concerns the \_\_\_\_\_. 6)
    - a) value of some variable
    - b) Rate of change
    - c) Condition or status of a system
    - d) Presence or absence of some specific object
  - The following aspect of product is concerned with the ease and efficiency 7) of the product performance \_\_\_\_\_.
    - a) Functional aspect b) **Operational aspect**
    - Durability aspect Aesthetic aspect d) c)



Max. Marks: 50

Marks: 10

10

- 8) The cost reduction technique in comparison to the worth of a product is known as \_\_\_\_\_.
  - a) Reverse engineering
- b) Value engineering
- c) Material engineering
- d) Quality engineering

Set S

- 9) Which of the following is (are) closely related to the INTRODUCTION stage of the Product?
  - a) Demand is high
  - b) Advertisement and promotion are required
  - c) Both A and B
  - d) None of these
- 10) The following is (are) the source(s) for developing new or improved product \_\_\_\_\_.
  - a) Research and development department of the enterprise
  - b) Consumer suggestions and complaints
  - c) Other competitive products in the market
  - d) All of the above

| Seat |  |
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## T.E. (Part – II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL PRODUCT DESIGN

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) Figures to right indicate full marks.

- 2) Solve any two questions from remaining Q.2 to Q.4.
- 3) Draw neat, suitable diagrams whenever required

| Q.2 | a)               | Explain the steps in design and development process of industrial products.   | 06             |
|-----|------------------|---|----------------|
|     | b)               | What is creativity? Explain the role of creativity in the product design with example.  | 06             |
|     | C)               | Discuss the aspect of ergonomic design of radial drilling machine.  | 08             |
| Q.3 | a)<br>b)<br>c)   | Explain generation, selection and evaluation of concepts in product design<br>Explain the concept of symmetry, balance and stability in aesthetic design.<br>Discuss the visual effect of line and form for cars and sport vehicles | 06<br>06<br>08 |
| Q.4 | Writ<br>a)<br>b) | t <b>e short-note ( Any Four)</b><br>Product Life Cycle<br>Design for Manufacturing   | 20             |

- Challenges in Product development C)
- Anthropometry d)
- Product study and market study e)

S



Max. Marks: 40

## T.E. (Part – II) (New) (CBSC) Examination Nov/Dec-2019 Mechanical Engineering COMPOSITE MATERIALS

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

2) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

Duration: 20 Minutes

Seat

No.

### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10

- 1) Composite materials means \_\_\_\_
  - a) Mixing of two dissimilar materials
  - b) Mixing of two same materials
  - c) Both a & b
  - d) None
- 2) Reinforcement includes \_\_\_\_\_
  - a) fibres
  - c) particulates d)
- 3) PRC means \_\_\_\_
  - a) Particulate Reinforced Composites
  - b) Laminar Composites
  - c) Fibre Reinforced Composites
  - d) None
- 4) CCC means \_\_\_\_\_
  - a) Particulate Reinforced Composites
  - b) Fracture toughness
  - c) Fibre Reinforced Composites
  - d) Carbon-Carbon Composites

### 5) Properties of a Matrix are \_\_\_\_\_

- a) Reduced moisture absorption
- b) Low shrinkage
- c) Low coefficient of thermal expansion
- d) All of above
- Strength of composite is affected by \_\_\_\_\_
  - a) porosity b) types of flakes
  - c) both a & b d) None
- 7) Pultrusion is used for \_\_\_\_\_ fibers.
  - a) short b) Long
  - c) both a & b d) None

Max. Marks: 50

Marks: 10

b) Flakes

all of above



- Set P
- 8) Usually softer constituent of a composite is \_\_\_\_\_.
  - a) Matrix

b) Reinforcement

.

None

None

- c) Both are of equal strength d)
- Usually stronger constituent of a composite is \_\_\_\_ 9) Reinforcement
  - a) Matrix b) d)
  - c) Both are of equal strength
- The following material can be used for filling in sandwich structures \_\_\_\_\_. 10)
  - a) Polymers c) Wood

- Cement b) All of above
- d)

|             |   | •          |       |
|-------------|---|------------|-------|
| Seat<br>No. |   | Set        | Ρ     |
|             | T.E. (Part – II) (New) (CBSC) Examination Nov/De<br>Mechanical Engineering<br>COMPOSITE MATERIALS                           | ∋c-2019    |       |
|             | Date: Thursday, 28-11-2019<br>0:00 AM To 12:00 PM   | Max. Marks | s: 40 |
| Instruc     | <ul><li>Attempt any four questions from Q. No. 2 to Q. No.7.</li><li>2) Figures to the right indicate full marks.</li></ul> |            |       |

## Attempt any four of the following question.

| Q.2 | Define and Classify composite materials.                          | 10 |
|-----|---|----|
| Q.3 | Explain characteristics and selection of composite.               | 10 |
| Q.4 | Explain different applications of composites.                     | 10 |
| Q.5 | Explain open and closed mould process of composite manufacturing. | 10 |
| Q.6 | Explain types of defects observed in composites.                  | 10 |
| Q.7 | Explain thermoforming process.                                    | 10 |

| Seat<br>No. |                   |  |                                       |                        |     |   | Set            | Q          |
|-------------|-------------------|--|---------------------------------------|------------------------|-----|---|----------------|------------|
|             | T.E               | E. (Part – II)   | (New) (CB<br>Mechanic<br>COMPOS       | cal Engi               | nee | •   | c-2019         |            |
|             |                   | hursday, 28-11<br>M To 12:00 PM                                  |                                       |                        |     |   | Max. Mark      | :s: 50     |
| Instru      |                   | 1) Q. No. 1 is o<br>book.<br>2) Figures to th                    |                                       |                        |     | solved in first 20                                      | minutes in ans | swer       |
|             |                   | М  | CQ/Objecti                            | ive Tvpe               | Qı  | uestions  |                |            |
| Duratio     | on: 20 M          |  | <b>, ,</b>                            |                        |     |   | Mark           | s: 10      |
|             | 1) Str            | the correct al<br>rength of comp<br>porosity<br>both a & b       |                                       |                        | t   | o <b>ns and rewrite t</b><br><br>ypes of flakes<br>Jone | he sentence.   | 10         |
| 2           | ,                 | ltrusion is use<br>short<br>both a & b                           | d for                                 | fibers.<br>b)<br>d)    |     | .ong<br>Jone  |                |            |
|             | 3) Us<br>a)<br>c) | ually softer co<br>Matrix<br>Both are of e                       |                                       | b)                     | F   | <br>Reinforcement<br>None                               |                |            |
| 2           | 4) Us<br>a)<br>c) | ually stronger<br>Matrix<br>Both are of e                        |                                       | b)                     | F   | is<br>Reinforcement<br>None                             |                |            |
| Ę           | 5) Th<br>a)<br>c) | Polymers   | terial can be                         | used for f<br>b)<br>d) | Č   | g in sandwich stru<br>Cement<br>All of above            | uctures        | _ <b>.</b> |
| (           | a)                |  | o dissimilar m                        | aterials               |     |   |                |            |
| 7           | ́a)               | inforcement in fibres particulates                               | cludes                                | <br>b)<br>d)           |     | Takes<br>III of above                                   |                |            |
| ٤           | a)<br>b)<br>c)    | C means<br>Particulate R<br>Laminar Con<br>Fibre Reinfor<br>None | einforced Co                          | ·                      |     |   |                |            |
| Q           | a)                | C means<br>Particulate R<br>Fracture toug<br>Fibre Reinfor       | einforced Co<br>ghness<br>rced Compos | sites                  |     |   |                |            |

d) Carbon-Carbon Composites

SLR-FM-134

# SLR-FM-134 Set Q

- 10)
- Properties of a Matrix are \_\_\_\_\_.
  a) Reduced moisture absorption
  b) Low shrinkage
  c) Low coefficient of thermal expansion
  - d) All of above

|             | •   |            | •••   |
|-------------|---|------------|-------|
| Seat<br>No. | t   | Set        | Q     |
|             | T.E. (Part – II) (New) (CBSC) Examination Nov/Dec-2<br>Mechanical Engineering<br>COMPOSITE MATERIALS                                    | 2019       |       |
|             | & Date: Thursday, 28-11-2019<br>: 10:00 AM To 12:00 PM  | Max. Marks | s: 40 |
| Instr       | <ul><li>uctions: 1) Attempt any four questions from Q. No. 2 to Q. No.7.</li><li>2) Figures to the right indicate full marks.</li></ul> |            |       |
| Atter       | npt any four of the following question.   |            |       |
| Q.2         | Define and Classify composite materials.  |            | 10    |
| Q.3         | Explain characteristics and selection of composite.   |            | 10    |
| Q.4         | Explain different applications of composites.   |            | 10    |
| Q.5         | Explain open and closed mould process of composite manufacturing.   |            | 10    |
| Q.6         | Explain types of defects observed in composites.  |            | 10    |

**Q.7** Explain thermoforming process.

10

|       |                  | COMPOSITE MATERIALS  |
|-------|------------------|--|
|       |                  | e: Thursday, 28-11-2019 Max. Marks: 50<br>0 AM To 12:00 PM   |
| Instr | uctio            | <b>ns:</b> 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.  |
|       |                  | 2) Figures to the right indicate full marks.   |
|       |                  | MCQ/Objective Type Questions   |
| Dura  | tion: 2          | 20 Minutes Marks: 10   |
| Q.1   | <b>Cho</b><br>1) | ose the correct alternatives from the options and rewrite the sentence.10Usually stronger constituent of a composite isa) Matrixb) Reinforcementc) Both are of equal strengthd) None       |
|       | 2)               | The following material can be used for filling in sandwich structuresa) Polymersb) Cementc) Woodd) All of above  |
|       | 3)               | Composite materials means<br>a) Mixing of two dissimilar materials<br>b) Mixing of two same materials<br>c) Both a & b<br>d) None  |
|       | 4)               | Reinforcement includesa) fibresb) Flakesc) particulatesd) all of above   |
|       | 5)               | <ul> <li>PRC means</li> <li>a) Particulate Reinforced Composites</li> <li>b) Laminar Composites</li> <li>c) Fibre Reinforced Composites</li> <li>d) None</li> </ul>                        |
|       | 6)               | <ul> <li>CCC means</li> <li>a) Particulate Reinforced Composites</li> <li>b) Fracture toughness</li> <li>c) Fibre Reinforced Composites</li> <li>d) Carbon-Carbon Composites</li> </ul>    |
|       | 7)               | <ul> <li>Properties of a Matrix are</li> <li>a) Reduced moisture absorption</li> <li>b) Low shrinkage</li> <li>c) Low coefficient of thermal expansion</li> <li>d) All of above</li> </ul> |
|       | 8)               | Strength of composite is affected bya) porosityb) types of flakesc) both a & bd) None  |

# Seat

No.

# T.E. (Part – II) (New) (CBSC) Examination Nov/Dec-2019 Mechanical Engineering

# SLR-FM-134

Set R

# SLR-FM-134 Set R

- 9) Pultrusion is used for \_\_\_\_\_ fibers.
  - a) short
  - Long c) both a & b d) None

b)

- Usually softer constituent of a composite is \_\_\_\_\_. 10) b) Reinforcement
  - a) Matrix
  - c) Both are of equal strength d) None

| Seat |  |
|------|--|
| No.  |  |

Set R

# T.E. (Part – II) (New) (CBSC) Examination Nov/Dec-2019 Mechanical Engineering COMPOSITE MATERIALS

Max. Marks: 40 Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM **Instructions:** 1) Attempt any four questions from Q. No. 2 to Q. No.7. 2) Figures to the right indicate full marks. Attempt any four of the following question. Define and Classify composite materials. Q.2 10 Q.3 Explain characteristics and selection of composite. 10 Q.4 Explain different applications of composites. 10 10 Q.5 Explain open and closed mould process of composite manufacturing. Q.6 Explain types of defects observed in composites. 10 Q.7 Explain thermoforming process. 10

# SLR-FM-134 Set S

Seat No.

# T.E. (Part – II) (New) (CBSC) Examination Nov/Dec-2019 Mechanical Engineering COMPOSITE MATERIALS

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer book.

2) Figures to the right indicate full marks.

# MCQ/Objective Type Questions

Duration: 20 Minutes

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10
  - 1) PRC means \_\_\_\_
    - a) Particulate Reinforced Composites
    - b) Laminar Composites
    - c) Fibre Reinforced Composites
    - d) None
  - 2) CCC means \_\_\_\_
    - a) Particulate Reinforced Composites
    - b) Fracture toughness
    - c) Fibre Reinforced Composites
    - d) Carbon-Carbon Composites
  - 3) Properties of a Matrix are \_\_\_\_\_
    - a) Reduced moisture absorption
    - b) Low shrinkage
    - c) Low coefficient of thermal expansion
    - d) All of above

a)

- 4) Strength of composite is affected by \_\_\_\_\_.
  - a) porosity b) types of flakes
  - c) both a & b d) None
- 5) Pultrusion is used for \_\_\_\_\_ fibers.
  - a) short b) Long
- c) both a & b d) None

6) Usually softer constituent of a composite is \_\_\_\_\_

- a) Matrix b) Reinforcement
- c) Both are of equal strength d) None
- 7) Usually stronger constituent of a composite is \_\_\_\_\_
  - Matrix b) Reinforcement
  - c) Both are of equal strength d) None
- 8) The following material can be used for filling in sandwich structures \_\_\_\_\_\_.
  - a) Polymersb) Cementc) Woodd) All of above

Max. Marks: 50

Marks: 10

)

# SLR-FM-134 Set S

- 9)
- Composite materials means \_\_\_\_\_.a) Mixing of two dissimilar materialsb) Mixing of two same materials

  - c) Both a & b
  - d) None
- Reinforcement includes \_\_\_\_\_. 10)
  - a) fibres
  - c) particulates

- b) Flakes
- d) all of above

|             |  |   | • |           |       |
|-------------|--|---|---|-----------|-------|
| Seat<br>No. |  |   |   | Set       | S     |
|             | T.E. (Part – II)                           | (New) (CBSC) Ex<br>Mechanical Eng<br>COMPOSITE MA |   | :-2019    |       |
|             | Date: Thursday, 28-1<br>0:00 AM To 12:00 P |   |   | Max. Mark | s: 40 |
| Instruc     | , .  | ly four questions from the right indicate full n  |   |           |       |
| Attemp      | ot any four of the fo                      | llowing question.                                 |   |           |       |

| Q.2 | Define and Classify composite materials.                          | 10 |
|-----|---|----|
| Q.3 | Explain characteristics and selection of composite.               | 10 |
| Q.4 | Explain different applications of composites.                     | 10 |
| Q.5 | Explain open and closed mould process of composite manufacturing. | 10 |
| Q.6 | Explain types of defects observed in composites.                  | 10 |
| Q.7 | Explain thermoforming process.                                    | 10 |

Set

Max. Marks: 50

Ρ

# Seat No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer Book.

2) Figures to the right indicate full marks.

# MCQ/Objectives Type Questions

**Duration: 20 Minutes** 

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10
  - The Electrical Discharge Machining (EDM) process is . 1)
    - a) Burr free
    - b) Not for hard metals
    - c) Direct contact machining
    - d) Capable of producing sharp comers
  - In Electron beam machining, workpiece is held in 2)
    - a) vacuum chamber b) dielectric medium
    - electrolyte d) none of these C)
  - 3) Which of the following processes is generally applied for dentistry work like to drill fine holes of particular shape in teeth?
    - a) Electrical Discharge Machining (EDM)
    - b) Electron Beam Machining (EBM)
    - c) Laser Beam Machining (LBM)
    - d) Ultrasonic Machining (USM)
  - The process utilizing mainly thermal energy for removing material is \_\_\_\_\_. 4)
    - b) Electrochemical Machining a) Ultrasonic Machining
    - Abrasive Jet Machining d) Laser Beam Machining c)
  - 5) In electrochemical machining (ECM) removal of metal from the work piece takes place
    - a) anodic dissolution b) abrasive action
    - c) thermal melting d) erosion
  - In Ultrasonic machining, the function of transducer is to \_\_\_\_\_. 6)
    - a) convert mechanical energy into heat
    - convert electrical energy into heat b)
    - convert electrical energy into mechanical vibrations C)
    - convert mechanical energy into electrical energy d)
  - What is the value of velocity of plasma jet in Plasma beam machining? 7)
    - 100 m/sec b) 300 m/sec a)
    - c) 400 m/sec d) 500 m/sec
  - 8) What is the depth-to-diameter ratio obtained in drilling process using Laser beam machining?
    - 10:1 20:1 a) b)
    - 50:1 d) 80:1 c)

Marks: 10

# 9) What is the main mechanism of material removal in Electro chemical grinding?

- a) Mechanical erosion of material
- b) Electro chemical dissolution
- c) Melting and vaporization
- d) Electron removal from material
- 10) What is the value of stand-off distance in Water jet machining?

c) 2 - 6 mm d) 6 - 14 mm

**SLR-FM-135** 

Set P

| Seat |  |
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| No.  |  |

# T.E. (Part-II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) All questions are compulsory.

2) Figures to the right indicate full marks.

## Q.2 Solve any four of the following questions.

- a) Explain the needs of nonconventional machining processes.
- **b)** With a neat sketch explain working of Water Jet Machining.
- c) What are various etchants used and process parameters in Chemical machining (CHM)?
- d) State advantages, disadvantages and applications of Electrical Discharge Machining (EDM).
- e) Explain with a neat sketch working of laser Beam Machining.
- f) State advantages, disadvantages and applications of Electron Beam Machining.

#### **Q.3** Solve any two of the following questions.

- a) Classify various non-conventional machining processes depending upon the energy sources used.
- **b)** Explain the principle of working of Ion Beam Machining (IBM) and state its applications.
- c) What are various advantages, disadvantages and applications of Plasma Arc Machining?
- d) Explain the following parameters with respect to Ultrasonic Machining (USM)-
  - 1) Effect of amplitude and frequency of vibration
  - 2) Effect of grain size
  - 3) Effect of applied static load
  - 4) Effect of slurry

Max. Marks: 40

16

24

Set P

| Page <b>4</b> of <b>1</b> 2 |
|-----------------------------|
|-----------------------------|

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer Book.

2) Figures to the right indicate full marks.

# MCQ/Objectives Type Questions

**Duration: 20 Minutes** 

1)

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10
  - In Ultrasonic machining, the function of transducer is to .
    - convert mechanical energy into heat a)
    - b) convert electrical energy into heat
    - convert electrical energy into mechanical vibrations c)
    - d) convert mechanical energy into electrical energy
  - What is the value of velocity of plasma jet in Plasma beam machining? 2)
    - 100 m/sec b) 300 m/sec a)
    - 400 m/sec d) 500 m/sec C)
  - 3) What is the depth-to-diameter ratio obtained in drilling process using Laser beam machining?
    - a) 10:1 b) 20:1 50:1 d) 80:1 c)
  - What is the main mechanism of material removal in Electro chemical 4) arindina?
    - Mechanical erosion of material a)
    - Electro chemical dissolution b)
    - Melting and vaporization c)
    - d) Electron removal from material
  - What is the value of stand-off distance in Water jet machining? 5)
    - a) 0.1-1 mm b) 1 - 2 mm
      - d) 6 14 mm c) 2 - 6 mm
  - The Electrical Discharge Machining (EDM) process is \_\_\_\_\_. 6)
    - a) Burr free

a)

- Not for hard metals b)
- Direct contact machining c)
- Capable of producing sharp comers d)
- In Electron beam machining, workpiece is held in \_\_\_\_\_. 7) vacuum chamber
  - b) dielectric medium
  - c) electrolyte d) none of these



Set

Max. Marks: 50

Marks: 10

# 8) Which of the following processes is generally applied for dentistry work like to drill fine holes of particular shape in teeth?

- a) Electrical Discharge Machining (EDM)
- b) Electron Beam Machining (EBM)
- c) Laser Beam Machining (LBM)
- d) Ultrasonic Machining (USM)

#### 9) The process utilizing mainly thermal energy for removing material is \_\_\_\_\_.

- a) Ultrasonic Machining
- b) Electrochemical Machining

**SLR-FM-135** 

Set Q

- Abrasive Jet Machining d) Laser Beam Machining
- 10) In electrochemical machining (ECM) removal of metal from the work piece takes place \_\_\_\_\_.
  - a) anodic dissolution

C)

- b) abrasive action
- c) thermal melting
- d) erosion

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# SLR-FM-135

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part-II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

**Instructions:** 1) All questions are compulsory.

2) Figures to the right indicate full marks.

## Q.2 Solve any four of the following questions.

- a) Explain the needs of nonconventional machining processes.
- **b)** With a neat sketch explain working of Water Jet Machining.
- c) What are various etchants used and process parameters in Chemical machining (CHM)?
- d) State advantages, disadvantages and applications of Electrical Discharge Machining (EDM).
- e) Explain with a neat sketch working of laser Beam Machining.
- f) State advantages, disadvantages and applications of Electron Beam Machining.

#### **Q.3** Solve any two of the following questions.

- a) Classify various non-conventional machining processes depending upon the energy sources used.
- **b)** Explain the principle of working of Ion Beam Machining (IBM) and state its applications.
- c) What are various advantages, disadvantages and applications of Plasma Arc Machining?
- d) Explain the following parameters with respect to Ultrasonic Machining (USM)-
  - 1) Effect of amplitude and frequency of vibration
  - 2) Effect of grain size
  - 3) Effect of applied static load
  - 4) Effect of slurry

Max. Marks: 40

16

24

Set Q

Set

Max. Marks: 50

R

# Seat No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer Book.

2) Figures to the right indicate full marks.

# MCQ/Objectives Type Questions

Duration: 20 Minutes

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10
  - What is the main mechanism of material removal in Electro chemical grinding?
    - a) Mechanical erosion of material
    - b) Electro chemical dissolution
    - c) Melting and vaporization
    - d) Electron removal from material
  - 2) What is the value of stand-off distance in Water jet machining?
    - a) 0.1-1 mm b) 1 2 mm
    - c) 2 6 mm d) 6 14 mm
  - 3) The Electrical Discharge Machining (EDM) process is \_\_\_\_\_.
    - a) Burr free
    - b) Not for hard metals
    - c) Direct contact machining
    - d) Capable of producing sharp comers
  - 4) In Electron beam machining, workpiece is held in \_\_\_\_\_.
    - a) vacuum chamber b) dielectric medium
    - c) electrolyte d) none of these
  - 5) Which of the following processes is generally applied for dentistry work like to drill fine holes of particular shape in teeth?
    - a) Electrical Discharge Machining (EDM)
    - b) Electron Beam Machining (EBM)
    - c) Laser Beam Machining (LBM)
    - d) Ultrasonic Machining (USM)

### 6) The process utilizing mainly thermal energy for removing material is \_\_\_\_\_.

- a) Ultrasonic Machining b) Electrochemical Machining
- c) Abrasive Jet Machining
- In electrochemical machining (ECM) removal of metal from the work piece takes place \_\_\_\_\_.
  - a) anodic dissolution
  - c) thermal melting d) erosion
- d) Laser Beam Machining

b) abrasive action

Marks: 10

## 8) In Ultrasonic machining, the function of transducer is to \_\_\_\_\_.

- a) convert mechanical energy into heat
- b) convert electrical energy into heat
- c) convert electrical energy into mechanical vibrations
- d) convert mechanical energy into electrical energy
- 9) What is the value of velocity of plasma jet in Plasma beam machining?
  - a) 100 m/sec b) 300 m/sec
  - c) 400 m/sec d) 500 m/sec
- 10) What is the depth-to-diameter ratio obtained in drilling process using Laser beam machining?
  - a) 10:1 b) 20:1
  - c) 50:1

d) 80:1

**SLR-FM-135** 

Set R

24

# SLR-FM-135

Set

R

# T.E. (Part-II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Seat

No.

**Instructions:** 1) All questions are compulsory.

2) Figures to the right indicate full marks.

### Q.2 Solve any four of the following questions.

- a) Explain the needs of nonconventional machining processes.
- **b)** With a neat sketch explain working of Water Jet Machining.
- c) What are various etchants used and process parameters in Chemical machining (CHM)?
- d) State advantages, disadvantages and applications of Electrical Discharge Machining (EDM).
- e) Explain with a neat sketch working of laser Beam Machining.
- f) State advantages, disadvantages and applications of Electron Beam Machining.

#### Q.3 Solve any two of the following questions.

- a) Classify various non-conventional machining processes depending upon the energy sources used.
- **b)** Explain the principle of working of Ion Beam Machining (IBM) and state its applications.
- c) What are various advantages, disadvantages and applications of Plasma Arc Machining?
- d) Explain the following parameters with respect to Ultrasonic Machining (USM)-
  - 1) Effect of amplitude and frequency of vibration
  - 2) Effect of grain size
  - 3) Effect of applied static load
  - 4) Effect of slurry

3

Max. Marks: 40

16

# Seat No.

## T.E. (Part - II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 20 minutes in answer Book.

2) Figures to the right indicate full marks.

# MCQ/Objectives Type Questions

#### Duration: 20 Minutes

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 10
  - 1) Which of the following processes is generally applied for dentistry work like to drill fine holes of particular shape in teeth?
    - a) Electrical Discharge Machining (EDM)
    - b) Electron Beam Machining (EBM)
    - c) Laser Beam Machining (LBM)
    - d) Ultrasonic Machining (USM)
  - 2) The process utilizing mainly thermal energy for removing material is \_\_\_\_\_.
    - a) Ultrasonic Machining b) Electrochemical Machining
    - c) Abrasive Jet Machining d) Laser Beam Machining
  - In electrochemical machining (ECM) removal of metal from the work piece takes place \_\_\_\_\_.
    - a) anodic dissolution b) abrasive action
    - c) thermal melting d) erosion
  - 4) In Ultrasonic machining, the function of transducer is to \_\_\_\_\_.
    - a) convert mechanical energy into heat
    - b) convert electrical energy into heat
    - c) convert electrical energy into mechanical vibrations
    - d) convert mechanical energy into electrical energy
  - 5) What is the value of velocity of plasma jet in Plasma beam machining?
    - a) 100 m/sec b) 300 m/sec
    - c) 400 m/sec d) 500 m/sec
  - 6) What is the depth-to-diameter ratio obtained in drilling process using Laser beam machining?

| a) | 10:1 | b) | 20:1 |
|----|------|----|------|
|    |      | I) | 004  |

- c) 50:1 d) 80:1
- 7) What is the main mechanism of material removal in Electro chemical grinding?
  - a) Mechanical erosion of material
  - b) Electro chemical dissolution
  - c) Melting and vaporization
  - d) Electron removal from material

# Set S

Max. Marks: 50

Marks: 10

Set S

- 8) What is the value of stand-off distance in Water jet machining?
  - a) 0.1-1 mm b) 1 2 mm
  - c) 2 6 mm d) 6 14 mm
- 9) The Electrical Discharge Machining (EDM) process is \_\_\_\_\_.
  - a) Burr free
  - b) Not for hard metals
  - c) Direct contact machining
  - d) Capable of producing sharp comers
- 10) In Electron beam machining, workpiece is held in \_\_\_\_\_.
  - a) vacuum chamber
- b) dielectric medium
- c) electrolyte d) none of these

24

# SLR-FM-135 Set S

# T.E. (Part-II) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering

NON-CONVENTIONAL MACHINING PROCESSES

Day & Date: Thursday, 28-11-2019 Time: 10:00 AM To 12:00 PM

Seat

No.

**Instructions:** 1) All questions are compulsory.

2) Figures to the right indicate full marks.

#### Q.2 Solve any four of the following questions.

- a) Explain the needs of nonconventional machining processes.
- **b)** With a neat sketch explain working of Water Jet Machining.
- c) What are various etchants used and process parameters in Chemical machining (CHM)?
- d) State advantages, disadvantages and applications of Electrical Discharge Machining (EDM).
- e) Explain with a neat sketch working of laser Beam Machining.
- f) State advantages, disadvantages and applications of Electron Beam Machining.

#### Q.3 Solve any two of the following questions.

- a) Classify various non-conventional machining processes depending upon the energy sources used.
- **b)** Explain the principle of working of Ion Beam Machining (IBM) and state its applications.
- c) What are various advantages, disadvantages and applications of Plasma Arc Machining?
- d) Explain the following parameters with respect to Ultrasonic Machining (USM)-
  - 1) Effect of amplitude and frequency of vibration
  - 2) Effect of grain size
  - 3) Effect of applied static load
  - 4) Effect of slurry

Max. Marks: 40

L\_\_\_\_

16

# Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering METROLOGY AND MECHANICAL MEASUREMENTS

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

## MCQ/Objective Type Questions

Duration: 30 Minutes

# Q.1 A) Choose the correct alternatives from the options and rewrite the sentence.

- 1) Value of maximum Interference is given by \_\_\_\_\_.
  - a) Size of smallest hole size of biggest shaft
  - b) Largest hole size smallest hole size
  - c) Size of smallest shaft size of biggest shaft
  - d) Size of biggest Shaft Size of biggest hole

## 2) Johansson mickrocator is a type of \_\_\_\_\_

- a) mechanical optical comparator
- b) mechanical comparator
- c) optical comparator
- d) electrical comparator
- 3) A bore of  $\emptyset$  14.67 mm in a work piece can be accurately measured by
  - a) Vernier depth gauge
  - c) Vernier Caliper d
- b) Inside Micrometer
  - d) Micrometer depth gauge
- 4) Interference fit \_\_\_\_\_.
  - a) 100H<sub>8</sub>k6 b) 100H<sub>7</sub>f<sub>6</sub>
  - c)  $100H_7r_6$  d)  $100H_8h_6$

5) To avoid reading errors due to parallax a steel rule should be \_\_\_\_\_.
 a) As thick as possible b) Satin chrome finished

- a) As thick as possibleb) Sc) As thin as possibled) A
  - d) As longer as possible
- 6) The best size wire for measuring the effective diameter of threads is

a) 
$$\frac{p \sec \theta}{2}$$
  
b)  $\frac{p \cos \theta}{2}$   
c)  $\frac{p \cos \theta}{2}$   
d)  $\frac{p}{p}$ 

c) psec  $\theta$  d)  $\frac{p}{2\cos ec\theta}$ 

SLR-FM-136



Max. Marks: 70

Marks: 14

06

#### B) Select the correct alternatives. There may be more than correct answers. (2 marks each)

- In a rotameter the flow is inferred from 1)
  - a) Force balance on float
- Direction of flow
- c) Position of float
- b) d) Colour change
- As per the Taylor's principle of gauging \_\_\_\_\_
  - a) Go gauge should be full form gauge
  - b) Go gauge should check all the related dimensions simultaneously

b)

- c) No Go gauge should the full form
- d) No Go gauge should check only one dimension at a time
- Comparator consists of \_\_\_\_\_ 3)
  - a) End Standard
    - Manipulation unit d)
- In measurement systems which of the following static characteristics 4) are undesirable \_\_\_\_\_
  - a) Sensitivity

C)

- c) Non-linearity
- b) Reproducibility

Sensing device

Presentation element

d) Drift 80

**SLR-FM-136** 

Set

| Sea<br>No. | t        | Set  | Ρ        |
|------------|----------|--|----------|
|            |          | T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>METROLOGY AND MECHANICAL MEASUREMENTS  |          |
|            |          | ate: Friday, 22-11-2019 Max. Marks<br>:00 AM To 01:00 PM   | s: 56    |
| Instr      | ructi    | <ul> <li>ons: 1) Attempt any two questions from the each Section.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Assume suitable data if necessary and mention it clearly.</li> </ul>   |          |
|            |          | Section – I  |          |
| Q.2        | a)       | Distinguish clearly between anyone pair of the following:<br>i) Precision and accuracy.<br>ii) Line standard and end standard  | 04       |
|            | b)       |  | 06       |
|            | c)       | Explain Wave length standards. Why it is preferred over material standards.  | 04       |
| Q.3        | a)<br>b) | <ul> <li>With neat sketch write a short note on Sine Centre.</li> <li>Design a workshop type progressive type GO- NO GO plug gauges suitable for 25H<sub>7</sub> with following information. Assume suitable allowances.</li> <li>i) 25mm lies in the dia. step of 18mm - 30mm</li> <li>ii) IT7=16i</li> </ul> | 04<br>10 |
| Q.4        | a)       | Describe in brief construction, working and application of Solex Pneumatic Comparator.   | 04       |
|            | b)       | Explain three wire Method for measurement of effective diameter of screw thread.   | 05       |
|            | c)       | Explain with neat sketch Autocollimator.   | 05       |
|            |          | Section – II   |          |
| Q.5        | a)<br>b) | <ul> <li>Identify following functional elements in Bourdon tube pressure gauge and explain their working with sketch.</li> <li>1) Transducer element</li> <li>2) Presentation Element</li> <li>3) Transmission element</li> <li>Explain the meaning of Sensitivity, Linearity &amp; Hysteresis.</li> </ul>     | 08<br>06 |
| 06         |          |  | 08       |
| Q.6        | a)<br>b) | Describe construction, working & application of Pirani gauge.<br>Write a short note on thermistors.  | 06       |
| Q.7        | a)<br>b) | Explain working of Drag cup tachometer with neat sketch.<br>Explain application of Strain gauge for load measurement.  | 07<br>07 |

# Seat

Set P

SLR-FM-136

Set

Max. Marks: 70

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering METROLOGY AND MECHANICAL MEASUREMENTS**

Day & Date: Friday, 22-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

# **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Marks: 14

06

- Q.1 A) Choose the correct alternatives from the options and rewrite the sentence.
  - Interference fit \_\_\_\_\_. 1)
    - a) 100H<sub>8</sub>k6  $100H_7f_6$ b)
    - c)  $100H_7r_6$ d)  $100H_8h_6$
  - To avoid reading errors due to parallax a steel rule should be \_\_\_\_\_ b) Satin chrome finished
    - a) As thick as possible
    - c) As thin as possible
  - 3) The best size wire for measuring the effective diameter of threads is

d)

| a) | $\frac{p \sec \theta}{2}$ . | b) | $\frac{p\cos\theta}{2}$    |
|----|-----------------------------|----|----------------------------|
| c) | psec θ                      | d) | <sup>2</sup> p<br>2cos ecθ |

- Value of maximum Interference is given by \_
  - a) Size of smallest hole size of biggest shaft
  - b) Largest hole size smallest hole size
  - c) Size of smallest shaft size of biggest shaft
  - d) Size of biggest Shaft Size of biggest hole

#### Johansson mickrocator is a type of \_\_\_\_\_. 5)

- mechanical optical comparator a)
- mechanical comparator b)
- c) optical comparator
- d) electrical comparator
- 6) A bore of  $\emptyset$  14.67 mm in a work piece can be accurately measured by
  - a) Vernier depth gauge
  - c) Vernier Caliper
- Inside Micrometer b)
- d) Micrometer depth gauge

As longer as possible

# B) Select the correct alternatives. There may be more than correct answers. (2 marks each)

- 1) In measurement systems which of the following static characteristics are undesirable \_\_\_\_\_.
  - a) Sensitivity
- b) Reproducibility
- c) Non-linearity d) Drift
- 2) In a rotameter the flow is inferred from \_\_\_\_\_
  - a) Force balance on floatc) Position of float
- b) Direction of flowd) Colour change
- 3) As per the Taylor's principle of gauging \_\_\_\_\_
  - a) Go gauge should be full form gauge
  - b) Go gauge should check all the related dimensions simultaneously
  - c) No Go gauge should the full form
  - d) No Go gauge should check only one dimension at a time
- 4) Comparator consists of \_\_\_\_\_

c) Manipulation unit

- a) End Standard
- b) Sensing device
- d) Presentation element

08

SLR-FM-136

Set

| Sea<br>No. | t        | Set  | Q        |
|------------|----------|--|----------|
|            |          | T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>METROLOGY AND MECHANICAL MEASUREMENTS  |          |
| ,          |          | ate: Friday, 22-11-2019 Max. Marks<br>:00 AM To 01:00 PM   | s: 56    |
| Instr      | ucti     | <ul> <li>ons: 1) Attempt any two questions from the each Section.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Assume suitable data if necessary and mention it clearly.</li> </ul>   |          |
| Q.2        | a)       | Distinguish clearly between anyone pair of the following:  | 04       |
|            |          | <ul><li>i) Precision and accuracy.</li><li>ii) Line standard and end standard</li></ul>  |          |
|            | b)       |  | 06       |
|            | c)       | Explain Wave length standards. Why it is preferred over material standards.  | 04       |
| Q.3        | a)<br>b) | <ul> <li>With neat sketch write a short note on Sine Centre.</li> <li>Design a workshop type progressive type GO- NO GO plug gauges suitable for 25H<sub>7</sub> with following information. Assume suitable allowances.</li> <li>i) 25mm lies in the dia. step of 18mm - 30mm</li> <li>ii) IT7=16i</li> </ul> | 04<br>10 |
| Q.4        | a)       | Describe in brief construction, working and application of Solex Pneumatic Comparator.   | 04       |
|            | b)       | Explain three wire Method for measurement of effective diameter of screw thread.   | 05       |
|            | c)       | Explain with neat sketch Autocollimator.   | 05       |
|            |          | Section – II   |          |
| Q.5        | a)       | <ul> <li>explain their working with sketch.</li> <li>1) Transducer element</li> <li>2) Presentation Element</li> <li>3) Transmission element</li> </ul>  | 08       |
| • •        | b)       | Explain the meaning of Sensitivity, Linearity & Hysteresis.  | 06       |
| Q.6        | a)<br>b) | Describe construction, working & application of Pirani gauge.<br>Write a short note on thermistors.  | 08<br>06 |
| Q.7        | a)<br>b) | Explain working of Drag cup tachometer with neat sketch.<br>Explain application of Strain gauge for load measurement.  | 07<br>07 |

SLR-FM-136 Set Q

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METROLOGY AND MECHANICAL MEASUREMENTS

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat No.

#### Q.1 A) Choose the correct alternatives from the options and rewrite the 06 sentence.

- Johansson mickrocator is a type of \_\_\_\_\_. 1)
  - a) mechanical optical comparator
  - b) mechanical comparator
  - c) optical comparator
  - d) electrical comparator

# 2) A bore of $\emptyset$ 14.67 mm in a work piece can be accurately measured by

b)

d)

b)

- a) Vernier depth gauge
- c) Vernier Caliper
- 3) Interference fit
  - a) 100H<sub>8</sub>k6
  - c)  $100H_7r_6$
- $100H_7f_6$ d)  $100H_8h_6$
- To avoid reading errors due to parallax a steel rule should be \_\_\_\_\_. Satin chrome finished
  - a) As thick as possible b) c) As thin as possible
    - d) As longer as possible

Inside Micrometer

Micrometer depth gauge

# 5) The best size wire for measuring the effective diameter of threads is

| a) | $\frac{p \sec \theta}{2}$ . | b) | $\frac{p\cos\theta}{2}$                |
|----|-----------------------------|----|--|
| c) | psec θ                      | d) | ) $\frac{\frac{2}{p}}{2\cos ec\theta}$ |

- Value of maximum Interference is given by \_
  - a) Size of smallest hole size of biggest shaft
  - b) Largest hole size smallest hole size
  - c) Size of smallest shaft size of biggest shaft
  - d) Size of biggest Shaft Size of biggest hole

Max. Marks: 70

Marks: 14



**SLR-FM-136** 



80

**SLR-FM-136** 

# B) Select the correct alternatives. There may be more than correct answers. (2 marks each)

- 1) Comparator consists of \_\_\_\_
  - a) End Standard
- b) Sensing device
- c) Manipulation unit d)
- d) Presentation element
- In measurement systems which of the following static characteristics are undesirable \_\_\_\_\_.
  - a) Sensitivity
- b) Reproducibility
- c) Non-linearity d) Drift
- 3) In a rotameter the flow is inferred from \_
  - a) Force balance on floatc) Position of float
- b) Direction of flow
- d) Colour change
- 4) As per the Taylor's principle of gauging \_\_\_\_\_
  - a) Go gauge should be full form gauge
  - b) Go gauge should check all the related dimensions simultaneously
  - c) No Go gauge should the full form
  - d) No Go gauge should check only one dimension at a time

| No.   |   | Set  | R        |  |  |  |
|-------|---|--|----------|--|--|--|
|       | T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>METROLOGY AND MECHANICAL MEASUREMENTS |  |          |  |  |  |
|       |   | ate: Friday, 22-11-2019 Max. Marks<br>:00 AM To 01:00 PM   | s: 56    |  |  |  |
| Instr | ucti  | <ul> <li>ons: 1) Attempt any two questions from the each Section.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Assume suitable data if necessary and mention it clearly.</li> </ul>   |          |  |  |  |
|       |   | Section – I  |          |  |  |  |
| Q.2   | a)  | <ul> <li>Distinguish clearly between anyone pair of the following:</li> <li>i) Precision and accuracy.</li> <li>ii) Line standard and end standard</li> </ul>  | 04       |  |  |  |
|       | b)  | ,<br>,   | 06       |  |  |  |
|       | c)  |  | 04       |  |  |  |
| Q.3   | a)<br>b)  | <ul> <li>With neat sketch write a short note on Sine Centre.</li> <li>Design a workshop type progressive type GO- NO GO plug gauges suitable for 25H<sub>7</sub> with following information. Assume suitable allowances.</li> <li>i) 25mm lies in the dia. step of 18mm - 30mm</li> <li>ii) IT7=16i</li> </ul> | 04<br>10 |  |  |  |
| Q.4   | a)  | Describe in brief construction, working and application of Solex Pneumatic Comparator.   | 04       |  |  |  |
|       | b)  | Explain three wire Method for measurement of effective diameter of screw thread.   | 05       |  |  |  |
|       | c)  | Explain with neat sketch Autocollimator.   | 05       |  |  |  |
|       |   | Section – II   |          |  |  |  |
| Q.5   | a)  | <ul> <li>Identify following functional elements in Bourdon tube pressure gauge and explain their working with sketch.</li> <li>1) Transducer element</li> <li>2) Presentation Element</li> <li>3) Transmission element</li> </ul>  | 08       |  |  |  |
|       | b)  | Explain the meaning of Sensitivity, Linearity & Hysteresis.  | 06       |  |  |  |
| Q.6   | a)<br>b)  | Describe construction, working & application of Pirani gauge.<br>Write a short note on thermistors.  | 08<br>06 |  |  |  |
| Q.7   | a)<br>b)  | Explain working of Drag cup tachometer with neat sketch.<br>Explain application of Strain gauge for load measurement.  | 07<br>07 |  |  |  |

Seat

# SLR-FM-136 Set R

# Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering METROLOGY AND MECHANICAL MEASUREMENTS

Day & Date: Friday, 22-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

# Q.1 A) Choose the correct alternatives from the options and rewrite the sentence.

1) The best size wire for measuring the effective diameter of threads is

| a) | $\frac{p \sec \theta}{2}$ | b) | $\frac{p\cos\theta}{2}$    |
|----|---------------------------|----|----------------------------|
| c) | psec θ                    | d) | $\frac{p}{2\cos ec\theta}$ |

## 2) Value of maximum Interference is given by \_\_\_\_\_.

- a) Size of smallest hole size of biggest shaft
- b) Largest hole size smallest hole size
- c) Size of smallest shaft size of biggest shaft
- d) Size of biggest Shaft Size of biggest hole
- 3) Johansson mickrocator is a type of \_\_\_\_
  - a) mechanical optical comparator
  - b) mechanical comparator
  - c) optical comparator
  - d) electrical comparator

# 4) A bore of $\emptyset$ 14.67 mm in a work piece can be accurately measured by

- a) Vernier depth gauge
- c) Vernier Caliper
- b) Inside Micrometer
- d) Micrometer depth gauge
- 5) Interference fit \_\_\_\_\_.
  - a) 100H<sub>8</sub>k6 c) 100H<sub>7</sub>r<sub>6</sub>
- b) 100H<sub>7</sub>f<sub>6</sub> d) 100H<sub>8</sub>h<sub>6</sub>
- 6) To avoid reading errors due to parallax a steel rule should be \_\_\_\_\_
  - a) As thick as possible
  - c) As thin as possible
- b) Satin chrome finishedd) As longer as possible

Marks: 14

Max. Marks: 70

06



80

# B) Select the correct alternatives. There may be more than correct answers. (2 marks each)

- 1) As per the Taylor's principle of gauging \_\_\_\_\_.
  - a) Go gauge should be full form gauge
  - b) Go gauge should check all the related dimensions simultaneously
  - c) No Go gauge should the full form
  - d) No Go gauge should check only one dimension at a time
- 2) Comparator consists of \_\_\_\_\_
  - a) End Standard b) Sensing device
  - c) Manipulation unit d) Presentation element
- In measurement systems which of the following static characteristics are undesirable \_\_\_\_\_\_.

a) Sensitivity

- b) Reproducibilityd) Drift
- c) Non-linearity d) Drift
- 4) In a rotameter the flow is inferred from \_
  - a) Force balance on float
  - c) Position of float
- b) Direction of flow
- d) Colour change

| Sea<br>No. | t        | Set  | S        |
|------------|----------|--|----------|
|            |          | T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>METROLOGY AND MECHANICAL MEASUREMENTS  |          |
|            |          | ate: Friday, 22-11-2019 Max. Marks<br>:00 AM To 01:00 PM   | s: 56    |
| Instr      | ucti     | <ul> <li>ons: 1) Attempt any two questions from the each Section.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Assume suitable data if necessary and mention it clearly.</li> </ul>   |          |
|            |          | Section – I  |          |
| Q.2        | a)       | <ul> <li>Distinguish clearly between anyone pair of the following:</li> <li>i) Precision and accuracy.</li> <li>ii) Line standard and end standard</li> </ul>  | 04       |
|            | b)       | What are the three basic types of fits? Explain any two of them with simple sketches arbitrarily chosen numerical values of sizes of the mating components.  | 06       |
|            | c)       | Explain Wave length standards. Why it is preferred over material standards.  | 04       |
| Q.3        | a)<br>b) | <ul> <li>With neat sketch write a short note on Sine Centre.</li> <li>Design a workshop type progressive type GO- NO GO plug gauges suitable for 25H<sub>7</sub> with following information. Assume suitable allowances.</li> <li>i) 25mm lies in the dia. step of 18mm - 30mm</li> <li>ii) IT7=16i</li> </ul> | 04<br>10 |
| Q.4        | a)       | Describe in brief construction, working and application of Solex Pneumatic Comparator.   | 04       |
|            | b)       | Explain three wire Method for measurement of effective diameter of screw thread.   | 05       |
|            | c)       | Explain with neat sketch Autocollimator.   | 05       |
|            |          | Section – II   |          |
| Q.5        | ,        | <ul> <li>Identify following functional elements in Bourdon tube pressure gauge and explain their working with sketch.</li> <li>1) Transducer element</li> <li>2) Presentation Element</li> <li>3) Transmission element</li> </ul>  | 08       |
| <b>-</b> - | b)       | Explain the meaning of Sensitivity, Linearity & Hysteresis.  |          |
| Q.6        | a)<br>b) | Describe construction, working & application of Pirani gauge.<br>Write a short note on thermistors.  | 08<br>06 |
| Q.7        | a)<br>b) | Explain working of Drag cup tachometer with neat sketch.<br>Explain application of Strain gauge for load measurement.  | 07<br>07 |

# SLR-FM-136

# Seat <u>No.</u> T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) | Q. No. 1 is compulsory and should be solved in first 30 minutes in |
|------------------|--|
|                  | answer book.   |
| •                |  |

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full marks.

# MCQ/Objective Type Questions

INTERNAL COMBUSTION ENGINE

**Duration: 30 Minutes** 

- Choose the correct alternatives from the options and rewrite the Q.1 14 sentence. 1) The exhaust valve usually starts opening at TDC a) At BDC b) c) Before BDC d) After BDC The mixture requirement of a SI engine under normal running on a road is 2) a) a stoichiometric mixture b) a rich mixture c) a lean mixture d) none of the above 3) Economizer system is provided in the carburetors . a) to achieve fuel economy in fuel consumption b) To allow richer mixture for maximum power range c) To facilitate easy starting d) To accelerate the engine rapidly The throttle valve controls the supply of 4) a) air only fuel only b) c) air-fuel mixture none of the above d) 5) Main advantage of pintaux nozzle is \_\_\_\_ a) better cold starting performance b) ability to distribute the fuel good penetration c) d) good atomization 6) The quality of the petrol fuel is expressed as \_\_\_\_\_. a) Octane number b) cetane number c) API gravity d) SAE rating In 7) engine supercharging is essential. a) Marine b) Petrol c) Aircraft d) Diesel 8) EGR system is employed for controlling emission of \_\_\_\_ a) HC b) CO
  - c) NOx d) HC and CO

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Max. Marks: 70

Marks: 14



- 9) The function of quench area in a wedge shaped combustion chamber is to .
  - a) Improve the compression ratio
  - b) Cool the end gas
  - c) Decrease the volume of combustion chamber
  - d) Increase the area of combustion chamber

10) The choke is usually closed when the engine \_\_\_\_\_.

- a) Hot b) Cold
- c) Idling d) Accelerating
- 11) Dry sump lubrication system in \_\_\_\_\_.
  - a) Racing cars b) Modem cars
  - c) Jet engines d) None of the above

#### 12) From the engine indicator diagram we obtain \_\_\_\_

- a) I.M.E.P b) B.M.E.P
- c) Mechanical efficiency d) Relative efficiency

#### 13) Brake thermal efficiency for SI engine usually varies between \_\_\_\_\_.

- a) 25 to 30 % b) 30 to 60 %
- c) 60 to 80 % d) None of the above
- 14) Alcohol alone cannot be used in CI engines as \_\_\_\_\_.
  - a) Their self-ignition temperature is high
  - b) Latent heat of vaporization is low
  - c) Both (a) and (b)
  - d) None of the above

|       |          | T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INTERNAL COMBUSTION ENGINE   |          |
|-------|----------|--|----------|
|       |          | te: Saturday, 23-11-2019 Max. Marks<br>00 AM To 01:00 PM   | s: 56    |
| Instr | ructio   | <ul> <li>ons: 1) Answer any two questions from each section.</li> <li>2) Assume suitable data if necessary.</li> <li>3) Use of non-programmable calculator is allowed</li> <li>4) Figures to the right indicate full marks.</li> </ul>   |          |
|       |          | Section – I  |          |
| Q.2   | a)       | Discuss the effect of following losses on engine with neat sketches.<br>i) Pumping losses<br>ii) Exhaust blow down losses  | 06       |
|       | b)       | <ul> <li>iii) Time losses</li> <li>Compare Otto and Diesel Cycle for</li> <li>i) same compression ratio and Heat addition</li> <li>ii) same compression ratio and Heat rejection</li> </ul>  | 04       |
|       | c)       | Explain the terms valve timing diagram and valve overlap.  | 04       |
| Q.3   | a)<br>b) | Derive the equation for air fuel ratio by approximate method.<br>Enlist the limitations of a simple carburetor and methods to overcome them?   | 06<br>04 |
|       | c)       | Write a short note on mist lubricant system.   | 04       |
| Q.4   | a)       | Enlist and explain different types of nozzles used in CI engines with neat sketch of each.   | 06       |
|       | b)<br>c) | A six cylinder four stroke diesel engine develops 200kW at 1200rpm and consumes 0.3kg/kWhr. Determine the mass of fuel injected per seconds, when injection is carried out for 30° rotation of crank.<br>With a neat sketch explain the necessity and working of bendix drive.   | 04<br>04 |
|       | -,       | Section – II   | •        |
| Q.5   | a)       | Explain, Why High load application prefer CI engine and small load application prefer SI engine?   | 04       |
|       | b)<br>c) | What is Delay period? Explain factors affecting on Delay period.<br>What are the types of abnormal combustion in SI engine? Explain in short.  | 04<br>06 |
| Q.6   | a)       | <ul> <li>The air flow to four cylinder four stroke petrol engine is measured by means of a 7.5 cm diameter sharp edge orifice, Cd = 0.6. During a test on the engine following data were recorded-</li> <li>Bore = 11 cm, stroke = 13 cm, Engine speed = 2250 rpm, Brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000kJ/kg, pressure drop across the orifice = 4.1 cm of water. Atmospheric temperature and pressure are 15°C and 1.013 bar. Calculate -</li> <li>i) Thermal efficiency on brake power basis</li> <li>ii) Brake mean effective pressure</li> <li>ii) Volumetric efficiency based on free air condition.</li> </ul> | 10       |

Volumetric efficiency based on free air condition. II) b) Explain Thermodynamic cycle of supercharged engine.

# **SLR-FM-137**

Seat No.

Set P

|     |    | Set   | Ρ  |
|-----|----|---|----|
| Q.7 | a) | Write note on Cetane number.  | 04 |
|     | b) | Write note Catalytic convertor.                                       | 04 |
|     | c) | What are the emission from SI engine? Explain thermal reactor method. | 06 |

### Seat No. T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) | Q. No. 1 is compulsory and should be solved in first 30 minutes in |
|------------------|--|
|                  | answer book.   |

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

INTERNAL COMBUSTION ENGINE

**Duration: 30 Minutes** 

- Choose the correct alternatives from the options and rewrite the Q.1 14 sentence. 1) EGR system is employed for controlling emission of . a) HC b) CO c) NOx d) HC and CO 2) The function of quench area in a wedge shaped combustion chamber is to a) Improve the compression ratio b) Cool the end gas c) Decrease the volume of combustion chamber d) Increase the area of combustion chamber The choke is usually closed when the engine \_ 3) a) Hot b) Cold c) Idling d) Accelerating 4) Dry sump lubrication system in \_\_\_\_ a) Racing cars b) Modem cars c) Jet engines d) None of the above 5) From the engine indicator diagram we obtain \_ a) I.M.E.P B.M.E.P b) d) c) Mechanical efficiency Relative efficiency 6) Brake thermal efficiency for SI engine usually varies between \_\_\_\_\_. a) 25 to 30 % b) 30 to 60 % None of the above c) 60 to 80 % d) 7) Alcohol alone cannot be used in CI engines as . a) Their self-ignition temperature is high b) Latent heat of vaporization is low c) Both (a) and (b) d) None of the above 8) The exhaust valve usually starts opening \_ at TDC a) At BDC b)
  - c) Before BDC d) After BDC

SLR-FM-137

Max. Marks: 70

Marks: 14

- 9) The mixture requirement of a SI engine under normal running on a road is
  - a) a stoichiometric mixture
- b) a rich mixture
- c) a lean mixture
- d) none of the above

Set

- 10) Economizer system is provided in the carburetors \_\_\_\_\_.
  - to achieve fuel economy in fuel consumption a)
  - b) To allow richer mixture for maximum power range
  - c) To facilitate easy starting
  - d) To accelerate the engine rapidly
- 11) The throttle valve controls the supply of \_
  - a) air only fuel only b)
  - c) air-fuel mixture none of the above d)
- 12) Main advantage of pintaux nozzle is
  - a) better cold starting performance
  - b) ability to distribute the fuel
  - c) good penetration
  - d) good atomization

c) API gravity

- 13) The quality of the petrol fuel is expressed as \_
  - a) Octane number
    - cetane number b) SAE rating
    - d)
- 14) In \_\_\_\_\_ engine supercharging is essential.
  - a) Marine Petrol b)
  - c) Aircraft d) Diesel

| With a neat sketch explain the necessity and working of bendix drive.  |
|--|
| Section – II   |
| Explain, Why High load application prefer CI engine and small load<br>application prefer SI engine?<br>What is Delay period? Explain factors affecting on Delay period.<br>What are the types of abnormal combustion in SI engine? Explain in sho  |
| The air flow to four cylinder four stroke petrol engine is measured by<br>means of a 7.5 cm diameter sharp edge orifice, Cd = 0.6. During a test of<br>the engine following data were recorded-<br>Bore = 11 cm, stroke = 13 cm, Engine speed = 2250 rpm, Brake power =<br>36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000kJ/kg<br>pressure drop across the orifice = 4.1 cm of water. Atmospheric<br>temperature and pressure are 15 °C and 1.013 bar. Calculate -<br>i) Thermal efficiency on brake power basis<br>ii) Brake mean effective pressure<br>ii) Volumetric efficiency based on free air condition.<br>Explain Thermodynamic cycle of supercharged engine. |

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE

3) Use of non-programmable calculator is allowed

Section – I

Discuss the effect of following losses on engine with neat sketches.

4) Figures to the right indicate full marks.

same compression ratio and Heat addition

same compression ratio and Heat rejection

when injection is carried out for 30° rotation of crank.

Write a short note on mist lubricant system.

Explain the terms valve timing diagram and valve overlap.

Derive the equation for air fuel ratio by approximate method.

Enlist the limitations of a simple carburetor and methods to overcome

Enlist and explain different types of nozzles used in CI engines with neat

A six cylinder four stroke diesel engine develops 200kW at 1200rpm and

consumes 0.3kg/kWhr. Determine the mass of fuel injected per seconds,

**Instructions:** 1) Answer any two questions from each section. 2) Assume suitable data if necessary.

Pumping losses

iii) Time losses

sketch of each.

Exhaust blow down losses

Compare Otto and Diesel Cycle for

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

06

04

04

06

04

04

06

04

04

04

04

06

10

ort.

Seat

No.

Q.2

Q.3

Q.4

Q.5

Q.6

a)

b)

C)

a)

b)

C)

a)

b)

C)

a)

b)

c)

a)

b)

i)

ii)

i)

ii)

them?



04

Set Q

# Set Q

| Q.7 | a)<br>b)<br>c) | Write note on Cetane number.<br>Write note Catalytic convertor.<br>What are the emission from SI engine? Explain thermal reactor method. | 04<br>04<br>06 |
|-----|----------------|--|----------------|
|     |                |  |                |

| Seat |  |
|------|--|
| No.  |  |

### T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INTERNAL COMBUSTION ENGINE Max. Marks: 70

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) | Q. No. 1 is compulsory and should be solved in first 30 minutes in |
|------------------|--|
|                  | answer book.   |
| 2)               | Assume suitable data if necessary.                                 |

- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

- Choose the correct alternatives from the options and rewrite the Q.1 14 sentence. Main advantage of pintaux nozzle is \_\_\_\_\_. 1) a) better cold starting performance b) ability to distribute the fuel c) good penetration d) good atomization 2) The quality of the petrol fuel is expressed as \_\_\_\_\_. a) Octane number b) cetane number c) API gravity d) SAE rating In \_\_\_\_\_ engine supercharging is essential. 3) a) Marine b) Petrol c) Aircraft d) Diesel 4) EGR system is employed for controlling emission of \_\_\_\_\_. a) HC b) CO c) NOx HC and CO d) The function of guench area in a wedge shaped combustion chamber is 5) to \_\_\_\_\_. a) Improve the compression ratio b) Cool the end gas Decrease the volume of combustion chamber c) d) Increase the area of combustion chamber The choke is usually closed when the engine \_\_\_\_\_. 6) a) Hot Cold b) c) Idling d) Accelerating 7) Dry sump lubrication system in \_\_\_\_ a) Racing cars b) Modem cars c) Jet engines None of the above d)
  - From the engine indicator diagram we obtain \_ 8)
    - a) I.M.E.P

- B.M.E.P b)
- c) Mechanical efficiency **Relative efficiency** d)

Set

R

Marks: 14

|     |  |                   | SLR-FM-137     |
|-----|--|-------------------|----------------|
|     |  |                   | Set R          |
| 9)  | ,  | e usu<br>b)<br>d) | -              |
| 10) | <ul> <li>Alcohol alone cannot be used in CI er</li> <li>a) Their self-ignition temperature is</li> <li>b) Latent heat of vaporization is low</li> <li>c) Both (a) and (b)</li> <li>d) None of the above</li> </ul>                         | high              |                |
| 11) |  | ning<br>b)<br>d)  | at TDC         |
| 12) | The mixture requirement of a SI engir<br><br>a) a stoichiometric mixture<br>c) a lean mixture  |                   | a rich mixture |
| 13) | <ul> <li>Economizer system is provided in the</li> <li>a) to achieve fuel economy in fuel co</li> <li>b) To allow richer mixture for maxim</li> <li>c) To facilitate easy starting</li> <li>d) To accelerate the engine rapidly</li> </ul> | onsı              | Imption        |
| 14) | The throttle valve controls the supply a) air only   | of _<br>b)        | fuel only      |

- c) air-fuel mixture d)
- b) fuel only d) none of the above

| With a neat sketch explain the necessity and working of bendix drive.   |
|---|
| Section – II  |
| Explain, Why High load application prefer CI engine and small load<br>application prefer SI engine?<br>What is Delay period? Explain factors affecting on Delay period.<br>What are the types of abnormal combustion in SI engine? Explain in short.  |
| The air flow to four cylinder four stroke petrol engine is measured by<br>means of a 7.5 cm diameter sharp edge orifice, Cd = 0.6. During a test on<br>the engine following data were recorded-<br>Bore = 11 cm, stroke = 13 cm, Engine speed = 2250 rpm, Brake power =<br>36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000kJ/kg,<br>pressure drop across the orifice = 4.1 cm of water. Atmospheric<br>temperature and pressure are 15 °C and 1.013 bar. Calculate -<br>i) Thermal efficiency on brake power basis<br>ii) Brake mean effective pressure<br>ii) Volumetric efficiency based on free air condition.<br>Explain Thermodynamic cycle of supercharged engine. |

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** 

**Instructions:** 1) Answer any two questions from each section. 2) Assume suitable data if necessary.

INTERNAL COMBUSTION ENGINE

Section – I

Discuss the effect of following losses on engine with neat sketches.

3) Use of non-programmable calculator is allowed

4) Figures to the right indicate full marks.

same compression ratio and Heat addition

same compression ratio and Heat rejection

when injection is carried out for 30° rotation of crank.

Write a short note on mist lubricant system.

Explain the terms valve timing diagram and valve overlap.

Derive the equation for air fuel ratio by approximate method.

Enlist the limitations of a simple carburetor and methods to overcome

Enlist and explain different types of nozzles used in CI engines with neat

A six cylinder four stroke diesel engine develops 200kW at 1200rpm and

consumes 0.3kg/kWhr. Determine the mass of fuel injected per seconds,

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM

Pumping losses

iii) Time losses

sketch of each.

Exhaust blow down losses

Compare Otto and Diesel Cycle for

Max. Marks: 56

06

04

04

06

04

04

06

04

04

04

04

06

10

Seat No.

Q.2

Q.3

Q.4

Q.5

Q.6

a)

b)

C)

a)

b)

C)

a)

b)

c)

a)

b)

c)

a)

b)

i)

ii)

i)

ii)

them?



04

Set R

|    | Set   | R  |
|----|---|----|
| a) | Write note on Cetane number.  | 04 |
| b) | Write note Catalytic convertor.                                       | 04 |
| c) | What are the emission from SI engine? Explain thermal reactor method. | 06 |

Q.7 a)

| The                         | The mixture requirement of a SI engine under normal running on a road is   |          |                                     |                             |  |  |  |
|-----------------------------|--|----------|-------------------------------------|-----------------------------|--|--|--|
| a)<br>c)                    | a stoichiometric mixture<br>a lean mixture   | b)<br>d) | a rich mixture<br>none of the above |                             |  |  |  |
| Eco<br>a)<br>b)<br>c)<br>d) | <ul> <li>Economizer system is provided in the carburetors</li> <li>a) to achieve fuel economy in fuel consumption</li> <li>b) To allow richer mixture for maximum power range</li> <li>c) To facilitate easy starting</li> </ul> |          |                                     |                             |  |  |  |
|                             |  |          |                                     | Page <b>13</b> of <b>16</b> |  |  |  |

at TDC

After BDC

b)

d)

**Mechanical Engineering** INTERNAL COMBUSTION ENGINE Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. 2) Assume suitable data if necessary. 3) Use of non-programmable calculator is allowed. 4) Figures to the right indicate full marks. MCQ/Objective Type Questions Choose the correct alternatives from the options and rewrite the sentence. 1) The choke is usually closed when the engine Cold a) Hot b) c) Idling d) Accelerating Dry sump lubrication system in \_\_\_\_ 2) a) Racing cars b) Modem cars c) Jet engines d) None of the above 3) From the engine indicator diagram we obtain a) I.M.E.P B.M.E.P b) c) Mechanical efficiency d) Relative efficiency Brake thermal efficiency for SI engine usually varies between \_\_\_\_ 4) a) 25 to 30 % 30 to 60 % b) c) 60 to 80 % d) None of the above

Alcohol alone cannot be used in CI engines as \_\_\_\_\_.

a) Their self-ignition temperature is high b) Latent heat of vaporization is low

The exhaust valve usually starts opening \_\_\_\_\_

c) Both (a) and (b) d) None of the above

a) At BDC

c) Before BDC

T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019

Day & Date: Saturday, 23-11-2019 Time: 10:00 AM To 01:00 PM **Duration: 30 Minutes** Q.1

Seat No.

5)

6)

7)

8)

## **SLR-FM-137**

Set

Max. Marks: 70

Marks: 14

14

|     |   |                    |                                   | Set   | S |
|-----|---|--------------------|-----------------------------------|-------|---|
| 9)  | The throttle valve controls the supply<br>a) air only<br>c) air-fuel mixture  | / of _<br>b)<br>d) |                                   |       |   |
| 10) | <ul> <li>Main advantage of pintaux nozzle is</li> <li>a) better cold starting performance</li> <li>b) ability to distribute the fuel</li> <li>c) good penetration</li> <li>d) good atomization</li> </ul> |                    |                                   |       |   |
| 11) | <ul><li>The quality of the petrol fuel is expression</li><li>a) Octane number</li><li>c) API gravity</li></ul>  | essed<br>b)<br>d)  | as<br>cetane number<br>SAE rating |       |   |
| 12) | In engine supercharging is es<br>a) Marine<br>c) Aircraft   | senti<br>b)<br>d)  | al.<br>Petrol<br>Diesel           |       |   |
| 13) | EGR system is employed for control<br>a) HC<br>c) NOx   | ling e<br>b)<br>d) | mission of<br>CO<br>HC and CO     |       |   |
| 14) | The function of quench area in a we   | dge s              | haped combustion chambe           | er is |   |

- to \_\_\_\_\_.

- a) Improve the compression ratiob) Cool the end gasc) Decrease the volume of combustion chamber
- d) Increase the area of combustion chamber

Set S

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INTERNAL COMBUSTION ENGINE

Seat

No.

Day & Date: Saturday, 23-11-2019 Max. Marks: 56 Time: 10:00 AM To 01:00 PM **Instructions:** 1) Answer any two questions from each section. 2) Assume suitable data if necessary. 3) Use of non-programmable calculator is allowed 4) Figures to the right indicate full marks. Section – I 06 Q.2 a) Discuss the effect of following losses on engine with neat sketches. Pumping losses i) Exhaust blow down losses ii) iii) Time losses Compare Otto and Diesel Cycle for 04 b) same compression ratio and Heat addition i) same compression ratio and Heat rejection ii) Explain the terms valve timing diagram and valve overlap. c) 04 Q.3 a) Derive the equation for air fuel ratio by approximate method. 06 Enlist the limitations of a simple carburetor and methods to overcome 04 b) them? Write a short note on mist lubricant system. 04 C) Q.4 Enlist and explain different types of nozzles used in CI engines with neat 06 a) sketch of each. b) A six cylinder four stroke diesel engine develops 200kW at 1200rpm and 04 consumes 0.3kg/kWhr. Determine the mass of fuel injected per seconds, when injection is carried out for 30° rotation of crank. With a neat sketch explain the necessity and working of bendix drive. 04 C) Section – II Q.5 Explain, Why High load application prefer CI engine and small load 04 a) application prefer SI engine? What is Delay period? Explain factors affecting on Delay period. 04 b) What are the types of abnormal combustion in SI engine? Explain in short. 06 C) The air flow to four cylinder four stroke petrol engine is measured by 10 Q.6 a) means of a 7.5 cm diameter sharp edge orifice, Cd = 0.6. During a test on the engine following data were recorded-Bore = 11 cm, stroke = 13 cm, Engine speed = 2250 rpm, Brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000kJ/kg, pressure drop across the orifice = 4.1 cm of water. Atmospheric temperature and pressure are 15°C and 1.013 bar. Calculate -Thermal efficiency on brake power basis i)

- ii) Brake mean effective pressure
- ii) Volumetric efficiency based on free air condition.
- **b)** Explain Thermodynamic cycle of supercharged engine.

|     |    | Set   | S  |
|-----|----|---|----|
| Q.7 | a) | Write note on Cetane number.  | 04 |
|     | b) | Write note Catalytic convertor.                                       | 04 |
|     | c) | What are the emission from SI engine? Explain thermal reactor method. | 06 |

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

### CAD/CAM

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary and state it clearly.

### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

d)

- G 90 preparatory code is used for \_ 1) b) Absolute co-ordinate setting
  - Absolute Presetting a)
  - Metric unit setting c)
- Miscellaneous function used for Coolant off is \_\_\_\_\_ 2)
  - M 00 M 09 a) b) M 03 d) c)
- CADIAN is \_\_\_\_\_ software. 3)
  - CAD b) a)
  - C) CAE d)
- 4) Windowing transformation means \_
  - Window to Viewport transformation a)
    - Geometric transformation b)
    - C) Vertices transformation
    - d) All
- Common language developed for computer assisted part programming is 5)
  - WAF a) b) MDI APT d) all C)
- 6) Calculation of physical properties such as volume, surface area, center of gravity, M.I etc is possible using
  - Solid modeling b) Surface a)
  - Wire frame d) C) all type
- Zoom in and Zoom out of an object and any portion of an object between 7) the edges is
  - Translation Rotation a) b)
  - c) Scaling d) None
- 8) Milling operation is an example \_\_\_\_
  - Contouring NC Point to Point NC a) b)
  - Straight cut C) d) all of above

Marks: 14

Max. Marks: 70

## **SLR-FM-138**



All

None

- CAM
- None of above

|     |  |                    | •=  |     |   |
|-----|--|--------------------|---|-----|---|
|     |  |                    |   | Set | Ρ |
| 9)  | In turning operation Z-axis refers to<br>a) Spindle axis<br>c) Plane designation               | b)<br>d)           | <br>Depth of cut<br>none of these                   |     |   |
| 10) | Adaptive control system reduces _<br>a) Machining time<br>c) Power output                      | b)<br>d)           | Non machining time<br>none of the above             |     |   |
| 11) | The major difference between ope<br>presence of<br>a) Drives<br>c) Lubrication system          | n and<br>b)<br>d)  | closed loop system is the<br>Feedback device<br>all |     |   |
| 12) | Among these which is Drawing inte<br>a) DXF<br>c) CAD  | erchan<br>b)<br>d) | ge file format<br>UCS<br>None of these              |     |   |
| 13) | In computer graphics GKS stands<br>a) General Knowledge System<br>c) Graphics Knowledge System | b)                 | Graphics kernel System                              |     |   |
| 14) | Basic transformation of rotation of<br>a) Origin   | an ima<br>b)       |   | ·   |   |

- c) Centre of image
- d) Top plane

**08** 

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

### CAD/CAM

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section I.

- 2) Q.No.5 is compulsory from section II and solve any one from remaining.
- 3) Assume suitable data if necessary and mention it clearly.
- 4) Figures to right indicate full marks.

### Section – I

- Q.2 a) What is CAD/CAM? Discuss the concept of integration of CAD to CAM. 07 Magnify the triangle ABC. First along X by 2 units and then by 2 units along 07 b) Y. Coordinate of triangle are A (1,1), B (3,3) and C (6,4). Write importance of curves in Graphics packages. What are various Q.3 07 a) properties of B spline & Bezier curves? b) Explain 3D Modeling Schemes 07 14 Q.4 Write short notes on (Any four) a) CAD/CAM data Exchange
  - b) CAPP & its types
  - c) Windowing and Viewing transformation
  - d) Design workstation
  - e) Standardization in Graphics Software

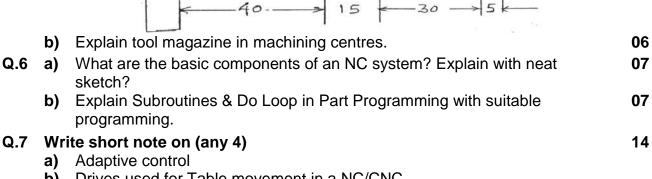
### Section – II

\$23

625

Q.5 a) Write manual part program to machine a component as shown in fig.
 Assume cutting speed as 500 rpm and feed rate of 0.5 mm/revolution.
 Assume that the face is not to be machined.

Work material : Aluminium work size : 30 X 90 mm Tool matl : HSS



**b)** Drives used for Table movement in a NC/CNC

\$30

- c) Compare CNC & DNC Machine Tools.
- d) EIA standards of parameter of Punched tape
- e) HMC

\_\_\_\_\_

Seat No.





Max. Marks: 56

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** CAD/CAM

Day & Date: Monday, 25-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Assume suitable data if necessary and state it clearly.

### **MCQ/Objective Type Questions**

### **Duration: 30 Minutes**

a)

Marks: 14

#### Choose the correct alternatives from the options and rewrite the sentence. Q.1 14

- Milling operation is an example 1)
  - Contouring NC b) Point to Point NC a) Straight cut d) all of above c)
- 2) In turning operation Z-axis refers to
  - Spindle axis b) Depth of cut a) Plane designation d) none of these c)
- 3) Adaptive control system reduces
  - Machining time b) Non machining time a)
    - none of the above Power output d) c)
- The major difference between open and closed loop system is the 4) presence of .
  - a) Drives b) Feedback device
  - Lubrication system C) d) all
- 5) Among these which is Drawing interchange file format \_\_\_\_\_. a)
  - DXF b) UCS
  - CAD None of these C) d)

In computer graphics GKS stands for 6)

- General Knowledge System Graphics kernel System b)
- Graphics Knowledge System None of the above C) d)

7) Basic transformation of rotation of an image takes place about \_\_\_\_\_.

- Origin Corner of image a) b) Centre of image d) Top plane C)
- 8) G 90 preparatory code is used for Absolute Presetting b) Absolute co-ordinate setting a)
  - Metric unit setting C) d) None

9) Miscellaneous function used for Coolant off is

M 09 a) M 00 b) M 03 d) All c)

Max. Marks: 70

Set

- 10) CADIAN is \_\_\_\_\_ software.
  - a) CAD

CAE

C)

- b) CAM
- d) None of above

**SLR-FM-138** 

Set Q

- 11) Windowing transformation means \_\_\_\_
  - a) Window to Viewport transformation
  - b) Geometric transformation
  - c) Vertices transformation
  - d) All
- 12) Common language developed for computer assisted part programming is
  - a) WAF b) MDI c) APT d) all
- 13) Calculation of physical properties such as volume, surface area, center of gravity, M.I etc is possible using \_\_\_\_\_.
  - a) Solid modeling b) Surface
  - c) Wire frame d) all type
- 14) Zoom in and Zoom out of an object and any portion of an object between the edges is \_\_\_\_\_.
  - a) Translation
  - c) Scaling
- b) Rotation
- d) None

Page 6 of 12

## SLR-FM-138

### Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering CAD/CAM

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section I.

- 2) Q.No.5 is compulsory from section II and solve any one from remaining.
- 3) Assume suitable data if necessary and mention it clearly.
- 4) Figures to right indicate full marks.

### Section – I

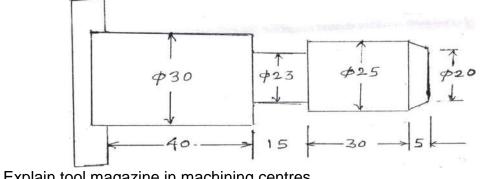
| Q.2 | a) | What is CAD/CAM? Discuss the concept of integration of CAD to CAM.  | 07 |
|-----|----|---|----|
|     | b) | Magnify the triangle ABC. First along X by 2 units and then by 2 units along                              | 07 |
|     |    | Y. Coordinate of triangle are A $(1,1)$ , B $(3,3)$ and C $(6,4)$ .                                       |    |
| Q.3 | a) | Write importance of curves in Graphics packages. What are various properties of B spline & Bezier curves? | 07 |
|     | b) | Explain 3D Modeling Schemes   | 07 |
| Q.4 | Wr | ite short notes on (Any four)   | 14 |
|     | a) | CAD/CAM data Exchange   |    |

- b) CAPP & its types
- c) Windowing and Viewing transformation
- d) Design workstation
- e) Standardization in Graphics Software

### Section – II

Q.5 a) Write manual part program to machine a component as shown in fig. Assume cutting speed as 500 rpm and feed rate of 0.5 mm/revolution. Assume that the face is not to be machined.

Work material : Aluminium work size : 30 X 90 mm Tool matl : HSS



|     | D) | Explain tool magazine in machining centres.                                  | 00 |
|-----|----|--|----|
| Q.6 | a) | What are the basic components of an NC system? Explain with neat sketch?     | 07 |
|     | b) | Explain Subroutines & Do Loop in Part Programming with suitable programming. | 07 |
| Q.7 | •  | ite short note on (any 4)  | 14 |
|     | a) | Adaptive control   |    |
|     | b) | Drives used for Table movement in a NC/CNC                                   |    |

- c) Compare CNC & DNC Machine Tools.
- d) EIA standards of parameter of Punched tape
- e) HMC

Max. Marks: 56

Set

O

08

20

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** CAD/CAM

Day & Date: Monday, 25-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

3) Assume suitable data if necessary and state it clearly.

### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

Common language developed for computer assisted part programming is 1)

|    | ·   |    |     |
|----|-----|----|-----|
| a) | WAF | b) | MDI |
| c) | APT | d) | all |

- 2) Calculation of physical properties such as volume, surface area, center of gravity, M.I etc is possible using
  - a) Solid modeling b) Surface
  - Wire frame d) c) all type

#### 3) Zoom in and Zoom out of an object and any portion of an object between the edges is

- a) Translation b) Rotation
- Scaling C) d) None
- 4) Milling operation is an example
  - Contouring NC Point to Point NC b) a) C) Straight cut d) all of above
- In turning operation Z-axis refers to 5) Spindle axis
  - a) b) Depth of cut Plane designation none of these C) d)
- Adaptive control system reduces 6)
  - Machining time a) b) Non machining time
    - Power output d) none of the above c)
- 7) The major difference between open and closed loop system is the presence of .
  - a) Drives Feedback device b)
  - Lubrication system d) all C)
- Among these which is Drawing interchange file format . 8)
  - a) DXF UCS b) CAD d) None of these
- In computer graphics GKS stands for 9)

c)

- General Knowledge System a) Graphics Knowledge System C)
  - Graphics kernel System b) None of the above d)

Max. Marks: 70

Marks: 14

Set





- Basic transformation of rotation of an image takes place about \_\_\_\_\_. 10)
  - Origin a)
- Corner of image b)
- C) Centre of image
- d) Top plane

CAM

None of above

- G 90 preparatory code is used for \_\_\_\_ 11) Absolute Presetting
  - b) Absolute co-ordinate setting
  - Metric unit setting d) C) None

12) Miscellaneous function used for Coolant off is \_\_\_\_

- M 09 a) M 00 b) All
- M 03 c) d)
- CADIAN is \_\_\_\_\_ software. 13)
  - a) CAD b)
  - CAE d) c)
- 14) Windowing transformation means \_
  - Window to Viewport transformation a)
  - Geometric transformation b)
  - C) Vertices transformation
  - d) All

a)

### Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering CAD/CAM

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section I.

- 2) Q.No.5 is compulsory from section II and solve any one from remaining.
- 3) Assume suitable data if necessary and mention it clearly.
- 4) Figures to right indicate full marks.

### Section – I

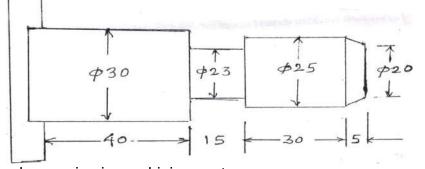
| Q.2 | a) | What is CAD/CAM? Discuss the concept of integration of CAD to CAM.           | 07 |
|-----|----|--|----|
|     | b) | Magnify the triangle ABC. First along X by 2 units and then by 2 units along | 07 |
|     |    | Y. Coordinate of triangle are A (1,1), B (3,3) and C (6,4).                  |    |
| Q.3 | a) | Write importance of curves in Graphics packages. What are various            | 07 |
|     |    | properties of B spline & Bezier curves?                                      |    |
|     | b) | Explain 3D Modeling Schemes  | 07 |
| Q.4 | Wr | ite short notes on (Any four)  | 14 |
|     | a) | CAD/CAM data Exchange  |    |

- b) CAPP & its types
- c) Windowing and Viewing transformation
- **d**) Design workstation
- e) Standardization in Graphics Software

### Section – II

Q.5 a) Write manual part program to machine a component as shown in fig.
 O8 Assume cutting speed as 500 rpm and feed rate of 0.5 mm/revolution. Assume that the face is not to be machined.

Work material : Aluminium work size : 30 X 90 mm Tool matl : HSS



- b) Explain tool magazine in machining centres.
  Q.6 a) What are the basic components of an NC system? Explain with neat 07 sketch?
  b) Explain Subroutines & Do Loop in Part Programming with suitable 07 programming.
  Q.7 Write short note on (any 4) 14 a) Adaptive control b) Drives used for Table movement in a NC/CNC
  - c) Compare CNC & DNC Machine Tools.
  - d) EIA standards of parameter of Punched tape
  - e) HMC

Max. Marks: 56

Set R

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** CAD/CAM

Day & Date: Monday, 25-11-2019

Time: 10:00 AM To 01:00 PM

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.
  - 2) Figures to the right indicate full marks.

3) Assume suitable data if necessary and state it clearly.

### **MCQ/Objective Type Questions**

### **Duration: 30 Minutes**

Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- Adaptive control system reduces 1)
  - Machining time b) Non machining time a) Power output d) none of the above c)
- 2) The major difference between open and closed loop system is the presence of \_\_\_\_\_. b) Feedback device
  - Drives a)
  - Lubrication system c)

3) Among these which is Drawing interchange file format .

DXF UCS a) b) c) CAD d) None of these

#### In computer graphics GKS stands for 4)

General Knowledge System b) Graphics kernel System a)

d)

- Graphics Knowledge System c) d)
- None of the above

all

Basic transformation of rotation of an image takes place about \_\_\_\_\_. 5) a) Origin

- Corner of image b)
- Centre of image Top plane C) d)

G 90 preparatory code is used for 6)

- Absolute Presetting b) Absolute co-ordinate setting a) Metric unit setting d) None
- C)

Miscellaneous function used for Coolant off is 7) b)

- M 00 a) M 03 C)
- 8) CADIAN is \_\_\_\_\_ software.
  - a) CAD b)
    - c) CAE d)
- 9) Windowing transformation means
  - Window to Viewport transformation a)
  - b) Geometric transformation
  - Vertices transformation C)
  - d) All

- M 09 d) All
- CAM
- None of above

Max. Marks: 70

Set

10) Common language developed for computer assisted part programming is

- WAF b) MDI a)
- APT C) d) all
- 11) Calculation of physical properties such as volume, surface area, center of gravity, M.I etc is possible using \_ \_.
  - a) Solid modeling b) Surface
  - Wire frame C) d) all type
- Zoom in and Zoom out of an object and any portion of an object between 12) the edges is \_\_\_\_\_.
  - Translation b) Rotation a)
  - Scaling d) None c)
- 13) Milling operation is an example \_\_\_\_
  - Contouring NC b) Point to Point NC
  - Straight cut C) d) all of above
- 14) In turning operation Z-axis refers to \_ b)
  - Spindle axis a)

a)

- C) Plane designation
- Depth of cut

**SLR-FM-138** 

Set

S

d) none of these

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering CAD/CAM

Day & Date: Monday, 25-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Answer any two questions from Section I.

- 2) Q.No.5 is compulsory from section II and solve any one from remaining.
- 3) Assume suitable data if necessary and mention it clearly.
- 4) Figures to right indicate full marks.

### Section – I

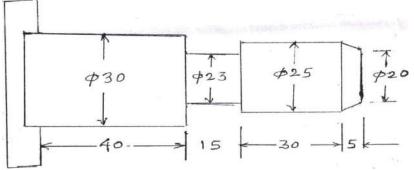
| Q.2 | a) | What is CAD/CAM? Discuss the concept of integration of CAD to CAM.   | 07 |
|-----|----|--|----|
|     | b) | Magnify the triangle ABC. First along X by 2 units and then by 2 units along                                 | 07 |
|     |    | Y. Coordinate of triangle are A $(1,1)$ , B $(3,3)$ and C $(6,4)$ .  |    |
| Q.3 | a) | Write importance of curves in Graphics packages. What are various<br>properties of B spline & Bezier curves? | 07 |
|     | b) | Explain 3D Modeling Schemes  | 07 |
| Q.4 | Wr | ite short notes on (Any four)  | 14 |
|     | a) | CAD/CAM data Exchange  |    |

- b) CAPP & its types
- c) Windowing and Viewing transformation
- d) Design workstation
- e) Standardization in Graphics Software

### Section – II

Q.5 a) Write manual part program to machine a component as shown in fig.
 O8 Assume cutting speed as 500 rpm and feed rate of 0.5 mm/revolution. Assume that the face is not to be machined.

Work material : Aluminium work size : 30 X 90 mm Tool matl : HSS



- **b)** Explain tool magazine in machining centres.
- Q.6 a) What are the basic components of an NC system? Explain with neat sketch?
  b) Explain Subroutines & Do Loop in Part Programming with suitable
  - b) Explain Subroutines & Do Loop in Part Programming with suitable programming.

### Q.7 Write short note on (any 4)

- a) Adaptive control
- b) Drives used for Table movement in a NC/CNC
- c) Compare CNC & DNC Machine Tools.
- d) EIA standards of parameter of Punched tape
- e) HMC

06

07

07

14

Set S

Max. Marks: 56

SLR-FM-138

Seat No.

| Seat |  |
|------|--|
| No.  |  |

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

**Instructions:** 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book

- 2) Assume suitable data wherever necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 A) Multiple correct answer type questions, carrying two marks each. 06

- Bearing number 6210 indicates that the bearing is . 1)
  - a) having bore diameter of 10 mm
  - b) having bore diameter of 50 mm
  - c) Angular contact ball bearing
  - d) Deep groove ball bearing
- According to Stribec's equation, the static load carrying capacity 'C' of 2) bearing depends upon .
  - a) Ball diameter b)
  - c) Lubricants used

Number of balls Ambient temperature d)

- For maximum power transmission condition for gears \_\_\_\_\_. a) Wear strength must be less
  - b) Dynamic load must be equal to static load
  - c) Beam strength must be high
  - d) Factor of safety must be one

#### Single correct answer type questions, carrying one marks each. **08** B)

- Class-1 pressure vessels are \_\_\_\_\_.
  - a) Fully radiographed b) Spot radiographed c) Not radiographed
    - None of the above d)
- In thick film lubrication 2)
  - a) There is no metal to metal contact
  - There is partial metal to metal contact b)
  - c) There is full metal to metal contact
  - d) None of the above
- The allowable static stress for steel gears is approximately \_\_\_\_\_ the 3) ultimate tensile stresses.
  - a) One-fourth One-third b)
  - c) One-half d) Double
- Formative number of teeth for helical gears are obtained as \_\_\_\_\_.

| a) | Z                        | b) | Ζ               |
|----|--------------------------|----|-----------------|
| c) | $\cos^2_Z \Psi$          | d) | $\cos \Psi_{Z}$ |
| 0) | $\overline{\cos^3 \Psi}$ | ч) | $\sin^2 \Psi$   |

Set

Max. Marks: 70

Marks: 14

- 5) Which of the following gear is used for the self-locking condition?
  - a) Spur gears

b) Helical gearsd) Worm gears

50%

85%

c) Bevel gears

6)

- Weld joint efficiency for Class II pressure vessels according to IS 2825-1969 is \_\_\_\_\_.
  - 100 %
- a) 100 % b) c) 75% d)
- 7) Antifriction bearings are \_\_\_\_\_.
  - a) Rolling contact bearing
  - c) Hydrodynamic bearing
- b) Sliding contact bearing
- d) Thin lubricated bearing
- 8) The overhanging of bevel pinion reduced wear strength by \_\_\_\_\_.
  - a) 75%
  - c) 50%

b) 25%d) Both (a) & (b)

- Set P
- SLR-FM-139

06

## **SLR-FM-139**

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** MACHINE DESIGN - II

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data wherever necessary and mention it clearly.

### Section – I

- What are the various types of gear tooth failures? State their causes and 06 Q.2 a) remedies. A pair of mating spur gears with 20° pressure angle, consists of 25 teeth **08** b) pinion meshing with 60 teeth gear. The module is 5mm, while face width is 50mm. The pinion rotates at 540 rpm. The gears are made of steel and heat treated to surface hardness of 400 BHN. Both the gears are made of plain carbon steel (Sut =  $600 \text{ N/mm}^2$ ). Assume the dynamic load is accounted by means of the velocity factor. Service factor and factor of safety are 1.75 and 1.9 respectively. Calculate the beam strength and wear strength of gear tooth, the safe static load that the gear can transmit and rated power that can be transmitted by gears. Use  $C_v = [3/(3 + v)]$ . Y for 25 teeth = 0.34 Q.3 What are the helical gears? In what way helical gears are preferable to 04 a) spur gears? Explain the adequate design and optimum design with suitable examples. 04 b) A pair of parallel helical gears consists of 25 teeth pinion meshing with 50 06 c) teeth gear. The normal is module is 4mm. The center distance is 165mm. Calculate: 1) Module, 2) Helix angle, 3) The axial pitch, 4) Transverse pressure angle and
  - The pitch circle diameters of the pinion & gear. 5)

Assuming the normal pressure angle is  $20^{\circ}$ .

- Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 04 a) 04
  - Explain the various types of parameters used in optimum design. b)
  - A seamless cylinder with a storage capacity of 0.3m<sup>3</sup> is subjected to an C) internal pressure of 25 MPa. The length of the cylinder is twice its internal diameter. The cylinder is made of plain carbon steel (Sut =  $420 \text{ N/mm}^2$ ) and factor of safety is 3. Determine the internal diameter, length and the outer diameter of the cylinder.

Max. Marks: 56

Set P

### Section – II

| Q.5 | a)<br>b)       | Derive the expression for formative number of teeth in bevel gear.<br>Explain Types of bevel gear with neat sketches.   | 03<br>04       |
|-----|----------------|---|----------------|
|     | c)             | A pair of bevel gears with $20^{\circ}$ pressure angle, consists of a 20 teeth pinion mashing with 30 teeth gear. The module is 4 mm, while the face width is 20 mm. The material for the pinion and gear is made of steel 50C4 (Sut = 750 N/mm <sup>2</sup> ). The surface hardness is 400 BHN. The pinion rotates at 500 rpm and receives 2.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Determine the factor of safety against bending failure and against pitting failure. Take Lewis form factor, Y = 0.340 for Z = 25 and Y = 0.337 for Z = 24. C = deformation factor = 11400 N/mm <sup>2</sup> . Error for class-3 gear for module 4 mm is 0.0125 mm.  | 07             |
| Q.6 | a)<br>b)<br>c) | Derive the expression for efficiency of worm gear drive.<br>Compare sliding contact and rolling contact bearings.<br>A pair of worm gears is designated as <b>1/30/10/10</b> . The input speed of<br>worm shaft is 1200 rpm. The worm wheel is made of centrifugal cast<br>phosphor-bronze with surface stress factor (Sc2) 1.55. The worm is made<br>of case hardened carbon steel 14C6 with surface stress factor(Sc1) 4.93.<br>Speed factors for 1200 rpm is 0.112 (Xc1) and for 40 rpm is 0.26 (Xc2).<br>The external surface area of housing is 0.7 m <sup>2</sup> and the overall heat transfer<br>coefficient is 28 W/m <sup>2</sup> °C. The normal pressure angle is 20° and the<br>permissible temperature rise of the lubricating oil is 50 °C. Determine the<br>power transmitting capacity based on,<br>1) Wear strength rating and<br>2) Thermal considerations.<br>Take zone factor, Yz = 1.143 | 04<br>03<br>07 |
| Q.7 | a)             | Give various guidelines for selecting proper type of roller bearing for a   | 03             |
|     | b)             | given application.<br>Following data is given for a $360^{\circ}$ hydrodynamic journal bearing:<br>Speed of journal = 1500 rpm; Length of bearing, 1 = 50 mm;<br>Diameter of journal = 50 mm; Viscosity = 20 Centipoises;<br>Radial clearance = 0.05 mm; Sommerfeld number = 0.052;<br>Calculate the load capacity of bearing.  | 04             |
|     | c)             | A ball bearing subjected to a radial load of 2500 N. The expected life of bearing for 95%. reliability is 10000 hours at 1000 rpm. Calculate the dynamic load capacity of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability. If there are six such identical bearings each with reliability of 95%, what is the reliability of the system?  | 07             |

| Seat |  |
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| No.  |  |

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

**Instructions:** 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book

- 2) Assume suitable data wherever necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Multiple correct answer type questions, carrying two marks each. Q.1 A) 06

- According to Stribec's equation, the static load carrying capacity 'C' of 1) bearing depends upon \_\_\_\_\_.
  - a) Ball diameter b) Number of balls c) Lubricants used
    - d) Ambient temperature
- For maximum power transmission condition for gears \_\_\_\_\_. 2)
  - a) Wear strength must be less
  - b) Dynamic load must be equal to static load
  - c) Beam strength must be high
  - d) Factor of safety must be one
- Bearing number 6210 indicates that the bearing is \_\_\_\_\_. 3)
  - a) having bore diameter of 10 mm
  - b) having bore diameter of 50 mm
  - c) Angular contact ball bearing
  - d) Deep groove ball bearing

#### Single correct answer type questions, carrying one marks each. B)

- 1) Which of the following gear is used for the self-locking condition?
  - a) Spur gears Helical gears b)
  - c) Bevel gears d) Worm gears
- Weld joint efficiency for Class II pressure vessels according to 2) IS 2825-1969 is .
  - a) 100 % b) 50%
  - c) 75% 85% d)
- 3) Antifriction bearings are \_\_\_\_\_.
  - a) Rolling contact bearing
  - c) Hydrodynamic bearing
- The overhanging of bevel pinion reduced wear strength by \_\_\_\_\_. 4)

b)

d)

- a) 75% b) 25%
- c) 50% Both (a) & (b) d)
- Class-1 pressure vessels are \_\_\_\_ 5)
  - a) Fully radiographed c) Not radiographed
- b) Spot radiographed
- None of the above d)

Sliding contact bearing

Thin lubricated bearing

Set

Max. Marks: 70

Marks: 14

**08** 

Set Q

- 6) In thick film lubrication \_\_\_\_\_.
  - a) There is no metal to metal contact
  - b) There is partial metal to metal contact
  - c) There is full metal to metal contact
  - d) None of the above
- 7) The allowable static stress for steel gears is approximately \_\_\_\_\_ the ultimate tensile stresses.
  - a) One-fourth b) One-third
  - c) One-half d) Double
- 8) Formative number of teeth for helical gears are obtained as \_\_\_\_\_.
  - a)  $\frac{z}{\cos^2 \Psi}$ c)  $\frac{z}{\cos^3 \Psi}$ b)  $\frac{z}{\cos \Psi}$ d)  $\frac{z}{\sin^2 \Psi}$

06

## SLR-FM-139

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DESIGN – II

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

**Instructions:** 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data wherever necessary and mention it clearly.

### Section – I

- What are the various types of gear tooth failures? State their causes and 06 Q.2 a) remedies. b) A pair of mating spur gears with 20° pressure angle, consists of 25 teeth **08** pinion meshing with 60 teeth gear. The module is 5mm, while face width is 50mm. The pinion rotates at 540 rpm. The gears are made of steel and heat treated to surface hardness of 400 BHN. Both the gears are made of plain carbon steel (Sut =  $600 \text{ N/mm}^2$ ). Assume the dynamic load is accounted by means of the velocity factor. Service factor and factor of safety are 1.75 and 1.9 respectively. Calculate the beam strength and wear strength of gear tooth, the safe static load that the gear can transmit and rated power that can be transmitted by gears. Use  $C_v = [3/(3 + v)]$ . Y for 25 teeth = 0.34 Q.3 What are the helical gears? In what way helical gears are preferable to 04 a) spur gears? Explain the adequate design and optimum design with suitable examples. 04 b) A pair of parallel helical gears consists of 25 teeth pinion meshing with 50 06 c) teeth gear. The normal is module is 4mm. The center distance is 165mm. Calculate: 1) Module, 2) Helix angle, 3) The axial pitch, 4) Transverse pressure angle and The pitch circle diameters of the pinion & gear. 5) Assuming the normal pressure angle is  $20^{\circ}$ . Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 04 a) Explain the various types of parameters used in optimum design. 04 b)
  - c) A seamless cylinder with a storage capacity of 0.3m<sup>3</sup> is subjected to an internal pressure of 25 MPa. The length of the cylinder is twice its internal diameter. The cylinder is made of plain carbon steel (Sut = 420 N/mm<sup>2</sup>) and factor of safety is 3. Determine the internal diameter, length and the outer diameter of the cylinder.

Max. Marks: 56

Set C

# Set Q

### Section – II

| Q.5 | a)<br>b)       | Derive the expression for formative number of teeth in bevel gear.<br>Explain Types of bevel gear with neat sketches.   | 03<br>04       |
|-----|----------------|---|----------------|
|     | c)             | A pair of bevel gears with $20^{\circ}$ pressure angle, consists of a 20 teeth pinion<br>mashing with 30 teeth gear. The module is 4 mm, while the face width is<br>20 mm. The material for the pinion and gear is made of steel 50C4<br>(Sut = 750 N/mm <sup>2</sup> ). The surface hardness is 400 BHN. The pinion rotates<br>at 500 rpm and receives 2.5 kW power from the electric motor. The starting<br>torque of the motor is 150% of the rated torque. Determine the factor of<br>safety against bending failure and against pitting failure. Take Lewis form<br>factor, Y = 0.340 for Z = 25 and Y = 0.337 for Z = 24.<br>C = deformation factor = 11400 N/mm <sup>2</sup> . Error for class-3 gear for module 4<br>mm is 0.0125 mm.   | 07             |
| Q.6 | a)<br>b)<br>c) | Derive the expression for efficiency of worm gear drive.<br>Compare sliding contact and rolling contact bearings.<br>A pair of worm gears is designated as <b>1/30/10/10</b> . The input speed of<br>worm shaft is 1200 rpm. The worm wheel is made of centrifugal cast<br>phosphor-bronze with surface stress factor (Sc2) 1.55. The worm is made<br>of case hardened carbon steel 14C6 with surface stress factor(Sc1) 4.93.<br>Speed factors for 1200 rpm is 0.112 (Xc1) and for 40 rpm is 0.26 (Xc2).<br>The external surface area of housing is 0.7 m <sup>2</sup> and the overall heat transfer<br>coefficient is 28 W/m <sup>2</sup> °C. The normal pressure angle is 20° and the<br>permissible temperature rise of the lubricating oil is 50 °C. Determine the<br>power transmitting capacity based on,<br>1) Wear strength rating and<br>2) Thermal considerations.<br>Take zone factor, Yz = 1.143 | 04<br>03<br>07 |
| Q.7 | a)             | Give various guidelines for selecting proper type of roller bearing for a   | 03             |
|     | b)             | given application.<br>Following data is given for a $360^{\circ}$ hydrodynamic journal bearing:<br>Speed of journal = 1500 rpm; Length of bearing, 1 = 50 mm;<br>Diameter of journal = 50 mm; Viscosity = 20 Centipoises;<br>Radial clearance = 0.05 mm; Sommerfeld number = 0.052;<br>Calculate the load capacity of bearing.  | 04             |
|     | c)             | A ball bearing subjected to a radial load of 2500 N. The expected life of bearing for 95%. reliability is 10000 hours at 1000 rpm. Calculate the dynamic load capacity of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability. If there are six such identical bearings each with reliability of 95%, what is the reliability of the system?  | 07             |

| Seat |  |
|------|--|
| No.  |  |

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - II**

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

**Duration: 30 Minutes** 

**Instructions:** 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book

- 2) Assume suitable data wherever necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

#### Multiple correct answer type questions, carrying two marks each. Q.1 A)

- For maximum power transmission condition for gears . 1)
  - a) Wear strength must be less
  - b) Dynamic load must be equal to static load
  - c) Beam strength must be high
  - d) Factor of safety must be one
- Bearing number 6210 indicates that the bearing is \_\_\_\_\_. 2)
  - having bore diameter of 10 mm a)
  - b) having bore diameter of 50 mm
  - c) Angular contact ball bearing
  - d) Deep groove ball bearing
- 3) According to Stribec's equation, the static load carrying capacity 'C' of bearing depends upon \_\_\_\_\_.
  - a) Ball diameter Number of balls b)
  - c) Lubricants used d) Ambient temperature

#### Single correct answer type questions, carrying one marks each. B)

- The allowable static stress for steel gears is approximately \_\_\_\_\_ the 1) ultimate tensile stresses.
  - a) One-fourth One-third b)
  - c) One-half d) Double

Formative number of teeth for helical gears are obtained as \_\_\_\_\_. 2)

- Ζ Ζ a) b)  $\cos^2 \Psi$ cos Ψ Ζ Ζ d) C)  $\cos^3 \Psi$  $\sin^2 \Psi$
- 3) Which of the following gear is used for the self-locking condition? Helical gears

b)

- a) Spur gears
- c) Bevel gears d) Worm gears
- Weld joint efficiency for Class II pressure vessels according to IS 2825-1969 is \_\_\_\_\_.
  - a) 100 % b) 50% c) 75% d) 85%

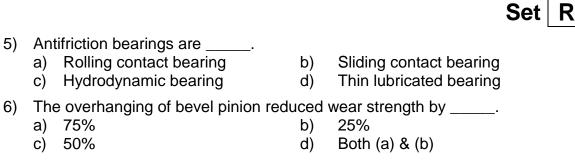
Set

Max. Marks: 70

Marks: 14

06

**08** 



- Class-1 pressure vessels are \_\_\_\_\_. 7) a) Fully radiographed
- b) Spot radiographed
- c) Not radiographed
- None of the above d)

In thick film lubrication \_\_\_\_\_. 8)

6)

a) 75%

c) 50%

- a) There is no metal to metal contact
- b) There is partial metal to metal contact
- c) There is full metal to metal contact
- d) None of the above

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DESIGN – II

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

**Instructions:** 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data wherever necessary and mention it clearly.

### Section – I

- What are the various types of gear tooth failures? State their causes and 06 Q.2 a) remedies. A pair of mating spur gears with 20° pressure angle, consists of 25 teeth **08** b) pinion meshing with 60 teeth gear. The module is 5mm, while face width is 50mm. The pinion rotates at 540 rpm. The gears are made of steel and heat treated to surface hardness of 400 BHN. Both the gears are made of plain carbon steel (Sut =  $600 \text{ N/mm}^2$ ). Assume the dynamic load is accounted by means of the velocity factor. Service factor and factor of safety are 1.75 and 1.9 respectively. Calculate the beam strength and wear strength of gear tooth, the safe static load that the gear can transmit and rated power that can be transmitted by gears. Use  $C_v = [3/(3 + v)]$ . Y for 25 teeth = 0.34 Q.3 What are the helical gears? In what way helical gears are preferable to 04 a) spur gears? Explain the adequate design and optimum design with suitable examples. 04 b) A pair of parallel helical gears consists of 25 teeth pinion meshing with 50 06 c) teeth gear. The normal is module is 4mm. The center distance is 165mm. Calculate: 1) Module, 2) Helix angle, 3) The axial pitch, 4) Transverse pressure angle and The pitch circle diameters of the pinion & gear. 5) Assuming the normal pressure angle is  $20^{\circ}$ . Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 04 a) Explain the various types of parameters used in optimum design. 04 b) A seamless cylinder with a storage capacity of 0.3m<sup>3</sup> is subjected to an 06 C)
  - c) A seamless cylinder with a storage capacity of 0.3m<sup>3</sup> is subjected to an internal pressure of 25 MPa. The length of the cylinder is twice its internal diameter. The cylinder is made of plain carbon steel (Sut = 420 N/mm<sup>2</sup>) and factor of safety is 3. Determine the internal diameter, length and the outer diameter of the cylinder.

Set | R

Max. Marks: 56

# Set R

### Section – II

| Q.5 | a)<br>b)       | Derive the expression for formative number of teeth in bevel gear.<br>Explain Types of bevel gear with neat sketches.   | 03<br>04       |
|-----|----------------|---|----------------|
|     | c)             | A pair of bevel gears with $20^{\circ}$ pressure angle, consists of a 20 teeth pinion<br>mashing with 30 teeth gear. The module is 4 mm, while the face width is<br>20 mm. The material for the pinion and gear is made of steel 50C4<br>(Sut = 750 N/mm <sup>2</sup> ). The surface hardness is 400 BHN. The pinion rotates<br>at 500 rpm and receives 2.5 kW power from the electric motor. The starting<br>torque of the motor is 150% of the rated torque. Determine the factor of<br>safety against bending failure and against pitting failure. Take Lewis form<br>factor, Y = 0.340 for Z = 25 and Y = 0.337 for Z = 24.<br>C = deformation factor = 11400 N/mm <sup>2</sup> . Error for class-3 gear for module 4<br>mm is 0.0125 mm.   | 07             |
| Q.6 | a)<br>b)<br>c) | Derive the expression for efficiency of worm gear drive.<br>Compare sliding contact and rolling contact bearings.<br>A pair of worm gears is designated as <b>1/30/10/10</b> . The input speed of<br>worm shaft is 1200 rpm. The worm wheel is made of centrifugal cast<br>phosphor-bronze with surface stress factor (Sc2) 1.55. The worm is made<br>of case hardened carbon steel 14C6 with surface stress factor(Sc1) 4.93.<br>Speed factors for 1200 rpm is 0.112 (Xc1) and for 40 rpm is 0.26 (Xc2).<br>The external surface area of housing is 0.7 m <sup>2</sup> and the overall heat transfer<br>coefficient is 28 W/m <sup>2</sup> °C. The normal pressure angle is 20° and the<br>permissible temperature rise of the lubricating oil is 50 °C. Determine the<br>power transmitting capacity based on,<br>1) Wear strength rating and<br>2) Thermal considerations.<br>Take zone factor, Yz = 1.143 | 04<br>03<br>07 |
| Q.7 | a)             | Give various guidelines for selecting proper type of roller bearing for a   | 03             |
|     | b)             | given application.<br>Following data is given for a $360^{\circ}$ hydrodynamic journal bearing:<br>Speed of journal = 1500 rpm; Length of bearing, 1 = 50 mm;<br>Diameter of journal = 50 mm; Viscosity = 20 Centipoises;<br>Radial clearance = 0.05 mm; Sommerfeld number = 0.052;<br>Calculate the load capacity of bearing.  | 04             |
|     | c)             | A ball bearing subjected to a radial load of 2500 N. The expected life of bearing for 95%. reliability is 10000 hours at 1000 rpm. Calculate the dynamic load capacity of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability. If there are six such identical bearings each with reliability of 95%, what is the reliability of the system?  | 07             |

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DESIGN - II

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book

- 2) Assume suitable data wherever necessary and mention it clearly.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

2)

#### Q.1 A) Multiple correct answer type questions, carrying two marks each. 06

- 1) Bearing number 6210 indicates that the bearing is \_\_\_\_\_.
  - a) having bore diameter of 10 mm
  - b) having bore diameter of 50 mm
  - c) Angular contact ball bearing
  - d) Deep groove ball bearing
- According to Stribec's equation, the static load carrying capacity 'C' of bearing depends upon \_\_\_\_\_.
  - a) Ball diameter

b) Number of ballsd) Ambient temperature

Sliding contact bearing

Thin lubricated bearing

Spot radiographed

- c) Lubricants used
- For maximum power transmission condition for gears \_\_\_\_\_.
  - a) Wear strength must be less
  - b) Dynamic load must be equal to static load
  - c) Beam strength must be high
  - d) Factor of safety must be one

### B) Single correct answer type questions, carrying one marks each.

- 1) Antifriction bearings are \_\_\_\_\_.
  - a) Rolling contact bearing
  - c) Hydrodynamic bearing
  - The overhanging of bevel pinion reduced wear strength by \_\_\_\_\_.

b)

d)

b)

- a) 75% b) 25%
- c) 50% d) Both (a) & (b)
- 3) Class-1 pressure vessels are \_\_\_\_\_
  - a) Fully radiographed
  - c) Not radiographed d) None of the above
- 4) In thick film lubrication \_\_\_\_\_.
  - a) There is no metal to metal contact
  - b) There is partial metal to metal contact
  - c) There is full metal to metal contact
  - d) None of the above

Set S

Max. Marks: 70



Marks: 14

08

|    |   |                        | SLR-   | FM-1 | 39 |
|----|---|------------------------|--|------|----|
|    |   |                        |  | Set  | S  |
| 5) | The allowable static stress for ste<br>ultimate tensile stresses.                                 | el gears               | is approximately   | the  |    |
|    | a) One-fourth   | b)                     | One-third  |      |    |
|    | c) One-half   | d)                     | Double   |      |    |
| 5) | Formative number of teeth for he<br>a) $\frac{z}{\cos^2 \Psi}$<br>c) $\frac{z}{\cos^3 \Psi}$      | lical gea<br>b)<br>d)  | $\frac{z}{\cos \Psi} = \frac{1}{\sin^2 \Psi}$            | _•   |    |
| 7) | <ul><li>Which of the following gear is use</li><li>a) Spur gears</li><li>c) Bevel gears</li></ul> | ed for the<br>b)<br>d) | e self-locking condition?<br>Helical gears<br>Worm gears |      |    |
| 8) | Weld joint efficiency for Class II p<br>IS 2825-1969 is   | oressure               | vessels according to                                     |      |    |

- a) 100 % c) 75% b) 50%
  - d) 85%

#### Seat No.

#### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DESIGN – II

Day & Date: Tuesday, 26-11-2019 Time: 10:00 AM To 1:00 PM

**Instructions:** 1) Answer any two questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data wherever necessary and mention it clearly.

#### Section – I

What are the various types of gear tooth failures? State their causes and 06 Q.2 a) remedies. b) A pair of mating spur gears with 20° pressure angle, consists of 25 teeth **08** pinion meshing with 60 teeth gear. The module is 5mm, while face width is 50mm. The pinion rotates at 540 rpm. The gears are made of steel and heat treated to surface hardness of 400 BHN. Both the gears are made of plain carbon steel (Sut =  $600 \text{ N/mm}^2$ ). Assume the dynamic load is accounted by means of the velocity factor. Service factor and factor of safety are 1.75 and 1.9 respectively. Calculate the beam strength and wear strength of gear tooth, the safe static load that the gear can transmit and rated power that can be transmitted by gears. Use  $C_v = [3/(3 + v)]$ . Y for 25 teeth = 0.34 Q.3 What are the helical gears? In what way helical gears are preferable to 04 a) spur gears? Explain the adequate design and optimum design with suitable examples. 04 b) A pair of parallel helical gears consists of 25 teeth pinion meshing with 50 06 c) teeth gear. The normal is module is 4mm. The center distance is 165mm. Calculate: 1) Module, 2) Helix angle, 3) The axial pitch, 4) Transverse pressure angle and The pitch circle diameters of the pinion & gear. 5) Assuming the normal pressure angle is  $20^{\circ}$ . Explain the types of pressure vessel according to IS 2825-1969 code. Q.4 04 a) Explain the various types of parameters used in optimum design. 04 b) A seamless cylinder with a storage capacity of 0.3m<sup>3</sup> is subjected to an 06 C) internal pressure of 25 MPa. The length of the cylinder is twice its internal diameter. The cylinder is made of plain carbon steel (Sut =  $420 \text{ N/mm}^2$ ) and factor of safety is 3. Determine the internal diameter, length and the outer diameter of the cylinder.



Max. Marks: 56

## Set S

#### Section – II

| Q.5 | a)<br>b)       | Derive the expression for formative number of teeth in bevel gear.<br>Explain Types of bevel gear with neat sketches.   | 03<br>04       |
|-----|----------------|---|----------------|
|     | c)             | A pair of bevel gears with $20^{\circ}$ pressure angle, consists of a 20 teeth pinion<br>mashing with 30 teeth gear. The module is 4 mm, while the face width is<br>20 mm. The material for the pinion and gear is made of steel 50C4<br>(Sut = 750 N/mm <sup>2</sup> ). The surface hardness is 400 BHN. The pinion rotates<br>at 500 rpm and receives 2.5 kW power from the electric motor. The starting<br>torque of the motor is 150% of the rated torque. Determine the factor of<br>safety against bending failure and against pitting failure. Take Lewis form<br>factor, Y = 0.340 for Z = 25 and Y = 0.337 for Z = 24.<br>C = deformation factor = 11400 N/mm <sup>2</sup> . Error for class-3 gear for module 4<br>mm is 0.0125 mm.   | 07             |
| Q.6 | a)<br>b)<br>c) | Derive the expression for efficiency of worm gear drive.<br>Compare sliding contact and rolling contact bearings.<br>A pair of worm gears is designated as <b>1/30/10/10</b> . The input speed of<br>worm shaft is 1200 rpm. The worm wheel is made of centrifugal cast<br>phosphor-bronze with surface stress factor (Sc2) 1.55. The worm is made<br>of case hardened carbon steel 14C6 with surface stress factor(Sc1) 4.93.<br>Speed factors for 1200 rpm is 0.112 (Xc1) and for 40 rpm is 0.26 (Xc2).<br>The external surface area of housing is 0.7 m <sup>2</sup> and the overall heat transfer<br>coefficient is 28 W/m <sup>2</sup> °C. The normal pressure angle is 20° and the<br>permissible temperature rise of the lubricating oil is 50 °C. Determine the<br>power transmitting capacity based on,<br>1) Wear strength rating and<br>2) Thermal considerations.<br>Take zone factor, Yz = 1.143 | 04<br>03<br>07 |
| Q.7 | a)             | Give various guidelines for selecting proper type of roller bearing for a   | 03             |
|     | b)             | given application.<br>Following data is given for a $360^{\circ}$ hydrodynamic journal bearing:<br>Speed of journal = 1500 rpm; Length of bearing, 1 = 50 mm;<br>Diameter of journal = 50 mm; Viscosity = 20 Centipoises;<br>Radial clearance = 0.05 mm; Sommerfeld number = 0.052;<br>Calculate the load capacity of bearing.  | 04             |
|     | c)             | A ball bearing subjected to a radial load of 2500 N. The expected life of bearing for 95%. reliability is 10000 hours at 1000 rpm. Calculate the dynamic load capacity of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability. If there are six such identical bearings each with reliability of 95%, what is the reliability of the system?  | 07             |

| Duration: 30 Minutes |    |           |  |     | Marks: 14   | ۲ |
|----------------------|----|-----------|--|-----|---|---|
| Q.1                  | A) |           | Foil strain gauges r)  | )   | 04<br>Column (2)<br>Fringe order<br>Micro strain<br>Sensitive to cross-axis sensitivity<br>Unique axis for passing light<br>Insensitive to cross-axis sensitivity |   |
|                      | B) | Ма        | tch the appropriate pairs  |     | 04  | • |
|                      |    | b)        | Zero order Isochromatics q)<br>A.C. Bridge r)                                    | )   | -   |   |
|                      | C) |           |  | fr  | from the options and rewrite the 06   | ; |
|                      |    | ser<br>1) | ntence.<br>Monochromatic light has<br>a) Single wavelength<br>c) Zero wavelength |     | <br>b) Different wavelength<br>d) none  |   |
|                      |    | 2)        | Strain gauges directly measur<br>a) Stress<br>c) Weight                          | res | es<br>b) Strain<br>d) None  |   |
|                      |    | 3)        | Figure of merit for photo elast<br>a) Low<br>c) Medium                           | ic  | c material should be<br>b) High<br>d) not related to  |   |
|                      |    | 4)        | One of the Principal stress, at a) Maximum                                       | th  | the free boundary is<br>b) Minimum  |   |

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering EXPERIMENTAL STRESS ANALYSIS

- 2) Use of non-programmable calculator is allowed.
- 3) Figures to the right indicate full marks.
- 4) Make necessary assumption, if required and mention it clearly.

### **MCQ/Objective Type Questions**



Maximum a) D) Zero d) Negative C)

Max. Marks: 70

Ρ

Set



- 5) Output voltage in case of four arm sensitive bridge as compared with one arm sensitive is \_\_\_\_\_.
  - a) Same
- b) Double
- c) Tripple d)
- Four times (quadruplicated)
- Babinet Soleil Method is known as \_ 6)
  - Compensation a)
- b) Theoretical d)

Stressed c)

None

06

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

## EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly .

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a) Explain the measurement of stresses at large number of location using 04 b)
  - strain gauges.c) Derive the equation of output voltage for.
    - 1) 4-arm sensitive (2 linear and 2 lateral) combination.
    - 2) 2-arm sensitive (1 linear and 1 lateral) combination

SLR-FM-140



Max. Marks: 56

|      |         |      | <ol> <li>Use of non-programmable</li> <li>Figures to the right indicat</li> </ol>  |                            |                         |  |
|------|---------|------|--|----------------------------|-------------------------|--|
|      |         |      | , .  |                            |                         | uired and mention it clearly.  |
|      |         |      | MCQ/Objecti  | ve T                       | ype Q                   | uestions   |
| Dura | tion: 3 | 30 N | linutes  |                            |                         | Ма   |
| Q.1  | A)      |      | ve the objective question.<br>tch the appropriate pairs.<br>Column (1)<br>Photo elastic analysis<br>Strain Gauges<br>Foil strain gauges<br>Polarizer | p)<br>q)<br>r)<br>s)<br>t) | Micro<br>Sensi<br>Uniqu | Column (2)<br>e order<br>strain<br>tive to cross-axis sensitivity<br>le axis for passing light<br>sitive to cross-axis sensitivity |
|      | B)      |      | tch the appropriate pairs<br>Column (1)  |                            |                         | Column (2)   |
|      |         |      | Electrical analogy<br>Zero order Isochromatics<br>A.C. Bridge<br>D.C. Bridge   |                            | Black<br>Color<br>Easy  | ce Equation<br>in white light<br>ed in white light<br>to balance<br>ult to balance   |
|      | C)      |      | oose the correct alternativ<br>ntence.   | es f                       | rom th                  | e options and rewrite the  |
|      |         | 1)   | One of the Principal stress,<br>a) Maximum<br>c) Zero  | at t                       | he free<br>b)<br>d)     | boundary is<br>Minimum<br>Negative   |
|      |         | 2)   | Output voltage in case of fo<br>one arm sensitive is<br>a) Same<br>c) Tripple  |                            | urm ser<br>b)<br>d)     | nsitive bridge as compared with<br>Double<br>Four times (quadruplicated)   |
|      |         | 3)   | Babinet Soleil Method is kr<br>a) Compensation<br>c) Stressed  | iown                       | i as<br>b)<br>d)        | Theoretical<br>None  |
|      |         | 4)   | Monochromatic light has<br>a) Single wavelength  |                            | <br>b)                  | Different wavelength   |

c) Zero wavelength

Stress

Weight

5)

a)

C)

Strain gauges directly measures

EXPERIMENTAL STRESS ANALYSIS Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

- learly.

d)

b)

d)

none

Strain

None

# Set

**SLR-FM-140** 

Max. Marks: 70

Q

04

Marks: 14

04

- 06



- 6) Figure of merit for photo elastic material should be \_\_\_\_\_.
  - a) Low c) Medium

- High
- b) d) not related to

## T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

## EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly.

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a)
  - Explain the measurement of stresses at large number of location using 04 b) strain gauges. 06
    - Derive the equation of output voltage for. c)
      - 1) 4-arm sensitive (2 linear and 2 lateral) combination.
      - 2) 2-arm sensitive (1 linear and 1 lateral) combination

Max. Marks: 56

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| c)             | Weight   | d)                 | None   |                            |
|----------------|--|--------------------|--|----------------------------|
| 、 <b>-</b>     | ure of merit for photo elastic r<br>Low                                  | nateri<br>b)       | al should be<br>High   |                            |
| a)<br>c)       | Medium   | d)                 | not related to   |                            |
| On<br>a)<br>c) | e of the Principal stress, at the<br>Maximum<br>Zero                     | e free<br>b)<br>d) | boundary is<br>Minimum<br>Negative                                       |                            |
| one            | tput voltage in case of four an<br>e arm sensitive is<br>Same<br>Tripple | m ser<br>b)<br>d)  | nsitive bridge as compared with<br>Double<br>Four times (quadruplicated) | 1                          |
|                | binet Soleil Method is known a<br>Compensation<br>Stressed               | as<br>b)<br>d)     | Theoretical<br>None  |                            |
|                |  |                    |  | Page <b>7</b> of <b>12</b> |

Seat No.

#### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. 2) Use of non-programmable calculator is allowed.

- 3) Figures to the right indicate full marks.
- 4) Make necessary assumption, if required and mention it clearly.

#### **MCQ/Objective Type Questions**

p)

q)

r)

t)

#### Q.1 A) Solve the objective question. Match the appropriate pairs.

**Duration: 30 Minutes** 

#### Column (1)

- Photo elastic analysis a)
- b) Strain Gauges
- Foil strain gauges C)
- d) Polarizer

#### Match the appropriate pairs B)

Column (1)

- Electrical analogy a)
- b) Zero order Isochromatics
- A.C. Bridge c)
- D.C. Bridge d)

1)

5)

- Easy to balance
- Choose the correct alternatives from the options and rewrite the C) sentence.
  - Strain gauges directly measures \_
    - Stress b) Strain a)
  - F 2)
  - 3) С
  - 4) С 0

- r) s) Difficult to balance t)
- Unique axis for passing light

Sensitive to cross-axis sensitivity

- s) Insensitive to cross-axis sensitivity
  - Column (2)

Column (2)

- Laplace Equation p)
- Black in white light q) Colored in white light

Fringe order

Micro strain

**SLR-FM-140** 



Max. Marks: 70

Marks: 14

04

04

06



- 6) Monochromatic light has \_\_\_\_\_.
  a) Single wavelength b)
  c) Zero wavelength d)
- Different wavelength
- none

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

## EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly.

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b)
- Explain brittle coating method. What are the merit and demerit. Q.7 04 a) Explain the measurement of stresses at large number of location using 04 b) strain gauges. 06
  - Derive the equation of output voltage for. c)
    - 1) 4-arm sensitive (2 linear and 2 lateral) combination.
    - 2) 2-arm sensitive (1 linear and 1 lateral) combination

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Set

Max. Marks: 56

|       |                              | 3                     | <ul> <li>B) Figures to the right indicate</li> <li>Make necessary assumption</li> </ul>  | e ful          | l mark                 |  |   |  |  |
|-------|------------------------------|-----------------------|--|----------------|------------------------|--|---|--|--|
|       | MCQ/Objective Type Questions |                       |  |                |                        |  |   |  |  |
| urati | on: :                        | 30 M                  | linutes  |                |                        | Marks  |   |  |  |
| .1    | A)                           | Ma <sup>.</sup><br>a) | ve the objective question.<br>tch the appropriate pairs.<br>Column (1)<br>Photo elastic analysis<br>Strain Gauges  |                | Fringe<br>Micro        | Column (2)<br>e order<br>strain  | ( |  |  |
|       |                              |                       | Foil strain gauges<br>Polarizer  | r)<br>s)<br>t) | Sensi<br>Uniqu         | tive to cross-axis sensitivity<br>le axis for passing light<br>sitive to cross-axis sensitivity  |   |  |  |
| I     | B)                           | a)<br>b)              | tch the appropriate pairs<br>Column (1)<br>Electrical analogy<br>Zero order Isochromatics<br>A.C. Bridge<br>D.C. Bridge                                    | q)<br>r)       | Black<br>Color<br>Easy | Column (2)<br>ce Equation<br>in white light<br>ed in white light<br>to balance<br>ult to balance | ( |  |  |
| (     | C)                           |                       | bose the correct alternative<br>tence.<br>Babinet Soleil Method is kn<br>a) Compensation<br>c) Stressed<br>Monochromatic light has<br>a) Single wavelength | own            | as<br>b)<br>d)         | e options and rewrite the<br><br>Theoretical<br>None<br>Different wavelength                     |   |  |  |
|       |                              | 3)                    | <ul> <li>c) Zero wavelength</li> <li>Strain gauges directly meas</li> <li>a) Stress</li> <li>c) Weight</li> </ul>  | sure           | d)                     | none<br><br>Strain<br>None   |   |  |  |
|       |                              | 4)                    | Figure of merit for photo ela<br>a) Low<br>c) Medium   | astic          | materi<br>b)<br>d)     | ial should be<br>High<br>not related to  |   |  |  |

5) One of the Principal stress, at the free boundary is \_\_\_\_\_.

b)

d)

Minimum

Negative

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

Mechanical Engineering EXPERIMENTAL STRESS ANALYSIS

2) Use of non-programmable calculator is allowed.

Du

Seat

No.

# **Q.**1

a) Maximum

Zero

C)

Day & Date: Wednesday, 27-11-2019

Time: 10:00 AM To 01:00 PM

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

Max. Marks: 70

S

Set



04

14

04

06



# 6) Output voltage in case of four arm sensitive bridge as compared with one arm sensitive is \_\_\_\_\_.

- a) Same
- c) Tripple

- b) Double
- d) Four times (quadruplicated)

06

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

## Mechanical Engineering

EXPERIMENTAL STRESS ANALYSIS

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

strain gauges.

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Use of non-programmable calculator is allowed.
- 3) Figure to the right indicates full marks.
- 4) Make necessary Assumption, if required and mention it clearly .

#### Section – I

- Q.2 a) Derive the expression for the light intensity seen through analyzer when the 10 stressed model is kept in the Dark field circular polariscope. Explain the Tarady's method for determination of fractional fringe order. 04 b) Q.3 Explain the properties of different photo elastic materials. 07 a) A loaded two dimensional photo elastic model of 6 mm thickness is 07 b) observed in circular polariscope. The isochromatics fringe pattern revealed that the point of interest lies between 4<sup>th</sup> and 5<sup>th</sup> order fringe. On rotation of analyzer through 30°, the 5<sup>th</sup> order fringe passed through the point of interest .Calculate the fractional fringe order and maximum shear stress, if material fringe value is 14.5N/mm. Q.4 Explain the separation method by Hooks Law followings. 04 a) Write short notes on scaling of model results to prototype. 05 b) Explain how to determine exact fringe order (N) and the principal stress 05 C) difference at a given point of interest. Section – II Q.5 The strain readings as measured by a three element rectangular rosette at 80 a) a point in the stressed body are as follows: €a = 450 micro-strains, €b = -230 micro-strain, and €c =550 micro-strains Determine the maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 210 GPa and  $\mu$  = 0.285. b) Explain bonding of strain gauges and moisture proofing. 06 Q.6 Define transverse sensitivity of a strain gauge. Derive the expression for 07 a) transverse sensitivity of a strain gauge. Explain various ways of initial balance of Whetstone's bridge. 07 b) Explain brittle coating method. What are the merit and demerit. Q.7 04 a) Explain the measurement of stresses at large number of location using 04 b)
  - c) Derive the equation of output voltage for.
    1) 4-arm sensitive (2 linear and 2 lateral) combination.
    - 2) 2-arm sensitive (1 linear and 1 lateral) combination

SLR-FM-140



Max. Marks: 56

Seat No.

# T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 MECHANICAL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

**Instructions:** 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book.

POWER PLANT AND ENERGY ENGINEERING

- 2) Make suitable assumptions if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- For a power plant, the cost of labor is considered as cost, 1)
  - a) Fixed Variable b)
  - c) Progressive Maior d)
- 2) The standard frequency for electric power supply in India is .
  - a) 60 Hz 50 Hz b)
  - c) 440 Hz d)

#### 3) From the area under the load curve we can come to know

- Constant increase in power a) Approximate load b)
- c) Steady decrease in power d) Total energy consumption
- 4) A curve showing the variation of load on a power station with respect to time is known as \_\_\_\_\_. b) Load duration curve
  - a) Load curve
  - c) Performance curve
    - d) Flow chart
- 5) India has a per capita consumption \_
  - a) In equality with developed countries b) In excess of developed countries
  - c) Very severely behind developed countries
  - d) None of the above

#### 6) Low utilization factor for a power plant indicates that \_\_\_\_\_.

- a) Plant is under maintenance
- b) Plant is used for base load only
- c) Plant is used for stand by purpose only
- d) Plant is used for peak load as well as base load
- The temperature attained by a flat plate collector is of the 7)
  - a) Order of above 90° C c) Above 150° C
- Range of 100° C to 150° C b) Below 90° C d)
- 8) Depreciation charges are high in case of \_\_\_\_\_
  - a) Thermal plant c) Hydro-electric plant
- **Diesel plant** b)
  - All of the above d)

- 220 Hz

## **SLR-FM-141**



Max. Marks: 70

Marks: 14

|     |   |                    | Set   |
|-----|---|--------------------|---|
| 9)  | <ul><li>Pyreheliometer is used to measure</li><li>a) Beam radiation</li><li>c) Global radiation</li></ul> | b)<br>d)           | <br>Diffuse radiation<br>All of the above         |
| 10) | The sun subtends on the earth an a<br>a) 30°<br>c) 25°  | ngle d<br>b)<br>d) | of<br>32°<br>35°                                  |
| 11) | The turbine which is used in a tidal power is<br>a) Simple impulse turbine<br>c) Propeller type           | b)<br>d)           |   |
| 12) | Geothermal steam and hot water matrix<br>a) $NH_3$<br>c) $H_2S$ . $NH_3$ and Radon gas                    | b)                 | Na <sub>2</sub> S                                 |
| 13) | Conservation of energy means usin<br>activity.<br>a) More<br>c) Partial                                   | g<br>b)<br>d)      | energy for the same level of<br>Less<br>Zero      |
| 14) | The objective of Energy Audit is to _<br>a) Spend energy<br>c) Save energy                                | b)<br>d)           | <br>Conduct formal survey<br>Promote energy usage |

Ρ

| <b>SLR-FM-141</b> |
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| Seat |  |
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| No.  |  |

### T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 MECHANICAL ENGINEERING POWER PLANT AND ENERGY ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

Max. Marks: 56

Set

Ρ

**Instructions:** 1) Answer any two questions from each Section.

2) Make suitable assumption if necessary and state it clearly.

3) Figures to the right indicate full marks.

#### Section – I

| Q.2 | a)<br>b)<br>c) | Discuss different organization of power sector in India.<br>Explain in detail what do you mean by load curve?<br>Write a short note on impact of energy sources on environment.  | 05<br>05<br>04 |
|-----|----------------|--|----------------|
| Q.3 | a)<br>b)<br>c) | <ul> <li>Write a note on effect of variable load on power plant design and operation.</li> <li>Discuss the compressed air storage plant.</li> <li>The maximum (peak) load on a thermal power plant of 90 mW capacity is 80 mW at an annual load factor of 50%. The loads having maximum demands of 35 mW, 30 mW, 12 mW and 8 mW are connected to the power station.</li> <li>Determine : <ol> <li>Average load on power station</li> <li>Energy generated per year</li> <li>Demand factor</li> </ol> </li> </ul> | 04<br>05<br>05 |
| Q.4 | a)<br>b)<br>c) | Describe role of private sector in energy management.<br>Explain in detail cost of electrical energy.<br>From the following data calculate the cost of generation per unit delivered<br>from the power plant:<br>Installed capacity of power plant = 200 MW<br>Annual load factor = 0.4<br>Capital cost of power plant = Rs. 280 lacs<br>Annual cost of fuel, oil, salaries, taxation = Rs. 60 lacs.<br>Interest and depreciation = 13%<br>Section – II  | 05<br>04<br>05 |
| Q.5 | a)             | State its advantage and disadvantages of wind energy along with their  | 04             |
|     | b)<br>c)       | classification.<br>Write a short note on solar radiation geometry.<br>Discuss the performance analysis of liquid flat plate collector.   | 05<br>05       |
| Q.6 | a)<br>b)<br>c) | Discuss method of harnessing.<br>With neat sketch explain pyranometer.<br>Give detail information about single basin system of tidal power plant.  | 05<br>05<br>04 |
| Q.7 | a)<br>b)<br>c) | Explain horizontal axis wind mill in detail.<br>What are the feature of Energy Conservation Act, 2001?<br>Discuss in detail types of energy audit.   | 04<br>05<br>05 |

| Seat |  |
|------|--|
| No.  |  |

**Duration: 30 Minutes** 

1)

Q.1

## T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 **MECHANICAL ENGINEERING** POWER PLANT AND ENERGY ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

a) Thermal plant

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book.

**MCQ/Objective Type Questions** 

- 2) Make suitable assumptions if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.

|     | c) Hydro-electric plant  | d)                 | All of the above  |
|-----|--|--------------------|---|
| 2)  | Pyreheliometer is used to measure<br>a) Beam radiation<br>c) Global radiation                      | b)<br>d)           | Diffuse radiation   |
| 3)  | The sun subtends on the earth an a<br>a) 30°<br>c) 25°   | angle<br>b)<br>d)  | of<br>32°<br>35°  |
| 4)  | The turbine which is used in a tidal<br>power is<br>a) Simple impulse turbine<br>c) Propeller type | •                  | r plant for getting continuous<br>Reversible type<br>Any one              |
| 5)  | Geothermal steam and hot water m<br>a) $NH_3$<br>c) $H_2S$ . $NH_3$ and Radon gas                  | b)                 | Na <sub>2</sub> S   |
| 6)  | Conservation of energy means usir<br>activity.<br>a) More<br>c) Partial                            | ng<br>b)<br>d)     | energy for the same level of<br>Less<br>Zero                              |
| 7)  | The objective of Energy Audit is to<br>a) Spend energy<br>c) Save energy                           |                    | <br>Conduct formal survey<br>Promote energy usage                         |
| 8)  | For a power plant, the cost of labor<br>a) Fixed<br>c) Progressive                                 | is cor<br>b)<br>d) | nsidered as cost,<br>Variable<br>Major                                    |
| 9)  | The standard frequency for electric<br>a) 60 Hz<br>c) 440 Hz                                       | powe<br>b)<br>d)   | r supply in India is<br>50 Hz<br>220 Hz                                   |
| 10) | From the area under the load curve<br>a) Approximate load<br>c) Steady decrease in power           | b)                 | an come to know<br>Constant increase in power<br>Total energy consumption |



Marks: 14

14

- Choose the correct alternatives from the options and rewrite the sentence.
  - Depreciation charges are high in case of **Diesel** plant b)

Set Q 11) A curve showing the variation of load on a power station with respect to time is known as \_\_\_\_\_.

d)

a) Load curve

b) Load duration curve

**SLR-FM-141** 

Set Q

- c) Performance curve
- Flow chart
- 12) India has a per capita consumption \_\_\_\_\_
  - a) In equality with developed countries
  - b) In excess of developed countries
  - c) Very severely behind developed countries
  - d) None of the above
- 13) Low utilization factor for a power plant indicates that \_\_\_\_\_.
  - a) Plant is under maintenance
  - b) Plant is used for base load only
  - c) Plant is used for stand by purpose only
  - d) Plant is used for peak load as well as base load
- 14) The temperature attained by a flat plate collector is of the \_\_\_\_
  - a) Order of above 90° C
- b) Range of  $100^{\circ}$  C to  $150^{\circ}$  C
- c) Above 150° C
- d) Below 90° C

| Seat |  |
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| No.  |  |

### T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 MECHANICAL ENGINEERING POWER PLANT AND ENERGY ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

Max. Marks: 56

**Instructions:** 1) Answer any two questions from each Section.

- 2) Make suitable assumption if necessary and state it clearly.
- 3) Figures to the right indicate full marks.

#### Section – I

| Q.2 | a)<br>b)<br>c) | Discuss different organization of power sector in India.<br>Explain in detail what do you mean by load curve?<br>Write a short note on impact of energy sources on environment.  | 05<br>05<br>04 |
|-----|----------------|--|----------------|
| Q.3 | a)<br>b)<br>c) | <ul> <li>Write a note on effect of variable load on power plant design and operation.</li> <li>Discuss the compressed air storage plant.</li> <li>The maximum (peak) load on a thermal power plant of 90 mW capacity is 80 mW at an annual load factor of 50%. The loads having maximum demands of 35 mW, 30 mW, 12 mW and 8 mW are connected to the power station.</li> <li>Determine : <ol> <li>Average load on power station</li> <li>Energy generated per year</li> <li>Demand factor</li> </ol> </li> </ul> | 04<br>05<br>05 |
| Q.4 | a)<br>b)<br>c) | Describe role of private sector in energy management.<br>Explain in detail cost of electrical energy.<br>From the following data calculate the cost of generation per unit delivered<br>from the power plant:<br>Installed capacity of power plant = 200 MW<br>Annual load factor = 0.4<br>Capital cost of power plant = Rs. 280 lacs<br>Annual cost of fuel, oil, salaries, taxation = Rs. 60 lacs.<br>Interest and depreciation = 13%<br>Section – II  | 05<br>04<br>05 |
| Q.5 | a)             | State its advantage and disadvantages of wind energy along with their classification.  | 04             |
|     | b)<br>c)       | Write a short note on solar radiation geometry.<br>Discuss the performance analysis of liquid flat plate collector.  | 05<br>05       |
| Q.6 | a)<br>b)<br>c) | Discuss method of harnessing.<br>With neat sketch explain pyranometer.<br>Give detail information about single basin system of tidal power plant.  | 05<br>05<br>04 |
| Q.7 | a)<br>b)<br>c) | Explain horizontal axis wind mill in detail.<br>What are the feature of Energy Conservation Act, 2001?<br>Discuss in detail types of energy audit.   | 04<br>05<br>05 |
|     |                |  |                |



# T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book.

MECHANICAL ENGINEERING POWER PLANT AND ENERGY ENGINEERING

- 2) Make suitable assumptions if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

a)

NH<sub>3</sub>

Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) India has a per capita consumption \_
  - a) In equality with developed countries
  - b) In excess of developed countries
  - c) Very severely behind developed countries
  - d) None of the above
- 2) Low utilization factor for a power plant indicates that \_\_\_\_\_.
  - a) Plant is under maintenance
  - b) Plant is used for base load only
  - c) Plant is used for stand by purpose only
  - d) Plant is used for peak load as well as base load
- 3) The temperature attained by a flat plate collector is of the \_
  - a) Order of above 90° C b) Range of 100° C to 150° C
  - c) Above 150° C d) Below 90° C
- 4) Depreciation charges are high in case of \_\_\_\_\_
  - a) Thermal plantb) Diesel plantc) Hydro-electric plantd) All of the above
- 5) Pyreheliometer is used to measure \_\_\_\_\_.
  - a) Beam radiation b) Diffuse radiation
  - c) Global radiation d) All of the above
- 6) The sun subtends on the earth an angle of \_\_\_\_\_.
  - a)  $30^{\circ}$  b)  $32^{\circ}$  c)  $25^{\circ}$  d)  $35^{\circ}$
- The turbine which is used in a tidal power plant for getting continuous power is \_\_\_\_\_.
  - a) Simple impulse turbine b) Reversible type
  - c) Propeller type d) Any one
- 8) Geothermal steam and hot water may contain \_\_\_\_\_.
  - b) Na<sub>2</sub>S
  - c)  $H_2S$ .  $NH_3$  and Radon gas d) All of above

Set R

Max. Marks: 70



Set 9) Conservation of energy means using \_\_\_\_\_ energy for the same level of activity. a) More b) Less c) Partial d) Zero 10) The objective of Energy Audit is to \_\_\_\_\_ b) Spend energy Conduct formal survey a) c) Save energy d) Promote energy usage For a power plant, the cost of labor is considered as \_\_\_\_\_ cost, 11) a) Fixed Variable b) c) Progressive d) Major 12) The standard frequency for electric power supply in India is \_\_\_\_\_. a) 60 Hz b) 50 Hz c) 440 Hz d) 220 Hz From the area under the load curve we can come to know \_\_\_\_\_. 13) a) Approximate load Constant increase in power b) c) Steady decrease in power d) Total energy consumption 14) A curve showing the variation of load on a power station with respect to

- time is known as \_\_\_\_\_.
  - a) Load curve
  - c) Performance curve
- b) Load duration curve

**SLR-FM-141** 

R

d) Flow chart

| Seat |  |
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| No.  |  |

#### T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 MECHANICAL ENGINEERING POWER PLANT AND ENERGY ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

Max. Marks: 56

**Instructions:** 1) Answer any two questions from each Section.

- 2) Make suitable assumption if necessary and state it clearly.
- 3) Figures to the right indicate full marks.

#### Section – I

| Q.2 | a)<br>b)<br>c) | Discuss different organization of power sector in India.<br>Explain in detail what do you mean by load curve?<br>Write a short note on impact of energy sources on environment.  | 05<br>05<br>04 |
|-----|----------------|--|----------------|
| Q.3 | a)<br>b)<br>c) | <ul> <li>Write a note on effect of variable load on power plant design and operation.</li> <li>Discuss the compressed air storage plant.</li> <li>The maximum (peak) load on a thermal power plant of 90 mW capacity is 80 mW at an annual load factor of 50%. The loads having maximum demands of 35 mW, 30 mW, 12 mW and 8 mW are connected to the power station.</li> <li>Determine : <ol> <li>Average load on power station</li> <li>Energy generated per year</li> <li>Demand factor</li> </ol> </li> </ul> | 04<br>05<br>05 |
| Q.4 | a)<br>b)<br>c) | Describe role of private sector in energy management.<br>Explain in detail cost of electrical energy.<br>From the following data calculate the cost of generation per unit delivered<br>from the power plant:<br>Installed capacity of power plant = 200 MW<br>Annual load factor = 0.4<br>Capital cost of power plant = Rs. 280 lacs<br>Annual cost of fuel, oil, salaries, taxation = Rs. 60 lacs.<br>Interest and depreciation = 13%  | 05<br>04<br>05 |
|     |                | Section – II   |                |
| Q.5 | a)             | State its advantage and disadvantages of wind energy along with their classification.  | 04             |
|     | b)<br>c)       | Write a short note on solar radiation geometry.<br>Discuss the performance analysis of liquid flat plate collector.  | 05<br>05       |
| Q.6 | a)<br>b)<br>c) | Discuss method of harnessing.<br>With neat sketch explain pyranometer.<br>Give detail information about single basin system of tidal power plant.  | 05<br>05<br>04 |
| Q.7 | a)<br>b)<br>c) | Explain horizontal axis wind mill in detail.<br>What are the feature of Energy Conservation Act, 2001?<br>Discuss in detail types of energy audit.   | 04<br>05<br>05 |
|     |                |  |                |



# T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019

MECHANICAL ENGINEERING POWER PLANT AND ENERGY ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

**Instructions:** 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book.

- 2) Make suitable assumptions if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The sun subtends on the earth an angle of
  - 32° a) 30° b) c) 25°  $35^{\circ}$ d)
- 2) The turbine which is used in a tidal power plant for getting continuous power is
  - a) Simple impulse turbine b) Reversible type
  - c) Propeller type Any one d)

#### 3) Geothermal steam and hot water may contain \_\_\_\_

- a) NH<sub>3</sub> b) c)  $H_2S$ .  $NH_3$  and Radon gas d) All of above
- Conservation of energy means using \_\_\_\_\_ energy for the same level of 4) activity.
  - a) More b) Less c) Partial d)
    - Zero

#### The objective of Energy Audit is to \_ 5) Spend energy b) Conduct formal survey a)

- c) Save energy d) Promote energy usage
- For a power plant, the cost of labor is considered as \_\_\_\_\_ cost, 6)
  - a) Fixed b) Variable
  - Progressive d) Major C)
- 7) The standard frequency for electric power supply in India is .
  - 50 Hz a) 60 Hz b) c) 440 Hz
    - d) 220 Hz
- From the area under the load curve we can come to know \_ 8) a) Approximate load
  - b) Constant increase in power
  - c) Steady decrease in power Total energy consumption d)
- 9) A curve showing the variation of load on a power station with respect to time is known as \_\_\_\_\_. Load duration curve
  - a) Load curve b)
  - c) Performance curve d) Flow chart





Max. Marks: 70

Marks: 14

- - Na<sub>2</sub>S

SLR-FM-141 Set S

- 10) India has a per capita consumption \_\_\_\_\_
  - a) In equality with developed countries
  - b) In excess of developed countries
  - c) Very severely behind developed countries
  - d) None of the above
- 11) Low utilization factor for a power plant indicates that \_\_\_\_\_.
  - a) Plant is under maintenance
  - b) Plant is used for base load only
  - c) Plant is used for stand by purpose only
  - d) Plant is used for peak load as well as base load
- 12) The temperature attained by a flat plate collector is of the \_
  - a) Order of above 90° C b) Range of 100° C to 150° C

\_\_\_-

- c) Above 150° C d) Below 90° C
- 13) Depreciation charges are high in case of \_
  - a) Thermal plant b) Diesel plant
  - c) Hydro-electric plant d) All of the above
- 14) Pyreheliometer is used to measure \_\_\_\_
  - a) Beam radiation

- b) Diffuse radiation
- c) Global radiation
- d) All of the above

| Seat |  |
|------|--|
| No.  |  |

### T.E. (Part - II) (Old) (CGPA) Examination Nov/Dec-2019 **MECHANICAL ENGINEERING** POWER PLANT AND ENERGY ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10.00 AM To 01.00 PM

Max. Marks: 56

**Instructions:** 1) Answer any two questions from each Section.

2) Make suitable assumption if necessary and state it clearly.

3) Figures to the right indicate full marks.

#### Section – I

| Q.2 | a)<br>b)<br>c) | Discuss different organization of power sector in India.<br>Explain in detail what do you mean by load curve?<br>Write a short note on impact of energy sources on environment.  | 05<br>05<br>04 |
|-----|----------------|--|----------------|
| Q.3 | a)<br>b)<br>c) | <ul> <li>Write a note on effect of variable load on power plant design and operation.</li> <li>Discuss the compressed air storage plant.</li> <li>The maximum (peak) load on a thermal power plant of 90 mW capacity is 80 mW at an annual load factor of 50%. The loads having maximum demands of 35 mW, 30 mW, 12 mW and 8 mW are connected to the power station.</li> <li>Determine : <ol> <li>Average load on power station</li> <li>Energy generated per year</li> <li>Demand factor</li> </ol> </li> </ul> | 04<br>05<br>05 |
| Q.4 | a)<br>b)<br>c) | Describe role of private sector in energy management.<br>Explain in detail cost of electrical energy.<br>From the following data calculate the cost of generation per unit delivered<br>from the power plant:<br>Installed capacity of power plant = 200 MW<br>Annual load factor = 0.4<br>Capital cost of power plant = Rs. 280 lacs<br>Annual cost of fuel, oil, salaries, taxation = Rs. 60 lacs.<br>Interest and depreciation = 13%  | 05<br>04<br>05 |
| Q.5 | a)             | Section – II<br>State its advantage and disadvantages of wind energy along with their  | 04             |
|     | b)<br>c)       | classification.<br>Write a short note on solar radiation geometry.<br>Discuss the performance analysis of liquid flat plate collector.   | 05<br>05       |
| Q.6 | a)<br>b)<br>c) | Discuss method of harnessing.<br>With neat sketch explain pyranometer.<br>Give detail information about single basin system of tidal power plant.  | 05<br>05<br>04 |
| Q.7 | a)<br>b)<br>c) | Explain horizontal axis wind mill in detail.<br>What are the feature of Energy Conservation Act, 2001?<br>Discuss in detail types of energy audit.   | 04<br>05<br>05 |
|     |                |  |                |



| Seat |  |
|------|--|
| No.  |  |

#### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MECHANICAL VIBRATION**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

- 2) Figures to the right indicate full marks.
- 4) Make suitable assumptions if necessary and state them clearly.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The resultant stiffness of two springs in parallel as compared to individual stiffness.
  - a) is more c) is equal

c)

- b) is less
- d) none of above
- Simple pendulum is a case of \_\_\_\_\_ of freedom system. 2)
  - two degree a) single degree b) three degree
    - four degree d)
- During Resonance . 3)
  - high amplitude of vibration occurs a)
  - low amplitude of vibration occurs b)
  - c) no vibration occurs
  - d) vibration remain unaffected
- In energy method for finding frequency of system 4)
  - The sum of kinetic & potential a)
  - The sum of kinetic & potential energy b)
  - C) System is assumed to be non
  - Frequency cannot be determined d)
- 5) The energy dissipated per cycle depends upon of coefficient of friction in case of .
  - a) viscous damping b) coulomb damping c) structural damping slip damping d)
- In a harmonic motion the maximum velocity is \_\_\_\_\_. 6)
  - directly proportional to the amplitude a)
  - inversely proportional to the amplitude b)
  - directly proportional to square of C)
  - independent of amplitude d)
- The unit of viscous damping coefficient. 7)
  - N-m/sec m/N-sec a) b) c)
    - N-sec/m d) N-m-sec



Max. Marks: 70

Set P

- It analysis noise signal in frequency domain into various frequency bands by magnetically separating the signal
- It analysis noise signal in frequency domain into various frequency b) bands by electronically separating the signal
- It analysis noise signal in frequency domain into various frequency c) bands by electromagnetically separating the signal
- d) none

a)

8)

9)

10)

a) nonlinear

stochastic

decreases

does not change

to be measured

to be measured

all of above

vibration to be measured

C)

a)

c)

a)

b)

C)

d)

- 11) Vibrometers is known as \_\_\_\_\_ frequency transducer.
  - a) high b) low
  - c) medium d) none
- The material normally used for vibration isolation is 12)
  - a)
    - c)
- The energy dissipated per cycle depends upon of coefficient of friction, the 13) pressure at the contacting parts & amplitudes in case of
  - viscous damping a)
  - d) c) structural damping

When dealing with random vibration problems both excitation and

b)

d)

b)

d)

because of its natural frequency is high compared to that of vibration

because of its natural frequency is low compared to that of vibration

because of its natural frequency is peak value compared to that of

With increase in frequency, equivalent stiffness of soft spring system \_\_\_\_\_.

linear

none

variable

increases

response process are modelled as \_\_\_\_\_ process.

An accelerometer is used to measure acceleration.

- - rubber b) metallic spring
  - both a & b d) glass
- coulomb damping b)
  - slip damping
- 14) What is the function of frequency analyzer?

| T.E. (Part – II) (Old) (CGPA) Examination Nov | v/Dec-2019 |
|---|------------|
| Mechanical Engineering                        |            |
| MECHANICAL VIBRATION                          |            |
| Date: Wednesday, 27-11-2019                   | Max. Marks |

Day & Time: 10:00 AM To 01:00 PM

Seat

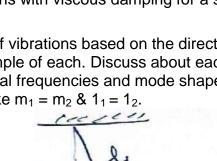
No.

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicates full marks.

#### Section – I

- Q.2 a) Define following terms.
  - 1) Natural frequency
  - 2) Period
  - 3) Damping
  - b) Explain free vibrations with viscous damping for a single degree of freedom 80 system
- Give classification of vibrations based on the direction of movement of Q.3 a) 06 particles. Give example of each. Discuss about each type of vibration.
  - Determine the natural frequencies and mode shapes of a double pendulum 80 b) shown in figure. Take  $m_1 = m_2 \& 1_1 = 1_2$ .

2



s: 56

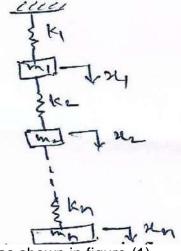
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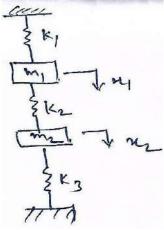
**SLR-FM-142** 

Set P

Q.4 a) For a system shown in figure, write equations of motion. Put these in the matrix form.



- **b)** For spring mass system as shown in figure (1), Determine
  - 1) Equation of motion
  - 2) Natural frequency
  - 3) Normal mode of system



#### Section - II

Q.5 Distinguish between linear and nonlinear vibrations. 04 a) What is importance of vibration measuring Instrument? Explain principle of 06 b) accelerometer with sketch and frequency curve. Explain time and frequency domain analysis with suitable example. 04 c) Q.6 What is dynamic vibration absorber & show that its natural frequency 07 a) should be equal to frequency of applied force. Explain mean square value, variance and standard deviation of a random 07 b) process. Q.7 Write short note. (Any Two) 14 Probability density function a) Vibration Damping b) c) FFT analyzer

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

#### **MECHANICAL VIBRATION** Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

**Mechanical Engineering** 

- 2) Figures to the right indicate full marks.
- 4) Make suitable assumptions if necessary and state them clearly.

### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- When dealing with random vibration problems both excitation and 1) response process are modelled as \_\_\_\_\_ process.
  - a) nonlinear
  - c) stochastic d)
- 2) With increase in frequency, equivalent stiffness of soft spring system \_\_\_\_\_.
  - a) decreases b) increases
  - c) does not change d) none
- An accelerometer is used to measure acceleration. 3)
  - because of its natural frequency is high compared to that of vibration a) to be measured
  - because of its natural frequency is low compared to that of vibration b) to be measured
  - because of its natural frequency is peak value compared to that of C) vibration to be measured
  - d) all of above
- Vibrometers is known as \_\_\_\_\_ frequency transducer. 4)
  - a) high b) low c) medium d) none
- The material normally used for vibration isolation is \_\_\_\_\_. 5)
  - rubber metallic spring a) b)
    - both a & b C) d) glass
- 6) The energy dissipated per cycle depends upon of coefficient of friction, the pressure at the contacting parts & amplitudes in case of
  - viscous damping coulomb damping b) a) slip damping
  - structural damping C)
- What is the function of frequency analyzer? 7)
  - It analysis noise signal in frequency domain into various frequency a) bands by magnetically separating the signal

d)

- It analysis noise signal in frequency domain into various frequency b) bands by electronically separating the signal
- It analysis noise signal in frequency domain into various frequency C) bands by electromagnetically separating the signal
- d) none



Max. Marks: 70

Marks: 14

linear

- b) variable

Set C

**SLR-FM-142** 

b) two degree d) four degree

is less

none of above

The resultant stiffness of two springs in parallel as compared to individual

Simple pendulum is a case of \_\_\_\_\_ of freedom system.

b)

d)

10) During Resonance \_\_\_\_\_

is equal

a) single degree

three degree

stiffness. a) is more

C)

c)

8)

9)

- a) high amplitude of vibration occurs
- b) low amplitude of vibration occurs
- c) no vibration occurs
- d) vibration remain unaffected
- 11) In energy method for finding frequency of system
  - a) The sum of kinetic & potential
  - b) The sum of kinetic & potential energy
  - c) System is assumed to be non
  - d) Frequency cannot be determined
- 12) The energy dissipated per cycle depends upon of coefficient of friction in case of \_\_\_\_\_.
  - a) viscous damping
- b) coulomb damping
- c) structural damping d) slip damping
- 13) In a harmonic motion the maximum velocity is \_\_\_\_\_.
  - a) directly proportional to the amplitude
  - b) inversely proportional to the amplitude
  - c) directly proportional to square of
  - d) independent of amplitude
- 14) The unit of viscous damping coefficient.
  - a) N-m/sec b) m/N-sec
  - c) N-sec/m d) N-m-sec

| Q.2 | a)<br>b) | <ul> <li>Define following terms.</li> <li>1) Natural frequency</li> <li>2) Period</li> <li>3) Damping</li> <li>Explain free vibrations with viscous damping for a single degree of freedom system</li> </ul> | 06<br>08 |
|-----|----------|--|----------|
| Q.3 | a)       | Give classification of vibrations based on the direction of movement of particles. Give example of each. Discuss about each type of vibration.   | 06       |
|     | b)       | Determine the natural frequencies and mode shapes of a double pendulum shown in figure. Take $m_1 = m_2 \& 1_1 = 1_2$ .  | 08       |

#### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering **MECHANICAL VIBRATION**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Solve any two questions from each Section. 2) Figures to the right indicates full marks.

#### Section – I

**SLR-FM-142** 

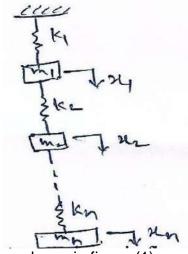


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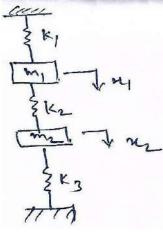
Max. Marks: 56

Seat No.

**Q.4 a)** For a system shown in figure, write equations of motion. Put these in the matrix form.



- **b)** For spring mass system as shown in figure (1), Determine
  - 1) Equation of motion
  - 2) Natural frequency
  - 3) Normal mode of system



#### Section – II

| Q.5 | a)<br>b)<br>c)               | Distinguish between linear and nonlinear vibrations.<br>What is importance of vibration measuring Instrument? Explain principle of<br>accelerometer with sketch and frequency curve.<br>Explain time and frequency domain analysis with suitable example. | 04<br>06<br>04 |
|-----|------------------------------|---|----------------|
| Q.6 | a)<br>b)                     | What is dynamic vibration absorber & show that its natural frequency should be equal to frequency of applied force.<br>Explain mean square value, variance and standard deviation of a random process.  | 07<br>07       |
| Q.7 | Wri <sup>:</sup><br>a)<br>b) | <b>te short note. (Any Two)</b><br>Probability density function<br>Vibration Damping  | 14             |

**c)** FFT analyzer

Set | Q

06

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

#### Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

**MECHANICAL VIBRATION** 

- 2) Figures to the right indicate full marks.
- 4) Make suitable assumptions if necessary and state them clearly.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

c)

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The energy dissipated per cycle depends upon of coefficient of friction in case of \_\_\_\_\_.
  - a) viscous damping b) coulomb damping
    - structural damping d) slip damping
- 2) In a harmonic motion the maximum velocity is \_\_\_\_\_.
  - a) directly proportional to the amplitude
  - b) inversely proportional to the amplitude
  - c) directly proportional to square of
  - d) independent of amplitude
- 3) The unit of viscous damping coefficient.
  - a) N-m/sec b) m/N-sec
  - c) N-sec/m d) N-m-sec
- 4) When dealing with random vibration problems both excitation and response process are modelled as \_\_\_\_\_ process.
  - a) nonlinear
  - c) stochastic d) variable
- 5) With increase in frequency, equivalent stiffness of soft spring system \_\_\_\_\_.

b)

linear

low

- a) decreases b) increases
- c) does not change d) none
- 6) An accelerometer is used to measure acceleration.
  - a) because of its natural frequency is high compared to that of vibration to be measured
  - b) because of its natural frequency is low compared to that of vibration to be measured
  - c) because of its natural frequency is peak value compared to that of vibration to be measured

b)

- d) all of above
- 7) Vibrometers is known as \_\_\_\_\_\_ frequency transducer.
  - a) high
  - c) medium d) none

Seat No.

## SLR-FM-142



Max. Marks: 70

Marks: 14

SLR-FM-142 Set R

- 8) The material normally used for vibration isolation is \_\_\_\_\_
  - a) rubber

b) metallic spring

c) both a & b

- d) glass
- The energy dissipated per cycle depends upon of coefficient of friction, the pressure at the contacting parts & amplitudes in case of \_\_\_\_\_.
  - a) viscous dampingb)c) structural dampingd)
- b) coulomb dampingd) slip damping
- 10) What is the function of frequency analyzer?
  - a) It analysis noise signal in frequency domain into various frequency bands by magnetically separating the signal
  - b) It analysis noise signal in frequency domain into various frequency bands by electronically separating the signal
  - c) It analysis noise signal in frequency domain into various frequency bands by electromagnetically separating the signal
  - d) none
- 11) The resultant stiffness of two springs in parallel as compared to individual stiffness.
  - a) is more b)
  - c) is equal d)
- 12) Simple pendulum is a case of \_\_\_\_\_ of freedom system.
  - a) single degree
- b) two degree

is less

none of above

- c) three degree
  - d) four degree
- 13) During Resonance \_\_\_\_\_.
  - a) high amplitude of vibration occurs
  - b) low amplitude of vibration occurs
  - c) no vibration occurs
  - d) vibration remain unaffected
- 14) In energy method for finding frequency of system
  - a) The sum of kinetic & potential
  - b) The sum of kinetic & potential energy
  - c) System is assumed to be non
  - d) Frequency cannot be determined

| NO.                               |                              |
|-----------------------------------|------------------------------|
| T.E. (Part – II) (Old) (CG        | PA) Examination Nov/Dec-2019 |
| Mechan                            | ical Engineering             |
| MECHAN                            | ICAL VIBRATION               |
| Day & Date: Wednesday, 27-11-2019 | Max. Mark                    |

Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicates full marks.

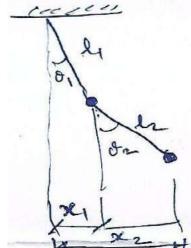
#### Section – I

- Q.2 a) Define following terms.
  - 1) Natural frequency
  - 2) Period
  - 3) Damping
  - b) Explain free vibrations with viscous damping for a single degree of freedom 80 system
- Give classification of vibrations based on the direction of movement of Q.3 a) 06 particles. Give example of each. Discuss about each type of vibration.
  - Determine the natural frequencies and mode shapes of a double pendulum 80 b) shown in figure. Take  $m_1 = m_2 \& 1_1 = 1_2$ .

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**SLR-FM-142** 

Set R

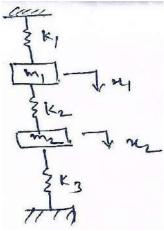


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Q.4 a) For a system shown in figure, write equations of motion. Put these in the matrix form.

The try

- **b)** For spring mass system as shown in figure (1), Determine
  - 1) Equation of motion
  - 2) Natural frequency
  - 3) Normal mode of system



#### Section - II

Q.5 Distinguish between linear and nonlinear vibrations. 04 a) What is importance of vibration measuring Instrument? Explain principle of 06 b) accelerometer with sketch and frequency curve. Explain time and frequency domain analysis with suitable example. 04 c) Q.6 What is dynamic vibration absorber & show that its natural frequency 07 a) should be equal to frequency of applied force. Explain mean square value, variance and standard deviation of a random 07 b) process. Q.7 Write short note. (Any Two) 14 Probability density function a) Vibration Damping b) c) FFT analyzer

| Seat |  |
|------|--|
| No.  |  |

## T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MECHANICAL VIBRATION**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Objective type Question. No. 1 is compulsory. It should be solved in 30 minutes. Each question carries one mark.

- 2) Figures to the right indicate full marks.
- 4) Make suitable assumptions if necessary and state them clearly.

### **MCQ/Objective Type Questions**

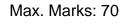
**Duration: 30 Minutes** 

#### Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- An accelerometer is used to measure acceleration. 1)
  - because of its natural frequency is high compared to that of vibration a) to be measured
  - b) because of its natural frequency is low compared to that of vibration to be measured
  - because of its natural frequency is peak value compared to that of C) vibration to be measured
  - d) all of above
- 2) Vibrometers is known as \_\_\_\_\_ frequency transducer.
  - a) high b) low
  - c) medium d) none
- The material normally used for vibration isolation is \_\_\_\_ 3)
  - a) rubber metallic spring b)
  - c) both a & b d) alass
- 4) The energy dissipated per cycle depends upon of coefficient of friction, the pressure at the contacting parts & amplitudes in case of \_
  - coulomb damping a) viscous damping b)
  - c) structural damping slip damping d)
- What is the function of frequency analyzer? 5)
  - It analysis noise signal in frequency domain into various frequency a) bands by magnetically separating the signal
  - It analysis noise signal in frequency domain into various frequency b) bands by electronically separating the signal
  - It analysis noise signal in frequency domain into various frequency C) bands by electromagnetically separating the signal
  - none d)
- The resultant stiffness of two springs in parallel as compared to individual 6) stiffness.
  - a) is more
  - c) is equal

- is less b)
- d) none of above
- Simple pendulum is a case of \_\_\_\_\_ of freedom system. 7)
  - a) single degree c)
    - three degree
- two degree b)
- four degree d)



Set

Set S

SLR-FM-142

- 8) During Resonance \_\_\_\_\_.
  - a) high amplitude of vibration occurs
  - b) low amplitude of vibration occurs
  - c) no vibration occurs
  - d) vibration remain unaffected
- 9) In energy method for finding frequency of system
  - a) The sum of kinetic & potential
  - b) The sum of kinetic & potential energy
  - c) System is assumed to be non
  - d) Frequency cannot be determined
- 10) The energy dissipated per cycle depends upon of coefficient of friction in case of \_\_\_\_\_.
  - a) viscous damping b) coulomb damping
  - c) structural damping d) slip damping
- 11) In a harmonic motion the maximum velocity is \_\_\_\_\_.
  - a) directly proportional to the amplitude
  - b) inversely proportional to the amplitude
  - c) directly proportional to square of
  - d) independent of amplitude
- 12) The unit of viscous damping coefficient.
  - a) N-m/sec b) m/N-sec
  - c) N-sec/m d) N-m-sec
- 13) When dealing with random vibration problems both excitation and response process are modelled as \_\_\_\_\_ process.
  - a) Nonlinear b) linear
  - c) stochastic d) variable
- 14) With increase in frequency, equivalent stiffness of soft spring system \_\_\_\_\_.
  - a) decreases b) increases
  - c) does not change d) none

| Q.2 | a)<br>b) | <ul> <li>Define following terms.</li> <li>1) Natural frequency</li> <li>2) Period</li> <li>3) Damping</li> <li>Explain free vibrations with viscous damping for a single degree of freedom system</li> </ul> | 06<br>08 |
|-----|----------|--|----------|
| Q.3 | a)       | Give classification of vibrations based on the direction of movement of particles. Give example of each. Discuss about each type of vibration.   | 06       |
|     | b)       | Determine the natural frequencies and mode shapes of a double pendulum shown in figure. Take $m_1 = m_2 \& 1_1 = 1_2$ .  | 08       |

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering **MECHANICAL VIBRATION** 

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicates full marks.

#### Section – I

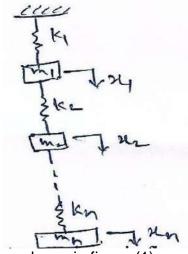
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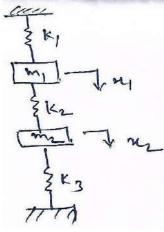
Max. Marks: 56

Set S

**Q.4 a)** For a system shown in figure, write equations of motion. Put these in the matrix form.



- **b)** For spring mass system as shown in figure (1), Determine
  - 1) Equation of motion
  - 2) Natural frequency
  - 3) Normal mode of system



#### Section – II

| Q.5 | a)<br>b)<br>c)               | Distinguish between linear and nonlinear vibrations.<br>What is importance of vibration measuring Instrument? Explain principle of<br>accelerometer with sketch and frequency curve.<br>Explain time and frequency domain analysis with suitable example. | 04<br>06<br>04 |
|-----|------------------------------|---|----------------|
| Q.6 | a)<br>b)                     | What is dynamic vibration absorber & show that its natural frequency should be equal to frequency of applied force.<br>Explain mean square value, variance and standard deviation of a random process.  | 07<br>07       |
| Q.7 | Wri <sup>:</sup><br>a)<br>b) | <b>te short note. (Any Two)</b><br>Probability density function<br>Vibration Damping  | 14             |

**c)** FFT analyzer

S

06

Set

#### **Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. 2) Figures to right indicate full marks. **MCQ/Objective Type Questions Duration: 30 Minutes** Marks: 14 Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 In ASA system, if the tool signature is 8-6-5-5-12-16-2 then nose radius 1) will be \_\_ a) 12 b) 2 8 C) 6 d) Continuous chips are not formed during machining of \_\_\_\_\_. 2) Mild Steel Aluminum a) b) c) Tin d) Cast Iron 3) Helix angle or rake angle of drill tool used for steel material is \_\_\_\_\_. 24° 14° a) b) 40° 60° d) c) In Blanking operation clearance is provided on 4) a) On punch 50% on punch b) 50% on Die d) On die c) Which of the following represents drawing ratio? 5) h/d a) d/D b) D/d h/D C) d) 6) No. of bolts required to clamp die mainly depends upon. Stripping force Total force on die b) a) Die area d) Thickness or stripper c) The relation between the tool life (T) in minutes and cutting speed (V) in 7) mm/min is a) $V^n = CT$ $VT^n = C$ b) $(V^n/T) = C$ $(V/T^n) = C$ d) c) 8) Crater wear is predominant in \_\_\_\_ a) Carbon tool steel b) Tungsten carbide HSS tools Ceramic tools C) d) Thrust force on tool will increase will increase with increase in 9)

**Mechanical Engineering** TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Seat

**SLR-FM-143** 

Max. Marks: 70

- - Tool nose radius Side cutting edge angle b)
  - a) Rake angle Ceramic tools C) d)

Set

No. T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

| SLR-FM-1 | 43 |
|----------|----|
| Set      | Ρ  |

- In bending allowance the value of K is dependent on \_ 10)
  - Length of bend a)
- Bend angle b)
- Inner radius C)
- d) All above
- Spring back phenomenon is associated with \_ 11) \_\_.
  - a) Forming b) Cutting
  - Bending C) Drawing d)
- 12) The most common material for multipoint cutting tool is \_\_\_\_\_.
  - Mild steel HSS a) b) Stainless Steel C)
    - None of these d)
- 13) Dynamometer is used to measure \_\_\_\_
  - a) Cutting force b) Power
  - Cutting speed d) C) None of these
- The male component of the die assembly which is fastened to press ram 14)
  - is Bolster plate a)

Punch b)

c) Die d) Stripper

Seat No.

## T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering TOOL ENGINEERING**

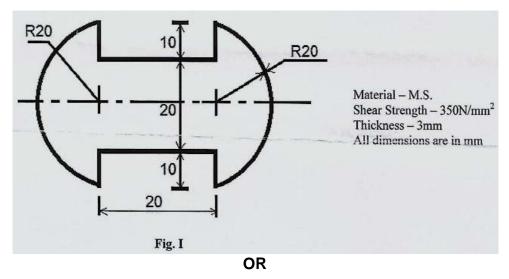
Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

- Instructions: 1) Q. No. 2 and 6 compulsory. Attempt any two guestion out of Q.No.3,4,and 5 from Section I and Attempt any two question out of Q.No.7,8,and 9 from section II
  - 2) Figure to the right indicates full marks.
  - 3) Assume additional suitable data if necessary and state it clearly.

### Section – I

- **Q.2** Design a press tool for the production of component in Fig. I. Giving following 14 details.
  - Strip layout a)
  - **b)** Cutting force
  - Clearance between die & punch C)
  - **d)** Design of element
    - Die thickness 1)
    - 2) Stripper plate thickness.

Also draw any one view of tool along with strip layout and part list.





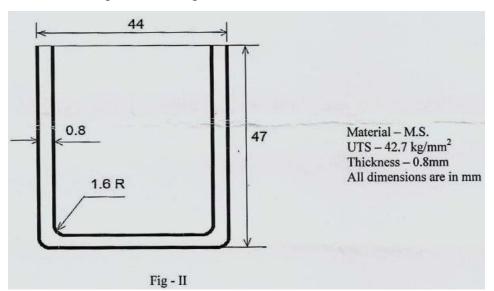
Max. Marks: 56



Design the drawing tool for component shown in fig. II. Determine the following.

- a) Blank size
- b) Draw ratio
- c) No. of draws
- d) % reduction
- e) Die and punch radius
- f) Die clearance

Also draw first stage of drawing tool with dimensions.



| Q.3 | a) | The following data related to the ortho |                        | 04 |
|-----|----|---|------------------------|----|
|     |    | Cutting Speed = 80 m/min                | Back rake angle = 1.5° |    |
|     |    | Cutting Force = 20 kg                   | Feed = 0.2 mm/rev      |    |
|     |    | Feed Force = 8 kg                       | Chip thickness = 0.4mm |    |
|     |    | Determine,                              |                        |    |
|     |    | 1) Chip thickness ratio                 |                        |    |
|     |    | 2) Shear angle                          |                        |    |
|     |    | 3) Shear Strain                         |                        |    |
|     |    | 4) W. D. in shear                       |                        |    |

b) Explain various types of tool wear.

| Q.4 | , | Explain heat generation in metal cutting.<br>Write the various types of dies. | 04<br>03 |
|-----|---|---|----------|
| Q.5 |   | i <b>te short notes. (any two)</b><br>Progressive die                         | 07       |

- **b)** Tool material
- **c)** Tool dynamometer
- d) Blanking

03

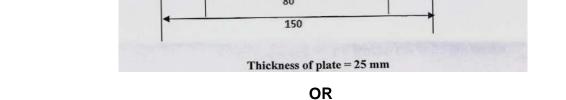
**SLR-FM-143** 

Set P

#### Page 5 of 20

#### Section – II

#### Q.6 a) Design and draw a drilling jig for component shown in Fig-I below. Hole size Ø10mm draw one sectional view.



- a) Design and draw a milling fixture for component shown in above Fig – I for milling slot 12x10 draw one sectional view.
- Q.7 Describe the nomenclature and geometry of single point cutting tool as per 04 a) ASA system.
  - Explain in brief about important of setting block and tenon in fixture with 03 b) neat sketch.

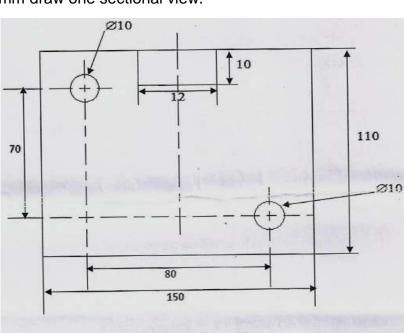
#### Q.8 What is depreciation explain in brief about any two method of depreciation. 03 a) 04

- b) Following data related to a manufacturing organization.
  - Annual sales = Rs 80,000 1)
  - 2) Variable expenses = Rs 64,000
  - Fixed expenses = Rs 24,000 3)

What should be the selling price per unit if B.E.P. is to be brought down to, 10,000 units?

### Q.9 Write short notes. (any two)

- Types of drill bushes a)
- Cost and estimation of cost b)
- EBQ C)



Set

14

**SLR-FM-143** 

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| 1 11 116 | e. 10.0          |                  |  |                    |   |
|----------|------------------|------------------|--|--------------------|---|
| Inst     | ructio           |                  | <ol> <li>Q. No. 1 is compulsory and sh<br/>book.</li> <li>Figures to right indicate full matrix</li> </ol> |                    | be solved in first 30 minutes in answer                                 |
|          |                  |                  | MCQ/Objective T  | ype Q              | luestions   |
| Dura     | ation: 3         | 30 M             | linutes  |                    | Marks: 14   |
| Q.1      | <b>Cho</b><br>1) |                  | the correct alternatives from t<br>ater wear is predominant in<br>Carbon tool steel<br>HSS tools           |                    | tions and rewrite the sentence. 14<br>Tungsten carbide<br>Ceramic tools |
|          | 2)               | ,                | rust force on tool will increase wil<br>Tool nose radius<br>Rake angle                                     | ,                  |   |
|          | 3)               | ln b<br>a)<br>c) | pending allowance the value of K<br>Length of bend<br>Inner radius   | is dej<br>b)<br>d) |   |
|          | 4)               | Spr<br>a)<br>c)  | ing back phenomenon is associa<br>Forming<br>Drawing   | ated w<br>b)<br>d) | rith<br>Cutting<br>Bending  |
|          | 5)               | Th∉<br>a)<br>c)  | e most common material for mult<br>Mild steel<br>Stainless Steel   | ipoint<br>b)<br>d) | cutting tool is<br>HSS<br>None of these                                 |
|          | 6)               | Dyr<br>a)<br>c)  | namometer is used to measure _<br>Cutting force<br>Cutting speed   | <br>b)<br>d)       | Power<br>None of these  |
|          | 7)               |                  | e male component of the die asso<br><br>Bolster plate<br>Die   | embly<br>b)<br>d)  | which is fastened to press ram<br>Punch<br>Stripper                     |
|          | 8)               |                  | ASA system, if the tool signature be   | is 8-6<br>b)       | 2   |

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering **TOOL ENGINEERING** 

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

# **SLR-FM-143**

Max. Marks: 70

Set

Q

- c) 6 d) 8
- Continuous chips are not formed during machining of 9)
  - Aluminum a) Mild Steel b) Tin d) Cast Iron c)

Seat No.

- Set Q
- 10) Helix angle or rake angle of drill tool used for steel material is \_\_\_\_\_.
  - 24° 14° a) b)
  - C) 60° d) 40°

In Blanking operation clearance is provided on \_\_\_\_\_ 11)

- a) On punch b) 50% on punch
- 50% on Die C) d) On die
- 12) Which of the following represents drawing ratio?
  - d/D h/d a) b) h/D C)
    - D/d d)
- No. of bolts required to clamp die mainly depends upon. 13)
  - a) Stripping force Total force on die b)
  - Die area d) Thickness or stripper C)
- The relation between the tool life (T) in minutes and cutting speed (V) in 14) mm/min is
  - a)  $V^n = CT$  $VT^n = C$ b) C)  $(V^n/T) = C$ d)  $(V/T^n) = C$

Set Q

Max. Marks: 56

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Seat

No.

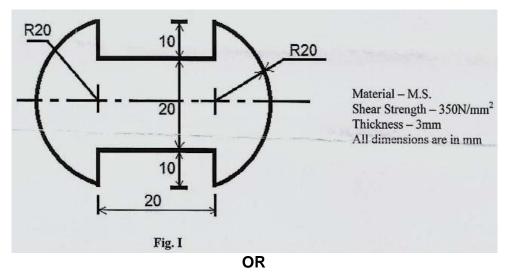
Instructions: 1) Q. No. 2 and 6 compulsory. Attempt any two question out of Q.No.3,4,and 5 from Section I and Attempt any two question out of Q.No.7,8,and 9 from section II

- 2) Figure to the right indicates full marks.
- 3) Assume additional suitable data if necessary and state it clearly.

#### Section – I

- Q.2 Design a press tool for the production of component in Fig. I. Giving following details.
  - a) Strip layout
  - **b)** Cutting force
  - c) Clearance between die & punch
  - d) Design of element
    - 1) Die thickness
    - 2) Stripper plate thickness.

Also draw any one view of tool along with strip layout and part list.

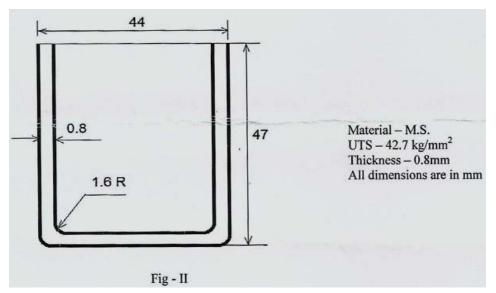


Set Q

Design the drawing tool for component shown in fig. II. Determine the following.

- a) Blank size
- b) Draw ratio
- c) No. of draws
- d) % reduction
- e) Die and punch radius
- f) Die clearance

Also draw first stage of drawing tool with dimensions.



| Q.3 | a) | The following data related to the orthogonal cutting of a component |                                 |  |  |
|-----|----|---|---------------------------------|--|--|
|     |    | Cutting Speed = 80 m/min  | Back rake angle = $1.5^{\circ}$ |  |  |
|     |    | Cutting Force = 20 kg   | Feed = 0.2 mm/rev               |  |  |
|     |    | Feed Force = 8 kg   | Chip thickness = 0.4mm          |  |  |
|     |    | Determine,  | ·                               |  |  |
|     |    | 1) Chip thickness ratio   |                                 |  |  |

- 2) Shear angle
- 3) Shear Strain
- 4) W. D. in shear
- b) Explain various types of tool wear.
  Q.4 a) Explain heat generation in metal cutting.
  b) Write the various types of dies.

#### Q.5 Write short notes. (any two)

- a) Progressive die
- **b)** Tool material
- **c)** Tool dynamometer
- d) Blanking

04

03

04

03

07

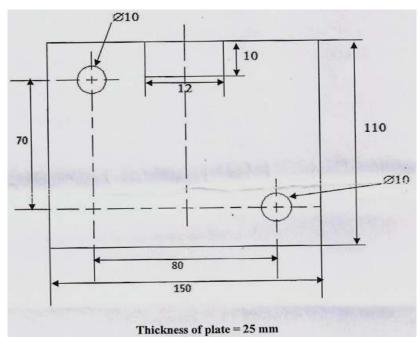
### Section – II

**SLR-FM-143** 

Set | Q

14

Design and draw a drilling jig for component shown in Fig-I below. Hole Q.6 a) size Ø10mm draw one sectional view.



OR

- Design and draw a milling fixture for component shown in above Fig I for a) milling slot 12x10 draw one sectional view.
- Describe the nomenclature and geometry of single point cutting tool as per Q.7 a) 04 ASA system.
  - b) Explain in brief about important of setting block and tenon in fixture with 03 neat sketch.
- Q.8 What is depreciation explain in brief about any two method of depreciation. 03 a) 04
  - Following data related to a manufacturing organization. b)
    - Annual sales = Rs 80,000 1)
    - Variable expenses = Rs 64,000 2)
    - Fixed expenses = Rs 24,0003)

What should be the selling price per unit if B.E.P. is to be brought down to, 10,000 units?

#### Q.9 Write short notes. (any two)

- a) Types of drill bushes
- **b)** Cost and estimation of cost
- c) EBQ

# T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

**TOOL ENGINEERING** 

2) Figures to right indicate full marks.

### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

| Q.1 | Cho | oose the correct alternatives from the options and rewrite the sentence. | 14 |
|-----|-----|--|----|
|     | 1)  | Which of the following represents drawing ratio?                         |    |

| vvni | cn of | the | tollowing | represents | arawing | ratio |
|------|-------|-----|-----------|------------|---------|-------|
| a)   | d/D   |     |           |            | h)      | h/d   |

- a/D a) D) n/a h/D C) D/d d)
- 2) No. of bolts required to clamp die mainly depends upon.
  - a) Stripping force Total force on die b)
  - Die area d) Thickness or stripper c)
- The relation between the tool life (T) in minutes and cutting speed (V) in 3) mm/min is
  - a)  $V^n = CT$  $VT^n = C$ b)  $(V^n/T) = C$  $(V/T^n) = C$ d) c)
- Crater wear is predominant in \_\_\_\_\_ 4)
  - Carbon tool steel b) **Tungsten carbide** a)
  - HSS tools Ceramic tools C) d)
- Thrust force on tool will increase will increase with increase in 5) Side cutting edge angle b)

d)

Ceramic tools

- a) Tool nose radius
- c) Rake angle

6) In bending allowance the value of K is dependent on

- Length of bend Bend angle a) b) c)
  - Inner radius All above d)
- 7) Spring back phenomenon is associated with
  - a) Forming b) Cutting c) Drawing d) Bending
  - The most common material for multipoint cutting tool is \_\_\_\_\_.
- 8) a) Mild steel b) HSS
  - Stainless Steel d) None of these c)
- Dynamometer is used to measure \_\_\_\_\_ 9)
  - Cutting force b) Power a)
  - C) Cutting speed d) None of these



Max. Marks: 70

**SLR-FM-143** 

Marks: 14

10) The male component of the die assembly which is fastened to press ram is \_ . a) Bolster plate Punch b) d) Stripper C) Die

- 11) In ASA system, if the tool signature is 8-6-5-5-12-16-2 then nose radius will be \_\_\_\_\_.
  - a) 12 2 b) 6 d) 8 C)

Continuous chips are not formed during machining of \_\_\_\_\_. 12) Mild Steel a)

- b) Aluminum
- Tin d) Cast Iron C)
- Helix angle or rake angle of drill tool used for steel material is \_\_\_\_\_. 13)
  - 14° 24° a) b)
  - 60° d) 40° C)
- In Blanking operation clearance is provided on \_\_\_\_ 14)
  - On punch a)
  - 50% on Die c)
- 50% on punch b) On die d)

**SLR-FM-143** 

Set | R

Seat No.

### T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering TOOL ENGINEERING**

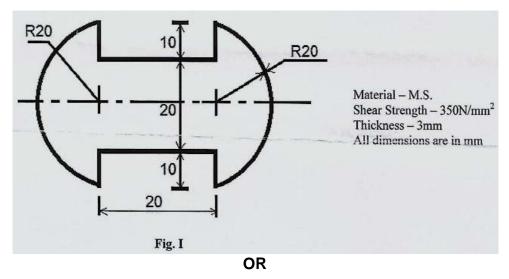
Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

- Instructions: 1) Q. No. 2 and 6 compulsory. Attempt any two guestion out of Q.No.3,4,and 5 from Section I and Attempt any two question out of Q.No.7,8,and 9 from section II
  - 2) Figure to the right indicates full marks.
  - 3) Assume additional suitable data if necessary and state it clearly.

#### Section – I

- **Q.2** Design a press tool for the production of component in Fig. I. Giving following 14 details.
  - Strip layout a)
  - **b)** Cutting force
  - Clearance between die & punch C)
  - **d)** Design of element
    - Die thickness 1)
    - 2) Stripper plate thickness.

Also draw any one view of tool along with strip layout and part list.





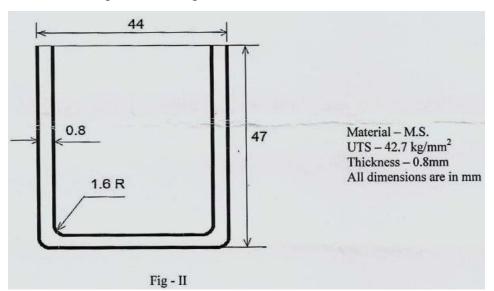
Max. Marks: 56



Design the drawing tool for component shown in fig. II. Determine the following.

- a) Blank size
- b) Draw ratio
- c) No. of draws
- d) % reduction
- e) Die and punch radius
- f) Die clearance

Also draw first stage of drawing tool with dimensions.



|   | Feed Force = 8 kg<br>Determine,<br>1) Chip thickness ratio<br>2) Shear angle | Chip thickness = 0.4mm |  |
|---|--|------------------------|--|
| 3 | <ol> <li>Shear Strain</li> <li>W. D. in shear</li> </ol>                     |                        |  |

**b)** Explain various types of tool wear.

| Q.4 | , | Explain heat generation in metal cutting.<br>Write the various types of dies. | 04<br>03 |
|-----|---|---|----------|
| Q.5 |   | <b>ite short notes. (any two)</b><br>Progressive die                          | 07       |

- **b)** Tool material
- **c)** Tool dynamometer
- d) Blanking

03

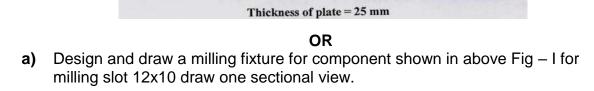
**SLR-FM-143** 

Set R

#### Page 15 of 20

#### Section – II

#### Q.6 a) Design and draw a drilling jig for component shown in Fig-I below. Hole size Ø10mm draw one sectional view.



- Q.7 Describe the nomenclature and geometry of single point cutting tool as per 04 a) ASA system.
  - Explain in brief about important of setting block and tenon in fixture with 03 b) neat sketch.

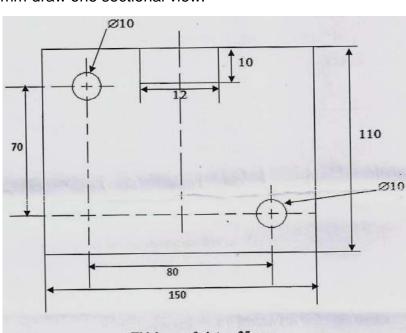
#### Q.8 What is depreciation explain in brief about any two method of depreciation. 03 a) 04

- b) Following data related to a manufacturing organization.
  - Annual sales = Rs 80,000 1)
  - 2) Variable expenses = Rs 64,000
  - Fixed expenses = Rs 24,000 3)

What should be the selling price per unit if B.E.P. is to be brought down to, 10,000 units?

#### Q.9 Write short notes. (any two)

- Types of drill bushes a)
- Cost and estimation of cost b)
- EBQ C)



14

**SLR-FM-143** 

Set

| a)   | Bolster plate                        | b)     | Punch                        |    |
|------|--------------------------------------|--------|------------------------------|----|
| c)   | Die                                  | d)     | Stripper                     |    |
|      | ASA system, if the tool signature is | s 8-6- | 5-5-12-16-2 then nose radius |    |
| will | be                                   |        |                              |    |
| a)   | 12                                   | b)     | 2                            |    |
| C)   | 6                                    | d)     | 8                            |    |
| Cor  | ntinuous chips are not formed dur    | ing m  | achining of                  |    |
| a)   | Mild Steel                           | b)     | Aluminum                     |    |
| c)   | Tin                                  | d)     | Cast Iron                    |    |
| Hel  | ix angle or rake angle of drill tool | used   | for steel material is        |    |
| a)   | 24°                                  | b)     | 14°                          |    |
| c)   | 60°                                  | d)     | 40°                          |    |
| Ín F | Blanking operation clearance is pro  | ovida  | don                          |    |
| a)   | On punch                             |        | 50% on punch                 |    |
| c)   | 50% on Die                           | d)     | On die                       |    |
| ,    |                                      | ,      |                              |    |
|      | ich of the following represents dra  |        |                              |    |
| a)   | d/D                                  | b)     | h/d                          |    |
| C)   | D/d                                  | d)     | h/D                          |    |
|      |                                      |        |                              |    |
|      |                                      |        | Page                         | 16 |

T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** TOOL ENGINEERING

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to right indicate full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

10)

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - In bending allowance the value of K is dependent on 1)
    - Length of bend a) b) Bend angle
    - Inner radius d) All above C)
  - Spring back phenomenon is associated with 2)
    - Forming Cutting a) b) C) Drawing d) Bending
  - The most common material for multipoint cutting tool is \_\_\_\_\_. 3)
    - Mild steel HSS a) b) None of these
      - Stainless Steel C)
  - 4) Dynamometer is used to measure .
    - Cutting force Power b) a) Cutting speed d) None of these C)
  - The male component of the die assembly which is fastened to press ram 5)

d)

6)

7)

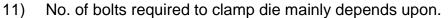
- 8)
- 9)

Set

Max. Marks: 70

Seat No.

Marks: 14



a) Stripping force

b) Total force on die

**SLR-FM-143** 

Set S

- c) Die area d) Thickness or stripper
- 12) The relation between the tool life (T) in minutes and cutting speed (V) in mm/min is \_\_\_\_\_.
  - a)  $V^n = \overline{CT}$  b)  $VT^n = C$
  - c)  $(V^n/T) = C$  d)  $(V/T^n) = C$
- 13) Crater wear is predominant in \_\_\_\_\_.
  a) Carbon tool steel
  b) Tungsten carbide
  c) HSS tools
  d) Ceramic tools
  - c) HSS tools d) Ceramic tools
- 14) Thrust force on tool will increase will increase with increase in \_\_\_\_\_.
  - a) Tool nose radius
- b) Side cutting edge angle

c) Rake angle

d) Ceramic tools

## T.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering TOOL ENGINEERING**

Day & Date: Wednesday, 27-11-2019 Time: 10:00 AM To 02:00 PM

Seat

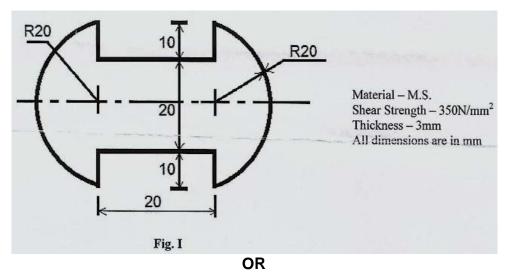
No.

- Instructions: 1) Q. No. 2 and 6 compulsory. Attempt any two guestion out of Q.No.3,4,and 5 from Section I and Attempt any two question out of Q.No.7,8,and 9 from section II
  - 2) Figure to the right indicates full marks.
  - 3) Assume additional suitable data if necessary and state it clearly.

#### Section – I

- **Q.2** Design a press tool for the production of component in Fig. I. Giving following 14 details.
  - Strip layout a)
  - **b)** Cutting force
  - Clearance between die & punch C)
  - **d)** Design of element
    - Die thickness 1)
    - 2) Stripper plate thickness.

Also draw any one view of tool along with strip layout and part list.





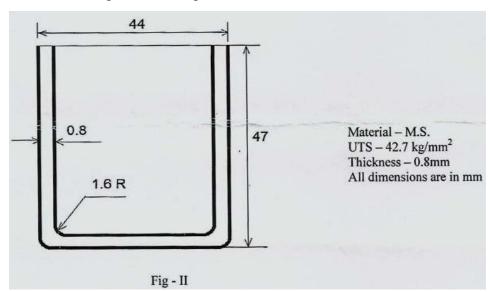


Max. Marks: 56

Design the drawing tool for component shown in fig. II. Determine the following.

- a) Blank size
- b) Draw ratio
- c) No. of draws
- d) % reduction
- e) Die and punch radius
- f) Die clearance

Also draw first stage of drawing tool with dimensions.



| Q.3 | a) |                          |                        |  |
|-----|----|--------------------------|------------------------|--|
|     |    | Cutting Speed = 80 m/min | Back rake angle = 1.5° |  |
|     |    | Cutting Force = 20 kg    | Feed = 0.2 mm/rev      |  |
|     |    | Feed Force = 8 kg        | Chip thickness = 0.4mm |  |
|     |    | Determine,               |                        |  |
|     |    | 1) Chip thickness ratio  |                        |  |
|     |    | 2) Shear angle           |                        |  |
|     |    | 3) Shear Strain          |                        |  |
|     |    | 4) W. D. in shear        |                        |  |

**b)** Explain various types of tool wear.

| Q.4 | , | Explain heat generation in metal cutting.<br>Write the various types of dies. | 04<br>03 |
|-----|---|---|----------|
| Q.5 |   | <b>ite short notes. (any two)</b><br>Progressive die                          | 07       |

- b) Tool material
- **c)** Tool dynamometer
- d) Blanking

03

**SLR-FM-143** 

Set S

#### Section – II

#### Q.6 a) Design and draw a drilling jig for component shown in Fig-I below. Hole size Ø10mm draw one sectional view.

OR a) Design and draw a milling fixture for component shown in above Fig – I for

- milling slot 12x10 draw one sectional view. Q.7 Describe the nomenclature and geometry of single point cutting tool as per 04 a)
  - ASA system. Explain in brief about important of setting block and tenon in fixture with 03 b) neat sketch.

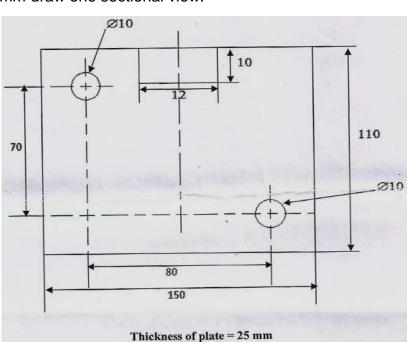
#### Q.8 What is depreciation explain in brief about any two method of depreciation. 03 a) 04

- b) Following data related to a manufacturing organization.
  - Annual sales = Rs 80,000 1)
  - 2) Variable expenses = Rs 64,000
  - Fixed expenses = Rs 24,000 3)

What should be the selling price per unit if B.E.P. is to be brought down to, 10,000 units?

### Q.9 Write short notes. (any two)

- Types of drill bushes a)
- Cost and estimation of cost b)
- EBQ C)



14

**SLR-FM-143** 

Set

# B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMATIC CONTROL ENGINEERING Day & Date: Saturday, 07-12-2019 Time: 02:30 PM To 05:30 PM **Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book. 2) Figures to the right indicate full marks. MCQ/Objective Type Questions

Seat

No.

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- An air conditioner is an example of \_\_ 1)
  - a) manual open loop system b) manual closed loop system c) automatic open loop system d) automatic closed loop system
- In the direct analog for a thermal system, the quantity analogous to 2) temperature is \_\_\_\_\_.
  - a) Current b) Resistance c) Voltage d) Capacitance
- 3) The impedance term for an inductance is given by \_\_\_\_\_.
  - a) 1/LD b) LD 1/L c) L d)
- Derivative Time is given by \_\_\_\_ 4) b)  $K_p / K_d$ a)  $K_d / K_p$ 
  - c)  $K_d / K_i$ K<sub>i</sub> / K<sub>d</sub> d)
- 5) In linearization of operating curves, the partial derivatives are \_\_\_\_\_
  - a) calculated from a graph b) calculated from an equation not at all required d)
  - c) impossible to find
- 6) In block diagram algebra, series blocks are \_
  - a) added Integrated b) Subtracted d)
  - c) multiplied
- Anticipatory Control action is \_\_\_\_\_ 7) a) P - action b) I – action
  - **ON/OFF** action D – action c) d)

8) In a controller lines plot,  $(\partial V / \partial C)_{M}$  indicates \_\_\_\_\_ horizontal spacing a) slope b)

- vertical spacing d) perpendicular distance C)
- If two sign changes are observed in the first column of Routh's array, the 9) system
  - a) has two roots symmetric about the origin
  - b) is stable
  - has two roots in the right half plane c)
  - d) is oscillatory

SLR-FM-144

Set

Max. Marks: 70

Marks: 14

|     |   |              | SLR-FM-144  |
|-----|---|--------------|---|
|     |   |              | Set P   |
| 10) | Angles of departure are needed in a<br>a) real poles<br>c) complex conjugate poles                                      | b)           | real zeros  |
| 11) | <ul> <li>A root locus has any branches appro</li> <li>a) P = Z</li> <li>c) Z &gt; P</li> </ul>                          | b)           | ng infinity when<br>P > Z<br>Z = 0                      |
| 12) | <ul><li>'Gain Margin' is always calculated a</li><li>a) gain cross-over frequency</li><li>c) corner frequency</li></ul> |              | resonant frequency                                      |
| 13) | For a marginally stable system,<br>a) G.M. & P.M. are positive<br>c) G.M. & P.M. are infinity                           |              |   |
| 14) | In State - Space representation, the of<br>a) parallel programming  | partia<br>b) | al fractions are required in case<br>direct programming |
|     |   | '            |   |

c) general programming d) series programming

Set

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

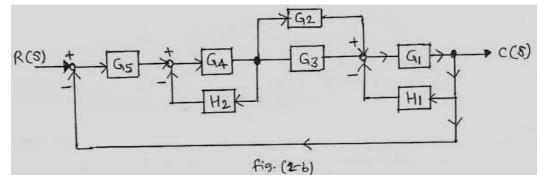
Day & Date: Saturday, 07-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

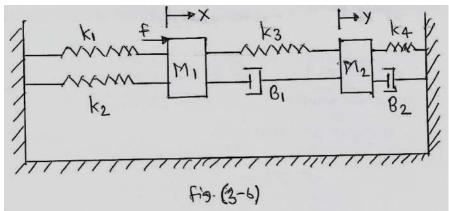
- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.
- 5) Use university graph paper & semi-log paper if required.

#### Section – I

- **Q.2** a) Distinguish between open loop and closed loop control systems.
  - b) For the block diagram of a feedback control system as shown in fig. (2-b), obtain the closed loop transfer function C(S)/R(S).



- c) Explain with a graph, P+I control system. What do you mean by 'Integral 05 Time'?
- **Q.3 a)** Obtain the linear approximation to calculate the moment of inertia about the diameter D of a circular section. Also calculate the percentage error by its use if  $D_i = 10$  and D = 12.
  - b) For a system as shown in fig.(3-b), draw the grounded chair representation 05 and obtain the relations between
    - 1) f & x
    - 2) f&y



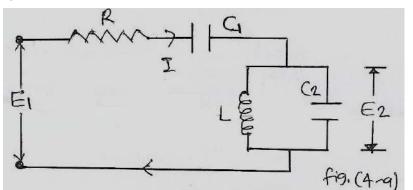
c) What do you mean by a 'Comparator'? Explain its need in a closed loop03 control system.

Max. Marks: 56

Set P

06

- Q.4 a) For the electric circuit as shown in fig, (4-a), obtain the relation between
   1) E<sub>1</sub> & I
  - 2)  $E_1 \& E_2$



- b) Discuss the advantages and limitations of P, (P+D) and (P+I+D) control actions.
  c) Explain the parallel law for a mechanical system with necessary equations.
  04
  - Section II

| Q.5 | a)         | For a control system represented by,<br>K(S + 4)  | 08 |
|-----|------------|---|----|
|     | b)         | $G(S)H(S) = \frac{K(S+4)}{S(S^2+2S+2)}$<br>Sketch the complete Root Locus and comment on the system stability.<br>Characteristic equation of a feedback control system is given by,<br>$2S^3 + 8S^2 + 18S + K(S+15) = 0$<br>Using Routh's criterion, determine the range of K for the system to be<br>stable. | 06 |
| Q.6 | a)         | For a unity feedback system given by,<br>100(S + 2)   | 08 |
|     |            | $G(S) = \frac{100(S+2)}{S^2(S+20)}$   |    |
|     | b)         | Sketch the Bode Plots and comment on the system stability.<br>Explain the point of 'Equilibrium' in a system under steady state.  | 03 |
|     | c)         | Explain the 'Angle Condition' in Root Locus and its importance.   | 03 |
| Q.7 | a)         | Obtain State - Space representation using ' Parallel Programming' and also<br>draw the 'Computer diagram' for a feedback control system given by,<br>$Y(t) = \frac{(D+3)}{(D+4)(D+1)(D+5)}f(t)$   | 08 |
|     | b)         | (D + 4)(D + 1)(D + 5) Explain the nature of Bode Plots or zeros at the origin.  | 03 |
|     | <b>D</b> ) |   | 05 |

c) Discuss the significance of 'Load line Plot' for a system under steady state. 03

|    | o) vortiour opuoling  | с,                 |  |
|----|---|--------------------|--|
| 2) | If two sign changes are observed in<br>system<br>a) has two roots symmetric about to<br>b) is stable<br>c) has two roots in the right half pla<br>d) is oscillatory | the or             |  |
| 3) | <ul><li>Angles of departure are needed in a</li><li>a) real poles</li><li>c) complex conjugate poles</li></ul>  | b)                 | real zeros   |
| 4) | <ul> <li>A root locus has any branches apprending</li> <li>a) P = Z</li> <li>c) Z &gt; P</li> </ul>   | b)                 | ng infinity when<br>P > Z<br>Z = 0                     |
| 5) | <ul><li>'Gain Margin' is always calculated a</li><li>a) gain cross-over frequency</li><li>c) corner frequency</li></ul>   | b)                 | resonant frequency phase cross-over frequency          |
| 6) | For a marginally stable system,<br>a) G.M. & P.M. are positive<br>c) G.M. & P.M. are infinity   | b)                 | G.M. & P.M. are zero                                   |
| 7) | In State - Space representation, the<br>of<br>a) parallel programming<br>c) general programming   | partia<br>b)<br>d) |  |
| 8) | <ul><li>An air conditioner is an example of _</li><li>a) manual open loop system</li><li>c) automatic open loop system</li></ul>                                    | b)                 | manual closed loop system                              |
| 9) | In the direct analog for a thermal systemperature is<br>a) current<br>c) voltage  | stem,<br>b)<br>d)  | the quantity analogous to<br>Resistance<br>Capacitance |

2) Figures to the right indicate full marks.

Day & Date: Saturday, 07-12-2019

book.

Time: 02:30 PM To 05:30 PM

## **MCQ/Objective Type Questions**

**Mechanical Engineering** AUTOMATIC CONTROL ENGINEERING

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 1)

- In a controller lines plot,  $(\partial V / \partial C)_{M}$  indicates \_ horizontal spacing
  - a) slope b)
  - perpendicular distance c) vertical spacing d)
- 2)

# 8)

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

Seat No. B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019

Set Q

Max. Marks: 70

Marks: 14

The impedance term for an inductance is given by \_\_\_\_\_. 10) a) 1/LD b) LD c) L d) 1/L Derivative Time is given by \_\_\_\_\_. 11) b) a)  $K_d / K_p$  $K_p / K_d$ c)  $K_d / K_i$ K<sub>i</sub> / K<sub>d</sub> d) In linearization of operating curves, the partial derivatives are \_\_\_\_\_. 12) a) calculated from a graph calculated from an equation b) c) impossible to find not at all required d) 13) In block diagram algebra, series blocks are \_\_\_\_ Integrated a) added b) c) multiplied d) Subtracted Anticipatory Control action is \_\_\_\_\_. 14) a) P - action b) I – action c) ON/OFF action d) D – action

**SLR-FM-144** 

Set Q

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Q

| Seat |  |
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## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

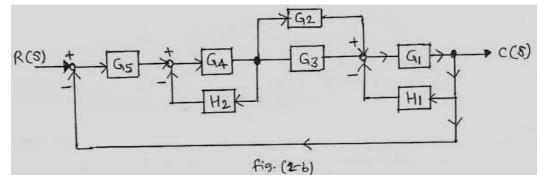
Day & Date: Saturday, 07-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

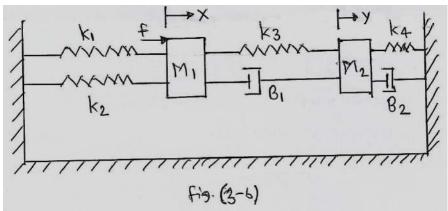
- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.
- 5) Use university graph paper & semi-log paper if required.

#### Section – I

- **Q.2** a) Distinguish between open loop and closed loop control systems.
  - b) For the block diagram of a feedback control system as shown in fig. (2-b), obtain the closed loop transfer function C(S)/R(S).



- c) Explain with a graph, P+I control system. What do you mean by 'Integral 05 Time'?
- **Q.3 a)** Obtain the linear approximation to calculate the moment of inertia about the diameter D of a circular section. Also calculate the percentage error by its use if  $D_i = 10$  and D = 12.
  - b) For a system as shown in fig.(3-b), draw the grounded chair representation 05 and obtain the relations between
    - 1) f & x
    - 2) f&y



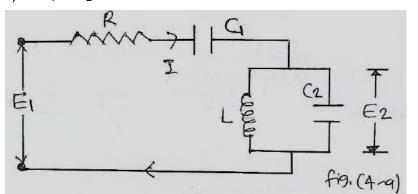
c) What do you mean by a 'Comparator'? Explain its need in a closed loop03 control system.

Max. Marks: 56



06

- Q.4 a) For the electric circuit as shown in fig, (4-a), obtain the relation between
   1) E<sub>1</sub> & I
  - 2)  $E_1 \& E_2$



b) Discuss the advantages and limitations of P, (P+D) and (P+I+D) control actions.
c) Explain the parallel law for a mechanical system with necessary equations.
04
Section – II

| Q.5 |          | For a control system represented by,<br>$G(S)H(S) = \frac{K(S+4)}{S(S^2+2S+2)}$ Sketch the complete Root Locus and comment on the system stability.<br>Characteristic equation of a feedback control system is given by,<br>$2S^3 + 8S^2 + 18S + K(S+15) = 0$ Using Routh's criterion, determine the range of K for the system to be<br>stable. | 08<br>06 |
|-----|----------|---|----------|
| Q.6 | a)       | For a unity feedback system given by,<br>$G(S) = \frac{100(S+2)}{S^2(S+20)}$  | 08       |
|     | b)<br>c) | Sketch the Bode Plots and comment on the system stability.<br>Explain the point of 'Equilibrium' in a system under steady state.<br>Explain the 'Angle Condition' in Root Locus and its importance.   | 03<br>03 |
| Q.7 | a)       | Obtain State - Space representation using ' Parallel Programming' and also<br>draw the 'Computer diagram' for a feedback control system given by,<br>$Y(t) = \frac{(D+3)}{(D+4)(D+1)(D+5)}f(t)$   | 08       |

- **b)** Explain the nature of Bode Plots or zeros at the origin.
- c) Discuss the significance of 'Load line Plot' for a system under steady state. 03

|  | B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering |                  |   |                    |   |  |  |  |
|--|---|------------------|---|--------------------|---|--|--|--|
|  | AUTOMATIC CONTROL ENGINEERING   |                  |   |                    |   |  |  |  |
|  |   |                  | turday, 07-12-2019<br>1 To 05:30 PM   |                    | Max. Marks: 70  |  |  |  |
| Instru   | uction  |                  | ) Q. No. 1 is compulsory and sho<br>book.<br>) Figures to the right indicate full   |                    | e solved in first 30 minutes in answer                        |  |  |  |
|  |   | 2                |   |                    |   |  |  |  |
| Durat  | ion: 3  | 0 Mi             | MCQ/Objective Ty<br>nutes   | her                | Marks: 14   |  |  |  |
| Q.1  | Choc<br>1)  |                  | <b>the correct alternatives from the</b><br>nearization of operating curves, t<br>calculated from a graph<br>impossible to find | he pa              |   |  |  |  |
|  | 2)  | In b<br>a)<br>c) | lock diagram algebra, series bloc<br>added<br>multiplied  | ks ar<br>b)<br>d)  | e<br>Integrated<br>Subtracted                                 |  |  |  |
|  | 3)  |                  | icipatory Control action is<br>P - action<br>ON/OFF action  | b)<br>d)           | I – action<br>D – action                                      |  |  |  |
|  | 4)  | In a<br>a)<br>c) | controller lines plot, $(\partial V / \partial C)_{M}$ ir slope vertical spacing  | ndicat<br>b)<br>d) | es<br>horizontal spacing<br>perpendicular distance            |  |  |  |
| <ul> <li>5) If two sign changes are observed in the first column of Routh's arra system</li> <li>a) has two roots symmetric about the origin</li> <li>b) is stable</li> <li>c) has two roots in the right half plane</li> <li>d) is oscillatory</li> </ul> |   |                  |   |                    |   |  |  |  |
|  | 6)  | Ang<br>a)<br>c)  | les of departure are needed in a<br>real poles<br>complex conjugate poles   | root l<br>b)<br>d) | ocus if a system has<br>real zeros<br>complex conjugate zeros |  |  |  |
|  | 7)  |                  | pot locus has any branches appro<br>P = Z<br>Z > P  |                    | ng infinity when<br>P > Z<br>Z = 0                            |  |  |  |
|  | 8)  | 'Ga<br>a)<br>c)  | in Margin' is always calculated at<br>gain cross-over frequency<br>corner frequency   | b)<br>d)           | resonant frequency<br>phase cross-over frequency              |  |  |  |
|  | 9)  | For<br>a)<br>c)  | a marginally stable system,<br>G.M. & P.M. are positive<br>G.M. & P.M. are infinity   | b)<br>d)           | G.M. & P.M. are zero<br>G.M. & P.M. are negative              |  |  |  |

Seat

No.

## SLR-FM-144



Set R

|     |  |                    | Set R  |
|-----|--|--------------------|--|
| 10) | In State - Space representation, the of  | partia             | al fractions are required in case                                  |
|     | <ul><li>a) parallel programming</li><li>c) general programming</li></ul>   | ,                  | direct programming<br>series programming                           |
| 11) | <ul><li>An air conditioner is an example of</li><li>a) manual open loop system</li><li>c) automatic open loop system</li></ul> | b)                 | manual closed loop system  |
| 12) | In the direct analog for a thermal systemperature is<br>a) current<br>c) voltage   | stem,<br>b)<br>d)  | the quantity analogous to<br>Resistance<br>Capacitance             |
| 13) | The impedance term for an inductar<br>a) 1/LD<br>c) L  | nce is<br>b)<br>d) | given by<br>LD<br>1/L  |
| 14) | Derivative Time is given by<br>a) $K_d / K_p$<br>c) $K_d / K_i$  | b)<br>d)           | K <sub>p</sub> / K <sub>d</sub><br>K <sub>i</sub> / K <sub>d</sub> |

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

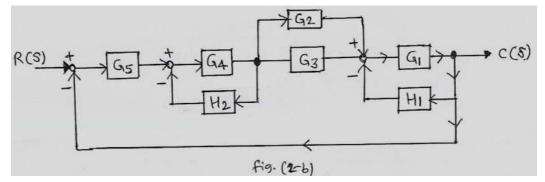
Day & Date: Saturday, 07-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

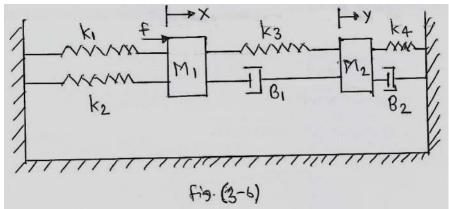
- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.
- 5) Use university graph paper & semi-log paper if required.

#### Section – I

- **Q.2** a) Distinguish between open loop and closed loop control systems.
  - **b)** For the block diagram of a feedback control system as shown in fig. (2-b), obtain the closed loop transfer function C(S)/R(S).



- c) Explain with a graph, P+I control system. What do you mean by 'Integral 05 Time'?
- **Q.3 a)** Obtain the linear approximation to calculate the moment of inertia about the diameter D of a circular section. Also calculate the percentage error by its use if  $D_i = 10$  and D = 12.
  - b) For a system as shown in fig.(3-b), draw the grounded chair representation 05 and obtain the relations between
    - 1) f & x
    - 2) f&y



c) What do you mean by a 'Comparator'? Explain its need in a closed loop03 control system.

Max. Marks: 56

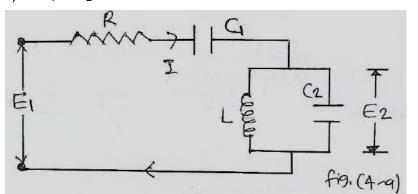
Set

R



06

- Q.4 a) For the electric circuit as shown in fig, (4-a), obtain the relation between
   1) E<sub>1</sub> & I
  - 2)  $E_1 \& E_2$



b) Discuss the advantages and limitations of P, (P+D) and (P+I+D) control 04 actions. c) Explain the parallel law for a mechanical system with necessary equations. 04 Section – II Q.5 a) For a control system represented by, **08**  $G(S)H(S) = \frac{K(S+4)}{S(S^2+2S+2)}$ Sketch the complete Root Locus and comment on the system stability. **b)** Characteristic equation of a feedback control system is given by, 06  $2S^3 + 8S^2 + 18S + K(S+15) = 0$ Using Routh's criterion, determine the range of K for the system to be stable. Q.6 a) For a unity feedback system given by, **08**  $G(S) = \frac{100(S+2)}{--}$ 

$$G(0) = S^2(S + 20)$$

Sketch the Bode Plots and comment on the system stability.

- b) Explain the point of 'Equilibrium' in a system under steady state. 03
- c) Explain the 'Angle Condition' in Root Locus and its importance.03
- Q.7 a) Obtain State Space representation using ' Parallel Programming' and also draw the 'Computer diagram' for a feedback control system given by,

$$Y(t) = \frac{(D+3)}{(D+4)(D+1)(D+5)}f(t)$$

- b) Explain the nature of Bode Plots or zeros at the origin. 03
- c) Discuss the significance of 'Load line Plot' for a system under steady state. 03

| Seat   |   |  |                         |  | . [   |       |
|--|---|--|-------------------------|--|-------|-------|
| No.  |   |  |                         | 5  | et    | S     |
| B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>AUTOMATIC CONTROL ENGINEERING |   |  |                         |  |       |       |
|  | Date: Saturday<br>02:30 PM To 0                                     |  |                         | Max. M   | larks | 3: 70 |
| Instruc  | book  |  |                         | e solved in first 30 minutes in<br>s.  | ansv  | wer   |
|  |   | MCQ/Objectiv   | ve Type Q               | Questions  |       |       |
| Duratio  | on: 30 Minutes  | -  |                         | N  | larks | s: 14 |
|  | l) Angles of<br>a) real p   | f departure are neede  | d in a root l<br>b)     | ions and rewrite the senten<br>ocus if a system has<br>real zeros<br>complex conjugate zeros | ce.   | 14    |
| 2  | <ul> <li>A root loc</li> <li>a) P =</li> <li>c) Z &gt; F</li> </ul> | Z  |                         | ng infinity when<br>P > Z<br>Z = 0   |       |       |
| 3  | a) gain   | rgin' is always calcula<br>cross-over frequency<br>er frequency        |                         |  |       |       |
| 4  | a) G.M.   | rginally stable system<br>& P.M. are positive<br>& P.M. are infinity   | b)                      | G.M. & P.M. are zero<br>G.M. & P.M. are negative   |       |       |
| 5  | ,   |  | n, the partia           | Il fractions are required in cas   | е     |       |
|  | <i>,</i> .  | <br>lel programming<br>ral programming                                 | b)<br>d)                | direct programming series programming  |       |       |
| 6  | a) manu   | nditioner is an examp<br>Jal open loop system<br>matic open loop syste | b)                      | manual closed loop system  | n     |       |
| 7  |   | ure is<br>ent  | hal system,<br>b)<br>d) | the quantity analogous to<br>Resistance<br>Capacitance                                       |       |       |
| 8  | 3) The impe<br>a) 1/LD<br>c) L                                      | edance term for an inc   | luctance is<br>b)<br>d) | given by<br>LD<br>1/L  |       |       |
| ç  | 9) Derivative<br>a) K <sub>d</sub> / k<br>c) K <sub>d</sub> / k     | •  | <br>b)<br>d)            | K <sub>p</sub> / K <sub>d</sub><br>K <sub>i</sub> / K <sub>d</sub>                           |       |       |
| 1  | a) calcu  | zation of operating cu<br>llated from a graph<br>ssible to find        | •                       | rtial derivatives are<br>calculated from an equation<br>not at all required                  |       |       |

# SLR-FM-144 Set S

SLR-FM-144 Set S

- 11) In block diagram algebra, series blocks are \_\_\_\_\_.
  - a) added b) Integrated
  - c) multiplied d) Subtracted
- 12) Anticipatory Control action is \_\_\_\_\_.
  - a) P action b) I action
  - c) ON/OFF action d) D action
- 13) In a controller lines plot,  $(\partial V / \partial C)_{M}$  indicates \_\_\_\_\_.
  - b) horizontal spacing
  - c) vertical spacing d) perpendicular distance
- 14) If two sign changes are observed in the first column of Routh's array, the system \_\_\_\_\_.
  - a) has two roots symmetric about the origin
  - b) is stable

a) slope

- c) has two roots in the right half plane
- d) is oscillatory

Set

S

| Seat |  |
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| No.  |  |

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMATIC CONTROL ENGINEERING

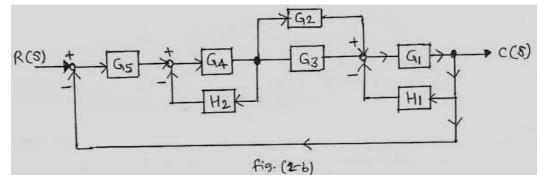
Day & Date: Saturday, 07-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each Section.

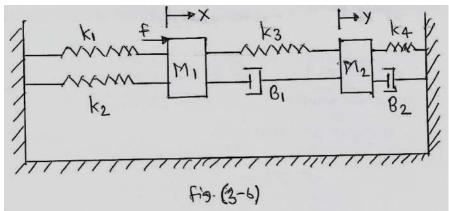
- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.
- 5) Use university graph paper & semi-log paper if required.

#### Section – I

- Q.2 Distinguish between open loop and closed loop control systems. a)
  - **b)** For the block diagram of a feedback control system as shown in fig. (2-b), obtain the closed loop transfer function C(S)/R(S).



- c) Explain with a graph, P+I control system. What do you mean by 'Integral Time'?
- Obtain the linear approximation to calculate the moment of inertia about the Q.3 a) 06 diameter D of a circular section. Also calculate the percentage error by its use if  $D_i = 10$  and D = 12.
  - **b)** For a system as shown in fig.(3-b), draw the grounded chair representation 05 and obtain the relations between
    - f&x 1)
    - 2) f&y



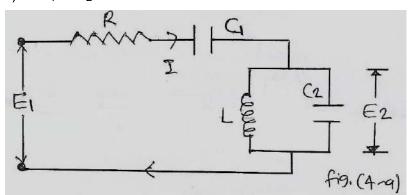
c) What do you mean by a 'Comparator'? Explain its need in a closed loop 03 control system.

Max. Marks: 56





- Q.4 a) For the electric circuit as shown in fig, (4-a), obtain the relation between
   1) E<sub>1</sub> & I
  - 2)  $E_1 \& E_2$



- b) Discuss the advantages and limitations of P, (P+D) and (P+I+D) control actions.
  c) Explain the parallel law for a mechanical system with necessary equations.
  04
  - Section II

| Q.5 | a)       | For a control system represented by,<br>K(S + A)  | 08       |
|-----|----------|---|----------|
|     | b)       | $G(S)H(S) = \frac{K(S+4)}{S(S^2+2S+2)}$<br>Sketch the complete Root Locus and comment on the system stability.<br>Characteristic equation of a feedback control system is given by,<br>$2S^3 + 8S^2 + 18S + K(S+15) = 0$<br>Using Routh's criterion, determine the range of K for the system to be<br>stable. | 06       |
| Q.6 | a)       | For a unity feedback system given by,<br>100(S + 2)   | 08       |
|     |          | $G(S) = \frac{100(S+2)}{S^2(S+20)}$   |          |
|     |          | Sketch the Bode Plots and comment on the system stability.  | ~~       |
|     | b)<br>c) | Explain the point of 'Equilibrium' in a system under steady state.<br>Explain the 'Angle Condition' in Root Locus and its importance.   | 03<br>03 |
| Q.7 | a)       | Obtain State - Space representation using ' Parallel Programming' and also<br>draw the 'Computer diagram' for a feedback control system given by,<br>$Y(t) = \frac{(D+3)}{(D+4)(D+1)(D+5)}f(t)$   | 08       |
|     | b)       | $(- \cdot -)(- \cdot -)(- \cdot -)$   | 03       |

c) Discuss the significance of 'Load line Plot' for a system under steady state. 03

### Seat No.

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The function of a compressor in a vapour compression refrigeration system is to
  - a) To maintain the required low-side pressure in the evaporator
  - b) To maintain the required high-side pressure in the condenser
  - c) To circulate required amount of refrigerant through the system
  - d) All of the above
- 2) Air cycle refrigeration systems are most commonly used in \_\_\_\_\_.
  - a) Domestic refrigerators
  - b) Aircraft air conditioning systems
  - c) Cold storages
  - d) Car air conditioning systems
- 3) Sub cooling is beneficial as it \_
  - Increases specific refrigeration effect a)
  - b) Decreases work of compression
  - c) Ensures liquid entry into expansion device
  - d) All of the above
- 4) Multi-stage vapour compression refrigeration systems are used when .
  - a) Required temperature lift increases
  - Required temperature lift decreases b)
  - Refrigeration is required at different temperatures c)
  - Required refrigeration capacity is large d)
- 5) Ammonia is one of the oldest refrigerants, which is still used widely, because
  - It offers excellent performance a)
  - It is a natural refrigerant b)
  - It is inexpensive C)
  - All of the above d)
- 6) Absorption of the refrigerant by the absorbent in a vapour absorption refrigeration system is accompanied by Release of heat
  - a) Absorption of heat b)
  - No thermal effects c) Reduction in volume d)



Max. Marks: 70

Marks: 14

#### 7) In a triple fluid vapour absorption refrigeration system, the hydrogen gas is used to

- a) Improve system performance
- b) Reduce the partial pressure of refrigerant in evaporator
- c) Circulate the refrigerant
- d) Provide a vapour seal

#### 8) The temperature at which moisture in air starts condensing is known as \_\_\_\_\_.

- Dry bulb temperature b) a)
- Super dry temperature c) Wet bulb temperature d) Dew point temperature

SLR-FM-145

Set

- For which of the following process, the Sensible Heat Factor (SHF) 9) is one?
  - a) Sensible heating b)
    - Humidification d) None
  - Dehumidification C)
- The difference between dry bulb temperature and wet bulb temperature, 10) is called \_\_\_\_\_.
  - a) dry bulb depression wet bulb depression b)
  - c) dew point depression d) degree of saturation
- 11) The conditioned air supplied to the room must have the capacity to take up \_\_\_\_\_.
  - a) Room sensible heat load only
  - b) Room latent heat load only
  - c) Both room sensible heat and latent heat loads
  - d) None of the above
- 12) In an air washer, if the temperature of water is higher than the dry bulb temperature of entering air, then the air is \_
  - a) Heated and dehumidified b)
    - Heated and humidified
  - c) Cooled and humidified d) Cooled and dehumidified
- 13) Rectangular ducts are generally preferred over circular ducts in buildings as
  - a) For a given flow rate, the pressure drop is less compared to a circular duct
  - b) For a given pressure drop, it requires less material compared to a circular duct
  - Rectangular ducts are easier to fabricate c)
  - d) Rectangular ducts match well with building profile

.

- 14) In cascade systems \_
  - a) Different refrigerants are used in individual cascade cycles
  - There is no mixing of refrigerants and no migration of lubricating oil b)
  - Operating pressures need not be too high or too low c)
  - d) All of the above

|  |  | 04 |
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|  |  |    |
|  |  |    |
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Page **3** of **16** 

| Seat |  |
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| No.  |  |

### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section of remaining question.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Refrigerant property tables, Psychrometric chart and non-programmable calculator is allowed.

#### Section – I

Q.2 a) An ideal vapor-compression refrigeration cycle operates at steady state 05 with 134a as a refrigerant. Saturated vapour enters the compressor at -10°C, and saturated liquid leaves the condenser at 28°C. The mass flow rate of refrigerant is 5 kg/min. Determine 1) The compressor power, in kW 2) The refrigerating capacity, in tons 3) The coefficient of performance Discuss the limitations of Reversed Carnot Cycle with vapor as 05 b) Refrigerant. c) Describe with neat sketch a boot strap air refrigeration system. 04 Q.3 An air refrigerator operates between pressure limits of 1 bar and 8 bar on 05 a) Bell Coleman Cycle. Air enters the compressor at 6.7°C and enters the expander turbine at 26.7°C. The compression & Expansion follows the law PV<sup>1.35</sup>=constant. Determine 1) C.O.P.

- 2) Specific power required in KW/TR, if the flow rate of air is 6 Kg/min.
- Explain necessity of air conditioning in air craft's. b) 05 04
- Explain the effect of CFC on Ozone depletion. C)
- Explain desirable properties of a good refrigerant. 05 Q.4 a)
  - Explain complete multistage compression system in detail. 05 b)
  - Describe the practical Agua-Ammonia Vapour Absorption System with the 04 c) help of neat diagram.

#### Section-II

- On a particular day the weather forecast states that the dry bulb Q.5 a) 05 temperature is 37°C, while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day. 05
  - b) Define following terms
    - 1) DBT
    - WBT 2)
    - 3) Specific Humidity
    - 4) DPT
    - 5) **Relative Humidity**
  - Write a short note on-Bypass factor of cooling coil. C)



Max. Marks: 56

### Set P

| Q.6 | a) | Moist air at 1bar & 40°C with RH. of 50% enters a cooling a device at the rate of 10 m <sup>3</sup> /sec and exit as saturated air at 10°C. Calculate rate at which the condensate leaves the cooling unit. Also determine the temperature at which condensation of water vapour begins. | 05 |
|-----|----|--|----|
|     | b) | Derive an expression for Equivalent diameter of rectangular duct for equal discharge and equal velocity through both ducts.  | 05 |
|     | c) | State and explain the factors affecting human comfort.   | 04 |

- **Q.7** a) Explain with neat sketch the Comfort chart.
  - b) Explain the various factors causing the heat load for the air conditioning 05 system.
  - c) Explain with schematic diagram Linde system for liquefaction of air. 04

Set

Q

| Seat |  |
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| No.  |  |
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#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering REFRIGERATION AND AIR CONDITIONING

Day & Date: Tuesday,10-12-2019 Time: 02:30 PM To 05:30 PM

- Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book
  - 2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

Duration: 30 Minutes

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - 1) The temperature at which moisture in air starts condensing is known as \_\_\_\_\_.
    - a) Dry bulb temperature
- b) Super dry temperature
- c) Wet bulb temperature d) Dew point temperature
- 2) For which of the following process, the Sensible Heat Factor (SHF) is one?
  - a) Sensible heating b) humidification
  - c) Dehumidification d) none
- The difference between dry bulb temperature and wet bulb temperature, is called \_\_\_\_\_.
  - a) dry bulb depression b) wet bulb depression
  - c) dew point depression d) degree of saturation
- 4) The conditioned air supplied to the room must have the capacity to take up \_\_\_\_\_.
  - a) Room sensible heat load only
  - b) Room latent heat load only
  - c) Both room sensible heat and latent heat loads
  - d) None of the above
- 5) In an air washer, if the temperature of water is higher than the dry bulb temperature of entering air, then the air is \_\_\_\_\_.
  - a) Heated and dehumidified b) Heated and humidified
  - c) Cooled and humidified d) Cooled and dehumidified
- Rectangular ducts are generally preferred over circular ducts in buildings as \_\_\_\_\_.
  - a) For a given flow rate, the pressure drop is less compared to a circular duct
  - b) For a given pressure drop, it requires less material compared to a circular duct
  - c) Rectangular ducts are easier to fabricate
  - d) Rectangular ducts match well with building profile

Max. Marks: 70

Marks: 14

- In cascade systems \_\_\_\_\_.
  - a) Different refrigerants are used in individual cascade cycles
  - b) There is no mixing of refrigerants and no migration of lubricating oil

Set

- c) Operating pressures need not be too high or too low
- d) All of the above
- 8) The function of a compressor in a vapour compression refrigeration system is to \_\_\_\_\_.
  - a) To maintain the required low-side pressure in the evaporator
  - b) To maintain the required high-side pressure in the condenser
  - c) To circulate required amount of refrigerant through the system
  - d) All of the above
- 9) Air cycle refrigeration systems are most commonly used in \_\_\_\_\_.
  - a) Domestic refrigerators
  - b) Aircraft air conditioning systems
  - c) Cold storages
  - d) Car air conditioning systems
- 10) Sub cooling is beneficial as it \_\_\_\_
  - a) Increases specific refrigeration effect
  - b) Decreases work of compression
  - c) Ensures liquid entry into expansion device
  - d) All of the above
- 11) Multi-stage vapour compression refrigeration systems are used when \_\_\_\_\_.
  - a) Required temperature lift increases
  - b) Required temperature lift decreases
  - c) Refrigeration is required at different temperatures
  - d) Required refrigeration capacity is large
- 12) Ammonia is one of the oldest refrigerants, which is still used widely, because \_\_\_\_\_
  - a) It offers excellent performance
  - b) It is a natural refrigerant
  - c) It is inexpensive
  - d) All of the above
- 13) Absorption of the refrigerant by the absorbent in a vapour absorption refrigeration system is accompanied by
  - a) Absorption of heat b) Release of heat
  - c) No thermal effects d) Reduction in volume
- 14) In a triple fluid vapour absorption refrigeration system, the hydrogen gas is used to \_\_\_\_\_.
  - a) Improve system performance
  - b) Reduce the partial pressure of refrigerant in evaporator
  - c) Circulate the refrigerant
  - d) Provide a vapour seal

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### Seat No.

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering REFRIGERATION AND AIR CONDITIONING

Day & Date: Tuesday,10-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section of remaining question.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Refrigerant property tables, Psychrometric chart and non-programmable calculator is allowed.

#### Section - I

Q.2 a) An ideal vapor-compression refrigeration cycle operates at steady state 05 with 134a as a refrigerant. Saturated vapour enters the compressor at -10°C, and saturated liquid leaves the condenser at 28°C. The mass flow rate of refrigerant is 5 kg/min. Determine 1) The compressor power, in kW 2) The refrigerating capacity, in tons 3) The coefficient of performance Discuss the limitations of Reversed Carnot Cycle with vapor as 05 b) Refrigerant. c) Describe with neat sketch a boot strap air refrigeration system. 04 Q.3 An air refrigerator operates between pressure limits of 1 bar and 8 bar on 05 a) Bell Coleman Cycle. Air enters the compressor at 6.7°C and enters the expander turbine at 26.7°C. The compression & Expansion follows the law PV<sup>1.35</sup>=constant. Determine 1) C.O.P. 2) Specific power required in KW/TR, if the flow rate of air is 6 Kg/min. Explain necessity of air conditioning in air craft's. b) 05 Explain the effect of CFC on Ozone depletion. 04 C)

#### Q.4 a) Explain desirable properties of a good refrigerant. 05

- b) Explain complete multistage compression system in detail. 05
- c) Describe the practical Aqua-Ammonia Vapour Absorption System with the 04 help of neat diagram.

#### Section-II

- Q.5 a) On a particular day the weather forecast states that the dry bulb
   05 temperature is 37°C, while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day.
  - **b)** Define following terms
    - 1) DBT
    - 2) WBT
    - 3) Specific Humidity
    - 4) DPT
    - 5) Relative Humidity
  - c) Write a short note on-Bypass factor of cooling coil.

Set Q

Max. Marks: 56

## Set Q

| Q.6 | a) | Moist air at 1bar & 40°C with RH. of 50% enters a cooling a device at the rate of 10 m <sup>3</sup> /sec and exit as saturated air at 10°C. Calculate rate at which the condensate leaves the cooling unit. Also determine the temperature at which condensation of water vapour begins. | lich |  |  |
|-----|----|--|------|--|--|
|     | b) | Derive an expression for Equivalent diameter of rectangular duct for equal discharge and equal velocity through both ducts.  | 05   |  |  |
|     | C) | State and explain the factors affecting human comfort.   | 04   |  |  |
| Q.7 | a) | Explain with neat sketch the Comfort chart.  | 05   |  |  |

- b) Explain the various factors causing the heat load for the air conditioning 05 system.
- c) Explain with schematic diagram Linde system for liquefaction of air. 04

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Ammonia is one of the oldest refrigerants, which is still used widely, because
  - It offers excellent performance a)
  - It is a natural refrigerant b)
  - It is inexpensive c)
  - All of the above d)
- 2) Absorption of the refrigerant by the absorbent in a vapour absorption refrigeration system is accompanied by
  - a) Absorption of heat
- Release of heat b)
- No thermal effects c)
- In a triple fluid vapour absorption refrigeration system, the hydrogen gas 3) is used to
  - Improve system performance a)
  - b) Reduce the partial pressure of refrigerant in evaporator
  - c) Circulate the refrigerant
  - d) Provide a vapour seal

#### The temperature at which moisture in air starts condensing is known as \_\_\_\_\_. 4)

b)

d)

- Dry bulb temperature a)
- c) Wet bulb temperature
- 5) For which of the following process, the Sensible Heat Factor (SHF) is one?
  - a) Sensible heating b) humidification
  - Dehumidification d) none C)
- The difference between dry bulb temperature and wet bulb temperature, 6) is called .
  - a) dry bulb depression c) dew point depression
- b) wet bulb depression degree of saturation d)
- 7) The conditioned air supplied to the room must have the capacity to take up \_\_\_\_\_.
  - a) Room sensible heat load only
  - b) Room latent heat load only
  - c) Both room sensible heat and latent heat loads
  - d) None of the above

Set R

Max. Marks: 70

- d) Reduction in volume

Super dry temperature

Dew point temperature

8) In an air washer, if the temperature of water is higher than the dry bulb temperature of entering air, then the air is \_\_\_\_\_.

- a) Heated and dehumidified
- b) Heated and humidified
- c) Cooled and humidified
- d) Cooled and dehumidified

SLR-FM-145

Set

- Rectangular ducts are generally preferred over circular ducts in buildings as \_\_\_\_\_.
  - a) For a given flow rate, the pressure drop is less compared to a circular duct
  - b) For a given pressure drop, it requires less material compared to a circular duct
  - c) Rectangular ducts are easier to fabricate
  - d) Rectangular ducts match well with building profile
- 10) In cascade systems \_\_\_\_
  - a) Different refrigerants are used in individual cascade cycles
  - b) There is no mixing of refrigerants and no migration of lubricating oil
  - c) Operating pressures need not be too high or too low
  - d) All of the above
- 11) The function of a compressor in a vapour compression refrigeration system is to \_\_\_\_\_.
  - a) To maintain the required low-side pressure in the evaporator
  - b) To maintain the required high-side pressure in the condenser
  - c) To circulate required amount of refrigerant through the system
  - d) All of the above
- 12) Air cycle refrigeration systems are most commonly used in \_\_\_\_\_.
  - a) Domestic refrigerators
  - b) Aircraft air conditioning systems
  - c) Cold storages
  - d) Car air conditioning systems
- 13) Sub cooling is beneficial as it \_\_\_\_
  - a) Increases specific refrigeration effect
  - b) Decreases work of compression
  - c) Ensures liquid entry into expansion device
  - d) All of the above
- 14) Multi-stage vapour compression refrigeration systems are used when \_\_\_\_\_.
  - a) Required temperature lift increases
  - b) Required temperature lift decreases
  - c) Refrigeration is required at different temperatures
  - d) Required refrigeration capacity is large

|      | •  | •  |    |
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|      |    |    |    |
| Page | 11 | of | 16 |

| Seat |  |
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| No.  |  |

### B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section of remaining question.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Refrigerant property tables, Psychrometric chart and non-programmable calculator is allowed.

#### Section - I

- Q.2 a) An ideal vapor-compression refrigeration cycle operates at steady state 05 with 134a as a refrigerant. Saturated vapour enters the compressor at -10°C, and saturated liquid leaves the condenser at 28°C. The mass flow rate of refrigerant is 5 kg/min. Determine 1) The compressor power, in kW 2) The refrigerating capacity, in tons 3) The coefficient of performance Discuss the limitations of Reversed Carnot Cycle with vapor as 05 b) Refrigerant. c) Describe with neat sketch a boot strap air refrigeration system. 04 Q.3 An air refrigerator operates between pressure limits of 1 bar and 8 bar on 05 a) Bell Coleman Cycle. Air enters the compressor at 6.7°C and enters the expander turbine at 26.7°C. The compression & Expansion follows the law PV<sup>1.35</sup>=constant. Determine 1) C.O.P. 2) Specific power required in KW/TR, if the flow rate of air is 6 Kg/min. Explain necessity of air conditioning in air craft's. b) 05 Explain the effect of CFC on Ozone depletion. 04 C) Explain desirable properties of a good refrigerant. 05 Q.4 a) Explain complete multistage compression system in detail. 05 b)
  - Describe the practical Agua-Ammonia Vapour Absorption System with the 04 c) help of neat diagram.

### Section-II

- On a particular day the weather forecast states that the dry bulb Q.5 a) 05 temperature is 37°C, while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day. 05
  - b) Define following terms
    - 1) DBT
    - WBT 2)
    - 3) Specific Humidity
    - 4) DPT
    - 5) **Relative Humidity**
  - Write a short note on-Bypass factor of cooling coil. C)

04



Max. Marks: 56

## Set R

| Q.6 | a) | Moist air at 1bar & 40°C with RH. of 50% enters a cooling a device at the rate of 10 m <sup>3</sup> /sec and exit as saturated air at 10°C. Calculate rate at which the condensate leaves the cooling unit. Also determine the temperature at which condensation of water vapour begins. | 05 |
|-----|----|--|----|
|     | b) | Derive an expression for Equivalent diameter of rectangular duct for equal discharge and equal velocity through both ducts.  | 05 |
|     | c) | State and explain the factors affecting human comfort.   | 04 |
| Q.7 | a) | Explain with neat sketch the Comfort chart.  | 05 |

- a) Explain with neat sketch the Comfort chart.
   b) Explain the various factors causing the heat load for the air conditioning 05 system.
- c) Explain with schematic diagram Linde system for liquefaction of air. 04

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering REFRIGERATION AND AIR CONDITIONING

Day & Date: Tuesday,10-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

Duration: 30 Minutes

Seat No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The difference between dry bulb temperature and wet bulb temperature, is called \_\_\_\_\_.
  - a) dry bulb depressionc) dew point depression
- b) wet bulb depressiond) degree of saturation
- The conditioned air supplied to the room must have the capacity to take up \_\_\_\_\_.
  - a) Room sensible heat load only
  - b) Room latent heat load only
  - c) Both room sensible heat and latent heat loads
  - d) None of the above
- 3) In an air washer, if the temperature of water is higher than the dry bulb temperature of entering air, then the air is \_\_\_\_\_.
  - a) Heated and dehumidified b) Heated and humidified
  - c) Cooled and humidified d) Cooled and dehumidified
- 4) Rectangular ducts are generally preferred over circular ducts in buildings as \_\_\_\_\_.
  - a) For a given flow rate, the pressure drop is less compared to a circular duct
  - b) For a given pressure drop, it requires less material compared to a circular duct
  - c) Rectangular ducts are easier to fabricate
  - d) Rectangular ducts match well with building profile
- 5) In cascade systems \_\_\_\_\_
  - a) Different refrigerants are used in individual cascade cycles
  - b) There is no mixing of refrigerants and no migration of lubricating oil
  - c) Operating pressures need not be too high or too low
  - d) All of the above
- 6) The function of a compressor in a vapour compression refrigeration system is to \_\_\_\_\_.
  - a) To maintain the required low-side pressure in the evaporator
  - b) To maintain the required high-side pressure in the condenser
  - c) To circulate required amount of refrigerant through the system
  - d) All of the above

Max. Marks: 70

Marks: 14

Set S

- Set
- 7) Air cycle refrigeration systems are most commonly used in \_\_\_\_\_.
  - a) Domestic refrigerators
  - b) Aircraft air conditioning systems
  - c) Cold storages
  - d) Car air conditioning systems
- 8) Sub cooling is beneficial as it
  - a) Increases specific refrigeration effect
  - b) Decreases work of compression
  - c) Ensures liquid entry into expansion device
  - d) All of the above
- 9) Multi-stage vapour compression refrigeration systems are used when .
  - Required temperature lift increases a)
  - Required temperature lift decreases b)
  - Refrigeration is required at different temperatures c)
  - d) Required refrigeration capacity is large
- 10) Ammonia is one of the oldest refrigerants, which is still used widely, because
  - It offers excellent performance a)
  - b) It is a natural refrigerant
  - It is inexpensive c)
  - All of the above d)
- 11) Absorption of the refrigerant by the absorbent in a vapour absorption refrigeration system is accompanied by
  - a) Absorption of heat
- b) Release of heat
- c) No thermal effects
- d) Reduction in volume
- 12) In a triple fluid vapour absorption refrigeration system, the hydrogen gas is used to
  - a) Improve system performance
  - b) Reduce the partial pressure of refrigerant in evaporator
  - c) Circulate the refrigerant
  - d) Provide a vapour seal
- The temperature at which moisture in air starts condensing is known as \_\_\_\_\_. 13)
  - Dry bulb temperature b) Super dry temperature a) c) Wet bulb temperature
    - d) Dew point temperature
- For which of the following process, the Sensible Heat Factor (SHF) 14) is one?
  - a) Sensible heating
- humidification b)
- c) Dehumidification
- d) none

|      | -  |    |    |
|------|----|----|----|
| Page | 15 | of | 16 |

| Seat |  |
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#### B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section of remaining question.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Refrigerant property tables, Psychrometric chart and non-programmable calculator is allowed.

#### Section - I

- Q.2 a) An ideal vapor-compression refrigeration cycle operates at steady state 05 with 134a as a refrigerant. Saturated vapour enters the compressor at -10°C, and saturated liquid leaves the condenser at 28°C. The mass flow rate of refrigerant is 5 kg/min. Determine 1) The compressor power, in kW 2) The refrigerating capacity, in tons 3) The coefficient of performance Discuss the limitations of Reversed Carnot Cycle with vapor as 05 b) Refrigerant. c) Describe with neat sketch a boot strap air refrigeration system. 04 Q.3 An air refrigerator operates between pressure limits of 1 bar and 8 bar on 05 a) Bell Coleman Cycle. Air enters the compressor at 6.7°C and enters the expander turbine at 26.7°C. The compression & Expansion follows the law PV<sup>1.35</sup>=constant. Determine 1) C.O.P. 2) Specific power required in KW/TR, if the flow rate of air is 6 Kg/min. Explain necessity of air conditioning in air craft's. b) 05 Explain the effect of CFC on Ozone depletion. 04 C) Explain desirable properties of a good refrigerant. 05 Q.4 a) Explain complete multistage compression system in detail. 05 b)
  - Describe the practical Agua-Ammonia Vapour Absorption System with the 04 c) help of neat diagram.

#### Section-II

- On a particular day the weather forecast states that the dry bulb Q.5 a) 05 temperature is 37°C, while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day. 05
  - b) Define following terms
    - 1) DBT
    - WBT 2)
    - 3) Specific Humidity
    - 4) DPT
    - 5) **Relative Humidity**
  - Write a short note on-Bypass factor of cooling coil. C)



## Set S

| Q.6 | a) | Moist air at 1bar & 40°C with RH. of 50% enters a cooling a device at the rate of 10 m <sup>3</sup> /sec and exit as saturated air at 10°C. Calculate rate at which the condensate leaves the cooling unit. Also determine the temperature at which condensation of water vapour begins. | 05 |
|-----|----|--|----|
|     | b) | Derive an expression for Equivalent diameter of rectangular duct for equal discharge and equal velocity through both ducts.  | 05 |
|     | C) | State and explain the factors affecting human comfort.   | 04 |
| Q.7 | a) | Explain with neat sketch the Comfort chart.  | 05 |

- a) Explain with neat sketch the Comfort chart.
   b) Explain the various factors causing the heat load for the air conditioning os system.
- c) Explain with schematic diagram Linde system for liquefaction of air. 04

|        |        |               | -                 | Mechanical Engi<br>OPERATIONS RE  |                   |   |    |
|--------|--------|---------------|-------------------|---|-------------------|---|----|
|        |        |               |                   | y, 12-12-2019<br>5:30 PM  |                   | Max. Marks:   | 70 |
| Instru | ictio  | <b>ns:</b> 1) | Q. N<br>boo       | • •   | e sol             | ved in first 30 minutes in answer                                     |    |
|        |        | 2)            | Figu              | res to the right indicate full ma   | arks.             |   |    |
|        |        |               |                   | MCQ/Objective Type  | e Qu              | estions   |    |
| Durati | ion: 3 | 80 Min        | utes              |   |                   | Marks:  | 14 |
| Q.1    | A)     |               | ose t<br>ence     | he correct alternatives from  | the c             | options and rewrite the   | 08 |
|        |        | 1)            | -                 | rations Research attempts to problem.<br>Optimum  | find th<br>b)     | ne best and solution Perfect  |    |
|        |        |               | а)<br>С)          | Degenerate  | d)                | None of the above   |    |
|        |        | 2)            |                   | not easy to make any modifica<br>Iconic Models<br>Symbolic Models                                 |                   | or improvement in<br>Analogue Models<br>None of the above             |    |
|        |        | 3)            | lf in a           | a LPP, the solution of a variat<br>out violating the constraint, the<br>Infeasible<br>Alternative | le ca             | n be made infinity large  |    |
|        |        | 4)            |                   | aximization cases, are<br>neir coefficients in the objective<br>+m<br>0                           |                   | gned to the artificial variables<br>ction.<br>-m<br>None of the above |    |
|        |        | 5)            | For s<br>a)<br>c) | solving an assignment probler<br>Hungarian<br>German  | n, wh<br>b)<br>d) | ich method is used?<br>American<br>None                               |    |
|        |        | 6)            | MOE<br>a)<br>c)   | DI method is used to obtain<br>Optimal solutions<br>Optimization                                  | b)<br>d)          | Optimality test<br>Both a and b                                       |    |
|        |        | 7)            | Sequ<br>a)<br>c)  | uencing is a subset of<br>Routing<br>expediting   | b)<br>d)          | Scheduling<br>none of these   |    |
|        |        | 8)            | Whio<br>a)<br>c)  | ch of the following is not an inv<br>Machines<br>Finished products                                | vento<br>b)<br>d) | ry?<br>Raw material<br>Consumable tools                               |    |
|        | B)     | Туре          | -                 | uestions. (2 marks each)  |                   |   | 06 |
|        |        | 1)            | The               | value of the game whose pay   | off ma            | atrix $\begin{bmatrix} 1 & 3\\ -1 & 4 \end{bmatrix}$ is               |    |
|        |        |               | a)<br>c)          | 1<br>3  | b)<br>d)          | 4<br>-2   |    |

### Seat No.

B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019

Set

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Page  ${\bf 1}$  of  ${\bf 16}$ 

#### 2) When money value changes 20% a year, discount factor for the second year is \_\_\_\_\_.

a) 1 b) 0.833

a)

- c) d) 0.6944 zero
- In the PERT network, distribution of the project completion time is 3) assumed to follow \_\_\_\_\_. Beta distribution
  - b) Poisson distribution

**SLR-FM-146** 

Set P

C) Normal distribution d) **Binomial distribution** 

Set

### Seat No.

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Day & Date: Thursday, 12-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

Q.2 a) Seven jobs are to be processed on two machines A & B in order AB. Each machine can process only one job at a time. The processing time in hrs are given below. Find the optimal sequence & idle time of each machine.

| Job       | 1  | 2  | 3  | 4 | 5  | 6 | 7  |
|-----------|----|----|----|---|----|---|----|
| Machine A | 10 | 12 | 13 | 7 | 14 | 5 | 16 |
| Machine B | 15 | 11 | 8  | 9 | 6  | 7 | 16 |

b) Solve the following LPP by Simplex method Minimize  $Z = X_1 - 3X_2 + 2 X_3$ subject to  $3X_1 - X_2 + 3 X_3 \le 7$ 

$$-2 X_1 + 4 X_2 \le 12$$
  
-4X<sub>1</sub> + 3 X<sub>2</sub> + 8 X<sub>3</sub> \le 10  
X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub> \ge 0

- **Q.3** a) Explain the mathematical formulation of transportation model.
  - b) Five operators have to be assigned to five machines. The assignment costs are given in the table below. Operator A cannot operate Machine III & C cannot operate Machine IV. Find the optimal assignment.

| Operators /<br>Machines | I | II | III | IV | V |
|-------------------------|---|----|-----|----|---|
| А                       | 5 | 5  | -   | 2  | 6 |
| В                       | 7 | 4  | 2   | 3  | 4 |
| С                       | 9 | 3  | 5   | -  | 3 |
| D                       | 7 | 2  | 6   | 7  | 2 |
| E                       | 6 | 5  | 7   | 9  | 1 |

Find the optimum assignment of Job to machines so as to minimize total cost.

- **Q.4 a)** Write in brief applications of OR.
  - **b)** Explain the sensitivity analysis in LPP.
  - c) Determine the IBFS to the following transportation problem by
    - 1) Matrix minima method
    - 2) VAM

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| O1     | 1  | 2  | 1  | 4  | 30     |
| 02     | 3  | 3  | 2  | 1  | 50     |
| O3     | 4  | 2  | 5  | 9  | 20     |
| Demand | 20 | 40 | 30 | 10 |        |

Max. Marks: 56

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#### **Q.5** a) Solve the following game by graphical method.

|          | 00             | , ,                |                |       |       |
|----------|----------------|--------------------|----------------|-------|-------|
|          |                |                    | Play           | er B  |       |
|          |                | B <sub>1</sub>     | B <sub>2</sub> | $B_3$ | $B_4$ |
| Player A | A <sub>1</sub> | -5                 | 5              | 0     | 8     |
|          | A <sub>2</sub> | 8                  | -4             | -1    | -5    |
| 0 - 1    |                | and the set of the | - f - l        |       |       |

**b)** Solve the game by the principle of dominance.

| Player B |                |                |                |                |                |  |  |
|----------|----------------|----------------|----------------|----------------|----------------|--|--|
|          |                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> |  |  |
|          | A <sub>1</sub> | 4              | 2              | 3              | 6              |  |  |
| Player A | A <sub>2</sub> | 3              | 4              | 7              | 5              |  |  |
|          | A <sub>3</sub> | 4              | 1              | 2              | 3              |  |  |
|          | A <sub>4</sub> | 6              | 3              | 5              | 4              |  |  |

**Q.6 a)** The maintenance costs and the resale price of a machine whose purchase price is Rs.10,000 are given as follows:

| Year                  | 1         | 2         | 3       | 4     | 5     | 6     | 7     |  |
|-----------------------|-----------|-----------|---------|-------|-------|-------|-------|--|
| Maintenance Cost      | 1,500     | 1,900     | 2,300   | 2,900 | 3,600 | 4,500 | 5,500 |  |
| (Rs.)                 |           |           |         |       |       |       |       |  |
| Resale Value (Rs.)    | 5,000     | 2,500     | 1,250   | 600   | 400   | 400   | 400   |  |
| What is the optimal p | eriod for | the repla | acement | ?     |       |       |       |  |

b) Explain the basic EOQ model in the inventory control.

c) Differentiate between CPM & PERT.

#### **Q.7** a) A certain project has the following data:

| Activity         | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 3-6 | 4-6 | 5-7 | 6-7 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration in week | 3   | 5   | 4   | 2   | 3   | 7   | 9   | 8   | 9   |

1) Construct the network

2) Determine project duration and critical path.

3) Find total float

b) Explain in detail classification of inventories.

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**SLR-FM-146** 

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|           |                  | hursday, 12-12-2019<br>// To 05:30 PM  |                        | Max. Marks: 70  |
|-----------|------------------|--|------------------------|---|
| Instructi |                  | I) Q. No. 1 is compulsory. It shoul book.  |                        | lved in first 30 minutes in answer                        |
|           | 2                | 2) Figures to the right indicate full  | marks.                 |   |
| Destin    | 00 M             | MCQ/Objective Ty   | vpe Qu                 |   |
| Duration: |                  |  |                        | Marks: 14   |
| Q.1 A)    |                  | oose the correct alternatives front<br>ntence.   | om the o               | options and rewrite the 08                                |
|           | 1)               | For solving an assignment prob<br>a) Hungarian<br>c) German  | blem, wh<br>b)<br>d)   | iich method is used?<br>American<br>None                  |
|           | 2)               | MODI method is used to obtain<br>a) Optimal solutions<br>c) Optimization   | b)<br>d)               | Optimality test<br>Both a and b                           |
|           | 3)               | Sequencing is a subset of<br>a) Routing<br>c) expediting   | <br>b)<br>d)           | Scheduling<br>none of these                               |
|           | 4)               | Which of the following is not an<br>a) Machines<br>c) Finished products  |                        | ry?<br>Raw material<br>Consumable tools                   |
|           | 5)               | Operations Research attempts<br>to a problem.<br>a) Optimum<br>c) Degenerate   | to find th<br>b)<br>d) |   |
|           | 6)               | It is not easy to make any modi<br>a) Iconic Models<br>c) Symbolic Models  | b)                     | or improvement in<br>Analogue Models<br>None of the above |
|           | 7)               | If in a LPP, the solution of a var<br>without violating the constraint,<br>a) Infeasible<br>c) Alternative                             |                        |   |
|           | 8)               | In maximization cases,<br>as their coefficients in the object<br>a) +m<br>c) 0   |                        | -   |
| B)        | <b>Тур</b><br>1) | <ul> <li>be II questions. (2 marks each)</li> <li>When money value changes 20 second year is</li> <li>a) 1</li> <li>c) zero</li> </ul> | )% a yea<br>b)<br>d)   | 06<br>ar, discount factor for the<br>0.833<br>0.6944      |
|           |                  | 0, 2010  | ч)                     | 0.0011  |

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## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Page **5** of **16** 

Set

SLR-FM-146

Q

## SLR-FM-146 Set Q

- 2) In the PERT network, distribution of the project completion time is assumed to follow \_
  - Beta distribution a)

b) Poisson distribution d)

- c) Normal distribution
- **Binomial distribution**

The value of the game whose payoff matrix  $\begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$  is \_\_\_\_\_. 3)

- b) 4 1 a) -2 c)
  - 3 d)

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#### B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH**

Day & Date: Thursday, 12-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

Seven jobs are to be processed on two machines A & B in order AB. Each Q.2 a) machine can process only one job at a time. The processing time in hrs are given below. Find the optimal sequence & idle time of each machine.

| Job       | 1  | 2  | 3  | 4 | 5  | 6 | 7  |
|-----------|----|----|----|---|----|---|----|
| Machine A | 10 | 12 | 13 | 7 | 14 | 5 | 16 |
| Machine B | 15 | 11 | 8  | 9 | 6  | 7 | 16 |

Solve the following LPP by Simplex method b) Minimize  $Z = X_1 - 3X_2 + 2X_3$ subject to  $3X_1 - X_2 + 3X_3 \le 7$ 

$$-2 X_{1} + 4 X_{2} \le 12$$
  
-4X<sub>1</sub> + 3 X<sub>2</sub> + 8 X<sub>3</sub> ≤ 10  
X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub> ≥ 0

- Explain the mathematical formulation of transportation model. Q.3 a)
  - b) Five operators have to be assigned to five machines. The assignment costs are given in the table below. Operator A cannot operate Machine III & C cannot operate Machine IV. Find the optimal assignment.

| Operators /<br>Machines | I | . 11 | III | IV | V |
|-------------------------|---|------|-----|----|---|
| A                       | 5 | 5    | -   | 2  | 6 |
| В                       | 7 | 4    | 2   | 3  | 4 |
| С                       | 9 | 3    | 5   | -  | 3 |
| D                       | 7 | 2    | 6   | 7  | 2 |
| Ē                       | 6 | 5    | 7   | 9  | 1 |

Find the optimum assignment of Job to machines so as to minimize total cost.

- Q.4 Write in brief applications of OR. a)
  - Explain the sensitivity analysis in LPP. b)
  - Determine the IBFS to the following transportation problem by C)
    - 1) Matrix minima method
    - 2) VAM

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| 01     | 1  | 2  | 1  | 4  | 30     |
| O2     | 3  | 3  | 2  | 1  | 50     |
| O3     | 4  | 2  | 5  | 9  | 20     |
| Demand | 20 | 40 | 30 | 10 |        |

Max. Marks: 56

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**Q.5 a)** Solve the following game by graphical method.

|          |                |                |            | ауего          |       |
|----------|----------------|----------------|------------|----------------|-------|
|          |                | B <sub>1</sub> | $B_2$      | B <sub>3</sub> | $B_4$ |
| Player A | A <sub>1</sub> | -5             | 5          | 0              | 8     |
|          | A <sub>2</sub> | 8              | -4         | -1             | -5    |
|          | 1 4            |                | <b>~</b> 1 |                |       |

**b)** Solve the game by the principle of dominance.

| Player B |                |                |                |                |       |  |  |  |
|----------|----------------|----------------|----------------|----------------|-------|--|--|--|
|          |                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | $B_4$ |  |  |  |
|          | A <sub>1</sub> | 4              | 2              | 3              | 6     |  |  |  |
| Player A | A <sub>2</sub> | 3              | 4              | 7              | 5     |  |  |  |
|          | A <sub>3</sub> | 4              | 1              | 2              | 3     |  |  |  |
|          | A <sub>4</sub> | 6              | 3              | 5              | 4     |  |  |  |

**Q.6 a)** The maintenance costs and the resale price of a machine whose purchase price is Rs.10,000 are given as follows:

| Year                  | 1         | 2         | 3       | 4     | 5     | 6     | 7     |  |
|-----------------------|-----------|-----------|---------|-------|-------|-------|-------|--|
| Maintenance Cost      | 1,500     | 1,900     | 2,300   | 2,900 | 3,600 | 4,500 | 5,500 |  |
| (Rs.)                 |           |           |         |       |       |       |       |  |
| Resale Value (Rs.)    | 5,000     | 2,500     | 1,250   | 600   | 400   | 400   | 400   |  |
| What is the optimal p | eriod for | the repla | acement | ?     |       |       |       |  |

b) Explain the basic EOQ model in the inventory control.

c) Differentiate between CPM & PERT.

#### **Q.7** a) A certain project has the following data:

| Activity         | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 3-6 | 4-6 | 5-7 | 6-7 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration in week | 3   | 5   | 4   | 2   | 3   | 7   | 9   | 8   | 9   |

1) Construct the network

2) Determine project duration and critical path.

3) Find total float

**b)** Explain in detail classification of inventories.

05

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Set | Q

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### Set B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH** Max. Marks: 70

Day & Date: Thursday, 12-12-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

B)

Seat

No.

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

Q.1 A) Choose the correct alternatives from the options and rewrite the sentence.

- If in a LPP, the solution of a variable can be made infinity large 1) without violating the constraint, the solution is \_
  - a) Infeasible Unbounded b)
  - Alternative d) None of the above C)
- In maximization cases, \_\_\_\_\_ are assigned to the artificial variables 2) as their coefficients in the objective function.
  - a) +m b) -m
  - 0 d) None of the above C)
- For solving an assignment problem, which method is used? 3)
  - Hungarian American a) b)
    - C) German d) None
- MODI method is used to obtain \_\_\_\_ 4)
  - Optimal solutions b) Optimality test a)
  - Optimization d) Both a and b c)
- Sequencing is a subset of \_\_\_\_ 5)
  - Routing b) Scheduling a) C)
    - expediting none of these d)

Which of the following is not an inventory? 6)

- Machines Raw material a) b) Finished products d) Consumable tools C)
- Operations Research attempts to find the best and solution 7) to a problem. Perfect
  - a) Optimum b) c)
    - Degenerate None of the above d)
- It is not easy to make any modification or improvement in \_ 8) b) Analogue Models
  - a) Iconic Models C)
    - Symbolic Models
- None of the above d) Type II questions. (2 marks each)
- In the PERT network, distribution of the project completion time is 1) assumed to follow . Poisson distribution
  - Beta distribution b) a)
  - Normal distribution d) **Binomial distribution** c)

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Marks: 14

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- 2) The value of the game whose payoff matrix  $\begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$  is \_\_\_\_\_.
  - 4 1 b) a)
  - d) -2 3 C)
- When money value changes 20% a year, discount factor for the 3) second year is \_\_\_\_\_. a)
  - b) 0.833 1
  - c) zero d) 0.6944

Set

### Seat No.

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Day & Date: Thursday, 12-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

Q.2 a) Seven jobs are to be processed on two machines A & B in order AB. Each machine can process only one job at a time. The processing time in hrs are given below. Find the optimal sequence & idle time of each machine.

| Job       | 1  | 2  | 3  | 4 | 5  | 6 | 7  |
|-----------|----|----|----|---|----|---|----|
| Machine A | 10 | 12 | 13 | 7 | 14 | 5 | 16 |
| Machine B | 15 | 11 | 8  | 9 | 6  | 7 | 16 |

b) Solve the following LPP by Simplex method Minimize  $Z = X_1 - 3X_2 + 2 X_3$ subject to  $3X_1 - X_2 + 3 X_3 \le 7$ 

$$-2X_{1} + 4X_{2} \le 12$$
  
-4X<sub>1</sub> + 3X<sub>2</sub> + 8X<sub>3</sub> \le 10  
X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub> \ge 0

- **Q.3 a)** Explain the mathematical formulation of transportation model.
  - b) Five operators have to be assigned to five machines. The assignment costs are given in the table below. Operator A cannot operate Machine III & C cannot operate Machine IV. Find the optimal assignment.

|                         |   | <u> </u> |   |    |   |
|-------------------------|---|----------|---|----|---|
| Operators /<br>Machines | Ι | Π        | Ш | IV | V |
| А                       | 5 | 5        | - | 2  | 6 |
| В                       | 7 | 4        | 2 | 3  | 4 |
| C                       | 9 | 3        | 5 | -  | 3 |
| D                       | 7 | 2        | 6 | 7  | 2 |
| E                       | 6 | 5        | 7 | 9  | 1 |

Find the optimum assignment of Job to machines so as to minimize total cost.

- **Q.4 a)** Write in brief applications of OR.
  - **b)** Explain the sensitivity analysis in LPP.
  - c) Determine the IBFS to the following transportation problem by
    - 1) Matrix minima method
    - 2) VAM

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| O1     | 1  | 2  | 1  | 4  | 30     |
| O2     | 3  | 3  | 2  | 1  | 50     |
| O3     | 4  | 2  | 5  | 9  | 20     |
| Demand | 20 | 40 | 30 | 10 |        |

Max. Marks: 56

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#### **Q.5** a) Solve the following game by graphical method.

|           |                |                | Player B       |       |       |  |  |  |
|-----------|----------------|----------------|----------------|-------|-------|--|--|--|
|           |                | B <sub>1</sub> | B <sub>2</sub> | $B_3$ | $B_4$ |  |  |  |
| Player A  | A <sub>1</sub> | -5             | 5              | 0     | 8     |  |  |  |
| -         | $A_2$          | 8              | -4             | -1    | -5    |  |  |  |
| Colve the |                | ممستسماهم      |                |       |       |  |  |  |

**b)** Solve the game by the principle of dominance.

| Player B |                |                |                |                |       |  |  |  |
|----------|----------------|----------------|----------------|----------------|-------|--|--|--|
| Player A |                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | $B_4$ |  |  |  |
|          | A <sub>1</sub> | 4              | 2              | 3              | 6     |  |  |  |
|          | A <sub>2</sub> | 3              | 4              | 7              | 5     |  |  |  |
|          | A <sub>3</sub> | 4              | 1              | 2              | 3     |  |  |  |
|          | $A_4$          | 6              | 3              | 5              | 4     |  |  |  |

**Q.6 a)** The maintenance costs and the resale price of a machine whose purchase price is Rs.10,000 are given as follows:

| Year                  | 1         | 2         | 3       | 4     | 5     | 6     | 7     |  |
|-----------------------|-----------|-----------|---------|-------|-------|-------|-------|--|
| Maintenance Cost      | 1,500     | 1,900     | 2,300   | 2,900 | 3,600 | 4,500 | 5,500 |  |
| (Rs.)                 |           |           |         |       |       |       |       |  |
| Resale Value (Rs.)    | 5,000     | 2,500     | 1,250   | 600   | 400   | 400   | 400   |  |
| What is the optimal p | eriod for | the repla | acement | ?     |       |       |       |  |
|                       | <u> </u>  |           |         |       |       |       |       |  |

**b)** Explain the basic EOQ model in the inventory control.

c) Differentiate between CPM & PERT.

#### **Q.7 a)** A certain project has the following data:

| Activity         | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 3-6 | 4-6 | 5-7 | 6-7 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration in week | 3   | 5   | 4   | 2   | 3   | 7   | 9   | 8   | 9   |

1) Construct the network

2) Determine project duration and critical path.

3) Find total float

b) Explain in detail classification of inventories.

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| Time: 02:30 PM To 05:30 PM   |      |        |   |   |  |  |  |
|--|------|--------|---|---|--|--|--|
| Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book. |      |        |   |   |  |  |  |
|  |      | 2      | Figures to the right indicate full marks.   |   |  |  |  |
| Duro   | tion | 30 Mii | MCQ/Objective Type Questions<br>Marks: 14   | 1 |  |  |  |
|  |      |        |   |   |  |  |  |
| Q.1  | A)   | sen    | se the correct alternatives from the options and rewrite the 08 nce.  | ) |  |  |  |
|  |      | 1)     | Sequencing is a subset of<br>) Routing b) Scheduling<br>) expediting d) none of these   |   |  |  |  |
|  |      | 2)     | Vhich of the following is not an inventory?<br>) Machines b) Raw material<br>) Finished products d) Consumable tools  |   |  |  |  |
|  |      | 3)     | Operations Research attempts to find the best and solution         o a problem.         o) Optimum         b) Perfect         c) Degenerate         d) None of the above                |   |  |  |  |
|  |      | 4)     | is not easy to make any modification or improvement in<br>I conic Models b) Analogue Models<br>Symbolic Models d) None of the above   |   |  |  |  |
|  |      | 5)     | in a LPP, the solution of a variable can be made infinity large<br>without violating the constraint, the solution is<br>) Infeasible b) Unbounded<br>) Alternative d) None of the above |   |  |  |  |
|  |      | 6)     | n maximization cases, are assigned to the artificial variables<br>as their coefficients in the objective function.<br>b) +m<br>b) -m<br>c) 0 d) None of the above                       |   |  |  |  |
|  |      | 7)     | or solving an assignment problem, which method is used?<br>) Hungarian b) American<br>) German d) None  |   |  |  |  |
|  |      | 8)     | IODI method is used to obtain)Optimal solutions)Optimality test)Optimizationd)Both a and b  |   |  |  |  |
|  | B)   |        | I questions. (2 marks each) 06  | ) |  |  |  |
|  |      | 1)     | The value of the game whose payoff matrix $\begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$ is  |   |  |  |  |
|  |      |        | b) 4<br>b) 3<br>d) -2   |   |  |  |  |

## Seat No.

Day & Date: Thursday, 12-12-2019

# B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Set

**SLR-FM-146** 

Max. Marks: 70

S

- 2) When money value changes 20% a year, discount factor for the second year is \_\_\_\_\_.
  - a) 1 b) 0.833

a)

- c) d) 0.6944 zero
- In the PERT network, distribution of the project completion time is 3) assumed to follow \_\_\_\_\_. Beta distribution
  - b) Poisson distribution

**SLR-FM-146** 

Set S

C) Normal distribution d) **Binomial distribution** 

## Seat No.

### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Day & Date: Thursday, 12-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

Q.2 a) Seven jobs are to be processed on two machines A & B in order AB. Each machine can process only one job at a time. The processing time in hrs are given below. Find the optimal sequence & idle time of each machine.

| Job       | 1  | 2  | 3  | 4 | 5  | 6 | 7  |
|-----------|----|----|----|---|----|---|----|
| Machine A | 10 | 12 | 13 | 7 | 14 | 5 | 16 |
| Machine B | 15 | 11 | 8  | 9 | 6  | 7 | 16 |

b) Solve the following LPP by Simplex method Minimize  $Z = X_1 - 3X_2 + 2 X_3$ subject to  $3X_1 - X_2 + 3 X_3 \le 7$ 

$$-2 X_1 + 4 X_2 \le 12$$
  
-4X<sub>1</sub> + 3 X<sub>2</sub> + 8 X<sub>3</sub> \le 10  
X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub> \ge 0

- **Q.3 a)** Explain the mathematical formulation of transportation model.
  - b) Five operators have to be assigned to five machines. The assignment costs are given in the table below. Operator A cannot operate Machine III & C cannot operate Machine IV. Find the optimal assignment.

| Operators /<br>Machines | Ι | П | Ш | IV | V |  |  |
|-------------------------|---|---|---|----|---|--|--|
| А                       | 5 | 5 | - | 2  | 6 |  |  |
| В                       | 7 | 4 | 2 | 3  | 4 |  |  |
| С                       | 9 | 3 | 5 | -  | 3 |  |  |
| D                       | 7 | 2 | 6 | 7  | 2 |  |  |
| E                       | 6 | 5 | 7 | 9  | 1 |  |  |

Find the optimum assignment of Job to machines so as to minimize total cost.

- **Q.4 a)** Write in brief applications of OR.
  - **b)** Explain the sensitivity analysis in LPP.
  - c) Determine the IBFS to the following transportation problem by
    - 1) Matrix minima method
    - 2) VAM

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| O1     | 1  | 2  | 1  | 4  | 30     |
| O2     | 3  | 3  | 2  | 1  | 50     |
| O3     | 4  | 2  | 5  | 9  | 20     |
| Demand | 20 | 40 | 30 | 10 |        |

Max. Marks: 56

Set

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Set S

| Q.5 | a) | Solve the following game by graphical method. |
|-----|----|---|
|     |    | Dlover P                                      |

|          |                |                      | Player B |       |       |  |
|----------|----------------|----------------------|----------|-------|-------|--|
|          |                | B <sub>1</sub>       | $B_2$    | $B_3$ | $B_4$ |  |
| Player A | A <sub>1</sub> | -5                   | 5        | 0     | 8     |  |
|          | $A_2$          | 8                    | -4       | -1    | -5    |  |
|          |                | والمرابع مرابع مرابع |          |       |       |  |

**b)** Solve the game by the principle of dominance.

|          |                | Player B       |                |                |                |
|----------|----------------|----------------|----------------|----------------|----------------|
|          |                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> |
|          | $A_1$          | 4              | 2              | 3              | 6              |
| Player A | A <sub>2</sub> | 3              | 4              | 7              | 5              |
|          | A <sub>3</sub> | 4              | 1              | 2              | 3              |
|          | $A_4$          | 6              | 3              | 5              | 4              |

**Q.6 a)** The maintenance costs and the resale price of a machine whose purchase price is Rs.10,000 are given as follows:

| Year  | 1     | 2     | 3     | 4     | 5     | 6     | 7     |
|---|-------|-------|-------|-------|-------|-------|-------|
| Maintenance Cost                                | 1,500 | 1,900 | 2,300 | 2,900 | 3,600 | 4,500 | 5,500 |
| (Rs.)   |       |       |       |       |       |       |       |
| Resale Value (Rs.)                              | 5,000 | 2,500 | 1,250 | 600   | 400   | 400   | 400   |
| What is the optimal period for the replacement? |       |       |       |       |       |       |       |

b) Explain the basic EOQ model in the inventory control.

c) Differentiate between CPM & PERT.

#### **Q.7** a) A certain project has the following data:

| Activity         | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 3-6 | 4-6 | 5-7 | 6-7 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration in week | 3   | 5   | 4   | 2   | 3   | 7   | 9   | 8   | 9   |

1) Construct the network

2) Determine project duration and critical path.

3) Find total float

**b)** Explain in detail classification of inventories.

05

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07

## Seat No. B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

FINITE ELEMENT METHOD

- 2) Figures to the right indicate full marks.
- Assume suitable data if necessary.

### MCQ/Objective Type Questions

#### Q.1 Choose the correct alternatives from the options.

- 1) Which problem area does structural analysis of a brake lever belong to?
  - a) Steady state problem c) Propagation problem
- Eigen value problem b) None of the above d)

Eigen value problem

None of above

#### 2) Which problem area does harmonic analysis of a crankshaft belong to?

- a) Steady state problem b) d)
- c) Propagation Problem
- 3) In a finite element analysis, the stiffness matrix is till boundary conditions are imposed.
  - a) Zero b) Unity
  - c) Infinite Singular d)
- 4) FDM is a numerical method which uses interpolation.
  - a) point wise areawise b)
  - c) piecewise d) all of the above
- 5) The computational technique best suited to fracture mechanics and acoustics is \_\_\_\_\_.
  - a) FEM b) **FDM**
  - c) FVM d) BEM

6) element can accept uniaxial loads only. А

- Triangular b) Axisymmetric a) Truss Beam d) c)
- 7) Which of the following is not an essential boundary condition?
  - a) Temperature Linear Displacements b)
  - c) Angular displacement d) Force
- The interpolation function for a CST element is given by \_\_\_\_ 8)
  - a)  $U = a_1 + a_2 x + a_3 y$ b)  $U = a_1 + a_2 x + a_3 x^2$
  - c)  $U = a_1 + a_2 x + a_3 x^2 + a_4 y$ d)  $U = a_1 + a_2 x + a_3 y + a_4 0 z$

#### 9) Complex elements are defined as those elements which .

- a) have higher order interpolation polynomials
- have sides parallel to coordinate system b)
- have sides parallel to coordinate system and use higher order c) interpolation polynomials
- have polynomials with only linear and constant terms d)

Marks: 14

14

Max. Marks: 70

Set

#### 10) Simplex elements are defined as those elements which \_\_\_\_\_.

- a) have higher order interpolation polynomials
- b) have sides parallel to coordinate system
- c) have sides parallel to coordinate system and use higher order interpolation polynomials
- d) have polynomials with only linear and constant terms
- 11) The value of the shape function Ni (for higher order polynomial), at nodes j & k always \_\_\_\_\_.
  - a) equals zero b) equals -1
  - c) equals 1 d) varies between -1 and 1
- 12) An element in which the order of the geometry interpolation function is same as the order of the field variable interpolation function is called \_\_\_\_\_.
  - a) Isoparametric b) Super parametric
  - c) Sub parametric d) All of the above
- 13) Improving accuracy using hp- refinement involves using \_\_\_\_
  - a) higher order elements b) higher mesh density
  - c) both of the above d)
- d) neither of the two

**SLR-FM-147** 

Set P

- 14) The modulus of elasticity matrix is referred to as the \_\_\_\_\_ matrix.
  - a) [A] c) [C]
- b) [B] d) [D]

### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHOD

Day & Date: Saturday,14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

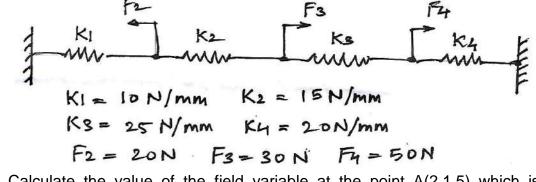
2) Figures to the right indicate full marks

3) Assume suitable data if necessary.

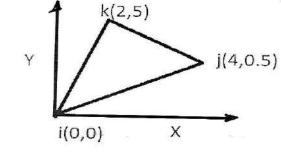
#### Section – I

#### Q.2 Attempt any one.

a) Solve for all unknowns. These are all primary and secondary field variables, and reactions.



**b)** Calculate the value of the field variable at the point A(2,1.5) which is located inside the triangle shown in the figure. The nodal values for the field variable are Ui = 40, Uj = 34, Uk = 46.



#### Q.3 Attempt any four.

- a) List the various steps in preprocessing stage of FEA simulation.
- **b)** List the nodal degrees of freedom and the associated force actions for common 2D truss, 3D beam, 2D LST and 2D Quadrilateral elements.
- c) Discuss types of 3<sup>,</sup>D elements in term of DOF. behavior and order of polynomial.
- **d)** Using Lagrange polynomials write down the shape functions for a 1D cubic truss element.
- e) What are the properties of the stiffness matrix?

16

12

Set P

SLR-FM-147

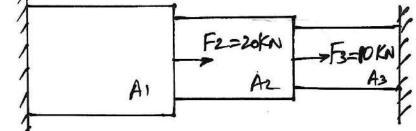


# SLR-FM-147 Set P

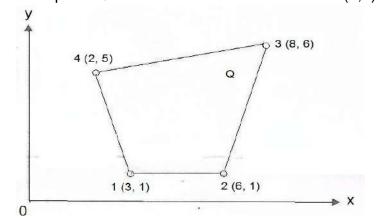
12

## Q.4 Attempt any one.

a) Solve the following problem for all unknowns. Impose the boundary conditions using the penalty method.  $A_1=900 \text{ mm}^2$ ,  $A_2=400 \text{ mm}^2$ ,  $A_3=200 \text{ mm}^2$   $L_1=80 \text{ mm}$ ,  $L_2=80 \text{ mm}$ ,  $L_3=70 \text{ mm}$   $E_1=70 \text{ GPa}$ ,  $E_2=105 \text{ GPa}$ ,  $E_3=200 \text{ GPa}$  $F_2=20 \text{ kN}$ ,  $F_3=10 \text{ KN}$ 



**b)** What are isoparametric elements? List their advantages. For the isoparametric element shown in the figure determine local coordinates of the point Q which has cartesian coordinates (7,4)



### Q.5 Attempt any four.

- a) What do understand by the term model validity?
- b) Sketch problems showing the plane stress, plane strain and axis symmetry conditions.
- c) What is convergence study? Why is it necessary to do a convergence study in FEA?
- d) Compare static and dynamic finite element analysis procedures.
- e) Why do all software still provide linear elements even though it's a known fact that they arc not accurate?

|     |  | 3) Assume suitable data if necessary.  |
|-----|--|--|
|     |  | MCQ/Objective Type Questions   |
| ura | tion: 3  | ) Minutes Marks: 14  |
| .1  | <b>Choo</b><br>1)  | se the correct alternatives from the options.<br>The interpolation function for a CST element is given by<br>a) $U = a_1 + a_2x + a_3y$ b) $U = a_1 + a_2x + a_3x^2$<br>c) $U = a_1 + a_2x + a_3x^2 + a_4y$ d) $U = a_1 + a_2x + a_3y + a40z$  |
|     | 2)   | <ul> <li>Complex elements are defined as those elements which</li> <li>a) have higher order interpolation polynomials</li> <li>b) have sides parallel to coordinate system</li> <li>c) have sides parallel to coordinate system and use higher order interpolation polynomials</li> <li>d) have polynomials with only linear and constant terms</li> </ul> |
|     | <ul> <li>Simplex elements are defined as those elements which</li> <li>a) have higher order interpolation polynomials</li> <li>b) have sides parallel to coordinate system</li> <li>c) have sides parallel to coordinate system and use higher order interpolation polynomials</li> <li>d) have polynomials with only linear and constant terms</li> </ul> |  |
|     | 4)   | The value of the shape function Ni (for higher order polynomial), at nodes<br>j & k always<br>a) equals zero b) equals -1  |
|     |  | c) equals 1 d) varies between -1 and 1   |
|     | 5)   | An element in which the order of the geometry interpolation function is same asthe order of the field variable interpolation function is calleda) Isoparametricb) Super parametricc) Sub parametricd) All of the above   |
|     | 6)   | Improving accuracy using hp- refinement involves using<br>a) higher order elements b) higher mesh density<br>c) both of the above d) neither of the two  |
|     | 7)   | The modulus of elasticity matrix is referred to as the matrix.<br>a) [A] b) [B]<br>c) [C] d) [D]   |
|     | 8)   | Which problem area does structural analysis of a brake lever belong to?<br>a) Steady state problem b) Eigen value problem  |

## Seat No.

#### B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** FINITE ELEMENT METHOD

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

Du

#### Q.'

- a) Steady state problem c) Propagation problem
- b) Eigen value problem d) None of the above

# **SLR-FM-147**

Set

Max. Marks: 70



Q

- 9) Which problem area does harmonic analysis of a crankshaft belong to?
  - a) Steady state problem
- b) Eigen value problem

Set Q

- c) Propagation Problem
- d) None of above
- 10) In a finite element analysis, the stiffness matrix is \_\_\_\_\_ till boundary conditions are imposed.
  - a) Zero b) Unity c) Infinite
    - d) Singular
- 11) FDM is a numerical method which uses interpolation.
  - point wise areawise a) b)
  - all of the above c) piecewise d)
- 12) The computational technique best suited to fracture mechanics and acoustics is
  - a) FEM b) FDM
  - c) FVM d) BEM
- A element can accept uniaxial loads only. 13) a) Triangular
  - Axisymmetric b)
  - c) Beam d) Truss
- 14) Which of the following is not an essential boundary condition?
  - Temperature a)

c)

Angular displacement

- Linear Displacements b)
- d) Force

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHOD

Day & Date: Saturday,14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

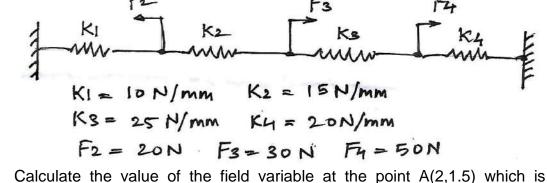
2) Figures to the right indicate full marks

3) Assume suitable data if necessary.

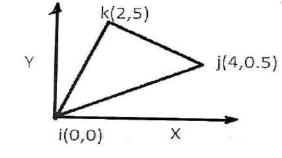
#### Section – I

#### Q.2 Attempt any one.

a) Solve for all unknowns. These are all primary and secondary field variables, and reactions.



**b)** Calculate the value of the field variable at the point A(2,1.5) which is located inside the triangle shown in the figure. The nodal values for the field variable are Ui = 40, Uj = 34, Uk = 46.



#### Q.3 Attempt any four.

- a) List the various steps in preprocessing stage of FEA simulation.
- **b)** List the nodal degrees of freedom and the associated force actions for common 2D truss, 3D beam, 2D LST and 2D Quadrilateral elements.
- c) Discuss types of 3<sup>,</sup>D elements in term of DOF. behavior and order of polynomial.
- **d)** Using Lagrange polynomials write down the shape functions for a 1D cubic truss element.
- e) What are the properties of the stiffness matrix?

16

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SLR-FM-147

Set Q

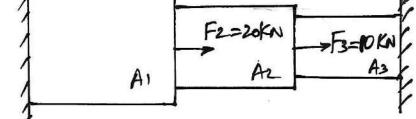
Max. Marks: 56

# SLR-FM-147 Set Q

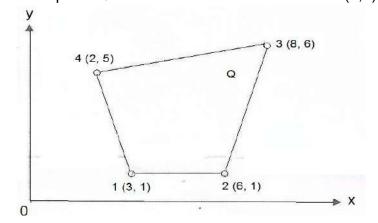
12

## Q.4 Attempt any one.

 a) Solve the following problem for all unknowns. Impose the boundary conditions using the penalty method. A<sub>1</sub>=900 mm<sup>2</sup>, A<sub>2</sub>=400 mm<sup>2</sup>, A<sub>3</sub>=200 mm<sup>2</sup> L<sub>1</sub>=80 mm, L<sub>2</sub>=80 mm, L<sub>3</sub>=70 mm E<sub>1</sub>=70 GPa, E<sub>2</sub>=105 GPa, E<sub>3</sub>=200 GPa F<sub>2</sub>=20 kN, F<sub>3</sub>=10 KN



**b)** What are isoparametric elements? List their advantages. For the isoparametric element shown in the figure determine local coordinates of the point Q which has cartesian coordinates (7,4)



#### Q.5 Attempt any four.

- a) What do understand by the term model validity?
- b) Sketch problems showing the plane stress, plane strain and axis symmetry conditions.
- c) What is convergence study? Why is it necessary to do a convergence study in FEA?
- d) Compare static and dynamic finite element analysis procedures.
- e) Why do all software still provide linear elements even though it's a known fact that they arc not accurate?

| d) | interpolation polynomials<br>have polynomials with only linear and constant terms |        |                                  |                          |  |  |  |  |
|----|---|--------|----------------------------------|--------------------------|--|--|--|--|
|    | e value of the shape function Ni (f<br>k always                                   | or hig | gher order polynomial), at nodes |                          |  |  |  |  |
| a) | equals zero   | b)     | equals -1                        |                          |  |  |  |  |
| c) | equals 1  | d)     | varies between -1 and 1          |                          |  |  |  |  |
|    |   |        |                                  |                          |  |  |  |  |
|    |   |        |                                  |                          |  |  |  |  |
|    |   |        |                                  |                          |  |  |  |  |
|    |   |        | Ра                               | ge <b>9</b> of <b>16</b> |  |  |  |  |
|    |   |        |                                  | •                        |  |  |  |  |

B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** 

# FINITE ELEMENT METHOD

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- Assume suitable data if necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options.

- 1) The computational technique best suited to fracture mechanics and acoustics is .
  - a) FEM b) FDM
  - c) FVM d) BEM
- 2) element can accept uniaxial loads only. Α
  - a) Triangular b) Axisymmetric
  - Beam d) Truss C)

#### Which of the following is not an essential boundary condition? 3)

- Linear Displacements a) Temperature b)
- Angular displacement d) Force c)
- The interpolation function for a CST element is given by \_\_\_\_ 4)
  - $U = a_1 + a_2 x + a_3 x^2$ a)  $U = a_1 + a_2 x + a_3 y$ b)
  - c)  $U = a_1 + a_2 x + a_3 x^2 + a_4 y$ d)  $U = a_1 + a_2 x + a_3 y + a_4 0 z$

#### 5) Complex elements are defined as those elements which \_\_\_\_\_.

- a) have higher order interpolation polynomials
- have sides parallel to coordinate system b)
- c) have sides parallel to coordinate system and use higher order interpolation polynomials
- d) have polynomials with only linear and constant terms
- 6) Simplex elements are defined as those elements which \_\_\_\_\_.
  - have higher order interpolation polynomials a)
  - have sides parallel to coordinate system b)

- have sides parallel to coordinate system and use higher order c) interpolat
- have poly d)

#### The value of t 7) j & k always \_

14

Marks: 14

Max. Marks: 70

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|     |  | <b>SLR-FM-147</b>   |
|-----|--|---|
|     |  | Set R   |
| 8)  | , <b>,</b> ,   |   |
| 9)  | Improving accuracy using hp- refinement inverse<br>a) higher order elements b) high<br>c) both of the above d) ne  |   |
| 10) | ) The modulus of elasticity matrix is referred to<br>a) [A] b) [B<br>c) [C] d) [D  | ]   |
| 11) | <ul> <li>Which problem area does structural analysis</li> <li>a) Steady state problem</li> <li>b) Ei</li> <li>c) Propagation problem</li> <li>d) No</li> </ul> | gen value problem   |
| 12) | a) Steady state problem b) Ei  | of a crankshaft belong to?<br>gen value problem<br>one of above |
| 13) | conditions are imposed.<br>a) Zero b) Ui   | rix is till boundary<br>nity<br>ngular                          |
| 14) | ,  | interpolation.<br>eawise  |

c) piecewise d) all of the above

| Seat |  |
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## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHOD

Day & Date: Saturday,14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

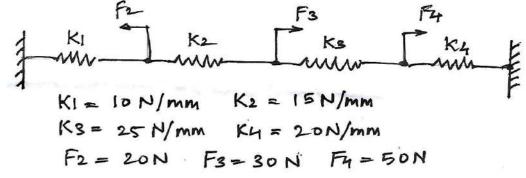
2) Figures to the right indicate full marks

3) Assume suitable data if necessary.

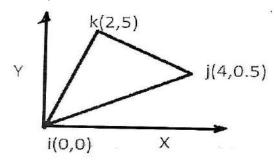
#### Section – I

#### Q.2 Attempt any one.

a) Solve for all unknowns. These are all primary and secondary field variables, and reactions.



**b)** Calculate the value of the field variable at the point A(2,1.5) which is located inside the triangle shown in the figure. The nodal values for the field variable are Ui = 40, Uj = 34, Uk = 46.



#### Q.3 Attempt any four.

- a) List the various steps in preprocessing stage of FEA simulation.
- **b)** List the nodal degrees of freedom and the associated force actions for common 2D truss, 3D beam, 2D LST and 2D Quadrilateral elements.
- c) Discuss types of 3<sup>,</sup>D elements in term of DOF. behavior and order of polynomial.
- **d)** Using Lagrange polynomials write down the shape functions for a 1D cubic truss element.
- e) What are the properties of the stiffness matrix?

16

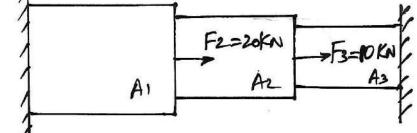
12

Set R

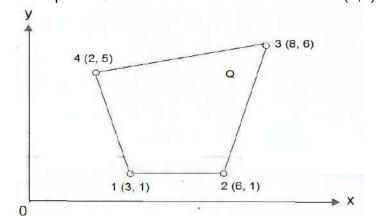
Max. Marks: 56

#### Q.4 Attempt any one.

a) Solve the following problem for all unknowns. Impose the boundary conditions using the penalty method.  $A_1=900 \text{ mm}^2$ ,  $A_2=400 \text{ mm}^2$ ,  $A_3=200 \text{ mm}^2$   $L_1=80 \text{ mm}$ ,  $L_2=80 \text{ mm}$ ,  $L_3=70 \text{ mm}$   $E_1=70 \text{ GPa}$ ,  $E_2=105 \text{ GPa}$ ,  $E_3=200 \text{ GPa}$  $F_2=20 \text{ kN}$ ,  $F_3=10 \text{ KN}$ 



**b)** What are isoparametric elements? List their advantages. For the isoparametric element shown in the figure determine local coordinates of the point Q which has cartesian coordinates (7,4)



#### Q.5 Attempt any four.

- a) What do understand by the term model validity?
- b) Sketch problems showing the plane stress, plane strain and axis symmetry conditions.
- c) What is convergence study? Why is it necessary to do a convergence study in FEA?
- d) Compare static and dynamic finite element analysis procedures.
- e) Why do all software still provide linear elements even though it's a known fact that they arc not accurate?

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SLR-FM-147

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| Seat |  |
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#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** FINITE ELEMENT METHOD

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options.

- Simplex elements are defined as those elements which . 1)
  - a) have higher order interpolation polynomials
  - have sides parallel to coordinate system b)
  - have sides parallel to coordinate system and use higher order C) interpolation polynomials
  - have polynomials with only linear and constant terms d)
- 2) The value of the shape function Ni (for higher order polynomial), at nodes j & k always \_\_\_
  - a) equals zero b) equals -1
  - c) equals 1 varies between -1 and 1 d)
- 3) An element in which the order of the geometry interpolation function is same as the order of the field variable interpolation function is called \_
  - a) Isoparametric b) Super parametric
  - All of the above c) Sub parametric d)
- 4) Improving accuracy using hp- refinement involves using \_ b) higher mesh density
  - a) higher order elements
  - c) both of the above d) neither of the two
- The modulus of elasticity matrix is referred to as the \_\_\_\_\_ matrix. 5)
  - a) [A] b) [B] c) [C] d) [D]
- 6) Which problem area does structural analysis of a brake lever belong to?
  - Steady state problem Eigen value problem b) a)
  - Propagation problem None of the above d) c)
- Which problem area does harmonic analysis of a crankshaft belong to? 7)
  - a) Steady state problem c) Propagation Problem
- Eigen value problem b) d) None of above
- In a finite element analysis, the stiffness matrix is \_\_\_\_\_ till boundary 8) conditions are imposed.
  - a) Zero Unitv b) Infinite Singular C) d)



Max. Marks: 70

Marks: 14

9) FDM is a numerical method which uses \_\_\_\_\_ interpolation.

- a) point wise
- b) areawise

**SLR-FM-147** 

Set S

- c) piecewise d) all of the above
- 10) The computational technique best suited to fracture mechanics and acoustics is \_\_\_\_\_.
  - a) FEM b) FDM
  - c) FVM d) BEM

11) A \_\_\_\_\_\_ element can accept uniaxial loads only.

- a) Triangular b) Axisymmetric
- c) Beam d) Truss
- 12) Which of the following is not an essential boundary condition?
  - a) Temperature b) Linear Displacements
  - c) Angular displacement d) Force
- 13) The interpolation function for a CST element is given by \_\_\_\_\_
  - a)  $U = a_1 + a_2 x + a_3 y$  b)  $U = a_1 + a_2 x + a_3 x^2$
  - c)  $U = a_1 + a_2 x + a_3 x^2 + a_4 y$  d)  $U = a_1 + a_2 x + a_3 y + a_4 0 z$
- 14) Complex elements are defined as those elements which \_\_\_\_\_.
  - a) have higher order interpolation polynomials
  - b) have sides parallel to coordinate system
  - c) have sides parallel to coordinate system and use higher order interpolation polynomials
  - d) have polynomials with only linear and constant terms

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHOD

Day & Date: Saturday,14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

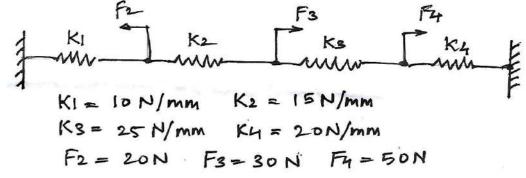
2) Figures to the right indicate full marks

3) Assume suitable data if necessary.

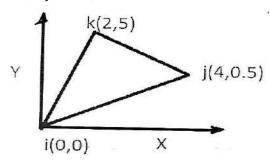
#### Section – I

#### Q.2 Attempt any one.

a) Solve for all unknowns. These are all primary and secondary field variables, and reactions.



**b)** Calculate the value of the field variable at the point A(2,1.5) which is located inside the triangle shown in the figure. The nodal values for the field variable are Ui = 40, Uj = 34, Uk = 46.



#### Q.3 Attempt any four.

- a) List the various steps in preprocessing stage of FEA simulation.
- **b)** List the nodal degrees of freedom and the associated force actions for common 2D truss, 3D beam, 2D LST and 2D Quadrilateral elements.
- c) Discuss types of 3<sup>,</sup>D elements in term of DOF. behavior and order of polynomial.
- **d)** Using Lagrange polynomials write down the shape functions for a 1D cubic truss element.
- e) What are the properties of the stiffness matrix?

16

12

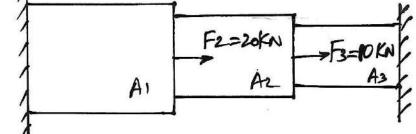
Set S

Max. Marks: 56

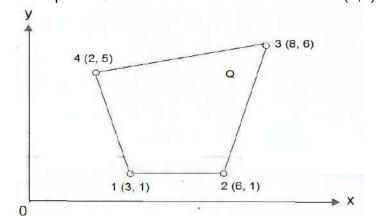
#### Section – II

#### Q.4 Attempt any one.

a) Solve the following problem for all unknowns. Impose the boundary conditions using the penalty method.  $A_1=900 \text{ mm}^2$ ,  $A_2=400 \text{ mm}^2$ ,  $A_3=200 \text{ mm}^2$   $L_1=80 \text{ mm}$ ,  $L_2=80 \text{ mm}$ ,  $L_3=70 \text{ mm}$   $E_1=70 \text{ GPa}$ ,  $E_2=105 \text{ GPa}$ ,  $E_3=200 \text{ GPa}$  $F_2=20 \text{ kN}$ ,  $F_3=10 \text{ KN}$ 



**b)** What are isoparametric elements? List their advantages. For the isoparametric element shown in the figure determine local coordinates of the point Q which has cartesian coordinates (7,4)



#### Q.5 Attempt any four.

- a) What do understand by the term model validity?
- **b)** Sketch problems showing the plane stress, plane strain and axis symmetry conditions.
- c) What is convergence study? Why is it necessary to do a convergence study in FEA?
- d) Compare static and dynamic finite element analysis procedures.
- e) Why do all software still provide linear elements even though it's a known fact that they arc not accurate?

16

SLR-FM-147

Set

| B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 |   |          |   |  |  |  |  |
|---|---|----------|---|--|--|--|--|
|   | Mechanical Engineering<br>PRODUCTION AND OPERATIONAL MANAGEMENT   |          |   |  |  |  |  |
|   | Day & Date: Saturday, 14-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70   |          |   |  |  |  |  |
| Instructi   | ons: 1) Q. No. 1 is compulsory and sh<br>book.  | nould    | be solved in first 30 minutes in answer             |  |  |  |  |
|   | <ul><li>2) Figures to the right indicate fu</li><li>3) Assume suitable data if neces</li></ul>  |          | rks.  |  |  |  |  |
|   | MCQ/Objective 1   | Гуре     |   |  |  |  |  |
|   | 30 Minutes  |          | Marks: 14   |  |  |  |  |
| Q.1 Ch<br>1)  | oose the correct alternatives from to<br>Aggregate planning is capacity pla   |          |   |  |  |  |  |
| .,  | <ul><li>a) The long range</li><li>c) The short range</li></ul>  | -        | The intermediate range<br>None of above             |  |  |  |  |
| 2)  | Bill Of material is a sub sequencing  | · .      |   |  |  |  |  |
|   | a) MPS<br>c) Line balancing   | b)<br>d) | Dispatching<br>Routing                              |  |  |  |  |
| 3)  | In value engineering, the term valu a) Manufacturing cost of the proc   |          | ers to  |  |  |  |  |
|   | <ul> <li>b) Selling price of the product</li> <li>c) Total cost of the product</li> <li>d) Utility of the product</li> </ul>  |          |   |  |  |  |  |
| 4)  | SIX SIGMA Means<br>a)  3.6 PPM<br>c)  3.4 PPM   | b)<br>d) | 4.3 PPM<br>6.3 PPM                                  |  |  |  |  |
| 5)  | One of the major outputs of MRP is  | ,        |   |  |  |  |  |
| ,   | <ul><li>a) Actual planned order release</li><li>c) Bill of material</li></ul>   |          | Master production schedule<br>Inventory status file |  |  |  |  |
| 6)  | Loading may be defined as<br>a) Sending the raw material to the<br>b) Sending the finished material t<br>c) Assign the work to the facilities<br>d) Uploading a software in machi | o the    | store   |  |  |  |  |
| 7)  | JIT is targeted for<br>a) Average inventory<br>c) High inventory  | b)<br>d) | Zero inventory<br>None of Above                     |  |  |  |  |
| 8)  | Aggregate planners attempt to bala  |          |   |  |  |  |  |
|   | <ul><li>a) demand and inventories</li><li>c) capacity and costs</li></ul>   | b)<br>d) | demand and costs<br>capacity and demand             |  |  |  |  |
| 9)  | The Kanban system uses ca   |          | 3   |  |  |  |  |
|   | a) 2<br>c) 4  | b)<br>d) | 3<br>5  |  |  |  |  |

c) 4 d) 5

Seat

No.

# **SLR-FM-148**

Set P

10) The length of time between placing an order and receipt of material is called as \_\_\_\_\_.

- a) Order time
- c) Cycle time

- b) Lead time
- d) Process time

b)

- 11) Penalty cost is included in \_\_\_\_\_.
  - a) Shortage cost
  - c) Holding cost d) None of above
- In regards to maintenance, breakdown maintenance is\_\_\_\_\_, while 12) preventive maintenance is \_\_\_\_\_.
  - a) proactive; cheaper
  - c) reactive; proactive d)
- b) cheaper; reactive

Ordering cost

- none of these
- Which of the following is not a type of judgmental forecasting? 13)
  - a) executive opinions b) sales force opinions d) time series analysis
  - c) consumer surveys
- TPM Means 14)
  - a) Total product management
  - c) Total production management

.

- Total process management b)
- d) Total productive maintenance

**SLR-FM-148** 

Set P

| Seat |  |
|------|--|
| No.  |  |

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** PRODUCTION AND OPERATIONAL MANAGEMENT

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

Instructions: 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

Q.2 a) Define production & operations management. Explain the objective and 07 scope production management in detail. b) Explain various types of errors in forecasting. 07 Q.3 a) Explain Aggregate Planning. 07 b) There are six jobs to be processed on machine A & B in the order of AB. 07 processing time in minutes are given below. Job 2 1 3 6 4 5 Machine A 5 2 13 10 8 12 Machine B

> Determine the sequence of the jobs that will minimize the total elapsed time. Calculate total elapsed time & idle time on Machine B if any.

1

9

11

14

#### Q.4 Write short notes (Any two)

a) Explain various factors influencing capacity.

3

4

- b) Explain Delphi Technique.
- c) Routing & Scheduling in PPC.

#### Section – II

| Q.5 | a)<br>b) | Explain objectives of inventory & different types of inventory.<br>Explain various cost associated with inventory. | 07<br>07 |
|-----|----------|--|----------|
| Q.6 | a)       | What are functions of maintenance department? Explain Preventive & Breakdown Maintenance.                          | 07       |
|     | b)       | Explain Just In Time in detail.  | 07       |
| Q.7 | Wr<br>a) | ite short notes (Any two)<br>Various phases of value analysis  | 14       |

- b) TPM
- Six Sigma C)



|   |         |                                      | 14-12-2019  | 4110             | Max. Marks: 70   |
|---|---------|--------------------------------------|---|------------------|--|
|   |         |                                      |   | ould b           | be solved in first 30 minutes in answer                              |
|   |         | book.<br>2) Figure                   |   | ll mar           |  |
| Duro  | lion: 2 | ) Minutes                            | MCQ/Objective T   | уре              | Questions<br>Marks: 14   |
|   |         |                                      | reat alternatives from t                                  | he em            |  |
| Q.1   | 1)      | Aggregate                            | rect alternatives from t<br>planners attempt to bala      | ince _           |  |
|   |         | a) demar<br>c) capaci                | nd and inventories ty and costs                           | b)<br>d)         | demand and costs<br>capacity and demand                              |
|   | 2)      |                                      | in system uses ca   |                  |  |
|   |         | a) 2<br>c) 4                         |   | b)<br>d)         |  |
|   | 3)      | ,                                    |   | ,                | der and receipt of material is                                       |
|   |         | a) Order<br>c) Cycle                 | time  | ,                | Lead time<br>Process time  |
|   | 4)      | Penalty co<br>a) Shorta<br>c) Holdin | •   | b)<br>d)         | Ordering cost<br>None of above                                       |
| 5) In regards to maintenance, breakdown maintenance is, while preventive maintenance is |         |                                      | aintenance is, while                                      |                  |  |
|   |         | , <b>.</b>                           | ive; cheaper<br>re; proactive                             | ,                | •  |
|   | 6)      | a) execut                            | ne following is not a type<br>ive opinions<br>mer surveys | -                | gmental forecasting?<br>sales force opinions<br>time series analysis |
|   | 7)      | , .                                  | ns<br>product management<br>production management         | b)<br>d)         | Total process management<br>Total productive maintenance             |
|   | 8)      | a) The lo                            | planning is capacity plar<br>ng range<br>nort range       | -                | for:<br>The intermediate range<br>None of above                      |
|   | 9)      | a) MPS                               | erial is a sub sequencing<br>alancing                     | ) of<br>b)<br>d) | <br>Dispatching<br>Routing   |

# Seat

No.

# B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering PRODUCTION AND OPERATIONAL MANAGEMENT

**SLR-FM-148** 

Set Q

- 10) In value engineering, the term value refers to \_\_\_\_\_.
  - a) Manufacturing cost of the product
  - b) Selling price of the product
  - c) Total cost of the product
  - d) Utility of the product
- 11) SIX SIGMA Means \_\_\_\_\_.
  - a) 3.6 PPMc) 3.4 PPM

- b) 4.3 PPM
- d) 6.3 PPM
- 12) One of the major outputs of MRP is \_
  - a) Actual planned order release
- b) Master production schedule

Set Q

- c) Bill of material
- d) Inventory status file
- 13) Loading may be defined as \_\_\_\_
  - a) Sending the raw material to the machine
  - b) Sending the finished material to the store
  - c) Assign the work to the facilities
  - d) Uploading a software in machine control panel

\_.

- 14) JIT is targeted for \_\_\_\_
  - a) Average inventory
  - c) High inventory

- b) Zero inventory
- d) None of Above

| Seat |  |
|------|--|
| No.  |  |

Q.2

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** PRODUCTION AND OPERATIONAL MANAGEMENT

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

Instructions: 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

a) Define production & operations management. Explain the objective and scope production management in detail. b) Explain various types of errors in forecasting. 07 Q.3 a) Explain Aggregate Planning. 07 b) There are six jobs to be processed on machine A & B in the order of AB. 07 processing time in minutes are given below. Job 2 1 3 6 4 5 Machine A 5 2 13 10 8 12 Machine B 4 3 14 1 9 11

Determine the sequence of the jobs that will minimize the total elapsed time. Calculate total elapsed time & idle time on Machine B if any.

#### Q.4 Write short notes (Any two)

- a) Explain various factors influencing capacity.
- b) Explain Delphi Technique.
- c) Routing & Scheduling in PPC.

#### Section – II

| Q.5 | a)<br>b) | Explain objectives of inventory & different types of inventory.<br>Explain various cost associated with inventory. | 07<br>07 |
|-----|----------|--|----------|
| Q.6 | a)       | What are functions of maintenance department? Explain Preventive & Breakdown Maintenance.                          | 07       |
|     | b)       | Explain Just In Time in detail.  | 07       |
| Q.7 | Wr<br>a) | <b>ite short notes (Any two)</b><br>Various phases of value analysis   | 14       |

- b) TPM
- c) Six Sigma



14

| Time  | . 02.30 |  |   |
|-------|---------|--|---|
| Instr | uctior  | ns: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.   |   |
|       |         | <ul><li>2) Figures to the right indicate full marks.</li><li>3) Assume suitable data if necessary.</li></ul>   |   |
|       |         | MCQ/Objective Type Questions   |   |
| Dura  | tion: 3 | 0 Minutes Marks: 14  | 4 |
| Q.1   | Choo    | ose the correct alternatives from the options. 14  | 4 |
|       | 1)      | One of the major outputs of MRP is   |   |
|       |         | <ul><li>a) Actual planned order release</li><li>b) Master production schedule</li><li>c) Bill of material</li><li>d) Inventory status file</li></ul> |   |
|       | 2)      | Loading may be defined as  |   |
|       |         | a) Sending the raw material to the machine   |   |
|       |         | <ul><li>b) Sending the finished material to the store</li><li>c) Assign the work to the facilities</li></ul>   |   |
|       |         | d) Uploading a software in machine control panel   |   |
|       | 3)      | JIT is targeted for  |   |
|       | 5)      | a) Average inventory b) Zero inventory   |   |
|       |         | c) High inventory d) None of Above   |   |
|       | 4)      | Aggregate planners attempt to balance  |   |
|       | ,       | a) demand and inventories b) demand and costs  |   |
|       |         | c) capacity and costs d) capacity and demand   |   |
|       | 5)      | The Kanban system uses cards.  |   |
|       |         | a) 2 b) 3  |   |
|       |         | c) 4 d) 5  |   |
|       | 6)      | The length of time between placing an order and receipt of material is called as   |   |
|       |         | a) Order time b) Lead time   |   |
|       |         | c) Cycle time d) Process time  |   |
|       | 7)      | Penalty cost is included in  |   |
|       |         | a) Shortage cost b) Ordering cost  |   |
|       |         | c) Holding cost d) None of above   |   |
|       | 8)      | In regards to maintenance, breakdown maintenance is , while preventive maintenance is  |   |
|       |         | a) proactive; cheaper b) cheaper; reactive   |   |
|       |         | c) reactive; proactive d) none of these  |   |
|       | 9)      | Which of the following is not a type of judgmental forecasting?  |   |
|       |         | a) executive opinions<br>b) sales force opinions<br>d) time series analysis  |   |
|       |         |  |   |

Seat No.

## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering PRODUCTION AND OPERATIONAL MANAGEMENT

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

## **SLR-FM-148**

- c) consumer surveys
- d) time series analysis

Max. Marks: 70

Set R

- 10) TPM Means \_\_\_\_\_.
  - a) Total product management
  - c) Total production management
- b) Total process management

Set R

- d) Total productive maintenance
- 11) Aggregate planning is capacity planning for:a) The long rangeb) Th
  - b) The intermediate range
  - c) The short range

c) Line balancing

- d) None of above
- 12) Bill Of material is a sub sequencing of \_
  - a) MPS

- b) Dispatchingd) Routing
- 13) In value engineering, the term value refers to \_\_\_\_\_.
  - a) Manufacturing cost of the product
  - b) Selling price of the product
  - c) Total cost of the product
  - d) Utility of the product
- 14) SIX SIGMA Means \_\_\_\_\_.
  - a) 3.6 PPM
  - c) 3.4 PPM
- b) 4.3 PPM
- d) 6.3 PPM

| Seat |  |
|------|--|
| No.  |  |

Q.2

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering PRODUCTION AND OPERATIONAL MANAGEMENT

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

a) Define production & operations management. Explain the objective and

scope production management in detail. b) Explain various types of errors in forecasting. 07 Q.3 a) Explain Aggregate Planning. 07 b) There are six jobs to be processed on machine A & B in the order of AB. 07 processing time in minutes are given below. Job 2 1 3 6 4 5 Machine A 5 2 13 10 8 12 Machine B 4 3 14 1 9 11

Determine the sequence of the jobs that will minimize the total elapsed time. Calculate total elapsed time & idle time on Machine B if any.

#### Q.4 Write short notes (Any two)

- a) Explain various factors influencing capacity.
- b) Explain Delphi Technique.
- c) Routing & Scheduling in PPC.

#### Section – II

| Q.5 | a)<br>b) | Explain objectives of inventory & different types of inventory.<br>Explain various cost associated with inventory. | 07<br>07 |
|-----|----------|--|----------|
| Q.6 | a)       | What are functions of maintenance department? Explain Preventive & Breakdown Maintenance.                          | 07       |
|     | b)       | Explain Just In Time in detail.  | 07       |
| Q.7 | Wr<br>a) | <b>ite short notes (Any two)</b><br>Various phases of value analysis   | 14       |

- b) TPM
- c) Six Sigma



14

# B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

PRODUCTION AND OPERATIONAL MANAGEMENT

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

4)

5)

7)

Seat

No.

#### Q.1 Choose the correct alternatives from the options.

- 1) The length of time between placing an order and receipt of material is called as
  - a) Order time
  - c) Cycle time
- 2) Penalty cost is included in \_\_\_\_\_. a) Shortage cost b)
  - c) Holding cost

3) In regards to maintenance, breakdown maintenance is\_\_\_\_\_, while preventive maintenance is \_\_\_\_\_.

- a) proactive; cheaper
- c) reactive; proactive
- Which of the following is not a type of judgmental forecasting?
- a) executive opinions
- c) consumer surveys
- TPM Means .
- b) Total process management
- Total product management a)
- c) Total production management d)

#### Aggregate planning is capacity planning for: 6)

- a) The long range b) The intermediate range c) The short range d)
- Bill Of material is a sub sequencing of a) MPS Dispatching b)
  - c) Line balancing d) Routing
- In value engineering, the term value refers to . 8) a) Manufacturing cost of the product
  - b) Selling price of the product
  - c) Total cost of the product

  - d) Utility of the product
- SIX SIGMA Means \_\_\_\_\_ 9)
  - a) 3.6 PPM b) 4.3 PPM c) 3.4 PPM d) 6.3 PPM

Marks: 14

14

# **SLR-FM-148**



Max. Marks: 70

- b) Lead time
- d) Process time

- Ordering cost
- d)
  - None of above
- b) cheaper; reactive
- d) none of these
- b) sales force opinions
- time series analysis d)

Page 10 of 12

- None of above
- Total productive maintenance

- 10) One of the major outputs of MRP is \_
  - a) Actual planned order release
  - c) Bill of material
- b) Master production schedule

Set S

- d) Inventory status file
- 11) Loading may be defined as \_\_\_\_\_.
  - a) Sending the raw material to the machine
  - b) Sending the finished material to the store
  - c) Assign the work to the facilities
  - d) Uploading a software in machine control panel
- JIT is targeted for \_\_\_\_\_. 12)
- Zero inventory b)
- a) Average inventory c) High inventory d) None of Above

- Aggregate planners attempt to balance 13) a) demand and inventories
  - b) demand and costs
  - c) capacity and costs d) capacity and demand
- The Kanban system uses \_\_\_\_\_ cards. 14)
  - a) 2 b) 3
  - c) 4 d) 5

| Seat |  |
|------|--|
| No.  |  |

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering PRODUCTION AND OPERATIONAL MANAGEMENT

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

Instructions: 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

Q.2 a) Define production & operations management. Explain the objective and 07 scope production management in detail. b) Explain various types of errors in forecasting. 07 Q.3 a) Explain Aggregate Planning. 07 b) There are six jobs to be processed on machine A & B in the order of AB. 07 processing time in minutes are given below. Job 2 1 3 6 4 5 Machine A 5 2 13 10 8 12 Machine B 4 3 14 1 9 11

Determine the sequence of the jobs that will minimize the total elapsed time. Calculate total elapsed time & idle time on Machine B if any.

#### Q.4 Write short notes (Any two)

- a) Explain various factors influencing capacity.
- b) Explain Delphi Technique.
- c) Routing & Scheduling in PPC.

#### Section – II

| Q.5 | a)<br>b) | Explain objectives of inventory & different types of inventory.<br>Explain various cost associated with inventory. | 07<br>07 |
|-----|----------|--|----------|
| Q.6 | a)       | What are functions of maintenance department? Explain Preventive & Breakdown Maintenance.                          | 07       |
|     | b)       | Explain Just In Time in detail.  | 07       |
| Q.7 |          | ite short notes (Any two)<br>Various phases of value analysis  | 14       |

- b) TPM
- c) Six Sigma



## Seat No.

#### B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering AUTOMOBILE ENGINEERING**

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- 2) Figures to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Use of non-programmable calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options. 1)

- The load supported by an automobile frame are
  - a) Weight of the body, passengers and cargo loads
  - b) Torque from engine and transmission
  - c) Sudden impacts from collisions
  - d) All of the mentioned
- 2) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.
  - Delivers improved cornering on dry road surfaces a)
  - b) Eliminates the need of snow tyres, tyre chains, etc
  - c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
  - d) Ensures that effective braking can be performed, even on slippery surfaces
- The force available at the contact between road and driving wheel is 3) called .
  - a) Brake power
    - b) Friction power d) Engine torque
- 4) Which of these is not a power loss which takes place between engine and driving wheel .
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss

c) Tractive effort

- d) None of the mentioned
- 5) Clutch and friction linings are to the clutch plate.
  - Riveted b) Welded a)
  - Any of the above c) Bolted d)
- 6) Transfer case is located next to the gearbox in Rear wheel drive
  - a) Four wheel drive b)
  - c) Front wheel drive All of the above d)

Set

Max. Marks: 70

Marks: 14

|     |                             |  |                   | SLR-FM-149                                |
|-----|-----------------------------|--|-------------------|---|
|     |                             |  |                   | Set P                                     |
| 7)  | a)                          | raction control system (TCS) in a<br>Vibrations on the steering whee<br>Torque that is transmitted by the<br>Engine power during acceleration<br>Stopping distance in case of em | l<br>e tyre<br>on | s to the road surface                     |
| 8)  |                             | e to Positive camber the tyre will<br>Inner side<br>Both inner and outer side  | wear<br>b)<br>d)  | on its<br>Outer side<br>None of the above |
| 9)  |                             | aight ahead recovery is achieved<br>King pin inclination<br>Oversteer  | due t<br>b)<br>d) |   |
| 10) | The<br>a)<br>c)             | e brake bleeding process remove<br>air<br>excess fluid   | es<br>b)<br>d)    | from system.<br>vacuum<br>excess pressure |
| 11) | The<br>a)<br>b)<br>c)<br>d) | e coil spring in wishbone suspens<br>two wishbones<br>upper wishbone and the cross-r<br>lower wishbone and the cross-n<br>shock absorber and the cross-n                         | nemb<br>nemb      | er<br>er                                  |
| 12) | The                         | e type of spring that can be used  | in su             | spension of automobile is                 |
|     | a)<br>c)                    | air spring<br>coil spring  | b)<br>d)          | leaf spring<br>all of above               |
| 13) | Ano<br>a)<br>c)             | other name for a stabilizer bar is<br>Sway bar<br>Panhard rod  | b)<br>d)          | <br>Strut rod<br>None of above            |
| 14) |                             | el cells convert<br>Chemical into electrical energy<br>Mechanical into electrical energ<br>Chemical into mechanical energ  | •                 |   |

c) Chemical into mechanical energyd) None of above

## Seat No. B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering AUTOMOBILE ENGINEERING

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Answer any two questions from each section.

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full mark.

#### Section – I

- Q.2 a) Draw the neat sketch of Conventional chassis layout and state function of its parts.
   b) Define the following
  - **b)** Define the following.
    - 1) Air Resistance
    - 2) Rolling Resistance
    - 3) Gradient Resistance
    - 4) Traction and Tractive effort.
  - c) What are requirements of clutch? Draw a neat sketch of Electromagnetic 04 Clutch.
- Q.3 a) A Layland truck has a gross vehicle weight of 89026 N. Engine 10 displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m. Maximum Torque 345.8 N-m at 1400 r.p.m, Rear axle ratio 6.166:1. Fourth speed reduction ratio in transmission, 1.605:1, drive line losses amount to 10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X 1.016 m) (Effective wheel diameter 0.950 m), frontal area of truck 6.95 m<sup>2</sup>. Calculate the grades which the vehicle can climb in fourth gear in still air conditions:
  - 1) At governed engine speed, and
  - 2) At speed of maximum torque, in the equation.
  - $R = KW + KaAV^{2}$ ; K = 0.014, Ka = 0.0462, where V is in km/hr.
  - **b)** Discuss necessity of differential in an Automobile.
- Q.4 a) Explain with neat sketches different types of rear axles used in an Automobile.
   b) Write notes on both with neat Sketch
   08
  - b) Write notes on both with neat Sketch1) Charging System of an Automobile
    - 2) Wiper

#### Section – II

| Q.5 a | a) | 71 55 1   | 06 |
|-------|----|---|----|
|       |    | pinion type streeing gear box with a neat sketch.                         |    |
|       | b) | Derive the equation for correct steering condition in terms of wheel base | 04 |
|       |    | and wheel track.  |    |
|       | C) | Write short notes on any one  | 04 |
|       |    | 1) Hydraulic power steering System  |    |

2) Disk Brake

Set P

SLR-FM-149

04

04

Max. Marks: 56

# SLR-FM-149 Set P

- Q.6 a) A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is travelling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when
  1) The rear wheels are braked
  2) The front wheels are braked
  - 3) All wheels are braked
  - The coefficient of friction between tyre and road may be taken as 0.6.

|     | b)<br>c) |  |          |
|-----|----------|--|----------|
| Q.7 | a)       | What are the requirements of automobile suspension system? Explain with neat sketch torsion bar type suspension used in vehicle. | 06       |
|     | b)<br>c) | Explain the concept of sprung and unsprung mass in suspension system<br>Write short notes on any one                             | 04<br>04 |

- 1) Hybrid Vehicles
- 2) Construction and working of fuel cell.

| -     |   |  |           |  |  |
|-------|---|--|-----------|--|--|
| Instr | <b>Instructions:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book. |  |           |  |  |
|       |   | <ul><li>2) Figures to the right indicates full marks.</li><li>3) Assume suitable data if necessary.</li><li>4) Use of non-programmable calculator is allowed.</li></ul>  |           |  |  |
|       |   | MCQ/Objective Type Questions   |           |  |  |
| Dura  | tion: 3   |  | Marks: 14 |  |  |
| Q.1   | Cho   | ose the correct alternatives from the options.   | 14        |  |  |
|       | 1)  | Due to Positive camber the tyre will wear on its   |           |  |  |
|       |   | a) Inner side b) Outer side  |           |  |  |
|       |   | c) Both inner and outer side d) None of the above  |           |  |  |
|       | 2)  | Straight ahead recovery is achieved due to   |           |  |  |
|       |   | a) King pin inclination b) Scrub radius  |           |  |  |
|       |   | c) Oversteer d) None of above  |           |  |  |
|       | 3)  | The brake bleeding process removes from system.  |           |  |  |
|       |   | a) air b) vacuum<br>c) excess fluid d) excess pressure   |           |  |  |
|       |   | , , , ,  |           |  |  |
|       | 4)  | <ul> <li>The coil spring in wishbone suspension is placed between the</li> <li>a) two wishbones</li> <li>b) upper wishbone and the cross-member</li> <li>c) lower wishbone and the cross-member</li> <li>d) shock absorber and the cross-member</li> </ul> |           |  |  |
|       | 5)  | The type of spring that can be used in suspension of automobile is   |           |  |  |
|       |   | a) air spring b) leaf spring   |           |  |  |
|       |   | c) coil spring d) all of above   |           |  |  |
|       | 6)  | Another name for a stabilizer bar is   |           |  |  |
|       |   | a) Sway bar b) Strut rod   |           |  |  |
|       |   | c) Panhard rod d) None of above  |           |  |  |
|       | 7)  | <ul> <li>Fuel cells convert</li> <li>a) Chemical into electrical energy</li> <li>b) Mechanical into electrical energy</li> <li>c) Chemical into mechanical energy</li> <li>d) None of above</li> </ul>   |           |  |  |
|       | 8)  | <ul> <li>The load supported by an automobile frame are</li> <li>a) Weight of the body, passengers and cargo loads</li> <li>b) Torque from engine and transmission</li> <li>c) Sudden impacts from collisions</li> <li>d) All of the mentioned</li> </ul>   |           |  |  |

B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering **AUTOMOBILE ENGINEERING** 

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

## Q.1

- d) All of the mentioned

# **SLR-FM-149**

Max. Marks: 70

Set

Q

Set C

- 9) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.
  - a) Delivers improved cornering on dry road surfaces
  - b) Eliminates the need of snow tyres, tyre chains, etc
  - c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
  - d) Ensures that effective braking can be performed, even on slippery surfaces
- 10) The force available at the contact between road and driving wheel is called \_\_\_\_\_.
  - a) Brake power

- b) Friction power
- c) Tractive effort d) Engine torque
- 11) Which of these is not a power loss which takes place between engine and driving wheel \_\_\_\_\_.
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss
  - d) None of the mentioned
- 12) Clutch and friction linings are \_\_\_\_\_ to the clutch plate.
  - a) Riveted b) Welded
  - c) Bolted d) Any of the above
- 13) Transfer case is located next to the gearbox in \_\_\_\_
  - a) Four wheel drive b) Rear wheel drive
  - c) Front wheel drive d) All of the above
- 14) A traction control system (TCS) in automobiles controls the \_\_\_\_\_.
  - a) Vibrations on the steering wheel
  - b) Torque that is transmitted by the tyres to the road surface
  - c) Engine power during acceleration
  - d) Stopping distance in case of emergency

04

## Seat No. B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Answer any two questions from each section.

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full mark.

## Section – I

AUTOMOBILE ENGINEERING

- a) Draw the neat sketch of Conventional chassis layout and state function of Q.2 06 its parts.
  - **b)** Define the following.
    - 1) Air Resistance
    - 2) Rolling Resistance
    - 3) Gradient Resistance
    - 4) Traction and Tractive effort.
  - c) What are requirements of clutch? Draw a neat sketch of Electromagnetic 04 Clutch.
- a) A Layland truck has a gross vehicle weight of 89026 N. Engine 10 Q.3 displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m. Maximum Torque 345.8 N-m at 1400 r.p.m, Rear axle ratio 6.166:1. Fourth speed reduction ratio in transmission, 1.605:1, drive line losses amount to 10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X 1.016 m) (Effective wheel diameter 0.950 m), frontal area of truck 6.95 m<sup>2</sup>. Calculate the grades which the vehicle can climb in fourth gear in still air conditions:
  - 1) At governed engine speed, and
  - 2) At speed of maximum torque, in the equation.
  - $R = KW + KaAV^{2}$ ; K = 0.014, Ka = 0.0462, where V is in km/hr.
  - b) Discuss necessity of differential in an Automobile.
- Q.4 a) Explain with neat sketches different types of rear axles used in an 06 Automobile. **08** 
  - **b)** Write notes on both with neat Sketch Charging System of an Automobile 1)
    - 2) Wiper

## Section – II

| Q.5 | a) | 71 55 1   | 06 |
|-----|----|---|----|
|     |    | pinion type streeing gear box with a neat sketch.                         |    |
|     | b) | Derive the equation for correct steering condition in terms of wheel base | 04 |
|     |    | and wheel track.  |    |
|     | C) | Write short notes on any one  | 04 |
|     |    | 1) Hydraulic power steering System  |    |

Disk Brake



Set



| Set | Q |
|-----|---|
|-----|---|

| Q.6 | a) | A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is | 06 |
|-----|----|--|----|
|     |    | travelling at 40 km/hr on a level track, determine the minimum distance in   |    |
|     |    | which the car may be stopped, when   |    |

- 1) The rear wheels are braked
- 2) The front wheels are braked
- 3) All wheels are braked
- The coefficient of friction between tyre and road may be taken as 0.6.

| <ul> <li>b) Explain with the help neat sketch working of a Pneumatic brakin</li> <li>c) Write short notes on any one         <ol> <li>Ackermann steering mechanism</li> <li>2) King pin inclination and Thrust Angle</li> </ol> </li> </ul> |          | 1) Ackermann steering mechanism  | 04<br>04 |
|---|----------|--|----------|
| Q.7   | a)       | What are the requirements of automobile suspension system? Explain with neat sketch torsion bar type suspension used in vehicle. | 06       |
|   | b)<br>c) | Explain the concept of sprung and unsprung mass in suspension system<br>Write short notes on any one                             | 04<br>04 |

- Hybrid Vehicles
   Construction and working of fuel cell.

| - /  |  | - /           |   |  |  |  |
|--|--|---------------|---|--|--|--|
| Th∉<br>a)<br>c)  | e brake bleeding process remove<br>air<br>excess fluid   | s<br>b)<br>d) | from system.<br>vacuum<br>excess pressure |  |  |  |
| a)   | e coil spring in wishbone suspens<br>two wishbones<br>upper wishbone and the cross-r<br>lower wishbone and the cross-r<br>shock absorber and the cross-r | nemb<br>nembe | er<br>er                                  |  |  |  |
| The type of spring that can be used in suspension of automobile is |  |               |   |  |  |  |
| a)<br>c)   | air spring<br>coil spring  | b)<br>d)      | leaf spring<br>all of above               |  |  |  |

No.

B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMOBILE ENGINEERING

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

7)

8)

Seat

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- 2) Figures to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Use of non-programmable calculator is allowed.

## MCQ/Objective Type Questions

## Q.1 Choose the correct alternatives from the options.

- Clutch and friction linings are \_\_\_\_\_ to the clutch plate. 1) Welded
  - a) Riveted b) c) Bolted
    - d) Any of the above
- 2) Transfer case is located next to the gearbox in \_\_\_\_\_
  - Four wheel drive Rear wheel drive b) a)
  - Front wheel drive d) All of the above c)

### A traction control system (TCS) in automobiles controls the \_\_\_\_\_. 3)

- a) Vibrations on the steering wheel
- b) Torque that is transmitted by the tyres to the road surface
- c) Engine power during acceleration
- d) Stopping distance in case of emergency

### 4) Due to Positive camber the tyre will wear on its .

- a) Inner side Outer side b)
- c) Both inner and outer side None of the above d)

Straight ahead recovery is achieved due to \_\_\_\_ 5)

- a) King pin inclination Scrub radius b)
- c) Oversteer d) None of above
- 6) The bra
  - a) air
  - C)
  - exc

**SLR-FM-149** 

Set R

Max. Marks: 70

Marks: 14

SLR-FM-149 Set R

- 9) Another name for a stabilizer bar is \_\_\_\_
  - a) Sway bar

b) Strut rod

c) Panhard rod

- d) Strut rodd) None of above
- d) N
- 10) Fuel cells convert \_\_\_\_
  - a) Chemical into electrical energy
  - b) Mechanical into electrical energy
  - c) Chemical into mechanical energy
  - d) None of above
- 11) The load supported by an automobile frame are \_\_\_\_\_
  - a) Weight of the body, passengers and cargo loads
  - b) Torque from engine and transmission
  - c) Sudden impacts from collisions
  - d) All of the mentioned
- 12) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.
  - a) Delivers improved cornering on dry road surfaces
  - b) Eliminates the need of snow tyres, tyre chains, etc
  - c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
  - d) Ensures that effective braking can be performed, even on slippery surfaces
- 13) The force available at the contact between road and driving wheel is called \_\_\_\_\_.
  - a) Brake power b) Friction power
    - Tractive effort d)
- Í) Engine torque
- 14) Which of these is not a power loss which takes place between engine and driving wheel \_\_\_\_\_.
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss

C)

d) None of the mentioned

04

## Seat No.

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMOBILE ENGINEERING

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Answer any two questions from each section.

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full mark.

## Section – I

- a) Draw the neat sketch of Conventional chassis layout and state function of Q.2 06 its parts. 04
  - **b)** Define the following.
    - 1) Air Resistance
    - 2) Rolling Resistance
    - 3) Gradient Resistance
    - 4) Traction and Tractive effort.
  - c) What are requirements of clutch? Draw a neat sketch of Electromagnetic 04 Clutch.
- a) A Layland truck has a gross vehicle weight of 89026 N. Engine 10 Q.3 displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m. Maximum Torque 345.8 N-m at 1400 r.p.m, Rear axle ratio 6.166:1. Fourth speed reduction ratio in transmission, 1.605:1, drive line losses amount to 10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X 1.016 m) (Effective wheel diameter 0.950 m), frontal area of truck 6.95 m<sup>2</sup>. Calculate the grades which the vehicle can climb in fourth gear in still air conditions:
  - 1) At governed engine speed, and
  - 2) At speed of maximum torque, in the equation.
  - $R = KW + KaAV^{2}$ ; K = 0.014, Ka = 0.0462, where V is in km/hr.
  - b) Discuss necessity of differential in an Automobile.
- Q.4 a) Explain with neat sketches different types of rear axles used in an 06 Automobile. **08** 
  - **b)** Write notes on both with neat Sketch Charging System of an Automobile 1)
    - 2) Wiper

## Section – II

| Q.5 | a) | 71 55 1   | 06 |
|-----|----|---|----|
|     |    | pinion type streeing gear box with a neat sketch.                         |    |
|     | b) | Derive the equation for correct steering condition in terms of wheel base | 04 |
|     |    | and wheel track.  |    |
|     | C) | Write short notes on any one  | 04 |
|     |    | 1) Hydraulic power steering System  |    |

2) Disk Brake



SLR-FM-149

Max. Marks: 56

Set R

## **SLR-FM-149** Set R

Q.6 a) A motor car has a wheel base of 2.64 m, the height of its C.G. above the 06 ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is travelling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when The rear wheels are braked 1) 2) The front wheels are braked 3) All wheels are braked The coefficient of friction between tyre and road may be taken as 0.6.

|     |    | The obemolent of motion between tyre and road may be taken as o.o.   |    |
|-----|----|--|----|
|     | b) | Explain with the help neat sketch working of a Pneumatic braking system.   | 04 |
|     | c) | Write short notes on any one   | 04 |
|     |    | 1) Ackermann steering mechanism  |    |
|     |    | 2) King pin inclination and Thrust Angle   |    |
| Q.7 | a) | What are the requirements of automobile suspension system? Explain with neat sketch torsion bar type suspension used in vehicle. | 06 |
|     | b) | Explain the concept of sprung and unsprung mass in suspension system   | 04 |
|     | c) | Write short notes on any one   | 04 |

- c) Write short notes on any one
  - 1) Hybrid Vehicles
  - 2) Construction and working of fuel cell.

# Seat No.

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMOBILE ENGINEERING

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- 2) Figures to the right indicates full marks.
- 3) Assume suitable data if necessary.
- 4) Use of non-programmable calculator is allowed.

## MCQ/Objective Type Questions

### Q.1 Choose the correct alternatives from the options.

- The brake bleeding process removes \_\_\_\_\_ from system. 1)
  - a) air b) vacuum c) excess fluid d)
  - excess pressure
- 2) The coil spring in wishbone suspension is placed between the \_\_\_\_\_.
  - two wishbones a)
    - b) upper wishbone and the cross-member
    - c) lower wishbone and the cross-member
    - d) shock absorber and the cross-member
- 3) The type of spring that can be used in suspension of automobile is

### air spring b) leaf spring a)

- coil spring d) c)
- 4) Another name for a stabilizer bar is
  - Sway bar a)
  - c) Panhard rod d)

### 5) Fuel cells convert

- a) Chemical into electrical energy
- b) Mechanical into electrical energy
- c) Chemical into mechanical energy
- d) None of above
- The load supported by an automobile frame are 6)
  - a) Weight of the body, passengers and cargo loads
  - b) Torque from engine and transmission
  - c) Sudden impacts from collisions
  - d) All of the mentioned

### 7) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.

- a) Delivers improved cornering on dry road surfaces
- Eliminates the need of snow tyres, tyre chains, etc b)
- Ensures effective transmission of engine torque to all four wheels, c) even on slippery road surfaces
- Ensures that effective braking can be performed, even on slippery d) surfaces





Max. Marks: 70

14

- all of above
- Strut rod b)
- None of above

**Duration: 30 Minutes** 

- The force available at the contact between road and driving wheel is called \_\_\_\_\_.
  - a) Brake power

Riveted

a) c)

a)

b) Friction power

SLR-FM-149

Set S

- c) Tractive effort d) Engine torque
- 9) Which of these is not a power loss which takes place between engine and driving wheel \_\_\_\_\_.
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss
  - d) None of the mentioned

Four wheel drive

- 10) Clutch and friction linings are \_\_\_\_\_ to the clutch plate.
  - b) Welded
  - Bolted d) Any of the above
- 11) Transfer case is located next to the gearbox in \_
  - b) Rear wheel drive
  - c) Front wheel drive d) All of the above
- 12) A traction control system (TCS) in automobiles controls the \_\_\_\_\_.
  - a) Vibrations on the steering wheel
  - b) Torque that is transmitted by the tyres to the road surface
  - c) Engine power during acceleration
  - d) Stopping distance in case of emergency
- 13) Due to Positive camber the tyre will wear on its \_\_\_\_\_.
  - a) Inner side

- b) Outer side
- c) Both inner and outer side d) None of the above
- 14) Straight ahead recovery is achieved due to \_\_\_\_\_.
  - a) King pin inclination
- b) Scrub radius

c) Oversteer

d) None of above

04

## Seat No. B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Answer any two questions from each section.

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full mark.

## Section – I

AUTOMOBILE ENGINEERING

- a) Draw the neat sketch of Conventional chassis layout and state function of Q.2 06 its parts. 04
  - **b)** Define the following.
    - 1) Air Resistance
    - 2) Rolling Resistance
    - 3) Gradient Resistance
    - 4) Traction and Tractive effort.
  - c) What are requirements of clutch? Draw a neat sketch of Electromagnetic 04 Clutch.
- a) A Layland truck has a gross vehicle weight of 89026 N. Engine 10 Q.3 displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m. Maximum Torque 345.8 N-m at 1400 r.p.m, Rear axle ratio 6.166:1. Fourth speed reduction ratio in transmission, 1.605:1, drive line losses amount to 10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X 1.016 m) (Effective wheel diameter 0.950 m), frontal area of truck 6.95 m<sup>2</sup>. Calculate the grades which the vehicle can climb in fourth gear in still air conditions:
  - 1) At governed engine speed, and
  - 2) At speed of maximum torque, in the equation.
  - $R = KW + KaAV^{2}$ ; K = 0.014, Ka = 0.0462, where V is in km/hr.
  - b) Discuss necessity of differential in an Automobile.
- Q.4 a) Explain with neat sketches different types of rear axles used in an 06 Automobile. **08** 
  - **b)** Write notes on both with neat Sketch Charging System of an Automobile 1)
    - 2) Wiper

## Section – II

| Q.5 | a) | What are the different types of steering gear boxes? Explain rack and     | 06 |
|-----|----|---|----|
|     |    | pinion type streeing gear box with a neat sketch.                         |    |
|     | b) | Derive the equation for correct steering condition in terms of wheel base | 04 |
|     |    | and wheel track.  |    |
|     | C) | Write short notes on any one  | 04 |
|     | -  | 1) Hydraulic power steering System  |    |

2) Disk Brake

## SLR-FM-149

Set



Max. Marks: 56

| Q.6 | a) | A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is | 06 |
|-----|----|--|----|
|     |    | travelling at 40 km/hr on a level track, determine the minimum distance in   |    |
|     |    | which the car may be stopped, when   |    |

- 1) The rear wheels are braked
- 2) The front wheels are braked
- 3) All wheels are braked
- The coefficient of friction between tyre and road may be taken as 0.6.

|     | b)<br>c) | <ul> <li>Explain with the help neat sketch working of a Pneumatic braking system.</li> <li>Write short notes on any one</li> <li>1) Ackermann steering mechanism</li> <li>2) King pin inclination and Thrust Angle</li> </ul> |          |
|-----|----------|---|----------|
| Q.7 | a)       | What are the requirements of automobile suspension system? Explain with neat sketch torsion bar type suspension used in vehicle.  | 06       |
|     | b)<br>c) | Explain the concept of sprung and unsprung mass in suspension system<br>Write short notes on any one  | 04<br>04 |

- Hybrid Vehicles
   Construction and working of fuel cell.

| Seat<br>No.  |   |                  |                    | Set  | Ρ     |  |  |
|--|---|------------------|--------------------|--|-------|--|--|
| B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INDUSTRIAL ROBOTICS   |   |                  |                    |  |       |  |  |
|  | Date: Tuesday,17-12-2<br>02:30 PM To 05:30 PM   |                  |                    | Max. Mark  | s: 70 |  |  |
| Instrue  | Book Page   |                  |                    | solved in first 30 Minutes in answ<br>s.                         | /er   |  |  |
|  |   | CQ/Objective Typ | be C               |  |       |  |  |
| Duratio  | on: 30 Minutes  |                  |                    | Mark   | s: 14 |  |  |
|  | <ul><li>a) Three linear</li><li>b) Three rotation</li><li>c) Two linear a</li></ul>                     |                  | oord               | inate systems has<br>nent  | 14    |  |  |
| 2  | 2) The most widely u<br>control.<br>a) Pl<br>c) PID   |                  | ontrol<br>b)<br>d) | l for industrial robots is<br>PD<br>ID                           |       |  |  |
| 3  | 8) General Motors ir<br>a) 1984<br>c) 1958  | I                | t for<br>b)<br>d)  | spot welding in<br>1974<br>1963                                  |       |  |  |
| 4  | <ul> <li>Which type of rob</li> <li>a) Jointed arm</li> <li>c) SCARA</li> </ul>                         |                  |                    | rpose?<br>PUMA<br>None of these                                  |       |  |  |
| 5  | a) Automatic G  | Guided Vehicle   | b)<br>d)           | Autonomous Guided Vehicle<br>Alternative Guided Vehicle          |       |  |  |
| 6  | <ul> <li>Drives are also kr</li> <li>a) Actuators</li> <li>c) Sensors</li> </ul>                        | I                | b)<br>d)           | Controller<br>Manipulator  |       |  |  |
| <ul> <li>Only one surface required to grasp or hold the object"</li> <li>a) Vacuum gripper</li> <li>b) Magnetic gripper</li> <li>c) Adhesive gripper</li> <li>d) Any of the above</li> </ul> |   |                  |                    |  |       |  |  |
| 8  | <ul> <li>is the proc<br/>fragments) from a</li> <li>a) Edge Analysi</li> <li>c) Edge develop</li> </ul> | an image.<br>is  | set o<br>b)<br>d)  | of edges (edge points or edge<br>Edge detection<br>none of these |       |  |  |

Seat

# Γ

- 9) The process of finding the position of the end effector when the joint variable are know is called
  - a) Forward Kinematics c) Forward Dynamics
- b) **Inverse Kinematics** d) **Inverse Dynamics**
- 10) Digitizing the image intensity amplitude is called \_\_\_\_\_.
  - quantization a) b) framing
  - d) c) sampling both a and c
- 11) Link coordinates for manipulators are expressed using \_\_\_\_\_.
  - a) Jacobian representation
  - b) Denavit-Hartenburg representation
  - c) Euler-Lagrangian representation
  - d) Newton-Euler representation
- 12) Which one of the following statements is TRUE?
  - Asimo humanoid robot was developed by Odetics a)
  - ASV (Adaptive Suspension Vehicle) was developed by Cincinnati b) Milacron Corporation
  - T3 (The Tomorrow Tool) was developed by Unimation c)
  - CNC machine is not a robot d)
- 13) A Robot is a
  - Programmable a)
  - Both (a) and (b) C)
- Multi-functional manipulator b)
- None of the above d)
- 14) The term CCD with regards to "CCD Camera" stands for \_\_\_\_\_
  - Charged Coupled Device a) C) Charged Calibrated Device
- **Coupled Charged Device** b)
- d) **Calibrated Charged Device**



## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ROBOTICS

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

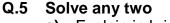
Instructions: 1) Solve any two questions from each section.

2) Figures to the right indicate full marks.

## Section – I

### Q.2 Solve any two

- a) Discuss SCARA and jointed arm configuration for Industrial Robots. List the defining characteristics and typical applications of each 06
- **b)** Define the following
  - 1) work envelope
  - 2) DOF
  - Payload 3)
- Q.3 Discuss in detail the different end effectors used in robot work cells. **08** a) b) Discuss the construction and working of stepper motors. List its advantages, 06 disadvantages and applications.
- Derive the arm equation of inverse kinematics of 2 DOF Robot 06 Q.4 a)
  - Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. it b) 08 is desired to determine the values of which the angels  $\theta 1 \& \theta 2$  must be set into order to achieve certain point the length of joint L1= 12 in the length of L2=10 in . The coordinates x=.15.7 and y=12.6 using the reverse transformation method determine the angles  $\theta 1 \& \theta 2$



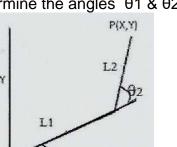
- a) Explain in briefly offline programming, teach through method and **08** walkthrough method of robot programming.
- b) Discuss in brief edge detection and object classification in image processing. 06
- a) Discuss the use of industrial robots for assembly and material inspection **08** Q.6 state the robot configuration, choice of drive and give justification.

Section – II

b) Compare CCD and CMOS cameras on the basis of their application for robot 06 vision systems.

### Q.7 Write a short notes on any three

- a) AGV
- **b)** Robot workcell layouts
- c) Welding application of robot
- d) Difference wheeled robot and tracked robot
- e) Segmentation



Max. Marks: 56

08

14



Set

Seat No.

## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book Page No.3

2) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

## **Duration: 30 Minutes**

Seat

No.

## Q.1 Choose the correct alternatives from the options.

- is the process that produces a set of edges (edge points or edge 1) fragments) from an image.
  - a) Edge Analysis c) Edge development
- b) Edge detection d) none of these
- The process of finding the position of the end effector when the joint 2) variable are know is called
  - a) Forward Kinematics b) **Inverse Kinematics**
  - c) Forward Dynamics d) **Inverse Dynamics**

### 3) Digitizing the image intensity amplitude is called

- quantization framing b) a)
- c) sampling d) both a and c
- 4) Link coordinates for manipulators are expressed using \_\_\_\_\_.
  - a) Jacobian representation
  - b) Denavit-Hartenburg representation
  - c) Euler-Lagrangian representation
  - d) Newton-Euler representation
- Which one of the following statements is TRUE? 5)
  - Asimo humanoid robot was developed by Odetics a)
  - ASV (Adaptive Suspension Vehicle) was developed by Cincinnati b) Milacron Corporation
  - T3 (The Tomorrow Tool) was developed by Unimation c)
  - CNC machine is not a robot d)
- 6) A Robot is a

c)

Programmable a) c) Both (a) and (b)

- Multi-functional manipulator b) d) None of the above
- The term CCD with regards to "CCD Camera" stands for 7)
  - Charged Coupled Device a)
- b) **Coupled Charged Device Calibrated Charged Device** d)
- Charged Calibrated Device
- The Robot designed with cylindrical coordinate systems has \_\_\_\_\_. 8)
  - Three linear movements a)
  - Three rotational movements b)
  - Two linear and one rotational movement C)
  - Two rotational and one linear movement d)

Max. Marks: 70

**INDUSTRIAL ROBOTICS** 

SLR-FM-151





## 9) The most widely used technique of control for industrial robots is \_\_\_\_\_ control.

- ΡI PD a) b)
- c) PID d) ID

10) General Motors installed the first robot for spot welding in \_\_\_\_\_. 1984

b) 1974

b)

d)

1958 d) 1963

11) Which type of robot used for assembly purpose?

- Jointed arm PUMA a) b)
- c) **SCARA** d) None of these

### The term AGV stands for \_\_\_\_\_. 12)

a)

c)

- a) Automatic Guided Vehicle
- c) Automated Guided Vehicle
- 13) Drives are also known as \_\_\_\_\_.
  - a) Actuators b) Controller
  - c) Sensors Manipulator d)
- Only one surface required to grasp or hold the object" 14)
  - a) Vacuum gripper
  - c) Adhesive gripper
- b) Magnetic gripper

Autonomous Guided Vehicle

Alternative Guided Vehicle

Any of the above d)

**SLR-FM-151** 

## Set Q

# B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019

## **Mechanical Engineering** INDUSTRIAL ROBOTICS

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section.

2) Figures to the right indicate full marks.

## Section – I

### Q.2 Solve any two

- a) Discuss SCARA and jointed arm configuration for Industrial Robots. List the 08 defining characteristics and typical applications of each 06
- **b)** Define the following
  - 1) work envelope
  - 2) DOF
  - Payload 3)
- Q.3 Discuss in detail the different end effectors used in robot work cells. **08** a) b) Discuss the construction and working of stepper motors. List its advantages, 06 disadvantages and applications.
- Derive the arm equation of inverse kinematics of 2 DOF Robot 06 Q.4 a)
  - Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. it b) 08 is desired to determine the values of which the angels  $\theta 1 \& \theta 2$  must be set into order to achieve certain point the length of joint L1= 12 in the length of L2=10 in . The coordinates x=.15.7 and y=12.6 using the reverse transformation method determine the angles  $\theta 1 \& \theta 2$



### Q.5 Solve any two

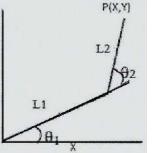
- a) Explain in briefly offline programming, teach through method and **08** walkthrough method of robot programming.
- b) Discuss in brief edge detection and object classification in image processing. 06
- a) Discuss the use of industrial robots for assembly and material inspection **08** Q.6 state the robot configuration, choice of drive and give justification.
  - Compare CCD and CMOS cameras on the basis of their application for robot 06 b) vision systems.

### Q.7 Write a short notes on any three

- a) AGV
- **b)** Robot workcell layouts
- c) Welding application of robot
- d) Difference wheeled robot and tracked robot
- e) Segmentation

Max. Marks: 56

Set





## Set B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book Page No.3

INDUSTRIAL ROBOTICS

2) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

### Q.1 Choose the correct alternatives from the options.

- The term AGV stands for 1)
  - \_\_\_. a) Automatic Guided Vehicle
  - c) Automated Guided Vehicle
- Drives are also known as \_\_\_\_\_. 2)
  - a) Actuators
    - c) Sensors Manipulator d)

## 3) Only one surface required to grasp or hold the object" Magnetic gripper

- a) Vacuum gripper b)
- c) Adhesive gripper d) Any of the above
- is the process that produces a set of edges (edge points or edge 4) fragments) from an image. Edge detection
  - a) Edge Analysis b)
  - c) Edge development d) none of these
- The process of finding the position of the end effector when the joint 5) variable are know is called
  - a) Forward Kinematics b)
  - c) Forward Dynamics d) **Inverse Dynamics**
- 6) Digitizing the image intensity amplitude is called \_\_\_\_\_.
  - quantization a) b) framing
    - c) sampling d) both a and c
- Link coordinates for manipulators are expressed using \_\_\_\_\_. 7)
  - a) Jacobian representation
  - b) Denavit-Hartenburg representation
  - c) Euler-Lagrangian representation
  - d) Newton-Euler representation
- 8) Which one of the following statements is TRUE?
  - Asimo humanoid robot was developed by Odetics a)
  - ASV (Adaptive Suspension Vehicle) was developed by Cincinnati b) Milacron Corporation
  - T3 (The Tomorrow Tool) was developed by Unimation c)
  - CNC machine is not a robot d)

14

Max. Marks: 70

- b) Autonomous Guided Vehicle
- Alternative Guided Vehicle d)

**Inverse Kinematics** 

- b) Controller



Seat No.

R

Marks: 14

9) A Robot is a \_\_\_\_\_.

C)

- a) Programmable
- c) Both (a) and (b)

b) Multi-functional manipulator

**SLR-FM-151** 

Set

- d) None of the above
- 10) The term CCD with regards to "CCD Camera" stands for \_\_\_\_\_.
  - a) Charged Coupled Device
- b) Coupled Charged Deviced) Calibrated Charged Device
- 11) The Robot designed with cylindrical coordinate systems has .
  - a) Three linear movements
  - b) Three rotational movements

Charged Calibrated Device

- c) Two linear and one rotational movement
- d) Two rotational and one linear movement
- 12) The most widely used technique of control for industrial robots is \_\_\_\_\_ control.
  - a) PI b) PD
  - c) PID d) ID

13) General Motors installed the first robot for spot welding in \_\_\_\_\_.

- a) 1984 b) 1974
- c) 1958 d) 1963
- 14) Which type of robot used for assembly purpose?
  - a) Jointed arm

b) PUMA

d)

c) SCARA

None of these

14

## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ROBOTICS

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section.

2) Figures to the right indicate full marks.

## Section – I

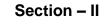
### Q.2 Solve any two

Seat

No.

- a) Discuss SCARA and jointed arm configuration for Industrial Robots. List the 08 defining characteristics and typical applications of each **b)** Define the following 06
  - 1) work envelope
  - 2) DOF
  - Payload 3)
- Q.3 Discuss in detail the different end effectors used in robot work cells. **08** a)
  - b) Discuss the construction and working of stepper motors. List its advantages, 06 disadvantages and applications.
- Derive the arm equation of inverse kinematics of 2 DOF Robot 06 Q.4 a)
  - Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. it b) 08 is desired to determine the values of which the angels  $\theta 1 \& \theta 2$  must be set into order to achieve certain point the length of joint L1= 12 in the length of L2=10 in . The coordinates x=.15.7 and y=12.6 using the reverse transformation method determine the angles  $\theta 1 \& \theta 2$

P(X,Y)



T.1

### Q.5 Solve any two

- a) Explain in briefly offline programming, teach through method and walkthrough method of robot programming.
- b) Discuss in brief edge detection and object classification in image processing. 06
- a) Discuss the use of industrial robots for assembly and material inspection **08** Q.6 state the robot configuration, choice of drive and give justification.
  - b) Compare CCD and CMOS cameras on the basis of their application for robot 06 vision systems.

### Q.7 Write a short notes on any three

- a) AGV
- **b)** Robot workcell layouts
- c) Welding application of robot
- d) Difference wheeled robot and tracked robot
- e) Segmentation

Max. Marks: 56

Set

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Seat No.

## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering INDUSTRIAL ROBOTICS**

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book Page No.3

2) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

### Q.1 Choose the correct alternatives from the options.

- Digitizing the image intensity amplitude is called \_\_\_\_\_. 1)
  - quantization b) framing a)
  - sampling d) both a and c c)
- 2) Link coordinates for manipulators are expressed using \_\_\_\_\_.
  - a) Jacobian representation
  - b) Denavit-Hartenburg representation
  - c) Euler-Lagrangian representation
  - d) Newton-Euler representation
- 3) Which one of the following statements is TRUE?
  - Asimo humanoid robot was developed by Odetics a)
  - ASV (Adaptive Suspension Vehicle) was developed by Cincinnati b) Milacron Corporation
  - T3 (The Tomorrow Tool) was developed by Unimation C)
  - CNC machine is not a robot d)
- A Robot is a \_\_\_\_ 4)

a)

- a) Programmable c) Both (a) and (b)
- Multi-functional manipulator b)
- None of the above d)
- 5) The term CCD with regards to "CCD Camera" stands for \_\_\_\_
  - Charged Coupled Device b) **Coupled Charged Device** d) **Calibrated Charged Device**
  - Charged Calibrated Device c)
- The Robot designed with cylindrical coordinate systems has \_\_\_\_\_. 6)
  - Three linear movements a)
  - b) Three rotational movements
  - Two linear and one rotational movement C)
  - Two rotational and one linear movement d)
- 7) The most widely used technique of control for industrial robots is \_\_\_\_\_ control.
  - ΡI PD a) b)
  - PID d) ID c)

Marks: 14

Max. Marks: 70

14

Set

SLR-FM-151 Set S

- 8) General Motors installed the first robot for spot welding in \_\_\_\_\_.
  - a) 1984 b)
  - c) 1958 d) 1963
- 9) Which type of robot used for assembly purpose?
  - a) Jointed arm

b) PUMAd) None of these

- c) SCARA
- 10) The term AGV stands for \_\_\_\_\_
  - a) Automatic Guided Vehicle
  - c) Automated Guided Vehicle
- b) Autonomous Guided Vehicle
- d) Alternative Guided Vehicle
- 11) Drives are also known as \_\_\_\_\_.
  - a) Actuators b) Controller
  - c) Sensors d) Manipulator
- 12) Only one surface required to grasp or hold the object"
  - a) Vacuum gripper b) Magnetic gripper
  - c) Adhesive gripper d) Any of the above
- 13) \_\_\_\_\_ is the process that produces a set of edges (edge points or edge fragments) from an image.
  - a) Edge Analysis

- b) Edge detection
- c) Edge development
- d) none of these
- 14) The process of finding the position of the end effector when the joint variable are know is called \_\_\_\_\_.
  - a) Forward Kinematics
  - c) Forward Dynamics
- b) Inverse Kinematics
- d) Inverse Dynamics

## B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ROBOTICS

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section.

2) Figures to the right indicate full marks.

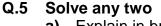
## Section – I

### Q.2 Solve any two

Seat

No.

- a) Discuss SCARA and jointed arm configuration for Industrial Robots. List the 08 defining characteristics and typical applications of each 06
- **b)** Define the following
  - 1) work envelope
  - 2) DOF
  - 3) Payload
- Q.3 Discuss in detail the different end effectors used in robot work cells. **08** a) b) Discuss the construction and working of stepper motors. List its advantages, 06 disadvantages and applications.
- Derive the arm equation of inverse kinematics of 2 DOF Robot 06 Q.4 a)
  - Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. it b) 08 is desired to determine the values of which the angels  $\theta 1 \& \theta 2$  must be set into order to achieve certain point the length of joint L1= 12 in the length of L2=10 in . The coordinates x=.15.7 and y=12.6 using the reverse transformation method determine the angles  $\theta 1 \& \theta 2$



- a) Explain in briefly offline programming, teach through method and **08** walkthrough method of robot programming.
- b) Discuss in brief edge detection and object classification in image processing. 06
- a) Discuss the use of industrial robots for assembly and material inspection **08** Q.6 state the robot configuration, choice of drive and give justification.
  - Compare CCD and CMOS cameras on the basis of their application for robot 06 b) vision systems.

### Q.7 Write a short notes on any three

- a) AGV
- **b)** Robot workcell layouts
- c) Welding application of robot
- d) Difference wheeled robot and tracked robot
- e) Segmentation



P(X,Y) T.1

Section – II

14

Set

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| B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 |  |              |  |  |  |  |  |  |  |
|---|--|--------------|--|--|--|--|--|--|--|
| Mechanical Engineering<br>SUGAR TECHNOLOGY            |  |              |  |  |  |  |  |  |  |
|   | Day & Date: Tuesday, 17-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM   |              |  |  |  |  |  |  |  |
| Instruction   | <b>ns:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minute Book.   | es in answer |  |  |  |  |  |  |  |
|   | <ul><li>2) Figures to the right indicate full marks.</li><li>3) Use of scientific calculator is allowed.</li></ul>   |              |  |  |  |  |  |  |  |
|   | MCQ/Objective Type Questions   |              |  |  |  |  |  |  |  |
| Duration: 30  |  | Marks: 14    |  |  |  |  |  |  |  |
| 1)  | <ul> <li>bose the correct alternatives from the options.</li> <li>Object of fibrizer is</li> <li>a) Even distribution of the cane</li> <li>b) Complete the preparation of the cane</li> <li>c) Cut the cane in to 4 to 5 inches</li> <li>d) Lifting of cane</li> </ul> | 14           |  |  |  |  |  |  |  |
|   | Each mill equipped with hydraulic accumulator<br>a) for bottom roller journal b) for discharge roller journ<br>c) for lotus roller journal d) for top roller journal   | nal          |  |  |  |  |  |  |  |
|   | Messchaert grooves are used fora) feeding of baggaseb) pressing of baggasec) juice extractiond) none of the above  |              |  |  |  |  |  |  |  |
| ,   | <ul> <li>Mill setting means</li> <li>a) Opening between top and bottom rollers</li> <li>b) Opening between feed and bottom rollers</li> <li>c) Opening between discharge and bottom rollers</li> <li>d) None of the above</li> </ul>                                   |              |  |  |  |  |  |  |  |
| -   | In mill imbibitions temperature of the hot water<br>a) $90^{\circ}$ to $100^{\circ}$ b) $120^{\circ}$ to $150^{\circ}$<br>c) $70^{\circ}$ to $80^{\circ}$ d) $85^{\circ}$ to $105^{\circ}$   |              |  |  |  |  |  |  |  |
| 6)  | <ul> <li>Sulphur is used for</li> <li>a) To improve the juice extraction</li> <li>b) Sanitation purpose</li> <li>c) To bring the whiteness to the sugar</li> <li>d) None of the above</li> </ul>   |              |  |  |  |  |  |  |  |
| 7)  | In multiple effect evaporator juice boiled up to<br>a) 80 to 90 brix b) 60 to 65 brix<br>c) 40 to 50 brix d) 100 to 150 brix   |              |  |  |  |  |  |  |  |
|   | Inventor of the multiple effect evaporator<br>a) Hugot b) Dorr<br>c) Nobert Rillieux d) None of the above  |              |  |  |  |  |  |  |  |

Set P

\_. Melt b) Magma a) c) Massecuite Strike d) Air cooled Cystallisers are mainly used for \_ 10) \_\_\_\_. 'C' Massecuite a) 'A' and 'C' massecuite b) c) 'B' and 'C ' Massecite d) 'A' Massecuite The separation of sugar crystals from masecuit is called \_\_\_\_\_. 11) a) Centrifugal machine b) Curing c) Grader d) None of the above 12) Batch type centrifugal machine used for \_\_\_\_ 'B 'massecuite a) 'A' massecuite b) c) 'C' massecuite d) none of the above Main factor affecting the centrifugal machine performance \_\_\_\_ 13) a) Screen size Basket of the machine b) c) Seed of the machine Uniformity of grain size d) Sugar elevator is used for \_\_\_\_\_. 14) a) Grading of sugar b) Lifting of sugar c) Drying of sugar All the above d)

Mass of sugar crystal s surrounded by sugar containing liquid is called

9)

**SLR-FM-152** 

Set P

|       |                             | Mechanical Engineering<br>SUGAR TECHNOLOGY   | .019             |
|-------|-----------------------------|--|------------------|
|       |                             | te: Tuesday, 17-12-2019<br>30 PM To 05:30 PM   | Max. Marks: 56   |
| Instr | uctio                       | <ul><li>ons: 1) Answer any two questions from each section</li><li>2) Use of scientific calculator is allowed.</li></ul>   |                  |
|       |                             | Section – I  |                  |
| Q.1   | a)<br>b)<br>c)              | Explain cane knives with neat sketch.<br>Explain tramp iron separator.<br>Why arching is done on the roller.   | 06<br>04<br>04   |
| Q.2   | a)<br>b)<br>c)              | Describe juice Sulphitation with neat sketch.<br>Explain the principle of multiple effect evaporators.<br>How cleaning of evaporator tubes carried out in quadriple sectio | 06<br>04<br>n 04 |
| Q.3   | Wri<br>a)<br>b)<br>c)<br>d) | <b>te short notes on (Any three)</b><br>Roller grooving<br>Juice clarifier (Dorr)<br>Cane carrier<br>Mill imbibition   | 14               |
|       |                             | Section – II   |                  |
| Q.4   | a)<br>b)<br>c)              | Describe vacuum pan with neat sketch.<br>Why crystallizers are used<br>Explain operation of Batch type centrifugal machine   | 06<br>04<br>04   |
| Q.5   | a)<br>b)<br>c)              | Explain grass hopper conveyor<br>Describe rotary drier with neat sketch<br>Why dust catchers are used?   | 06<br>04<br>04   |
| Q.6   | Wri<br>a)<br>b)<br>c)<br>d) | <b>te short notes on (any three)</b><br>sugar drying and cooling<br>Waste water treatment<br>Air pollution control<br>Syrup sulphitation                                   | 14               |

# B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019

Seat

No.

## **SLR-FM-152**

Set P

| Seat<br>No.   |   |  |                      | ę  | Set   | Q     |  |  |
|---|---|--|----------------------|--|-------|-------|--|--|
| B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>SUGAR TECHNOLOGY |   |  |                      |  |       |       |  |  |
|   | Date: Tuesday, 17-1<br>)2:30 PM To 05:30 F  |  |                      | Max.   | Marks | s: 70 |  |  |
| Instruc   | <ul> <li>Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of scientific calculator is allowed.</li> </ul> |  |                      |  |       |       |  |  |
|   |   | ICQ/Objective T  | уре 🤇                |  |       |       |  |  |
|   | on: 30 Minutes  |  |                      |  | Marks | s: 14 |  |  |
|   | ) Inventor of the   | alternatives from t<br>multiple effect evap                          |                      |  |       | 14    |  |  |
|   | a) Hugot<br>c) Nobert Rilli   |  | b)<br>d)             | Dorr<br>None of the above  |       |       |  |  |
| 2   | 2) Mass of sugar  | crystal s surrounded   | l by su              | gar containing liquid is called                                      | l     |       |  |  |
|   | <br>a) Melt<br>c) Massecuite  | 9  | b)<br>d)             | Magma<br>Strike  |       |       |  |  |
| 3   | a) 'A' and C'ı  | allisers are mainly u<br>nassecuite<br>Massecite                     | b)                   | r<br>'C' Massecuite<br>'A' Massecuite                                |       |       |  |  |
| 4   | l) The separation<br>a) Centrifugal<br>c) Grader  |  | om ma<br>b)<br>d)    | secuit is called<br>Curing<br>None of the above                      |       |       |  |  |
| 5   | 5) Batch type cent<br>a) 'A' massec<br>c) 'C' massec  |  | ed for _<br>b)<br>d) | B 'massecuite<br>none of the above                                   |       |       |  |  |
| 6   | <ul> <li>Main factor affered</li> <li>a) Screen size</li> <li>c) Seed of the</li> </ul>   | 9  | l mach<br>b)<br>d)   | ine performance<br>Basket of the machine<br>Uniformity of grain size |       |       |  |  |
| 7   | <ul> <li>Sugar elevator</li> <li>a) Grading of</li> <li>c) Drying of s</li> </ul>   | 0  | b)<br>d)             | Lifting of sugar<br>All the above                                    |       |       |  |  |
| 8   | b) Complete t   | oution of the cane<br>he preparation of th<br>he in to 4 to 5 inches |                      | )  |       |       |  |  |
| ç   |   | ped with hydraulic a<br>roller journal<br>ler journal                |                      | ulator<br>for discharge roller journal<br>for top roller journal     |       |       |  |  |

## a) for bottom roller journalc) for lotus roller journal b) d)

**SLR-FM-152** 

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- **SLR-FM-152** 
  - Set Q

- 10) Messchaert grooves are used for
  - a) feeding of baggase
  - c) juice extraction
- b) pressing of baggase
- d) none of the above
- 11) Mill setting means \_\_\_\_\_.
  - a) Opening between top and bottom rollers
  - b) Opening between feed and bottom rollers
  - c) Opening between discharge and bottom rollers
  - d) None of the above
- In mill imbibitions temperature of the hot water 12)
  - a)  $90^{\circ}$  to  $100^{\circ}$ 120<sup>0</sup> to 150<sup>0</sup> b)
  - c)  $70^{\circ}$  to  $80^{\circ}$ d)  $85^{\circ}$  to  $105^{\circ}$
- 13) Sulphur is used for \_\_\_\_
  - a) To improve the juice extraction
  - b) Sanitation purpose
  - c) To bring the whiteness to the sugar
  - d) None of the above
- 14) In multiple effect evaporator juice boiled up to \_\_\_\_\_.
  - a) 80 to 90 brix
- 60 to 65 brix

- c) 40 to 50 brix
- b)
- d) 100 to 150 brix

Set Q

Max. Marks: 56

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering SUGAR TECHNOLOGY

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

Instructions: 1) Answer any two questions from each section

2) Use of scientific calculator is allowed.

## Section – I

| Q.1 | a)  | Explain cane knives with neat sketch.                             | 06 |
|-----|-----|---|----|
|     | b)  | Explain tramp iron separator.                                     | 04 |
|     | c)  | Why arching is done on the roller.                                | 04 |
| Q.2 | a)  | Describe juice Sulphitation with neat sketch.                     | 06 |
|     | b)  | Explain the principle of multiple effect evaporators.             | 04 |
|     | c)  | How cleaning of evaporator tubes carried out in quadriple section | 04 |
| Q.3 | Wri | te short notes on (Any three)                                     | 14 |

- a) Roller grooving
- **b)** Juice clarifier (Dorr)
- c) Cane carrier
- **d**) Mill imbibition

## Section – II

| Q.4 | a)  | Describe vacuum pan with neat sketch.               | 06 |
|-----|-----|---|----|
|     | b)  | Why crystallizers are used                          | 04 |
|     | c)  | Explain operation of Batch type centrifugal machine | 04 |
| Q.5 | a)  | Explain grass hopper conveyor                       | 06 |
|     | b)  | Describe rotary drier with neat sketch              | 04 |
|     | c)  | Why dust catchers are used?                         | 04 |
| Q.6 | Wri | ite short notes on (any three)                      | 14 |
|     | a)  | sugar drying and cooling                            |    |
|     | ЬŃ  | Maste water treatment                               |    |

- **b)** Waste water treatment
- c) Air pollution control
- **d)** Syrup sulphitation

| Seat<br>No. |   |   | Set R            |  |  |  |  |  |  |
|-------------|---|---|------------------|--|--|--|--|--|--|
|             | B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>SUGAR TECHNOLOGY |   |                  |  |  |  |  |  |  |
|             | Day & Date: Tuesday, 17-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM                        |   |                  |  |  |  |  |  |  |
| Instru      | uctio   | <ul> <li>ns: 1) Q. No. 1 is compulsory and should be solved in first 30 m<br/>Book.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of scientific calculator is allowed.</li> </ul>                         | inutes in answer |  |  |  |  |  |  |
| Durat       | ion: 3  | MCQ/Objective Type Questions 30 Minutes   | Marks: 14        |  |  |  |  |  |  |
|             |   |   |                  |  |  |  |  |  |  |
| Q.1         | <b>Cho</b><br>1)  | ose the correct alternatives from the options.In mill imbibitions temperature of the hot watera) $90^{\circ}$ to $100^{\circ}$ b) $120^{\circ}$ to $150^{\circ}$ c) $70^{\circ}$ to $80^{\circ}$ d) $85^{\circ}$ to $105^{\circ}$ | 14               |  |  |  |  |  |  |
|             | 2)  | <ul> <li>Sulphur is used for</li> <li>a) To improve the juice extraction</li> <li>b) Sanitation purpose</li> <li>c) To bring the whiteness to the sugar</li> <li>d) None of the above</li> </ul>                                  |                  |  |  |  |  |  |  |
|             | 3)  | In multiple effect evaporator juice boiled up to<br>a) 80 to 90 brix b) 60 to 65 brix<br>c) 40 to 50 brix d) 100 to 150 brix  |                  |  |  |  |  |  |  |
|             | 4)  | Inventor of the multiple effect evaporator<br>a) Hugot b) Dorr<br>c) Nobert Rillieux d) None of the above   |                  |  |  |  |  |  |  |
|             | 5)  | Mass of sugar crystal s surrounded by sugar containing liquid i   | s called         |  |  |  |  |  |  |
|             |   | a) Melt b) Magma<br>c) Massecuite d) Strike   |                  |  |  |  |  |  |  |
|             | 6)  | Air cooled Cystallisers are mainly used for<br>a) 'A' and 'C' massecuite b) 'C' Massecuite<br>c) 'B' and 'C ' Massecite d) 'A' Massecuite   |                  |  |  |  |  |  |  |
|             | 7)  | The separation of sugar crystals from masecuit is calleda) Centrifugal machineb) Curingc) Graderd) None of the above  |                  |  |  |  |  |  |  |
|             | 8)  | Batch type centrifugal machine used for<br>a) 'A' massecuite b) 'B 'massecuite  |                  |  |  |  |  |  |  |

c) 'C' massecuite d) none of the above

Page 8 of 12

for discharge roller journal b) d) for top roller journal

b)

d)

- c) for lotus roller journal
- 13) Messchaert grooves are used for \_\_\_\_\_.
  - a) feeding of baggase
  - c) juice extraction
- Mill setting means . 14)
  - a) Opening between top and bottom rollers
  - b) Opening between feed and bottom rollers
  - c) Opening between discharge and bottom rollers
  - d) None of the above

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# Set R

- none of the above
- b) pressing of baggase
- d)

- Main factor affecting the centrifugal machine performance \_\_\_\_ Basket of the machine
  - b) Uniformity of grain size d)

Lifting of sugar

All the above

- c) Seed of the machine Sugar elevator is used for \_\_\_\_\_. 10)
  - a) Grading of sugar
  - c) Drying of sugar
- Object of fibrizer is \_\_\_\_\_. 11)

a) Screen size

9)

- a) Even distribution of the cane
- b) Complete the preparation of the cane
- c) Cut the cane in to 4 to 5 inches
- d) Lifting of cane

## Each mill equipped with hydraulic accumulator \_\_\_\_\_. 12)

a) for bottom roller journal

|       |                             | Mechanical Engineering<br>SUGAR TECHNOLOGY   |                  |
|-------|-----------------------------|--|------------------|
|       |                             | te: Tuesday, 17-12-2019<br>30 PM To 05:30 PM   | Max. Marks: 56   |
| Instr | uctio                       | <ul><li>ons: 1) Answer any two questions from each section</li><li>2) Use of scientific calculator is allowed.</li></ul>   |                  |
|       |                             | Section – I  |                  |
| Q.1   | a)<br>b)<br>c)              | Explain cane knives with neat sketch.<br>Explain tramp iron separator.<br>Why arching is done on the roller.   | 06<br>04<br>04   |
| Q.2   | a)<br>b)<br>c)              | Describe juice Sulphitation with neat sketch.<br>Explain the principle of multiple effect evaporators.<br>How cleaning of evaporator tubes carried out in quadriple sectio | 06<br>04<br>n 04 |
| Q.3   | Wri<br>a)<br>b)<br>c)<br>d) | <b>te short notes on (Any three)</b><br>Roller grooving<br>Juice clarifier (Dorr)<br>Cane carrier<br>Mill imbibition   | 14               |
|       |                             | Section – II   |                  |
| Q.4   | a)<br>b)<br>c)              | Describe vacuum pan with neat sketch.<br>Why crystallizers are used<br>Explain operation of Batch type centrifugal machine   | 06<br>04<br>04   |
| Q.5   | a)<br>b)<br>c)              | Explain grass hopper conveyor<br>Describe rotary drier with neat sketch<br>Why dust catchers are used?   | 06<br>04<br>04   |
| Q.6   | Wri<br>a)<br>b)<br>c)<br>d) | <b>te short notes on (any three)</b><br>sugar drying and cooling<br>Waste water treatment<br>Air pollution control<br>Syrup sulphitation                                   | 14               |

B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019

Seat

No.

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Set R

| Seat<br>No.   |   |   |   |                        |  | Set    | S           |  |  |
|---|---|---|---|------------------------|--|--------|-------------|--|--|
| B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019<br>Mechanical Engineering<br>SUGAR TECHNOLOGY |   |   |   |                        |  |        |             |  |  |
|   | Day & Date: Tuesday, 17-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM  |   |   |                        |  |        |             |  |  |
| Instru  | <ul> <li>Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of scientific calculator is allowed.</li> </ul> |   |   |                        |  |        |             |  |  |
| Durati  | on: 30 N  |   | ICQ/Objective   | е Туре (               | Questions  | Mark   | c· 1/       |  |  |
|   |   |   | alternatives fror   | n the on               | tions  | IVIAIN | 5. 14<br>14 |  |  |
|   | 1) Ai   | r cooled Cysta                                  | allisers are mainly   | y used fo              | r  |        | .4          |  |  |
|   | a)<br>c)  |   | nassecuite<br>Massecite   | b)<br>d)               | 'C' Massecuite<br>'A' Massecuite                                     |        |             |  |  |
|   |   | •   | • •   |                        | secuit is called   |        |             |  |  |
|   | a)<br>c)  | Centrifugal<br>Grader                           | machine   | b)<br>d)               | Curing<br>None of the above  |        |             |  |  |
| ;   | a)  | itch type cent<br>'A' massecu<br>'C' massecu    |   | used for _<br>b)<br>d) | B 'massecuite<br>none of the above                                   |        |             |  |  |
| 2   | ́a)   | ain factor affe<br>Screen size<br>Seed of the   | e   | gal mach<br>b)<br>d)   | ine performance<br>Basket of the machine<br>Uniformity of grain size |        |             |  |  |
| Ę   | ,   | igar elevator i<br>Grading of<br>Drying of su   | -   |                        | Lifting of sugar<br>All the above                                    |        |             |  |  |
| (   | a)<br>b)<br>c)  | Complete the                                    | oution of the cane<br>ne preparation of<br>le in to 4 to 5 inch | the cane               | 9  |        |             |  |  |
| 7   | a)  | ach mill equip<br>for bottom r<br>for lotus rol | -   | c accumi<br>b)<br>d)   |  | al     |             |  |  |
| ٤   | a)  | esschaert gro<br>feeding of b<br>juice extrac   |   | r<br>b)<br>d)          | pressing of baggase none of the above                                |        |             |  |  |

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- 9) Mill setting means \_\_\_\_\_. a) Opening between top and bottom rollers b) Opening between feed and bottom rollers c) Opening between discharge and bottom rollers d) None of the above 10) In mill imbibitions temperature of the hot water 120<sup>0</sup> to 150<sup>0</sup> a)  $90^{\circ}$  to  $100^{\circ}$ b) c)  $70^{\circ}$  to  $80^{\circ}$  $85^{\circ}$  to  $105^{\circ}$ d) 11) Sulphur is used for \_\_\_\_\_ a) To improve the juice extraction b) Sanitation purpose c) To bring the whiteness to the sugar d) None of the above In multiple effect evaporator juice boiled up to \_\_\_\_\_. 12)
  - - a) 80 to 90 brix 60 to 65 brix b)
    - c) 40 to 50 brix d) 100 to 150 brix

13) Inventor of the multiple effect evaporator \_\_\_\_\_

- a) Hugot b)
- c) Nobert Rillieux d) None of the above
- 14) Mass of sugar crystal s surrounded by sugar containing liquid is called
  - a) Melt

b) Magma

Dorr

Massecuite c)

d) Strike **SLR-FM-152** 

Set S

|       |                             | Mechanical Engineering  |                |
|-------|-----------------------------|---|----------------|
|       |                             | SUGAR TECHNOLOGY  |                |
|       |                             | te: Tuesday, 17-12-2019<br>30 PM To 05:30 PM  | Max. Marks: 56 |
| Instr | uctic                       | <ul><li>2) Answer any two questions from each section</li><li>2) Use of scientific calculator is allowed.</li></ul>   |                |
|       |                             | Section – I   |                |
| Q.1   | a)<br>b)<br>c)              | Explain cane knives with neat sketch.<br>Explain tramp iron separator.<br>Why arching is done on the roller.  | 06<br>04<br>04 |
| Q.2   | a)<br>b)<br>c)              | Describe juice Sulphitation with neat sketch.<br>Explain the principle of multiple effect evaporators.<br>How cleaning of evaporator tubes carried out in quadriple section | 06<br>04<br>04 |
| Q.3   | Wri<br>a)<br>b)<br>c)<br>d) | <b>te short notes on (Any three)</b><br>Roller grooving<br>Juice clarifier (Dorr)<br>Cane carrier<br>Mill imbibition  | 14             |
|       |                             | Section – II  |                |
| Q.4   | a)<br>b)<br>c)              | Describe vacuum pan with neat sketch.<br>Why crystallizers are used<br>Explain operation of Batch type centrifugal machine  | 06<br>04<br>04 |
| Q.5   | a)<br>b)<br>c)              | Explain grass hopper conveyor<br>Describe rotary drier with neat sketch<br>Why dust catchers are used?  | 06<br>04<br>04 |
| Q.6   | Wri<br>a)<br>b)<br>c)<br>d) | <b>te short notes on (any three)</b><br>sugar drying and cooling<br>Waste water treatment<br>Air pollution control<br>Syrup sulphitation                                    | 14             |

B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019

**SLR-FM-152** 

Set S

Seat

No.

## Seat No.

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

## MCQ/Objective Type Questions

## **Duration: 30 Minutes**

5)

### Q.1 Choose the correct alternatives from the options.

- Which of the following is considered to be integral part of entrepreneurship? 1)
  - a) Innovation b) Risk c) Organising d) All of these
- The liberalization policy came into existence in \_ 2)
  - a) 1947 1974 b)
  - c) 1991 d) 2015
- Which type of entrepreneur, imitates some part of business activity only 3) when it is the only option available to run the enterprise?
  - a) Innovative b)
  - C) Fabian d)
- According to David C. McClelland, which of the following is the key 4) parameter that can be boosted in individuals so that they get ready to take up challenges against all odds?
  - a) Need for money b)
  - c) Need for status
  - The Business Model Canvas was initially proposed by
    - a) John Schumpeter b) Peter Drucker
    - c) Alexander Osterwalder d) Ash Maurya
- In business theory, a \_\_\_\_\_ innovation is an innovation that eventually 6) throws out an existing product or service from the market.
  - a) inclusive exclusive b)
  - disruptive d) imitative c)
- Small, Medium or Large firms supplying to other firms who assemble the 7) final product are called as \_\_\_\_\_ units.
  - a) primary b)
  - c) ancillary franchisee d)

Set

Max. Marks: 70

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- Marks: 14
  - 14

- Imitative drone
- Need for achievement
- d) Need for glamour

secondary

- 8) Getting work done from countries far away, where there is political stability, lower labor costs or tax savings is considered as \_\_\_\_\_ outsourcing.
  - a) on-shore

9)

c) near-shore

- b) off-shore none of these d)
- Which of the following is not included in four 'P's of marketing?
- Perfection a) Price b)
- c) Promotion Place d)
- 10) Which of the following projects shall not face stringent ecological assessment?
  - Refineries a)
  - d) C) Chemical plants
- 11) As per MSMED Act 2006, for manufacturing sector, a medium enterprise is an enterprise which has investment of more than \_\_\_\_\_ but less than in plant and machinery.
  - 50 lakhs, 1 crore a)
- b) 50 lakhs, 10 crores
- 1 crore, 5 crores 5 crores, 10 crores d) C)
- In a private limited company type of ownership, two or more members 12) describe a memorandum of .
  - a) Understanding b)
  - c) Association d)
- 13) EPC stands for \_\_\_\_
  - a) Entrepreneurs Product Centre
  - b) Export Promotion Council
  - c) Export Production Company
  - **Entrepreneurship Progress Council** d)
- 14) The analysis of the adequacy of the plant and equipment of the proposed project is called.
  - Market feasibility a) Managerial feasibility analysis C)
- Economic feasibility analysis b) d) Technical feasibility analysis

b) Power plants Handicraft works

- SLR-FM-153
  - Set

- Profit
  - - Failure

| Seat |  |
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| No.  |  |

B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Define entrepreneur and entrepreneurship. Explain role of entrepreneurship development in growth of a country   | 07       |
|-----|----------|---|----------|
|     | b)       | Give classification of entrepreneurs with examples.   | 07       |
| Q.3 | a)       | Explain corporate entrepreneurship/intrapreneurship with suitable examples.   | 07       |
|     | b)       | Enlist marketing problems faced by new entrepreneurs and suggest probable solutions.  | 07       |
| Q.4 | a)<br>b) | What is outsourcing? Describe different types of outsourcing.<br>Explain curriculum of a typical entrepreneurship development programme.  | 07<br>07 |
|     |          | Section – II  |          |
| Q.5 | a)<br>b) | Describe contents of a project report/business plan.<br>Explain SWOT analysis with suitable example.  | 07<br>07 |
| Q.6 | a)<br>b) | Explain business model formulation with a model canvas<br>Explain sole proprietorship type of business ownership with respect to its<br>important aspects, advantages and limitations | 07<br>07 |
| Q.7 | a)       | What are policies of government influencing growth of small scale<br>industries?  | 07       |
|     | b)       | What is DIC? Explain important activities of DIC.   | 07       |

Set P

Max. Marks: 56

# Seat B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book.

**Mechanical Engineering** ENTREPRENEURSHIP DEVELOPMENT

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

b)

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

No.

### Q.1 Choose the correct alternatives from the options.

- Getting work done from countries far away, where there is political 1) stability, lower labor costs or tax savings is considered as outsourcing.
  - a) on-shore
  - c) near-shore d) none of these

### Which of the following is not included in four 'P's of marketing? 2)

- a) Price b)
- c) Promotion d)
- 3) Which of the following projects shall not face stringent ecological assessment?
  - Refineries a)
    - C) Chemical plants d)
- 4) As per MSMED Act - 2006, for manufacturing sector, a medium enterprise is an enterprise which has investment of more than but less than in plant and machinery.
  - 50 lakhs, 1 crore b) 50 lakhs, 10 crores a)
  - 1 crore, 5 crores 5 crores, 10 crores C) d)
- 5) In a private limited company type of ownership, two or more members describe a memorandum of \_\_\_\_\_.
  - a) Understanding b) Profit
  - c) Association Failure d)
- 6) EPC stands for \_\_\_\_\_.
  - a) Entrepreneurs Product Centre
  - b) Export Promotion Council
  - **Export Production Company** c)
  - **Entrepreneurship Progress Council** d)
- The analysis of the adequacy of the plant and equipment of the proposed 7) project is called.
  - Market feasibility b) Economic feasibility analysis a)
  - Managerial feasibility analysis Technical feasibility analysis d) c)

Perfection

off-shore

- Place
- b) Power plants
  - Handicraft works

Max. Marks: 70

Set

Marks: 14

- Set Q
- 8) Which of the following is considered to be integral part of entrepreneurship?
  - a) Innovation

- b) Risk
- c) Organising d) All of these
- 9) The liberalization policy came into existence in \_\_\_\_\_.
  - a) 1947 b) 1974
  - c) 1991 d) 2015
- 10) Which type of entrepreneur, imitates some part of business activity only when it is the only option available to run the enterprise?
  - a) Innovative b) Imitative
  - c) Fabian d) drone
- 11) According to David C. McClelland, which of the following is the key parameter that can be boosted in individuals so that they get ready to take up challenges against all odds?
  - a) Need for money
- b) Need for achievement
- c) Need for status
- d) Need for glamour

12) The Business Model Canvas was initially proposed by \_\_\_\_\_

a) John Schumpeter

C)

- b) Peter Drucker
- c) Alexander Osterwalder d) Ash Maurya
- 13) In business theory, a \_\_\_\_\_ innovation is an innovation that eventually throws out an existing product or service from the market.
  - a) inclusive b) exclusive
    - disruptive d) imitative
- 14) Small, Medium or Large firms supplying to other firms who assemble the final product are called as \_\_\_\_\_ units.
  - a) primary b) secondary
  - c) ancillary d) franchisee

| Seat |  |
|------|--|
| No.  |  |

# B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Define entrepreneur and entrepreneurship. Explain role of entrepreneurship development in growth of a country   | 07       |
|-----|----------|---|----------|
|     | b)       | Give classification of entrepreneurs with examples.   | 07       |
| Q.3 | a)       | Explain corporate entrepreneurship/intrapreneurship with suitable examples.   | 07       |
|     | b)       | Enlist marketing problems faced by new entrepreneurs and suggest probable solutions.  | 07       |
| Q.4 | a)<br>b) | What is outsourcing? Describe different types of outsourcing.<br>Explain curriculum of a typical entrepreneurship development programme.  | 07<br>07 |
|     |          | Section – II  |          |
| Q.5 | a)<br>b) | Describe contents of a project report/business plan.<br>Explain SWOT analysis with suitable example.  | 07<br>07 |
| Q.6 | a)<br>b) | Explain business model formulation with a model canvas<br>Explain sole proprietorship type of business ownership with respect to its<br>important aspects, advantages and limitations | 07<br>07 |
| Q.7 | a)       | What are policies of government influencing growth of small scale industries?   | 07       |
|     | b)       | What is DIC? Explain important activities of DIC.   | 07       |

Set Q

Max. Marks: 56

# Set

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

| <b>Instructions:</b> 1) Q. No. 1 is compulsory. | It should be solved in first 30 minutes in Answer |
|---|---|
| Book.   |   |

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

### Q.1 Choose the correct alternatives from the options.

- The Business Model Canvas was initially proposed by \_\_\_\_\_ 1) b) Peter Drucker
  - John Schumpeter a)
  - Alexander Osterwalder C)
- 3) In business theory, a \_\_\_\_\_ innovation is an innovation that eventually throws out an existing product or service from the market.

d)

Ash Maurya

- a) inclusive exclusive b)
- c) disruptive d) imitative
- Small, Medium or Large firms supplying to other firms who assemble the 3) final product are called as \_\_\_\_\_ units.
  - a) primary b) secondary
  - c) ancillary franchisee d)
- Getting work done from countries far away, where there is political 4) stability, lower labor costs or tax savings is considered as \_\_\_\_\_ outsourcing.
  - a) on-shore b) off-shore
  - c) near-shore d) none of these
- Which of the following is not included in four 'P's of marketing? 5)
  - a) Price b) Perfection
  - Place c) Promotion d)
- Which of the following projects shall not face stringent ecological 6) assessment?
  - a) Refineries b) Power plants
  - Handicraft works c) Chemical plants d)
- As per MSMED Act 2006, for manufacturing sector, a medium enterprise 7) is an enterprise which has investment of more than \_\_\_\_\_ but less than in plant and machinery.
  - 50 lakhs, 1 crore a)
  - 50 lakhs, 10 crores b) 1 crore, 5 crores 5 crores, 10 crores d) C)

Marks: 14

SLR-FM-153

Max. Marks: 70

- In a private limited company type of ownership, two or more members describe a memorandum of \_\_\_\_\_.
  - a) Understanding b)
  - c) Association
- 9) EPC stands for \_\_\_\_
  - a) Entrepreneurs Product Centre
  - b) Export Promotion Council
  - c) Export Production Company
  - d) Entrepreneurship Progress Council
- 10) The analysis of the adequacy of the plant and equipment of the proposed project is called.
  - a) Market feasibility
- b) Economic feasibility analysisd) Technical feasibility analysis
- c) Managerial feasibility analysis
- 11) Which of the following is considered to be integral part of entrepreneurship?
  - a) Innovation b) Risk
  - c) Organising d) All of these
- 12) The liberalization policy came into existence in \_\_\_\_\_.
  - a) 1947 b) 1974
  - c) 1991 d) 2015
- 13) Which type of entrepreneur, imitates some part of business activity only when it is the only option available to run the enterprise?
  - a) Innovative b) Imitative
  - c) Fabian d) drone
- 14) According to David C. McClelland, which of the following is the key parameter that can be boosted in individuals so that they get ready to take up challenges against all odds?
  - a) Need for money
  - c) Need for status

- b) Need for achievement
- d) Need for glamour

- b) Profit
- d) Failure



Set R



| Seat |  |
|------|--|
| No.  |  |

# B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicate full marks.

## Section – I

| Q.2 | a)       | Define entrepreneur and entrepreneurship. Explain role of entrepreneurship development in growth of a country   | 07       |
|-----|----------|---|----------|
|     | b)       | Give classification of entrepreneurs with examples.   | 07       |
| Q.3 | a)       | Explain corporate entrepreneurship/intrapreneurship with suitable examples.   | 07       |
|     | b)       | Enlist marketing problems faced by new entrepreneurs and suggest probable solutions.  | 07       |
| Q.4 | a)<br>b) | What is outsourcing? Describe different types of outsourcing.<br>Explain curriculum of a typical entrepreneurship development programme.  | 07<br>07 |
|     |          | Section – II  |          |
| Q.5 | a)<br>b) | Describe contents of a project report/business plan.<br>Explain SWOT analysis with suitable example.  | 07<br>07 |
| Q.6 | a)<br>b) | Explain business model formulation with a model canvas<br>Explain sole proprietorship type of business ownership with respect to its<br>important aspects, advantages and limitations | 07<br>07 |
| Q.7 | a)       | What are policies of government influencing growth of small scale industries?   | 07       |
|     | b)       | What is DIC? Explain important activities of DIC.   | 07       |

Set R

Max. Marks: 56

Set

## B.E. (Part – I) (New) (CBCS) Examination Nov/Dec-2019 **Mechanical Engineering** ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

- Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book.
  - 2) Figures to the right indicate full marks.
  - 3) Make suitable assumptions if necessary and state them clearly.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

### Q.1 Choose the correct alternatives from the options.

- Which of the following projects shall not face stringent ecological 1) assessment? b) Power plants
  - Refineries a)
  - Chemical plants C)
- As per MSMED Act 2006, for manufacturing sector, a medium enterprise 2) is an enterprise which has investment of more than but less than in plant and machinery.

d)

- 50 lakhs, 1 crore a)
- b) 50 lakhs, 10 crores

Handicraft works

- 1 crore, 5 crores 5 crores, 10 crores d) C)
- In a private limited company type of ownership, two or more members 3) describe a memorandum of \_\_\_\_\_. b)
  - a) Understanding
  - c) Association d)
- 4) EPC stands for
  - a) Entrepreneurs Product Centre
  - **Export Promotion Council** b)
  - **Export Production Company** C)
  - Entrepreneurship Progress Council d)
- The analysis of the adequacy of the plant and equipment of the proposed 5) project is called.
  - a) Market feasibility b) Economic feasibility analysis
  - Managerial feasibility analysis Technical feasibility analysis d) C)
- Which of the following is considered to be integral part of entrepreneurship? 6)
  - a) Innovation Risk b) C)
    - Organising d) All of these
- 7) The liberalization policy came into existence in
  - 1947 1974 a) b) 1991 c) d) 2015

SLR-FM-153

Marks: 14

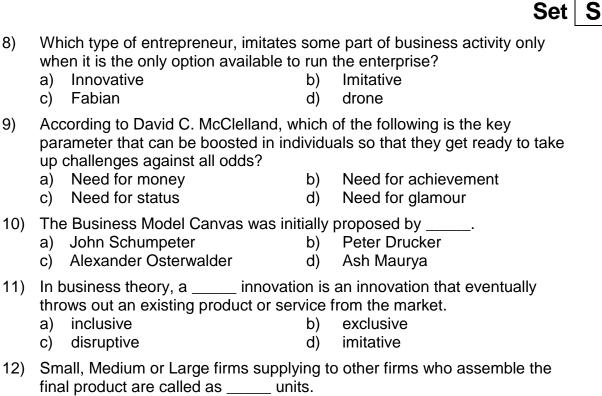
14

Profit

Failure

Seat No.

Max. Marks: 70



- a) primary secondary b)
- c) ancillary d) franchisee
- 13) Getting work done from countries far away, where there is political stability, lower labor costs or tax savings is considered as \_\_\_\_\_ outsourcing.
  - a) on-shore b)
    - off-shore none of these d)
- 14) Which of the following is not included in four 'P's of marketing?
  - a) Price

8)

9)

11)

C)

Perfection b)

c) Promotion

c) near-shore

Place d)

| Seat |  |
|------|--|
| No.  |  |

# B.E. (Part - I) (New) (CBCS) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | Define entrepreneur and entrepreneurship. Explain role of entrepreneurship development in growth of a country   | 07       |
|-----|----------|---|----------|
|     | b)       | Give classification of entrepreneurs with examples.   | 07       |
| Q.3 | a)       | Explain corporate entrepreneurship/intrapreneurship with suitable examples.   | 07       |
|     | b)       | Enlist marketing problems faced by new entrepreneurs and suggest probable solutions.  | 07       |
| Q.4 | a)<br>b) | What is outsourcing? Describe different types of outsourcing.<br>Explain curriculum of a typical entrepreneurship development programme.  | 07<br>07 |
|     |          | Section – II  |          |
| Q.5 | a)<br>b) | Describe contents of a project report/business plan.<br>Explain SWOT analysis with suitable example.  | 07<br>07 |
| Q.6 | a)<br>b) | Explain business model formulation with a model canvas<br>Explain sole proprietorship type of business ownership with respect to its<br>important aspects, advantages and limitations | 07<br>07 |
| Q.7 | a)       | What are policies of government influencing growth of small scale industries?   | 07       |
|     | b)       | What is DIC? Explain important activities of DIC.   | 07       |

Set S

Max. Marks: 56

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH**

Day & Date: Thursday, 12-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q.no.1 is compulsory. It should be solved in first 30 minutes in Answer book.

- 2) Assume the suitable data whenever necessary.
- 3) Figures to the right indicate full marks.

MCQ/Objective Type Questions

b)

**Duration: 30 Minutes** 

Seat

No.

- Choose the correct alternatives from the options and rewrite the sentence. Q.1 Type - I: questions : (1 mark each x 8 questions = 08)
  - 1) OR is said to be \_\_\_\_\_
    - a) Only art
    - c) Art as well as science
- d) None of these

b) Value of the decision variable

d) Uncertainty of optimum value

Only science

- A constraint in LPP restricts \_\_\_\_\_ a) Value of objective function

  - Use of available resources c)
- 3) For maximization LPP, the simplex method is terminated when all the net evaluations are \_\_\_\_\_.
  - a) Negative b) Non negative
  - c) Zero d) non positive
- Which of the following is used in solving Dynamic Programming 4) Problems
  - a) Bellman's principle of optimality
  - b) Johnson's Rule
  - c) MODI method
  - d) Monte Carlo Technique
- In an unbalanced assignment problem if m is no. of rows & n is no. of 5) columns then .
  - a) m=n

- b) m≠n
- c)  $m \le n$  always d)  $m \ge n$  always
- The initial solution of a Transportation problem obtained by . 6)
  - a) North West Corner Rule would invariably be optimum
  - b) Least cost method does not provide the least solution to a problem
  - c) VAM would mostly give solution very near to optimum solution
  - d) MODI method is infeasible
- 7) Which of the following costs are associated with inventory?
  - a) holding cost c) shortage cost

- b) order cost
- d) all of these

## **SLR-FM-154**

Max. Marks: 70

Set

Marks: 14

- 8) Re order level for inventory item depends upon \_\_\_\_\_.
  - a) lead time

- b) Economic order quantity
- d) all of these

## Type - II: questions : (2 marks each x 3 questions = 06)

- 1) In PERT, the three time estimates used to calculate expected duration, are supposed to follow the distribution curve called as \_\_\_\_\_.
  - a) Poison curve c) Beta curve

- Normal curve b)
- d) Gamma curve
- Group replacement is not preferred for \_ 2) b) low cost items
  - a) large number of identical item
  - c) Items that fail suddenly d) repairable item
- When money value is changing with time is 10%, the discount factor for the 3) fourth year is \_\_\_\_\_.
  - a) 0.751 0.909 b) d) 0.826
  - c) 0.683

06

- Set P
- **SLR-FM-154**

c) Safety Stock

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH**

Day & Date: Thursday, 12-12-2019 Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section. 2) Assume the suitable data if necessary.

## Section – I

- Q.2 a) Explain in brief the various phases in Operations Research. b) Solve the following LPP by Simplex Method Maximize  $Z = 3x_1 + 2x_2$ Subject to  $2x_1 + x_2 \le 40$  $x_1 + x_2 \le 24$  $2x_1 + 3x_2 \le 60$  $x_1, x_2 \ge 0$
- Q.3 a) Explain the significance of Slack, Surplus & Artificial variables in LPP. 05 **b)** Four jobs are to be assigned to four workers & the respective profits in 09
  - rupees of these assignments is given in following matrix. Determine the optimal assignment to maximize the profit.

| Workers/Jobs | А  | В  | С  | D  |
|--------------|----|----|----|----|
| 1            | 21 | 15 | 19 | 16 |
| 2            | 19 | 16 | 20 | 20 |
| 3            | 10 | 20 | 18 | 17 |
| 4            | 18 | 17 | 19 | 20 |

a) Explain Bellman's Principle used in Dynamic Programming. 05 Q.4 b) Determine the IBFS to the following transportation problem by VAM & hence 09 solve for optimum solution.

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| 01     | 23 | 27 | 16 | 18 | 30     |
| O2     | 12 | 17 | 20 | 51 | 40     |
| O3     | 22 | 28 | 12 | 32 | 53     |
| Demand | 22 | 35 | 25 | 41 |        |

Max. Marks: 56

Set

05

## Section – II

### Player B IV Ш 111 L 3 2 4 0 L Player П 3 4 2 4 А Ш 4 2 4 1 IV 3 3 4 4

Player B

V 8 -5

**b)** Solve the game by graphical method whose payoff matrix is.

**Q.5** a) Solve following game using principle of dominance.

| Dlovor |   | _  | =  |    | ١V |
|--------|---|----|----|----|----|
| Player |   | -5 | 5  | 0  | -1 |
| ~      | = | 8  | -4 | -1 | 6  |

- c) Define the following terms
  - 1) Project
  - 2) Saddle point
  - 3) Expected Value Criterion
- Q.6 a) A automatic safety electric switches attached to a press has the following 05 probability.

| No. of years              | 1    | 2   | 3    | 4   | 5    | 6   | 7    |
|---------------------------|------|-----|------|-----|------|-----|------|
| Probability of<br>failure | 0.05 | 0.1 | 0.15 | 0.2 | 0.35 | 0.1 | 0.05 |

If the average cost to replace the single switch is Rs.15/- but, this come down to Rs.3/- when the replacement is carried out on the group basis. Find the optimum replacement plan.

- b) The demand for an item is 6000 units per year. Its production rate is 1000 06 units per month. The carrying cost is Rs. 50/unit/year and the set-up cost is Rs. 2000 per set-up. The shortage cost is Rs. 1000 per unit per year. Find the EOQ & cycle time.
- c) Distinguish between PERT and CPM
- Q.7 a) A certain project has the following data.

| Activity       | 1-2 | 1-3 | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time in months | 15  | 15  | 3   | 5   | 8   | 12  | 1   | 14  | 3   | 14  |

Construct the network 1)

2) Determine project duration and critical path

- 3) Find total float
- b) Explain the concept of Laplace and Hurwitz criterion.

06



03

08

05

SLR-FM-154

Set

# B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Thursday, 12-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q.no.1 is compulsory. It should be solved in first 30 minutes in Answer book. 2) Assume the suitable data whenever necessary. 3) Figures to the right indicate full marks.

**OPERATIONS RESEARCH** 

MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

### Choose the correct alternatives from the options and rewrite the sentence. Q.1 Type - I: questions : (1 mark each x 8 questions = 08)

- 1) In an unbalanced assignment problem if m is no. of rows & n is no. of columns then \_\_\_\_\_.
  - a) m=n c)  $m \le n$  always
- b) m≠n d) m≥ n always
- The initial solution of a Transportation problem obtained by \_\_\_\_\_. 2)
  - a) North West Corner Rule would invariably be optimum
  - b) Least cost method does not provide the least solution to a problem
  - c) VAM would mostly give solution very near to optimum solution
  - d) MODI method is infeasible
- Which of the following costs are associated with inventory? 3) a) holding cost
  - b) order cost
  - c) shortage cost d) all of these
- Re order level for inventory item depends upon \_\_\_\_ 4) b) Economic order quantity
  - a) lead time
  - c) Safety Stock
- OR is said to be \_\_\_\_\_ 5)
  - a) Only art
  - c) Art as well as science
- A constraint in LPP restricts 6)
  - a) Value of objective function
  - c) Use of available resources
- For maximization LPP, the simplex method is terminated when all the net 7) evaluations are .
  - b) a) Negative C)
    - Zero non positive d)
- Which of the following is used in solving Dynamic Programming 8) Problems
  - a) Bellman's principle of optimality
  - b) Johnson's Rule
  - c) MODI method
  - d) Monte Carlo Technique

- Marks: 14

**08** 

Max. Marks: 70

Q



b) Only science

d) all of these

- None of these d)
- b) Value of the decision variable
- d) Uncertainty of optimum value
  - Non negative

## Type - II: questions : (2 marks each x 3 questions = 06)

- 1) Group replacement is not preferred for \_
  - a) large number of identical item
- b) low cost items
- c) Items that fail suddenly
- d) repairable item
- 2) When money value is changing with time is 10%, the discount factor for the fourth year is \_\_\_\_\_.
  - a) 0.751

- b) 0.909
- c) 0.683 0.826 d)
- In PERT, the three time estimates used to calculate expected duration, are 3) supposed to follow the distribution curve called as \_\_\_\_
  - a) Poison curve

- b) Normal curve
- c) Beta curve
- d) Gamma curve

Set Q 06



| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH**

Day & Date: Thursday, 12-12-2019 Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section. 2) Assume the suitable data if necessary.

## Section – I

- Q.2 a) Explain in brief the various phases in Operations Research. b) Solve the following LPP by Simplex Method Maximize  $Z = 3x_1 + 2x_2$ Subject to  $2x_1 + x_2 \le 40$  $x_1 + x_2 \le 24$  $2x_1 + 3x_2 \le 60$  $x_1, x_2 \ge 0$
- Q.3 a) Explain the significance of Slack, Surplus & Artificial variables in LPP. 05 **b)** Four jobs are to be assigned to four workers & the respective profits in
  - rupees of these assignments is given in following matrix. Determine the optimal assignment to maximize the profit.

| Workers/Jobs | Α  | В  | С  | D  |
|--------------|----|----|----|----|
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| 2            | 19 | 16 | 20 | 20 |
| 3            | 10 | 20 | 18 | 17 |
| 4            | 18 | 17 | 19 | 20 |

a) Explain Bellman's Principle used in Dynamic Programming. 05 Q.4 b) Determine the IBFS to the following transportation problem by VAM & hence 09 solve for optimum solution.

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| 01     | 23 | 27 | 16 | 18 | 30     |
| O2     | 12 | 17 | 20 | 51 | 40     |
| O3     | 22 | 28 | 12 | 32 | 53     |
| Demand | 22 | 35 | 25 | 41 |        |



Max. Marks: 56

09

05

## Section – II

### Player B IV Ш 111 L 3 2 4 0 L Player П 3 4 2 4 А Ш 4 2 4 1 IV 3 3 4 4

Player B

V 8 -5

**b)** Solve the game by graphical method whose payoff matrix is.

**Q.5** a) Solve following game using principle of dominance.

| Blover |  |    | =  |    | IV |  |
|--------|--|----|----|----|----|--|
| Player |  | -5 | 5  | 0  | -1 |  |
| A      |  | 8  | -4 | -1 | 6  |  |

- c) Define the following terms
  - 1) Project
  - 2) Saddle point
  - 3) Expected Value Criterion
- Q.6 a) A automatic safety electric switches attached to a press has the following 05 probability.

| No. of years              | 1    | 2   | 3    | 4   | 5    | 6   | 7    |
|---------------------------|------|-----|------|-----|------|-----|------|
| Probability of<br>failure | 0.05 | 0.1 | 0.15 | 0.2 | 0.35 | 0.1 | 0.05 |

If the average cost to replace the single switch is Rs.15/- but, this come down to Rs.3/- when the replacement is carried out on the group basis. Find the optimum replacement plan.

- b) The demand for an item is 6000 units per year. Its production rate is 1000 06 units per month. The carrying cost is Rs. 50/unit/year and the set-up cost is Rs. 2000 per set-up. The shortage cost is Rs. 1000 per unit per year. Find the EOQ & cycle time.
- c) Distinguish between PERT and CPM
- Q.7 a) A certain project has the following data.

| Activity       | 1-2 | 1-3 | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time in months | 15  | 15  | 3   | 5   | 8   | 12  | 1   | 14  | 3   | 14  |

Construct the network 1)

2) Determine project duration and critical path

- 3) Find total float
- b) Explain the concept of Laplace and Hurwitz criterion.

06

SLR-FM-154 Set

06

05

03

03

# Seat

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH**

Day & Date: Thursday, 12-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q.no.1 is compulsory. It should be solved in first 30 minutes in Answer book.

- 2) Assume the suitable data whenever necessary.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

No.

### Choose the correct alternatives from the options and rewrite the sentence. Q.1 Type - I: questions : (1 mark each x 8 questions = 08)

1) For maximization LPP, the simplex method is terminated when all the net evaluations are \_\_\_\_\_.

b)

- a) Negative c) Zero
  - Non negative non positive d)
- 2) Which of the following is used in solving Dynamic Programming Problems
  - a) Bellman's principle of optimality
  - b) Johnson's Rule
  - c) MODI method
  - d) Monte Carlo Technique
- In an unbalanced assignment problem if m is no. of rows & n is no. of 3) columns then \_\_\_\_\_.
  - a) m=n b) m≠n
  - c)  $m \le n$  always d)  $m \ge n$  always
- 4) The initial solution of a Transportation problem obtained by \_\_\_\_\_.
  - a) North West Corner Rule would invariably be optimum
  - b) Least cost method does not provide the least solution to a problem
  - VAM would mostly give solution very near to optimum solution c)
  - d) MODI method is infeasible
- Which of the following costs are associated with inventory? 5)
  - a) holding cost b) order cost
  - c) shortage cost d) all of these
- Re order level for inventory item depends upon \_ 6) b) Economic order quantity
  - a) lead time
  - c) Safety Stock
- 7) OR is said to be .
  - a) Only art
  - c) Art as well as science
- A constraint in LPP restricts \_ 8)
  - a) Value of objective function C)
    - Use of available resources
- b) Only science

d) all of these

- None of these d)
- b) Value of the decision variable
- d) Uncertainty of optimum value

**SLR-FM-154** 



Max. Marks: 70

R

Marks: 14

## Type - II: questions : (2 marks each x 3 questions = 06)

- 1) When money value is changing with time is 10%, the discount factor for the fourth year is \_\_\_\_\_.
  - a) 0.751
  - c) 0.683

- b) 0.909 d) 0.826
- In PERT, the three time estimates used to calculate expected duration, are 2) supposed to follow the distribution curve called as \_\_\_\_ .\_\_..
  - a) Poison curve

- b) Normal curve
- c) Beta curve Gamma curve d)
- Group replacement is not preferred for \_ 3)
  - a) large number of identical item
- b) low cost items
- c) Items that fail suddenly
- d) repairable item

Set R 06

**SLR-FM-154** 

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Day & Date: Thursday,12-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Assume the suitable data if necessary.

## Section – I

**Q.2** a) Explain in brief the various phases in Operations Research. b) Solve the following LPP by Simplex Method Maximize  $Z = 3x_1 + 2x_2$ Subject to  $2x_1 + x_2 \le 40$   $x_1 + x_2 \le 24$  $2x_1 + 3x_2 \le 60$ 

$$x_1, x_2 \ge 0$$

- Q.3 a) Explain the significance of Slack, Surplus & Artificial variables in LPP. 05
  - b) Four jobs are to be assigned to four workers & the respective profits in rupees of these assignments is given in following matrix. Determine the optimal assignment to maximize the profit.

| Workers/Jobs | Α  | В  | С  | D  |
|--------------|----|----|----|----|
| 1            | 21 | 15 | 19 | 16 |
| 2            | 19 | 16 | 20 | 20 |
| 3            | 10 | 20 | 18 | 17 |
| 4            | 18 | 17 | 19 | 20 |

Q.4 a) Explain Bellman's Principle used in Dynamic Programming.
 Determine the IBFS to the following transportation problem by VAM & hence 09 solve for optimum solution.

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| 01     | 23 | 27 | 16 | 18 | 30     |
| O2     | 12 | 17 | 20 | 51 | 40     |
| O3     | 22 | 28 | 12 | 32 | 53     |
| Demand | 22 | 35 | 25 | 41 |        |

Max. Marks: 56

Set

05 09

05

09

### Section – II

### Player B IV Ш 111 L 3 2 4 0 L Player П 3 4 2 4 А Ш 4 2 4 1 IV 3 3 4 4

Plaver B

8 -5

**b)** Solve the game by graphical method whose payoff matrix is.

**Q.5** a) Solve following game using principle of dominance.

|  |             |   |    | 1.10 | ,  |    |  |  |
|--|-------------|---|----|------|----|----|--|--|
|  | Dlovor      |   | I  | Ш    |    | IV |  |  |
|  | Player<br>A | Ι | -5 | 5    | 0  | -1 |  |  |
|  |             | Π | 8  | -4   | -1 | 6  |  |  |
|  |             |   |    |      |    |    |  |  |

- c) Define the following terms
  - 1) Project
  - 2) Saddle point
  - 3) Expected Value Criterion
- Q.6 a) A automatic safety electric switches attached to a press has the following 05 probability.

| No. of years              | 1    | 2   | 3    | 4   | 5    | 6   | 7    |
|---------------------------|------|-----|------|-----|------|-----|------|
| Probability of<br>failure | 0.05 | 0.1 | 0.15 | 0.2 | 0.35 | 0.1 | 0.05 |

If the average cost to replace the single switch is Rs.15/- but, this come down to Rs.3/- when the replacement is carried out on the group basis. Find the optimum replacement plan.

- b) The demand for an item is 6000 units per year. Its production rate is 1000 06 units per month. The carrying cost is Rs. 50/unit/year and the set-up cost is Rs. 2000 per set-up. The shortage cost is Rs. 1000 per unit per year. Find the EOQ & cycle time.
- c) Distinguish between PERT and CPM
- Q.7 a) A certain project has the following data.

| Activity       | 1-2 | 1-3 | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time in months | 15  | 15  | 3   | 5   | 8   | 12  | 1   | 14  | 3   | 14  |

- Construct the network 1)
- 2) Determine project duration and critical path
- 3) Find total float
- b) Explain the concept of Laplace and Hurwitz criterion.

06

06

03

**08** 

05

SLR-FM-154

Set

## Seat No.

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering OPERATIONS RESEARCH**

Day & Date: Thursday, 12-12-2019 Time: 02.30 PM To 05.30 PM

| Instructions: 1) Q.no.1 is compulsory. It should be solved in first 30 minutes in Answer |
|--|
| book.  |
| 2) Assume the suitable date whenever peacearry   |

- 2) Assume the suitable data whenever necessary.
- Figures to the right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Choose the correct alternatives from the options and rewrite the sentence. Q.1 Type - I: questions : (1 mark each x = 08)

- 1) Which of the following costs are associated with inventory?
  - a) holding cost
  - c) shortage cost
- Re order level for inventory item depends upon \_\_\_\_ 2)
  - a) lead time
  - c) Safety Stock
- OR is said to be \_\_\_\_\_. 3)
  - a) Only art
  - c) Art as well as science
- A constraint in LPP restricts 4)
  - a) Value of objective function
- b) Value of the decision variable d) Uncertainty of optimum value
- For maximization LPP, the simplex method is terminated when all the net 5) evaluations are \_\_\_\_\_.
  - a) Negative
  - C) Zero d) non positive
- Which of the following is used in solving Dynamic Programming 6) Problems
  - a) Bellman's principle of optimality
  - b) Johnson's Rule
  - c) MODI method
  - d) Monte Carlo Technique
- 7) In an unbalanced assignment problem if m is no. of rows & n is no. of columns then \_\_\_\_\_.
  - a) m=n
  - c)  $m \le n$  always d)  $m \ge n$  always
- The initial solution of a Transportation problem obtained by \_\_\_\_\_. 8)
  - a) North West Corner Rule would invariably be optimum
  - b) Least cost method does not provide the least solution to a problem
  - c) VAM would mostly give solution very near to optimum solution
  - d) MODI method is infeasible

# d) all of these

- b) Economic order quantity
- d) all of these

b) Only science

d)

b)

b) m≠n

None of these

Non negative

b) order cost

**SLR-FM-154** 



Max. Marks: 70

**08** 

Marks: 14

## Type - II: questions : (2 marks each x 3 questions = 06)

- 1) In PERT, the three time estimates used to calculate expected duration, are supposed to follow the distribution curve called as \_\_\_\_
  - a) Poison curve c) Beta curve

- b) Normal curve
- d) Gamma curve
- Group replacement is not preferred for 2) b)
  - a) large number of identical item c) Items that fail suddenly
- low cost items d) repairable item
- When money value is changing with time is 10%, the discount factor for the 3) fourth year is \_\_\_\_\_.
  - 0.909 a) 0.751 b)
  - c) 0.683

- d)
  - 0.826

Set

**SLR-FM-154** 

06

S

| Seat |  |
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| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering OPERATIONS RESEARCH

Day & Date: Thursday,12-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Assume the suitable data if necessary.

### Section – I

- Q.2 a)Explain in brief the various phases in Operations Research.05b)Solve the following LPP by Simplex Method09Maximize  $Z = 3x_1 + 2x_2$ <br/>Subject to  $2x_1 + x_2 \le 40$ <br/> $x_1 + x_2 \le 24$ <br/> $2x_1 + 3x_2 \le 60$ 09
  - $x_1, x_2 \ge 0$ **a)** Explain the significance of Slack, Surplus & Artificial variables in LPP.
- Q.3 a) Explain the significance of Slack, Surplus & Artificial variables in LPP.
   b) Four jobs are to be assigned to four workers & the respective profits in rupees of these assignments is given in following matrix. Determine the optimal assignment to maximize the profit.

| Workers/Jobs | Α  | В  | С  | D  |
|--------------|----|----|----|----|
| 1            | 21 | 15 | 19 | 16 |
| 2            | 19 | 16 | 20 | 20 |
| 3            | 10 | 20 | 18 | 17 |
| 4            | 18 | 17 | 19 | 20 |

Q.4 a) Explain Bellman's Principle used in Dynamic Programming.
 b) Determine the IBFS to the following transportation problem by VAM & hence
 09 solve for optimum solution.

|        | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| 01     | 23 | 27 | 16 | 18 | 30     |
| O2     | 12 | 17 | 20 | 51 | 40     |
| O3     | 22 | 28 | 12 | 32 | 53     |
| Demand | 22 | 35 | 25 | 41 |        |

Max. Marks: 56

Set

### Section – II

### Player B IV Ш 111 L 3 2 4 0 I Player П 3 4 2 4 А Ш 4 2 4 1 3 3 IV 4 4

Player B Ш

0

-1

IV

-1

6

V

8

-5

Ш

5

-4

**b)** Solve the game by graphical method whose payoff matrix is.

Player

**Q.5** a) Solve following game using principle of dominance.

| c) | Define the following terms |  |
|----|----------------------------|--|
| C) | Define the following terms |  |

- 1) Project
- 2) Saddle point
- 3) Expected Value Criterion
- Q.6 a) A automatic safety electric switches attached to a press has the following 05 probability.

L

-5

8

| No. of years              | 1    | 2   | 3    | 4   | 5    | 6   | 7    |
|---------------------------|------|-----|------|-----|------|-----|------|
| Probability of<br>failure | 0.05 | 0.1 | 0.15 | 0.2 | 0.35 | 0.1 | 0.05 |

If the average cost to replace the single switch is Rs.15/- but, this come down to Rs.3/- when the replacement is carried out on the group basis. Find the optimum replacement plan.

- b) The demand for an item is 6000 units per year. Its production rate is 1000 06 units per month. The carrying cost is Rs. 50/unit/year and the set-up cost is Rs. 2000 per set-up. The shortage cost is Rs. 1000 per unit per year. Find the EOQ & cycle time.
- c) Distinguish between PERT and CPM
- Q.7 a) A certain project has the following data.

| Activity       | 1-2 | 1-3 | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time in months | 15  | 15  | 3   | 5   | 8   | 12  | 1   | 14  | 3   | 14  |

- Construct the network 1)
- 2) Determine project duration and critical path
- 3) Find total float
- b) Explain the concept of Laplace and Hurwitz criterion.

06

Set

SLR-FM-154

06

05

03

03

# B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

AUTOMATIC CONTROL ENGINEERING Day & Date: Saturday,07-12-2019

Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) In 'direct analogy' the 'temperature' in a thermal system with convective heat transfer, the 'temperature' is analogous to

b)

- a) Current
- Resistance d) c)
- 2) A person driving an automobile is an example of closed loop control system.
  - a) True b)
- 3) In linearization of operating curves, the partial derivatives are \_\_\_\_\_ b)
  - evaluated from the equation a)
  - c) not required d)
- 4) The standard stepper motor is an example of loop system. Closed b)
  - a) open
  - c) hybrid

a)

For a linear control system, all the relationship between the variables are \_\_\_\_\_. 5)

d)

- a) non-linear algebraic equation
- b) linear algebraic equations
- linear differential equation c)
- d) second order partial difference equation
- For a system in steady state, if command signal decreases and load is 6) constant, then the output will
  - b) a) decrease Increase c) increase then decrease d) remain the same
- 7) In BDA the functions in series blocks are
  - Subtracted a) added b) c) multiplied d) Divided
- In field-controlled DC motor speed is controlled using 8)
  - field current field voltage b)
  - c) field resistance d) field capacitance

**SLR-FM-155** 



Max. Marks: 70

Marks: 14

- Voltage
- Capacitance
- False
  - - evaluated from the graph
    - equated to zero

feed forward

**SLR-FM-155** Set P 9) The control action which is never used alone is \_\_\_\_\_. a) P b) Т c) D d) all of the above 10) If the poles of control system lie on the imaginary axis in s-plane the system will be . unstable b) Stable a) c) conditionally stable d) marginally stable If P-Z=2, then the angle of the asymptotes to the root locus are \_\_\_\_\_. 11) a) 45 & 315 deg b) 90 & 270 deg c) 135 & 225 deg 180 & -180 deg d) If a row in Routh's array contains all zeros the system . 12) a) is unstable b) is stable c) has two roots in the right half plane d) has two or more roots symmetrically about the origin 13) In magnitude plot of Bode Plots, the slop changes at \_\_\_\_ a) the point of zero magnitude b) every corner frequency c) gain cross over frequency d) None of the above A root locus will have branches terminating to infinity if, \_\_\_\_\_. 14) Z<P a) Z>P b) c) Z=P d) all the above

Seat No.

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019

Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

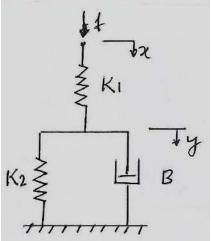
## Section – I

## Q.2 Attempt the following questions.

- a) List two examples each of open loop control system, closed loop control system, biological feedback control system.
- b) The speed torque curves for a DC motor are shown in the Fig. where V is the applied voltage, N is the speed, and T is the output torque, Determine the linear approximation for the change in torque t due to change in speed n and a voltage v. The motor drives an inertial load such that t = J dn/dt, where J is the mass moment of inertia. For J = 0.1, determine the differential equation relating the change in speed n to the change in voltage v. Determine the time constant? And the steady state gain.



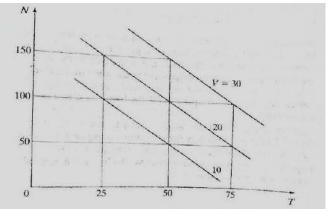
- a) For the mechanical system, shown in the figure write the force equation at each coordinate and then determine the equation which relates
  - i) x to f





Max. Marks: 70

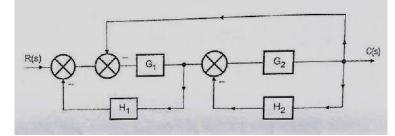
SLR-FM-155



## Set P

04

- b) Draw the block diagram of an armature-controlled DC motor. State the transfer function.
   04
- c) Reduce the block diagram shown in the Fig. and obtain the closed loop 06 transfer function C(S)/R(S).

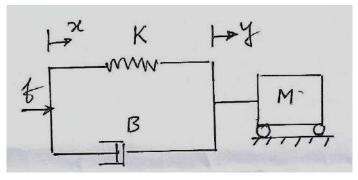


## Q.4 Attempt any three:

- a) List any four laws of block diagram reduction.
- b) Determine the linear approximation for the following function for P
   04
   PV = WRT

Where, Pi=100, Vi=100, Wi=10/53, Ti=1000, T=1200, R=53.3, W=Wi

c) For the mechanical system shown below, construct the direct analogue 06 and inverse analogue.



Section - II

## Q.5 Attempt any two.

a) Sketch the complete root locus and comment on system stability a control 07 system represented by,

$$G(S)H(S) = \frac{K}{S(S+3)(S^2+3S+3)}$$

b) Determine the stability of system of the system whose characteristic 07 equation is

S<sup>6</sup>+3S<sup>5</sup>+2S<sup>4</sup>+4S<sup>2</sup>+12S+8=0

Comment on location of roots.

## Q.6 Attempt the following questions.

- a) A unity feedback system is given by,  $G(S) = \frac{80}{s(s+2)(s+20)}$  Sketch Bode plots and comment on system stability.
- **b)** Define the following terms :
  - 1) Gain crossover frequency
  - 2) Phase crossover frequency
  - 3) Gain margin
  - 4) Phase margin
  - 5) Rouths Criterion
  - 6) Linear control system

# SLR-FM-155 Set P

## Q.7 Attempt the following questions.

- a) Discuss in detail proportional, integral and PI control.
- **b)** The motion of driverless vehicle which follows a wire embedded in the floor **07** is described by the differential equation  $y(t) = \frac{(D+3)}{(D+2)(D+1)}f(t)$ .

Determine the computer diagram and state space representation by parallel programming.

# B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

### **Duration: 30 Minutes** Marks: 14

### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

MCQ/Objective Type Questions

- 1) In field-controlled DC motor speed is controlled using
  - field voltage a) field current b)
  - c) field resistance d) field capacitance
- 2) The control action which is never used alone is \_\_\_\_\_.
  - a) P b) L c) D
    - d) all of the above
- If the poles of control system lie on the imaginary axis in s-plane the 3) system will be \_\_\_\_\_.
  - a) unstable b) Stable
  - c) conditionally stable d) marginally stable
- 4) If P-Z=2, then the angle of the asymptotes to the root locus are .
  - a) 45 & 315 deg
- 90 & 270 deg b)
- c) 135 & 225 deg
- d) 180 & -180 deg

d)

- 5) If a row in Routh's array contains all zeros the system .
  - a) is unstable
  - b) is stable
  - c) has two roots in the right half plane
  - d) has two or more roots symmetrically about the origin
- In magnitude plot of Bode Plots, the slop changes at 6) b)
  - a) the point of zero magnitude
  - c) gain cross over frequency
- A root locus will have branches terminating to infinity if, \_\_\_\_\_. 7)
  - a) Z>P b) Z<P all the above c) Z=P d)
- 8) In 'direct analogy' the 'temperature' in a thermal system with convective heat transfer, the 'temperature' is analogous to .
  - a) Current Voltage b)
    - c) Resistance d) Capacitance
- 9) A person driving an automobile is an example of closed loop control system. b) False
  - a) True

Max. Marks: 70



SLR-FM-155

Set

Q

Seat No.

- every corner frequency
- - None of the above



Set Q

- 10) In linearization of operating curves, the partial derivatives are \_\_\_\_\_
  - a) evaluated from the equation
- b) evaluated from the graph
- c) not required
- d) equated to zero
- 11) The standard stepper motor is an example of \_\_\_\_\_ loop system.
  - a) open c) hybrid
- b) Closed
- d) feed forward
- 12) For a linear control system, all the relationship between the variables are \_\_\_\_\_.a) non-linear algebraic equation
  - b) linear algebraic equations
  - c) linear differential equation
  - d) second order partial difference equation
- 13) For a system in steady state, if command signal decreases and load is constant, then the output will \_\_\_\_\_.
  - a) decrease b) Increase
  - c) increase then decrease d) remain the same
- 14) In BDA the functions in series blocks are \_\_\_\_
  - a) added

- b) Subtracted
- d) Divided

c) multiplied

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019

Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

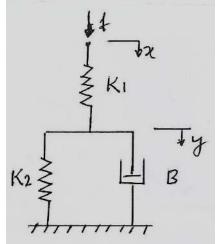
## Section – I

## Q.2 Attempt the following questions.

- a) List two examples each of open loop control system, closed loop control system, biological feedback control system.
- b) The speed torque curves for a DC motor are shown in the Fig. where V is the applied voltage, N is the speed, and T is the output torque, Determine the linear approximation for the change in torque t due to change in speed n and a voltage v. The motor drives an inertial load such that t = J dn/dt, where J is the mass moment of inertia. For J = 0.1, determine the differential equation relating the change in speed n to the change in voltage v. Determine the time constant? And the steady state gain.



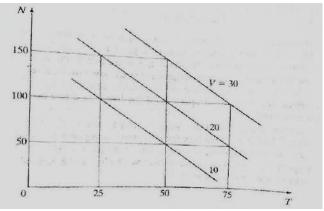
- a) For the mechanical system, shown in the figure write the force equation at each coordinate and then determine the equation which relates
  - i) x to f





Max. Marks: 70

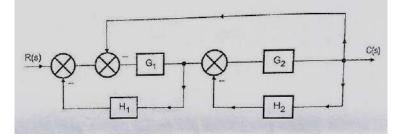
SLR-FM-155



## Set Q

04

- b) Draw the block diagram of an armature-controlled DC motor. State the transfer function.
   04
- c) Reduce the block diagram shown in the Fig. and obtain the closed loop 06 transfer function C(S)/R(S).

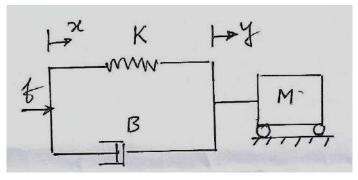


#### Q.4 Attempt any three:

- a) List any four laws of block diagram reduction.
- b) Determine the linear approximation for the following function for P
   04
   PV = WRT

Where, Pi=100, Vi=100, Wi=10/53, Ti=1000, T=1200, R=53.3, W=Wi

c) For the mechanical system shown below, construct the direct analogue 06 and inverse analogue.



Section - II

#### Q.5 Attempt any two.

a) Sketch the complete root locus and comment on system stability a control 07 system represented by,

$$G(S)H(S) = \frac{K}{S(S+3)(S^2+3S+3)}$$

b) Determine the stability of system of the system whose characteristic 07 equation is

S<sup>6</sup>+3S<sup>5</sup>+2S<sup>4</sup>+4S<sup>2</sup>+12S+8=0

Comment on location of roots.

#### Q.6 Attempt the following questions.

- a) A unity feedback system is given by,  $G(S) = \frac{80}{s(s+2)(s+20)}$  Sketch Bode plots and comment on system stability.
- **b)** Define the following terms :
  - 1) Gain crossover frequency
  - 2) Phase crossover frequency
  - 3) Gain margin
  - 4) Phase margin
  - 5) Rouths Criterion
  - 6) Linear control system

Set Q

07

## Q.7 Attempt the following questions.

- a) Discuss in detail proportional, integral and PI control.
- **b)** The motion of driverless vehicle which follows a wire embedded in the floor **07** is described by the differential equation  $y(t) = \frac{(D+3)}{(D+2)(D+1)}f(t)$ .

Determine the computer diagram and state space representation by parallel programming.

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Choose the correct alternatives from the options and rewrite the sentence. 14 Q.1

- 1) For a linear control system, all the relationship between the variables are
  - a) non-linear algebraic equation
  - b) linear algebraic equations
  - c) linear differential equation
  - d) second order partial difference equation
- 2) For a system in steady state, if command signal decreases and load is constant, then the output will
  - a) decrease b) Increase c) increase then decrease remain the same d)
- 3) In BDA the functions in series blocks are
  - added b) Subtracted a)
  - multiplied d) Divided c)

4) In field-controlled DC motor speed is controlled using \_\_\_\_\_.

- field voltage a) field current b)
- c) field resistance d) field capacitance

#### The control action which is never used alone is . 5)

- a) P b)
- d) c) D all of the above
- If the poles of control system lie on the imaginary axis in s-plane the 6) system will be .
  - a) unstable b) Stable c) conditionally stable
    - d) marginally stable
- 7) If P-Z=2, then the angle of the asymptotes to the root locus are \_\_\_\_\_.
  - a) 45 & 315 deg 90 & 270 deg b)
  - c) 135 & 225 deg 180 & -180 deg d)
- If a row in Routh's array contains all zeros the system . 8)
  - a) is unstable
  - b) is stable
  - c) has two roots in the right half plane
  - d) has two or more roots symmetrically about the origin



Marks: 14

Max. Marks: 70

|  |                     |  | Set F |
|--|---------------------|--|-------|
| In magnitude plot of Bode Plots, the<br>a) the point of zero magnitude<br>c) gain cross over frequency | b)                  | every corner frequency                             |       |
| A root locus will have branches tern<br>a) Z>P<br>c) Z=P   | minatiı<br>b)<br>d) | ng to infinity if,<br>Z <p<br>all the above</p<br> |       |
| In 'direct analogy' the 'temperature'  |                     | 2  | tive  |

- heat transfer, the 'temperature' is analogous to \_\_\_\_\_. a) Current b) Voltage
- c) Resistance d) Capacitance
- A person driving an automobile is an example of closed loop control 12) system.
  - a) True b) False
- In linearization of operating curves, the partial derivatives are \_\_\_\_\_. 13)
  - a) evaluated from the equation evaluated from the graph b)
  - c) not required d)
    - equated to zero
- 14) The standard stepper motor is an example of \_\_\_\_\_ loop system.
  - a) open

9)

10)

11)

Closed b)

c) hybrid

> d) feed forward

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019

Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

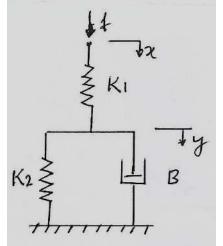
#### Section – I

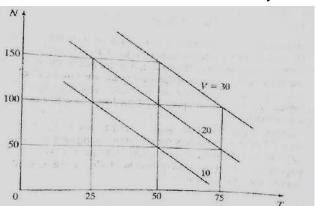
#### Q.2 Attempt the following questions.

- a) List two examples each of open loop control system, closed loop control system, biological feedback control system.
- b) The speed torque curves for a DC motor are shown in the Fig. where V is the applied voltage, N is the speed, and T is the output torque, Determine the linear approximation for the change in torque t due to change in speed n and a voltage v. The motor drives an inertial load such that t = J dn/dt, where J is the mass moment of inertia. For J = 0.1, determine the differential equation relating the change in speed n to the change in voltage v. Determine the time constant? And the steady state gain.



- a) For the mechanical system, shown in the figure write the force equation at each coordinate and then determine the equation which relates
  - i) x to f





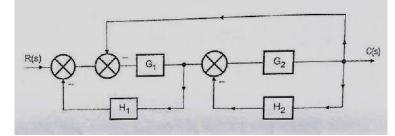
Max. Marks: 70

SLR-FM-155 Set R

## Set R

04

- b) Draw the block diagram of an armature-controlled DC motor. State the transfer function.
   04
- c) Reduce the block diagram shown in the Fig. and obtain the closed loop 06 transfer function C(S)/R(S).

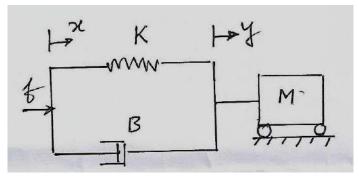


#### Q.4 Attempt any three:

- a) List any four laws of block diagram reduction.
- b) Determine the linear approximation for the following function for P
   04
   PV = WRT

Where, Pi=100, Vi=100, Wi=10/53, Ti=1000, T=1200, R=53.3, W=Wi

c) For the mechanical system shown below, construct the direct analogue 06 and inverse analogue.



Section - II

## Q.5 Attempt any two.

a) Sketch the complete root locus and comment on system stability a control 07 system represented by,

$$G(S)H(S) = \frac{K}{S(S+3)(S^2+3S+3)}$$

b) Determine the stability of system of the system whose characteristic 07 equation is

S<sup>6</sup>+3S<sup>5</sup>+2S<sup>4</sup>+4S<sup>2</sup>+12S+8=0

Comment on location of roots.

#### Q.6 Attempt the following questions.

- a) A unity feedback system is given by,  $G(S) = \frac{80}{s(s+2)(s+20)}$  Sketch Bode plots and comment on system stability.
- **b)** Define the following terms :
  - 1) Gain crossover frequency
  - 2) Phase crossover frequency
  - 3) Gain margin
  - 4) Phase margin
  - 5) Rouths Criterion
  - 6) Linear control system

## Set R

07

## Q.7 Attempt the following questions.

- a) Discuss in detail proportional, integral and PI control.
- **b)** The motion of driverless vehicle which follows a wire embedded in the floor **07** is described by the differential equation  $y(t) = \frac{(D+3)}{(D+2)(D+1)}f(t)$ .

Determine the computer diagram and state space representation by parallel programming.

# B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) If the poles of control system lie on the imaginary axis in s-plane the system will be .
  - unstable a)
  - conditionally stable d) marginally stable C)
- 2) If P-Z=2, then the angle of the asymptotes to the root locus are \_\_\_\_\_.
  - a) 45 & 315 deg b) 90 & 270 deg
  - c) 135 & 225 deg d) 180 & -180 deg

3) If a row in Routh's array contains all zeros the system \_\_\_\_\_.

- a) is unstable
- b) is stable
- c) has two roots in the right half plane
- d) has two or more roots symmetrically about the origin
- 4) In magnitude plot of Bode Plots, the slop changes at \_\_\_\_\_
  - a) the point of zero magnitude b) every corner frequency
  - c) gain cross over frequency d) None of the above
- A root locus will have branches terminating to infinity if. 5)
  - a) Z>P Z<P b)
  - c) Z=P d) all the above
- In 'direct analogy' the 'temperature' in a thermal system with convective 6) heat transfer, the 'temperature' is analogous to .
  - a) Current Voltage b)
  - c) Resistance d) Capacitance
- 7) A person driving an automobile is an example of closed loop control system.
  - a) True b) False
- In linearization of operating curves, the partial derivatives are 8)
  - a) evaluated from the equation c) not required
- evaluated from the graph b) d) equated to zero
- 9) The standard stepper motor is an example of \_\_\_\_\_ \_\_\_ loop system.
  - a) open hybrid c)
- Closed feed forward d)

b)

**SLR-FM-155** 

Max. Marks: 70

Marks: 14



- Stable

- b)



- 10) For a linear control system, all the relationship between the variables are \_\_\_\_\_.
  - a) non-linear algebraic equation
  - b) linear algebraic equations
  - c) linear differential equation
  - d) second order partial difference equation
- 11) For a system in steady state, if command signal decreases and load is constant, then the output will \_\_\_\_\_.
  - a) decrease b) Increase
  - c) increase then decrease d) remain the same
- 12) In BDA the functions in series blocks are \_
  - a) added b) Subtracted
  - c) multiplied d) Divided
- 13) In field-controlled DC motor speed is controlled using \_\_\_\_\_.
  - a) field current b) field voltage
  - c) field resistance d) field capacitance
- 14) The control action which is never used alone is \_\_\_\_\_.
  - a) P

b) I

c) D

d) all of the above

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AUTOMATIC CONTROL ENGINEERING

Day & Date: Saturday,07-12-2019

Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section.

N

150

100

50

0

- 2) Assume suitable data if required.
- 3) Figures to right indicate maximum marks.

#### Section – I

#### Q.2 Attempt the following questions.

- a) List two examples each of open loop control system, closed loop control system, biological feedback control system.
- b) The speed torque curves for a DC motor are shown in the Fig. where V is the applied voltage, N is the speed, and T is the output torque, Determine the linear approximation for the change in torque t due to change in speed n and a voltage v. The motor drives an inertial load such that t = J dn/dt, where J is the mass moment of inertia. For J = 0.1, determine the differential equation relating the change in speed n to the change in voltage v. Determine the time constant? And the steady state gain.

30

10

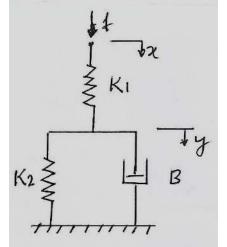
75



a) For the mechanical system, shown in the figure write the force equation at each coordinate and then determine the equation which relates

50

i) x to f



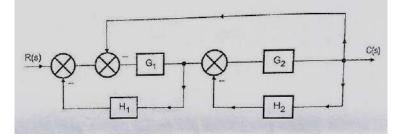




## Set S

04

- b) Draw the block diagram of an armature-controlled DC motor. State the transfer function.
   04
- c) Reduce the block diagram shown in the Fig. and obtain the closed loop 06 transfer function C(S)/R(S).

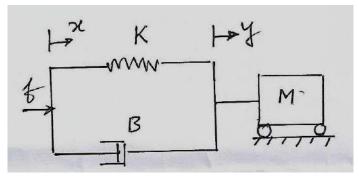


#### Q.4 Attempt any three:

- a) List any four laws of block diagram reduction.
- b) Determine the linear approximation for the following function for P
   04
   PV = WRT

Where, Pi=100, Vi=100, Wi=10/53, Ti=1000, T=1200, R=53.3, W=Wi

c) For the mechanical system shown below, construct the direct analogue 06 and inverse analogue.



Section - II

## Q.5 Attempt any two.

a) Sketch the complete root locus and comment on system stability a control 07 system represented by,

$$G(S)H(S) = \frac{K}{S(S+3)(S^2+3S+3)}$$

b) Determine the stability of system of the system whose characteristic 07 equation is

S<sup>6</sup>+3S<sup>5</sup>+2S<sup>4</sup>+4S<sup>2</sup>+12S+8=0

Comment on location of roots.

#### Q.6 Attempt the following questions.

- a) A unity feedback system is given by,  $G(S) = \frac{80}{s(s+2)(s+20)}$  Sketch Bode plots and comment on system stability.
- **b)** Define the following terms :
  - 1) Gain crossover frequency
  - 2) Phase crossover frequency
  - 3) Gain margin
  - 4) Phase margin
  - 5) Rouths Criterion
  - 6) Linear control system

Set S

07

## Q.7 Attempt the following questions.

- a) Discuss in detail proportional, integral and PI control.
- **b)** The motion of driverless vehicle which follows a wire embedded in the floor **07** is described by the differential equation  $y(t) = \frac{(D+3)}{(D+2)(D+1)}f(t)$ .

Determine the computer diagram and state space representation by parallel programming.

# B.E. (Part -I) (CGPA) Examination Nov/Dec-2019

**Mechanical Engineering REFRIGERATION AND AIR CONDITIONING** 

Day & Date: Tuesday, 10-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Draw neat sketches wherever necessary.
- 3) Use of non programmable calculator is permitted.
- 4) Figures to right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

The heat removing capacity 1 tonne refrigerator is equal to \_\_\_\_\_. 1)

| a) | $21\frac{kJ}{min.}$   | b) | $210 \frac{kJ}{min.}$ |
|----|-----------------------|----|-----------------------|
| c) | $420 \frac{kJ}{min.}$ | d) | $610 \frac{kJ}{min.}$ |

2) The C.O.P. for reversed carnot refrigerator is 4. The ratio of its highest temperature to the lowest temperature will be

- 1.25 a) 1 b) c) 1.75 d) 2
- 3) A boot-strap air cooling system has \_\_\_\_
  - a) One Heat Exchanger b) Three Heat Exchangers
    - Two Heat Exchangers d) Four Heat Exchangers C)
- 4) The highest temperature during the cycle in a vapour compression refrigeration system occurs after \_
  - b) Condensation a) Compression
  - c) Expansion d) Evaporation
- A system with multiple evaporators at different temperatures with 5) compound will
  - a) Increase the power requirement
  - b) Decrease the power requirement
  - c) Neither Increase nor Decrease the power requirement
  - d) None of these
- 6) The refrigerant commonly used in vapour absorption system is \_\_\_\_\_.
  - a) Water Ammonia b)
  - c) Freon d) Aqua Ammonia
- 7) An Electrolux refrigerator is called a \_
  - Single fluid absorption system b) Two fluid absorption system a) C)
    - Three fluid absorption system None of these d)

**SLR-FM-156** 



Max. Marks: 70

Marks: 14

|     | SLR-FM-156  |
|-----|---|
|     | Set P   |
| 8)  | Which of the following refrigerant has the lowest boiling point?<br>a) Ammonia b) Carbon dioxide<br>c) Sulphur dioxide d) R-12  |
| 9)  | The Freon group of refrigerants area) Azeotrope refrigerantsb) Inorganic Refrigerantsc) Hydrocarbon Refrigerantsd) Halo carbon refrigerants                                 |
| 10) | In the simple Linde system, the high pressure air from the compressor is<br>cooled inn heat exchanger to temperature of<br>a) -53.6°c b) -72.8°c<br>c) -106.7°c d) -138.5°c |
| 11) | The weight bulb depression is zero when relative humidity is equal to   |
|     | a) 1.0<br>c) 0.75<br>b) 0.5<br>d) Zero  |
| 12) | The bypass factor of two rows of similar coil is 0.01 the bypass factor ofone row of the coil will bea) 0.005b) 0.05c) 0.1d) 0.2  |
| 13) | The human body feels comfortable, when the heat stored in the body is   |
|     | a) Zerob) Positivec) Negatived) None of these   |
| 14) | The summer air conditioning, the relative humidity should not be less than  |

 a)
 40%
 b)
 75%

 c)
 90%
 d)
 60%

04

06

04

04

04

05

## SLR-FM-156

Max. Marks: 56

| Page | 3 | of | 16 |
|------|---|----|----|

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering REFRIGERATION AND AIR CONDITIONING

Day & Date: Tuesday,10-12-2019 Time: 02.30 PM To 05.30 PM

Instructions: 1) Solve any two questions from each section.

2) Use of non scientific calculator is permitted.

- 3) Figures to right indicate full marks.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Use of psychometric chart is allowed.

## Section – I

- **Q.2 a)** In a refrigeration plant working on Bell-Coleman cycle, air is compressed to **05** 5 bar from1 bar. Its initial temperature is 10°C. After compression, the air is cooled up to 20°C in a cooler before expanding back to a pressure of 1 bar. Determine the theoretical C.O.P. of the plant & net refrigerating effect. Given  $C_p = 1.005$  kJ/KgK &  $C_v = 0.718$  kJ/KgK.
  - b) Explain the term 'one tonne of refrigeration'.
  - c) Explain with neat sketch reduced ambient air cooling system. 05
- Q.3 a) 28 tonnes of ice form and at 0°C is produced per day in an ammonia refrigerator. The temperature range in the compressor is from 25°C to -15°C. The vapour is dry and saturated at the end of compression and an expansion valve is used. There is no liquid sub cooling. Assuming actual C.O.P. of 62% of the theoretical, calculate the power required to drive the compressor. Following properties of ammonia are given.

| Temperature | Enthalpy (KJ/kg) |         | Entropy | (KJ/kg K) |
|-------------|------------------|---------|---------|-----------|
| (°C)        | Liquid           | Vapour  | Liquid  | Vapour    |
| 25          | 298.9            | 1465.84 | 1.1242  | 5.0391    |
| -15         | 112.34           | 1426.54 | 0.4572  | 5.5490    |

Take latent heat of ice=335 kJ/kg.

- **b)** Write a note on multi evaporator systems.
- c) Write a note on TEWI.
- Q.4 a) Write a short note on R-12 & R-22 as refrigerant.
  - b) Compare vapour absorption & vapour compression refrigeration systems. 05
  - c) Derive equation for C.O.P. of Bell-Coleman cycle.

## Section - II

- Q.5 a) Write a note on total heat of moist air.
  b) The readings from a sling psychrometer are as follows:
  Dry bulb temperature = 30°C; wet bulb temperature = 20°C; barometer reading = 740 mm of mercury. Using steam table, determine:
  - 1) Due point temperature
  - 2) Relative humidity
  - 3) Specific humidity
  - 4) Degree of saturation

|     |          | SLR-FM-156  |          |
|-----|----------|---|----------|
|     |          | Set   | Ρ        |
|     | c)       | Write a note on thermodynamic wet bulb temperature or adiabatic saturation temperature.   | 05       |
| Q.6 | a)<br>b) | <ul> <li>Explain adiabatic mixing of two air streams.</li> <li>In an air conditioning system, the inside &amp; outside conditions are dry bulb temperature 25°C, relative humidity 50% and dry bulb temperature 40°C, wet bulb temperature 27°C respectively the sensible heat factor is 0.8.</li> <li>50% of the room air is rejected to atmosphere and an equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air added is 100m<sup>3</sup>/min. Determine:</li> <li>1) Room sensible and latent heat load</li> <li>2) Sensible and latent heat load due to fresh air</li> <li>3) Apparatus dew point</li> <li>4) Humidity ratio &amp; dry bulb temperature of air entering air conditioning apparatus.</li> <li>Assume bypass factor as zero, density of air as 1.2 kg/m<sup>3</sup> at a total pressure of 1.01325 bar.</li> </ul> | 05<br>09 |
| Q.7 | a)<br>b) | Explain methods of duct design.<br>Explain with neat sketch production of low temperature by adiabatic<br>de-magnetization of paramagnetic salt.  | 05<br>05 |
|     | c)       | Write a note on thermal heat exchange between human body and  | 04       |

environment.

**SLR-FM-156** Set Q

B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering **REFRIGERATION AND AIR CONDITIONING** 

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

Day & Date: Tuesday,10-12-2019 Time: 02.30 PM To 05.30 PM

Seat

No.

| mou  | uotio            | book.   |
|------|------------------|---|
|      |                  | <ul><li>2) Draw neat sketches wherever necessary.</li><li>3) Use of non programmable calculator is permitted.</li><li>4) Figures to right indicate full marks.</li></ul>  |
|      |                  | MCQ/Objective Type Questions  |
| Dura | ition: (         | 0 Minutes Marks: 14   |
| Q.1  | <b>Cho</b><br>1) | se the correct alternatives from the options and rewrite the sentence.14Which of the following refrigerant has the lowest boiling point?a)Ammoniab)Carbon dioxidea)Ammoniab)Carbon dioxidec)Sulphur dioxided)R-12 |
|      | 2)               | The Freon group of refrigerants area) Azeotrope refrigerantsb) Inorganic Refrigerantsc) Hydrocarbon Refrigerantsd) Halo carbon refrigerants   |
|      | 3)               | In the simple Linde system, the high pressure air from the compressor is<br>cooled inn heat exchanger to temperature of<br>a) -53.6°c b) -72.8°c<br>c) -106.7°c d) -138.5°c                                       |
|      | 4)               | The weight bulb depression is zero when relative humidity is equal to   |
|      |                  | a) 1.0     b) 0.5       c) 0.75     d) Zero   |
|      | 5)               | The bypass factor of two rows of similar coil is 0.01 the bypass factor ofone row of the coil will bea) 0.005b) 0.05c) 0.1d) 0.2  |
|      | 6)               | The human body feels comfortable, when the heat stored in the body is   |
|      |                  | a) Zerob) Positivec) Negatived) None of these   |
|      | 7)               | The summer air conditioning, the relative humidity should not be less than  |
|      |                  | a) 40%<br>b) 75%<br>c) 90%<br>d) 60%  |

Max. Marks: 70

|     | SLR-FM-156  |
|-----|---|
|     | Set Q   |
| 8)  | The heat removing capacity 1 tonne refrigerator is equal to<br>a) $21 \frac{kJ}{min.}$ b) $210 \frac{kJ}{min.}$<br>c) $420 \frac{kJ}{min.}$ d) $610 \frac{kJ}{min.}$  |
| 9)  | The C.O.P. for reversed carnot refrigerator is 4. The ratio of its highesttemperature to the lowest temperature will bea) 1b) 1.25c) 1.75d) 2   |
| 10) | A boot-strap air cooling system has<br>a) One Heat Exchanger b) Three Heat Exchangers<br>c) Two Heat Exchangers d) Four Heat Exchangers   |
| 11) | The highest temperature during the cycle in a vapour compressionrefrigeration system occurs aftera) Compressionb) Condensationc) Expansiond) Evaporation  |
| 12) | <ul> <li>A system with multiple evaporators at different temperatures with compound will</li> <li>a) Increase the power requirement</li> <li>b) Decrease the power requirement</li> <li>c) Neither Increase nor Decrease the power requirement</li> <li>d) None of these</li> </ul> |
| 13) | The refrigerant commonly used in vapour absorption system is<br>a) Water b) Ammonia<br>c) Freon d) Aqua Ammonia   |

- 14)
- Two fluid absorption system
- An Electrolux refrigerator is called aa) Single fluid absorption systemb)c) Three fluid absorption systemd)
  - None of these

## Seat No.

## B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of non scientific calculator is permitted.
- 3) Figures to right indicate full marks.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Use of psychometric chart is allowed.

## Section – I

- Q.2 a) In a refrigeration plant working on Bell-Coleman cycle, air is compressed to 05 5 bar from1 bar. Its initial temperature is 10°C. After compression, the air is cooled up to 20°C in a cooler before expanding back to a pressure of 1 bar. Determine the theoretical C.O.P. of the plant & net refrigerating effect. Given  $C_p = 1.005 \text{ kJ/KgK} \& C_v = 0.718 \text{ kJ/KgK}$ .
  - Explain the term 'one tonne of refrigeration'. b)
  - Explain with neat sketch reduced ambient air cooling system. 05 C)
- Q.3 28 tonnes of ice form and at 0°C is produced per day in an ammonia a) refrigerator. The temperature range in the compressor is from 25°C to -15°C. The vapour is dry and saturated at the end of compression and an expansion valve is used. There is no liquid sub cooling. Assuming actual C.O.P. of 62% of the theoretical, calculate the power required to drive the compressor. Following properties of ammonia are given.

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| -15         | 112.34           | 1426.54 | 0.4572  | 5.5490    |

Take latent heat of ice=335 kJ/kg.

- Write a note on multi evaporator systems. b)
- C) Write a note on TEWI.
- Q.4 a) Write a short note on R-12 & R-22 as refrigerant.
  - Compare vapour absorption & vapour compression refrigeration systems. 05 b) 05
  - Derive equation for C.O.P. of Bell-Coleman cycle. c)

## Section - II

- 04 Q.5 a) Write a note on total heat of moist air. The readings from a sling psychrometer are as follows: 05 b) Dry bulb temperature =  $30^{\circ}$ C; wet bulb temperature =  $20^{\circ}$ C; barometer reading = 740 mm of mercury. Using steam table, determine:
  - Due point temperature 1)
  - Relative humidity 2)
  - Specific humidity 3)
  - Degree of saturation 4)

Max. Marks: 56



06

04

04

|     |          | SLR-FM-1   | 56       |
|-----|----------|--|----------|
|     |          | Set  | Q        |
|     | c)       | Write a note on thermodynamic wet bulb temperature or adiabatic saturation temperature.  | 05       |
| Q.6 | a)<br>b) | <ul> <li>Explain adiabatic mixing of two air streams.</li> <li>In an air conditioning system, the inside &amp; outside conditions are dry bulb temperature 25°C, relative humidity 50% and dry bulb temperature 40°C, wet bulb temperature 27°C respectively the sensible heat factor is 0.8. 50% of the room air is rejected to atmosphere and an equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air added is 100m<sup>3</sup>/min. Determine:</li> <li>1) Room sensible and latent heat load</li> <li>2) Sensible and latent heat load due to fresh air</li> <li>3) Apparatus dew point</li> <li>4) Humidity ratio &amp; dry bulb temperature of air entering air conditioning apparatus.</li> <li>Assume bypass factor as zero, density of air as 1.2 kg/m<sup>3</sup> at a total pressure of 1.01325 bar.</li> </ul> | 05<br>09 |
| Q.7 | a)<br>b) | Explain methods of duct design.<br>Explain with neat sketch production of low temperature by adiabatic<br>de-magnetization of paramagnetic salt.   | 05<br>05 |
|     | c)       | Write a note on thermal heat exchange between human body and   | 04       |

c) Write a note on thermal heat exchange between human body and environment.

# Seat

## B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Draw neat sketches wherever necessary.
- 3) Use of non programmable calculator is permitted.
- 4) Figures to right indicate full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- A system with multiple evaporators at different temperatures with 1)
  - compound will
    - a) Increase the power requirement
    - b) Decrease the power requirement
    - c) Neither Increase nor Decrease the power requirement
    - d) None of these

The refrigerant commonly used in vapour absorption system is \_\_\_\_\_. 2)

- a) Water b) Ammonia
- c) Freon d) Aqua Ammonia
- 3) An Electrolux refrigerator is called a \_\_\_\_\_
  - Single fluid absorption system b) Two fluid absorption system a)
  - Three fluid absorption system None of these d) C)

Which of the following refrigerant has the lowest boiling point\_\_\_\_\_? 4)

- a) Ammonia Carbon dioxide b) R-12
  - Sulphur dioxide c) d)
- The Freon group of refrigerants are \_\_\_\_ 5)
  - a) Azeotrope refrigerants **Inorganic Refrigerants** b)
  - c) Hydrocarbon Refrigerants Halo carbon refrigerants d)
- In the simple Linde system, the high pressure air from the compressor is 6) cooled inn heat exchanger to temperature of
  - a) -53.6°c b) -72.8°c
  - d) c) -106.7°c -138.5°c
- 7) The weight bulb depression is zero when relative humidity is equal to
  - 1.0 0.5 b) a) c) 0.75 d) Zero
- The bypass factor of two rows of similar coil is 0.01 the bypass factor of 8) one row of the coil will be .
  - a) 0.005 b) 0.05
  - 0.1 d) 0.2 c)

**SLR-FM-156** 

#### Set R

Max. Marks: 70

Marks: 14

| 9)   | The numan body leels comonable,  | wher     | i the heat stored in the body is              |
|------|--|----------|---|
|      | a) Zero<br>c) Negative   | b)<br>d) | Positive<br>None of these                     |
| 10)  | The summer air conditioning, the re  | lative   | humidity should not be less than              |
|      | a) 40%<br>c) 90%   | b)<br>d) | 75%<br>60%                                    |
| 11)  | The heat removing capacity 1 tonne   | refrig   | gerator is equal to                           |
|      | a) $21 \frac{kJ}{min.}$  | b)       | $210 \frac{kJ}{min.}$                         |
|      | c) $420 \frac{kJ}{min.}$   | d)       | $610 \frac{kJ}{min.}$                         |
| 12)  | The C.O.P. for reversed carnot refrig<br>temperature to the lowest temperature | •        | •   |
|      | a) 1   | b)       | 1.25  |
|      | c) 1.75  | d)       | 2   |
| 13)  | A boot-strap air cooling system has  |          |   |
|      | <ul><li>a) One Heat Exchanger</li><li>c) Two Heat Exchangers</li></ul>         | ,        | Three Heat Exchangers<br>Four Heat Exchangers |
| 4 4) | , 0  | ,        |   |
| 14)  | The highest temperature during the refrigeration system occurs after           | -        | · · ·   |
|      | a) Compression   | <br>b)   | Condensation                                  |
|      |  |          |   |

- a) Compressionc) Expansion b) d) Evaporation

Set R

9) The human body feels comfortable, when the heat stored in the body is

**SLR-FM-156** 

R

## Seat No.

## B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering REFRIGERATION AND AIR CONDITIONING

Day & Date: Tuesday,10-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of non scientific calculator is permitted.
- 3) Figures to right indicate full marks.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Use of psychometric chart is allowed.

## Section – I

- **Q.2 a)** In a refrigeration plant working on Bell-Coleman cycle, air is compressed to **05** 5 bar from1 bar. Its initial temperature is 10°C. After compression, the air is cooled up to 20°C in a cooler before expanding back to a pressure of 1 bar. Determine the theoretical C.O.P. of the plant & net refrigerating effect. Given  $C_p = 1.005$  kJ/KgK &  $C_v = 0.718$  kJ/KgK.
  - b) Explain the term 'one tonne of refrigeration'.
  - c) Explain with neat sketch reduced ambient air cooling system.
- Q.3 a) 28 tonnes of ice form and at 0°C is produced per day in an ammonia refrigerator. The temperature range in the compressor is from 25°C to -15°C. The vapour is dry and saturated at the end of compression and an expansion valve is used. There is no liquid sub cooling. Assuming actual C.O.P. of 62% of the theoretical, calculate the power required to drive the compressor. Following properties of ammonia are given.

| Temperature | Enthalpy (KJ/kg) |         | Entropy | (KJ/kg K) |
|-------------|------------------|---------|---------|-----------|
| (°C)        | Liquid           | Vapour  | Liquid  | Vapour    |
| 25          | 298.9            | 1465.84 | 1.1242  | 5.0391    |
| -15         | 112.34           | 1426.54 | 0.4572  | 5.5490    |

Take latent heat of ice=335 kJ/kg.

- b) Write a note on multi evaporator systems.c) Write a note on TEWI.
- **Q.4** a) Write a short note on R-12 & R-22 as refrigerant.
  - b) Compare vapour absorption & vapour compression refrigeration systems. 05
  - c) Derive equation for C.O.P. of Bell-Coleman cycle.

## Section - II

- Q.5 a) Write a note on total heat of moist air.
  b) The readings from a sling psychrometer are as follows:
  Dry bulb temperature = 30°C; wet bulb temperature = 20°C; barometer reading = 740 mm of mercury. Using steam table, determine:
  - 1) Due point temperature
  - 2) Relative humidity
  - 3) Specific humidity
  - 4) Degree of saturation

Max. Marks: 56

04 05

06

04

04

04

|     |          | SLR-FM-1  | 56       |
|-----|----------|---|----------|
|     |          | Set   | R        |
|     | c)       | Write a note on thermodynamic wet bulb temperature or adiabatic saturation temperature.   | 05       |
| Q.6 | a)<br>b) | <ul> <li>Explain adiabatic mixing of two air streams.</li> <li>In an air conditioning system, the inside &amp; outside conditions are dry bulb temperature 25°C, relative humidity 50% and dry bulb temperature 40°C, wet bulb temperature 27°C respectively the sensible heat factor is 0.8.</li> <li>50% of the room air is rejected to atmosphere and an equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air added is 100m<sup>3</sup>/min. Determine:</li> <li>1) Room sensible and latent heat load</li> <li>2) Sensible and latent heat load due to fresh air</li> <li>3) Apparatus dew point</li> <li>4) Humidity ratio &amp; dry bulb temperature of air entering air conditioning apparatus.</li> <li>Assume bypass factor as zero, density of air as 1.2 kg/m<sup>3</sup> at a total pressure of 1.01325 bar.</li> </ul> | 05<br>09 |
| Q.7 | a)<br>b) | Explain methods of duct design.<br>Explain with neat sketch production of low temperature by adiabatic<br>de-magnetization of paramagnetic salt.  | 05<br>05 |
|     | c)       | Write a note on thermal heat exchange between human body and  | 04       |

c) write a note on thermal heat exchange between human body and environment.

# Seat B.E. (Part -I) (CGPA) Examination Nov/Dec-2019

**Mechanical Engineering REFRIGERATION AND AIR CONDITIONING** 

Day & Date: Tuesday, 10-12-2019 Time: 02.30 PM To 05.30 PM

No.

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Draw neat sketches wherever necessary.
- 3) Use of non programmable calculator is permitted.
- 4) Figures to right indicate full marks.

## MCQ/Objective Type Questions

## **Duration: 30 Minutes**

3)

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- In the simple Linde system, the high pressure air from the compressor is 1) cooled inn heat exchanger to temperature of a) -53.6°c -72.8°c b)
  - c) -106.7°c d) -138.5°c
- 2) The weight bulb depression is zero when relative humidity is equal to

|    | •    |    |      |
|----|------|----|------|
| a) | 1.0  | b) | 0.5  |
| C) | 0.75 | d) | Zero |

The bypass factor of two rows of similar coil is 0.01 the bypass factor of الانبيانية مطلكم

| one row of the coll will be |    |      |
|-----------------------------|----|------|
| a) 0.005                    | b) | 0.05 |
| c) 0.1                      | d) | 0.2  |

- The human body feels comfortable, when the heat stored in the body is 4)
  - Zero a) b) Positive
  - c) Negative d) None of these
- 5) The summer air conditioning, the relative humidity should not be less than

| a) | 40% | b) | 75% |
|----|-----|----|-----|
| C) | 90% | d) | 60% |

6) The heat removing capacity 1 tonne refrigerator is equal to .

| a) | $21 \frac{\kappa j}{min.}$ | b) | $210 \frac{\kappa f}{min.}$ |
|----|----------------------------|----|-----------------------------|
| c) | $420 \frac{kJ}{min.}$      | d) | $610 \frac{kJ}{min.}$       |

7) The C.O.P. for reversed carnot refrigerator is 4. The ratio of its highest temperature to the lowest temperature will be \_\_\_\_\_.

| a) | 1    | b) | 1.25 |
|----|------|----|------|
| c) | 1.75 | d) | 2    |

## **SLR-FM-156**



Max. Marks: 70

Marks: 14

|     | SLR-FM-156  |
|-----|---|
|     | Set S   |
| 8)  | A boot-strap air cooling system has<br>a) One Heat Exchanger b) Three Heat Exchangers<br>c) Two Heat Exchangers d) Four Heat Exchangers   |
| 9)  | The highest temperature during the cycle in a vapour compressionrefrigeration system occurs aftera) Compressionb) Condensationc) Expansiond) Evaporation  |
| 10) | <ul> <li>A system with multiple evaporators at different temperatures with compound will</li> <li>a) Increase the power requirement</li> <li>b) Decrease the power requirement</li> <li>c) Neither Increase nor Decrease the power requirement</li> <li>d) None of these</li> </ul> |
| 11) | The refrigerant commonly used in vapour absorption system isa) Waterb) Ammoniac) Freond) Aqua Ammonia   |
| 12) | <ul> <li>An Electrolux refrigerator is called a</li> <li>a) Single fluid absorption system b) Two fluid absorption system</li> <li>c) Three fluid absorption system d) None of these</li> </ul>   |
| 13) | Which of the following refrigerant has the lowest boiling point?a) Ammoniab) Carbon dioxidec) Sulphur dioxided) R-12  |
| 14) | The Freon group of refrigerants area) Azeotrope refrigerantsb) Inorganic Refrigerantsc) Hydrocarbon Refrigerantsd) Halo carbon refrigerants   |

## Seat No.

## B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering REFRIGERATION AND AIR CONDITIONING**

Day & Date: Tuesday, 10-12-2019 Time: 02.30 PM To 05.30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of non scientific calculator is permitted.
- 3) Figures to right indicate full marks.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Use of psychometric chart is allowed.

## Section – I

- Q.2 a) In a refrigeration plant working on Bell-Coleman cycle, air is compressed to 05 5 bar from1 bar. Its initial temperature is 10°C. After compression, the air is cooled up to 20°C in a cooler before expanding back to a pressure of 1 bar. Determine the theoretical C.O.P. of the plant & net refrigerating effect. Given  $C_p = 1.005 \text{ kJ/KgK} \& C_v = 0.718 \text{ kJ/KgK}$ .
  - Explain the term 'one tonne of refrigeration'. b)
  - Explain with neat sketch reduced ambient air cooling system. C)
- Q.3 28 tonnes of ice form and at 0°C is produced per day in an ammonia a) refrigerator. The temperature range in the compressor is from 25°C to -15°C. The vapour is dry and saturated at the end of compression and an expansion valve is used. There is no liquid sub cooling. Assuming actual C.O.P. of 62% of the theoretical, calculate the power required to drive the compressor. Following properties of ammonia are given.

| Temperature | Enthalpy (KJ/kg) |         | Entropy | (KJ/kg K) |
|-------------|------------------|---------|---------|-----------|
| (°C)        | Liquid           | Vapour  | Liquid  | Vapour    |
| 25          | 298.9            | 1465.84 | 1.1242  | 5.0391    |
| -15         | 112.34           | 1426.54 | 0.4572  | 5.5490    |

Take latent heat of ice=335 kJ/kg.

- Write a note on multi evaporator systems. b)
  - C) Write a note on TEWI.
- Q.4 a) Write a short note on R-12 & R-22 as refrigerant.
  - Compare vapour absorption & vapour compression refrigeration systems. 05 b) 05
  - Derive equation for C.O.P. of Bell-Coleman cycle. c)

## Section - II

- 04 Q.5 a) Write a note on total heat of moist air. The readings from a sling psychrometer are as follows: 05 b) Dry bulb temperature =  $30^{\circ}$ C; wet bulb temperature =  $20^{\circ}$ C; barometer reading = 740 mm of mercury. Using steam table, determine:
  - Due point temperature 1)
  - Relative humidity 2)
  - Specific humidity 3)
  - Degree of saturation 4)

Max. Marks: 56

04 05

06

04

04

|     | SLR-FM-1  |   |          |  |  |
|-----|---|---|----------|--|--|
|     |   | Set   | S        |  |  |
|     | c)  | Write a note on thermodynamic wet bulb temperature or adiabatic saturation temperature.   | 05       |  |  |
| Q.6 | a)<br>b)  | <ul> <li>Explain adiabatic mixing of two air streams.</li> <li>In an air conditioning system, the inside &amp; outside conditions are dry bulb temperature 25°C, relative humidity 50% and dry bulb temperature 40°C, wet bulb temperature 27°C respectively the sensible heat factor is 0.8.</li> <li>50% of the room air is rejected to atmosphere and an equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air added is 100m<sup>3</sup>/min. Determine:</li> <li>1) Room sensible and latent heat load</li> <li>2) Sensible and latent heat load due to fresh air</li> <li>3) Apparatus dew point</li> <li>4) Humidity ratio &amp; dry bulb temperature of air entering air conditioning apparatus.</li> <li>Assume bypass factor as zero, density of air as 1.2 kg/m<sup>3</sup> at a total pressure of 1.01325 bar.</li> </ul> |          |  |  |
| Q.7 | <ul> <li>7 a) Explain methods of duct design.</li> <li>b) Explain with neat sketch production of low temperature by adiabatic de-magnetization of paramagnetic salt.</li> </ul> |   | 05<br>05 |  |  |
|     | c)  | Write a note on thermal heat exchange between human body and  | 04       |  |  |

c) Write a note on thermal heat exchange between human body and environment.

| FINITE ELEMENT METHODS |   |  |  |  |  |  |
|------------------------|---|--|--|--|--|--|
|                        | Day & Date: Saturday, 14-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70       |  |  |  |  |  |
| Instru                 | <b>Instructions:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.                   |  |  |  |  |  |
|                        | 2) All questions are compulsory.<br>3) Figures to the right indicate full marks.<br>4) Assume suitable data if necessary. |  |  |  |  |  |
| _                      |   | MCQ/Objective Type Questions   |  |  |  |  |
|                        |   | 30 Minutes Marks: 14   |  |  |  |  |
| Q.1                    | <b>Cho</b><br>1)  | ose the correct alternatives from the options.14Mass element type is of shapea) Point (•)b) line ()c) Triangle ( $\Delta$ )d) rectangle ( $\Box$ ) |  |  |  |  |
|                        | 2)  | The FE solution to reach the exact solution the polynomial should be of order  |  |  |  |  |
|                        |   | a) Constant b) Linear<br>c) Quadratic d) Cubic   |  |  |  |  |
|                        | 3)  | Size of shape function matrix of 2 D element having 3 nodes isa) $2 \times 6$ b) $3 \times 3$ c) $4 \times 6$ d) $2 \times 5$                      |  |  |  |  |
|                        | 4)  | In an Element the value of the field variable changes in the circumferential direction only.<br>a) 1 D and 2D b) Beam                              |  |  |  |  |
|                        |   | c) Solid d) Axisymmetric   |  |  |  |  |
|                        | <ol> <li>In a type of refinement higher order elements are used instead of<br/>increasing number of elements.</li> </ol>  |  |  |  |  |  |
|                        |   | <ul><li>a) h-type of refinement</li><li>b) p-type of refinement</li><li>c) ph-type of refinement</li><li>d) d- type of refinement</li></ul>        |  |  |  |  |
|                        | 6)  | The material property matrix is represented as<br>a) [D] b) [K]<br>c) [C] d) [B]   |  |  |  |  |
|                        | 7)  | Which of the following is a weighted residual method?a) Galerkin's methodb) Variational methodc) Potential energy methodd) All of the above        |  |  |  |  |
|                        | 8)  | Triangular element having 3 nodes is known asa) 2 D simplex elementb) 3D Complex elementc) Multiplex elementd) None                                |  |  |  |  |
|                        | 9)  | A measure of distortion of a element isa) bandwidthb) damping ratioc) aspect ratiod) shape function  |  |  |  |  |

## Seat No.

B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Set P

**SLR-FM-157** 

- Size of stiffness matrix of 3 nodded 2 D element is \_\_\_\_\_. 10)
  - a) 6 × 6
  - c) 4 × 6
- Which of the following is a weighted residual method? 11)
  - a) Least square method
- b) Rayleigh - Ritz method
- c) Potential energy method
- All of the above d)
- 12) Formula for point collocation method is
  - a)  $\int f(x)R(x)dx = 0$
  - c) R(x) = 0
- $\int R(x)dx = 0$ b)
- d)  $\int R^2(x)dx = 0$
- The element with three degree interpolation function is called as \_\_\_\_\_. 13) b) Cubic element
  - a) Quadratic element c) Linear
- d) None of the above

- 14) FEM is
  - \_\_. a) Analytical method
  - c) Both a and c

- b) Numerical method
- d) None of the above

- **SLR-FM-157**

## Set P

- b) 3 × 3
- d) 2 × 5

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHODS

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary.

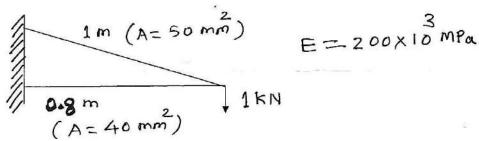
#### Section – I

- Q.2 a) Explain Properties of global stiffness matrix and write stiffness matrix for 2D 07 truss element.
  - b) Obtain solution of differential equation by using Galerkin's method. 07

$$3\frac{\partial^2 u}{\partial x^2} + x + 1 = 0$$

Take boundary conditions f(0) = f(1) = 1

Q.3 a) Find the axial force in two members of simple truss shown in fig. using finite 07 element method.



**b)** Explain steps in finite element methods with example.

#### Q.4 Write short notes. (Any four)

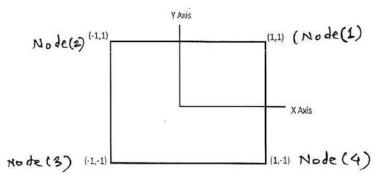
- a) Principle of minimum potential energy
- **b)** Explain axi-symmetric elasticity
- c) List advantages of FEA
- d) Explain any four choice of element type with application.
- e) Explain one diamensional elasticity.
- f) Simplification using Symmetry

Max. Marks: 56

## SLR-FM-157 Set P

#### Section – II

**Q.5 a)** Obtain shape functions of element as shown in figure by using Lagrange' **07** polynomial.



|     | b) | Explain mesh design in detail.  | 07 |
|-----|----|---|----|
| Q.6 | a) | Derive equation for shape function of two dimensional simplex element in natural coordinates. | 07 |
|     | b) | Differentiate between static analysis and dynamic analysis in FEM.                            | 07 |
| Q.7 | a) | <b>ite short notes. (Any four)</b><br>Material non-linearity<br>Applications of FEA           | 14 |

- c) Result Processing
- d) Element distortion and check
- e) Modal analysis
- f) Explain transient thermal problems.

| B.E. (Part – I) (CGPA) Examination Nov/Dec-2019  |   |                 |   |                   |   |  |
|--|---|-----------------|---|-------------------|---|--|
| Mechanical Engineering<br>FINITE ELEMENT METHODS |   |                 |   |                   |   |  |
|  | Day & Date: Saturday, 14-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70 |                 |   |                   |   |  |
| Instru   | uctior  | 2<br>3          | <ul> <li>) Q. No. 1 is compulsory and sho<br/>book.</li> <li>) All questions are compulsory.</li> <li>) Figures to the right indicate full</li> <li>) Assume suitable data if necess</li> </ul> | mar               | be solved in first 30 minutes in answer<br>ks.                  |  |
|  |   |                 | MCQ/Objective Ty  |                   | Questions   |  |
| Durat  | ion: 3  | 0 Mi            |   | 60                | Marks: 14   |  |
| Q.1  | Choc<br>1)  | Tria            | the correct alternatives from th<br>angular element having 3 nodes is<br>2 D simplex element<br>Multiplex element   | s kno             |   |  |
|  | 2)  |                 | neasure of distortion of a element<br>bandwidth<br>aspect ratio   |                   | damping ratio   |  |
|  | 3)  | a)              | e of stiffness matrix of 3 nodded 2<br>6 × 6<br>4 × 6   | b)                | element is<br>3 × 3<br>2 × 5                                    |  |
|  | 4)  | a)              | ich of the following is a weighted<br>Least square method<br>Potential energy method  | b)                | dual method?<br>Rayleigh - Ritz method<br>All of the above      |  |
|  | 5)  | a)              | mula for point collocation method<br>$\int f(x)R(x)dx = 0$ $R(x) = 0$   | b)                | $\int R(x)dx = 0$<br>$\int R^2(x)dx = 0$                        |  |
|  | 6)  | The<br>a)<br>c) | e element with three degree inter<br>Quadratic element<br>Linear  | bolat<br>b)<br>d) | ion function is called as<br>Cubic element<br>None of the above |  |
|  | 7)  |                 | M is<br>Analytical method<br>Both a and c   | b)<br>d)          | Numerical method<br>None of the above                           |  |
|  | 8)  |                 | ss element type is of shape<br>Point (•)<br>Triangle (Δ)  | b)<br>d)          | line (– –)<br>rectangle ( ┌── )                                 |  |
|  | 9)  |                 | e FE solution to reach the exact s<br>er<br>Constant<br>Quadratic   | oluti<br>b)<br>d) | on the polynomial should be of<br>Linear<br>Cubic               |  |

Seat No.

# B.E. (Part – I) (CGPA) Examination Nov/Dec-2019

Page **5** of **16** 

**SLR-FM-157** 

Set Q

10) Size of shape function matrix of 2 D element having 3 nodes is \_\_\_\_\_.

a) 2 × 6

- b) 3 × 3
- c) 4 × 6 d) 2 × 5
- In an \_\_\_\_\_ Element the value of the field variable changes in the 11) circumferential direction only. a) 1 D and 2D
  - b) Beam
  - c) Solid d) Axisymmetric
- In a \_\_\_\_\_ type of refinement higher order elements are used instead of 12) increasing number of elements.
  - a) h-type of refinement
- b) p-type of refinement

**SLR-FM-157** 

Set Q

- c) ph-type of refinement d) d- type of refinement
- 13) The material property matrix is represented as .
  - a) [D] b) [K]
  - c) [C] d) [B]
- Which of the following is a weighted residual method? 14)
  - Galerkin's method a)
  - c) Potential energy method
- b) Variational method
- d) All of the above

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHODS

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary.

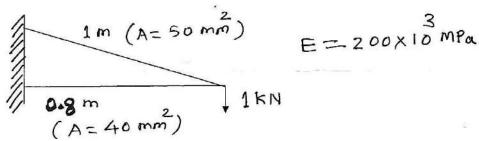
#### Section – I

- Q.2 a) Explain Properties of global stiffness matrix and write stiffness matrix for 2D 07 truss element.
  - b) Obtain solution of differential equation by using Galerkin's method. 07

$$3\frac{\partial^2 u}{\partial x^2} + x + 1 = 0$$

Take boundary conditions f(0) = f(1) = 1

Q.3 a) Find the axial force in two members of simple truss shown in fig. using finite 07 element method.



**b)** Explain steps in finite element methods with example.

#### Q.4 Write short notes. (Any four)

- a) Principle of minimum potential energy
- **b)** Explain axi-symmetric elasticity
- c) List advantages of FEA
- d) Explain any four choice of element type with application.
- e) Explain one diamensional elasticity.
- f) Simplification using Symmetry

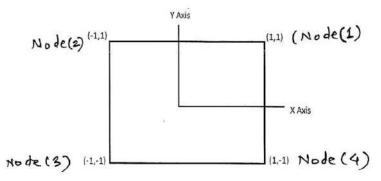
Max. Marks: 56

07

## SLR-FM-157 Set Q

## Section – II

Q.5 a) Obtain shape functions of element as shown in figure by using Lagrange' 07 polynomial.



|     | b) | Explain mesh design in detail.  | 07 |
|-----|----|---|----|
| Q.6 | a) | Derive equation for shape function of two dimensional simplex element in natural coordinates. | 07 |
|     | b) | Differentiate between static analysis and dynamic analysis in FEM.                            | 07 |
| Q.7 | a) | <b>ite short notes. (Any four)</b><br>Material non-linearity<br>Applications of FEA           | 14 |

- c) Result Processing
- d) Element distortion and check
- e) Modal analysis
- f) Explain transient thermal problems.

# B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FINITE ELEMENT METHODS

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) All questions are compulsory.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

# MCQ/Objective Type Questions

#### Q.1 Choose the correct alternatives from the options.

In a \_\_\_\_\_ type of refinement higher order elements are used instead of 1) increasing number of elements. p-type of refinement

d)

None

- a) h-type of refinement b) d) d- type of refinement
- c) ph-type of refinement
- The material property matrix is represented as \_\_\_\_\_ 2)
  - a) [D] b) [K] c) [C] d) [B]
- 3) Which of the following is a weighted residual method?
  - a) Galerkin's method b) Variational method c) Potential energy method d) All of the above
- 4)
  - Triangular element having 3 nodes is known as \_\_\_\_ 2 D simplex element b) **3D** Complex element a)
    - Multiplex element c)
- A measure of distortion of a element is 5)
  - damping ratio a) bandwidth b) shape function c) aspect ratio d)
- 6) Size of stiffness matrix of 3 nodded 2 D element is
  - a) 6 × 6  $3 \times 3$ b)
- c)  $4 \times 6$ d) 2 × 5 Which of the following is a weighted residual method? 7)
  - a) Least square method
- b) Rayleigh - Ritz method All of the above
- c) Potential energy method d)
- Formula for point collocation method is 8)
  - a)  $\int f(x)R(x)dx = 0$ b)  $\int R(x)dx = 0$
  - d)  $\int R^2(x)dx = 0$ c) R(x) = 0

9) The element with three degree interpolation function is called as \_\_\_\_\_. a) Quadratic element

- b) Cubic element
- c) Linear None of the above d)

Seat No.

**Duration: 30 Minutes** 

SLR-FM-157

Set

R

Max. Marks: 70

Marks: 14

|     |  |                    | SLR-FM-157<br>Set R                               |
|-----|--|--------------------|---|
| 10) | FEM is<br>a) Analytical method<br>c) Both a and c                            | b)<br>d)           | Numerical method<br>None of the above             |
| 11) | Mass element type is of shape<br>a) Point (•)<br>c) Triangle (Δ)             | <br>b)<br>d)       | line (– –)<br>rectangle ( ┌── )                   |
| 12) | The FE solution to reach the exact s<br>order<br>a) Constant<br>c) Quadratic | boluti<br>b)<br>d) | on the polynomial should be of<br>Linear<br>Cubic |
| 13) | Size of shape function matrix of 2 D<br>a) 2 × 6<br>c) 4 × 6                 |                    | nent having 3 nodes is<br>3 × 3<br>2 × 5          |

- In an \_\_\_\_\_ Element the value of the field variable changes in the 14) circumferential direction only.
  - a) 1 D and 2Dc) Solid

- b) Beam
- d) Axisymmetric

Seat No.

### B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHODS

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary.

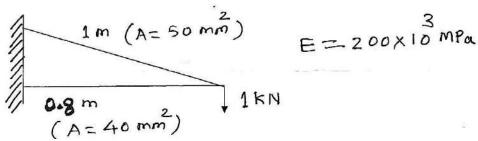
#### Section – I

- Q.2 a) Explain Properties of global stiffness matrix and write stiffness matrix for 2D 07 truss element.
  - b) Obtain solution of differential equation by using Galerkin's method. 07

$$3\frac{\partial^2 u}{\partial x^2} + x + 1 = 0$$

Take boundary conditions f(0) = f(1) = 1

Q.3 a) Find the axial force in two members of simple truss shown in fig. using finite 07 element method.



**b)** Explain steps in finite element methods with example.

#### Q.4 Write short notes. (Any four)

- a) Principle of minimum potential energy
- **b)** Explain axi-symmetric elasticity
- c) List advantages of FEA
- d) Explain any four choice of element type with application.
- e) Explain one diamensional elasticity.
- f) Simplification using Symmetry

Max. Marks: 56

07

14

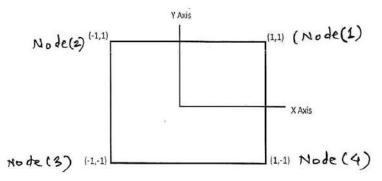
Set R

SLR-FM-157

# SLR-FM-157 Set R

# Section – II

Q.5 a) Obtain shape functions of element as shown in figure by using Lagrange' 07 polynomial.



|     | b)  | Explain mesh design in detail.  | 07 |
|-----|---|---|----|
| Q.6 | a)  | Derive equation for shape function of two dimensional simplex element in natural coordinates. | 07 |
|     | b)  | Differentiate between static analysis and dynamic analysis in FEM.                            | 07 |
| Q.7 | Write short notes. (Any four) a) Material non-linearity |   |    |
|     | b)  | Applications of FEA   |    |

- c) Result Processing
- d) Element distortion and check
- e) Modal analysis
- f) Explain transient thermal problems.

| B.E. (Part – I) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering |  |   |  |  |  |  |  |
|---|--|---|--|--|--|--|--|
| •   | FINITE ELEMENT METHODSDay & Date: Saturday, 14-12-2019Max. Marks: 70Time: 02:30 PM To 05:30 PMMax. Marks: 70   |   |  |  |  |  |  |
| Instructio  | <ul> <li>Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.</li> <li>2) All questions are compulsory.</li> <li>3) Figures to the right indicate full marks.</li> </ul> |   |  |  |  |  |  |
|   | 4) Assume suitable data if neces<br>MCQ/Objective  | •   |  |  |  |  |  |
| Duration:   | 30 Minutes   | Marks: 14   |  |  |  |  |  |
| <b>Q.1 Cho</b><br>1)  | <ul> <li>ose the correct alternatives from 5</li> <li>Size of stiffness matrix of 3 nodded</li> <li>a) 6 × 6</li> <li>c) 4 × 6</li> </ul>  | •   |  |  |  |  |  |
| 2)  | Which of the following is a weighte<br>a) Least square method<br>c) Potential energy method  | b) Rayleigh - Ritz method   |  |  |  |  |  |
| 3)  | Formula for point collocation method<br>a) $\int f(x)R(x)dx = 0$<br>c) $R(x) = 0$  | hod is<br>b) $\int R(x)dx = 0$<br>d) $\int R^2(x)dx = 0$                      |  |  |  |  |  |
| 4)  | The element with three degree inte<br>a) Quadratic element<br>c) Linear  | terpolation function is called as<br>b) Cubic element<br>d) None of the above |  |  |  |  |  |
| 5)  | FEM is<br>a) Analytical method<br>c) Both a and c  | <ul><li>b) Numerical method</li><li>d) None of the above</li></ul>            |  |  |  |  |  |
| 6)  | Mass element type is of shape<br>a) Point (•)<br>c) Triangle (Δ)   | <br>b) line (– –)<br>d) rectangle ( □□ )                                      |  |  |  |  |  |
| 7)  | The FE solution to reach the exact<br>order<br>a) Constant<br>c) Quadratic   | ct solution the polynomial should be of<br>b) Linear<br>d) Cubic              |  |  |  |  |  |
| 8)  | Size of shape function matrix of 2<br>a) 2 × 6<br>c) 4 × 6   | D element having 3 nodes is<br>b) 3 × 3<br>d) 2 × 5                           |  |  |  |  |  |
| 9)  | In an Element the value of t<br>circumferential direction only.<br>a) 1 D and 2D<br>c) Solid   | the field variable changes in the<br>b) Beam<br>d) Axisymmetric               |  |  |  |  |  |

# Seat No.

. . . • ` ... /n 2010 . •

Set S

10) In a \_\_\_\_\_ type of refinement higher order elements are used instead of increasing number of elements.

- a) h-type of refinement
- b) p-type of refinement

**SLR-FM-157** 

Set S

- c) ph-type of refinement
- d) d- type of refinement
- 11) The material property matrix is represented as \_\_\_\_\_.
  - a) [D] b) [K]
  - c) [C] d) [B]
- 12) Which of the following is a weighted residual method?
  - a) Galerkin's method b) Variational method
  - c) Potential energy method d) All of the above
- 13) Triangular element having 3 nodes is known as \_\_\_\_\_
  - a) 2 D simplex elementc) Multiplex element
- b) 3D Complex element
- d) None
- 14) A measure of distortion of a element is \_
  - a) bandwidth

- b) damping ratio
- c) aspect ratio
- d) shape function

| Seat |  |
|------|--|
| No.  |  |

# B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FINITE ELEMENT METHODS

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each section

- 2) Figures to the right indicate full marks.
  - 3) Assume suitable data if necessary.

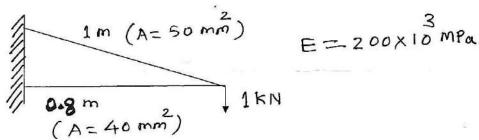
#### Section – I

- Q.2 a) Explain Properties of global stiffness matrix and write stiffness matrix for 2D 07 truss element.
  - b) Obtain solution of differential equation by using Galerkin's method. 07

$$3\frac{\partial^2 u}{\partial x^2} + x + 1 = 0$$

Take boundary conditions f(0) = f(1) = 1

Q.3 a) Find the axial force in two members of simple truss shown in fig. using finite 07 element method.



**b)** Explain steps in finite element methods with example.

#### Q.4 Write short notes. (Any four)

- a) Principle of minimum potential energy
- **b)** Explain axi-symmetric elasticity
- c) List advantages of FEA
- d) Explain any four choice of element type with application.
- e) Explain one diamensional elasticity.
- f) Simplification using Symmetry

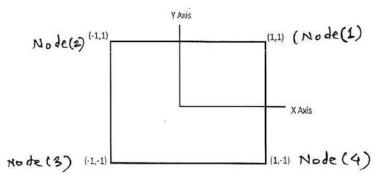
Max. Marks: 56

07

# SLR-FM-157 Set S

#### Section – II

**Q.5 a)** Obtain shape functions of element as shown in figure by using Lagrange' **07** polynomial.



|     | b) | Explain mesh design in detail.  | 07 |
|-----|----|---|----|
| Q.6 | a) | Derive equation for shape function of two dimensional simplex element in natural coordinates. | 07 |
|     | b) | Differentiate between static analysis and dynamic analysis in FEM.                            | 07 |
| Q.7 | a) | <b>ite short notes. (Any four)</b><br>Material non-linearity<br>Applications of FEA           | 14 |

- c) Result Processing
- d) Element distortion and check
- e) Modal analysis
- f) Explain transient thermal problems.

Set

# B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMOBILE ENGINEERING

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book Page No.3

2) Figures to the right indicate full mark.

# MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options.

- The loads supported by an automobile frame are \_\_\_\_\_ 1)
  - a) Weight of the body, passengers and cargo loads
  - b) Torque from engine and transmission
  - Sudden impacts from collisions c)
  - d) All of the mentioned
- 2) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.
  - a) Delivers improved cornering on dry road surfaces
  - b) Eliminates the need of snow tyres, tyre chains, etc.
  - c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
  - d) Ensures that effective braking can be performed, even on slippery surfaces
- 3) The force available at the contact between road and driving wheel is called \_\_\_\_.
  - a) Brake power b)
  - Engine torque Tractive effort d) c)
- Which of these is not a power loss which takes place between engine and 4) driving wheel?
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss
  - d) None of the mentioned

a) Four wheel drive

- Clutch and friction linings are \_\_\_\_\_ to the clutch plate. 5)
  - a) Riveted Welded b)
  - c) Bolted Any of the above d)
- 6) Transfer case is located next to the gearbox in \_
  - Rear wheel drive b)
  - c) Front wheel drive All of the above d)

Seat No.

Max. Marks: 70

Marks: 14



|     | SLR-FM-158   |
|-----|--|
|     | Set P  |
| 7)  | <ul> <li>A traction control system (TCS) in automobiles controls the</li> <li>a) Vibrations on the steering wheel</li> <li>b) Torque that is transmitted by the tyres to the road surface</li> <li>c) Engine power during acceleration</li> <li>d) Stopping distance in case of emergency</li> </ul> |
| 8)  | Due to Positive camber the tyre will wear on itsa) Inner sideb) Outer sidec) Both inner and outer sided) None of above   |
| 9)  | Straight ahead recovery is achieved due toa) King pin inclinationb) Scrub radiusc) Oversteerd) None of above   |
| 10) | The brake bleeding process removes from system.a) Airb) Vacuumc) Excess fluidd) Excess pressure  |
| 11) | <ul> <li>The coil spring in wishbone suspension is placed between the</li> <li>a) two wishbones</li> <li>b) upper wishbone and the cross-member</li> <li>c) lower wishbone and the cross-member</li> <li>d) shock absorber and the cross-member</li> </ul>   |
| 12) | The type of spring that can be used in suspension of automobile isa) air springb) leaf springc) coil springd) all of above   |
| 13) | Another name for a stabilizer bar isa) Sway barb) Strut rodc) Panhard rodd) None of above  |
| 14) | <ul> <li>Fuel cell convert</li> <li>a) Chemical into electrical energy</li> <li>b) mechanical into electrical energy</li> <li>c) chemical into mechanical energy</li> <li>d) none of above</li> </ul>  |

| Mechanical Engineering<br>AUTOMOBILE ENGINEERING |  |  |          |  |
|--|--|--|----------|--|
|  | Day & Date: Saturday,14-12-2019 Max. Marks: 56<br>Time: 02:30 PM To 05:30 PM |  |          |  |
| Instr  | uctio  | <ul> <li>ns: 1) Answer any two questions from each section.</li> <li>2) Assume suitable data if necessary.</li> <li>3) Use of non-programmable calculator is allowed.</li> <li>4) Figures to the right indicate full mark.</li> </ul> SECTION I  |          |  |
| Q.2  | a)   | Draw the neat sketch of Conventional chassis layout and state function of  | 06       |  |
|  | b)   | <ul> <li>its parts.</li> <li>Define the following.</li> <li>1) Gradability</li> <li>2) Acceleration</li> <li>3) Draw bar pull</li> <li>4) Traction and Tractive effort</li> </ul>  | 04       |  |
|  | c)   | What are requirements of clutch? Draw a neat sketch of Single Plate Clutch.  | 04       |  |
| Q.3  | a)<br>b)   | A Layland truck has a gross vehicle weight of 89026 N. Engine<br>displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m.<br>Maximum Torque 345.8 N-m at 1400 r.p.m. Rear axle ratio 6.166:1. Fourth<br>speed reduction ratio in transmission, 1.605:1, drive line losses amount to<br>10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X<br>1.016 m)(Effective wheel diameter 0.950 m), frontal area of truck 6.95 m <sup>2</sup> .<br>Calculate the grades which the vehicle can climb in fourth gear in still air<br>conditions:<br>1) At governed engine speed, and<br>2) At speed of maximum torque, in the equation.<br>R = KW + KaAV <sup>2</sup> ; K=0.014, Ka= 0.0462, where V is in km/hr.<br>Discuss necessity of differential in an Automobile | 10       |  |
| Q.4  | ы)<br>а)   | What is Torque Converter? Explain its construction and working with  | 04<br>06 |  |
| <b>Q</b> .7                                      | b)   | figure.<br>Write notes on both with neat Sketch<br>1) Starting System of an Automobile<br>2) Epicyclic gear box  | 08       |  |
|  |  | Section - II   |          |  |
| Q.5  | a)   | What are the different types of steering gear boxes? Explain recirculating ball type steering gear box with a neat sketch.   | 06       |  |
|  | b)   | Derive the equation for correct steering condition m in term of wheel base and wheel track.  | 04       |  |
|  | c)   | Write short notes on any one 1) Linkage power steering   | 04       |  |

- - Antilock braking system

# Seat No.

B.E. (Part - I) (CGPA) Examination Nov/Dec-2019

Set P

| Q.6 | a)<br>b)<br>c) | <ul> <li>A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is travelling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when</li> <li>1) The rear wheels are braked</li> <li>2) The front wheels are braked</li> <li>The coefficient of friction between tyre and road may be taken as 0.6.</li> <li>Explain with the help neat sketch working of a hydraulic braking system.</li> <li>Write short note on any one</li> <li>1) Ackermann steering mechanism</li> <li>2) Vacuum brakes</li> </ul> | 06<br>04<br>04 |
|-----|----------------|---|----------------|
| Q.7 | a)             | What are the requirements of automobile suspension system? Explain with neat sketch wish-bone type suspension used in vehicle.  | 06             |
|     | b)             | Explain the concept of sprung and unsprung mass in suspension system.   | 04             |

- Explain the concept of sprung and unsprung mass in suspension system. b) c)
  - Write short notes on any one
    - Sensors used in modern automobiles
       Construction and working of fuel cell

|             |                   | SLR-FM-15  | 8 |
|-------------|-------------------|--|---|
| Seat<br>No. |                   | Set C  | ) |
|             |                   | B.E. (Part - I) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>AUTOMOBILE ENGINEERING  |   |
|             |                   | e: Saturday,14-12-2019 Max. Marks: 7<br>D PM To 05:30 PM   | 0 |
| Instru      | uctior            | <ul> <li>ns: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer<br/>Book Page No.3</li> <li>2) Figures to the right indicate full mark.</li> </ul>   |   |
|             |                   | MCQ/Objective Type Questions   |   |
|             |                   | 0 Minutes Marks: 1   |   |
|             | <b>Choc</b><br>1) | Due to Positive camber the tyre will wear on its       1         a) Inner side       b) Outer side         c) Both inner and outer side       d) None of above   | 4 |
|             | 2)                | Straight ahead recovery is achieved due toa) King pin inclinationb) Scrub radiusc) Oversteerd) None of above   |   |
|             | 3)                | The brake bleeding process removes from system.a) Airb) Vacuumc) Excess fluidd) Excess pressure  |   |
|             | 4)                | <ul> <li>The coil spring in wishbone suspension is placed between the</li> <li>a) two wishbones</li> <li>b) upper wishbone and the cross-member</li> <li>c) lower wishbone and the cross-member</li> <li>d) shock absorber and the cross-member</li> </ul> |   |
|             | 5)                | The type of spring that can be used in suspension of automobile isa) air springb) leaf springc) coil springd) all of above   |   |
|             | 6)                | Another name for a stabilizer bar isa) Sway barb) Strut rodc) Panhard rodd) None of above  |   |
|             | 7)                | <ul> <li>Fuel cell convert</li> <li>a) Chemical into electrical energy</li> <li>b) mechanical into electrical energy</li> <li>c) chemical into mechanical energy</li> <li>d) none of above</li> </ul>  |   |
|             | 8)                | <ul> <li>The loads supported by an automobile frame are</li> <li>a) Weight of the body, passengers and cargo loads</li> <li>b) Torque from engine and transmission</li> <li>c) Sudden impacts from collisions</li> <li>d) All of the mentioned</li> </ul>  |   |

Page **5** of **16** 



- 9) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.
  - a) Delivers improved cornering on dry road surfaces
  - b) Eliminates the need of snow tyres, tyre chains, etc.
  - c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
  - d) Ensures that effective braking can be performed, even on slippery surfaces
- The force available at the contact between road and driving wheel is called \_\_\_\_\_.
  - a) Brake power

b) Friction power

All of the above

- c) Tractive effort d) Engine torque
- 11) Which of these is not a power loss which takes place between engine and driving wheel?
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss
  - d) None of the mentioned
- 12) Clutch and friction linings are \_\_\_\_\_ to the clutch plate.
  - a) Riveted b) Welded
  - c) Bolted d) Any of the above
- 13) Transfer case is located next to the gearbox in \_\_\_\_\_
  - a) Four wheel drive b) Rear wheel drive
  - c) Front wheel drive d)
- 14) A traction control system (TCS) in automobiles controls the \_\_\_\_\_.
  - a) Vibrations on the steering wheel
  - b) Torque that is transmitted by the tyres to the road surface
  - c) Engine power during acceleration
  - d) Stopping distance in case of emergency

| Sea<br>No. | t        | Set  | Q        |
|------------|----------|--|----------|
|            |          | B.E. (Part - I) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>AUTOMOBILE ENGINEERING  |          |
|            |          | te: Saturday,14-12-2019 Max. Marks<br>30 PM To 05:30 PM  | s: 56    |
| Instr      | uctio    | <ul> <li>ons: 1) Answer any two questions from each section.</li> <li>2) Assume suitable data if necessary.</li> <li>3) Use of non-programmable calculator is allowed.</li> <li>4) Figures to the right indicate full mark.</li> </ul> SECTION I   |          |
| Q.2        | a)       | Draw the neat sketch of Conventional chassis layout and state function of its parts.   | 06       |
|            | b)       | <ul> <li>Define the following.</li> <li>1) Gradability</li> <li>2) Acceleration</li> <li>3) Draw bar pull</li> <li>4) Traction and Tractive effort</li> </ul>  | 04       |
|            | c)       | What are requirements of clutch? Draw a neat sketch of Single Plate Clutch.  | 04       |
| Q.3        | a)       | A Layland truck has a gross vehicle weight of 89026 N. Engine<br>displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m.<br>Maximum Torque 345.8 N-m at 1400 r.p.m. Rear axle ratio 6.166:1. Fourth<br>speed reduction ratio in transmission, 1.605:1, drive line losses amount to<br>10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X<br>1.016 m)(Effective wheel diameter 0.950 m), frontal area of truck 6.95 m <sup>2</sup> .<br>Calculate the grades which the vehicle can climb in fourth gear in still air<br>conditions:<br>1) At governed engine speed, and<br>2) At speed of maximum torque, in the equation.<br>R = KW + KaAV <sup>2</sup> ; K=0.014, Ka= 0.0462, where V is in km/hr. | 10       |
| 0.4        | b)<br>2) | Discuss necessity of differential in an Automobile   | 04<br>06 |
| Q.4        | a)<br>b) | What is Torque Converter? Explain its construction and working with figure.<br>Write notes on both with neat Sketch  | 06<br>08 |
|            | ,        | <ol> <li>Starting System of an Automobile</li> <li>Epicyclic gear box</li> </ol>   |          |
|            |          | Section - II   |          |
| Q.5        | a)       | What are the different types of steering gear boxes? Explain recirculating ball type steering gear box with a neat sketch.   | 06       |
|            | b)       | Derive the equation for correct steering condition m in term of wheel base<br>and wheel track.   | 04       |
|            | c)       | Write short notes on any one<br>1) Linkage power steering<br>2) Antilook broking outom   | 04       |

| Set | Q |
|-----|---|
|-----|---|

| Q.6 | a)<br>b)<br>c) | <ul> <li>A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is travelling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when</li> <li>1) The rear wheels are braked</li> <li>2) The front wheels are braked</li> <li>The coefficient of friction between tyre and road may be taken as 0.6.</li> <li>Explain with the help neat sketch working of a hydraulic braking system.</li> <li>Write short note on any one</li> <li>1) Ackermann steering mechanism</li> <li>2) Vacuum brakes</li> </ul> | 06<br>04<br>04 |
|-----|----------------|---|----------------|
| Q.7 | a)             | What are the requirements of automobile suspension system? Explain with   | 06             |

- neat sketch wish-bone type suspension used in vehicle. Explain the concept of sprung and unsprung mass in suspension system.
  Write short notes on any one
  1) Sensors used in modern automobiles
  2) Construction and working of fuel cell b) 04
  - c)

| B.E. (Part - I) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering |                  |  |  |  |  |
|---|------------------|--|--|--|--|
|   |                  | AUTOMOBILE ENGINEERING   |  |  |  |
|   |                  | e: Saturday,14-12-2019 Max. Marks: 70<br>80 PM To 05:30 PM   |  |  |  |
| Instr   | ructio           | <ul> <li>ns: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer<br/>Book Page No.3</li> <li>2) Figures to the right indicate full mark.</li> </ul>   |  |  |  |
|   |                  | MCQ/Objective Type Questions   |  |  |  |
| Dura  | ition: (         | 30 Minutes Marks: 14   |  |  |  |
| Q.1   | <b>Cho</b><br>1) | ose the correct alternatives from the options.14Clutch and friction linings are to the clutch plate.14a) Rivetedb) Weldedc) Boltedd) Any of the above  |  |  |  |
|   | 2)               | Transfer case is located next to the gearbox ina) Four wheel driveb) Rear wheel drivec) Front wheel drived) All of the above   |  |  |  |
|   | 3)               | <ul> <li>A traction control system (TCS) in automobiles controls the</li> <li>a) Vibrations on the steering wheel</li> <li>b) Torque that is transmitted by the tyres to the road surface</li> <li>c) Engine power during acceleration</li> <li>d) Stopping distance in case of emergency</li> </ul> |  |  |  |
|   | 4)               | Due to Positive camber the tyre will wear on its<br>a) Inner side b) Outer side<br>c) Both inner and outer side d) None of above   |  |  |  |
|   | 5)               | Straight ahead recovery is achieved due toa) King pin inclinationb) Scrub radiusc) Oversteerd) None of above   |  |  |  |
|   | 6)               | The brake bleeding process removes from system.a) Airb) Vacuumc) Excess fluidd) Excess pressure  |  |  |  |
|   | 7)               | <ul> <li>The coil spring in wishbone suspension is placed between the</li> <li>a) two wishbones</li> <li>b) upper wishbone and the cross-member</li> <li>c) lower wishbone and the cross-member</li> <li>d) shock absorber and the cross-member</li> </ul>   |  |  |  |
|   | 8)               | The type of spring that can be used in suspension of automobile is<br>a) air spring b) leaf spring   |  |  |  |

<u>No.</u>

# B E (Part - I) (CGPA) Examination Nov/Dec-2019

Seat

# **SLR-FM-158**

Set R

- all of above c) coil spring d)

Set

**SLR-FM-158** 

- 9) Another name for a stabilizer bar is \_\_\_\_
  - a) Sway bar

b) Strut rod

c) Panhard rod

- d) None of above
- 10) Fuel cell convert \_\_\_\_\_
  - a) Chemical into electrical energy
  - b) mechanical into electrical energy
  - c) chemical into mechanical energy
  - d) none of above
- 11) The loads supported by an automobile frame are \_\_\_\_\_
  - a) Weight of the body, passengers and cargo loads
  - b) Torque from engine and transmission
  - c) Sudden impacts from collisions
  - d) All of the mentioned
- 12) The basic purpose of a four wheel drive (4WD) system is that it \_\_\_\_\_.
  - a) Delivers improved cornering on dry road surfaces
  - b) Eliminates the need of snow tyres, tyre chains, etc.
  - c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
  - d) Ensures that effective braking can be performed, even on slippery surfaces
- The force available at the contact between road and driving wheel is called \_\_\_\_\_.
  - a) Brake power b) Friction power
  - c) Tractive effort
- d) Engine torque
- 14) Which of these is not a power loss which takes place between engine and driving wheel?
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss
  - d) None of the mentioned

| Instr | uctior   | <ul> <li>ns: 1) Answer any two questions from each section.</li> <li>2) Assume suitable data if necessary.</li> <li>3) Use of non-programmable calculator is allowed.</li> <li>4) Figures to the right indicate full mark.</li> </ul>   |          |
|-------|----------|---|----------|
| Q.2   | a)       | Draw the neat sketch of Conventional chassis layout and state function of its parts.  | 06       |
|       | b)<br>c) | <ul> <li>Define the following.</li> <li>1) Gradability</li> <li>2) Acceleration</li> <li>3) Draw bar pull</li> <li>4) Traction and Tractive effort</li> <li>What are requirements of clutch? Draw a neat sketch of Single Plate</li> </ul>  | 04<br>04 |
| Q.3   | a)<br>b) | Clutch.<br>A Layland truck has a gross vehicle weight of 89026 N. Engine<br>displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m.<br>Maximum Torque 345.8 N-m at 1400 r.p.m. Rear axle ratio 6.166:1. Fourth<br>speed reduction ratio in transmission, 1.605:1, drive line losses amount to<br>10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X<br>1.016 m)(Effective wheel diameter 0.950 m), frontal area of truck 6.95 m <sup>2</sup> .<br>Calculate the grades which the vehicle can climb in fourth gear in still air<br>conditions:<br>1) At governed engine speed, and<br>2) At speed of maximum torque, in the equation.<br>R = KW + KaAV <sup>2</sup> ; K=0.014, Ka= 0.0462, where V is in km/hr.<br>Discuss necessity of differential in an Automobile | 10       |
| Q.4   | ,<br>а)  | What is Torque Converter? Explain its construction and working with   | 06       |
|       | b)       | figure.<br>Write notes on both with neat Sketch<br>1) Starting System of an Automobile<br>2) Epicyclic gear box   | 08       |
|       |          | Section - II  |          |
| Q.5   | a)       | What are the different types of steering gear boxes? Explain recirculating ball type steering gear box with a neat sketch.  | 06       |
|       | b)       | Derive the equation for correct steering condition m in term of wheel base<br>and wheel track.  | 04       |
|       | c)       | Write short notes on any one<br>1) Linkage power steering<br>2) Antilock braking system   | 04       |

Seat No.

# B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AUTOMOBILE ENGINEERING

Day & Date: Saturday,14-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

SLR-FM-158

Set R

| Set | R |
|-----|---|
|-----|---|

| <ul> <li>Q.6 a) A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is travelling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when <ol> <li>The rear wheels are braked</li> <li>The front wheels are braked</li> <li>The coefficient of friction between tyre and road may be taken as 0.6.</li> </ol> </li> <li>b) Explain with the help neat sketch working of a hydraulic braking system.</li> <li>C) Write short note on any one <ol> <li>Ackermann steering mechanism</li> <li>Vacuum brakes</li> </ol> </li> </ul> | 06<br>04<br>04 |
|--|----------------|

- What are the requirements of automobile suspension system? Explain with Q.7 a) 06 neat sketch wish-bone type suspension used in vehicle.
  - Explain the concept of sprung and unsprung mass in suspension system. b) 04 04
  - Write short notes on any one C)
    - 1) Sensors used in modern automobiles
    - 2) Construction and working of fuel cell

|       |                  | Mechar   | A) Examination Nov/Dec-20<br>nical Engineering<br>BILE ENGINEERING  | 19              |
|-------|------------------|--|---|-----------------|
|       |                  | : Saturday,14-12-2019<br>PM To 05:30 PM  |   | Max. Marks: 70  |
| Insti | ructio           | <ul> <li>s: 1) Q.No.1 is compulsory a<br/>Book Page No.3</li> <li>2) Figures to the right ind</li> </ul>   | and should be solved in first 30 Mi<br>icate full mark.   | nutes in answer |
|       |                  | -  | ctive Type Questions  |                 |
| Dura  | ition: 3         | ) Minutes  |   | Marks: 1        |
| Q.1   | <b>Cho</b><br>1) | se the correct alternatives<br>The brake bleeding process<br>a) Air<br>c) Excess fluid   | from the options.<br>removes from system.<br>b) Vacuum<br>d) Excess pressure  | 1,              |
|       | 2)               | <ul> <li>The coil spring in wishbone</li> <li>a) two wishbones</li> <li>b) upper wishbone and the</li> <li>c) lower wishbone and the</li> <li>d) shock absorber and the</li> </ul> | e cross-member  | 9               |
|       | 3)               | The type of spring that can l<br>a) air spring<br>c) coil spring   | be used in suspension of automot<br>b) leaf spring<br>d) all of above   | oile is         |
|       | 4)               | Another name for a stabilize<br>a) Sway bar<br>c) Panhard rod  | r bar is<br>b) Strut rod<br>d) None of above  |                 |
|       | 5)               | <ul> <li>Fuel cell convert</li> <li>a) Chemical into electrical</li> <li>b) mechanical into electric</li> <li>c) chemical into mechanic</li> <li>d) none of above</li> </ul>       | al energy   |                 |
|       | 6)               |  |   |                 |
|       | 7)               | <ul><li>a) Delivers improved corner</li><li>b) Eliminates the need of s</li></ul>  | wheel drive (4WD) system is that<br>ering on dry road surfaces<br>snow tyres, tyre chains, etc.<br>mission of engine torque to all four |                 |

Seat No.

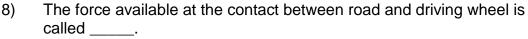
70

# Q.

- c) Ensures effective transmission of engine torque to all four wheels, even on slippery road surfaces
- d) Ensures that effective braking can be performed, even on slippery surfaces

**SLR-FM-158** Set S

4



- a) Brake power
- b) Friction power

Set S

- c) Tractive effort d) Engine torque
- 9) Which of these is not a power loss which takes place between engine and driving wheel?
  - a) Power loss due to friction of piston bearings and gears
  - b) Power loss from clutch to drive wheel due to friction of various parts
  - c) Transmission line loss
  - d) None of the mentioned

a) Four wheel drive

a) Riveted

- 10) Clutch and friction linings are \_\_\_\_\_ to the clutch plate.
  - b) Welded
  - c) Bolted d) Any of the above
- 11) Transfer case is located next to the gearbox in \_
  - b) Rear wheel drive
  - c) Front wheel drive d) All of the above
- 12) A traction control system (TCS) in automobiles controls the \_\_\_\_\_.
  - a) Vibrations on the steering wheel
  - b) Torque that is transmitted by the tyres to the road surface
  - c) Engine power during acceleration
  - d) Stopping distance in case of emergency
- 13) Due to Positive camber the tyre will wear on its \_\_\_\_\_.
  - a) Inner side
- b) Outer side
- c) Both inner and outer side d) None of above
- 14) Straight ahead recovery is achieved due to \_\_\_\_\_
  - a) King pin inclination
- b) Scrub radius

c) Oversteer

d) None of above

|     | c) | <ol> <li>Acceleration</li> <li>Draw bar pull</li> <li>Traction and Tractive effort</li> <li>What are requirements of clutch? Draw a neat sketch of Single Plate<br/>Clutch.</li> </ol>   | 04 |
|-----|----|--|----|
| Q.3 | a) | <ul> <li>A Layland truck has a gross vehicle weight of 89026 N. Engine displacement is 10 m2, power 77.3 KW at governed speed of 2400 r.p.m. Maximum Torque 345.8 N-m at 1400 r.p.m. Rear axle ratio 6.166:1. Fourth speed reduction ratio in transmission, 1.605:1, drive line losses amount to 10.7 KW at 2400 r.p.m and 6.3 KW at 1400 r.p.m. (Tyre size 0.4572 m X 1.016 m)(Effective wheel diameter 0.950 m), frontal area of truck 6.95 m<sup>2</sup>. Calculate the grades which the vehicle can climb in fourth gear in still air conditions:</li> <li>1) At governed engine speed, and</li> </ul> | 10 |
|     |    | <ol> <li>At speed of maximum torque, in the equation.</li> <li>R = KW + KaAV<sup>2</sup>; K=0.014, Ka= 0.0462, where V is in km/hr.</li> </ol>   |    |
|     | b) | Discuss necessity of differential in an Automobile   | 04 |
| Q.4 | a) | What is Torque Converter? Explain its construction and working with  | 06 |
|     | b) | figure.<br>Write notes on both with neat Sketch<br>1) Starting System of an Automobile<br>2) Epicyclic gear box  | 08 |
|     |    | Section - II   |    |
| Q.5 | a) | What are the different types of steering gear boxes? Explain recirculating ball type steering gear box with a neat sketch.   | 06 |
|     | b) | Derive the equation for correct steering condition m in term of wheel base<br>and wheel track.   | 04 |
|     | c) | Write short notes on any one<br>1) Linkage power steering<br>2) Antilock braking system  | 04 |

B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** AUTOMOBILE ENGINEERING

Day & Date: Saturday, 14-12-2019 Time: 02:30 PM To 05:30 PM

its parts.

1)

Define the following.

Gradability

**Instructions:** 1) Answer any two questions from each section.

- 2) Assume suitable data if necessary.
- 3) Use of non-programmable calculator is allowed.
- 4) Figures to the right indicate full mark.

#### **SECTION I**

Draw the neat sketch of Conventional chassis layout and state function of

# **SLR-FM-158**

S

06

04

Set

Max. Marks: 56

Seat No.

Q.2

a)

b)

| Set | S |
|-----|---|
|-----|---|

| Q.6 | a)<br>b)<br>c) | <ul> <li>A motor car has a wheel base of 2.64 m, the height of its C.G. above the ground is 0.61 m and it is 1.2 m in front of the rear axle. If the car is travelling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when</li> <li>1) The rear wheels are braked</li> <li>2) The front wheels are braked</li> <li>The coefficient of friction between tyre and road may be taken as 0.6. Explain with the help neat sketch working of a hydraulic braking system.</li> <li>Write short note on any one</li> <li>1) Ackermann steering mechanism</li> <li>2) Vacuum brakes</li> </ul> | 06<br>04<br>04 |
|-----|----------------|--|----------------|
|     |                |  |                |

- What are the requirements of automobile suspension system? Explain with Q.7 a) 06 neat sketch wish-bone type suspension used in vehicle.
  - Explain the concept of sprung and unsprung mass in suspension system. b) 04 04
  - Write short notes on any one C)
    - 1) Sensors used in modern automobiles
    - 2) Construction and working of fuel cell

| Seat   |                    |   |  |                     |   | Sat            | Р                 |
|--------|--------------------|---|--|---------------------|---|----------------|-------------------|
| No.    |                    |   |  |                     |   | Set            | Γ                 |
|        |                    | B.E. (Part                                  | -I) (CGPA) Exa<br>Mechanical E<br>INDUSTRIAL | ingin               | eering                                      | 019            |                   |
| •      |                    | uesday, 17-1<br>M To 05:30 F                |  |                     |   | Max. Mark      | s: 70             |
| Instru |                    | book.                                       | compulsory and sh                            |                     |   | minutes in ans | wer               |
|        |                    | , C   | the right indicate fu                        |                     |   |                |                   |
| Durat  | ion: 30 M          |   | ICQ/Objective T                              | ype (               | Questions                                   | Mark           | s <sup>.</sup> 14 |
|        |                    |   | alternatives from tl                         | ne oni              | ions  | Mark           | 14                |
|        |                    |   | o move wrist up and<br>averse                |                     |   |                |                   |
|        | ,                  | ed to indicate<br>potentiome<br>micro switc |  | ce of a<br>b)<br>d) | an object<br>accelerometer<br>none of these |                |                   |
|        | ,                  | lid state cam<br>Charge cou<br>faceplate    | eras used for robot v<br>ple device          | vision<br>b)<br>d)  | includes<br>Lens<br>none of these           |                |                   |
|        | 4) A t<br>a)<br>c) | actile array s<br>Range<br>Force            | ensor is special type                        | e of<br>b)<br>d)    |   |                |                   |
|        | de                 | •   |  |                     | -   | s              |                   |
|        | a)                 | e term "Robo<br>Karel Capel<br>Leonardo D   |  | b)<br>d)            | Aurther C. Clarke<br>None of these          |                |                   |
|        | ) a)               | Sensing the decision ma                     | required operations                          | ternal              | sensor                                      |                |                   |
|        | 8) Wł<br>a)<br>c)  |   | lowing tactile sensor<br>ensors              | ·?<br>b)<br>d)      | force sensors range sensors                 |                |                   |
|        | ,                  | sphere                                      | generated by SCAR<br><sup>.</sup> box        | A arm<br>b)<br>d)   | robot is<br>cylinder<br>triangle            |                |                   |

#### 10) The purpose of Robot Kinematics is to \_\_\_\_\_.

- a) study the nature of robotic joints
- b) study the relative motion of different links
- c) Determine the joint torques of a robot
- d) find collision-free path for the robot
- 11) According to Denavit-Hartenberg's notations, Joint Angle can have
  - a) Positive value
  - b) negative value
  - c) zero value only
  - d) either positive, negative or zero value
- 12) Spot welding and Arc welding are the examples of \_\_\_\_\_.
  - a) Point-to-point tasks
  - b) Continuous path tasks
  - c) Point-to-point and continuous path tasks respectively
  - d) Continuous path task and point-to-point tasks, respectively
- 13) The envelope or space within which robot can manipulate the wrist is known as \_\_\_\_\_.
  - a) repeatability b)
  - c) work volume d) stability
- 14) Which type of robot used for high speed assembly?
  - a) Jointed arm

b) PUMA

c) SCARA

d) None of these

accuracy

**SLR-FM-160** 

Set | F

Page **2** of **12** 

Seat No.

# B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL ROBOTICS

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two question from each section.

# 2) Figures to the right indicate full marks. **SECTION I**

| Q.2 | a)             | Explain the five basic robot types according to the work envelope geometries.  | 05             |
|-----|----------------|--|----------------|
|     | b)<br>c)       | Classify sensors in details<br>List advantages, disadvantages and applications of DC Motors.   | 05<br>04       |
| Q.3 | a)             | A vector V = $3i+2j+7k$ is rotated by $60^{\circ}$ about the z axes of the reference frame. it is then rotated by $30^{\circ}$ about x axes of the reference frame. Find the rotation transformation.  | 05             |
|     | b)             | What do you understand by forward & inverse kinematics for 2 dof's configuration.  | 05             |
|     | c)             | Explain any two grippers.  | 04             |
| Q.4 | a)             | It is desired to determine the values of which the angels $01 \& 02$ must be<br>set into order to achieve certain point the length of joint L1= 12 in the<br>length of L2=10 in. The coordinates x= 15.7 and y=12.6 using the reverse<br>transformation method determine the angles $01 \& 02$ . | 05             |
|     | b)<br>c)       | <ul> <li>Explain jacobian matrix in detail for 2 dof jointed configuration.</li> <li>Define the following</li> <li>1) Work envelope</li> <li>2) spatial resolution</li> <li>3) Degrees of freedom</li> <li>4) repeatability</li> </ul>   | 05<br>04       |
|     |                | Section-II   |                |
| Q.5 | a)<br>b)<br>c) | Define robot vision system & explain with block diagram.<br>Explain template matching technique for image processing.<br>Explain with neat sketch image segmentation process.  | 05<br>05<br>04 |
| Q.6 | a)<br>b)       | Compare CCD and CMOS camera.<br>Discuss the application, advantages of the wheeled robot and tracked<br>robot.   | 05<br>05       |
|     | c)             | Explain in briefly offline programming, teach through method and walk through method.  | 04             |
| Q.7 | a)<br>b)<br>c) | Explain the applications of industrial robot in welding process.<br>Explain spray painting application of industrial robot.<br>Discuss use of industrial robots for material transfer application, state the<br>robot configuration.   | 05<br>05<br>04 |





Max. Marks: 56

| Seat<br>No. |                   |  | Set         | Q     |
|-------------|-------------------|--|-------------|-------|
|             |                   | B.E. (Part -I) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INDUSTRIAL ROBOTICS  | )           |       |
|             |                   | te: Tuesday, 17-12-2019<br>30 PM To 05:30 PM   | Max. Mark   | s: 70 |
| Instru      | uctior            | <ul> <li><b>ons:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 mir book.</li> <li>2) Figures to the right indicate full mark.</li> </ul>  | utes in ans | wer   |
|             |                   | MCQ/Objective Type Questions   |             |       |
| Durat       | ion: 3            | 30 Minutes   | Mark        | s: 14 |
| Q.1         | <b>Choc</b><br>1) | ose the correct alternatives from the options.Which is the following tactile sensor?a) Magnetic sensorsb) force sensorsc) Visiond) range sensors   |             | 14    |
|             | 2)                | Work envelope generated by SCARA arm robot is<br>a) sphere b) cylinder<br>c) rectangular box d) triangle   |             |       |
|             | 3)                | <ul> <li>The purpose of Robot Kinematics is to</li> <li>a) study the nature of robotic joints</li> <li>b) study the relative motion of different links</li> <li>c) Determine the joint torques of a robot</li> <li>d) find collision-free path for the robot</li> </ul>  |             |       |
|             | 4)                | According to Denavit-Hartenberg's notations, Joint Angle can ha<br><br>a) Positive value<br>b) negative value<br>c) zero value only<br>d) either positive, negative or zero value  | ave         |       |
|             | 5)                | <ul> <li>Spot welding and Arc welding are the examples of</li> <li>a) Point-to-point tasks</li> <li>b) Continuous path tasks</li> <li>c) Point-to-point and continuous path tasks respectively</li> <li>d) Continuous path task and point-to-point tasks, respectively</li> </ul>  |             |       |
|             | 6)                | The envelope or space within which robot can manipulate the within which robot c | rist is     |       |

- Which type of robot used for high speed assembly? a) Jointed arm b) PUMA 7)

  - d) c) SCARA None of these

**SLR-FM-160** 

|     | SLR-FM-160   |
|-----|--|
|     | Set Q  |
| 8)  | The capability to move wrist up and down is known as<br>a) rotational traverse b) radial<br>c) vertical traverse d) none of these  |
| 9)  | Used to indicate presence or absence of an object<br>a) potentiometer b) accelerometer<br>c) micro switch d) none of these   |
| 10) | Solid state cameras used for robot vision includes<br>a) Charge couple device b) Lens<br>c) faceplate d) none of these   |
| 11) | A tactile array sensor is special type of sensora) Rangeb) electricalc) Forced) none of these  |
| 12) | <ul> <li>When the joint angles and the different configurations of manipulator are derived from the position orientation, the scheme is known as</li> <li>a) forward kinematics</li> <li>b) inverse kinematics</li> <li>c) transformation</li> <li>d) none of these</li> </ul> |
| 13) | The term "Robotics" was coined bya) Karel Capekb) Aurther C. Clarkec) Leonardo Da Vincid) None of these  |
| 14) | The function of the robot are<br>a) Sensing the environment by external sensor<br>b) decision making   |

- c) Performing required operationsd) All of the above

Seat No.

### B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL ROBOTICS

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two question from each section.

# 2) Figures to the right indicate full marks. **SECTION I**

| Q.2 | a)             | Explain the five basic robot types according to the work envelope geometries.  | 05             |
|-----|----------------|--|----------------|
|     | b)<br>c)       | Classify sensors in details<br>List advantages, disadvantages and applications of DC Motors.   | 05<br>04       |
| Q.3 | a)             | A vector V = $3i+2j+7k$ is rotated by $60^{\circ}$ about the z axes of the reference frame. it is then rotated by $30^{\circ}$ about x axes of the reference frame. Find the rotation transformation.  | 05             |
|     | b)             | What do you understand by forward & inverse kinematics for 2 dof's configuration.  | 05             |
|     | c)             | Explain any two grippers.  | 04             |
| Q.4 | a)             | It is desired to determine the values of which the angels $\theta 1 \& \theta 2$ must be<br>set into order to achieve certain point the length of joint L1= 12 in the<br>length of L2=10 in. The coordinates x= 15.7 and y=12.6 using the reverse<br>transformation method determine the angles $\theta 1 \& \theta 2$ . | 05             |
|     | b)<br>c)       | <ul> <li>Explain jacobian matrix in detail for 2 dof jointed configuration.</li> <li>Define the following</li> <li>1) Work envelope</li> <li>2) spatial resolution</li> <li>3) Degrees of freedom</li> <li>4) repeatability</li> </ul>   | 05<br>04       |
|     |                | Section-II   |                |
| Q.5 | a)<br>b)<br>c) | Define robot vision system & explain with block diagram.<br>Explain template matching technique for image processing.<br>Explain with neat sketch image segmentation process.  | 05<br>05<br>04 |
| Q.6 | a)<br>b)       | Compare CCD and CMOS camera.<br>Discuss the application, advantages of the wheeled robot and tracked<br>robot.   | 05<br>05       |
|     | c)             | Explain in briefly offline programming, teach through method and walk through method.  | 04             |
| Q.7 | a)<br>b)<br>c) | Explain the applications of industrial robot in welding process.<br>Explain spray painting application of industrial robot.<br>Discuss use of industrial robots for material transfer application, state the<br>robot configuration.   | 05<br>05<br>04 |



Max. Marks: 56

#### B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ROBOTICS Day & Date: Tuesday, 17-12-2019 Max. Marks: 70 Time: 02:30 PM To 05:30 PM Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full mark.

# MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options.

When the joint angles and the different configurations of manipulator are 1) derived from the position orientation, the scheme is known as

b)

- a) forward kinematics
  - c) transformation d)
- The term "Robotics" was coined by \_ 2) b)
  - a) Karel Capek c) Leonardo Da Vinci
- d) None of these

#### 3) The function of the robot are

- a) Sensing the environment by external sensor
- b) decision making
- c) Performing required operations
- d) All of the above
- Which is the following tactile sensor? 4)
  - a) Magnetic sensors b) force sensors
    - c) Vision d) range sensors
- 5) Work envelope generated by SCARA arm robot is \_
  - a) sphere cylinder b)
  - c) rectangular box triangle d)
- The purpose of Robot Kinematics is to . 6)
  - a) study the nature of robotic joints
  - b) study the relative motion of different links
  - c) Determine the joint torques of a robot
  - d) find collision-free path for the robot
- 7) According to Denavit-Hartenberg's notations, Joint Angle can have
  - a) Positive value
  - b) negative value
  - c) zero value only
  - d) either positive, negative or zero value
- 8) Spot welding and Arc welding are the examples of \_\_\_\_\_.
  - a) Point-to-point tasks
  - b) Continuous path tasks
  - c) Point-to-point and continuous path tasks respectively
  - d) Continuous path task and point-to-point tasks, respectively

R

**SLR-FM-160** 

Marks: 14

14

- Set

- inverse kinematics none of these

Aurther C. Clarke

9) The envelope or space within which robot can manipulate the wrist is known as \_\_\_

- a) repeatability b) accuracy
- c) work volume d) stability
- 10) Which type of robot used for high speed assembly?
  - Jointed arm b) PUMA a) C)
    - None of these **SCARA** d)
- 11) The capability to move wrist up and down is known as \_\_\_\_\_.
  - rotational traverse radial a) b)
  - none of these C) vertical traverse d)

| 12) | Use | ed to indicate presence | or absence | of an | object        |
|-----|-----|-------------------------|------------|-------|---------------|
|     | a)  | potentiometer           | b          | ) a   | accelerometer |

- c) micro switch d) none of these
- Solid state cameras used for robot vision includes \_\_\_\_\_. 13)
  - a) Charge couple device b) Lens
  - c) faceplate d) none of these
- A tactile array sensor is special type of \_\_\_\_\_ 14) sensor
  - Range b) electrical a) c) Force d) none of these

**SLR-FM-160** 

Set R

Seat No.

# B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL ROBOTICS

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two question from each section.

#### 2) Figures to the right indicate full marks. Section – I

| Q.2 | a)             | Explain the five basic robot types according to the work envelope geometries.   | 05             |
|-----|----------------|---|----------------|
|     | b)<br>c)       | Classify sensors in details<br>List advantages, disadvantages and applications of DC Motors.  | 05<br>04       |
| Q.3 | a)             | A vector V = $3i+2j+7k$ is rotated by $60^{\circ}$ about the z axes of the reference frame. it is then rotated by $30^{\circ}$ about x axes of the reference frame. Find the rotation transformation.   | 05             |
|     | b)             | What do you understand by forward & inverse kinematics for 2 dof's configuration.   | 05             |
|     | c)             | Explain any two grippers.   | 04             |
| Q.4 | a)             | It is desired to determine the values of which the angels $\theta 1 \& \theta 2$ must be set into order to achieve certain point the length of joint L1= 12 in the length of L2=10 in. The coordinates x= 15.7 and y=12.6 using the reverse transformation method determine the angles $\theta 1 \& \theta 2$ . | 05             |
|     | b)<br>c)       | <ul> <li>Explain jacobian matrix in detail for 2 dof jointed configuration.</li> <li>Define the following</li> <li>1) Work envelope</li> <li>2) spatial resolution</li> <li>3) Degrees of freedom</li> <li>4) repeatability</li> </ul>  | 05<br>04       |
|     |                | Section – II  |                |
| Q.5 | a)<br>b)<br>c) | Define robot vision system & explain with block diagram.<br>Explain template matching technique for image processing.<br>Explain with neat sketch image segmentation process.   | 05<br>05<br>04 |
| Q.6 | a)<br>b)       | Compare CCD and CMOS camera.<br>Discuss the application, advantages of the wheeled robot and tracked robot.   | 05<br>05       |
|     | c)             | Explain in briefly offline programming, teach through method and walk through method.   | 04             |
| Q.7 | a)<br>b)       | Explain the applications of industrial robot in welding process.<br>Explain spray painting application of industrial robot.   | 05<br>05       |

c) Discuss use of industrial robots for material transfer application, state the **04** robot configuration.

Max. Marks: 56

Set R

# B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

**INDUSTRIAL ROBOTICS** 

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full mark.

MCQ/Objective Type Questions

**Duration: 30 Minutes** 

No.

#### Q.1 Choose the correct alternatives from the options.

- The purpose of Robot Kinematics is to \_\_\_\_\_. 1)
  - a) study the nature of robotic joints
  - b) study the relative motion of different links
  - c) Determine the joint torques of a robot
  - d) find collision-free path for the robot
- 2) According to Denavit-Hartenberg's notations, Joint Angle can have
  - a) Positive value
  - b) negative value
  - c) zero value only
  - d) either positive, negative or zero value

Spot welding and Arc welding are the examples of \_\_\_\_\_. 3)

- a) Point-to-point tasks
- b) Continuous path tasks
- c) Point-to-point and continuous path tasks respectively
- d) Continuous path task and point-to-point tasks, respectively

#### The envelope or space within which robot can manipulate the wrist is 4) known as

- a) repeatability b) accuracy d) c) work volume stability
- 5) Which type of robot used for high speed assembly?
  - a) Jointed arm PUMA b)
  - c) SCARA d) None of these
- 6) The capability to move wrist up and down is known as \_\_\_\_\_.
  - a) rotational traverse b) radial
  - c) vertical traverse d) none of these
- Used to indicate presence or absence of an object \_\_\_\_\_ 7)
  - a) potentiometer accelerometer b)
  - c) micro switch d) none of these
- 8) Solid state cameras used for robot vision includes \_\_\_\_\_
  - a) Charge couple device b) Lens
  - c) faceplate
- none of these d)

Max. Marks: 70

**SLR-FM-160** 

Set



Marks: 14

|     | SLR-FM-160   |
|-----|--|
|     | Set S  |
| 9)  | A tactile array sensor is special type of sensora) Rangeb) electricalc) Forced) none of these  |
| 10) | <ul> <li>When the joint angles and the different configurations of manipulator are derived from the position orientation, the scheme is known as</li> <li>a) forward kinematics</li> <li>b) inverse kinematics</li> <li>c) transformation</li> <li>d) none of these</li> </ul> |
| 11) | The term "Robotics" was coined bya) Karel Capekb) Aurther C. Clarkec) Leonardo Da Vincid) None of these  |
| 12) | <ul> <li>The function of the robot are</li> <li>a) Sensing the environment by external sensor</li> <li>b) decision making</li> <li>c) Performing required operations</li> <li>d) All of the above</li> </ul>   |
| 13) | Which is the following tactile sensor?<br>a) Magnetic sensors b) force sensors<br>c) Vision d) range sensors   |
| 14) | Work envelope generated by SCARA arm robot isa) sphereb) cylinderc) rectangular boxd) triangle   |

Set S

### B.E. (Part -I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL ROBOTICS

Day & Date: Tuesday, 17-12-2019 Max. Marks: 56 Time: 02:30 PM To 05:30 PM Instructions: 1) Solve any two question from each section. 2) Figures to the right indicate full marks. SECTION I Q.2 a) Explain the five basic robot types according to the work envelope 05 geometries. b) Classify sensors in details 05 c) List advantages, disadvantages and applications of DC Motors. 04 A vector V = 3i+2j+7k is rotated by  $60^{\circ}$  about the z axes of the reference Q.3 05 a) frame. it is then rotated by 30<sup>°</sup> about x axes of the reference frame. Find the rotation transformation. b) What do you understand by forward & inverse kinematics for 2 dof's 05 configuration. Explain any two grippers. 04 C) 05 Q.4 a) It is desired to determine the values of which the angels  $\theta 1 \& \theta 2$  must be set into order to achieve certain point the length of joint L1= 12 in the length of L2=10 in. The coordinates x = 15.7 and y = 12.6 using the reverse transformation method determine the angles  $\theta 1 \& \theta 2$ . Explain jacobian matrix in detail for 2 dof jointed configuration. 05 b) Define the following c) 04 1) Work envelope 2) spatial resolution 3) Degrees of freedom 4) repeatability Section-II Define robot vision system & explain with block diagram. Q.5 a) 05 Explain template matching technique for image processing. 05 b) C) Explain with neat sketch image segmentation process. 04 Q.6 a) Compare CCD and CMOS camera. 05 Discuss the application, advantages of the wheeled robot and tracked 05 b) robot. Explain in briefly offline programming, teach through method and walk 04 c) through method. Q.7 a) Explain the applications of industrial robot in welding process. 05 Explain spray painting application of industrial robot. 05 b) Discuss use of industrial robots for material transfer application, state the c) 04 robot configuration.

Seat No.

|       |                  | Mechanical E<br>SUGAR ENG  | -                   | -  |            |
|-------|------------------|--|---------------------|--|------------|
|       |                  | e: Tuesday, 17-12-2019<br>0 PM To 05:30 PM   |                     | Max. N   | /larks: 70 |
| Instr | uctio            | ns: 1) Q. No. 1 is compulsory and sh   | ould b              | be solved in first 30 minutes in   | answer     |
|       |                  | Book.<br>2) Figures to the right indicate ful  | l marl              | KS.  |            |
|       |                  | 3) Use of scientific calculator is a   |                     |  |            |
| Dura  | 4. a.a. 0        | MCQ/Objective T  | ype                 |  |            |
|       |                  | 0 Minutes  |                     |  | /larks: 14 |
| Q.1   | <b>Cho</b><br>1) | Speed of the cane Kicker   | -                   |  | 14         |
|       |                  | a) 60-70 rpm<br>c) 80-100 rpm  | b)<br>d)            | 40-50 rpm<br>100-200 rpm   |            |
|       | 2)               | Location of the fibrizer<br>a) Before the cane kicker<br>c) After the first mill   | b)<br>d)            | Near to feeder table<br>After the cane knives                                  |            |
|       | 3)               | <ul> <li>Diameter of the underfeed roller is</li> <li>a) Half to two third of mill diameter</li> <li>b) One fourth of mill diameter</li> <li>c) Twice of that feed roller</li> <li>d) none of the above</li> </ul> |                     |  |            |
|       | 4)               | In imbibitions system temperature c<br>a) 40 <sup>0</sup> -50 <sup>0</sup><br>c) 70 <sup>0</sup> -80 <sup>0</sup>  | of hot<br>b)<br>d)  | water<br>20 <sup>0</sup> -30 <sup>0</sup><br>90 <sup>0</sup> -100 <sup>0</sup> |            |
|       | 5)               | <ul><li>Purpose of juice Sulphitation</li><li>a) To increase the pH of the juice</li><li>c) To reduce the juice brix</li></ul>   | b)<br>d)            | to bring whiteness to sugar<br>none of the above                               |            |
|       | 6)               | Invertor of the multiple effect evapo<br>a) Chevron<br>c) Nobert rilieux   | rator _<br>b)<br>d) | <br>Victor ducasse<br>Lotus  |            |
|       | 7)               | In juice heater and in second step t<br>a) $25^{\circ}-40^{\circ}$<br>c) $100^{\circ}-105^{\circ}$   | he jui<br>b)<br>d)  | ce is heated from<br>65 <sup>0</sup> -75 <sup>0</sup><br>none of the above     |            |
|       | 8)               | Juice clarifier(dorr) is used for<br>a) boiling of juice<br>c) to reduce the juice brix  | <br>b)<br>d)        | settling of mud<br>curing of sugar   |            |
|       | 9)               | <ul> <li>In labile phase</li> <li>a) no crystal formation</li> <li>b) spontaneous formation of suga</li> <li>c) Crystal neither dissolves nor gr</li> <li>d) none of the above</li> </ul>                          | -                   | tal  |            |

Seat No.

# B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

**SLR-FM-161** 

Set P

- d) none of the above



**SLR-FM-161** Set P

- 10)
- When syrup purity below 80 \_\_\_\_\_.
  a) Two massecuite boiling scheme is used
  b) Three massecuite boiling scheme is used
  c) Four massecuite boiling scheme is used

  - d) Three and half massecuite boiling scheme is used

| 11) | Mixture of crystal & syrup is called _<br>a) Massecuite<br>c) Strike          | b)<br>d)           | Magma<br>Melt                    |
|-----|---|--------------------|----------------------------------|
| 12) | Air cooled crystallizer is used for<br>a) 'A' massecuite<br>c) 'D' massecuite | b)<br>d)           | 'C' massecuite<br>'M' massecuite |
| 13) | Gravity factor for 'C' massecuite<br>a) 600-800<br>c) 2000-2800               | b)<br>d)           | 1200-1500<br>none of the above   |
| 14) | In deterioration of sugar safety factors<br>a) 0.20<br>c) 0.33                | or sho<br>b)<br>d) | uld not exceed<br>0.25<br>0.50   |

Seat No.

### B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering SUGAR ENGINEERING

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section 2) Use of scientific calculator is allowed.

### Section – I

- Q.2 a) Describe cane Kicker with neat sketch. 06 Describe pressure in milling. b) 04 Explain rotary juice screen. 04 c) What are the types of imbibitions system? Explain simple imbibitions Q.3 a) 06 system. Explain preparation of lime for purification of juice in clarification. 04 b) Describe construction of evaporator. c) 04 Q.4 Write short notes. (Any Three) 14 Distributing valve of rotary vacuum filter a)
  - b) Semi kestner
  - c) Arching of roller
  - d) Messchaert grooves

### Section – II

| Q.5 | a)   | Describe three massecuite boiling scheme.                           | 06 |
|-----|------|---|----|
|     | b)   | Explain slurry preparation methods.                                 | 04 |
|     | C)   | Explain vertical crystalliser.                                      | 04 |
| Q.6 | a)   | Describe centrifugal station.                                       | 06 |
|     | b)   | What are the factors affecting the centrifugal machine performance? | 04 |
|     | c)   | Explain sugar grader.   | 04 |
| Q.7 | Writ | e short notes. (Any Three)  | 14 |
|     | a)   | Waste water treatment   |    |

- **b**) Automation of centrifugal operation
- c) Sugar dust collectors
- d) Sugar elevator



|       |                   | Mechanical Engin<br>SUGAR ENGINE   |   |
|-------|-------------------|--|---|
|       |                   | e: Tuesday, 17-12-2019<br>0 PM To 05:30 PM   | Max. Marks: 70                                |
| Instr | uctior            | <b>is:</b> 1) Q. No. 1 is compulsory and should l<br>Book.   | be solved in first 30 minutes in answer       |
|       |                   | <ul><li>2) Figures to the right indicate full mar</li><li>3) Use of scientific calculator is allowed</li></ul>   |   |
|       |                   | MCQ/Objective Type   |   |
| Dura  | tion: 3           | 0 Minutes  | Marks: 14                                     |
| Q.1   | <b>Choo</b><br>1) | Juice clarifier(dorr) is used for         a) boiling of juice       b)         c) to reduce the juice brix       d)  |   |
|       | 2)                | <ul><li>c) to reduce the juice brix</li><li>d)</li><li>In labile phase</li></ul>   | curing of sugar                               |
|       | 2)                | <ul> <li>a) no crystal formation</li> <li>b) spontaneous formation of sugar crys</li> <li>c) Crystal neither dissolves nor grow</li> <li>d) none of the above</li> </ul>   | tal   |
|       | 3)                | <ul> <li>When syrup purity below 80</li> <li>a) Two massecuite boiling scheme is u</li> <li>b) Three massecuite boiling scheme is u</li> <li>c) Four massecuite boiling scheme is u</li> <li>d) Three and half massecuite boiling scheme is u</li> </ul> | used<br>sed                                   |
|       | 4)                | Mixture of crystal & syrup is calleda)Massecuiteb)c)Striked)   | Magma<br>Melt                                 |
|       | 5)                | Air cooled crystallizer is used fora) 'A' massecuiteb)c) 'D' massecuited)  | 'C' massecuite<br>'M' massecuite              |
|       | 6)                | Gravity factor for 'C' massecuite<br>a) 600-800 b)<br>c) 2000-2800 d)  | 1200-1500<br>none of the above                |
|       | 7)                | In deterioration of sugar safety factor shoa)0.20b)b)c)0.33  | ould not exceed<br>0.25<br>0.50               |
|       | 8)                | Speed of the cane Kicker         b)           a) 60-70 rpm         b)           c) 80-100 rpm         d)   | 40-50 rpm<br>100-200 rpm                      |
|       | 9)                | Location of the fibrizera) Before the cane kickerb)c) After the first milld)   | Near to feeder table<br>After the cane knives |

Q

Set

**SLR-FM-161** Set Q Diameter of the underfeed roller is \_\_\_\_\_. 10) a) Half to two third of mill diameter b) One fourth of mill diameter c) Twice of that feed roller d) none of the above In imbibitions system temperature of hot water 11)  $20^{0} - \overline{30^{0}}$ a)  $40^{\circ}-50^{\circ}$ b) c)  $70^{\circ}-80^{\circ}$ 90<sup>0</sup>-100<sup>0</sup> d) Purpose of juice Sulphitation \_ 12) a) To increase the pH of the juice to bring whiteness to sugar b) c) To reduce the juice brix none of the above d) Invertor of the multiple effect evaporator \_ 13) a) Chevron Victor ducasse b) c) Nobert rilieux d) Lotus

- 14) In juice heater and in second step the juice is heated from \_\_\_\_\_
  - a)  $25^{\circ}-40^{\circ}$

65<sup>0</sup>-75<sup>0</sup>

b)

.

c)  $100^{\circ}-105^{\circ}$  d) none of the above

Seat No.

### B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering SUGAR ENGINEERING

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section 2) Use of scientific calculator is allowed.

### Section – I

- Q.2 a) Describe cane Kicker with neat sketch. 06 Describe pressure in milling. b) 04 Explain rotary juice screen. 04 c) What are the types of imbibitions system? Explain simple imbibitions Q.3 a) 06 system. Explain preparation of lime for purification of juice in clarification. 04 b) Describe construction of evaporator. c) 04 Q.4 Write short notes. (Any Three) 14 Distributing valve of rotary vacuum filter a)
  - b) Semi kestner
  - c) Arching of roller
  - d) Messchaert grooves

### Section – II

| Q.5 | a)  | Describe three massecuite boiling scheme.                           | 06 |
|-----|-----|---|----|
|     | b)  | Explain slurry preparation methods.                                 | 04 |
|     | c)  | Explain vertical crystalliser.                                      | 04 |
| Q.6 | a)  | Describe centrifugal station.                                       | 06 |
|     | b)  | What are the factors affecting the centrifugal machine performance? | 04 |
|     | c)  | Explain sugar grader.   | 04 |
| Q.7 | Wri | te short notes. (Any Three)   | 14 |
|     | a)  | Waste water treatment   |    |

- **b**) Automation of centrifugal operation
- c) Sugar dust collectors
- **d**) Sugar elevator



|       |                  | SUGAR ENG   | •                   | -  |
|-------|------------------|---|---------------------|--|
|       |                  | e: Tuesday, 17-12-2019<br>0 PM To 05:30 PM  |                     | Max. Marks: 70   |
| Instr | uctio            | · · ·   | ould b              | be solved in first 30 minutes in answer                                    |
|       |                  | Book.<br>2) Figures to the right indicates fr<br>3) Use of scientific calculator is a   |                     |  |
| _     |                  | MCQ/Objective T   | ype                 |  |
|       |                  | 0 Minutes   | _                   | Marks: 14  |
| Q.1   | <b>Cho</b><br>1) | ose the correct alternatives from t<br>Purpose of juice Sulphitation  | -                   | tions. 14  |
|       | • ,              | <ul> <li>a) To increase the pH of the juice</li> <li>c) To reduce the juice brix</li> </ul>   | b)                  | to bring whiteness to sugar none of the above                              |
|       | 2)               | <ul><li>Invertor of the multiple effect evapore</li><li>a) Chevron</li><li>c) Nobert rilieux</li></ul>  | rator _<br>b)<br>d) |  |
|       | 3)               | In juice heater and in second step t<br>a) $25^{\circ}-40^{\circ}$<br>c) $100^{\circ}-105^{\circ}$  | he juid<br>b)<br>d) | ce is heated from<br>65 <sup>0</sup> -75 <sup>0</sup><br>none of the above |
|       | 4)               | Juice clarifier(dorr) is used for<br>a) boiling of juice<br>c) to reduce the juice brix   | <br>b)<br>d)        | settling of mud<br>curing of sugar   |
|       | 5)               | <ul> <li>In labile phase</li> <li>a) no crystal formation</li> <li>b) spontaneous formation of suga</li> <li>c) Crystal neither dissolves nor gr</li> <li>d) none of the above</li> </ul>                               | -                   | tal  |
|       | 6)               | <ul> <li>When syrup purity below 80</li> <li>a) Two massecuite boiling schem</li> <li>b) Three massecuite boiling schem</li> <li>c) Four massecuite boiling schem</li> <li>d) Three and half massecuite boil</li> </ul> | me is<br>ie is u    | used<br>sed  |
|       | 7)               | Mixture of crystal & syrup is called .<br>a) Massecuite<br>c) Strike  | b)<br>d)            | Magma<br>Melt  |
|       | 8)               | Air cooled crystallizer is used for<br>a) 'A' massecuite<br>c) 'D' massecuite   | b)<br>d)            | 'C' massecuite<br>'M' massecuite   |
|       | 9)               | Gravity factor for 'C' massecuite<br>a) 600-800<br>c) 2000-2800   | b)<br>d)            | 1200-1500<br>none of the above   |

Seat No.

# B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Set | R

**SLR-FM-161** 

In deterioration of sugar safety factor should not exceed \_\_\_\_\_. 10) 0.25

- a) 0.20 b)
- c) 0.33 d) 0.50
- Speed of the cane Kicker \_\_\_\_\_. 11)
  - a) 60-70 rpm
  - c) 80-100 rpm
- Location of the fibrizer . 12) a) Before the cane kicker
- Near to feeder table b)

40-50 rpm

100-200 rpm

**SLR-FM-161** 

Set R

- After the cane knives c) After the first mill d)
- 13) Diameter of the underfeed roller is .
  - a) Half to two third of mill diameter
  - b) One fourth of mill diameter
  - c) Twice of that feed roller
  - d) none of the above

#### 14) In imbibitions system temperature of hot water

a)  $40^{\circ}-50^{\circ}$ c)  $70^{\circ}-80^{\circ}$ 

 $20^{0} - \overline{30^{0}}$ b)

b)

d)

90<sup>0</sup>-100<sup>0</sup> d)

Seat No.

### B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering SUGAR ENGINEERING

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section 2) Use of scientific calculator is allowed.

### Section – I

- Q.2 a) Describe cane Kicker with neat sketch. 06 Describe pressure in milling. b) 04 Explain rotary juice screen. 04 c) What are the types of imbibitions system? Explain simple imbibitions Q.3 a) 06 system. Explain preparation of lime for purification of juice in clarification. 04 b) Describe construction of evaporator. c) 04 Q.4 Write short notes. (Any Three) 14 Distributing valve of rotary vacuum filter a)
  - **b)** Semi kestner
  - c) Arching of roller
  - d) Messchaert grooves

### Section – II

| Q.5 | a)  | Describe three massecuite boiling scheme.                           | 06 |
|-----|-----|---|----|
|     | b)  | Explain slurry preparation methods.                                 | 04 |
|     | c)  | Explain vertical crystalliser.                                      | 04 |
| Q.6 | a)  | Describe centrifugal station.                                       | 06 |
|     | b)  | What are the factors affecting the centrifugal machine performance? | 04 |
|     | c)  | Explain sugar grader.   | 04 |
| Q.7 | Wri | te short notes. (Any Three)   | 14 |
|     | a)  | Waste water treatment   |    |

- **b**) Automation of centrifugal operation
- c) Sugar dust collectors
- **d**) Sugar elevator



| Seat<br>No. |                   |  |   |                               |  | Set          | S    |
|-------------|-------------------|--|---|-------------------------------|--|--------------|------|
|             |                   | B.E. (Part   | – I) (CGPA) Exa<br>Mechanical E<br>SUGAR ENG  | ngin                          | -  |              |      |
|             |                   | uesday, 17-1:<br>M To 05:30 P                          | 2-2019  |                               |  | Max. Marks   | : 70 |
| Instru      | ctions:           | 1) Q. No. 1 is<br>Book.                                | compulsory and sh   | ould b                        | e solved in first 30 min   | utes in ansv | ver  |
|             |                   | 2) Figures to  | the right indicates fuentific calculator is a   |                               |  |              |      |
|             |                   |  | ICQ/Objective T   | ype (                         | Questions  |              |      |
|             | on: 30 M          |  |   |                               | • • • •  | Marks        |      |
|             | 1) W              | hen syrup pur<br>Two masse<br>Three mass<br>Four masse | alternatives from the<br>rity below 80<br>secuite boiling scheme<br>secuite boiling scheme<br>cuite boiling schemenalf massecuite boili | e is us<br>ne is u<br>e is us | ed<br>used<br>sed  |              | 14   |
| 2           |                   | Massecuite   | al & syrup is called <sub>-</sub>   | b)<br>d)                      | Magma<br>Melt  |              |      |
| 3           |                   | 'A' massecu  |   | <br>b)<br>d)                  | 'C' massecuite<br>'M' massecuite   |              |      |
| 2           | ,                 | avity factor fc<br>600-800<br>2000-2800                | or 'C' massecuite   | <br>b)<br>d)                  | 1200-1500<br>none of the above   |              |      |
| Ę           | a)                | deterioration<br>0.20<br>0.33                          | of sugar safety facto   | or sho<br>b)<br>d)            | uld not exceed<br>0.25<br>0.50   |              |      |
| 6           | ́a)               | eed of the ca<br>60-70 rpm<br>80-100 rpm               | ne Kicker   | b)<br>d)                      | 40-50 rpm<br>100-200 rpm   |              |      |
| 7           | a)                | cation of the<br>Before the<br>After the firs          |   | b)<br>d)                      | Near to feeder table<br>After the cane knives                                  |              |      |
| ٤           | ́a)               | Half to two<br>One fourth<br>Twice of tha              |   |                               |  |              |      |
| ç           | 9) In<br>a)<br>c) | 40 <sup>°</sup> -50 <sup>°</sup>                       | vstem temperature c   | of hot v<br>b)<br>d)          | vater<br>20 <sup>0</sup> -30 <sup>0</sup><br>90 <sup>0</sup> -100 <sup>0</sup> |              |      |

## Seat

10) Purpose of juice Sulphitation

- a) To increase the pH of the juice b)
- c) To reduce the juice brix d)
- to bring whiteness to sugar

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Set

- none of the above
- Invertor of the multiple effect evaporator \_ 11)
  - a) Chevron b)
- Victor ducasse
  - c) Nobert rilieux d) Lotus

In juice heater and in second step the juice is heated from \_\_\_\_\_. 12) a)  $25^{\circ}-40^{\circ}$ 

- $65^{\circ}-75^{\circ}$ b)
- c)  $100^{\circ} 105^{\circ}$ d) none of the above
- Juice clarifier(dorr) is used for \_\_\_\_\_. 13)
  - a) boiling of juice
- b) settling of mud
- c) to reduce the juice brix d) curing of sugar

#### 14) In labile phase \_\_\_\_\_.

- a) no crystal formation
- b) spontaneous formation of sugar crystal
- c) Crystal neither dissolves nor grow
- d) none of the above

| Seat |  |
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| No.  |  |

### B.E. (Part – I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering SUGAR ENGINEERING

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

Set

**Instructions:** 1) Answer any two questions from each section 2) Use of scientific calculator is allowed.

### Section – I

- Q.2 Describe cane Kicker with neat sketch. 06 a) Describe pressure in milling. b) 04 Explain rotary juice screen. 04 c) What are the types of imbibitions system? Explain simple imbibitions Q.3 a) 06 system. Explain preparation of lime for purification of juice in clarification. 04 b) Describe construction of evaporator. C) 04 Q.4 Write short notes. (Any Three) 14 Distributing valve of rotary vacuum filter a)
  - **b)** Semi kestner
  - c) Arching of roller
  - d) Messchaert grooves

### Section – II

| Q.5 | a)  | Describe three massecuite boiling scheme.                           | 06 |
|-----|-----|---|----|
|     | b)  | Explain slurry preparation methods.                                 | 04 |
|     | c)  | Explain vertical crystalliser.                                      | 04 |
| Q.6 | a)  | Describe centrifugal station.                                       | 06 |
|     | b)  | What are the factors affecting the centrifugal machine performance? | 04 |
|     | c)  | Explain sugar grader.   | 04 |
| Q.7 | Wri | te short notes. (Any Three)   | 14 |
|     | a)  | Waste water treatment   |    |

- **b**) Automation of centrifugal operation
- c) Sugar dust collectors
- d) Sugar elevator

| Seat<br>No. |        |                      |   |   |                     |   | Set     | Ρ     |
|-------------|--------|----------------------|---|---|---------------------|---|---------|-------|
|             |        |                      |   | - I) (CGPA) Exa<br>Mechanical E<br>REPRENEURSHI | ngine               | •   |         |       |
| -           |        |                      | uesday,17-12<br>// To 05:30 P                                 | 2-2019  |                     | -   | . Marks | s: 70 |
| Instru      | uction |                      | Book.   | compulsory and sho<br>the right indicate ful    |                     | solved in first 30 Minutes in   | า answ  | er    |
|             |        | -                    | , <b>-</b>  | _   |                     |   |         |       |
| Durat       | ion: 3 | 80 Mi                | inutes  | ICQ/Objective T                                 | ype                 |   | Marks   | s: 14 |
|             |        |                      |   | alternatives from th                            | ne opt              | ions.   |         | 14    |
|             | 1)     |                      |   | breneur is derived fro                          |                     |   |         |       |
|             | 2)     | The<br>a)<br>c)      |   | o creates an enterpri<br>ur                     | se is c<br>b)<br>d) | alled<br>Managers<br>Owners   |         |       |
|             | 3)     |                      |   | ket research                                    |                     | siness failure?<br>Poor financial control<br>All the above                      |         |       |
|             | 4)     | be<br>a)<br>b)<br>c) | Obtained from<br>Websites<br>Product info                     | m<br>ormation leaflets<br>eports and published  | ·                   | reneur about competitors c<br>unts  | an      |       |
|             | 5)     | a)<br>b)<br>c)       |   | skills  | <br>neurs           |   |         |       |
|             | 6)     | a)<br>b)<br>c)       | <br>Lack of inde<br>Franchise b<br>Lack of brar               | pendence<br>usinesses typically h               | ave a               | -   |         |       |
|             | 7)     |                      | provide finar<br>a number of<br>financial ad<br>Industrial es | visors  | ntrepre<br>b)<br>d) | eneurs the government has<br>financial intermediaries<br>financial institutions | set     |       |

8) Refusal to adopt and use opportunities to make changes in production entrepreneurs. a) Fabian b) Imitative c) Innovative d) Drone 9) Goods or services reach the market place through \_ multilevel pyramids a) marketing channels b) c) monopolies Multiplication d) Which of the following is a function of SIDBI? 10) a) Extension of seed capital **Discounting of bills** b) Providing factoring services All of the above d) C) 11) District Industries Centres are located \_\_\_\_ a) in each district b) in each state c) only in selected districts only in selected states d) 12) The small scale unit wishing to export has to obtain exporters' code number from a) The Reserve Bank of India b) The Central Bank of India c) Any Regional Bank d) Any International Bank 13) Units provide inputs to other industries Export b) Small a) None of these Ancillary d) C) Business risks can be \_\_\_\_\_. 14) Avoided Reduced b) a) Ignored C) d) Erased

**SLR-FM-163** 

Set P

| Seat |  |
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| No.  |  |

### B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)<br>b) | What are the problems faced by potential entrepreneur in India?<br>What is the effect of entrepreneurship on economy?   | 07<br>07 |
|-----|----------|---|----------|
| Q.3 | a)<br>b) | Explain evolution of entrepreneurship.<br>What is EDP? What is its role in India?   | 07<br>07 |
| Q.4 | a)<br>b) | <ul> <li>Who is an entrepreneur? Elaborate with various definitions.</li> <li>Write a short note on</li> <li>1) Outsourcing</li> <li>2) Corporate Entrepreneurship</li> <li>Section – II</li> </ul> | 07<br>07 |
| Q.5 | a)       | Explain SWOT analysis in entrepreneurship.  | 07       |
| Q.J | a)<br>b) | Explain Swor analysis in entrepreneurship.<br>Explain Significance of project report & its contents.  | 07       |
| Q.6 | a)<br>b) | What do you mean by Business plan? Explain Its Components.<br>Narrate the policy support given by the government for the growth small scale industries.   | 07<br>07 |

| Q.7 | a) | Write a note on Turnaround strategies & Tax benefits to SMEs. | 07 |
|-----|----|---|----|
|     | b) | What are the functions of SISI and SIDBI?                     | 07 |



| 140.  |                  |  |   |
|-------|------------------|--|---|
|       |                  | B.E. (Part - I) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>ENTREPRENEURSHIP DEVELOPMENT  |   |
|       |                  | e: Tuesday,17-12-2019 Max. Marks: 70<br>30 PM To 05:30 PM  | C |
| Instr | uctio            | <ul> <li>ns: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book.</li> <li>2) Figures to the right indicate full marks.</li> </ul>                                     |   |
|       |                  | MCQ/Objective Type Questions   |   |
| Dura  | tion: 3          | 30 Minutes Marks: 1  | 4 |
| Q.1   | <b>Cho</b><br>1) | ose the correct alternatives from the options.       14         Refusal to adopt and use opportunities to make changes in production       14         entrepreneurs.       14                      | 4 |
|       |                  | a) Fabianb) Imitativec) Innovatived) Drone   |   |
|       | 2)               | Goods or services reach the market place througha) marketing channelsb) multilevel pyramidsc) monopoliesd) Multiplication  |   |
|       | 3)               | Which of the following is a function of SIDBI?<br>a) Extension of seed capital b) Discounting of bills<br>c) Providing factoring services d) All of the above                                      |   |
|       | 4)               | District Industries Centres are located<br>a) in each district b) in each state<br>c) only in selected districts d) only in selected states  |   |
|       | 5)               | The small scale unit wishing to export has to obtain exporters' code<br>number from<br>a) The Reserve Bank of India b) The Central Bank of India<br>c) Any Regional Bank d) Any International Bank |   |
|       | 6)               | Units provide inputs to other industries<br>a) Export b) Small<br>c) Ancillary d) None of these  |   |
|       | 7)               | Business risks can bea) Avoidedb) Reducedc) Ignoredd) Erased   |   |
|       | 8)               | The term Entrepreneur is derived from the word.<br>a) English b) Tamil<br>c) Hindi d) French   |   |
|       | 9)               | The person who creates an enterprise is called<br>a) Entrepreneur b) Managers<br>c) Leaders d) Owners  |   |
|       | 10)              | Which of the following is the reason for business failure?a) Lack of market researchb) Poor financial controlc) Poor managementd) All the above  |   |

# Seat No.

SLR-FM-163 Set Q

- Good sources of information for an entrepreneur about competitors can be Obtained from \_\_\_\_\_.
  - a) Websites
  - b) Product information leaflets
  - c) Company reports and published accounts
  - d) All the above
- 12) EDPs course contents contains \_\_\_\_\_
  - a) General introduction to entrepreneurs
  - b) Motivation training
  - c) Managerial skills
  - d) All the above
- 13) One of the disadvantages of a franchise business for a franchisee is
  - a) Lack of independence
  - b) Franchise businesses typically have a high failure rate
  - c) Lack of brand identity
  - d) Training is not normally provided by the franchisor
- 14) To provide financial assistance to entrepreneurs the government has set up a number of \_\_\_\_\_.
  - a) financial advisors
- b) financial intermediaries

Set

- c) Industrial estates
- d) financial institutions

| Seat |  |
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| No.  |  |

### B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | What are the problems faced by potential entrepreneur in India?   | 07       |
|-----|----------|---|----------|
|     | b)       | What is the effect of entrepreneurship on economy?  | 07       |
| Q.3 | a)       | Explain evolution of entrepreneurship.  | 07       |
|     | b)       | What is EDP? What is its role in India?   | 07       |
| Q.4 | a)<br>b) | <ul> <li>Who is an entrepreneur? Elaborate with various definitions.</li> <li>Write a short note on</li> <li>1) Outsourcing</li> <li>2) Corporate Entrepreneurship</li> <li>Section – II</li> </ul> | 07<br>07 |
| Q.5 | a)       | Explain SWOT analysis in entrepreneurship.  | 07       |
|     | b)       | Explain Significance of project report & its contents.  | 07       |
| Q.6 | a)       | What do you mean by Business plan? Explain Its Components.  | 07       |
|     | b)       | Narrate the policy support given by the government for the growth small scale industries.   | 07       |

| Q.7 | a) | Write a note on Turnaround strategies & Tax benefits to SMEs. | 07 |
|-----|----|---|----|
|     | b) | What are the functions of SISI and SIDBI?                     | 07 |



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| No.  |            |                   |
|      | B.E. (Part | : - I) (CGPA) Exa |

### mination Nov/Dec-2019 **Mechanical Engineering** ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday, 17-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer Book.

2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options.

- EDPs course contents contains 1)
  - a) General introduction to entrepreneurs
  - b) Motivation training
  - c) Managerial skills
  - d) All the above
- 2) One of the disadvantages of a franchise business for a franchisee is
  - a) Lack of independence
  - b) Franchise businesses typically have a high failure rate
  - c) Lack of brand identity
  - d) Training is not normally provided by the franchisor
- 3) To provide financial assistance to entrepreneurs the government has set up a number of
  - a) financial advisors b) financial intermediaries
  - c) Industrial estates d) financial institutions
- Refusal to adopt and use opportunities to make changes in production 4) entrepreneurs.
  - a) Fabian b) Imitative
  - c) Innovative d) Drone

Goods or services reach the market place through \_\_\_\_\_ 5) a) marketing channels

- multilevel pyramids b)
- c) monopolies **Multiplication** d)
- Which of the following is a function of SIDBI? 6)
  - a) Extension of seed capital
  - c) Providing factoring services All of the above d)
- District Industries Centres are located 7)
  - a) in each district c) only in selected districts
- in each state b) d) only in selected states

b)

- The small scale unit wishing to export has to obtain exporters' code 8) number from
  - a) The Reserve Bank of India c) Any Regional Bank
- The Central Bank of India b)
- Any International Bank d)

**Discounting of bills** 

Max. Marks: 70

Set

R

Marks: 14

14

**SLR-FM-163** Set R

#### 9) Units provide inputs to other industries

- a) Export b)
- c) Ancillary d)
- Small None of these
- Business risks can be \_\_\_\_\_. 10) a) Avoided b)
  - Reduced c) Ignored d) Erased
- 11) The term Entrepreneur is derived from the \_\_\_\_\_ word.
  - Tamil a) English b) c) Hindi
    - French d)
- The person who creates an enterprise is called \_\_\_\_\_. 12)
  - a) Entrepreneur Managers b)
  - c) Leaders d) Owners
- 13) Which of the following is the reason for business failure \_\_\_\_\_? a) Lack of market research
  - b) Poor financial control
  - d) c) Poor management All the above
- 14) Good sources of information for an entrepreneur about competitors can be Obtained from \_\_\_\_\_.
  - a) Websites
  - b) Product information leaflets
  - c) Company reports and published accounts
  - d) All the above

| Seat |  |
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| No.  |  |

### B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | What are the problems faced by potential entrepreneur in India?   | 07       |
|-----|----------|---|----------|
|     | b)       | What is the effect of entrepreneurship on economy?  | 07       |
| Q.3 | a)       | Explain evolution of entrepreneurship.  | 07       |
|     | b)       | What is EDP? What is its role in India?   | 07       |
| Q.4 | a)<br>b) | <ul> <li>Who is an entrepreneur? Elaborate with various definitions.</li> <li>Write a short note on</li> <li>1) Outsourcing</li> <li>2) Corporate Entrepreneurship</li> <li>Section – II</li> </ul> | 07<br>07 |
| 0 E | -        |   | 07       |
| Q.5 | a)       | Explain SWOT analysis in entrepreneurship.  | 07       |
|     | b)       | Explain Significance of project report & its contents.  | 07       |
| Q.6 | a)       | What do you mean by Business plan? Explain Its Components.  | 07       |
|     | b)       | Narrate the policy support given by the government for the growth small scale industries.   | 07       |

| Q.7 | a) | Write a note on Turnaround strategies & Tax benefits to SMEs. | 07 |
|-----|----|---|----|
|     | b) | What are the functions of SISI and SIDBI?                     | 07 |



|      |                  |                 | B.E. (Part - I) (CGPA) Ex<br>Mechanical<br>ENTREPRENEURS  | l Engin                 | eering                       |          |
|------|------------------|-----------------|---|-------------------------|------------------------------|----------|
|      |                  |                 | uesday,17-12-2019<br>M To 05:30 PM  |                         |                              | Marks: 7 |
| Inst | ructio           |                 | <ol> <li>Q.No.1 is compulsory and s<br/>Book.</li> <li>Figures to the right indicate</li> </ol>                                   |                         |                              | answer   |
|      |                  |                 | MCQ/Objective   | • Туре 🤇                | Questions                    |          |
| Dura | ation: 3         | 30 M            | linutes   |                         |                              | Marks: 1 |
| Q.1  | <b>Cho</b><br>1) | Wł              | the correct alternatives from<br>hich of the following is a function<br>Extension of seed capital<br>Providing factoring services | on of SID<br>b)         | BI?<br>Discounting of bills  | 1        |
|      | 2)               | a)              | strict Industries Centres are loo<br>in each district<br>only in selected districts   | b)                      | in each state                |          |
|      | 3)               | nui<br>a)       | e small scale unit wishing to ex<br>mber from<br>The Reserve Bank of India<br>Any Regional Bank                                   | b)                      | The Central Bank of India    |          |
|      | 4)               |                 | its provide inputs to other indu<br>Export<br>Ancillary   | stries<br>b)<br>d)      | Small                        |          |
|      | 5)               | Bu<br>a)<br>c)  | siness risks can be<br>Avoided<br>Ignored   | b)<br>d)                | Reduced<br>Erased            |          |
|      | 6)               | The<br>a)<br>c) | e term Entrepreneur is derived<br>English<br>Hindi  | l from the<br>b)<br>d)  | e word.<br>Tamil<br>French   |          |
|      | 7)               | Th<br>a)<br>c)  | e person who creates an enter<br>Entrepreneur<br>Leaders  | rprise is o<br>b)<br>d) | called<br>Managers<br>Owners |          |
|      | 8)               |                 | nich of the following is the reas<br>Lack of market research<br>Poor management   | on for bu<br>b)<br>d)   |                              |          |
|      | 9)               |                 | od sources of information for a Obtained from   | an entrep               | preneur about competitors ca | an       |

- a) Websites
- b) Product information leaflets
- c) Company reports and published accounts
- d) All the above

Seat No.

70

14

14

Set S

**SLR-FM-163** 

- 10) EDPs course contents contains
  - a) General introduction to entrepreneurs
  - b) Motivation training
  - c) Managerial skills
  - d) All the above
- One of the disadvantages of a franchise business for a franchisee is 11)
  - a) Lack of independence
  - b) Franchise businesses typically have a high failure rate
  - c) Lack of brand identity
  - d) Training is not normally provided by the franchisor
- To provide financial assistance to entrepreneurs the government has set 12) up a number of \_\_\_\_ \_\_\_.
  - a) financial advisors
- b) financial intermediaries financial institutions
- c) Industrial estates
- d)
- Refusal to adopt and use opportunities to make changes in production 13) entrepreneurs.
  - a) Fabian c) Innovative
- b) Imitative d) Drone
- 14) Goods or services reach the market place through \_\_\_\_\_ a) marketing channels
  - multilevel pyramids b)

c) monopolies

- **Multiplication** d)



| Seat |  |
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| No.  |  |

### B.E. (Part - I) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENTREPRENEURSHIP DEVELOPMENT

Day & Date: Tuesday,17-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Answer any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)       | What are the problems faced by potential entrepreneur in India?   | 07       |
|-----|----------|---|----------|
|     | b)       | What is the effect of entrepreneurship on economy?  | 07       |
| Q.3 | a)       | Explain evolution of entrepreneurship.  | 07       |
|     | b)       | What is EDP? What is its role in India?   | 07       |
| Q.4 | a)<br>b) | <ul> <li>Who is an entrepreneur? Elaborate with various definitions.</li> <li>Write a short note on</li> <li>1) Outsourcing</li> <li>2) Corporate Entrepreneurship</li> <li>Section – II</li> </ul> | 07<br>07 |
| Q.5 | a)       | Explain SWOT analysis in entrepreneurship.  | 07       |
|     | b)       | Explain Significance of project report & its contents.  | 07       |
| Q.6 | a)       | What do you mean by Business plan? Explain Its Components.  | 07       |
|     | b)       | Narrate the policy support given by the government for the growth small scale industries.   | 07       |

| Q.7 | a) | Write a note on Turnaround strategies & Tax benefits to SMEs. | 07 |
|-----|----|---|----|
|     | b) | What are the functions of SISI and SIDBI?                     | 07 |



## Seat B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

No.

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

INDUSTRIAL AND QUALITY MANAGEMENT

- Attempt any TWO Questions from each Section-I & Section-II.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

### MCQ/Objective Type Questions

#### Q.1 A) Match the examples to costs of quality.

- Re-inspection and investigation. 1)
- 2) Handling of returned items
- 3) Quality audits

a)

c)

C)

- Identification of customers' quality 4) requirements
- B) Choose most appropriate alternative from the given choices. (1 marks each)
  - 1) Process control is carried out \_\_\_\_
    - a) before production
    - c) after production control d) All of the above
  - When a manager monitors the work performance of workers in his 2) department to determine if the quality of their work is 'up to standard', this manager is engaging in which function?

b)

- a) Leading b) Planning
- c) Organizing d) Controlling
- What is the first step in a control process? 3)

Allocate resources

Set standards

b) Delegate authority

b) Kaizen

Measure the performance d)

during production

- Improving quality through small, incremental improvements is a 4) characteristic of
  - a) Just in time
  - c) Zero defect d) Six Sigma
- Which of these is not part of human resource policy? 5)
  - a) Reward systems Staff appraisals C)

Training centres

- b) Suppliers choice d) Staff development
- 6) Where can formal employee training and education take place?
  - Colleges a)

b) In the workplace d) All of the above

- a) Prevention costs
- b) Internal failure cost
- C) External failure cost
- Appraisal cost d)

Marks: 14

04

10

Max. Marks: 70



Set



- 7) Which of the following motivators is the most basic need in Maslow's hierarchy?
  - a) Physiological c) Belonging
- b) Safetyd) Social
- 8) A sampling plan helps in \_
  - a) Keeping the process in control
  - b) Keeping workers motivated
  - c) Tuning the machines
  - d) Rejecting lots of unacceptable quality
- 9) An example of a random cause is \_\_\_\_\_.
  - a) Absenteeism
  - b) Shortage of material supplies
  - c) Photocopy machine failure
  - d) Small vibrations in the equipment
- 10) Control charts help in \_\_\_\_\_.
  - a) Reaching six sigma
  - b) Keeping workers motivated
  - c) Deciding when to investigate the process
  - d) Zero defect production

| Sea<br>No. | t   | Set   | Ρ        |  |  |  |  |
|------------|---|---|----------|--|--|--|--|
|            | B.E. (Part – II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INDUSTRIAL AND QUALITY MANAGEMENT |   |          |  |  |  |  |
|            |   | ate: Friday, 22-11-2019 Max. Marks<br>30 PM To 05:30 PM   | 56 :: 56 |  |  |  |  |
| Instr      | ucti  | <ul> <li>ons: 1) Attempt any TWO Questions from each Section-I &amp; Section-II.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Assume suitable data if necessary and mention it clearly.</li> </ul>   |          |  |  |  |  |
|            |   | Section – I   |          |  |  |  |  |
| Q.2        | a)<br>b)  | Explain in detail functions of the management.<br>Define Leadership. Explain different styles of leadership   | 07       |  |  |  |  |
| Q.3        | a)<br>b)  | Define capital and explain the different sources of finance.<br>What is motivation? Explain Maslow's theory of motivation.  | 07<br>07 |  |  |  |  |
| Q.4        | a)<br>b)  | Explain managerial span. Distinguish between narrow span and wide span.<br>Explain the need and elements of the performance appraisal.  | 07<br>07 |  |  |  |  |
|            |   | Section – II  |          |  |  |  |  |
| Q.5        | a)  | Explain Cost of prevention, cost of appraisal, cost of internal failure and cost of external failure.   | 07       |  |  |  |  |
|            | b)  | Write short note on X chart and R chart.  | 07       |  |  |  |  |
| Q.6        | a)  | Explain tools of quality control: Pareto analysis, cause effect diagram and scatter diagrams.   | 07       |  |  |  |  |
|            | b)  | <ul> <li>A double sampling plan is as follows:</li> <li>1) Select a sample of 2 from a lot of 20. If both article inspected bare good, accept the lot, it both are defective, reject the lot. If 1 is good &amp; 1 defective, take the second sample of one article.</li> <li>2) If the article in the second sample is good, accept the lot. If it is defective reject the lot.</li> <li>If a lot of 25% defective is submitted, what is the probability of acceptance? Compute this by exact method.</li> </ul> | 07       |  |  |  |  |

### **Q.7** a) Following are the inspection results of magnets for 19 observations

SLR-FM-164

| Week No. | No. of<br>magnets<br>inspected | No. of<br>defective<br>magnets | Fraction defectives |
|----------|--------------------------------|--------------------------------|---------------------|
| 1        | 724                            | 48                             | 0.0066              |
| 2        | 763                            | 83                             | 0.109               |
| 3        | 748                            | 70                             | 0.094               |
| 4        | 748                            | 85                             | 0.114               |
| 5        | 724                            | 45                             | 0.062               |
| 6        | 727                            | 56                             | 0.077               |
| 7        | 726                            | 48                             | 0.66                |
| 8        | 719                            | 67                             | 0.093               |
| 9        | 759                            | 37                             | 0.049               |
| 10       | 745                            | 52                             | 0.070               |

## SLR-FM-164 Set P

| 11 | 736 | 47 | 0.064 |
|----|-----|----|-------|
| 12 | 739 | 50 | 0.068 |
| 13 | 723 | 47 | 0.065 |
| 14 | 748 | 57 | 0.076 |
| 15 | 770 | 51 | 0.066 |
| 16 | 756 | 71 | 0.094 |
| 17 | 719 | 53 | 0.074 |
| 18 | 757 | 34 | 0.045 |
| 19 | 760 | 29 | 0.038 |

Calculate average fraction defective and  $3\sigma$  control limits, construct the control charts and state whether the process is in statistical control.

**b)** Write short note on Quality Function deployment and FMEA.

07

### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL AND QUALITY MANAGEMENT

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Attempt any TWO Questions from each Section-I & Section-II.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

### **MCQ/Objective Type Questions**

### **Duration: 30 Minutes** Q.1

- A) Match the examples to costs of quality. 1) Re-inspection and investigation.

  - 2) Handling of returned items
  - 3) Quality audits
  - 4) Identification of customers' quality requirements
- B) Choose most appropriate alternative from the given choices. (1 marks each)
  - 1) Where can formal employee training and education take place?
    - a) Colleges b) In the workplace d) All of the above
      - Training centres c)
  - 2) Which of the following motivators is the most basic need in Maslow's hierarchy?
    - a) Physiological b) Safety d) Social
    - Belonging c)
  - 3) A sampling plan helps in \_\_\_\_
    - a) Keeping the process in control
    - b) Keeping workers motivated
    - c) Tuning the machines
    - d) Rejecting lots of unacceptable quality
  - An example of a random cause is \_\_\_\_\_. 4)
    - a) Absenteeism
    - b) Shortage of material supplies
    - c) Photocopy machine failure
    - d) Small vibrations in the equipment

#### Control charts help in \_\_\_\_ 5)

- a) Reaching six sigma
- b) Keeping workers motivated
- Deciding when to investigate the process c)
- d) Zero defect production

### 04

- a) Prevention costs
- b) Internal failure cost
- C) External failure cost
- Appraisal cost d)

Set

Max. Marks: 70

SLR-FM-164

Marks: 14

### 6) Process control is carried out \_\_\_\_\_

- a) before production
- b) during production

**SLR-FM-164** 

Set Q

- c) after production control
- d) All of the above
- 7) When a manager monitors the work performance of workers in his department to determine if the quality of their work is 'up to standard', this manager is engaging in which function?
  - a) Leading

- b) Planning
- c) Organizing d) Controlling
- 8) What is the first step in a control process?
  - a) Allocate resources
- b) Delegate authority
- c) Set standards d) Measure the performance
- 9) Improving quality through small, incremental improvements is a characteristic of \_\_\_\_\_.
  - a) Just in time
- b) Kaizen
- c) Zero defect d) Six Sigma
- 10) Which of these is not part of human resource policy?
  - a) Reward systems
- b) Suppliers choice
- c) Staff appraisals
- d) Staff development

| 0.114 |                            |
|-------|----------------------------|
| 0.062 |                            |
| 0.077 |                            |
| 0.66  |                            |
| 0.093 |                            |
| 0.049 |                            |
| 0.070 |                            |
|       |                            |
|       |                            |
|       | Page <b>7</b> of <b>16</b> |

| No.   |   |  | Set   | Q        |  |  |
|-------|---|--|---|----------|--|--|
|       | B.E. (Part – II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INDUSTRIAL AND QUALITY MANAGEMENT |  |   |          |  |  |
|       |   | ate: Friday, 22-11-2<br>30 PM To 05:30 P                                 |   | s: 56    |  |  |
| Instr | ucti  | 2) Figures to  | ny TWO Questions from each Section-I & Section-II.<br>the right indicate full marks.<br>uitable data if necessary and mention it clearly. |          |  |  |
|       |   |  | Section – I   |          |  |  |
| Q.2   | a)<br>b)  |  | unctions of the management.<br>p. Explain different styles of leadership  | 07       |  |  |
| Q.3   | a)<br>b)  | •  | d explain the different sources of finance.<br>n? Explain Maslow's theory of motivation.  | 07<br>07 |  |  |
| Q.4   | a)<br>b)  |  | ial span. Distinguish between narrow span and wide span.<br>and elements of the performance appraisal.                                    | 07<br>07 |  |  |
|       |   |  | Section – II  |          |  |  |
| Q.5   | a)  | Explain Cost of p cost of external fa                                    | revention, cost of appraisal, cost of internal failure and ailure.  | 07       |  |  |
|       | b)  | Write short note of  | on X chart and R chart.   | 07       |  |  |
| Q.6   | a)  | Explain tools of q scatter diagrams.                                     | uality control: Pareto analysis, cause effect diagram and   | 07       |  |  |
|       | b)  | <ol> <li>Select a sar<br/>good, acception</li> <li>defective,</li> </ol> | In the second sample is good, accept the lot. If it is good & the lot. If a sample of a sample of a sample of one article.                | 07       |  |  |

If a lot of 25% defective is submitted, what is the probability of acceptance?

No. of

defective

magnets

Fraction

defectives

0.0066

0.109

0.094

0.114

Q.7 a) Following are the inspection results of magnets for 19 observations

No. of

magnets

inspected

Compute this by exact method.

Week No.

**SLR-FM-164** 



Seat

## SLR-FM-164 Set Q

| 736 | 47  | 0.064                               |
|-----|---|-------------------------------------|
| 739 | 50  | 0.068                               |
| 723 | 47  | 0.065                               |
| 748 | 57  | 0.076                               |
| 770 | 51  | 0.066                               |
| 756 | 71  | 0.094                               |
| 719 | 53  | 0.074                               |
| 757 | 34  | 0.045                               |
| 760 | 29  | 0.038                               |
|     | 739<br>723<br>748<br>770<br>756<br>719<br>757 | 73950723477485777051756717195375734 |

Calculate average fraction defective and  $3\sigma$  control limits, construct the control charts and state whether the process is in statistical control.

**b)** Write short note on Quality Function deployment and FMEA.

07

# Set

### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL AND QUALITY MANAGEMENT

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Attempt any TWO Questions from each Section-I & Section-II.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

#### **MCQ/Objective Type Questions**

#### Q.1 A) Match the examples to costs of quality.

- 1) Re-inspection and investigation.
- 2) Handling of returned items
- 3) Quality audits
- 4) Identification of customers' quality
  - requirements

c)

- B) Choose most appropriate alternative from the given choices. (1 marks each)
  - 1) An example of a random cause is \_\_\_\_\_.
    - a) Absenteeism
    - b) Shortage of material supplies
    - Photocopy machine failure C)
    - d) Small vibrations in the equipment
  - 2) Control charts help in \_\_\_\_
    - a) Reaching six sigma
    - b) Keeping workers motivated
    - c) Deciding when to investigate the process
    - d) Zero defect production

#### 3) Process control is carried out

- a) before production
  - b) during production after production control d) All of the above
- When a manager monitors the work performance of workers in his 4) department to determine if the quality of their work is 'up to standard'. this manager is engaging in which function?
  - a) Leading b) Planning
  - c) Organizing d) Controlling
- What is the first step in a control process? 5)
  - b) Delegate authority
  - a) Allocate resources c) Set standards
- d) Measure the performance

Marks: 14

- 04
- Prevention costs
- a) b) Internal failure cost
- C) External failure cost
- Appraisal cost d)

10

SLR-FM-164

Max. Marks: 70

Seat No.

**Duration: 30 Minutes** 

- Improving quality through small, incremental improvements is a 6) characteristic of \_\_\_\_\_.
  - a) Just in time
  - c) Zero defect
- Which of these is not part of human resource policy? 7) b) Suppliers choice
  - a) Reward systems Staff appraisals c)
    - d) Staff development

b) Kaizen

d) Six Sigma

**SLR-FM-164** 

Set | R

- Where can formal employee training and education take place? 8)
  - Colleges b) In the workplace a)
    - d) All of the above Training centres
- 9) Which of the following motivators is the most basic need in Maslow's hierarchy?
  - a) Physiological Safety b)
  - c) Belonging d) Social
- 10) A sampling plan helps in

C)

- a) Keeping the process in control
- b) Keeping workers motivated
- c) Tuning the machines
- d) Rejecting lots of unacceptable quality

|            |   |   | VŦ       |  |  |  |  |
|------------|---|---|----------|--|--|--|--|
| Sea<br>No. | t   | Set   | R        |  |  |  |  |
|            | B.E. (Part – II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INDUSTRIAL AND QUALITY MANAGEMENT |   |          |  |  |  |  |
|            |   | ate: Friday, 22-11-2019 Max. Marks<br>30 PM To 05:30 PM   | 56 56    |  |  |  |  |
| Instr      | ucti  | <ul> <li>ons: 1) Attempt any TWO Questions from each Section-I &amp; Section-II.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Assume suitable data if necessary and mention it clearly.</li> </ul>   |          |  |  |  |  |
|            |   | Section – I   |          |  |  |  |  |
| Q.2        | a)<br>b)  | Explain in detail functions of the management.<br>Define Leadership. Explain different styles of leadership   | 07       |  |  |  |  |
| Q.3        | a)<br>b)  | Define capital and explain the different sources of finance.<br>What is motivation? Explain Maslow's theory of motivation.  | 07<br>07 |  |  |  |  |
| Q.4        | a)<br>b)  | Explain managerial span. Distinguish between narrow span and wide span.<br>Explain the need and elements of the performance appraisal.  | 07<br>07 |  |  |  |  |
|            |   | Section – II  |          |  |  |  |  |
| Q.5        | a)  | Explain Cost of prevention, cost of appraisal, cost of internal failure and cost of external failure.   | 07       |  |  |  |  |
|            | b)  | Write short note on X chart and R chart.  | 07       |  |  |  |  |
| Q.6        | a)  | Explain tools of quality control: Pareto analysis, cause effect diagram and scatter diagrams.   | 07       |  |  |  |  |
|            | b)  | <ul> <li>A double sampling plan is as follows:</li> <li>1) Select a sample of 2 from a lot of 20. If both article inspected bare good, accept the lot, it both are defective, reject the lot. If 1 is good &amp; 1 defective, take the second sample of one article.</li> <li>2) If the article in the second sample is good, accept the lot. If it is defective reject the lot.</li> <li>If a lot of 25% defective is submitted, what is the probability of acceptance? Compute this by exact method.</li> </ul> | 07       |  |  |  |  |

### **Q.7** a) Following are the inspection results of magnets for 19 observations

| 07 | • |
|----|---|
|----|---|

SLR-FM-164

| Week No. | No. of magnets | No. of defective | Fraction defectives |
|----------|----------------|------------------|---------------------|
| 1        | inspected      | magnets          | 0.0000              |
| 1        | 724            | 48               | 0.0066              |
| 2        | 763            | 83               | 0.109               |
| 3        | 748            | 70               | 0.094               |
| 4        | 748            | 85               | 0.114               |
| 5        | 724            | 45               | 0.062               |
| 6        | 727            | 56               | 0.077               |
| 7        | 726            | 48               | 0.66                |
| 8        | 719            | 67               | 0.093               |
| 9        | 759            | 37               | 0.049               |
| 10       | 745            | 52               | 0.070               |

## SLR-FM-164 Set R

| 11 | 736 | 47 | 0.064 |
|----|-----|----|-------|
| 12 | 739 | 50 | 0.068 |
| 13 | 723 | 47 | 0.065 |
| 14 | 748 | 57 | 0.076 |
| 15 | 770 | 51 | 0.066 |
| 16 | 756 | 71 | 0.094 |
| 17 | 719 | 53 | 0.074 |
| 18 | 757 | 34 | 0.045 |
| 19 | 760 | 29 | 0.038 |

Calculate average fraction defective and  $3\sigma$  control limits, construct the control charts and state whether the process is in statistical control.

**b)** Write short note on Quality Function deployment and FMEA.

07

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL AND QUALITY MANAGEMENT

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Attempt any TWO Questions from each Section-I & Section-II.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.

#### **MCQ/Objective Type Questions**

#### **Duration: 30 Minutes** Q.1 A)

- Match the examples to costs of quality. 1) Re-inspection and investigation.
- 2) Handling of returned items
- 3) Quality audits

c)

C)

- 4) Identification of customers' quality requirements
- B) Choose most appropriate alternative from the given choices. (1 marks each)
  - What is the first step in a control process? 1)
    - a) Allocate resources b) Delegate authority d) Measure the performance
    - Set standards C)
  - 2) Improving quality through small, incremental improvements is a characteristic of .
    - a) Just in time b) Kaizen d) Six Sigma
    - c) Zero defect
  - 3) Which of these is not part of human resource policy?
    - b) Suppliers choice a) Reward systems
      - Staff appraisals d) Staff development
  - Where can formal employee training and education take place? 4)
    - Colleges a)
      - d) All of the above Training centres
  - Which of the following motivators is the most basic need in Maslow's 5) hierarchy?

b) In the workplace

- a) Physiological b) Safety
- c) Belonging d) Social
- A sampling plan helps in 6)
  - a) Keeping the process in control
  - b) Keeping workers motivated
  - c) Tuning the machines
  - d) Rejecting lots of unacceptable quality

Marks: 14

04

10

- a) Prevention costs
- b) Internal failure cost
- C) External failure cost
- Appraisal cost d)

Set

Max. Marks: 70

SLR-FM-164

- 7) An example of a random cause is \_\_\_\_\_.
  - a) Absenteeism
  - b) Shortage of material supplies
  - c) Photocopy machine failure
  - d) Small vibrations in the equipment
- 8) Control charts help in \_\_\_\_\_.
  - a) Reaching six sigma
  - b) Keeping workers motivated
  - c) Deciding when to investigate the process
  - d) Zero defect production
- 9) Process control is carried out \_\_\_\_\_
  - a) before production
- b) during productiond) All of the above

Set S

- c) after production control d
- 10) When a manager monitors the work performance of workers in his department to determine if the quality of their work is 'up to standard', this manager is engaging in which function?
  - a) Leading b) Plann
  - c) Organizing

- b) Planning
- d) Controlling

|      |   | Mechanical Engineering  |          |  |  |  |
|------|---|---|----------|--|--|--|
| Time | INDUSTRIAL AND QUALITY MANAGEMENT Day & Date: Friday, 22-11-2019 Max. Marks: 56 Time: 02:30 PM To 05:30 PM Instructions: 1) Attempt any TWO Questions from each Section-I & Section-II. 2) Figures to the right indicate full marks. 3) Assume suitable data if necessary and mention it clearly. Section – I |   |          |  |  |  |
| Q.2  | a)<br>b)  | Explain in detail functions of the management.<br>Define Leadership. Explain different styles of leadership   | 07       |  |  |  |
| Q.3  | a)<br>b)  | Define capital and explain the different sources of finance.<br>What is motivation? Explain Maslow's theory of motivation.  | 07<br>07 |  |  |  |
| Q.4  | a)<br>b)  | Explain managerial span. Distinguish between narrow span and wide span.<br>Explain the need and elements of the performance appraisal.  | 07<br>07 |  |  |  |
|      |   | Section – II  |          |  |  |  |
| Q.5  | a)  | Explain Cost of prevention, cost of appraisal, cost of internal failure and cost of external failure.   | 07       |  |  |  |
|      | b)  | Write short note on X chart and R chart.  | 07       |  |  |  |
| Q.6  | a)  | Explain tools of quality control: Pareto analysis, cause effect diagram and scatter diagrams.   | 07       |  |  |  |
|      | b)  | <ul> <li>A double sampling plan is as follows:</li> <li>1) Select a sample of 2 from a lot of 20. If both article inspected bare good, accept the lot, it both are defective, reject the lot. If 1 is good &amp; 1 defective, take the second sample of one article.</li> <li>2) If the article in the second sample is good, accept the lot. If it is defective reject the lot.</li> <li>If a lot of 25% defective is submitted, what is the probability of acceptance? Compute this by exact method.</li> </ul> | 07       |  |  |  |
| Q.7  | a)  | Following are the inspection results of magnets for 19 observations   | 07       |  |  |  |

B.E. (Part – II) (CGPA) Examination Nov/Dec-2019

Seat

No.

| Week No. | No. of<br>magnets<br>inspected | No. of<br>defective<br>magnets | Fraction defectives |
|----------|--------------------------------|--------------------------------|---------------------|
| 1        | 724                            | 48                             | 0.0066              |
| 2        | 763                            | 83                             | 0.109               |
| 3        | 748                            | 70                             | 0.094               |
| 4        | 748                            | 85                             | 0.114               |
| 5        | 724                            | 45                             | 0.062               |
| 6        | 727                            | 56                             | 0.077               |
| 7        | 726                            | 48                             | 0.66                |
| 8        | 719                            | 67                             | 0.093               |
| 9        | 759                            | 37                             | 0.049               |
| 10       | 745                            | 52                             | 0.070               |

SLR-FM-164

Set S

# SLR-FM-164 Set S

| 11 | 736 | 47 | 0.064 |
|----|-----|----|-------|
| 12 | 739 | 50 | 0.068 |
| 13 | 723 | 47 | 0.065 |
| 14 | 748 | 57 | 0.076 |
| 15 | 770 | 51 | 0.066 |
| 16 | 756 | 71 | 0.094 |
| 17 | 719 | 53 | 0.074 |
| 18 | 757 | 34 | 0.045 |
| 19 | 760 | 29 | 0.038 |

Calculate average fraction defective and  $3\sigma$  control limits, construct the control charts and state whether the process is in statistical control.

**b)** Write short note on Quality Function deployment and FMEA.

Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL ENGINEERING

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

2) Figures to the right Indicates full marks.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) Match Pairs

| Activity   | Type of Element 0  | )4  |
|--|--|---|
| 1. Element performed by a worker                 | P. A constant element  |   |
| 2. Press working parts                           | Q. A manual element  |   |
| 3. Switch on machine                             | R. A machine element   |   |
| 4. Dropping work on the floor                    | S. A foreign element   |   |
| a) Fixed Type Layout b                           | b) Product Type Layout   | )1  |
|  | b) 0.0006  | )1  |
| a) Personal allowance b                          | b) Contingency allowance   | )1  |
| a) 1 % k   | b) 6%  | )1  |
| a) Light source                                  | b) Stop watch  | )1  |
| ,  | b) Job description   | )1  |
| specify the attributes possessed satisfactorily. | ed by employee to complete the job 0   | )1  |
| ,  | ,  |   |
|  | <ul> <li>2. Press working parts</li> <li>3. Switch on machine</li> <li>4. Dropping work on the floor</li> <li>Which type of layout is used in ship be</li> <li>a) Fixed Type Layout</li> <li>c) Process Type Layout</li> <li>One TMU = Minutes</li> <li>a) 0.0001</li> <li>c) 0.001</li> <li>Which type of allowance depends uport</li> <li>a) Personal allowance</li> <li>c) Fatigue allowance for male worked</li> <li>a) 1 %</li> <li>c) 5%</li> <li> is required for drawing cycle grate</li> <li>a) Light source</li> <li>c) String</li> <li>Point rate system is type of method</li> <li>a) Job evaluation</li> <li>c) Merit rating</li> <li> specify the attributes possessed satisfactorily.</li> <li>a) Job analysis</li> </ul> | ActivityType of Element1. Element performed by a workerP. A constant element2. Press working partsQ. A manual element3. Switch on machineR. A machine element4. Dropping work on the floorS. A foreign element4. Dropping work on the floorS. A foreign elementWhich type of layout is used in ship building & air craft industry0a) Fixed Type Layoutb) Product Type Layoutc) Process Type Layoutd) Group LayoutOne TMU = Minutes0a) 0.0001b) 0.0006c) 0.001d) 0.006Which type of allowance depends upon management decision?a) Personal allowanceb) Contingency allowancec) Fatigue allowanced) Policy allowancec) Fatigue allowanceb) 6%c) 5%d) 8% |

Set Ρ

Max. Marks: 70

Marks: 14

|     |   |                  | SLR-FM-16  |     |    |
|-----|---|------------------|--|-----|----|
|     |   |                  |  | Set | Ρ  |
| 9)  | In method study critical examination<br>a) Work sampling<br>c) Flow process chart | done<br>b)<br>d) | through<br>Stop watch technology<br>Questioning technology |     | 01 |
| 10) | Taylor contributed to<br>a) Time study<br>c) Project study                        | b)<br>d)         | Motion study<br>All the above                              |     | 01 |
| 11) | In method study the symbol ∇ prese<br>a) Operation<br>c) Delay                    | nts<br>b)<br>d)  | <br>Storage<br>Inspection                                  |     | 01 |

## Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ENGINEERING

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

- Define work study. Explain the work study procedure. Q.2 a) 07 Explain role of industrial engineer in Industrial engineering. b) 07 Q.3 How environmental factors affect the Man-machine system? List types of 07 a) displavs. Explain the significance and applications of the operation process chart b) 07 and flow process chart. Write short Note. (Any Two) Q.4 Safety measures essential in Industry a)
  - Therbligs b)
  - The Employees' State Insurance Act, 1948 c)
  - Anthropometry d)

#### Section – II

Q.5 The element times (in minutes) for 4 cycle of an operation using a stop 07 a) watch are presented below:

| Elements |      | Cycle times in minutes |      |      |  |  |
|----------|------|------------------------|------|------|--|--|
|          | 1    | 2                      | 3    | 4    |  |  |
| 1        | 1.5  | 1.5                    | 1.3  | 1.4  |  |  |
| 2        | 2.6  | 2.7                    | 2.4  | 2.6  |  |  |
| 3        | 3.3  | 3.2                    | 3.4  | 3.4  |  |  |
| 4        | 1.2  | 1.2                    | 1.1  | 1.2  |  |  |
| 5        | 0.51 | 0.51                   | 0.52 | 0.49 |  |  |

Calculate standard time for the operation if

- Element 2 and 4 are the machine element 1)
- For the other elements, the operator is rated at 120% 2)
- 3) Total allowances are 10 % of the normal time.
- Explain brief about selection of material handling equipment. 07 b)
- Explain product layout with suitable examples. What are the advantages Q.6 07 a) and limitations of product layout.
  - What are the various methods of Job Evaluation with their advantages and 07 b) limitations?

Max. Marks: 56

# **SLR-FM-165** Set P 14

- Q.7 Write short note. (Any Two)
  a) PMTS (Predetermined Motion Time Analysis)
  b) Merit rating Methods

  - Steps Involved in Work sampling c)
  - . Travel Chart d)

|   |                     | SLR-FM-1   | 65              |
|---|---------------------|--|-----------------|
|   |                     | Set  | Q               |
| B.E. (Part – II) (CGPA) Exa<br>Mechanical E<br>INDUSTRIAL E   | Engin               | eering   |                 |
| Saturday, 23-11-2019<br>PM To 05:30 PM  |                     | Max. Marks   | s: 70           |
| <ol> <li>Q. No. 1 is compulsory and sh<br/>Book.</li> <li>Figures to the right Indicates f</li> </ol> |                     | be solved in first 30 minutes in answ                    | wer             |
| , ,   |                     |  |                 |
| MCQ/Objective 1   | ype                 | Questions<br>Marks                                       | s· 1⊿           |
|   | -                   | tions and rewrite the sentence.                          | <b>14</b><br>01 |
| oint rate system is type of method<br>Job evaluation<br>Merit rating                                  | l<br>b)<br>d)       | Job description<br>Productivity                          | 01              |
| specify the attributes posses<br>atisfactorily.<br>Job analysis<br>Job specification                  | ssed by<br>b)<br>d) | y employee to complete the job<br>Job description<br>Job | 01              |
| method study critical examination<br>Work sampling<br>Flow process chart                              | n done<br>b)<br>d)  | -  | 01              |
| aylor contributed to<br>Time study<br>Project study   | b)<br>d)            | Motion study<br>All the above                            | 01              |
| method study the symbol ∇ pres<br>) Operation<br>) Delay<br>atch Pairs                                | ents _<br>b)<br>d)  | <br>Storage<br>Inspection                                | 01              |

Day & Date: Sature Time: 02:30 PM To

Seat

No.

| Instr | uction  | <b>ns:</b> 1) | ) Q. No. 1 is compulsory and sho<br>Book.   | uld               | be solved in first 30 minutes in answe  | er              |  |  |  |
|-------|---|---------------|---|-------------------|---|-----------------|--|--|--|
|       | 2) Figures to the right Indicates full marks. |               |   |                   |   |                 |  |  |  |
|       |   |               | MCQ/Objective Ty  | pe                | Questions   |                 |  |  |  |
| Durat | tion: 3                                       | 0 Mir         | nutes   | -                 | Marks:  | 14              |  |  |  |
| Q.1   | <b>Choo</b><br>1)                             |               | <b>he correct alternatives from th</b><br>is required for drawing cycle g<br>Light source                           |                   | otions and rewrite the sentence.<br>ר<br>Stop watch   | <b>14</b><br>01 |  |  |  |
|       |   | ,             | String  | d)                | Template  |                 |  |  |  |
|       | 2)  | a)            | it rate system is type of method<br>Job evaluation<br>Merit rating  | b)<br>d)          | Job description<br>Productivity   | 01              |  |  |  |
|       | 3)  | a)            | specify the attributes possess<br>sfactorily.<br>Job analysis<br>Job specification                                  | ed b<br>b)<br>d)  | by employee to complete the job<br>Job description<br>Job   | 01              |  |  |  |
|       | 4)  | a)            | ethod study critical examination<br>Work sampling<br>Flow process chart   | don<br>b)<br>d)   | e through<br>Stop watch technology<br>Questioning technology  | 01              |  |  |  |
|       | 5)  | a)            | or contributed to<br>Time study<br>Project study  | b)<br>d)          | Motion study<br>All the above   | 01              |  |  |  |
|       | 6)  | a)            | ethod study the symbol ∇ preser<br>Operation<br>Delay   | nts _<br>b)<br>d) | <br>Storage<br>Inspection   | 01              |  |  |  |
|       | 7)  | Mate          | ch Pairs  |                   |   | 04              |  |  |  |
|       |   | 6.<br>7.      | Activity<br>Element performed by a worker<br>Press working parts<br>Switch on machine<br>Dropping work on the floor | C<br>F            | Type of Element<br>P. A constant element<br>Q. A manual element<br>R. A machine element<br>S. A foreign element | 04              |  |  |  |
|       | 8)  | a)            | ch type of layout is used in ship t<br>Fixed Type Layout<br>Process Type Layout                                     | build<br>b)<br>d) | ing & air craft industry<br>Product Type Layout<br>Group Layout   | 01              |  |  |  |

# SLR-FM-165

|     | SLR-FM-   |                   |  | 65 |
|-----|---|-------------------|--|----|
|     |   |                   | Set  | Q  |
| 9)  | One TMU = Minutes<br>a) 0.0001<br>c) 0.001  | b)<br>d)          | 0.0006<br>0.006  | 01 |
| 10) | <ul><li>Which type of allowance depends up</li><li>a) Personal allowance</li><li>c) Fatigue allowance</li></ul> | oon m<br>b)<br>d) | anagement decision?<br>Contingency allowance<br>Policy allowance | 01 |
| 11) | <ul><li>T. Personal allowance for male work</li><li>a) 1 %</li><li>c) 5%</li></ul>                              | er is<br>b)<br>d) | 6%<br>8%   | 01 |

## Seat No.

### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering INDUSTRIAL ENGINEERING

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

| Q.2 | a)<br>b)        | Define work study. Explain the work study procedure.<br>Explain role of industrial engineer in Industrial engineering. | 07<br>07 |
|-----|-----------------|--|----------|
| Q.3 | a)              | How environmental factors affect the Man-machine system? List types of displays.                                       | 07       |
|     | b)              | Explain the significance and applications of the operation process chart and flow process chart.                       | 07       |
| Q.4 | Wri<br>a)<br>b) | <b>te short Note. (Any Two)</b><br>Safety measures essential in Industry<br>Therbligs                                  | 14       |

- b) Therbligs
- c) The Employees' State Insurance Act, 1948
- d) Anthropometry

#### Section – II

Q.5 a) The element times (in minutes) for 4 cycle of an operation using a stop 07 watch are presented below:

| Elements |      | Cycle times in minutes |      |      |  |  |  |
|----------|------|------------------------|------|------|--|--|--|
|          | 1    | 2                      | 3    | 4    |  |  |  |
| 1        | 1.5  | 1.5                    | 1.3  | 1.4  |  |  |  |
| 2        | 2.6  | 2.7                    | 2.4  | 2.6  |  |  |  |
| 3        | 3.3  | 3.2                    | 3.4  | 3.4  |  |  |  |
| 4        | 1.2  | 1.2                    | 1.1  | 1.2  |  |  |  |
| 5        | 0.51 | 0.51                   | 0.52 | 0.49 |  |  |  |

Calculate standard time for the operation if

- 1) Element 2 and 4 are the machine element
- 2) For the other elements, the operator is rated at 120%
- 3) Total allowances are 10 % of the normal time.
- b) Explain brief about selection of material handling equipment. 07
- **Q.6 a)** Explain product layout with suitable examples. What are the advantages **07** and limitations of product layout.
  - b) What are the various methods of Job Evaluation with their advantages and 07 limitations?

Max. Marks: 56

Set Q

# **SLR-FM-165** Set Q

- Q.7 Write short note. (Any Two)
  a) PMTS (Predetermined Motion Time Analysis)
  b) Merit rating Methods

  - Steps Involved in Work sampling c)
  - . Travel Chart d)

|             |                  | SLR-FM-16  | 5       |
|-------------|------------------|--|---------|
| Seat<br>No. | t                | Set F  | 2       |
|             |                  | B.E. (Part – II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>INDUSTRIAL ENGINEERING   |         |
|             |                  | e: Saturday, 23-11-2019 Max. Marks: 7<br>D PM To 05:30 PM  | '0      |
| Instru      | uctio            | <b>ns:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answe Book.   | r       |
|             |                  | 2) Figures to the right Indicates full marks.  |         |
| Durat       | tion: 3          | MCQ/Objective Type Questions<br>0 Minutes Marks: 1   | 4       |
| Q.1         | <b>Cho</b><br>1) |  | 1)<br>1 |
|             | 2)               | Which type of allowance depends upon management decision?0a) Personal allowanceb) Contingency allowancec) Fatigue allowanced) Policy allowance | )1      |
|             | 3)               | T. Personal allowance for male worker is       0         a) 1 %       b) 6%         c) 5%       d) 8%  | )1      |
|             | 4)               | is required for drawing cycle graph 0<br>a) Light source b) Stop watch<br>c) String d) Template  | )1      |
|             | 5)               | Point rate system is type of method0a) Job evaluationb) Job descriptionc) Merit ratingd) Productivity  | )1      |

# B.E.

|    | c)               | 0.001  | d)                | 0.006  |    |
|----|------------------|--|-------------------|--|----|
| 2) | Wh<br>a)<br>c)   | ich type of allowance depends up<br>Personal allowance<br>Fatigue allowance        | on m<br>b)<br>d)  | anagement decision?<br>Contingency allowance<br>Policy allowance | 01 |
| 3) | T.F<br>a)<br>c)  | Personal allowance for male work<br>1 %<br>5%                                      | er is<br>b)<br>d) | 6%<br>8%   | 01 |
| 4) | a)<br>c)         | is required for drawing cycle g<br>Light source<br>String                          | raph<br>b)<br>d)  | Stop watch<br>Template   | 01 |
| 5) | Poir<br>a)<br>c) | nt rate system is type of method<br>Job evaluation<br>Merit rating                 | b)<br>d)          | Job description<br>Productivity                                  | 01 |
| 6) | sati<br>a)<br>c) | specify the attributes possess<br>sfactorily.<br>Job analysis<br>Job specification | ed by<br>b)<br>d) | employee to complete the job<br>Job description<br>Job           | 01 |
| 7) | In n<br>a)<br>c) | nethod study critical examination<br>Work sampling<br>Flow process chart           | done<br>b)<br>d)  | through<br>Stop watch technology<br>Questioning technology       | 01 |
| 8) | Tay<br>a)<br>c)  | lor contributed to<br>Time study<br>Project study                                  | b)<br>d)          | Motion study<br>All the above                                    | 01 |
| 9) | ln n<br>a)<br>c) | nethod study the symbol ∇ preser<br>Operation<br>Delay                             | nts<br>b)<br>d)   | Storage<br>Inspection  | 01 |
|    |                  |  |                   |  |    |

# **SLR-FM-165** Set R

#### 10) Match Pairs

| Activity                         | Type of Element       |
|----------------------------------|-----------------------|
| 9. Element performed by a worker | P. A constant element |
| 10. Press working parts          | Q. A manual element   |
| 11. Switch on machine            | R. A machine element  |
| 12. Dropping work on the floor   | S. A foreign element  |

#### 11) Which type of layout is used in ship building & air craft industry

- a) Fixed Type Layout
- Product Type Layout b)
- c) Process Type Layout
- d) Group Layout

Set

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ENGINEERING

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicate full marks.

#### Section – I

#### Q.2 Define work study. Explain the work study procedure. 07 a) Explain role of industrial engineer in Industrial engineering. 07 b) How environmental factors affect the Man-machine system? List types of Q.3 a) 07 displays. Explain the significance and applications of the operation process chart 07 b) and flow process chart. 14

#### Write short Note. (Any Two) Q.4

- Safety measures essential in Industry a)
- Therblias b)
- The Employees' State Insurance Act, 1948 c)
- Anthropometry d)

#### Section – II

The element times (in minutes) for 4 cycle of an operation using a stop 07 Q.5 a) watch are presented below:

| Elements | Cycle times in minutes |      |      |      |
|----------|------------------------|------|------|------|
|          | 1                      | 2    | 3    | 4    |
| 1        | 1.5                    | 1.5  | 1.3  | 1.4  |
| 2        | 2.6                    | 2.7  | 2.4  | 2.6  |
| 3        | 3.3                    | 3.2  | 3.4  | 3.4  |
| 4        | 1.2                    | 1.2  | 1.1  | 1.2  |
| 5        | 0.51                   | 0.51 | 0.52 | 0.49 |

Calculate standard time for the operation if

- 1) Element 2 and 4 are the machine element
- 2) For the other elements, the operator is rated at 120%
- Total allowances are 10 % of the normal time. 3)
- Explain brief about selection of material handling equipment. 07 b)
- Explain product layout with suitable examples. What are the advantages Q.6 07 a) and limitations of product layout.
  - What are the various methods of Job Evaluation with their advantages and 07 b) limitations?

Max. Marks: 56

Set R

- Q.7 Write short note. (Any Two)
  a) PMTS (Predetermined Motion Time Analysis)
  b) Merit rating Methods
  c) Steps Involved in Work sampling

  - . Travel Chart d)

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ENGINEERING Max. Marks: 70 **Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

2) Figures to the right Indicates full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence.

- \_ specify the attributes possessed by employee to complete the job 01 1) satisfactorily. a) Job analysis b) Job description Job specification d) Job C) 2) In method study critical examination done through \_\_\_\_\_ 01 a) Work sampling Stop watch technology b) c) Flow process chart d) Questioning technology Taylor contributed to \_\_\_\_\_ 3) 01 a) Time study b) Motion study All the above Project study d) c) 4) 01 In method study the symbol  $\nabla$  presents \_\_\_\_\_ a) Operation Storage b) c) Delay d) Inspection 5) Match Pairs 04 Activity Type of Element 13. Element performed by a P. A constant element worker Press working parts 14. Q. A manual element 15. Switch on machine R. A machine element
  - Dropping work on the floor S. A foreign element 16. 6) Which type of layout is used in ship building & air craft industry 01 a) Fixed Type Layout Product Type Layout b) c) Process Type Layout Group Layout d) 7) One TMU = \_\_\_\_\_ Minutes 01 a) 0.0001 0.0006 b) 0.001 d) 0.006 c) 8) Which type of allowance depends upon management decision? 01
    - Personal allowance Contingency allowance b) a) Fatigue allowance d) Policy allowance c)

Seat No.

Day & Date: Saturday, 23-11-2019

Book.

Time: 02:30 PM To 05:30 PM

## **SLR-FM-165**

Set

14

Marks: 14

|     |                                     |       |                 | SLR-FM-1 | 65 |
|-----|-------------------------------------|-------|-----------------|----------|----|
|     |                                     |       |                 | Set      | S  |
| 9)  | T. Personal allowance for male work | er is |                 |          | 01 |
|     | a) 1 %                              | b)    | 6%              |          |    |
|     | c) 5%                               | d)    | 8%              |          |    |
| 10) | is required for drawing cycle       | graph |                 |          | 01 |
|     | a) Light source                     | b)    | Stop watch      |          |    |
|     | c) String                           | d)    | Template        |          |    |
| 11) | Point rate system is type of method |       |                 |          | 01 |
| ,   | a) Job evaluation                   | b)    | Job description |          |    |
|     | c) Marit rating                     | d)    | Productivity    |          |    |

c) Merit rating

d) Productivity

## Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** INDUSTRIAL ENGINEERING

Day & Date: Saturday, 23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section. 2) Figures to the right indicate full marks.

#### Section – I

| Q.2 | a)<br>b) | Define work study. Explain the work study procedure.<br>Explain role of industrial engineer in Industrial engineering. | 07<br>07 |
|-----|----------|--|----------|
| Q.3 | a)       | How environmental factors affect the Man-machine system? List types of displays.                                       | 07       |
|     | b)       | Explain the significance and applications of the operation process chart and flow process chart.                       | 07       |
| Q.4 | Wri      | te short Note. (Any Two)   | 14       |
|     | a)<br>b) | Safety measures essential in Industry  |          |

- Iherbligs D)
- c) The Employees' State Insurance Act, 1948
- Anthropometry d)

#### Section – II

Q.5 a) The element times (in minutes) for 4 cycle of an operation using a stop 07 watch are presented below:

| Elements | Cycle times in minutes |      |      |      |
|----------|------------------------|------|------|------|
|          | 1                      | 2    | 3    | 4    |
| 1        | 1.5                    | 1.5  | 1.3  | 1.4  |
| 2        | 2.6                    | 2.7  | 2.4  | 2.6  |
| 3        | 3.3                    | 3.2  | 3.4  | 3.4  |
| 4        | 1.2                    | 1.2  | 1.1  | 1.2  |
| 5        | 0.51                   | 0.51 | 0.52 | 0.49 |

Calculate standard time for the operation if

- Element 2 and 4 are the machine element 1)
- 2) For the other elements, the operator is rated at 120%
- 3) Total allowances are 10 % of the normal time.
- Explain brief about selection of material handling equipment. 07 b)
- Explain product layout with suitable examples. What are the advantages Q.6 a) 07 and limitations of product layout.
  - What are the various methods of Job Evaluation with their advantages and 07 b) limitations?

Max. Marks: 56

- Q.7 Write short note. (Any Two)
  a) PMTS (Predetermined Motion Time Analysis)
  - Merit rating Methods b)
  - Steps Involved in Work sampling c)
  - . Travel Chart d)

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MECHATRONICS**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Draw neat sketches wherever necessary.
- 3) Figures to the right indicate full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

c)

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- In the OSI model, the \_\_\_\_\_ layer is responsible for routing packets within 1) or across networks.
  - Physical a)
    - Network d) Transport
- 2) The advantages of PLCs over conventional microcontrollers are .
  - Programming can be done using ladder logic which is simpler than a) using assembly language
  - PLCs are more rugged b)
  - PLCs allow interfacing of devices of different voltage levels easily c)
  - All of the above d)
- 3) The Controller Area Network protocol was developed by \_\_\_\_\_
  - b) Robert Bosch Gmbh IBM a)
  - Boeing computer Services d) Dassault Systemes c)
- Which of the following are used for protection in a signal conditioning 4) circuit?
  - Triode, pentode, cathode a)
  - Zener diode, optioisolator, optocoupler b)
  - Diode, cathode, triode C)
  - Resistor, capacitor, inductor d)
- A buffer amplifier has gain of . 5)
  - Infinity a)
  - b) Unity
  - c) Zero
  - Dependent upon the circuit parameters d)
- Filters that transmit all frequencies below a defined cut-off frequency are 6) known as \_\_\_\_\_.
  - a) Low pass filters b) High pass filters c)
    - Band pass filters d) All pass filters
- 7) The 8051 has \_\_\_\_\_ bytes of program memory and \_\_\_\_\_ bytes of data memory.
  - 4096, 2048 a) 128, 4096 c)
- b) 4096, 128 d) 2048, 4096

Max. Marks: 70

Marks: 14



**SLR-FM-166** 

Seat No.

b) Application

#### 8) The unique feature of the parallel ports on the 8051 is that \_\_\_\_\_.

- a) They are bit addressable and bidirectional
- b) Can allow analog inputs to be connected
- c) Can be connected to any voltage source
- d) Can be configured as serial ports as well
- 9) The clock frequency and the supply voltage for the 8085A processors is
  - a) 5 MHz and +12 V
- b) 5 MHz and +5 V

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Set

- c) 3 MHz and 12 V d) 3 MHz and +5 V
- 10) The 16 bit registers in the 8085 are the \_\_\_\_\_ & \_\_\_\_\_.
  - a) Accumulator and B register
  - b) B register and C register
  - c) Stack Pointer and Program counter
  - d) H register and L register
- 11) When it comes to speed and accuracy which of the following actuators is the preferred choice?
  - a) Hydraulic

- b) Electric
- c) Mechanical d) Pneumatic
- 12) Fluid power systems are preferred for continuous control because \_\_\_\_\_.
  - a) They allows linear movements at high speeds over longer lengths
    - b) They have higher bandwidth
    - c) Maintains system under load with excessive use of control devices
    - d) All of the above
- 13) A smart sensor can do which of the following.
  - a) Compensate for random errors
  - b) Adjust for non linearities
  - c) Automatic calibration of accuracy
  - d) All of the above
- 14) Throttle position sensor used in the automobile is typically a \_\_\_\_\_.
  - a) Tachometer

b) Potentiometer

c) Odometer

d) strain gauge sensor

## Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MECHATRONICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Figures to right indicate full marks.
- 3) Draw neat sketches where ever necessary.

#### Section – I

#### Q.2 Answer any four questions.

- a) Define any four static characteristics of sensors.
- b) Sketch the pin diagram of the 8051 microcontroller.
- c) What is signal conditioning?
- d) Define Mechatronics. List the Constituents of the mechatronic system.
- e) Describe classification of electric motors.
- f) List four characteristics of OPAMPS.

#### Q.3 Answer any two questions.

- a) Amongst all DC motors (series, shunt, compound and separately excited) which one is the most suited for control applications and why. Explain with the help of simple control system block diagram.
- b) Show how a temperature sensor can be interfaced with an 8051 for measuring temperature. Sketch the circuit diagram. Label all ports correctly. Show precisely where the sensor can be connected. Show where and how the LED display will be connected. The diagram should also include signal conditioning elements at in their most appropriate position.
- c) Sketch a block diagram of the automotive ABS from the point of view of a typical mechatronic control system and answer the following questions: What vehicle parameters are being measured and what type of sensors are being used to measure these parameters? What is the controller called? Which vehicle system is the plant (process being controlled)?

What is the actuating device being used to control the process?

#### Section – II

#### Q.4 Answer any four questions

- a) Compare serial and parallel communication.
- **b)** Define artificial intelligence and list some of its types.
- c) Explain ring, star, mesh and bus network topologies?
- d) Discuss in brief LAN, WAN/MAN.
- e) List four advantages of PLCs over conventional electromechanical relays.
- f) Discuss an industrial robot as a mechatronic system.

#### Q.5 Answer any two questions

- A manufacturing cell will operate only if certain conditions are met. These are as follows;
  - 1) The condition of the cell to start is that any one of two start buttons X & Y must be pressed and the guard (G) must be in the correct position.
  - 2) The cell must stop of the guard in not in the correct position or either of the two stop buttons are pressed. (S1 and S2)

12

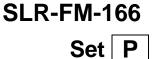
16

Max. Marks: 56



**SLR-FM-166** 

16



- 3) Start and stop conditions are activated via internal relays and may be considered normally open.
- 4) Safe state of the guard may be considered as normally closed.
- b) Device a circuit for a cyclic timer which will switch on an output for 50 seconds and then off for 50 seconds. The start and stop buttons are spring loaded push buttons.
- c) Many companies advertise that their products feature Fuzzy Logic. In the context of the three products mentioned below explain what the role of Fuzzy Logic in those products is.
  - 1) Vacuum Cleaner
  - 2) Air Conditioner
  - 3) Automatic Transmission

#### Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MECHATRONICS**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Draw neat sketches wherever necessary.
- 3) Figures to the right indicate full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The unique feature of the parallel ports on the 8051 is that \_\_\_\_\_. 1)
  - They are bit addressable and bidirectional a)
  - Can allow analog inputs to be connected b)
  - Can be connected to any voltage source C)
  - Can be configured as serial ports as well d)
- 2) The clock frequency and the supply voltage for the 8085A processors is
  - 5 MHz and +12 V a)
- b) 5 MHz and +5 V
- 3 MHz and-12 V C)
- d) 3 MHz and+5 V
- 3) The 16 bit registers in the 8085 are the \_\_\_\_\_ & \_\_\_\_\_.
  - Accumulator and B register a)
  - B register and C register b)
  - Stack Pointer and Program counter C)
  - H register and L register d)
- 4) When it comes to speed and accuracy which of the following actuators is the preferred choice?
  - Hydraulic a) b) Electric
  - c) Mechanical d) Pneumatic
- Fluid power systems are preferred for continuous control because 5)
  - They allows linear movements at high speeds over longer lengths a)
  - They have higher bandwidth b)
  - Maintains system under load with excessive use of control devices c)
  - All of the above d)
- A smart sensor can do which of the following. 6)
  - Compensate for random errors a)
  - Adjust for non linearities b)
  - Automatic calibration of accuracy C)
  - All of the above d)

Odometer

c)

- 7) Throttle position sensor used in the automobile is typically a \_\_\_\_\_. Tachometer a)
  - b) Potentiometer
  - strain gauge sensor d)





Max. Marks: 70

Marks: 14

#### In the OSI model, the \_\_\_\_\_ layer is responsible for routing packets within or across networks.

a) Physical

b) Application

**SLR-FM-166** 

- c) Network d) Transport
- 9) The advantages of PLCs over conventional microcontrollers are \_\_\_\_\_.
  - a) Programming can be done using ladder logic which is simpler than using assembly language
  - b) PLCs are more rugged
  - c) PLCs allow interfacing of devices of different voltage levels easily
  - d) All of the above
- 10) The Controller Area Network protocol was developed by \_\_\_\_
  - a) IBM b) Robert Bosch Gmbh
  - c) Boeing computer Services d)
- d) Dassault Systemes
- 11) Which of the following are used for protection in a signal conditioning circuit?
  - a) Triode, pentode, cathode
  - b) Zener diode, optioisolator, optocoupler
  - c) Diode, cathode, triode
  - d) Resistor, capacitor, inductor
- 12) A buffer amplifier has gain of \_\_\_\_\_.
  - a) Infinity
  - b) Unity
  - c) Zero
  - d) Dependent upon the circuit parameters
- 13) Filters that transmit all frequencies below a defined cut-off frequency are known as \_\_\_\_\_.
  - a) Low pass filters
- b) High pass filters
- c) Band pass filters d) All pass filters
- 14) The 8051 has \_\_\_\_\_ bytes of program memory and \_\_\_\_\_ bytes of data memory.
  - a) 4096, 2048 b) 4096, 128
  - c) 128, 4096 d) 2048, 4096

## Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MECHATRONICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

- 2) Figures to right indicate full marks.
- 3) Draw neat sketches where ever necessary.

#### Section – I

#### Q.2 Answer any four questions.

- a) Define any four static characteristics of sensors.
- b) Sketch the pin diagram of the 8051 microcontroller.
- c) What is signal conditioning?
- d) Define Mechatronics. List the Constituents of the mechatronic system.
- e) Describe classification of electric motors.
- f) List four characteristics of OPAMPS.

#### Q.3 Answer any two questions.

- a) Amongst all DC motors (series, shunt, compound and separately excited) which one is the most suited for control applications and why. Explain with the help of simple control system block diagram.
- b) Show how a temperature sensor can be interfaced with an 8051 for measuring temperature. Sketch the circuit diagram. Label all ports correctly. Show precisely where the sensor can be connected. Show where and how the LED display will be connected. The diagram should also include signal conditioning elements at in their most appropriate position.
- c) Sketch a block diagram of the automotive ABS from the point of view of a typical mechatronic control system and answer the following questions: What vehicle parameters are being measured and what type of sensors are being used to measure these parameters? What is the controller called? Which vehicle system is the plant (process being controlled)?

What is the actuating device being used to control the process?

#### Section – II

#### Q.4 Answer any four questions

- a) Compare serial and parallel communication.
- **b)** Define artificial intelligence and list some of its types.
- c) Explain ring, star, mesh and bus network topologies?
- d) Discuss in brief LAN, WAN/MAN.
- e) List four advantages of PLCs over conventional electromechanical relays.
- f) Discuss an industrial robot as a mechatronic system.

#### Q.5 Answer any two questions

- A manufacturing cell will operate only if certain conditions are met. These are as follows;
  - The condition of the cell to start is that any one of two start buttons X & Y must be pressed and the guard (G) must be in the correct position.
  - 2) The cell must stop of the guard in not in the correct position or either of the two stop buttons are pressed. (S1 and S2)

12

16

16

12



Max. Marks: 56

**SLR-FM-166** 



- 3) Start and stop conditions are activated via internal relays and may be considered normally open.
- 4) Safe state of the guard may be considered as normally closed.
- b) Device a circuit for a cyclic timer which will switch on an output for 50 seconds and then off for 50 seconds. The start and stop buttons are spring loaded push buttons.
- c) Many companies advertise that their products feature Fuzzy Logic. In the context of the three products mentioned below explain what the role of Fuzzy Logic in those products is.
  - 1) Vacuum Cleaner
  - 2) Air Conditioner
  - 3) Automatic Transmission

# S

#### Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MECHATRONICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Draw neat sketches wherever necessary.
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#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) A buffer amplifier has gain of \_\_\_\_\_.

Band pass filters

- a) Infinity
- b) Unity
- c) Zero

C)

- d) Dependent upon the circuit parameters
- Filters that transmit all frequencies below a defined cut-off frequency are known as \_\_\_\_\_.
  - a) Low pass filters
- b) High pass filtersd) All pass filters
- 3) The 8051 has \_\_\_\_\_ bytes of program memory and \_\_\_\_\_ bytes of data memory.
  - a) 4096, 2048 b) 4096, 128
  - c) 128, 4096 d) 2048, 4096
- 4) The unique feature of the parallel ports on the 8051 is that \_\_\_\_\_.
  - a) They are bit addressable and bidirectional
  - b) Can allow analog inputs to be connected
  - c) Can be connected to any voltage source
  - d) Can be configured as serial ports as well

#### 5) The clock frequency and the supply voltage for the 8085A processors is

- a) 5 MHz and +12 V b) 5 MHz and +5 V
- c) 3 MHz and-12 V d) 3 MHz and+5 V
- 6) The 16 bit registers in the 8085 are the \_\_\_\_\_ & \_\_\_\_\_.
  - a) Accumulator and B register
  - b) B register and C register
  - c) Stack Pointer and Program counter
  - d) H register and L register
- 7) When it comes to speed and accuracy which of the following actuators is the preferred choice?
  - a) Hydraulic
  - c) Mechanical

- b) Electric
- d) Pneumatic



Max. Marks: 70

**SLR-FM-166** 

### 8) Fluid power systems are preferred for continuous control because \_\_\_\_\_

- a) They allows linear movements at high speeds over longer lengths
- b) They have higher bandwidth
- c) Maintains system under load with excessive use of control devices
- d) All of the above
- 9) A smart sensor can do which of the following.
  - a) Compensate for random errors
  - b) Adjust for non linearities
  - c) Automatic calibration of accuracy
  - d) All of the above

Tachometer

Odometer

- 10) Throttle position sensor used in the automobile is typically a \_\_\_\_\_.
  - b) Potentiometer

**SLR-FM-166** 

Set R

- d) strain gauge sensor
- 11) In the OSI model, the \_\_\_\_\_ layer is responsible for routing packets within or across networks.
  - a) Physical

a)

c)

- b) Application
- c) Network
- d) Transport
- 12) The advantages of PLCs over conventional microcontrollers are \_\_\_\_\_
  - a) Programming can be done using ladder logic which is simpler than using assembly language
  - b) PLCs are more rugged
  - c) PLCs allow interfacing of devices of different voltage levels easily
  - d) All of the above
- 13) The Controller Area Network protocol was developed by \_\_\_\_\_
  - a) IBM
- b) Robert Bosch Gmbh
- c) Boeing computer Services
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- 14) Which of the following are used for protection in a signal conditioning circuit?
  - a) Triode, pentode, cathode
  - b) Zener diode, optioisolator, optocoupler
  - c) Diode, cathode, triode
  - d) Resistor, capacitor, inductor

### Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MECHATRONICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

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#### Section – I

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  - 2) The cell must stop of the guard in not in the correct position or either of the two stop buttons are pressed. (S1 and S2)

12

16

16

12



Max. Marks: 56

**SLR-FM-166** 





- 3) Start and stop conditions are activated via internal relays and may be considered normally open.
- 4) Safe state of the guard may be considered as normally closed.
- b) Device a circuit for a cyclic timer which will switch on an output for 50 seconds and then off for 50 seconds. The start and stop buttons are spring loaded push buttons.
- c) Many companies advertise that their products feature Fuzzy Logic. In the context of the three products mentioned below explain what the role of Fuzzy Logic in those products is.
  - 1) Vacuum Cleaner
  - 2) Air Conditioner
  - 3) Automatic Transmission

| Seat |  |
|------|--|
| No.  |  |

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MECHATRONICS

Day & Date: Monday, 25-11-2019

Time: 02:30 PM To 05:30 PM **Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

- book. 2) Draw neat sketches wherever necessary.
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#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Marks: 14

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - 1) The 16 bit registers in the 8085 are the \_\_\_\_\_ & \_\_\_\_\_.
    - a) Accumulator and B register
    - b) B register and C register
    - c) Stack Pointer and Program counter
    - d) H register and L register
  - 2) When it comes to speed and accuracy which of the following actuators is the preferred choice?
    - a) Hydraulic

c)

c)

- b) Electricd) Pneumatic
- 3) Fluid power systems are preferred for continuous control because \_\_\_\_\_.
  - a) They allows linear movements at high speeds over longer lengths
  - b) They have higher bandwidth
  - c) Maintains system under load with excessive use of control devices
  - d) All of the above

Mechanical

- 4) A smart sensor can do which of the following.
  - a) Compensate for random errors
  - b) Adjust for non linearities
  - c) Automatic calibration of accuracy
  - d) All of the above
- 5) Throttle position sensor used in the automobile is typically a \_\_\_\_\_.
  - a) Tachometer b) Potentiometer
    - Odometer d) strain gauge sensor
- 6) In the OSI model, the \_\_\_\_\_ layer is responsible for routing packets within or across networks.
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Max. Marks: 70

- 11) Filters that transmit all frequencies below a defined cut-off frequency are known as
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- b) 4096, 128 d) 2048, 4096
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  - They are bit addressable and bidirectional a)
  - Can allow analog inputs to be connected b)
  - Can be connected to any voltage source C)
  - Can be configured as serial ports as well d)
- The clock frequency and the supply voltage for the 8085A processors is 14)
  - 5 MHz and +12 V a)
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  - 3 MHz and-12 V c)
- d) 3 MHz and+5 V

- b) Robert Bosch Gmbh
- C) Boeing computer Services

Triode, pentode, cathode

Resistor, capacitor, inductor

A buffer amplifier has gain of \_\_\_\_\_.

Diode, cathode, triode

Zener diode, optioisolator, optocoupler

Dependent upon the circuit parameters

8)

9)

10)

a)

b)

C)

d)

a) b)

c) d)

c)

C)

Infinity

Unity Zero

circuit? a)

IBM d) Dassault Systemes

Which of the following are used for protection in a signal conditioning

- The Controller Area Network protocol was developed by .
- Set

**SLR-FM-166** 

## Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MECHATRONICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) All questions are compulsory.

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#### Section – I

#### Q.2 Answer any four questions.

- a) Define any four static characteristics of sensors.
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   What is the controller called?
   Which vehicle system is the plant (process being controlled)?

What is the actuating device being used to control the process?

#### Section – II

#### Q.4 Answer any four questions

- a) Compare serial and parallel communication.
- b) Define artificial intelligence and list some of its types.
- c) Explain ring, star, mesh and bus network topologies?
- d) Discuss in brief LAN, WAN/MAN.
- e) List four advantages of PLCs over conventional electromechanical relays.
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  - 2) The cell must stop of the guard in not in the correct position or either of the two stop buttons are pressed. (S1 and S2)

12

16

12

16

Max. Marks: 56



Set





- 3) Start and stop conditions are activated via internal relays and may be considered normally open.
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- b) Device a circuit for a cyclic timer which will switch on an output for 50 seconds and then off for 50 seconds. The start and stop buttons are spring loaded push buttons.
- c) Many companies advertise that their products feature Fuzzy Logic. In the context of the three products mentioned below explain what the role of Fuzzy Logic in those products is.
  - 1) Vacuum Cleaner
  - 2) Air Conditioner
  - 3) Automatic Transmission

## B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS

Day & Date: Monday, 25-11-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of non programmable calculator is allowed.

#### MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

Seat

No.

# Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 1) CFD is method to calculate heat transfer and fluid flow .

- a) Numerically b) Experimentally
- c) Instantaneously d) None of these
- 2) Discretization technique is \_\_\_\_\_.
  - a) Finite volume
  - c) Finite element d) All of these
- 3) Test used to check accuracy of solution is called \_\_\_\_\_
  - a) Grid independence test
    - c) Optimal test
- 4) The adiabatic heat transfer thermal boundary condition is an example of which type of boundary condition: \_\_\_\_\_.
  - a) Dirichlet type b) Robin type
  - c) Neumann type d) None of the above
- 5) The turbulent kinetic energy is representative of velocity fluctuations of

b)

- a) Large eddies
- c) Inertial range eddies d) All of the above
- 6) Which of the following statements is true about the MacCormack scheme?
  - a) It can be used only for incompressible flows
  - b) It can be used for compressible flows
  - c) It can be used only for linear equations
  - d) None of these
- 7) Finite difference method is \_\_\_\_\_
  - a) Exact solution method
  - c) Unique solution method
- d) None of these
- 8) Triangular mesh is common in \_\_\_\_\_
  - a) Structured meshc) Dirichlet mesh
- b) Unstructured mesh
- d) None of these

b) Finite difference

b) Solution test

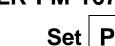
Small eddies

d) Aspect test

b) Approximate solution method

Marks: 14

SLR-FM-167



Max. Marks: 70

- 9) Forces which act directly on volumetric mass of fluid element called
  - a) Fluid forces
  - C) Direct forces
- CFD is based on fundamental governing equations of \_\_\_\_\_. 10)
  - a) Continuity b) Energy
  - Momentum d) All of these c)
- 11) Division of physical domain into a finite number of discrete regions is
  - Meshing a)

b) Generation

b) Body forces d) None of these

- Division C) d) Merging
- 12) Many of different categories of different plot can be combined into a single plot called as
  - Contour plot a)

- b) Vector plot
- Mesh plot d) Composite plot C)
- 13) Numerical method is used for solution of hyperbolic and parabolic PDE based on finite difference method \_\_\_\_
  - Lax-Wendroff technique a)
- b) Relaxation technique
- Finite difference technique C)
- d) ADI technique
- 14) If the numbers of nodes are M, then the nodal spacing  $\Delta x$  can be calculated by \_
  - a)  $\Delta x = L/M-1$
  - c)

b)  $\Delta x = M/L-1$ 

 $\Delta x = L/M$ 

d)  $\Delta x = L/M+1$ 

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05

09

#### Seat No. B.E. (Part – II) (CC

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS

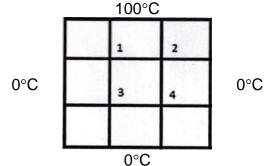
Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from remaining three questions of each section.

- 2) Assume suitable data if necessary.
- 3) Figure to the right indicate full marks.
- 4) Use of non programmable calculator is allowed.

#### Section – I

- Q.2 a) Consider a large plane wall of thickness L=0.4m Thermal Conductivity K=2.5 W/M°C and the left side of the wall is maintained at a constant temperature of 75°C while the right side losses heat by convection to the surrounding air T∞=22°C with a heat transfer and taking the nodal spacing to be 0.1m.
  - 1) Obtain the finite difference formulation for all nodes
  - 2) Determine the nodal temperatures by solving those equations
  - **b)** Consider steady two dimensional heat transfers in a long solid bar of square cross section as shown in the figure. The measured temperatures at selected points of the outer surfaces are as shown. There is no heat generation using the finite difference method with a mesh size of  $\Delta x = \Delta y = 1$  cm determine the temperatures at the indicated points in the medium.



| Q.3 | a) | What is FDM? Explain finite difference schemes with forward.  | 05 |
|-----|----|---|----|
|     | b) | Derive the Navier-stokes equations in non-conservation forms. | 05 |
|     | c) | What are the important applications of CFD in engineering?    | 04 |

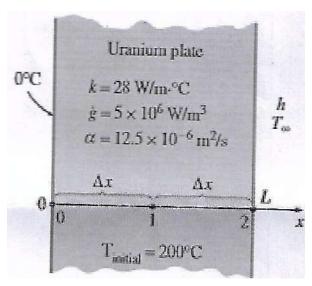
- **Q.4** a) Give and explain the three errors in CFD.
  - **b)** Consider a large uranium plate of thickness L=4cm, K=28 W/M°C, &  $\alpha$ =12.5× 10<sup>-6</sup>m<sup>2</sup>/s, that is initially at a uniform temperature of 200°C. Heat is generated uniformly in the plate at a constant rate of (e) =5x 10<sup>6</sup>w/m<sup>3</sup>. At time t =0, one side of the plate is brought into contact with iced water & is maintained at 0°C at all times while the other side is subjected to convection to an environment at T $\infty$  = 30°C with a heat transfer coefficient h =45 w/m<sup>2</sup>°C, as shown in fig. below Considering a total of three equally spaced node in the medium, two at the boundaries & one at, estimate at the middle, estimate the exposed surface temperature of the plate 2.5 min after the start of cooling using the explicit method.



07

07





## Section – II

| generation & constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform network of $\Delta x$ . The wall is initially at specified temperature. Using the energy balance approach, obtain the explicit finite formulation of the boundary nodes for case of uniform heat flux q <sub>o</sub> at the left boundar 0) and convection at the right boundary (node 7) with a convection |                | What are the advantages of the FVM over FDM method?<br>Consider transient heat conduction in a plane wall with variable heat<br>generation & constant thermal conductivity. The nodal network of the<br>medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform nodal<br>spacing of $\Delta x$ . The wall is initially at specified temperature. Using the<br>energy balance approach, obtain the explicit finite formulation of the<br>boundary nodes for case of uniform heat flux q <sub>0</sub> at the left boundary (node<br>0) and convection at the right boundary (node 7) with a convection<br>coefficient of h and ambient temperature of T $\infty$ . | 04<br>06       |
|--|----------------|--|----------------|
|  | C)             | Explain the FVM for one -dimensional steady state diffusion.   | 04             |
| Q.6  | a)<br>b)       | What are the types of turbulence models? Explain the K- $\varepsilon$ Models.<br>What are the different plots of computer graphics? Explain any two in details   | 04<br>05       |
|  | c)             | Explain the Lax-Wendorff techniques.   | 05             |
| Q.7  | a)<br>b)<br>c) | What is Turbulence? Classification of Turbulence.<br>Write short note on unstructured grids for viscous flows.<br>Explain with diagram SIMPLE algorithm steps of Patankar & Spalding.  | 04<br>05<br>05 |

**SLR-FM-167** 

Set P

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS**

Day & Date: Monday, 25-11-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

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- 3) Assume suitable data if necessary.
- 4) Use of non programmable calculator is allowed.

#### MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

C)

C)

c)

1)

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

Triangular mesh is common in \_\_\_\_ a) Structured mesh

Dirichlet mesh

- b) Unstructured mesh
- d) None of these
- 2) Forces which act directly on volumetric mass of fluid element called
  - Fluid forces a)
    - Direct forces
- 3) CFD is based on fundamental governing equations of \_\_\_\_\_.
  - Continuity b) Energy a)
    - Momentum d) All of these C)
- 4) Division of physical domain into a finite number of discrete regions is
  - Meshing a)
    - Generation b) Division d) Merging
- 5) Many of different categories of different plot can be combined into a single plot called as \_\_\_\_
  - Contour plot a)

- b) Vector plot
- Mesh plot d) Composite plot C)
- Numerical method is used for solution of hyperbolic and parabolic PDE 6) based on finite difference method \_
  - a) Lax-Wendroff technique Relaxation technique b) c)
    - Finite difference technique d) ADI technique
- 7) If the numbers of nodes are M, then the nodal spacing  $\Delta x$  can be calculated by \_\_\_\_
  - a)  $\Delta x = L/M-1$ b)  $\Lambda x = M/L-1$
  - $\Delta x = L/M$ d)  $\Delta x = L/M+1$ C)
- CFD is method to calculate heat transfer and fluid flow 8)
  - Numerically b) Experimentally a)
  - d) None of these Instantaneously C)

Seat No.

SLR-FM-167



Max. Marks: 70

Marks: 14

- Body forces
- d) None of these

- b)

- 9) Discretization technique is \_\_\_\_\_.
  - Finite volume a)

C)

C)

Finite element C)

b) Finite difference

**SLR-FM-167** 

Set | Q

- d) All of these
- 10) Test used to check accuracy of solution is called \_
  - a) Grid independence test c) Optimal test
- b) Solution test d) Aspect test
- The adiabatic heat transfer thermal boundary condition is an example of 11) which type of boundary condition:
  - b) Robin type a) Dirichlet type
    - d) None of the above Neumann type
- The turbulent kinetic energy is representative of velocity fluctuations of 12)
  - a) Large eddies
- b) Small eddies
- Inertial range eddies d) All of the above
- 13) Which of the following statements is true about the MacCormack scheme?
  - It can be used only for incompressible flows a)
  - It can be used for compressible flows b)
  - It can be used only for linear equations c)
  - None of these d)

#### Finite difference method is 14)

- Exact solution method a)
- C) Unique solution method
- b) Approximate solution methodd) None of these

04

05

09

# Seat No. B.E. (Part – II) (CG

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS

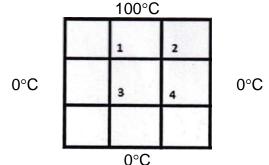
Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from remaining three questions of each section.

- 2) Assume suitable data if necessary.
- 3) Figure to the right indicate full marks.
- 4) Use of non programmable calculator is allowed.

#### Section – I

- Q.2 a) Consider a large plane wall of thickness L=0.4m Thermal Conductivity K=2.5 W/M°C and the left side of the wall is maintained at a constant temperature of 75°C while the right side losses heat by convection to the surrounding air T∞=22°C with a heat transfer and taking the nodal spacing to be 0.1m.
  - 1) Obtain the finite difference formulation for all nodes
  - 2) Determine the nodal temperatures by solving those equations
  - **b)** Consider steady two dimensional heat transfers in a long solid bar of square cross section as shown in the figure. The measured temperatures at selected points of the outer surfaces are as shown. There is no heat generation using the finite difference method with a mesh size of  $\Delta x = \Delta y = 1$  cm determine the temperatures at the indicated points in the medium.



Q.3 a) What is FDM? Explain finite difference schemes with forward.
b) Derive the Navier-stokes equations in non-conservation forms.
05

- c) What are the important applications of CFD in engineering?
- **Q.4** a) Give and explain the three errors in CFD.
  - **b**) Consider a large uranium plate of thickness L=4cm, K=28 W/M°C, &  $\alpha$ =12.5× 10<sup>-6</sup>m<sup>2</sup>/s, that is initially at a uniform temperature of 200°C. Heat is generated uniformly in the plate at a constant rate of (e) =5x 10<sup>6</sup>w/m<sup>3</sup>. At time t =0, one side of the plate is brought into contact with iced water & is maintained at 0°C at all times while the other side is subjected to convection to an environment at T $\infty$  = 30°C with a heat transfer coefficient h =45 w/m<sup>2</sup>°C, as shown in fig. below Considering a total of three equally spaced node in the medium, two at the boundaries & one at, estimate at the middle, estimate the exposed surface temperature of the plate 2.5 min after the start of cooling using the explicit method.

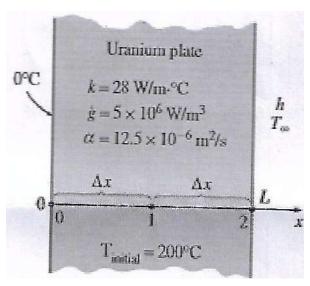
Max. Marks: 56

07

07



**SLR-FM-167** 



## Section – II

| Q.5 | a)<br>b) | What are the advantages of the FVM over FDM method?<br>Consider transient heat conduction in a plane wall with variable heat<br>generation & constant thermal conductivity. The nodal network of the<br>medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform nodal<br>spacing of $\Delta x$ . The wall is initially at specified temperature. Using the | 04<br>06 |
|-----|----------|--|----------|
|     | c)       | energy balance approach, obtain the explicit finite formulation of the boundary nodes for case of uniform heat flux $q_0$ at the left boundary (node 0) and convection at the right boundary (node 7) with a convection coefficient of h and ambient temperature of $T\infty$ .<br>Explain the FVM for one -dimensional steady state diffusion.                      | 04       |
| Q.6 | a)       | What are the types of turbulence models? Explain the K- $\varepsilon$ Models.  | 04       |
|     | b)       | What are the different plots of computer graphics? Explain any two in details  | 05       |
|     | c)       | Explain the Lax-Wendorff techniques.   | 05       |
| Q.7 | a)       | What is Turbulence? Classification of Turbulence.  | 04       |
|     | b)       | Write short note on unstructured grids for viscous flows.  | 05       |
|     | c)       | Explain with diagram SIMPLE algorithm steps of Patankar & Spalding.  | 05       |

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#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS**

Day & Date: Monday, 25-11-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of non programmable calculator is allowed.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

C)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The turbulent kinetic energy is representative of velocity fluctuations of 1)
  - a) Large eddies

- b) Small eddies d) All of the above
- 2) Which of the following statements is true about the MacCormack scheme?
  - It can be used only for incompressible flows a)
  - It can be used for compressible flows b)
  - It can be used only for linear equations c)
  - None of these d)
- Finite difference method is 3)
  - Exact solution method a)

Inertial range eddies

- C) Unique solution method
- Triangular mesh is common in \_ 4)
  - a) Structured mesh
  - c) Dirichlet mesh
- Forces which act directly on volumetric mass of fluid element called 5)
  - a) Fluid forces Body forces b)
  - None of these Direct forces C) d)
- 6) CFD is based on fundamental governing equations of \_\_\_\_\_.
  - b) Energy Continuity a)
  - Momentum d) All of these C)
- 7) Division of physical domain into a finite number of discrete regions is
  - Meshing b) Generation a)
  - Division c)
- Many of different categories of different plot can be combined into a single 8) plot called as \_
  - Contour plot a)
  - c) Mesh plot

b) Vector plot

d) Merging

d) Composite plot

- b) Unstructured mesh
- d) None of these

Marks: 14

SLR-FM-167



- b) Approximate solution method
- - d) None of these



Max. Marks: 70

- 9) Numerical method is used for solution of hyperbolic and parabolic PDE based on finite difference method
  - a) Lax-Wendroff technique
- b) Relaxation technique d) ADI technique
- Finite difference technique C)
- 10) If the numbers of nodes are M, then the nodal spacing  $\Delta x$  can be calculated by
  - a)  $\Delta x = L/M-1$ b)  $\Delta x = M/L-1$
  - $\Delta x = L/M$ d)  $\Delta x = L/M+1$ C)
- CFD is method to calculate heat transfer and fluid flow \_\_\_\_\_. 11)
  - Numerically a)

C)

- Instantaneously
- Discretization technique is \_\_\_\_\_. 12)
  - Finite volume a)
  - Finite element C)
- 13) Test used to check accuracy of solution is called \_\_\_\_\_
  - Grid independence test b) Solution test a)
  - C) Optimal test
- The adiabatic heat transfer thermal boundary condition is an example of 14) which type of boundary condition: \_\_\_\_\_
  - Dirichlet type a)
  - Neumann type c)

- b) Robin type
- d) None of the above



- b) Finite difference d) All of these

- \_.
- d) Aspect test

- - - b) Experimentally
    - d) None of these

## at \_\_\_\_\_\_ . \_\_\_\_\_ B.E. (Part – III) (C.G.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

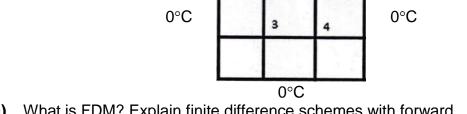
Instructions: 1) Solve any two questions from remaining three questions of each section.

- 2) Assume suitable data if necessary.
- 3) Figure to the right indicate full marks.4) Use of non programmable calculator is allowed.
  - Section I
- Q.2 a) Consider a large plane wall of thickness L=0.4m Thermal Conductivity K=2.5 W/M°C and the left side of the wall is maintained at a constant temperature of 75°C while the right side losses heat by convection to the surrounding air T∞=22°C with a heat transfer and taking the nodal spacing to be 0.1m.
  - 1) Obtain the finite difference formulation for all nodes
  - 2) Determine the nodal temperatures by solving those equations
  - **b)** Consider steady two dimensional heat transfers in a long solid bar of square cross section as shown in the figure. The measured temperatures at selected points of the outer surfaces are as shown. There is no heat generation using the finite difference method with a mesh size of  $\Delta x = \Delta y = 1$  cm determine the temperatures at the indicated points in the medium.

1

100°C

2



- Q.3 a) What is FDM? Explain finite difference schemes with forward.
   b) Derive the Navier-stokes equations in non-conservation forms.
   05
  - c) What are the important applications of CFD in engineering?
- **Q.4** a) Give and explain the three errors in CFD.
  - **b)** Consider a large uranium plate of thickness L=4cm, K=28 W/M°C, &  $\alpha$ =12.5× 10<sup>-6</sup>m<sup>2</sup>/s, that is initially at a uniform temperature of 200°C. Heat is generated uniformly in the plate at a constant rate of (e) =5x 10<sup>6</sup>w/m<sup>3</sup>. At time t =0, one side of the plate is brought into contact with iced water & is maintained at 0°C at all times while the other side is subjected to convection to an environment at T $\infty$  = 30°C with a heat transfer coefficient h =45 w/m<sup>2</sup>°C, as shown in fig. below Considering a total of three equally spaced node in the medium, two at the boundaries & one at, estimate at the middle, estimate the exposed surface temperature of the plate 2.5 min after the start of cooling using the explicit method.

Max. Marks: 56

07

04

05

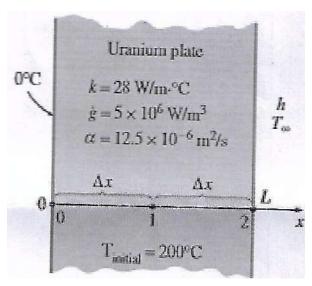
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**SLR-FM-167** 

Seat No.



## Section – II

| generation & constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform nod spacing of $\Delta x$ . The wall is initially at specified temperature. Using the energy balance approach, obtain the explicit finite formulation of the boundary nodes for case of uniform heat flux q <sub>o</sub> at the left boundary (0) and convection at the right boundary (node 7) with a convection |                | Consider transient heat conduction in a plane wall with variable heat generation & constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform nodal spacing of $\Delta x$ . The wall is initially at specified temperature. Using the energy balance approach, obtain the explicit finite formulation of the boundary nodes for case of uniform heat flux q <sub>0</sub> at the left boundary (node 0) and convection at the right boundary (node 7) with a convection coefficient of h and ambient temperature of T $\infty$ . |                |
|--|----------------|--|----------------|
|  | c)             | Explain the FVM for one -dimensional steady state diffusion.   | 04             |
| Q.6  | a)<br>b)       | What are the types of turbulence models? Explain the K- $\varepsilon$ Models.<br>What are the different plots of computer graphics? Explain any two in details   | 04<br>05       |
|  | C)             | Explain the Lax-Wendorff techniques.   | 05             |
| Q.7  | a)<br>b)<br>c) | What is Turbulence? Classification of Turbulence.<br>Write short note on unstructured grids for viscous flows.<br>Explain with diagram SIMPLE algorithm steps of Patankar & Spalding.  | 04<br>05<br>05 |

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## B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering COMPUTATIONAL FLUID DYNAMICS**

Day & Date: Monday, 25-11-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of non programmable calculator is allowed.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- CFD is based on fundamental governing equations of \_\_\_\_\_. 1) a) Continuity b) Energy
  - C) Momentum d) All of these
- 2) Division of physical domain into a finite number of discrete regions is
  - a) Meshina

c)

C)

Division

- 3) Many of different categories of different plot can be combined into a single plot called as
  - Contour plot a)
  - b) Vector plot d) Composite plot Mesh plot c)
- Numerical method is used for solution of hyperbolic and parabolic PDE 4) based on finite difference method
  - a) Lax-Wendroff technique

Finite difference technique

- 5) If the numbers of nodes are M, then the nodal spacing  $\Delta x$  can be
  - calculated by \_ a)  $\Delta x = L/M-1$ b)  $\Delta x = M/L-1$ 
    - $\Delta x = L/M$ d)  $\Delta x = L/M+1$ C)
- 6) CFD is method to calculate heat transfer and fluid flow
  - Numerically b) Experimentally a) d) None of these
  - Instantaneously C)
- Discretization technique is \_\_\_\_\_ 7)
  - Finite volume b) Finite difference a) d) All of these
  - c) Finite element
- 8) Test used to check accuracy of solution is called \_\_\_\_\_
  - Grid independence test b) Solution test a) C) Optimal test d) Aspect test



b) Relaxation technique

d) ADI technique

- b) Generation
- d) Merging

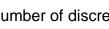


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Max. Marks: 70

Marks: 14

SLR-FM-167





- 9) The adiabatic heat transfer thermal boundary condition is an example of which type of boundary condition: \_\_\_\_
  - a) Dirichlet type C)

- b) Robin type d) None of the above
- Neumann type
- The turbulent kinetic energy is representative of velocity fluctuations of 10)
  - Large eddies a)
    - b) Small eddies
  - Inertial range eddies d) All of the above C)
- 11) Which of the following statements is true about the MacCormack scheme?
  - It can be used only for incompressible flows a)
  - It can be used for compressible flows b)
  - It can be used only for linear equations c)
  - None of these d)
- Finite difference method is 12)
  - a) Exact solution method
  - Unique solution method C)
- 13) Triangular mesh is common in \_\_\_\_
  - Structured mesh a)
  - Dirichlet mesh c)
- b) Unstructured mesh
- Forces which act directly on volumetric mass of fluid element called 14)
  - Fluid forces a)
  - Direct forces C)

- b) Body forces
- d) None of these

# **SLR-FM-167** Set S

d) None of these

b) Approximate solution method

- d) None of these

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

COMPUTATIONAL FLUID DYNAMICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

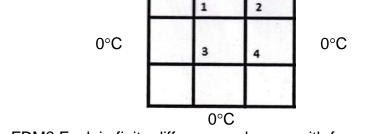
**Instructions:** 1) Solve any two questions from remaining three questions of each section.

- 2) Assume suitable data if necessary.
- 3) Figure to the right indicate full marks.4) Use of non programmable calculator is allowed.

#### Section – I

- Q.2 a) Consider a large plane wall of thickness L=0.4m Thermal Conductivity K=2.5 W/M°C and the left side of the wall is maintained at a constant temperature of 75°C while the right side losses heat by convection to the surrounding air T∞=22°C with a heat transfer and taking the nodal spacing to be 0.1m.
  - 1) Obtain the finite difference formulation for all nodes
  - 2) Determine the nodal temperatures by solving those equations
  - **b)** Consider steady two dimensional heat transfers in a long solid bar of square cross section as shown in the figure. The measured temperatures at selected points of the outer surfaces are as shown. There is no heat generation using the finite difference method with a mesh size of  $\Delta x = \Delta y = 1$  cm determine the temperatures at the indicated points in the medium.

100°C



Q.3 a) What is FDM? Explain finite difference schemes with forward.
b) Derive the Navier-stokes equations in non-conservation forms.
05

- c) What are the important applications of CFD in engineering?
- **Q.4** a) Give and explain the three errors in CFD.
  - **b**) Consider a large uranium plate of thickness L=4cm, K=28 W/M°C, &  $\alpha$ =12.5× 10<sup>-6</sup>m<sup>2</sup>/s, that is initially at a uniform temperature of 200°C. Heat is generated uniformly in the plate at a constant rate of (e) =5x 10<sup>6</sup>w/m<sup>3</sup>. At time t =0, one side of the plate is brought into contact with iced water & is maintained at 0°C at all times while the other side is subjected to convection to an environment at T $\infty$  = 30°C with a heat transfer coefficient h =45 w/m<sup>2</sup>°C, as shown in fig. below Considering a total of three equally spaced node in the medium, two at the boundaries & one at, estimate at the middle, estimate the exposed surface temperature of the plate 2.5 min after the start of cooling using the explicit method.



07

07

04

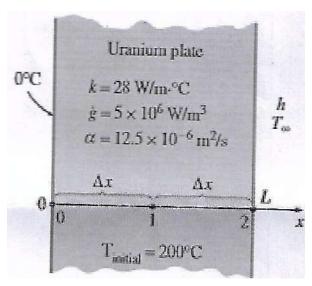
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09

**SLR-FM-167** 

Seat

No.



## Section – II

| generation & constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform nod spacing of $\Delta x$ . The wall is initially at specified temperature. Using the energy balance approach, obtain the explicit finite formulation of the boundary nodes for case of uniform heat flux q <sub>o</sub> at the left boundary (0) and convection at the right boundary (node 7) with a convection |                | Consider transient heat conduction in a plane wall with variable heat generation & constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5, 6 and 7 with a uniform nodal spacing of $\Delta x$ . The wall is initially at specified temperature. Using the energy balance approach, obtain the explicit finite formulation of the boundary nodes for case of uniform heat flux q <sub>0</sub> at the left boundary (node 0) and convection at the right boundary (node 7) with a convection coefficient of h and ambient temperature of T $\infty$ . | 04<br>06       |
|--|----------------|--|----------------|
|  | c)             | Explain the FVM for one -dimensional steady state diffusion.   | 04             |
| Q.6  | a)<br>b)       | What are the types of turbulence models? Explain the K- $\varepsilon$ Models.<br>What are the different plots of computer graphics? Explain any two in details   | 04<br>05       |
|  | C)             | Explain the Lax-Wendorff techniques.   | 05             |
| Q.7  | a)<br>b)<br>c) | What is Turbulence? Classification of Turbulence.<br>Write short note on unstructured grids for viscous flows.<br>Explain with diagram SIMPLE algorithm steps of Patankar & Spalding.  | 04<br>05<br>05 |

**SLR-FM-167** 

Set S

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

## **PRODUCTION AND OPERATION MANAGEMENT**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

#### Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.

- 2) Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 1)

- Highly skilled labor is required in \_\_\_\_\_. Batch production a)
  - b) Job production
- C) Mass production d) Both a and c
- 2) In weighted average method the highest weightage is given to \_\_\_\_\_.
  - Latest Period a)
  - First Period b)
  - Intermediate period c)
  - d) Equal weightage is given to all periods
- 3) The time taken for machine set up and adjustments is termed as \_\_\_\_\_.
  - Lead time b) Nonproductive time a)
  - C) Down time d) Idle time
- Expediting in production planning and control is \_\_\_\_\_. 4)
  - a) Time table of production
  - b) Assessing the performance
  - Authorizing the start of production c)
  - Follow up and keeping records d)
- Six sigma quality level is achieved when, quality PPM level is \_\_\_\_\_. 5) a)
  - below 3.4 b) above 3.4
  - below 6.8 d) equal to 6.8 c)
- Lubricating the machine parts while machine is being operated, is termed 6) as
  - Breakdown maintenance b) Shut down maintenance a) d) Productive maintenance
    - Running maintenance C)
- 7) Aggregate planning is done for \_\_\_\_\_ periods.
  - a) Medium term b) Short term c) Long Term d) Medium and Long term
- 8) Preparation of manufacturing orders is a function of \_\_\_\_\_.
  - Scheduling a)
  - Dispatching C)

Shortage Cost

a) c)

- b) Routing
- d) Both a and b
- 9) Cost of handling the inventory on shop floor will come under \_\_\_\_\_ Ordering Cost
  - b) Carrying Cost
    - d) Transportation Cost

SLR-FM-168



Marks: 14

Max. Marks: 70

**SLR-FM-168** Set P 10) Visual cards are used in \_\_\_\_\_. Kaizen a) b) Kanban Six Sigma d) 5S C) In ABC analysis A type of items are 11) a) high cost and high usage b) high cost and low usage C) low cost and high usage d) low cost and low usage 12) Scheduled maintenance is part of \_\_\_\_ b) Corrective maintenance a) Predictive maintenance Preventive maintenance d) Emergency maintenance C) Value of the Coefficient of correlation varies between \_\_\_\_\_. 13) 0 to 1 b) 0 to 0.5 a) 0.5 to 1 d) -1 to 1 c) \_.

- 14) Short term capacity planning is done for \_\_\_\_
  - more than six months a) C) less than six months
- b) for six months to one year
- d) more than one year

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

## PRODUCTION AND OPERATION MANAGEMENT

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicates full marks.

#### Section – I

- Q.2 Explain the mass production systems. Give suitable exam of the mass 07 a) production system. Enlist the advantages and disadvantages of mass production system b) Evaluate the forecast for the year 2016 and 2017 using least square 07 technique with respect below sales data 2011 2012 2013 Year 2014 2015 79 Sale 88 82 90 86 Sale is in thousands. Q.3 Explain the objectives and functions of Production Planning and Control. 07 a) Explain the following terms with proper example - Design Capacity, Rated b) 07 Capacity, Installed Capacity, Licensed Capacity and System Capacity Explain the loading, scheduling and sequencing in brief. 07 Q.4 a) Explain the factors affecting the effective capacity. 07 b) Section – II Q.5 Explain the EOQ model with instantaneous stock replenishment. State the a) 07 assumption and derive expression for EOQ. A company is consuming the 10,000 units of a product per year. The 07 b) product has the cost of Rs.2 per unit. It takes Rs.50 to place an order for product. The inventory storage cost is about 8%. Calculate the economic order quantity. Number of orders to be placed in one year. Time between two orders and total minimum cost of inventory. Q.6 Explain the various development stages of TPM. 07 a) Explain the various reasons for the unnecessary cost. 07 b) Q.7 Explain the concept of six sigma and steps to achieve the six sigma quality 07 a) level.
  - b) Explain the different types of the maintenance with suitable example. 07

SLR-FM-168

Set P

Max. Marks: 56

B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** 

**PRODUCTION AND OPERATION MANAGEMENT** 

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

#### Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.

- 2) Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.
- 3) Figures to the right indicate full marks.

#### MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- Preparation of manufacturing orders is a function of \_\_\_\_\_. 1) b) Routing
  - a) Scheduling
    - C) Dispatching d) Both a and b
  - 2) Cost of handling the inventory on shop floor will come under \_\_\_\_\_. b) Carrying Cost
    - a) Ordering Cost
    - Shortage Cost c)
  - Visual cards are used in . 3)
    - a) Kaizen b) Kanban d) 5S
    - Six Sigma C)
  - In ABC analysis A type of items are \_ 4)
    - high cost and high usage b) high cost and low usage a)
    - low cost and high usage d) low cost and low usage C)

Scheduled maintenance is part of \_\_\_\_ 5)

- Predictive maintenance b) Corrective maintenance a) Preventive maintenance d) Emergency maintenance c)
- Value of the Coefficient of correlation varies between \_\_\_\_\_. 6)
  - 0 to 1 b) 0 to 0.5 a)
  - C) 0.5 to 1 d) -1 to 1

7) Short term capacity planning is done for \_\_\_\_ more than six months

b) for six months to one year

d) Transportation Cost

less than six months d) more than one year C)

8) Highly skilled labor is required in \_\_\_\_

- Batch production b) Job production a)
- Mass production d) Both a and c c)
- In weighted average method the highest weightage is given to \_\_\_\_\_. 9)
  - Latest Period a)
  - First Period b)

a)

- Intermediate period c)
- d) Equal weightage is given to all periods

Seat No.



Max. Marks: 70

Marks: 14



- 10) The time taken for machine set up and adjustments is termed as .
  - a) Lead time

b) Nonproductive time

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Set | Q

C) Down time

- d) Idle time
- 11) Expediting in production planning and control is .
  - Time table of production a)
  - b) Assessing the performance
  - Authorizing the start of production c)
  - Follow up and keeping records d)
- Six sigma quality level is achieved when, quality PPM level is \_\_\_\_\_. 12)
  - below 3.4 b) above 3.4 a)
  - below 6.8 d) equal to 6.8 C)
- 13) Lubricating the machine parts while machine is being operated, is termed as
  - Breakdown maintenance a)
  - C) Running maintenance
- b) Shut down maintenance d) Productive maintenance
- Aggregate planning is done for \_\_\_\_\_ periods. 14)
  - Medium term a)
  - Long Term C)

- b) Short term
- d) Medium and Long term

#### **SLR-FM-168**

Max. Marks: 56

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering PRODUCTION AND OPERATION MANAGEMENT**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Seat No.

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicates full marks.

#### Section – I

- Explain the mass production systems. Give suitable exam of the mass 07 Q.2 a) production system. Enlist the advantages and disadvantages of mass production system
  - b) Evaluate the forecast for the year 2016 and 2017 using least square technique with respect below sales data

| Year                 | 2011 | 2012 | 2013 | 2014 | 2015 |
|----------------------|------|------|------|------|------|
| Sale                 | 88   | 79   | 82   | 90   | 86   |
| Salo is in thousands |      |      |      |      |      |

Sale is in thousands.

Q.3 a) Explain the objectives and functions of Production Planning and Control. 07 Explain the following terms with proper example - Design Capacity, Rated 07 b) Capacity, Installed Capacity, Licensed Capacity and System Capacity Explain the loading, scheduling and sequencing in brief. 07 Q.4 a) b) Explain the factors affecting the effective capacity. 07 Section – II a) Q.5 Explain the EOQ model with instantaneous stock replenishment. State the 07 assumption and derive expression for EOQ. A company is consuming the 10,000 units of a product per year. The 07 b) product has the cost of Rs.2 per unit. It takes Rs.50 to place an order for product. The inventory storage cost is about 8%. Calculate the economic order quantity. Number of orders to be placed in one year. Time between two orders and total minimum cost of inventory. Explain the various development stages of TPM. 07 Q.6 a) Explain the various reasons for the unnecessary cost. 07 b) Q.7 a) Explain the concept of six sigma and steps to achieve the six sigma guality 07 level. **b)** Explain the different types of the maintenance with suitable example. 07

07

SLR-FM-168

Set

Max. Marks: 70

Marks: 14

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering PRODUCTION AND OPERATION MANAGEMENT**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

#### Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.

- 2) Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- Six sigma quality level is achieved when, quality PPM level is \_\_\_\_\_. 1)
  - a) below 3.4 b) above 3.4
  - below 6.8 c) d) equal to 6.8
- Lubricating the machine parts while machine is being operated, is termed 2) as
  - a) Breakdown maintenance
  - C) Running maintenance
- 3) Aggregate planning is done for \_\_\_\_\_ periods. b) Short term
  - Medium term a)
  - Long Term d) Medium and Long term c)
- 4) Preparation of manufacturing orders is a function of
  - a) Scheduling b) Routing
  - Dispatching c)
- Cost of handling the inventory on shop floor will come under \_\_\_\_\_. 5)
  - a) Ordering Cost
  - Shortage Cost C)
- 6) Visual cards are used in \_\_\_\_\_.
  - a) Kaizen
  - d) 5S c) Six Sigma
- 7) In ABC analysis A type of items are \_
  - high cost and high usage a)
  - C) low cost and high usage
- Scheduled maintenance is part of \_\_\_\_ 8)
  - b) Corrective maintenance Predictive maintenance a) d) Emergency maintenance
  - Preventive maintenance c)
- 9) Value of the Coefficient of correlation varies between \_\_\_\_\_. b) 0 to 0.5
  - a) 0 to 1
  - 0.5 to 1 d) -1 to 1 c)

- d) Both a and b
- b) Carrying Cost
- d) Transportation Cost

b) high cost and low usage

d) low cost and low usage

b) Shut down maintenance

d) Productive maintenance

- b) Kanban





**SLR-FM-168** Set | R 10) Short term capacity planning is done for \_\_\_\_\_. more than six months b) for six months to one year a) less than six months d) more than one year C) 11) Highly skilled labor is required in \_\_\_\_ b) Job production Batch production a) C) Mass production d) Both a and c In weighted average method the highest weightage is given to \_\_\_\_\_. 12) a) Latest Period First Period b) Intermediate period c) Equal weightage is given to all periods d) 13) The time taken for machine set up and adjustments is termed as \_\_\_\_\_. a) Lead time b) Nonproductive time Down time d) Idle time c) 14) Expediting in production planning and control is \_\_\_\_\_. Time table of production a) Assessing the performance b)

- c) Authorizing the start of production
- d) Follow up and keeping records

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

## PRODUCTION AND OPERATION MANAGEMENT

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicates full marks.

#### Section – I

- Q.2 Explain the mass production systems. Give suitable exam of the mass 07 a) production system. Enlist the advantages and disadvantages of mass production system b) Evaluate the forecast for the year 2016 and 2017 using least square 07 technique with respect below sales data 2011 2012 2013 Year 2014 2015 79 Sale 88 82 90 86 Sale is in thousands. Q.3 Explain the objectives and functions of Production Planning and Control. 07 a) Explain the following terms with proper example - Design Capacity, Rated b) 07 Capacity, Installed Capacity, Licensed Capacity and System Capacity Explain the loading, scheduling and sequencing in brief. 07 Q.4 a) Explain the factors affecting the effective capacity. 07 b) Section – II Q.5 Explain the EOQ model with instantaneous stock replenishment. State the a) 07 assumption and derive expression for EOQ. A company is consuming the 10,000 units of a product per year. The 07 b) product has the cost of Rs.2 per unit. It takes Rs.50 to place an order for product. The inventory storage cost is about 8%. Calculate the economic order quantity. Number of orders to be placed in one year. Time between two orders and total minimum cost of inventory. Q.6 Explain the various development stages of TPM. 07 a) Explain the various reasons for the unnecessary cost. 07 b) Q.7 Explain the concept of six sigma and steps to achieve the six sigma quality 07 a) level.
  - b) Explain the different types of the maintenance with suitable example. 07

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Max. Marks: 56

## B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering PRODUCTION AND OPERATION MANAGEMENT**

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

#### Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.

- 2) Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.
- 3) Figures to the right indicate full marks.

## MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

1)

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - Visual cards are used in \_\_\_\_\_.
  - a) Kaizen

a)

c) Six Sigma d) 5S

#### In ABC analysis A type of items are \_ 2)

- a) high cost and high usage b) high cost and low usage d) low cost and low usage
- low cost and high usage c)
- Scheduled maintenance is part of \_\_\_\_ 3)
  - Predictive maintenance b) Corrective maintenance d) Emergency maintenance
  - Preventive maintenance C)

Value of the Coefficient of correlation varies between \_\_\_\_\_. 4)

- 0 to 1 b) 0 to 0.5 a)
- d) -1 to 1 C) 0.5 to 1

5) Short term capacity planning is done for \_\_\_\_

- more than six months b) for six months to one year a)
- less than six months d) more than one year C)

#### Highly skilled labor is required in \_\_\_\_\_. 6)

- Batch production b) Job production a) C)
  - Mass production d) Both a and c

7) In weighted average method the highest weightage is given to \_\_\_\_\_.

- a) Latest Period
- **First Period** b)
- Intermediate period C)
- d) Equal weightage is given to all periods
- 8) The time taken for machine set up and adjustments is termed as \_\_\_\_\_.
  - b) Nonproductive time Lead time a)
  - Down time d) Idle time C)

#### Expediting in production planning and control is \_\_\_\_\_. 9)

- Time table of production a)
- Assessing the performance b)
- Authorizing the start of production C)
- Follow up and keeping records d)

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Max. Marks: 70

Marks: 14

- b) Kanban

- 10) Six sigma quality level is achieved when, quality PPM level is .
  - below 3.4 a)
- b) above 3.4
- below 6.8 C)
- d) equal to 6.8
- 11) Lubricating the machine parts while machine is being operated, is termed as \_\_
  - a) Breakdown maintenance
  - Running maintenance C)
- b) Shut down maintenance

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Set S

- d) Productive maintenance
- 12) Aggregate planning is done for \_\_\_\_\_ periods.
  - Medium term a)

C)

a)

- b) Short term
- Long Term Medium and Long term d)
- 13) Preparation of manufacturing orders is a function of \_\_\_\_\_.
  - Scheduling a) C) Dispatching
- b) Routing d) Both a and b
- Cost of handling the inventory on shop floor will come under \_\_\_\_\_. 14)
  - b) Carrying Cost
  - Ordering Cost Shortage Cost c)
- d) Transportation Cost

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

## PRODUCTION AND OPERATION MANAGEMENT

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicates full marks.

#### Section – I

- Q.2 Explain the mass production systems. Give suitable exam of the mass 07 a) production system. Enlist the advantages and disadvantages of mass production system b) Evaluate the forecast for the year 2016 and 2017 using least square 07 technique with respect below sales data 2011 2012 2013 Year 2014 2015 79 Sale 88 82 90 86 Sale is in thousands. Q.3 Explain the objectives and functions of Production Planning and Control. 07 a) Explain the following terms with proper example - Design Capacity, Rated b) 07 Capacity, Installed Capacity, Licensed Capacity and System Capacity Explain the loading, scheduling and sequencing in brief. 07 Q.4 a) Explain the factors affecting the effective capacity. 07 b) Section – II Q.5 Explain the EOQ model with instantaneous stock replenishment. State the a) 07 assumption and derive expression for EOQ. A company is consuming the 10,000 units of a product per year. The 07 b) product has the cost of Rs.2 per unit. It takes Rs.50 to place an order for product. The inventory storage cost is about 8%. Calculate the economic order quantity. Number of orders to be placed in one year. Time between two orders and total minimum cost of inventory. Q.6 Explain the various development stages of TPM. 07 a) Explain the various reasons for the unnecessary cost. 07 b) Q.7 Explain the concept of six sigma and steps to achieve the six sigma quality 07 a) level.
  - b) Explain the different types of the maintenance with suitable example. 07

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Set

Max. Marks: 56

# Seat

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Make suitable assumptions, if necessary and mention them clearly.

d)

ii)

Weeders

- Figures to the right indicate full mark.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The main function of a \_\_\_\_\_ is to break the liquid into droplets of effective size and distribute them uniformly over the plant.
  - a) Drip irrigation b) Duster
  - Flame thrower c) Sprayer d)
- 2) \_ is the main purpose of puddling.
  - To reduce leaching of water a)
  - To reduce evaporation C)
- 3) The main advantages of using long handle weeder is Cheaper cost of weeder b)
  - Less area of coverage a)
  - Less drudgery of operator C)
- A perfect seeding gives 4)
  - Correct amount of seed per unit area i)
  - Correct depth at which seed is placed in the soil ii)
  - Correct spacing between row-to-row and plant-to-plant iii)
  - only i only ii a) b)
  - i and iii all of the above C) d)
- 5) Seed drill equipment is used for \_\_\_\_
  - Harvesting b) Ploughing a)
  - Sowing d) Threshing C)
- Seed metering mechanism is mainly used for . 6)
  - Supporting the parts of seed drill a)
  - Opening the furrows b)
  - Covering the soil on the seed c)
  - Delivers the seeds at selected rate d)
- 7) Interculture equipments are \_\_\_\_\_
  - Cultivator i)
  - iii) Rotary hoe iv) Thresher
  - only i b) i, ii and iii a)
  - only ii all of these C) d)

Max. Marks: 70

Set

**SLR-FM-170** 

Marks: 14



- b) To reduce transpiration
- None of the above d)

Tradition tool

 The angle made by a disc of disc plough with the direction of motion is known as \_\_\_\_\_.

- a) Tilt angle b)
  - b) Plough angled) None of these

**SLR-FM-170** 

Set

- c) Disc angled) None ofMain function of Interculture equipment is \_\_\_\_\_.
  - a) To destroy weed

9)

- b) To supply water to the plants
- c) Protect the plant from high heat of sun
- d) None of these
- 10) The operation performed to open up any cultivated land with a view to prepare seedbed for growing crops is termed as \_\_\_\_\_.
  - a) Secondary tillage b) Primary tillage
  - c) pulverization d) harvesting
- 11) Combine Harvester is a machine designed for \_\_\_\_\_.
  - a) Only Harvesting
  - b) Harvesting, Threshing, Separating, Cleaning
  - c) Cutting and Threshing
  - d) Only Cutting
- 12) Accessories of Mouldboard plough are \_\_\_\_\_.
  - a) beam and frame, standards, coulter, landside, cross shaft
  - b) Coulter, Jointer, wheel, frame and beam, cross shaft
  - c) Wheel, standards, scraper, cross shaft, frog
  - d) Frame and beam, standards, scraper, cross shaft, frog
- 13) Secondary tillage operation is \_\_\_\_
  - a) Heavier operation than primary tillage operation
  - b) Lighter or finer operation than primary tillage operation
  - c) Same as primary tillage operation
  - d) Same or less as primary tillage operation
- 14) Function of star wheel of reaper \_\_\_\_\_.
  - a) Cutting the crops
  - b) Guiding the crops toward the cutter bar
  - c) Provide supports to the crops
  - d) Blocking the crops

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| No.  |          |  |
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#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to right indicate full marks.
- 3) Make suitable assumption if necessary and state it clearly.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

#### Section – I

| Q.2 | Sol                    | ve the following.  |                |  |  |  |  |
|-----|------------------------|--|----------------|--|--|--|--|
|     | a)<br>b)<br>c)         | Explain how to select Disc harrow.<br>Explain various types of Mould Board plough.<br>What is meant by tillage? What is the objective tillage?   | 05<br>04<br>05 |  |  |  |  |
| Q.3 | Sol <sup>v</sup><br>a) | ve the following.<br>Write a short note on force acting on tillage tool and their measurement.   | 05             |  |  |  |  |
|     | b)<br>c)               | Explain construction features of Disc harrow with neat labeled diagram.<br>Explain Virtual and real hitching for single points.  | 05<br>04       |  |  |  |  |
| Q.4 | Sol                    | ve the following.  |                |  |  |  |  |
|     | a)<br>b)               | <ul> <li>Write a short note on Force acting on disc harrow and there analysis.</li> <li>Write a short note on.</li> <li>1) Rotavators</li> <li>2) Subsoiler</li> <li>3) Paddypuddler</li> </ul>  | 04<br>05       |  |  |  |  |
|     | c)                     | Explain single axis and double axis hitch implements.  | 05             |  |  |  |  |
|     |                        | Section – II   |                |  |  |  |  |
| Q.5 | Solve the following.   |  |                |  |  |  |  |
|     | a)<br>b)<br>c)         | <ul> <li>Explain construction and working of seed drill.</li> <li>The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data-</li> <li>1) no. of furrow openers = 10</li> <li>2) Spacing between furrow = 20 cm</li> <li>3) Diameter of drive wheel = 1.5 m</li> <li>4) rpm = 500</li> <li>5) Seed collected = 20 kg.</li> <li>What are different types of Weeders? Explain in brief.</li> </ul> | 05<br>04<br>05 |  |  |  |  |
| Q.6 |                        | ve the following.  |                |  |  |  |  |
|     | a)<br>b)               | Explain construction and working of seed cum fertilizer drill.<br>Explain different types mowers.  | 05<br>05       |  |  |  |  |
|     | c)                     | Explain how to select Plant protection equipment's.  | 04             |  |  |  |  |
| Q.7 | Sol                    | ve the following.  |                |  |  |  |  |
|     | a)                     | Explain different types Threshers in brief.  | 04             |  |  |  |  |
|     | b)                     | Write a short note on furrow opening unit.   | 05             |  |  |  |  |
|     | C)                     | Write a short note on covering devices of seed drill   | 05             |  |  |  |  |

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Max. Marks: 56

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

**Mechanical Engineering** AGRO MACHINE ENGINEERING

- 2) Make suitable assumptions, if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - The angle made by a disc of disc plough with the direction of motion is 1) known as
    - a) Tilt angle
    - b) Plough angle c) Disc angle d) None of these
  - 2) Main function of Interculture equipment is \_\_\_\_\_.
    - To destroy weed a)
    - b) To supply water to the plants
    - c) Protect the plant from high heat of sun
    - d) None of these
  - The operation performed to open up any cultivated land with a view to 3) prepare seedbed for growing crops is termed as \_
    - Secondary tillage Primary tillage a) b)
    - pulverization c) d) harvesting
  - 4) Combine Harvester is a machine designed for .
    - Only Harvesting a)
    - Harvesting, Threshing, Separating, Cleaning b)
    - Cutting and Threshing c)
    - Only Cutting d)
  - 5) Accessories of Mouldboard plough are
    - beam and frame, standards, coulter, landside, cross shaft a)
    - b) Coulter, Jointer, wheel, frame and beam, cross shaft
    - Wheel, standards, scraper, cross shaft, frog C)
    - Frame and beam, standards, scraper, cross shaft, frog d)
  - 6) Secondary tillage operation is
    - Heavier operation than primary tillage operation a)
    - Lighter or finer operation than primary tillage operation b)
    - Same as primary tillage operation c)
    - Same or less as primary tillage operation d)

Max. Marks: 70

Marks: 14

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7) Function of star wheel of reaper . Cutting the crops a) Guiding the crops toward the cutter bar b) Provide supports to the crops C) Blocking the crops d) The main function of a \_\_\_\_\_ is to break the liquid into droplets of effective 8) size and distribute them uniformly over the plant. Drip irrigation a) b) Duster Sprayer Flame thrower C) d) 9) \_ is the main purpose of puddling. To reduce leaching of water b) To reduce transpiration a) To reduce evaporation d) None of the above C) 10) The main advantages of using long handle weeder is \_\_\_\_\_. Less area of coverage a) b) Cheaper cost of weeder Less drudgery of operator d) Tradition tool C) 11) A perfect seeding gives \_ Correct amount of seed per unit area i) ii) Correct depth at which seed is placed in the soil Correct spacing between row-to-row and plant-to-plant iii) only ii a) only i b) i and iii d) all of the above C) 12) Seed drill equipment is used for \_\_\_\_\_. Harvesting b) Ploughing a) Sowing Threshing C) d) 13) Seed metering mechanism is mainly used for . Supporting the parts of seed drill a) Opening the furrows b) Covering the soil on the seed C) Delivers the seeds at selected rate d) 14) Interculture equipments are . Cultivator ii) Weeders i) iii) Rotary hoe iv) Thresher onlv i b) i. ii and iii a) all of these only ii d) c)

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#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to right indicate full marks.
- 3) Make suitable assumption if necessary and state it clearly.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

#### Section – I

| Q.2 | Sol                                | ve the following.   |                |
|-----|------------------------------------|---|----------------|
|     | a)<br>b)<br>c)                     | Explain how to select Disc harrow.<br>Explain various types of Mould Board plough.<br>What is meant by tillage? What is the objective tillage?  | 05<br>04<br>05 |
| Q.3 | Sol <sup>y</sup><br>a)<br>b)<br>c) | <b>ve the following.</b><br>Write a short note on force acting on tillage tool and their measurement.<br>Explain construction features of Disc harrow with neat labeled diagram.<br>Explain Virtual and real hitching for single points.  | 05<br>05<br>04 |
| Q.4 | Sol <sup>v</sup><br>a)<br>b)<br>c) | <ul> <li>ve the following.</li> <li>Write a short note on Force acting on disc harrow and there analysis.</li> <li>Write a short note on.</li> <li>1) Rotavators</li> <li>2) Subsoiler</li> <li>3) Paddypuddler</li> <li>Explain single axis and double axis hitch implements.</li> </ul>   | 04<br>05<br>05 |
|     | 0)                                 | Section – II  | 00             |
| Q.5 | a)<br>b)<br>c)                     | <ul> <li>ve the following.</li> <li>Explain construction and working of seed drill.</li> <li>The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data-</li> <li>1) no. of furrow openers = 10</li> <li>2) Spacing between furrow = 20 cm</li> <li>3) Diameter of drive wheel = 1.5 m</li> <li>4) rpm = 500</li> <li>5) Seed collected = 20 kg.</li> <li>What are different types of Weeders? Explain in brief.</li> </ul> | 05<br>04<br>05 |
| Q.6 | Sol <sup>v</sup><br>a)<br>b)<br>c) | <b>ve the following.</b><br>Explain construction and working of seed cum fertilizer drill.<br>Explain different types mowers.<br>Explain how to select Plant protection equipment's.  | 05<br>05<br>04 |
| Q.7 | Sol <sup>r</sup><br>a)<br>b)<br>c) | <b>ve the following.</b><br>Explain different types Threshers in brief.<br>Write a short note on furrow opening unit.<br>Write a short note on covering devices of seed drill   | 04<br>05<br>05 |

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Set Q

Max. Marks: 56

Seat No.

## Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Make suitable assumptions, if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - 1) Seed drill equipment is used for
    - Ploughing Harvesting b) a)
    - Sowing d) Threshing C)
  - 2) Seed metering mechanism is mainly used for \_\_\_\_\_.
    - Supporting the parts of seed drill a)
    - Opening the furrows b)
    - Covering the soil on the seed c)
    - Delivers the seeds at selected rate d)
  - Interculture equipments are \_\_\_\_ 3)
    - Cultivator i)
    - iii) Rotary hoe iv) Thresher
    - a) only i
    - i. ii and iii b) only ii all of these C) d)
  - 4) The angle made by a disc of disc plough with the direction of motion is known as

ii)

Weeders

- Tilt angle a) b) Plough angle
- None of these Disc angle d) C)
- 5) Main function of Interculture equipment is .
  - To destroy weed a)
  - To supply water to the plants b)
  - Protect the plant from high heat of sun C)
  - None of these d)
- 6) The operation performed to open up any cultivated land with a view to prepare seedbed for growing crops is termed as \_\_\_\_\_.
  - Secondary tillage Primary tillage a) b)
  - C) pulverization d) harvesting

Max. Marks: 70

Marks: 14

Set R

# **SLR-FM-170**

- 7) Combine Harvester is a machine designed for .
  - **Only Harvesting** a)
  - b) Harvesting, Threshing, Separating, Cleaning
  - Cutting and Threshing C)
  - Only Cutting d)
- 8) Accessories of Mouldboard plough are
  - beam and frame, standards, coulter, landside, cross shaft a)
  - Coulter, Jointer, wheel, frame and beam, cross shaft b)
  - Wheel, standards, scraper, cross shaft, frog c)
  - Frame and beam, standards, scraper, cross shaft, frog d)
- 9) Secondary tillage operation is
  - Heavier operation than primary tillage operation a)
  - b) Lighter or finer operation than primary tillage operation
  - Same as primary tillage operation c)
  - Same or less as primary tillage operation d)
- 10) Function of star wheel of reaper \_\_\_\_\_.
  - Cutting the crops a)
  - b) Guiding the crops toward the cutter bar
  - Provide supports to the crops c)
  - Blocking the crops d)
- 11) The main function of a \_\_\_\_\_ is to break the liquid into droplets of effective size and distribute them uniformly over the plant.
  - a) Drip irrigation
  - Sprayer C)
- b) Duster
  - Flame thrower d)
- 12) is the main purpose of puddling.
  - To reduce leaching of water a)
  - To reduce evaporation C)
- b) To reduce transpiration d) None of the above
- 13) The main advantages of using long handle weeder is
  - Less area of coverage a) Less drudgery of operator
- b) d)
- 14) A perfect seeding gives \_

c)

- Correct amount of seed per unit area i)
- Correct depth at which seed is placed in the soil ii)
- Correct spacing between row-to-row and plant-to-plant iii)
- only i b) only ii a)
- i and iii all of the above C) d)
- Cheaper cost of weeder Tradition tool

- **SLR-FM-170** Set

|      | B.E. (Part - | – II) (CGP) |
|------|--------------|-------------|
| No.  |              |             |
| Seat |              |             |

### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to right indicate full marks.
- 3) Make suitable assumption if necessary and state it clearly.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

#### Section – I

| Q.2 | Sol                                | ve the following.   |                |
|-----|------------------------------------|---|----------------|
|     | a)<br>b)<br>c)                     | Explain how to select Disc harrow.<br>Explain various types of Mould Board plough.<br>What is meant by tillage? What is the objective tillage?  | 05<br>04<br>05 |
| Q.3 | Sol <sup>y</sup><br>a)<br>b)<br>c) | <b>ve the following.</b><br>Write a short note on force acting on tillage tool and their measurement.<br>Explain construction features of Disc harrow with neat labeled diagram.<br>Explain Virtual and real hitching for single points.  | 05<br>05<br>04 |
| Q.4 | Sol <sup>v</sup><br>a)<br>b)<br>c) | <ul> <li>ve the following.</li> <li>Write a short note on Force acting on disc harrow and there analysis.</li> <li>Write a short note on.</li> <li>1) Rotavators</li> <li>2) Subsoiler</li> <li>3) Paddypuddler</li> <li>Explain single axis and double axis hitch implements.</li> </ul>   | 04<br>05<br>05 |
|     | 0)                                 | Section – II  | 00             |
| Q.5 | a)<br>b)<br>c)                     | <ul> <li>ve the following.</li> <li>Explain construction and working of seed drill.</li> <li>The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data-</li> <li>1) no. of furrow openers = 10</li> <li>2) Spacing between furrow = 20 cm</li> <li>3) Diameter of drive wheel = 1.5 m</li> <li>4) rpm = 500</li> <li>5) Seed collected = 20 kg.</li> <li>What are different types of Weeders? Explain in brief.</li> </ul> | 05<br>04<br>05 |
| Q.6 | Sol <sup>v</sup><br>a)<br>b)<br>c) | <b>ve the following.</b><br>Explain construction and working of seed cum fertilizer drill.<br>Explain different types mowers.<br>Explain how to select Plant protection equipment's.  | 05<br>05<br>04 |
| Q.7 | Sol <sup>y</sup><br>a)<br>b)<br>c) | <b>ve the following.</b><br>Explain different types Threshers in brief.<br>Write a short note on furrow opening unit.<br>Write a short note on covering devices of seed drill   | 04<br>05<br>05 |

## **SLR-FM-170**



Max. Marks: 56

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Make suitable assumptions, if necessary and mention them clearly.
- 3) Figures to the right indicate full mark.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

### MCQ/Objective Type Questions

#### Duration: 30 Minutes

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The operation performed to open up any cultivated land with a view to prepare seedbed for growing crops is termed as \_\_\_\_\_.
  - a) Secondary tillage b) Primary tillage
  - c) pulverization d) harvesting
- 2) Combine Harvester is a machine designed for \_\_\_\_\_.
  - a) Only Harvesting
  - b) Harvesting, Threshing, Separating, Cleaning
  - c) Cutting and Threshing
  - d) Only Cutting
- 3) Accessories of Mouldboard plough are \_\_\_\_
  - a) beam and frame, standards, coulter, landside, cross shaft
  - b) Coulter, Jointer, wheel, frame and beam, cross shaft
  - c) Wheel, standards, scraper, cross shaft, frog
  - d) Frame and beam, standards, scraper, cross shaft, frog
- 4) Secondary tillage operation is \_
  - a) Heavier operation than primary tillage operation
  - b) Lighter or finer operation than primary tillage operation
  - c) Same as primary tillage operation
  - d) Same or less as primary tillage operation
- 5) Function of star wheel of reaper \_\_\_\_\_.
  - a) Cutting the crops
  - b) Guiding the crops toward the cutter bar
  - c) Provide supports to the crops
  - d) Blocking the crops

a)

C)

6) The main function of a \_\_\_\_\_ is to break the liquid into droplets of effective size and distribute them uniformly over the plant.

b)

- a) Drip irrigation b)
- c) Sprayer d) Flame thrower
- 7) \_\_\_\_\_ is the main purpose of puddling.

To reduce evaporation

To reduce leaching of water

- To reduce transpiration
- d) None of the above

Duster

Max. Marks: 70

SLR-FM-170



Set S

Marks: 14

|     |                                      |  |                |  | Set  | S |
|-----|--------------------------------------|--|----------------|--|------|---|
| 8)  | The<br>a)<br>c)                      | e main advantages of using long<br>Less area of coverage<br>Less drudgery of operator  | b)             | Cheaper cost of weeder                               |      |   |
| 9)  | A p<br>i)<br>ii)<br>iii)<br>a)<br>c) | erfect seeding gives<br>Correct amount of seed per un<br>Correct depth at which seed is<br>Correct spacing between row-t<br>only i<br>i and iii              | place<br>o-row | ed in the soil                                       |      |   |
| 10) | See<br>a)<br>c)                      | ed drill equipment is used for<br>Harvesting<br>Sowing   | b)<br>d)       | Ploughing<br>Threshing                               |      |   |
| 11) | a)<br>b)                             | ed metering mechanism is mainly<br>Supporting the parts of seed do<br>Opening the furrows<br>Covering the soil on the seed<br>Delivers the seeds at selected | rill           | d for  |      |   |
| 12) | i)<br>iii)<br>a)                     | rculture equipments are<br>Cultivator<br>Rotary hoe<br>only i<br>only ii   | iv)<br>b)      | Weeders<br>Thresher<br>i, ii and iii<br>all of these |      |   |
| 13) | kno<br>a)                            | e angle made by a disc of disc plown as<br>Wn as<br>Tilt angle<br>Disc angle   | b)<br>d)       |  | n is |   |
| 14) | Mai                                  | n function of Interculture equipm  | ent is         | ·  |      |   |

- To destroy weed a)
- b)
- To supply water to the plants Protect the plant from high heat of sun None of these c)
- d)

| Seat |  |
|------|--|
| No.  |  |

### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering AGRO MACHINE ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Figures to right indicate full marks.
- 3) Make suitable assumption if necessary and state it clearly.
- 4) Neat Diagrams must be drawn whenever necessary.
- 5) Use of non programmable single memory calculator is allowed.

#### Section – I

| Q.2 | Sol                                | ve the following.  |                |  |  |  |  |
|-----|------------------------------------|--|----------------|--|--|--|--|
|     | a)                                 | Explain how to select Disc harrow.   | 05             |  |  |  |  |
|     | b)<br>c)                           | Explain various types of Mould Board plough.<br>What is meant by tillage? What is the objective tillage?   | 04<br>05       |  |  |  |  |
| Q.3 | Sol <sup>v</sup><br>a)<br>b)<br>c) | ve the following.<br>Write a short note on force acting on tillage tool and their measurement.<br>Explain construction features of Disc harrow with neat labeled diagram.<br>Explain Virtual and real hitching for single points.  | 05<br>05<br>04 |  |  |  |  |
| Q.4 | Sol                                | ve the following.  |                |  |  |  |  |
|     | a)<br>b)                           | <ul> <li>Write a short note on Force acting on disc harrow and there analysis.</li> <li>Write a short note on.</li> <li>1) Rotavators</li> <li>2) Subsoiler</li> <li>3) Paddypuddler</li> </ul>  | 04<br>05       |  |  |  |  |
|     | c)                                 | Explain single axis and double axis hitch implements.  | 05             |  |  |  |  |
|     |                                    | Section – II   |                |  |  |  |  |
| Q.5 | Solve the following.               |  |                |  |  |  |  |
|     | a)<br>b)<br>c)                     | <ul> <li>Explain construction and working of seed drill.</li> <li>The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data-</li> <li>1) no. of furrow openers = 10</li> <li>2) Spacing between furrow = 20 cm</li> <li>3) Diameter of drive wheel = 1.5 m</li> <li>4) rpm = 500</li> <li>5) Seed collected = 20 kg.</li> <li>What are different types of Weeders? Explain in brief.</li> </ul> | 05<br>04<br>05 |  |  |  |  |
| Q.6 |                                    | ve the following.  | 05             |  |  |  |  |
|     | a)<br>b)<br>c)                     | Explain construction and working of seed cum fertilizer drill.<br>Explain different types mowers.<br>Explain how to select Plant protection equipment's.   | 05<br>05<br>04 |  |  |  |  |
| Q.7 | Sol                                | ve the following.  |                |  |  |  |  |
|     | a)<br>b)<br>c)                     | Explain different types Threshers in brief.<br>Write a short note on furrow opening unit.<br>Write a short note on covering devices of seed drill  | 04<br>05<br>05 |  |  |  |  |

**SLR-FM-170** 



Max. Marks: 56

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** PLASTIC ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q.No.1 Objective question is compulsory. It should be solved in first 30 minutes in the Answer Book.

2) Assume suitable data whenever necessary and state it clearly.

### MCQ/Objective Type Questions

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - 1) \_ are the materials added to plastics materials to raise mechanical properties. b) Plasticizers
    - Fillers a)

**Duration: 30 Minutes** 

- Reinforcing agents d) None c)
- 2) \_ molding is manufacturing process that is used to produce hollow plastic part.
  - Blow Injection a) b)
  - Transfer c) Compression d)
- 3) Generally polymers are very \_\_\_\_\_ in weight with significant degrees of strenath.
  - Heavy b) Light a) Both a & b None d) C)
- 4) Which of the welding process is used for thermoplastics?
  - Hot gas welding Induction heating a) b)
  - Heated tool All of the above d) c)
- 5) Materials having a \_\_\_\_\_ shrinkage allowance can be molded with close tolerance.
  - b) a) Low High
  - Medium d) None c)
- Due to the nature of plastic the dimension of plastic parts after molding 6) and cooling is \_\_\_\_\_ than that of the cavity.
  - Smaller a) b) Bigger
  - d) Same None c)
- 7) Which of the following is the type of compression moulding?
  - Semi-automatic open flash mould a)
  - Hand compression mould b)
  - Semi-automatic semi positive mould c)
  - All of above d)
- 8) The area of the pot in pot type transfer mould should be 20-30% \_\_\_\_\_ than the projected area.
  - Higher a) b)
  - Same c)

Smaller d) None

Max. Marks: 70



SLR-FM-171

- Marks: 14

|     |   |                    |                                  | Set | Ρ |  |
|-----|---|--------------------|----------------------------------|-----|---|--|
| 9)  | Injection mold bases, cavities, and from  | cores              | are most commonly made           |     |   |  |
|     | <ul><li>a) special aluminums</li><li>c) beryllium copper</li></ul>                            | b)<br>d)           | epoxies<br>special mold steels   |     |   |  |
| 10) | The usual range of mold draft angle<br>a) 5° to 10° per side<br>c) 1° to 2° per side          | b)                 | 1° to 4° per side Bevel          |     |   |  |
| 11) | Polymers have very thermal<br>a) high<br>c) low   | b)                 | uctivity.<br>medium<br>very high |     |   |  |
| 12) | Processing operations, however, de<br>a) low<br>c) medium                                     | emano<br>b)<br>d)  | quick                            |     |   |  |
| 13) | A biodegradable polymer should<br>a) contained hydrophilic group<br>c) group contain only C-C | b)                 |                                  |     |   |  |
| 14) | An example of biodegradable polyn<br>a) PHBV<br>c) Polyethylene                               | ner is<br>b)<br>d) | PVC                              |     |   |  |

Set

Max. Marks: 56

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** PLASTIC ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any 2 questions from Q2, Q3, Q4, and 2 questions from to Q5, Q6, Q7.

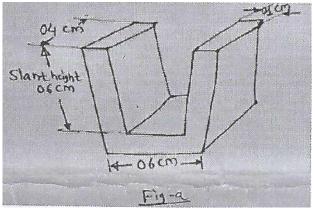
2) Assume suitable data whenever necessary and state it clearly.

#### Section – I

- Q.2 A) What are the different tests carried out on plastic parts? Explain any two in 05 detail. B) Explain the Calendaring method for plastics with advantages, limitation 05 and application.
  - C) What is polymerization? Explain addition polymerization in detail.
- Q.3 A) Explain with a neat sketch a Extrusion Moulding Process for plastics. 05 B) Explain the Hot gas Welding for plastic along with its advantages and 05 applications.
  - C) With neat sketch, explain high frequency induction welding.
- Q.4 A) Discuss on "Wall thickness" as a key area in moulded plastic part design.
  - Explain design rules related to holes in plastics. B)
  - A walker of weight 4 kg having Four leg support requires a plastic bottom 07 C) support bush to restrict scratches, noise, skidding etc. Pipe of each leg is 30mm diameter and bush is fitted with screw (Dia. 4mm) to its bottom flat. Design the bush for this application. Suggest suitable manufacturing methods for plastic part. Assume suitable mould material, plastic part material and its necessary relative quantitative data. Draw a sketch of final part.

#### Section – II

- Q.5 A) With neat sketch explain transfer moulding process.
  - Write a note on Mould heating in Compression moulding. B)
    - Design a compression mould for the component shown in fig a. It is made 07 C) up of melamine material. Take k = 2, compression pressure = 90kg/cm<sup>2</sup>, density =  $1.79 \text{ g/cm}^2$ .





04

04 03

#### **SLR-FM-171** Set Ρ Q.6 A) What is importance of "Design of Mould" in injection moulding? Explain 05 multi cavity injection mould in brief. B) Explain in detail hot runner system used in injection mould die. 05 Explain the concept of polymer degradation. C) 04 Water entering at 50°C to the cooling system provided to mould is leaving 05 Q.7 A) at 80°C. If the total heat absorbed per hour is 20000 kJ, then find out the amount of water circulated per hour (k = 30.5)Explain the parameters considered for design of effective cooling system. 05 B) Which are the Advanced plastics used in Agricultural industries? 04 C)

| Seat<br>No. |   |   |                  |             |  | Set    | Q     |  |
|-------------|---|---|------------------|-------------|--|--------|-------|--|
|             | B.E. (Part – II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>PLASTIC ENGINEERING   |   |                  |             |  |        |       |  |
|             | Day & Date: Tuesday, 26-11-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM  |   |                  |             |  |        |       |  |
| Instru      | <ul> <li>Instructions: 1) Q.No.1 Objective question is compulsory. It should be solved in first 30 minutes in the Answer Book.</li> <li>2) Assume suitable data whenever necessary and state it clearly.</li> </ul> |   |                  |             |  |        |       |  |
|             |   | Ν   | ICQ/Objectiv     | ve Tvpe (   | Questions                                      |        |       |  |
| Duratio     | on: 30 Mii  |   |                  |             |  | Mark   | s: 14 |  |
| Q.1 (       | Choose t  | he correct                                | alternatives fro | om the op   | tions and rewrite the                          |        | 14    |  |
| 5           | sentence  | )_  |                  | -           |  |        |       |  |
|             |   |   |                  | transfer m  | ould should be 20-30% _                        |        |       |  |
|             | a)  | n the project<br>Higher                   | eu alea.         | b)          | Smaller  |        |       |  |
|             | c)  | Same                                      |                  | d)          | None   |        |       |  |
| 2           | <ol> <li>Injection mold bases, cavities, and cores are most commonly mad<br/>from</li> </ol>  |   |                  |             | le   |        |       |  |
|             | a)  | special alu                               |                  | b)          | epoxies  |        |       |  |
|             | c)  | beryllium o                               | ••               | d)          | special mold steels                            |        |       |  |
| 3           | 3) The<br>a)<br>c)  | usual range<br>5° to 10° p<br>1° to 2° pe |                  |             | 1° to 4° per side Bevel<br>0.5° to 1° per side |        |       |  |
| 4           | 4) Poly   | ymers have                                | very the         | rmal condu  | uctivity.                                      |        |       |  |
|             | a)  | high                                      |                  | b)          | medium   |        |       |  |
|             | c)  | low                                       |                  | d)          | very high                                      |        |       |  |
| 5           |   | • •                                       | rations, howeve  |             | a'cooling' operat                              | ion.   |       |  |
|             | a)<br>c)  | low<br>medium                             |                  | b)<br>d)    | quick<br>moderate                              |        |       |  |
| F           | ,   |   | e polymer shou   | ,           |  |        |       |  |
| · · ·       | ,   | -   | hydrophilic grou |             | contain hydrophobic                            |        |       |  |
|             | c)  |   | ain only C-C     | d)          | contain aromatic group                         |        |       |  |
| 7           | 7) An   | example of l                              | biodegradable p  | olymer is   |  |        |       |  |
|             | a)  | PHBV                                      |                  | b)          | PVC  |        |       |  |
|             | c)  | Polyethyle                                |                  | d)          | Polyacetylene                                  |        |       |  |
| ξ           | 3)  | are the n<br>perties.                     | naterials added  | to plastics | materials to raise mecha                       | anical |       |  |
|             | a)  | Fillers                                   |                  | b)          | Plasticizers                                   |        |       |  |
|             | c)  | Reinforcin                                | g agents         | d)          | None   |        |       |  |
| ç           | 9)  | molding                                   | is manufacturin  | g process   | that is used to produce h                      | ollow  |       |  |
|             |   | stic part.                                |                  | 1.5         | In in atting                                   |        |       |  |
|             | a)  | Blow                                      |                  | b)          | Injection                                      |        |       |  |

Injection b) a) Blow Compression d) Transfer c)

**SLR-FM-171** 

## Seat Ν

10) Generally polymers are very \_\_\_\_\_ in weight with significant degrees of strength.

- a) Heavy b) Light
- c) Both a & b d) None
- 11) Which of the welding process is used for thermoplastics?
  - a) Hot gas welding b) Induction heating
  - c) Heated tool d) All of the above
- 12) Materials having a \_\_\_\_\_ shrinkage allowance can be molded with close tolerance.
  - a) Low b) High
  - c) Medium d) None
- 13) Due to the nature of plastic the dimension of plastic parts after molding and cooling is \_\_\_\_\_ than that of the cavity.
  - a) Smaller b) Bigger
  - c) Same d) None
- 14) Which of the following is the type of compression moulding?
  - a) Semi-automatic open flash mould
  - b) Hand compression mould
  - c) Semi-automatic semi positive mould
  - d) All of above

**SLR-FM-171** 

Set Q

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** PLASTIC ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any 2 questions from Q2, Q3, Q4, and 2 questions from to Q5, Q6, Q7.

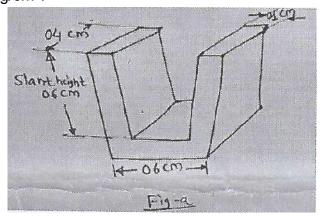
2) Assume suitable data whenever necessary and state it clearly.

#### Section – I

- Q.2 A) What are the different tests carried out on plastic parts? Explain any two in 05 detail. B) Explain the Calendaring method for plastics with advantages, limitation 05 and application.
  - C) What is polymerization? Explain addition polymerization in detail.
- Q.3 A) Explain with a neat sketch a Extrusion Moulding Process for plastics. 05 B) Explain the Hot gas Welding for plastic along with its advantages and 05 applications.
  - C) With neat sketch, explain high frequency induction welding.
- Q.4 A) Discuss on "Wall thickness" as a key area in moulded plastic part design.
  - Explain design rules related to holes in plastics. B)
  - A walker of weight 4 kg having Four leg support requires a plastic bottom 07 C) support bush to restrict scratches, noise, skidding etc. Pipe of each leg is 30mm diameter and bush is fitted with screw (Dia. 4mm) to its bottom flat. Design the bush for this application. Suggest suitable manufacturing methods for plastic part. Assume suitable mould material, plastic part material and its necessary relative quantitative data. Draw a sketch of final part.

#### Section – II

- Q.5 A) With neat sketch explain transfer moulding process.
  - Write a note on Mould heating in Compression moulding. B)
    - Design a compression mould for the component shown in fig a. It is made C) up of melamine material. Take k = 2, compression pressure = 90kg/cm<sup>2</sup>, density =  $1.79 \text{ g/cm}^2$ .



Max. Marks: 56

Set

Q

04

04

04

04

03

#### **SLR-FM-171** Set Q Q.6 A) What is importance of "Design of Mould" in injection moulding? Explain 05 multi cavity injection mould in brief. B) Explain in detail hot runner system used in injection mould die. 05 Explain the concept of polymer degradation. C) 04 Water entering at 50°C to the cooling system provided to mould is leaving 05 Q.7 A) at 80°C. If the total heat absorbed per hour is 20000 kJ, then find out the amount of water circulated per hour (k = 30.5)Explain the parameters considered for design of effective cooling system. B) 05 Which are the Advanced plastics used in Agricultural industries? 04 C)

# B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

Seat

No.

Instructions: 1) Q.No.1 Objective question is compulsory. It should be solved in first 30 minutes in the Answer Book.

PLASTIC ENGINEERING

Assume suitable data whenever necessary and state it clearly.

#### MCQ/Objective Type Questions

Q.1 Choose the correct alternatives from the options and rewrite the sentence.

- Materials having a \_\_\_\_\_ shrinkage allowance can be molded with close 1) tolerance.
  - a) Low b) High
  - Medium d) None C)
- 2) Due to the nature of plastic the dimension of plastic parts after molding and cooling is \_\_\_\_\_ than that of the cavity.
  - Smaller Bigger a) b)
  - Same c) d) None
- 3) Which of the following is the type of compression moulding?
  - Semi-automatic open flash mould a)
  - Hand compression mould b)
  - Semi-automatic semi positive mould C)
  - d) All of above

4) The area of the pot in pot type transfer mould should be 20-30% \_\_\_\_\_ than the projected area.

- Higher Smaller a) b)
- Same d) None C)
- Injection mold bases, cavities, and cores are most commonly made 5) from
  - special aluminums a) b) epoxies
  - beryllium copper special mold steels d) C)
- The usual range of mold draft angles is 6)
  - $5^{\circ}$  to  $10^{\circ}$  per side 1° to 4° per side Bevel a) b) 0.5° to 1° per side 1° to 2° per side
  - C) d)
- Polymers have very \_\_\_\_\_ thermal conductivity. 7)
  - a) high b) medium c) low
    - d) very high
- 8) Processing operations, however, demand a \_\_\_\_\_\_ 'cooling' operation.
  - a) low c) medium
- auick b) d) moderate

Set

R

Max. Marks: 70

Marks: 14

- a) contained hydrophilic group contain hydrophobic b) c) group contain only C-C contain aromatic group d) An example of biodegradable polymer is \_ 10) PVC a) PHBV b) C) Polyethylene d) Polyacetylene 11) are the materials added to plastics materials to raise mechanical properties. Fillers b) **Plasticizers** a) Reinforcing agents d) None C) \_\_\_\_ molding is manufacturing process that is used to produce hollow 12) plastic part. Blow a) b) Injection Compression Transfer C) d) Generally polymers are very \_\_\_\_\_ in weight with significant degrees of 13) strength. a) Heavy b) Light Both a & b d) None C)
- 14) Which of the welding process is used for thermoplastics?
  - Hot gas welding a)
- b) Induction heating
- Heated tool
- All of the above

Page 10 of 16

A biodegradable polymer should

# **SLR-FM-171**

Set R

- C)

9)

- - d)

Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** PLASTIC ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any 2 questions from Q2, Q3, Q4, and 2 questions from to Q5, Q6, Q7.

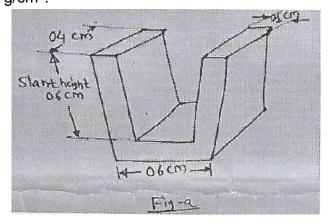
2) Assume suitable data whenever necessary and state it clearly.

#### Section – I

- Q.2 A) What are the different tests carried out on plastic parts? Explain any two in 05 detail. B) Explain the Calendaring method for plastics with advantages, limitation 05 and application. 04
  - C) What is polymerization? Explain addition polymerization in detail.
- Q.3 A) Explain with a neat sketch a Extrusion Moulding Process for plastics. 05 B) Explain the Hot gas Welding for plastic along with its advantages and 05 applications.
  - C) With neat sketch, explain high frequency induction welding.
- Q.4 A) Discuss on "Wall thickness" as a key area in moulded plastic part design.
  - Explain design rules related to holes in plastics. B)
  - A walker of weight 4 kg having Four leg support requires a plastic bottom 07 C) support bush to restrict scratches, noise, skidding etc. Pipe of each leg is 30mm diameter and bush is fitted with screw (Dia. 4mm) to its bottom flat. Design the bush for this application. Suggest suitable manufacturing methods for plastic part. Assume suitable mould material, plastic part material and its necessary relative quantitative data. Draw a sketch of final part.

#### Section – II

- Q.5 A) With neat sketch explain transfer moulding process.
  - Write a note on Mould heating in Compression moulding. B)
    - Design a compression mould for the component shown in fig a. It is made C) up of melamine material. Take k = 2, compression pressure = 90kg/cm<sup>2</sup>, density =  $1.79 \text{ g/cm}^2$ .



Max. Marks: 56

Set

R

04

04

04

03

#### **SLR-FM-171** Set R Q.6 A) What is importance of "Design of Mould" in injection moulding? Explain 05 multi cavity injection mould in brief. B) Explain in detail hot runner system used in injection mould die. 05 Explain the concept of polymer degradation. C) 04 Water entering at 50°C to the cooling system provided to mould is leaving 05 Q.7 A) at 80°C. If the total heat absorbed per hour is 20000 kJ, then find out the amount of water circulated per hour (k = 30.5)Explain the parameters considered for design of effective cooling system. B) 05 Which are the Advanced plastics used in Agricultural industries? 04 C)

|       | B.E. (Part – II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>PLASTIC ENGINEERING  |  |  |  |  |  |  |
|-------|--|--|--|--|--|--|--|
|       |  | : Tuesday, 26-11-2019 Max. Marks: 70<br>PM To 05:30 PM   |  |  |  |  |  |
| Instr | <ul> <li>nstructions: 1) Q.No.1 Objective question is compulsory. It should be solved in first 30 minutes in the Answer Book.</li> <li>2) Assume suitable data whenever necessary and state it clearly.</li> </ul> |  |  |  |  |  |  |
|       |  | MCQ/Objective Type Questions   |  |  |  |  |  |
| Dura  | tion: 3  | ) Minutes Marks: 14  |  |  |  |  |  |
| Q.1   | Choo<br>sente  | se the correct alternatives from the options and rewrite the 14  |  |  |  |  |  |
|       | 1)   | The usual range of mold draft angles is<br>a) 5° to 10° per side b) 1° to 4° per side Bevel<br>c) 1° to 2° per side d) 0.5° to 1° per side     |  |  |  |  |  |
|       | 2)   | Polymers have very thermal conductivity.<br>a) high b) medium<br>c) low d) very high   |  |  |  |  |  |
|       | 3)   | Processing operations, however, demand a'cooling' operation.<br>a) low b) quick<br>c) medium d) moderate                                       |  |  |  |  |  |
|       | 4)   | A biodegradable polymer should<br>a) contained hydrophilic group b) contain hydrophobic<br>c) group contain only C-C d) contain aromatic group |  |  |  |  |  |
|       | 5)   | An example of biodegradable polymer is<br>a) PHBV b) PVC<br>c) Polyethylene d) Polyacetylene   |  |  |  |  |  |
|       | 6)   | are the materials added to plastics materials to raise mechanical properties.<br>a) Fillers b) Plasticizers<br>c) Reinforcing agents d) None   |  |  |  |  |  |
|       | 7)   | molding is manufacturing process that is used to produce hollow<br>plastic part.<br>a) Blow b) Injection<br>c) Compression d) Transfer         |  |  |  |  |  |
|       | 8)   | Generally polymers are very in weight with significant degrees of strength.<br>a) Heavy b) Light<br>c) Both a & b d) None                      |  |  |  |  |  |
|       | 9)   | Which of the welding process is used for thermoplastics?a) Hot gas weldingb) Induction heatingc) Heated toold) All of the above                |  |  |  |  |  |

### Seat No.

**SLR-FM-171** 





Materials having a \_\_\_\_\_ shrinkage allowance can be molded with close 10) tolerance.

b)

High

- Low a) C)
  - Medium d) None
- 11) Due to the nature of plastic the dimension of plastic parts after molding and cooling is \_\_\_\_\_ than that of the cavity.
  - Smaller a) b) Bigger
  - Same d) None C)
- Which of the following is the type of compression moulding? 12)
  - Semi-automatic open flash mould a)
  - Hand compression mould b)
  - Semi-automatic semi positive mould c)
  - d) All of above
- The area of the pot in pot type transfer mould should be 20-30% \_\_\_\_\_ 13) than the projected area.
  - Higher a) b) Smaller
  - Same C) d) None
- 14) Injection mold bases, cavities, and cores are most commonly made from
  - special aluminums a)
  - c) beryllium copper
- b) epoxies
- d) special mold steels

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** PLASTIC ENGINEERING

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

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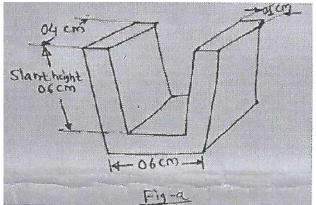
2) Assume suitable data whenever necessary and state it clearly.

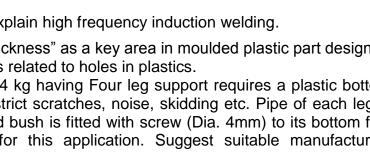
#### Section – I

- Q.2 A) What are the different tests carried out on plastic parts? Explain any two in 05 detail. B) Explain the Calendaring method for plastics with advantages, limitation 05 and application.
  - C) What is polymerization? Explain addition polymerization in detail.
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  - C) With neat sketch, explain high frequency induction welding.
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  - A walker of weight 4 kg having Four leg support requires a plastic bottom 07 C) support bush to restrict scratches, noise, skidding etc. Pipe of each leg is 30mm diameter and bush is fitted with screw (Dia. 4mm) to its bottom flat. Design the bush for this application. Suggest suitable manufacturing methods for plastic part. Assume suitable mould material, plastic part material and its necessary relative quantitative data. Draw a sketch of final part.

#### Section – II

- Q.5 A) With neat sketch explain transfer moulding process.
  - - Write a note on Mould heating in Compression moulding. B) Design a compression mould for the component shown in fig a. It is made C) up of melamine material. Take k = 2, compression pressure = 90kg/cm<sup>2</sup>,
      - density =  $1.79 \text{ g/cm}^2$ .







Set

Max. Marks: 56

04 03

07

04

04

04

#### **SLR-FM-171** Set S Q.6 A) What is importance of "Design of Mould" in injection moulding? Explain 05 multi cavity injection mould in brief. B) Explain in detail hot runner system used in injection mould die. 05 Explain the concept of polymer degradation. C) 04 Water entering at 50°C to the cooling system provided to mould is leaving 05 Q.7 A) at 80°C. If the total heat absorbed per hour is 20000 kJ, then find out the amount of water circulated per hour (k = 30.5)Explain the parameters considered for design of effective cooling system. B) 05 Which are the Advanced plastics used in Agricultural industries? 04 C)

|   |   | 0 PM To 05:30 PM   |   |  |  |
|---|---|--|---|--|--|
| <ul> <li>Instructions: 1) Q.No.1 is Compulsory. It should be solved in first 30 minutes in the Answer Book on page No.3</li> <li>2) Answer cannot be changed once it is marked.</li> <li>3) Don't forget to mention Que. Paper set at the top of the page.</li> <li>4) Figures to the right indicate full marks.</li> </ul> |   |  |   |  |  |
| Dure  | tion. C   | MCQ/Objective Type Questions<br>30 Minutes Marks: 14   | 4 |  |  |
| <b>Q.1</b>  |   | 30 Minutes Marks: 14 ose the correct alternatives from the options and rewrite the 14  |   |  |  |
| Q. I  |   | ence.  | • |  |  |
|   | 1)  | If two products are substitutes, their CPED will be<br>a) Negative b) positive<br>c) Zero d) infinity  |   |  |  |
|   | 2)  | The goods for which law of demand is not valid are known asa) luxury goodsb) routine goodsc) Giffen goodsd) normal goods   |   |  |  |
|   | <ul> <li>3) Consumer surplus is always</li> <li>a) above price paid &amp; below demand curve</li> <li>b) above price paid &amp; above demand curve</li> <li>c) below price paid &amp; above demand curve</li> <li>d) below price paid &amp; below demand curve</li> </ul> |  |   |  |  |
|   | 4)  | Cost of welding rods is an example ofa) direct material costb) sunk costc) economist's costd) indirect material cost   |   |  |  |
|   | 5)  | Higher angle of incidence indicatesa) lower profitb) higher profitc) lower variable costd) lower fixed cost  |   |  |  |
|   | 6)  | Which of the following is an example of indirect material cost for afoundry?a) cost of main metalb) cost of buildingc) cost of resind) cost of advertising           |   |  |  |
|   | 7)  | Finding the yearly installment from other data is known as<br>a) future worth method b) present worth method<br>c) rate of return method d) annual equivalent method |   |  |  |
|   | 8)  | Which of the following favours 'Make' decision?<br>a) high production volume b) higher fixed cost<br>c) availability of vendors d) fluctuating demand                |   |  |  |
|   | 9)  | Deciding plant layout is a necessary step in<br>a) process planning b) process design  |   |  |  |

d)

product planning

Seat No.

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

c) product design

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Set P

Max. Marks: 70

|     |                                  |        | SLR-FM-172       |
|-----|----------------------------------|--------|------------------|
|     |                                  |        | Set P            |
| Cu  | stomers' feedback is a necessary | v step | in               |
| a)  | process design                   | b)     | process planning |
| c)  | product planning                 | d)     | plant layout     |
| A r | ew equipment to be purchased is  | s knov | vn as a          |
| a)  | Challenger                       | b)     | survivor         |
| c)  | Defender                         | d)     | competitor       |

- Carrying out maintenance on weekly off days is an example of\_\_\_\_\_ 12) maintenance.
  - a) Unplanned

10)

11)

c) Breakdown

- b) predictive
- opportunistic d)

- C.E.A. stands for\_ 13)
  - a) Cost Efficiency Analysis c) Cost Economic Analysis
- Cost Effectiveness Analysis b)
- Conditional efficiency Analysis d)
- The second stage in project management life cycle is\_\_\_\_\_ 14)
  - a) execution
  - c) Accounting

- designing b)
- d) planning

| Seat |  |
|------|--|
| No.  |  |

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

- Q.2 a) What is Engineering economics? Explain its scope in today's world.
  b) A person wants to invest money to earn Rs 50000 per year for the next
  06
  - eight years. If rate of interest is 8% compounded annually, what is the amount of his current investment? Draw its cash flow diagram.
- **Q.3 a)** Explain the following terms in brief.
  - 1) SRAC 2) LRAC
  - 3) Marginal cost 4) Overhead
  - b) What do you mean by inflation? How does it affect the value of money? 06
- Q.4 a) If the price of a cellphone increases from Rs 18000 to Rs 22000, its sale 07 reduces from 60000 pieces/month to 35000 pieces/month. Determine PED of this cellphone and Comment on it.
  - b) A product is manufactured in batches of 400. Direct material and direct labour costs are Rs 8000 and Rs 12000 respectively. Factory overheads are 50% of the prime cost and selling expenses are 25% of the factory cost. Determine the selling price of the product so that the profit is 10% of the total cost.

### Section – II

- Q.5 Explain various steps in process engineering with a block diagram. 08 a) b) Write a note on resource management. 06 Q.6 What are the various costs associated with maintenance? Explain **08** a) graphically the cost of maintenance. Explain classification of engineering projects. b) 06 Q.7 What are the reasons that necessitate replacement of an asset? 07 a) Demand for a component is 4000 per year. A company can produce it in-07 b)
  - house at a fixed cost of Rs 10000 and a variable cost of Rs 10 per unit. The company has an option to purchase it from outside at Rs 12 per unit. Justify make or buy decision for this product.

Max. Marks: 56

Set Q

Max. Marks: 70

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Instructions: 1) Q.No.1 is Compulsory. It should be solved in first 30 minutes in the

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

|      |               | 2) /<br>3)    | Answer Book on page No.3<br>Answer cannot be changed onc<br>Don't forget to mention Que. Pa<br>Figures to the right indicate full | aper s             | set at the top of the page.                                    |         |
|------|---------------|---------------|---|--------------------|--|---------|
|      |               |               | MCQ/Objective Ty  | pe G               | Questions  |         |
| Dura | tion: 3       | 0 Minu        |   | •                  |  | rks: 14 |
| Q.1  | Choo<br>sente |               | e correct alternatives from the   | e opt              | ions and rewrite the   | 14      |
|      | 1)            | a) h          | h of the following favours 'Make<br>igh production volume<br>vailability of vendors   | b)                 | higher fixed cost  |         |
|      | 2)            | a) p          | ling plant layout is a necessary<br>rocess planning<br>roduct design  | b)                 | in<br>process design<br>product planning                       |         |
|      | 3)            | a) p          | omers' feedback is a necessary<br>rocess design<br>roduct planning  | b)                 | in<br>process planning<br>plant layout                         |         |
|      | 4)            | a) C          | v equipment to be purchased is<br>Challenger<br>Defender  | knov<br>b)<br>d)   | vn as a<br>survivor<br>competitor                              |         |
|      | 5)            | maint<br>a) L | ing out maintenance on weekly<br>enance.<br>Inplanned<br>Breakdown  | off d<br>b)<br>d)  | ays is an example of<br>predictive<br>opportunistic            |         |
|      | 6)            | a) C          | A. stands for<br>Cost Efficiency Analysis<br>Cost Economic Analysis   | b)<br>d)           | Cost Effectiveness Analysis<br>Conditional efficiency Analysis |         |
|      | 7)            | a) e          | econd stage in project manage<br>xecution<br>Accounting   | ment<br>b)<br>d)   | life cycle is<br>designing<br>planning                         |         |
|      | 8)            | a) N          | products are substitutes, their<br>legative<br>lero   | CPE[<br>b)<br>d)   | D will be<br>positive<br>infinity                              |         |
|      | 9)            | a) lu         | poods for which law of demand<br>uxury goods<br>Giffen goods  | is not<br>b)<br>d) | valid are known as<br>routine goods<br>normal goods            |         |

# Seat No.

10) Consumer surplus is always\_\_\_\_\_.

- a) above price paid & below demand curve
- b) above price paid & above demand curve
- c) below price paid & above demand curve
- d) below price paid & below demand curve

#### 11) Cost of welding rods is an example of\_\_\_\_

- a) direct material cost b) sunk cost
- c) economist's cost d) indirect material cost

### 12) Higher angle of incidence indicates\_\_\_\_\_.

- a) lower profit b) higher profit
- c) lower variable cost d) lower fixed cost
- 13) Which of the following is an example of indirect material cost for a foundry?
  - a) cost of main metal b) cost of building
  - c) cost of resin d) cost of advertising

#### 14) Finding the yearly installment from other data is known as\_

- a) future worth method
- b) present worth method
- c) rate of return method
- d) annual equivalent method

**SLR-FM-172** 

Set Q

| Seat |  |
|------|--|
| No.  |  |

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section.

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- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

- Q.2 a) What is Engineering economics? Explain its scope in today's world.
  b) A person wants to invest money to earn Rs 50000 per year for the next eight years. If rate of interest is 8% compounded annually, what is the amount of his current investment? Draw its cash flow diagram.
- Q.3 a) Explain the following terms in brief.
  - 1) SRAC 2) LRAC
  - 3) Marginal cost 4) Overhead
  - b) What do you mean by inflation? How does it affect the value of money? 06
- Q.4 a) If the price of a cellphone increases from Rs 18000 to Rs 22000, its sale 07 reduces from 60000 pieces/month to 35000 pieces/month. Determine PED of this cellphone and Comment on it.
  - b) A product is manufactured in batches of 400. Direct material and direct labour costs are Rs 8000 and Rs 12000 respectively. Factory overheads are 50% of the prime cost and selling expenses are 25% of the factory cost. Determine the selling price of the product so that the profit is 10% of the total cost.

### Section – II

| Q.5 | a) | Explain various steps in process engineering with a block diagram.                                   | 08 |
|-----|----|--|----|
|     | b) | Write a note on resource management.   | 06 |
| Q.6 | a) | What are the various costs associated with maintenance? Explain graphically the cost of maintenance. | 08 |
|     | b) | Explain classification of engineering projects.  | 06 |
| Q.7 | a) | What are the reasons that necessitate replacement of an asset?                                       | 07 |
|     | b) | Demand for a component is 4000 per year. A company can produce it in-                                | 07 |

house at a fixed cost of Rs 10000 and a variable cost of Rs 10 per unit. The company has an option to purchase it from outside at Rs 12 per unit. Justify make or buy decision for this product.

Max. Marks: 56

I) (CGPA) Examination Nov/Dec-2019

B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Instructions: 1) Q.No.1 is Compulsory. It should be solved in first 30 minutes in the

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

|      |               | 3    | Answer Book on page No.3<br>2) Answer cannot be changed ond<br>3) Don't forget to mention Que. Pa<br>4) Figures to the right indicate full | aper s              | set at the top of the page.                         |           |
|------|---------------|------|--|---------------------|---|-----------|
|      |               |      | MCQ/Objective Ty   | vpe Q               | Questions   |           |
| Dura | tion: 3       | 0 Mi | nutes  |                     |   | Marks: 14 |
| Q.1  | Choo<br>sente |      | the correct alternatives from th   | e opt               | ions and rewrite the                                | 14        |
|      | 1)            |      | her angle of incidence indicates_  |                     |   |           |
|      | - /           | a)   | lower profit<br>lower variable cost  | b)<br>d)            | higher profit<br>lower fixed cost                   |           |
|      | 2)            |      | ich of the following is an example ndry?   | e of in             | direct material cost for a                          |           |
|      |               |      | cost of main metal<br>cost of resin  | b)<br>d)            | cost of building<br>cost of advertising             |           |
|      | 3)            | a)   | ding the yearly installment from o<br>future worth method<br>rate of return method   | ther c<br>b)<br>d)  | present worth method                                |           |
|      | 4)            | a)   | ich of the following favours 'Make<br>high production volume<br>availability of vendors  | b)                  | ision?<br>higher fixed cost<br>fluctuating demand   |           |
|      | 5)            |      | ciding plant layout is a necessary<br>process planning<br>product design   | -                   | in<br>process design<br>product planning            |           |
|      | 6)            | a)   | stomers' feedback is a necessary<br>process design<br>product planning   |                     | process planning                                    |           |
|      | 7)            | a)   | ew equipment to be purchased is<br>Challenger<br>Defender  |                     | vn as a<br>survivor<br>competitor                   |           |
|      | 8)            | ma   | rrying out maintenance on weekly<br>intenance.<br>Unplanned<br>Breakdown   | v off d<br>b)<br>d) | ays is an example of<br>predictive<br>opportunistic |           |

Seat

No.

# SLR-FM-172

Set R

Max. Marks: 70

- 9) C.E.A. stands for\_\_\_\_
  - a) Cost Efficiency Analysis
  - c) Cost Economic Analysis
- b) Cost Effectiveness Analysis
- d) Conditional efficiency Analysis
- 10) The second stage in project management life cycle is \_\_\_\_\_\_a) execution b) designing
  - a) execution b) c) Accounting d)
    - d) planning
- 11) If two products are substitutes, their CPED will be\_\_\_\_\_
  - a) Negative b) positive
  - c) Zero d) infinity
- 12) The goods for which law of demand is not valid are known as\_\_\_\_\_.
  - a) luxury goods b)
  - c) Giffen goods
- o) routine goods
- d) normal goods
- 13) Consumer surplus is always\_\_\_\_\_.
  - a) above price paid & below demand curve
  - b) above price paid & above demand curve
  - c) below price paid & above demand curve
  - d) below price paid & below demand curve
- 14) Cost of welding rods is an example of\_\_\_\_\_
  - a) direct material cost
  - c) economist's cost
- b) sunk cost
- d) indirect material cost

SLR-FM-172 Set R

Set R

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

Seat No.

#### Instructions: 1) Solve any two questions from each section.

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#### Section - I

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  4) Overhead
  - 3) Marginal cost 4) Overhead
  - **b)** What do you mean by inflation? How does it affect the value of money? **06**
- Q.4 a) If the price of a cellphone increases from Rs 18000 to Rs 22000, its sale 07 reduces from 60000 pieces/month to 35000 pieces/month. Determine PED of this cellphone and Comment on it.
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#### Section – II

| Q.5 | a)<br>b) | Explain various steps in process engineering with a block diagram.<br>Write a note on resource management.  | 08<br>06 |
|-----|----------|---|----------|
| Q.6 | a)       | What are the various costs associated with maintenance? Explain graphically the cost of maintenance.  | 08       |
|     | b)       | Explain classification of engineering projects.   | 06       |
| Q.7 | a)<br>b) | What are the reasons that necessitate replacement of an asset?<br>Demand for a component is 4000 per year. A company can produce it in-<br>house at a fixed cost of Rs 10000 and a variable cost of Rs 10 per unit.<br>The company has an option to purchase it from outside at Rs 12 per unit. | 07<br>07 |

Justify make or buy decision for this product.

Max. Marks: 56

80

B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS uesday,26-11-2019 Max

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

| Instr | uctior        |                             | <ol> <li>Q.No.1 is Compulsory. It should<br/>Answer Book on page No.3</li> <li>Answer cannot be changed one</li> <li>Don't forget to mention Que. Path</li> <li>Eigures to the right indicate full</li> </ol> | ce it is<br>aper s  | s marked.<br>set at the top of the page.                       |
|-------|---------------|-----------------------------|---|---------------------|--|
|       |               |                             | <ol> <li>Figures to the right indicate full<br/>MCQ/Objective Ty</li> </ol>   |                     | Questions  |
| Dura  | tion: 3       | 0 M                         | inutes  |                     | Marks:   |
| Q.1   | Choo<br>sente |                             | the correct alternatives from th  | e opt               | ions and rewrite the   |
|       | 1)            |                             | stomers' feedback is a necessary<br>process design  | v step<br>b)<br>d)  |  |
|       | 2)            | a)                          | ew equipment to be purchased is<br>Challenger<br>Defender   | s knov<br>b)<br>d)  | vn as a<br>survivor<br>competitor                              |
|       | 3)            | ma<br>a)                    | rrying out maintenance on weekly<br>intenance.<br>Unplanned<br>Breakdown  | / off d<br>b)<br>d) | ays is an example of<br>predictive<br>opportunistic            |
|       | 4)            | a)                          | E.A. stands for<br>Cost Efficiency Analysis<br>Cost Economic Analysis   | b)<br>d)            | Cost Effectiveness Analysis<br>Conditional efficiency Analysis |
|       | 5)            | The<br>a)<br>c)             | e second stage in project manage<br>execution<br>Accounting   | ement<br>b)<br>d)   | life cycle is<br>designing<br>planning                         |
|       | 6)            | lf tv<br>a)<br>c)           | wo products are substitutes, their<br>Negative<br>Zero  | CPEI<br>b)<br>d)    | D will be<br>positive<br>infinity                              |
|       | 7)            | The<br>a)<br>c)             | e goods for which law of demand<br>luxury goods<br>Giffen goods   | is not<br>b)<br>d)  | t valid are known as<br>routine goods<br>normal goods          |
|       | 8)            | Col<br>a)<br>b)<br>c)<br>d) | nsumer surplus is always<br>above price paid & below dema<br>above price paid & above dema<br>below price paid & above dema<br>below price paid & below demar   | nd cu<br>nd cu      | rve<br>rve   |

### Seat No.

# **SLR-FM-172**

Set S

Max. Marks: 70

14

9) Cost of welding rods is an example of\_

> a) direct material cost b)

sunk cost

**SLR-FM-172** 

Set S

- c) economist's cost d)
- indirect material cost
- 10) Higher angle of incidence indicates\_
  - a) lower profit b) higher profit
  - c) lower variable cost lower fixed cost d)
- 11) Which of the following is an example of indirect material cost for a foundry?
  - a) cost of main metal b) cost of building
  - cost of resin d) cost of advertising C)
- 12) Finding the yearly installment from other data is known as\_
  - a) future worth method c) rate of return method
- b) present worth method
- d) annual equivalent method
- 13) Which of the following favours 'Make' decision?
  - higher fixed cost b)
  - a) high production volume c) availability of vendors
- d) fluctuating demand
- Deciding plant layout is a necessary step in\_ 14)
  - a) process planning c) product design
- b) process design
- d) product planning

| Seat |  |
|------|--|
| No.  |  |

#### B.E. (Part – II) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ECONOMICS FOR ENGINEERS

Day & Date: Tuesday,26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

- Q.2 a) What is Engineering economics? Explain its scope in today's world.
   b) A person wants to invest money to earn Rs 50000 per year for the next eight years. If rate of interest is 8% compounded annually, what is the
- Q.3 a) Explain the following terms in brief.
  - 1) SRAC 2) LRAC
  - 3) Marginal cost4) Overhead

amount of his current investment? Draw its cash flow diagram.

- b) What do you mean by inflation? How does it affect the value of money? 06
- Q.4 a) If the price of a cellphone increases from Rs 18000 to Rs 22000, its sale 07 reduces from 60000 pieces/month to 35000 pieces/month. Determine PED of this cellphone and Comment on it.
  - b) A product is manufactured in batches of 400. Direct material and direct labour costs are Rs 8000 and Rs 12000 respectively. Factory overheads are 50% of the prime cost and selling expenses are 25% of the factory cost. Determine the selling price of the product so that the profit is 10% of the total cost.

### Section – II

| Q.5 | a)<br>b) | Explain various steps in process engineering with a block diagram.<br>Write a note on resource management.   | 08<br>06 |
|-----|----------|--|----------|
| Q.6 | a)       | What are the various costs associated with maintenance? Explain graphically the cost of maintenance.   | 08       |
|     | b)       | Explain classification of engineering projects.  | 06       |
| Q.7 | a)<br>b) | What are the reasons that necessitate replacement of an asset?<br>Demand for a component is 4000 per year. A company can produce it in-<br>house at a fixed cost of Rs 10000 and a variable cost of Rs 10 per unit | 07<br>07 |

house at a fixed cost of Rs 10000 and a variable cost of Rs 10 per unit. The company has an option to purchase it from outside at Rs 12 per unit. Justify make or buy decision for this product.

Max. Marks: 56

| NO.    |  |  |
|--------|--|--|
|        | · ·  | t -II) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>R PLANT & ENERGY ENGINEERING |
|        | Date: Thursday,19-1<br>02:30 PM To 05:30 F |  |
| Instru | ctions: 1) Q.No.1 is                       | compulsory and should be solved in first 30 Minu   |

d be solved in first 30 Minutes in answer

- book. 2) Make suitable assumptions if necessary and state if clearly.
  - 3) Figures to the right indicate full mark.

### MCQ/Objective Type Questions

b)

**Duration: 30 Minutes** 

Seat

#### Q.1 Choose the correct alternatives from the options.

- consumption in India is less than the developed nations. 1)
  - a) Total
  - Middling c) Per capital None of above d)
- While plotting load curve, \_\_\_\_\_ point represents Max. utilization. 2)
  - a) Middle b)
  - c) lower
- 3) In the graph of the incremental rate vs. the output, as the output increases, the incremental rate curve \_\_\_\_
  - a) Increases b) Decreases
  - c) Remains constant d) Becomes parallel to X-axis
- solar radiations are possible to measure with the help of 4) Pyranometer. b)
  - a) Record
  - c) Local d)
- Following are corresponding to each other \_ 5)
  - a) Altitude angle and Zenith angle b) d)
  - c) Hour angle and latitude angle

#### Geothermal energy is the energy from 6) Tidal

- a) Ocean thermal b) c) Earth's crust Atmosphere d)
- An inspection, survey and analysis of energy is called . 7)
  - energy management a)
  - energy consumption C)
- Extreme economy of \_\_\_\_\_ production is achieved when the plant is 8) totally loaded.
  - a) Energy b) c) Intermediate
    - d) None of these
- energy conservation

energy audit

- Power



- Highest
- d) Max rating



Set

Max. Marks: 70

Marks: 14

14

Global

All of these

- Terrestrial
- Azimuth angle and hour anle

b)

d)

- 9) Plant is used as stand by unit indicated by \_\_\_\_\_.
  - a) Plant is under no use
  - b) Low utilization factor
  - c) Plant is used for base load only
  - d) Plant is used for peak as well as base loads
- 10) The capacity of \_\_\_\_\_ is always rated in terms of kVA.
  - b) Initiator
  - c) transformer d) power plant
- 11) Maximum value \_\_\_\_\_ of is 23.5<sup>0</sup>
  - a) Declination angle

a) motor

- b) Hour angle
- c) Azimuth angle d) Latitude angle
- 12) Energy management emphasizes on \_\_\_\_\_.
  - a) Controlling the supply and consumption
  - b) Maximizing productivity and comfort levels
  - c) Minimize energy costs and pollution with effective use of energy
  - d) All of the above
- 13) \_\_\_\_\_ should have high lift to drag ratio.
  - a) Blade b) Turbine
  - c) Car d) Airfoil
- 14) One of the objective of energy management aims \_
  - a) prevention of pollution b)
  - c) prevent the energy use
- ement aims \_\_\_\_\_.
  b) regulating the pollution levels

**SLR-FM-173** 

Set P

d) none of the above

| 100 mW at an annual load factor of 50%. | The loads having maximum   |
|---|----------------------------|
| demands of 45 mW, 30 mW, 25 mW and,     | 15 mW are connected to the |
| power station. Determine:               |                            |

- 1) Average load on power station
- Energy generated per year 2)
- Demand factor 3)
- **Diversity factor** 4)

| Seat |  |
|------|--|
| No.  |  |

### B.E. (Part -II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering POWER PLANT & ENERGY ENGINEERING**

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

Solve the following questions

Q.2

a)

Max. Marks: 56

05

04

05

07

07

04

04

03

03

05

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full mark.
- 3) Use of non-programmable calculator is allowed.

#### SECTION I

#### Describe in detail solar radiation geometry along with various angles with the help of neat sketch. Write the similarity and difference between pyranometer & pyrheliometer. b) Performance of liquid flat plate collector depends on various parameters. C) Enlist the various parameters and describe in detail. Solve the following questions Q.3 a) Write the future prospectus and methods of harnessing geothermal energy. What is maximum efficiency of wind turbine? Prove it and write the b) depending parameters. Q.4 Write short note on the following Flow diagram in accordance with energy a) Need and methods of electrical energy conservation in small scale b) industries Energy audit and various instruments c) d) Energy conservation in commercial sectors

#### Section-II

#### Q.5 Solve the following questions

- Write the significant points that should be taken into consideration while 04 a) making selection of generation equipment.
- Necessity of organization of power sector in India. 04 b) What is fixed and operating cost? Write the difference between fixed and 03 c) operating cost.
- Which are the various factors taken into consideration at the time of d) 03 selecting the site for power station.

#### Q.6 Solve the following questions

- The maximum (peak) load on a thermal power plant of 110 mW capacity is a) 100 m/M at an annual load factor of E00/Th a 1 9

Set P

| b)                         | How private sector can help in energy management? What is role of private sector in energy management?   | 04                   |
|----------------------------|--|----------------------|
| c)                         | Presently what is the status of organization of power sector in India.   | 05                   |
| Wr<br>a)<br>b)<br>c)<br>d) | ite short note on the following<br>Depreciation methods<br>Variable load effect on power plant<br>Renewable energy sources-Forms and Characteristics<br>Base load & peak load power stations | 04<br>04<br>03<br>03 |
|                            |  |                      |

Q.7

# Seat B.E. (Part -II) (CGPA) Examination Nov/Dec-2019

**Mechanical Engineering POWER PLANT & ENERGY ENGINEERING** 

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer book.

- 2) Make suitable assumptions if necessary and state if clearly.
- 3) Figures to the right indicate full mark.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

No.

#### Q.1 Choose the correct alternatives from the options.

- 1) Extreme economy of \_\_\_\_\_ production is achieved when the plant is totally loaded.
  - a) Energy
  - c) Intermediate d)
- Plant is used as stand by unit indicated by \_\_\_\_\_. 2)
  - a) Plant is under no use
  - b) Low utilization factor
  - c) Plant is used for base load only
  - d) Plant is used for peak as well as base loads
- The capacity of \_\_\_\_\_ is always rated in terms of kVA. 3)
  - a) motor b) Initiator
  - c) transformer d) power plant
- Maximum value \_\_\_\_\_ of is 23.5<sup>°</sup> 4) a) Declination angle
  - Hour angle b)

d)

- c) Azimuth angle d) Latitude angle
- 5) Energy management emphasizes on \_\_\_\_
  - a) Controlling the supply and consumption
  - b) Maximizing productivity and comfort levels
  - c) Minimize energy costs and pollution with effective use of energy
  - d) All of the above

c) lower

- 6) \_\_\_\_ should have high lift to drag ratio.
  - Blade Turbine a) b)
  - Car d) Airfoil C)
- 7) One of the objective of energy management aims b)
  - prevention of pollution a) prevent the energy use c)
- consumption in India is less than the developed nations. 8)
  - Total b) a)
  - None of above c) Per capital d)
- While plotting load curve, \_\_\_\_\_ point represents Max. utilization. 9) Middle a)
  - Highest b)
  - Max rating d)

Marks: 14

Max. Marks: 70

14

SLR-FM-173



- Power

- None of these
- b)

- regulating the pollution levels
- none of the above
- Middling

10) In the graph of the incremental rate vs. the output, as the output increases, the incremental rate curve

a) Increases

c) Remains constant

b) Decreases

d) Becomes parallel to X-axis

**SLR-FM-173** 

Set Q

- 11) \_ solar radiations are possible to measure with the help of Pyranometer.
  - a) Record

a)

- Global b)
- c) Local Terrestrial d)

#### 12) Following are corresponding to each other \_ b) Azimuth angle and hour anle

- a) Altitude angle and Zenith angle
- c) Hour angle and latitude angle d)
  - All of these

13) Geothermal energy is the energy from

- a) Ocean thermal Tidal b) c) Earth's crust
  - Atmosphere d)
- 14) An inspection, survey and analysis of energy is called
  - energy audit b)
  - energy management C) energy consumption d) energy conservation

Set

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part -II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering POWER PLANT & ENERGY ENGINEERING**

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full mark.
- 3) Use of non-programmable calculator is allowed.

#### SECTION I

#### Q.2 Solve the following questions

- Describe in detail solar radiation geometry along with various angles with 05 a) the help of neat sketch.
- Write the similarity and difference between pyranometer & pyrheliometer. b) 04
- Performance of liquid flat plate collector depends on various parameters. C) 05 Enlist the various parameters and describe in detail.

#### Solve the following questions Q.3

- a) Write the future prospectus and methods of harnessing geothermal 07 energy.
- What is maximum efficiency of wind turbine? Prove it and write the 07 b) depending parameters.

#### Q.4 Write short note on the following

- Flow diagram in accordance with energy 04 a) b) Need and methods of electrical energy conservation in small scale 04 industries 03
- Energy audit and various instruments c)
- d) Energy conservation in commercial sectors

## Section-II

#### Q.5 Solve the following questions

- Write the significant points that should be taken into consideration while 04 a) making selection of generation equipment.
- Necessity of organization of power sector in India. 04 b) What is fixed and operating cost? Write the difference between fixed and C) 03
- operating cost. Which are the various factors taken into consideration at the time of 03 d) selecting the site for power station.

#### Q.6 Solve the following questions

- The maximum (peak) load on a thermal power plant of 110 mW capacity is 05 a) 100 mW at an annual load factor of 50%. The loads having maximum demands of 45 mW, 30 mW, 25 mW and, 15 mW are connected to the power station. Determine:
  - Average load on power station 1)
  - Energy generated per year 2)
  - 3) Demand factor
  - **Diversity factor** 4)

03

Set Q

| b)                          | How private sector can help in energy management? What is role of private sector in energy management?   | 04                   |
|-----------------------------|--|----------------------|
| c)                          | Presently what is the status of organization of power sector in India.   | 05                   |
| Wri<br>a)<br>b)<br>c)<br>d) | ite short note on the following<br>Depreciation methods<br>Variable load effect on power plant<br>Renewable energy sources-Forms and Characteristics<br>Base load & peak load power stations | 04<br>04<br>03<br>03 |

Q.7

# B.E. (Part -II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

**POWER PLANT & ENERGY ENGINEERING** 

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

Seat

No.

**Instructions:** 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer book.

- 2) Make suitable assumptions if necessary and state if clearly.
- 3) Figures to the right indicate full mark.

## MCQ/Objective Type Questions

#### Q.1 Choose the correct alternatives from the options.

- 1) Following are corresponding to each other
  - a) Altitude angle and Zenith angle Azimuth angle and hour anle b)
  - c) Hour angle and latitude angle All of these d)
- 2) Geothermal energy is the energy from
  - Tidal a) Ocean thermal b)
  - c) Earth's crust d) Atmosphere
- An inspection, survey and analysis of energy is called \_ 3)
  - a) energy management b) energy audit
  - energy consumption d) energy conservation c)
- 4) Extreme economy of \_\_\_\_\_ production is achieved when the plant is totally loaded. Power b)

d)

b)

Hour angle

None of these

- a) Energy
- c) Intermediate
- Plant is used as stand by unit indicated by \_\_\_\_\_. 5)
  - a) Plant is under no use
  - b) Low utilization factor
  - c) Plant is used for base load only
  - d) Plant is used for peak as well as base loads
- The capacity of \_\_\_\_\_ is always rated in terms of kVA. 6)
  - a) motor b) Initiator
  - c) transformer d) power plant
- Maximum value of is 23.5<sup>0</sup> 7)
  - a) Declination angle
    - c) Azimuth angle d) Latitude angle
- Energy management emphasizes on 8)
  - a) Controlling the supply and consumption
  - b) Maximizing productivity and comfort levels
  - c) Minimize energy costs and pollution with effective use of energy
  - d) All of the above
- 9) should have high lift to drag ratio.
  - a) Blade Turbine b) C)
    - d) Airfoil Car

# SLR-FM-173

Max. Marks: 70

Marks: 14 14

- One of the objective of energy management aims . 10)
  - a) prevention of pollution
- regulating the pollution levels b)

Set R

- c) prevent the energy use
- d) none of the above
- 11) \_\_\_\_ consumption in India is less than the developed nations.
  - a) Total

c) Per capital

- b) Middling
- None of above d)
- While plotting load curve, \_\_\_\_\_ point represents Max. utilization. 12)
  - Highest a) Middle b) c) lower
    - Max rating d)
- 13) In the graph of the incremental rate vs. the output, as the output increases, the incremental rate curve \_
  - a) Increases c) Remains constant
- b) Decreases
- d) Becomes parallel to X-axis
- \_\_\_\_\_ solar radiations are possible to measure with the help of 14) Pyranometer.
  - a) Record
  - c) Local

- b) Global
- d) Terrestrial

Set

03

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part -II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering POWER PLANT & ENERGY ENGINEERING**

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full mark.
- 3) Use of non-programmable calculator is allowed.

#### SECTION I

#### Q.2 Solve the following questions

- Describe in detail solar radiation geometry along with various angles with 05 a) the help of neat sketch.
- Write the similarity and difference between pyranometer & pyrheliometer. b) 04
- Performance of liquid flat plate collector depends on various parameters. c) 05 Enlist the various parameters and describe in detail.

#### Solve the following questions Q.3

- Write the future prospectus and methods of harnessing geothermal a) 07 energy. What is maximum efficiency of wind turbine? Prove it and write the 07 b)
- depending parameters.

#### Write short note on the following Q.4

- Flow diagram in accordance with energy 04 a) b) Need and methods of electrical energy conservation in small scale 04 industries 03
- Energy audit and various instruments c)
- d) Energy conservation in commercial sectors

## Section-II

#### Q.5 Solve the following questions

- Write the significant points that should be taken into consideration while 04 a) making selection of generation equipment.
- Necessity of organization of power sector in India. 04 b) What is fixed and operating cost? Write the difference between fixed and c) 03
- operating cost. Which are the various factors taken into consideration at the time of 03 d) selecting the site for power station.

#### Q.6 Solve the following questions

- The maximum (peak) load on a thermal power plant of 110 mW capacity is 05 a) 100 mW at an annual load factor of 50%. The loads having maximum demands of 45 mW, 30 mW, 25 mW and, 15 mW are connected to the power station. Determine:
  - Average load on power station 1)
  - Energy generated per year 2)
  - 3) Demand factor
  - **Diversity factor** 4)

Set R

| b)                          | How private sector can help in energy management? What is role of private sector in energy management?  | 04                   |
|-----------------------------|---|----------------------|
| c)                          | Presently what is the status of organization of power sector in India.  | 05                   |
| Wri<br>a)<br>b)<br>c)<br>d) | <b>ite short note on the following</b><br>Depreciation methods<br>Variable load effect on power plant<br>Renewable energy sources-Forms and Characteristics<br>Base load & peak load power stations | 04<br>04<br>03<br>03 |

Q.7

# B.E. (Part -II) (CGPA) Examination Nov/Dec-2019

**Mechanical Engineering POWER PLANT & ENERGY ENGINEERING** 

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q.No.1 is compulsory and should be solved in first 30 Minutes in answer book.

- Make suitable assumptions if necessary and state if clearly.
- 3) Figures to the right indicate full mark.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

2)

Seat

No.

#### Q.1 Choose the correct alternatives from the options.

- 1) The capacity of is always rated in terms of kVA.
  - a) motor
  - c) transformer

Hour angle b)

Initiator

b)

d)

- a) Declination angle c) Azimuth angle
- 3) Energy management emphasizes on

Maximum value of is 23.5<sup>°</sup>

- a) Controlling the supply and consumption
- b) Maximizing productivity and comfort levels
- c) Minimize energy costs and pollution with effective use of energy
- d) All of the above
- should have high lift to drag ratio. 4)
  - Blade b) a)
  - Car C)
- One of the objective of energy management aims 5)
  - prevention of pollution a)
  - c) prevent the energy use
- consumption in India is less than the developed nations. 6) Total a)
  - b)
  - Per capital d) None of above c)
- While plotting load curve, \_\_\_\_\_ point represents Max. utilization. 7)
  - Middle Highest a) b)
  - c) lower d) Max rating
- In the graph of the incremental rate vs. the output, as the output 8) increases, the incremental rate curve
  - a) Increases c) Remains constant
- b) Decreases d) Becomes parallel to X-axis
- 9) \_ solar radiations are possible to measure with the help of Pyranometer.
  - a) Record b) Global Local d) Terrestrial C)

# Set

**SLR-FM-173** 

Max. Marks: 70

Marks: 14

14

- Turbine
- d) Airfoil
- - regulating the pollution levels b)
  - none of the above d)

- d) Latitude angle
- power plant

Middling

- An inspection, survey and analysis of energy is called \_\_\_\_\_. 12)
  - energy management b) energy audit a)
  - energy consumption d) energy conservation C)
- Extreme economy of \_\_\_\_\_ production is achieved when the plant is 13) totally loaded.
  - a) Energy b) Power
  - c) Intermediate None of these d)
- 14) Plant is used as stand by unit indicated by \_\_\_\_\_.
  - a) Plant is under no use
  - b) Low utilization factor
  - c) Plant is used for base load only
  - d) Plant is used for peak as well as base loads

- \_.
- Azimuth angle and hour anle b)
- All of these d)
- c) Hour angle and latitude angle Geothermal energy is the energy from \_ 11)

a) Altitude angle and Zenith angle

10)

a) Ocean thermal b) c) Earth's crust

Following are corresponding to each other

- Tidal d)
  - Atmosphere
- **SLR-FM-173** Set

| Seat |  |
|------|--|
| No.  |  |

## B.E. (Part -II) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering POWER PLANT & ENERGY ENGINEERING**

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full mark.
- 3) Use of non-programmable calculator is allowed.

#### SECTION I

#### Q.2 Solve the following questions

- Describe in detail solar radiation geometry along with various angles with 05 a) the help of neat sketch. Write the similarity and difference between pyranometer & pyrheliometer. b) 04
- Performance of liquid flat plate collector depends on various parameters. c) 05 Enlist the various parameters and describe in detail.

#### Solve the following questions Q.3

- Write the future prospectus and methods of harnessing geothermal a) 07 energy. 07
- What is maximum efficiency of wind turbine? Prove it and write the b) depending parameters.

#### Write short note on the following Q.4

- Flow diagram in accordance with energy 04 a) b) Need and methods of electrical energy conservation in small scale 04 industries
- Energy audit and various instruments 03 c) 03
- d) Energy conservation in commercial sectors

## Section-II

#### Q.5 Solve the following questions

- Write the significant points that should be taken into consideration while 04 a) making selection of generation equipment.
- Necessity of organization of power sector in India. 04 b) What is fixed and operating cost? Write the difference between fixed and c) 03
- operating cost. Which are the various factors taken into consideration at the time of 03 d) selecting the site for power station.

#### Q.6 Solve the following questions

- The maximum (peak) load on a thermal power plant of 110 mW capacity is 05 a) 100 mW at an annual load factor of 50%. The loads having maximum demands of 45 mW, 30 mW, 25 mW and, 15 mW are connected to the power station. Determine:
  - Average load on power station 1)
  - Energy generated per year 2)
  - 3) Demand factor
  - **Diversity factor** 4)

Set S

| b)       | How private sector can help in energy management? What is role of private sector in energy management? | 04       |
|----------|--|----------|
| c)       | Presently what is the status of organization of power sector in India.                                 | 05       |
| Wr<br>a) | ite short note on the following<br>Depreciation methods  | 04       |
| b)       | Variable load effect on power plant  | 04       |
| c)<br>d) | Renewable energy sources-Forms and Characteristics<br>Base load & peak load power stations             | 03<br>03 |
|          |  |          |

Q.7

| Seat |  |
|------|--|
| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory. It should be solved in first 30 minutes in the Answer book.

2) All the sub-questions in Q.No.1 are compulsory for one mark each and every question has only one correct answer.

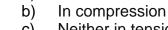
## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - The layer at the center of gravity of the beam as shown in the below 1) figure, will be 6

Gi

d



a)

- Neither in tension nor in compression C)
- d) None of these

In tension

C

- 2) If the value of Poisson's ratio is zero, then it means that \_\_\_\_\_.
  - The material is rigid a)
  - The material is perfectly plastic b)
  - There is no longitudinal strain in the material c)
  - The longitudinal strain in the material is infinity d)
- 3) Which one of the following is correct? When a nut is tightened by placing a washer below it, the bolt will be subjected to
  - Compression only Tension a) b) C)
    - Shear only d) Compression and shear
- If at a section distant from one of the ends of the beam, M represents the 4) bending moment. V the shear force and w the intensity of loading, then \_\_\_\_\_.
  - i) dM/dx = V
  - ii) dV/dx = w

ii) and iii)

- dw/dx = y (the deflection of the beam at the section) iii) Select the correct answer using the codes given below: \_\_\_\_\_.
- i) and iii) a)

c)

- i) and ii) b)
- i), ii) and iii) d)



Max. Marks: 70

Marks: 14



- 5) A point, along the length of a beam subjected to loads, where bending moment changes its sign, is known as the point of \_\_\_\_\_.
  - a) Inflexion

b) Maximum stress

Contra flexure

- c) Zero shear force
- 6) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by .

d)

- The diameter of the Mohr's circle a)
- Half the diameter of the Mohr's circle b)
- One-third the diameter of the Mohr's circle C)
- One-fourth the diameter of the Mohr's circle d)
- For a circular shaft of diameter d subjected to torque T, the maximum 7) value of the shear stress is \_\_\_\_\_.
  - $32T/\tau D^3$  $64T/\tau D^3$ b) a)
  - $16T/\tau D^3$  $8T/\tau D^3$ C) d)
- 8) In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to \_ \_\_\_\_\_•
  - The sum of the normal stresses a)
  - Difference of the normal stresses b)
  - C) Half the sum of the normal stresses
  - Half the difference of the normal stresses d)
- 9) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed
  - At the centre of the web a)
  - b) At the top edge of the top flange
  - At the bottom edge of the top flange C)
  - None of the above d)

Slope

a)

- 10) If one end of a hinged column is made fixed and the other free, how much is the critical load compared to the original value?
  - 1/2 1⁄4 a) b)
  - C) Twice d) Four times
- For which one of the following columns, Euler buckling load  $4\pi^2 EI / L^2$ . 11)
  - Column with both hinged ends a)
  - Column with one end fixed and other end free b)
  - Column with both ends fixed c)
  - Column with one end fixed and other hinged d)
- The property by which an amount of energy is absorbed by a material 12) without plastic deformation, is called
  - Toughness Impact strength b) a)
  - Ductility Resilience C) d)
- In double integration method, third integration will be value of 13)
  - Bending moment b)
  - C) Deflection d) shear force
- A simply supported beam is of a rectangular section. It carries a uniformly 14) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - 2y a) b) 4y
  - c) y/2 d) y/8

**SLR-FM-643** 

Set

#### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Seat

No.

Instructions: 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.

C

D

4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

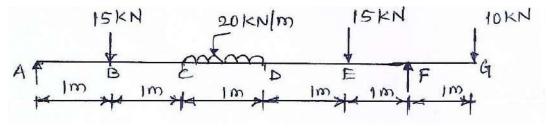
Q.2 a) Two planes AB and BC which are at right angles are acted upon by tensile stress of 140 N/mm<sup>2</sup> and a compressive stress of 70 N/mm<sup>2</sup> respectively and also by stress 35 N/mm<sup>2</sup>. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.

b) A copper rod of 40 mm diameter is surrounded tightly by a cast iron tube of external diameter 80 mm & internal diameter 40mm, the ends being firmly fastened together. When it is subjected to a compressive load of 30 kN, what will be the load shared by each? Also determine the amount by which a compound bar shortens if it is 2 meter long. Eci = 175 GN/m<sup>2</sup>, Ec = 75 GN/m<sup>2</sup>

B

140N/mm2

- Q.3 a) A simply supported beam of span length 6m and 75mm diameter carries a uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - b) Calculate maximum intensity of shear stress induced and angle of twist produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
  - c) For a given material  $E = 110 \text{GN/m}^2$  and  $C = 42 \text{ GN/m}^2$ . Find the bulk **04** modulus and lateral contraction of a round bar of 37.5 mm diameter and 2.4 m long when stretched by 2.5 mm.
- Q.4 a) Draw SF & BM diagrams for the beam as shown in the fig. and mark the silent points. Find the position of point of Cotraflexure and maximum bending moment.



SLR-FM-643

Set P

Max. Marks: 56



|     |    | SLR-FM-6  | 43       |
|-----|----|---|----------|
|     |    | Set   | Ρ        |
|     | b) | <ul> <li>Explain the following</li> <li>1) Assumption in torsion theory</li> <li>2) Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>  | 03<br>03 |
| Q.5 | a) | A cantilever I section bean carries u.d.l. of 20 KN/m over its entire span 3m. the beam section carries its upper flange 90mm *10 mm, web 120mm *10mm and lower flange 120 mm* 15mm. determine shear stress distribution at important locations of cross section and show shear stress distribution diagram.                                      | 07       |
|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = 1 *10 <sup>5</sup> N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and $f_c = 550N/mm^2$ | 07       |
| Q.6 | a) | A simply supported beam has a span of 4 m and rectangular cross-section 100mm * 200mm. Find uniformly distributed it can carry, if maximum bending stress & shear stress are not to exceed 10N/mm <sup>2</sup> & 0.6 N/mm <sup>2</sup>  | 06       |
|     | b) | What will be the instantaneous stress and elongation of a 25 mm diameter bar, 2.6 m long, suspended vertically, if a mass of 10 kg falls through a height of 300 mm onto a collar which is rigidly attached to the bottom end of the bar? Take $E = 200$ GPa.   | 04       |
|     | c) | Define the following<br>1) Equivalent length<br>2) Strain energy<br>3) Section Modulus<br>4) Proof resilience   | 04       |
| Q.7 | a) | A beam of length 5 m and uniform rectangular section is simply supported at its ends. It carries u.d.l. of 9 KN/m run over its entire span. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm <sup>2</sup> and central deflection 1 cm. $E=1*10^4$ N/mm <sup>2</sup>  | 06       |
|     | b) | Derive the expression for maximum shear stress in rectangular section is equal to 1.5 times average shear stress.   | 04       |
|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.   | 04       |

# S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory. It should be solved in first 30 minutes in the Answer book.

2) All the sub-questions in Q.No.1 are compulsory for one mark each and every question has only one correct answer.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

a)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to
  - The sum of the normal stresses a)
  - b) Difference of the normal stresses
  - Half the sum of the normal stresses c)
  - Half the difference of the normal stresses d)
- 2) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed
  - At the centre of the web a)
  - At the top edge of the top flange b)
  - At the bottom edge of the top flange c)
  - None of the above d)
- If one end of a hinged column is made fixed and the other free, how much 3) is the critical load compared to the original value?
  - 1/4 a) b) 1/2
  - Twice c) d) Four times
- 4) For which one of the following columns, Euler buckling load  $4\pi^2 EI / L^2$ .
  - Column with both hinged ends a)
  - Column with one end fixed and other end free b)
  - Column with both ends fixed c)
  - Column with one end fixed and other hinged
- The property by which an amount of energy is absorbed by a material 5) without plastic deformation, is called
  - Toughness b) Impact strength
  - Ductility d) Resilience C)
- 6) In double integration method, third integration will be value of \_\_\_\_\_.
  - Slope b) Bending moment a) c)
    - shear force Deflection d)
- A simply supported beam is of a rectangular section. It carries a uniformly 7) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - a) 2y b) 4y d) y/8
  - y/2 C)



Marks: 14

Set Q

- d)

Set

C

a) In tension

figure, will be

8)

- b) In compression
- c) Neither in tension nor in compression

6

- d) None of these
- 9) If the value of Poisson's ratio is zero, then it means that \_\_\_\_\_.

Ci

d

The layer at the center of gravity of the beam as shown in the below

- a) The material is rigid
- b) The material is perfectly plastic
- c) There is no longitudinal strain in the material
- d) The longitudinal strain in the material is infinity
- 10) Which one of the following is correct?When a nut is tightened by placing a washer below it, the bolt will be subjected to \_\_\_\_\_.
  - a) Compression only
- b) Tension
- c) Shear only d) Compression and shear
- If at a section distant from one of the ends of the beam, M represents the bending moment. V the shear force and w the intensity of loading, then \_\_\_\_\_.
  - i) dM/dx = V

a)

- ii) dV/dx = w
- iii) dw/dx = y (the deflection of the beam at the section)

Select the correct answer using the codes given below: \_\_\_\_\_.

- a) i) and iii) b) i) and ii)
- c) ii) and iii) d) i), ii) and iii)
- 12) A point, along the length of a beam subjected to loads, where bending moment changes its sign, is known as the point of \_\_\_\_\_.
  - Inflexion b) Maximum stress
  - c) Zero shear force d) Contra flexure
- 13) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by \_\_\_\_\_.
  - a) The diameter of the Mohr's circle
  - b) Half the diameter of the Mohr's circle
  - c) One-third the diameter of the Mohr's circle
  - d) One-fourth the diameter of the Mohr's circle
- 14) For a circular shaft of diameter d subjected to torque T, the maximum value of the shear stress is \_\_\_\_\_.
  - a)  $64T/\tau D^3$  b)  $32T/\tau D^3$
  - c)  $16T/\tau D^3$  d)  $8T/\tau D^3$

## Seat No.

#### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each section.

2) Use of scientific calculator is allowed.

C

D

- 3) Figures to right indicate full marks.
- 4) Assume additional suitable data if necessary and state it clearly.

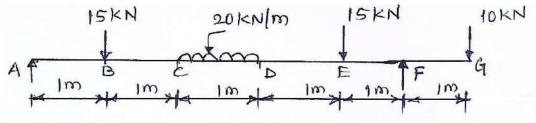
#### Section – I

Q.2 a) Two planes AB and BC which are at right angles are acted upon by tensile 07 stress of 140 N/mm<sup>2</sup> and a compressive stress of 70 N/mm<sup>2</sup> respectively and also by stress 35 N/mm<sup>2</sup>. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.

b) A copper rod of 40 mm diameter is surrounded tightly by a cast iron tube of external diameter 80 mm & internal diameter 40mm, the ends being firmly fastened together. When it is subjected to a compressive load of 30 kN, what will be the load shared by each? Also determine the amount by which a compound bar shortens if it is 2 meter long. Eci = 175 GN/m<sup>2</sup>, Ec = 75 GN/m<sup>2</sup>

B

- Q.3 a) A simply supported beam of span length 6m and 75mm diameter carries a uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - b) Calculate maximum intensity of shear stress induced and angle of twist produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
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- Q.4 a) Draw SF & BM diagrams for the beam as shown in the fig. and mark the silent points. Find the position of point of Cotraflexure and maximum bending moment.



Max. Marks: 56

Set Q

|     |    | SLR-FM-6  | 43       |
|-----|----|---|----------|
|     |    | Set   | Q        |
|     | b) | <ul> <li>Explain the following</li> <li>1) Assumption in torsion theory</li> <li>2) Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>  | 03<br>03 |
| Q.5 | a) | A cantilever I section bean carries u.d.l. of 20 KN/m over its entire span 3m. the beam section carries its upper flange 90mm *10 mm, web 120mm *10mm and lower flange 120 mm* 15mm. determine shear stress distribution at important locations of cross section and show shear stress distribution diagram.                                      | 07       |
|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = 1 *10 <sup>5</sup> N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and $f_c = 550N/mm^2$ | 07       |
| Q.6 | a) | A simply supported beam has a span of 4 m and rectangular cross-section 100mm * 200mm. Find uniformly distributed it can carry, if maximum bending stress & shear stress are not to exceed 10N/mm <sup>2</sup> & 0.6 N/mm <sup>2</sup>  | 06       |
|     | b) | What will be the instantaneous stress and elongation of a 25 mm diameter bar, 2.6 m long, suspended vertically, if a mass of 10 kg falls through a height of 300 mm onto a collar which is rigidly attached to the bottom end of the bar? Take $E = 200$ GPa.   | 04       |
|     | c) | <ul> <li>Define the following</li> <li>1) Equivalent length</li> <li>2) Strain energy</li> <li>3) Section Modulus</li> <li>4) Proof resilience</li> </ul>   | 04       |
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|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.   | 04       |

| Seat |  |
|------|--|
| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory. It should be solved in first 30 minutes in the Answer book.

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## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- A point, along the length of a beam subjected to loads, where bending moment changes its sign, is known as the point of \_\_\_\_\_.
   a) Inflexion b) Maximum stress
  - a) Inflexion b) c) Zero shear force d)
    - d) Contra flexure
- 2) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by \_\_\_\_\_.
  - a) The diameter of the Mohr's circle
  - b) Half the diameter of the Mohr's circle
  - c) One-third the diameter of the Mohr's circle
  - d) One-fourth the diameter of the Mohr's circle
- 3) For a circular shaft of diameter d subjected to torque T, the maximum value of the shear stress is \_\_\_\_\_.
  - a)  $64T/\tau D^3$  b)  $32T/\tau D^3$
  - c)  $16T/\tau D^3$  d)  $8T/\tau D^3$
- In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to \_\_\_\_\_.
  - a) The sum of the normal stresses
  - b) Difference of the normal stresses
  - c) Half the sum of the normal stresses
  - d) Half the difference of the normal stresses
- 5) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed \_\_\_\_\_.
  - a) At the centre of the web
  - b) At the top edge of the top flange
  - c) At the bottom edge of the top flange
  - d) None of the above
- 6) If one end of a hinged column is made fixed and the other free, how much is the critical load compared to the original value?
  - a) <sup>1</sup>⁄<sub>4</sub> b) <sup>1</sup>⁄<sub>2</sub>
  - c) Twice d) Four times

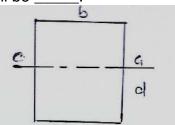
Set R

Max. Marks: 70

Marks: 14

#### 7) For which one of the following columns, Euler buckling load $4\pi^2 EI / L^2$ .

- Column with both hinged ends a)
- b) Column with one end fixed and other end free
- c) Column with both ends fixed
- d) Column with one end fixed and other hinged
- 8) The property by which an amount of energy is absorbed by a material without plastic deformation, is called
  - Toughness Impact strength a) b)
  - c) Ductility d) Resilience
- 9) In double integration method, third integration will be value of \_\_\_\_\_.
  - Bending moment a) Slope b)
  - shear force Deflection c) d)
- A simply supported beam is of a rectangular section. It carries a uniformly 10) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - a) 2y b) 4y
  - y/2 d) y/8 C)
- 11) The layer at the center of gravity of the beam as shown in the below figure, will be



- In tension a)
- b) In compression
- Neither in tension nor in compression c)
- None of these d)
- 12) If the value of Poisson's ratio is zero, then it means that \_\_\_\_\_.
  - a) The material is rigid
  - The material is perfectly plastic b)
  - There is no longitudinal strain in the material c)
  - The longitudinal strain in the material is infinity d)
- 13) Which one of the following is correct? When a nut is tightened by placing a washer below it, the bolt will be subjected to \_\_\_\_\_
  - Compression only a) Tension b) c) Shear only
    - d) Compression and shear
- If at a section distant from one of the ends of the beam, M represents the 14) bending moment. V the shear force and w the intensity of loading, then .
  - dM/dx = Vi) ii) dV/dx = w

  - dw/dx = y (the deflection of the beam at the section) iii)
  - Select the correct answer using the codes given below: \_\_\_\_\_.
  - a) i) and iii) b) i) and ii) C)
    - ii) and iii) d) i), ii) and iii)

**SLR-FM-643** 

Set

#### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
- 3) Figures to right indicate full marks.

C

D

4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

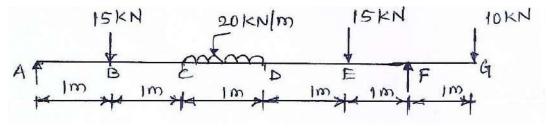
Q.2 a) Two planes AB and BC which are at right angles are acted upon by tensile stress of 140 N/mm<sup>2</sup> and a compressive stress of 70 N/mm<sup>2</sup> respectively and also by stress 35 N/mm<sup>2</sup>. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.

b) A copper rod of 40 mm diameter is surrounded tightly by a cast iron tube of external diameter 80 mm & internal diameter 40mm, the ends being firmly fastened together. When it is subjected to a compressive load of 30 kN, what will be the load shared by each? Also determine the amount by which a compound bar shortens if it is 2 meter long. Eci = 175 GN/m<sup>2</sup>, Ec = 75 GN/m<sup>2</sup>

B

140N/mm<sup>2</sup>

- Q.3 a) A simply supported beam of span length 6m and 75mm diameter carries a 04 uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - b) Calculate maximum intensity of shear stress induced and angle of twist produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
  - c) For a given material  $E = 110 \text{GN/m}^2$  and  $C = 42 \text{ GN/m}^2$ . Find the bulk **04** modulus and lateral contraction of a round bar of 37.5 mm diameter and 2.4 m long when stretched by 2.5 mm.
- Q.4 a) Draw SF & BM diagrams for the beam as shown in the fig. and mark the silent points. Find the position of point of Cotraflexure and maximum bending moment.



SLR-FM-643



Max. Marks: 56



|     |    | SLR-FM-6  | 43       |
|-----|----|---|----------|
|     |    | Set   | R        |
|     | b) | <ul> <li>Explain the following</li> <li>Assumption in torsion theory</li> <li>Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>  | 03<br>03 |
| Q.5 | a) | A cantilever I section bean carries u.d.l. of 20 KN/m over its entire span 3m. the beam section carries its upper flange 90mm *10 mm, web 120mm *10mm and lower flange 120 mm* 15mm. determine shear stress distribution at important locations of cross section and show shear stress distribution diagram.  | 07       |
|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = $1 * 10^5$ N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and f <sub>c</sub> = 550N/mm <sup>2</sup> | 07       |
| Q.6 | a) | A simply supported beam has a span of 4 m and rectangular cross-section 100mm * 200mm. Find uniformly distributed it can carry, if maximum bending stress & shear stress are not to exceed 10N/mm <sup>2</sup> & 0.6 N/mm <sup>2</sup>  | 06       |
|     | b) | What will be the instantaneous stress and elongation of a 25 mm diameter bar, 2.6 m long, suspended vertically, if a mass of 10 kg falls through a height of 300 mm onto a collar which is rigidly attached to the bottom end of the bar? Take $E = 200$ GPa.   | 04       |
|     | c) | Define the following<br>1) Equivalent length<br>2) Strain energy<br>3) Section Modulus<br>4) Proof resilience   | 04       |
| Q.7 | a) | A beam of length 5 m and uniform rectangular section is simply supported at its ends. It carries u.d.l. of 9 KN/m run over its entire span. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm <sup>2</sup> and central deflection 1 cm. $E=1*10^4$ N/mm <sup>2</sup>  | 06       |
|     | b) | Derive the expression for maximum shear stress in rectangular section is equal to 1.5 times average shear stress.   | 04       |
|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.   | 04       |

| Seat |  |
|------|--|
| No.  |  |

#### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

- Instructions: 1) Q.No.1 is compulsory. It should be solved in first 30 minutes in the Answer book.
  - 2) All the sub-questions in Q.No.1 are compulsory for one mark each and every question has only one correct answer.

## MCQ/Objective Type Questions

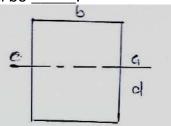
**Duration: 30 Minutes** 

c)

C)

6)

- Q.1 Choose the correct alternatives from the options and rewrite the sentence.
  - If one end of a hinged column is made fixed and the other free, how much 1) is the critical load compared to the original value? b) 1/2
    - a) 1/4 Twice
- Four times d)
- For which one of the following columns, Euler buckling load  $4\pi^2 EI$  /  $L^2$  . 2)
  - Column with both hinged ends a)
  - Column with one end fixed and other end free b)
  - Column with both ends fixed c)
  - Column with one end fixed and other hinged d)
- The property by which an amount of energy is absorbed by a material 3) without plastic deformation, is called a)
  - Toughness b) Impact strength Ductility
    - Resilience d)
- In double integration method, third integration will be value of \_\_\_\_\_. 4)
  - Slope a) Deflection C)
- Bending moment b) shear force d)
- A simply supported beam is of a rectangular section. It carries a uniformly 5) distributed load over the whole span. The deflection at the centre is y. If the depth of the beam is doubled, the deflection at the centre would be \_\_\_\_\_.
  - a) 2y b) 4y d) c)
  - y/2 v/8 The layer at the center of gravity of the beam as shown in the below
  - figure, will be



- a) In tension
- b) In compression
- Neither in tension nor in compression c)
- None of these d)

Max. Marks: 70

Set

Marks: 14

14

- Set 7) If the value of Poisson's ratio is zero, then it means that The material is rigid a) b) The material is perfectly plastic There is no longitudinal strain in the material C) The longitudinal strain in the material is infinity d) 8) Which one of the following is correct? When a nut is tightened by placing a washer below it, the bolt will be subjected to \_\_\_\_ Compression only Tension a) b) Shear only d) Compression and shear C) 9) If at a section distant from one of the ends of the beam, M represents the bending moment. V the shear force and w the intensity of loading, then . dM/dx = Vi) ii) dV/dx = wiii) dw/dx = y (the deflection of the beam at the section) Select the correct answer using the codes given below: \_\_\_\_\_. a) i) and iii) b) i) and ii) ii) and iii) i), ii) and iii) c) d) A point, along the length of a beam subjected to loads, where bending 10) moment changes its sign, is known as the point of \_\_\_\_\_. a) Inflexion b) Maximum stress d) c) Zero shear force Contra flexure 11) When two mutually perpendicular principal stresses are unequal but like, the maximum shear stress is represented by \_\_\_\_\_. The diameter of the Mohr's circle a) b) Half the diameter of the Mohr's circle One-third the diameter of the Mohr's circle c) One-fourth the diameter of the Mohr's circle d) For a circular shaft of diameter d subjected to torque T, the maximum 12) value of the shear stress is \_\_\_\_\_. a)  $64T/\tau D^3$ b)  $32T/\tau D^3$  $16T/\tau D^3$  $8T/\tau D^3$ C) d) 13) In the case of bi-axial state of normal stresses, the normal stress on 45° plane is equal to . The sum of the normal stresses a) Difference of the normal stresses b) Half the sum of the normal stresses C) Half the difference of the normal stresses d)
- 14) In I-Section of a beam subjected to transverse shear force, the maximum shear stress is developed \_\_\_\_\_.
  - a) At the centre of the web
  - b) At the top edge of the top flange
  - c) At the bottom edge of the top flange
  - d) None of the above

## Seat No.

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ANALYSIS OF MECHANICAL ELEMENTS

Day & Date: Saturday, 07-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Solve any two questions from each section.

- 2) Use of scientific calculator is allowed.
  - 3) Figures to right indicate full marks.

0

D

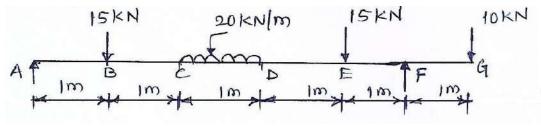
4) Assume additional suitable data if necessary and state it clearly.

#### Section – I

Q.2 a) Two planes AB and BC which are at right angles are acted upon by tensile stress of 140 N/mm<sup>2</sup> and a compressive stress of 70 N/mm<sup>2</sup> respectively and also by stress 35 N/mm<sup>2</sup>. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.

B

- Q.3 a) A simply supported beam of span length 6m and 75mm diameter carries a uniformly distributed load of 1.5 kN/m Draw Shear force and bending moment. What is the maximum value of bending moment?
  - b) Calculate maximum intensity of shear stress induced and angle of twist produced in degrees in solid shaft of 100 mm diameter, 10m long, transmitting 112.5 KW at 150 rpm. Take G = 82KN/mm<sup>2</sup>
  - c) For a given material  $E = 110 \text{GN/m}^2$  and  $C = 42 \text{ GN/m}^2$ . Find the bulk **04** modulus and lateral contraction of a round bar of 37.5 mm diameter and 2.4 m long when stretched by 2.5 mm.
- Q.4 a) Draw SF & BM diagrams for the beam as shown in the fig. and mark the silent points. Find the position of point of Cotraflexure and maximum bending moment.



Max. Marks: 56

Set S

|     |    | SLR-FM-643  |          |
|-----|----|---|----------|
|     |    | Set   | S        |
|     | b) | <ul> <li>Explain the following</li> <li>Assumption in torsion theory</li> <li>Relation between three elastic constants (E,C&amp; K)</li> <li>Section – II</li> </ul>  | 03<br>03 |
| Q.5 | a) | A cantilever I section bean carries u.d.l. of 20 KN/m over its entire span 3m. the beam section carries its upper flange 90mm *10 mm, web 120mm *10mm and lower flange 120 mm* 15mm. determine shear stress distribution at important locations of cross section and show shear stress distribution diagram.                                      | 07       |
|     | b) | A hollow C.I. column whose outside diameter is 200 mm and thickness of 20mm is 4.5 m long and fixed at both ends. Calculate safe load by Rankine's formula using F.O.S = 2.5 Find the ratio of Euler's to Rankine's load? Take E = 1 *10 <sup>5</sup> N/mm <sup>2</sup> and Rankin's constant = 1/1600 for both ends pinned and $f_c = 550N/mm^2$ | 07       |
| Q.6 | a) | A simply supported beam has a span of 4 m and rectangular cross-section 100mm * 200mm. Find uniformly distributed it can carry, if maximum bending stress & shear stress are not to exceed 10N/mm <sup>2</sup> & 0.6 N/mm <sup>2</sup>  | 06       |
|     | b) | What will be the instantaneous stress and elongation of a 25 mm diameter bar, 2.6 m long, suspended vertically, if a mass of 10 kg falls through a height of 300 mm onto a collar which is rigidly attached to the bottom end   | 04       |
|     | c) | of the bar? Take E = 200 GPa.<br>Define the following<br>1) Equivalent length<br>2) Strain energy<br>3) Section Modulus<br>4) Proof resilience  | 04       |
| Q.7 | a) | A beam of length 5 m and uniform rectangular section is simply supported at its ends. It carries u.d.l. of 9 KN/m run over its entire span. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm <sup>2</sup> and central deflection 1 cm. $E=1*10^4$ N/mm <sup>2</sup>  | 06       |
|     | b) | Derive the expression for maximum shear stress in rectangular section is equal to 1.5 times average shear stress.   | 04       |
|     | c) | Calculate the safe compressive load on a hollow C.I. column of external diameter 150mm and internal diameter 100 mm and length 10m with one end fixed and other hinged.<br>Using Euler's formula with F.O.S = 5 & E = 95 GPa.   | 04       |

# Se

#### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMIC

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.
- 6) Neat diagram must be draw wherever necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
 1) Enthalpy remains constant during which of the following process?
 a) Throttling process
 b) Free expansion

- c) Isothermal process d) None of these
- The value of dryness fraction at critical point for water-steam phase transformation may be, \_\_\_\_\_.
  - a) 0b) 1c) Either 0 or 1d) None of these
- 3) Coefficient of performance for heat pump may have value \_\_\_\_\_.
  - a) Slightly more than 0 b) Equal to 1
  - c) Greater than 1 d) None of these
- 4) Second law of thermodynamics defines \_\_\_\_\_.
  a) heat b) work
  - c) entropy d) internal energy
- 5) The major heat loss in boiler is due to \_\_\_\_\_.
  - a) Moisture in fuel b) Dry flue gases
  - c) Steam formation d) Unburnt fuel

6) Which of the following is/are super critical boiler?

- a) Cochran boiler b) Locomotive boiler
  - c) Benson boiler d) Lancashire boiler
- 7) The steam is superheated in boiler at \_\_\_\_\_
  - a) Isothermal process b) Isobaric process
  - c) Isochoric process d) None of these
- 8) For a subsonic flow the increase in velocity from inlet to exit may be obtained from a duct of \_\_\_\_\_.
  - a) Diverging cross-sectional area type
  - b) Diverging- converging cross-sectional area type
  - c) Converging cross sectional area type
  - d) None of these

SLR-FM-644



Max. Marks: 70

Marks: 14

- Set P
- Critical pressure ratio for initially superheated steam in nozzle is \_\_\_\_\_.
  - a) 0.528 b) 0.546
  - c) 0.577 d) 0.582
- 10) In a shell and tube surface condenser \_\_\_\_\_.
  - a) steam and cooling water mix to give the condensate
  - b) cooling water passes through the tubes and steam surrounds them
  - c) steam passes the cooling tubes and cooling water surrounds them
  - d) all of the above varying with situation
- 11) In case of reaction steam turbine \_\_\_\_\_
  - a) there is enthalpy drop both in fixed and moving blades
  - b) there is enthalpy drop only in fixed blades
  - c) there is enthalpy drop only in moving blades
  - d) none of these
- 12) For maximum blade efficiency for single stage impulse turbine, speed ratio ( $\rho$ ) is
  - a)  $\rho = \cos^2 \alpha$ b)  $\rho = \cos \alpha$ c)  $\rho = \frac{\cos \alpha}{2}$ d)  $\rho = \cos^2 \alpha / 2$
- 13) The compression work requirement is minimum in case of the compression following process of \_\_\_\_\_.
  - a) Adiabatic type b) Isochoric type
  - c) Isothermal type d) Hyperbolic type
- 14) With increase in clearance volume, the idea work of compressing 1 kg of air \_\_\_\_\_.
  - a) increases
  - b) decreases
  - c) remains same
  - d) first increases and then decreases

04

| Seat |  |
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## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMIC

Day & Date: Tuesday,10-12-2019 Time: 10:00 AM To 01:00 PM Max. Marks: 56

**Instructions:** 1) Answer any two question form each section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.

#### Section – I

#### Q.2 Attempt the following questions.

a) What is throttling process? Explain any one application of it in detail. 04 b) Calculate the standard enthalpy at 298.15 K for the reaction 05  $4NH_3(_g)+50_2(_g) \rightarrow 4NO(_g)+6H_2O(_g)$ Given that standard enthalpies of formation for as  $NH_3(\sigma) = -46.055 \text{ KJ/mole}$   $NO(_g)=90.435 \text{ KJ/mole}$   $H_2O(_g) =-24.997 \text{ KJ/mol}$ .  $O_2(_g) = 0 \text{ KJ/mol}$ c) State and prove the Clausius Inequality. 05

Q.3 Attempt the following questions.

- a) State Kelvin–Planck and Clausius statement of second law of thermodynamics and prove that how they are equivalent to each other.
- b) A hot copper block of mass 30 kg and at a temperature of 500°C is dropped in 200 kg of oil at 20°C. If C<sub>p</sub> for oil is 2.5 kJ/kgK and C<sub>p</sub> for copper block is 0.5 kJ/kgK, find the change in entropy of the universe. Assume adiabatic mixing.
- c) A boiler produces wet steam having dryness fraction 0.90. The working pressure of boiler is 12 bar absolute. It generates steam at the rate of 640 kg/hr and consumes coal at the rate of 80 kg/hr, if the calorific value of coal is 31400 kJ/kg and water is fed at temp, of 20°C, Calculate
  - 1) equivalent evaporation/kg of coal
  - 2) factor of evaporation
  - 3) boiler efficiency



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|     |  | Set  | Ρ        |  |
| Q.4 | Atte   | empt the following questions.  |          |  |
|     | a)   | Enlist the different losses in a boiler and draw model heat balance sheet for boiler.  | 04       |  |
|     | b)   | Explain ideal regenerative Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.   | 05       |  |
|     | c)   | In a Rankine cycle superheated steam is entering the turbine at 20 bar pressure and 450°C temperature .If the exhaust pressure of steam from turbine is 0.08 bar, and all processes are reversible, find:  | 05       |  |
|     |  | 1) Cycle thermal efficiency  |          |  |
|     |  | 2) Work ratio  |          |  |
|     |  | 3) Steam rate  |          |  |
| 0.5 |  | Section – II   |          |  |
| Q.5 | Atte<br>a)<br>b)   | empt the following questions<br>Derive an expression for maximum discharge through the nozzle.<br>Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150<br>m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine<br>theoretical and actual exit velocity.  | 04<br>05 |  |
|     | c)   | Explain the terms condenser efficiency and vacuum efficiency in connection with steam condensers.  | 05       |  |
| Q.6 | <ul><li>Attempt the following questions</li><li>a) What do you mean by compounding of steam turbines? Discuss pressure (</li></ul> |  |          |  |
|     | a)   | velocity compounding steam turbines.   | 04       |  |
|     | b)<br>c)   | <ul> <li>In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is 18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.</li> <li>1) The resultant thrust on the blade</li> <li>2) Power Developed</li> <li>3) Blade efficiency</li> <li>What are the sources of air leakage in condenser? Explain the effect of air</li> </ul> | 05       |  |
|     | C)   | leakage on the performance of condenser.   | 05       |  |
| Q.7 | Atte<br>a)   | empt the following questions.<br>Derive the expression for a polytropic work done in a single stage  | 04       |  |
|     | a)   | reciprocating air compressor with a suitable P-V diagram neglecting clearance volume.  | 04       |  |
|     | b)   | Derive the equation for optimum interstage pressure for 2 stage reciprocating compressor with perfect intercooling.  | 05       |  |
|     | c)   | Air is to be compressed in a single state reciprocating compressor from $1.013$ bar and $15^{\circ}$ C to 7 bar. Calculate the indicated power required for a free air delivery of $0.3 \text{ m}^3$ / min, when the compression process is 1) Isentropic 2) Polytropic if n=1.25  | 05       |  |

∠) Polytropic if n=1.253) Isothermal

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMIC

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.
- 6) Neat diagram must be draw wherever necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- For a subsonic flow the increase in velocity from inlet to exit may be obtained from a duct of \_\_\_\_\_.
  - a) Diverging cross-sectional area type
  - b) Diverging- converging cross-sectional area type
  - c) Converging cross sectional area type
  - d) None of these
- Critical pressure ratio for initially superheated steam in nozzle is \_\_\_\_\_.
  - a) 0.528 b) 0.546
  - c) 0.577 d) 0.582
- In a shell and tube surface condenser \_\_\_\_\_.
  - a) steam and cooling water mix to give the condensate
  - b) cooling water passes through the tubes and steam surrounds them
  - c) steam passes the cooling tubes and cooling water surrounds them
  - d) all of the above varying with situation
- 4) In case of reaction steam turbine \_\_\_\_
  - a) there is enthalpy drop both in fixed and moving blades
  - b) there is enthalpy drop only in fixed blades
  - c) there is enthalpy drop only in moving blades
  - d) none of these
- 5) For maximum blade efficiency for single stage impulse turbine, speed ratio ( $\rho$ ) is
  - a)  $\rho = \cos^2 \alpha$ b)  $\rho = \cos \alpha$ c)  $\rho = \frac{\cos \alpha}{2}$ d)  $\rho = \cos^2 \alpha / 2$
- 6) The compression work requirement is minimum in case of the compression following process of \_\_\_\_\_.
  - a) Adiabatic type b) Isochoric type
  - c) Isothermal type d) Hyperbolic type



Max. Marks: 70

Marks: 14

Set 7) With increase in clearance volume, the idea work of compressing 1 kg of air a) increases b) decreases c) remains same d) first increases and then decreases 8) Enthalpy remains constant during which of the following process? Free expansion Throttling process b) a) c) Isothermal process d) None of these 9) The value of dryness fraction at critical point for water-steam phase transformation may be, \_\_\_\_\_. b) a) 0 1 c) Either 0 or 1 d) None of these Coefficient of performance for heat pump may have value \_\_\_\_\_. 10) Slightly more than 0 Equal to 1 b) a) Greater than 1 None of these c) d) 11) Second law of thermodynamics defines \_ work a) heat b) c) entropy d) internal energy The major heat loss in boiler is due to 12) Moisture in fuel Dry flue gases a) b) Steam formation Unburnt fuel c) d) 13) Which of the following is/are super critical boiler? a) Cochran boiler Locomotive boiler b) c) Benson boiler d) Lancashire boiler The steam is superheated in boiler at 14) Isothermal process b) Isobaric process a) Isochoric process None of these c) d)

**SLR-FM-644** 

04

| Seat |  |
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## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMIC

Day & Date: Tuesday,10-12-2019 Time: 10:00 AM To 01:00 PM Max. Marks: 56

**Instructions:** 1) Answer any two question form each section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.

#### Section – I

#### Q.2 Attempt the following questions.

a) What is throttling process? Explain any one application of it in detail. 04 b) Calculate the standard enthalpy at 298.15 K for the reaction 05  $4NH_3(_g)+50_2(_g)\rightarrow 4NO(_g)+6H_2O(_g)$ Given that standard enthalpies of formation for as  $NH_3(\sigma) = -46.055$  KJ/mole  $NO(_g)=90.435$  KJ/mole  $H_2O(_g) = -24.997$  KJ/mol.  $O_2(_g) = 0$  KJ/mol c) State and prove the Clausius Inequality. 05

Q.3 Attempt the following questions.

- a) State Kelvin–Planck and Clausius statement of second law of thermodynamics and prove that how they are equivalent to each other.
- b) A hot copper block of mass 30 kg and at a temperature of 500°C is dropped in 200 kg of oil at 20°C. If C<sub>p</sub> for oil is 2.5 kJ/kgK and C<sub>p</sub> for copper block is 0.5 kJ/kgK, find the change in entropy of the universe. Assume adiabatic mixing.
- c) A boiler produces wet steam having dryness fraction 0.90. The working pressure of boiler is 12 bar absolute. It generates steam at the rate of 640 kg/hr and consumes coal at the rate of 80 kg/hr, if the calorific value of coal is 31400 kJ/kg and water is fed at temp, of 20°C, Calculate
  - 1) equivalent evaporation/kg of coal
  - 2) factor of evaporation
  - 3) boiler efficiency



|     |                  | SLR-FM-644   |          |
|-----|------------------|--|----------|
|     |                  | Set  | Q        |
| Q.4 | Atte<br>a)       | <b>Empt the following questions.</b><br>Enlist the different losses in a boiler and draw model heat balance sheet for boiler.  | 04       |
|     | b)               | Explain ideal regenerative Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.   | 05       |
|     | c)               | In a Rankine cycle superheated steam is entering the turbine at 20 bar<br>pressure and 450°C temperature .If the exhaust pressure of steam from<br>turbine is 0.08 bar, and all processes are reversible,<br>find:   | 05       |
|     |                  | <ol> <li>Cycle thermal efficiency</li> <li>Work ratio</li> </ol>   |          |
|     |                  | 3) Steam rate  |          |
|     |                  | Section – II   |          |
| Q.5 | Atte<br>a)<br>b) | <b>Example the following questions</b><br>Derive an expression for maximum discharge through the nozzle.<br>Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150<br>m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine<br>theoretical and actual exit velocity.  | 04<br>05 |
|     | c)               | Explain the terms condenser efficiency and vacuum efficiency in connection with steam condensers.  | 05       |
| Q.6 | Atte<br>a)       | mpt the following questions<br>What do you mean by compounding of steam turbines? Discuss pressure   | 04       |
|     | b)<br>c)         | <ul> <li>velocity compounding steam turbines.</li> <li>In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is 18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.</li> <li>1) The resultant thrust on the blade</li> <li>2) Power Developed</li> <li>3) Blade efficiency</li> <li>What are the sources of air leakage in condenser? Explain the effect of air</li> </ul> | 05       |
| 07  | <b>^ + + -</b>   | leakage on the performance of condenser.   |          |
| Q.7 | a)               | <b>Empt the following questions.</b><br>Derive the expression for a polytropic work done in a single stage<br>reciprocating air compressor with a suitable P-V diagram neglecting<br>clearance volume.   | 04       |
|     | b)               | Derive the equation for optimum interstage pressure for 2 stage reciprocating compressor with perfect intercooling.  | 05       |
|     | c)               | Air is to be compressed in a single state reciprocating compressor from 1.013 bar and $15^{\circ}$ C to 7 bar. Calculate the indicated power required for a free air delivery of 0.3 m <sup>3</sup> / min, when the compression process is 1) Isentropic 2) Polytropic if n=1.25   | 05       |

∠) Polytropic if n=1.253) Isothermal

| Seat |  |
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| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** APPLIED THERMODYNAMIC

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Figures to the right indicate full marks.
- Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.
- 6) Neat diagram must be draw wherever necessary.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

1)

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - The major heat loss in boiler is due to
  - a) Moisture in fuel b)
  - Steam formation d) c)
  - 2) Which of the following is/are super critical boiler?
    - a) Cochran boiler b)
    - c) Benson boiler d)
  - 3) The steam is superheated in boiler at
    - Isothermal process a) b)
    - Isochoric process d) c)
  - 4) For a subsonic flow the increase in velocity from inlet to exit may be obtained from a duct of
    - Diverging cross-sectional area type a)
    - Diverging- converging cross-sectional area type b)
    - Converging cross sectional area type c)
    - d) None of these
  - 5) Critical pressure ratio for initially superheated steam in nozzle is \_\_\_\_\_.
    - 0.528 0.546 a) b) c) 0.577 d) 0.582
  - In a shell and tube surface condenser 6)
    - steam and cooling water mix to give the condensate a)
    - cooling water passes through the tubes and steam surrounds them b)
    - steam passes the cooling tubes and cooling water surrounds them c)
    - d) all of the above varying with situation



Max. Marks: 70

- Marks: 14
- Dry flue gases
- Unburnt fuel
  - - Locomotive boiler
    - Lancashire boiler
    - None of these

  - Isobaric process

|     | <ul><li>c) there is enthalpy drop only in m</li><li>d) none of these</li></ul>   |                    |  |
|-----|--|--------------------|--|
| 8)  | For maximum blade efficiency for si ratio ( $\rho$ ) is  | ngle s             | stage impulse turbine, speed                     |
|     | a) $\rho = \cos^2 \alpha$<br>c) $\rho = \frac{\cos \alpha}{2}$   |                    | $\rho = \cos\alpha$ $\rho = \cos^2 \alpha / 2$   |
| 9)  | The compression work requirement   | is mi              | nimum in case of the                             |
|     | compression following process of _<br>a) Adiabatic type  | <br>b)             |  |
|     | c) Isothermal type   | d)                 |  |
| 10) | <ul> <li>With increase in clearance volume, air</li> <li>a) increases</li> <li>b) decreases</li> <li>c) remains same</li> <li>d) first increases and then decreases</li> </ul> |                    | lea work of compressing 1 kg of                  |
| 11) | Enthalpy remains constant during w<br>a) Throttling process<br>c) Isothermal process   | hich d<br>b)<br>d) | • •  |
| 12) | The value of dryness fraction at crititit transformation may be,<br>a) 0<br>c) Either 0 or 1   | cal po<br>b)<br>d) | pint for water-steam phase<br>1<br>None of these |
| 13) | Coefficient of performance for heat<br>a) Slightly more than 0<br>c) Greater than 1  |                    | Equal to 1                                       |
| 14) | Second law of thermodynamics defi<br>a) heat<br>c) entropy   | nes _<br>b)<br>d)  |  |

- 8 d
- 7)
- In case of reaction steam turbine \_\_\_\_\_.a) there is enthalpy drop both in fixed and moving bladesb) there is enthalpy drop only in fixed blades

Set R

04

| Seat |  |
|------|--|
| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMIC

Day & Date: Tuesday,10-12-2019 Time: 10:00 AM To 01:00 PM Max. Marks: 56

**Instructions:** 1) Answer any two question form each section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.

## Section – I

## Q.2 Attempt the following questions.

a) What is throttling process? Explain any one application of it in detail. 04 b) Calculate the standard enthalpy at 298.15 K for the reaction 05  $4NH_3(_g)+50_2(_g) \rightarrow 4NO(_g)+6H_2O(_g)$ Given that standard enthalpies of formation for as  $NH_3(\sigma) = -46.055 \text{ KJ/mole}$   $NO(_g)=90.435 \text{ KJ/mole}$   $H_2O(_g) =-24.997 \text{ KJ/mol}.$   $O_2(_g) = 0 \text{ KJ/mol}$ c) State and prove the Clausius Inequality. 05

Q.3 Attempt the following questions.

- a) State Kelvin–Planck and Clausius statement of second law of thermodynamics and prove that how they are equivalent to each other.
- b) A hot copper block of mass 30 kg and at a temperature of 500°C is dropped in 200 kg of oil at 20°C. If C<sub>p</sub> for oil is 2.5 kJ/kgK and C<sub>p</sub> for copper block is 0.5 kJ/kgK, find the change in entropy of the universe. Assume adiabatic mixing.
- c) A boiler produces wet steam having dryness fraction 0.90. The working pressure of boiler is 12 bar absolute. It generates steam at the rate of 640 kg/hr and consumes coal at the rate of 80 kg/hr, if the calorific value of coal is 31400 kJ/kg and water is fed at temp, of 20°C, Calculate
  - 1) equivalent evaporation/kg of coal
  - 2) factor of evaporation
  - 3) boiler efficiency



|     |            | SLR-FM-6  | 644      |
|-----|------------|---|----------|
|     |            | Set   | R        |
| Q.4 | Atte<br>a) | empt the following questions.<br>Enlist the different losses in a boiler and draw model heat balance sheet<br>for boiler.   | 04       |
|     | b)         | Explain ideal regenerative Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.  | 05       |
|     | c)         | In a Rankine cycle superheated steam is entering the turbine at 20 bar<br>pressure and 450°C temperature .If the exhaust pressure of steam from<br>turbine is 0.08 bar, and all processes are reversible,<br>find:  | 05       |
|     |            | 1) Cycle thermal efficiency   |          |
|     |            | <ol> <li>Work ratio</li> <li>Steam rate</li> </ol>  |          |
|     |            | Section – II  |          |
| Q.5 | Atte       | empt the following questions  |          |
|     | a)<br>b)   | Derive an expression for maximum discharge through the nozzle.<br>Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150 m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine theoretical and actual exit velocity.   | 04<br>05 |
|     | C)         | Explain the terms condenser efficiency and vacuum efficiency in connection with steam condensers.   | 05       |
| Q.6 | Atte<br>a) | empt the following questions<br>What do you mean by compounding of steam turbines? Discuss pressure   | 04       |
|     |            | velocity compounding steam turbines.  | -        |
|     | b)         | <ul> <li>In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is 18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.</li> <li>1) The resultant thrust on the blade</li> <li>2) Power Developed</li> <li>3) Blade efficiency</li> </ul> | 05       |
|     | c)         | What are the sources of air leakage in condenser? Explain the effect of air leakage on the performance of condenser.  | 05       |
| Q.7 |            | empt the following questions.<br>Derive the expression for a polytropic work done in a single stage   | 04       |
|     | a)         | reciprocating air compressor with a suitable P-V diagram neglecting clearance volume.   | 04       |
|     | b)         | Derive the equation for optimum interstage pressure for 2 stage reciprocating compressor with perfect intercooling.   | 05       |
|     | c)         | Air is to be compressed in a single state reciprocating compressor from $1.013$ bar and $15^{0}$ C to 7 bar. Calculate the indicated power required for a free air delivery of $0.3 \text{ m}^{3}$ / min, when the compression process is 1) Isentropic 2) Polytropic if n=1.25   | 05       |

2) Polytropic if n=1.253) Isothermal

## Seat No.

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** APPLIED THERMODYNAMIC

Day & Date: Tuesday, 10-12-2019 Time: 10:00 AM To 01:00 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

- 2) Figures to the right indicate full marks.
- Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.
- 6) Neat diagram must be draw wherever necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

1)

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- In a shell and tube surface condenser \_\_\_\_\_.
  - a) steam and cooling water mix to give the condensate
  - b) cooling water passes through the tubes and steam surrounds them
  - c) steam passes the cooling tubes and cooling water surrounds them
  - d) all of the above varying with situation
- 2) In case of reaction steam turbine \_
  - a) there is enthalpy drop both in fixed and moving blades
  - b) there is enthalpy drop only in fixed blades
  - c) there is enthalpy drop only in moving blades
  - d) none of these
- 3) For maximum blade efficiency for single stage impulse turbine, speed ratio ( $\rho$ ) is
  - a)  $\rho = \cos^2 \alpha$ b)  $\rho = cos\alpha$
  - c)  $\rho = \frac{\cos \alpha}{2}$ d)  $\rho = \cos^2 \alpha / 2$
- 4) The compression work requirement is minimum in case of the compression following process of
  - a) Adiabatic type b) Isochoric type
  - c) Isothermal type d) Hyperbolic type
- 5) With increase in clearance volume, the idea work of compressing 1 kg of air \_\_\_\_.
  - a) increases
  - b) decreases
  - remains same c)
  - d) first increases and then decreases
- 6) Enthalpy remains constant during which of the following process?
  - a) Throttling process Free expansion b)
  - Isothermal process d) None of these c)





Marks: 14

Set

Max. Marks: 70

Set 7) The value of dryness fraction at critical point for water-steam phase transformation may be, \_\_\_\_\_. a) 0 b) 1 c) Either 0 or 1 d) None of these 8) Coefficient of performance for heat pump may have value . Slightly more than 0 Equal to 1 a) b) Greater than 1 None of these c) d) 9) Second law of thermodynamics defines a) heat work b) c) entropy d) internal energy The major heat loss in boiler is due to \_\_\_\_\_ 10) a) Moisture in fuel b) Dry flue gases c) Steam formation d) Unburnt fuel 11) Which of the following is/are super critical boiler? a) Cochran boiler Locomotive boiler b) c) Benson boiler d) Lancashire boiler 12) The steam is superheated in boiler at Isothermal process Isobaric process a) b) c) Isochoric process d) None of these For a subsonic flow the increase in velocity from inlet to exit may be 13) obtained from a duct of \_\_\_\_\_. a) Diverging cross-sectional area type b) Diverging- converging cross-sectional area type c) Converging cross sectional area type d) None of these 14) Critical pressure ratio for initially superheated steam in nozzle is \_\_\_\_\_.

- a) 0.528 b) d) c) 0.577

0.546 0.582

**SLR-FM-644** 

04

| Seat |  |
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## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering APPLIED THERMODYNAMIC

Day & Date: Tuesday,10-12-2019 Time: 10:00 AM To 01:00 PM Max. Marks: 56

**Instructions:** 1) Answer any two question form each section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of Steam tables and Mollier diagram is allowed.
- 5) Use of Scientific calculator is allowed.

## Section – I

## Q.2 Attempt the following questions.

a) What is throttling process? Explain any one application of it in detail. 04 b) Calculate the standard enthalpy at 298.15 K for the reaction 05  $4NH_3(_g)+50_2(_g)\rightarrow 4NO(_g)+6H_2O(_g)$ Given that standard enthalpies of formation for as  $NH_3(\sigma) = -46.055$  KJ/mole  $NO(_g)=90.435$  KJ/mole  $H_2O(_g) = -24.997$  KJ/mol.  $O_2(_g) = 0$  KJ/mol c) State and prove the Clausius Inequality. 05

Q.3 Attempt the following questions.

- a) State Kelvin–Planck and Clausius statement of second law of thermodynamics and prove that how they are equivalent to each other.
- b) A hot copper block of mass 30 kg and at a temperature of 500°C is dropped in 200 kg of oil at 20°C. If C<sub>p</sub> for oil is 2.5 kJ/kgK and C<sub>p</sub> for copper block is 0.5 kJ/kgK, find the change in entropy of the universe. Assume adiabatic mixing.
- c) A boiler produces wet steam having dryness fraction 0.90. The working pressure of boiler is 12 bar absolute. It generates steam at the rate of 640 kg/hr and consumes coal at the rate of 80 kg/hr, if the calorific value of coal is 31400 kJ/kg and water is fed at temp, of 20°C, Calculate
  - 1) equivalent evaporation/kg of coal
  - 2) factor of evaporation
  - 3) boiler efficiency



|     |                  | SLR-FM-6  | 44       |
|-----|------------------|---|----------|
|     |                  | Set   | S        |
| Q.4 | Atte<br>a)       | <b>mpt the following questions.</b><br>Enlist the different losses in a boiler and draw model heat balance sheet for boiler.  | 04       |
|     | b)               | Explain ideal regenerative Rankine cycle with the help of neat sketch and T-S diagram. Also derive expression for efficiency of the cycle.  | 05       |
|     | c)               | In a Rankine cycle superheated steam is entering the turbine at 20 bar pressure and 450°C temperature .If the exhaust pressure of steam from turbine is 0.08 bar, and all processes are reversible, find:   | 05       |
|     |                  | <ol> <li>Cycle thermal efficiency</li> <li>Work ratio</li> </ol>  |          |
|     |                  | 3) Steam rate   |          |
|     |                  | Section – II  |          |
| Q.5 | Atte<br>a)<br>b) | <b>mpt the following questions</b><br>Derive an expression for maximum discharge through the nozzle.<br>Steam expands from 5 bar to 1 bar in a nozzle. The initial velocity is 150<br>m/s and initial temperature is 200°C. Nozzle efficiency is 0.90. Determine<br>theoretical and actual exit velocity.   | 04<br>05 |
|     | c)               | Explain the terms condenser efficiency and vacuum efficiency in connection with steam condensers.   | 05       |
| Q.6 | Atte<br>a)       | <b>mpt the following questions</b><br>What do you mean by compounding of steam turbines? Discuss pressure<br>velocity compounding steam turbines.   | 04       |
|     | b)               | <ul> <li>In a single stage impulse turbine the rotor diameter is of 105 cm and having speed of rotation equals to 3000 rpm. The nozzle angle at inlet tip of blade is 18°. The ratio of blade speed to steam speed at inlet is 0.42. The outlet angle of blade is 3° less than the inlet angle of the blade. The ratio of relative velocity at outlet from the blade to that of inlet is 0.84 and steam flow rate is 8 kg/s. determine.</li> <li>1) The resultant thrust on the blade</li> <li>2) Power Developed</li> <li>3) Blade efficiency</li> </ul> | 05       |
|     | c)               | What are the sources of air leakage in condenser? Explain the effect of air leakage on the performance of condenser.  | 05       |
| Q.7 | Atte<br>a)       | <b>mpt the following questions.</b><br>Derive the expression for a polytropic work done in a single stage<br>reciprocating air compressor with a suitable P-V diagram neglecting<br>clearance volume.   | 04       |
|     | b)               | Derive the equation for optimum interstage pressure for 2 stage reciprocating compressor with perfect intercooling.   | 05       |
|     | c)               | Air is to be compressed in a single state reciprocating compressor from 1.013 bar and 15 <sup>o</sup> C to 7 bar. Calculate the indicated power required for a free air delivery of 0.3 m <sup>3</sup> / min, when the compression process is 1) Isentropic 2) Polytropic if n=1.25   | 05       |

2) Polytropic if n=1.253) Isothermal

# SLR-FM-645 Set P

| Seat |  |
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| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENGINEERING METHAMATICS - III

Day & Date: Thursday,12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

## Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_.
  - a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ c)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$
- 2) The value of  $\frac{1}{D-a} X =$  \_\_\_\_\_. a)  $e^{-ax} \int e^{-ax} X dx$  b)  $e^{-ax} \int e^{ax} X dx$ 
  - c)  $e^{ax} \int e^{-ax} X dx$ On putting  $(1 + x) = e^{t}$  the differential equation

3) On putting 
$$(1 + x) = e^t$$
 the differential equation  
 $(1 + x)^2 \frac{d^2 y}{dx^2} + (1 + x) \frac{dy}{dx} = y = 2 \sin[\log(1 + x)]$  is transformed to \_\_\_\_\_.  
a)  $(D^2 + 1)Y = 2 \sin t$  b)  $(D^2 + 1)Y = 2 \sin t \log t$   
c)  $(D^2 + D)Y = 2 \sin t$  d)  $(D^2 + 2D + 1)Y = 2 \sin e^t$ 

 $\frac{5!}{s^6}$ 

4) The 
$$L(e^{2t} \sin t)$$
 is \_\_\_\_\_.  
a)  $\frac{1}{s^2-4}$  b)  $\frac{1}{s^2-4s+5}$   
c)  $\frac{1}{s^2-4s+1}$  d)  $\frac{1}{s^2-1}$   
5)  $L^{-1}\left[\frac{1}{(s+2)^2}\right] =$ \_\_\_\_\_.  
a)  $e^{-2t} t$  b)  $\frac{e^{-2t}}{t}$ 

c) 
$$e^{-2t} t$$
 d) None of these

6) The value of integral 
$$\int_0^\infty e^{-st} t^5 dt$$
 is \_\_\_\_\_.  
a)  $\frac{1}{s^5}$  b)  $\frac{1}{s^6}$ 

c) 
$$\frac{5}{s^6}$$
 d)

7) 
$$L^{-1}[\phi(s+a)] =$$
  
a)  $e^{-at}L^{-1}[\phi(s)]$   
b)  $e^{t}L^{-1}[\phi(s)]$   
c)  $t L^{-1}[\phi(s)]$   
d)  $e^{at}L^{-1}[\phi(s)]$ 

Max. Marks: 70

Marks: 14

|     |   | Set     | Ρ |
|-----|---|---------|---|
| 8)  | The solution of $p^2q^3 = 1$ is<br>a) $x^2y^3 = 1$ b) $x^2 = 1 - y^3$<br>c) $y^3 = 1 - x^2$ d) none of these  |         |   |
| 9)  | The area under std. normal curve from $z = -\infty$ to $z = 0$ is<br>a) 1 b) 0<br>c) 0.5 d) 1.5   |         |   |
| 10) | For a poisson distribution, which of the following is true?a) Mean < Variance   |         |   |
| 11) | Cauchy- Riemann equations for $f(re^{i\theta})$ to be analytic are<br>a) $u_r = v_r, u_{\theta} = -v_{\theta}$ b) $u_r = -v_r, u_{\theta} = v_{\theta}$<br>c) $u_{\theta} = -rv_r, ru_r = v_{\theta}$ d) $u_{\theta} = r v_r, u_{\theta} = rv_{\theta}$ |         |   |
| 12) | The value of integral $\int_0^{2+i} \bar{z}^2 dz$ along $x = 2y$ is<br>a) $\frac{1}{3}(10+5i)$ b) $\frac{1}{3}(10-5i)$<br>c) $(10+5i)$ d) $(10-5i)$   |         |   |
| 13) | The Fourier series of $f(x) = 1 - x^2$ in (-1,1) contains<br>a) only sine series b) only cosine series<br>c) both sine & cosine series d) none of these   |         |   |
| 14) | Which of the following functions can not be expanded in Fourier se<br>the interval $(-\pi, \pi)$<br>a) $e^x$<br>b) $ x $<br>c) cosecx<br>d) $x^2$   | ries in |   |

c) cosecx d) x<sup>2</sup> SLR-FM-645

|       | S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 |  |                |  |  |
|-------|---|--|----------------|--|--|
|       |   | Mechanical Engineering<br>ENGINEERING METHAMATICS- III   |                |  |  |
| •     |   | te: Thursday,12-12-2019<br>00 AM To 01:00 PM   | Max. Marks: 56 |  |  |
| Instr | uctio   | <ul> <li>ons: 1) All questions are compulsory.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>  |                |  |  |
|       |   | Section – I  |                |  |  |
| Q.2   | a)<br>b)  | Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$  | 09             |  |  |
| Q.3   | Atte<br>a)<br>b)                                      | Prove that $\int_0^{\infty} e^{-2t} \cosh^5 t  dt = \frac{2}{7}$<br>Evaluate $L[(t + \sin t)^2]$   | 09             |  |  |
|       | c)  | Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$   |                |  |  |
|       | d)  | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2-s^2-s^2-s^2-s^2-s^2-s^2-s^2-s^2-s^2-$   | +9)            |  |  |
|       | e)  | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$   |                |  |  |
| Q.4   | Atte<br>a)  | <b>Example any Two.</b><br>Find:<br>1) $L[t^2H(t-3)]$  | 10             |  |  |
|       | b)  | 2) $L[\sin 2t \delta(t-2)]$<br>A body executes damped forced vibration given by the equation $(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the owner<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$ | cases          |  |  |

**c)** Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

Seat

No.

SLR-FM-645

Set P

## Section-II

## Q.5 Attempt any Three.

- **a)** Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- c) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- **d)** Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$
- e) Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ .

## Q.6 Attempt any Three.

- **a)** Solve (z y)p (z x)q = y x
- **b)** Solve  $p^3 + q^3 = 27 z$
- c) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

e) Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ 

## Q.7 Attempt any Two.

- a) In a normal distribution 31% items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].
- **b)** Evaluate.  $c \oint \frac{4z-1}{z^2-3z-4} dz$  where c is a elliose  $x^2 + 4y^2 = 4$
- **c)** Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$

09

**SLR-FM-645** 

Set

10

Mean > Variance

|  | Time: 10:00 AM To 01:00 PM   |                          |  |  |  |
|--|--|--------------------------|--|--|--|
| bc<br>2) Fi  | <ul> <li>Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul> |                          |  |  |  |
|  | MCQ/Objective Ty   | pe C                     | Questions  |  |  |
| Duration: 30 Minute                                  | es   | -                        | Marks: 14  |  |  |
| <ol> <li>The so</li> <li>a) x<sup>2</sup></li> </ol> | lution of $p^2 q^3 = 1$ is   | b)                       | tions and rewrite the sentence. 14<br>$x^2 = 1 - y^3$<br>none of these |  |  |
| 2) The are<br>a) 1<br>c) 0.5                         | ea under std. normal curve fro   | m <i>z</i> =<br>b)<br>d) | $z = -\infty$ to $z = 0$ is<br>0<br>1.5                                |  |  |
| , · ·  | ooisson distribution, which of th<br>ean < Variance  | ne fol<br>b)             | lowing is true?<br>Mean = Variance                                     |  |  |

d)

Cauchy- Riemann equations for  $f(re^{i\theta})$  to be analytic are \_\_\_\_\_. 4)

a)  $u_r = v_r$ ,  $u_{\theta} = -v_{\theta}$ b)  $u_r = -v_r, u_\theta = v_\theta$ d)  $u_{\theta} = r v_r, u_{\theta} = r v_{\theta}$ c)  $u_{\theta} = -rv_r$ ,  $ru_r = v_{\theta}$ 

## The value of integral $\int_0^{2+i} \bar{z}^2 dz$ along x = 2y is \_\_\_\_\_. a) $\frac{1}{2}(10+5i)$ b) $\frac{1}{3}(10-5i)$ . 5) a) $\frac{1}{3}(10+5i)$

c) Mean  $\times$  Variance = 1

- c) (10 + 5i)(10 - 5i)d)
- The Fourier series of  $f(x) = 1 x^2$  in (-1,1) contains \_\_\_\_\_. 6) only cosine series only sine series a) b)
  - both sine & cosine series d) none of these C)
- Which of the following functions can not be expanded in Fourier series in 7) the interval  $(-\pi, \pi)$ a)  $e^x$ 
  - b) |x| $\chi^2$ d) c) cosecx

#### The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_. 8)

a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ c)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$  d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ 

S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING METHAMATICS - III** 

Seat

No.

Day & Date: Thursday, 12-12-2019 Time

Max. Marks: 70

**SLR-FM-645** 

Set

Set Q The value of  $\frac{1}{D-a} X =$ \_\_\_\_\_. 9) a)  $e^{-ax} \int e^{-ax} X dx$ b)  $e^{-ax} \int e^{ax} X dx$ d)  $e^{ax} \int e^{ax} X dx$ c)  $e^{ax} \int e^{-ax} X dx$ On putting  $(1 + x) = e^t$  the differential equation 10)  $(1+x)^{2} \frac{d^{2}y}{dx^{2}} + (1+x)\frac{dy}{dx} = y = 2\sin[\log(1+x)] \text{ is transformed to } \_\_\_\_.$ a)  $(D^{2}+1)Y = 2\sin t$  b)  $(D^{2}+1)Y = 2\sin t\log t$ c)  $(D^{2}+D)Y = 2\sin t$  d)  $(D^{2}+2D+1)Y = 2\sin e^{t}$ The  $L(e^{2t} \sin t)$  is \_\_\_\_\_. 11) a) <u>1</u>  $\frac{1}{s^2 - 4s + 5}$ b)  $s^2 - 4$ c)  $\frac{1}{s^2 - 4s + 1}$  $\frac{1}{s^2 - 1}$ d) 12)  $L^{-1}\left[\frac{1}{(s+2)^2}\right] =$ \_\_\_\_\_. a)  $e^{-2t} t$  $\frac{e^{-2t}}{t}$ b) c)  $e^{-2t} t$ d) None of these The value of integral  $\int_0^\infty e^{-st} t^5 dt$  is \_\_\_\_\_ 13)  $\frac{1}{s^6}$ b) a)  $\frac{1}{s^5}$ c)  $\frac{5}{s^6}$  $\frac{5!}{s^6}$ d) 14)  $L^{-1}[\phi(s+a)] =$ a)  $e^{-at}L^{-1}[\phi(s)]$ b)  $e^{t}L^{-1}[\phi(s)]$ c)  $t L^{-1}[\phi(s)]$ d)  $e^{at}L^{-1}[\phi(s)]$ 

**SLR-FM-645** 

|       |                                    | Mechanical Engineering<br>ENGINEERING METHAMATICS- III  |                |
|-------|------------------------------------|---|----------------|
| -     |                                    | te: Thursday,12-12-2019<br>00 AM To 01:00 PM  | Max. Marks: 56 |
| Instr | uctic                              | <ul> <li>ons: 1) All questions are compulsory.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>   |                |
|       |                                    | Section – I   |                |
| Q.2   | Atte<br>a)<br>b)<br>c)<br>d)<br>e) | Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$  | 09             |
| Q.3   | Atte<br>a)<br>b)<br>c)             | <b>Example any Three.</b><br>Prove that $\int_0^{\infty} e^{-2t} \cosh^5 t  dt = \frac{2}{7}$<br>Evaluate $L[(t + \sin t)^2]$<br>Find the inverse Laplace transform of $\frac{2s^2 - 4}{(s+1)(s-2)(s-3)}$   | 09             |
|       | d)                                 | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2+1)}$   | 9)             |
|       | e)                                 | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$  |                |
| Q.4   | Atte<br>a)<br>b)                   | Find:<br>1) $L[t^2H(t-3)]$<br>2) $L[\sin 2t \delta(t-2)]$<br>A body executes damped forced vibration given by the equation<br>$(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the call | 10<br>ases     |
|       |                                    | when<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$   |                |

c) Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

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## Seat No.

S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

## Section-II

## Q.5 Attempt any Three.

- a) Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- C) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$ d)
- Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ . e)

#### Attempt any Three. Q.6

- Solve (z y)p (z x)q = y xa)
- Solve  $p^3 + q^3 = 27 z$ b)
- C) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ e)

#### Q.7 Attempt any Two.

- In a normal distribution 31% items are under 45 and 8% are over 64. Find a) the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].
- **b)** Evaluate.  $c \oint \frac{4z-1}{z^2-3z-4} dz$  where c is a elliose  $x^2 + 4y^2 = 4$
- Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$ c)

**SLR-FM-645** 

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# S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Day & Date: Thursday,12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.

**ENGINEERING METHAMATICS - III** 

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

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|            |  | the op             | buons and rewrite the sen                  |
|------------|--|--------------------|--|
| 1)         | $L^{-1}\left[\frac{1}{(s+2)^2}\right] = \underline{\qquad}.$   |                    |  |
|            | a) $e^{-2t} t$   | b)                 | $\frac{e^{-2t}}{t}$                        |
|            | c) $e^{-2t} t$   | d)                 | None of these                              |
| 2)         | The value of integral $\int_0^\infty e^{-st} t^5 dt$ is        | S                  | ·  |
| ŗ          | a) $\frac{1}{s^5}$   | b)                 | $\frac{1}{s^6}$                            |
|            | C) $\frac{5}{s^6}$   | d)                 | 5!<br>s <sup>6</sup>                       |
| 3)         | $L^{-1}[\phi(s+a)] =$  |                    |  |
| ,          | $L^{-1}[\phi(s+a)] = \_\_\_\_$<br>a) $e^{-at} L^{-1}[\phi(s)]$ | b)                 | $e^t L^{-1}[\phi(s)]$                      |
|            | C) $t L^{-1}[\phi(s)]$   | d)                 | $e^{at}L^{-1}[\phi(s)]$                    |
| 4)         | The solution of $p^2q^3 = 1$ is                                |                    | 2  |
|            | a) $x^2y^3 = 1$<br>c) $y^3 = 1 - x^2$                          | ,                  | $x^2 = 1 - y^3$<br>none of these           |
| <b>5</b> ) |  | ,                  |  |
| 5)         | The area under std. normal curve a) 1                          | trom z<br>b)       |  |
|            | c) 0.5   | ,                  | 1.5  |
| 6)         | For a poisson distribution, which c                            |                    |  |
|            | a) Mean < Variance   | b)                 | Mean = Variance                            |
|            | c) Mean $\times$ Variance = 1                                  | d)                 | Mean > Variance                            |
| 7)         | Cauchy- Riemann equations for $f$                              |                    | -  |
|            | a) $u_r = v_r$ , $u_{	heta} = -v_{	heta}$                      | b)                 | $u_r = -v_r$ , $u_	heta = v_	heta$         |
|            | c) $u_{	heta} = -rv_r$ , $ru_r = v_{	heta}$                    | d)                 | $u_	heta = r  v_r$ , $u_	heta = r v_	heta$ |
| 8)         | The value of integral $\int_0^{2+i} \bar{z}^2 dz$ ald          | ng x =             | = 2 <i>y</i> is                            |
|            | a) $\frac{1}{3}(10+5i)$  | b)                 | $\frac{1}{3}(10-5i)$                       |
|            | c) $(10+5i)$   |                    | (10-5i)                                    |
| 9)         | The Fourier series of $f(x) = 1 - x$                           | <sup>2</sup> in (– | 1,1) contains                              |
|            | a) only sine series  |                    | only cosine series                         |
|            | c) both sine & cosine series                                   | d)                 | none of these                              |

## SLR-FM-645



Max. Marks: 70

Marks: 14

## Set R Which of the following functions can not be expanded in Fourier series in 10) the interval $(-\pi, \pi)$ a) $e^x$ b) |x|d) $x^2$ c) cosecx The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_. 11) a) $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ b) $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ d) $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ C) $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ 12) The value of $\frac{1}{D-a} X =$ \_\_\_\_\_. b) $e^{-ax} \int e^{ax} X dx$ a) $e^{-ax} \int e^{-ax} X dx$ c) $e^{ax} \int e^{-ax} X dx$ d) $e^{ax} \int e^{ax} X dx$ 13) On putting $(1 + x) = e^t$ the differential equation $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} = y = 2 \sin[\log(1+x)] \text{ is transformed to } \_\_\_\_.$ a) $(D^2 + 1)Y = 2 \sin t$ b) $(D^2 + 1)Y = 2 \sin t \log t$ c) $(D^2 + D)Y = 2 \sin t$ d) $(D^2 + 2D + 1)Y = 2 \sin e^t$ 14) The $L(e^{2t} \sin t)$ is \_\_\_\_\_. a) $\frac{1}{2}$ 1 b) d)

c) 
$$\frac{1}{s^2 - 4s + 1}$$

$$\frac{1}{s^2 - 4s + 5}$$

$$\frac{1}{s^2 - 1}$$

**SLR-FM-645** 

|       |                        | S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>ENGINEERING METHAMATICS- III   |          |
|-------|------------------------|---|----------|
|       |                        | te: Thursday,12-12-2019 Max. Ma<br>00 AM To 01:00 PM  | arks: 56 |
| Instr | uctio                  | <ul> <li>and a straight straight indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>  |          |
|       |                        | Section – I   |          |
| Q.2   | a)<br>b)<br>c)         | <b>Example any Three.</b><br>Solve $(D^3 - 1)y = (1 + e^x)^2$<br>Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$<br>Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$<br>Solve $(x^2D^2 - 3xD + 5)y = x^2 \sin(\log x)$ | 09       |
| Q.3   | Atte<br>a)<br>b)<br>c) | <b>Example any Three.</b><br>Prove that $\int_0^{\infty} e^{-2t} \cosh^5 t  dt = \frac{2}{7}$<br>Evaluate $L[(t + \sin t)^2]$<br>Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$                                       | 09       |
|       | d)                     | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2+9)}$   |          |
|       | e)                     | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$  |          |
| Q.4   | Atte<br>a)             | <b>EXAMPLE 1</b> Find:<br>1) $L[t^2H(t-3)]$   | 10       |
|       | b)                     | 2) $L[\sin 2 t  \delta(t-2)]$<br>A body executes damped forced vibration given by the equation<br>$(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the cases<br>when<br>1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$   |          |

**c)** Solve:  $(D^2 - 1)y = x^2 \sin 3x$ 

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# Seat No.

## Section-II

## Q.5 Attempt any Three.

- **a)** Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- c) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- **d)** Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$
- e) Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ .

## Q.6 Attempt any Three.

- **a)** Solve (z y)p (z x)q = y x
- **b)** Solve  $p^3 + q^3 = 27 z$
- c) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

e) Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ 

## Q.7 Attempt any Two.

a) In a normal distribution 31% items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].

**b)** Evaluate. 
$$c \oint \frac{4z-1}{z^2-3z-4} dz$$
 where c is a elliose  $x^2 + 4y^2 = 4$ 

**c)** Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$ 

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**SLR-FM-645** 

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## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING METHAMATICS - III**

Day & Date: Thursday, 12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q.No.1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- Use of calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) For a poisson distribution, which of the following is true?
  - a) Mean < Variance Mean = Variance b)
  - c) Mean  $\times$  Variance = 1 d) Mean > Variance
- Cauchy- Riemann equations for  $f(re^{i\theta})$  to be analytic are \_\_\_\_\_. 2) a)  $u_r = v_r, u_{\theta} = -v_{\theta}$ 
  - b)  $u_r = -v_r, u_\theta = v_\theta$ c)  $u_{\theta} = -rv_r$ ,  $ru_r = v_{\theta}$ d)  $u_{\theta} = r v_r, u_{\theta} = r v_{\theta}$
- 3)
  - The value of integral  $\int_0^{2+i} \bar{z}^2 dz$  along x = 2y is \_\_\_\_\_. a)  $\frac{1}{3}(10+5i)$  b)  $\frac{1}{3}(10-5i)$ . (10 - 5i)c) (10 + 5i)d)
- The Fourier series of  $f(x) = 1 x^2$  in (-1,1) contains \_\_\_\_\_. 4) a) only sine series b) only cosine series
  - c) both sine & cosine series none of these d)
- 5) Which of the following functions can not be expanded in Fourier series in the interval  $(-\pi, \pi)$ 
  - a)  $e^x$ b) |x|d)  $x^2$ c) cosecx
- The differential equation whose auxiliary equation has roots 0,-1,-1 is \_\_\_\_\_. 6)
  - b)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ a)  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + y = 0$ d)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ C)  $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$
- The value of  $\frac{1}{D-a} X =$ \_\_\_\_\_. 7)
  - b)  $e^{-ax} \int e^{ax} X dx$ a)  $e^{-ax} \int e^{-ax} X dx$
  - d)  $e^{ax} \int e^{ax} X dx$ c)  $e^{ax} \int e^{-ax} X dx$

On putting  $(1 + x) = e^t$  the differential equation 8)  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} = y = 2\sin[\log(1+x)]$  is transformed to \_\_\_\_\_. b)  $(D^2 + 1)Y = 2 \sin t \log t$ d)  $(D^2 + 2D + 1)Y = 2 \sin e^t$ a)  $(D^2 + 1)Y = 2\sin t$ c)  $(D^2 + D)Y = 2\sin t$ 

# SLR-FM-645

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Max. Marks: 70

Marks: 14

Set S The  $L(e^{2t} \sin t)$  is \_\_\_\_\_. 9) a)  $\frac{1}{s^2-4}$ b)  $\frac{1}{s^2 - 4s + 5}$ c)  $\frac{1}{s^2 - 4s + 1}$ d) 10)  $L^{-1}\left[\frac{1}{(s+2)^2}\right] =$ \_\_\_\_\_. a)  $e^{-2t} t$  $\frac{e^{-2t}}{t}$ b) c)  $e^{-2t} t$ None of these d) The value of integral  $\int_0^\infty e^{-st} t^5 dt$  is \_\_\_\_ 11)  $\frac{1}{s^6}$ a)  $\frac{1}{s^5}$ b) c)  $\frac{5}{s^6}$  $\frac{5!}{s^6}$ d) 12)  $L^{-1}[\phi(s+a)] =$ \_\_\_\_\_ a)  $e^{-at}L^{-1}[\phi(s)]$ b)  $e^{t}L^{-1}[\phi(s)]$ d)  $e^{at}L^{-1}[\phi(s)]$ c)  $t L^{-1}[\phi(s)]$ The solution of  $p^2q^3 = 1$  is \_\_\_\_\_. 13) a)  $x^2y^3 = 1$ b)  $x^2 = 1 - y^3$ c)  $y^3 = 1 - x^2$ d) none of these 14) The area under std. normal curve from  $z = -\infty$  to z = 0 is \_\_\_\_\_. a) 1 b) 0 c) 0.5 d) 1.5

**SLR-FM-645** 

| uciic                              | <ul> <li>2) Figures to the right indicate full marks.</li> <li>3) Use of calculator is allowed.</li> </ul>   |    |
|------------------------------------|--|----|
|                                    | Section – I  |    |
| Atte<br>a)<br>b)<br>c)<br>d)<br>e) | Example any Three.<br>Solve $(D^3 - 1)y = (1 + e^x)^2$<br>Solve $(D^4 + 8D^2 + 16)y = \sin^2(x)$<br>Solve $(D^3 + D)y = \cos t + t^2 + 3$<br>Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$<br>Solve $(x^2D^2 - 3xD + 5)y = x^2 \sin(\log x)$ | 09 |
| Atte<br>a)                         | Prove that $\int_0^\infty e^{-2t} \cosh^5 t  dt = \frac{2}{7}$   | 09 |
| b)                                 | Evaluate $L[(t + \sin t)^2]$   |    |
| c)                                 | Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$   |    |
| d)                                 | Find the inverse of the following by convolution theorem $\frac{s}{(s^2+4)(s^2+9)}$  |    |
| e)                                 | Solve the following equation using Laplace transform $(D^2 - D - 2)y = 20 \sin 2t$ with $y(0) = 1$ and $y'(0) = 2$   |    |
| Atte<br>a)                         | Find:<br>1) $L[t^2H(t-3)]$   | 10 |
| b)                                 | 2) $L[\sin 2 t  \delta(t-2)]$<br>A body executes damped forced vibration given by the equation<br>$(D^2 + 2KD + b^2)x = e^{-kt} \sin wt$ . solve the equation for both the cases<br>when   |    |
|                                    | 1) $w^2 \neq b^2 - k^2$<br>2) $w^2 = b^2 - k^2$<br>2 $h = (2^2 - k^2)^2$   |    |
| <b>c)</b>                          | Solve: $(D^2 - 1)y - r^2 \sin 3r$  |    |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering **ENGINEERING METHAMATICS- III**

Day & Date: Thursday, 12-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) All questions are compulsory.

#### Q.2

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## Q.3

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- 0
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#### Q.4

## ć

- k
- c) Solve:  $(D^2 1)y = x^2 \sin 3x$

# **SLR-FM-645**

Max. Marks: 56

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## Section-II

## Q.5 Attempt any Three.

- a) Solve :  $z^2(p^2 + x q^2) = x$
- **b)** Solve :  $q = px + p^2$
- c) If 10% bolts produced by a machine are defective, calculate the probability that out of a sample selected at random of 10 bolts, not more than one bolt will be defective.
- **d)** Find an analytic function f(z) = u + iv in terms of z, if  $u = \sin x \cosh y$
- e) Find the Fourier series expansion of  $f(x) = x^2$ ,  $(-\pi \le x \le \pi)$ .

## Q.6 Attempt any Three.

- **a)** Solve (z y)p (z x)q = y x
- **b)** Solve  $p^3 + q^3 = 27 z$
- c) Fit a poisson distribution for following data.

| X: | 0   | 1  | 2  | 3 | 4 | Total |
|----|-----|----|----|---|---|-------|
| F: | 109 | 65 | 22 | 3 | 1 | 200   |

d) Determine the constant k if

$$f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{ky}{x}\right)$$
 is analytic.

e) Obtain the half range sine series for  $f(x) = x(\pi - x)$  in  $(0, \pi)$ 

## Q.7 Attempt any Two.

- a) In a normal distribution 31% items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [Given area for S.N.V. z = 0 and z = 0.5 is 0.19 and that between S.N.V. z = 0 and z = 1.4 is 0.42].
- **b)** Evaluate.  $c \oint \frac{4z-1}{z^2-3z-4} dz$  where c is a elliose  $x^2 + 4y^2 = 4$
- **c)** Find the Fourier series expansion for  $f(x) = e^x$  in  $(-\pi, \pi)$

09

09

**SLR-FM-645** 

Set

## Seat No.

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENGINEERING MATHEMATICS – III

Day & Date: Thursday, 19-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer Book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

## MCQ/Objective Type Questions

Duration: 30 Minutes

## Q.1 Choose the correct alternatives from the options.

 $\frac{1}{D^2+9}\cos 3x$  is equal to \_\_\_\_\_.

| a) | $-\frac{x}{6}\sin 3x$ | b) | $\frac{x}{6}\sin 3x$ |
|----|-----------------------|----|----------------------|
| c) | $\frac{x}{3}\cos 3x$  | d) | $\frac{x}{3}$ sin 3x |

# The differential equation whose auxiliary equation has the roots 0, - 1, - 1 is \_\_\_\_\_.

a)  $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + y = 0$ b)  $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + \frac{dy}{dt} = 0$ c)  $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^3} + 3\frac{dy}{dt} + y = 0$ d)  $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$ 

3) The general solution of  $(x + 2)^2 \frac{d^2 y}{dx^2} - 4(x + 2) \frac{dy}{dx} + 6y = 0$  is y =\_\_\_\_\_.

- a)  $(c_1 + c_2 x)e^x$ b)  $(c_1 x + c_2 x^2) \log x$ c)  $c_1(x+2) + c_2(x+2)^2$ d)  $c_1(x+2)^2 + c_2(x+2)^3$
- 4)  $\frac{1}{D+a}X =$ \_\_\_\_\_. a)  $e^{-ax}\int Xe^{ax} dx$  b)  $e^{ax}\int Xe^{-ax} dx$ c)  $\int Xe^{ax} dx$  d)  $\int Xe^{-ax} dx$ 5) The solution of  $q = 3p^2$  is \_\_\_\_\_. a)  $z = 3ax + a^2y + c$  b)  $z = ax + 3a^2y + c$ c)  $z = 3ax^2 + by$  d) None of these 6) A vector function F is called irrotational if \_\_\_\_\_.
- a) grad F = 0 b) div F = 0 c) curl F = 0 7) If  $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$  then curl  $\vec{r} =$ \_\_\_\_. a) 3 c) 0 b) 2 d) 1

Max. Marks: 70

Marks: 14

|     |  | Set F   | כ |
|-----|--|---|---|
| 8)  | If x denote the binomial variate, the n  | mean of the distribution is given   |   |
|     | by<br>a) $\overline{x} = npq$<br>c) $\overline{x} = \frac{p}{n}$                                       | b) $\bar{x} = np$<br>d) $\bar{x} = pq$  |   |
| 9)  | The level of significance <i>α</i> is the size<br>a) Type - I error<br>c) Type - I and Type - II error | b) Type - II error  |   |
| 10) | Which of the following are Cauchy Ri<br>a) $U_x = V_y$ , $U_y = V_x$<br>c) $U_x = V_y$ , $U_y = -V_x$  | Riemann equations?<br>b) $U_x = -V_y, U_y = V_x$<br>d) $U_x = V_x, U_y = V_y$ |   |
| 11) | The area under standard normal curv<br>a) 1<br>c) 0.5  | rve from $z = -\infty$ to $z = 0$ is<br>b) 0<br>d) 1.5                        |   |
| 12) | Chi-square test is also known as<br>a) Parametric test<br>c) t-test                                    | b) Non-parametric test<br>d) None   |   |
| 13) | a) Mean<br>c) Standard deviation   | b) Variance<br>d) None  |   |
| 14) | If C is the circle $ z  = 1$ , the value of  | $\int_{C} \frac{e^z}{z} dz = \underline{\qquad}.$                             |   |
|     | a) πi<br>c) 0  | <sup>c</sup><br>b) 2πi<br>d) None   |   |

| Seat |  |
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| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENGINEERING MATHEMATICS – III

Day & Date: Thursday, 19-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 4 & Q. No. 8 are compulsory.

- 2) Solve any two questions from each section.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.

## Section – I

- Q.2 a) Solve  $(D^2 5D + 6)y = \sin 3x$ b) Solve  $(D^3 - 3D^2 + 3D - 1)y = xe^x + e^x$ c) Solve  $(D^2 + a^2)y = x \sin ax$ Q.3 a) The motion of a particle is given by  $\frac{d^2s}{dt^2} + k^2 \frac{ds}{dt} = 0$ . If at  $t = 0, s = s_0$  and 05
  - $\frac{ds}{dt} = v_0. \text{ Show that at } t \to \infty, s = s_0 + \frac{v_0}{k^2}$  **b)** Solve  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin[2\log(1+x)]$  **04**

## **Q.4 a)** Solve p + pq = qz

- b) Solve x(y-z)p + y(z-x)q = z(x-y). c) Solve the following equation by the method of separation of variables. 03
- c) Solve the following equation by the method of separation of variables.  $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y} \text{ where } u(0, y) = 8 e^{-3y}$
- **Q.5** a) A particle moves along the curve  $x = e^{-t}$ ,  $y = 2\cos 3t$ ,  $z = 2\sin 3t$ . Find the Velocity and acceleration vector and the magnitude of velocity and acceleration at t = 0.
  - **b)** Find the directional derivative of the function  $\phi = x^2 y^2 + 2z^2$  at the point P(1, 2, 3) in the direction of the line PQ, where Q is the point (5, 0, 4).
  - c) Show that the vector field defined by  $\overline{F} = (y+z)i + (z+x)j + (x+y)k$  is **03** irrotational. Also Find scalar potential.

## Section – II

- Q.6 a) Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six?
  - b) The mortality rate for a certain disease is 7 in 1000. What is the probability **03** for just 2 deaths on account of this disease in a group of 400? (Given  $e^{-2.8} = 0.06$ )
  - c) A random variable X is normally distributed with mean  $\mu = 12$  and S.D. 03  $\sigma = 2$ . Find P(9.6 < X < 13.8). Given that the area: A=0.3159 from z=0 to z=0.9 and A=0.3849 from z=0 to z=1.2.
- **Q.7 a)** In a sample of 400 burners, there were 12 whose internal diameters were **03** not within tolerance. Is this sufficient evidence for concluding that the manufacturing process is turning out more than 2% defective burners? Take  $\alpha = 0.05$  [Critical value at 5% one tailed test is 1.645]

Max. Marks: 56

03

Set | F

#### Set 03 b) A machine produced 20 defective articles in a batch of 400. After overhauling, it 3 produced 10 defectives in a batch of 300. Has the machine improved? [Critical value at 5% one tailed test is 1.645] [Critical value at 5% two tailed test is 1.96] c) A stenographer claims that she can take dictation at the rate of 120 words 03 per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words with a standard deviation of 15 words? Use 5% L.O.S. [Critical value for two-tailed test at 5% L.O.S. is 1.96]. Q.8 A machine is designed to produce insulating washers for electrical devices 03 a) of average thickness of 0.025 cm. A random sample of 10 washers was found to have an average thickness of 0.024 cm with a standard deviation of 0.002 cm. Test the significance of the deviation. Value of t for 9 degrees of freedom at 5% level is 2.262. b) The mean life of a sample of 10 electric bulbs was found to be 1456 hours 03 with a standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with standard deviation 398 hours. Is there significant difference between the means of the two batches? [Value of t for 25 degrees of freedom at 5% level is 2.06] A dice is tossed 120 times with the following results c) 04 Number turned up: 2 3 Total 1 4 5 6 Frequency: 30 25 18 10 22 15 120 Use Chi-square test, to test the hypothesis that the dice is unbiased. (Value of Chi-square for 5 degrees of freedom at 5% level is 11.07) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic function. Q.9 a) 03 Evaluate $\oint_c \log z \, dz$ , where C is the unit circle |z| = 1 taken in counter clockwise sense. b) 03

**c)** Evaluate  $\int_c \frac{z^2+1}{(2z^2-z)} dz$ , where C is the circle |z| = 1.

03

SLR-FM-645-RE

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENGINEERING MATHEMATICS – III

Day & Date: Thursday, 19-12-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer Book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat No.

## Q.1 Choose the correct alternatives from the options.

 If x denote the binomial variate, the mean of the distribution is given by

| Oy                         |    |                |
|----------------------------|----|----------------|
| a) $\bar{x} = npq$         | b) | $\bar{x} = np$ |
| c) $\bar{x} = \frac{p}{2}$ | d) | $\bar{x} = pq$ |
| n                          |    |                |

## 2) The level of significance $\alpha$ is the size of \_\_\_\_\_

- a) Type I error b) Type II error c) Type - I and Type - II error d) None
- 3) Which of the following are Cauchy Riemann equations?
  - a)  $U_x = V_y, U_y = V_x$ b)  $U_x = -V_y, U_y = V_x$ c)  $U_x = V_y, U_y = -V_x$ d)  $U_x = V_x, U_y = V_y$

4) The area under standard normal curve from  $z = -\infty$  to z = 0 is \_\_\_\_\_. a) 1 b) 0

- c) 0.5 d) 1.5
- 5) Chi-square test is also known as \_\_\_\_\_.
   a) Parametric test
   b) Non-parametric test
  - c) t-test d) None
- 6) The standard error is the \_\_\_\_\_ of the sampling distribution of statistic.
  - a) Mean b) Variance c) Standard deviation d) None
- 7) If C is the circle |z| = 1, the value of  $\int_{c} \frac{e^{z}}{z} dz =$ \_\_\_\_\_\_. a)  $\pi i$ b)  $2\pi i$ c) 0d) None 8)  $\frac{1}{D^{2}+9}\cos 3x$  is equal to \_\_\_\_\_\_. a)  $-\frac{x}{6}\sin 3x$ b)  $\frac{x}{6}\sin 3x$ 
  - c)  $\frac{x}{3}\cos 3x$  d)  $\frac{x}{3}\sin 3x$

Max. Marks: 70

Marks: 14

#### Set Q The differential equation whose auxiliary equation has the roots 0, - 1, - 1 9) is a) $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + y = 0$ b) $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + \frac{dy}{dt} = 0$ c) $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^3} + 3\frac{dy}{dt} + y = 0$ d) $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$ The general solution of $(x + 2)^2 \frac{d^2 y}{dx^2} - 4(x + 2) \frac{dy}{dx} + 6y = 0$ is y =\_\_\_\_\_. 10) a) $(c_1 + c_2 x)e^x$ b) $(c_1 x + c_2 x^2) \log x$ c) $c_1(x+2) + c_2(x+2)^2$ d) $c_1(x+2)^2 + c_2(x+2)^3$ 11) $\frac{1}{D+a}X =$ \_\_\_\_\_. a) $e^{-ax} \int X e^{ax} dx$ b) $e^{ax} \int X e^{-ax} dx$ c) $\int Xe^{ax} dx$ d) $\int Xe^{-ax} dx$ 12) The solution of $q = 3p^2$ is \_\_\_\_\_. a) $z = 3ax + a^2y + c$ b) $z = ax + 3a^2y + c$ c) $z = 3ax^2 + by$ d) None of these A vector function F is called irrotational if 13) $\operatorname{div} F = 0$ a) grad F = 0b) $\nabla^2 \mathbf{F} = \mathbf{0}$ d) c) curl F = 0If $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$ then curl $\vec{r} =$ \_\_\_\_\_ 14) b) 2 a) 3 c) 0 1 d)

SLR-FM-645-RE

| Seat |  |
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| No.  |  |

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING MATHEMATICS – III**

Day & Date: Thursday, 19-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 4 & Q. No. 8 are compulsory.

- 2) Solve any two questions from each section.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.

## Section – I

- Solve  $(D^2 5D + 6)y = \sin 3x$ Solve  $(D^3 3D^2 + 3D 1)y = xe^x + e^x$ Q.2 a) 03 b) 03 Solve  $(D^2 + a^2)y = x \sin ax$ 03 c) The motion of a particle is given by  $\frac{d^2s}{dt^2} + k^2 \frac{ds}{dt} = 0$ . If at  $t = 0, s = s_0$  and Q.3 05 a)
  - $\frac{ds}{dt} = v_0$ . Show that at  $t \to \infty$ ,  $s = s_0 + \frac{v_0}{k^2}$ b)
    - Solve  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin[2\log(1+x)]$ 04 03

#### Q.4 a) Solve p + pq = qz

- Solve x(y-z)p + y(z-x)q = z(x-y). 03 b) 04
- Solve the following equation by the method of separation of variables. c)  $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$  where  $u(0, y) = 8 e^{-3y}$
- A particle moves along the curve  $x = e^{-t}$ ,  $y = 2 \cos 3t$ ,  $z = 2 \sin 3t$ . Find Q.5 a) 03 the Velocity and acceleration vector and the magnitude of velocity and acceleration at t = 0.
  - Find the directional derivative of the function  $\phi = x^2 y^2 + 2z^2$  at the 03 b) point P(1, 2, 3) in the direction of the line PQ, where Q is the point (5, 0, 4).
  - c) Show that the vector field defined by  $\overline{F} = (y + z)i + (z + x)j + (x + y)k$  is 03 irrotational. Also Find scalar potential.

## Section - II

- Q.6 a) Six dice are thrown 729 times. How many times do you expect at least 03 three dice to show a five or six?
  - The mortality rate for a certain disease is 7 in 1000. What is the probability 03 b) for just 2 deaths on account of this disease in a group of 400? (Given  $e^{-2.8} = 0.06$ )
  - A random variable X is normally distributed with mean  $\mu = 12$  and S.D. 03 c)  $\sigma = 2$ . Find P(9.6 < X < 13.8). Given that the area: A=0.3159 from z=0 to z=0.9 and A=0.3849 from z=0 to z=1.2.
- In a sample of 400 burners, there were 12 whose internal diameters were 03 Q.7 a) not within tolerance. Is this sufficient evidence for concluding that the manufacturing process is turning out more than 2% defective burners? Take  $\alpha = 0.05$ [Critical value at 5% one tailed test is 1.645]

Max. Marks: 56

#### Set 03 b) A machine produced 20 defective articles in a batch of 400. After overhauling, it 3 produced 10 defectives in a batch of 300. Has the machine improved? [Critical value at 5% one tailed test is 1.645] [Critical value at 5% two tailed test is 1.96] c) A stenographer claims that she can take dictation at the rate of 120 words 03 per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words with a standard deviation of 15 words? Use 5% L.O.S. [Critical value for two-tailed test at 5% L.O.S. is 1.96]. Q.8 A machine is designed to produce insulating washers for electrical devices 03 a) of average thickness of 0.025 cm. A random sample of 10 washers was found to have an average thickness of 0.024 cm with a standard deviation of 0.002 cm. Test the significance of the deviation. Value of t for 9 degrees of freedom at 5% level is 2.262. b) The mean life of a sample of 10 electric bulbs was found to be 1456 hours 03 with a standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with standard deviation 398 hours. Is there significant difference between the means of the two batches? [Value of t for 25 degrees of freedom at 5% level is 2.06] A dice is tossed 120 times with the following results c) 04 Number turned up: 2 3 Total 1 4 5 6 Frequency: 30 25 18 10 22 15 120 Use Chi-square test, to test the hypothesis that the dice is unbiased. (Value of Chi-square for 5 degrees of freedom at 5% level is 11.07) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic function. Q.9 a) 03 Evaluate $\oint_c \log z \, dz$ , where C is the unit circle |z| = 1 taken in counter clockwise sense. b) 03

c) Evaluate  $\int_c \frac{z^2+1}{(2z^2-z)} dz$ , where C is the circle |z| = 1.

03

SLR-FM-645-RE

Day & Date: Thursday, 19-12-2019

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer Book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options.

- The solution of  $q = 3p^2$  is . 1)
  - a)  $z = 3ax + a^2v + c$ b)  $z = ax + 3a^2y + c$ 
    - c)  $z = 3ax^2 + by$ d) None of these
- A vector function F is called irrotational if 2) a) grad F = 0 $\operatorname{div} F = 0$ b) c) curl F = 0d)  $\nabla^2 \mathbf{F} = \mathbf{0}$
- 3) If  $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$  then curl  $\vec{r} = \_\_\_$ 2 a) 3 b) 1 c) 0 d)
- 4) If x denote the binomial variate, the mean of the distribution is given by \_\_\_\_\_.

| a) | $\bar{x} = npq$         | b) | $\bar{x} = np$ |
|----|-------------------------|----|----------------|
| C) | $\bar{x} = \frac{p}{2}$ | d) | $\bar{x} = pq$ |
|    | n n                     |    |                |

5) The level of significance  $\alpha$  is the size of \_

a) Type - I error b) Type - II error c) Type - I and Type - II error d) None

Which of the following are Cauchy Riemann equations? 6)

- a)  $U_x = V_y, U_y = V_x$ b)  $U_x = -V_v, U_v = V_x$ 
  - c)  $U_x = V_y, U_y = -V_x$  $U_x = V_x$ ,  $U_v = V_v$ d)

7) The area under standard normal curve from  $z = -\infty$  to z = 0 is \_\_\_\_\_. a) 1 b) 0

- c) 0.5 1.5 d)
- 8) Chi-square test is also known as \_\_\_\_
  - b) a) Parametric test Non-parametric test c) t-test None d)
- The standard error is the \_\_\_\_\_ of the sampling distribution of statistic. 9) Variance
  - a) Mean b)
  - c) Standard deviation d) None

Max. Marks: 70

Set

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Marks: 14

## Set 10) If C is the circle |z| = 1, the value of $\int \frac{e^z}{z} dz =$ \_\_\_\_\_. b) 2πi d) None a) *πi* c) 0 11) $\frac{1}{n^2+9}\cos 3x$ is equal to \_\_\_\_\_. b) $\frac{x}{6}\sin 3x$ a) $-\frac{x}{6}\sin 3x$ c) $\frac{x}{2}\cos 3x$ d) $\frac{x}{2}\sin 3x$ The differential equation whose auxiliary equation has the roots 0, - 1, - 1 12) a) $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + y = 0$ b) $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + \frac{dy}{dt} = 0$ c) $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^3} + 3\frac{dy}{dt} + y = 0$ d) $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$ The general solution of $(x + 2)^2 \frac{d^2 y}{dx^2} - 4(x + 2) \frac{dy}{dx} + 6y = 0$ is y =\_\_\_\_\_. 13) b) $(c_1 x + c_2 x^2) \log x$ a) $(c_1 + c_2 x)e^x$ c) $c_1(x+2) + c_2(x+2)^2$ d) $c_1(x+2)^2 + c_2(x+2)^3$ 14) $\frac{1}{D+a}X =$ \_\_\_\_\_. a) $e^{-ax} \int X e^{ax} dx$ b) $e^{ax} \int X e^{-ax} dx$ c) $\int X e^{ax} dx$ d) $\int Xe^{-ax} dx$

SLR-FM-645-RE

| Seat |  |
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## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING MATHEMATICS – III**

Day & Date: Thursday, 19-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 4 & Q. No. 8 are compulsory.

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  - 4) Use of calculator is allowed.

## Section – I

Solve  $(D^2 - 5D + 6)y = \sin 3x$ Solve  $(D^3 - 3D^2 + 3D - 1)y = xe^x + e^x$ Q.2 a) 03 b) 03 Solve  $(D^2 + a^2)y = x \sin ax$ 03 c) The motion of a particle is given by  $\frac{d^2s}{dt^2} + k^2 \frac{ds}{dt} = 0$ . If at  $t = 0, s = s_0$  and 05 Q.3 a)

b) Solve 
$$(1 + x)^2 \frac{d^2y}{dt^2} + (1 + x)\frac{dy}{dt} + y = \sin[2\log(1 + x)]$$
 04

b) Solve 
$$(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin[2\log(1+x)]$$
  
a) Solve  $p + pq = qz$   
03

#### Q.4 a) Solve p + pq = qz

- Solve x(y-z)p + y(z-x)q = z(x-y). 03 b) 04
- Solve the following equation by the method of separation of variables. C)  $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$  where  $u(0, y) = 8 e^{-3y}$
- A particle moves along the curve  $x = e^{-t}$ ,  $y = 2 \cos 3t$ ,  $z = 2 \sin 3t$ . Find Q.5 a) 03 the Velocity and acceleration vector and the magnitude of velocity and acceleration at t = 0.
  - Find the directional derivative of the function  $\phi = x^2 y^2 + 2z^2$  at the 03 b) point P(1, 2, 3) in the direction of the line PQ, where Q is the point (5, 0, 4).
  - C) Show that the vector field defined by  $\overline{F} = (y + z)i + (z + x)j + (x + y)k$  is 03 irrotational. Also Find scalar potential.

## Section - II

- Q.6 a) Six dice are thrown 729 times. How many times do you expect at least 03 three dice to show a five or six?
  - The mortality rate for a certain disease is 7 in 1000. What is the probability 03 b) for just 2 deaths on account of this disease in a group of 400? (Given  $e^{-2.8} = 0.06$ )
  - A random variable X is normally distributed with mean  $\mu = 12$  and S.D. 03 c)  $\sigma = 2$ . Find P(9.6 < X < 13.8). Given that the area: A=0.3159 from z=0 to z=0.9 and A=0.3849 from z=0 to z=1.2.
- Q.7 In a sample of 400 burners, there were 12 whose internal diameters were 03 a) not within tolerance. Is this sufficient evidence for concluding that the manufacturing process is turning out more than 2% defective burners? Take  $\alpha = 0.05$ [Critical value at 5% one tailed test is 1.645]

Max. Marks: 56

R

#### Set 03 b) A machine produced 20 defective articles in a batch of 400. After overhauling, it 3 produced 10 defectives in a batch of 300. Has the machine improved? [Critical value at 5% one tailed test is 1.645] [Critical value at 5% two tailed test is 1.96] c) A stenographer claims that she can take dictation at the rate of 120 words 03 per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words with a standard deviation of 15 words? Use 5% L.O.S. [Critical value for two-tailed test at 5% L.O.S. is 1.96]. Q.8 A machine is designed to produce insulating washers for electrical devices 03 a) of average thickness of 0.025 cm. A random sample of 10 washers was found to have an average thickness of 0.024 cm with a standard deviation of 0.002 cm. Test the significance of the deviation. Value of t for 9 degrees of freedom at 5% level is 2.262. b) The mean life of a sample of 10 electric bulbs was found to be 1456 hours 03 with a standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with standard deviation 398 hours. Is there significant difference between the means of the two batches? [Value of t for 25 degrees of freedom at 5% level is 2.06] A dice is tossed 120 times with the following results c) 04 Number turned up: 2 3 Total 1 4 5 6 Frequency: 30 25 18 10 22 15 120 Use Chi-square test, to test the hypothesis that the dice is unbiased. (Value of Chi-square for 5 degrees of freedom at 5% level is 11.07) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic function. Q.9 a) 03 b) 03

- Evaluate  $\oint_c \log z \, dz$ , where C is the unit circle |z| = 1 taken in counter clockwise sense.
  - c) Evaluate  $\int_{c} \frac{z^2+1}{(2z^2-z)} dz$ , where C is the circle |z| = 1.

03

SLR-FM-645-RE

S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering ENGINEERING MATHEMATICS – III** Day & Date: Thursday, 19-12-2019 Max. Marks: 70

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer Book. 2) Figures to the right indicate full marks.

- Use of calculator is allowed.

MCQ/Objective Type Questions

### **Duration: 30 Minutes**

6)

Seat

No.

### Q.1 Choose the correct alternatives from the options.

- Which of the following are Cauchy Riemann equations? 1)
  - a)  $U_x = V_y$ ,  $U_y = V_x$  $U_x = -V_v, U_v = V_x$ b) c)  $U_x = V_y, U_y = -V_x$  $U_x = V_x$ ,  $U_y = V_y$ d)
- 2) The area under standard normal curve from  $z = -\infty$  to z = 0 is \_\_\_\_\_. a) 1 b) 0
  - 1.5 c) 0.5 d)
- 3) Chi-square test is also known as \_\_\_\_
  - a) Parametric test b) Non-parametric test c) t-test d) None
- 4) The standard error is the \_\_\_\_\_ of the sampling distribution of statistic.
  - a) Mean b) Variance c) Standard deviation d) None If C is the circle |z| = 1, the value of  $\int \frac{e^z}{z} dz =$ \_\_\_\_\_. 5)
    - a) πi c) 0 d) None

 $\frac{1}{D^2+9}\cos 3x$  is equal to \_\_\_\_\_. a)  $-\frac{x}{6}\sin 3x$ b)  $\frac{x}{6}\sin 3x$ c)  $\frac{x}{2}\cos 3x$ d)  $\frac{x}{2} \sin 3x$ 

The differential equation whose auxiliary equation has the roots 0, - 1, - 1 7) is

a)  $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + y = 0$  b)  $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + \frac{dy}{dt} = 0$ c)  $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^3} + 3\frac{dy}{dt} + y = 0$  d)  $\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$ 

## SLR-FM-645-RE

Set

- b) 2πi

Marks: 14

14

### SLR-FM-645-RE Set S The general solution of $(x + 2)^2 \frac{d^2 y}{dx^2} - 4(x + 2) \frac{dy}{dx} + 6y = 0$ is y =\_\_\_\_\_. 8) a) $(c_1 + c_2 x)e^x$ b) $(c_1 x + c_2 x^2) \log x$ c) $c_1(x+2) + c_2(x+2)^2$ d) $c_1(x+2)^2 + c_2(x+2)^3$ $\frac{1}{D+a}X = \underline{\qquad}.$ 9) a) $e^{-ax} \int X e^{ax} dx$ b) $e^{ax} \int X e^{-ax} dx$ c) $\int Xe^{ax} dx$ d) $\int Xe^{-ax} dx$ 10) The solution of $q = 3p^2$ is \_\_\_\_\_. a) $z = 3ax + a^2y + c$ b) $z = ax + 3a^2y + c$ c) $z = 3ax^2 + by$ d) None of these A vector function F is called irrotational if \_\_\_\_ 11) b) div F = 0a) grad F = 0 $\nabla^2 F = 0$ c) curl F = 0d) If $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$ then curl $\vec{r} =$ 12) \_. b) 2 a) 3 c) 0 d) 1

 If x denote the binomial variate, the mean of the distribution is given by \_\_\_\_\_.

a) 
$$\bar{x} = npq$$
  
b)  $\bar{x} = np$   
c)  $\bar{x} = \frac{p}{n}$   
d)  $\bar{x} = pq$ 

14) The level of significance  $\alpha$  is the size of \_\_\_\_\_

- a) Type I error b) Type II error
- c) Type I and Type II error d) None

## SLR-FM-645-RE

### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ENGINEERING MATHEMATICS – III

Day & Date: Thursday, 19-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 4 & Q. No. 8 are compulsory.

- 2) Solve any two questions from each section.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.

### Section – I

Q.2 a) Solve  $(D^2 - 5D + 6)y = \sin 3x$ b) Solve  $(D^3 - 3D^2 + 3D - 1)y = xe^x + e^x$ c) Solve  $(D^2 + a^2)y = x \sin ax$ Q.3 a) The motion of a particle is given by  $\frac{d^2s}{dt^2} + k^2 \frac{ds}{dt} = 0$ . If at  $t = 0, s = s_0$  and 05

$$\frac{ds}{dt} = v_0. \text{ Show that at } t \to \infty, s = s_0 + \frac{v_0}{k^2}$$
**b)** Solve  $(1 + x)^2 \frac{d^2y}{k} + (1 + x) \frac{dy}{k} + y = \sin[2\log(1 + x)]$ 
**04**

**b)** Solve 
$$(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin[2\log(1+x)]$$

### **Q.4 a)** Solve p + pq = qz

- b) Solve x(y-z)p + y(z-x)q = z(x-y). c) Solve the following equation by the method of separation of variables. 03
- c) Solve the following equation by the method of separation of variables.  $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y} \text{ where } u(0, y) = 8 e^{-3y}$
- **Q.5** a) A particle moves along the curve  $x = e^{-t}$ ,  $y = 2\cos 3t$ ,  $z = 2\sin 3t$ . Find the Velocity and acceleration vector and the magnitude of velocity and acceleration at t = 0.
  - **b)** Find the directional derivative of the function  $\phi = x^2 y^2 + 2z^2$  at the point P(1, 2, 3) in the direction of the line PQ, where Q is the point (5, 0, 4).
  - **c)** Show that the vector field defined by  $\overline{F} = (y+z)i + (z+x)j + (x+y)k$  is **03** irrotational. Also Find scalar potential.

### Section – II

- Q.6 a) Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six?
  b) The metality rate for a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000. What is the probability of a cortain diagona is 7 is 4000.
  - b) The mortality rate for a certain disease is 7 in 1000. What is the probability **03** for just 2 deaths on account of this disease in a group of 400? (Given  $e^{-2.8} = 0.06$ )
  - c) A random variable X is normally distributed with mean  $\mu = 12$  and S.D. 03  $\sigma = 2$ . Find P(9.6 < X < 13.8). Given that the area: A=0.3159 from z=0 to z=0.9 and A=0.3849 from z=0 to z=1.2.
- **Q.7 a)** In a sample of 400 burners, there were 12 whose internal diameters were **03** not within tolerance. Is this sufficient evidence for concluding that the manufacturing process is turning out more than 2% defective burners? Take  $\alpha = 0.05$  [Critical value at 5% one tailed test is 1.645]

Max. Marks: 56

03

### Set 03 b) A machine produced 20 defective articles in a batch of 400. After overhauling, it 3 produced 10 defectives in a batch of 300. Has the machine improved? [Critical value at 5% one tailed test is 1.645] [Critical value at 5% two tailed test is 1.96] c) A stenographer claims that she can take dictation at the rate of 120 words 03 per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words with a standard deviation of 15 words? Use 5% L.O.S. [Critical value for two-tailed test at 5% L.O.S. is 1.96]. Q.8 A machine is designed to produce insulating washers for electrical devices 03 a) of average thickness of 0.025 cm. A random sample of 10 washers was found to have an average thickness of 0.024 cm with a standard deviation of 0.002 cm. Test the significance of the deviation. Value of t for 9 degrees of freedom at 5% level is 2.262. b) The mean life of a sample of 10 electric bulbs was found to be 1456 hours 03 with a standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with standard deviation 398 hours. Is there significant difference between the means of the two batches? [Value of t for 25 degrees of freedom at 5% level is 2.06] A dice is tossed 120 times with the following results c) 04 Number turned up: 2 3 Total 1 4 5 6 Frequency: 30 25 18 10 22 15 120 Use Chi-square test, to test the hypothesis that the dice is unbiased. (Value of Chi-square for 5 degrees of freedom at 5% level is 11.07) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic function. Q.9 a) 03 Evaluate $\oint_c \log z \, dz$ , where C is the unit circle |z| = 1 taken in counter clockwise sense. b) 03

**c)** Evaluate  $\int_{c} \frac{z^2+1}{(2z^2-z)} dz$ , where C is the circle |z| = 1.

03

SLR-FM-645-RE

| Seat    |           |                                | ]  |                |                                     | Set     | Р     |
|---------|-----------|--------------------------------|--|----------------|-------------------------------------|---------|-------|
| No.     |           |                                |  | _              |                                     |         | -     |
|         | S         | 5.E. (Part – I                 | (Old) (CGPA)<br>Mechanical                   |                | ination Nov/Dec-2019<br>eering      |         |       |
|         |           | MA                             | CHINE TOOLS                                  | -              | -                                   |         |       |
|         |           | Saturday, 14-1                 |  |                | Max.                                | Mark    | s: 70 |
|         |           | AM To 01:00 F                  |  | bould b        | be solved in first 30 minutes       | in one  | wor   |
| mənuv   | CUONS     | book.                          | s compulsory and s                           |                |                                     | 11 0115 | WEI   |
|         |           | , .                            | the right indicate f                         |                |                                     |         |       |
| Duratio | n. 30     | N<br>Minutes                   | ICQ/Objective                                | Туре           | Questions                           | Mark    | s· 14 |
|         |           |                                | alternatives from                            | the op         | tions and rewrite the sente         |         | 14    |
|         | 1) V      | Vhich of the fo                | llowing attachment                           | is used        | on centre lathe?                    |         |       |
|         | a<br>c    | ) Taper turni<br>) Rotary tabl | •  | b)<br>d)       | Dividing head<br>All of these       |         |       |
|         | 2) L      | ive centre is th               | ne term associated                           | with           |                                     |         |       |
|         | a<br>c    | ) Head stock<br>) Tool post    | ζ.   | b)<br>d)       | Tail stock<br>Carriage              |         |       |
|         |           |                                | ng straight shank is                         | ,              | U                                   |         |       |
|         | a         | ) Drill chuck                  | 5 5  | b)             | Sleeve                              |         |       |
|         | c<br>4) A | , I                            | le is provided on                            | d)             | Adapter                             |         |       |
| _       | ́ a       | ) Capstan la                   | the  | b)             | Turret lathe                        |         |       |
|         | C         |                                |  | d)             | None                                |         |       |
| :       | 5) V<br>a |                                | terial removal proc                          | ess in E<br>b) | Melting                             |         |       |
|         |           | ) Electrolysis                 |  | d)             | Electro deposition                  |         |       |
| 6       | 5) J<br>a |                                | ress tool die can be                         | e accura<br>b) | ate manufactured by using _<br>AWJM |         |       |
|         | C         | ,<br>,                         | cut  | d)             | Lathe                               |         |       |
| 7       |           |                                | e of forward stroke                          |                | rn stroke is<br>240:130             |         |       |
|         | a<br>c    | ,<br>,                         |  | b)<br>d)       | 200:160                             |         |       |
| 8       | ,         | n plainer mach                 |  | <i>,</i> ,     |                                     |         |       |
|         |           | <i>,</i> .                     | ocates, job is given<br>cates, tool is given |                |                                     |         |       |
|         | C         | •                              | both reciprocates                            |                |                                     |         |       |
| c       | d<br>9) F | ,                              | ration the Cylindric                         | al ioh s       | should always be clamped o          | na      |       |
| ,       | a         | ) Collet                       | adon, ale Oyindhe                            | b)             | Socket                              | α       |       |
|         | C         | ) Jaw                          |  | d)             | V-block                             |         |       |

## Seat

Set P

### 10) Up milling is a conventional milling and during process lot of heat is generated \_\_\_\_\_.

- a) True b) False
- 11) To divide a job in 45 equal divisions, which type of indexing method is preferred \_\_\_\_\_.
  - a) Simple
  - c) Direct
- b) Compound d) All of these
- Most widely used bond is \_\_\_\_\_. 12) a) Oxy chloride bond
  - b) Vitrified bond
  - c) Rubber bond d) Shellac bond

### 13) To carry out boring of precise hole of guide plate \_\_\_\_\_.

- a) Precision boring machine
- Drilling machine b) c) Milling machine d) Jig boring machine
- 14) The cutting tool in a milling machine is mounted on \_\_\_\_\_.
  - a) Tool holder b) Arbor
  - c) Spindle
- d) Table

Max. Marks: 56

Ρ

## No. S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019

Day & Date: Saturday, 14-12-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) Q. No. 4 & Q. No. 7 are compulsory. Solve any two questions from each |
|--|
| section.   |
| 2) Figures to the right indicates full marks   |

Mechanical Engineering MACHINE TOOLS & PROCESSES

### 2) Figures to the right indicates full marks.

### Section – I

| Q.2 | a)<br>b)                           | Explain with neat diagram the taper turning by swiveling compound rest.<br>List the different accessories used in lathe machine. Explain any one in<br>brief.                         | 05<br>04 |
|-----|------------------------------------|---|----------|
| Q.3 | a)<br>b)                           | With neat diagram explain radial drilling machine.<br>Compare shaper and planer machine.  | 05<br>04 |
| Q.4 | a)<br>b)                           | Explain USM process with neat diagram.<br>List down the advantages and application of unconventional machining<br>process.  | 05<br>05 |
| Q.5 | Writ<br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>Capstan lathe<br>Lathe operations<br>Drilling machine tool holding devices<br>Types of reciprocating machines<br>Turret indexing mechanism | 09       |
|     |                                    | Section – II  |          |
| Q.6 | a)                                 | With neat diagram explain construction an working of column an knee type of milling machine.  | 05       |
|     | b)                                 | Difference between up milling and down milling.   | 04       |
| Q.7 | a)<br>b)                           | Classify the grinding machines. Explain any one.<br>What are the operators in NET talk? Elaborate on each.  | 05<br>05 |
| Q.8 | a)<br>b)                           | Explain jig boring machine.<br>Explain gear finishing processes.  | 05<br>04 |
| Q.9 | Writ<br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>CNC machine<br>Bonding materials<br>Boring Tools<br>Indexing methods<br>Gear shaving   | 09       |

SL



| Seat |  |
|------|--|
| No.  |  |

### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOLS AND PROCESSES

Day & Date: Saturday, 14-12-2019 Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

### **MCQ/Objective Type Questions**

Marks: 14

### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) In plainer machine \_\_\_\_\_.
  - a) Tool reciprocates, job is given feed
  - b) Job reciprocates, tool is given feed
  - c) Tool & job both reciprocates
  - d) None

**Duration: 30 Minutes** 

### 2) For drilling operation, the Cylindrical job should always be clamped on a \_\_\_\_\_.

- a) Collet b) Socket c) Jaw d) V-block
- Up milling is a conventional milling and during process lot of heat is generated \_\_\_\_\_.
  - a) True b) False
- 4) To divide a job in 45 equal divisions, which type of indexing method is preferred \_\_\_\_\_.
  - a) Simple b) Compound
  - c) Direct d) All of these
- 5) Most widely used bond is \_\_\_\_\_.
  - a) Oxy chloride bondb) Vitrified bondc) Rubber bondd) Shellac bond
- 6) To carry out boring of precise hole of guide plate \_\_\_\_\_.
  - a) Precision boring machine b) Drilling machine
    - c) Milling machine d) Jig boring machine
- 7) The cutting tool in a milling machine is mounted on \_\_\_\_\_.
  - a) Tool holder b) Arbor
  - c) Spindle d) Table
- 8) Which of the following attachment is used on centre lathe?
  - a) Taper turning b) Dividing head
  - c) Rotary table d) All of these

### Live centre is the term associated with \_\_\_\_\_

- a) Head stockb) Tail stockc) Tool postd) Carriage
- 10) A drill tool having straight shank is to be held in \_\_\_\_\_
  - a) Drill chuck b) Sleeve
  - c) Spindle d) Adapter

Set Q

Max. Marks: 70

### 11) An auxiliary slide is provided on \_\_\_\_\_.

- a) Capstan lathe b) Turret lathe
- c) Centre lathe d) None
- 12) What is the material removal process in ECM?
  - a) Indentation b) Melting
  - c) Electrolysis d) Electro deposition

### 13) Jig & fixtures press tool die can be accurate manufactured by using \_\_\_\_\_.

- a) USM b) AWJM
- c) EDM wire cut d) Lathe
- 14) In shaper, angle of forward stroke to return stroke is \_\_\_\_\_.
  - a) 216:144

b) 240:130

**SLR-FM-646** 

Set Q

c) 270:90

- 240:130
- d) 200:160

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

### MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 14-12-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) Q. No. 4 & Q. No. 7 are compulsory. Solve any two questions from each |
|--|
| section.   |
| <ol><li>Figures to the right indicates full marks.</li></ol>                           |

### Section – I

| Q.2 | a)<br>b)                           | Explain with neat diagram the taper turning by swiveling compound rest.<br>List the different accessories used in lathe machine. Explain any one in<br>brief.                         | 05<br>04 |
|-----|------------------------------------|---|----------|
| Q.3 | a)<br>b)                           | With neat diagram explain radial drilling machine.<br>Compare shaper and planer machine.  | 05<br>04 |
| Q.4 | a)<br>b)                           | Explain USM process with neat diagram.<br>List down the advantages and application of unconventional machining process.   | 05<br>05 |
| Q.5 | Writ<br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>Capstan lathe<br>Lathe operations<br>Drilling machine tool holding devices<br>Types of reciprocating machines<br>Turret indexing mechanism | 09       |
|     |                                    | Section – II  |          |
| Q.6 | a)                                 | With neat diagram explain construction an working of column an knee type of milling machine.  | 05       |
|     | b)                                 | Difference between up milling and down milling.   | 04       |
| Q.7 | a)<br>b)                           | Classify the grinding machines. Explain any one.<br>What are the operators in NET talk? Elaborate on each.  | 05<br>05 |
| Q.8 | a)<br>b)                           | Explain jig boring machine.<br>Explain gear finishing processes.  | 05<br>04 |
| Q.9 | Writ<br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>CNC machine<br>Bonding materials<br>Boring Tools<br>Indexing methods<br>Gear shaving   | 09       |

Seat No.



Max. Marks: 56

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| Seat<br>No. |        |  |                    | Set R   |
|-------------|--------|--|--------------------|---|
|             |        | S.E. (Part – I) (Old) (CGPA) Ex<br>Mechanical En   |                    |   |
|             |        | MACHINE TOOLS AN   |                    |   |
|             |        | : Saturday, 14-12-2019<br>AM To 01:00 PM   |                    | Max. Marks: 70                                    |
| Instru      | ction  | <ul> <li><b>s:</b> 1) Q. No. 1 is compulsory and shou book.</li> <li>2) Figures to the right indicate full r</li> </ul>                              |                    |   |
|             |        | MCQ/Objective Ty   |                    |   |
| Duratio     | on: 30 | ) Minutes  | pes                | Marks: 14   |
|             | 1)     | ,  | -                  |   |
| 2           |        | ,  | cura<br>b)<br>d)   | te manufactured by using<br>AWJM<br>Lathe         |
| (           |        | ,  | returı<br>b)<br>d) | n stroke is<br>240:130<br>200:160                 |
| 2           |        | In plainer machine<br>a) Tool reciprocates, job is given fee<br>b) Job reciprocates, tool is given fee<br>c) Tool & job both reciprocates<br>d) None |                    |   |
| Ę           | -      | a) Collet  | ob sl<br>b)<br>d)  | hould always be clamped on a<br>Socket<br>V-block |
| (           | ,      | Up milling is a conventional milling an generated<br>a) True   | nd du<br>b)        | ring process lot of heat is<br>False              |
| -           | 7)     | To divide a job in 45 equal divisions, v<br>preferred<br>a) Simple   | ,                  |   |
| ٤           | ,      |  | b)<br>d)           | Vitrified bond<br>Shellac bond                    |
| ę           |        | 0  |                    | e plate<br>Drilling machine<br>Jig boring machine |
|             | ,      | The cutting tool in a milling machine is<br>a) Tool holder   | s mo<br>b)         | unted on<br>Arbor                                 |

## Seat

- Table
- c) Spindle d)



Set R

| 11) | Which of the following attachment is used on control latho? |
|-----|---|
| 11/ | Which of the following attachment is used on centre lathe?  |

a) Taper turning

- b) **Dividing head** All of these
- c) Rotary table d)
- Live centre is the term associated with \_ 12)
  - a) Head stock b) Tail stock
  - c) Tool post d) Carriage

A drill tool having straight shank is to be held in \_\_\_\_\_. 13)

- a) Drill chuck Sleeve b) c) Spindle
  - d) Adapter
- An auxiliary slide is provided on \_\_\_\_\_. 14)
  - a) Capstan lathe b) Turret lathe c) Centre lathe
    - d) None

Max. Marks: 56

| Seat |  |
|------|--|
| No.  |  |

### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering **MACHINE TOOLS & PROCESSES**

Day & Date: Saturday, 14-12-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) Q. No. 4 & Q. No. 7 are compulsory. Solve any two questions from each |  |
|--|--|
| section.   |  |
| <ol><li>Figures to the right indicates full marks.</li></ol>                           |  |

### Section – I

| Q.2 | a)<br>b)                                       | Explain with neat diagram the taper turning by swiveling compound rest.<br>List the different accessories used in lathe machine. Explain any one in<br>brief.                         | 05<br>04 |
|-----|--|---|----------|
| Q.3 | a)<br>b)                                       | With neat diagram explain radial drilling machine.<br>Compare shaper and planer machine.  | 05<br>04 |
| Q.4 | a)<br>b)                                       | Explain USM process with neat diagram.<br>List down the advantages and application of unconventional machining<br>process.  | 05<br>05 |
| Q.5 | Wri <sup>:</sup><br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>Capstan lathe<br>Lathe operations<br>Drilling machine tool holding devices<br>Types of reciprocating machines<br>Turret indexing mechanism | 09       |
|     |  | Section – II  |          |
| Q.6 | a)   | With neat diagram explain construction an working of column an knee type of milling machine.  | 05       |
|     | b)   | Difference between up milling and down milling.   | 04       |
| Q.7 | a)<br>b)                                       | Classify the grinding machines. Explain any one.<br>What are the operators in NET talk? Elaborate on each.  | 05<br>05 |
| Q.8 | a)<br>b)                                       | Explain jig boring machine.<br>Explain gear finishing processes.  | 05<br>04 |
| Q.9 | Wri<br>a)<br>b)<br>c)<br>d)<br>e)              | <b>te short notes on following (Any three)</b><br>CNC machine<br>Bonding materials<br>Boring Tools<br>Indexing methods<br>Gear shaving  | 09       |



| Mechanical Engineering<br>MACHINE TOOLS AND PROCESSES   |   |   |  |  |  |  |  |  |  |  |  |
|---|---|---|--|--|--|--|--|--|--|--|--|
|   | Day & Date: Saturday, 14-12-2019 Max. Marks: 70<br>Time: 10:00 AM To 01:00 PM |   |  |  |  |  |  |  |  |  |  |
|   |   | <b>ns:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.   |  |  |  |  |  |  |  |  |  |
|   |   | 2) Figures to the right indicate full marks.  |  |  |  |  |  |  |  |  |  |
|   | MCQ/Objective Type Questions  |   |  |  |  |  |  |  |  |  |  |
| Dura  | tion: 3   | 0 Minutes Marks: 14   |  |  |  |  |  |  |  |  |  |
| <ul> <li>Q.1 Choose the correct alternatives from the options and rewrite the sentence.</li> <li>1) Up milling is a conventional milling and during process lot of heat is generated</li> </ul> |   |   |  |  |  |  |  |  |  |  |  |
|   |   | a) True b) False  |  |  |  |  |  |  |  |  |  |
|   | 2)  | To divide a job in 45 equal divisions, which type of indexing method is preferred<br>a) Simple b) Compound                              |  |  |  |  |  |  |  |  |  |
|   |   | c) Direct d) All of these   |  |  |  |  |  |  |  |  |  |
|   | 3)  | Most widely used bond isa) Oxy chloride bondb) Vitrified bondc) Rubber bondd) Shellac bond  |  |  |  |  |  |  |  |  |  |
|   | 4)  | To carry out boring of precise hole of guide platea) Precision boring machineb) Drilling machinec) Milling machined) Jig boring machine |  |  |  |  |  |  |  |  |  |
|   | 5)  | The cutting tool in a milling machine is mounted ona) Tool holderb) Arborc) Spindled) Table   |  |  |  |  |  |  |  |  |  |
|   | 6)  | Which of the following attachment is used on centre lathe?a) Taper turningb) Dividing headc) Rotary tabled) All of these                |  |  |  |  |  |  |  |  |  |
|   | 7)  | Live centre is the term associated with<br>a) Head stock b) Tail stock<br>c) Tool post d) Carriage                                      |  |  |  |  |  |  |  |  |  |
|   | 8)  | A drill tool having straight shank is to be held in<br>a) Drill chuck b) Sleeve   |  |  |  |  |  |  |  |  |  |

# S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019

c) Spindle

a)

c)

a)

c)

Capstan lathe

Centre lathe

Indentation

Electrolysis

9)

10)

Seat No.

## **SLR-FM-646**

Set

Page **10** of **12** 

S

Set S

- 11) Jig & fixtures press tool die can be accurate manufactured by using \_\_\_\_\_.
  - a) USM

- AWJM b)
- c) EDM wire cut d) Lathe
- In shaper, angle of forward stroke to return stroke is \_\_\_\_\_. 12)
  - a) 216:144 b) 240:130 c) 270:90
    - d) 200:160
- In plainer machine \_\_\_\_ 13)
  - a) Tool reciprocates, job is given feed
  - b) Job reciprocates, tool is given feed
  - c) Tool & job both reciprocates
  - d) None
- For drilling operation, the Cylindrical job should always be clamped on a \_\_\_\_\_. 14)
  - a) Collet C) Jaw

- Socket b)
- d) V-block

Set

## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

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## MACHINE TOOLS & PROCESSES

Day & Date: Saturday, 14-12-2019 Time: 10:00 AM To 01:00 PM

| Instructions: 1) Q. No. 4 & Q. No. 7 are compulsory. Solve any two questions from each |
|--|
| section.   |
| <ol><li>Figures to the right indicates full marks.</li></ol>                           |

### Section – I

.

| Q.2 | a)<br>b)                           | List the different accessories used in lathe machine. Explain any one in brief.   | 05<br>04 |
|-----|------------------------------------|---|----------|
| Q.3 | a)<br>b)                           | With neat diagram explain radial drilling machine.<br>Compare shaper and planer machine.  | 05<br>04 |
| Q.4 | a)<br>b)                           | Explain USM process with neat diagram.<br>List down the advantages and application of unconventional machining process.   | 05<br>05 |
| Q.5 | Writ<br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>Capstan lathe<br>Lathe operations<br>Drilling machine tool holding devices<br>Types of reciprocating machines<br>Turret indexing mechanism | 09       |
|     |                                    | Section – II  |          |
| Q.6 | a)                                 | With neat diagram explain construction an working of column an knee type of milling machine.  | 05       |
|     | b)                                 | Difference between up milling and down milling.   | 04       |
| Q.7 | a)<br>b)                           | Classify the grinding machines. Explain any one.<br>What are the operators in NET talk? Elaborate on each.  | 05<br>05 |
| Q.8 | a)<br>b)                           | Explain jig boring machine.<br>Explain gear finishing processes.  | 05<br>04 |
| Q.9 | Writ<br>a)<br>b)<br>c)<br>d)<br>e) | te short notes on following (Any three)<br>CNC machine<br>Bonding materials<br>Boring Tools<br>Indexing methods<br>Gear shaving   | 09       |

### Seat No.

S

Max. Marks: 56

| S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DRAWING |  |                      |                     |  |    |  |  |  |  |  |
|--|--|----------------------|---------------------|--|----|--|--|--|--|--|
| Day & Date: Tuesday, 17-12-2019 Max. Marks: 70<br>Time: 10:00 AM To 02:00 PM                       |  |                      |                     |  |    |  |  |  |  |  |
| Instructio   | ons: 1) Q. No. 1 is compulsory   | y and sh             | nould               | be solved in first 30 minutes in answe                               | er |  |  |  |  |  |
|  | book.<br>2) Assume suitable dimer<br>3) Use first angle Method<br>4) Figures to the right ind  | of proje             | ection              | S.   |    |  |  |  |  |  |
| _  | MCQ/Objec  | tive T               | ype (               |  |    |  |  |  |  |  |
|  | 30 Minutes   | <b>6</b>             |                     | Marks: 1   |    |  |  |  |  |  |
|  | bose the correct alternatives<br>be:1 Match the pairs (One matrix)   |                      | r eacl              | n correct answer)  | 3  |  |  |  |  |  |
| 1)   | Geometrical Tolerance<br>Concentricity   | a)                   | Sym                 |  |    |  |  |  |  |  |
| 2)   | Circularity  | b)                   | $\langle x \rangle$ |  |    |  |  |  |  |  |
| _)<br>3)   | Cylindricity   | c)                   | $\bigcirc$          |  |    |  |  |  |  |  |
| <b>Тур</b><br>1)<br>2)<br>3)   | <b>De: 2 Correct or Incorrect (At</b><br>A shaft whose upper deviation<br>The size across flats in hexa<br>Woodruff key is self aligning | on is ze<br>agonal n | ro is c             | called as basic shaft.   | 2  |  |  |  |  |  |
| Typ<br>ma  | be: 3 Multiple correct answer  | type.(S              | Solve               | any two) (Each correct bit 2 0                                       | 94 |  |  |  |  |  |
| 1)   | Which of the following symb<br>a) M<br>c) R  | ols india            | cate ty<br>b)<br>d) | /pe of lay pattern?<br>C<br>Y  |    |  |  |  |  |  |
| 2)   | Which of the following pairs   | defines              | clear               |  |    |  |  |  |  |  |
|  | a) ф40H <sub>8</sub> d <sub>6</sub><br>c) ф40H <sub>7</sub> p <sub>6</sub>   |                      | b)<br>d)            | φ40H <sub>7</sub> f <sub>6</sub><br>φ40H <sub>7</sub> r <sub>6</sub> |    |  |  |  |  |  |
| 3)   | Which of the following are st<br>a) A2<br>c) A4  | tandard              | ,                   |  |    |  |  |  |  |  |
| Type: 4 Straight Objective Type/Classical MCQ.(Each bit 1 mark each) 0                             |  |                      |                     |  |    |  |  |  |  |  |
| 1)   | This symbol is used in   | drawing              | g for s             | howing   |    |  |  |  |  |  |
|  | a) Taper<br>c) Depth of hole   |                      | b)<br>d)            | Countersunk<br>Counter bore  |    |  |  |  |  |  |
| 2)   | This symbol is used to   | show _               |                     |  |    |  |  |  |  |  |
|  | a) Internal threading<br>c) Symmetry   |                      | b)<br>d)            | External threading<br>Concentricity                                  |    |  |  |  |  |  |

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Seat No.

Set

Ρ

# 3) Represents which type of section?

a) Removed c) Partial

- b) Halfd) Revolved
- 4) Which of the following is used for high speed reduction ratio?
  - a) Spur gear assembly b) Bevel gear assembly
    - c) Worm and worm wheel
- d) Rack and pinion

### 5) In half section how much part of object is imagined to be removed?

a) Half

- b) Full
- c) Quarter d) Can't predict

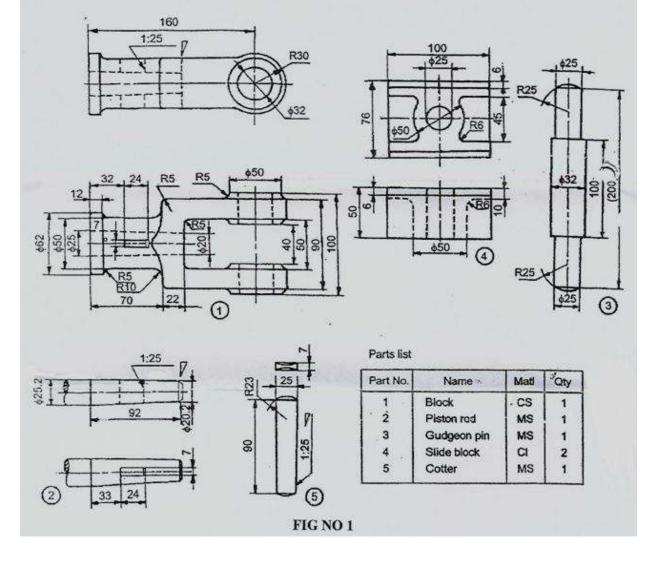
### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- **Q.2** Figure No. 1 shows the details of steam engine cross head. Assemble the **20** given parts and draw :
  - 1) Front View
  - 2) Top View

Prepare bill of material and give all the dimensions.

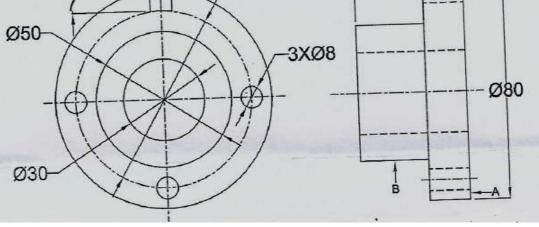


Seat No.

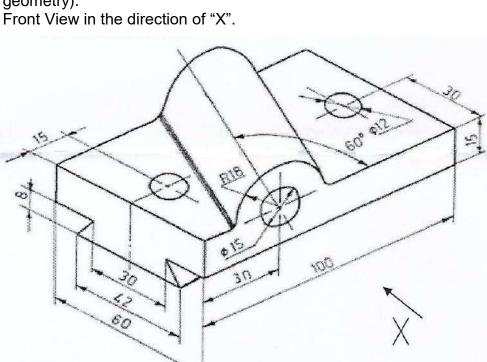
Max. Marks: 56

Set P

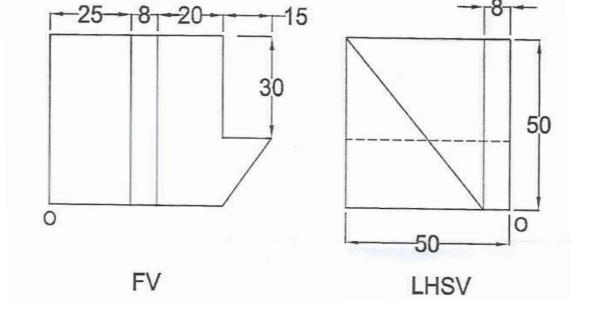
|   |                              | Set  | Ρ        |  |  |  |  |  |  |
|---|------------------------------|--|----------|--|--|--|--|--|--|
| Q.3   |                              |  |          |  |  |  |  |  |  |
|   | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut   |          |  |  |  |  |  |  |
|   | c)                           | <ul><li>Draw BIS Conventions of</li><li>1) Cylindrical compression spring</li><li>2) Glass material</li></ul>  |          |  |  |  |  |  |  |
|   | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud  |          |  |  |  |  |  |  |
| Q.4   | Solv<br>a)<br>b)<br>c)<br>d) | <ul> <li>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.</li> <li>Draw BIS Conventions for Half Section.</li> </ul>   |          |  |  |  |  |  |  |
| Q.5   | Solv<br>a)                   | <ul> <li>e the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) φ30H<sub>7</sub>g<sub>6</sub></li> <li>2) φ50H<sub>8</sub>p<sub>6</sub></li> <li>Also support the answer by writing the calculations and draw diagram for the same.</li> </ul> | 09<br>04 |  |  |  |  |  |  |
| <ul> <li>b) Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> |                              |  |          |  |  |  |  |  |  |
|   | ~                            |  |          |  |  |  |  |  |  |



- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



09

09



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| (Values in microns)  |          |          |           |           |            |              |              |               |            |            |
|----------------------|----------|----------|-----------|-----------|------------|--------------|--------------|---------------|------------|------------|
|                      | roleran  | ces of   | holes     |           |            |              | Táleran      | ces of        | shafts     |            |
| Nominal              | Н7       | на       | Н9        | H10       | H11        | ¢Ь           | e8           | 17            | g6         | <b>h</b> 6 |
| From 1<br>Upto 3     | +10      | +14      | + 25      | + 40      | + 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 3 | - 6        |
| Over 3<br>Upto 6     | +12<br>D | +18      | + 30      | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | - 4<br>-12 | 0<br>- 8   |
| Over 6<br>Upto 10    | +15      | +22      | + 36<br>0 | + 58      | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | ~ 9        |
| Over 10<br>Upto 1B   | +18      | +27      | + 43<br>0 | + 70<br>0 | +110<br>U  | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0<br>-11   |
| Over 18<br>Upto 30   | +21<br>0 | +33      | + 52      | 4 84<br>0 | +130<br>0  | - 65         | - 40<br>- 73 | - 20<br>- 41  | - 7        | 0<br>-13   |
| Over 30<br>Upto 50   | +25      | +39      | + 62      | +100      | +160<br>0  | -80<br>-142  | - 50<br>- 59 | - 25<br>- 50  | - 9<br>-25 | 0          |
| Over 50<br>Upto 80   | +30      | +46      | + 76      | +120      | +190       | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0<br>-19   |
| Over 80<br>Upto 120  | +35      | +54      | + 87      | +140<br>0 | +220       | -120<br>-207 | - 72<br>-126 | - 36          | -12<br>-34 | 0<br>-22   |
| Over 120<br>Upto 180 | +40<br>0 | +63      | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | -25        |
| Over 180<br>Upto 250 | +45      | ÷72<br>0 | +115      | +185      | +290       | -170<br>-285 | ~100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0<br>-29   |
| Over 250<br>Upto 315 | +52      | +81      | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56          | -17<br>-49 | -32        |
| Over 315<br>Upto 400 | +57      | +89      | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3    |
| Over 400<br>Upto 500 | +63      | +97      | +155      | +250      | 4 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0          |

| (Values | in | m | icrons |
|---------|----|---|--------|

| (Values in microns)  |              |              |              |            |                |             |                    |            |            |              |
|----------------------|--------------|--------------|--------------|------------|----------------|-------------|--------------------|------------|------------|--------------|
|                      | Tol          | erance       | s of ho      | les        | And and        |             | Toler              | ances      | of sha     | fts          |
| Nominal<br>sizes     | D10          | E 9          | F8           | G7         | JS7            | К7          | j6                 | k6         | n6         | p 5          |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14 | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10    | + 3<br>- 3         | + 6<br>0   | +10+4      | + 12 + 6     |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20    | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9  | + 4<br>- 4         | + 9<br>+ 1 | +16<br>+ 8 | + 20         |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25 | + 35<br>+ 13 | +20 + 5    | + 7.5          | + 5<br>-10  | + 4.5 - 4.5        | +10<br>+ 1 | +19<br>+10 | + 2-+ 1.     |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32 | + 43<br>+ 16 | +24<br>+ 6 | + 9<br>- 9     | + 6<br>-12  | + 5.5 - 5.5        | +12<br>+ 1 | +23<br>+12 | + 29<br>+ 10 |
| Over 18<br>Upto 30   | +149<br>+ 65 | + 92<br>+ 40 | + 53 + 20    | +28<br>+7  | +10.5          | +6<br>-15   | + 6.5 - 6.5        | +15<br>+ 2 | +28 + 15   | + 3 + 2      |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112<br>+ 50 | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18  | + 8<br>- 8         | +18<br>+ 2 | +33<br>+17 | + 4<br>+ 2   |
| Over 50<br>Upto 80   | +220         | +134<br>+ 60 | + 76<br>+ 30 | +40 +10    | +15<br>-15     | +_9_<br>-21 | $\pm 9.5$<br>- 9.5 | +21-+2     | +39 + 20   | + 5 + 3      |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72 | +90<br>+36   | +47<br>+12 | +17.5          | +10<br>-25  | +11<br>-11         | +25 + 3    | +45<br>+23 | + 5+3        |
| Over 120<br>Upto 180 | +305<br>+145 | +185         | +106 + 43    | +54<br>+14 | +20<br>-20     | +12<br>-28  | +12.5<br>+12.5     | +28 + 3    | +52<br>+27 | + 6 + 4      |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100     | +122 + 50    | +61<br>+15 | +23<br>-23     | +13<br>+33  | +14.5<br>-14.5     | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5   |
| Over 250<br>Upto 315 | +400<br>+190 | +240         | +135<br>+ 55 | +69<br>+17 | +26<br>-26     | +16<br>-36  | +16 - 16           | +36 + 4    | +66<br>+34 | + 8<br>+ 5   |
| Over 315<br>Upto 400 | +440<br>+210 | +265<br>+125 | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40  | +18<br>-18         | +40 + 4    | +73<br>+37 | + 9 + 6      |
| Over 400<br>Upto 500 | +480+230     | +290+135     | +165<br>+ 68 | +83<br>+20 | +31.5          | +18<br>-45  | +20<br>-20         | +45 + 5    | +80<br>+40 | +10+6        |

| _   |  |  |   |  |  |  |  |  |  |  |
|---|--|--|---|--|--|--|--|--|--|--|
| S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DRAWING  |  |  |   |  |  |  |  |  |  |  |
|   | e: Tuesday, 17-12-2019<br>D AM To 02:00 PM   |  | Max. Marks: 70  |  |  |  |  |  |  |  |
| Instruction   | ,  | and should                             | be solved in first 30 minutes in answer   |  |  |  |  |  |  |  |
| book.<br>2) Assume suitable dimensions if not given<br>3) Use first angle Method of projections.<br>4) Figures to the right indicates full marks. |  |  |   |  |  |  |  |  |  |  |
|   | MCQ/Objecti  | ve Type (                              | Questions   |  |  |  |  |  |  |  |
| Duration: 3   | 0 Minutes  |  | Marks: 14   |  |  |  |  |  |  |  |
|   | ose the correct alternatives fi<br>:1 Match the pairs (One mar<br>Geometrical Tolerance<br>Concentricity   | •                                      | n correct answer)<br>Ibol   |  |  |  |  |  |  |  |
| 2)  | Circularity  | b) 🔘                                   |   |  |  |  |  |  |  |  |
| 3)  | Cylindricity   | c) Ŏ                                   |   |  |  |  |  |  |  |  |
| 1)<br>2)<br>3)  | <ul> <li>2 Correct or Incorrect (Atte<br/>A shaft whose upper deviation<br/>The size across flats in hexage<br/>Woodruff key is self aligning k</li> <li>3 Multiple correct answer ty</li> </ul> | i is zero is c<br>onal nut is 2<br>ey. | called as basic shaft.<br>2D.   |  |  |  |  |  |  |  |
| mark  |  |  | <i>,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,  |  |  |  |  |  |  |  |
| 1)  | Which of the following pairs de<br>a) $\phi 40H_8d_6$<br>c) $\phi 40H_7p_6$  | efines clear<br>b)<br>d)               | ance type of fit?<br>φ40H <sub>7</sub> f <sub>6</sub><br>φ40H <sub>7</sub> r <sub>6</sub> |  |  |  |  |  |  |  |
| 2)  | Which of the following are star  | ndard sheet                            | t sizes?  |  |  |  |  |  |  |  |
|   | a) A2  | b)                                     | A3  |  |  |  |  |  |  |  |
|   | c) A4  | d)                                     | A5  |  |  |  |  |  |  |  |
| 3)  | Which of the following symbols a) M  | s indicate ty<br>b)                    | C   |  |  |  |  |  |  |  |
|   | c) R   | d)                                     | Y   |  |  |  |  |  |  |  |
| Type  | : 4 Straight Objective Type/   | ,                                      | MCQ.(Each bit 1 mark each) 05   |  |  |  |  |  |  |  |
| 1)  | <ul> <li>Which of the following is used</li> <li>a) Spur gear assembly</li> <li>c) Worm and worm wheel</li> </ul>  |  |   |  |  |  |  |  |  |  |
| 2)  | In half section how much part<br>a) Half<br>c) Quarter   | of object is<br>b)<br>d)               | imagined to be removed?<br>Full<br>Can't predict  |  |  |  |  |  |  |  |
| 3)  | This symbol is used in di  | awing for s                            | howing  |  |  |  |  |  |  |  |
|   | a) Taper<br>c) Depth of hole   | b)<br>d)                               | Countersunk<br>Counter bore   |  |  |  |  |  |  |  |

Page **7** of **24** 

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## Seat

No.

Set Q

## SLR-FM-647 Set Q

- 4) This symbol is used to show \_\_\_\_\_.
  - Internal threading a)
- External threading b)
- Concentricity d)
- Symmetry c) - magigan 5) Represents which type of section? 12224 1.10 Removed b) a)
  - c) Partial

- Half
- d) Revolved

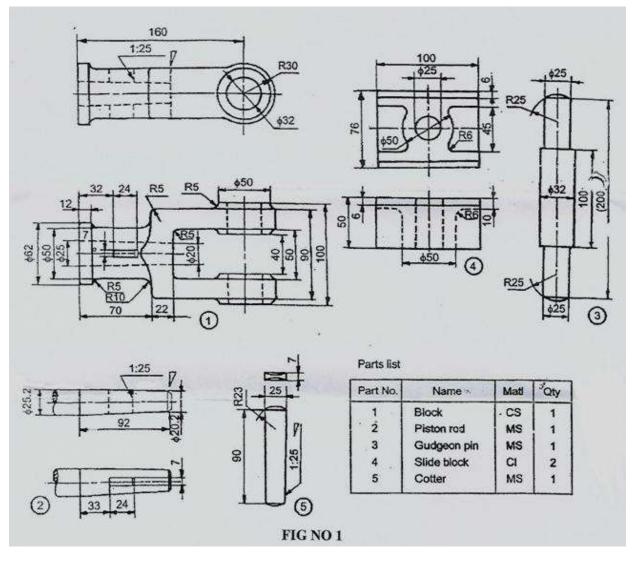
### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

Instructions: 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- Figure No. 1 shows the details of steam engine cross head. Assemble the Q.2 20 given parts and draw :
  - Front View 1)
  - 2) **Top View**

Prepare bill of material and give all the dimensions.



Seat No.

Max. Marks: 56

Set

Q

|     |                              | Set   | Q        |
|-----|------------------------------|---|----------|
| Q.3 | Solv<br>a)                   | <ul> <li>ve any three out of four. (Every bit has 03 marks)</li> <li>Draw BIS Conventions of</li> <li>1) Splined shaft</li> <li>2) Bearing</li> </ul>   | 09       |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut  |          |
|     | c)                           | <ul> <li>Draw BIS Conventions of</li> <li>1) Cylindrical compression spring</li> <li>2) Glass material</li> </ul>   |          |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud   |          |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | <b>The any three out of four (Every bit has 03 marks)</b><br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling.   | 09       |
| Q.5 | Solv<br>a)                   | <ul> <li>the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) \$\phi_30H_7g_6\$</li> <li>2) \$\phi_50H_8p_6\$</li> <li>Also support the answer by writing the calculations and draw diagram for the same.</li> </ul>  | 09<br>04 |
|     | b)                           | <ul> <li>Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm.</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> | 05       |
|     | ø                            |   |          |

-3XØ8

B

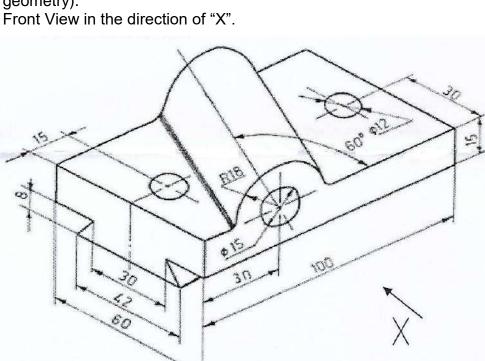
Ø30-

Ø80

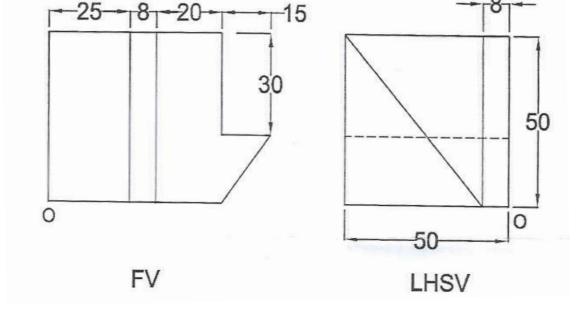
A

SLR-FM-647

- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



09

8

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Set | Q

09



| (Values in microns)  |          |          |           |           |            |              |              |               |            |          |
|----------------------|----------|----------|-----------|-----------|------------|--------------|--------------|---------------|------------|----------|
|                      | toleran  | ces of   | holes     |           |            |              | Túleran      | ces, uf       | shaits     |          |
| Nominal              | Н7       | на       | Н9        | H10       | H11        | ¢Ь           | e8           | 17            | g6         | h6       |
| From 1<br>Upto 3     | +10      | +14      | + 25      | + 40      | + 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 3 | - 6      |
| Over 3<br>Upto 6     | +12<br>D | +18      | + 30      | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | - 4<br>-12 | 0<br>- 8 |
| Over 6<br>Upto 10    | +15      | +22<br>0 | + 36<br>0 | + 58      | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | ~ 9      |
| Over 10<br>Upto 1B   | +18      | +27      | + 43<br>0 | + 70<br>0 | +110<br>U  | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0<br>-11 |
| Over 18<br>Upto 30   | +21<br>0 | +33      | + 52      | 4 84<br>0 | +130<br>0  | - 65         | - 40<br>- 73 | - 20<br>- 41  | - 7<br>-20 | 0<br>-13 |
| Over 30<br>Upto 50   | +25      | +39      | + 62      | +100      | +160       | -80<br>-142  | - 50<br>- 59 | - 25          | - 9        | -16      |
| Over 50<br>Upto 80   | +30      | +46      | + 76      | +120      | +190       | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0<br>-19 |
| Over 80<br>Upto 120  | +35      | +54      | + 87      | +140      | +220       | -120<br>-207 | - 72<br>-126 | - 36<br>- 71  | -12<br>-34 | 0<br>-22 |
| Over 120<br>Upto 180 | +40      | +63      | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0        |
| Over 180<br>Upto 250 | +45      | +72      | +115      | +185      | +290       | -170<br>-285 | -100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0        |
| Over 250<br>Upto 315 | +52      | +81<br>0 | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56          | -17        | -32      |
| Over 315<br>Upto 400 | +57      | +89      | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3  |
| Over 400<br>Upto 500 | +63<br>0 | +97      | +155      | +250      | 4 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0        |

| Contraction in the |     |             |
|--------------------|-----|-------------|
| (Values            | in  | <br>crone   |
| 1 Yaiuco           | 144 | <br>CI OILS |

| (Values in microns)  |              |              |              |            |                |            |                    |            |            |              |
|----------------------|--------------|--------------|--------------|------------|----------------|------------|--------------------|------------|------------|--------------|
|                      | Tol          | erance       | s of ho      | les        | And and        |            | Toler              | ances      | of sha     | fts          |
| Nominal<br>sizes     | D10          | E 9          | F8           | G7         | JS7            | K7         | j6                 | k6         | n6         | p 5          |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14 | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10   | + 3<br>- 3         | + 6<br>0   | +10<br>+ 4 | + 12 + 6     |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20    | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9 | + 4<br>- 4         | + 9<br>+ 1 | +16<br>+ 8 | + 20         |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25 | + 35<br>+ 13 | +20 + 5    | + 7.5          | + 5<br>-10 | + 4.5 - 4.5        | +10<br>+ 1 | +19<br>+10 | + 2-+ 1.     |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32 | + 43<br>+ 16 | +24<br>+ 6 | + 9<br>- 9     | + 6<br>-12 | + 5.5 - 5.5        | +12<br>+ 1 | +23<br>+12 | + 29<br>+ 10 |
| Over 18<br>Upto 30   | +149<br>+ 65 | + 92<br>+ 40 | + 53 + 20    | +28<br>+7  | +10.5          | +6<br>-15  | + 6.5 - 6.5        | +15<br>+ 2 | +28 +15    | + 3 + 2      |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112 + 50    | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18 | + 8<br>- 8         | +18<br>+ 2 | +33<br>+17 | + 4<br>+ 2   |
| Over 50<br>Upto 80   | +220         | +134<br>+ 60 | + 76<br>+ 30 | +40 +10    | +15<br>-15     | +9<br>-21  | $\pm 9.5$<br>- 9.5 | +21-+2     | +39 + 20   | + 5 + 3      |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72 | +90<br>+36   | +47<br>+12 | +17.5          | +10<br>-25 | +11<br>-11         | +25 + 3    | +45<br>+23 | + 5+3        |
| Over 120<br>Upto 180 | +305<br>+145 | +185         | +106 + 43    | +54<br>+14 | +20<br>-20     | +12<br>-28 | +12.5<br>+12.5     | +28 + 3    | +52<br>+27 | + 6 + 4      |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100     | +122 + 50    | +61<br>+15 | +23<br>-23     | +13<br>+33 | +14.5<br>-14.5     | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5   |
| Over 250<br>Upto 315 | +400<br>+190 | +240         | +135<br>+ 55 | +69<br>+17 | +26<br>-26     | +16<br>-36 | +16 - 16           | +36 + 4    | +66<br>+34 | + 8<br>+ 5   |
| Over 315<br>Upto 400 | +440<br>+210 | +265<br>+125 | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40 | +18<br>-18         | +40 + 4    | +73<br>+37 | + 9 + 6      |
| Over 400<br>Upto 500 | +480+230     | +290+135     | +165<br>+ 68 | +83<br>+20 | +31.5          | +18<br>-45 | +20<br>-20         | +45 + 5    | +80<br>+40 | +10          |

| Seat   | •                            |  |                              |   |  |  |  |  |  |  |
|--|------------------------------|--|------------------------------|---|--|--|--|--|--|--|
| No.  | -                            |  |                              | Set R   |  |  |  |  |  |  |
| S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DRAWING |                              |  |                              |   |  |  |  |  |  |  |
| •  |                              | e: Tuesday, 17-12-2019<br>00 AM To 02:00 PM  |                              | Max. Marks: 70  |  |  |  |  |  |  |
| _  |                              |  | nd should l                  | be solved in first 30 minutes in answer                 |  |  |  |  |  |  |
|  |                              | <ul> <li>book.</li> <li>2) Assume suitable dimensional and the suitable di</li></ul> | ons if not g<br>projections  | iven<br>S.  |  |  |  |  |  |  |
|  |                              | MCQ/Objectiv   | /е Туре (                    | Questions   |  |  |  |  |  |  |
| Durat<br><b>Q.1</b>  | Cho<br>Typ                   | 30 Minutes<br>pose the correct alternatives fro<br>e:1 Match the pairs (One mark<br>Geometrical Tolerance  | s for each<br>Sym            | n correct answer)                                       |  |  |  |  |  |  |
|  | 1)                           | Concentricity  | a) 🔗                         |   |  |  |  |  |  |  |
|  | 2)                           | Circularity  | b) 🔘                         |   |  |  |  |  |  |  |
|  | 3)                           | Cylindricity   | c) ()                        |   |  |  |  |  |  |  |
|  | <b>Typ</b><br>1)<br>2)<br>3) | e: 2 Correct or Incorrect (Atten<br>A shaft whose upper deviation<br>The size across flats in hexago<br>Woodruff key is self aligning ke   | is zero is c<br>nal nut is 2 | alled as basic shaft.                                   |  |  |  |  |  |  |
|  | Тур                          | e: 3 Multiple correct answer ty  | pe.(Solve                    | any two) (Each correct bit 2 04                         |  |  |  |  |  |  |
|  | mar<br>1)<br>2)              | <ul> <li>k)</li> <li>Which of the following are standard</li> <li>a) A2</li> <li>c) A4</li> <li>Which of the following symbols</li> <li>a) M</li> <li>c) R</li> </ul>  | b)<br>d)                     | A3<br>A5  |  |  |  |  |  |  |
|  | 3)                           | Which of the following pairs def a) $\phi 40 H_8 d_6$ c) $\phi 40 H_7 p_6$   | fines cleara<br>b)<br>d)     | ance type of fit?<br>$\phi 40H_7f_6$<br>$\phi 40H_7r_6$ |  |  |  |  |  |  |
|  | <b>Typ</b><br>1)             | e: 4 Straight Objective Type/C   |                              | ICQ.(Each bit 1 mark each) 05                           |  |  |  |  |  |  |
|  |                              | <ul><li>a) Internal threading</li><li>c) Symmetry</li></ul>  | b)<br>d)                     | External threading<br>Concentricity                     |  |  |  |  |  |  |
|  | 2)                           | Represents which ty  | pe of section                | on?   |  |  |  |  |  |  |
|  |                              | a) Removed<br>c) Partial   | b)<br>d)                     | Half<br>Revolved  |  |  |  |  |  |  |

### Page **13** of **24**

## SLR-FM-647



Set | R

- Which of the following is used for high speed reduction ratio? 3)
  - Spur gear assembly a)
- Bevel gear assembly b)
- c) Worm and worm wheel
- Rack and pinion d)
- In half section how much part of object is imagined to be removed? 4)
  - a) Half Quarter c)
- b) Full d) Can't predict
- 5) This symbol is used in drawing for showing \_\_\_\_\_.
  - Taper a)

c)

- Countersunk b)
- Depth of hole
- d) Counter bore

| Seat |  |
|------|--|
| No.  |  |

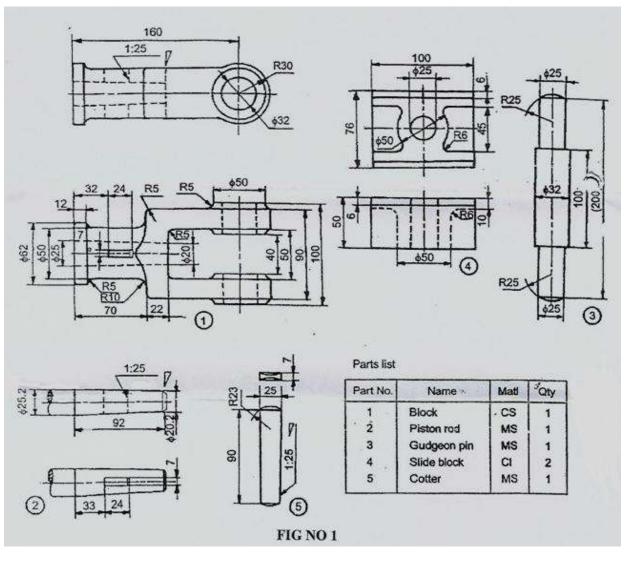
### S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- **Q.2** Figure No. 1 shows the details of steam engine cross head. Assemble the **20** given parts and draw :
  - 1) Front View
  - 2) Top View

Prepare bill of material and give all the dimensions.



Set R

Max. Marks: 56

|     |                              | 0_111   | ••       |
|-----|------------------------------|---|----------|
|     |                              | Set   | R        |
| Q.3 | Solv<br>a)                   | <b>ve any three out of four. (Every bit has 03 marks)</b><br>Draw BIS Conventions of<br>1) Splined shaft<br>2) Bearing  | 09       |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut  |          |
|     | c)                           | Draw BIS Conventions of<br>1) Cylindrical compression spring<br>2) Glass material   |          |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud   |          |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | ve any three out of four (Every bit has 03 marks)<br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling. | 09       |
| Q.5 | Solv<br>a)                   |   | 09<br>04 |
|     | b)                           |   | 05       |
|     | Ø                            |   |          |

-3XØ8

B

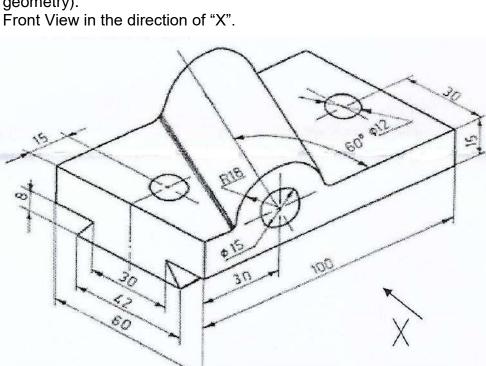
Ø30-

Ø80

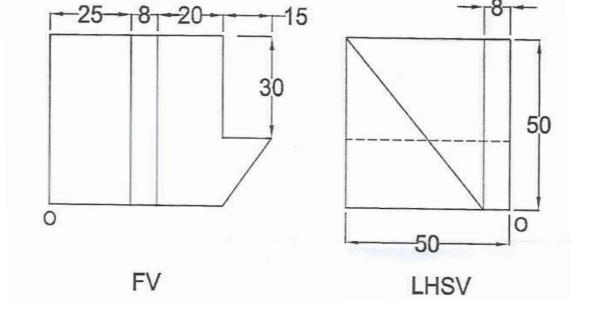
A

SLR-FM-647

- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



09

09



.

|                      |          |        | ()        | lalues in | n micro    | ins)         |              |               |            |           |
|----------------------|----------|--------|-----------|-----------|------------|--------------|--------------|---------------|------------|-----------|
|                      | Toleran  | ces of | holes     |           |            |              | Toleran      | ces, uf       | shafts     |           |
| Nominal              | Н7       | на     | Н9        | H10       | H11        | dЭ           | e8           | 17            | g6         | h6        |
| From 1<br>Upto 3     | +10      | +14    | + 25      | + 40<br>0 | ÷ 60<br>0  | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 8 | - 6       |
| Over 3<br>Upto 6     | +12      | +18    | + 30<br>0 | + 45      | + 75<br>0  | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | 4<br>-12   | _0<br>_ 8 |
| Over 6<br>Upto 10    | +15      | +22    | + 36<br>0 | + 58      | + 90<br>0  | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | ~ 9       |
| Over 10<br>Upto 1B   | +18      | +27    | + 43<br>0 | + 70<br>0 | +110<br>U  | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0<br>-11  |
| Over 18<br>Upto 30   | +21<br>0 | +33    | + 52      | 4 84<br>0 | +130<br>0  | - 65         | - 40<br>- 73 | - 20<br>- 41  | - 7<br>-20 | 0<br>-13  |
| Over 30<br>Upto 50   | +25      | +39    | + 62      | +100      | +160<br>0  | -80<br>-142  | - 50<br>- 59 | - 25<br>- 50  | - 9        | 0         |
| Over 50<br>Upto 80   | +30      | +46    | + 76      | +120      | +190       | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0<br>-19  |
| Over 80<br>Upto 120  | +35      | +54    | + 87      | +140      | +220       | -120<br>-207 | - 72<br>-126 | - 36<br>- 71  | -12<br>-34 | 0<br>-22  |
| Over 120<br>Upto 180 | +40<br>0 | +63    | +100      | +160<br>0 | +250       | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0         |
| Over 180<br>Upto 250 | +45      | ÷72    | +115      | +185      | +290       | -170<br>-285 | -100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0         |
| Over 250<br>Upto 315 | +52      | +81    | +130      | +210      | +320       | -190<br>-320 | -110<br>-191 | - 56<br>-108  | -17        | 0-32      |
| Over 315<br>Upto 400 | +57      | +89    | +140      | +230      | +360       | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3   |
| Over 400<br>Uptu 500 | +63<br>0 | +97    | +155      | +250      | + 400<br>0 | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | 0         |

| (Val  | lues  | in  | mi | crons   |
|-------|-------|-----|----|---------|
| 1 7 4 | LL CO | 141 |    | CI OIIS |

| (Values in microns)  |              |              |              |            |                |            |                    |            |            |              |
|----------------------|--------------|--------------|--------------|------------|----------------|------------|--------------------|------------|------------|--------------|
|                      | Tol          | erance       | s of ho      | les        | And and        |            | Toler              | ances      | of sha     | fts          |
| Nominal<br>sizes     | D10          | E 9          | F8           | G7         | JS7            | K7         | j6                 | k6         | n6         | p 5          |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14 | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10   | + 3<br>- 3         | + 6<br>0   | +10<br>+ 4 | + 12 + 6     |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20    | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9 | + 4<br>- 4         | + 9<br>+ 1 | +16<br>+ 8 | + 20         |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25 | + 35<br>+ 13 | +20 + 5    | + 7.5          | + 5<br>-10 | + 4.5 - 4.5        | +10<br>+ 1 | +19<br>+10 | + 2-+ 1.     |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32 | + 43<br>+ 16 | +24<br>+ 6 | + 9<br>- 9     | + 6<br>-12 | + 5.5 - 5.5        | +12<br>+ 1 | +23<br>+12 | + 29<br>+ 10 |
| Over 18<br>Upto 30   | +149<br>+ 65 | + 92<br>+ 40 | + 53 + 20    | +28<br>+7  | +10.5          | +6<br>-15  | + 6.5 - 6.5        | +15<br>+ 2 | +28 +15    | + 3 + 2      |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112 + 50    | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18 | + 8<br>- 8         | +18<br>+ 2 | +33<br>+17 | + 4<br>+ 2   |
| Over 50<br>Upto 80   | +220         | +134<br>+ 60 | + 76<br>+ 30 | +40 +10    | +15<br>-15     | +9<br>-21  | $\pm 9.5$<br>- 9.5 | +21-+2     | +39 + 20   | + 5 + 3      |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72 | +90<br>+36   | +47<br>+12 | +17.5          | +10<br>-25 | +11<br>-11         | +25 + 3    | +45<br>+23 | + 5+3        |
| Over 120<br>Upto 180 | +305<br>+145 | +185         | +106 + 43    | +54<br>+14 | +20<br>-20     | +12<br>-28 | +12.5<br>+12.5     | +28 + 3    | +52<br>+27 | + 6 + 4      |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100     | +122 + 50    | +61<br>+15 | +23<br>-23     | +13<br>+33 | +14.5<br>-14.5     | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5   |
| Over 250<br>Upto 315 | +400<br>+190 | +240         | +135<br>+ 55 | +69<br>+17 | +26<br>-26     | +16<br>-36 | +16 - 16           | +36 + 4    | +66<br>+34 | + 8<br>+ 5   |
| Over 315<br>Upto 400 | +440<br>+210 | +265<br>+125 | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40 | +18<br>-18         | +40 + 4    | +73<br>+37 | + 9 + 6      |
| Over 400<br>Upto 500 | +480+230     | +290+135     | +165<br>+ 68 | +83<br>+20 | +31.5          | +18<br>-45 | +20<br>-20         | +45 + 5    | +80<br>+40 | +10          |

| S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DRAWING  |   |                          |                                   |  |  |  |  |  |  |  |
|---|---|--------------------------|-----------------------------------|--|--|--|--|--|--|--|
| Day & Date: Tuesday, 17-12-2019         Max. Marks: 70           Time: 10:00 AM To 02:00 PM         Max. Marks: 70  |   |                          |                                   |  |  |  |  |  |  |  |
| <b>Instructions:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.   |   |                          |                                   |  |  |  |  |  |  |  |
| <ul> <li>2) Assume suitable dimensions if not given</li> <li>3) Use first angle Method of projections.</li> <li>4) Figures to the right indicates full marks.</li> </ul>  |   |                          |                                   |  |  |  |  |  |  |  |
| Duration  | MCQ/Object  | tive Type                |                                   |  |  |  |  |  |  |  |
| Duration: 3   | ose the correct alternatives  | from the (               | Marks: 14 Options. 03             |  |  |  |  |  |  |  |
|   | e:1 Match the pairs (One ma<br>Geometrical Tolerance<br>Concentricity | rks for ea<br>Sy         | ch correct answer)<br>mbol        |  |  |  |  |  |  |  |
| 1)<br>2)  | Circularity   | b)                       |                                   |  |  |  |  |  |  |  |
| 3)  | Cylindricity  | c) (                     | 9<br>)                            |  |  |  |  |  |  |  |
| <ul> <li>Type: 2 Correct or Incorrect (Attempt any two) (Each bit one mark each)</li> <li>A shaft whose upper deviation is zero is called as basic shaft.</li> <li>The size across flats in hexagonal nut is 2D.</li> <li>Woodruff key is self aligning key.</li> </ul> |   |                          |                                   |  |  |  |  |  |  |  |
| Type<br>mar   | -   | type.(Solv               | e any two) (Each correct bit 2 04 |  |  |  |  |  |  |  |
| 1)  | Which of the following symbol<br>a) M<br>c) R                         | bls indicate<br>b)<br>d) |                                   |  |  |  |  |  |  |  |
| 2)  | Which of the following pairs c a) $\phi 40H_8d_6$ c) $\phi 40H_7p_6$  | defines cle<br>b)<br>d)  | $\phi 40H_7f_6$                   |  |  |  |  |  |  |  |
| 3)  | Which of the following are sta<br>a) A2<br>c) A4                      | b)<br>d)                 | A3<br>A5                          |  |  |  |  |  |  |  |
|   | e: 4 Straight Objective Type<br>In half section how much par          |                          | MCQ.(Each bit 1 mark each) 05     |  |  |  |  |  |  |  |
| 1)  | a) Half<br>c) Quarter   | b)<br>d                  | Full                              |  |  |  |  |  |  |  |
| 2)  |   |                          |                                   |  |  |  |  |  |  |  |
|   | a) Taper<br>c) Depth of hole  | b)<br>d)                 |                                   |  |  |  |  |  |  |  |
| 3)  | This symbol is used to s  | show                     |                                   |  |  |  |  |  |  |  |
|   | <ul><li>a) Internal threading</li><li>c) Symmetry</li></ul>           | b)<br>d)                 | 0                                 |  |  |  |  |  |  |  |

Set S

Seat No.

SLR-FM-647

# 4) Represents which type of section?

a) Removed c) Partial

- b) Halfd) Revolved
- 5) Which of the following is used for high speed reduction ratio?
  - a) Spur gear assembly b) Bevel gear assembly
    - c) Worm and worm wheel
- d) Rack and pinion

| Seat |  |
|------|--|
| No.  |  |

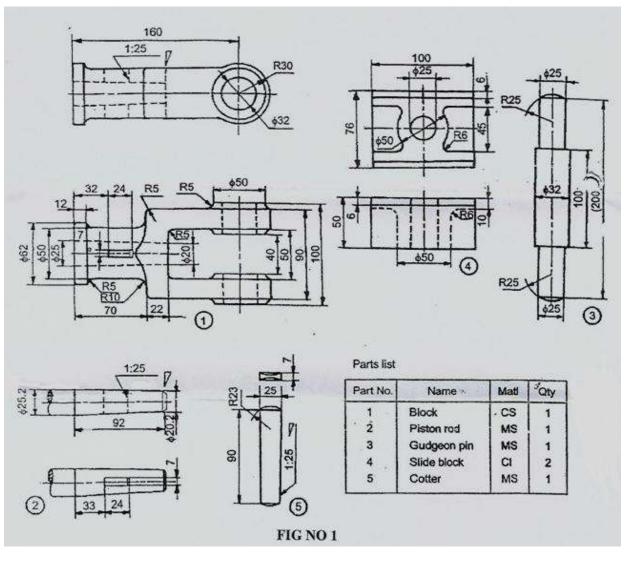
## S.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DRAWING

Day & Date: Tuesday, 17-12-2019 Time: 10:00 AM To 02:00 PM

**Instructions:** 1) Q. No. 2 are compulsory and out of question no. 3 to 7, attempt any four. 2) Assume suitable dimensions if not given

- 3) Use first angle Method of projections.
- 4) Figures to the right indicates full marks.
- **Q.2** Figure No. 1 shows the details of steam engine cross head. Assemble the given parts and draw :
  - 1) Front View
  - 2) Top View

Prepare bill of material and give all the dimensions.



Set S

Max. Marks: 56



|     |                              | Set  | S        |
|-----|------------------------------|--|----------|
| Q.3 | Solv<br>a)                   | <b>ve any three out of four. (Every bit has 03 marks)</b><br>Draw BIS Conventions of<br>1) Splined shaft<br>2) Bearing   | 09       |
|     | b)                           | Draw Free Hand Sketch of<br>1) Buttress thread<br>2) Flanged nut   |          |
|     | c)                           | Draw BIS Conventions of<br>1) Cylindrical compression spring<br>2) Glass material  |          |
|     | d)                           | Draw Free Hand Sketch of<br>1) T – headed bolt<br>2) Stud  |          |
| Q.4 | Solv<br>a)<br>b)<br>c)<br>d) | <b>ve any three out of four (Every bit has 03 marks)</b><br>Draw BIS Conventions of Spur Gear Assembly (Both view).<br>Draw Free Hand Sketch of Single Riveted Single Strap Butt Joint.<br>Draw BIS Conventions for Half Section.<br>Draw Free Hand Sketch of flange coupling.   | 09       |
| Q.5 | Solv<br>a)                   | <ul> <li>the following</li> <li>Identify the type of fit indicated with following fit designation (Attempt any one)</li> <li>1) \$\phi30H_7g_6\$</li> <li>2) \$\phi50H_8p_6\$</li> <li>Also support the answer by writing the calculations and draw diagram for</li> </ul>   | 09<br>04 |
|     | b)                           | <ul> <li>the same.</li> <li>Redraw the following Figure with given dimensions and show following geometrical tolerances on it.</li> <li>1) Diameter of base plate is having bilateral tolerance within 0.02 mm.</li> <li>2) Hole of φ30 is perpendicular to base within 0.01 mm.</li> <li>3) Cylindricity of surface B is within 0.03 mm.</li> <li>4) Cylindrical feature of Ø8O has circular run out within 0.01</li> </ul> | 05       |
|     | Ø                            |  |          |

-3XØ8

B

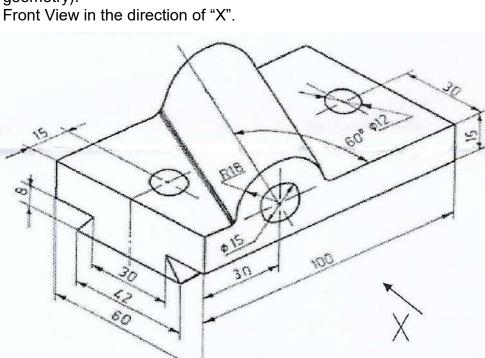
Ø30-

Ø80

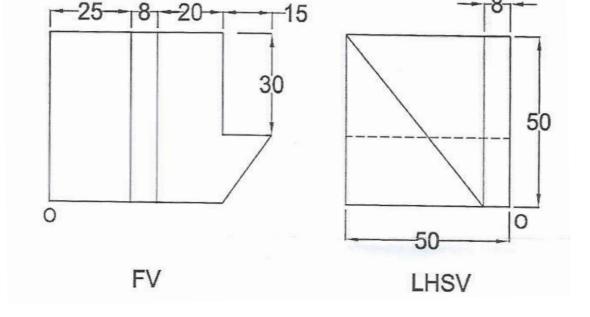
A

SLR-FM-647

- Refer Fig. of Angle bearing and draw following views with necessary Q.6 dimensions.
  - Top view 1)
  - Partial auxiliary view (to represent true shape of inclined surface 2) geometry).
  - 3)



**Q.7** Refer following orthographic view and draw its isometric View.



09

09



| (Values in microns)  |           |          |           |           |           |              |              |               |            |           |
|----------------------|-----------|----------|-----------|-----------|-----------|--------------|--------------|---------------|------------|-----------|
|                      | Toleran   | ces of   | holes     |           |           |              | Toleran      | ces, uf       | shafts     |           |
| Nominal              | Н7        | на       | H9        | H10       | H11       | dЭ           | e8           | 17            | g6         | h6        |
| From 1<br>Upto 3     | +10       | +14      | + 25      | + 40      | + 60<br>0 | - 20<br>- 45 | - 14<br>- 28 | - 6<br>- 16   | - 2<br>- 8 | - 6       |
| Over 3<br>Upto 6     | +12       | +18      | + 30<br>0 | + 45      | + 75<br>0 | - 30<br>- 60 | - 20<br>- 38 | - 10<br>- 22  | - 4<br>-12 | _0<br>_ 8 |
| Over 6<br>Upto 10    | +15       | +22      | + 36      | + 58      | + 90<br>0 | - 40<br>- 75 | - 25<br>- 47 | - 13<br>- 28  | - 5<br>-14 | ~ 9       |
| Over 10<br>Upto 1B   | +18       | +27      | + 43<br>0 | + 70<br>0 | +110<br>U | - 5G<br>- 93 | - 32<br>- 59 | - 16<br>- 34  | - 6<br>-17 | 0-11      |
| Over 18<br>Upto 30   | +21<br>0  | +33      | + 52      | 4 84<br>0 | +130<br>0 | - 65         | - 40<br>- 73 | - 20<br>- 41  | - 7        | 0<br>-13  |
| Over 30<br>Upto 50   | +25       | +39      | + 62      | +100      | +160<br>0 | -80<br>-142  | - 50<br>- 59 | - 25          | - 9        | 0         |
| Over 50<br>Upto 80   | +30       | +46      | + 76      | +120      | +190<br>0 | -100<br>-174 | - 60<br>-105 | - 30<br>- 60  | -10<br>-29 | 0<br>-19  |
| Over 80<br>Upto 120  | +35       | +54      | + 87      | +140      | +220      | -120         | - 72<br>-126 | - 36<br>- 71  | -12<br>-34 | 0<br>-22  |
| Over 120<br>Upto 180 | +40<br>0  | +63      | +100      | +160<br>0 | +250      | -145<br>-245 | -85<br>-148  | - 43<br>- 83  | -14<br>-39 | 0         |
| Over 180<br>Upto 250 | +45       | +72<br>0 | +115      | +185      | +290      | -170<br>-265 | ~100<br>-172 | - 50<br>- 96  | -15<br>-44 | 0         |
| Over 250<br>Upto 315 | +52       | +81      | +130      | +210      | +320      | -190<br>-320 | -110<br>-191 | - 56<br>-108  | -17        | -32       |
| Over 315<br>Upto 400 | +57       | +89      | +140      | +230      | +360      | -210<br>-350 | -125<br>-214 | - 62<br>-119  | -18<br>-54 | 0<br>-3!  |
| Over 400<br>Upto 500 | -+G3<br>0 | +97      | +155      | +250      | + 400     | -230<br>-385 | -135<br>-232 | - 68<br>-13,1 | -20<br>-60 | -41       |

| 151-1 |      | 1  |   |       |
|-------|------|----|---|-------|
| (Ya)  | lues | in | m | crons |

| (Values in microns)  |              |              |              |            |                |             |                    |            |            |              |
|----------------------|--------------|--------------|--------------|------------|----------------|-------------|--------------------|------------|------------|--------------|
|                      | Tol          | erance       | s of ho      | les        | And and        |             | Toler              | ances      | of sha     | fts          |
| Nominal<br>sizes     | D10          | E 9          | F8           | G7         | JS7            | К7          | j6                 | k6         | n6         | p 5          |
| From 1<br>Upto 3     | + 60 + 20    | + 39<br>+ 14 | + 20<br>+ 6  | +12<br>+ 2 | + 5<br>- 5     | 0<br>-10    | + 3<br>- 3         | + 6<br>0   | +10+4      | + 12 + 6     |
| Over 3<br>Upto 6     | +78<br>+30   | + 50 + 20    | + 28<br>+ 10 | +16<br>+ 4 | + 6<br>- 6     | + 3<br>- 9  | + 4<br>- 4         | + 9<br>+ 1 | +16<br>+ 8 | + 20         |
| Over 6<br>Upto 10    | + 98<br>+ 40 | + 61<br>+ 25 | + 35<br>+ 13 | +20 + 5    | + 7.5          | + 5<br>-10  | + 4.5 - 4.5        | +10<br>+ 1 | +19<br>+10 | + 2-+ 1.     |
| Over 10<br>Upto 18   | +120<br>+ 50 | + 75<br>+ 32 | + 43<br>+ 16 | +24<br>+ 6 | + 9<br>- 9     | + 6<br>-12  | + 5.5 - 5.5        | +12<br>+ 1 | +23<br>+12 | + 29<br>+ 10 |
| Over 18<br>Upto 30   | +149<br>+ 65 | + 92<br>+ 40 | + 53 + 20    | +28<br>+7  | +10.5          | +6<br>-15   | + 6.5 - 6.5        | +15<br>+ 2 | +28 + 15   | + 3 + 2      |
| Over 30<br>Upto 50   | +180<br>+ 80 | +112<br>+ 50 | + 64 + 25    | +34<br>+ 9 | +12.5<br>-12.5 | + 7<br>-18  | + 8<br>- 8         | +18<br>+ 2 | +33<br>+17 | + 4<br>+ 2   |
| Over 50<br>Upto 80   | +220         | +134<br>+ 60 | + 76<br>+ 30 | +40 +10    | +15<br>-15     | +_9_<br>-21 | $\pm 9.5$<br>- 9.5 | +21-+2     | +39 + 20   | + 5 + 3      |
| Over 80<br>Upto 120  | +260<br>+120 | +159<br>+ 72 | +90<br>+36   | +47<br>+12 | +17.5          | +10<br>-25  | +11<br>-11         | +25 + 3    | +45<br>+23 | + 5+3        |
| Over 120<br>Upto 180 | +305<br>+145 | +185         | +106 + 43    | +54<br>+14 | +20<br>-20     | +12<br>-28  | +12.5<br>+12.5     | +28 + 3    | +52<br>+27 | + 6 + 4      |
| Over 180<br>Upto 250 | +355<br>+170 | +215+100     | +122 + 50    | +61<br>+15 | +23<br>-23     | +13<br>+33  | +14.5<br>-14.5     | +33<br>+ 4 | +60<br>+31 | + 7<br>+ 5   |
| Over 250<br>Upto 315 | +400<br>+190 | +240         | +135<br>+ 55 | +69<br>+17 | +26<br>-26     | +16<br>-36  | +16 - 16           | +36 + 4    | +66<br>+34 | + 8<br>+ 5   |
| Over 315<br>Upto 400 | +440<br>+210 | +265<br>+125 | +151 + 69    | +75<br>+18 | +28.5<br>-28.5 | +17<br>-40  | +18<br>-18         | +40 + 4    | +73<br>+37 | + 9 + 6      |
| Over 400<br>Upto 500 | +480+230     | +290+135     | +165<br>+ 68 | +83<br>+20 | +31.5          | +18<br>-45  | +20<br>-20         | +45 + 5    | +80<br>+40 | +10          |

Page **24** of **24** 

### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering THEORY OF MACHINES – I**

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

#### **MCQ/Objective Type Questions**

Choose the correct alternatives from the options and rewrite the sentence.

The motion of a piston in the cylinder of a steam engine is an example of

**Duration: 30 Minutes** 

Seat No.

Q.1

1)

- completely constrained motion a)
  - incompletely constrained motion b)
  - successfully constrained motion C)
  - none of these d)
- 2) The lead screw of a lathe with nut forms a
  - sliding pair b) rolling pair a)
  - screw pair C) d) turning pair
- 3) The mechanism forms a structure, when the number of degrees of freedom (n) is equal to \_\_\_\_\_
  - a) 0 b) 1
  - C) 2 d) -1
- 4) The Coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - Slider-crank mech a) Quick-return motion mech c)
- b) 4 bar mech d) None of these

b) parabolic curve

- 5) According to Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a
  - a) straight line
  - C) ellipse d) none of these
- Pantograph consists of \_\_\_\_\_ 6)
  - a) 4 links b) 6 links C) 8 links d) 10 links
- 7) In a dynamically-equivalent system, a uniformly distributed mass is divided
  - into \_\_\_\_\_ point masses. two a)
  - b) three four d) five C)
- The cam follower used in air-craft engine is \_\_\_\_\_\_ follower. 8) a)
  - roller b) flat faced
  - c) spherical faced d) knife-edged



Max. Marks: 70

**SLR-FM-648** 



Marks: 14

- 9) The reference point on the follower to lay the cam profile is known as the
  - a) cam centre
- b) pitch pointd) prime point
- 10) The circle drawn to the cam profile with minimum radius is called the
  - a) prime circle

C)

c) trace point

- Pitch circle
- 11) The efficiency of a screw jack increases with \_\_\_\_\_
  - a) decrease in load b) increase in load
  - c) decrease in pitch d) increase in pitch
- 12) When the frictional force helps the applied force in applying the brake, the brake is \_\_\_\_\_.
  - a) self-locking
  - c) self-energizing
- b) automatic
- d) Friction brake
- 13) A Hartnell governor is a \_\_\_\_\_ governor.a) dead weightb) pend
  - b) pendulum type
  - d) spring-loaded
- 14) The frictional resistance at the sleeve \_\_\_\_\_ the sensitivity of governor.
  - a) does not affect
  - c) decreases

inertia

C)

- b) increases
- d) may increase or decrease

- b) cam circled) base circle
- e with minimum ra

Set

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicate full marks.

#### Section – I

- Q.2 a) Define Kinematic Pair and describe any three type of kinematic pairs.
  - In mechanism shown in figure OA = 200 mm AB = 400 mm BC = 300 mm, b) BD = 500 mm and crank OA rotates in anticlockwise with 210 rpm. Determine linear acceleration of slider D and angular acceleration of link BD.



- Scott-Russel mechanism 1)
- Tchebiceff mechanism. 2)
- Two shafts with an included angle of 150° are connected by a Hooke's 80 b) joint. The driving shaft runs at a uniform speed of 1400 r.p.m. The driven shaft carries a flywheel of mass 10 kg and 0.1 m radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required.
- Derive an expression for approximate analytical velocity and acceleration Q.4 a) **08** of the Piston.
  - Explain various types of instantaneous centers with neat diagram, mark 06 b) the same on diagram.

#### Section – II

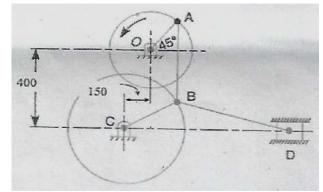
- Q.5 a) It is required to set out profile of a cam to give the following motion to the 80 follower:
  - Follower to move outward through 30 mm during 100° of cam rotation, 1) with SHM.
  - Dwell for the next 40° 2)
  - Follower to return with SHM motion during 100° of cam rotation. 3)
  - Remaining is Dwell 4)

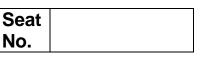
The base circle of the cam is 30 mm diameter and the roller diameter of the follower is 10mm.

The axis of the follower is in line with cam axis.

b) Derive an expression for the torque required to lower the body by screw 06 jack.

## **THEORY OF MACHINES – I** Max. Marks: 56







Set

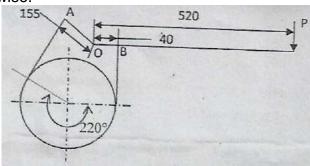
**SLR-FM-648** 

06

06

Set

- Q.6 a) A figure shows a differential band brake, in which an angle of contact is 220°. The band bears against a cast iron drum of 400 mm diameter. The brake is to sustain a torque of 355 N-m and the coefficient of friction between the band and the drum is 0.28. Find :
  - The necessary force (P) for the clockwise and anticlockwise rotation of 1) the drum.
  - 2) The value of 'OA' for the brake to be self locking, when the drum rotates clockwise.



- Explain with neat diagram centrifugal clutch. b)
- Q.7 a) The arms of a Porter governor are each 255 mm long and pivoted on the 80 governor axis. The mass of each ball is 5.5 kg and the mass of the central sleeve is 25 kg. The radius of rotation of the balls is 160 mm when the sleeve begins to rise and reaches a value of 210 mm for maximum speed. Determine the speed range of the governor.
  - Define with neat diagram: b)
    - 1) Knife edge follower
    - 2) Roller follower
    - Mushroom follower 3)

06

06

|                  | MCQ/Objective  | Туре        | Questions   |     |
|------------------|--|-------------|---|-----|
| ation:           | 30 Minutes   |             | Marks   | : 1 |
| <b>Chc</b><br>1) | The cam follower used in air-craft<br>a) roller<br>c) spherical faced  | engin<br>b) |   | 1   |
| 2)               | The reference point on the followe   | r to la     | y the cam profile is known as the                                     |     |
|                  | a) cam centre<br>c) trace point  | b)<br>d)    | pitch point<br>prime point  |     |
| 3)               | The circle drawn to the cam profile  | e with      | minimum radius is called the  |     |
|                  | a) prime circle<br>c) Pitch circle   | b)<br>d)    | cam circle<br>base circle   |     |
| 4)               | The efficiency of a screw jack increation a) decrease in load c) decrease in pitch   | b)          | with<br>increase in load<br>increase in pitch                         |     |
| 5)               | When the frictional force helps the<br>brake is<br>a) self-locking<br>c) self-energizing   | b)          | ed force in applying the brake, the<br>automatic<br>Friction brake    |     |
| 6)               | A Hartnell governor is a<br>a) dead weight<br>c) inertia   | b)          | nor.<br>pendulum type<br>spring-loaded                                |     |
| 7)               | The frictional resistance at the slee<br>a) does not affect<br>c) decreases  | b)          | the sensitivity of governor.<br>increases<br>may increase or decrease |     |
| 8)               | The motion of a piston in the cylind<br>a) completely constrained motion<br>b) incompletely constrained motion<br>c) successfully constrained motion<br>d) none of these | n<br>ion    | a steam engine is an example of                                       |     |
| 9)               | The lead screw of a lathe with nut a) sliding pair   | forms<br>b) | a<br>rolling pair   |     |

S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** THEORY OF MACHINES - I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

Dur

screw pair d) turning pair C)



Set

Max. Marks: 70

Q



4

Set | Q

- 10) The mechanism forms a structure, when the number of degrees of freedom (n) is equal to \_\_\_\_\_.
  - a) 0 b) 1
  - c) 2 d) -1
- 11) The Coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - a) Slider-crank mech
- b) 4 bar mech
- c) Quick-return motion mech
- d) None of these
- 12) According to Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a \_\_\_\_\_.
  - a) straight line
- b) parabolic curve
- ellipse d) none of these
- 13) Pantograph consists of \_\_\_\_\_.
  - a) 4 links b) 6 links
  - c) 8 links d) 10 links
- 14) In a dynamically-equivalent system, a uniformly distributed mass is divided into \_\_\_\_\_ point masses.
  - a) two

C)

c) four

- b) three
- d) five

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicate full marks.

#### Section – I

- Q.2 a) Define Kinematic Pair and describe any three type of kinematic pairs.
  - In mechanism shown in figure OA = 200 mm AB = 400 mm BC = 300 mm, b) BD = 500 mm and crank OA rotates in anticlockwise with 210 rpm. Determine linear acceleration of slider D and angular acceleration of link BD.



- Scott-Russel mechanism 1)
- Tchebiceff mechanism. 2)
- Two shafts with an included angle of 150° are connected by a Hooke's 80 b) joint. The driving shaft runs at a uniform speed of 1400 r.p.m. The driven shaft carries a flywheel of mass 10 kg and 0.1 m radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required.
- Derive an expression for approximate analytical velocity and acceleration Q.4 a) **08** of the Piston.
  - Explain various types of instantaneous centers with neat diagram, mark 06 b) the same on diagram.

#### Section – II

- Q.5 a) It is required to set out profile of a cam to give the following motion to the 80 follower:
  - Follower to move outward through 30 mm during 100° of cam rotation, 1) with SHM.
  - Dwell for the next 40° 2)
  - Follower to return with SHM motion during 100° of cam rotation. 3)
  - Remaining is Dwell 4)

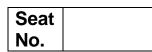
The base circle of the cam is 30 mm diameter and the roller diameter of the follower is 10mm.

The axis of the follower is in line with cam axis.

b) Derive an expression for the torque required to lower the body by screw 06 jack.

## **THEORY OF MACHINES – I** Max. Marks: 56

400 150 B





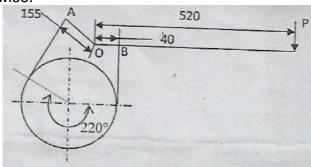
**SLR-FM-648** 

06

06

Set

- Q.6 a) A figure shows a differential band brake, in which an angle of contact is 220°. The band bears against a cast iron drum of 400 mm diameter. The brake is to sustain a torque of 355 N-m and the coefficient of friction between the band and the drum is 0.28. Find :
  - The necessary force (P) for the clockwise and anticlockwise rotation of 1) the drum.
  - 2) The value of 'OA' for the brake to be self locking, when the drum rotates clockwise.



- Explain with neat diagram centrifugal clutch. b)
- Q.7 a) The arms of a Porter governor are each 255 mm long and pivoted on the 80 governor axis. The mass of each ball is 5.5 kg and the mass of the central sleeve is 25 kg. The radius of rotation of the balls is 160 mm when the sleeve begins to rise and reaches a value of 210 mm for maximum speed. Determine the speed range of the governor.
  - Define with neat diagram: b)
    - 1) Knife edge follower
    - 2) Roller follower
    - Mushroom follower 3)

06

06

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** THEORY OF MACHINES - I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence.

- According to Kennedy's theorem, if three bodies move relatively to each 1) other, their instantaneous centres will lie on a
  - a) straight line
  - ellipse c)
- Pantograph consists of \_\_\_\_\_ 2)
  - 4 links b) 6 links a) C) 8 links d)
- In a dynamically-equivalent system, a uniformly distributed mass is divided 3) into \_\_\_\_\_ point masses.
  - a) two b) three
  - c) four
- The cam follower used in air-craft engine is \_\_\_\_ follower. 4)
  - roller b) flat faced a)
  - spherical faced d) knife-edged C)
- The reference point on the follower to lay the cam profile is known as the 5)
  - cam centre a)
  - C) trace point
- The circle drawn to the cam profile with minimum radius is called the 6)
  - a) prime circle b) cam circle
  - C) Pitch circle d) base circle
- 7) The efficiency of a screw jack increases with \_
  - decrease in load b) increase in load a) C)
    - decrease in pitch d) increase in pitch
- When the frictional force helps the applied force in applying the brake, the 8) brake is .
  - self-locking a) b) automatic c)
    - self-energizing d) Friction brake
- A Hartnell governor is a \_\_\_\_\_ governor. 9)
  - dead weight a)
  - C) inertia

- b) pendulum type
- d) spring-loaded

Max. Marks: 70

**SLR-FM-648** 

Set

Marks: 14

14

## Seat No.

- - 10 links

- d) five

b) pitch point d) prime point

b) parabolic curve d) none of these

Set R

- 10) The frictional resistance at the sleeve \_\_\_\_\_ the sensitivity of governor.
  - a) does not affect

C)

- b) increases
- decreases d) may increase or decrease
- 11) The motion of a piston in the cylinder of a steam engine is an example of
  - a) completely constrained motion
  - b) incompletely constrained motion
  - c) successfully constrained motion
  - d) none of these
- 12) The lead screw of a lathe with nut forms a \_\_\_\_\_
  - a) sliding pair b) rolling pair
  - c) screw pair d) turning pair
- 13) The mechanism forms a structure, when the number of degrees of freedom (n) is equal to \_\_\_\_\_.
  - a) 0 b) 1
  - c) 2 d) -1
- 14) The Coriolis component of acceleration is taken into account for \_\_\_\_\_.
  - a) Slider-crank mech
- b) 4 bar mech
- c) Quick-return motion mech
- d) None of these

#### Seat No. S.E. (Part – II) (Old) (C

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicate full marks.

## Section – I

- **Q.2** a) Define Kinematic Pair and describe any three type of kinematic pairs.
  - b) In mechanism shown in figure OA = 200mm AB = 400mm BC=300mm, BD = 500 mm and crank OA rotates in anticlockwise with 210 rpm. Determine linear acceleration of slider D and angular acceleration of link BD.



- 1) Scott-Russel mechanism
- 2) Tchebiceff mechanism.
- b) Two shafts with an included angle of 150° are connected by a Hooke's joint. The driving shaft runs at a uniform speed of 1400 r.p.m. The driven shaft carries a flywheel of mass 10 kg and 0.1 m radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required.
- **Q.4 a)** Derive an expression for approximate analytical velocity and acceleration **08** of the Piston.
  - b) Explain various types of instantaneous centers with neat diagram, mark 06 the same on diagram.

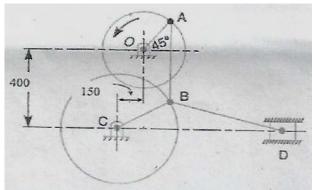
#### Section – II

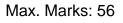
- **Q.5 a)** It is required to set out profile of a cam to give the following motion to the follower:
  - 1) Follower to move outward through 30 mm during 100° of cam rotation, with SHM.
  - 2) Dwell for the next 40°
  - 3) Follower to return with SHM motion during 100° of cam rotation.
  - 4) Remaining is Dwell

The base circle of the cam is 30 mm diameter and the roller diameter of the follower is 10mm.

The axis of the follower is in line with cam axis.

b) Derive an expression for the torque required to lower the body by screw 06 jack.





06

06

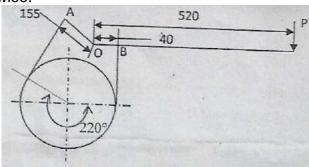
08

Set R

**SLR-FM-648** 

Set R

- Q.6 a) A figure shows a differential band brake, in which an angle of contact is 220°. The band bears against a cast iron drum of 400 mm diameter. The brake is to sustain a torque of 355 N-m and the coefficient of friction between the band and the drum is 0.28. Find :
  - 1) The necessary force (P) for the clockwise and anticlockwise rotation of the drum.
  - 2) The value of 'OA' for the brake to be self locking, when the drum rotates clockwise.



- **b)** Explain with neat diagram centrifugal clutch.
- Q.7 a) The arms of a Porter governor are each 255 mm long and pivoted on the governor axis. The mass of each ball is 5.5 kg and the mass of the central sleeve is 25 kg. The radius of rotation of the balls is 160 mm when the sleeve begins to rise and reaches a value of 210 mm for maximum speed. Determine the speed range of the governor.
  - **b)** Define with neat diagram:
    - 1) Knife edge follower
    - 2) Roller follower
    - 3) Mushroom follower

06

08

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** THEORY OF MACHINES – I

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Choose the correct alternatives from the options and rewrite the sentence. 14 Q.1

- The circle drawn to the cam profile with minimum radius is called the 1)
  - a) prime circle
  - Pitch circle c)
- 2) The efficiency of a screw jack increases with \_\_\_\_\_
  - decrease in load a)
  - decrease in pitch c)
- When the frictional force helps the applied force in applying the brake, the 3) brake is \_\_\_\_\_.
  - a) self-locking
    - d) Friction brake self-energizing C)
- 4) A Hartnell governor is a \_\_\_\_\_ governor.
  - dead weight b) pendulum type a)
  - inertia d) spring-loaded C)
- The frictional resistance at the sleeve \_\_\_\_ \_\_\_\_\_ the sensitivity of governor. 5)
  - does not affect b) increases a) C)
    - decreases d) may increase or decrease
- The motion of a piston in the cylinder of a steam engine is an example of 6)
  - completely constrained motion a)
  - incompletely constrained motion b)
  - successfully constrained motion C)
  - d) none of these

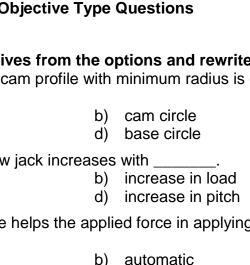
7) The lead screw of a lathe with nut forms a \_\_\_\_\_

- sliding pair b) rolling pair a)
- screw pair d) turning pair C)
- The mechanism forms a structure, when the number of degrees of 8) freedom (n) is equal to \_\_\_\_\_.
  - a) 0 b) 1
  - C) 2 d) -1
- The Coriolis component of acceleration is taken into account for \_\_\_\_\_. 9)
  - a) Slider-crank mech Quick-return motion mech C)
- b) 4 bar mech
- d) None of these

Max. Marks: 70

Marks: 14

## **SLR-FM-648**



Seat No.





- 10) According to Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a \_\_\_\_\_.
  - a) straight line

11)

b) parabolic curve

c) ellipse

d) none of these

) empse

- Pantograph consists of \_\_\_\_\_. a) 4 links b) 6 links
  - c) 8 links d) 10 links
- 12) In a dynamically-equivalent system, a uniformly distributed mass is divided into \_\_\_\_\_ point masses.
  - a) two b) three
  - c) four d) five
- 13) The cam follower used in air-craft engine is \_\_\_\_\_\_ follower.
  - a) roller b) flat faced
  - c) spherical faced d) knife-edged
- 14) The reference point on the follower to lay the cam profile is known as the
  - a) cam centre
  - c) trace point

- b) pitch point
- d) prime point

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

**THEORY OF MACHINES – I** 

Day & Date: Friday, 22-11-2019 Time: 02:30 PM To 05:30 PM

Seat

No.

**Instructions:** 1) Attempt any two questions from each section.

2) Figures to the right indicate full marks.

#### Section – I

- Q.2 a) Define Kinematic Pair and describe any three type of kinematic pairs.
  - In mechanism shown in figure OA = 200 mm AB = 400 mm BC = 300 mm, b) BD = 500 mm and crank OA rotates in anticlockwise with 210 rpm. Determine linear acceleration of slider D and angular acceleration of link BD.



- Scott-Russel mechanism 1)
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- Two shafts with an included angle of 150° are connected by a Hooke's 80 b) joint. The driving shaft runs at a uniform speed of 1400 r.p.m. The driven shaft carries a flywheel of mass 10 kg and 0.1 m radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required.
- Derive an expression for approximate analytical velocity and acceleration Q.4 a) **08** of the Piston.
  - Explain various types of instantaneous centers with neat diagram, mark 06 b) the same on diagram.

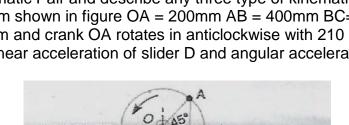
#### Section – II

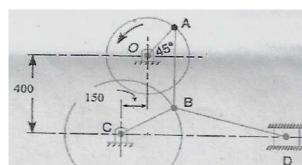
- Q.5 a) It is required to set out profile of a cam to give the following motion to the 80 follower:
  - Follower to move outward through 30 mm during 100° of cam rotation, 1) with SHM.
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  - Follower to return with SHM motion during 100° of cam rotation. 3)
  - Remaining is Dwell 4)

The base circle of the cam is 30 mm diameter and the roller diameter of the follower is 10mm.

The axis of the follower is in line with cam axis.

b) Derive an expression for the torque required to lower the body by screw 06 jack.





Set

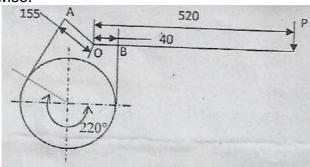
Max. Marks: 56

06

Set

80

- Q.6 a) A figure shows a differential band brake, in which an angle of contact is 220°. The band bears against a cast iron drum of 400 mm diameter. The brake is to sustain a torque of 355 N-m and the coefficient of friction between the band and the drum is 0.28. Find :
  - The necessary force (P) for the clockwise and anticlockwise rotation of 1) the drum.
  - 2) The value of 'OA' for the brake to be self locking, when the drum rotates clockwise.



- Explain with neat diagram centrifugal clutch. b)
- Q.7 a) The arms of a Porter governor are each 255 mm long and pivoted on the 80 governor axis. The mass of each ball is 5.5 kg and the mass of the central sleeve is 25 kg. The radius of rotation of the balls is 160 mm when the sleeve begins to rise and reaches a value of 210 mm for maximum speed. Determine the speed range of the governor.
  - Define with neat diagram: b)
    - 1) Knife edge follower
    - 2) Roller follower
    - Mushroom follower 3)

06

06

Page 16 of 16

| Seat<br>No. |   | Set P  |  |  |  |  |  |  |  |  |
|-------------|---|--|--|--|--|--|--|--|--|--|
|             | S.E. (Part – II) (OId) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MANUFACTURING PROCESSES |  |  |  |  |  |  |  |  |  |
|             |   | Saturday,23-11-2019         Max. Marks: 70           'M To 05:30 PM         Max. Marks: 70   |  |  |  |  |  |  |  |  |
| Instruc     | tions:  | <ol> <li>Q.No.1 is compulsory. It should be solved in the first 30 minutes in<br/>the Answer Book.</li> <li>Figures to right indicate full marks.</li> </ol>   |  |  |  |  |  |  |  |  |
|             |   | MCQ/Objective Type Questions   |  |  |  |  |  |  |  |  |
| Duratio     |   |  |  |  |  |  |  |  |  |  |
| Q.1 A       | se  | boose the correct alternatives from the options and rewrite the06ntence.Sand which is used for core making isa) Shell sandb) Facing sandc) Green sandd) Dry Sand   |  |  |  |  |  |  |  |  |
|             | 2)  | Riser should solidifya) After solidification of castingb) Before solidification of castingc) In solidification of castingd) All of these   |  |  |  |  |  |  |  |  |
|             | 3)  | Choke is generally provided at<br>a) Gate b) Pouring cup<br>c) Feeder d) Mould Cavity  |  |  |  |  |  |  |  |  |
|             | 4)  | Crank Shaft is manufactured by<br>a) Rolling b) Forging<br>c) Extrusion d) Non conventional forming  |  |  |  |  |  |  |  |  |
|             | 5)  | Tooth paste is manufactured bya) Direct extrusionb) Indirect Extrusionc) Impact extrusiond) Hydrostatic Extrusion  |  |  |  |  |  |  |  |  |
|             | 6)  | Carburetor of two wheeler is manufactured by<br>a) Sand Casting b) Shell Moulding<br>c) Permanent Mold casting d) Centrifugal casting  |  |  |  |  |  |  |  |  |
| В           | <b>) MC</b><br>1)   | CQ with more than one answer correct (2 marks each)08For joining of two parts having poor weld ability materials, following<br>processes are useda)a)Brazingb)c)Gas and Arc weldingd)Soldering                     |  |  |  |  |  |  |  |  |
|             | 2)  | In shell Arc moldinga) Need of metal patternb) Need of heatc) Does not uses cored) Used for Making lathe bed   |  |  |  |  |  |  |  |  |
|             | 3)  | <ul> <li>Among the following, properties of molding sand are</li> <li>a) High Refractoriness</li> <li>b) High thermal expansion coefficient</li> <li>c) High cohesiveness</li> <li>d) Reactive to metal</li> </ul> |  |  |  |  |  |  |  |  |





- 4) Which of the following are resistant welding processes?
   a) Spot welding
   b) Projection welding
   c) Arc Welding
   d) Gas welding

## No. S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

Day & Date: Saturday,23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Neat sketches must be drawn whenever necessary.

#### Section - I

**Mechanical Engineering** MANUFACTURING PROCESSES

- Q.2 a) Explain in brief any three types molding sand and their properties. 05 Explain the basic steps in casting process with flow chart 04 b) Explain with neat sketches types of cores used in the casting process. c) 05 Explain the various types of pattern allowances with one example. 05 Q.3 a) Explain the advantages and limitations of centrifugal casting process. 04 b) Explain the process of shell molding with neat sketches. c) 05 Q.4 Write a short note on (Attempt any three) 14
  - **Casting Defects** a)
  - b) Fettling and cleaning of casting
  - C) Induction Furnace
  - Computer Applications in foundry d)
  - Injection Moulding e)

#### Section – II

| Q.5 | a)  | Give broad classification of forming processes.                         | 04 |
|-----|-----|---|----|
|     | b)  | Differentiate between hot rolling and cold rolling operations.          | 05 |
|     | c)  | Explain with neat sketch closed die forging process.                    | 05 |
| Q.6 | a)  | Give classification of joining processes.                               | 05 |
|     | b)  | Explain with neat sketch hydrostatic extrusion process.                 | 04 |
|     | c)  | Explain with neat sketch single pass and multi pass wire drawing setup. | 05 |
| Q.7 | Wri | te short notes.   | 14 |
|     | a)  | Difference between TIG and MIG welding.                                 |    |
|     |     |   |    |

- Difference between soldering and brazing. b)
- Difference between direct and indirect extrusion. c)
- Method of rod or tube drawing. d)

Max. Marks: 56

Seat

Set Ρ

| Seat<br>No.   |  |                     |   |                   | Set Q  |  |  |  |  |  |
|---|--|---------------------|---|-------------------|--|--|--|--|--|--|
| S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MANUFACTURING PROCESSES |  |                     |   |                   |  |  |  |  |  |  |
|   | Day & Date: Saturday,23-11-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70   |                     |   |                   |  |  |  |  |  |  |
| Instruc   | <ul> <li>Instructions: 1) Q.No.1 is compulsory. It should be solved in the first 30 minutes in the Answer Book.</li> <li>2) Figures to right indicate full marks.</li> </ul> |                     |   |                   |  |  |  |  |  |  |
|   |  |                     | MCQ/Objective Ty  | vpe               | Questions  |  |  |  |  |  |
| Duratio   | on: 30   | ) Mir               |   |                   | Marks: 14  |  |  |  |  |  |
| Q.1 A   | Ś  | sento<br>1) (<br>a  | ose the correct alternatives fro<br>ence.<br>Crank Shaft is manufactured by _<br>a) Rolling<br>c) Extrusion   | b)<br>d)          | Forging<br>Non conventional forming                                  |  |  |  |  |  |
|   | 2  | 2) 7<br>a<br>c      | Tooth paste is manufactured by _<br>a) Direct extrusion<br>c) Impact extrusion  | b)<br>d)          | <br>Indirect Extrusion<br>Hydrostatic Extrusion                      |  |  |  |  |  |
|   | 3  | <u></u> 2           | Carburetor of two wheeler is man<br>a) Sand Casting<br>c) Permanent Mold casting  | b)                | Shell Moulding   |  |  |  |  |  |
|   | ۷  | 6                   | Sand which is used for core maki<br>a) Shell sand<br>c) Green sand  | ng is<br>b)<br>d) |  |  |  |  |  |  |
|   | 5  |                     | Riser should solidify<br>a) After solidification of casting<br>c) In solidification of casting  | b)<br>d)          | Before solidification of casting All of these                        |  |  |  |  |  |
|   | 6  | ,<br>2              | Choke is generally provided at<br>a) Gate<br>c) Feeder  | b)<br>d)          | <br>Pouring cup<br>Mould Cavity                                      |  |  |  |  |  |
| E   | · .  | 1) A<br>a<br>k<br>c | <b>2 with more than one answer co</b><br>Among the following, properties o<br>a) High Refractoriness<br>b) High thermal expansion coeff<br>c) High cohesiveness<br>d) Reactive to metal | of mo             | lding sand are   |  |  |  |  |  |
|   | 2  | 2                   | Which of the following are resista<br>a) Spot welding<br>c) Arc Welding   |                   | elding processes?<br>Projection welding<br>Gas welding               |  |  |  |  |  |
|   | 3  | r<br>a              | For joining of two parts having po<br>processes are used<br>a) Brazing<br>c) Gas and Arc welding  |                   | eld ability materials, following<br>TIG and MIG welding<br>Soldering |  |  |  |  |  |



- 4) In shell Arc molding \_\_\_\_\_.
  a) Need of metal pattern
  c) Does not uses core
  b) Need of heat
  d) Used for Making lathe bed

## Seat No.

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** MANUFACTURING PROCESSES

Day & Date: Saturday,23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Neat sketches must be drawn whenever necessary.

#### Section - I

- Q.2 a) Explain in brief any three types molding sand and their properties. 05 Explain the basic steps in casting process with flow chart 04 b) Explain with neat sketches types of cores used in the casting process. c) 05 Explain the various types of pattern allowances with one example. 05 Q.3 a) Explain the advantages and limitations of centrifugal casting process. 04 b) Explain the process of shell molding with neat sketches. c) 05 Q.4 Write a short note on (Attempt any three) 14
  - **Casting Defects** a)
  - b) Fettling and cleaning of casting
  - C) Induction Furnace
  - Computer Applications in foundry d)
  - Injection Moulding e)

## Section – II

| Q.5 | a)  | Give broad classification of forming processes.                         | 04 |  |  |  |  |  |
|-----|-----|---|----|--|--|--|--|--|
|     | b)  | Differentiate between hot rolling and cold rolling operations.          | 05 |  |  |  |  |  |
|     | c)  | Explain with neat sketch closed die forging process.                    | 05 |  |  |  |  |  |
| Q.6 | a)  | Give classification of joining processes.                               | 05 |  |  |  |  |  |
|     | b)  | Explain with neat sketch hydrostatic extrusion process.                 | 04 |  |  |  |  |  |
|     | c)  | Explain with neat sketch single pass and multi pass wire drawing setup. | 05 |  |  |  |  |  |
| Q.7 | Wri | Write short notes.  |    |  |  |  |  |  |
|     | a)  | Difference between TIG and MIG welding.                                 |    |  |  |  |  |  |
|     | . ( |   |    |  |  |  |  |  |

- Difference between soldering and brazing. b)
- Difference between direct and indirect extrusion. c)
- Method of rod or tube drawing. d)

Max. Marks: 56



|       |   |      | MANUFACTURING PROCESSES  |    |  |  |  |
|-------|---|------|--|----|--|--|--|
|       |   |      | aturday,23-11-2019 Max. Marks:<br>M To 05:30 PM  | 70 |  |  |  |
| Instr | <ul><li>Instructions: 1) Q.No.1 is compulsory. It should be solved in the first 30 minutes in the Answer Book.</li><li>2) Figures to right indicate full marks.</li></ul> |      |  |    |  |  |  |
| Dura  | tion.   | 30 N | MCQ/Objective Type Questions  Inutes Marks:  | 14 |  |  |  |
| Q.1   | <b>A</b> )  |      |  | 06 |  |  |  |
|       | ,   | sei  | ntence.  |    |  |  |  |
|       |   | 1)   | Riser should solidifya) After solidification of castingb) Before solidification of castingc) In solidification of castingd) All of these   |    |  |  |  |
|       |   | 2)   | Choke is generally provided ata) Gateb) Pouring cupc) Feederd) Mould Cavity  |    |  |  |  |
|       |   | 3)   | Crank Shaft is manufactured by<br>a) Rolling b) Forging<br>c) Extrusion d) Non conventional forming  |    |  |  |  |
|       |   | 4)   | Tooth paste is manufactured bya) Direct extrusionb) Indirect Extrusionc) Impact extrusiond) Hydrostatic Extrusion  |    |  |  |  |
|       |   | 5)   | Carburetor of two wheeler is manufactured by<br>a) Sand Casting b) Shell Moulding<br>c) Permanent Mold casting d) Centrifugal casting  |    |  |  |  |
|       |   | 6)   | Sand which is used for core making is<br>a) Shell sand b) Facing sand<br>c) Green sand d) Dry Sand   |    |  |  |  |
|       | B)  |      |  | 80 |  |  |  |
|       |   | 1)   | In shell Arc moldinga) Need of metal patternb) Need of heatc) Does not uses cored) Used for Making lathe bed   |    |  |  |  |
|       |   | 2)   | <ul> <li>Among the following, properties of molding sand are</li> <li>a) High Refractoriness</li> <li>b) High thermal expansion coefficient</li> <li>c) High cohesiveness</li> <li>d) Reactive to metal</li> </ul> |    |  |  |  |
|       |   | 3)   | <ul> <li>Which of the following are resistant welding processes?</li> <li>a) Spot welding</li> <li>b) Projection welding</li> <li>c) Arc Welding</li> <li>d) Gas welding</li> </ul>                                |    |  |  |  |

# S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Seat No.

**SLR-FM-649** 

Set

- R



- 4) For joining of two parts having poor weld ability materials, following processes are used \_\_\_\_\_.
  - a) Brazing
  - c) Gas and Arc welding
- b) TIG and MIG welding
- d) Soldering

## Seat No.

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** MANUFACTURING PROCESSES

Day & Date: Saturday,23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Neat sketches must be drawn whenever necessary.

#### Section - I

- Q.2 a) Explain in brief any three types molding sand and their properties. 05 Explain the basic steps in casting process with flow chart 04 b) Explain with neat sketches types of cores used in the casting process. c) 05 Explain the various types of pattern allowances with one example. 05 Q.3 a) Explain the advantages and limitations of centrifugal casting process. 04 b) Explain the process of shell molding with neat sketches. c) 05 Q.4 Write a short note on (Attempt any three) 14
  - **Casting Defects** a)
  - b) Fettling and cleaning of casting
  - C) Induction Furnace
  - Computer Applications in foundry d)
  - Injection Moulding e)

#### Section – II

| Q.5 | a)                 | Give broad classification of forming processes.                         | 04 |  |  |  |  |
|-----|--------------------|---|----|--|--|--|--|
|     | b)                 | Differentiate between hot rolling and cold rolling operations.          | 05 |  |  |  |  |
|     | c)                 | Explain with neat sketch closed die forging process.                    | 05 |  |  |  |  |
| Q.6 | a)                 | Give classification of joining processes.                               | 05 |  |  |  |  |
|     | b)                 | Explain with neat sketch hydrostatic extrusion process.                 | 04 |  |  |  |  |
|     | c)                 | Explain with neat sketch single pass and multi pass wire drawing setup. | 05 |  |  |  |  |
| Q.7 | Write short notes. |   |    |  |  |  |  |
|     | a)                 | Difference between TIG and MIG welding.                                 |    |  |  |  |  |
|     |                    |   |    |  |  |  |  |

#### (

- Difference between soldering and brazing. b)
- Difference between direct and indirect extrusion. c)
- Method of rod or tube drawing. d)

Max. Marks: 56

Set R

|  |                              | 3               | E. (Part – II) (Old) (CGPA) E<br>Mechanical E   |                    |   |       |  |  |
|--|------------------------------|-----------------|---|--------------------|---|-------|--|--|
|  |                              |                 | MANUFACTURIN  | -                  | -   |       |  |  |
|  |                              |                 | aturday,23-11-2019<br>M To 05:30 PM   |                    | Max. Mark                                       | s: 70 |  |  |
| <b>Instructions:</b> 1) Q.No.1 is compulsory. It sho<br>the Answer Book. |                              |                 |   |                    | solved in the first 30 minutes in               |       |  |  |
|  | MCQ/Objective Type Questions |                 |   |                    |   |       |  |  |
| Dura   | tion:                        | 30 N            | linutes   | / 1                | Mark  | s: 14 |  |  |
| Q.1  | A)                           |                 | oose the correct alternatives fro   | m th               | e options and rewrite the                       | 06    |  |  |
|  |                              | ser<br>1)       | <ul> <li>tence.</li> <li>Carburetor of two wheeler is man</li> <li>a) Sand Casting</li> <li>c) Permanent Mold casting</li> </ul>  | b)                 | Shell Moulding                                  |       |  |  |
|  |                              | 2)              | Sand which is used for core maki<br>a) Shell sand<br>c) Green sand  | ing is<br>b)<br>d) | Facing sand<br>Dry Sand                         |       |  |  |
|  |                              | 3)              | <ul><li>Riser should solidify</li><li>a) After solidification of casting</li><li>c) In solidification of casting</li></ul>  | b)<br>d)           | •   |       |  |  |
|  |                              | 4)              | Choke is generally provided at<br>a) Gate<br>c) Feeder  | b)<br>d)           | <br>Pouring cup<br>Mould Cavity                 |       |  |  |
|  |                              | 5)              | Crank Shaft is manufactured by _<br>a) Rolling<br>c) Extrusion  | b)<br>d)           | <br>Forging<br>Non conventional forming         |       |  |  |
|  |                              | 6)              | <ul><li>Tooth paste is manufactured by _</li><li>a) Direct extrusion</li><li>c) Impact extrusion</li></ul>  | b)                 | <br>Indirect Extrusion<br>Hydrostatic Extrusion |       |  |  |
|  | B)                           | <b>MC</b><br>1) | <ul> <li>Q with more than one answer constrained for joining of two parts having performing of two parts having performed and the processes are used</li> <li>a) Brazing</li> <li>c) Gas and Arc welding</li> </ul> | bor we             |   | 08    |  |  |
|  |                              | 2)              | In shell Arc molding<br>a) Need of metal pattern<br>c) Does not uses core   |                    |   |       |  |  |
|  |                              | 3)              | <ul> <li>Among the following, properties of</li> <li>a) High Refractoriness</li> <li>b) High thermal expansion coef</li> <li>c) High cohesiveness</li> <li>d) Reactive to metal</li> </ul>                          |                    | -   |       |  |  |

# S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

Seat No.

## **SLR-FM-649**

Set S



- 4) Which of the following are resistant welding processes?
   a) Spot welding
   b) Projection welding
   c) Arc Welding
   d) Gas welding

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

MANUFACTURING PROCESSES

Day & Date: Saturday,23-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

2) Neat sketches must be drawn whenever necessary.

#### Section - I

- Q.2 a) Explain in brief any three types molding sand and their properties. 05 Explain the basic steps in casting process with flow chart 04 b) Explain with neat sketches types of cores used in the casting process. c) 05 Explain the various types of pattern allowances with one example. 05 Q.3 a) Explain the advantages and limitations of centrifugal casting process. 04 b) Explain the process of shell molding with neat sketches. c) 05 Q.4 Write a short note on (Attempt any three) 14
  - **Casting Defects** a)
  - b) Fettling and cleaning of casting
  - c) Induction Furnace
  - Computer Applications in foundry d)
  - Injection Moulding e)

#### Section – II

| Q.5 | a)                 | Give broad classification of forming processes.                         | 04 |
|-----|--------------------|---|----|
|     | b)                 | Differentiate between hot rolling and cold rolling operations.          | 05 |
|     | c)                 | Explain with neat sketch closed die forging process.                    | 05 |
| Q.6 | a)                 | Give classification of joining processes.                               | 05 |
|     | b)                 | Explain with neat sketch hydrostatic extrusion process.                 | 04 |
|     | c)                 | Explain with neat sketch single pass and multi pass wire drawing setup. | 05 |
| Q.7 | Write short notes. |   |    |
|     | a)                 | Difference between TIG and MIG welding.                                 |    |
|     |                    | -   |    |

- Difference between soldering and brazing. b)
- Difference between direct and indirect extrusion. c)
- Method of rod or tube drawing. d)

Max. Marks: 56

Set S

Seat No.

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.

4) Assume suitable data if necessary and state it clearly.

5) Figures to the right indicates full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- The body is called stream lined body when it is placed in a flow and surface of the body \_\_\_\_\_.
  - a) Coincides with the stream lines
  - b) Does not coincides with the stream lines
  - c) Is perpendicular to the stream lines
  - d) None of above
- 2) Pitot-tube is used for measurement of \_\_\_\_
  - a) pressure b) Flow
  - c) velocity at a point d) Discharge
- 3) Similarity of forces between model and prototype \_\_\_\_\_
  - a) Geometric similarity b) Dynamic similarity
  - c) Kinematic similarity d) None of above
- 4) The range for co-efficient of discharge (Cd) for a venturimeter is \_\_\_\_\_.
  - a) 0.6 to 0.7 b) 0.7 to 0.8
  - c) 0.8 to 0.9 d) 0.95 to 0.99
- 5) The loss of head due to sudden expansion of a pipe is given by \_\_\_\_\_.

a) 
$$h_L = \frac{v_1^2 - v_2^2}{2g}$$
  
b)  $h_L = \frac{0.5v_1^2}{2g}$   
c)  $h_L = \frac{(v_1 - v_2)^2}{2g}$   
d) none of the above

- 6) Hydraulic gradient line (H.G.L.) represents the sum of \_\_\_\_\_.
  - a) pressure head and kinetic head
  - b) kinetic head and datum head
  - c) pressure head, kinetic head and datum head
  - d) pressure head and datum head
- 7) The increase of temperature \_\_\_\_\_
  - a) Increases the viscosity of a liquid
  - b) Decreases the viscosity of a liquid
  - c) Remains same
  - d) None of the above

Max. Marks: 70

Set

Marks: 14

Set A Newtonian fluid is defined as the fluid which . a) is incompressible and non-viscous b) obeys Newton's law of viscosity c) is highly viscous d) is compressible and non-viscous Poise is the unit of . a) mass density b) kinematic viscosity c) dynamic viscosity d) velocity gradient 10) Continuity equation deals with the law of conservation of \_\_\_\_\_. a) mass Momentum b) d) none of the above c) energy The co-efficient of velocity (Cv) for an orifice is \_ 11) b)  $C_v = \frac{2x}{\sqrt{4yH}}$ a)  $C_v = \sqrt{\frac{4x^2}{yH}}$ c)  $C_v = \sqrt{\frac{4x^2}{4yH}}$ none of the above d) The co-efficient of discharge (Cd) in terms of Cv and Cc is \_\_\_\_\_. 12) a)  $C_d = \frac{c_v}{c_c}$ c)  $C_d = \frac{c_c}{c_v}$ b)  $C_d = C_v \times C_c$ d) none of the above

13) The Magnus effect is defined as \_\_\_\_\_

8)

9)

- a) the generation of lift per unit drag force
- b) the generation of lift on a rotating cylinder in a uniform flow
- c) the circulation induced in an aircraft wing
- d) the separation of boundary layer near the trailing edge of slender body
- Reynolds number is expressed as \_\_\_\_\_. 14)

a) 
$$R_e = \frac{\rho \mu L}{V}$$
  
b)  $R_e = \frac{V \mu L}{\rho}$   
c)  $R_e = \frac{\rho V L}{\mu}$   
d)  $R_e = \frac{V \times d}{v}$ 

**SLR-FM-650** 

## Seat No.

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Figures to the right indicates full marks.

#### Section – I

| Q.2 | a)<br>b) | Discuss the conditions of stability for floating and submerged bodies.<br>An oil of viscosity 0.1 Ns/m <sup>2</sup> & relative density 0.9 is flowing through a circular pipe of diameter 50 mm of length 300 m. The rate of flow of fluid through the pipe is 3.5 liters/s. Find the pressure drop in a length of 300 m and also shear stress at the pipe wall. | 05<br>05 |
|-----|----------|--|----------|
|     | c)       | State Bernoulli's theorem along with its assumptions. How the Bernoulli's equation gets modified when applied to real fluid?   | 04       |
| Q.3 | a)       | If for a two dimensional potential flow, the velocity potential function is given by $\phi = x (2y - 1)$ , determine the velocity at the point P (4,5). Determine also the value of stream function $\Psi$ at the point P.   | 05       |
|     | b)       | A rectangular plane surface 3 m wide & 4 m deep lies in water in such a way that its plane makes an angle of $30^{\circ}$ with the free surface of water.<br>Determine the total pressure force & position of centre of pressure, when the upper edge is 2 m below the free surface of water.  | 05       |
|     | c)       | Find the velocity of the flow of an oil through a pipe, when the difference of mercury level in a differential U tube manometer connected to the two tappings of the pitot tube is 100 mm. Take coefficient of pitot tube as 0.98 and specific gravity of oil = $0.8$  | 04       |
| Q.4 | a)       | Derive an equation for velocity distribution for a laminar flow between two parallel plates. Draw a neat labeled sketch.   | 05       |
|     | b)       | An orificemeter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orificemeter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orificemeter is 0.64       | 05       |
|     | c)       | Derive continuity equation in Cartesian co-ordinates.  | 04       |
|     |          | Section – II   |          |
| Q.5 | a)       | Derive Darcy-Weisbach equation for flow through the pipe for obtaining frictional head loss.   | 05       |
|     | b)       | The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300m, 170m & 210m & of diameters 300mm, 200mm & 400mm respectively, is 12m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 & 0.0048 respectively. Considering minor losses.   | 05       |
|     | c)       | Write a short note on equivalent pipe.   | 04       |



Max. Marks: 56

| ) |
|---|
|   |

| a)       | What is mean by Syphon? Show that pressure head at summit point is lower than atmospheric pressure in case of syphon.  | 05   |
|----------|--|--|
| b)       | Find the displacement thickness & momentum thickness for the velocity distribution in the Boundary layer is given by $\frac{u}{U} = \frac{y}{\delta}$ , where u is velocity at a | 05   |
|          | distance y from the plate & $u = U$ at $y = \delta$ , where $\delta =$ Boundary layer thickness.   |  |
| c)       | What is meant by similarity? Explain types of similarities.  | 04   |
| a)<br>b) | Obtain an Expression for Drag & Lift on stationary body.<br>What is mean by CFD? State various advantages, Limitations & applications of CFD.                                    | 05<br>05   |
| c)       | A flat plate 1.5 m X 1.5 m moves at 50 km/hr in a stationary air of density 1.15 kg/m <sup>3</sup> if the coefficient of drag & lift are 0.15 & 0.75 respectively. Determine:    | 04   |
|          | b)<br>c)<br>a)<br>b)   | <ul> <li>lower than atmospheric pressure in case of syphon.</li> <li>b) Find the displacement thickness &amp; momentum thickness for the velocity distribution in the Boundary layer is given by <sup>u</sup>/<sub>U</sub> = <sup>y</sup>/<sub>δ</sub>, where u is velocity at a distance y from the plate &amp; u = U at y = δ, where δ = Boundary layer thickness.</li> <li>c) What is meant by similarity? Explain types of similarities.</li> <li>a) Obtain an Expression for Drag &amp; Lift on stationary body.</li> <li>b) What is mean by CFD? State various advantages, Limitations &amp; applications of CFD.</li> <li>c) A flat plate 1.5 m X 1.5 m moves at 50 km/hr in a stationary air of density 1.15 kg/m<sup>3</sup> if the coefficient of drag &amp; lift are 0.15 &amp; 0.75 respectively.</li> </ul> |

- 1) The lift force
- 2) The Drag force3) The resultant force & the power required to keep the plate in motion

S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** 

# FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Figure to the right indicates full marks.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- A Newtonian fluid is defined as the fluid which . 1)
  - a) is incompressible and non-viscous
  - b) obeys Newton's law of viscosity
  - c) is highly viscous
  - d) is compressible and non-viscous
- Poise is the unit of \_\_\_\_\_. 2)
  - a) mass density b)
  - dynamic viscosity d) c)
- 3) Continuity equation deals with the law of
  - mass Momentum a) b) c) energy d) none of the above
- 4) The co-efficient of velocity (Cv) for an orifice is

a) 
$$C_v = \sqrt{\frac{4x^2}{yH}}$$
 b)  
c)  $C_v = \sqrt{\frac{4x^2}{4yH}}$  d)

The co-efficient of discharge (Cd) in terms of Cv and Cc is \_\_\_\_\_. 5)

a) 
$$C_d = \frac{C_v}{c_c}$$
  
b)  $C_d = C_v \times C_c$   
c)  $C_d = \frac{C_c}{c_v}$   
d) none of the above

- 6) The Magnus effect is defined as .
  - a) the generation of lift per unit drag force
  - b) the generation of lift on a rotating cylinder in a uniform flow
  - c) the circulation induced in an aircraft wing
  - d) the separation of boundary layer near the trailing edge of slender body

kinematic viscosity

Set

Max. Marks: 70

Marks: 14

Seat No.

$$C_v = \frac{2x}{\sqrt{4yH}}$$

none of the above (t

Set 7) Reynolds number is expressed as \_\_\_\_ b)  $R_e = \frac{V\mu L}{\rho}$ a)  $R_e = \frac{\rho \mu L}{V}$ d)  $R_e = \frac{V \times d}{V}$ c)  $R_e = \frac{\rho VL}{\mu}$ 8) The body is called stream lined body when it is placed in a flow and surface of the body \_ a) Coincides with the stream lines b) Does not coincides with the stream lines c) Is perpendicular to the stream lines d) None of above 9) Pitot-tube is used for measurement of Flow a) pressure b) c) velocity at a point d) Discharge 10) Similarity of forces between model and prototype \_\_\_\_\_ a) Geometric similarity Dynamic similarity b) Kinematic similarity None of above c) d) The range for co-efficient of discharge (Cd) for a venturimeter is \_\_\_\_\_. 11) a) 0.6 to 0.7 0.7 to 0.8 b) c) 0.8 to 0.9 d) 0.95 to 0.99 The loss of head due to sudden expansion of a pipe is given by \_\_\_\_\_. 12) a)  $h_L = \frac{{v_1}^2 - {v_2}^2}{2g}$ b)  $h_L = \frac{0.5 v_1^2}{2g}$ c)  $h_L = \frac{(v_1 - v_2)^2}{2\sigma}$ d) none of the above Hydraulic gradient line (H.G.L.) represents the sum of \_\_\_\_\_. 13) a) pressure head and kinetic head b) kinetic head and datum head pressure head, kinetic head and datum head c) d) pressure head and datum head 14) The increase of temperature a) Increases the viscosity of a liquid b) Decreases the viscosity of a liquid Remains same c) d) None of the above

**SLR-FM-650** 

#### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Figures to the right indicates full marks.

#### Section – I

| Q.2 | a)<br>b)<br>c) | Discuss the conditions of stability for floating and submerged bodies.<br>An oil of viscosity 0.1 Ns/m <sup>2</sup> & relative density 0.9 is flowing through a circular pipe of diameter 50 mm of length 300 m. The rate of flow of fluid through the pipe is 3.5 liters/s. Find the pressure drop in a length of 300 m and also shear stress at the pipe wall.<br>State Bernoulli's theorem along with its assumptions. How the Bernoulli's equation gets modified when applied to real fluid? | 05<br>05<br>04 |
|-----|----------------|--|----------------|
| Q.3 | a)             | If for a two dimensional potential flow, the velocity potential function is given by $\phi = x (2y - 1)$ , determine the velocity at the point P (4,5). Determine also the value of stream function $\Psi$ at the point P.   | 05             |
|     | b)             | A rectangular plane surface 3 m wide & 4 m deep lies in water in such a way that its plane makes an angle of $30^{\circ}$ with the free surface of water.<br>Determine the total pressure force & position of centre of pressure, when the upper edge is 2 m below the free surface of water.  | 05             |
|     | c)             | Find the velocity of the flow of an oil through a pipe, when the difference of mercury level in a differential U tube manometer connected to the two tappings of the pitot tube is 100 mm. Take coefficient of pitot tube as 0.98 and specific gravity of oil = $0.8$  | 04             |
| Q.4 | a)             | Derive an equation for velocity distribution for a laminar flow between two parallel plates. Draw a neat labeled sketch.   | 05             |
|     | b)             | An orificemeter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orificemeter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orificemeter is 0.64   | 05             |
|     | c)             | Derive continuity equation in Cartesian co-ordinates.  | 04             |
|     |                | Section – II   |                |
| Q.5 | a)             | Derive Darcy-Weisbach equation for flow through the pipe for obtaining frictional head loss.   | 05             |
|     | b)             | The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300m, 170m & 210m & of diameters 300mm, 200mm & 400mm respectively, is 12m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 & 0.0048 respectively. Considering minor losses.   | 05             |
|     | c)             | Write a short note on equivalent pipe.   | 04             |

Write a short note on equivalent pipe. C)



Max. Marks: 56

# Set Q

| Q.6 | a)       | What is mean by Syphon? Show that pressure head at summit point is lower than atmospheric pressure in case of syphon.   | 05       |
|-----|----------|---|----------|
|     | b)       | Find the displacement thickness & momentum thickness for the velocity distribution in the Boundary layer is given by $\frac{u}{U} = \frac{y}{\delta}$ , where u is velocity at a distance y from the plate & $u = U$ at $y = \delta$ , where $\delta$ = Boundary layer thickness. | 05       |
|     | c)       | What is meant by similarity? Explain types of similarities.   | 04       |
| Q.7 | a)<br>b) | Obtain an Expression for Drag & Lift on stationary body.<br>What is mean by CFD? State various advantages, Limitations & applications of CFD.   | 05<br>05 |
|     | c)       | <ul> <li>A flat plate 1.5 m X 1.5 m moves at 50 km/hr in a stationary air of density</li> <li>1.15 kg/m<sup>3</sup> if the coefficient of drag &amp; lift are 0.15 &amp; 0.75 respectively.</li> <li>Determine:</li> <li>1) The lift force</li> <li>2) The Drag force</li> </ul>  | 04       |
|     |          |   |          |

3) The resultant force & the power required to keep the plate in motion

## S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Figure to the right indicates full marks.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

The loss of head due to sudden expansion of a pipe is given by \_\_\_\_\_. 1)

a) 
$$h_L = \frac{v_1^2 - v_2^2}{2g}$$
  
b)  $h_L = \frac{(v_1 - v_2)^2}{2g}$   
c)  $h_L = \frac{(v_1 - v_2)^2}{2g}$   
d) none of the above

- 2) Hydraulic gradient line (H.G.L.) represents the sum of \_\_\_\_\_.
  - a) pressure head and kinetic head
  - b) kinetic head and datum head
  - pressure head, kinetic head and datum head C)
  - d) pressure head and datum head
- 3) The increase of temperature \_\_\_\_\_
  - Increases the viscosity of a liquid a)
  - b) Decreases the viscosity of a liquid
  - c) Remains same
  - d) None of the above
- 4) A Newtonian fluid is defined as the fluid which \_\_\_\_\_.
  - a) is incompressible and non-viscous
  - b) obeys Newton's law of viscosity
  - is highly viscous c)
  - d) is compressible and non-viscous
- 5) Poise is the unit of \_\_\_\_\_.
  - a) mass density b) kinematic viscosity
  - dynamic viscosity velocity gradient d) c)
- Continuity equation deals with the law of conservation of \_\_\_\_\_. 6)
  - Momentum a) mass b)
  - none of the above energy d) c)

**SLR-FM-650** 

Max. Marks: 70

Marks: 14

Set R

**SLR-FM-650** Set

7) The co-efficient of velocity (Cv) for an orifice is \_\_\_\_\_.

a) 
$$C_v = \sqrt{\frac{4x^2}{yH}}$$
  
b)  $C_v = \frac{2x}{\sqrt{4yH}}$   
c)  $C_v = \sqrt{\frac{4x^2}{4yH}}$   
d) none of the above

8) The co-efficient of discharge (Cd) in terms of Cv and Cc is \_\_\_\_\_.

a) 
$$C_d = \frac{c_v}{c_c}$$
  
b)  $C_d = C_v \times C_c$   
c)  $C_d = \frac{c_c}{c_v}$   
d) none of the above

9) The Magnus effect is defined as \_\_\_\_\_.

- a) the generation of lift per unit drag force
- b) the generation of lift on a rotating cylinder in a uniform flow
- c) the circulation induced in an aircraft wing
- d) the separation of boundary layer near the trailing edge of slender body
- 10) Reynolds number is expressed as \_\_\_\_\_.

a) 
$$R_e = \frac{\rho \mu L}{V}$$
  
b)  $R_e = \frac{V \mu L}{\rho}$   
c)  $R_e = \frac{\rho V L}{\mu}$   
d)  $R_e = \frac{V \times d}{v}$ 

11) The body is called stream lined body when it is placed in a flow and surface of the body \_ .

- a) Coincides with the stream lines
- b) Does not coincides with the stream lines
- c) Is perpendicular to the stream lines
- d) None of above
- Pitot-tube is used for measurement of 12)
  - Flow a) pressure b)
  - c) velocity at a point d) Discharge

13) Similarity of forces between model and prototype \_\_\_\_\_

- a) Geometric similarity b) Dynamic similarity c) Kinematic similarity
  - None of above d)
- The range for co-efficient of discharge (Cd) for a venturimeter is \_\_\_\_\_. 14)
  - 0.6 to 0.7 a)
- 0.7 to 0.8 b)
- 0.95 to 0.99 c) 0.8 to 0.9 d)

Set

| Seat |  |
|------|--|
| No.  |  |

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Figures to the right indicates full marks.

#### Section – I

| Q.2 | a)<br>b) | Discuss the conditions of stability for floating and submerged bodies.<br>An oil of viscosity 0.1 Ns/m <sup>2</sup> & relative density 0.9 is flowing through a circular pipe of diameter 50 mm of length 300 m. The rate of flow of fluid through the pipe is 3.5 liters/s. Find the pressure drop in a length of 300 m and also shear stress at the pipe wall. | 05<br>05 |
|-----|----------|--|----------|
|     | c)       | State Bernoulli's theorem along with its assumptions. How the Bernoulli's equation gets modified when applied to real fluid?   | 04       |
| Q.3 | a)       | If for a two dimensional potential flow, the velocity potential function is given by $\phi = x (2y - 1)$ , determine the velocity at the point P (4,5). Determine also the value of stream function $\Psi$ at the point P.   | 05       |
|     | b)       | A rectangular plane surface 3 m wide & 4 m deep lies in water in such a way that its plane makes an angle of $30^{\circ}$ with the free surface of water.<br>Determine the total pressure force & position of centre of pressure, when the upper edge is 2 m below the free surface of water.  | 05       |
|     | c)       | Find the velocity of the flow of an oil through a pipe, when the difference of mercury level in a differential U tube manometer connected to the two tappings of the pitot tube is 100 mm. Take coefficient of pitot tube as 0.98 and specific gravity of oil = $0.8$  | 04       |
| Q.4 | a)       | Derive an equation for velocity distribution for a laminar flow between two parallel plates. Draw a neat labeled sketch.   | 05       |
|     | b)       | An orificemeter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orificemeter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orificemeter is 0.64       | 05       |
|     | c)       | Derive continuity equation in Cartesian co-ordinates.  | 04       |
|     |          | Section – II   |          |
| Q.5 | a)       | Derive Darcy-Weisbach equation for flow through the pipe for obtaining frictional head loss.   | 05       |
|     | b)       | The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300m, 170m & 210m & of diameters 300mm, 200mm & 400mm respectively, is 12m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 & 0.0048 respectively. Considering minor losses.   | 05       |
|     | c)       | Write a short note on equivalent pipe.   | 04       |

c) Write a short note on equivalent pipe.

R

Max. Marks: 56

| Set | R |
|-----|---|
|-----|---|

| Q.6 | a)       | What is mean by Syphon? Show that pressure head at summit point is lower than atmospheric pressure in case of syphon.   | 05       |
|-----|----------|---|----------|
|     | b)       | Find the displacement thickness & momentum thickness for the velocity distribution in the Boundary layer is given by $\frac{u}{tt} = \frac{y}{s}$ , where u is velocity at a  | 05       |
|     |          | distance y from the plate & $u = U$ at $y = \delta$ , where $\delta =$ Boundary layer thickness.  |          |
|     | c)       | What is meant by similarity? Explain types of similarities.   | 04       |
| Q.7 | a)<br>b) | Obtain an Expression for Drag & Lift on stationary body.<br>What is mean by CFD? State various advantages, Limitations & applications of CFD.                                 | 05<br>05 |
|     | c)       | A flat plate 1.5 m X 1.5 m moves at 50 km/hr in a stationary air of density 1.15 kg/m <sup>3</sup> if the coefficient of drag & lift are 0.15 & 0.75 respectively. Determine: | 04       |

- 1) The lift force
- 2) The Drag force
- 3) The resultant force & the power required to keep the plate in motion

### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

- Neat diagrams must be drawn wherever necessa
- 3) Use of single memory non-programmable calculator is allowed.

4) Assume suitable data if necessary and state it clearly.

5) Figure to the right indicates full marks.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the or e sentence. 14

- Continuity equation deals with the law of 1)
  - a) mass b)
  - c) energy d) /e
- The co-efficient of velocity (Cv) for an orif 2)

a) 
$$C_v = \sqrt{\frac{4x^2}{yH}}$$
 b) C  
c)  $C_v = \sqrt{\frac{4x^2}{4yH}}$  d) r

none of the above

-- -

3) The co-efficient of discharge (Cd) in terms of Cv and Cc is \_\_\_\_\_.

a) 
$$C_d = \frac{c_v}{c_c}$$
  
b)  $C_d = C_v \times C_c$   
c)  $C_d = \frac{c_c}{c_v}$   
d) none of the above

- 4) The Magnus effect is defined as
  - a) the generation of lift per unit drag force
  - b) the generation of lift on a rotating cylinder in a uniform flow
  - c) the circulation induced in an aircraft wing
  - d) the separation of boundary layer near the trailing edge of slender body
- 5) Reynolds number is expressed as \_\_\_\_\_.

a) 
$$R_e = \frac{\rho \mu L}{V}$$
  
b)  $R_e = \frac{V \mu L}{\rho}$   
c)  $R_e = \frac{\rho V L}{\mu}$   
d)  $R_e = \frac{V \times d}{v}$ 

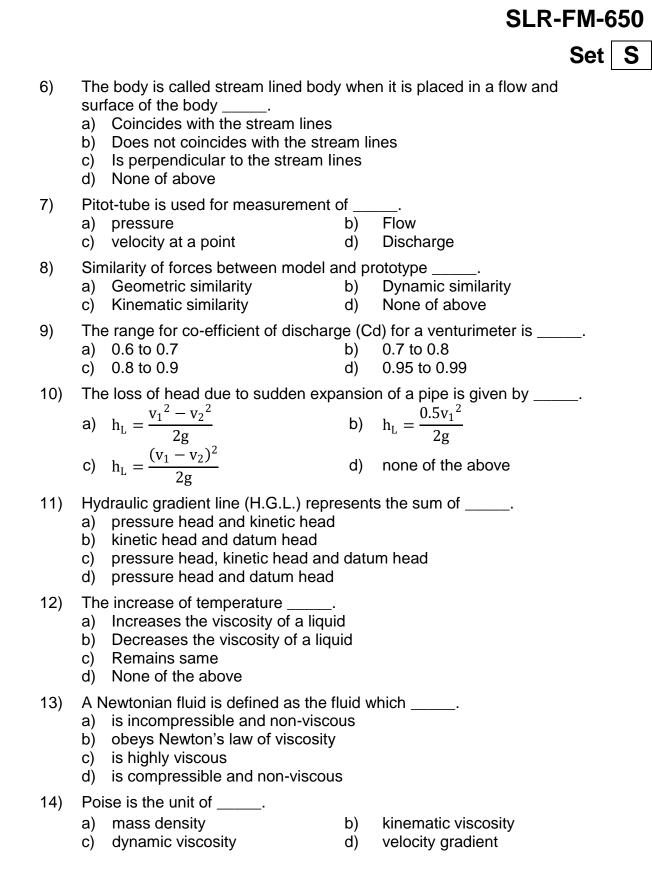
# **SLR-FM-650**

Set

Max. Marks: 70

Marks: 14

$$C_v = \frac{2x}{\sqrt{4vH}}.$$



04

### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FLUID MECHANICS

Day & Date: Monday, 25-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Attempt any two questions from each section.

Write a short note on equivalent pipe.

C)

- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non-programmable calculator is allowed.
- 4) Assume suitable data if necessary and state it clearly.
- 5) Figures to the right indicates full marks.

#### Section – I

| Q.2 | a)<br>b)<br>c) | Discuss the conditions of stability for floating and submerged bodies.<br>An oil of viscosity 0.1 Ns/m <sup>2</sup> & relative density 0.9 is flowing through a circular pipe of diameter 50 mm of length 300 m. The rate of flow of fluid through the pipe is 3.5 liters/s. Find the pressure drop in a length of 300 m and also shear stress at the pipe wall.<br>State Bernoulli's theorem along with its assumptions. How the Bernoulli's | 05<br>05<br>04 |
|-----|----------------|---|----------------|
|     |                | equation gets modified when applied to real fluid?  |                |
| Q.3 | a)             | If for a two dimensional potential flow, the velocity potential function is given by $\phi = x (2y - 1)$ , determine the velocity at the point P (4,5). Determine also the value of stream function $\Psi$ at the point P.  | 05             |
|     | b)             | A rectangular plane surface 3 m wide & 4 m deep lies in water in such a way that its plane makes an angle of $30^{\circ}$ with the free surface of water.<br>Determine the total pressure force & position of centre of pressure, when the upper edge is 2 m below the free surface of water.   | 05             |
|     | c)             | Find the velocity of the flow of an oil through a pipe, when the difference of mercury level in a differential U tube manometer connected to the two tappings of the pitot tube is 100 mm. Take coefficient of pitot tube as 0.98 and specific gravity of oil = $0.8$   | 04             |
| Q.4 | a)             | Derive an equation for velocity distribution for a laminar flow between two parallel plates. Draw a neat labeled sketch.  | 05             |
|     | b)             | An orificemeter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orificemeter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orificemeter is 0.64  | 05             |
|     | c)             | Derive continuity equation in Cartesian co-ordinates.   | 04             |
|     |                | Section – II  |                |
| Q.5 | a)             | Derive Darcy-Weisbach equation for flow through the pipe for obtaining frictional head loss.  | 05             |
|     | b)             | The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300m, 170m & 210m & of diameters 300mm, 200mm & 400mm respectively, is 12m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 & 0.0048 respectively. Considering minor losses.  | 05             |



Max. Marks: 56

| Set S |
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| Q.6 | a)       | What is mean by Syphon? Show that pressure head at summit point is lower than atmospheric pressure in case of syphon.   | 05       |
|-----|----------|---|----------|
|     | b)       | Find the displacement thickness & momentum thickness for the velocity distribution in the Boundary layer is given by $\frac{u}{H} = \frac{y}{s}$ , where u is velocity at a   | 05       |
|     |          | distance y from the plate & $u = U$ at $y = \delta$ , where $\delta =$ Boundary layer thickness.  |          |
|     | c)       | What is meant by similarity? Explain types of similarities.   | 04       |
| Q.7 | a)<br>b) | Obtain an Expression for Drag & Lift on stationary body.<br>What is mean by CFD? State various advantages, Limitations & applications of CFD.                                 | 05<br>05 |
|     | c)       | A flat plate 1.5 m X 1.5 m moves at 50 km/hr in a stationary air of density 1.15 kg/m <sup>3</sup> if the coefficient of drag & lift are 0.15 & 0.75 respectively. Determine: | 04       |

- 1) The lift force
- 2) The Drag force
- 3) The resultant force & the power required to keep the plate in motion

|      | - | _ | - |  | <br> |
|------|---|---|---|--|------|
| No.  |   |   |   |  |      |
| Seat |   |   |   |  |      |

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

4) Assume suitable data if necessary.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

| Q.1 | Choose the correct alternatives from the options and rewrite the sentence |   |  |  |  |  |
|-----|---|---|--|--|--|--|
|     | 1)  | What will happen if the back emf of a DC motor vanishes suddenly? |  |  |  |  |

- What will happen if the back emf of a DC motor vanishes suddenly? a) The motor will stop b)
  - The motor will continue to run
  - c) The armature may burn d) The motor will run noisy
- 2) Which power is mentioned on a name plate of a motor?
  - a) Gross power
  - b) Power drawn in kVA
  - c) Power drawn in kW
  - d) Output power available at the shaft
- 3) When the supply frequency of a three-phase induction motor is increased, then its synchronous speed is \_
  - a) decreases b) increases
  - c) remain same d) none of the above
- 4) A permanent-split single-phase capacitor motor does not have \_\_\_\_\_.
  - a) Centrifugal switch b) Starting winding
  - c) Squirrel-cage rotor d) High power factor
- One of the basic requirements of a servomotor is that it must produce 5) high torque at all
  - a) loads b) Frequencies
  - c) Speeds d) Voltages

6) method has leading power factor.

- a) Resistance heating b) **Dielectric heating**
- d) Induction heating c) Arc heating
- For arc welding, current range is usually \_ 7) a) 10 to 15 A b) 30 to 40 A
  - c) 50 to 100 A 100 to 350 d)

#### 8) A decade counter skips

- a) binary states 1000 to 1111 b) binary states 0000 to 0011 binary states 1010 to 1111 binary states 1111 and higher c) d)
- 9) In microcontroller 8051 there are resister banks each containing - \_\_\_\_\_ registers.
  - a) 4,8 b) 8,4 d) 8.8 c) 4,4



Max. Marks: 70

- Marks: 14

10) D/A converters are generally \_\_\_\_

- a) Weighted resistor network
- c) Either (a) or (b)
- b) Binary ladder network
- d) Neither (a) nor (b)
- 11) Op-amp can amplify \_\_\_\_\_.
  - a) a.c. signals only
  - c) both a.c. and d.c. signals
- b) d.c. signals only

input stage

collector follower

d) neither d.c. nor a.c. signals

**SLR-FM-651** 

Set P

12) In op amp block diagram level shifting stage works such as \_\_\_\_\_.

- a) output stage
- c) emitter follower
  - ower
- 13) The address bus is \_\_\_\_\_.
  - a) Unidirectional
    - c) Parallel
- b) bidirectional
- d) serial.

b)

d)

- 14) The flip-flop which is free from race around problem is\_\_\_\_\_
  - a) RS FF
  - c) Master Slave JK FF
- b) JK FF
- d) All of above.

### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

#### Q.2 Attempt any four.

- a) Explain that DC series motor is not started without load.
- **b)** Explain the torque slip characteristics of 3 phase induction Motor.
- c) Write short note on BLDC motor.
- d) Compare in between Individual Drive and Group Drive.
- e) Explain clearly high frequency eddy current heating and its application.
- f) Explain power measurement of Induction Motor by two wattmeter method with phasor diagram

#### Q.3 Attempt any two.

- a) Explain dielectric heating. Give at least 5 applications and briefly introduce of each one.
- **b)** Describe the various methods of Electric Welding. Write short note on Electric arc Welding.
- c) A 250 V dc shunt motor has an armature resistance of 0.5 ohm and a field resistance of 250 ohm, when driving constant torque load at 600 rpm the motor draws 21 A, what will be the new speed of the motor if an additional 250 ohm resistance is inserted in the filed circuit.

#### Section – II

#### Q.4 Attempt any four

- a) Explain the block diagram representation of an op-amp.
- **b)** Explain the working of successive approximation A/D convertor.
- c) Explain the D flip flop with truth table.
- d) Explain types of addressing modes of microcontroller.
- e) Give similarities and differences between microprocessor and microcontroller.
- f) Explain interfacing of temperature sensor LM 35 using microcontroller.

#### Q.5 Attempt any two.

- a) Explain different logical instructions of microcontroller 8051.
- **b)** With neat sketch explain op-amp as an inverting adder and subtractor.
- c) Derive expression for the closed loop voltage gain of non-inverting opamp.

16

16

12

| Set | Ρ |
|-----|---|
|     |   |

Max. Marks: 56

12

|   | ч)       |  |
|---|----------|--|
| address bus is<br>Jnidirectional<br>Parallel  | b)<br>d) | bidirectional<br>serial.   |
| lip-flop which is free from race a<br>RS FF<br>Master Slave JK FF   | b)       | d problem is<br>JK FF<br>All of above.   |
| t will happen if the back emf of a<br>The motor will stop<br>The armature may burn  | b)       | motor vanishes suddenly?<br>The motor will continue to run<br>The motor will run noisy |
| h power is mentioned on a nam<br>Gross power<br>Power drawn in kVA<br>Power drawn in kW<br>Dutput power available at the sh | ·        | te of a motor?   |

# S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

**Mechanical Engineering** 

ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

4) Assume suitable data if necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

3)

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence 14
  - A decade counter skips \_ 1)
    - a) binary states 1000 to 1111
    - c) binary states 1010 to 1111
- b) binary states 0000 to 0011 binary states 1111 and higher d)
- 2) In microcontroller 8051 there are resister banks each containing - \_\_\_\_\_ registers.
  - a) 4.8 b) 8.4 c) 4,4 d) 8,8
  - D/A converters are generally
  - a) Weighted resistor network Binary ladder network b)
    - c) Either (a) or (b) d) Neither (a) nor (b)
- 4) Op-amp can amplify \_\_\_\_\_
  - a) a.c. signals only b) d.c. signals only
  - c) both a.c. and d.c. signals neither d.c. nor a.c. signals d)

In op amp block diagram level shifting stage works such as \_\_\_\_\_. 5)

- a) output stage
- c) emitter follower
- input stage b)
- d) collector follower
- 6) The a
  - a) U Ρ c)
- 7)
  - The fli a) R
    - C) Μ
- What 8)
  - Т
  - c) T
- 9) Which
  - G a)

a)

- b) Ρ
- P c)
- 0 d)

# **SLR-FM-651**

Max. Marks: 70

Marks: 14

**SLR-FM-651** Set Q 10) When the supply frequency of a three-phase induction motor is increased, then its synchronous speed is \_\_\_\_\_. a) decreases b) increases d) c) remain same none of the above 11) A permanent-split single-phase capacitor motor does not have . Centrifugal switch b) Starting winding a) High power factor Squirrel-cage rotor d) c) One of the basic requirements of a servomotor is that it must produce 12) high torque at all \_\_\_\_\_. a) loads b) Frequencies c) speeds voltages. d) 13) \_\_\_\_ method has leading power factor \_ a) Resistance heating **Dielectric heating** b) d) Induction heating c) Arc heating For arc welding, current range is usually \_ 14) 10 to 15 A 30 to 40 A a) b) c) 50 to 100 A d) 100 to 350

Max. Marks: 56

### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

#### Q.2 Attempt any four.

- a) Explain that DC series motor is not started without load.
- b) Explain the torque slip characteristics of 3 phase induction Motor.
- c) Write short note on BLDC motor.
- d) Compare in between Individual Drive and Group Drive.
- e) Explain clearly high frequency eddy current heating and its application.
- f) Explain power measurement of Induction Motor by two wattmeter method with phasor diagram

#### Q.3 Attempt any two.

- a) Explain dielectric heating. Give at least 5 applications and briefly introduce of each one.
- **b)** Describe the various methods of Electric Welding. Write short note on Electric arc Welding.
- c) A 250 V dc shunt motor has an armature resistance of 0.5 ohm and a field resistance of 250 ohm, when driving constant torque load at 600 rpm the motor draws 21 A, what will be the new speed of the motor if an additional 250 ohm resistance is inserted in the filed circuit.

#### Section – II

#### Q.4 Attempt any four

- a) Explain the block diagram representation of an op-amp.
- **b)** Explain the working of successive approximation A/D convertor.
- c) Explain the D flip flop with truth table.
- d) Explain types of addressing modes of microcontroller.
- e) Give similarities and differences between microprocessor and microcontroller.
- f) Explain interfacing of temperature sensor LM 35 using microcontroller.

### Q.5 Attempt any two.

- a) Explain different logical instructions of microcontroller 8051.
- **b)** With neat sketch explain op-amp as an inverting adder and subtractor.
- c) Derive expression for the closed loop voltage gain of non-inverting opamp.

16

12

16

12

| Instr | uctio  | <b>is:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book   |  |  |  |  |  |  |  |
|-------|--|--|--|--|--|--|--|--|--|
|       | 4) Assume suitable data if necessary.  |  |  |  |  |  |  |  |  |
|       |  | MCQ/Objective Type Questions   |  |  |  |  |  |  |  |
| Dura  | tion: 3  | 0 Minutes Marks: 14  |  |  |  |  |  |  |  |
| Q.1   | <ol> <li>One of the basic requirements of a servomotor is that it must produce the high torque at all</li> <li>a) loads</li> <li>b) frequencies</li> </ol> |  |  |  |  |  |  |  |  |
|       | 2)   | <ul> <li>c) Speeds</li> <li>d) voltages</li> <li> method has leading power factor</li> <li>a) Resistance heating</li> <li>b) Dielectric heating</li> <li>c) Arc heating</li> <li>d) Induction heating</li> </ul> |  |  |  |  |  |  |  |
|       | 3)   | For arc welding, current range is usually         a) 10 to 15 A       b) 30 to 40 A         c) 50 to 100 A       d) 100 to 350   |  |  |  |  |  |  |  |
|       | 4)   | A decade counter skipsa) binary states 1000 to 1111b) binary states 0000 to 0011c) binary states 1010 to 1111d) binary states 1111 and higher  |  |  |  |  |  |  |  |
|       | 5)   | In microcontroller 8051 there are resister banks each containing<br>registers.<br>a) 4,8 b) 8,4<br>c) 4,4 d) 8,8   |  |  |  |  |  |  |  |
|       | 6)   | D/A converters are generallya) Weighted resistor networkb) Binary ladder networkc) Either (a) or (b)d) Neither (a) nor (b)   |  |  |  |  |  |  |  |
|       | 7)   | Op-amp can amplifya) a.c. signals onlyb) d.c. signals onlyc) both a.c. and d.c. signalsd) neither d.c. nor a.c. signals  |  |  |  |  |  |  |  |
|       | 8)   | In op amp block diagram level shifting stage works such asa) output stageb) input stagec) emitter followerd) collector follower  |  |  |  |  |  |  |  |
|       | 9)   | The address bus isa) Unidirectionalb) bidirectionalc) Paralleld) serial  |  |  |  |  |  |  |  |
|       | 10)  | The flip-flop which is free from race around problem is<br>a) RS FF b) JK FF   |  |  |  |  |  |  |  |

d)

All of above.

Master Slave JK FF

c)

S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONICS TECHNOLOGY

## SLR-FM-651

Set R

Max. Marks: 70

| Seat |  |
|------|--|
| No.  |  |

Day & Date: Tuesday, 26-11-2019

Time: 02:30 PM To 05:30 PM

- What will happen if the back emf of a DC motor vanishes suddenly? 11)
  - a) The motor will stop
- b) The motor will continue to run

Set | R

- c) The armature may burn
- d) The motor will run noisy
- Which power is mentioned on a name plate of a motor? 12)
  - a) Gross power
  - b) Power drawn in kVA
  - c) Power drawn in kW
  - d) Output power available at the shaft
- When the supply frequency of a three-phase induction motor is 13) increased, then its synchronous speed is \_
  - decreases b) a)
    - remain same
- increases
- d) none of the above
- A permanent-split single-phase capacitor motor does not have \_\_\_\_\_. 14)
  - a) Centrifugal switch

c)

- Starting winding b) High power factor
- c) Squirrel-cage rotor d)

### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

#### Q.2 Attempt any four.

- a) Explain that DC series motor is not started without load.
- b) Explain the torque slip characteristics of 3 phase induction Motor.
- c) Write short note on BLDC motor.
- d) Compare in between Individual Drive and Group Drive.
- e) Explain clearly high frequency eddy current heating and its application.
- f) Explain power measurement of Induction Motor by two wattmeter method with phasor diagram

#### Q.3 Attempt any two.

- a) Explain dielectric heating. Give at least 5 applications and briefly introduce of each one.
- **b)** Describe the various methods of Electric Welding. Write short note on Electric arc Welding.
- c) A 250 V dc shunt motor has an armature resistance of 0.5 ohm and a field resistance of 250 ohm, when driving constant torque load at 600 rpm the motor draws 21 A, what will be the new speed of the motor if an additional 250 ohm resistance is inserted in the filed circuit.

#### Section – II

#### Q.4 Attempt any four

- a) Explain the block diagram representation of an op-amp.
- **b)** Explain the working of successive approximation A/D convertor.
- c) Explain the D flip flop with truth table.
- d) Explain types of addressing modes of microcontroller.
- e) Give similarities and differences between microprocessor and microcontroller.
- f) Explain interfacing of temperature sensor LM 35 using microcontroller.

#### Q.5 Attempt any two.

- a) Explain different logical instructions of microcontroller 8051.
- **b)** With neat sketch explain op-amp as an inverting adder and subtractor.
- c) Derive expression for the closed loop voltage gain of non-inverting opamp.

16

12

16

12



Max. Marks: 56

# **SLR-FM-651** Set

Max. Marks: 70

Marks: 14

#### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book

4) Assume suitable data if necessary.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence 14

b)

d)

- 1) D/A converters are generally
  - a) Weighted resistor network
  - c) Either (a) or (b)
- 2) Op-amp can amplify \_\_\_\_\_.
  - a.c. signals only a)
  - both a.c. and d.c. signals c) d)
- In op amp block diagram level shifting stage works such as \_\_\_\_\_. 3)
  - a) output stage
  - c) emitter follower
- 4) The address bus is \_\_\_\_
  - Unidirectional b) a) c) Parallel
- The flip-flop which is free from race around problem is 5) JK FF
  - a) RS FF b)
  - c) Master Slave JK FF All of above d)
- What will happen if the back emf of a DC motor vanishes suddenly? 6) b) The motor will continue to run

d)

- a) The motor will stop
- The armature may burn c)
- Which power is mentioned on a name plate of a motor? 7)
  - a) Gross power
  - b) Power drawn in kVA
  - c) Power drawn in kW
  - d) Output power available at the shaft
- 8) When the supply frequency of a three-phase induction motor is increased, then its synchronous speed is
  - decreases a) c) remain same
- b) increases d) none of the above
- 9) A permanent-split single-phase capacitor motor does not have Starting winding
  - a) Centrifugal switch b)
  - Squirrel-cage rotor High power factor c) d)

- input stage b)
- collector follower d)

  - bidirectional
- d) serial

- d.c. signals only
- Neither (a) nor (b)

**Binary ladder network** 

- b)
- neither d.c. nor a.c. signals

The motor will run noisy

10) One of the basic requirements of a servomotor is that it must produce high torgue at all a) loads Frequencies b) c) Speeds d) voltages 11) method has leading power factor a) Resistance heating **Dielectric heating** b) c) Arc heating d) Induction heating For arc welding, current range is usually \_ 12) 30 to 40 A a) 10 to 15 A b) c) 50 to 100 A 100 to 350 d) A decade counter skips \_\_\_\_\_. 13) a) binary states 1000 to 1111 b) binary states 0000 to 0011 c) binary states 1010 to 1111 binary states 1111 and higher d) 14) In microcontroller 8051 there are resister banks each containing - \_\_\_\_\_ registers. a) 4,8 8,4 b) c) 4,4 d) 8,8

Page **11** of **12** 

**SLR-FM-651** 

Set S

### Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering ELECTRICAL AND ELECTRONICS TECHNOLOGY

Day & Date: Tuesday, 26-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) All questions are compulsory.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

#### Section – I

#### Q.2 Attempt any four.

- a) Explain that DC series motor is not started without load.
- b) Explain the torque slip characteristics of 3 phase induction Motor.
- c) Write short note on BLDC motor.
- d) Compare in between Individual Drive and Group Drive.
- e) Explain clearly high frequency eddy current heating and its application.
- f) Explain power measurement of Induction Motor by two wattmeter method with phasor diagram

#### Q.3 Attempt any two.

- a) Explain dielectric heating. Give at least 5 applications and briefly introduce of each one.
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- c) A 250 V dc shunt motor has an armature resistance of 0.5 ohm and a field resistance of 250 ohm, when driving constant torque load at 600 rpm the motor draws 21 A, what will be the new speed of the motor if an additional 250 ohm resistance is inserted in the filed circuit.

#### Section – II

#### Q.4 Attempt any four

- a) Explain the block diagram representation of an op-amp.
- **b)** Explain the working of successive approximation A/D convertor.
- c) Explain the D flip flop with truth table.
- d) Explain types of addressing modes of microcontroller.
- e) Give similarities and differences between microprocessor and microcontroller.
- f) Explain interfacing of temperature sensor LM 35 using microcontroller.

#### Q.5 Attempt any two.

- a) Explain different logical instructions of microcontroller 8051.
- **b)** With neat sketch explain op-amp as an inverting adder and subtractor.
- c) Derive expression for the closed loop voltage gain of non-inverting opamp.

12

16

16

12



Max. Marks: 56

Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book.

- Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

#### **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

b)

Regula Falsi method

- Which of the following method is called method of chord? 1)
  - Newton-Raphson method a)
  - Muller's method **Bisection method** c) d)
- Newton's Raphson method fails, when 2)
  - f'(x) is too large a) f'(x) is negative b) d) never fails
  - c) f'(x) is zero
- While finding a root of an equation f(x) = 0 by Bisection method, the length 3) of interval can be reduced by a factor
  - 1.5 a) 0.5 b) C) 1.6 2 d)
- If  $y = x^2$ , then the first divided difference of the argument -1 and 2 is \_\_\_\_\_. 4) a) 2 b) 3 c) 0 d) 1

To fit a polynomial  $y = a_0 + a_1x + a_2x^2 + a_3x^3$  for the data of 'n' observations 5) by Least square principle the required number of normal equations are \_\_\_\_\_. a) 3 b) 2 4 c) d) n

- In solving simultaneous linear equations Ax = B by Jordan method, the 6)
  - coefficient matrix A reduced to b) Lower triangular matrix a) Diagonal matrix
  - Upper triangular matrix C) d) Singular matrix

If  $b_{yx} = \frac{-5}{18}$  and  $b_{xy} = \frac{-8}{5}$ , then the coefficient of correlation 'r' equals 7) to  $^{2}/_{5}$ b)  $\frac{1}{2}$ d)  $\frac{-2}{3}$ a)  $2/_{2}$ c)

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Set

Max. Marks: 70

Marks: 14

Set | P If  $I = \int_{-1}^{1} f(x) dx = a_1 f(x_1) + a_2 f(x_2) + a_3 f(x_3)$ , then by Gaussion 3-point 8) formula the value of  $a_1, a_2, a_3$  are \_\_\_\_\_. a)  $5/_{8}, 9/_{8}, 5/_{8}$  b)  $5/_{9}, 8/_{9}, 5/_{9}$ c)  $\overline{3/_{0}}, \overline{3/_{0}}$  d)  $8/_{9}, 5/_{9}, 8/_{9}$ a)  $\frac{5}{8}, \frac{9}{8}, \frac{5}{8}$ c)  $-\sqrt{3}{5}, 0, \sqrt{3}{5}$ The error in simposn's  $1/3^{rd}$  rule is \_\_\_\_\_. b)  $h^2$ d)  $h^4$ 9) The partial differential equation  $xu_{xx} + u_{yy} = 0$  is parabolic if \_\_\_\_\_. 10) b) a) x = 0*x* < 0 c) x > 0d) both (b) & (c) The finite difference approximation to y' at  $x = x_i$  is \_\_\_\_\_. 11) b)  $\frac{1}{h^2}(y_{i+1}-y_{i-1})$ a)  $\frac{1}{2h}(y_{i+i}+y_{i-1})$ d)  $\frac{1}{h^2}(y_{i+1} + y_{i-1})$ c)  $\frac{1}{2h}(y_{i+1}-y_{i-1})$ In solving simultaneous differential equation  $\frac{dy}{dx} = 1 + xz \frac{dz}{dx} = -xy$  with 12) y(0) = 0, z(0) = 1 by Picard's method the first approximation for y is \_\_\_\_\_. a)  $x + \frac{x^2}{2}$  b)  $x - \frac{x^2}{2}$ c)  $1 + x + \frac{x^2}{2}$ d) none of these Crank Nicholson's scheme is called 13) b) Explicit scheme **Dirichlet scheme** a) Poisson d) Implicit scheme C) The differential equation  $\frac{\partial^2 u}{\partial x^2} + 3 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$  is classified as \_\_\_\_\_. 14) a elliptic equation a parabolic equation a) b) a hyperbolic equation d) C) circular equation

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| Page  | 3 | of | 20 |
|-------|---|----|----|
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05

Set

Max. Marks: 56

| Seat |  |
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| No.  |  |

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 2 and Q. No. 7 are compulsory.

- 2) Solve any two questions from each Section.
- 3) Use of scientific calculator is allowed.
- 4) Figure to the right indicates full marks.

#### Section – I

#### Q.2 Solve the following.

- Solve the equation  $x \tan x = -1$  by Regula Falsi Method starting with 03 a) a = 2.5 and b = 3 correct to three decimal places.
- **b)** Using Newton's Raphson iterative formula, find approximate value of  $\sqrt{29}$ 03 correct to four places of decimals.
- Equations giving the two lines of regression of y on x and of x on y are 04 C) 7x - 16y + 9 = 0 and 5y - 4x - 3 = 0 respectively, then find mean of x and y. Also find the coefficient of correlation.

| Q.3 | a) | Using Gauss Jordan method solve the following system of equation | 04 |
|-----|----|--|----|
|     |    | x + y + x = 9, $2x - 3y + 4z = 13$ , $3x + 4y + 5z = 40$         |    |
|     | b) | Solve any one from the following:                                | 05 |

- **b)** Solve any one from the following:
  - Find the dominant eigen value and corresponding eigen vector of a i) matrix

| [25 | 1 | 2 ] |
|-----|---|-----|
| 1   | 3 | 0   |
| L 2 | 0 | -4] |

correct to three decimal places by Power method, taking  $X_0 = [1 \ 0 \ 0]^T$ as initial eigen vector

ii) Solve by Gauss Seidal method correct to four decimal places.

28x + 4y - z = 32, 2x + 17y + 4z = 35, x + 3y + 10z = 24

Q.4 a) Fit a second degree parabola by taking x as the independent variable using 04 least square principle.

| <i>x</i> : | 0 | 1 | 2  | 3  | 4  |
|------------|---|---|----|----|----|
| <i>y</i> : | 1 | 5 | 10 | 22 | 38 |

**b)** Solve any one from the following:

Using Lagrange's formula of interpolation find f(z). Given that 1)

| x:        | 0 | 1 | 3  | 4   |
|-----------|---|---|----|-----|
| y = f(x): | 5 | 6 | 50 | 105 |

2) Determine polynomial y = f(x) using Newton's divided difference formula for the data.

| x:        | -4   | -1 | 0 | 2 | 5    |
|-----------|------|----|---|---|------|
| y = f(x): | 1245 | 33 | 5 | 9 | 1335 |

|     |     |   |   |                                   |                              |  |   | 3  |             | VI-0; | 52 |
|-----|-----|---|---|-----------------------------------|------------------------------|--|---|--|-------------|-------|----|
|     |     |   |   |                                   |                              |  |   |  | S           | Set   | Ρ  |
| Q.5 |     | ve the follo  | -   |                                   |                              |  |   |  |             |       | 04 |
|     | a)  | Find the co   | efficient                                     | t of corre                        | elation f                    | rom the f                                    | ollowing da                                       | ita.   |             |       |    |
|     |     | <i>x</i> :  | 62  | 64                                |                              | 69   | 70  | 71   | 72          | 74    |    |
|     |     | <i>y</i> :  |   | 125                               |                              | . 145  | 165   | 152  | 180         | 208   | ~- |
|     | b)  | Perform tw<br>simultaneo<br>approximat                    | us equa                                       | tions $x^2$                       | $+ y^2 =$                    | •  |   |  |             |       | 05 |
|     |     |   |   |                                   | Sec                          | tion - II                                    |   |  |             |       |    |
| Q.6 | Sol | ve any thre   | <b>e:</b>                                     |                                   |                              |  |   |  |             |       | 09 |
|     | a)  | Evaluate  | $\int_{1}^{2}\int_{2}^{4}\frac{1}{(x-1)^{4}}$ | $\frac{1}{(x+y)^2}dx$             | dy tak                       | ing $h = k$                                  | = 0.5 by T  | rapezoida  | al rule.    |       |    |
|     | b)  | The curve i<br>(4, 4.30), (s<br>area bound                | is drawr<br>5, 4.42),<br>led by c             | n to pass<br>(6, 4.54<br>urve, X- | throug<br>) and (<br>axis an | h the poii<br>7,4.67). U<br>d lines <i>x</i> | nts (1, 3.95<br>Ising simps<br>= 1, <i>x</i> = 7. | 5), (2, 4.0 <sup>°</sup><br>son's 1/3 <sup>r</sup> | 7), (3, 4.1 |       |    |
|     | c)  | Evaluate<br>Evaluate                                      | $\int_{1}^{2} \frac{1}{1+x}$                  | $\frac{1}{\sqrt{2}}dx$ by         | Gauss                        | sian 2-poi                                   | nt formula.                                       |  |             |       |    |
|     | d)  | Evaluate  | $\int_{0}^{6} \frac{1}{1+x}$                  | $\frac{1}{2}dx$ by                | Wedd                         | le's rule.                                   |   |  |             |       |    |
| Q.7 |     | Using Rom   |   |                                   |                              |  |   |  | ee decima   | al    | 05 |
|     | b)  | places, tak<br>Using Liem<br>following so<br>iterations o | ing <i>h</i> =<br>ıbann's<br>quare m          | 0.5, h = method,                  | 0.25 <i>, h</i><br>solve 1   | = 0.125.<br>he laplac                        | e equation  | $\nabla^2 u = 0$                                   | for the     |       | 05 |
|     |     | 500   | 100   | 100                               | 50                           | 1  |   |  |             |       |    |
|     |     | 20  | ι   | I <sub>1</sub> U <sub>2</sub>     | 0                            |  |   |  |             |       |    |
|     |     | 30  | ι   | I <sub>3</sub> U <sub>4</sub>     | 0                            |  |   |  |             |       |    |
|     |     | 0   | 0   | 0                                 | 0                            |  |   |  |             |       |    |

- **Q.8** a) Given that  $\frac{\partial^2 y}{\partial x^2} = 2 \frac{\partial u}{\partial t}$  subject to conditions u(0,t) = 0, u(5,t) = 0, $u(x,0) = x^2(25 - x^2)$  by Bendre scmidt's method, find the solution u upto 5 seconds, taking step size h = 1 for x.
  - **b)** Using crank Nichoson's scheme, solve  $u_{xx} = 16u_t \ 0 < x < 1, t > 0$  for one time step subject to conditions u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t taking  $h = \frac{1}{4}$ .

04

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## Set P

- **Q.9 a)** Using finite difference method find y(0.25), y(0.5) and y(0.75) satisfying the **04** differential equation y'' + y = x subject to the boundary conditions y(0) = 0 y(1) = 2.
  - **b)** Apply Picard's method to find the second approximations to the values of y and z, given that  $\frac{dy}{dx} = z$ ,  $\frac{dz}{dx} = x^3(y+z)$  with initial condition  $y_0 = 1$ ,  $z_0 = \frac{1}{2}$  when  $x_0 = 0$ .

| Seat |  |
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#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

#### MCQ/Objective Type Questions

Duration: 30 Minutes

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

1) If  $I = \int_{-1}^{1} f(x) dx = a_1 f(x_1) + a_2 f(x_2) + a_3 f(x_3)$ , then by Gaussion 3-point formula the value of  $a_1, a_2, a_3$  are \_\_\_\_\_. a) 5/8, 9/8, 5/8 b) 5/9, 8/9, 5/9

| •., | /8, /8, /8                            | ,  | -/9, /9, /9                                       |
|-----|---------------------------------------|----|---|
| C)  | $\boxed{2}$                           | d) | <sup>8</sup> /9, <sup>5</sup> /9, <sup>8</sup> /9 |
| ,   | $-\sqrt{3/_{5}}$ , 0, $\sqrt{3/_{5}}$ | ,  | /9, /9, /9  |
|     | N , 3 N , 3                           |    |   |
|     |                                       |    |   |

2) The error in simposn's 
$$1/3^{rd}$$
 rule is \_\_\_\_\_.  
a)  $h^3$  b)  $h^2$   
c)  $h^6$  d)  $h^4$ 

3) The partial differential equation  $xu_{xx} + u_{yy} = 0$  is parabolic if \_\_\_\_\_. a) x = 0 b) x < 0c) x > 0 d) both (b) & (c)

- c) x > 0 d) both (b) & (c)
- 4) The finite difference approximation to y' at  $x = x_i$  is \_\_\_\_\_.

a) 
$$\frac{1}{2h}(y_{i+i} + y_{i-1})$$
  
b)  $\frac{1}{h^2}(y_{i+1} - y_{i-1})$   
c)  $\frac{1}{2h}(y_{i+1} - y_{i-1})$   
d)  $\frac{1}{h^2}(y_{i+1} - y_{i-1})$ 

5) In solving simultaneous differential equation  $\frac{dy}{dx} = 1 + xz \frac{dz}{dx} = -xy$  with y(0) = 0, z(0) = 1 by Picard's method the first approximation for y is \_\_\_\_\_. a)  $x + \frac{x^2}{2}$  b)  $x - \frac{x^2}{2}$ c)  $1 + x + \frac{x^2}{2}$  d) none of these

#### 6) Crank Nicholson's scheme is called \_\_\_\_\_

- a) Explicit scheme b) Dirichlet scheme c) Poisson d) Implicit scheme
- 7) The differential equation  $\frac{\partial^2 u}{\partial x^2} + 3 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$  is classified as \_\_\_\_\_. a) a elliptic equation b) a parabolic equation
  - c) a hyperbolic equation d) circular equation

Max. Marks: 70

Marks: 14

Set Q

|     |  |                                       | Set Q  |
|-----|--|---------------------------------------|--|
| 8)  | Which of the following method is calle<br>a) Newton-Raphson method<br>c) Muller's method   | b)                                    |  |
| 9)  | Newton's Raphson method fails, when<br>a) $f'(x)$ is negative<br>c) $f'(x)$ is zero  | en<br>b)<br>d)                        | f'(x) is too large never fails                           |
| 10) | <ul> <li>While finding a root of an equation f (of interval can be reduced by a factor)</li> <li>a) 0.5</li> <li>c) 1.6</li> </ul> | r                                     | 1.5  |
| 11) | If $y = x^2$ , then the first divided differe<br>a) 2<br>c) 0  | nce c<br>b)<br>d)                     | 3  |
| 12) | To fit a polynomial $y = a_0 + a_1x + a_2$ .<br>by Least square principle the required<br>a) 3<br>c) 4                             | x <sup>2</sup> +<br>d nur<br>b)<br>d) | nber of normal equations are<br>2                        |
| 13) | In solving simultaneous linear equation<br>coefficient matrix A reduced to<br>a) Diagonal matrix<br>c) Upper triangular matrix     | <br>b)                                | Lower triangular matrix                                  |
| 14) | If $b_{yx} = \frac{-5}{18}$ and $b_{xy} = \frac{-8}{5}$ , then<br>to<br>a) $\frac{2}{5}$<br>c) $\frac{2}{3}$                       | b)                                    | coefficient of correlation 'r' equals $\frac{1/2}{-2/3}$ |

a) 
$$\frac{2}{5}$$
 b)  
c)  $\frac{2}{3}$  d)

| Page <b>8</b> of <b>20</b> |  |
|----------------------------|--|

05

| Mechanical Engineering<br>NUMERICAL METHODS |                |
|---|----------------|
| Day & Date: Wednesday, 27-11-2019           | Max. Marks: 56 |
| Time: 02:30 PM To 05:30 PM                  |                |

Instructions: 1) Q. No. 2 and Q. No. 7 are compulsory.

- 2) Solve any two questions from each Section.
- 3) Use of scientific calculator is allowed.
- 4) Figure to the right indicates full marks.

#### Section – I

#### Q.2 Solve the following.

- Solve the equation  $x \tan x = -1$  by Regula Falsi Method starting with 03 a) a = 2.5 and b = 3 correct to three decimal places.
- **b)** Using Newton's Raphson iterative formula, find approximate value of  $\sqrt{29}$ 03 correct to four places of decimals.
- Equations giving the two lines of regression of y on x and of x on y are 04 c) 7x - 16y + 9 = 0 and 5y - 4x - 3 = 0 respectively, then find mean of x and y. Also find the coefficient of correlation.

| Q.3 | a) | Using Gauss Jordan method solve the following system of equation | 04 |
|-----|----|--|----|
|     |    | x + y + x = 9, $2x - 3y + 4z = 13$ , $3x + 4y + 5z = 40$         |    |
|     | b) | Solve any one from the following:                                | 05 |

- **b)** Solve any one from the following:
  - Find the dominant eigen value and corresponding eigen vector of a i) matrix

| [25 | 1 | 2 ] |
|-----|---|-----|
| 1   | 3 | 0   |
| L 2 | 0 | _4  |

correct to three decimal places by Power method, taking  $X_0 = [1 \ 0 \ 0]^T$ as initial eigen vector

ii) Solve by Gauss Seidal method correct to four decimal places.

28x + 4y - z = 32, 2x + 17y + 4z = 35, x + 3y + 10z = 24

Fit a second degree parabola by taking x as the independent variable using Q.4 a) 04 least square principle.

| <i>x</i> : | 0 | 1 | 2  | 3  | 4  |
|------------|---|---|----|----|----|
| <i>y</i> : | 1 | 5 | 10 | 22 | 38 |

Solve any one from the following: b)

Using Lagrange's formula of interpolation find f(z). Given that 1)

| x:        | 0 | 1 | 3  | 4   |
|-----------|---|---|----|-----|
| y = f(x): | 5 | 6 | 50 | 105 |

2) Determine polynomial y = f(x) using Newton's divided difference formula for the data.

| x:        | -4   | -1 | 0 | 2 | 5    |
|-----------|------|----|---|---|------|
| y = f(x): | 1245 | 33 | 5 | 9 | 1335 |



S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019

SLR-FM-652

Seat

No.

|     |    |   |   |                               |                        |                                |                      | 3                                    |           | VI-0;     | JZ |
|-----|----|---|---|-------------------------------|------------------------|--------------------------------|----------------------|--------------------------------------|-----------|-----------|----|
|     |    |   |   |                               |                        |                                |                      |                                      | 5         | Set       | Q  |
| Q.5 |    | ve the follo  | -                                       |                               |                        |                                |                      |                                      |           |           | 04 |
|     | a) | Find the co   | pefficient                              | t of corre                    | lation fro             | m the foll                     | owing da             | ta.                                  |           |           |    |
|     |    | x:<br>y:  | 62<br>126                               | 64<br>125                     | 65<br>139              | 69<br>145                      | 70<br>165            | 71<br>152                            | 72<br>180 | 74<br>208 |    |
|     | b) | Perform tw<br>simultaneo<br>approxima                     | us equa                                 | tions $x^2$                   | $+y^2 = 4$             |                                |                      |                                      |           |           | 05 |
|     |    |   |   |                               | Section                | on - II                        |                      |                                      |           |           |    |
| Q.6 |    | ve any thre   | 2 4                                     |                               |                        |                                |                      |                                      |           |           | 09 |
|     | a) | Evaluate  | $\int_{1}\int_{2}\frac{1}{(x-x)^{2}}$   | $\frac{1}{(x+y)^2}dxd$        | ly taking              | g $h = k =$                    | 0.5 by Tr            | apezoida                             | al rule.  |           |    |
|     | b) | The curve<br>(4, 4.30), (<br>area bound                   | 5, 4.42),<br>ded by c                   | (6, 4.54)<br>urve, X-a        | ) and (7,4<br>axis and | 4.67). Usi<br>lines <i>x</i> = | ng simps $1, x = 7.$ |                                      |           |           |    |
|     | c) | Evaluate<br>Evaluate                                      | $\int_{1}^{\overline{1}} \frac{1}{1+x}$ | $\frac{1}{2}dx$ by            | Gaussia                | n 2-point                      | formula.             |                                      |           |           |    |
|     | d) | Evaluate  | $\int_{0}^{0} \frac{1}{1+x^2}$          | $\frac{1}{2}dx$ by            | Weddle'                | s rule.                        |                      |                                      |           |           |    |
| Q.7 | a) | Using Rom   | nberg's i                               | method e                      | valuate                | $\int_{0}^{1} \frac{1}{1+x}$   | dx corre             | ect to thre                          | ee decim  | al        | 05 |
|     | b) | places, tak<br>Using Liem<br>following so<br>iterations o | ing <i>h</i> =<br>1bann's<br>quare m    | 0.5, h = 0<br>method,         | 0.25, h = solve the    | 0.125.<br>e laplace e          | equation             | $\nabla^2 \mathbf{u} = 0 \mathbf{f}$ | or the    |           | 05 |
|     |    | 500   | 100                                     | 100                           | 50                     |                                |                      |                                      |           |           |    |
|     |    | 20  | L                                       | I <sub>1</sub> U <sub>2</sub> | 0                      |                                |                      |                                      |           |           |    |
|     |    | 30  | ι ι                                     | l <sub>3</sub> U <sub>4</sub> | 0                      |                                |                      |                                      |           |           |    |
|     |    | 0   | 0                                       | 0                             | 0                      |                                |                      |                                      |           |           |    |

- **Q.8** a) Given that  $\frac{\partial^2 y}{\partial x^2} = 2 \frac{\partial u}{\partial t}$  subject to conditions u(0,t) = 0, u(5,t) = 0, $u(x,0) = x^2(25 - x^2)$  by Bendre scmidt's method, find the solution u upto 5 seconds, taking step size h = 1 for x.
  - **b)** Using crank Nichoson's scheme, solve  $u_{xx} = 16u_t \ 0 < x < 1, t > 0$  for one time step subject to conditions u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t taking  $h = \frac{1}{4}$ .

04

SI R-FM-652

## Set Q

- **Q.9 a)** Using finite difference method find y(0.25), y(0.5) and y(0.75) satisfying the **04** differential equation y'' + y = x subject to the boundary conditions y(0) = 0 y(1) = 2.
  - **b)** Apply Picard's method to find the second approximations to the values of y and z, given that  $\frac{dy}{dx} = z$ ,  $\frac{dz}{dx} = x^3(y+z)$  with initial condition  $y_0 = 1$ ,  $z_0 = \frac{1}{2}$  when  $x_0 = 0$ .

# S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book.

NUMERICAL METHODS

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

#### MCQ/Objective Type Questions

Duration: 30 Minutes

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) To fit a polynomial  $y = a_0 + a_1 x + a_2 x^2 + a_3 x^3$  for the data of 'n' observations by Least square principle the required number of normal equations are \_\_\_\_\_.
  - a) 3 b) 2 c) 4 d) n
- 2) In solving simultaneous linear equations Ax = B by Jordan method, the coefficient matrix A reduced to \_\_\_\_\_.
  - a) Diagonal matrix b) Lower triangular matrix
    - c) Upper triangular matrix d) Singular matrix
- 3) If  $b_{yx} = \frac{-5}{18}$  and  $b_{xy} = \frac{-8}{5}$ , then the coefficient of correlation 'r' equals to \_\_\_\_\_. a)  $\frac{-2}{24}$ .

a) 
$$\frac{2}{5}$$
  
c)  $\frac{2}{3}$   
b)  $\frac{1}{2}$   
d)  $-\frac{2}{3}$ 

4) If  $I = \int_{-1}^{1} f(x) dx = a_1 f(x_1) + a_2 f(x_2) + a_3 f(x_3)$ , then by Gaussion 3-point formula the value of  $a_1, a_2, a_3$  are \_\_\_\_\_.

| a) | <sup>5</sup> / <sub>8</sub> , <sup>9</sup> / <sub>8</sub> , <sup>5</sup> / <sub>8</sub> | b) | <sup>5</sup> /9, <sup>8</sup> /9, <sup>5</sup> /9 |
|----|---|----|---|
|    | $-\sqrt{\frac{3}{5}}, 0, \sqrt{\frac{3}{5}}$  | d) | 8/9,5/9,8/9                                       |

5) The error in simposn's  $1/3^{rd}$  rule is \_\_\_\_\_. a)  $h^3$  b)  $h^2$ c)  $h^6$  d)  $h^4$ 

6) The partial differential equation  $xu_{xx} + u_{yy} = 0$  is parabolic if \_\_\_\_\_.

a) x = 0b) x < 0c) x > 0d) both (b) & (c)

7) The finite difference approximation to y' at  $x = x_i$  is \_\_\_\_\_. a)  $\frac{1}{1-x}(y_{i+1}+y_{i-1})$  b)  $\frac{1}{1-x}(y_{i+1}-y_{i-1})$ 

c) 
$$\frac{2h}{2h} (y_{i+1} - y_{i-1})$$
  
d)  $\frac{1}{h^2} (y_{i+1} - y_{i-1})$ 

Seat No.



Max. Marks: 70

Marks: 14

|     | Set R  | ) |
|-----|--|---|
| 8)  | In solving simultaneous differential equation $\frac{dy}{dx} = 1 + xz \frac{dz}{dx} = -xy$ with $y(0) = 0, z(0) = 1$ by Picard's method the first approximation for y is<br>a) $x + \frac{x^2}{2}$ b) $x - \frac{x^2}{2}$<br>c) $1 + x + \frac{x^2}{2}$ d) none of these |   |
| 9)  | Crank Nicholson's scheme is calleda) Explicit schemeb) Dirichlet schemec) Poissond) Implicit scheme  |   |
| 10) | The differential equation $\frac{\partial^2 u}{\partial x^2} + 3 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$ is classified as<br>a) a elliptic equation b) a parabolic equation<br>c) a hyperbolic equation d) circular equation |   |
| 11) | Which of the following method is called method of chord?a)Newton-Raphson methodb)Regula Falsi methodc)Muller's methodd)Bisection method  |   |
| 12) | Newton's Raphson method fails, when<br>a) $f'(x)$ is negative b) $f'(x)$ is too large<br>c) $f'(x)$ is zero d) never fails   |   |
| 13) | While finding a root of an equation $f(x) = 0$ by Bisection method, the length<br>of interval can be reduced by a factora) $0.5$ b) $1.5$ c) $1.6$ d) $2$  |   |
| 14) | If $y = x^2$ , then the first divided difference of the argument -1 and 2 is<br>a) 2 b) 3<br>c) 0 d) 1   |   |

| Page <b>13</b> of <b>20</b> |
|-----------------------------|
|-----------------------------|

05

| <b>SLR-FM-652</b> |
|-------------------|
|-------------------|

Set

Max. Marks: 56

R

| Seat |  |
|------|--|
| No.  |  |

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 2 and Q. No. 7 are compulsory.

- 2) Solve any two questions from each Section.
- 3) Use of scientific calculator is allowed.
- 4) Figure to the right indicates full marks.

#### Section – I

#### Q.2 Solve the following.

- Solve the equation  $x \tan x = -1$  by Regula Falsi Method starting with 03 a) a = 2.5 and b = 3 correct to three decimal places.
- **b)** Using Newton's Raphson iterative formula, find approximate value of  $\sqrt{29}$ 03 correct to four places of decimals.
- Equations giving the two lines of regression of y on x and of x on y are 04 C) 7x - 16y + 9 = 0 and 5y - 4x - 3 = 0 respectively, then find mean of x and y. Also find the coefficient of correlation.

| Q.3 | a) | Using Gauss Jordan method solve the following system of equation | 04 |
|-----|----|--|----|
|     |    | x + y + x = 9, $2x - 3y + 4z = 13$ , $3x + 4y + 5z = 40$         |    |
|     | b) | Solve any one from the following:                                | 05 |

- **b)** Solve any one from the following:
  - Find the dominant eigen value and corresponding eigen vector of a i) matrix

| [25 | 1 | 2 ] |
|-----|---|-----|
| 1   | 3 | 0   |
| L 2 | 0 | _4] |

correct to three decimal places by Power method, taking  $X_0 = [1 \ 0 \ 0]^T$ as initial eigen vector

ii) Solve by Gauss Seidal method correct to four decimal places.

28x + 4y - z = 32, 2x + 17y + 4z = 35, x + 3y + 10z = 24

Q.4 a) Fit a second degree parabola by taking x as the independent variable using 04 least square principle.

| <i>x</i> : | 0 | 1 | 2  | 3  | 4  |
|------------|---|---|----|----|----|
| <i>y</i> : | 1 | 5 | 10 | 22 | 38 |

**b)** Solve any one from the following:

Using Lagrange's formula of interpolation find f(z). Given that 1)

| x:        | 0 | 1 | 3  | 4   |
|-----------|---|---|----|-----|
| y = f(x): | 5 | 6 | 50 | 105 |

2) Determine polynomial y = f(x) using Newton's divided difference formula for the data.

| x:        | -4   | -1 | 0 | 2 | 5    |
|-----------|------|----|---|---|------|
| y = f(x): | 1245 | 33 | 5 | 9 | 1335 |

|     |     |   |   |                               |                               |                              |          | 3                | DLR-F    | 10-141 | 52         |
|-----|-----|---|---|-------------------------------|-------------------------------|------------------------------|----------|------------------|----------|--------|------------|
|     |     |   |   |                               |                               |                              |          |                  | ę        | Set    | R          |
| Q.5 | -   | ve the follo  |   |                               |                               |                              |          |                  |          |        | 04         |
|     | a)  | Find the co   | pefficien                                     |                               |                               |                              | owing da | ta.              |          |        |            |
|     |     | <i>x</i> :  | 62  |                               |                               | 69                           | 70       | 71               | 72       | 74     |            |
|     |     | <i>y</i> :  |   | 125                           |                               | 145                          | 165      | 152              | 180      | 208    | <b>0</b> 5 |
|     | b)  | Perform tw<br>simultaneo<br>approxima                     | us equa                                       | ations $x^2$                  | $+y^{2} = 4$                  |                              |          |                  |          | ſ      | 05         |
|     |     |   |   |                               | Secti                         | on - II                      |          |                  |          |        |            |
| Q.6 | Sol | ve any thre   | e:  |                               |                               |                              |          |                  |          |        | 09         |
|     | a)  | Evaluate  | $\int_{1}^{2}\int_{2}^{4}\frac{1}{(x-1)^{4}}$ | $\frac{1}{(x+y)^2}dx$         | dy takin                      | g $h = k =$                  | 0.5 by T | rapezoida        | al rule. |        |            |
|     | b)  | 1 3   |   |                               |                               |                              |          |                  |          |        |            |
|     |     |   |   |                               |                               |                              |          |                  |          |        |            |
|     | c)  | Evaluate  | $\int_{1}^{1} \frac{1}{1+x}$                  | $\frac{1}{x^2}dx$ by          | Gaussia                       | an 2-point                   | formula. |                  |          |        |            |
|     | d)  | Evaluate<br>Evaluate                                      | $\int_{0}^{0} \frac{1}{1+x}$                  | $\frac{1}{2}dx$ by            | Weddle                        | 's rule.                     |          |                  |          |        |            |
| Q.7 | a)  | Using Rom   | nberg's                                       | method                        | evaluate                      | $\int_{0}^{1} \frac{1}{1+x}$ | dx corr  | ect to thr       | ee decim | nal    | 05         |
|     | b)  | places, tak<br>Using Liem<br>following se<br>iterations o | ing <i>h</i> =<br>ıbann's<br>quare m          | 0.5, h = method,              | 0.25 <i>, h =</i><br>solve th | 0.125.<br>e laplace (        | equation | $\nabla^2 u = 0$ | for the  |        | 05         |
|     |     | 500   | 100   | 100                           | 50                            |                              |          |                  |          |        |            |
|     |     | 20  | ι ι   | J <sub>1</sub> U <sub>2</sub> | 0                             |                              |          |                  |          |        |            |
|     |     | 30  | ι ι   | l <sub>3</sub> U <sub>4</sub> | 0                             |                              |          |                  |          |        |            |
|     |     |   | 1 1   |                               |                               |                              |          |                  |          |        |            |

- **Q.8** a) Given that  $\frac{\partial^2 y}{\partial x^2} = 2 \frac{\partial u}{\partial t}$  subject to conditions u(0,t) = 0, u(5,t) = 0, $u(x,0) = x^2(25 - x^2)$  by Bendre scmidt's method, find the solution u upto 5 seconds, taking step size h = 1 for x.
  - **b)** Using crank Nichoson's scheme, solve  $u_{xx} = 16u_t \ 0 < x < 1, t > 0$  for one time step subject to conditions u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t taking  $h = \frac{1}{4}$ .

04

SI R-FM-652

### Set R

- **Q.9 a)** Using finite difference method find y(0.25), y(0.5) and y(0.75) satisfying the **04** differential equation y'' + y = x subject to the boundary conditions y(0) = 0 y(1) = 2.
  - **b)** Apply Picard's method to find the second approximations to the values of y and z, given that  $\frac{dy}{dx} = z$ ,  $\frac{dz}{dx} = x^3(y+z)$  with initial condition  $y_0 = 1$ ,  $z_0 = \frac{1}{2}$  when  $x_0 = 0$ .

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering NUMERICAL METHODS e: Wednesday, 27-11-2019 Max, Marks: 70

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer book.

- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.

#### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) The partial differential equation  $xu_{xx} + u_{yy} = 0$  is parabolic if \_\_\_\_\_.
  - a) x = 0c) x > 0b) x < 0d) both (b) & (c)
- 2) The finite difference approximation to y' at  $x = x_i$  is \_\_\_\_\_.
  - a)  $\frac{1}{2h}(y_{i+i} + y_{i-1})$ b)  $\frac{1}{h^2}(y_{i+1} - y_{i-1})$ c)  $\frac{1}{2h}(y_{i+1} - y_{i-1})$ d)  $\frac{1}{h^2}(y_{i+1} + y_{i-1})$

3) In solving simultaneous differential equation  $\frac{dy}{dx} = 1 + xz \frac{dz}{dx} = -xy$  with y(0) = 0, z(0) = 1 by Picard's method the first approximation for y is \_\_\_\_\_. a)  $x + \frac{x^2}{2}$  b)  $x - \frac{x^2}{2}$ c)  $1 + x + \frac{x^2}{2}$  d) none of these

c) 
$$1 + x + \frac{x^2}{2}$$
 d) none of the

4) Crank Nicholson's scheme is called \_\_\_\_\_.

- a) Explicit schemeb) Dirichlet schemec) Poissond) Implicit scheme
- 5) The differential equation  $\frac{\partial^2 u}{\partial x^2} + 3 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$  is classified as \_\_\_\_\_. a) a elliptic equation b) a parabolic equation
  - c) a hyperbolic equation d) circular equation

6) Which of the following method is called method of chord?

- a) Newton-Raphson method b) Regula Falsi method
- c) Muller's method d) Bisection method
- 7) Newton's Raphson method fails, when \_\_\_\_\_. a) f'(x) is negative b) f'(x) is too large
  - c) f'(x) is zero d) never fails

# 8) While finding a root of an equation f(x) = 0 by Bisection method, the length of interval can be reduced by a factor \_\_\_\_\_.

a) 0.5 b) 1.5 c) 1.6 d) 2 SLR-FM-652



Marks: 14

|     |   |                       | Set S   |
|-----|---|-----------------------|---|
| 9)  | If $y = x^2$ , then the first divided difference<br>a) 2<br>c) 0  | ence d<br>b)<br>d)    |   |
| 10) | To fit a polynomial $y = a_0 + a_1 x + a_2$<br>by Least square principle the require<br>a) 3<br>c) 4  |                       | mber of normal equations are 2  |
| 11) | In solving simultaneous linear equati<br>coefficient matrix A reduced to<br>a) Diagonal matrix<br>c) Upper triangular matrix  | <br>b)                | Lower triangular matrix   |
| 12) | If $b_{yx} = \frac{-5}{18}$ and $b_{xy} = \frac{-8}{5}$ , then to   | the c                 | coefficient of correlation ' $r$ ' equals   |
|     | to<br>a) $\frac{2}{5}$  | b)                    | $1_{2}$   |
|     | c) $\frac{2}{3}$  | d)                    | $\frac{1}{2}$   |
| 13) | If $I = \int_{-1}^{1} f(x) dx = a_1 f(x_1) + a_2 f(x_2)$<br>formula the value of $a_1, a_2, a_3$ are<br>a) $\frac{5}{8}, \frac{9}{8}, \frac{5}{8}$<br>c) $-\sqrt{3}/5, 0, \sqrt{3}/5$ | ) + a<br><br>b)<br>d) | $_{3}f(x_{3})$ , then by Gaussion 3-point<br>$\frac{5}{9}, \frac{8}{9}, \frac{5}{9}, \frac{8}{9}, \frac{5}{9}, \frac{8}{9}, \frac{5}{9}, \frac{8}{9}, \frac{5}{9}, \frac{8}{9}, \frac{5}{9}, \frac{8}{9}$ |
|     |   |                       |   |

14) The error in simposn's  $1/3^{rd}$  rule is \_\_\_\_\_. a)  $h^3$  b)  $h^2$ c)  $h^6$  d)  $h^4$  SLR-FM-652

| Page | 18 | of | 20 |
|------|----|----|----|
|------|----|----|----|

05

## SLR-FM-652

Set

Max. Marks: 56

Seat No.

#### S.E. (Part – II) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** NUMERICAL METHODS

Day & Date: Wednesday, 27-11-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 2 and Q. No. 7 are compulsory.

- 2) Solve any two questions from each Section.
- 3) Use of scientific calculator is allowed.
- 4) Figure to the right indicates full marks.

#### Section – I

#### Q.2 Solve the following.

- Solve the equation  $x \tan x = -1$  by Regula Falsi Method starting with 03 a) a = 2.5 and b = 3 correct to three decimal places.
- **b)** Using Newton's Raphson iterative formula, find approximate value of  $\sqrt{29}$ 03 correct to four places of decimals.
- Equations giving the two lines of regression of y on x and of x on y are 04 C) 7x - 16y + 9 = 0 and 5y - 4x - 3 = 0 respectively, then find mean of x and y. Also find the coefficient of correlation.

| Q.3 | a) | Using Gauss Jordan method solve the following system of equation | 04 |
|-----|----|--|----|
|     |    | x + y + x = 9, $2x - 3y + 4z = 13$ , $3x + 4y + 5z = 40$         |    |
|     | b) | Solve any one from the following:                                | 05 |

- **b)** Solve any one from the following:
  - Find the dominant eigen value and corresponding eigen vector of a i) matrix

| [25 | 1 | 2 ] |
|-----|---|-----|
| 1   | 3 | 0   |
| L 2 | 0 | _4] |

correct to three decimal places by Power method, taking  $X_0 = [1 \ 0 \ 0]^T$ as initial eigen vector

ii) Solve by Gauss Seidal method correct to four decimal places.

28x + 4y - z = 32, 2x + 17y + 4z = 35, x + 3y + 10z = 24

Fit a second degree parabola by taking x as the independent variable using Q.4 a) 04 least square principle.

| <i>x</i> : | 0 | 1 | 2  | 3  | 4  |
|------------|---|---|----|----|----|
| <i>y</i> : | 1 | 5 | 10 | 22 | 38 |

Solve any one from the following: b)

Using Lagrange's formula of interpolation find f(z). Given that 1)

| <i>x</i> : | 0 | 1 | 3  | 4   |
|------------|---|---|----|-----|
| y = f(x):  | 5 | 6 | 50 | 105 |

2) Determine polynomial y = f(x) using Newton's divided difference formula for the data.

| x:        | -4   | -1 | 0 | 2 | 5    |
|-----------|------|----|---|---|------|
| y = f(x): | 1245 | 33 | 5 | 9 | 1335 |

| Set S<br>Q.5 Solve the following. 04<br>a) Find the coefficient of correlation from the following data.<br>$\begin{array}{c} x:  62  64  65  69  70  71  72  74 \\ y:  126  125  139  145  165  152  180  208 \\ \end{array}$ b) Perform two steps of Newton's Raphson method to solve the non linear simultaneous equations $x^2 + y^2 = 4$ and $y + e^x = 1$ starting with initial approximation $x_0 = 1, y_0 = -1.7$<br>Section - II<br>Q.6 Solve any three: 09<br>a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^2} dxdy$ taking $h = k = 0.5$ by Trapezoidal rule.<br>b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18), (4, 4.30), (5, 4.42), (6, 4.54) and (7, 4.67). Using simpson's 1/3'' rule estimate area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1+x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{2} \frac{1}{1+x^2} dx$ by Weddle's rule.<br>50.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>500 100 100 50 0<br>20 0 0 0 0 0 0 0  |     |            |                              |   |                               |            |                              |             | 3                                    |             | VI-0; | JZ |
|---|-----|------------|------------------------------|---|-------------------------------|------------|------------------------------|-------------|--------------------------------------|-------------|-------|----|
| a) Find the coefficient of correlation from the following data.<br>$x: 62 64 65 69 70 71 72 74 y: 126 125 139 145 165 152 180 208$ b) Perform two steps of Newton's Raphson method to solve the non linear simultaneous equations $x^2 + y^2 = 4$ and $y + e^x = 1$ starting with initial approximation $x_0 = 1, y_0 = -1.7$<br>Section - II<br>Q.6 Solve any three: 09<br>a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x + y)^2} dx dy$ taking $h = k = 0.5$ by Trapezoidal rule.<br>b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18), (4, 4.30), (5, 4.42), (6, 4.54) and (7, 4.67). Using simpson's 1/3 <sup>rd</sup> rule estimate area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1 + x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{2} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>9. Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1 + x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>500 $100 100 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0$   |     |            |                              |   |                               |            |                              |             |                                      | S           | Set   | S  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | Q.5 |            |                              | -   |                               |            |                              |             |                                      |             |       | 04 |
| y: 126 125 139 145 165 152 180 208<br>b) Perform two steps of Newton's Raphson method to solve the non linear<br>simultaneous equations $x^2 + y^2 = 4$ and $y + e^x = 1$ starting with initial<br>approximation $x_0 = 1, y_0 = -1.7$<br>Section - II<br>Q.6 Solve any three:<br>a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^2} dx dy$ taking $h = k = 0.5$ by Trapezoidal rule.<br>b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18),<br>(4, 4.30), (5, 4.42), (6, 4.54) and (7, 4.67). Using simpson's 1/3 <sup>rd</sup> rule estimate<br>area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1+x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{2} \frac{1}{1+x^2} dx$ by Weddle's rule.<br>93<br>Q.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal<br>places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the<br>following square mesh with boundary values as shown in fig. (perform five<br>iterations only).<br>500 100 100 50<br>20 10 100 100 50<br>20 10 10 100 50<br>20 10 10 100 50<br>20 10 10 10 0<br>20 10 10 0<br>20 10 10 10 0<br>20   |     | a)         | Find the co                  | efficient                                     | t of corre                    |            |                              | owing da    | ta.                                  |             |       |    |
| b) Perform two steps of Newton's Raphson method to solve the non linear simultaneous equations $x^2 + y^2 = 4$ and $y + e^x = 1$ starting with initial approximation $x_0 = 1, y_0 = -1.7$<br>Section - II<br>Q.6 Solve any three:<br>a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x + y)^2} dx dy$ taking $h = k = 0.5$ by Trapezoidal rule.<br>b) The curve is drawn to pass through the points $(1, 3.95), (2, 4.07), (3, 4.18), (4, 4.30), (5, 4.42), (6, 4.54)$ and $(7, 4.67)$ . Using simpson's 1/3 <sup>rd</sup> rule estimate area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1 + x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{2} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>500 Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1 + x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>500 $100 - 100 - 50$<br>$20 \frac{100 - 100 - 50}{20 - 10 - 100 - 50}$   |     |            |                              |   |                               |            |                              |             |                                      |             |       |    |
| simultaneous equations $x^2 + y^2 = 4$ and $y + e^x = 1$ starting with initial<br>approximation $x_0 = 1, y_0 = -1.7$<br>Section - II<br>Q.6 Solve any three:<br>a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^2} dx dy$ taking $h = k = 0.5$ by Trapezoidal rule.<br>b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18),<br>(4, 4.30), (5, 4.42), (6, 4.54) and (7,4.67). Using simpson's 1/3 <sup>rd</sup> rule estimate<br>area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1+x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{1} \frac{1}{1+x^2} dx$ by Weddle's rule.<br>Q.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal<br>places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the<br>following square mesh with boundary values as shown in fig. (perform five<br>iterations only).<br>$\int_{0}^{20} \frac{100 \ 100 \ 50 \ 0}{0} \int_{0}^{50} \frac{100 \ 100 \ 100 \ 0}{0} \int_{0}^{50} \frac{100 \ 100 \ 100 \ 0}{0} \int_{0}^{50} \frac{100 \ 0}{0} \int_{0}^{50} 100$   |     | <b>հ</b> ) | 2                            |   |                               |            |                              |             |                                      |             |       | 05 |
| Q.6 Solve any three:<br>a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^{2}} dx dy \text{ taking } h = k = 0.5 \text{ by Trapezoidal rule.}$ b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18), (4, 4.30), (5, 4.42), (6, 4.54) and (7, 4.67). Using simpson's 1/3' <sup>d</sup> rule estimate area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1+x^{2}} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{2} \frac{1}{1+x^{2}} dx$ by Weddle's rule.<br>Q.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^{2}u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>$\int_{0}^{20} \frac{100  100}{100} \int_{0}^{50} 0$  |     | D)         | simultaneo                   | us equa                                       | tions $x^2$                   | $+y^{2}=4$ |                              |             |                                      |             |       | 05 |
| a) Evaluate $\int_{1}^{2} \int_{3}^{4} \frac{1}{(x+y)^{2}} dx dy \text{ taking } h = k = 0.5 \text{ by Trapezoidal rule.}$<br>b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18), (4, 4.30), (5, 4.42), (6, 4.54) and (7, 4.67). Using simpson's 1/3' <sup>d</sup> rule estimate area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{1}^{2} \frac{1}{1+x^{2}} dx \text{ by Gaussian 2-point formula.}$<br>d) Evaluate $\int_{0}^{2} \frac{1}{1+x^{2}} dx \text{ by Weddle's rule.}$<br>Q.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx \text{ correct to three decimal places, taking } h = 0.5, h = 0.25, h = 0.125.$<br>b) Using Liembann's method, solve the laplace equation $\nabla^{2}u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>$\int_{0}^{20} \frac{100 - 100}{u_{1} - u_{2}} \int_{0}^{50} \frac{100 - 100}{0} \int_{0}^{50} \frac$  |     |            |                              |   |                               | Section    | on - II                      |             |                                      |             |       |    |
| b) The curve is drawn to pass through the points (1, 3.95), (2, 4.07), (3, 4.18),<br>(4, 4.30), (5, 4.42), (6, 4.54) and (7,4.67). Using simpson's 1/3 <sup>rd</sup> rule estimate<br>area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{0}^{2} \frac{1}{1 + x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{6} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>Q.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1 + x} dx$ correct to three decimal<br>places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the<br>following square mesh with boundary values as shown in fig. (perform five<br>iterations only).<br>$\int_{0}^{500} \frac{100 + 100}{4 + 4} \int_{0}^{50} $   | Q.6 | Sol        | ve any thre                  | e:  |                               |            |                              |             |                                      |             |       | 09 |
| (4, 4.30), (5, 4.42), (6, 4.54) and (7,4.67). Using simpson's 1/3 <sup>rd</sup> rule estimate<br>area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>() Evaluate $\int_{1}^{2} \frac{1}{1 + x^2} dx$ by Gaussian 2-point formula.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>() Evaluate $\int_{0}^{1} \frac{1}{1 + x$  |     | a)         | Evaluate                     | $\int_{1}^{2}\int_{2}^{4}\frac{1}{(x-1)^{4}}$ | $\frac{1}{(x+y)^2}dxd$        | ly takinę  | g $h = k =$                  | 0.5 by Tr   | apezoida                             | al rule.    |       |    |
| area bounded by curve, X-axis and lines $x = 1, x = 7$ .<br>c) Evaluate $\int_{1}^{2} \frac{1}{1 + x^2} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{6} \frac{1}{1 + x^2} dx$ by Weddle's rule.<br>Q.7 a) Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1 + x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>$\int_{0}^{500} \frac{100 - 100}{u_1 - u_2} \int_{0}^{50} 0$   |     |            | The curve                    | is drawr                                      | to pass                       | through    | the points                   | s (1, 3.95) | ), (2, 4.07                          | 7), (3, 4.1 |       |    |
| c) Evaluate $\int_{1}^{2} \frac{1}{1+x^{2}} dx$ by Gaussian 2-point formula.<br>d) Evaluate $\int_{0}^{6} \frac{1}{1+x^{2}} dx$ by Weddle's rule.<br><b>Q.7 a)</b> Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br>b) Using Liembann's method, solve the laplace equation $\nabla^{2}u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>$\int_{0}^{50} \frac{100 - 100}{u_{1} - u_{2}} \int_{0}^{50} \frac{100 - 100}{0} $ |     |            |                              |   |                               |            |                              |             | 0115 1/3                             | Tule esti   | male  |    |
| <b>Q.7 a)</b> Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br><b>b)</b> Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br><b>500</b> $100$ $100$ $50$ $0$ $100$ $100$ $0$ $0$ $0$ $0$   |     |            |                              |   |                               |            |                              |             |                                      |             |       |    |
| <b>Q.7 a)</b> Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br><b>b)</b> Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br><b>500</b> $100$ $100$ $50$ $0$ $100$ $100$ $0$ $0$ $0$ $0$   |     | c)         | Evaluate                     | $\int_{1}^{1} \frac{1}{1+x}$                  | $\frac{1}{2}dx$ by            | Gaussia    | n 2-point                    | formula.    |                                      |             |       |    |
| <b>Q.7 a)</b> Using Romberg's method evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ correct to three decimal places, taking $h = 0.5, h = 0.25, h = 0.125$ .<br><b>b)</b> Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br><b>500</b> 100 100 50<br>20 $\frac{100}{100}$ $\frac{100}{0}$ $\frac{50}{0}$  |     | d)         | Evaluate                     | $\int_{0}^{0} \frac{1}{1+x^2}$                | $\frac{1}{2}dx$ by            | Weddle'    | s rule.                      |             |                                      |             |       |    |
| b) Using Liembann's method, solve the laplace equation $\nabla^2 u = 0$ for the following square mesh with boundary values as shown in fig. (perform five iterations only).<br>$500  100  100  50$ $20  u_1  u_2  0$ $30  u_3  u_4  0$ $0$  | Q.7 | a)         | Using Rom                    | nberg's i                                     | method e                      | evaluate   | $\int_{0}^{1} \frac{1}{1+x}$ | dx corre    | ect to thre                          | ee decim    | al    | 05 |
| following square mesh with boundary values as shown in fig. (perform five iterations only).<br>$500  100  100  50$ $20  u_1  u_2  0$ $30  u_3  u_4  0$ $0  u_3  u_4  0$   |     |            | places, tak                  | ing $h =$                                     | 0.5, h = 0                    | 0.25, h =  | 0.125.                       |             |                                      |             |       |    |
| iterations only).<br>$500  100  100  50$ $20  u_1  u_2  0$ $30  u_3  u_4  0$ $0  u_3  u_4  0$   |     | b)         | Using Liem                   | nbann's                                       | method,                       | solve the  | e laplace e                  | equation    | $\nabla^2 \mathbf{u} = 0 \mathbf{f}$ | or the      |       | 05 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |     |            | following so<br>iterations o | quare m<br>only).                             | esh with                      | boundar    | y values a                   | as shown    | in fig. (p                           | erform fiv  | /e    |    |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |     |            | 500                          | 100   | 100                           | 50         |                              |             |                                      |             |       |    |
|   |     |            | 20                           | ι   | I <sub>1</sub> U <sub>2</sub> | 0          |                              |             |                                      |             |       |    |
|   |     |            | 30                           | ι   | l <sub>3</sub> U <sub>4</sub> | 0          |                              |             |                                      |             |       |    |
|   |     |            | 0                            | 0   | 0                             | 0          |                              |             |                                      |             |       |    |

- **Q.8** a) Given that  $\frac{\partial^2 y}{\partial x^2} = 2 \frac{\partial u}{\partial t}$  subject to conditions u(0,t) = 0, u(5,t) = 0,  $u(x,0) = x^2(25 x^2)$  by Bendre scmidt's method, find the solution u upto 5 seconds, taking step size h = 1 for x.
  - **b)** Using crank Nichoson's scheme, solve  $u_{xx} = 16u_t \ 0 < x < 1, t > 0$  for one time step subject to conditions u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t taking  $h = \frac{1}{4}$ .

04

**SLR-FM-652** 

## Set S

- **Q.9 a)** Using finite difference method find y(0.25), y(0.5) and y(0.75) satisfying the **04** differential equation y'' + y = x subject to the boundary conditions y(0) = 0 y(1) = 2.
  - **b)** Apply Picard's method to find the second approximations to the values of y and z, given that  $\frac{dy}{dx} = z$ ,  $\frac{dz}{dx} = x^3(y+z)$  with initial condition  $y_0 = 1$ ,  $z_0 = \frac{1}{2}$  when  $x_0 = 0$ .

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

## THEORY OF MACHINE - II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicates full marks.
- 3) Use of calculator is allowed.
- 4) Assume additional data, if necessary and mention it clearly.

## MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- Interference can be avoided if addendum circle of two mating gears cuts 1) the common tangent to base circle between
  - a) point of approach & recess pitch point & length of recess b) pitch points
  - c) point of tangency d)
- 2) The size of gear is usually specified by
  - a) pressure angle circular pitch b) pitch circle diameter c) diametral pitch d)
- 3) Ratio of speed of driver to driven is called as
  - a) train value b) speed ratio
  - c) train ratio d) speed value
- In gear train when axes of shafts over which gears are mounted, move 4) relative to a fixed axis is called b) compound GT
  - a) simple GT
  - epicyclic GT reverted GT d) c)
- 5) Gyroscopic effect occurs when \_
  - a) axis of spin & precession are perpendicular
  - b) axis of spin & precession coinsides
  - c) axis of spin & axis of pitch are perpendicular
  - d) axis of spin & pitch are perpendicular

In four wheel effect of gyroscopic couple on outer wheel is \_ 6)

- a) upward or downward vertically downward b)
- c) vertically upward None of these d)
- 7) For static balancing of shaft \_\_\_\_
  - b) net couple is zero can't sav a) both force & couple is zero net force is zero c) d)
- 8) In V-engine balancing if  $2\alpha = 90$ , value of Fp is
  - $mr\omega^2$ a)  $\sqrt{2mr\omega^2} \cdot sin 2\theta/n$ b)
  - c)  $mr\omega^2 / \sqrt{2}$  $mr\omega^2/2$ d)

Seat No.



Set

Max. Marks: 70

Marks: 14

- Longitudinal vibrations are said to occurs when the particles of the body moves \_\_\_\_\_.
  - a) perpendicular to axis
  - b) in a circle about axis
  - c) parallel to axis
  - d) none of these

a) viscous damping

- 10) In vibration isolation system if  $w / wn < \sqrt{2}$  then for all values of damping factor the transmissibility will be \_\_\_\_\_.
  - a) less than unity b) greater than unity
  - c) equal to unity d) Zero
- 11) Deflection of simply supported shaft with load at dist a from one end can be given as \_\_\_\_\_.
  - a)  $wl^3 / 48 El$  b)  $Wl^4 / 84 El$
  - c)  $wl^3 / 84 El$  d)  $wa^2b^2 / 3EIL$
- 12) When damping is provided by fluid it is called as \_\_\_\_\_
  - b) coulomb damping

.

- c) wet damping d) fluid damping
- 13) Mass of flywheel can be calculated as \_\_\_\_\_
   a) πDA<sup>2</sup> p
   b) πD<sup>2</sup>A<sup>2</sup> p
   c) πDA p
   d) DA<sup>2</sup>p
- 14) Value of  $\theta$  is \_\_\_\_\_ in 2 stroke engine.
  - a) π
     b) π/2

     c) 4π
     d) 2π

Set P

**SLR-FM-653** 

### Seat No.

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

06

**08** 

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full marks.
- 3) Use of Calculator is allowed.
- 4) Assume additional data, if necessary and mention it clearly.

#### Section – I

- **Q.2 a)** State law of gearing. Derive an equation for condition for constant velocity **06** ratio.
  - b) In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D E. The gear B meshes with gear E. The gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.
- Q.3 a) What is the function of a flywheel? How does it differ from that of a governor? Explain the terms 'fluctuation of energy' and 'fluctuation of speed' as applied to flywheels.
  - **b)** The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship:
    - 1) when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.
    - 2) when the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.
- **Q.4 a)** Explain construction and working of differential gear train with neat sketch. **06** Draw the table of motions.
  - b) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find:
    - 1) The angle turned through by pinion when one pair of teeth is in mesh; and
    - 2) The maximum velocity of sliding.



#### Page 4 of 16

#### Section – II

Q.5 a) Distinguish between the static balancing and the dynamic balancing 04 A four cylinder vertical engine has cranks 150 mm long. The planes of b) 10 rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance. Q.6 Define the following terms: 04 a) Damping coefficient 1) 2) Damping ratio 3) Logarithmic decrement 4) Amplitude reduction factor A vibrating system consists of a mass of 12 kg, a spring of a stiffness of 5.8 b) 10 N/mm and a dashpot of damping coefficient of 38 N/m/s. Find 1) critical damping coefficient 2) damping factor Logarithmic decrement 3) Ratio of two consecutive amplitudes, 4) 5) Frequency of vibration. Q.7 Explain the term whirling speed of a shaft. 06 a) A shaft as shown in Fig.7 (b) carries two masses namely C & D. The mass b) 08 A is 390 kg with radius of gyration of 0.70 m and mass B is 650 kg with a radius of gyration of 0.85 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) =  $80 \text{ GN/m}^2$ I C D Ē o 350 d 240 ¢ 250 φ150

400 420 160 All dimensions are in mm. Fig.7 (b)

**SLR-FM-653** 

Set

## T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** THEORY OF MACHINE - II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicates full marks.

3) Use of calculator is allowed.

4) Assume additional data, if necessary and mention it clearly.

### MCQ/Objective Type Questions

#### **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14 1)

d)

- In V-engine balancing if  $2\alpha = 90$ , value of Fp is b)
  - a)  $\sqrt{2mr\omega^2} \cdot \sin 2\theta / n$
  - c)  $mr\omega^2 / \sqrt{2}$
- Longitudinal vibrations are said to occurs when the particles of the body 2) moves .
  - a) perpendicular to axis
  - b) in a circle about axis
  - parallel to axis c)
  - d) none of these
- 3) In vibration isolation system if  $w / wn < \sqrt{2}$  then for all values of damping factor the transmissibility will be \_\_\_\_\_
  - a) less than unity b) greater than unity
  - c) equal to unity d) Zero
- Deflection of simply supported shaft with load at dist a from one end can 4) be given as \_\_\_\_\_.
  - a)  $wl^3 / 48 El$ Wl<sup>4</sup> / 84 El b)  $wa^2\dot{b}^2$  / 3EIL c)  $wl^3 / 84 El$ d)
- When damping is provided by fluid it is called as \_\_\_\_\_ 5)
  - a) viscous damping b) coulomb damping
  - c) wet damping d) fluid damping
- Mass of flywheel can be calculated as 6)  $\pi D^2 A^2 p$ a)  $\pi DA^2 p$ b)
  - DA<sup>2</sup>p c) πDA p d)
- Value of  $\theta$  is in 2 stroke engine. 7)
  - $\pi/2$ a) Π b)
  - c) 4π d) 2π
- Interference can be avoided if addendum circle of two mating gears cuts 8) the common tangent to base circle between
  - pitch point & length of recess a) point of approach & recess b) c) point of tangency
    - d) pitch points

Max. Marks: 70

Marks: 14

SLR-FM-653



- $mr\omega^2/2$

Seat No.

- 9) The size of gear is usually specified by \_\_\_\_\_
  - a) pressure angle
- b) circular pitch

Set C

- c) diametral pitch
- d) pitch circle diameter

.

- 10) Ratio of speed of driver to driven is called as \_\_\_\_
  - a) train value b) speed ratio
  - c) train ratio d) speed value
- 11) In gear train when axes of shafts over which gears are mounted, move relative to a fixed axis is called \_\_\_\_\_.
  - a) simple GT b)
    - b) compound GT d) reverted GT
- 12) Gyroscopic effect occurs when \_\_\_\_\_.
  - a) axis of spin & precession are perpendicular
  - b) axis of spin & precession coinsides
  - c) axis of spin & axis of pitch are perpendicular
  - d) axis of spin & pitch are perpendicular
- 13) In four wheel effect of gyroscopic couple on outer wheel is \_\_\_\_\_
  - a) upward or downward

c) vertically upward

- b) vertically downwardd) None of these
- d) None of th
- 14) For static balancing of shaft \_\_\_\_\_.
  - a) can't sayboth force & couple is zero

c) epicyclic GT

- b) net couple is zero
- d) net force is zero

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### Seat No.

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section.

- 2) Figures to the right indicate full marks.
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- 4) Assume additional data, if necessary and mention it clearly.

#### Section – I

- **Q.2 a)** State law of gearing. Derive an equation for condition for constant velocity **06** ratio.
  - b) In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D E. The gear B meshes with gear E. The gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.
- Q.3 a) What is the function of a flywheel? How does it differ from that of a governor? Explain the terms 'fluctuation of energy' and 'fluctuation of speed' as applied to flywheels.
  - **b)** The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship:
    - 1) when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.
    - 2) when the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.
- **Q.4 a)** Explain construction and working of differential gear train with neat sketch. **06** Draw the table of motions.
  - b) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find:
    - 1) The angle turned through by pinion when one pair of teeth is in mesh; and
    - 2) The maximum velocity of sliding.



08

06

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#### Section – II

**SLR-FM-653** 

Set

Q.5 a) Distinguish between the static balancing and the dynamic balancing 04 A four cylinder vertical engine has cranks 150 mm long. The planes of b) 10 rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance. Q.6 Define the following terms: a) 04 1) Damping coefficient 2) Damping ratio 3) Logarithmic decrement 4) Amplitude reduction factor A vibrating system consists of a mass of 12 kg, a spring of a stiffness of 5.8 b) 10 N/mm and a dashpot of damping coefficient of 38 N/m/s. Find 1) critical damping coefficient 2) damping factor Logarithmic decrement 3) Ratio of two consecutive amplitudes, 4) 5) Frequency of vibration. Q.7 Explain the term whirling speed of a shaft. 06 a) A shaft as shown in Fig.7 (b) carries two masses namely C & D. The mass b) **08** A is 390 kg with radius of gyration of 0.70 m and mass B is 650 kg with a radius of gyration of 0.85 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) =  $80 \text{ GN/m}^2$ I C D Ē o 350 d 240 ¢ 250 φ150

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

## THEORY OF MACHINE - II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicates full marks.
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### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

b)

None of these

- Gyroscopic effect occurs when . 1)
  - a) axis of spin & precession are perpendicular
  - b) axis of spin & precession coinsides
  - c) axis of spin & axis of pitch are perpendicular
  - d) axis of spin & pitch are perpendicular

#### 2) In four wheel effect of gyroscopic couple on outer wheel is \_ vertically downward

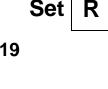
- a) upward or downward
- c) vertically upward d)
- For static balancing of shaft \_\_\_\_\_. 3)
  - b) a) can't say net couple is zero
  - c) both force & couple is zero net force is zero d)
- 4) In V-engine balancing if  $2\alpha = 90$ , value of Fp is
  - $mr\omega^2$ a)  $\sqrt{2mr\omega^2} \cdot \sin 2\theta / n$ b)
  - d)  $mr\omega^2/2$ c)  $mr\omega^2 / \sqrt{2}$
- Longitudinal vibrations are said to occurs when the particles of the body 5) moves .
  - a) perpendicular to axis
  - b) in a circle about axis
  - c) parallel to axis
  - d) none of these

c) wet damping

- 6) In vibration isolation system if  $w / wn < \sqrt{2}$  then for all values of damping factor the transmissibility will be \_\_\_\_\_.
  - a) less than unity b) greater than unity
  - c) equal to unity d) Zero
- Deflection of simply supported shaft with load at dist a from one end can 7) be given as \_\_\_\_\_.
  - a)  $wl^3 / 48 El$ Wl<sup>4</sup> / 84 El b)
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- 8) When damping is provided by fluid it is called as \_\_\_\_\_. a) viscous damping
  - coulomb damping b)
  - fluid damping d)

Marks: 14

## SLR-FM-653



Max. Marks: 70

|     |   |                 | Set   |
|-----|---|-----------------|---|
| 9)  | Mass of flywheel can be calculated<br>a) πDA <sup>2</sup> p<br>c) πDA p   |                 | πD <sup>2</sup> A <sup>2</sup> p<br>DA <sup>2</sup> p |
| 10) | Value of θ is in 2 stroke eng<br>a) π<br>c) 4π  | ne.<br>b)<br>d) | π / 2<br>2π   |
| 11) | Interference can be avoided if adde<br>the common tangent to base circle<br>a) point of approach & recess<br>c) point of tangency | betwe<br>b)     | en  |
| 12) | The size of gear is usually specified<br>a) pressure angle<br>c) diametral pitch  | b)              | <br>circular pitch<br>pitch circle diameter           |
| 13) | Ratio of speed of driver to driven is<br>a) train value<br>c) train ratio   | b)              | d as<br>speed ratio<br>speed value                    |
| 14) | In gear train when axes of shafts ov<br>relative to a fixed axis is called<br>a) simple GT<br>c) epicyclic GT                     |                 | -   |

R

### Seat No.

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

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#### Section – I

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  - b) In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D E. The gear B meshes with gear E. The gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.
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08

06

## Page **12** of **16**

#### Section – II

**SLR-FM-653** 

Set

R

Q.5 a) Distinguish between the static balancing and the dynamic balancing 04 A four cylinder vertical engine has cranks 150 mm long. The planes of b) 10 rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance. Q.6 Define the following terms: a) 04 1) Damping coefficient 2) Damping ratio 3) Logarithmic decrement 4) Amplitude reduction factor A vibrating system consists of a mass of 12 kg, a spring of a stiffness of 5.8 b) 10 N/mm and a dashpot of damping coefficient of 38 N/m/s. Find 1) critical damping coefficient 2) damping factor Logarithmic decrement 3) Ratio of two consecutive amplitudes, 4) 5) Frequency of vibration. Q.7 Explain the term whirling speed of a shaft. 06 a) A shaft as shown in Fig.7 (b) carries two masses namely C & D. The mass b) 08 A is 390 kg with radius of gyration of 0.70 m and mass B is 650 kg with a radius of gyration of 0.85 m. Determine the frequency of torsional vibrations. Take modulus of rigidity (G) =  $80 \text{ GN/m}^2$ I C D Ē o 350 d 240 ¢ 250 φ150

 $\phi 150$   $\phi 150$  $\phi$ 

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Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

**Mechanical Engineering** THEORY OF MACHINE - II

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### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

3)

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- In vibration isolation system if  $w / wn < \sqrt{2}$  then for all values of 1) damping factor the transmissibility will be .
  - a) less than unity greater than unity b)
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- 5) Value of  $\theta$  is in 2 stroke engine.
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- Interference can be avoided if addendum circle of two mating gears cuts 6) the common tangent to base circle between
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8) Ratio of speed of driver to driven is called as

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- In gear train when axes of shafts over which gears are mounted, move 9) relative to a fixed axis is called \_\_\_\_ a) simple GT b) compound GT
  - epicyclic GT c) d) reverted GT

Max. Marks: 70

**SLR-FM-653** 

Set

Marks: 14

10) Gyroscopic effect occurs when \_\_\_\_\_.

- a) axis of spin & precession are perpendicular
- b) axis of spin & precession coinsides
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**SLR-FM-653** 

Set S

- c) vertically upward d) None of these
- For static balancing of shaft \_\_\_\_\_. a) can't say b) net couple is zero
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  - c)  $mr\omega^2/\sqrt{2}$  d)  $mr\omega^2/2$
- 14) Longitudinal vibrations are said to occurs when the particles of the body moves \_\_\_\_\_.
  - a) perpendicular to axis
  - b) in a circle about axis
  - c) parallel to axis

12)

d) none of these

### Seat No.

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering THEORY OF MACHINE – II

Day & Date: Friday, 06-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

06

**08** 

**Instructions:** 1) Solve any two questions from each section.

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#### Section – I

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    - 1) when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.
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#### Page 16 of 16

#### Section – II

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400 420 All dimensions are in mm. Fig.7 (b)

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**SLR-FM-653** 

Set

| Seat |  |
|------|--|
| No.  |  |
|      |  |

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** HEAT AND MASS TRANSFER

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of scientific calculator is allowed.
- 5) Neat diagrams must be drawn wherever necessary.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- A fin will be effective only when Biot number is 1)
  - a) less than one b)
  - c) equal to one
- 2) Transient conduction means
  - a) heat transfer with small temperature difference
  - b) variation of temperature with time
  - c) heat transfer for a short time
  - d) very little heat transfer
- 3) Heat is transferred by all the three modes, viz., conduction, convection and radiation in
  - a) refrigerator freezer coils melting of ice b)
  - c) boiler tubes d) steam condenser
- 4) A composite plane wall is made of two different materials of same thickness with thermal conductivities  $k_1$  and  $k_2$  respectively. The equivalent thermal conductivity of the slab is \_\_\_\_\_.
  - a)  $k_1 + k_2$ b) k1 k2
  - c)  $(2k_1 k_2) / (k_1 + k_2)$ d) None of these
- 5) It is considered appropriate that area of cross section, for a finned surface, be
  - a) reduced along the length
  - b) increased along the length
  - c) maintained constant along the length
  - d) none of the above

#### 6) The Prandtl number for air is about

- a) 0.1 b) 0.7
- c) 1.7 d) 1.0
- 7) For free convection, Nusselt number is a function of \_\_\_\_\_.
  - a) Prandtl and Grashof number
  - b) Reynoids and Grashof number
  - c) Grashof number only
  - d) Reynolds and Prandtl number

Max. Marks: 70

Marks: 14

Set

more than one

- d) infinite



- With increasing temperature, the wave length for maximum monochromatic emission \_\_\_\_\_.
  - a) decreases and then increases
  - b) increases and then decreases
  - c) increases continuously
  - d) decreases continuously
- 9) Every substance in the universe radiates \_\_\_\_\_.
  - a) at all temperature above 0 K
  - b) at all temperature above 0°C
  - c) only above room temperature
  - d) depending on the environment temperature
- 10) The correction factor for evaporators is \_\_\_\_\_
  - a) less than 1 b) 1
  - c) greater than 1 d) zero
- 11) An automobile radiator is \_\_\_\_\_ type of heat exchanger.
  - a) cross-flow

- b) regenerator
- c) counter-flow d) recuperator
- 12) In pool boiling, the heat flux becomes maximum towards the end of \_\_\_\_\_.
  - a) free convection boiling regime
    - b) nucleate boiling regimed) stable film boiling regime
  - c) unstable film boiling regime d)
- 13) The operation of a heat exchanger is independent of flow direction using the two fluids as \_\_\_\_\_.
  - a) oil and gas
- b) water and gas
- c) steam and water d) oil and water
- 14) If  $\varepsilon$  is the emissivity of surfaces and shields and *n* is the number of shields introduced between the two surfaces, then overall emissivity is given \_\_\_\_\_.
  - a) n ɛ
  - c)  $\epsilon/[(n+1)(2-\epsilon)]$
- b)  $1/(2n \epsilon)$
- d) None of these

### Seat No.

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering HEAT AND MASS TRANSFER

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Answer any two questions from each Section.

- 2) Use of scientific calculator is allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

#### Section – I

#### Q.2 Attempt the following questions.

- a) Define thermal diffusivity. Explain its physical significance. 04
- b) Derive the general heat conduction equation in three dimensions in Cartesian coordinates.
- c) The exterior wall of the house consists of 10.16 cm layer of common brick 05 having thermal conductivity 0.7 W/mK. It is followed by 3.8 cm layer of gypsum plaster with thermal conductivity of 0.48 W/mK. What thickness of loosely packed rock wool insulation having thermal conductivity of 0.065 W/mK should be added to reduce the heat loss through the wall by 80 %.

#### Q.3 Attempt the following questions.

- a) Derive an expression for critical radius of insulation for a cylinder.
- b) A steel pipe having thermal conductivity of 43 W/mK, with 5 cm I.D. and 7.5 cm O.D., is covered with 2.5 cm asbestos insulation having thermal conductivity 0.20 W/mK. The hot gases are flowing in the pipe at 300 <sup>0</sup>C (h<sub>i</sub>=280 W/m<sup>2</sup>K), while outer surface (h<sub>°</sub>=18 W/m<sup>2</sup>K) is exposed to an ambient temperature of 30 <sup>0</sup>C. Estimate the heat loss to air through the pipe of 3 m length and temperature drop across the layers of insulation.
- c) The rod of copper protrudes from a wall which is at 300 °C. The other end of the rod is inside the room where the temperature is 15 °C. The rod is 3 mm in diameter and 30 mm in length. The heat transfer coefficient between rod surface and environment is 30 W/m²K. Estimate the total heat dissipated by the rod if thermal conductivity of the rod is 300 W/mK. Also determine the temperature of the rod at 15mm from the wall.

#### Q.4 Attempt the following questions.

- a) Differentiate between forced convection and natural convection heat transfer. 04
- b) Using dimensional analysis show that for forced convection heat transfer
   05 Nu=f(Re,Pr)
- c) In a certain glass making process, a square plate of glass 1 m<sup>2</sup> area and 3 mm thick heated uniformly to 90 °C is cooled by air at 20 °C is flowing over both sides parallel to the plate at 2 m/s. Calculate heat transfer from both sides of the plate. Take following properties of air

$$g = 1.076 \text{ kg/m}^3 \text{ Cp} = 1008 \frac{\text{J}}{\text{kgK}} \text{ K} = 0.0286 \frac{\text{W}}{\text{mK}} \mu = 19.8 \times 10^{-6} \text{ N} - s / m^2$$

Use the relation  $Nu = 0.664 (Re)^{0.5} (Pr)^{1/3}$ 

Max. Marks: 56

05

04

05

Set

#### Section – II

SLR-FM-654

Set P

| Q.5 | Atte<br>a)             | empt the following questions.<br>Explain the terms<br>1) Solid angle<br>2) Lamberts cosine rule   | 04             |
|-----|------------------------|---|----------------|
|     | b)                     | Determine the shape factor for the cylindrical cavity of diameter 'D' and depth 'H' with respect to itself.   | 05             |
|     | c)                     | Two large parallel plates at temperatures of 1000 K and 600 K having<br>emissivities 0.5 and 0.8 for hot and cold plate respectively. If a polished<br>aluminum shield of emissivity 0.1 on one side and 0.05 on other side is<br>placed between them, Calculate the heat transfer rate by the radiation per<br>square meter with and without radiation shield. Also find percentage<br>reduction in the heat transfer.   | 05             |
| Q.6 | Atte<br>a)<br>b)<br>c) | <b>Example the following questions.</b><br>State and explain Ficks law diffusion in mass transfer.<br>With the help of neat sketch explain pool boiling curve in detail.<br>Calculate maximum possible heat transfer area for parallel flow heat<br>exchanger for maximum possible theoretical heat transfer between hot and<br>cold fluid in heat exchanger. Given that the hot fluid with mass flow rate of<br>0.16 kg/s, inlet temperature of 80 °C and specific heat 1.45 KJ/kg.K is<br>entering in the heat exchanger and the cold fluid with mass flow rate of<br>0.08 kg/s, inlet temperature of 20 °C and specific heat 4.187 KJ/kg.K is<br>entering in the heat exchanger. Take $U = 75 w/m^2 k$ | 04<br>05<br>05 |
| Q.7 | Atte<br>a)<br>b)<br>c) | <b>Explain the concept of fouling factor in heat exchanger.</b><br>Derive an expression for LMTD for parallel flow heat exchanger.<br>Water enters a counter flow, double pipe heat exchanger at 15 $^{\circ}$ C flowing at the rate of 1300 kg/h. It is heated by oil (C <sub>p</sub> = 2000 J/kg.K) flowing at the rate of 550 kg/h from the inlet temperature of 94 $^{\circ}$ C. For an area of 1 m <sup>2</sup>  | 04<br>05<br>05 |

and an overall heat transfer coefficient of 1075 W/m<sup>2</sup>K, determine the total heat transfer and the outlet temperatures of water and oil. Take  $C_p$  for water=4186 J/kg .K

| Seat |  |
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#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering HEAT AND MASS TRANSFER

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Use of scientific calculator is allowed.
- 5) Neat diagrams must be drawn wherever necessary.

### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

### Marks: 14

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) With increasing temperature, the wave length for maximum monochromatic emission \_\_\_\_\_.
  - a) decreases and then increases
  - b) increases and then decreases
  - c) increases continuously
  - d) decreases continuously
- 2) Every substance in the universe radiates \_\_\_\_\_.
  - a) at all temperature above 0 K
  - b) at all temperature above 0°C
  - c) only above room temperature
  - d) depending on the environment temperature
- 3) The correction factor for evaporators is \_\_\_\_\_
  - a) less than 1 b) 1
  - c) greater than 1 d) zero
- 4) An automobile radiator is \_\_\_\_\_ type of heat exchanger.
  - a) cross-flow b) regenerator
  - c) counter-flow d) recuperator

5) In pool boiling, the heat flux becomes maximum towards the end of \_\_\_\_\_.

- a) free convection boiling regime b) nucleate boiling regime
  - c) unstable film boiling regime d) stable film boiling regime
- 6) The operation of a heat exchanger is independent of flow direction using the two fluids as \_\_\_\_\_.
  - a) oil and gas b) water and gas
  - c) steam and water d) oil and water
- If ε is the emissivity of surfaces and shields and *n* is the number of shields introduced between the two surfaces, then overall emissivity is given \_\_\_\_\_.
  - a) nε
  - c)  $\epsilon/[(n+1)(2-\epsilon)]$
- b)  $1/(2n \epsilon)$
- d) None of these



Max. Marks: 70

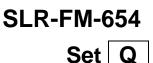
- 8) A fin will be effective only when Biot number is .
  - a) less than one

9)

- c) equal to one
- Transient conduction means \_\_\_\_\_.
- a) heat transfer with small temperature difference
  - b) variation of temperature with time
  - c) heat transfer for a short time
  - d) very little heat transfer
- Heat is transferred by all the three modes, viz., conduction, convection 10) and radiation in \_\_\_\_\_.
  - a) refrigerator freezer coils b)
  - c) boiler tubes steam condenser d)
- 11) A composite plane wall is made of two different materials of same thickness with thermal conductivities  $k_1$  and  $k_2$  respectively. The equivalent thermal conductivity of the slab is .
  - a)  $k_1 + k_2$
  - c)  $(2k_1 k_2) / (k_1 + k_2)$ d)
- 12) It is considered appropriate that area of cross section, for a finned surface, be
  - a) reduced along the length
  - b) increased along the length
  - c) maintained constant along the length
  - d) none of the above
- The Prandtl number for air is about 13)
  - a) 0.1 b) 0.7 c) 1.7 d) 1.0
- 14) For free convection, Nusselt number is a function of \_\_\_\_\_.
  - a) Prandtl and Grashof number
  - b) Reynoids and Grashof number
  - c) Grashof number only
  - d) Reynolds and Prandtl number

- more than one
- d) infinite

b)



- b)

  - $\mathbf{k}_1 \mathbf{k}_2$
  - None of these

melting of ice

### Seat No.

#### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** HEAT AND MASS TRANSFER

Day & Date: Monday, 09-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Answer any two questions from each Section.

- 2) Use of scientific calculator is allowed.
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- 4) Assume suitable data if necessary.

#### Section – I

#### Q.2 Attempt the following questions.

- Define thermal diffusivity. Explain its physical significance. 04 a)
- b) Derive the general heat conduction equation in three dimensions in Cartesian coordinates.
- c) The exterior wall of the house consists of 10.16 cm layer of common brick 05 having thermal conductivity 0.7 W/mK. It is followed by 3.8 cm layer of gypsum plaster with thermal conductivity of 0.48 W/mK. What thickness of loosely packed rock wool insulation having thermal conductivity of 0.065 W/mK should be added to reduce the heat loss through the wall by 80 %.

#### Q.3 Attempt the following questions.

- Derive an expression for critical radius of insulation for a cylinder. a)
- A steel pipe having thermal conductivity of 43 W/mK, with 5 cm I.D. and b) 7.5 cm O.D., is covered with 2.5 cm asbestos insulation having thermal conductivity 0.20 W/mK. The hot gases are flowing in the pipe at 300 °C  $(h_i=280 \text{ W/m}^2\text{K})$ , while outer surface  $(h_0=18 \text{ W/m}^2\text{K})$  is exposed to an ambient temperature of 30 °C. Estimate the heat loss to air through the pipe of 3 m length and temperature drop across the layers of insulation.
- The rod of copper protrudes from a wall which is at 300 °C. The other end 05 c) of the rod is inside the room where the temperature is 15 <sup>0</sup>C. The rod is 3 mm in diameter and 30 mm in length. The heat transfer coefficient between rod surface and environment is 30 W/m<sup>2</sup>K. Estimate the total heat dissipated by the rod if thermal conductivity of the rod is 300 W/mK. Also determine the temperature of the rod at 15mm from the wall.

#### Q.4 Attempt the following questions.

- Differentiate between forced convection and natural convection heat 04 a) transfer.
- **b)** Using dimensional analysis show that for forced convection heat transfer 05 Nu=f(Re,Pr)
- In a certain glass making process, a square plate of glass 1 m<sup>2</sup> area and 3 05 c) mm thick heated uniformly to 90 °C is cooled by air at 20 °C is flowing over both sides parallel to the plate at 2 m/s. Calculate heat transfer from both sides of the plate. Take following properties of air

$$g = 1.076 \text{ kg/m}^3 \text{ Cp} = 1008 \frac{\text{J}}{\text{kgK}} \text{ K} = 0.0286 \frac{\text{W}}{\text{mK}} \mu = 19.8 \times 10^{-6} \text{ N} - s / m^2$$

Use the relation  $Nu = 0.664 (Re)^{0.5} (Pr)^{1/3}$ 



Max. Marks: 56

- 04
  - 05

05

#### Section – II

SLR-FM-654

Set Q

| Q.5 | Atte<br>a)<br>b)<br>c) | <ul> <li>Explain the terms</li> <li>1) Solid angle</li> <li>2) Lamberts cosine rule</li> <li>Determine the shape factor for the cylindrical cavity of diameter 'D' and depth 'H' with respect to itself.</li> <li>Two large parallel plates at temperatures of 1000 K and 600 K having emissivities 0.5 and 0.8 for hot and cold plate respectively. If a polished aluminum shield of emissivity 0.1 on one side and 0.05 on other side is</li> </ul>   | 04<br>05<br>05 |
|-----|------------------------|---|----------------|
|     |                        | placed between them, Calculate the heat transfer rate by the radiation per<br>square meter with and without radiation shield. Also find percentage<br>reduction in the heat transfer.   |                |
| Q.6 | Atte<br>a)<br>b)<br>c) | <b>Example the following questions.</b><br>State and explain Ficks law diffusion in mass transfer.<br>With the help of neat sketch explain pool boiling curve in detail.<br>Calculate maximum possible heat transfer area for parallel flow heat<br>exchanger for maximum possible theoretical heat transfer between hot and<br>cold fluid in heat exchanger. Given that the hot fluid with mass flow rate of<br>0.16 kg/s, inlet temperature of 80 °C and specific heat 1.45 KJ/kg.K is<br>entering in the heat exchanger and the cold fluid with mass flow rate of<br>0.08 kg/s, inlet temperature of 20 °C and specific heat 4.187 KJ/kg.K is<br>entering in the heat exchanger. Take $U = 75 w/m^2 k$ | 04<br>05<br>05 |
| Q.7 | Atte<br>a)<br>b)<br>c) | <b>Explain the concept of fouling factor in heat exchanger.</b><br>Derive an expression for LMTD for parallel flow heat exchanger.<br>Water enters a counter flow, double pipe heat exchanger at 15 $^{\circ}$ C flowing at the rate of 1300 kg/h. It is heated by oil (C <sub>p</sub> = 2000 J/kg.K) flowing at the rate of 550 kg/h from the inlet temperature of 94 $^{\circ}$ C. For an area of 1 m <sup>2</sup>  | 04<br>05<br>05 |

and an overall heat transfer coefficient of 1075 W/m<sup>2</sup>K, determine the total heat transfer and the outlet temperatures of water and oil. Take  $C_p$  for water=4186 J/kg .K

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### MCQ/Objective Type Questions

**Duration: 30 Minutes** 

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) It is considered appropriate that area of cross section, for a finned surface, be
  - a) reduced along the length
  - b) increased along the length
  - c) maintained constant along the length
  - d) none of the above
- 2) The Prandtl number for air is about \_\_\_\_\_
  - a) 0.1 b) 0.7 c) 1.7 d) 1.0
- 3) For free convection, Nusselt number is a function of \_\_\_\_\_.
  - a) Prandtl and Grashof number
    - b) Reynoids and Grashof number
    - c) Grashof number only
  - d) Reynolds and Prandtl number
- 4) With increasing temperature, the wave length for maximum monochromatic emission \_\_\_\_\_.

regenerator

b)

- a) decreases and then increases
- b) increases and then decreases
- c) increases continuously
- d) decreases continuously
- 5) Every substance in the universe radiates \_\_\_\_\_.
  - a) at all temperature above 0 K
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  - c) only above room temperature
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- 6) The correction factor for evaporators is \_\_\_\_\_
  - a) less than 1 b) 1
  - c) greater than 1 d) zero
- 7) An automobile radiator is \_\_\_\_\_ type of heat exchanger.
  - a) cross-flow
  - c) counter-flow d) recuperator



Set

R

Marks: 14

|     |  |                  | Set R                            |
|-----|--|------------------|----------------------------------|
| 8)  | In pool boiling, the heat flux becomes<br>a) free convection boiling regime<br>c) unstable film boiling regime   | b)               | nucleate boiling regime          |
| 9)  | The operation of a heat exchanger is<br>the two fluids as<br>a) oil and gas<br>c) steam and water  |                  | water and gas                    |
| 10) | <ul> <li>If ε is the emissivity of surfaces and s shields introduced between the two s given</li> <li>a) n ε</li> </ul>  | shielo<br>surfa  | ds and <i>n</i> is the number of |
|     | c) $\epsilon/[(n+1)(2-\epsilon)]$  |                  | None of these                    |
| 11) | A fin will be effective only when Biot<br>a) less than one<br>c) equal to one  | numl<br>b)<br>d) | more than one                    |
| 12) | <ul> <li>Transient conduction means</li> <li>a) heat transfer with small tempera</li> <li>b) variation of temperature with tim</li> <li>c) heat transfer for a short time</li> <li>d) very little heat transfer</li> </ul> | ture             | difference                       |
| 13) | Heat is transferred by all the three m<br>and radiation in<br>a) refrigerator freezer coils<br>c) boiler tubes   |                  | melting of ice                   |
| 14) | A composite plane wall is made of tw   |                  |                                  |

- 1 with thermal conductivities  $k_1$  and  $k_2$  respectively. The equivalent thermal conductivity of the slab is \_\_\_\_\_. a)  $k_1 + k_2$  b)  $k_1 k_2$ 

  - c)  $(2k_1 k_2) / (k_1 + k_2)$
- d) None of these

| loosely packed rock wool insulation having thermal conductivity of 0.065 |  |
|--|--|
| W/mK should be added to reduce the heat loss through the wall by 80 %.   |  |

#### Q.3

- Derive an expression for critical radius of insulation for a cylinder. a)
- A steel pipe having thermal conductivity of 43 W/mK, with 5 cm I.D. and b) 7.5 cm O.D., is covered with 2.5 cm asbestos insulation having thermal conductivity 0.20 W/mK. The hot gases are flowing in the pipe at 300 °C  $(h_i=280 \text{ W/m}^2\text{K})$ , while outer surface  $(h_0=18 \text{ W/m}^2\text{K})$  is exposed to an ambient temperature of 30 °C. Estimate the heat loss to air through the pipe of 3 m length and temperature drop across the layers of insulation.
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#### Q.4 Attempt the following questions.

- a) Differentiate between forced convection and natural convection heat transfer.
- **b)** Using dimensional analysis show that for forced convection heat transfer 05 Nu=f(Re,Pr)
- In a certain glass making process, a square plate of glass 1 m<sup>2</sup> area and 3 mm thick heated uniformly to 90  $^{\circ}$ C is cooled by air at 20  $^{\circ}$ C is flowing over 05 c) both sides parallel to the plate at 2 m/s. Calculate heat transfer from both sides of the plate. Take following properties of air

$$g = 1.076 \text{ kg/m}^3 \text{ Cp} = 1008 \frac{\text{J}}{\text{kgK}} \text{ K} = 0.0286 \frac{\text{W}}{\text{mK}} \mu = 19.8 \times 10^{-6} \text{ N} - s / m^2$$

Use the relation  $Nu = 0.664 (Re)^{0.5} (Pr)^{1/3}$ 

HEAT AND MASS TRANSFER

Instructions: 1) Answer any two questions from each Section.

2) Use of scientific calculator is allowed. 3) Figures to the right indicate full marks. 4) Assume suitable data if necessary.

**Mechanical Engineering** 

Section – I

Derive the general heat conduction equation in three dimensions in

The exterior wall of the house consists of 10.16 cm layer of common brick

T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019

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#### having thermal conductivity 0.7 W/mK. It is followed by 3.8 cm layer of gypsum plaster with thermal conductivity of 0.48 W/mK. What thickness of

Attempt the following questions.

Cartesian coordinates.

### Attempt the following questions.

Define thermal diffusivity. Explain its physical significance.

04

05

04

05

05

04

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Q.2

a) b)

c)

Page **12** of **16** 

#### Section – II

| Q.5 |                                    | empt the following questions.   | • •      |  |
|-----|------------------------------------|---|----------|--|
|     | a)                                 | Explain the terms <ol> <li>Solid angle</li> <li>Lamberts cosine rule</li> </ol>   | 04       |  |
|     | b)                                 | Determine the shape factor for the cylindrical cavity of diameter 'D' and depth 'H' with respect to itself.   | 05       |  |
|     | c)                                 | Two large parallel plates at temperatures of 1000 K and 600 K having<br>emissivities 0.5 and 0.8 for hot and cold plate respectively. If a polished<br>aluminum shield of emissivity 0.1 on one side and 0.05 on other side is<br>placed between them, Calculate the heat transfer rate by the radiation per<br>square meter with and without radiation shield. Also find percentage<br>reduction in the heat transfer. | 05       |  |
| Q.6 | 6 Attempt the following questions. |   |          |  |
|     | a)<br>b)                           | State and explain Ficks law diffusion in mass transfer.<br>With the help of neat sketch explain pool boiling curve in detail.   | 04<br>05 |  |
|     | c)                                 | Calculate maximum possible heat transfer area for parallel flow heat  | 05       |  |
|     | - ,                                | exchanger for maximum possible theoretical heat transfer between hot and cold fluid in heat exchanger. Given that the hot fluid with mass flow rate of 0.16 kg/s, inlet temperature of 80 <sup>0</sup> C and specific heat 1.45 KJ/kg.K is  |          |  |
|     |                                    | entering in the heat exchanger and the cold fluid with mass flow rate of  |          |  |
|     |                                    | 0.08 kg/s, inlet temperature of 20 $^{0}$ C and specific heat 4.187 KJ/kg.K is  |          |  |
|     | _                                  | entering in the heat exchanger. Take $\cup = 75 w/m^2 k$  |          |  |
| Q.7 |                                    | empt the following questions.   | 04       |  |
|     | a)<br>b)                           | Explain the concept of fouling factor in heat exchanger.<br>Derive an expression for LMTD for parallel flow heat exchanger.   | 05<br>05 |  |
|     | c)                                 | Water enters a counter flow, double pipe heat exchanger at 15 $^{\circ}$ C flowing at the rate of 1300 kg/h. It is heated by oil (C <sub>p</sub> = 2000 J/kg.K) flowing at the rate of 550 kg/h from the inlet temperature of 94 $^{\circ}$ C. For an area of 1 m <sup>2</sup>  |          |  |

and an overall heat transfer coefficient of 1075 W/m<sup>2</sup>K, determine the total heat transfer and the outlet temperatures of water and oil. Take  $C_p$  for water=4186 J/kg .K



# SLR-FM-654 Set R

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** HEAT AND MASS TRANSFER

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# MCQ/Objective Type Questions

**Duration: 30 Minutes** 

Seat

No.

- Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14
  - The correction factor for evaporators is 1)
    - a) less than 1 1 b)
    - c) greater than 1 d) zero
  - 2) An automobile radiator is \_\_\_\_\_ type of heat exchanger.
    - a) cross-flow regenerator b)
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  - In pool boiling, the heat flux becomes maximum towards the end of . 3)
    - a) free convection boiling regime b) nucleate boiling regime
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  - The operation of a heat exchanger is independent of flow direction using 4) the two fluids as . b) water and gas
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    - oil and water c) steam and water d)
  - If  $\varepsilon$  is the emissivity of surfaces and shields and *n* is the number of 5) shields introduced between the two surfaces, then overall emissivity is given \_\_\_\_\_.
    - a) ne
    - c)  $\epsilon/[(n+1)(2-\epsilon)]$
- b)  $1/(2n - \varepsilon)$
- d) None of these
- 6) A fin will be effective only when Biot number is \_\_\_\_\_
  - a) less than one more than one b)
  - c) equal to one d) infinite
- Transient conduction means \_\_\_\_\_ 7)
  - a) heat transfer with small temperature difference
  - b) variation of temperature with time
  - c) heat transfer for a short time
  - d) very little heat transfer
- 8) Heat is transferred by all the three modes, viz., conduction, convection and radiation in \_\_\_\_\_.
  - a) refrigerator freezer coils
  - c) boiler tubes
- melting of ice b)
- d) steam condenser



Max. Marks: 70



- 9) A composite plane wall is made of two different materials of same thickness with thermal conductivities  $k_1$  and  $k_2$  respectively. The equivalent thermal conductivity of the slab is \_\_\_\_\_. b)
  - a)  $k_1 + k_2$

- $k_1 k_2$
- c)  $(2k_1 k_2) / (k_1 + k_2)$ d) None of these
- 10) It is considered appropriate that area of cross section, for a finned surface, be
  - a) reduced along the length
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  - c) 1.7 d) 1.0
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T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-201 Mechanical Engineering HEAT AND MASS TRANSFER

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Max. Marks: 56

05

04

05

- Instructions: 1) Answer any two questions from each Section.
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## Section – I

## Q.2 Attempt the following questions.

- a) Define thermal diffusivity. Explain its physical significance. 04
- b) Derive the general heat conduction equation in three dimensions in Cartesian coordinates.
- c) The exterior wall of the house consists of 10.16 cm layer of common brick 05 having thermal conductivity 0.7 W/mK. It is followed by 3.8 cm layer of gypsum plaster with thermal conductivity of 0.48 W/mK. What thickness of loosely packed rock wool insulation having thermal conductivity of 0.065 W/mK should be added to reduce the heat loss through the wall by 80 %.

## **Q.3** Attempt the following questions.

- a) Derive an expression for critical radius of insulation for a cylinder.
- b) A steel pipe having thermal conductivity of 43 W/mK, with 5 cm I.D. and 7.5 cm O.D., is covered with 2.5 cm asbestos insulation having thermal conductivity 0.20 W/mK. The hot gases are flowing in the pipe at 300 °C (h<sub>i</sub>=280 W/m<sup>2</sup>K), while outer surface (h<sub>°</sub>=18 W/m<sup>2</sup>K) is exposed to an ambient temperature of 30 °C. Estimate the heat loss to air through the pipe of 3 m length and temperature drop across the layers of insulation.
- c) The rod of copper protrudes from a wall which is at 300 °C. The other end of the rod is inside the room where the temperature is 15 °C. The rod is 3 mm in diameter and 30 mm in length. The heat transfer coefficient between rod surface and environment is 30 W/m²K. Estimate the total heat dissipated by the rod if thermal conductivity of the rod is 300 W/mK. Also determine the temperature of the rod at 15mm from the wall.

## Q.4 Attempt the following questions.

- a) Differentiate between forced convection and natural convection heat transfer.
   04
- b) Using dimensional analysis show that for forced convection heat transfer
   05 Nu=f(Re,Pr)
- c) In a certain glass making process, a square plate of glass 1 m<sup>2</sup> area and 3 mm thick heated uniformly to 90 °C is cooled by air at 20 °C is flowing over both sides parallel to the plate at 2 m/s. Calculate heat transfer from both sides of the plate. Take following properties of air

Set S



Seat No.

## Section – II

SLR-FM-654

Set S

| Q.5 | Atte<br>a)<br>b)<br>c) | <ul> <li>Explain the terms</li> <li>1) Solid angle</li> <li>2) Lamberts cosine rule</li> <li>Determine the shape factor for the cylindrical cavity of diameter 'D' and depth 'H' with respect to itself.</li> <li>Two large parallel plates at temperatures of 1000 K and 600 K having emissivities 0.5 and 0.8 for hot and cold plate respectively. If a polished aluminum shield of emissivity 0.1 on one side and 0.05 on other side is placed between them, Calculate the heat transfer rate by the radiation per</li> </ul>   | 04<br>05<br>05 |
|-----|------------------------|--|----------------|
| Q.6 | Atte<br>a)<br>b)<br>c) | square meter with and without radiation shield. Also find percentage reduction in the heat transfer.<br><b>Empt the following questions.</b><br>State and explain Ficks law diffusion in mass transfer.<br>With the help of neat sketch explain pool boiling curve in detail.<br>Calculate maximum possible heat transfer area for parallel flow heat<br>exchanger for maximum possible theoretical heat transfer between hot and<br>cold fluid in heat exchanger. Given that the hot fluid with mass flow rate of<br>0.16 kg/s, inlet temperature of 80 °C and specific heat 1.45 KJ/kg.K is<br>entering in the heat exchanger and the cold fluid with mass flow rate of                      | 04<br>05<br>05 |
| Q.7 | Atte<br>a)<br>b)<br>c) | 0.08 kg/s, inlet temperature of 20 $^{0}$ C and specific heat 4.187 KJ/kg.K is<br>entering in the heat exchanger. Take $\cup = 75 w/m^{2}k$<br><b>empt the following questions.</b><br>Explain the concept of fouling factor in heat exchanger.<br>Derive an expression for LMTD for parallel flow heat exchanger.<br>Water enters a counter flow, double pipe heat exchanger at 15 $^{0}$ C flowing<br>at the rate of 1300 kg/h. It is heated by oil (C <sub>p</sub> = 2000 J/kg.K) flowing at the<br>rate of 550 kg/h from the inlet temperature of 94 $^{0}$ C. For an area of 1 m <sup>2</sup><br>and an overall heat transfer coefficient of 1075 W/m <sup>2</sup> K, determine the total | 04<br>05<br>05 |

heat transfer and the outlet temperatures of water and oil. Take  $C_p$  for water=4186 J/kg .K

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METALLURGY

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in | answer |
|---|--------|
| book.   |        |

2) Figures to the right indicate full marks.

# **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

a)

c)

Seat

No.

#### Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

b)

- Pearlite is product of transformation. 1) Monotectic
- d) c) Eutectoid Peritectic
- Which of the following alloy is having best casting properties? 2) Eutectoid alloy b)
  - Eutectic alloy a)
  - Solid solution alloy c) Peritectic alloy d)
- Which of the following treatments is carried out to improve machinability of 3) Low carbon steels? Normalising
  - a) Homogenisation b) Recovery d) c)
- In  $\alpha$  brass which of the following is solute? 4)
  - b) a) Zn
  - C) Cu d) Tin
- True toughness of material can be measured by \_\_\_\_\_ test. 5)
  - Impact test a) b)
  - Fatigue test d) c)
- 6) Stainless steel powder is frequently produced by \_ a)
  - Carbonyl method Reduction method b) Atomization d)
  - Electrodeposition
- Which of the following treatments will result in formation of Martensite in 7) structure of steel?
  - a) Patenting b) Austempering
  - Normalising Martempering d) C)
- Which of the following alloys is hardened by precipitation hardeneing? 8)
  - Tin bronze Brass a) b) c)
    - Al Bronze d) Duralumin
- Which of the following method of powder manufacture is regarded as 9) mechanical methods of Powder mfg.?
  - a) Reduction Condensation b)
  - c) Electrodeposition d) Milling

**SLR-FM-655** 



Max. Marks: 70

Marks: 14

Recrystallisation annealing

Eutectic

- $Cu_3Zn$

- Creep test
- Tensile test

Which of the following treatment is based on isothermal transformation of 10) austenite?

- a) Annealing C)
- Normalizing b)

**SLR-FM-655** 

Set | P

- Patenting d) Tempering
- 11) Which of the following treatments is carried out to restore ductility of cold worked parts?
  - Homogenisation a) Partial Annealing C)
- b) Spherodising

Brinell

Vicker's

- d) Recrystallisation annealing
- Which hardness test is recommended to measure hardness of Razor 12) blade?
  - Rockwell b) a)
  - c) Shore's Schleroscope d)
- 13) Innoculation treatment is given to \_\_\_\_\_ Iron to produce Mehanite.
  - Gray Cast Iron b) White Cast Iron a) c) S G Iron
    - d) Chilled Cast Iron
- To produce tungsten powder which of the following method is employed? 14)
  - Reduction method a)
  - c) Electrodeposition
- Carbonyl method b)
- d) Atomization

## No. T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METALLURGY Max. Marks: 56 Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM Instructions: 1) Solve any two questions from each Section. 2) Neat sketches must be drawn wherever necessary. 3) Figure to the right indicates full marks. 4) Assume additional suitable data if necessary and state it clearly. Section – I **Q.2** a) Draw Fe-Fe<sub>3</sub>C equilibrium diagram. Label all the constituents and temperatures correctly.

- b) Draw microstructures of 0.18% C and 1% C steels. 04 c) Give classification of Metals. Compare between Steel & Cast Iron. 05 Q.3 Give typical composition, properties and application of any five of the 10 a) following: 1) HCHC steel 2) Free cutting steel HSS 4) Martensitic stainless steel 5) Cartridge brass
  - 6) Duralumin
  - **Babbits** 7)

Seat

b) Why Modification treatment given to AI-Si system?

## Q.4 Write a note on any four of the following:

- a) Explain the application of lever arm principle.
- b) Draw neat sketch of interstitial and substitutional solid solution.
- c) Compare between S.G. Iron and malleable iron.
- d) Explain why Copper is an essential constituent of babbits?
- e) What are composites? What are their applications?
- f) Explain the effect of Si and Ni on properties of steel.

## Section – II

| Q.5 | a)       | Draw T-T-T diagram for eutectoid steel. What is significance of Critical cooling rate.   | 05       |
|-----|----------|--|----------|
|     | b)       | Explain the Normalizing process with Objectives.   | 05       |
|     | C)       | Explain the significance of Hardenability.   | 04       |
| Q.6 | a)<br>b) | What are the different types of tempering? Explain Temper embrittlement.<br>Give detail classification of Surface hardening. Explain Cyniding process in<br>brief. | 05<br>05 |
|     | c)       | Explain the process of Flame hardening in brief.   | 04       |
| Q.7 | a)       | Which properties are obtained from Tensile Testing? Draw stress-strain curve for mild steel and cast irons.  | 05       |
|     | b)       | What is creep? What is effect of temperature & stress on the creep strength?   | 05       |
|     | C)       | Draw flow chart for manufacture of self lubricated bearings.   | 04       |

# SLR-FM-655

05

04 14

Set

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METALLURGY

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer |  |
|--|--|
| book.  |  |

2) Figures to the right indicate full marks.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- Which of the following alloys is hardened by precipitation hardeneing? 1)
  - a) Brass b) Tin bronze
- d) Duralumin C) Al Bronze Which of the following method of powder manufacture is regarded as 2)

mechanical methods of Powder mfg.?

- a) Reduction b)
- C) Electrodeposition d)
- 3) Which of the following treatment is based on isothermal transformation of austenite?
  - a) Annealing Normalizing b)
  - Patenting d) Tempering C)
- 4) Which of the following treatments is carried out to restore ductility of cold worked parts?
  - Homogenisation a)
  - Partial Annealing d) c)
- Which hardness test is recommended to measure hardness of Razor 5) blade?
  - a) Rockwell b) Shore's Schleroscope d) C)
- Innoculation treatment is given to \_\_\_\_\_ Iron to produce Mehanite. 6)
  - Gray Cast Iron b) White Cast Iron a)
  - C) S G Iron d) Chilled Cast Iron
- To produce tungsten powder which of the following method is employed? 7)
  - Reduction method b) Carbonyl method d) Atomization
  - Electrodeposition C)

a)

- Pearlite is product of \_\_\_\_\_ transformation. 8)
  - Monotectic Eutectic a) b) C) Eutectoid d) Peritectic
- Which of the following alloy is having best casting properties? 9)
  - Eutectic alloy Eutectoid alloy a) b)
  - Peritectic alloy C) d) Solid solution alloy

- Condensation
- Milling

**SLR-FM-655** 

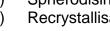


Marks: 14

- Spherodising
- Recrystallisation annealing
- Brinell Vicker's



Set



- b)

- Which of the following treatments is carried out to improve machinability of 10) Low carbon steels? Normalising
  - Homogenisation a) C)

11)

- b) d) Recrystallisation annealing Recovery
- In  $\alpha$  brass which of the following is solute?
- Zn a) b)  $Cu_3Zn$
- C) Cu d) Tin
- True toughness of material can be measured by \_\_\_\_\_ test. 12)
  - Impact test Creep test b) a)
  - Fatigue test d) Tensile test c)
- Stainless steel powder is frequently produced by \_ 13) Carbonyl method
  - **Reduction method** a) Electrodeposition C)
- Atomization d)

b)

- 14) Which of the following treatments will result in formation of Martensite in structure of steel?
  - Patenting a) C)

- Martempering
- b) Austempering
- d) Normalising



**SLR-FM-655** 

# Set Q

# No. T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METALLURGY Max. Marks: 56 2) Neat sketches must be drawn wherever necessary. 3) Figure to the right indicates full marks. 4) Assume additional suitable data if necessary and state it clearly. Section – I **Q.2** a) Draw Fe-Fe<sub>3</sub>C equilibrium diagram. Label all the constituents and temperatures correctly.

- b) Draw microstructures of 0.18% C and 1% C steels. 04 c) Give classification of Metals. Compare between Steel & Cast Iron. 05 Q.3 Give typical composition, properties and application of any five of the 10 a) following: 1) HCHC steel 2) Free cutting steel 3) HSS 4) Martensitic stainless steel 5) Cartridge brass 6) Duralumin Babbits 7) b) Why Modification treatment given to AI-Si system? 04
- b) Draw neat sketch of interstitial and substitutional solid solution. c) Compare between S.G. Iron and malleable iron. d) Explain why Copper is an essential constituent of babbits? e) What are composites? What are their applications? f) Explain the effect of Si and Ni on properties of steel. Section – II a) Draw T-T-T diagram for eutectoid steel. What is significance of Critical Q.5 05 cooling rate. b) Explain the Normalizing process with Objectives. 05 c) Explain the significance of Hardenability. 04 What are the different types of tempering? Explain Temper embrittlement. 05 Q.6 a) **b)** Give detail classification of Surface hardening. Explain Cyniding process in 05 brief. c) Explain the process of Flame hardening in brief.

Day & Date: Wednesday, 11-12-2019

Time: 02:30 PM To 05:30 PM

Seat

Instructions: 1) Solve any two questions from each Section.

# Q.4 Write a note on any four of the following: a) Explain the application of lever arm principle.

#### 04 Q.7 a) Which properties are obtained from Tensile Testing? Draw stress-strain 05 curve for mild steel and cast irons. 05

- **b)** What is creep? What is effect of temperature & stress on the creep strength? 04
- c) Draw flow chart for manufacture of self lubricated bearings.

SLR-FM-655

Set |

0

05

14

Set

Max. Marks: 70

Seat No.

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METALLURGY

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

Figures to the right indicate full marks.

# **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

# Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- True toughness of material can be measured by \_\_\_\_\_ test. 1) Creep test
  - a) Impact test
  - b) Fatigue test Tensile test C) d)
- 2) Stainless steel powder is frequently produced by \_ Carbonyl method
  - Reduction method a)
  - C) Electrodeposition
- Which of the following treatments will result in formation of Martensite in 3) structure of steel?

b)

d)

b)

Atomization

Condensation

- a) Patenting b) Austempering
- Martempering Normalising d) C)
- Which of the following alloys is hardened by precipitation hardeneing? 4) Tin bronze
  - Brass b) a)
  - Al Bronze Duralumin C) d)
- Which of the following method of powder manufacture is regarded as 5) mechanical methods of Powder mfg.?
  - Reduction a)

c)

- Electrodeposition d) Milling c)
- Which of the following treatment is based on isothermal transformation of 6) austenite?
  - a) Annealing b) Normalizing
  - Patenting d) Tempering c)
- 7) Which of the following treatments is carried out to restore ductility of cold worked parts?
  - a) Homogenisation b) Spherodising Partial Annealing c) d) Recrystallisation annealing
- Which hardness test is recommended to measure hardness of Razor 8) blade?
  - Rockwell Brinell a) b) Vicker's
  - Shore's Schleroscope d) c)
- 9) Innoculation treatment is given to \_\_\_\_ Iron to produce Mehanite. a) Gray Cast Iron White Cast Iron
  - b) S G Iron d) Chilled Cast Iron

Marks: 14

- Set R
- To produce tungsten powder which of the following method is employed? 10)
  - Reduction method a)
- Carbonyl method b)
- Electrodeposition C)
- d) Atomization
- Pearlite is product of \_\_\_\_\_ transformation. 11)
  - a) Monotectic b) Eutectic
  - C) Eutectoid d) Peritectic
- Which of the following alloy is having best casting properties? 12)
  - Eutectic alloy Eutectoid alloy a) b)
    - Peritectic alloy Solid solution alloy C) d)
- Which of the following treatments is carried out to improve machinability of 13) Low carbon steels?
  - Homogenisation a) Recovery c)
- b) Normalising
- Recrystallisation annealing d)
- In  $\alpha$  brass which of the following is solute? 14)
  - a) Zn b)  $Cu_3Zn$ c) d) Tin
    - Cu

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# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering METALLURGY** Day & Date: Wednesday, 11-12-2019 Max. Marks: 56 Time: 02:30 PM To 05:30 PM Instructions: 1) Solve any two questions from each Section. 2) Neat sketches must be drawn wherever necessary. 3) Figure to the right indicates full marks. 4) Assume additional suitable data if necessary and state it clearly.

Seat

No.

## Section – I

| Q.2 | a)       | Draw Fe-Fe <sub>3</sub> C equilibrium diagram. Label all the constituents and   | 05       |
|-----|----------|---|----------|
|     | b)<br>c) | temperatures correctly.<br>Draw microstructures of 0.18% C and 1% C steels.<br>Give classification of Metals. Compare between Steel & Cast Iron.  | 04<br>05 |
| Q.3 | a)<br>b) | <ul> <li>Give typical composition, properties and application of any five of the following:</li> <li>1) HCHC steel</li> <li>2) Free cutting steel</li> <li>3) HSS</li> <li>4) Martensitic stainless steel</li> <li>5) Cartridge brass</li> <li>6) Duralumin</li> <li>7) Babbits</li> <li>Why Modification treatment given to AI-Si system?</li> </ul> | 10<br>04 |
| Q.4 | Wri      | ite a note on any four of the following:  | 14       |
|     | a)       | Explain the application of lever arm principle.   |          |
|     | b)       | Draw neat sketch of interstitial and substitutional solid solution.   |          |
|     | c)<br>d) | Compare between S.G. Iron and malleable iron.<br>Explain why Copper is an essential constituent of babbits?   |          |
|     | e)<br>f) | What are composites? What are their applications?<br>Explain the effect of Si and Ni on properties of steel.  |          |
|     |          | Section – II  |          |
| Q.5 | a)       | Draw T-T-T diagram for eutectoid steel. What is significance of Critical cooling rate.  | 05       |
|     | b)<br>c) | Explain the Normalizing process with Objectives.<br>Explain the significance of Hardenability.  | 05<br>04 |
| Q.6 | a)<br>b) | What are the different types of tempering? Explain Temper embrittlement.<br>Give detail classification of Surface hardening. Explain Cyniding process in<br>brief.  | 05<br>05 |
|     | c)       | Explain the process of Flame hardening in brief.  | 04       |
| Q.7 | a)       | Which properties are obtained from Tensile Testing? Draw stress-strain curve for mild steel and cast irons.   | 05       |
|     | b)       | What is creep? What is effect of temperature & stress on the creep strength?  | 05       |
|     | C)       | Draw flow chart for manufacture of self lubricated bearings.  | 04       |

# **SLR-FM-655**

# Set R

T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** METALLURGY

Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

Figures to the right indicate full marks.

## **MCQ/Objective Type Questions**

**Duration: 30 Minutes** 

Seat

No.

#### Choose the correct alternatives from the options and rewrite the sentence. Q.1 14

- Which of the following treatment is based on isothermal transformation of 1) austenite?
  - a) Annealing b) Normalizing
  - Tempering c) Patenting d)
- Which of the following treatments is carried out to restore ductility of cold 2) worked parts?
  - Homogenisation a) b)
  - Partial Annealing d) Recrystallisation annealing c)
- Which hardness test is recommended to measure hardness of Razor 3) blade? Brinell
  - Rockwell a)
  - Shore's Schleroscope d) Vicker's c)
- 4) Innoculation treatment is given to \_\_\_\_\_ Iron to produce Mehanite.
  - Gray Cast Iron White Cast Iron b) a) c)
    - S G Iron Chilled Cast Iron d)
- 5) To produce tungsten powder which of the following method is employed? Carbonyl method

b)

- Reduction method a) b)
- Electrodeposition d) Atomization c)
- Pearlite is product of \_\_\_\_\_ transformation. 6)
  - Monotectic b) Eutectic a)
  - Eutectoid d) Peritectic C)
- 7) Which of the following alloy is having best casting properties?
  - Eutectic alloy Eutectoid alloy b) a)
  - Peritectic alloy d) Solid solution alloy C)
- Which of the following treatments is carried out to improve machinability of 8) Low carbon steels?
  - a) Homogenisation Normalising b) c)
    - Recovery d) Recrystallisation annealing
- 9) In  $\alpha$  brass which of the following is solute?
  - Zn a) b) c)
    - Cu

Spherodising

- $Cu_3Zn$
- d) Tin

Max. Marks: 70

Marks: 14

Set

- True toughness of material can be measured by \_\_\_\_\_ test. 10)
  - Impact test a) Fatigue test C)

- Creep test b)
- d) Tensile test
- Stainless steel powder is frequently produced by \_\_\_\_ 11)
  - a) Reduction method C) Electrodeposition
- b) Carbonyl method d) Atomization
- Which of the following treatments will result in formation of Martensite in 12) structure of steel?
  - Patenting a)

C)

- b) Austempering
- Martempering d) Normalising
- Which of the following alloys is hardened by precipitation hardeneing? 13)
  - Tin bronze Brass b) a)
  - Al Bronze d) Duralumin c)
- Which of the following method of powder manufacture is regarded as 14) mechanical methods of Powder mfg.? b) Condensation
  - a) Reduction
  - Electrodeposition C) d) Milling



### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering METALLURGY** Day & Date: Wednesday, 11-12-2019 Time: 02:30 PM To 05:30 PM Instructions: 1) Solve any two questions from each Section. 2) Neat sketches must be drawn wherever necessary. Figure to the right indicates full marks. 4) Assume additional suitable data if necessary and state it clearly. Section – I **Q.2** a) Draw Fe-Fe<sub>3</sub>C equilibrium diagram. Label all the constituents and temperatures correctly. b) Draw microstructures of 0.18% C and 1% C steels. c) Give classification of Metals. Compare between Steel & Cast Iron. Q.3 Give typical composition, properties and application of any five of the a) following: 1) HCHC steel 2) Free cutting steel

3) HSS

Seat

No.

- 4) Martensitic stainless steel
- 5) Cartridge brass
- 6) Duralumin
- 7) Babbits

**b)** Why Modification treatment given to AI-Si system?

## Q.4 Write a note on any four of the following:

- a) Explain the application of lever arm principle.
- b) Draw neat sketch of interstitial and substitutional solid solution.
- c) Compare between S.G. Iron and malleable iron.
- d) Explain why Copper is an essential constituent of babbits?
- e) What are composites? What are their applications?
- f) Explain the effect of Si and Ni on properties of steel.

## Section – II

| Q.5 | a)       | Draw T-T-T diagram for eutectoid steel. What is significance of Critical cooling rate.   | 05       |
|-----|----------|--|----------|
|     | b)<br>c) | Explain the Normalizing process with Objectives.<br>Explain the significance of Hardenability.   | 05<br>04 |
| Q.6 | a)<br>b) | What are the different types of tempering? Explain Temper embrittlement.<br>Give detail classification of Surface hardening. Explain Cyniding process in<br>brief. | 05<br>05 |
|     | c)       | Explain the process of Flame hardening in brief.   | 04       |
| Q.7 | a)       | Which properties are obtained from Tensile Testing? Draw stress-strain curve for mild steel and cast irons.  | 05       |
|     | b)       | What is creep? What is effect of temperature & stress on the creep<br>strength?  | 05       |
|     | C)       | Draw flow chart for manufacture of self lubricated bearings.   | 04       |

# SLR-FM-655

Set

Max. Marks: 56

05

04

05

10

04

14

|       |       | Т         | .E. (Part – I) (Old) (CGPA) E<br>Mechanical E<br>MACHINE D                    | ngine        | ering   |             |
|-------|-------|-----------|---|--------------|---|-------------|
|       |       |           | riday, 13-12-2019<br>M To 05:30 PM  |              | Max   | . Marks: 70 |
| Instr | uctio | ns:       | <ol> <li>Q. No. 1 is compulsory and sh<br/>book.</li> </ol>                   | ould be      | e solved in first 30 minutes                        | s in answer |
|       |       | 2         | Pigures to the right indicate full r  | marks.       |   |             |
|       |       |           | MCQ/Objective Ty  | ype Qu       | estions   |             |
| Dura  | tion: | 30 N      | linutes   |              |   | Marks: 14   |
| Q.1   | A)    |           | ve multiple correct answers. (2   |              | each)   | 08          |
|       |       | 1)        |   |              |   |             |
|       |       |           | <ul><li>a) Abrupt changes in section</li><li>c) Machining scratches</li></ul> | ,            | Material<br>Stiffness                               |             |
|       |       | 2)        | In a design of casting the following  | ng facto     | ors must be taken into                              |             |
|       |       |           | consideration.  |              |   |             |
|       |       |           | a) Economy in production  | -            | Maximum production                                  |             |
|       |       |           | c) Strength of casting  | d)           | None of above                                       |             |
|       |       | 3)        | 18/8 steel contains   |              | 400/  |             |
|       |       |           | a) 8% Chromium  | b)           |   |             |
|       |       | 4         | c) 18% Nickel   | d)           | 8% Nickel   |             |
|       |       | 4)        | Springs in parallel   | b)           | $S_{12} = S_{12} + S_{12}$                          |             |
|       |       |           | a) $W = W1 + W2$<br>c) $K = K1 - K2$  | b)<br>d)     | $\delta k = \delta k1 + \delta k2$<br>none of above |             |
|       | D)    | 60        | ,   | ,            |   | 06          |
|       | B)    | <b>30</b> | ve multiple choice questions. i.<br>The Major stress produced in the          |              |   | 06          |
|       |       | ')        | a) Compressive  | bons r<br>b) | Tensile   |             |
|       |       |           | c) Shear  | ,            | Torsional shear                                     |             |
|       |       | 2)        | Guest's theory is used for  |              |   |             |
|       |       | ,         | a) Brittle materials  | b)           | Ductile materials                                   |             |
|       |       |           | c) Elastic material   | d)           | Plastic materials                                   |             |
|       |       | 3)        | A bolt of M20x2 means that  |              |   |             |
|       |       |           | a) Pitch of thread is 20mm & de   | epth is 2    | 2mm   |             |
|       |       |           | b) Effective diameter of bolt is 2  |              | •   |             |
|       |       |           | c) Cross sectional area of threa  |              |   |             |
|       |       |           | d) The nominal diameter of bolt   |              | im &pitch is 2mm                                    |             |
|       |       | 4)        | Knuckle pin is designed for   |              |   |             |
|       |       |           | a) Torsion and bending  | b)           | Crushing  |             |
|       |       | -         | c) Bending  | d)           | Torsion   |             |
|       |       | 5)        | A rivet is specified by   |              | I an athe of the st                                 |             |
|       |       |           | a) Shank diameter   | b)           | Length of rivet                                     |             |
|       |       |           | c) Type of head   | d)           | Length of tail                                      |             |
|       |       | 6)        | The method of manufacturing use   |              | Iopted for levers is                                | _·          |
|       |       |           | a) Casting<br>c) Forging  | b)<br>d)     | Machining   |             |
|       |       |           |   | ч)           | maonining   |             |

Seat

No.

# SLR-FM-656

Set P

03

03

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - I**

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

# Section – I

- Explain design consideration used in machine design. Q.2 a)
  - Define factor of safety. Explain its physical significance and factor affecting b) 04 on selection of factor of safety.
  - Explain design procedure of Knulcke joint with necessary sketches. 07 C)
- Explain stress concentration. Explain the methods with diagrams to reduce Q.3 a) 06 the stress concentration.
  - A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is b) **08** subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35
- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt =  $380 \text{ N/mm}^2$ ), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - The yield strength in compression is twice of the tensile yield strength 1) and
  - The yield strength in shear is 50% of the tensile yield strength. The 2) factor of safety is 6.
  - It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor 07 b) to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - Diameters of motor and compressor pulleys; 1)
    - The specifications of the belt: 2)
    - The correct centre distance 3)
    - 4) The number of belts.

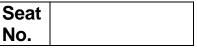
(Refer table No. 1 to 6 and fig. No. 1 and 2)

# Section – II

How you are differentiation the rigid and flexible couplings? Q.5 a) Explain ASME code Used in shaft design. b)

Max. Marks: 56

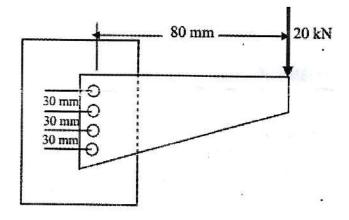
**SLR-FM-656** 



170 150 P= + 1000 N 0.25d -1.5d

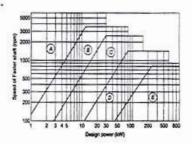
03

|     |                | Set  | Ρ              |
|-----|----------------|--|----------------|
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



# Set

#### Design data for Selection of V-Belt Selection of cross-section of V-belt



| Dimensio        | ns of Standard Cross-<br>section            |
|-----------------|---|
| Belt<br>Section | Minimum pitch<br>diameter of pulley<br>(mm) |

125

200

300

500

630

A

В

C

D

E

#### Conversion of inside length to pitch length of the belt

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| C               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |
|-----|---|------------------------------|-------|-------|--|
| No  |   | 0-10                         | 10-16 | 16-24 |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |

Correction factor (Fa) for industrial services

#### Power rating of V-belts

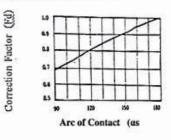
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118         | 125   |
|---------|----|------|------|------|-------|------|-------|-------|-------------|-------|
| A       | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81        | 2.00  |
| Section | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190         | 200   |
| B       | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77        | 5.23  |
| Section | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300         | 315   |
| C       | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10       | 12.50 |
| Section | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0.000000000 |       |
| D       | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |             |       |

#### Preferred pitch diameters of pulleys

| Pitch | i diame    | ters ( | n mm | ): 125 | 132  | 140 | 150  | 160     | 170 |
|-------|------------|--------|------|--------|------|-----|------|---------|-----|
| 180   | 190        | 200    | 212  | 224    | 236  | 250 | 265  | 280     | 300 |
| 315   | 190<br>355 | 375    | 400  | 425    | 450  | 475 | 500  | 530     | 560 |
| 600   | 630        | 670    | 710  | 750    | \$00 | 900 | 1000 | a vener |     |

#### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

|      |      | Be   | elt Secti | ion  |      |  |
|------|------|------|-----------|------|------|--|
| Li   | A    | B    | C         | D    | E    |  |
| 1905 | 1.02 | 0.97 | 0.87      | -    | -    |  |
| 1981 | 1.03 | 0.98 | -         | -    |      |  |
| 2032 | 1.04 | -    | -         | -    | ÷    |  |
| 2057 | 1.04 | 0.98 | 0.89      | -    |      |  |
| 2159 | 1.05 | 0.99 | 0.90      |      | -    |  |
| 2286 | 1.06 | 1.00 | 0.91      | -    | -    |  |
| 2438 | 1.08 | -    | 0.92      |      | -    |  |
| 2464 | -    | 1.02 | -         | -    |      |  |
| 2540 | -    | 1.03 | -         | -    | -    |  |
| 2667 | 1.10 | 1.04 | 0.94      | -    |      |  |
| 2845 | 1.11 | 1.05 | 0.95      | -    | -    |  |
| 3048 | 1.13 | 1.07 | 0.97      | 0.86 |      |  |
| 3150 | -    | -    | 0.97      | -    |      |  |
| 3251 | 1.14 | 1.03 | 0.98      | 0.87 |      |  |
| 3404 | -    | -    | 0.99      | -    | •    |  |
| 3658 |      | 1.11 | 1.00      | 0.90 | -    |  |
| 4013 |      | 1.13 | 1.02      | 0.92 | -    |  |
| 4115 | -    | 1.14 | 1.03      | 0.92 | -    |  |
| 4394 | -    | 1.15 | 1.04      | 0.93 | -    |  |
| 4572 | -    | 1.16 | 1.05      | 0.94 |      |  |
| 4953 | -    | 1.18 | 1.07      | 0.96 | -    |  |
| 5334 | ÷ 1  | 1.19 | 1.08      | 0.96 | 0.94 |  |
| 6045 |      | -    | 1.11      | 1.00 | 0.96 |  |
| 6807 | -    | -    | 1.14      | 1.03 | 0.99 |  |
| 7569 | -    | -    | 1.16      | 1.05 | 1.01 |  |

| 0           | 1   |                 |   |                         |  |  |  |  |  |  |  |  |  |
|-------------|---|-----------------|---|-------------------------|--|--|--|--|--|--|--|--|--|
| Seat<br>No. |   |                 |   | Set Q                   |  |  |  |  |  |  |  |  |  |
|             | T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE DESIGN – I             |                 |   |                         |  |  |  |  |  |  |  |  |  |
|             | Day & Date: Friday, 13-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70 |                 |   |                         |  |  |  |  |  |  |  |  |  |
| Instru      | ictio   | ns:             | 1) Q. No. 1 is compulsory and should be solved in fir   | st 30 minutes in answer |  |  |  |  |  |  |  |  |  |
|             |   | 2               | book.<br>2) Figures to the right indicate full marks.   |                         |  |  |  |  |  |  |  |  |  |
|             |   |                 | MCQ/Objective Type Questions  |                         |  |  |  |  |  |  |  |  |  |
| Durati      | on: (   | 30 N            | <i>l</i> inutes   | Marks: 14               |  |  |  |  |  |  |  |  |  |
| Q.1         | A)  | So              | lve multiple correct answers. (2 marks each)  | 08                      |  |  |  |  |  |  |  |  |  |
|             |   | 1)              | 18/8 steel contains         a) 8% Chromium       b) 18% chromi         c) 18% Nickel       d) 8% Nickel   | um                      |  |  |  |  |  |  |  |  |  |
|             |   | 2)              | Springs in parallela) $W = W1 + W2$ b) $\delta k = \delta k1 + \delta k$ c) $K = K1 - K2$ d) none of above  |                         |  |  |  |  |  |  |  |  |  |
|             |   | 3)              | Stress concentration is due toa) Abrupt changes in sectionb) Materialc) Machining scratchesd) Stiffness   |                         |  |  |  |  |  |  |  |  |  |
|             |   | 4)              | <ul> <li>In a design of casting the following factors must be ta consideration.</li> <li>a) Economy in production</li> <li>b) Maximum production</li> <li>c) Strength of casting</li> <li>d) None of above</li> </ul>   | roduction               |  |  |  |  |  |  |  |  |  |
|             | D)  | 60              | , 3   |                         |  |  |  |  |  |  |  |  |  |
|             | B)  | <b>30</b><br>1) | Ive multiple choice questions. i. e. MCQ: (1 marks e<br>Knuckle pin is designed for<br>a) Torsion and bending b) Crushing<br>c) Bending d) Torsion  | each) 06                |  |  |  |  |  |  |  |  |  |
|             |   | 2)              | A rivet is specified bya) Shank diameterb) Length of rivc) Type of headd) Length of ta  |                         |  |  |  |  |  |  |  |  |  |
|             |   | 3)              | The method of manufacturing usually adopted for levela)Castingb)Fabricationc)Forgingd)Machining   | ərs is                  |  |  |  |  |  |  |  |  |  |
|             |   | 4)              | The Major stress produced in the belts isa) Compressiveb) Tensilec) Sheard) Torsional sh  | iear                    |  |  |  |  |  |  |  |  |  |
|             |   | 5)              | Guest's theory is used fora) Brittle materialsb) Ductile materialc) Elastic materiald) Plastic material   |                         |  |  |  |  |  |  |  |  |  |
|             |   | 6)              | <ul> <li>A bolt of M20x2 means that</li> <li>a) Pitch of thread is 20mm &amp; depth is 2mm</li> <li>b) Effective diameter of bolt is 20mm &amp; 2 threads period</li> <li>c) Cross sectional area of thread 20 mm2</li> <li>d) The nominal diameter of bolt is 20mm &amp; pitch is 2</li> </ul> |                         |  |  |  |  |  |  |  |  |  |

Page **5** of **16** 

03

03

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - I**

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

# Section – I

- Explain design consideration used in machine design. Q.2 a)
  - Define factor of safety. Explain its physical significance and factor affecting b) 04 on selection of factor of safety.
  - Explain design procedure of Knulcke joint with necessary sketches. 07 C)
- Explain stress concentration. Explain the methods with diagrams to reduce Q.3 a) 06 the stress concentration.
  - A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is b) **08** subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt =  $380 \text{ N/mm}^2$ ), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - The yield strength in compression is twice of the tensile yield strength 1) and
  - The yield strength in shear is 50% of the tensile yield strength. The 2) factor of safety is 6.
  - It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor 07 b) to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - Diameters of motor and compressor pulleys; 1)
    - The specifications of the belt: 2)
    - The correct centre distance 3)
    - 4) The number of belts.

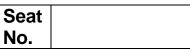
(Refer table No. 1 to 6 and fig. No. 1 and 2)

# Section – II

How you are differentiation the rigid and flexible couplings? Q.5 a) Explain ASME code Used in shaft design. b)

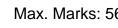
Max. Marks: 56

**SLR-FM-656** 

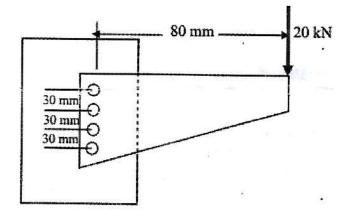


170 150 P= ± 1000 N 0.25d -1.5d

03

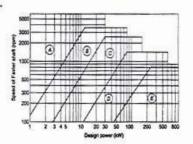


|     |                | Set  | Q              |
|-----|----------------|--|----------------|
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



# SLR-FM-656 Set

#### Design data for Selection of V-Belt Selection of cross-section of V-belt



| Dimensions of Standard Cross<br>section |   |  |  |  |  |  |  |
|---|---|--|--|--|--|--|--|
| Belt<br>Section                         | Minimum pitch<br>diameter of pulley<br>(mm) |  |  |  |  |  |  |

125

200

300

500

630

A

В

C

D

E

#### Conversion of inside length to pitch length of the belt

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| С               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |
|-----|---|------------------------------|-------|-------|--|
| No  |   | 0-10                         | 10-16 | 16-24 |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |

Correction factor (Fa) for industrial services

#### Power rating of V-belts

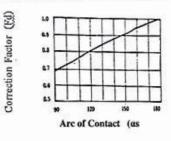
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section<br>A | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118     | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|---------|-------|
|              | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81    | 2.00  |
| Section<br>B | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190     | 200   |
|              | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77    | 5.23  |
| Section      | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300     | 315   |
| C            | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10   | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0-0.000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |         |       |

#### Preferred pitch diameters of pulleys

| Pitch | diame | ters ( | n mm | ): 125     | 132  | 140 | 150  | 160     | 170 |
|-------|-------|--------|------|------------|------|-----|------|---------|-----|
| 180   | 190   | 200    | 212  | 224        | 236  | 250 | 265  | 280     | 300 |
| 315   | 355   | 375    | 400  | 224<br>425 | 450  | 475 | 500  | 530     | 560 |
| 600   | 630   | 670    | 710  | 750        | \$00 | 900 | 1000 | 0.07050 |     |

#### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

|      |      | Be   | elt Secti | ion        |      |
|------|------|------|-----------|------------|------|
| Li   | A    | B    | C         | D          | E    |
| 1905 | 1.02 | 0.97 | 0.87      | -          |      |
| 1981 | 1.03 | 0.98 | -         | -          |      |
| 2032 | 1.04 | -    | -         | -          | -    |
| 2057 | 1.04 | 0.98 | 0.89      | -          |      |
| 2159 | 1.05 | 0.99 | 0.90      |            | -    |
| 2286 | 1.06 | 1.00 | 0.91      | -          | -    |
| 2438 | 1.08 | -    | 0.92      |            | -    |
| 2464 |      | 1.02 | -         | -          |      |
| 2540 | -    | 1.03 | -         | -          |      |
| 2667 | 1.10 | 1.04 | 0.94      | -          |      |
| 2845 | 1.11 | 1.05 | 0.95      | . <b>.</b> | -    |
| 3048 | 1.13 | 1.07 | 0.97      | 0.86       |      |
| 3150 | -    | -    | 0.97      | -          | -    |
| 3251 | 1.14 | 1.03 | 0.98      | 0.87       |      |
| 3404 | -    | -    | 0.99      | -          | •    |
| 3658 |      | 1.11 | 1.00      | 0.90       | -    |
| 4013 |      | 1.13 | 1.02      | 0.92       | -    |
| 4115 | -    | 1.14 | 1.03      | 0.92       | -    |
| 4394 | -    | 1.15 | 1.04      | 0.93       | -    |
| 4572 |      | 1.16 | 1.05      | 0.94       |      |
| 4953 | -    | 1.18 | 1.07      | 0.96       | -    |
| 5334 | -    | 1.19 | 1.08      | 0.96       | 0.94 |
| 6045 |      |      | 1.11      | 1.00       | 0.96 |
| 6807 | -    | -    | 1.14      | 1.03       | 0.99 |
| 7569 | -    | -    | 1.16      | 1.05       | 1.01 |

|       | Mechanical Engineering<br>MACHINE DESIGN – I |                   |  |             |  |             |  |  |  |  |  |  |
|-------|--|-------------------|--|-------------|--|-------------|--|--|--|--|--|--|
| Dav   | & Da   | te: F             | riday, 13-12-2019  |             |  | . Marks: 70 |  |  |  |  |  |  |
|       |  |                   | M To 05:30 PM  |             |  |             |  |  |  |  |  |  |
| Instr | ructio                                       | ons:              | 1) Q. No. 1 is compulsory and sh book.   | ould b      | e solved in first 30 minute            | s in answer |  |  |  |  |  |  |
|       |  |                   | 2) Figures to the right indicate full r  | narks.      |  |             |  |  |  |  |  |  |
|       |  |                   | MCQ/Objective Ty   |             | uestions                               |             |  |  |  |  |  |  |
| Dura  | tion:  | 30 N              | <i>l</i> inutes  |             |  | Marks: 14   |  |  |  |  |  |  |
| Q.1   | A)   |                   | Ive multiple correct answers. (2   | marks       | each)                                  | 08          |  |  |  |  |  |  |
|       | ,,   | 1)                |  |             |  |             |  |  |  |  |  |  |
|       |  |                   | <ul><li>a) Economy in production</li><li>c) Strength of casting</li></ul>  | b)<br>d)    | Maximum production<br>None of above    |             |  |  |  |  |  |  |
|       |  | 2)                | 18/8 steel contains<br>a) 8% Chromium<br>c) 18% Nickel   | b)<br>d)    | 18% chromium<br>8% Nickel              |             |  |  |  |  |  |  |
|       |  | 3)                | Springs in parallel<br>a) $W = W1 + W2$  | b)          | $\delta k = \delta k 1 + \delta k 2$   |             |  |  |  |  |  |  |
|       |  |                   | c) $K = K1 - K2$   | d)          | none of above                          |             |  |  |  |  |  |  |
|       |  | 4)                | Stress concentration is due to   | •           |  |             |  |  |  |  |  |  |
|       |  | ·                 | <ul><li>a) Abrupt changes in section</li><li>c) Machining scratches</li></ul>  | b)<br>d)    |  |             |  |  |  |  |  |  |
|       | B)   | Q: (1 marks each) | 06   |             |  |             |  |  |  |  |  |  |
|       |  | 1)                | Guest's theory is used for<br>a) Brittle materials<br>c) Elastic material  | b)<br>d)    | Ductile materials<br>Plastic materials |             |  |  |  |  |  |  |
|       |  | 2)                | A bolt of M20x2 means that   |             |  |             |  |  |  |  |  |  |
|       |  |                   | a) Pitch of thread is 20mm & de  |             |  |             |  |  |  |  |  |  |
|       |  |                   | <ul> <li>b) Effective diameter of bolt is 20mm &amp; 2 threads per cm</li> <li>c) Cross sectional area of thread 20 mm2</li> </ul> |             |  |             |  |  |  |  |  |  |
|       |  |                   | <ul><li>c) Cross sectional area of threa</li><li>d) The nominal diameter of bolt</li></ul>   |             |  |             |  |  |  |  |  |  |
|       |  | 3)                | Knuckle pin is designed for  |             |  |             |  |  |  |  |  |  |
|       |  | -,                | a) Torsion and bending   | b)          | Crushing                               |             |  |  |  |  |  |  |
|       |  |                   | c) Bending   | d)          | Torsion                                |             |  |  |  |  |  |  |
|       |  | 4)                | A rivet is specified by  |             |  |             |  |  |  |  |  |  |
|       |  |                   | a) Shank diameter  | b)          | Length of rivet                        |             |  |  |  |  |  |  |
|       |  |                   | c) Type of head  | d)          | Length of tail                         |             |  |  |  |  |  |  |
|       |  | 5)                | The method of manufacturing use  | •           | •                                      | ·           |  |  |  |  |  |  |
|       |  |                   | a) Casting<br>c) Forging   | b)<br>d)    | Fabrication<br>Machining               |             |  |  |  |  |  |  |
|       |  | C)                | , , ,  | ,           | -                                      |             |  |  |  |  |  |  |
|       |  | 6)                | The Major stress produced in the<br>a) Compressive   | beits<br>b) | is<br>Tensile                          |             |  |  |  |  |  |  |
|       |  |                   | c) Shear   | d)          | Torsional shear                        |             |  |  |  |  |  |  |
|       |  |                   |  | ,           |  |             |  |  |  |  |  |  |

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019

Seat

No.

# SLR-FM-656

Set R

03

03

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE DESIGN - I

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Time: 02:30 PM TO 05:30 PM

**Instructions:** 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

# Section – I

- **Q.2 a)** Explain design consideration used in machine design.
  - b) Define factor of safety. Explain its physical significance and factor affecting 04 on selection of factor of safety.
  - c) Explain design procedure of Knulcke joint with necessary sketches. 07
- **Q.3 a)** Explain stress concentration. Explain the methods with diagrams to reduce **06** the stress concentration.

170

0.25d

-1.5d

b) A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

P= + 1000 N

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt = 380 N/mm<sup>2</sup>), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - 1) The yield strength in compression is twice of the tensile yield strength and
  - 2) The yield strength in shear is 50% of the tensile yield strength. The factor of safety is 6.
  - b) It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - 1) Diameters of motor and compressor pulleys;
    - 2) The specifications of the belt;
    - 3) The correct centre distance
    - 4) The number of belts.

(Refer table No. 1 to 6 and fig. No. 1 and 2)

# Section – II

Q.5 a) How you are differentiation the rigid and flexible couplings?b) Explain ASME code Used in shaft design.

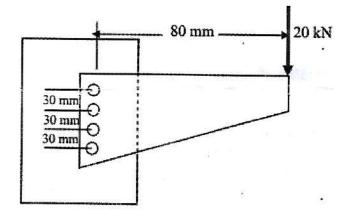


03

07

Seat No.

|     |                | Set  | R              |
|-----|----------------|--|----------------|
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |

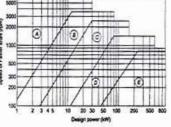


# SLR-FM-656 Set R

#### Design data for Selection of V-Belt Selection of cross-section of V-belt

# t Dimensions of Standard Crosssection

#### Conversion of inside length to pitch length of the belt



| Belt<br>Section | Minimum pitch<br>diameter of pulley<br>(mm) |
|-----------------|---|
| A               | 125   |
| В               | 200   |
| C               | 300   |
| D               | 500   |
| E               | 630   |

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| В               | 43  |
| С               | 56  |
| D               | 79  |
| F               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |  |
|-----|---|------------------------------|-------|-------|--|--|
| No  |   | 0-10                         | 10-16 | 16-24 |  |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |  |

Correction factor (Fa) for industrial services

#### Power rating of V-belts

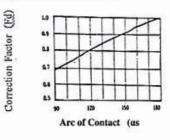
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section      | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118         | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|-------------|-------|
| A            | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81        | 2.00  |
| Section<br>B | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190         | 200   |
|              | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77        | 5.23  |
| Section      | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300         | 315   |
| C            | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10       | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0.000000000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |             |       |

#### Preferred pitch diameters of pulleys

| Pitch | i diame | ters ( | n mm | ): 125     | 132  | 140 | 150  | 160     | 170 |
|-------|---------|--------|------|------------|------|-----|------|---------|-----|
| 180   | 190     | 200    | 212  | 224        | 236  | 250 | 265  | 280     | 300 |
| 315   | 355     | 375    | 400  | 224<br>425 | 450  | 475 | 500  | 530     | 560 |
| 600   | 630     | 670    | 710  | 750        | \$00 | 900 | 1000 | 0.05355 |     |

#### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

|      |      | B    | elt Secti | on   | -    |  |
|------|------|------|-----------|------|------|--|
| Li   | A    | B    | C         | D    | E    |  |
| 1905 | 1.02 | 0.97 | 0.87      | -    | -    |  |
| 1981 | 1.03 | 0.98 | -         | -    |      |  |
| 2032 | 1.04 | -    | -         | -    | ÷    |  |
| 2057 | 1.04 | 0.98 | 0.89      | -    |      |  |
| 2159 | 1.05 | 0.99 | 0.90      |      | -    |  |
| 2286 | 1.06 | 1.00 | 0.91      | ÷ .  | -    |  |
| 2438 | 1.08 | -    | 0.92      | -    | -    |  |
| 2464 | -    | 1.02 | -         | -    |      |  |
| 2540 | -    | 1.03 | -         | -    | -    |  |
| 2667 | 1.10 | 1.04 | 0.94      | -    |      |  |
| 2845 | 1.11 | 1.05 | 0.95      | -    | -    |  |
| 3048 | 1.13 | 1.07 | 0.97      | 0.86 |      |  |
| 3150 | -    | -    | 0.97      | -    | -    |  |
| 3251 | 1.14 | 1.03 | 0.98      | 0.87 |      |  |
| 3404 | -    | -    | 0.99      | -    | •    |  |
| 3658 |      | 1.11 | 1.00      | 0.90 | -    |  |
| 4013 |      | 1.13 | 1.02      | 0.92 | -    |  |
| 4115 | -    | 1.14 | 1.03      | 0.92 | -    |  |
| 4394 | -    | 1.15 | 1.04      | 0.93 |      |  |
| 4572 |      | 1.16 | 1.05      | 0.94 |      |  |
| 4953 | -    | 1.18 | 1.07      | 0.96 | -    |  |
| 5334 | ÷ 1  | 1.19 | 1.08      | 0.96 | 0.94 |  |
| 6045 |      | -    | 1.11      | 1.00 | 0.96 |  |
| 6807 | -    | -    | 1.14      | 1.03 | 0.99 |  |
| 7569 | -    | -    | 1.16      | 1.05 | 1.01 |  |

|           | Т    | .E. (Part – I) (Old) (CGPA)<br>Mechanical<br>MACHINE I                        | Engine        | ering                             |              |
|-----------|------|---|---------------|-----------------------------------|--------------|
|           |      | riday, 13-12-2019<br>M To 05:30 PM  |               | Ма                                | x. Marks: 70 |
|           |      | 1) Q. No. 1 is compulsory and s book.   | should b      | e solved in first 30 minute       | es in answer |
|           |      | 2) Figures to the right indicate ful  | l marks.      |                                   |              |
|           |      | MCQ/Objective   | Type Qu       | uestions                          |              |
| Duration: | 30 N | linutes   |               |                                   | Marks: 14    |
| Q.1 A)    |      | lve multiple correct answers. (   |               | each)                             | 08           |
|           | 1)   | Stress concentration is due to _  |               |                                   |              |
|           |      | <ul><li>a) Abrupt changes in section</li><li>c) Machining scratches</li></ul> |               |                                   |              |
|           | 2)   | 0 0   | ving facto    | ors must be taken into            |              |
|           |      | consideration.<br>a) Economy in production                                    | ,             | Maximum production                |              |
|           |      | c) Strength of casting  | d)            | None of above                     |              |
|           | 3)   |   | b)            | 199/ obromium                     |              |
|           |      | a) 8% Chromium<br>c) 18% Nickel   | b)<br>d)      |                                   |              |
|           | 4)   | Springs in parallel   |               |                                   |              |
|           |      | a) $W = W1 + W2$  | b)            |                                   |              |
|           |      | c) $K = K1 - K2$  | d)            |                                   |              |
| В)        |      | Ive multiple choice questions.  |               |                                   | 06           |
|           | 1)   | The method of manufacturing u a) Casting                                      |               | Fabrication                       | <u> </u> .   |
|           |      | c) Forging  | d)            | Machining                         |              |
|           | 2)   | , 00  | ,             | 0                                 |              |
|           | 2)   | The Major stress produced in th<br>a) Compressive                             | beits beits b | Tensile                           |              |
|           |      | c) Shear  | d)            | Torsional shear                   |              |
|           | 3)   | Guest's theory is used for  | ,             |                                   |              |
|           | 0)   | a) Brittle materials  | <br>b)        | Ductile materials                 |              |
|           |      | c) Elastic material   | d)            |                                   |              |
|           | 4)   | A bolt of M20x2 means that  |               |                                   |              |
|           | ,    | a) Pitch of thread is 20mm & a  |               | 2mm                               |              |
|           |      | b) Effective diameter of bolt is  | 20mm a        | & 2 threads per cm                |              |
|           |      | c) Cross sectional area of three  |               |                                   |              |
|           |      | d) The nominal diameter of bo   |               | nm &pitch is 2mm                  |              |
|           | 5)   | Knuckle pin is designed for   |               |                                   |              |
|           |      | a) Torsion and bending  | b)            | Crushing                          |              |
|           |      | c) Bending  | d)            | Torsion                           |              |
|           | 6)   | A rivet is specified by   | <b>۲</b>      | Longth of river                   |              |
|           |      | <ul><li>a) Shank diameter</li><li>c) Type of head</li></ul>                   | b)<br>d)      | Length of rivet<br>Length of tail |              |
|           |      | o, Type of fieldu   | u)            |                                   |              |

Seat

No.

# SLR-FM-656

Set S

03

03

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering MACHINE DESIGN - I**

Day & Date: Friday, 13-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Solve any two questions from each Section I and II.

- 2) Make necessary assumptions, if required and mention it clearly.
- 3) Figures to the right indicates full marks.

## Section – I

- Explain design consideration used in machine design. Q.2 a)
  - Define factor of safety. Explain its physical significance and factor affecting b) 04 on selection of factor of safety.
  - Explain design procedure of Knulcke joint with necessary sketches. 07 C)
- Explain stress concentration. Explain the methods with diagrams to reduce Q.3 a) 06 the stress concentration.
  - A cantilever beam made of cold drawn steel 20C8 ( $S_{ut} = 540 \text{ N/mm}^2$ ) is b) **08** subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90 percent, determine the diameter (d) of the beam for a life of 10000 cycles. Take K<sub>a</sub>= 0.78, K<sub>b</sub>=0.85, K<sub>c</sub>= 0.897, Kt= 1.35

- Q.4 a) Two rods, made of plain carbon steel 40C8 (Syt =  $380 \text{ N/mm}^2$ ), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket and making following assumptions.
  - The yield strength in compression is twice of the tensile yield strength 1) and
  - The yield strength in shear is 50% of the tensile yield strength. The 2) factor of safety is 6.
  - It is required to design a V-belt drive to connect a 20 kW, 1440 r.p.m. motor 07 b) to a compressor running at 480 r.p.m. for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine:
    - Diameters of motor and compressor pulleys; 1)
    - The specifications of the belt: 2)
    - The correct centre distance 3)
    - 4) The number of belts.

(Refer table No. 1 to 6 and fig. No. 1 and 2)

# Section – II

How you are differentiation the rigid and flexible couplings? Q.5 a) Explain ASME code Used in shaft design. b)

Max. Marks: 56

Set

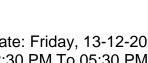
07

03

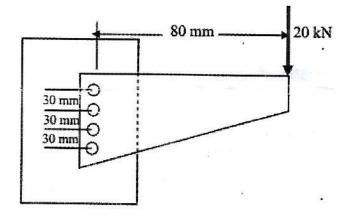
# **SLR-FM-656**

Seat No.

> 170 150 P= + 1000 N 0.25d -1.5d

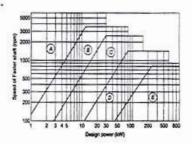


|     |                |  | •••            |
|-----|----------------|--|----------------|
|     |                | Set  | S              |
|     | c)             | The shaft and flange of a marine engine are to designed for flange coupling,<br>in which the flange is forged end of the shaft. The following particulars are<br>to be consider in the design.<br>Power of the engine = 3MW<br>Speed of the engine = 100 rpm<br>Permissible shear stress in bolt and shaft = 60 N/mm <sup>2</sup><br>No of bolts used = 08 Nos<br>Pitch circle diameter of bolts = 1.6 time diameter of shaft<br><b>Determine</b><br>1) Diameter of shaft<br>2) Diameter of shaft<br>3) Thickness of flange<br>4) Diameter of flange | 08             |
| Q.6 | a)<br>b)       | <ul> <li>Explain the significance of Wahl's factor in design of helical spring.</li> <li>Explain following terms of springs</li> <li>1) Free length</li> <li>2) Active coils</li> <li>3) Spring index</li> <li>4) Spring rate</li> </ul>   | 03<br>04       |
|     | c)             | A railway wagon of mass 2000 kg is moving with a velocity of 2 m/s. It is<br>brought to rest by a buffer consisting of two helical springs of spring index<br>6. The maximum deflection of spring is 200 mm. The springs are made of<br>oil hardened and tempered steel wire with ultimate tensile strength of 1250<br>N/mm <sup>2</sup> and modulus of rigidity of 81370 N/mm <sup>2</sup> . The permissible shear<br>stress for the springs wire can be taken as 50% of the ultimate strength.<br>Design the springs.                              | 07             |
| Q.7 | a)<br>b)<br>c) | Explain in the design consideration in forging.<br>Explain the design considerations for machining.<br>A bracket is supported by means of four rivets of same size as shown in the<br>figure. Determine the diameter of the rivet, if maximum shear stress is 140<br>MPa.  | 03<br>04<br>07 |



#### Set S

#### Design data for Selection of V-Belt Selection of cross-section of V-belt



| Dimensio        | ns of Standard Cross-<br>section            |
|-----------------|---|
| Belt<br>Section | Minimum pitch<br>diameter of pulley<br>(mm) |

125

200

300

500

630

A

В

C

D

E

#### Conversion of inside length to pitch length of the belt

| Belt<br>Section | Difference<br>between Pitch<br>length and inside<br>length (mm) |
|-----------------|---|
| A               | 36  |
| B               | 43  |
| C               | 56  |
| D               | 79  |
| E               | 92  |

| Sr  | Type of Services  | Operational hours per<br>day |       |       |  |  |
|-----|---|------------------------------|-------|-------|--|--|
| No  | No  | 0-10                         | 10-16 | 16-24 |  |  |
| (1) | Light Duty: agitators-blowers-<br>centrifugal pumps-fans (up to<br>7.5 kW) and compressors                              | 1.1                          | 1.2   | 1.3   |  |  |
| (2) | Medium Duty: conveyors-fans<br>(above 7.5 kW)-line shafts-<br>machine tools- presses and<br>positive displacement pumps | 1.2                          | 1.3   | 1.4   |  |  |
| (3) | Heavy duty: conveyors-bucket<br>elevators and hammers   | 1.3                          | 1.4   | 1.5   |  |  |

Correction factor (Fa) for industrial services

#### Power rating of V-belts

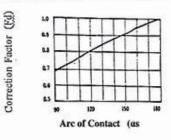
(as=180°; speed of the faster pulley= 1440 r.p.m.,

| Section      | D  | 75   | 80   | 85   | 90    | 100  | 106   | 112   | 118         | 125   |
|--------------|----|------|------|------|-------|------|-------|-------|-------------|-------|
| A            | PR | 0.73 | 0.86 | 0.99 | 1.12  | 1.38 | 1.50  | 1.63  | 1.81        | 2.00  |
| Section<br>B | D  | 125  | 132  | 140  | 150   | 160  | 170   | 180   | 190         | 200   |
|              | PR | 2.24 | 2.46 | 2.77 | 3.30  | 3.60 | 4.00  | 4.39  | 4.77        | 5.23  |
| Section<br>C | D  | 200  | 212  | 224  | 236   | 250  | 265   | 280   | 300         | 315   |
|              | PR | 6.14 | 6.81 | 7.68 | 8.20  | 9.40 | 10.10 | 11.10 | 12.10       | 12.50 |
| Section<br>D | D  | 350  | 375  | 400  | 425   |      | C     | 0     | 0.000000000 |       |
|              | PR | 15.7 | 17.5 | 19.3 | 20.60 |      |       |       |             |       |

#### Preferred pitch diameters of pulleys

| Pite | h diame    | ters ( | in mm | ): 125 | 132 | 140 | 150 | 160 | 170 |
|------|------------|--------|-------|--------|-----|-----|-----|-----|-----|
| 180  | 190        | 200    | 212   | 224    | 236 | 250 | 265 | 280 | 300 |
| 315  | 190<br>355 | 375    | 400   | 425    | 450 | 475 | 500 | 530 | 560 |
|      | 630        |        |       |        |     |     |     |     |     |

#### **Correction Factor for Arc of Contact**



Correction Factor F1 for belt length

|      | Belt Section |      |      |      |      |  |  |
|------|--------------|------|------|------|------|--|--|
| Li   | A            | B    | C    | D    | E    |  |  |
| 1905 | 1.02         | 0.97 | 0.87 | -    | -    |  |  |
| 1981 | 1.03         | 0.98 | -    | -    |      |  |  |
| 2032 | 1.04         | -    | -    | -    | ÷    |  |  |
| 2057 | 1.04         | 0.98 | 0.89 | -    |      |  |  |
| 2159 | 1.05         | 0.99 | 0.90 |      | -    |  |  |
| 2286 | 1.06         | 1.00 | 0.91 | -    | -    |  |  |
| 2438 | 1.08         | -    | 0.92 | -    | -    |  |  |
| 2464 | -            | 1.02 | -    | -    |      |  |  |
| 2540 | -            | 1.03 | -    | -    | -    |  |  |
| 2667 | 1.10         | 1.04 | 0.94 | -    |      |  |  |
| 2845 | 1.11         | 1.05 | 0.95 | -    | -    |  |  |
| 3048 | 1.13         | 1.07 | 0.97 | 0.86 |      |  |  |
| 3150 | -            | -    | 0.97 | -    |      |  |  |
| 3251 | 1.14         | 1.03 | 0.98 | 0.87 |      |  |  |
| 3404 | -            | -    | 0.99 | -    | •    |  |  |
| 3658 |              | 1.11 | 1.00 | 0.90 | -    |  |  |
| 4013 |              | 1.13 | 1.02 | 0.92 | -    |  |  |
| 4115 | -            | 1.14 | 1.03 | 0.92 | -    |  |  |
| 4394 | -            | 1.15 | 1.04 | 0.93 | -    |  |  |
| 4572 | -            | 1.16 | 1.05 | 0.94 |      |  |  |
| 4953 | -            | 1.18 | 1.07 | 0.96 | -    |  |  |
| 5334 | -            | 1.19 | 1.08 | 0.96 | 0.94 |  |  |
| 6045 |              | -    | 1.11 | 1.00 | 0.96 |  |  |
| 6807 | -            | -    | 1.14 | 1.03 | 0.99 |  |  |
| 7569 | -            | -    | 1.16 | 1.05 | 1.01 |  |  |

| mou                  | uction   | Book.   |  |  |  |  |  |  |  |
|----------------------|--|---|--|--|--|--|--|--|--|
|                      |  | 2) Figures to the right indicates full marks.   |  |  |  |  |  |  |  |
|                      |  | MCQ/Objective Type Questions  |  |  |  |  |  |  |  |
| Duration: 30 Minutes |  |   |  |  |  |  |  |  |  |
| Q.1                  | <b>Cho</b><br>1)   | primarily with the aim of achieving   |  |  |  |  |  |  |  |
|                      |  | <ul><li>a) Higher productivity</li><li>b) Higher production</li><li>c) Higher use of speed steps</li><li>d) Higher use of feed</li></ul>  |  |  |  |  |  |  |  |
|                      | 2)   | when the torque required is   |  |  |  |  |  |  |  |
|                      |  | a) Low b) High<br>c) Medium d) Zero   |  |  |  |  |  |  |  |
|                      | 3)   | <ul> <li>The basic points to be considered while designing machine tool structures</li> <li>a) Cutting force</li> <li>b) Friction force</li> <li>c) Force due to mass of structures</li> <li>d) All of these</li> </ul> |  |  |  |  |  |  |  |
|                      | <ul> <li>4) Design for strength is done on the basis of</li> <li>a) Shear stress</li> <li>b) Principal stress</li> <li>c) Bending stress</li> <li>d) Tensile stress</li> </ul> |   |  |  |  |  |  |  |  |
|                      | <ul> <li>5) The commonly used shape of slide ways in shaping machine is</li> <li>a) Flat</li> <li>b) V</li> <li>c) Dovetail</li> <li>d) Double V</li> </ul>                    |   |  |  |  |  |  |  |  |
|                      | 6)   | Which of the following material has greater damping property?a) Grey Cast Ironb) Alloy steelc) Plain Carbon steeld) Aluminum alloys   |  |  |  |  |  |  |  |
|                      | 7)   | What is the function of cone pulley drive in the lathe machines?a) Drive the lead screwb) Change the spindle speedc) Drive the tailstockd) All of these   |  |  |  |  |  |  |  |
|                      | 8)   | Which of the following is a positive drive?<br>a) V belt drive b) Rope drive<br>c) Chain drive d) Flat belt drive   |  |  |  |  |  |  |  |
|                      | 9)   | The most commonly used value of Φ in geometric progression ratio isa) 1.26b) 2.3c) 3.2d) 2.0  |  |  |  |  |  |  |  |

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** MACHINE TOOL DESIGN

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

Seat No.

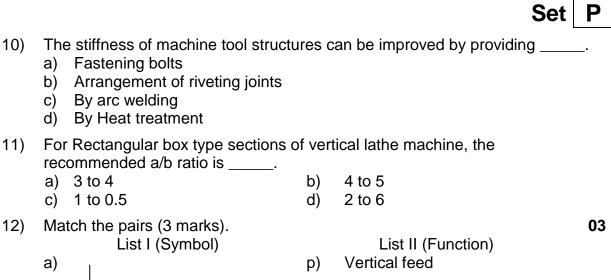
**SLR-FM-657** 

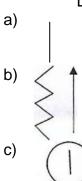
Set Ρ

Max. Marks: 70

4

4





q) On-off

r) On

## Seat No. T.E. (Part I) (Old) (C(

# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

## Section – I

| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes. |          |  |  |  |  |
|-----|------------------|--|----------|--|--|--|--|
| Q.3 | a)               | Explain different factors affecting the material selection for the machine tool structures.                          | 07       |  |  |  |  |
|     | b)               | What are the functions and major requirements of guide ways? Also, explain types of guide ways.                      | 07       |  |  |  |  |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design            | 14       |  |  |  |  |
|     |                  | Section – II   |          |  |  |  |  |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members. | 07<br>07 |  |  |  |  |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.                           | 07       |  |  |  |  |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.        | 07       |  |  |  |  |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear         | 14       |  |  |  |  |

# SLR-FM-657

Max. Marks: 56

Set

Ρ

|  |                                |  |  |                     | OER   |              | 51   |  |
|--|--------------------------------|--|--|---------------------|---|--------------|------|--|
| Seat<br>No.  |                                |  |  |                     |   | Set          | Q    |  |
| T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE TOOL DESIGN |                                |  |  |                     |   |              |      |  |
|  |                                | onday,16-12-<br>/I To 05:30 PI                 |  |                     | Max   | x. Marks     | : 70 |  |
| Instruc  |                                | Book.  |  |                     | e solved in first 30 minutes  | s in ansv    | ver  |  |
|  | 2                              | , .  | the right indicates                      |                     |   |              |      |  |
| Dungtin  |                                |  | CQ/Objective                             | Гуре (              | Questions   | N 4 a sel sa |      |  |
|  | on: 30 Mi                      |  |  |                     |   | Marks        |      |  |
|  |                                |  | alternatives from<br>owing is a positive | •                   | ions.   |              | 14   |  |
|  | ́a)                            | V belt drive<br>Chain drive                    |  | b)<br>d)            | Rope drive<br>Flat belt drive                                       |              |      |  |
| 2  | 2) The<br>a)<br>c)             | e most comm<br>1.26<br>3.2                     | only used value of                       | fΦinge<br>b)<br>d)  | eometric progression ratio<br>2.3<br>2.0                            | is           |      |  |
| 3  | 3) The<br>a)<br>b)<br>c)<br>d) | Fastening b                                    | olts<br>nt of riveting joints<br>ing     | tures ca            | an be improved by providir  | וּם          |      |  |
| 4  | rec<br>a)                      | -  | box type sections<br>/b ratio is         | of vert<br>b)<br>d) | ical lathe machine, the<br>4 to 5<br>2 to 6                         |              |      |  |
| 5  |                                | narily with the<br>Higher prod                 | e aim of achieving                       | <br>b)              | machine tools are automa<br>Higher production<br>Higher use of feed | ated         |      |  |
| 6  | ,                              |  | an be operated by<br>required is         |                     | ndle in the machine tool on<br>High<br>Zero                         | ly           |      |  |
| 7  | stru<br>a)                     | Cutting force                                  | <br>Ə                                    |                     | esigning machine tool   |              |      |  |
| 8  | 3) Des<br>a)<br>c)             | sign for stren<br>Shear stress<br>Bending stre |  | basis c<br>b)<br>d) | f<br>Principal stress<br>Tensile stress                             |              |      |  |

Page **4** of **12** 

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# 

Page 5 of 12

- 9) The commonly used shape of slide ways in shaping machine is \_\_\_\_\_.
  - a) Flat

a)

b) V

d)

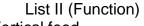
- c) Dovetail d) Double V
- 10) Which of the following material has greater damping property?
  - a) Grey Cast Iron
  - c) Plain Carbon steel

Drive the lead screw

- b) Alloy steeld) Aluminum alloys
- 11) What is the function of cone pulley drive in the lathe machines?
  - b) Change the spindle speed

All of these

- c) Drive the tailstock
- 12) Match the pairs (3 marks). List I (Symbol)

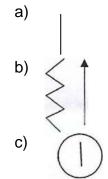


**SLR-FM-657** 

Set Q

03

- p) Vertical feed
  - q) On-off
  - r) On



## Seat No.

### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

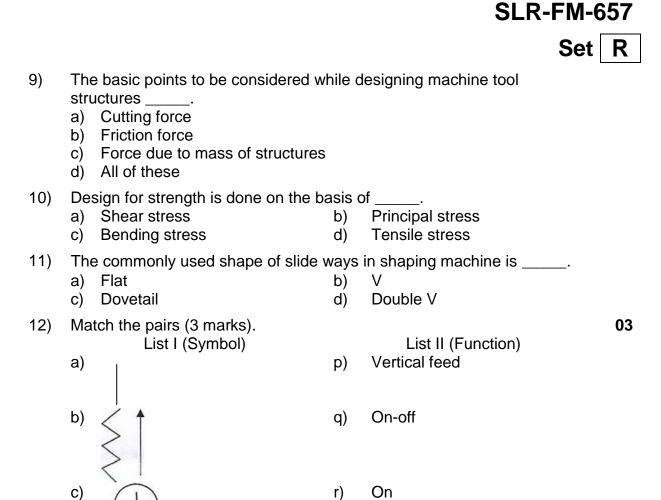
| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes. | 07<br>07 |
|-----|------------------|--|----------|
| Q.3 | a)               | Explain different factors affecting the material selection for the machine tool structures.                          | 07       |
|     | b)               | What are the functions and major requirements of guide ways? Also, explain types of guide ways.                      | 07       |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design            | 14       |
|     |                  | Section – II   |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members. | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.                           | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.        | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear         | 14       |

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Max. Marks: 56



| Seat   |  |  |  |                      |  | Set       | R     |  |  |  |
|--|--|--|--|----------------------|--|-----------|-------|--|--|--|
| No.  |  |  |  |                      |  |           |       |  |  |  |
| T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE TOOL DESIGN |  |  |  |                      |  |           |       |  |  |  |
|  | Day & Date: Monday,16-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70 |  |  |                      |  |           |       |  |  |  |
| Instruc  |  | Book.  |  |                      | e solved in first 30 minute  | es in ans | wer   |  |  |  |
|  | 4  | , .  | the right indicates fu                 |                      |  |           |       |  |  |  |
| Duratio  | on: 30 M   |  | ICQ/Objective T                        | ype (                | Ruestions  | Mark      | s: 14 |  |  |  |
| Q.1 (  | Choose   | the correct a                                  | alternatives from th                   | ne opt               | ions.  |           | 14    |  |  |  |
| 1  |  | ich of the fol<br>Grey Cast I<br>Plain Carbo   | ron                                    | greate<br>b)<br>d)   | er damping property?<br>Alloy steel<br>Aluminum alloys             |           |       |  |  |  |
| 2  | 2) Wh<br>a)<br>c)  |  | ad screw                               | drive iı<br>b)<br>d) | n the lathe machines?<br>Change the spindle spe<br>All of these    | ed        |       |  |  |  |
| 3  |  | iich of the fol<br>V belt drive<br>Chain drive |  | drive?<br>b)<br>d)   | Rope drive<br>Flat belt drive                                      |           |       |  |  |  |
| 4  | l) The<br>a)<br>c)   | e most comm<br>1.26<br>3.2                     | nonly used value of o                  | ⊅ in g<br>b)<br>d)   | eometric progression ratio<br>2.3<br>2.0                           | o is      |       |  |  |  |
| 5  | 5) The<br>a)<br>b)<br>c)<br>d)   | Fastening b                                    | oolts<br>nt of riveting joints<br>ling | ures ca              | an be improved by provid   | ing       |       |  |  |  |
| 6  | rec  | -  | r box type sections o<br>a/b ratio is  | bf vert<br>b)<br>d)  | cal lathe machine, the<br>4 to 5<br>2 to 6                         |           |       |  |  |  |
| 7  | ') The   | e forming and<br>narily with th<br>Higher proc | e aim of achieving _                   | ,                    | Machine tools are autom<br>Higher production<br>Higher use of feed | ated      |       |  |  |  |
| 8  |  |  | an be operated by the required is      | he har<br>b)<br>d)   | idle in the machine tool o<br>High<br>Zero                         | nly       |       |  |  |  |



On

## Seat No.

## T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

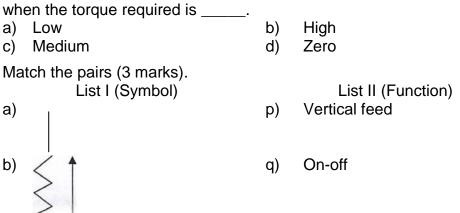
### Section – I

| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes. | 07<br>07 |
|-----|------------------|--|----------|
| Q.3 | a)               | Explain different factors affecting the material selection for the machine tool structures.                          | 07       |
|     | b)               | What are the functions and major requirements of guide ways? Also, explain types of guide ways.                      | 07       |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design            | 14       |
|     |                  | Section – II   |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members. | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.                           | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.        | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear         | 14       |

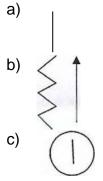




| r  | 1   |   |                                      |                     | ULIN  |      |       |  |  |  |
|--|---|---|--------------------------------------|---------------------|---|------|-------|--|--|--|
| Seat<br>No.  |   |   |                                      |                     |   | Set  | S     |  |  |  |
| T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MACHINE TOOL DESIGN   |   |   |                                      |                     |   |      |       |  |  |  |
|  | Day & Date: Monday,16-12-2019 Max. Marks: 70<br>Time: 02:30 PM To 05:30 PM  |   |                                      |                     |   |      |       |  |  |  |
| Instruc  | <ul> <li>Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.</li> <li>2) Figures to the right indicates full marks.</li> </ul> |   |                                      |                     |   |      |       |  |  |  |
|  |   | Ν   | CQ/Objective T                       | vpe (               | Questions   |      |       |  |  |  |
| Duratio  | on: 30 M  | Vinutes   | ,                                    | J 1                 |   | Mark | s: 14 |  |  |  |
|  | l) Ti<br>st   | he basic points<br>ructures<br>) Cutting forc<br>) Friction forc<br>) Force due t | <br>e                                | vhile c             | t <b>ions.</b><br>lesigning machine tool                        |      | 14    |  |  |  |
| <ul> <li>2) Design for strength is done on the basis of</li> <li>a) Shear stress</li> <li>b) Principal stress</li> <li>c) Bending stress</li> <li>d) Tensile stress</li> </ul> |   |   |                                      |                     |   |      |       |  |  |  |
| 3  | 3) T<br>a)<br>c)  | ) Flat  | used shape of slide                  | ways<br>b)<br>d)    | in shaping machine is<br>V<br>Double V                          |      |       |  |  |  |
| 4  | (a)   | /hich of the foll<br>) Grey Cast I<br>) Plain Carbo                               | ron                                  | greate<br>b)<br>d)  | er damping property?<br>Alloy steel<br>Aluminum alloys          |      |       |  |  |  |
| 5  | 5) W<br>a)<br>c)  | ) Drive the lea   | ad screw                             |                     | n the lathe machines?<br>Change the spindle spe<br>All of these | ed   |       |  |  |  |
| 6  |   | ) V belt drive  | owing is a positive                  | drive?<br>b)<br>d)  | Rope drive<br>Flat belt drive                                   |      |       |  |  |  |
| 7  |   | ) 1.26  | only used value of                   | Φ in g<br>b)<br>d)  | eometric progression ratio<br>2.3<br>2.0                        | o is | ·     |  |  |  |
| 8  | a   | <ul> <li>Fastening b</li> <li>Arrangement</li> <li>By arc weld</li> </ul>         | olts<br>nt of riveting joints<br>ing | ures c              | an be improved by provid  | ing  |       |  |  |  |
| g  | re<br>a   | ecommended a  | box type sections<br>/b ratio is     | of vert<br>b)<br>d) | ical lathe machine, the<br>4 to 5<br>2 to 6                     |      |       |  |  |  |



The forming and auxiliary feed motions in machine tools are automated



primarily with the aim of achieving

a) Higher productivity

10)

11)

12)

r) On

#### c) Higher use of speed steps Higher use of feed d) A hand wheel can be operated by the handle in the machine tool only

**SLR-FM-657** 

## Set S

03

b) Higher production

## Seat No.

### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MACHINE TOOL DESIGN

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)<br>b)         | Explain in detail working and auxiliary motion in machine tools.<br>Explain in detail classification of speed boxes. | 07<br>07 |
|-----|------------------|--|----------|
| Q.3 | a)               | Explain different factors affecting the material selection for the machine tool structures.                          | 07       |
|     | b)               | What are the functions and major requirements of guide ways? Also, explain types of guide ways.                      | 07       |
| Q.4 | Writ<br>a)<br>b) | <b>e short notes on.</b><br>Design of Aerostatic slideways<br>General requirements of machine tool design            | 14       |
|     |                  | Section – II   |          |
| Q.5 | a)<br>b)         | Explain functions of spindle unit and their requirements.<br>Explain compatibility in the design of control members. | 07<br>07 |
| Q.6 | a)               | Explain ergonomic considerations applied to the design of push buttons, toggles and knobs.                           | 07       |
|     | b)               | What is Stability analysis? Explain static cutting process characteristic of Single Degree of Freedom System.        | 07       |
| Q.7 | Writ<br>a)<br>b) | <b>e notes on.</b><br>High speed high efficiency machine tools<br>Design of Spindle due to bending and shear         | 14       |

## SLR-FM-657

Max. Marks: 56

Set S

| Seat No.  | Set F      | כ |  |  |  |  |  |  |  |  |
|---|------------|---|--|--|--|--|--|--|--|--|
| T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>MATERIAL HANDLING SYSTEMS  |            |   |  |  |  |  |  |  |  |  |
| Day & Date: Monday,16-12-2019         Max. Marks: 70           Time: 02:30 PM To 05:30 PM         Max. Marks: 70  |            |   |  |  |  |  |  |  |  |  |
| Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes<br>Book.   | s in answe | r |  |  |  |  |  |  |  |  |
| 2) Figures t the right indicate full marks.   |            |   |  |  |  |  |  |  |  |  |
| MCQ/Objective Type Questions Duration: 30 Minutes   | Marks: 1   | 1 |  |  |  |  |  |  |  |  |
|   |            | 4 |  |  |  |  |  |  |  |  |
| <ul> <li>Q.1 Choose the correct alternatives from the options .</li> <li>1) Flat belt conveyor are characterized by</li> <li>a) Bulk + On-Floor + No Accumulation</li> <li>b) Unit + Overhead + Accumulation</li> <li>c) Unit + On Floor + No Accumulation</li> <li>d) Bulk + Overhead + No Accumulation</li> </ul> |            | 4 |  |  |  |  |  |  |  |  |
| <ul> <li>2) Conveyors and industrial trucks are the equipment.</li> <li>a) Transport</li> <li>b) Positioning</li> <li>c) Storage</li> <li>d) Identification and control equipment</li> </ul>  |            |   |  |  |  |  |  |  |  |  |
| <ul> <li>3) Economy in material handling can be achieved by</li> <li>a) maximizing distance and time of travel</li> <li>b) minimizing distance and time of travel</li> <li>c) manual material handling</li> <li>d) All of above</li> </ul>  |            |   |  |  |  |  |  |  |  |  |
| <ul> <li>4) Interlock is available in controls of so that worker can Safely service the area.</li> <li>a) Electric safety</li> <li>b) Robotics safety</li> <li>c) Chemical safety</li> <li>d) Radiation safety</li> </ul>   |            |   |  |  |  |  |  |  |  |  |
| <ul> <li>5) Symbol → represents for</li> <li>a) Operation</li> <li>b) Store</li> <li>c) Inspection</li> <li>d) Transport</li> </ul>   |            |   |  |  |  |  |  |  |  |  |
| <ul> <li>6) A diagram showing the path followed by men and materials while<br/>Performing a task is known as</li> <li>a) String diagram</li> <li>b) Flow process chart</li> <li>c) Travel chart</li> <li>d) Flow diagram</li> </ul>   |            |   |  |  |  |  |  |  |  |  |
| <ul> <li>Figuipment evaluation sheet consist of equipment characteristic Utili and</li> <li>a) Safety</li> <li>b) Vendor characteristics</li> <li>c) Flexibility</li> <li>d) Unit load</li> </ul>   | zation     |   |  |  |  |  |  |  |  |  |

SLR-FM-658 Γ

|     |  |        | Set P   |
|-----|--|--------|---|
| 8)  | <ul> <li>Flow process chart gives</li> <li>a) To reduce the distance travelled</li> <li>b) Assembly line</li> <li>c) Relationship between product</li> <li>d) None of these</li> </ul> | d by n | nen and material  |
| 9)  | From to chart shows<br>a) Relative location of activities<br>c) Inspection stages  |        | Operation in the product<br>None of these                       |
| 10) | Instead of hoist, crane uses a<br>handle unit loads.<br>a) Jib crane<br>c) Gantry crane  | b)     | at with forks or a platform to<br>Bridge crane<br>Stacker crane |
| 11) | A good plant layout ensures<br>a) Maximum material handling<br>c) Exact MH   | b)     | Minimum material handling<br>None of these                      |
| 12) | For automation flow of mater<br>a) Low volume<br>c) High volume  | b)     | re required.<br>Medium volume<br>All of these                   |
| 13) | Hoisting equipments works in conject<br>cranes.<br>a) Roller<br>c) Elevator  |        | Industrial trucks   |
| 14) | common fork lift truck accide  | nts ai | e considered in material  |

- 14) \_\_\_\_\_ common fork lift truck accidents are considered in material handling system.
  - a) Five b) Seven c) One d) Ten

| Seat |  |
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### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: 1 | ) | Draw neat diagram where necessary.        |
|-----------------|---|---|
| 0               | 1 | Figures to the right indicate full mentes |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

### Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 04             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | t <b>e short notes (any three)</b>  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |



Max. Marks: 56

| cra                         | nes.  |                  |                          |
|-----------------------------|---|------------------|--------------------------|
| a)                          | Roller  | b)               | Industrial trucks        |
| c)                          | Elevator  | d)               | Overhead crane           |
| <br>har                     | common fork lift truck accider ndling system.   | nts ar           | e considered in material |
| a)                          | Five  | b)               | Seven                    |
| c)                          | One   | d)               | Ten                      |
| Fla<br>a)<br>b)<br>c)<br>d) | t belt conveyor are characterized<br>Bulk + On-Floor + No Accumula<br>Unit + Overhead + Accumulatior<br>Unit + On Floor + No Accumulat<br>Bulk + Overhead + No Accumula | tion<br>n<br>ion |                          |

cranes.

- 4) a) Maximum material handling b) Minimum material handling c) Exact MH None of these d)
- Relative location of activities b) a) Inspection stages d) c)
- Q.1 1)
- Choose the correct alternatives from the options.
- **Duration: 30 Minutes** 
  - - Flow process chart gives \_\_\_\_

2) Figures t the right indicate full marks.

- a) To reduce the distance travelled by men and material
- b) Assembly line
- c) Relationship between product
- d) None of these

7)

8)

Book.

Day & Date: Monday, 16-12-2019

Time: 02:30 PM To 05:30 PM

Seat

No.

## 2)

- From to chart shows \_\_\_\_

T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** MATERIAL HANDLING SYSTEMS

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

**MCQ/Objective Type Questions** 

## Operation in the product None of these

- 3) Instead of hoist, \_\_\_\_\_ crane uses a mast with forks or a platform to
  - handle unit loads.
  - a) Jib crane
  - b) Bridge crane Stacker crane c) Gantry crane d)
  - A good plant layout ensures
- For automation flow of materials are required. 5)
  - a) Low volume b) Medium volume
  - All of these c) High volume d)
- Hoisting equipments works in conjection with \_\_\_\_\_ and work station 6)
  - a) Roll
  - c) Elev

## **SLR-FM-658**



Max. Marks: 70

Marks: 14

14

- 9) Conveyors and industrial trucks are the \_\_\_\_\_ equipment.
  - a) Transport
  - b) Positioning
  - c) Storage
  - d) Identification and control equipment
- 10) Economy in material handling can be achieved by \_\_\_\_\_.
  - a) maximizing distance and time of travel
  - b) minimizing distance and time of travel
  - c) manual material handling
  - d) All of above
- 11) Interlock is available in controls of \_\_\_\_\_ so that worker can Safely service the area.
  - a) Electric safety
  - c) Chemical safety d) Radiation safety
- 12) Symbol <sup>→</sup> represents for \_\_\_\_.
  - a) Operation b) Store
  - c) Inspection d) Transport
- A diagram showing the path followed by men and materials while Performing a task is known as \_\_\_\_\_.
  - b) Flow process chart

b)

- c) Travel chart d) Flow diagram
- 14) Equipment evaluation sheet consist of equipment characteristic Utilization and \_\_\_\_\_.
  - a) Safety
  - c) Flexibility

a) String diagram

b) Vendor characteristics

Robotics safety

**SLR-FM-658** 

Set C

d) Unit load

| Seat |  |
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| No.  |  |

### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1)       | Draw neat diagram where necessary.        |  |
|---------------|----------|---|--|
|               | $\gamma$ | Figures to the right indicate full merica |  |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

### Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 05             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |



Max. Marks: 56

| Seat   |   |          |                                 |                                  |                   | - F                                   |      |  |
|--------|---|----------|---------------------------------|----------------------------------|-------------------|---------------------------------------|------|--|
| No.    |   |          |                                 |                                  |                   | Set                                   | R    |  |
|        |   | T.E      | E. (Part – I)                   | ) (Old) (CGPA                    | ) Exam            | ination Nov/Dec-2019                  |      |  |
|        | Mechanical Engineering<br>MATERIAL HANDLING SYSTEMS |          |                                 |                                  |                   |                                       |      |  |
| Day 8  | k Date  | e: M     | onday,16-12                     |                                  |                   | Max. Marks                            | : 70 |  |
| -      |   | -        | И To 05:30 P                    |                                  |                   |                                       |      |  |
| Instru | uctio   | ns: ´    | 1) Q. No. 1 is<br>Book.         | compulsory and                   | d should b        | be solved in first 30 minutes in answ | ver  |  |
|        |   |          |                                 | he right indicate                | full marks        | 3.                                    |      |  |
| Durat  | : 0   |          |                                 | ICQ/Objectiv                     | е Туре 🤇          |                                       |      |  |
|        |   |          | inutes                          |                                  |                   | Marks                                 |      |  |
| Q.1    | <b>Cno</b> (  |          |                                 | alternatives fro<br>presents for | •                 | tions.                                | 14   |  |
|        | ,   | a)       | Operation                       |                                  | b)                | Store                                 |      |  |
|        | $\sim$  | c)       | Inspection                      | die er tie er er tie feili       | d)                | Transport                             |      |  |
|        | 2)  |          |                                 | sk is known as _                 |                   | men and materials while               |      |  |
|        |   | a)       | String diag                     | am                               | b)                | Flow process chart                    |      |  |
|        | 3)  | C)       | Travel char                     |                                  | d)<br>point of on | Flow diagram                          |      |  |
|        | 3)  |          | d                               | uation sheet cor                 |                   | quipment characteristic Utilization   |      |  |
|        |   | a)<br>c) | Safety<br>Flexibility           |                                  | b)<br>d)          | Vendor characteristics<br>Unit load   |      |  |
|        | 4)  | Flo      | w process cl                    | nart gives                       | ,                 |                                       |      |  |
|        |   |          | To reduce t<br>Assembly li      |                                  | elled by n        | nen and material                      |      |  |
|        |   | c)       | Relationshi                     | p between produ                  | uct               |                                       |      |  |
|        | -)  | ,        | None of the                     |                                  |                   |                                       |      |  |
|        | 5)  |          | om to chart sl<br>Relative loc  |                                  | s b)              | Operation in the product              |      |  |
|        |   |          | Inspection                      |                                  |                   | None of these                         |      |  |
|        | 6)  |          | tead of hoist<br>ndle unit load |                                  | ses a mas         | st with forks or a platform to        |      |  |
|        |   |          | Jib crane                       | 15.                              | b)                | Bridge crane                          |      |  |
|        |   | c)       | Gantry crar                     | ne                               | d)                | Stacker crane                         |      |  |
|        | 7)  |          |                                 | out ensures                      |                   | Minimum material handling             |      |  |
|        |   |          | Exact MH                        |                                  | d)                |                                       |      |  |
|        | 8)  |          |                                 | flow of m                        |                   | •                                     |      |  |
|        |   |          | Low volume<br>High volum        |                                  | ,                 | Medium volume<br>All of these         |      |  |
|        | 9)  | ,        | •                               |                                  | ,                 | with and work station                 |      |  |
|        |   |          | nes.<br>Roller                  |                                  | ይ)                | Industrial trucks                     |      |  |
|        |   |          | Elevator                        |                                  | d)                | Overhead crane                        |      |  |
|        |   |          |                                 |                                  |                   |                                       |      |  |



- 10) \_\_\_\_\_ common fork lift truck accidents are considered in material handling system.
  - a) Five b) Seven
  - c) One d) Ten
- 11) Flat belt conveyor are characterized by \_\_\_\_\_.
  - a) Bulk + On-Floor + No Accumulation
  - b) Unit + Overhead + Accumulation
  - c) Unit + On Floor + No Accumulation
  - d) Bulk + Overhead + No Accumulation
- 12) Conveyors and industrial trucks are the \_\_\_\_\_ equipment.
  - a) Transport
  - b) Positioning
  - c) Storage
  - d) Identification and control equipment
- 13) Economy in material handling can be achieved by \_\_\_\_\_.
  - a) maximizing distance and time of travel
  - b) minimizing distance and time of travel
  - c) manual material handling
  - d) All of above
- 14) Interlock is available in controls of \_\_\_\_\_ so that worker can Safely service the area.
  - a) Electric safety
- b) Robotics safety
- c) Chemical safety
- d) Radiation safety

| Seat |  |
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### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1) | Draw neat diagram where necessary.       |  |
|---------------|----|--|--|
|               | 2  | Eiguree to the right indicate full marks |  |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

### Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 04             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |





Max. Marks: 56

|             |   |  |                                | 3LK-FINI-030   |
|-------------|---|--|--------------------------------|--|
| Seat<br>No. |   |  |                                | Set S  |
|             |   | I) (Old) (CGPA<br>Mechanica<br>IATERIAL HAI  | al Engine                      | •  |
|             | Date: Monday,16-12<br>02:30 PM To 05:30 I   |  |                                | Max. Marks: 70   |
| Instru      | Book.   |  |                                | e solved in first 30 minutes in answer                       |
|             | , -   | the right indicate   |                                |  |
| Duratio     | n: 30 Minutes   | MCQ/Objectiv   | e Type C                       | Juestions<br>Marks: 14                                       |
|             | Choose the correct  | alternatives fro   | m the onf                      |  |
|             |   | t, crane us  |                                | t with forks or a platform to<br>Bridge crane                |
|             | c) Gantry cra   | ne   | d)                             | Stacker crane  |
| 2           |   | yout ensures<br>material handling  |                                | Minimum material handling<br>None of these                   |
| 3           | <ol> <li>For automation</li> <li>a) Low volum</li> <li>c) High volum</li> </ol>         |  | aterials an<br>b)<br>d)        | re required.<br>Medium volume<br>All of these                |
| 2           | <ul> <li>Hoisting equips<br/>cranes.</li> <li>a) Roller</li> <li>c) Elevator</li> </ul> | ments works in co  | onjection v<br>b)<br>d)        | with and work station<br>Industrial trucks<br>Overhead crane |
| Ę           | 5) common<br>handling syste<br>a) Five<br>c) One  |  | cidents ar<br>b)<br>d)         | e considered in material<br>Seven<br>Ten                     |
| e           | a) Bulk + On-<br>b) Unit + Ove<br>c) Unit + On  | yor are character<br>Floor + No Accur<br>rhead + Accumu<br>Floor + No Accur<br>erhead + No Accur | mulation<br>lation<br>nulation |  |
| 7           | <ul><li>a) Transport</li><li>b) Positioning</li><li>c) Storage</li></ul>                | l industrial trucks<br>)<br>on and control ec  |                                | equipment.   |
| 8           | a) maximizing   | aterial handling c<br>g distance and tir<br>distance and tim                                     | ne of trave                    | el   |

- Interlock is available in controls of \_\_\_\_\_ so that worker can Safely 9) service the area.
  - a) Electric safety b) Robotics safety
  - c) Chemical safety d) Radiation safety
- Symbol  $\implies$  represents for \_\_\_\_\_. 10)
  - b) Operation Store a)
  - Inspection d) Transport C)
- 11) A diagram showing the path followed by men and materials while Performing a task is known as \_\_\_\_\_. b) Flow process chart
  - a) String diagram
  - c) Travel chart d) Flow diagram
- 12) Equipment evaluation sheet consist of equipment characteristic Utilization and
  - a) Safety c) Flexibility
    - b) Vendor characteristics d) Unit load
- 13) Flow process chart gives \_\_\_\_\_.
  - a) To reduce the distance travelled by men and material
  - b) Assembly line
  - c) Relationship between product
  - d) None of these
- 14) From to chart shows
  - Relative location of activities a)
  - c) Inspection stages
- Operation in the product b)
- None of these d)



Max. Marks: 56

| Seat |  |
|------|--|
| No.  |  |

### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering MATERIAL HANDLING SYSTEM

Day & Date: Monday,16-12-2019 Time: 02:30 PM To 05:30 PM

| Instructions: | 1)       | Draw neat diagram where necessary.        |  |
|---------------|----------|---|--|
|               | $\gamma$ | Figures to the right indicate full merica |  |

- 2) Figures to the right indicate full marks.
  - 3) Solve any two questions in each section.

### Section – I

| Q.2 | a)             | Explain the productivity depends on material handling system.   | 05             |
|-----|----------------|---|----------------|
|     | b)             | Explain concepts of unit load, containerization and palletisation.  | 05             |
|     | c)             | Give the classification of material handling equipments.  | 04             |
| Q.3 | a)<br>b)<br>c) | Explain the general characteristics of storing equipments and Describe<br>with fig. any two types of equipments.<br>Explain any two types of Fork lift trucks.<br>Compare conventional and CIMS material handling system. | 05<br>05<br>04 |
| Q.4 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Industrial Robot  | 05             |
|     | b)             | Hoisting Equipments   | 05             |
|     | c)             | Industrial truck  | 05             |
|     | d)             | Need of MHS in Industry.  | 05             |
|     |                | Section – II  |                |
| Q.5 | a)             | Explain with figure procedure chart.  | 05             |
|     | b)             | Explain with figure Flow diagram.   | 05             |
|     | c)             | Explain in brief selection of material handling equipment.  | 04             |
| Q.6 | a)             | Explain material handling equation.   | 05             |
|     | b)             | Explain with Fig. Flow chart.   | 05             |
|     | c)             | Discuss the important of material handling safety.  | 04             |
| Q.7 | Writ           | te short notes (any three)  | 14             |
|     | a)             | Material Handling equipments Accidents  | 05             |
|     | b)             | Material handling equipment in Foundry  | 05             |
|     | c)             | Material flow patterns  | 05             |
|     | d)             | From TO chart   | 04             |



# T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

b)

d)

b)

d)

b)

b)

- Figures to the right indicate full marks.
- 3) Draw suitable diagrams wherever necessary.

#### **Duration: 30 Minutes** Q.1 Choose the correct alternatives from the options.

- 1) Pelton wheel is
  - Reaction water turbine a)
  - Impulse gas turbine C)
- 2) For very low head, turbine is suitable.
  - a) Pelton b) Francis
  - c) Kaplan d)
- Priming is done in case of \_\_\_\_\_. 3)
  - a) Water turbines
  - c) Centrifugal pump
- Draft tube is used for \_\_\_\_\_. 4)
  - Impulse water turbine a)
  - b) Reaction water turbine
  - c) Impulse or reaction water turbine
  - d) Gas turbine

5) Thermal efficiency of the gas turbine can be improved by \_\_\_\_\_.

- Inter cooling a)
- **Re-generation** All of the above c) d)
- 6) Gas turbine works on .
  - Otto cycle a)
  - Rankine cycle Joule's cycle d) C)
- Only kinetic energy is available at the inlet of the \_\_\_\_\_. 7)
  - a) Francis turbine Kaplan turbine b)
  - c) Pelton wheel All of the above d)
- Pressure relief valves are normally \_\_\_\_\_ pressure control valves. 8)
  - a) Closed b) Open
  - c) (a) or (b) d) None of the above
- 9) Weight loaded accumulator can be used in
  - a) Horizontal position Vertical position b)
  - Inclined position In any position c) d)

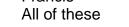
Marks: 14

14

Set

Max. Marks: 70

**SLR-FM-659** 



Gas turbines

**Re-heating** 

**Diesel cycle** 

All of the above

MCQ/Objective Type Questions

Impulse water turbine

Reaction gas turbine

- Mostly FRL is used at \_\_\_\_\_. 10)
  - a) Compressor outlet
  - c) At outlet of actuator
- b) Compressor inlet
- None of the above d)
- In case of meter-in circuit, heat generated due to throttling is fed to the 11)
  - a) Oil reservoir

b) Actuator

c) (a) or (b)

- Both (a) and (b) d)
- Air motors are \_\_\_\_\_. 12)
  - a) Compressors
  - b) Electric motors
  - c) Used to run the fluid power system using pressurized air
  - d) None of these
- 13) Accumulators are \_\_\_\_\_.
  - a) Intensifiers
  - b) Actuators
  - c) Only Storage reservoirs
  - d) Devices which receive, store & supply pressurized liquids
- 14) Cushioning effect is concerned with \_
  - a) Hydraulic system
  - c) Both a) and b)
- b) Pneumatic system
- d) None of the above

| Seat |  |
|------|--|
| No.  |  |

# Set P

## T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)             | What is cavitation in centrifugal pumps? How it can be avoided? What are different methods to reduce it?   | 05             |
|-----|----------------|--|----------------|
|     | b)<br>c)       | A Kaplan turbine develops 24647.6 KW power at an average head of 39 meters. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and overall efficiency of 90%, calculate the diameter and speed of the turbine.<br>Discuss about different types of fuels used for gas turbines                      | 05<br>04       |
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45°& reduce the Circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power? | 05             |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?  | 05             |
|     | C)             | Explain different types of draft tubes used in reaction water turbines.  | 04             |
| Q.4 | a)             | A gas turbine plant works on Joule cycle. Its compressor takes air at 101 KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine.  | 05             |
|     |                | 1) Thermal efficiency of the cycle<br>2) Work ratio<br>3) Power output<br>Take $\gamma = 1.4 \& C_p = 1.005 \text{ KJ/Kg K}$   |                |
|     | b)             | A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water<br>flowing at the rate of 700 lit/s under a head of 30 m. The buckets deflect<br>the jet through an angle of 160°. Calculate the power given by water to the<br>runner & hydraulic efficiency of the turbine. Assume coefficient of<br>velocity as 0.98.  | 05             |
|     | c)             | Explain with neat sketch governing of Pelton wheels.   | 04             |
|     |                | Section – II   |                |
| Q.5 | a)<br>b)<br>c) | Explain with neat sketch of Vane type pump.<br>Explain with neat sketch of 3/2 Direction Control Valve used.<br>Draw and explain neat sketch of Pressure Reducing Valve.   | 05<br>04<br>05 |
| Q.6 | a)<br>b)       | Explain with neat sketch of two stage reciprocating compressor.<br>Draw and label the parts of Hydraulic Clamping system and Pneumatic<br>operated clamping system.  | 05<br>04       |

|     |                | Set   | Ρ              |
|-----|----------------|---|----------------|
|     | c)             | Explain with neat sketch of Lubricator unit used in pneumatic system.   | 05             |
| Q.7 | a)<br>b)<br>c) | Explain the selection criteria for compressors.<br>With neat sketch, explain time delay circuit.<br>What is function of Seal, Classify it and explain any one of seal with its<br>Applications? | 04<br>05<br>05 |

## Seat No.

### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering** FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019

Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

d)

d)

b)

d)

- Figures to the right indicate full marks.
- 3) Draw suitable diagrams wherever necessary.

### MCQ/Objective Type Questions **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options.

- 1) Pressure relief valves are normally \_ \_\_ pressure control valves. b) Open
  - a) Closed
  - c) (a) or (b)
- Weight loaded accumulator can be used in 2) b)
  - a) Horizontal position
  - Inclined position c)
- Mostly FRL is used at 3)
  - Compressor outlet a)
  - c) At outlet of actuator
- In case of meter-in circuit, heat generated due to throttling is fed to the 4)
  - a) Oil reservoir
  - c) (a) or (b)
- 5) Air motors are
  - a) Compressors
  - b) Electric motors
  - Used to run the fluid power system using pressurized air c)
  - d) None of these
- Accumulators are . 6)
  - a) Intensifiers
  - b) Actuators

8)

a)

c)

- Only Storage reservoirs C)
- Devices which receive, store & supply pressurized liquids d)

b)

d)

7) Cushioning effect is concerned with

Reaction water turbine

Impulse gas turbine

- Hydraulic system a)
- Both a) and b) C) Pelton wheel is \_\_\_\_\_.
- b) Impulse water turbine

Pneumatic system

None of the above

d) Reaction gas turbine

None of the above

Vertical position

Compressor inlet

None of the above

In any position

- b) Actuator
- Both (a) and (b) d)

Marks: 14

14

**SLR-FM-659** 



Max. Marks: 70

- 9) For very low head, \_\_\_\_\_ turbine is suitable.
  - a) Peltonc) Kaplan

- b) Francis
- d) All of these

Gas turbines

All of the above

b)

d)

b)

- 10) Priming is done in case of \_\_\_\_\_.
  - a) Water turbines
  - c) Centrifugal pump
- 11) Draft tube is used for \_\_\_\_\_.
  - a) Impulse water turbine
  - b) Reaction water turbine
  - c) Impulse or reaction water turbine
  - d) Gas turbine

### 12) Thermal efficiency of the gas turbine can be improved by \_\_\_\_\_.

- a) Inter cooling
- c) Re-generation
- 13) Gas turbine works on \_\_\_\_\_.
  - a) Otto cycle
  - c) Rankine cycle
- 14) Only kinetic energy is available at the inlet of the \_\_\_\_\_.
  - a) Francis turbine
  - c) Pelton wheel

d) All of the above

Re-heating

- b) Diesel cycle
- d) Joule's cycle
- b) Kaplan turbine
- d) All of the above



| Seat |  |
|------|--|
| No.  |  |



### T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)             | What is cavitation in centrifugal pumps? How it can be avoided? What are different methods to reduce it?   | 05             |
|-----|----------------|--|----------------|
|     | b)<br>c)       | A Kaplan turbine develops 24647.6 KW power at an average head of 39 meters. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and overall efficiency of 90%, calculate the diameter and speed of the turbine.<br>Discuss about different types of fuels used for gas turbines                      | 05<br>04       |
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45°& reduce the Circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power? | 05             |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?  | 05             |
|     | c)             | Explain different types of draft tubes used in reaction water turbines.  | 04             |
| Q.4 | a)             | A gas turbine plant works on Joule cycle. Its compressor takes air at 101 KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine.  | 05             |
|     |                | 1) Thermal efficiency of the cycle<br>2) Work ratio<br>3) Power output<br>Take $\gamma = 1.4 \& C_p = 1.005 \text{ KJ/Kg K}$   |                |
|     | b)             | A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water<br>flowing at the rate of 700 lit/s under a head of 30 m. The buckets deflect<br>the jet through an angle of 160°. Calculate the power given by water to the<br>runner & hydraulic efficiency of the turbine. Assume coefficient of<br>velocity as 0.98.  | 05             |
|     | c)             | Explain with neat sketch governing of Pelton wheels.   | 04             |
|     |                | Section – II   |                |
| Q.5 | a)<br>b)<br>c) | Explain with neat sketch of Vane type pump.<br>Explain with neat sketch of 3/2 Direction Control Valve used.<br>Draw and explain neat sketch of Pressure Reducing Valve.   | 05<br>04<br>05 |
| Q.6 | a)<br>b)       | Explain with neat sketch of two stage reciprocating compressor.<br>Draw and label the parts of Hydraulic Clamping system and Pneumatic<br>operated clamping system.  | 05<br>04       |

|     |                | Set   | Q              |
|-----|----------------|---|----------------|
|     | c)             | Explain with neat sketch of Lubricator unit used in pneumatic system.   | 05             |
| Q.7 | a)<br>b)<br>c) | Explain the selection criteria for compressors.<br>With neat sketch, explain time delay circuit.<br>What is function of Seal, Classify it and explain any one of seal with its<br>Applications? | 04<br>05<br>05 |

| Sea<br>No. | t                | Set R   |
|------------|------------------|---|
|            |                  | T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019<br>Mechanical Engineering<br>FLUID MACHINERY AND FLUID POWER  |
|            |                  | e: Monday, 16-12-2019 Max. Marks: 70<br>30 PM To 05:30 PM   |
| Instr      | ructio           | <ul> <li>ns: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.</li> <li>2) Figures to the right indicate full marks.</li> <li>3) Draw suitable diagrams wherever necessary.</li> </ul> |
| _          | _                | MCQ/Objective Type Questions  |
|            |                  | 30 Minutes Marks: 14  |
| Q.1        | <b>Cho</b><br>1) | ose the correct alternatives from the options.14Thermal efficiency of the gas turbine can be improved bya) Inter coolingb) Re-heatingc) Re-generationd) All of the above  |
|            | 2)               | Gas turbine works ona) Otto cycleb) Diesel cyclec) Rankine cycled) Joule's cycle  |
|            | 3)               | Only kinetic energy is available at the inlet of the<br>a) Francis turbine b) Kaplan turbine<br>c) Pelton wheel d) All of the above   |
|            | 4)               | Pressure relief values are normally pressure control values.a) Closedb) Openc) (a) or (b)d) None of the above   |
|            | 5)               | Weight loaded accumulator can be used in<br>a) Horizontal position b) Vertical position<br>c) Inclined position d) In any position  |
|            | 6)               | Mostly FRL is used ata) Compressor outletb) Compressor inletc) At outlet of actuatord) None of the above  |
|            | 7)               | In case of meter-in circuit, heat generated due to throttling is fed to the   |
|            |                  | a) Oil reservoirb) Actuatorc) (a) or (b)d) Both (a) and (b)   |
|            | 8)               | <ul> <li>Air motors are</li> <li>a) Compressors</li> <li>b) Electric motors</li> <li>c) Used to run the fluid power system using pressurized air</li> </ul>   |

- c) Used to run the fluid power system using pressurized aird) None of these

Set R

- 9) Accumulators are \_\_\_\_\_.
  - a) Intensifiers
  - b) Actuators
  - c) Only Storage reservoirs
  - d) Devices which receive, store & supply pressurized liquids

b)

d)

b)

d)

- 10) Cushioning effect is concerned with \_
  - a) Hydraulic system
  - c) Both a) and b)
- 11) Pelton wheel is \_\_\_\_\_.
  - a) Reaction water turbine
  - c) Impulse gas turbine
- b) Impulse water turbine

Pneumatic system

None of the above

- d) Reaction gas turbine
- 12) For very low head, \_\_\_\_\_ turbine is suitable.
  - a) Pelton
  - c) Kaplan
- 13) Priming is done in case of \_\_\_\_\_.

### a) Water turbines

- c) Centrifugal pump
- 14) Draft tube is used for \_\_\_\_\_.
  - a) Impulse water turbine
  - b) Reaction water turbine
  - c) Impulse or reaction water turbine
  - d) Gas turbine

b) Gas turbines

All of these

Francis

d) All of the above



| Seat |  |
|------|--|
| No.  |  |



## T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)             | What is cavitation in centrifugal pumps? How it can be avoided? What are different methods to reduce it?  | 05             |
|-----|----------------|---|----------------|
|     | b)<br>c)       | A Kaplan turbine develops 24647.6 KW power at an average head of 39 meters. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and overall efficiency of 90%, calculate the diameter and speed of the turbine.<br>Discuss about different types of fuels used for gas turbines                                     | 05<br>04       |
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45°& reduce the Circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power?                | 05             |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?   | 05             |
|     | c)             | Explain different types of draft tubes used in reaction water turbines.   | 04             |
| Q.4 | a)             | A gas turbine plant works on Joule cycle. Its compressor takes air at 101 KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine.<br>1) Thermal efficiency of the cycle   | 05             |
|     |                | 2) Work ratio   |                |
|     |                | 3) Power output   |                |
|     | b)             | Take $\gamma = 1.4 \& C_p = 1.005 \text{ KJ/Kg K}$<br>A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water<br>flowing at the rate of 700 lit/s under a head of 30 m. The buckets deflect<br>the jet through an angle of 160°. Calculate the power given by water to the<br>runner & hydraulic efficiency of the turbine. Assume coefficient of<br>velocity as 0.98. | 05             |
|     | c)             | Explain with neat sketch governing of Pelton wheels.  | 04             |
|     |                | Section – II  |                |
| Q.5 | a)<br>b)<br>c) | Explain with neat sketch of Vane type pump.<br>Explain with neat sketch of 3/2 Direction Control Valve used.<br>Draw and explain neat sketch of Pressure Reducing Valve.  | 05<br>04<br>05 |
| Q.6 | a)<br>b)       | Explain with neat sketch of two stage reciprocating compressor.<br>Draw and label the parts of Hydraulic Clamping system and Pneumatic<br>operated clamping system.   | 05<br>04       |

|     |                | Set   | R              |
|-----|----------------|---|----------------|
|     | c)             | Explain with neat sketch of Lubricator unit used in pneumatic system.   | 05             |
| Q.7 | a)<br>b)<br>c) | Explain the selection criteria for compressors.<br>With neat sketch, explain time delay circuit.<br>What is function of Seal, Classify it and explain any one of seal with its<br>Applications? | 04<br>05<br>05 |

## Seat T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 **Mechanical Engineering**

Day & Date: Monday, 16-12-2019

Time: 02:30 PM To 05:30 PM

No.

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer Book.

FLUID MACHINERY AND FLUID POWER

- Figures to the right indicate full marks.
- 3) Draw suitable diagrams wherever necessary.

### MCQ/Objective Type Questions **Duration: 30 Minutes**

#### Q.1 Choose the correct alternatives from the options.

- 1) Mostly FRL is used at \_\_\_\_\_.
  - a) Compressor outlet
  - Compressor inlet c) At outlet of actuator d) None of the above
- 2) In case of meter-in circuit, heat generated due to throttling is fed to the

b)

b)

- a) Oil reservoir
- Both (a) and (b) d)

Actuator

Air motors are \_\_\_\_\_. 3)

c) (a) or (b)

- a) Compressors
- b) Electric motors
- Used to run the fluid power system using pressurized air c)
- d) None of these
- 4) Accumulators are .
  - a) Intensifiers
  - b) Actuators
  - c) Only Storage reservoirs
  - d) Devices which receive, store & supply pressurized liquids
- Cushioning effect is concerned with \_ 5)
  - a) Hydraulic system c) Both a) and b)
- Pneumatic system b)

b)

b)

- d) None of the above
- 6) Pelton wheel is .
  - a) Reaction water turbine

c) Impulse gas turbine

b) Impulse water turbine Reaction gas turbine d)

Francis

Gas turbines

- For very low head, \_\_\_\_\_ turbine is suitable. 7)
  - Pelton a)
  - All of these c) Kaplan d)
- Priming is done in case of \_\_\_\_\_. 8)
  - a) Water turbines
  - c) Centrifugal pump d) All of the above

Marks: 14

14

Max. Marks: 70

**SLR-FM-659** 

Set

9) Draft tube is used for \_\_\_\_\_. a) Impulse water turbine b) Reaction water turbine c) Impulse or reaction water turbine d) Gas turbine 10) Thermal efficiency of the gas turbine can be improved by \_\_\_\_\_. a) Inter cooling **Re-heating** b) c) Re-generation d) All of the above 11) Gas turbine works on \_\_\_\_\_. a) Otto cycle b) Diesel cycle c) Rankine cycle d) Joule's cycle

- Only kinetic energy is available at the inlet of the \_\_\_\_\_. 12)
  - a) Francis turbine Kaplan turbine b)
  - c) Pelton wheel d)
- 13) Pressure relief valves are normally \_\_\_\_\_ pressure control valves.
  - a) Closed

c) (a) or (b)

All of the above

**SLR-FM-659** 

Set S

- - b) Open
- None of the above d)
- Weight loaded accumulator can be used in \_ 14)
  - a) Horizontal position c) Inclined position
- Vertical position b)
  - d) In any position

| Seat |  |
|------|--|
| No.  |  |



## T.E. (Part – I) (Old) (CGPA) Examination Nov/Dec-2019 Mechanical Engineering FLUID MACHINERY AND FLUID POWER

Day & Date: Monday, 16-12-2019 Time: 02:30 PM To 05:30 PM Max. Marks: 56

**Instructions:** 1) Solve any two questions from each section. 2) Figures to the right indicate full marks.

### Section – I

| Q.2 | a)             | What is cavitation in centrifugal pumps? How it can be avoided? What are different methods to reduce it?  | 05             |
|-----|----------------|---|----------------|
|     | b)<br>c)       | A Kaplan turbine develops 24647.6 KW power at an average head of 39 meters. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and overall efficiency of 90%, calculate the diameter and speed of the turbine.<br>Discuss about different types of fuels used for gas turbines                                     | 05<br>04       |
| Q.3 | a)             | A three stage centrifugal pump has impellers 40 cm in diameter & 2 cm wide at outlet. The vanes are curved back at 45°& reduce the Circumferential area by 10%. The manometric efficiency is 90% & the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 liters per second. What should be the shaft power?                | 05             |
|     | b)             | A turbine develops 500 KW power under a head of 100 meters at 200 rpm. What would be its normal speed & output under a head of 81 meters?   | 05             |
|     | C)             | Explain different types of draft tubes used in reaction water turbines.   | 04             |
| Q.4 | a)             | A gas turbine plant works on Joule cycle. Its compressor takes air at 101 KPa and 300°K and delivers the same at 606 KPa. If the maximum cycle temperature is limited to 1200°K and heat input rate is 100 MW, determine.   | 05             |
|     |                | <ol> <li>Thermal efficiency of the cycle</li> <li>Work ratio</li> <li>Power output</li> </ol>   |                |
|     | b)             | Take $\gamma = 1.4 \& C_p = 1.005 \text{ KJ/Kg K}$<br>A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water<br>flowing at the rate of 700 lit/s under a head of 30 m. The buckets deflect<br>the jet through an angle of 160°. Calculate the power given by water to the<br>runner & hydraulic efficiency of the turbine. Assume coefficient of<br>velocity as 0.98. | 05             |
|     | c)             | Explain with neat sketch governing of Pelton wheels.  | 04             |
|     |                | Section – II  |                |
| Q.5 | a)<br>b)<br>c) | Explain with neat sketch of Vane type pump.<br>Explain with neat sketch of 3/2 Direction Control Valve used.<br>Draw and explain neat sketch of Pressure Reducing Valve.  | 05<br>04<br>05 |
| Q.6 | a)<br>b)       | Explain with neat sketch of two stage reciprocating compressor.<br>Draw and label the parts of Hydraulic Clamping system and Pneumatic<br>operated clamping system.   | 05<br>04       |

|     |                | Set   | S              |
|-----|----------------|---|----------------|
|     | c)             | Explain with neat sketch of Lubricator unit used in pneumatic system.   | 05             |
| Q.7 | a)<br>b)<br>c) | Explain the selection criteria for compressors.<br>With neat sketch, explain time delay circuit.<br>What is function of Seal, Classify it and explain any one of seal with its<br>Applications? | 04<br>05<br>05 |

|      | B.E. (Part – I) |
|------|-----------------|
| No.  |                 |
| Seat |                 |

## ) (Old) Examination Nov/Dec-2019 **Mechanical Engineering** POWER PLANT AND ENERGY ENGINEERING

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

**Duration: 30 Minutes** 

**Instructions:** 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

## **MCQ/Objective Type Questions**

#### Q.1 Choose the correct alternatives from the options.

- Solar thermal power generation can be achieved by 1)
  - Using focusing type collector Using solar pond b) a)
  - C) Using heliostats
- 2) The energy radiated by sun on a bright sunny day is approximately \_\_\_\_\_.

d)

- a) 700 W/m<sup>2</sup> 800 W/m<sup>2</sup> b)
- $1 \text{ kW/m}^2$  $2 \text{ kW/m}^2$ C) d)

#### Load factor of power station is defined as \_\_\_\_ 3) b)

- Maximum load / average load a)
- Average load / maximum load C)
- 4) Load factor of power station is generally \_
  - Equal to unity a) b)
  - More than unity C) d)
- Diversity factor is always . 5)
  - a) Equal to unity
  - c) More than unity d)

Annual depreciation cost is calculated by 6)

- Sinking fund method a)
- c) Both (a) and (b) d)
- Demand factor is defined as 7)
  - a) Average load / maximum demand
  - b) Maximum demand / connected load
  - c) Connected load / maximum demand
  - d) None of the above

#### 8) Annual depreciation as per straight line method is calculated by \_\_\_\_\_.

- The capital cost divided by number of years of life a)
- The capital cost minus salvage value, is divided by the number of b) years of life
- Investing a uniform sum of money per annum at stipulated rate of c) interest
- None of the above d)

- Average load x maximum load
- none of the above
- d)
  - Less than unity
- None of the above
- Less than unity b)

- None of the above

b) Straight line method Estimate value



Max. Marks: 100

**SLR-FM-767** 

Using any of the above system

| d)              | Two part tariff  |                     |   |
|-----------------|--|---------------------|---|
|                 | t plate collector absorbs<br>Direct radiation only<br>Direct and diffuse both  | b)<br>d)            |   |
|                 | Pyranometer is used for measurer<br>Direct radiation only<br>Direct and diffuse both   | b)                  | of<br>Diffuse radiation only<br>None of the above       |
| a)<br>b)<br>c)  | a solar collector the function of tra<br>Transmit solar radiations<br>Protect the collector from dust<br>Decrease the heat loss from col<br>All of the above |                     |   |
|                 | st widely used material of a solar<br>Arsenic<br>Silicon   | b)                  | S<br>Cadmium<br>Steel                                   |
| a)<br>b)<br>c)  | otovoltaic cell converts<br>Thermal energy into electrical er<br>Solar radiation into thermal ener<br>Electromagnetic radiation directl<br>All of the above  | gу                  | electricity   |
| a)<br>b)<br>c)  | ximum wind energy available is p<br>Square of the rotor diameter<br>Air density<br>Cube of wind velocity<br>All of the above                                 | ropor               | tional to   |
| pov<br>a)       | e turbine which is used in a tidal p<br>ver is<br>Simple impulse type<br>Reversible type   |                     | Reaction type   |
|                 | othermal plant is suitable for<br>Base load power<br>Peak load power   |                     |   |
| A g<br>a)<br>c) | eothermal field may yield<br>Hot water<br>Dry steam  | b)<br>d)            | Wet steam<br>Any of the above                           |
| Ter<br>a)<br>c) | nperature attained by a flat plate<br>Order of about 90°C<br>Above 150°C   | colleo<br>b)<br>d)  |   |
| Wh<br>a)<br>c)  |  | nill is<br>b)<br>d) | simple in design?<br>Vertical axis<br>None of the above |
|                 |  |                     |   |

- 9) In India the tariff for charging the consumers for the consumption of electricity is based on \_\_ \_\_\_\_
  - a) Straight meter rate
  - b) Block meter rate
  - c) Reverse form of block meter rate
  - d) Two part tariff
- 10) Flat p
  - a) D
  - c) D
- 11) A Pyr
  - a) D
- 12) In a s
  - a)
  - b) F
  - C) Ľ
  - d) A
- 13) Most
  - a) A
  - c) S
- 14) Photo
  - a) Т
  - S b)
  - c) Ε
  - Α d)
- 15) Maxir
  - S a)
  - b) Α
  - C C)
  - d) Α
- 16) The to ous powe
  - a) S
  - c) F
- 17) Geoth
  - a) E
  - b) F
  - C) E
  - d) Ν
- 18) A geo
  - a) H C)
    - E
- 19) Temp
  - С
  - a) C) A
- 20) Whicl
  - a) ŀ C)

**SLR-FM-767** Set P

|            |          |   |                      |                   |                                   |                                  |                           | SLR-FM-7                              | '67      |
|------------|----------|---|----------------------|-------------------|-----------------------------------|----------------------------------|---------------------------|---------------------------------------|----------|
| Sea<br>No. | t        |   |                      |                   |                                   |                                  |                           | Set                                   | Ρ        |
|            |          | -   | M                    | echai             | nical E                           | ngineer                          | Nov/Dee<br>ing<br>ENGINEE |                                       |          |
| Time       | : 02:    | ate: Thursday, 19<br>30 PM To 05:30   | PM                   |                   |                                   |                                  |                           | Max. Marks                            | 56 :: 56 |
| Instr      | uctio    | ons: 1) Solve any<br>2) Use of no<br>3) Figure to<br>4) Assume s  | on- prog<br>the rig  | gramm<br>ht indie | able cal<br>cates ful<br>if neces | lculator is<br>I marks.<br>sary. |                           |                                       |          |
|            |          |   |                      |                   | Section                           | n – I                            |                           |                                       |          |
| Q.2        | a)<br>b) | Define the follow<br>1) Load factor<br>2) Capacity fac<br>3) Demand fac<br>4) Diversity fac<br>Explain the effect   | ctor<br>ctor<br>ctor |                   | load on                           | power pla                        | ant design                | and operation.                        | 08<br>06 |
|            | C)       | Explain role of p   | orivate s            | sector            | in energ                          | y manage                         | ement.                    |                                       | 06       |
| Q.3        | a)       | A power plant h   | as to si             | upply l           | oad as f                          | ollows.                          |                           | 1                                     | 08       |
|            |          | Time in hrs   | 0-6                  | 6-12              | 12-14                             | 14-18                            | 18-24                     |                                       |          |
|            |          | Load in MW  | 30                   | 90                | 60                                | 100                              | 50                        |                                       |          |
|            |          | 2) Load factor  | erated               | or nun            | nber of e                         | electrical                       | units gene                | rated by plant                        |          |
|            | b)<br>c) | Explain with nea<br>advantages.<br>Differentiate bet  |                      |                   |                                   | 0 11                             |                           |                                       | 06<br>06 |
| Q.4        | с)<br>а) | What is short cir   |                      |                   |                                   | •                                | • •                       |                                       | 08       |
| ч.т        | uj       | limiting methods  |                      | vilat a           |                                   |                                  |                           |                                       | 00       |
|            | b)       | Explain basic pr  | -                    |                   |                                   |                                  |                           |                                       | 06       |
|            | c)       | Explain any thre  | e tarim              | metho             |                                   |                                  | hergy.                    |                                       | 06       |
| 0 F        | - )      |   | • • • • •            |                   | Section                           |                                  |                           | · · · · · · · · · · · · · · · · · · · | 00       |
| Q.5        | a)       | <ul> <li>Define the follow<br/>neat line diagram</li> <li>1) Angle of inc</li> <li>2) Tilt angle</li> <li>3) Angle of defined</li> <li>4) Hour angle</li> </ul> | ns.<br>idence        |                   | connect                           | ion with s                       | olar radiat               | ion geometry with                     | 08       |
|            | b)       | Explain with nea<br>India.  |                      |                   |                                   |                                  |                           | anometer used in                      | 06       |
|            | c)       | Explain with nea  | at sketo             | cons              | struction                         | of liquid                        | flat plate c              | ollector.                             | 06       |
| Q.6        | a)       | function of each  | Eleme                | ent.              |                                   |                                  |                           | system. Also state                    | 08<br>06 |
|            | b)       | State various typ<br>dominated Geot   |                      |                   |                                   | sources. A                       | aiso explai               | n vapour                              | 06       |
|            | c)       | Explain construct   |                      |                   |                                   | double cyo                       | cle Tidal po              | ower plant.                           | 06       |

|     |    | Set   | Ρ  |
|-----|----|---|----|
| Q.7 | a) | What is the principle of Ocean thermal energy conversion? Explain open cycle OTEC system. With neat sketch. | 08 |
|     | b) | What is Energy audit? Explain the difference between preliminary and detailed energy audit.                 | 06 |
|     | c) | Write note on energy conservation in sugar industry.  | 06 |

Set (

Max. Marks: 100

### B.E. (Part – I) (Old) Examination Nov/Dec-2019 Mechanical Engineering POWER PLANT AND ENERGY ENGINEERING

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

### MCQ/Objective Type Questions

b)

**Duration: 30 Minutes** 

Seat No.

### Q.1 Choose the correct alternatives from the options.

- 1) Annual depreciation cost is calculated by \_
  - a) Sinking fund method
  - c) Both (a) and (b) d)
- 2) Demand factor is defined as \_\_\_\_\_
  - a) Average load / maximum demand
  - b) Maximum demand / connected load
  - c) Connected load / maximum demand
  - d) None of the above

3) Annual depreciation as per straight line method is calculated by \_\_\_\_\_.

- a) The capital cost divided by number of years of life
- b) The capital cost minus salvage value, is divided by the number of years of life
- Investing a uniform sum of money per annum at stipulated rate of interest
- d) None of the above
- 4) In India the tariff for charging the consumers for the consumption of electricity is based on \_\_\_\_\_.
  - a) Straight meter rate
  - b) Block meter rate
  - c) Reverse form of block meter rate
  - d) Two part tariff
- 5) Flat plate collector absorbs \_\_\_\_\_.
  - a) Direct radiation only b) Diffuse radiation only
  - c) Direct and diffuse both d) None of the above
- 6) A Pyranometer is used for measurement of \_\_\_\_\_
  - a) Direct radiation only b) Diffuse radiation only
  - c) Direct and diffuse both d) None of the above
- 7) In a solar collector the function of transparent cover is to \_\_\_\_\_.
  - a) Transmit solar radiations
  - b) Protect the collector from dust
  - c) Decrease the heat loss from collector to atmosphere
  - d) All of the above

Straight line method

Estimate value

Marks: 20

8) Most widely used material of a solar cell is a) Arsenic Cadmium b) c) Silicon d) Steel 9) Photovoltaic cell converts \_\_\_\_ a) Thermal energy into electrical energy b) Solar radiation into thermal energy c) Electromagnetic radiation directly into electricity d) All of the above Maximum wind energy available is proportional to \_\_\_\_\_. 10) Square of the rotor diameter a) b) Air density Cube of wind velocity c) All of the above d) 11) The turbine which is used in a tidal power plant for getting continuous power is . Simple impulse type b) Reaction type a) c) Reversible type d) Propeller type Geothermal plant is suitable for \_\_\_\_\_. 12) a) Base load power b) Peak load power Both base and peak load power c) d) None of the above 13) A geothermal field may yield \_\_\_\_\_. b) Wet steam Hot water a) c) Dry steam d) Any of the above 14) Temperature attained by a flat plate collector is of the a) Order of about 90°C Range of 100°C to 150°C b) Above 150°C None of the above c) d) 15) Which of the following type of wind mill is simple in design? Horizontal axis b) Vertical axis a) Inclined axis None of the above c) d) Solar thermal power generation can be achieved by \_\_\_\_\_ 16) a) Using focusing type collector Using solar pond b) Using heliostats d) Using any of the above system c) The energy radiated by sun on a bright sunny day is approximately \_\_\_\_\_. 17) 800 W/m<sup>2</sup> a) 700 W/m<sup>2</sup> b) c)  $1 \text{ kW/m}^2$ d)  $2 \text{ kW/m}^2$ 18) Load factor of power station is defined as a) Maximum load / average load Average load x maximum load b) c) Average load / maximum load none of the above d) Load factor of power station is generally 19) a) Equal to unity Less than unity b) c) More than unity None of the above d) Diversity factor is always \_\_\_\_\_. 20) b) Less than unity

a) Equal to unityb) Less than unityc) More than unityd) None of the above

**SLR-FM-767** 

Set

| No. |                        |   |          |              |           |             |               | Jei                | Q        |
|-----|------------------------|---|----------|--------------|-----------|-------------|---------------|--------------------|----------|
|     |                        | B.E. (Pa  | art – Ij | ) (Old       | ) Exan    | nination    | Nov/De        | c-2019             |          |
|     | Mechanical Engineering |   |          |              |           |             |               |                    |          |
| _   |                        | _   |          |              | ND EN     | ERGY E      | ENGINEE       | -                  |          |
|     |                        | ate: Thursday, 19<br>:30 PM To 05:30                      |          | 19           |           |             |               | Max. Mark          | s: 56    |
|     |                        | ons: 1) Solve an  |          | uestio       | ns from   | each Sec    | tion.         |                    |          |
|     |                        | 2) Use of n   | on- pro  | gramn        | nable ca  | lculator is |               |                    |          |
|     |                        | <ol> <li>Figure to</li> <li>Assume</li> </ol>             | -        |              |           |             |               |                    |          |
|     |                        | +) Assume   | Suitabi  | e uala       | Sectio    | •           |               |                    |          |
| Q.2 | a)                     | Define the follow   | wing te  | rms.         |           |             |               |                    | 08       |
|     | ,                      | 1) Load factor  |          |              |           |             |               |                    |          |
|     |                        | <ol> <li>Capacity fa</li> <li>Demand fa</li> </ol>        |          |              |           |             |               |                    |          |
|     |                        | 4) Diversity fa   | ctor     |              |           |             |               |                    |          |
|     | b)<br>c)               | Explain the effe<br>Explain role of p                     |          |              |           |             | •             | and operation.     | 06<br>06 |
| Q.3 | с)<br>а)               | A power plant h   |          |              | -         |             | onnonn.       |                    | 08       |
| 4.0 | ч,                     | Time in hrs   | 0-6      | 6-12         | 12-14     | 14-18       | 18-24         |                    |          |
|     |                        | Load in MW  | 30       | 90           | 60        | 100         | 50            | •                  |          |
|     |                        | Draw load curve   |          |              |           |             |               |                    |          |
|     |                        | <ol> <li>Energy ger</li> <li>Load factor</li> </ol>       |          | or nur       | nber of e | electrical  | units gene    | rated by plant     |          |
|     | b)                     | Explain with ne   |          | ch pum       | ped sto   | rage type   | power pla     | nt with its        | 06       |
|     | -                      | advantages.   | <b>t</b> |              |           |             |               |                    | 06       |
| Q.4 | c)<br>a)               | Differentiate be<br>What is short ci                      |          |              |           | •           | • •           |                    | 06<br>08 |
| 4.4 | aj                     | limiting method   |          | inat a       | 10 113 04 |             |               |                    | 00       |
|     | b)                     | Explain basic p   |          |              |           |             |               |                    | 06       |
|     | c)                     | Explain any three   | e tann   | meuno        | Sectio    |             | nergy.        |                    | 06       |
| Q.5 | 2)                     | Dofine the follow   | wing to  | rme in       |           |             | olor radiat   | ion goomotry with  | 08       |
| Q.J | a)                     | neat line diagra  | -        | 1115 111     | COLINECT  |             |               | ion geometry with  | 00       |
|     |                        | 1) Angle of ind   | cidence  | <del>)</del> |           |             |               |                    |          |
|     |                        | <ol> <li>2) Tilt angle</li> <li>3) Angle of de</li> </ol> | clinatio | n            |           |             |               |                    |          |
|     |                        | 4) Hour angle   |          |              |           |             |               |                    |          |
|     | b)                     | Explain with neal India.                                  | at sket  | ch con       | struction | and work    | king of Pyr   | anometer used in   | 06       |
|     | c)                     | Explain with ne   | at skete | ch con       | struction | of liquid   | flat plate c  | ollector.          | 06       |
| Q.6 | a)                     |   |          |              | am Wind   | d energy o  | conversion    | system. Also state | 08       |
|     | b)                     | function of each<br>State various ty                      |          |              | ermal res | sources. A  | Also explai   | n Vapour           | 06       |
|     |                        | dominated Geo   | therma   | l syste      | m.        |             | -             | -                  |          |
|     | c)                     | Explain constru   | ction a  | na wor       | King of c | souble cyc  | cie i idal po | ower plant.        | 06       |

SLR-FM-767 Set Q

| Seat |  |
|------|--|
| No.  |  |

|     |    | Set  | Q  |
|-----|----|--|----|
| Q.7 | a) | What is the principle of Ocean thermal energy conversion? Explain open                                       | 08 |
|     | b) | cycle OTEC system. With neat sketch.<br>What is Energy audit? Explain the difference between preliminary and | 06 |
|     | c) | detailed energy audit.<br>Write note on energy conservation in sugar industry.                               | 06 |

|       |  | e: Thursday, 19-12-2019 Max. Marks: 100<br>0 PM To 05:30 PM   |  |  |  |  |  |  |
|-------|--|---|--|--|--|--|--|--|
|       | <b>Instructions:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer  |   |  |  |  |  |  |  |
|       | book.<br>2) Figures to the right indicate full marks.  |   |  |  |  |  |  |  |
|       |  | MCQ/Objective Type Questions  |  |  |  |  |  |  |
| Durat | ion: 3   | 0 Minutes Marks: 20   |  |  |  |  |  |  |
| Q.1   | <b>Cho</b><br>1)   | ose the correct alternatives from the options.20A Pyranometer is used for measurement ofa) Direct radiation onlyb) Diffuse radiation onlyc) Direct and diffuse bothd) None of the above |  |  |  |  |  |  |
|       | <ul> <li>2) In a solar collector the function of transparent cover is to</li> <li>a) Transmit solar radiations</li> <li>b) Protect the collector from dust</li> <li>c) Decrease the heat loss from collector to atmosphere</li> <li>d) All of the above</li> </ul> |   |  |  |  |  |  |  |
|       | 3)   | Most widely used material of a solar cell isa) Arsenicb) Cadmiumc) Silicond) Steel  |  |  |  |  |  |  |
|       | <ul> <li>4) Photovoltaic cell converts</li> <li>a) Thermal energy into electrical energy</li> <li>b) Solar radiation into thermal energy</li> <li>c) Electromagnetic radiation directly into electricity</li> <li>d) All of the above</li> </ul>                   |   |  |  |  |  |  |  |
|       | <ul> <li>5) Maximum wind energy available is proportional to</li> <li>a) Square of the rotor diameter</li> <li>b) Air density</li> <li>c) Cube of wind velocity</li> <li>d) All of the above</li> </ul>  |   |  |  |  |  |  |  |
|       | 6)   | The turbine which is used in a tidal power plant for getting continuouspower isa) Simple impulse typeb) Reaction typec) Reversible typed) Propeller type                                |  |  |  |  |  |  |
|       | 7)   | <ul> <li>Geothermal plant is suitable for</li> <li>a) Base load power</li> <li>b) Peak load power</li> <li>c) Both base and peak load power</li> <li>d) None of the above</li> </ul>    |  |  |  |  |  |  |
|       | 0)   | A seather medical menuicide   |  |  |  |  |  |  |

Seat No.

# B.E. (Part – I) (Old) Examination Nov/Dec-2019 Mechanical Engineering POWER PLANT AND ENERGY ENGINEERING

- A geothermal field may yield \_ 8)
  - Hot water a)
  - C) Dry steam
- Wet steam b)
  - Any of the above d)

**SLR-FM-767** 

Set R

|     | SLR-FM-767   |
|-----|--|
|     | Set R  |
| 9)  | Temperature attained by a flat plate collector is of the<br>a) Order of about 90°C b) Range of 100°C to 150°C<br>c) Above 150°C d) None of the above   |
| 10) | Which of the following type of wind mill is simple in design?a) Horizontal axisb) Vertical axisc) Inclined axisd) None of the above  |
| 11) | Solar thermal power generation can be achieved bya) Using focusing type collectorb) Using solar pondc) Using heliostatsd) Using any of the above system  |
| 12) | The energy radiated by sun on a bright sunny day is approximatelya) 700 W/m²b) 800 W/m²c) 1 kW/m²d) 2 kW/m²  |
| 13) | Load factor of power station is defined as<br>a) Maximum load / average load b) Average load x maximum load<br>c) Average load / maximum load d) none of the above   |
| 14) | Load factor of power station is generallya) Equal to unityb) Less than unityc) More than unityd) None of the above   |
| 15) | Diversity factor is alwaysa) Equal to unityb) Less than unityc) More than unityd) None of the above  |
| 16) | Annual depreciation cost is calculated by<br>a) Sinking fund method b) Straight line method<br>c) Both (a) and (b) d) Estimate value   |
| 17) | Demand factor is defined as<br>a) Average load / maximum demand<br>b) Maximum demand / connected load<br>c) Connected load / maximum demand<br>d) None of the above  |
| 18) | <ul> <li>Annual depreciation as per straight line method is calculated by</li> <li>a) The capital cost divided by number of years of life</li> <li>b) The capital cost minus salvage value, is divided by the number of years of life</li> <li>c) Investing a uniform sum of money per annum at stipulated rate of interest</li> <li>d) None of the above</li> </ul> |
| 19) | <ul> <li>In India the tariff for charging the consumers for the consumption of electricity is based on</li> <li>a) Straight meter rate</li> <li>b) Block meter rate</li> <li>c) Reverse form of block meter rate</li> <li>d) Two part tariff</li> </ul>  |
| 20) | Flat plate collector absorbsa) Direct radiation onlyb) Diffuse radiation onlyc) Direct and diffuse bothd) None of the above  |

|            |          |   | _        |          |           |            |              | •=                 | <b>—</b> |
|------------|----------|---|----------|----------|-----------|------------|--------------|--------------------|----------|
| Sea<br>No. | t        |   |          |          |           |            |              | Set                | R        |
|            |          | B.E. (Pa  | art — I) | ) (Old   | ) Exan    | nination   | Nov/De       | c-2019             |          |
|            |          | -   |          |          |           | ngineer    | •            |                    |          |
|            |          |   |          |          | ND EN     | IERGY E    | ENGINE       |                    |          |
|            |          | ite: Thursday, 19<br>30 PM To 05:30                       |          | 19       |           |            |              | Max. Marks         | s: 56    |
| Instr      | uctio    | ons: 1) Solve an  | -        |          |           |            |              |                    |          |
|            |          | 2) Use of no<br>3) Figure to                              | •        | -        |           |            | allowed.     |                    |          |
|            |          | 4) Assume   | suitabl  | e data   |           | •          |              |                    |          |
|            |          |   |          |          | Sectio    | n – I      |              |                    |          |
| Q.2        | a)       | Define the follow<br>1) Load factor                       | -        | rms.     |           |            |              |                    | 08       |
|            |          | 2) Capacity fa  |          |          |           |            |              |                    |          |
|            |          | 3) Demand fa  | ctor     |          |           |            |              |                    |          |
|            | b)       | <ol> <li>Diversity fa<br/>Explain the effe</li> </ol>     |          | ariable  | load on   | power pla  | ant design   | and operation      | 06       |
|            | c)       | Explain role of p   |          |          |           | • •        | -            |                    | 06       |
| Q.3        | a)       | A power plant h   | as to s  | upply l  | oad as f  | ollows.    |              |                    | 08       |
|            |          | Time in hrs   | 0-6      | 6-12     | 12-14     | 14-18      | 18-24        |                    |          |
|            |          | Load in MW  | 30       | 90       | 60        | 100        | 50           |                    |          |
|            |          | Draw load curve   |          |          |           |            |              |                    |          |
|            |          | <ol> <li>Energy gen</li> <li>Load factor</li> </ol>       |          | or nun   | nber of e | electrical | units gene   | rated by plant     |          |
|            | b)       | Explain with nea  |          | ch pum   | ped sto   | rage type  | power pla    | int with its       | 06       |
|            | c)       | advantages.<br>Differentiate be                           | tween l  | hase lo  | ad and    | neak loac  | hower nla    | ants               | 06       |
| Q.4        | c)<br>a) | What is short ci  |          |          |           | •          | • •          |                    | 08       |
|            | ω,       | limiting method   | s.       |          |           |            |              |                    |          |
|            | b)<br>c) | Explain basic pl<br>Explain any three                     |          |          |           |            |              |                    | 06<br>06 |
|            | 0)       |   |          | meuro    | Sectio    |            | nergy.       |                    | 00       |
| Q.5        | a)       | Dofine the follow   | vina to  | rme in   |           |            | olar radiat  | ion geometry with  | 08       |
| Q.J        | aj       | neat line diagra  | -        | 1113 111 | CONNECT   |            |              | ion geometry with  | 00       |
|            |          | 1) Angle of inc   | cidence  | ;        |           |            |              |                    |          |
|            |          | <ol> <li>2) Tilt angle</li> <li>3) Angle of de</li> </ol> | clinatic | n        |           |            |              |                    |          |
|            |          | 4) Hour angle   |          |          |           |            |              |                    |          |
|            | b)       | Explain with nea  | at sketo | ch con   | struction | and worl   | king of Pyr  | anometer used in   | 06       |
|            | c)       | Explain with nea  | at sketo | ch cons  | struction | of liquid  | flat plate c | ollector.          | 06       |
| Q.6        | a)       |   |          | •        | am Wind   | d energy o | conversion   | system. Also state | 08       |
|            | b)       | function of each<br>State various ty                      |          |          | ermal reg | sources 4  | Also explai  | n Vapour           | 06       |
|            | ~)       | dominated Geo   | therma   | l syste  | m.        |            |              |                    |          |
|            | c)       | Explain constru   | ction a  | nd wor   | king of o | double cy  | cle Tidal p  | ower plant.        | 06       |

|     |    | Set   | R  |
|-----|----|---|----|
| Q.7 | a) | What is the principle of Ocean thermal energy conversion? Explain open cycle OTEC system. With neat sketch. | 08 |
|     | b) | What is Energy audit? Explain the difference between preliminary and detailed energy audit.                 | 06 |
|     | c) | Write note on energy conservation in sugar industry.  | 06 |

#### B.E. (Part – I) (Old) Examination Nov/Dec-2019 Mechanical Engineering POWER PLANT AND ENERGY ENGINEERING

Day & Date: Thursday, 19-12-2019 Time: 02:30 PM To 05:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.

2) Figures to the right indicate full marks.

MCQ/Objective Type Questions

**Duration: 30 Minutes** 

a)

Seat No.

#### Q.1 Choose the correct alternatives from the options.

- 1) The turbine which is used in a tidal power plant for getting continuous power is \_\_\_\_\_.
  - a) Simple impulse type b) Reaction type
  - c) Reversible type d) Propeller type
- 2) Geothermal plant is suitable for \_\_\_\_\_.
  - a) Base load power
  - b) Peak load power
  - c) Both base and peak load power
  - d) None of the above
- 3) A geothermal field may yield \_\_\_\_\_
  - a) Hot water b) Wet steam
  - c) Dry steam d) Any of the above
- 4) Temperature attained by a flat plate collector is of the \_
  - Order of about 90°C b) Range of 100°C to 150°C
  - c) Above 150°C d) None of the above
- 5) Which of the following type of wind mill is simple in design?
  - a) Horizontal axis b) Vertical axis
  - c) Inclined axis d) None of the above

6) Solar thermal power generation can be achieved by \_\_\_\_\_

- a) Using focusing type collector b) Using solar pond
- Using heliostats
  - d) Using any of the above system

7) The energy radiated by sun on a bright sunny day is approximately \_\_\_\_\_.

- a) 700 W/m<sup>2</sup> b)  $800 W/m^2$ c) 1 kW/m<sup>2</sup> d) 2 kW/m<sup>2</sup>
- 8) Load factor of power station is defined as \_\_\_\_
  - a) Maximum load / average load b)
  - c) Average load / maximum load d)
- 9) Load factor of power station is generally \_\_\_\_
  - a) Equal to unity
  - c) More than unity

/ \_\_\_\_\_.

none of the above

Average load x maximum load

- b) Less than unity
- d) None of the above



Marks: 20

20

Set S

Max. Marks: 100

- 10) Diversity factor is always \_\_\_\_\_. a) Equal to unity
  - c) More than unity
- b) Less than unity
- None of the above d)

Set

- 11) Annual depreciation cost is calculated by \_
  - a) Sinking fund method
  - c) Both (a) and (b)
- b) Straight line method
- d) Estimate value
- 12) Demand factor is defined as .
  - a) Average load / maximum demand
  - b) Maximum demand / connected load
  - c) Connected load / maximum demand
  - d) None of the above
- Annual depreciation as per straight line method is calculated by \_\_\_\_\_. 13)
  - The capital cost divided by number of years of life a)
  - The capital cost minus salvage value, is divided by the number of b) years of life
  - Investing a uniform sum of money per annum at stipulated rate of c) interest
  - d) None of the above
- In India the tariff for charging the consumers for the consumption of 14) electricity is based on \_\_\_\_\_.
  - a) Straight meter rate
  - b) Block meter rate
  - c) Reverse form of block meter rate
  - d) Two part tariff
- 15) Flat plate collector absorbs \_\_\_\_\_.
  - a) Direct radiation only b) Diffuse radiation only
  - c) Direct and diffuse both None of the above d)
- 16) A Pyranometer is used for measurement of a) Direct radiation only
  - Diffuse radiation only b)
  - Direct and diffuse both d) None of the above c)
- 17) In a solar collector the function of transparent cover is to \_\_\_\_\_.
  - Transmit solar radiations a)
  - b) Protect the collector from dust
  - c) Decrease the heat loss from collector to atmosphere
  - d) All of the above
- Most widely used material of a solar cell is \_ 18)
  - a) Arsenic b)
  - c) Silicon d)
- 19) Photovoltaic cell converts \_
  - a) Thermal energy into electrical energy
  - b) Solar radiation into thermal energy
  - c) Electromagnetic radiation directly into electricity
  - d) All of the above
- Maximum wind energy available is proportional to \_\_\_\_\_. 20)
  - a) Square of the rotor diameter
  - b) Air density
  - c) Cube of wind velocity
  - d) All of the above

- Cadmium
  - Steel

|             |                |   |  |                                   |                                   |             | SLR-FM-7           | 67             |
|-------------|----------------|---|--|-----------------------------------|-----------------------------------|-------------|--------------------|----------------|
| Sea<br>No.  | t              |   |  |                                   |                                   |             | Set                | S              |
|             |                | -   | rt – I) (Olo<br>Mecha<br>PLANT A         | nical E                           | ingineer                          | ring        |                    |                |
|             |                | ate: Thursday, 19-<br>30 PM To 05:30 F  |  |                                   |                                   |             | Max. Marks         | s: 56          |
| Instr       | uctio          | ons: 1) Solve any<br>2) Use of no<br>3) Figure to<br>4) Assume s  | n- programr<br>the right ind             | nable ca<br>icates fu<br>if neces | lculator is<br>Il marks.<br>sary. |             |                    |                |
|             |                |   |  | Sectio                            | n – I                             |             |                    |                |
| Q.2         | a)<br>b)<br>c) | Define the follow<br>1) Load factor<br>2) Capacity fac<br>3) Demand fac<br>4) Diversity fac<br>Explain the effect<br>Explain role of pro- | tor<br>tor<br>tor<br>tor<br>tof variable |                                   | • •                               | •           | and operation.     | 08<br>06<br>06 |
| Q.3         | a)             | A power plant ha  | as to supply                             | load as f                         | ollows.                           | I           |                    | 08             |
|             |                | Time in hrs   | 0-6 6-12                                 | 12-14                             | 14-18                             | 18-24       |                    |                |
|             |                | Load in MW  | 30 90                                    | 60                                | 100                               | 50          |                    |                |
|             |                | Draw load curve<br>1) Energy gene<br>2) Load factor   |  |                                   |                                   |             | rated by plant     |                |
|             | b)<br>c)       | Explain with nea<br>advantages.<br>Differentiate bety   |  |                                   |                                   |             |                    | 06<br>06       |
| Q.4         | c)<br>a)       | What is short cire  |  |                                   | •                                 | • •         |                    | 08             |
| <b>4</b> .7 | uj             | limiting methods  |  |                                   |                                   |             |                    | 00             |
|             | b)<br>c)       | Explain basic pri<br>Explain any three  |  |                                   |                                   |             |                    | 06<br>06       |
|             | 0)             |   |  | Sectio                            |                                   | leigy.      |                    | 00             |
| Q.5         | a)             | Define the follow<br>neat line diagram<br>1) Angle of inci<br>2) Tilt angle<br>3) Angle of dec<br>4) Hour angle                           | ns.<br>idence                            |                                   |                                   | olar radiat | ion geometry with  | 08             |
|             | b)             | Explain with nea<br>India.  |  |                                   |                                   |             | anometer used in   | 06             |
|             | c)             | Explain with nea  |  |                                   | •                                 | •           |                    | 06             |
| Q.6         | a)             | function of each  | Element.                                 |                                   |                                   |             | system. Also state | 08             |
|             | b)             | State various typ<br>dominated Geot   |  |                                   | sources. A                        | iso explai  | n vapour           | 06             |
|             | c)             | Explain construc  |  |                                   | double cy                         | cle Tidal p | ower plant.        | 06             |

|     |    | Set   | S  |
|-----|----|---|----|
| Q.7 | a) | What is the principle of Ocean thermal energy conversion? Explain open cycle OTEC system. With neat sketch. | 08 |
|     | b) | What is Energy audit? Explain the difference between preliminary and detailed energy audit.                 | 06 |
|     | c) | Write note on energy conservation in sugar industry.  | 06 |

| B.E. (Part – I) (Old) Examination Nov/Dec-2019<br>Mechanical Engineering |   |                |   |                            |   |
|--|---|----------------|---|----------------------------|---|
|  |   |                | I.C   | . ENGINE                   |   |
|  |   |                | y, 20-12-2019<br>5:30 PM  |                            | Max. Marks: 100   |
| Instr  | uctior  | b              | ook.  |                            | e solved in first 30 minutes in answer                                |
|  |   |                | igures to the right indic<br>Make suitable assumptic                          |                            | s.<br>ary and state them clearly                                      |
|  |   |                | MCQ/Object  | ive Type G                 | Questions   |
| Dura   | tion: 3   | 0 Minut        | tes   |                            | Marks: 20   |
| Q.1  | <b>Choo</b><br>1)   | Brake          | e correct alternatives f<br>horse power of engine                             | is measured                | by  |
|  |   | c) Vo          | urette test<br>olume test   | b)<br>d)                   | Dynamometer test<br>Morse test  |
|  | 2)  | a) Ha          | otational speed of cam s<br>alf<br>ouble                                      | shaft with res<br>b)<br>d) | pect to Crank shaft is<br>Equal<br>Four times                         |
|  | 3)  | a) Cl          | plug is used in which o<br>I engine<br>eam engine                             | f the followin<br>b)<br>d) | g I C engines<br>SI engine<br>none of the above                       |
|  | 4)  | a) tw          | ch of the following engir<br>/o stroke<br>ur stroke                           | ne suction ar<br>b)<br>d)  | nd exhaust valves are used<br>three stroke<br>none of above           |
|  | 5)  | a) Id          | air-fuel mixture is requir<br>ling<br>arting                                  | ed for<br>b)<br>d)         | <br>Acceleration<br>Cruising  |
|  | 6)  | In whi         | ch of the following engir   | ne CRDI is u               | sed?  |
|  | ŗ   |                | l engine<br>eam engine  | b)<br>d)                   | CI engine<br>none of above  |
|  | 7)  | a) 2-          |   | b)                         | 7-10  |
|  |   | c) 16          | 6-20  | d)                         | 20-25   |
|  | 8)  | a) sii         | e test is applicable to<br>ngle cylinder SI engine<br>ulti cylinder CI engine | b)                         | single cylinder CI engine<br>None                                     |
|  | <ol> <li>An IC engine develops 20 kW output power. If the efficiency of the engine<br/>is 80 percentage, the heat supplied to the engine will be</li> </ol> |                |   | engine will be             |   |
|  |   | ,              | <w<br>5kW</w<br>  | b)<br>d)                   | 20kW<br>30kW  |
|  | 10)   | crank<br>a) be | ally, the initiation of kno<br>angle diagram in combu<br>efore TDC<br>BDC     | -                          | engine considering pressure -<br>occurs<br>after TDC<br>none of above |

# B.E. (Part – I) (Old) Examination Nov/Dec-2019

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**SLR-FM-768** 

Page **1** of **8** 

Set P

- c) at BDC

| Explain the factors considered for selection of I.C. engine for the following application.   |  |
|--|--|
| List various fuel nozzles used in I.C. engines. Explain any two in detail.   |  |
| Section – II   |  |
| Compare knocking in SI and CI engines.<br>Explain stages of combustion in CI engines.<br>Write the requirements of a good combustion chamber of a SI engine. |  |
| Explain Morse test in detail.<br>Write a note on 'Cetane number'.<br>Explain any two emission control techniques.  |  |
|  |  |
|  |  |
|  |  |

|     |    | 2) Volumetric efficiency   |    |
|-----|----|--|----|
|     |    | 3) Mechanical efficiency   |    |
|     | b) | List down the various compensating devices used by carburetor. Explain any one in detail.  | 07 |
|     | c) | Explain the limitations of supercharging in S.I. engines.  | 07 |
| Q.3 | a) | A 10 cm x 12 cm four cylinder, 4 stroke engine running at 2000 revolutions per minute has a carburetor venture with a 3 cm throat. Determine the suction at the throat assuming the volumetric efficiency of the engine to be 70 %. Assume density of air to be 1.2 kg/m <sup>2</sup> and coefficient of air flow 0.8. Consider the case with neglecting compressibility of air. | 06 |

Express the following terms:

Instructions: 1) All questions are compulsory.

2) Assume suitable data if necessary.

4) Figures to the right indicate full marks.

- Q.2 a) Mean effective pressure 1) Volumetric efficiency 2Ì

3) Make suitable assumption if necessary and state them clearly.

Section – I

B.E. (Part – I) (Old) Examination Nov/Dec-2019 **Mechanical Engineering** I.C. ENGINE

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# **SLR-FM-768**

Set

b)

c)

a)

b)

c)

a)

b)

c)

Q.4

Q.5

Day & Date: Friday, 20-12-2019

Time: 2:30 PM To 5:30 PM

Seat

No.

Max. Marks: 80

06

07

07

06

07

07

06

07

| book. |  |   |          |                                |  |  |  |
|-------|--|---|----------|--------------------------------|--|--|--|
|       | <ol><li>Figures to the right indicate full marks.</li></ol>  |   |          |                                |  |  |  |
|       |  | <ol><li>Make suitable assumptions if ne</li></ol> | ecess    | sary and state them clearly    |  |  |  |
|       | MCQ/Objective Type Questions   |   |          |                                |  |  |  |
| Dura  | tion: 3  | 30 Minutes  |          | Marks: 20                      |  |  |  |
| Q.1   |  | ose the correct alternatives from the             | -        |                                |  |  |  |
|       | 1)   | In which of the following engine CRD              |          |                                |  |  |  |
|       |  | , 0   | b)<br>d) | CI engine<br>none of above     |  |  |  |
|       | 2)   | The compression ratio range for SI er             | ,        |                                |  |  |  |
|       | 2)   |   | b)       | 7-10                           |  |  |  |
|       |  | ,   | d)       | 20-25                          |  |  |  |
|       | 3)   | Morse test is applicable to                       |          |                                |  |  |  |
|       |  | a) single cylinder SI engine                      |          |                                |  |  |  |
|       |  | c) multi cylinder CI engine                       | d)       | None                           |  |  |  |
|       | 4)   | An IC engine develops 20 kW output                |          | , ,                            |  |  |  |
|       |  | is 80 percentage, the heat supplied to            |          | -                              |  |  |  |
|       |  |   | b)<br>d) | 20kW<br>30kW                   |  |  |  |
|       | 5)   | ,   | ,        |                                |  |  |  |
|       | <ol> <li>Generally, the initiation of knocking in CI engine considering pressure -<br/>crank angle diagram in combustion phase occurs</li> </ol> |   |          |                                |  |  |  |
|       |  |   | b)       | after TDC                      |  |  |  |
|       | - )  | ,   | '        | none of above                  |  |  |  |
|       | 6)   | Brake horse power of engine is meas               |          | •                              |  |  |  |
|       |  |   | d)       | Dynamometer test<br>Morse test |  |  |  |
|       | 7)   | The rotational speed of cam shaft wit             | ,        |                                |  |  |  |
|       | ')   |   | b)       | Equal                          |  |  |  |
|       |  | ,   | d)       | Four times                     |  |  |  |
|       | 8)   | Spark plug is used in which of the foll           | lowir    | ng I C engines                 |  |  |  |
|       |  | , 3   | b)       | SI engine                      |  |  |  |
|       |  | c) steam engine                                   | d)       | none of the above              |  |  |  |
|       | 9)   | In which of the following engine suction          |          |                                |  |  |  |
|       |  |   | b)       | three stroke                   |  |  |  |
|       |  | c) four stroke                                    | d)       | none of above                  |  |  |  |

b)

d)

Acceleration

Cruising

Day & Date: Friday, 20-12-2019 Time: 2:30 PM To 5:30 PM

Lean air-fuel mixture is required for

10)

a) Idling

starting

c)

Seat No.

## B.E. (Part – I) (Old) Examination Nov/Dec-2019 **Mechanical Engineering** I.C. ENGINE

Max. Marks: 100

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Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

#### Section – II Q.4 a) Compare knocking in SI and CI engines. 06 b) Explain stages of combustion in CI engines. 07 Write the requirements of a good combustion chamber of a SI engine. c) 07 Q.5 a) Explain Morse test in detail. 06 Write a note on 'Cetane number'. 07 b) 07 Explain any two emission control techniques. c)

Explain the factors considered for selection of I.C. engine for the following

List various fuel nozzles used in I.C. engines. Explain any two in detail.

Section – I Express the following terms: Mean effective pressure 1)

2) Assume suitable data if necessary.

- Q.2 a) Volumetric efficiency 2) 3) Mechanical efficiency List down the various compensating devices used by carburetor. Explain b) any one in detail. Explain the limitations of supercharging in S.I. engines. c) Q.3 A 10 cm x 12 cm four cylinder, 4 stroke engine running at 2000 a) revolutions per minute has a carburetor venture with a 3 cm throat. Determine the suction at the throat assuming the volumetric efficiency of the engine to be 70 %. Assume density of air to be 1.2 kg/m<sup>2</sup> and coefficient of air flow 0.8. Consider the case with neglecting
- 4) Figures to the right indicate full marks.

3) Make suitable assumption if necessary and state them clearly.

Seat

Day & Date: Friday, 20-12-2019

Instructions: 1) All questions are compulsory.

compressibility of air.

application.

b)

c)

Time: 2:30 PM To 5:30 PM

No.

# B.E. (Part – I) (Old) Examination Nov/Dec-2019 **Mechanical Engineering** I.C. ENGINE

Max. Marks: 80

06

07

07

06

07

07

**SLR-FM-768** 

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book. Figures to the right indicate full marks. 3) Make suitable assumptions if necessary and state them clearly MCQ/Objective Type Questions **Duration: 30 Minutes** Choose the correct alternatives from the options. An IC engine develops 20 kW output power. If the efficiency of the engine 1) is 80 percentage, the heat supplied to the engine will be . a) 5kW b) 20kW c) 25kW d) 30kW 2) crank angle diagram in combustion phase occurs a) before TDC after TDC b) c) at BDC d) none of above 3) Brake horse power of engine is measured by a) Burette test Dynamometer test b) c) Volume test Morse test d) 4) a) Half b) Equal c) Double Four times d) Spark plug is used in which of the following I C engines \_\_\_\_\_ 5) a) CI engine SI engine b) none of the above c) steam engine d) In which of the following engine suction and exhaust valves are used . 6)

Day & Date: Friday, 20-12-2019 Time: 2:30 PM To 5:30 PM

Instructions: 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer

**Mechanical Engineering** I.C. ENGINE

- Generally, the initiation of knocking in CI engine considering pressure -
- The rotational speed of cam shaft with respect to Crank shaft is .
- - a) two stroke three stroke b) c) four stroke d) none of above
- 7) Lean air-fuel mixture is required for
  - Acceleration a) Idling b) c) starting d) Cruising
- In which of the following engine CRDI is used? 8)
  - a) SI engine b) CI engine
  - c) steam engine d) none of above
- 9) The compression ratio range for SI engine is
  - a) 2-3 7-10 b) c) 16-20 d) 20-25
- 10) Morse test is applicable to
  - single cylinder SI engine a)
  - multi cylinder CI engine c)
- single cylinder CI engine b)
- None d)

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Max. Marks: 100

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# B.E. (Part – I) (Old) Examination Nov/Dec-2019

Seat

No.

Q.1

| <ul><li>4) Figures to the right indicate full marks.</li></ul>   |  |  |  |  |  |
|--|--|--|--|--|--|
| Section – I  |  |  |  |  |  |
| <ul> <li>Express the following terms:</li> <li>1) Mean effective pressure</li> <li>2) Volumetric efficiency</li> <li>3) Mechanical efficiency</li> <li>List down the various compensating devices used by carburetor. Explain any one in detail.</li> <li>Explain the limitations of supercharging in S.I. engines.</li> </ul>   |  |  |  |  |  |
| A 10 cm x 12 cm four cylinder, 4 stroke engine running at 2000<br>revolutions per minute has a carburetor venture with a 3 cm throat.<br>Determine the suction at the throat assuming the volumetric efficiency of<br>the engine to be 70 %. Assume density of air to be 1.2 kg/m <sup>2</sup> and<br>coefficient of air flow 0.8. Consider the case with neglecting<br>compressibility of air.<br>Explain the factors considered for selection of I.C. engine for the following<br>application.<br>List various fuel nozzles used in I.C. engines. Explain any two in detail. |  |  |  |  |  |
| Section – II   |  |  |  |  |  |
| Compare knocking in SI and CI engines.<br>Explain stages of combustion in CI engines.<br>Write the requirements of a good combustion chamber of a SI engine.<br>Explain Morse test in detail.<br>Write a note on 'Cetane number'.<br>Explain any two emission control techniques.  |  |  |  |  |  |
|  |  |  |  |  |  |

## B.E. (Part – I) (Old) Examination Nov/Dec-2019 Mechanical Engineering I.C. ENGINE

Day & Date: Friday, 20-12-2019 Time: 2:30 PM To 5:30 PM

Instructions: 1) All questions are compulsory.

- 2) Assume suitable data if necessary.
- 3) Make suitable assumption if necessary and state them clearly.

# SLR-FM-768

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R

06

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07 07

Max. Marks: 80

Seat No.

Q.2 a)

b)

C)

b)

C)

b)

c)

a)

b)

c)

Q.4 a)

Q.5

Q.3 a)

| I.C. ENGINE |   |   |  |  |  |
|-------------|---|---|--|--|--|
|             | Day & Date: Friday, 20-12-2019         Max. Marks: 100           Time: 2:30 PM To 5:30 PM         Max. Marks: 100 |   |  |  |  |
| Instr       | uctio   | <b>ns:</b> 1) Q. No. 1 is compulsory and should be solved in first 30 minutes in answer book.   |  |  |  |
|             |   | <ul><li>2) Figures to the right indicate full marks.</li><li>3) Make suitable assumptions if necessary and state them clearly</li></ul>   |  |  |  |
|             |   | MCQ/Objective Type Questions  |  |  |  |
|             |   | 30 Minutes Marks: 20  |  |  |  |
| Q.1         | <b>Cho</b><br>1)  | ose the correct alternatives from the options.20Spark plug is used in which of the following I C enginesa)CI engine b)SI engine c)a)CI engine b)SI engine c)SI engine c)CI engine c)b)SI engine c)CI engine c)CI engine c)CI engine c)c)steam engine c)CI engine c)CI engine c)CI engine c) |  |  |  |
|             | 2)  | In which of the following engine suction and exhaust valves are useda) two strokeb) three strokec) four stroked) none of above  |  |  |  |
|             | 3)  | Lean air-fuel mixture is required fora) Idlingb) Accelerationc) startingd) Cruising   |  |  |  |
|             | 4)  | In which of the following engine CRDI is used?<br>a) SI engine b) CI engine<br>c) steam engine d) none of above   |  |  |  |
|             | 5)  | The compression ratio range for SI engine is<br>a) 2-3 b) 7-10<br>c) 16-20 d) 20-25   |  |  |  |
|             | 6)  | Morse test is applicable toa) single cylinder SI engineb) single cylinder CI enginec) multi cylinder CI engined) None   |  |  |  |
|             | 7)  | An IC engine develops 20 kW output power. If the efficiency of the engineis 80 percentage, the heat supplied to the engine will bea) 5kWb) 20kWc) 25kWd) 30kW   |  |  |  |
|             | 8)  | Generally, the initiation of knocking in CI engine considering pressure -<br>crank angle diagram in combustion phase occursa) before TDCb) after TDCc) at BDCd) none of above   |  |  |  |
|             | 9)  | Brake horse power of engine is measured bya) Burette testb) Dynamometer testc) Volume testd) Morse test   |  |  |  |
|             | 10)   | The rotational speed of cam shaft with respect to Crank shaft is<br>a) Half b) Equal<br>c) Double d) Four times   |  |  |  |

# B.E. (Part – I) (Old) Examination Nov/Dec-2019 Mechanical Engineering

# Seat No.

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| B.E. (Part – I) (Old) Examination Nov/Dec-2019 |                                       |  |                |  |  |  |
|--|---------------------------------------|--|----------------|--|--|--|
|  | Mechanical Engineering<br>I.C. ENGINE |  |                |  |  |  |
|  |                                       | te: Friday, 20-12-2019 Max. Marks<br>0 PM To 5:30 PM   | s: 80          |  |  |  |
| Instr  | uctio                                 | <ul> <li>All questions are compulsory.</li> <li>Assume suitable data if necessary.</li> <li>Make suitable assumption if necessary and state them clearly.</li> <li>Figures to the right indicate full marks.</li> </ul>  |                |  |  |  |
|  |                                       | Section – I  |                |  |  |  |
| Q.2  | a)                                    | <ul> <li>Express the following terms:</li> <li>1) Mean effective pressure</li> <li>2) Volumetric efficiency</li> </ul>   | 06             |  |  |  |
|  | b)                                    | <ol> <li>Mechanical efficiency</li> <li>List down the various compensating devices used by carburetor. Explain<br/>any one in detail.</li> </ol>   | 07             |  |  |  |
|  | c)                                    | Explain the limitations of supercharging in S.I. engines.  | 07             |  |  |  |
| Q.3  | a)                                    | A 10 cm x 12 cm four cylinder, 4 stroke engine running at 2000 revolutions per minute has a carburetor venture with a 3 cm throat. Determine the suction at the throat assuming the volumetric efficiency of the engine to be 70 %. Assume density of air to be 1.2 kg/m <sup>2</sup> and coefficient of air flow 0.8. Consider the case with neglecting compressibility of air. | 06             |  |  |  |
|  | b)                                    | Explain the factors considered for selection of I.C. engine for the following application.   | 07             |  |  |  |
|  | C)                                    | List various fuel nozzles used in I.C. engines. Explain any two in detail.   | 07             |  |  |  |
| Section – II                                   |                                       |  |                |  |  |  |
| Q.4  | a)<br>b)<br>c)                        | Compare knocking in SI and CI engines.<br>Explain stages of combustion in CI engines.<br>Write the requirements of a good combustion chamber of a SI engine.   | 06<br>07<br>07 |  |  |  |
| Q.5  | a)<br>b)<br>c)                        | Explain Morse test in detail.<br>Write a note on 'Cetane number'.<br>Explain any two emission control techniques.  | 06<br>07<br>07 |  |  |  |

Seat RE (Part

No.

# I) (Old) Examination Nov/Dec 2010

**SLR-FM-768** 

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