



SLR-TJ – 86

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

Set	P
-----	----------

S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Answer cannot be changed **once** it is marked.
 - 2) **Don't forget** to mention Que. Paper Set on the top of the page.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) Elongation of a cylindrical bar due to its self-weight is given by
a) $\rho g l^2 / 2E$ b) $\rho g l / 2E$ c) $\rho g l^2 / E$ d) $\rho g l^2 / 4E$
 - 2) If a wire is stretched to double its length, the tensile stress is given by
a) $\sigma = E/2$ b) $\sigma = 2E$ c) $\sigma = E$ d) none of these
 - 3) If an element is subjected to two equal perpendicular tensile stresses, radius of Mohr's circle is
a) σ_x b) zero c) σ_y d) $\sigma_x + \sigma_y$
 - 4) If an element is subjected to only a simple shear stress, principal stresses are
a) zero b) equal and like
c) unequal d) equal and unlike
 - 5) For a simply supported beam carrying a central point load, shape of BMD is
a) a rectangle b) a right angled triangle
c) an isosceles triangle d) parabolic

P.T.O.



- 6) For a cantilever of length l carrying a UVL of w/m at the fixed end and zero at the free end, the bending moment at the fixed end is given by
a) $-wl^2/12$ b) $-wl^2/2$ c) $-wl^2/8$ d) $-wl^2/6$
- 7) For a hollow circular shaft subjected to torsion, the minimum shear stress is at
a) the inner radius b) the outer radius
c) the mean radius d) geometric mean radius
- 8) For a rectangular section if τ_{\max} = maximum shear stress at the neutral axis and τ_{avg} = average shear stress then,
a) $\tau_{\max} = 2 \tau_{\text{avg}}$ b) $\tau_{\max} = 1.5 \tau_{\text{avg}}$ c) $\tau_{\max} = \tau_{\text{avg}}$ d) $\tau_{\max} = 3 \tau_{\text{avg}}$
- 9) Variation of bending stress across the depth of a section of a beam is
a) parabolic b) linear c) cubic d) exponential
- 10) For a simply supported beam of length l carrying a U.D.L. of w/m on its entire span, maximum slope is given by
a) $5wl^4/384 EI$ b) $wl^3/48EI$ c) $wl^3/6EI$ d) $wl^3/24EI$
- 11) For a cantilever carrying a point load at the free end,
a) deflection is maximum at the free end
b) deflection is maximum at the fixed end
c) slope is maximum at the fixed end
d) slope is minimum at the free end
- 12) The equivalent length is twice the actual length of a column with
a) both ends hinged
b) both ends fixed
c) one end fixed and another end free
d) one end fixed and another end hinged
- 13) Rankine's formula holds for
a) long columns only
b) short columns only
c) long as well as short columns
d) columns with rectangular section only
- 14) Total strain energy is
a) directly proportional to the force applied
b) inversely proportional to the force applied
c) inversely proportional to the square of the force applied
d) directly proportional to the square of the force applied



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

**S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) A compound tube consists of a steel tube with 140 mm and 160 mm internal and external diameters respectively surrounded by a 10 mm thick brass tube with 180 mm outer diameter. The compound tube is 140 mm long and carries an axial compressive load of 900 kN. Calculate the stress and the load in each material and compression of the compound tube. Take E for steel = 200 GPa and E for brass = 100 GPa. 8
- b) For the object loaded as shown in fig. 2-b, determine the principal stresses and the maximum shear stress. 6

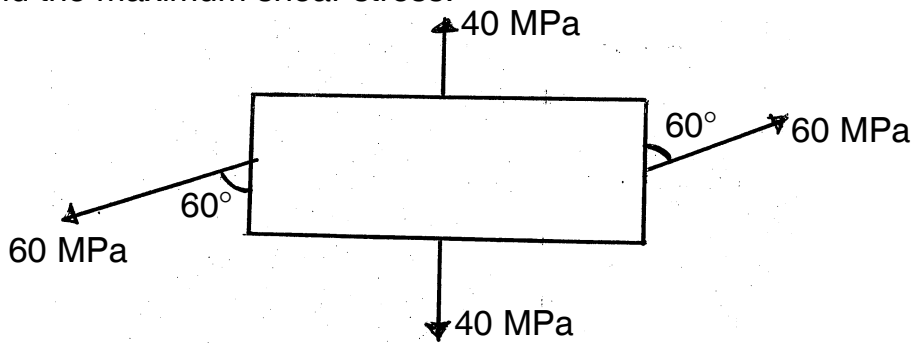


fig. 2-b

3. a) A simply supported beam AB of span 8 m carries a point load of 80 kN at 1 m from A. It also carries two clockwise couples of 60 kN-m and 120 kN-m at 3 m and 5 m respectively from end A. Draw SFD and BMD and indicate all the important points. 10
- b) Show that every simple shear stress is always accompanied by a complementary shear stress acting across the planes normal to it. 4

Set P



4. a) A shaft ABC with a part AB of aluminium 1.25 m long and a part BC of brass 1 m long is fixed at A. It has a uniform diameter of 60 mm. Determine the maximum safe torque that can be applied at the free end C if shear stresses in aluminium and brass are not to exceed 80 MPa and 60 MPa respectively and the total angle of twist is not to exceed 1° . Take G for aluminium = 30 GPa and G for brass = 35 GPa. 8
- b) Explain in brief the following terms : 6
- i) Principal stresses and principal planes.
 - ii) Maximum shear stress and planes of maximum shear.

SECTION – II

5. a) A cast iron hollow cylindrical column 3 m long has a buckling load of P kN when hinged at both the ends. The buckling load raises to $P + 300$ kN when it is fixed at both the ends. If the ratio of its outer diameter to inner diameter is 1.25 and $E = 100$ GPa, calculate its diameters using Euler's formula. 8
- b) Derive the complete bending equation $M/I = \sigma/y = E/R$. 6
6. a) A beam has a T-Section with the flange 150 mm \times 50 mm and the web 50 mm \times 150 mm. Draw the shear stress distribution diagram if it has to resist a shear force of 240 kN. 8
- b) A cantilever of span 2 m carries a UDL of 2.5 kN/m for a length of 1.25 m from the fixed end and a point load of 1 kN at the free end. It has a rectangular section 12 cm wide and 24 cm deep. Determine the deflection at the free end. Take $E = 10$ GPa. 6
7. a) A metallic bar has a uniform cross sectional area of 700 mm² and is 1.5 m long. If the stress at the elastic limit is 160 MPa, calculate its proof resilience. Also calculate the maximum load which may be applied suddenly exceeding the elastic limit. Take $E = 200$ GPa. 6
- b) Using 'Moment-Area' method, determine the expressions for the maximum slope and deflection for a cantilever carrying a point load W at its free end. 4
- c) Explain the following terms in brief : 4
- i) Equivalent length of a column
 - ii) Slenderness ratio of a column.



SLR-TJ – 86

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

Set	Q
-----	---

S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :** 1) Answer cannot be changed **once** it is marked.
2) **Don't forget** to mention Que. Paper Set on the top of the page.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**

- 1) For a rectangular section if τ_{\max} = maximum shear stress at the neutral axis and τ_{avg} = average shear stress then,
a) $\tau_{\max} = 2 \tau_{\text{avg}}$ b) $\tau_{\max} = 1.5 \tau_{\text{avg}}$ c) $\tau_{\max} = \tau_{\text{avg}}$ d) $\tau_{\max} = 3 \tau_{\text{avg}}$
- 2) Variation of bending stress across the depth of a section of a beam is
a) parabolic b) linear c) cubic d) exponential
- 3) For a simply supported beam of length 1 carrying a U.D.L. of w/m on its entire span, maximum slope is given by
a) $5wl^4/384 EI$ b) $wl^3/48EI$ c) $wl^3/6EI$ d) $wl^3/24EI$
- 4) For a cantilever carrying a point load at the free end,
a) deflection is maximum at the free end
b) deflection is maximum at the fixed end
c) slope is maximum at the fixed end
d) slope is minimum at the free end
- 5) The equivalent length is twice the actual length of a column with
a) both ends hinged
b) both ends fixed
c) one end fixed and another end free
d) one end fixed and another end hinged

P.T.O.



- 6) Rankine's formula holds for
- long columns only
 - short columns only
 - long as well as short columns
 - columns with rectangular section only
- 7) Total strain energy is
- directly proportional to the force applied
 - inversely proportional to the force applied
 - inversely proportional to the square of the force applied
 - directly proportional to the square of the force applied
- 8) Elongation of a cylindrical bar due to its self-weight is given by
- $\rho g l^2 / 2E$
 - $\rho g l / 2E$
 - $\rho g l^2 / E$
 - $\rho g l^2 / 4E$
- 9) If a wire is stretched to double its length, the tensile stress is given by
- $\sigma = E/2$
 - $\sigma = 2E$
 - $\sigma = E$
 - none of these
- 10) If an element is subjected to two equal perpendicular tensile stresses, radius of Mohr's circle is
- σ_x
 - zero
 - σ_y
 - $\sigma_x + \sigma_y$
- 11) If an element is subjected to only a simple shear stress, principal stresses are
- zero
 - equal and like
 - unequal
 - equal and unlike
- 12) For a simply supported beam carrying a central point load, shape of BMD is
- a rectangle
 - a right angled triangle
 - an isosceles triangle
 - parabolic
- 13) For a cantilever of length l carrying a UVL of w/m at the fixed end and zero at the free end, the bending moment at the fixed end is given by
- $-wl^2/12$
 - $-wl^2/2$
 - $-wl^2/8$
 - $-wl^2/6$
- 14) For a hollow circular shaft subjected to torsion, the minimum shear stress is at
- the inner radius
 - the outer radius
 - the mean radius
 - geometric mean radius



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

**S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) A compound tube consists of a steel tube with 140 mm and 160 mm internal and external diameters respectively surrounded by a 10 mm thick brass tube with 180 mm outer diameter. The compound tube is 140 mm long and carries an axial compressive load of 900 kN. Calculate the stress and the load in each material and compression of the compound tube. Take E for steel = 200 GPa and E for brass = 100 GPa. 8
- b) For the object loaded as shown in fig. 2-b, determine the principal stresses and the maximum shear stress. 6

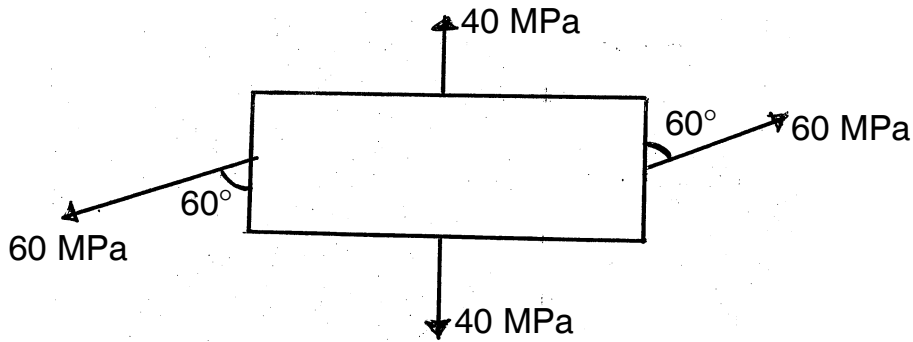


fig. 2-b

3. a) A simply supported beam AB of span 8 m carries a point load of 80 kN at 1 m from A. It also carries two clockwise couples of 60 kN-m and 120 kN-m at 3 m and 5 m respectively from end A. Draw SFD and BMD and indicate all the important points. 10
- b) Show that every simple shear stress is always accompanied by a complementary shear stress acting across the planes normal to it. 4



4. a) A shaft ABC with a part AB of aluminium 1.25 m long and a part BC of brass 1 m long is fixed at A. It has a uniform diameter of 60 mm. Determine the maximum safe torque that can be applied at the free end C if shear stresses in aluminium and brass are not to exceed 80 MPa and 60 MPa respectively and the total angle of twist is not to exceed 1° . Take G for aluminium = 30 GPa and G for brass = 35 GPa. 8
- b) Explain in brief the following terms : 6
- i) Principal stresses and principal planes.
 - ii) Maximum shear stress and planes of maximum shear.

SECTION – II

5. a) A cast iron hollow cylindrical column 3 m long has a buckling load of P kN when hinged at both the ends. The buckling load raises to $P + 300$ kN when it is fixed at both the ends. If the ratio of its outer diameter to inner diameter is 1.25 and $E = 100$ GPa, calculate its diameters using Euler's formula. 8
- b) Derive the complete bending equation $M/I = \sigma/y = E/R$. 6
6. a) A beam has a T-Section with the flange 150 mm \times 50 mm and the web 50 mm \times 150 mm. Draw the shear stress distribution diagram if it has to resist a shear force of 240 kN. 8
- b) A cantilever of span 2 m carries a UDL of 2.5 kN/m for a length of 1.25 m from the fixed end and a point load of 1 kN at the free end. It has a rectangular section 12 cm wide and 24 cm deep. Determine the deflection at the free end. Take $E = 10$ GPa. 6
7. a) A metallic bar has a uniform cross sectional area of 700 mm² and is 1.5 m long. If the stress at the elastic limit is 160 MPa, calculate its proof resilience. Also calculate the maximum load which may be applied suddenly exceeding the elastic limit. Take $E = 200$ GPa. 6
- b) Using 'Moment-Area' method, determine the expressions for the maximum slope and deflection for a cantilever carrying a point load W at its free end. 4
- c) Explain the following terms in brief : 4
- i) Equivalent length of a column
 - ii) Slenderness ratio of a column.



SLR-TJ – 86

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

Set	R
-----	---

S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS

Day and Date : Tuesday, 12-12-2017
Time : 3 .00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :** 1) Answer cannot be changed **once** it is marked.
2) **Don't forget** to mention Que. Paper Set on the top of the page.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) For a simply supported beam carrying a central point load, shape of BMD is
 - a) a rectangle
 - b) a right angled triangle
 - c) an isosceles triangle
 - d) parabolic
 - 2) For a cantilever of length l carrying a UVL of w/m at the fixed end and zero at the free end, the bending moment at the fixed end is given by
 - a) $-wl^2/12$
 - b) $-wl^2/2$
 - c) $-wl^2/8$
 - d) $-wl^2/6$
 - 3) For a hollow circular shaft subjected to torsion, the minimum shear stress is at
 - a) the inner radius
 - b) the outer radius
 - c) the mean radius
 - d) geometric mean radius
 - 4) For a rectangular section if τ_{max} = maximum shear stress at the neutral axis and τ_{avg} = average shear stress then,
 - a) $\tau_{max} = 2 \tau_{avg}$
 - b) $\tau_{max} = 1.5 \tau_{avg}$
 - c) $\tau_{max} = \tau_{avg}$
 - d) $\tau_{max} = 3 \tau_{avg}$
 - 5) Variation of bending stress across the depth of a section of a beam is
 - a) parabolic
 - b) linear
 - c) cubic
 - d) exponential

P.T.O.



- 6) For a simply supported beam of length l carrying a U.D.L. of w/m on its entire span, maximum slope is given by
a) $5wl^4/384 EI$ b) $wl^3/48EI$ c) $wl^3/6EI$ d) $wl^3/24EI$
- 7) For a cantilever carrying a point load at the free end,
a) deflection is maximum at the free end
b) deflection is maximum at the fixed end
c) slope is maximum at the fixed end
d) slope is minimum at the free end
- 8) The equivalent length is twice the actual length of a column with
a) both ends hinged
b) both ends fixed
c) one end fixed and another end free
d) one end fixed and another end hinged
- 9) Rankine's formula holds for
a) long columns only
b) short columns only
c) long as well as short columns
d) columns with rectangular section only
- 10) Total strain energy is
a) directly proportional to the force applied
b) inversely proportional to the force applied
c) inversely proportional to the square of the force applied
d) directly proportional to the square of the force applied
- 11) Elongation of a cylindrical bar due to its self-weight is given by
a) $\rho gl^2/2E$ b) $\rho gl/2E$ c) $\rho gl^2/E$ d) $\rho gl^2/4E$
- 12) If a wire is stretched to double its length, the tensile stress is given by
a) $\sigma = E/2$ b) $\sigma = 2E$ c) $\sigma = E$ d) none of these
- 13) If an element is subjected to two equal perpendicular tensile stresses, radius of Mohr's circle is
a) σ_x b) zero c) σ_y d) $\sigma_x + \sigma_y$
- 14) If an element is subjected to only a simple shear stress, principal stresses are
a) zero b) equal and like
c) unequal d) equal and unlike
-



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

**S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017
Time : 3 .00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) A compound tube consists of a steel tube with 140 mm and 160 mm internal and external diameters respectively surrounded by a 10 mm thick brass tube with 180 mm outer diameter. The compound tube is 140 mm long and carries an axial compressive load of 900 kN. Calculate the stress and the load in each material and compression of the compound tube. Take E for steel = 200 GPa and E for brass = 100 GPa. 8
- b) For the object loaded as shown in fig. 2-b, determine the principal stresses and the maximum shear stress. 6

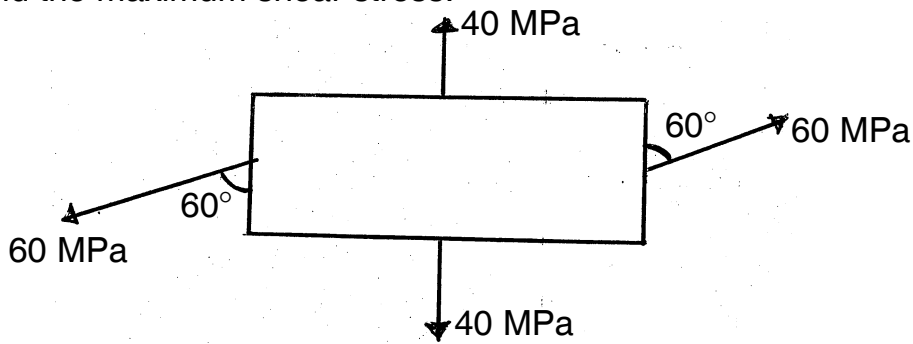


fig. 2-b

3. a) A simply supported beam AB of span 8 m carries a point load of 80 kN at 1 m from A. It also carries two clockwise couples of 60 kN-m and 120 kN-m at 3 m and 5 m respectively from end A. Draw SFD and BMD and indicate all the important points. 10
- b) Show that every simple shear stress is always accompanied by a complementary shear stress acting across the planes normal to it. 4

Set R



4. a) A shaft ABC with a part AB of aluminium 1.25 m long and a part BC of brass 1 m long is fixed at A. It has a uniform diameter of 60 mm. Determine the maximum safe torque that can be applied at the free end C if shear stresses in aluminium and brass are not to exceed 80 MPa and 60 MPa respectively and the total angle of twist is not to exceed 1° . Take G for aluminium = 30 GPa and G for brass = 35 GPa. 8
- b) Explain in brief the following terms : 6
- i) Principal stresses and principal planes.
 - ii) Maximum shear stress and planes of maximum shear.

SECTION – II

5. a) A cast iron hollow cylindrical column 3 m long has a buckling load of P kN when hinged at both the ends. The buckling load raises to $P + 300$ kN when it is fixed at both the ends. If the ratio of its outer diameter to inner diameter is 1.25 and $E = 100$ GPa, calculate its diameters using Euler's formula. 8
- b) Derive the complete bending equation $M/I = \sigma/y = E/R$. 6
6. a) A beam has a T-Section with the flange 150 mm \times 50 mm and the web 50 mm \times 150 mm. Draw the shear stress distribution diagram if it has to resist a shear force of 240 kN. 8
- b) A cantilever of span 2 m carries a UDL of 2.5 kN/m for a length of 1.25 m from the fixed end and a point load of 1 kN at the free end. It has a rectangular section 12 cm wide and 24 cm deep. Determine the deflection at the free end. Take $E = 10$ GPa. 6
7. a) A metallic bar has a uniform cross sectional area of 700 mm² and is 1.5 m long. If the stress at the elastic limit is 160 MPa, calculate its proof resilience. Also calculate the maximum load which may be applied suddenly exceeding the elastic limit. Take $E = 200$ GPa. 6
- b) Using 'Moment-Area' method, determine the expressions for the maximum slope and deflection for a cantilever carrying a point load W at its free end. 4
- c) Explain the following terms in brief : 4
- i) Equivalent length of a column
 - ii) Slenderness ratio of a column.



SLR-TJ – 86

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

Set	S
-----	----------

S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Answer cannot be changed **once** it is marked.
 - 2) **Don't forget** to mention Que. Paper Set on the top of the page.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) For a simply supported beam of length l carrying a U.D.L. of w/m on its entire span, maximum slope is given by
a) $5wl^4/384 EI$ b) $wl^3/48EI$ c) $wl^3/6EI$ d) $wl^3/24EI$
 - 2) For a cantilever carrying a point load at the free end,
a) deflection is maximum at the free end
b) deflection is maximum at the fixed end
c) slope is maximum at the fixed end
d) slope is minimum at the free end
 - 3) The equivalent length is twice the actual length of a column with
a) both ends hinged
b) both ends fixed
c) one end fixed and another end free
d) one end fixed and another end hinged
 - 4) Rankine's formula holds for
a) long columns only
b) short columns only
c) long as well as short columns
d) columns with rectangular section only

P.T.O.



- 5) Total strain energy is
- directly proportional to the force applied
 - inversely proportional to the force applied
 - inversely proportional to the square of the force applied
 - directly proportional to the square of the force applied
- 6) Elongation of a cylindrical bar due to its self-weight is given by
- $\rho g l^2 / 2E$
 - $\rho g l / 2E$
 - $\rho g l^2 / E$
 - $\rho g l^2 / 4E$
- 7) If a wire is stretched to double its length, the tensile stress is given by
- $\sigma = E/2$
 - $\sigma = 2E$
 - $\sigma = E$
 - none of these
- 8) If an element is subjected to two equal perpendicular tensile stresses, radius of Mohr's circle is
- σ_x
 - zero
 - σ_y
 - $\sigma_x + \sigma_y$
- 9) If an element is subjected to only a simple shear stress, principal stresses are
- zero
 - equal and like
 - unequal
 - equal and unlike
- 10) For a simply supported beam carrying a central point load, shape of BMD is
- a rectangle
 - a right angled triangle
 - an isosceles triangle
 - parabolic
- 11) For a cantilever of length l carrying a UVL of w/m at the fixed end and zero at the free end, the bending moment at the fixed end is given by
- $-wl^2/12$
 - $-wl^2/2$
 - $-wl^2/8$
 - $-wl^2/6$
- 12) For a hollow circular shaft subjected to torsion, the minimum shear stress is at
- the inner radius
 - the outer radius
 - the mean radius
 - geometric mean radius
- 13) For a rectangular section if τ_{\max} = maximum shear stress at the neutral axis and τ_{avg} = average shear stress then,
- $\tau_{\max} = 2 \tau_{\text{avg}}$
 - $\tau_{\max} = 1.5 \tau_{\text{avg}}$
 - $\tau_{\max} = \tau_{\text{avg}}$
 - $\tau_{\max} = 3 \tau_{\text{avg}}$
- 14) Variation of bending stress across the depth of a section of a beam is
- parabolic
 - linear
 - cubic
 - exponential



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

**S.E. (Mechanical) (Part – I) (New-CBCS) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) A compound tube consists of a steel tube with 140 mm and 160 mm internal and external diameters respectively surrounded by a 10 mm thick brass tube with 180 mm outer diameter. The compound tube is 140 mm long and carries an axial compressive load of 900 kN. Calculate the stress and the load in each material and compression of the compound tube. Take E for steel = 200 GPa and E for brass = 100 GPa. 8
- b) For the object loaded as shown in fig. 2-b, determine the principal stresses and the maximum shear stress. 6

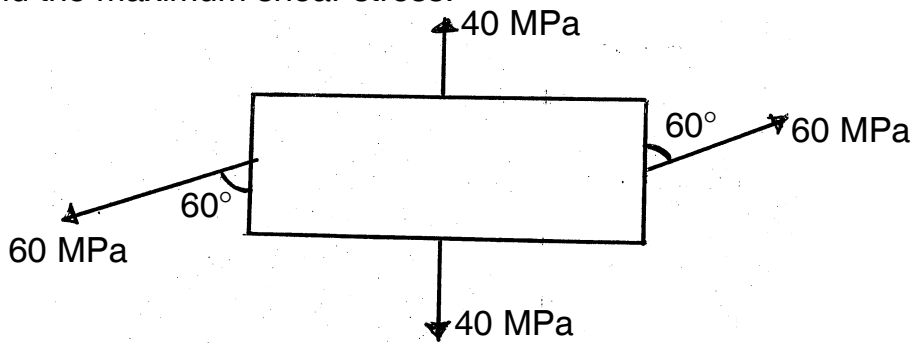


fig. 2-b

3. a) A simply supported beam AB of span 8 m carries a point load of 80 kN at 1 m from A. It also carries two clockwise couples of 60 kN-m and 120 kN-m at 3 m and 5 m respectively from end A. Draw SFD and BMD and indicate all the important points. 10
- b) Show that every simple shear stress is always accompanied by a complementary shear stress acting across the planes normal to it. 4

Set S



4. a) A shaft ABC with a part AB of aluminium 1.25 m long and a part BC of brass 1 m long is fixed at A. It has a uniform diameter of 60 mm. Determine the maximum safe torque that can be applied at the free end C if shear stresses in aluminium and brass are not to exceed 80 MPa and 60 MPa respectively and the total angle of twist is not to exceed 1° . Take G for aluminium = 30 GPa and G for brass = 35 GPa. 8
- b) Explain in brief the following terms : 6
- i) Principal stresses and principal planes.
 - ii) Maximum shear stress and planes of maximum shear.

SECTION – II

5. a) A cast iron hollow cylindrical column 3 m long has a buckling load of P kN when hinged at both the ends. The buckling load raises to $P + 300$ kN when it is fixed at both the ends. If the ratio of its outer diameter to inner diameter is 1.25 and $E = 100$ GPa, calculate its diameters using Euler's formula. 8
- b) Derive the complete bending equation $M/I = \sigma/y = E/R$. 6
6. a) A beam has a T-Section with the flange 150 mm \times 50 mm and the web 50 mm \times 150 mm. Draw the shear stress distribution diagram if it has to resist a shear force of 240 kN. 8
- b) A cantilever of span 2 m carries a UDL of 2.5 kN/m for a length of 1.25 m from the fixed end and a point load of 1 kN at the free end. It has a rectangular section 12 cm wide and 24 cm deep. Determine the deflection at the free end. Take $E = 10$ GPa. 6
7. a) A metallic bar has a uniform cross sectional area of 700 mm² and is 1.5 m long. If the stress at the elastic limit is 160 MPa, calculate its proof resilience. Also calculate the maximum load which may be applied suddenly exceeding the elastic limit. Take $E = 200$ GPa. 6
- b) Using 'Moment-Area' method, determine the expressions for the maximum slope and deflection for a cantilever carrying a point load W at its free end. 4
- c) Explain the following terms in brief : 4
- i) Equivalent length of a column
 - ii) Slenderness ratio of a column.



SLR-TJ – 87

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

Set	P
-----	---

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) 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) Economiser
- 2) Kelvin-Planks law deals with
 - a) Conversion of work
 - b) Conversion of heat
 - c) Conversion of mass
 - d) Conversion of heat into work
- 3) The flow of steam is supersonic
 - a) In divergent part of nozzle
 - b) At throat of nozzle
 - c) At entrance of nozzle
 - d) In convergent part of nozzle
- 4) The critical pressure ratio for initially dry saturated steam is
 - a) 0.528
 - b) 0.577
 - c) 0.546
 - d) 0.582
- 5) Cooling of water takes place in cooling tower mainly due to
 - a) Mixing of air and water
 - b) Evaporative cooling
 - c) Addition of heat into water
 - d) None of the above
- 6) Reversible adiabatic process has
 - a) $ds = 0$
 - b) $ds > 0$
 - c) $ds < 0$
 - d) $ds = dh$
- 7) Rankine cycle efficiency of good steam power plant may be in the range of
 - a) 15 to 20%
 - b) 35 to 45%
 - c) 70 to 80%
 - d) 90 to 95%
- 8) Pressure on the two sides of the impulse wheel of a steam turbine
 - a) Is same
 - b) Is different
 - c) Increases from one side to other side
 - d) Decreases from one side to other side

P.T.O.



9) Work done in a single, single-acting aircompressor without clearance per kg of air delivered when the compression process is isothermal is given by

$$a) \frac{n}{n-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} - 1 \right]$$

$$b) \frac{r}{r-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{r-1}{r}} - 1 \right]$$

$$c) P_1 V_1 \log \frac{P_2}{P_1}$$

$$d) \frac{n}{n-1} P_1 V_1 \log \frac{P_2}{P_1}$$

10) For reciprocating air compressor the law of compression desired is isothermal and that may be possible by

- a) Very low speeds
- b) Very high speeds
- c) Any speed as speed does not affect the compression law
- d) None of the above

11) De-laval turbine is

- a) Pressure compounded impulse turbine
- b) Velocity compounded impulse turbine
- c) Simple single wheel impulse turbine
- d) Simple single wheel reaction turbine

12) For Parson's reaction steam, degree of reaction is

- a) 75%
- b) 100%
- c) 50%
- d) 60%

13) In jet type condensers

- a) Cooling water passes through tubes and steam surrounds them
- b) Steam passes through tubes and cooling water surrounds them
- c) Steam and cooling water do not mix
- d) Steam and cooling water mix

14) In 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 through the cooling tubes and cooling water surrounds them
- d) All the above varying with situation



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

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) *Figures to the right indicate full marks.*
2) *Make suitable assumptions wherever necessary and state them clearly.*
3) *Draw neat diagram wherever necessary.*
4) **Use of steam tables and Mollier diagram is allowed.**
5) **Use of scientific calculator is allowed.**
6) *Solve any two questions from each Section.*

SECTION – I

2. a) Calculate the standard enthalpy change at 298.15°K for the reaction
$$\text{C}_5\text{H}_{12(g)} + 8\text{O}_{2(g)} \rightarrow 5\text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$$

$$\text{CO}_{2(g)} = -393 \text{ kJ/mol}$$

$$\text{H}_2\text{O}_{(g)} = -242 \text{ kJ/mol}$$

$$\text{C}_5\text{H}_{12(g)} = -146.5 \text{ kJ/mol} .$$
 4
- b) State Kelvin-Planck, Clausius statements of second law of thermodynamics and prove that both are equivalent. 5
- c) A boiler produces wet steam having $x = 0.9$, the working pressure of boiler is 12 bar abs. It generate steam at the rate of 640 kg/hr and consumes the coal at the rate of 80 kg/hr. If calorific value of coal is 31400 kJ/kg and water is fed at 20°C. Calculate :
1) Equivalent evaporation from and at 100°C
2) Factor of evaporation
3) Efficiency of boiler. 5
3. a) Explain the principle of increase of entropy and prove that entropy is a property of system. 5
b) Explain Reheat cycle with block diagram and T-S diagram. Write equation for its thermal efficiency. 5
c) Draw T-S plot of Rankine cycle when steam entering to the turbine is
i) Wet
ii) Dry and saturated
iii) Superheated. 4
4. a) Explain the various operations of a Carnot cycle. Also represent it on a T-S diagram. 5
b) Mention different losses in boiler and write a heat balance sheet. 5
c) A steam power plant operates on a Rankine cycle. Steam is delivered to the turbine at 38.0 bar and temp of 350°C. Steam from turbine expands up to a condenser pressure of 0.08 bar. Find
i) Dryness fraction of steam entering condenser.
ii) Heat rejected in condenser.
iii) Rankine cycle efficiency. 4

Set P



SECTION – II

5. a) Derive an expression for critical pressure ratio for maximum discharge through nozzle. **5**
- b) Dry saturated steam at a pressure of 11 bar enters a convergent divergent nozzle and leaves at pressure 2 bar. If the flow is adiabatic and frictionless, Determine
- The exit velocity of steam.
 - Cross section area at throat and exit. Take $n = 1.135$. **5**
- c) Explain difference between impulse and reaction steam turbine. **4**
6. a) Steam issues from the nozzles of De-laval turbine with the velocity of 1200 m/s. The nozzle angle is 20° . The mean blade velocity is 400 m/s. The inlet and outlet blade angle are equal. The mass of steam flowing through turbine per hour is 900 kg. Calculate :
- Blade angles
 - Power developed
 - Blade efficiency.
- Assume $K = 0.8$. **5**
- b) Derive an expression for volumetric efficiency of a single stage compressor with usual notations. **5**
- c) Write the difference between jet and surface condensers. **4**
7. a) A single stage single acting reciprocating compressor delivers 150 m^3 of free air per minute, compressing it from 1 bar to 8 bar. The speed of the compressor is 300 rpm. If the clearance is $\frac{1}{16}$ of swept volume, find the diameter and stroke of the compressor. Take $\frac{L}{D} = 1.5$ where L is stroke and D is bore. The value of n can be taken as 1.3. **5**
- b) Write expressions for the following for steam turbine :
- Tangential force
 - Work done
 - Blade efficiency
 - Stage efficiency
 - Axial thrust. **5**
- c) Explain necessity of multi stage compression and state its advantages. **4**
-



SLR-TJ – 87

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

Set	Q
-----	---

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Pressure on the two sides of the impulse wheel of a steam turbine
 - a) Is same
 - b) Is different
 - c) Increases from one side to other side
 - d) Decreases from one side to other side
- 2) Work done in a single, single-acting air compressor without clearance per kg of air delivered when the compression process is isothermal is given by
 - a) $\frac{n}{n-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} - 1 \right]$
 - b) $\frac{r}{r-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{r-1}{r}} - 1 \right]$
 - c) $P_1 V_1 \log \frac{P_2}{P_1}$
 - d) $\frac{n}{n-1} P_1 V_1 \log \frac{P_2}{P_1}$
- 3) For reciprocating air compressor the law of compression desired is isothermal and that may be possible by
 - a) Very low speeds
 - b) Very high speeds
 - c) Any speed as speed does not affect the compression law
 - d) None of the above
- 4) De-laval turbine is
 - a) Pressure compounded impulse turbine
 - b) Velocity compounded impulse turbine
 - c) Simple single wheel impulse turbine
 - d) Simple single wheel reaction turbine
- 5) For Parson's reaction steam, degree of reaction is
 - a) 75%
 - b) 100%
 - c) 50%
 - d) 60%

P.T.O.



- 6) In jet type condensers
- Cooling water passes through tubes and steam surrounds them
 - Steam passes through tubes and cooling water surrounds them
 - Steam and cooling water do not mix
 - Steam and cooling water mix
- 7) In shell and tube surface condenser
- Steam and cooling water mix to give the condensate
 - Cooling water passes through the tubes and steam surrounds them
 - Steam passes through the cooling tubes and cooling water surrounds them
 - All the above varying with situation
- 8) A device used to increase the temperature of saturated steam without raising its pressure, is called
- Fusible plug
 - Stop valve
 - Superheater
 - Economiser
- 9) Kelvin-Planks law deals with
- Conversion of work
 - Conversion of heat
 - Conversion of mass
 - Conversion of heat into work
- 10) The flow of steam is supersonic
- In divergent part of nozzle
 - At throat of nozzle
 - At entrance of nozzle
 - In convergent part of nozzle
- 11) The critical pressure ratio for initially dry saturated steam is
- 0.528
 - 0.577
 - 0.546
 - 0.582
- 12) Cooling of water takes place in cooling tower mainly due to
- Mixing of air and water
 - Evaporative cooling
 - Addition of heat into water
 - None of the above
- 13) Reversible adiabatic process has
- $ds = 0$
 - $ds > 0$
 - $ds < 0$
 - $ds = dh$
- 14) Rankine cycle efficiency of good steam power plant may be in the range of
- 15 to 20%
 - 35 to 45%
 - 70 to 80%
 - 90 to 95%
-



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

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) *Figures to the right indicate full marks.*
2) *Make suitable assumptions wherever necessary and state them clearly.*
3) *Draw neat diagram wherever necessary.*
4) **Use of steam tables and Mollier diagram is allowed.**
5) **Use of scientific calculator is allowed.**
6) **Solve any two questions from each Section.**

SECTION – I

2. a) Calculate the standard enthalpy change at 298.15°K for the reaction
$$\text{C}_5\text{H}_{12(g)} + 8\text{O}_{2(g)} \rightarrow 5\text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$$

$$\text{CO}_{2(g)} = -393 \text{ kJ/mol}$$

$$\text{H}_2\text{O}_{(g)} = -242 \text{ kJ/mol}$$

$$\text{C}_5\text{H}_{12(g)} = -146.5 \text{ kJ/mol} .$$
 4
- b) State Kelvin-Planck, Clausius statements of second law of thermodynamics and prove that both are equivalent. 5
- c) A boiler produces wet steam having $x = 0.9$, the working pressure of boiler is 12 bar abs. It generate steam at the rate of 640 kg/hr and consumes the coal at the rate of 80 kg/hr. If calorific value of coal is 31400 kJ/kg and water is fed at 20°C. Calculate :
1) Equivalent evaporation from and at 100°C
2) Factor of evaporation
3) Efficiency of boiler. 5
3. a) Explain the principle of increase of entropy and prove that entropy is a property of system. 5
b) Explain Reheat cycle with block diagram and T-S diagram. Write equation for its thermal efficiency. 5
c) Draw T-S plot of Rankine cycle when steam entering to the turbine is
i) Wet
ii) Dry and saturated
iii) Superheated. 4
4. a) Explain the various operations of a Carnot cycle. Also represent it on a T-S diagram. 5
b) Mention different losses in boiler and write a heat balance sheet. 5
c) A steam power plant operates on a Rankine cycle. Steam is delivered to the turbine at 38.0 bar and temp of 350°C. Steam from turbine expands up to a condenser pressure of 0.08 bar. Find
i) Dryness fraction of steam entering condenser.
ii) Heat rejected in condenser.
iii) Rankine cycle efficiency. 4

Set Q



SECTION – II

5. a) Derive an expression for critical pressure ratio for maximum discharge through nozzle. **5**
- b) Dry saturated steam at a pressure of 11 bar enters a convergent divergent nozzle and leaves at pressure 2 bar. If the flow is adiabatic and frictionless, Determine
- The exit velocity of steam.
 - Cross section area at throat and exit. Take $n = 1.135$. **5**
- c) Explain difference between impulse and reaction steam turbine. **4**
6. a) Steam issues from the nozzles of De-laval turbine with the velocity of 1200 m/s. The nozzle angle is 20° . The mean blade velocity is 400 m/s. The inlet and outlet blade angle are equal. The mass of steam flowing through turbine per hour is 900 kg. Calculate :
- Blade angles
 - Power developed
 - Blade efficiency.
- Assume $K = 0.8$. **5**
- b) Derive an expression for volumetric efficiency of a single stage compressor with usual notations. **5**
- c) Write the difference between jet and surface condensers. **4**
7. a) A single stage single acting reciprocating compressor delivers 150 m^3 of free air per minute, compressing it from 1 bar to 8 bar. The speed of the compressor is 300 rpm. If the clearance is $\frac{1}{16}$ of swept volume, find the diameter and stroke of the compressor. Take $\frac{L}{D} = 1.5$ where L is stroke and D is bore. The value of n can be taken as 1.3. **5**
- b) Write expressions for the following for steam turbine :
- Tangential force
 - Work done
 - Blade efficiency
 - Stage efficiency
 - Axial thrust. **5**
- c) Explain necessity of multi stage compression and state its advantages. **4**
-



SLR-TJ – 87

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

Set	R
-----	---

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Cooling of water takes place in cooling tower mainly due to
 - a) Mixing of air and water
 - b) Evaporative cooling
 - c) Addition of heat into water
 - d) None of the above
- 2) Reversible adiabatic process has
 - a) $ds = 0$
 - b) $ds > 0$
 - c) $ds < 0$
 - d) $ds = dh$
- 3) Rankine cycle efficiency of good steam power plant may be in the range of
 - a) 15 to 20%
 - b) 35 to 45%
 - c) 70 to 80%
 - d) 90 to 95%
- 4) Pressure on the two sides of the impulse wheel of a steam turbine
 - a) Is same
 - b) Is different
 - c) Increases from one side to other side
 - d) Decreases from one side to other side
- 5) Work done in a single, single-acting air compressor without clearance per kg of air delivered when the compression process is isothermal is given by

a) $\frac{n}{n-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} - 1 \right]$

b) $\frac{r}{r-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{r-1}{r}} - 1 \right]$

c) $P_1 V_1 \log \frac{P_2}{P_1}$

d) $\frac{n}{n-1} P_1 V_1 \log \frac{P_2}{P_1}$

- 6) For reciprocating air compressor the law of compression desired is isothermal and that may be possible by
 - a) Very low speeds
 - b) Very high speeds
 - c) Any speed as speed does not affect the compression law
 - d) None of the above

P.T.O.



- 7) De-laval turbine is
- a) Pressure compounded impulse turbine
 - b) Velocity compounded impulse turbine
 - c) Simple single wheel impulse turbine
 - d) Simple single wheel reaction turbine
- 8) For Parson's reaction steam, degree of reaction is
- a) 75%
 - b) 100%
 - c) 50%
 - d) 60%
- 9) In jet type condensers
- a) Cooling water passes through tubes and steam surrounds them
 - b) Steam passes through tubes and cooling water surrounds them
 - c) Steam and cooling water do not mix
 - d) Steam and cooling water mix
- 10) In 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 through the cooling tubes and cooling water surrounds them
 - d) All the above varying with situation
- 11) 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) Economiser
- 12) Kelvin-Planks law deals with
- a) Conversion of work
 - b) Conversion of heat
 - c) Conversion of mass
 - d) Conversion of heat into work
- 13) The flow of steam is supersonic
- a) In divergent part of nozzle
 - b) At throat of nozzle
 - c) At entrance of nozzle
 - d) In convergent part of nozzle
- 14) The critical pressure ratio for initially dry saturated steam is
- a) 0.528
 - b) 0.577
 - c) 0.546
 - d) 0.582
-



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

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) *Figures to the right indicate full marks.*
2) *Make suitable assumptions wherever necessary and state them clearly.*
3) *Draw neat diagram wherever necessary.*
4) **Use of steam tables and Mollier diagram is allowed.**
5) **Use of scientific calculator is allowed.**
6) *Solve any two questions from each Section.*

SECTION – I

2. a) Calculate the standard enthalpy change at 298.15°K for the reaction
$$\text{C}_5\text{H}_{12(g)} + 8\text{O}_{2(g)} \rightarrow 5\text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$$

$$\text{CO}_{2(g)} = -393 \text{ kJ/mol}$$

$$\text{H}_2\text{O}_{(g)} = -242 \text{ kJ/mol}$$

$$\text{C}_5\text{H}_{12(g)} = -146.5 \text{ kJ/mol} .$$
 4
- b) State Kelvin-Planck, Clausius statements of second law of thermodynamics and prove that both are equivalent. 5
- c) A boiler produces wet steam having $x = 0.9$, the working pressure of boiler is 12 bar abs. It generate steam at the rate of 640 kg/hr and consumes the coal at the rate of 80 kg/hr. If calorific value of coal is 31400 kJ/kg and water is fed at 20°C. Calculate :
1) Equivalent evaporation from and at 100°C
2) Factor of evaporation
3) Efficiency of boiler. 5
3. a) Explain the principle of increase of entropy and prove that entropy is a property of system. 5
b) Explain Reheat cycle with block diagram and T-S diagram. Write equation for its thermal efficiency. 5
c) Draw T-S plot of Rankine cycle when steam entering to the turbine is
i) Wet
ii) Dry and saturated
iii) Superheated. 4
4. a) Explain the various operations of a Carnot cycle. Also represent it on a T-S diagram. 5
b) Mention different losses in boiler and write a heat balance sheet. 5
c) A steam power plant operates on a Rankine cycle. Steam is delivered to the turbine at 38.0 bar and temp of 350°C. Steam from turbine expands up to a condenser pressure of 0.08 bar. Find
i) Dryness fraction of steam entering condenser.
ii) Heat rejected in condenser.
iii) Rankine cycle efficiency. 4

Set R



SECTION – II

5. a) Derive an expression for critical pressure ratio for maximum discharge through nozzle. **5**
- b) Dry saturated steam at a pressure of 11 bar enters a convergent divergent nozzle and leaves at pressure 2 bar. If the flow is adiabatic and frictionless, Determine
- The exit velocity of steam.
 - Cross section area at throat and exit. Take $n = 1.135$. **5**
- c) Explain difference between impulse and reaction steam turbine. **4**
6. a) Steam issues from the nozzles of De-laval turbine with the velocity of 1200 m/s. The nozzle angle is 20° . The mean blade velocity is 400 m/s. The inlet and outlet blade angle are equal. The mass of steam flowing through turbine per hour is 900 kg. Calculate :
- Blade angles
 - Power developed
 - Blade efficiency.
- Assume $K = 0.8$. **5**
- b) Derive an expression for volumetric efficiency of a single stage compressor with usual notations. **5**
- c) Write the difference between jet and surface condensers. **4**
7. a) A single stage single acting reciprocating compressor delivers 150 m^3 of free air per minute, compressing it from 1 bar to 8 bar. The speed of the compressor is 300 rpm. If the clearance is $\frac{1}{16}$ of swept volume, find the diameter and stroke of the compressor. Take $\frac{L}{D} = 1.5$ where L is stroke and D is bore. The value of n can be taken as 1.3. **5**
- b) Write expressions for the following for steam turbine :
- Tangential force
 - Work done
 - Blade efficiency
 - Stage efficiency
 - Axial thrust. **5**
- c) Explain necessity of multi stage compression and state its advantages. **4**
-



SLR-TJ – 87

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

Set	S
-----	---

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) For reciprocating air compressor the law of compression desired is isothermal and that may be possible by
 - a) Very low speeds
 - b) Very high speeds
 - c) Any speed as speed does not affect the compression law
 - d) None of the above
- 2) De-laval turbine is
 - a) Pressure compounded impulse turbine
 - b) Velocity compounded impulse turbine
 - c) Simple single wheel impulse turbine
 - d) Simple single wheel reaction turbine
- 3) For Parson's reaction steam, degree of reaction is
 - a) 75%
 - b) 100%
 - c) 50%
 - d) 60%
- 4) In jet type condensers
 - a) Cooling water passes through tubes and steam surrounds them
 - b) Steam passes through tubes and cooling water surrounds them
 - c) Steam and cooling water do not mix
 - d) Steam and cooling water mix
- 5) In 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 through the cooling tubes and cooling water surrounds them
 - d) All the above varying with situation

P.T.O.



- 6) 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) Economiser
- 7) Kelvin-Planks law deals with
 a) Conversion of work
 b) Conversion of heat
 c) Conversion of mass
 d) Conversion of heat into work
- 8) The flow of steam is supersonic
 a) In divergent part of nozzle
 b) At throat of nozzle
 c) At entrance of nozzle
 d) In convergent part of nozzle
- 9) The critical pressure ratio for initially dry saturated steam is
 a) 0.528
 b) 0.577
 c) 0.546
 d) 0.582
- 10) Cooling of water takes place in cooling tower mainly due to
 a) Mixing of air and water
 b) Evaporative cooling
 c) Addition of heat into water
 d) None of the above
- 11) Reversible adiabatic process has
 a) $ds = 0$
 b) $ds > 0$
 c) $ds < 0$
 d) $ds = dh$
- 12) Rankine cycle efficiency of good steam power plant may be in the range of
 a) 15 to 20%
 b) 35 to 45%
 c) 70 to 80%
 d) 90 to 95%
- 13) Pressure on the two sides of the impulse wheel of a steam turbine
 a) Is same
 b) Is different
 c) Increases from one side to other side
 d) Decreases from one side to other side
- 14) Work done in a single, single-acting aircompressor without clearance per kg of air delivered when the compression process is isothermal is given by

$$a) \frac{n}{n-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{n-1}{n}} - 1 \right]$$

$$b) \frac{r}{r-1} P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{\frac{r-1}{r}} - 1 \right]$$

$$c) P_1 V_1 \log \frac{P_2}{P_1}$$

$$d) \frac{n}{n-1} P_1 V_1 \log \frac{P_2}{P_1}$$



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

**S.E. (Mech.) (Part – I) (CBCS) Examination, 2017
APPLIED THERMODYNAMICS (New)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) *Figures to the right indicate full marks.*
2) *Make suitable assumptions wherever necessary and state them clearly.*
3) *Draw neat diagram wherever necessary.*
4) **Use of steam tables and Mollier diagram is allowed.**
5) **Use of scientific calculator is allowed.**
6) *Solve any two questions from each Section.*

SECTION – I

2. a) Calculate the standard enthalpy change at 298.15°K for the reaction
$$\text{C}_5\text{H}_{12(g)} + 8\text{O}_{2(g)} \rightarrow 5\text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$$

$$\text{CO}_{2(g)} = -393 \text{ kJ/mol}$$

$$\text{H}_2\text{O}_{(g)} = -242 \text{ kJ/mol}$$

$$\text{C}_5\text{H}_{12(g)} = -146.5 \text{ kJ/mol} .$$
 4
- b) State Kelvin-Planck, Clausius statements of second law of thermodynamics and prove that both are equivalent. 5
- c) A boiler produces wet steam having $x = 0.9$, the working pressure of boiler is 12 bar abs. It generate steam at the rate of 640 kg/hr and consumes the coal at the rate of 80 kg/hr. If calorific value of coal is 31400 kJ/kg and water is fed at 20°C. Calculate :
1) Equivalent evaporation from and at 100°C
2) Factor of evaporation
3) Efficiency of boiler. 5
3. a) Explain the principle of increase of entropy and prove that entropy is a property of system. 5
b) Explain Reheat cycle with block diagram and T-S diagram. Write equation for its thermal efficiency. 5
c) Draw T-S plot of Rankine cycle when steam entering to the turbine is
i) Wet
ii) Dry and saturated
iii) Superheated. 4
4. a) Explain the various operations of a Carnot cycle. Also represent it on a T-S diagram. 5
b) Mention different losses in boiler and write a heat balance sheet. 5
c) A steam power plant operates on a Rankine cycle. Steam is delivered to the turbine at 38.0 bar and temp of 350°C. Steam from turbine expands up to a condenser pressure of 0.08 bar. Find
i) Dryness fraction of steam entering condenser.
ii) Heat rejected in condenser.
iii) Rankine cycle efficiency. 4

Set S



SECTION – II

5. a) Derive an expression for critical pressure ratio for maximum discharge through nozzle. **5**
- b) Dry saturated steam at a pressure of 11 bar enters a convergent divergent nozzle and leaves at pressure 2 bar. If the flow is adiabatic and frictionless, Determine
- The exit velocity of steam.
 - Cross section area at throat and exit. Take $n = 1.135$. **5**
- c) Explain difference between impulse and reaction steam turbine. **4**
6. a) Steam issues from the nozzles of De-laval turbine with the velocity of 1200 m/s. The nozzle angle is 20° . The mean blade velocity is 400 m/s. The inlet and outlet blade angle are equal. The mass of steam flowing through turbine per hour is 900 kg. Calculate :
- Blade angles
 - Power developed
 - Blade efficiency.
- Assume $K = 0.8$. **5**
- b) Derive an expression for volumetric efficiency of a single stage compressor with usual notations. **5**
- c) Write the difference between jet and surface condensers. **4**
7. a) A single stage single acting reciprocating compressor delivers 150 m^3 of free air per minute, compressing it from 1 bar to 8 bar. The speed of the compressor is 300 rpm. If the clearance is $\frac{1}{16}$ of swept volume, find the diameter and stroke of the compressor. Take $\frac{L}{D} = 1.5$ where L is stroke and D is bore. The value of n can be taken as 1.3. **5**
- b) Write expressions for the following for steam turbine :
- Tangential force
 - Work done
 - Blade efficiency
 - Stage efficiency
 - Axial thrust. **5**
- c) Explain necessity of multi stage compression and state its advantages. **4**
-



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

Set	P
-----	----------

**S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- N.B. :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate full marks.**
 - 3) **Use of calculator is allowed.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The complementary function of $(D^4 - m^4)y = \sin mx$ is
 - a) $c_1 e^{-mx} + c_2 e^{mx} + c_3 \cos mx + c_4 \sin mx$
 - b) $(c_1 + c_2 x)e^{-mx} + c_3 \cos mx + c_4 \sin mx$
 - c) $(c_1 + c_2 x) e^{mx} + c_3 \cos mx + c_4 \sin mx$
 - d) none of these
- 2) $\frac{1}{D^2 + 16} \cos 4x$ is equal to
 - a) $\frac{x \cos 4x}{8}$
 - b) $\frac{x \sin 4x}{8}$
 - c) $\frac{-x \sin 4x}{8}$
 - d) $\frac{-x \cos 4x}{8}$
- 3) The particular integral of $x^2 D^2 y + 2xDy = \frac{1}{x^2}$ is
 - a) $y_p = c_1 + c_2 x^2$
 - b) $y_p = x - \frac{1}{x^2}$
 - c) $y_p = \frac{1}{x^2}$
 - d) $y_p = \frac{1}{2x^2}$
- 4) The value of integral $\int_0^{\infty} e^{-3t} \sin 5t dt$ is
 - a) $\frac{-3}{34}$
 - b) $\frac{s}{34}$
 - c) $\frac{5}{34}$
 - d) $\frac{-s}{34}$

P.T.O.



- 5) $L \{e^{2t} \sin 2t\} =$
- a) $\frac{2}{s^2 - 4s + 8}$ b) $\frac{2}{s^2 + 4}$ c) $\frac{s}{s^2 + 4}$ d) $\frac{s-2}{s^2 - 4s + 8}$
- 6) $L^{-1} \left\{ \frac{1}{(s+3)^2} \right\} =$
- a) t^2 b) t^3 c) te^{-3t} d) e^{-3t}
- 7) $L^{-1} \left\{ \frac{s+2}{(s+2)^2 + 25} \right\} =$
- a) $e^{2t} \cos 5t$ b) $e^{2t} \cos 25t$ c) $e^{-2t} \sin 5t$ d) $e^{-2t} \cos 5t$
- 8) $z = ax - \cos x - \cos y - ay + b$ is the general solution of
- a) $p + \sin x = q + \sin y$ b) $p - q = \sin x - \sin y$
 c) $p + q = \sin x + \sin y$ d) $p + q = \sin x - \sin y$
- 9) The solution of $p + q = pq$ is
- a) $z = ax + \frac{ay}{a-1} + c$ b) $z = \frac{ax}{a-1} + ay + c$
 c) $z = ax + \left(\frac{a-1}{a} \right) y + c$ d) $z = \left(\frac{a}{a-1} \right) x + ay + c$
- 10) If the probability density function of a discrete random variable x which assumes values x_1, x_2, x_3 such that $p(x_1) = 2p(x_2) = 3p(x_3)$, the value of $p(x_2)$ is
- a) $\frac{6}{11}$ b) $\frac{7}{13}$ c) $\frac{2}{11}$ d) $\frac{3}{11}$
- 11) If $2x - x^2 + ay^2$ is to be harmonic, then $a =$
- a) 2 b) 1 c) 0 d) 3
- 12) If $f(z) = re^{i\theta}$, then
- a) $f'(z) = r(u_\theta + iv_\theta)$ b) $f'(z) = e^{-i\theta}(u_r + iv_r)$
 c) $f'(z) = re^{i\theta} d\theta$ d) $f'(z) = u_\theta + iv_r$
- 13) If $f(x) = -f(-x)$ and $f(x)$ satisfy the Dirichlet's conditions, then $f(x)$ can be expanded in a Fourier series containing
- a) only sine terms b) only cosine terms
 c) cosine terms and a constant term d) both sine and cosine terms
- 14) Which of the following function is not periodic ?
- a) $f(x) = \cos 2x + \cos 3x$ b) $f(x) = e^{i8\pi x}$
 c) $f(x) = e^{-x} \sin 10\pi x$ d) $f(x) = \cos 2x \cos 4x$



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

**S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- N.B.** : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**

SECTION – I

2. Solve any three : 9

- a) Solve : $(D^3 + D) y = \cos x$
- b) Solve : $(D^2 - 9) y = e^{-3x} + 1 + e^{3x}$
- c) Solve : $(D^3 - 3D^2 + 3D - 1) y = xe^x + e^x$
- d) Solve : $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 2y = x \log x$
- e) Solve : $(1+x^2) \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin \log (1+x)$.

3. Solve any three : 9

- a) Find inverse Laplace transform of $\log \left(\frac{s^2 + a^2}{s^2 + b^2} \right)$
- b) Find $L^{-1} \left[\frac{2s+3}{s^2+2s+2} \right]$
- c) Find $L [te^{-4t} \sin 3t]$
- d) Evaluate $\int_0^{\infty} \frac{e^{-at} - e^{-bt}}{t} dt$
- e) $f(t) = \cos t$, $0 < t < \pi$
 $= \sin t$, $t > \pi$

Express in terms of Heavisides unit step function and find Laplace transform.

4. Solve any two : 10

- a) Solve $\frac{d^2y}{dx^2} + y = \sin x \sin 2x + 2^x$
- b) The equation of motion of a spring where one end is fixed and other end supports weight of 10lbs is given by $\frac{d^2x}{dt^2} + \frac{8}{25} \frac{dx}{dt} + 64 = 0$. If at $t = 0$, $x = 0.25$ and $\frac{dx}{dt} = 0$, solve the equation.

Set P



- c) Solve : $(D^2 + 3D + 2) y = 2 (t^2 + t + 1)$ with $y(0) = 2$ and $y'(0) = 0$, by Laplace transform.

SECTION – II

5. Solve **any three** of the following : 9
- Solve : $(x^2 - y^2 - yz) p + (x^2 - y^2 - zx) q = z (x - y)$.
 - In a large consignment of electric bulbs, 10 percent are defective. A random sample of 20 is taken for inspection. Find the probability that :
 - all are good bulbs
 - at most three are defective bulbs.
 - Between 2 p.m. and 4 p.m. the average number of phone calls per minute coming into a switch board of a company is 2.5. Find the probability during a minute there will be :
 - no phone call
 - exactly 3 calls
 - Find the analytic function whose real part is $u = \log \sqrt{x^2 + y^2}$.
 - Find half-range sine series for $x \sin x$ in $(0, \pi)$.
6. Solve **any three** of the following : 9
- Solve : $p^2 z^2 + q^2 = p^2 q$
 - Sacks of sugar packed by an automatic loader have an average weight of hundred kilograms with standard deviation of two hundred fifty grams. Assuming a normal distribution, find the chance of getting a sack weighting less than 99.5 kilograms. (Given : For S.N.V.Z, area from $z = 0$ to $z = 2$ is 0.4772)
 - 10% tools produced in a certain manufacturing process turn out to be defective. Find the probability that out of 20 tools selected at random there are
 - exactly two defectives
 - at least two defectives.
 - Show that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic. Find the analytic function assuming u as its real part.
 - Obtain the Fourier series expansion of x^2 in $(-\pi, \pi)$.
7. Solve **any two** of the following : 10
- Solve the partial differential equation $\frac{\partial z}{\partial x} - 2 \frac{\partial z}{\partial y} = z$; given $z(x, 0) = 3e^{-5x} + 2e^{-3x}$ by the method of separation of variables.
 - Evaluate : $\int_c \frac{z \cos(\pi z)}{z^2 - z - 2} dz$, where $\text{cis } |z - i| = 2$.
 - Find the Fourier series expansion of $f(x) = \begin{cases} x & ; 0 < x < 1 \\ 1-x & ; 1 < x < 2 \end{cases}$.



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

Set	Q
-----	---

**S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**
4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) $z = ax - \cos x - \cos y - ay + b$ is the general solution of
- a) $p + \sin x = q + \sin y$ b) $p - q = \sin x - \sin y$
c) $p + q = \sin x + \sin y$ d) $p + q = \sin x - \sin y$
- 2) The solution of $p + q = pq$ is
- a) $z = ax + \frac{ay}{a-1} + c$ b) $z = \frac{ax}{a-1} + ay + c$
c) $z = ax + \left(\frac{a-1}{a}\right)y + c$ d) $z = \left(\frac{a}{a-1}\right)x + ay + c$
- 3) If the probability density function of a discrete random variable x which assumes values x_1, x_2, x_3 such that $p(x_1) = 2p(x_2) = 3p(x_3)$, the value of $p(x_2)$ is
- a) $\frac{6}{11}$ b) $\frac{7}{13}$ c) $\frac{2}{11}$ d) $\frac{3}{11}$
- 4) If $2x - x^2 + ay^2$ is to be harmonic, then $a =$
- a) 2 b) 1 c) 0 d) 3
- 5) If $f(z) = re^{i\theta}$, then
- a) $f'(z) = r(u_\theta + iv_\theta)$ b) $f'(z) = e^{-i\theta}(u_r + iv_r)$
c) $f'(z) = re^{i\theta}d\theta$ d) $f'(z) = u_\theta + iv_r$

P.T.O.



- 6) If $f(x) = -f(-x)$ and $f(x)$ satisfy the Dirichlet's conditions, then $f(x)$ can be expanded in a Fourier series containing
- only sine terms
 - only cosine terms
 - cosine terms and a constant term
 - both sine and cosine terms
- 7) Which of the following function is not periodic ?
- $f(x) = \cos 2x + \cos 3x$
 - $f(x) = e^{i8\pi x}$
 - $f(x) = e^{-x} \sin 10\pi x$
 - $f(x) = \cos 2x \cos 4x$
- 8) The complementary function of $(D^4 - m^4)y = \sin mx$ is
- $c_1 e^{-mx} + c_2 e^{mx} + c_3 \cos mx + c_4 \sin mx$
 - $(c_1 + c_2 x)e^{-mx} + c_3 \cos mx + c_4 \sin mx$
 - $(c_1 + c_2 x) e^{mx} + c_3 \cos mx + c_4 \sin mx$
 - none of these
- 9) $\frac{1}{D^2 + 16} \cos 4x$ is equal to
- $\frac{x \cos 4x}{8}$
 - $\frac{x \sin 4x}{8}$
 - $\frac{-x \sin 4x}{8}$
 - $\frac{-x \cos 4x}{8}$
- 10) The particular integral of $x^2 D^2 y + 2xDy = \frac{1}{x^2}$ is
- $y_p = c_1 + c_2 x^2$
 - $y_p = x - \frac{1}{x^2}$
 - $y_p = \frac{1}{x^2}$
 - $y_p = \frac{1}{2x^2}$
- 11) The value of integral $\int_0^{\infty} e^{-3t} \sin 5t dt$ is
- $\frac{-3}{34}$
 - $\frac{s}{34}$
 - $\frac{5}{34}$
 - $\frac{-s}{34}$
- 12) $L \{e^{2t} \sin 2t\} =$
- $\frac{2}{s^2 - 4s + 8}$
 - $\frac{2}{s^2 + 4}$
 - $\frac{s}{s^2 + 4}$
 - $\frac{s - 2}{s^2 - 4s + 8}$
- 13) $L^{-1} \left\{ \frac{1}{(s+3)^2} \right\} =$
- t^2
 - t^3
 - te^{-3t}
 - e^{-3t}
- 14) $L^{-1} \left\{ \frac{s+2}{(s+2)^2 + 25} \right\} =$
- $e^{2t} \cos 5t$
 - $e^{2t} \cos 25t$
 - $e^{-2t} \sin 5t$
 - $e^{-2t} \cos 5t$



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

**S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**

SECTION – I

2. Solve any three : 9

- a) Solve : $(D^3 + D) y = \cos x$
- b) Solve : $(D^2 - 9) y = e^{-3x} + 1 + e^{3x}$
- c) Solve : $(D^3 - 3D^2 + 3D - 1) y = xe^x + e^x$
- d) Solve : $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 2y = x \log x$
- e) Solve : $(1+x^2) \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin \log (1+x)$.

3. Solve any three : 9

- a) Find inverse Laplace transform of $\log \left(\frac{s^2 + a^2}{s^2 + b^2} \right)$
- b) Find $L^{-1} \left[\frac{2s+3}{s^2+2s+2} \right]$
- c) Find $L [te^{-4t} \sin 3t]$
- d) Evaluate $\int_0^{\infty} \frac{e^{-at} - e^{-bt}}{t} dt$
- e) $f(t) = \cos t$, $0 < t < \pi$
 $= \sin t$, $t > \pi$

Express in terms of Heavisides unit step function and find Laplace transform.

4. Solve any two : 10

- a) Solve $\frac{d^2y}{dx^2} + y = \sin x \sin 2x + 2^x$
- b) The equation of motion of a spring where one end is fixed and other end supports weight of 10lbs is given by $\frac{d^2x}{dt^2} + \frac{8}{25} \frac{dx}{dt} + 64 = 0$. If at $t = 0$, $x = 0.25$ and $\frac{dx}{dt} = 0$, solve the equation.

Set Q



- c) Solve : $(D^2 + 3D + 2)y = 2(t^2 + t + 1)$ with $y(0) = 2$ and $y'(0) = 0$, by Laplace transform.

SECTION – II

5. Solve **any three** of the following : 9
- a) Solve : $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$.
- b) In a large consignment of electric bulbs, 10 percent are defective. A random sample of 20 is taken for inspection. Find the probability that :
- i) all are good bulbs ii) atmost three are defective bulbs.
- c) Between 2 p.m. and 4 p.m. the average number of phone calls per minute coining into a switch board of a company is 2.5. Find the probability during a minute there will be :
- i) no phone call ii) exactly 3 calls
- d) Find the analytic function whose real part is $u = \log \sqrt{x^2 + y^2}$.
- e) Find half-range sine series for $x \sin x$ in $(0, \pi)$.
6. Solve **any three** of the following : 9
- a) Solve : $p^2 z^2 + q^2 = p^2 q$
- b) Sacks of sugar packed by an automatic loader have an average weight of hundred kilograms with standard deviation of two hundred fifty grams. Assuming a normal distribution, find the chance of getting a sack weighting less than 99.5 kilograms. (Given : For S.N.V.Z, area from $z = 0$ to $z = 2$ is 0.4772)
- c) 10% tools produced in a certain manufacturing process turn out to be defective. Find the probability that out of 20 tools selected at random there are
- i) exactly two defectives ii) at least two defectives.
- d) Show that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic. Find the analytic function assuming u as its real part.
- e) Obtain the Fourier series expansion of x^2 in $(-\pi, \pi)$.
7. Solve **any two** of the following : 10
- a) Solve the partial differential equation $\frac{\partial z}{\partial x} - 2 \frac{\partial z}{\partial y} = z$; given $z(x, 0) = 3e^{-5x} + 2e^{-3x}$ by the method of separation of variables.
- b) Evaluate : $\int_c \frac{z \cos(\pi z)}{z^2 - z - 2} dz$, where $\text{cis } |z - i| = 2$.
- c) Find the Fourier series expansion of $f(x) = \begin{cases} x & ; 0 < x < 1 \\ 1-x & ; 1 < x < 2 \end{cases}$.



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

Set	R
-----	----------

S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- N.B. :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate full marks.**
 - 3) **Use of calculator is allowed.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

1) $L \{e^{2t} \sin 2t\} =$

a) $\frac{2}{s^2 - 4s + 8}$ b) $\frac{2}{s^2 + 4}$ c) $\frac{s}{s^2 + 4}$ d) $\frac{s - 2}{s^2 - 4s + 8}$

2) $L^{-1} \left\{ \frac{1}{(s+3)^2} \right\} =$

a) t^2 b) t^3 c) te^{-3t} d) e^{-3t}

3) $L^{-1} \left\{ \frac{s+2}{(s+2)^2 + 25} \right\} =$

a) $e^{2t} \cos 5t$ b) $e^{2t} \cos 25t$ c) $e^{-2t} \sin 5t$ d) $e^{-2t} \cos 5t$

4) $z = ax - \cos x - \cos y - ay + b$ is the general solution of

a) $p + \sin x = q + \sin y$ b) $p - q = \sin x - \sin y$
c) $p + q = \sin x + \sin y$ d) $p + q = \sin x - \sin y$

5) The solution of $p + q = pq$ is

a) $z = ax + \frac{ay}{a-1} + c$ b) $z = \frac{ax}{a-1} + ay + c$
c) $z = ax + \left(\frac{a-1}{a} \right) y + c$ d) $z = \left(\frac{a}{a-1} \right) x + ay + c$

P.T.O.



- 6) If the probability density function of a discrete random variable x which assumes values x_1, x_2, x_3 such that $p(x_1) = 2p(x_2) = 3p(x_3)$, the value of $p(x_2)$ is
- a) $\frac{6}{11}$ b) $\frac{7}{13}$ c) $\frac{2}{11}$ d) $\frac{3}{11}$
- 7) If $2x - x^2 + ay^2$ is to be harmonic, then $a =$
- a) 2 b) 1 c) 0 d) 3
- 8) If $f(z) = re^{i\theta}$, then
- a) $f'(z) = r(u_\theta + iv_\theta)$ b) $f'(z) = e^{-i\theta}(u_r + iv_r)$
 c) $f'(z) = re^{i\theta}d\theta$ d) $f'(z) = u_\theta + iv_r$
- 9) If $f(x) = -f(-x)$ and $f(x)$ satisfy the Dirichlet's conditions, then $f(x)$ can be expanded in a Fourier series containing
- a) only sine terms b) only cosine terms
 c) cosine terms and a constant term d) both sine and cosine terms
- 10) Which of the following function is not periodic ?
- a) $f(x) = \cos 2x + \cos 3x$ b) $f(x) = e^{i8\pi x}$
 c) $f(x) = e^{-x} \sin 10\pi x$ d) $f(x) = \cos 2x \cos 4x$
- 11) The complementary function of $(D^4 - m^4)y = \sin mx$ is
- a) $c_1 e^{-mx} + c_2 e^{mx} + c_3 \cos mx + c_4 \sin mx$
 b) $(c_1 + c_2 x)e^{-mx} + c_3 \cos mx + c_4 \sin mx$
 c) $(c_1 + c_2 x)e^{mx} + c_3 \cos mx + c_4 \sin mx$
 d) none of these
- 12) $\frac{1}{D^2 + 16} \cos 4x$ is equal to
- a) $\frac{x \cos 4x}{8}$ b) $\frac{x \sin 4x}{8}$ c) $\frac{-x \sin 4x}{8}$ d) $\frac{-x \cos 4x}{8}$
- 13) The particular integral of $x^2 D^2 y + 2xDy = \frac{1}{x^2}$ is
- a) $y_p = c_1 + c_2 x^2$ b) $y_p = x - \frac{1}{x^2}$ c) $y_p = \frac{1}{x^2}$ d) $y_p = \frac{1}{2x^2}$
- 14) The value of integral $\int_0^\infty e^{-3t} \sin 5t dt$ is
- a) $\frac{-3}{34}$ b) $\frac{s}{34}$ c) $\frac{5}{34}$ d) $\frac{-s}{34}$



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

**S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**

SECTION – I

2. Solve any three : 9

- a) Solve : $(D^3 + D) y = \cos x$
- b) Solve : $(D^2 - 9) y = e^{-3x} + 1 + e^{3x}$
- c) Solve : $(D^3 - 3D^2 + 3D - 1) y = xe^x + e^x$
- d) Solve : $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 2y = x \log x$
- e) Solve : $(1+x^2) \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin \log (1+x)$.

3. Solve any three : 9

- a) Find inverse Laplace transform of $\log \left(\frac{s^2 + a^2}{s^2 + b^2} \right)$
- b) Find $L^{-1} \left[\frac{2s+3}{s^2+2s+2} \right]$
- c) Find $L [te^{-4t} \sin 3t]$
- d) Evaluate $\int_0^{\infty} \frac{e^{-at} - e^{-bt}}{t} dt$
- e) $f(t) = \cos t$, $0 < t < \pi$
 $= \sin t$, $t > \pi$

Express in terms of Heavisides unit step function and find Laplace transform.

4. Solve any two : 10

- a) Solve $\frac{d^2y}{dx^2} + y = \sin x \sin 2x + 2^x$
- b) The equation of motion of a spring where one end is fixed and other end supports weight of 10lbs is given by $\frac{d^2x}{dt^2} + \frac{8}{25} \frac{dx}{dt} + 64 = 0$. If at $t = 0$, $x = 0.25$ and $\frac{dx}{dt} = 0$, solve the equation.

Set R



- c) Solve : $(D^2 + 3D + 2) y = 2 (t^2 + t + 1)$ with $y(0) = 2$ and $y'(0) = 0$, by Laplace transform.

SECTION – II

5. Solve **any three** of the following : 9
- Solve : $(x^2 - y^2 - yz) p + (x^2 - y^2 - zx) q = z (x - y)$.
 - In a large consignment of electric bulbs, 10 percent are defective. A random sample of 20 is taken for inspection. Find the probability that :
 - all are good bulbs
 - at most three are defective bulbs.
 - Between 2 p.m. and 4 p.m. the average number of phone calls per minute coming into a switch board of a company is 2.5. Find the probability during a minute there will be :
 - no phone call
 - exactly 3 calls
 - Find the analytic function whose real part is $u = \log \sqrt{x^2 + y^2}$.
 - Find half-range sine series for $x \sin x$ in $(0, \pi)$.
6. Solve **any three** of the following : 9
- Solve : $p^2 z^2 + q^2 = p^2 q$
 - Sacks of sugar packed by an automatic loader have an average weight of hundred kilograms with standard deviation of two hundred fifty grams. Assuming a normal distribution, find the chance of getting a sack weighting less than 99.5 kilograms. (Given : For S.N.V.Z, area from $z = 0$ to $z = 2$ is 0.4772)
 - 10% tools produced in a certain manufacturing process turn out to be defective. Find the probability that out of 20 tools selected at random there are
 - exactly two defectives
 - at least two defectives.
 - Show that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic. Find the analytic function assuming u as its real part.
 - Obtain the Fourier series expansion of x^2 in $(-\pi, \pi)$.
7. Solve **any two** of the following : 10
- Solve the partial differential equation $\frac{\partial z}{\partial x} - 2 \frac{\partial z}{\partial y} = z$; given $z(x, 0) = 3e^{-5x} + 2e^{-3x}$ by the method of separation of variables.
 - Evaluate : $\int_c \frac{z \cos(\pi z)}{z^2 - z - 2} dz$, where $\text{cis } |z - i| = 2$.
 - Find the Fourier series expansion of $f(x) = \begin{cases} x & ; 0 < x < 1 \\ 1-x & ; 1 < x < 2 \end{cases}$.



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

Set	S
-----	----------

S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**
4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) If the probability density function of a discrete random variable x which assumes values x_1, x_2, x_3 such that $p(x_1) = 2p(x_2) = 3p(x_3)$, the value of $p(x_2)$ is
- a) $\frac{6}{11}$ b) $\frac{7}{13}$ c) $\frac{2}{11}$ d) $\frac{3}{11}$
- 2) If $2x - x^2 + ay^2$ is to be harmonic, then $a =$
- a) 2 b) 1 c) 0 d) 3
- 3) If $f(z) = re^{i\theta}$, then
- a) $f'(z) = r(u_\theta + iv_\theta)$ b) $f'(z) = e^{-i\theta}(u_r + iv_r)$
c) $f'(z) = re^{i\theta}d\theta$ d) $f'(z) = u_\theta + iv_r$
- 4) If $f(x) = -f(-x)$ and $f(x)$ satisfy the Dirichlet's conditions, then $f(x)$ can be expanded in a Fourier series containing
- a) only sine terms b) only cosine terms
c) cosine terms and a constant term d) both sine and cosine terms
- 5) Which of the following function is not periodic ?
- a) $f(x) = \cos 2x + \cos 3x$ b) $f(x) = e^{i8\pi x}$
c) $f(x) = e^{-x} \sin 10\pi x$ d) $f(x) = \cos 2x \cos 4x$



- 6) The complementary function of $(D^4 - m^4)y = \sin mx$ is
- $c_1 e^{-mx} + c_2 e^{mx} + c_3 \cos mx + c_4 \sin mx$
 - $(c_1 + c_2 x) e^{-mx} + c_3 \cos mx + c_4 \sin mx$
 - $(c_1 + c_2 x) e^{mx} + c_3 \cos mx + c_4 \sin mx$
 - none of these
- 7) $\frac{1}{D^2 + 16} \cos 4x$ is equal to
- $\frac{x \cos 4x}{8}$
 - $\frac{x \sin 4x}{8}$
 - $\frac{-x \sin 4x}{8}$
 - $\frac{-x \cos 4x}{8}$
- 8) The particular integral of $x^2 D^2 y + 2xDy = \frac{1}{x^2}$ is
- $y_p = c_1 + c_2 x^2$
 - $y_p = x - \frac{1}{x^2}$
 - $y_p = \frac{1}{x^2}$
 - $y_p = \frac{1}{2x^2}$
- 9) The value of integral $\int_0^{\infty} e^{-3t} \sin 5t dt$ is
- $\frac{-3}{34}$
 - $\frac{s}{34}$
 - $\frac{5}{34}$
 - $\frac{-s}{34}$
- 10) $L \{e^{2t} \sin 2t\} =$
- $\frac{2}{s^2 - 4s + 8}$
 - $\frac{2}{s^2 + 4}$
 - $\frac{s}{s^2 + 4}$
 - $\frac{s - 2}{s^2 - 4s + 8}$
- 11) $L^{-1} \left\{ \frac{1}{(s+3)^2} \right\} =$
- t^2
 - t^3
 - te^{-3t}
 - e^{-3t}
- 12) $L^{-1} \left\{ \frac{s+2}{(s+2)^2 + 25} \right\} =$
- $e^{2t} \cos 5t$
 - $e^{2t} \cos 25t$
 - $e^{-2t} \sin 5t$
 - $e^{-2t} \cos 5t$
- 13) $z = ax - \cos x - \cos y - ay + b$ is the general solution of
- $p + \sin x = q + \sin y$
 - $p - q = \sin x - \sin y$
 - $p + q = \sin x + \sin y$
 - $p + q = \sin x - \sin y$
- 14) The solution of $p + q = pq$ is
- $z = ax + \frac{ay}{a-1} + c$
 - $z = \frac{ax}{a-1} + ay + c$
 - $z = ax + \left(\frac{a-1}{a} \right) y + c$
 - $z = \left(\frac{a}{a-1} \right) x + ay + c$



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

**S.E. (Mech.) Part – I (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is allowed.**

SECTION – I

2. Solve any three : 9

- a) Solve : $(D^3 + D) y = \cos x$
- b) Solve : $(D^2 - 9) y = e^{-3x} + 1 + e^{3x}$
- c) Solve : $(D^3 - 3D^2 + 3D - 1) y = xe^x + e^x$
- d) Solve : $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 2y = x \log x$
- e) Solve : $(1+x^2) \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin \log (1+x)$.

3. Solve any three : 9

- a) Find inverse Laplace transform of $\log \left(\frac{s^2 + a^2}{s^2 + b^2} \right)$
- b) Find $L^{-1} \left[\frac{2s+3}{s^2+2s+2} \right]$
- c) Find $L [te^{-4t} \sin 3t]$
- d) Evaluate $\int_0^{\infty} \frac{e^{-at} - e^{-bt}}{t} dt$
- e) $f(t) = \cos t$, $0 < t < \pi$
 $= \sin t$, $t > \pi$

Express in terms of Heavisides unit step function and find Laplace transform.

4. Solve any two : 10

- a) Solve $\frac{d^2y}{dx^2} + y = \sin x \sin 2x + 2^x$
- b) The equation of motion of a spring where one end is fixed and other end supports weight of 10lbs is given by $\frac{d^2x}{dt^2} + \frac{8}{25} \frac{dx}{dt} + 64 = 0$. If at $t = 0$, $x = 0.25$ and $\frac{dx}{dt} = 0$, solve the equation.

Set S



- c) Solve : $(D^2 + 3D + 2) y = 2 (t^2 + t + 1)$ with $y(0) = 2$ and $y'(0) = 0$, by Laplace transform.

SECTION – II

5. Solve **any three** of the following : 9
- Solve : $(x^2 - y^2 - yz) p + (x^2 - y^2 - zx) q = z (x - y)$.
 - In a large consignment of electric bulbs, 10 percent are defective. A random sample of 20 is taken for inspection. Find the probability that :
 - all are good bulbs
 - at most three are defective bulbs.
 - Between 2 p.m. and 4 p.m. the average number of phone calls per minute coming into a switch board of a company is 2.5. Find the probability during a minute there will be :
 - no phone call
 - exactly 3 calls
 - Find the analytic function whose real part is $u = \log \sqrt{x^2 + y^2}$.
 - Find half-range sine series for $x \sin x$ in $(0, \pi)$.
6. Solve **any three** of the following : 9
- Solve : $p^2 z^2 + q^2 = p^2 q$
 - Sacks of sugar packed by an automatic loader have an average weight of hundred kilograms with standard deviation of two hundred fifty grams. Assuming a normal distribution, find the chance of getting a sack weighting less than 99.5 kilograms. (Given : For S.N.V.Z, area from $z = 0$ to $z = 2$ is 0.4772)
 - 10% tools produced in a certain manufacturing process turn out to be defective. Find the probability that out of 20 tools selected at random there are
 - exactly two defectives
 - at least two defectives.
 - Show that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic. Find the analytic function assuming u as its real part.
 - Obtain the Fourier series expansion of x^2 in $(-\pi, \pi)$.
7. Solve **any two** of the following : 10
- Solve the partial differential equation $\frac{\partial z}{\partial x} - 2 \frac{\partial z}{\partial y} = z$; given $z(x, 0) = 3e^{-5x} + 2e^{-3x}$ by the method of separation of variables.
 - Evaluate : $\int_c \frac{z \cos(\pi z)}{z^2 - z - 2} dz$, where $\text{cis } |z - i| = 2$.
 - Find the Fourier series expansion of $f(x) = \begin{cases} x & ; 0 < x < 1 \\ 1-x & ; 1 < x < 2 \end{cases}$.



SLR-TJ – 89

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

Set	P
-----	----------

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) *Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3.*
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.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answer (1 mark each) : (1×8=8)
- 1) Which of the following is cold working process ?
 - a) Rolling of bars
 - b) Tube rolling
 - c) Rod drawing
 - d) Tube extrusion
 - 2) Cores are used to
 - a) Form internal cavities in the casting
 - b) Improve mould surface
 - c) Form a part of a green sand mould
 - d) None
 - 3) Welding is usually used to join the ends of two pipes of uniform cross section
 - a) Upset welding
 - b) Flash welding
 - c) Spot
 - d) Projection
 - 4) Oxy-acetylene flame is used to weld
 - a) steel
 - b) copper alloys
 - c) stainless steel
 - d) cast iron
 - 5) Following is not the type of extrusion
 - a) Indirect Extrusion
 - b) Hydrostatic Extrusion
 - c) Formal Extrusion
 - d) Forward Extrusion

P.T.O.



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

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Solve any two questions from each Section

SECTION – I

2. a) Define pattern and explain with figure any three different types of patterns. **5**
- b) Explain with figure different types of allowances. **4**
- c) Explain the significance of casting process and also give advantages and limitations of casting process. **5**
3. a) Explain briefly properties of moulding sand. **5**
- b) What are the distinguishing features between a casting and pattern ? **4**
- c) Describe CO₂ molding process. **5**
4. a) Explain with figure investment casting process. **5**
- b) Explain with figure electric arc furnace. **4**
- c) Explain common defects in casting. **5**

SECTION – II

5. a) Classify the forming processes and explain any one in detail. **5**
- b) Compare between forging and rolling processes. **4**
- c) Explain rolling of billets with one example. **5**

Set P



- 6. a) Explain in detail hydrostatic extrusion process. 5
 - b) Explain compression moulding process with it's advantages and limitation. 5
 - c) Explain the process of tube drawing with neat sketch. 4
 - 7. a) Compare thermoplastic and thermosetting plastic material. 4
 - b) Explain the process of plasma arc cutting. 5
 - c) Explain MIG welding process in detail. 5
-



SLR-TJ – 89

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

Set	Q
-----	----------

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :** 1) *Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3.*
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answer (2 marks each) : **(2×3=6)**
- 1) Which of the following material can be used for making patterns ?
a) Aluminium b) Wood c) Lead d) Tungsten
 - 2) The important properties of moulding sand are
a) Malleability b) Permeability
c) Hardenability d) Collapsibility
 - 3) There is no use of filler metal in
a) Soldering b) Brazing
c) Resistance welding d) Spot welding
- B) Choose the correct answer (1 mark each) : **(1×8=8)**
- 1) Welding is usually used to join the ends of two pipes of uniform cross section
a) Upset welding b) Flash welding
c) Spot d) Projection
 - 2) Oxy-acetylene flame is used to weld
a) steel b) copper alloys
c) stainless steel d) cast iron

P.T.O.



- 3) Following is not the type of extrusion
- a) Indirect Extrusion
 - b) Hydrostatic Extrusion
 - c) Formal Extrusion
 - d) Forward Extrusion
- 4) The method of joining metal surface by introducing a non ferrous alloy with melting point above 400° C is known as
- a) Soldering
 - b) Brazing
 - c) Welding
 - d) None of the above
- 5) A characteristic of a casting is its
- a) density
 - b) porosity
 - c) uniform grain structure
 - d) irregular grain structure
- 6) Blow holes are casting defects
- a) which occur due to some sand shearing from the cope surface
 - b) which takes the form of internal voids of surface depression due to excessive gaseous material not able to escape
 - c) which occur due to discontinuity in metal casting resulting from hindered contraction
 - d) caused by two streams of metals that are too cold to fuse properly
- 7) Which of the following is cold working process ?
- a) Rolling of bars
 - b) Tube rolling
 - c) Rod drawing
 - d) Tube extrusion
- 8) Cores are used to
- a) Form internal cavities in the casting
 - b) Improve mould surface
 - c) Form a part of a green sand mould
 - d) None
-



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

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Solve any two questions from each Section

SECTION – I

2. a) Define pattern and explain with figure any three different types of patterns. **5**
- b) Explain with figure different types of allowances. **4**
- c) Explain the significance of casting process and also give advantages and limitations of casting process. **5**
3. a) Explain briefly properties of moulding sand. **5**
- b) What are the distinguishing features between a casting and pattern ? **4**
- c) Describe CO₂ molding process. **5**
4. a) Explain with figure investment casting process. **5**
- b) Explain with figure electric arc furnace. **4**
- c) Explain common defects in casting. **5**

SECTION – II

5. a) Classify the forming processes and explain any one in detail. **5**
- b) Compare between forging and rolling processes. **4**
- c) Explain rolling of billets with one example. **5**

Set Q



- 6. a) Explain in detail hydrostatic extrusion process. 5
 - b) Explain compression moulding process with it's advantages and limitation. 5
 - c) Explain the process of tube drawing with neat sketch. 4
 - 7. a) Compare thermoplastic and thermosetting plastic material. 4
 - b) Explain the process of plasma arc cutting. 5
 - c) Explain MIG welding process in detail. 5
-



SLR-TJ – 89

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

Set	R
-----	---

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) *Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3.*
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answer (1 mark each) : (1×8=8)
- 1) The method of joining metal surface by introducing a non ferrous alloy with melting point above 400° C is known as
 - a) Soldering
 - b) Brazing
 - c) Welding
 - d) None of the above
 - 2) A characteristic of a casting is its
 - a) density
 - b) porosity
 - c) uniform grain structure
 - d) irregular grain structure
 - 3) Blow holes are casting defects
 - a) which occur due to some sand shearing from the cope surface
 - b) which takes the form of internal voids of surface depression due to excessive gaseous material not able to escape
 - c) which occur due to discontinuity in metal casting resulting from hindered contraction
 - d) caused by two streams of metals that are too cold to fuse properly
 - 4) Which of the following is cold working process ?
 - a) Rolling of bars
 - b) Tube rolling
 - c) Rod drawing
 - d) Tube extrusion

P.T.O.



- 5) Cores are used to
- a) Form internal cavities in the casting
 - b) Improve mould surface
 - c) Form a part of a green sand mould
 - d) None
- 6) Welding is usually used to join the ends of two pipes of uniform cross section
- a) Upset welding
 - b) Flash welding
 - c) Spot
 - d) Projection
- 7) Oxy-acetylene flame is used to weld
- a) steel
 - b) copper alloys
 - c) stainless steel
 - d) cast iron
- 8) Following is not the type of extrusion
- a) Indirect Extrusion
 - b) Hydrostatic Extrusion
 - c) Forward Extrusion
 - d) Forward Extrusion

B) Choose the correct answer (2 marks each) :

(2×3=6)

- 1) The important properties of moulding sand are
- a) Malleability
 - b) Permeability
 - c) Hardenability
 - d) Collapsibility
- 2) Which of the following material can be used for making patterns ?
- a) Aluminium
 - b) Wood
 - c) Lead
 - d) Tungsten
- 3) There is no use of filler metal in
- a) Soldering
 - b) Brazing
 - c) Resistance welding
 - d) Spot welding
-



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

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Solve any two questions from each Section

SECTION – I

2. a) Define pattern and explain with figure any three different types of patterns. **5**
b) Explain with figure different types of allowances. **4**
c) Explain the significance of casting process and also give advantages and limitations of casting process. **5**
3. a) Explain briefly properties of moulding sand. **5**
b) What are the distinguishing features between a casting and pattern ? **4**
c) Describe CO₂ molding process. **5**
4. a) Explain with figure investment casting process. **5**
b) Explain with figure electric arc furnace. **4**
c) Explain common defects in casting. **5**

SECTION – II

5. a) Classify the forming processes and explain any one in detail. **5**
b) Compare between forging and rolling processes. **4**
c) Explain rolling of billets with one example. **5**

Set R



- 6. a) Explain in detail hydrostatic extrusion process. 5
 - b) Explain compression moulding process with it's advantages and limitation. 5
 - c) Explain the process of tube drawing with neat sketch. 4
 - 7. a) Compare thermoplastic and thermosetting plastic material. 4
 - b) Explain the process of plasma arc cutting. 5
 - c) Explain MIG welding process in detail. 5
-



SLR-TJ – 89

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

Set	S
-----	----------

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answer (2 marks each) : **(2×3=6)**
- 1) The important properties of moulding sand are
 - a) Malleability
 - b) Permeability
 - c) Hardenability
 - d) Collapsibility
 - 2) There is no use of filler metal in
 - a) Soldering
 - b) Brazing
 - c) Resistance welding
 - d) Spot welding
 - 3) Which of the following material can be used for making patterns ?
 - a) Aluminium
 - b) Wood
 - c) Lead
 - d) Tungsten
- B) Choose the correct answer (1 mark each) : **(1×8=8)**
- 1) Cores are used to
 - a) Form internal cavities in the casting
 - b) Improve mould surface
 - c) Form a part of a green sand mould
 - d) None
 - 2) Which of the following is cold working process ?
 - a) Rolling of bars
 - b) Tube rolling
 - c) Rod drawing
 - d) Tube extrusion

P.T.O.



- 3) Oxy-acetylene flame is used to weld
- a) steel
 - b) copper alloys
 - c) stainless steel
 - d) cast iron
- 4) Welding is usually used to join the ends of two pipes of uniform cross section
- a) Upset welding
 - b) Flash welding
 - c) Spot
 - d) Projection
- 5) Following is not the type of extrusion
- a) Indirect Extrusion
 - b) Hydrostatic Extrusion
 - c) Forward Extrusion
 - d) Forward Extrusion
- 6) The method of joining metal surface by introducing a non ferrous alloy with melting point above 400°C is known as
- a) Soldering
 - b) Brazing
 - c) Welding
 - d) None of the above
- 7) Blow holes are casting defects
- a) which occur due to some sand shearing from the cope surface
 - b) which takes the form of internal voids of surface depression due to excessive gaseous material not able to escape
 - c) which occur due to discontinuity in metal casting resulting from hindered contraction
 - d) caused by two streams of metals that are too cold to fuse properly
- 8) A characteristic of a casting is its
- a) density
 - b) porosity
 - c) uniform grain structure
 - d) irregular grain structure
-



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

**S.E. (Mechanical Engineering) (Part – I) (CBCS) Examination, 2017
MANUFACTURING PROCESSES (New)**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Solve any two questions from each Section

SECTION – I

2. a) Define pattern and explain with figure any three different types of patterns. **5**
b) Explain with figure different types of allowances. **4**
c) Explain the significance of casting process and also give advantages and limitations of casting process. **5**
3. a) Explain briefly properties of moulding sand. **5**
b) What are the distinguishing features between a casting and pattern ? **4**
c) Describe CO₂ molding process. **5**
4. a) Explain with figure investment casting process. **5**
b) Explain with figure electric arc furnace. **4**
c) Explain common defects in casting. **5**

SECTION – II

5. a) Classify the forming processes and explain any one in detail. **5**
b) Compare between forging and rolling processes. **4**
c) Explain rolling of billets with one example. **5**

Set S



- 6. a) Explain in detail hydrostatic extrusion process. 5
 - b) Explain compression moulding process with it's advantages and limitation. 5
 - c) Explain the process of tube drawing with neat sketch. 4
 - 7. a) Compare thermoplastic and thermosetting plastic material. 4
 - b) Explain the process of plasma arc cutting. 5
 - c) Explain MIG welding process in detail. 5
-



SLR-TJ – 90

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

Set	P
-----	---

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 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) **Assume** suitable dimensions if **not** given.
 - 4) Use **first angle** method of projections.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Match the pairs (**Each bit one mark each**) :

Column – A Name of Thread	Column – B Included Angle
A. Sellers Threads	P. 29°
B. ACME Thread	Q. 47.5°
C. British Association threads	R. 60°

Type – II : Correct OR Incorrect (Attempt **any two**) (**Each bit one mark each**) :

- A) Isometric length is about 0.816 of the true length.
- B) Drawing made to one half of the actual size is 1 : 2.
- C) Projection on the auxiliary plane reveals the true shape of the inclined surface.

Type – III : Multiple correct answer type (**Each correct bit 2 marks each**) :

- A) Which of the following pair is for interference fit ?

p) $\phi 90H_7r_6$ q) $\phi 90H_7k_6$ r) $\phi 90H_7s_6$ s) $\phi 90H_7f_7$

- B) Which of the following delivers transition type of fit ?

p) $\phi 48 H_8p_6$ q) $\phi 48 H_7g_6$
r) $\phi 48 H_7n_6$ s) $\phi 48 H_8f_7$

P.T.O.



Type – IV : Straight Objective Type/Classical MCQ (Each bit one mark each) :

- A) Out of the following, which gear application normally delivers and used for reciprocation motion ?
- | | |
|--------------------|---------------|
| a) Bevel Gear | b) Spur Gear |
| c) Rack and Pinion | d) Screw Gear |
- B) The recommended scale 10 : 1 is called as _____ category.
- | | |
|-------------------|--------------|
| a) Enlarged scale | b) Full size |
| c) Reduced scale | d) None |
- C) In flanged coupling, the flanges are joined together by means of
- | | |
|----------------------|-------------------------|
| a) Hex. headed bolts | b) Headless taper bolts |
| c) Key | d) Rivets |
- D) The radius of chamfer, R in a hexagonal nut is
- | | | | |
|----------|----------|--------------|----------|
| a) 1.5 D | b) 0.9 D | c) 1.5 D + 3 | d) 1.2 D |
|----------|----------|--------------|----------|
- E) The algebraic difference between the minimum limit of size and the corresponding basic size is known as
- | | |
|--------------|--------------------|
| a) Deviation | b) Upper deviation |
| c) Allowance | d) Lower deviation |
-



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

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

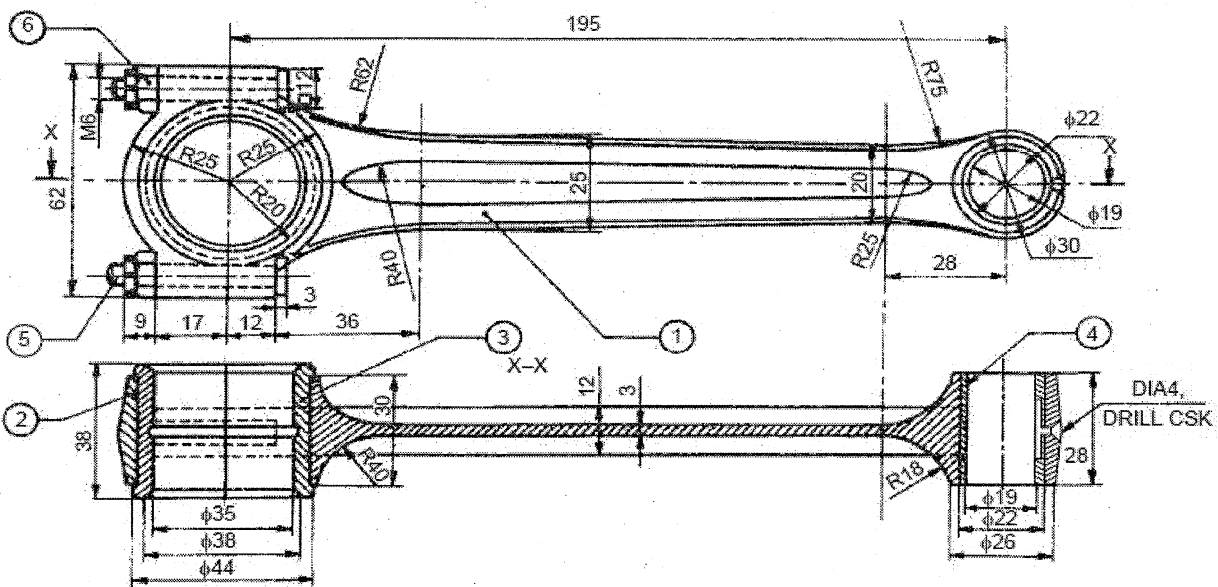
Marks : 56

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 7, attempt **any four**.
 - 3) **Assume** suitable dimensions if **not** given.
 - 4) Use **first** angle method of projections.

2. Figure No. 1 shows the assembly of PETROL ENGINE CONNECTING ROD. Draw the details of the following parts (**Two views each**) :

20

- 1) Rod 2) Cap 3) Bearing Brass 4) Bearing Bush.



Parts list

Part No.	Name	Matl.	Qty.
1	Rod	FS	1
2	Cap	FS	1
3	Bearing brass	GM	2
4	Bearing bush	P Bronze	1
5	Bolt	MCS	2
6	Nut	MCS	2

Figure No. 1



3. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Chain wheel
 ii) Compression spring with square section.
- B) Draw freehand sketching for Socket and Spigot Joint (Pipe Joint). **3**
- C) Draw B.I.S. Conventions of Bevel Gear. **3**
- D) Draw Freehand sketching for the Solid Coupling. **3**
4. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Repeated Parts
 ii) Holes on circular pitch.
- B) Draw the freehand sketching of -Rag Foundation bolt. **3**
- C) Draw welding symbols any three. **3**
- D) Draw free hand sketch of Speed Cone Pulley. **3**
5. A) Draw the figure to indicate Hole Basis System and Shaft Basis System. **3**
- B) Redraw the given Figure No. 2 and indicate the mentioned parameters on it. **6**
 i) Surface 'B' is to be milled with Ra value of 15 microns, direction of lay parallel to plane of projection with sampling length 3 mm and machining allowance 1 mm. Show this content with proper symbol in Figure.
 ii) Surface 'B' and 'A' are parallel is within 0.01 mm.
 iii) Axis of ϕ 40 extension is perpendicular to B within 0.03 mm.

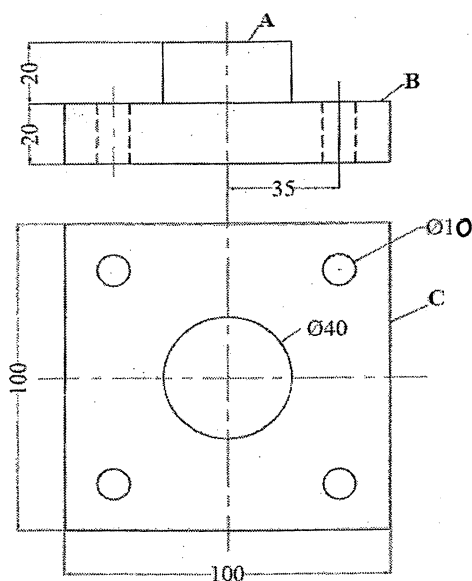


Figure No. 2



6. Figure No. 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 9

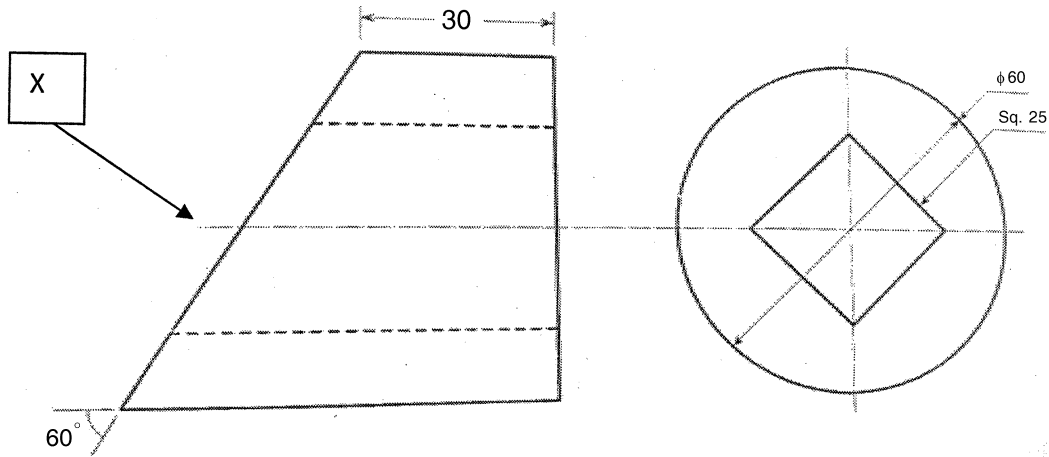


Figure No. 3

7. Figure No. 4 shows two views of an object. Draw isometric view of the object. 9

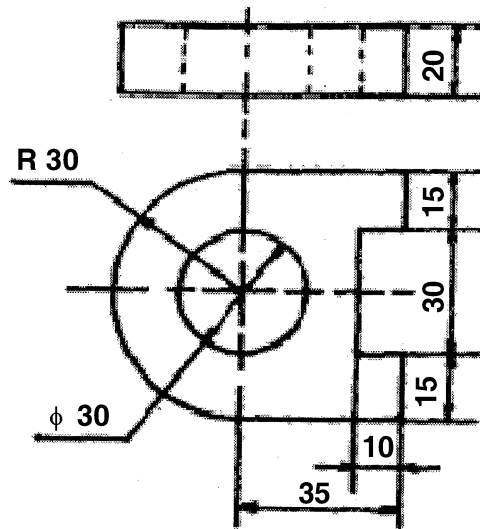


Figure No. 4



Table 15.1 Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 Fundamental deviations for shafts of types a to k of sizes upto 500mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
		a	b	c	d	e	f	g	h		j			k	
over	upto	All grades								± IT/2	5.6	7	8	4 to 7	≤3, >7
—	*3	-270	-140	-60	-20	-14	-6	-2	0		-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18										-4	-8	—	+2	0
18	24	-300	-160	-110	-65	-40	-20	-7	0		-5	-10	—	+2	0
24	30										-7	-12	—	+2	0
30	40	-310	-170	-120	-80	-50	-25	-9	0		-7	-12	—	+2	0
40	50	-320	-180	-130							-9	-10	0		
50	65	-340	-190	-140	-100	-60	-30	-10	0		-9	-15	—	+3	0
65	80	-360	-200	-150							-12	-12	0		
80	100	-380	-220	-170	-120	-72	-36	-12	0	-11	-18	—	+3	0	
100	120	-410	-240	-180											
120	140	-460	-260	-200											
140	160	-520	-280	-210											
160	180	-580	-310	-230	-145	-85	-43	-14	0	-11	-18	—	+3	0	



Table 15.3 Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

A to N

Fundamental deviation in microns											(1 micron = 0.001 mm)										
Diameter steps in mm		Lower deviations (EI)									Upper deviations (ES)										
		A*	*B	C	D	E	F	G	H	J _s +	J			K		M		N			
Over	Upto	All grades												≤ 8	> 8	≤ 8 ‡	> 8	≤ 8	> 8*	≤ 7	
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades 7 + Δ	
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0		
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0		
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0		
14	18																				
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0		
24	30																				
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0		
40	50	+320	+180	+130																	
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0		
65	80	+360	+200	+150																	
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0		
100	120	+410	+240	+180																	



SLR-TJ – 90

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

Set	Q
-----	---

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3.**
 - 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) **Assume suitable dimensions if not given.**
 - 4) **Use first angle method of projections.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Correct OR Incorrect (Attempt any two) (Each bit one mark each) :

- A) Isometric length is about 0.816 of the true length.
- B) Drawing made to one half of the actual size is 1 : 2.
- C) Projection on the auxiliary plane reveals the true shape of the inclined surface.

Type – II : Straight Objective Type/Classical MCQ (Each bit one mark each) :

- A) Out of the following, which gear application normally delivers and used for reciprocation motion ?
 - a) Bevel Gear
 - b) Spur Gear
 - c) Rack and Pinion
 - d) Screw Gear
- B) The recommended scale 10 : 1 is called as _____ category.
 - a) Enlarged scale
 - b) Full size
 - c) Reduced scale
 - d) None
- C) In flanged coupling, the flanges are joined together by means of
 - a) Hex. headed bolts
 - b) Headless taper bolts
 - c) Key
 - d) Rivets

P.T.O.



- D) The radius of chamfer, R in a hexagonal nut is
 a) 1.5 D b) 0.9 D c) 1.5 D + 3 d) 1.2 D
- E) The algebraic difference between the minimum limit of size and the corresponding basic size is known as
 a) Deviation b) Upper deviation
 c) Allowance d) Lower deviation

Type – III : Match the pairs (Each bit one mark each) :

Column – A Name of Thread	Column – B Included Angle
A. Sellers Threads	P. 29°
B. ACME Thread	Q. 47.5°
C. British Association threads	R. 60°

Type – IV : Multiple correct answer type (Each correct bit 2 marks each) :

- A) Which of the following pair is for interference fit ?
 p) $\phi 90H_7r_6$ q) $\phi 90H_7k_6$ r) $\phi 90H_7s_6$ s) $\phi 90H_7f_7$
- B) Which of the following delivers transition type of fit ?
 p) $\phi 48 H_8p_6$ q) $\phi 48 H_7g_6$
 r) $\phi 48 H_7n_6$ s) $\phi 48 H_8f_7$
-



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

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

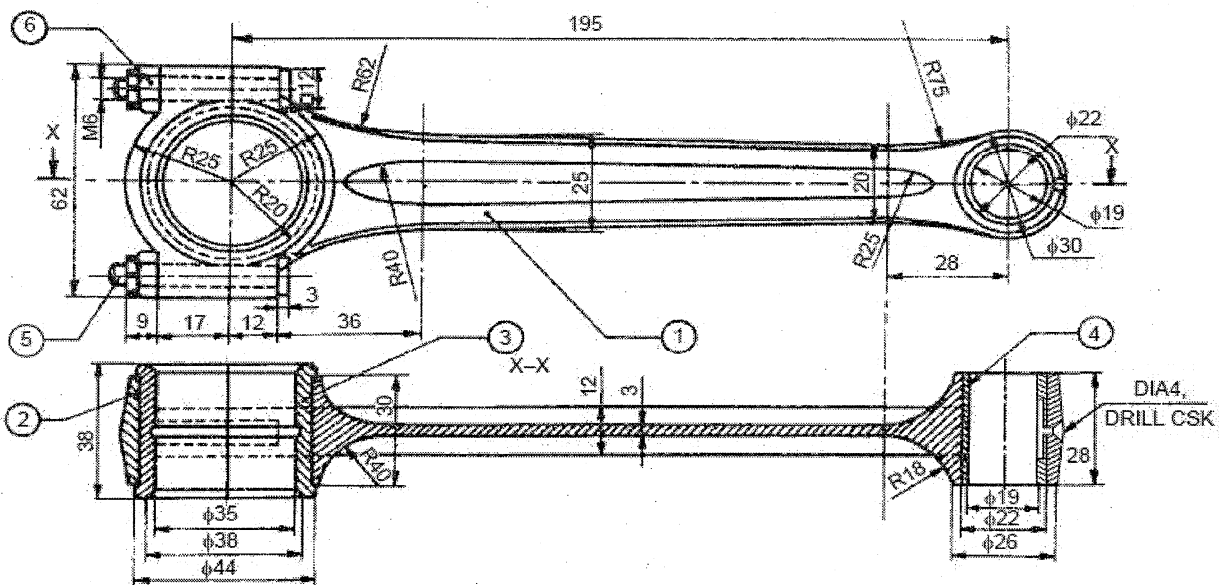
Marks : 56

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 7, attempt **any four**.
 - 3) **Assume** suitable dimensions if **not** given.
 - 4) Use **first** angle method of projections.

2. Figure No. 1 shows the assembly of PETROL ENGINE CONNECTING ROD. Draw the details of the following parts (**Two views each**) :

20

- 1) Rod 2) Cap 3) Bearing Brass 4) Bearing Bush.



Parts list

Part No.	Name	Matl.	Qty.
1	Rod	FS	1
2	Cap	FS	1
3	Bearing brass	GM	2
4	Bearing bush	P Bronze	1
5	Bolt	MCS	2
6	Nut	MCS	2

Figure No. 1

Set Q



3. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Chain wheel
 ii) Compression spring with square section.
- B) Draw freehand sketching for Socket and Spigot Joint (Pipe Joint). **3**
- C) Draw B.I.S. Conventions of Bevel Gear. **3**
- D) Draw Freehand sketching for the Solid Coupling. **3**
4. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Repeated Parts
 ii) Holes on circular pitch.
- B) Draw the freehand sketching of -Rag Foundation bolt. **3**
- C) Draw welding symbols any three. **3**
- D) Draw free hand sketch of Speed Cone Pulley. **3**
5. A) Draw the figure to indicate Hole Basis System and Shaft Basis System. **3**
- B) Redraw the given Figure No. 2 and indicate the mentioned parameters on it. **6**
 i) Surface 'B' is to be milled with Ra value of 15 microns, direction of lay parallel to plane of projection with sampling length 3 mm and machining allowance 1 mm. Show this content with proper symbol in Figure.
 ii) Surface 'B' and 'A' are parallel is within 0.01 mm.
 iii) Axis of ϕ 40 extension is perpendicular to B within 0.03 mm.

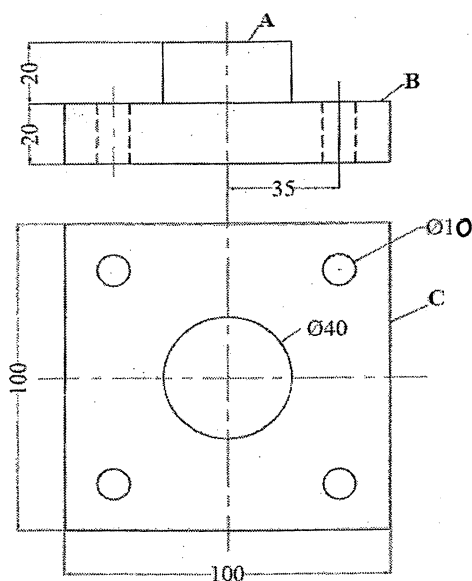


Figure No. 2



6. Figure No. 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 9

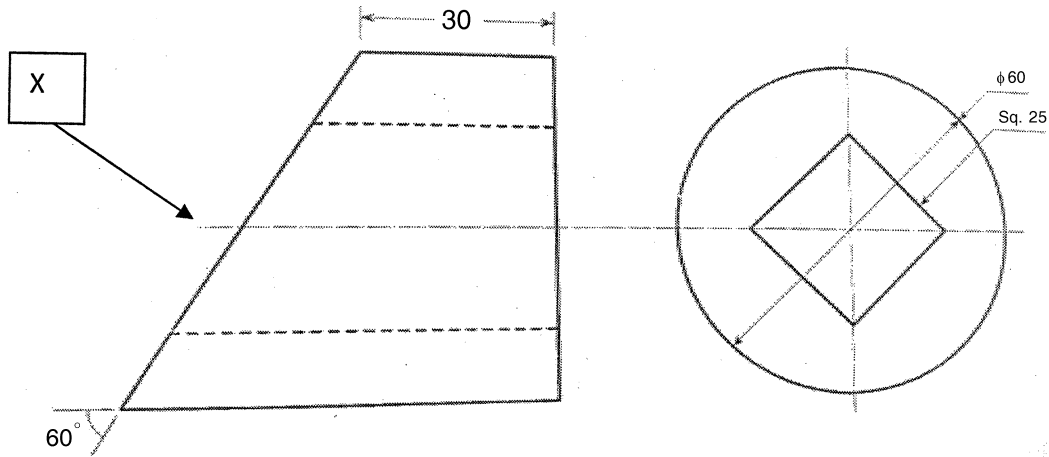


Figure No. 3

7. Figure No. 4 shows two views of an object. Draw isometric view of the object. 9

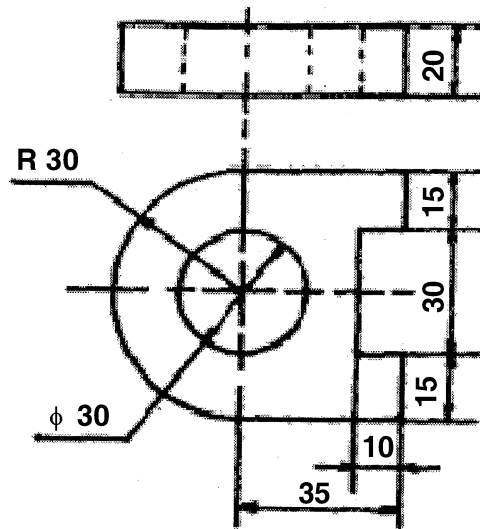


Figure No. 4



Table 15.1 Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm.	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 Fundamental deviations for shafts of types a to k of sizes upto 500mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
		a	b	c	d	e	f	g	h		j			k	
over	upto	All grades									5.6	7	8	4 to 7	≤3, >7
—	*3	-270	-140	-60	-20	-14	-6	-2	0	± IT/2	-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18										-4	-8	—	+2	0
18	24	-300	-160	-110	-65	-40	-20	-7	0		-5	-10	—	+2	0
24	30										-7	-12	—	+2	0
30	40	-310	-170	-120	-80	-50	-25	-9	0		-7	-12	—	+2	0
40	50	-320	-180	-130							-9	-10	0		
50	65	-340	-190	-140	-100	-60	-30	-10	0		-9	-15	—	+3	0
65	80	-360	-200	-150							-10	-12	0		
80	100	-380	-220	-170	-120	-72	-36	-12	0		-11	-18	—	+3	0
100	120	-410	-240	-180											
120	140	-460	-260	-200											
140	160	-520	-280	-210											
160	180	-580	-310	-230	-145	-85	-43	-14	0	-11	-18	—	+3	0	



Table 15.3 Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

A to N

Fundamental deviation in microns											(1 micron = 0.001 mm)										
Diameter steps in mm		Lower deviations (EI)									Upper deviations (ES)										
		A*	*B	C	D	E	F	G	H	J _s +	J			K		M		N			
Over	Upto	All grades												≤ 8	> 8	≤ 8 ‡	> 8	≤ 8	> 8*	≤ 7	
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades 7 + Δ	
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1 + Δ	—	-4 + Δ	-4 + Δ	-8 + Δ	0		
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1 + Δ	—	-6 + Δ	-6 + Δ	-10 + Δ	0		
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1 + Δ	—	-7 + Δ	-7	-12 + Δ	0		
14	18																				
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2 + Δ	—	-8 + Δ	-8	-15 + Δ	0		
24	30																				
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2 + Δ	—	-9 + Δ	-9	-17 + Δ	0		
40	50	+320	+180	+130																	
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2 + Δ	—	-11 + Δ	-11	-20 + Δ	0		
65	80	+360	+200	+150																	
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3 + Δ	—	-13 + Δ	-13	-23 + Δ	0		
100	120	+410	+240	+180																	



SLR-TJ – 90

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

Set	R
-----	---

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 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) **Assume** suitable dimensions if **not** given.
 - 4) Use **first angle** method of projections.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Multiple correct answer type (**Each** correct bit **2** marks **each**) :

A) Which of the following pair is for interference fit ?

- p) $\phi 90H_7r_6$
- q) $\phi 90H_7k_6$
- r) $\phi 90H_7s_6$
- s) $\phi 90H_7f_7$

B) Which of the following delivers transition type of fit ?

- p) $\phi 48 H_8p_6$
- q) $\phi 48 H_7g_6$
- r) $\phi 48 H_7n_6$
- s) $\phi 48 H_8f_7$

Type – II : Match the pairs (**Each** bit **one** mark **each**) :

Column – A Name of Thread	Column – B Included Angle
A. Sellers Threads	P. 29°
B. ACME Thread	Q. 47.5°
C. British Association threads	R. 60°

P.T.O.



Type – III : Straight Objective Type/Classical MCQ (Each bit one mark each) :

- A) Out of the following, which gear application normally delivers and used for reciprocation motion ?
- | | |
|--------------------|---------------|
| a) Bevel Gear | b) Spur Gear |
| c) Rack and Pinion | d) Screw Gear |
- B) The recommended scale 10 : 1 is called as _____ category.
- | | |
|-------------------|--------------|
| a) Enlarged scale | b) Full size |
| c) Reduced scale | d) None |
- C) In flanged coupling, the flanges are joined together by means of
- | | |
|----------------------|-------------------------|
| a) Hex. headed bolts | b) Headless taper bolts |
| c) Key | d) Rivets |
- D) The radius of chamfer, R in a hexagonal nut is
- | | | | |
|----------|----------|--------------|----------|
| a) 1.5 D | b) 0.9 D | c) 1.5 D + 3 | d) 1.2 D |
|----------|----------|--------------|----------|
- E) The algebraic difference between the minimum limit of size and the corresponding basic size is known as
- | | |
|--------------|--------------------|
| a) Deviation | b) Upper deviation |
| c) Allowance | d) Lower deviation |

Type – IV : Correct OR Incorrect (Attempt any two) (Each bit one mark each) :

- A) Isometric length is about 0.816 of the true length.
- B) Drawing made to one half of the actual size is 1 : 2.
- C) Projection on the auxiliary plane reveals the true shape of the inclined surface.



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

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

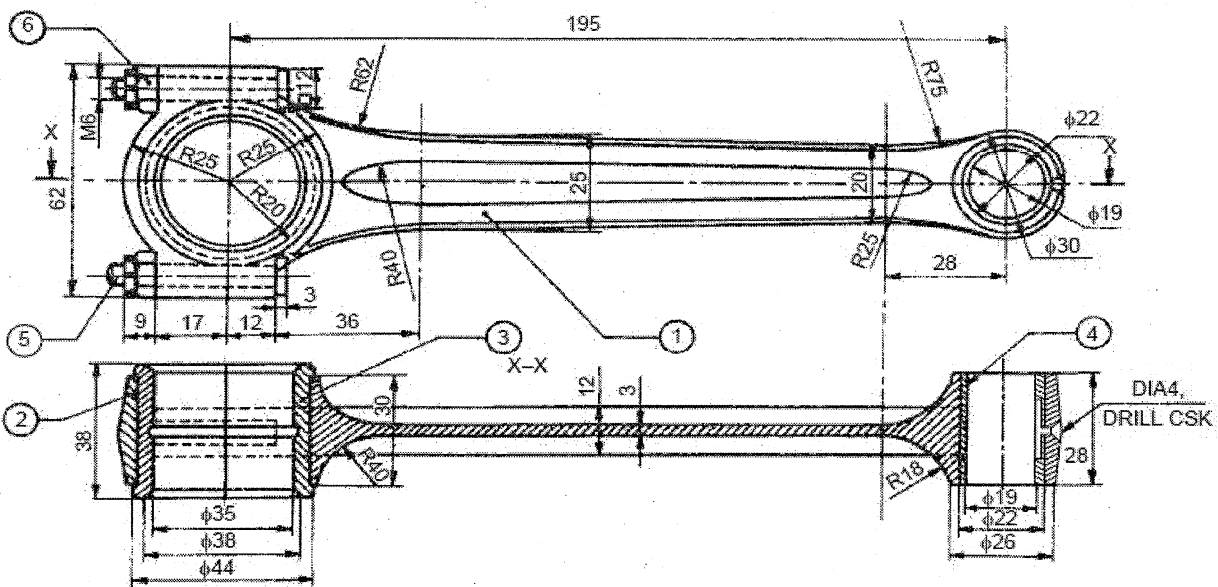
Marks : 56

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 7, attempt **any four**.
 - 3) **Assume** suitable dimensions if **not** given.
 - 4) Use **first** angle method of projections.

2. Figure No. 1 shows the assembly of PETROL ENGINE CONNECTING ROD. Draw the details of the following parts (**Two views each**) :

20

- 1) Rod 2) Cap 3) Bearing Brass 4) Bearing Bush.



Parts list

Part No.	Name	Matl.	Qty.
1	Rod	FS	1
2	Cap	FS	1
3	Bearing brass	GM	2
4	Bearing bush	P Bronze	1
5	Bolt	MCS	2
6	Nut	MCS	2

Figure No. 1



3. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Chain wheel
 ii) Compression spring with square section.
- B) Draw freehand sketching for Socket and Spigot Joint (Pipe Joint). **3**
- C) Draw B.I.S. Conventions of Bevel Gear. **3**
- D) Draw Freehand sketching for the Solid Coupling. **3**
4. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Repeated Parts
 ii) Holes on circular pitch.
- B) Draw the freehand sketching of -Rag Foundation bolt. **3**
- C) Draw welding symbols any three. **3**
- D) Draw free hand sketch of Speed Cone Pulley. **3**
5. A) Draw the figure to indicate Hole Basis System and Shaft Basis System. **3**
- B) Redraw the given Figure No. 2 and indicate the mentioned parameters on it. **6**
 i) Surface 'B' is to be milled with Ra value of 15 microns, direction of lay parallel to plane of projection with sampling length 3 mm and machining allowance 1 mm. Show this content with proper symbol in Figure.
 ii) Surface 'B' and 'A' are parallel is within 0.01 mm.
 iii) Axis of ϕ 40 extension is perpendicular to B within 0.03 mm.

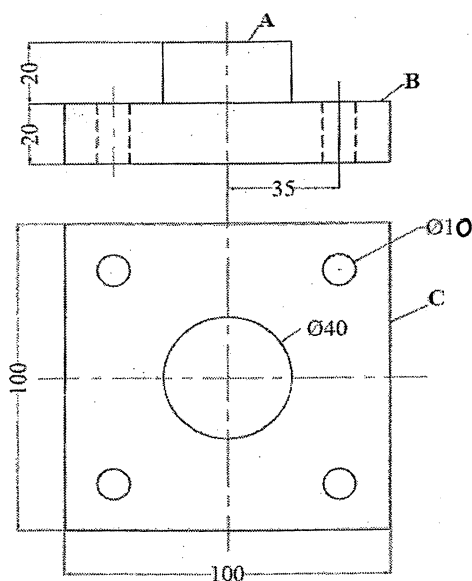


Figure No. 2



6. Figure No. 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 9

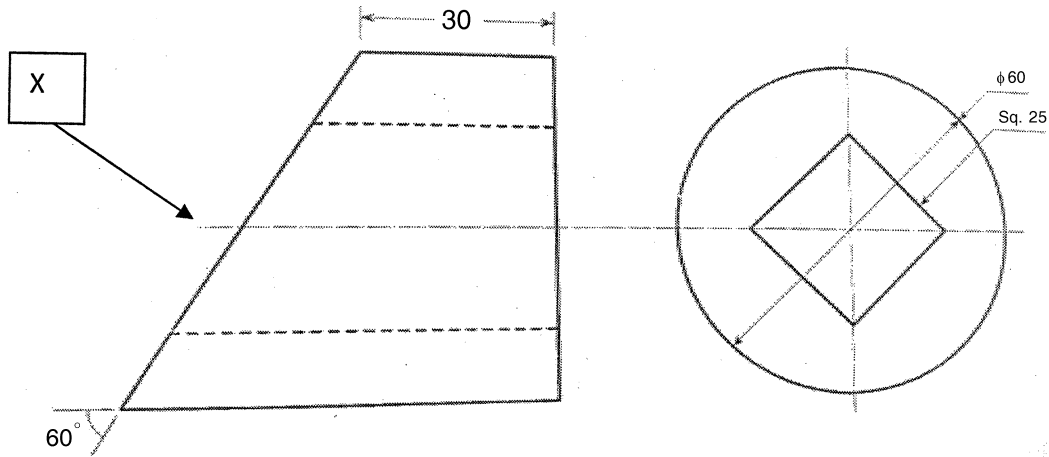


Figure No. 3

7. Figure No. 4 shows two views of an object. Draw isometric view of the object. 9

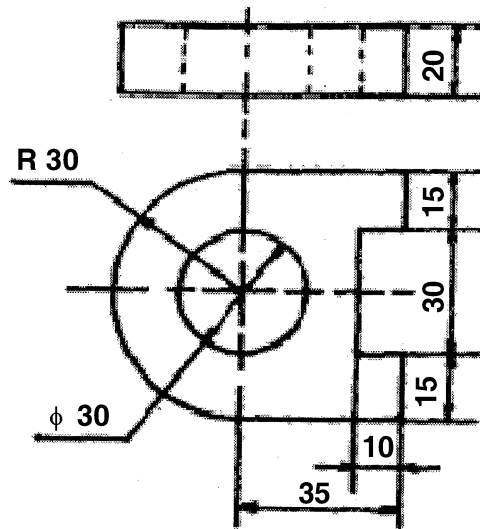


Figure No. 4



Table 15.1 Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm.	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 Fundamental deviations for shafts of types a to k of sizes upto 500mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
		a	b	c	d	e	f	g	h		j			k	
over	upto	All grades								± IT/2	5.6	7	8	4 to 7	≤3, >7
—	*3	-270	-140	-60	-20	-14	-6	-2	0		-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18										-4	-8	—	+2	0
18	24	-300	-160	-110	-65	-40	-20	-7	0		-5	-10	—	+2	0
24	30										-7	-12	—	+2	0
30	40	-310	-170	-120	-80	-50	-25	-9	0		-7	-12	—	+2	0
40	50	-320	-180	-130							-9	-10	0		
50	65	-340	-190	-140	-100	-60	-30	-10	0		-9	-15	—	+3	0
65	80	-360	-200	-150							-12	-12	0		
80	100	-380	-220	-170	-120	-72	-36	-12	0		-11	-18	—	+3	0
100	120	-410	-240	-180											
120	140	-460	-260	-200											
140	160	-520	-280	-210											
160	180	-580	-310	-230	-145	-85	-43	-14	0	-11	-18	—	+3	0	



Table 15.3 Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

A to N

Fundamental deviation in microns											(1 micron = 0.001 mm)													
Diameter steps in mm		Lower deviations (EI)									Upper deviations (ES)													
		A*	*B	C	D	E	F	G	H	J _s +	J			K		M		N						
Over	Upto	All grades												6	7	8	≤ 8	> 8	≤ 8 †	> 8	≤ 8	> 8*	≤ 7	
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades 7 + Δ				
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0					
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0					
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0					
14	18																							
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0					
24	30																							
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0					
40	50	+320	+180	+130																				
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0					
65	80	+360	+200	+150																				
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0					
100	120	+410	+240	+180																				



SLR-TJ – 90

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

Set	S
-----	---

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 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) **Assume** suitable dimensions if **not** given.
 - 4) Use **first angle** method of projections.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Straight Objective Type/Classical MCQ (**Each bit one mark each**) :

- A) Out of the following, which gear application normally delivers and used for reciprocation motion ?
- | | |
|--------------------|---------------|
| a) Bevel Gear | b) Spur Gear |
| c) Rack and Pinion | d) Screw Gear |
- B) The recommended scale 10 : 1 is called as _____ category.
- | | |
|-------------------|--------------|
| a) Enlarged scale | b) Full size |
| c) Reduced scale | d) None |
- C) In flanged coupling, the flanges are joined together by means of
- | | |
|----------------------|-------------------------|
| a) Hex. headed bolts | b) Headless taper bolts |
| c) Key | d) Rivets |
- D) The radius of chamfer, R in a hexagonal nut is
- | | | | |
|----------|----------|--------------|----------|
| a) 1.5 D | b) 0.9 D | c) 1.5 D + 3 | d) 1.2 D |
|----------|----------|--------------|----------|
- E) The algebraic difference between the minimum limit of size and the corresponding basic size is known as
- | | |
|--------------|--------------------|
| a) Deviation | b) Upper deviation |
| c) Allowance | d) Lower deviation |

P.T.O.



Type – II : Multiple correct answer type (Each correct bit 2 marks each) :

A) Which of the following pair is for interference fit ?

p) $\phi 90H_7r_6$ q) $\phi 90H_7k_6$ r) $\phi 90H_7s_6$ s) $\phi 90H_7f_7$

B) Which of the following delivers transition type of fit ?

p) $\phi 48 H_8p_6$ q) $\phi 48 H_7g_6$
r) $\phi 48 H_7n_6$ s) $\phi 48 H_8f_7$

Type – III : Correct OR Incorrect (Attempt any two) (Each bit one mark each) :

A) Isometric length is about 0.816 of the true length.

B) Drawing made to one half of the actual size is 1 : 2.

C) Projection on the auxiliary plane reveals the true shape of the inclined surface.

Type – IV : Match the pairs (Each bit one mark each) :

Column – A Name of Thread	Column – B Included Angle
A. Sellers Threads	P. 29°
B. ACME Thread	Q. 47.5°
C. British Association threads	R. 60°



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

**S.E. (Mech.) (Part – I) Examination, 2017
MACHINE DRAWING (New CBCS)**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

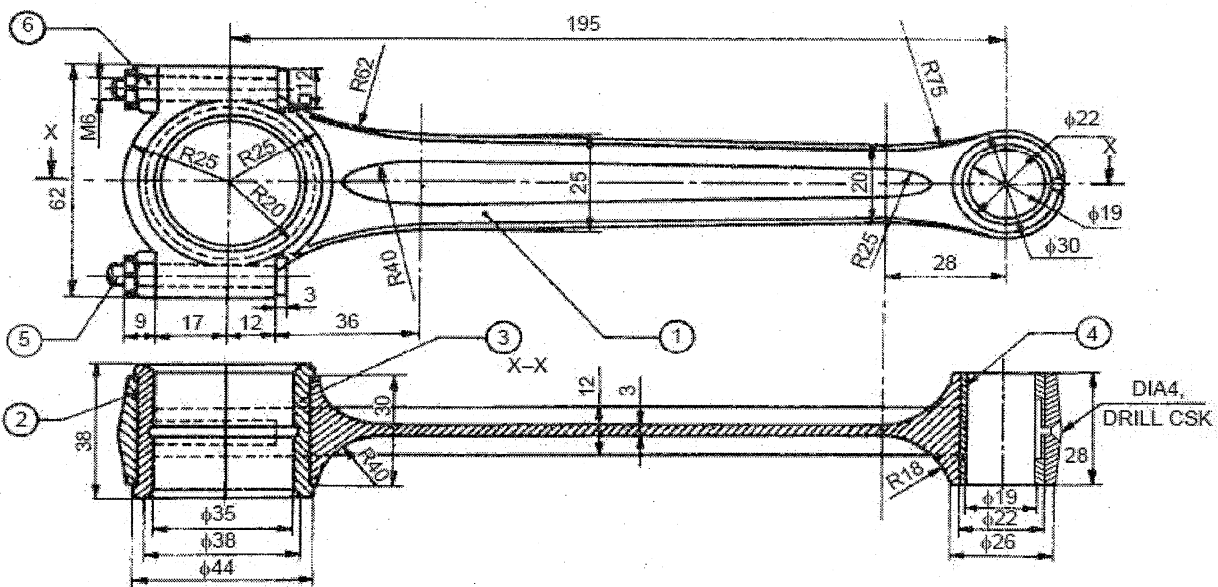
Marks : 56

- Instructions :** 1) Question No. 1 and 2 are **compulsory**.
 2) Out of Question No. 3 to 7, attempt **any four**.
 3) **Assume** suitable dimensions if **not** given.
 4) Use **first** angle method of projections.

2. Figure No. 1 shows the assembly of PETROL ENGINE CONNECTING ROD. Draw the details of the following parts (**Two views each**) :

20

- 1) Rod 2) Cap 3) Bearing Brass 4) Bearing Bush.



Parts list

Part No.	Name	Matl.	Qty.
1	Rod	FS	1
2	Cap	FS	1
3	Bearing brass	GM	2
4	Bearing bush	P Bronze	1
5	Bolt	MCS	2
6	Nut	MCS	2

Figure No. 1



3. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Chain wheel
 ii) Compression spring with square section.
- B) Draw freehand sketching for Socket and Spigot Joint (Pipe Joint). **3**
- C) Draw B.I.S. Conventions of Bevel Gear. **3**
- D) Draw Freehand sketching for the Solid Coupling. **3**
4. Solve **any 3** out of 4 (Every bit has **3** marks) :
- A) Draw the B.I.S. conventions for the following : **3**
 i) Repeated Parts
 ii) Holes on circular pitch.
- B) Draw the freehand sketching of -Rag Foundation bolt. **3**
- C) Draw welding symbols any three. **3**
- D) Draw free hand sketch of Speed Cone Pulley. **3**
5. A) Draw the figure to indicate Hole Basis System and Shaft Basis System. **3**
- B) Redraw the given Figure No. 2 and indicate the mentioned parameters on it. **6**
 i) Surface 'B' is to be milled with Ra value of 15 microns, direction of lay parallel to plane of projection with sampling length 3 mm and machining allowance 1 mm. Show this content with proper symbol in Figure.
 ii) Surface 'B' and 'A' are parallel is within 0.01 mm.
 iii) Axis of ϕ 40 extension is perpendicular to B within 0.03 mm.

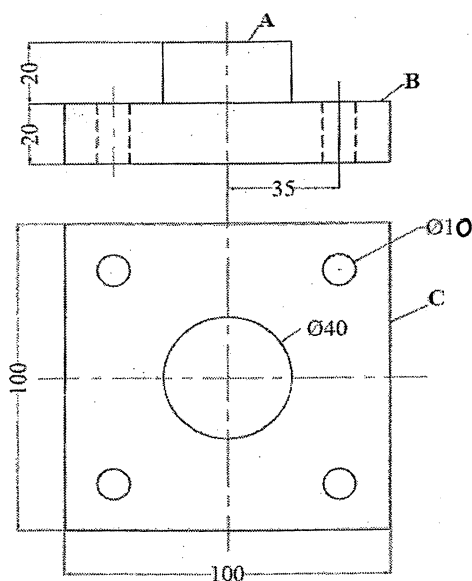


Figure No. 2



6. Figure No. 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 9

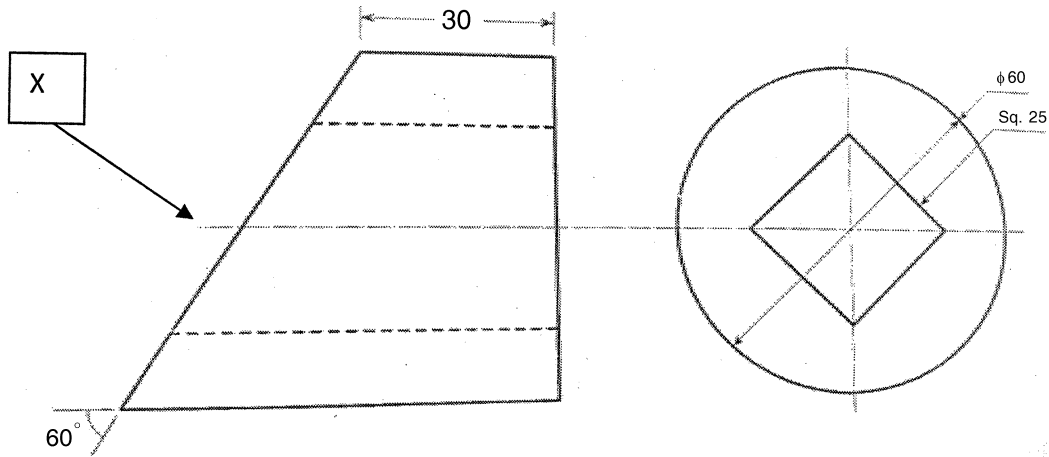


Figure No. 3

7. Figure No. 4 shows two views of an object. Draw isometric view of the object. 9

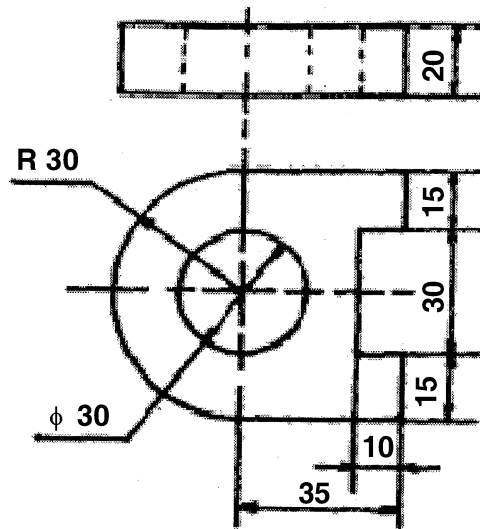


Figure No. 4



Table 15.1 Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm.	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 Fundamental deviations for shafts of types a to k of sizes upto 500mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
		a	b	c	d	e	f	g	h		j			k	
over	upto	All grades									5.6	7	8	4 to 7	≤3, >7
—	*3	-270	-140	-60	-20	-14	-6	-2	0	± IT/2	-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18														
18	24	-300	-160	-110	-65	-40	-20	-7	0		-4	-8	—	+2	0
24	30														
30	40	-310	-170	-120	-80	-50	-25	-9	0		-5	-10	—	+2	0
40	50										-320	-180	-130		
50	65	-340	-190	-140	-100	-60	-30	-10	0		-7	-12	—	+2	0
65	80										-360	-200	-150		
80	100	-380	-220	-170	-120	-72	-36	-12	0		-9	-15	—	+3	0
100	120									-410	-240	-180			
120	140	-460	-260	-200											
140	160	-520	-280	-210	-145	-85	-43	-14	0	-11	-18	—	+3	0	
160	180									-580	-310	-230			



Table 15.3 Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

A to N

Fundamental deviation in microns											(1 micron = 0.001 mm)													
Diameter steps in mm		Lower deviations (EI)									Upper deviations (ES)													
		A*	*B	C	D	E	F	G	H	J _s +	J			K		M		N						
Over	Upto	All grades												6	7	8	≤ 8	> 8	≤ 8 †	> 8	≤ 8	> 8*	≤ 7	
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades 7 + Δ				
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0					
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0					
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0					
14	18																							
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0					
24	30																							
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0					
40	50	+320	+180	+130																				
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0					
65	80	+360	+200	+150																				
80	100	+380	+220	+170	+120	+72	+36	+12	0	+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0						
100	120	+410	+240	+180																				



SLR-TJ – 91

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

Set **P**

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in the Answer Book on Page No. 3. **Each** question carries **one** mark.
2) **All** the sub-questions in Q. No. 1 are **compulsory** for **one mark each** and **every** question has **only one** correct answer.
3) Answer **cannot** be changed once it is marked.
4) **Mention** question paper set on the **top** of page No. 3.
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative : 14
- 1) The point in the stress-strain diagram at which the cross sectional area of the test specimen starts decreasing is called
 - a) Elastic limit
 - b) Upper yield point
 - c) Lower yield point
 - d) Ultimate stress point
 - 2) In a cantilever, carrying a load whose intensity varies uniformly from zero at the free end to maximum w per unit run at the fixed end, the SF changes following a
 - a) Linear law
 - b) Parabolic law
 - c) Cubic law
 - d) None of the above
 - 3) Nature of stress set up in the shaft due to torsion is
 - a) Tensile
 - b) Compressive
 - c) Crushing
 - d) Shear
 - 4) The strength of a beam mainly depends upon
 - a) Bending moment
 - b) C.G. of the section
 - c) Section modulus
 - d) Its weight
 - 5) The equivalent length is equal to $1/\sqrt{2}$ times the actual length of the column then
 - a) One end fixed and other end free
 - b) Both ends fixed
 - c) One end fixed and other end hinged
 - d) Both ends hinged

P.T.O.



- 6) Rubber is _____ elastic than steel.
a) Less b) More c) Equally d) None of the above
- 7) For an I section with unequal flanges, maximum shear stress occurs at
a) The junction of the flanges and the web
b) The top of the section
c) The neutral axis
d) The bottom of the section
- 8) For a simply supported beam carrying a UDL over the entire length, the slope is zero at
a) The supported ends b) Mid-span
c) $(1/4) L$ from the right support d) Anywhere in the length of the beam
- 9) Mohr's circle method is a graphical method of determining
a) Stresses on an oblique plane b) Principal stresses
c) Maximum shear stress d) All of the above
- 10) The buckling, in case of column takes place about the axis having
a) Minimum radius of gyration b) Maximum radius of gyration
c) Both a) and b) d) None of the above
- 11) Proof resilience is the mechanical property of materials which indicates their capacity to bear
a) Static tensile loads b) Static compressive loads
c) Shocks d) None of the above
- 12) If one of the principal stresses in a strained material is zero, the magnitude of the other principal stress must be
a) Twice the magnitude of maximum shear stress
b) Equal to the magnitude of maximum shear stress
c) One and half times the magnitude of maximum shear stress
d) None of the above
- 13) The amount of deflection of a beam subjected to some type of loading depends upon
a) Cross section b) Bending moment
c) Both a) and b) d) None of the above
- 14) The maximum bending moment for a simply supported beam of length l carrying a load whose intensity varies uniformly from zero at the one end to w per unit run at mid span is
a) $wl^2/4$ b) $wl^2/8$ c) $wl^2/12$ d) $wl^2/24$



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

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any two** questions from **each** Section.
2) **Use** of scientific calculator is **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Assume additional **suitable** data, **if necessary** and mention it **clearly**.

SECTION – I

2. a) A copper rod 40 mm diameter is surrounded tightly by a cast iron tube of 80 mm external diameter, the ends being firmly fastened together. When subjected to a compressive load of 30 kN, what load will be shared by each ? Also determine the amount by which the compound bar shortens if it is 2 m long. $E_{Ci} = 175$ GPa and $E_{Cu} = 75$ Gpa. 8
- b) Direct stresses of 120 N/mm² tensile and 90 N/mm² compressive exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm². What must be the magnitude of shearing stresses on the two planes ? 6
3. a) A beam AB 6 m long has support at its ends A and B. It carries UDL of 20 kN/m for 3 meters from left support and a point load of 40 kN at a distance of 3 m from right support. It also carries an external moment of 120 kN-m clockwise, at 1.5 m from right support. Draw SFD and BMD for the beam and indicate all important points. 8
- b) At a certain point in a strained material, the stresses on the two planes at right angles to each other are 40 N/mm² and 20 N/mm² both tensile. They are accompanied by a shear stress of magnitude 20 N/mm². Find graphically the location of principal planes and evaluate the principal stresses. 6
4. a) A shaft running at 150 rpm is required to transmit 38 kW. If the maximum torque is likely to exceed the mean torque by 25% and the maximum shear stress is 75 N/mm², find the diameter of the shaft. Also find the angle of twist for a length of 3 m. Take $G = 8 \times 10^4$ N/mm². 8
- b) Derive an expression for Young's modulus in terms of bulk modulus and Poisson's ratio. 6

Set P



SECTION – II

5. a) A T-shaped beam having flange (200 × 50 mm) and web (200 × 50 mm), is subjected to a vertical shear force of 100 kN. Calculate the shear stresses across the depth of the section and draw shear stress distribution diagram. **8**
- b) A weight of 1.2 kN is dropped on a collar attached at lower end of vertical rod 4 m long and 30 mm in diameter. Calculate the height of the drop if maximum instantaneous stress is not to exceed 120 MPa. Also calculate instantaneous elongation Take $E = 200 \text{ GPa}$. **6**
6. a) A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a UDL of 9 kN/m run over the entire span of 5 m. Take $E = 1 \times 10^4 \text{ N/mm}^2$. Find the slope at the supports and maximum deflection. **8**
- b) Derive the bending equation. **6**
7. a) A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the external diameter as 1.25 times the internal diameter. Take $\sigma_c = 550 \text{ N/mm}^2$ and $a = \frac{1}{1600}$. **8**
- b) A cantilever of 3 m length carries a UDL on entire span. If the deflection at the free end is 40 mm, find the slope at the free end. **6**
-



SLR-TJ – 91

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

Set **Q**

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in the Answer Book on Page No. 3. **Each** question carries **one** mark.
 - 2) **All** the sub-questions in Q. No. 1 are **compulsory** for **one mark each** and **every** question has **only one** correct answer.
 - 3) Answer **cannot** be changed once it is marked.
 - 4) **Mention** question paper set on the **top** of page No. 3.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative : **14**
- 1) For a simply supported beam carrying a UDL over the entire length, the slope is zero at
 - a) The supported ends
 - b) Mid-span
 - c) $(1/4) L$ from the right support
 - d) Anywhere in the length of the beam
 - 2) Mohr's circle method is a graphical method of determining
 - a) Stresses on an oblique plane
 - b) Principal stresses
 - c) Maximum shear stress
 - d) All of the above
 - 3) The buckling, in case of column takes place about the axis having
 - a) Minimum radius of gyration
 - b) Maximum radius of gyration
 - c) Both a) and b)
 - d) None of the above
 - 4) Proof resilience is the mechanical property of materials which indicates their capacity to bear
 - a) Static tensile loads
 - b) Static compressive loads
 - c) Shocks
 - d) None of the above

P.T.O.



- 5) If one of the principal stresses in a strained material is zero, the magnitude of the other principal stress must be
- Twice the magnitude of maximum shear stress
 - Equal to the magnitude of maximum shear stress
 - One and half times the magnitude of maximum shear stress
 - None of the above
- 6) The amount of deflection of a beam subjected to some type of loading depends upon
- Cross section
 - Bending moment
 - Both a) and b)
 - None of the above
- 7) The maximum bending moment for a simply supported beam of length l carrying a load whose intensity varies uniformly from zero at the one end to w per unit run at mid span is
- $wl^2/4$
 - $wl^2/8$
 - $wl^2/12$
 - $wl^2/24$
- 8) The point in the stress-strain diagram at which the cross sectional area of the test specimen starts decreasing is called
- Elastic limit
 - Upper yield point
 - Lower yield point
 - Ultimate stress point
- 9) In a cantilever, carrying a load whose intensity varies uniformly from zero at the free end to maximum w per unit run at the fixed end, the SF changes following a
- Linear law
 - Parabolic law
 - Cubic law
 - None of the above
- 10) Nature of stress set up in the shaft due to torsion is
- Tensile
 - Compressive
 - Crushing
 - Shear
- 11) The strength of a beam mainly depends upon
- Bending moment
 - C.G. of the section
 - Section modulus
 - Its weight
- 12) The equivalent length is equal to $1/\sqrt{2}$ times the actual length of the column then
- One end fixed and other end free
 - Both ends fixed
 - One end fixed and other end hinged
 - Both ends hinged
- 13) Rubber is _____ elastic than steel.
- Less
 - More
 - Equally
 - None of the above
- 14) For an I section with unequal flanges, maximum shear stress occurs at
- The junction of the flanges and the web
 - The top of the section
 - The neutral axis
 - The bottom of the section



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

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any two** questions from **each** Section.
2) **Use** of scientific calculator is **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Assume additional **suitable** data, **if necessary** and mention it **clearly**.

SECTION – I

2. a) A copper rod 40 mm diameter is surrounded tightly by a cast iron tube of 80 mm external diameter, the ends being firmly fastened together. When subjected to a compressive load of 30 kN, what load will be shared by each ? Also determine the amount by which the compound bar shortens if it is 2 m long. $E_{CI} = 175 \text{ GPa}$ and $E_{Cu} = 75 \text{ GPa}$. 8
- b) Direct stresses of 120 N/mm^2 tensile and 90 N/mm^2 compressive exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm^2 . What must be the magnitude of shearing stresses on the two planes ? 6
3. a) A beam AB 6 m long has support at its ends A and B. It carries UDL of 20 kN/m for 3 meters from left support and a point load of 40 kN at a distance of 3 m from right support. It also carries an external moment of 120 kN-m clockwise, at 1.5 m from right support. Draw SFD and BMD for the beam and indicate all important points. 8
- b) At a certain point in a strained material, the stresses on the two planes at right angles to each other are 40 N/mm^2 and 20 N/mm^2 both tensile. They are accompanied by a shear stress of magnitude 20 N/mm^2 . Find graphically the location of principal planes and evaluate the principal stresses. 6
4. a) A shaft running at 150 rpm is required to transmit 38 kW. If the maximum torque is likely to exceed the mean torque by 25% and the maximum shear stress is 75 N/mm^2 , find the diameter of the shaft. Also find the angle of twist for a length of 3 m. Take $G = 8 \times 10^4 \text{ N/mm}^2$. 8
- b) Derive an expression for Young's modulus in terms of bulk modulus and Poisson's ratio. 6

Set Q



SECTION – II

5. a) A T-shaped beam having flange (200 × 50 mm) and web (200 × 50 mm), is subjected to a vertical shear force of 100 kN. Calculate the shear stresses across the depth of the section and draw shear stress distribution diagram. **8**
- b) A weight of 1.2 kN is dropped on a collar attached at lower end of vertical rod 4 m long and 30 mm in diameter. Calculate the height of the drop if maximum instantaneous stress is not to exceed 120 MPa. Also calculate instantaneous elongation Take $E = 200 \text{ GPa}$. **6**
6. a) A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a UDL of 9 kN/m run over the entire span of 5 m. Take $E = 1 \times 10^4 \text{ N/mm}^2$. Find the slope at the supports and maximum deflection. **8**
- b) Derive the bending equation. **6**
7. a) A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the external diameter as 1.25 times the internal diameter. Take $\sigma_c = 550 \text{ N/mm}^2$ and $a = \frac{1}{1600}$. **8**
- b) A cantilever of 3 m length carries a UDL on entire span. If the deflection at the free end is 40 mm, find the slope at the free end. **6**
-



SLR-TJ – 91

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

Set **R**

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in the Answer Book on Page No. 3. **Each** question carries **one** mark.
2) **All** the sub-questions in Q. No. 1 are **compulsory** for **one mark each** and **every** question has **only one** correct answer.
3) Answer **cannot** be changed once it is marked.
4) **Mention** question paper set on the **top** of page No. 3.
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative : 14
- 1) The equivalent length is equal to $1/\sqrt{2}$ times the actual length of the column then
 - a) One end fixed and other end free
 - b) Both ends fixed
 - c) One end fixed and other end hinged
 - d) Both ends hinged
 - 2) Rubber is _____ elastic than steel.
 - a) Less
 - b) More
 - c) Equally
 - d) None of the above
 - 3) For an I section with unequal flanges, maximum shear stress occurs at
 - a) The junction of the flanges and the web
 - b) The top of the section
 - c) The neutral axis
 - d) The bottom of the section
 - 4) For a simply supported beam carrying a UDL over the entire length, the slope is zero at
 - a) The supported ends
 - b) Mid-span
 - c) $(1/4) L$ from the right support
 - d) Anywhere in the length of the beam

P.T.O.



- 5) Mohr's circle method is a graphical method of determining
- Stresses on an oblique plane
 - Principal stresses
 - Maximum shear stress
 - All of the above
- 6) The buckling, in case of column takes place about the axis having
- Minimum radius of gyration
 - Maximum radius of gyration
 - Both a) and b)
 - None of the above
- 7) Proof resilience is the mechanical property of materials which indicates their capacity to bear
- Static tensile loads
 - Static compressive loads
 - Shocks
 - None of the above
- 8) If one of the principal stresses in a strained material is zero, the magnitude of the other principal stress must be
- Twice the magnitude of maximum shear stress
 - Equal to the magnitude of maximum shear stress
 - One and half times the magnitude of maximum shear stress
 - None of the above
- 9) The amount of deflection of a beam subjected to some type of loading depends upon
- Cross section
 - Bending moment
 - Both a) and b)
 - None of the above
- 10) The maximum bending moment for a simply supported beam of length l carrying a load whose intensity varies uniformly from zero at the one end to w per unit run at mid span is
- $wl^2/4$
 - $wl^2/8$
 - $wl^2/12$
 - $wl^2/24$
- 11) The point in the stress-strain diagram at which the cross sectional area of the test specimen starts decreasing is called
- Elastic limit
 - Upper yield point
 - Lower yield point
 - Ultimate stress point
- 12) In a cantilever, carrying a load whose intensity varies uniformly from zero at the free end to maximum w per unit run at the fixed end, the SF changes following a
- Linear law
 - Parabolic law
 - Cubic law
 - None of the above
- 13) Nature of stress set up in the shaft due to torsion is
- Tensile
 - Compressive
 - Crushing
 - Shear
- 14) The strength of a beam mainly depends upon
- Bending moment
 - C.G. of the section
 - Section modulus
 - Its weight



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

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any two** questions from **each** Section.
2) **Use** of scientific calculator is **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Assume additional **suitable** data, **if necessary** and mention it **clearly**.

SECTION – I

2. a) A copper rod 40 mm diameter is surrounded tightly by a cast iron tube of 80 mm external diameter, the ends being firmly fastened together. When subjected to a compressive load of 30 kN, what load will be shared by each ? Also determine the amount by which the compound bar shortens if it is 2 m long. $E_{Ci} = 175 \text{ GPa}$ and $E_{Cu} = 75 \text{ GPa}$. 8
- b) Direct stresses of 120 N/mm^2 tensile and 90 N/mm^2 compressive exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm^2 . What must be the magnitude of shearing stresses on the two planes ? 6
3. a) A beam AB 6 m long has support at its ends A and B. It carries UDL of 20 kN/m for 3 meters from left support and a point load of 40 kN at a distance of 3 m from right support. It also carries an external moment of 120 kN-m clockwise, at 1.5 m from right support. Draw SFD and BMD for the beam and indicate all important points. 8
- b) At a certain point in a strained material, the stresses on the two planes at right angles to each other are 40 N/mm^2 and 20 N/mm^2 both tensile. They are accompanied by a shear stress of magnitude 20 N/mm^2 . Find graphically the location of principal planes and evaluate the principal stresses. 6
4. a) A shaft running at 150 rpm is required to transmit 38 kW. If the maximum torque is likely to exceed the mean torque by 25% and the maximum shear stress is 75 N/mm^2 , find the diameter of the shaft. Also find the angle of twist for a length of 3 m. Take $G = 8 \times 10^4 \text{ N/mm}^2$. 8
- b) Derive an expression for Young's modulus in terms of bulk modulus and Poisson's ratio. 6

Set R



SECTION – II

5. a) A T-shaped beam having flange (200 × 50 mm) and web (200 × 50 mm), is subjected to a vertical shear force of 100 kN. Calculate the shear stresses across the depth of the section and draw shear stress distribution diagram. **8**
- b) A weight of 1.2 kN is dropped on a collar attached at lower end of vertical rod 4 m long and 30 mm in diameter. Calculate the height of the drop if maximum instantaneous stress is not to exceed 120 MPa. Also calculate instantaneous elongation Take $E = 200 \text{ GPa}$. **6**
6. a) A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a UDL of 9 kN/m run over the entire span of 5 m. Take $E = 1 \times 10^4 \text{ N/mm}^2$. Find the slope at the supports and maximum deflection. **8**
- b) Derive the bending equation. **6**
7. a) A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the external diameter as 1.25 times the internal diameter. Take $\sigma_c = 550 \text{ N/mm}^2$ and $a = \frac{1}{1600}$. **8**
- b) A cantilever of 3 m length carries a UDL on entire span. If the deflection at the free end is 40 mm, find the slope at the free end. **6**
-



SLR-TJ – 91

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

Set **S**

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in the Answer Book on Page No. 3. **Each** question carries **one** mark.
2) **All** the sub-questions in Q. No. 1 are **compulsory** for **one mark each** and **every** question has **only one** correct answer.
3) Answer **cannot** be changed once it is marked.
4) **Mention** question paper set on the **top** of page No. 3.
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

14

- 1) The buckling, in case of column takes place about the axis having
 - a) Minimum radius of gyration
 - b) Maximum radius of gyration
 - c) Both a) and b)
 - d) None of the above
- 2) Proof resilience is the mechanical property of materials which indicates their capacity to bear
 - a) Static tensile loads
 - b) Static compressive loads
 - c) Shocks
 - d) None of the above
- 3) If one of the principal stresses in a strained material is zero, the magnitude of the other principal stress must be
 - a) Twice the magnitude of maximum shear stress
 - b) Equal to the magnitude of maximum shear stress
 - c) One and half times the magnitude of maximum shear stress
 - d) None of the above
- 4) The amount of deflection of a beam subjected to some type of loading depends upon
 - a) Cross section
 - b) Bending moment
 - c) Both a) and b)
 - d) None of the above

P.T.O.



- 5) The maximum bending moment for a simply supported beam of length l carrying a load whose intensity varies uniformly from zero at the one end to w per unit run at mid span is
- a) $wl^2/4$ b) $wl^2/8$ c) $wl^2/12$ d) $wl^2/24$
- 6) The point in the stress-strain diagram at which the cross sectional area of the test specimen starts decreasing is called
- a) Elastic limit b) Upper yield point
c) Lower yield point d) Ultimate stress point
- 7) In a cantilever, carrying a load whose intensity varies uniformly from zero at the free end to maximum w per unit run at the fixed end, the SF changes following a
- a) Linear law b) Parabolic law c) Cubic law d) None of the above
- 8) Nature of stress set up in the shaft due to torsion is
- a) Tensile b) Compressive c) Crushing d) Shear
- 9) The strength of a beam mainly depends upon
- a) Bending moment b) C.G. of the section
c) Section modulus d) Its weight
- 10) The equivalent length is equal to $1/\sqrt{2}$ times the actual length of the column then
- a) One end fixed and other end free
b) Both ends fixed
c) One end fixed and other end hinged
d) Both ends hinged
- 11) Rubber is _____ elastic than steel.
- a) Less b) More c) Equally d) None of the above
- 12) For an I section with unequal flanges, maximum shear stress occurs at
- a) The junction of the flanges and the web
b) The top of the section
c) The neutral axis
d) The bottom of the section
- 13) For a simply supported beam carrying a UDL over the entire length, the slope is zero at
- a) The supported ends b) Mid-span
c) $(1/4) L$ from the right support d) Anywhere in the length of the beam
- 14) Mohr's circle method is a graphical method of determining
- a) Stresses on an oblique plane b) Principal stresses
c) Maximum shear stress d) All of the above



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

**S.E. (Mechanical Engineering) (Part – I) (Old – CGPA) Examination, 2017
ANALYSIS OF MECHANICAL ELEMENTS**

Day and Date : Tuesday, 12-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any two** questions from **each** Section.
2) **Use** of scientific calculator is **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Assume additional **suitable** data, **if necessary** and mention it **clearly**.

SECTION – I

2. a) A copper rod 40 mm diameter is surrounded tightly by a cast iron tube of 80 mm external diameter, the ends being firmly fastened together. When subjected to a compressive load of 30 kN, what load will be shared by each ? Also determine the amount by which the compound bar shortens if it is 2 m long. $E_{CI} = 175 \text{ GPa}$ and $E_{Cu} = 75 \text{ GPa}$. 8
- b) Direct stresses of 120 N/mm^2 tensile and 90 N/mm^2 compressive exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm^2 . What must be the magnitude of shearing stresses on the two planes ? 6
3. a) A beam AB 6 m long has support at its ends A and B. It carries UDL of 20 kN/m for 3 meters from left support and a point load of 40 kN at a distance of 3 m from right support. It also carries an external moment of 120 kN-m clockwise, at 1.5 m from right support. Draw SFD and BMD for the beam and indicate all important points. 8
- b) At a certain point in a strained material, the stresses on the two planes at right angles to each other are 40 N/mm^2 and 20 N/mm^2 both tensile. They are accompanied by a shear stress of magnitude 20 N/mm^2 . Find graphically the location of principal planes and evaluate the principal stresses. 6
4. a) A shaft running at 150 rpm is required to transmit 38 kW. If the maximum torque is likely to exceed the mean torque by 25% and the maximum shear stress is 75 N/mm^2 , find the diameter of the shaft. Also find the angle of twist for a length of 3 m. Take $G = 8 \times 10^4 \text{ N/mm}^2$. 8
- b) Derive an expression for Young's modulus in terms of bulk modulus and Poisson's ratio. 6

Set S



SECTION – II

5. a) A T-shaped beam having flange (200 × 50 mm) and web (200 × 50 mm), is subjected to a vertical shear force of 100 kN. Calculate the shear stresses across the depth of the section and draw shear stress distribution diagram. **8**
- b) A weight of 1.2 kN is dropped on a collar attached at lower end of vertical rod 4 m long and 30 mm in diameter. Calculate the height of the drop if maximum instantaneous stress is not to exceed 120 MPa. Also calculate instantaneous elongation Take $E = 200 \text{ GPa}$. **6**
6. a) A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a UDL of 9 kN/m run over the entire span of 5 m. Take $E = 1 \times 10^4 \text{ N/mm}^2$. Find the slope at the supports and maximum deflection. **8**
- b) Derive the bending equation. **6**
7. a) A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the external diameter as 1.25 times the internal diameter. Take $\sigma_c = 550 \text{ N/mm}^2$ and $a = \frac{1}{1600}$. **8**
- b) A cantilever of 3 m length carries a UDL on entire span. If the deflection at the free end is 40 mm, find the slope at the free end. **6**
-



SLR-TJ – 92

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

Set	P
-----	---

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.
 - 4) Make suitable assumptions **wherever** necessary and state them **clearly**.
 - 5) Draw **neat** diagram **wherever** necessary.
 - 6) **Use of steam tables and Mollier diagram is allowed.**
 - 7) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) A Carnot cycle is having an efficiency of 0.75. If the temperature of the high temperature reservoir is 727°C, what is the temperature of low temperature reservoir ?
a) 23°C b) – 23°C c) 0°C d) 250°C
 - 2) Heat and work are
a) Intensive properties b) Extensive properties
c) Point functions d) Path functions
 - 3) Steam rate of a power plant is expressed as
a) W_p/W_t b) $3600 Q(KJ)/W_{net}$
c) $3600 (Kg)/W_{net} (KWh)$ d) None
 - 4) A gas having a negative Joule-Thomson coefficient ($\mu_{JT} < 0$), when throttled, will
a) Become cooler
b) Become warmer
c) Remain at the same temperature
d) Either be cooler or warmer depending on the type of gas

P.T.O.



- 5) In Rankine cycle, regeneration results in higher efficiency because
- Pressure inside the boiler increases
 - Heat is added before steam enters the low pressure turbine
 - Average temperature of heat addition in the boiler increases
 - Total work delivered by the turbine increases
- 6) If a closed system is undergoing an irreversible process, the entropy of the system
- Must increase
 - Always remains constant
 - Must decrease
 - Can increase, decrease or remain constant
- 7) Cochran boiler is of type
- Water tube
 - Fire tube
 - Vertical
 - Internally fired
- 8) In a nozzle
- Flow decelerates
 - Flow is steady
 - Flow accelerates
 - None
- 9) For same overall pressure ratio, leakage of air past the piston for multistage compression as compared to single stage compression.
- More
 - Less
 - Constant
 - May be more or less
- 10) For a given pressure and temperature of stream, the thermal efficiency of engine with condenser as compared to that without condenser is
- More
 - Less
 - Same
 - None
- 11) Work input to air compressor is minimum if compression law is
- Polytropic
 - Isothermal
 - Isentropic
 - None of the above
- 12) Parson's reaction steam turbine, degree of reaction is
- $3/4$
 - 1
 - $1/2$
 - $1/3$
- 13) The Zoelly turbine belongs to the category of
- Pressure compounded turbine
 - Reaction turbine
 - Velocity compounded turbine
 - Radial flow turbine
- 14) Effect of friction in nozzle for same pressure ratio causes
- Increases exit velocity and decrease in dryness fraction
 - Decrease exit velocity and increase in dryness fraction
 - Increases exit velocity and increase in dryness fraction
 - Decrease exit velocity and decrease in dryness fraction



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

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- 1) Solve **any two** questions from the remaining question from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Make suitable assumptions **wherever** necessary and state them **clearly**.
 - 4) Draw **neat** diagram **wherever** necessary.
 - 5) **Use of steam tables and Mollier diagram is allowed.**
 - 6) **Use of scientific calculator is allowed.**

SECTION – I

2. a) Write a note on available and unavailable energy. 4
b) Write complete combustion equation for pentane (C_5H_{12})_g with oxygen and air, find air, fuel ratio and calculate standard heat of reaction.
Standard heat of formation for
(C_5H_{12})_g = – 146.5 kJ/mol, (CO_2)_g = – 393.8 kJ/mol, (H_2O)_g = – 242 kJ/mol. 6
c) Write a note on Clausius inequality and what are its significance ? 4
3. a) In a Rankine cycle dry steam enters in a turbine at a pressure of 40 bar and leaves at pressure of 0.25 bar ? Compare the efficiency of Carnot and Rankine cycle. 5
b) Differentiate between Rankine and Carnot cycle. 5
c) Write the classification of boiler. 4
4. a) In a Carnot cycle heat is added at 480°C producing change in entropy of 5.65 kJ/k. The work delivered per cycle is 2300 kJ. Determine temperature at which heat is rejected. 5
b) 1000 kg/hr wet steam is generated in boiler at a pressure of 8 bar having dryness fraction 0.90. The feed water temperature is 15°C. Determine amount of coal consumed per hour if efficiency of boiler is 74% and calorific value is 32200 kJ/kg ? 5
c) What are applications of throttling process write any one in detail. 4

Set P



SECTION – II

5. a) Dry saturated steam at 2.8 bar is expanded through a convergent nozzle to 1.7 bar. The exit area is 3 cm^2 . Estimate the exit velocity and mass flow rate, assuming isentropic expansion ? **5**
- b) Derive equation for optimum inter-stage pressure for two stage compressors with perfect inter cooling. **5**
- c) Distinguish between jet condenser and surface condenser. **4**
6. a) Define steam turbine and write the classification of turbine. **5**
- b) A double acting single stage reciprocating air compressor has a piston displacement of 0.015 m^3 per revolution, operates at 500 rpm and has 5% clearance. The air is received at 1 bar and delivers at 6 bar. The compression and expansion are polytropic with $n = 1.3$. Determine volumetric efficiency and power required ? **5**
- c) What is metastable flow through nozzle and its significance ? **4**
7. a) Derive an expression for mass flow rate through nozzle. **5**
- b) A single row impulse turbine develops 132.4 kW at a blade speed of 175 m/s, using 2 kg of steam per second. Steam leaves the nozzle at 400 m/s. Velocity coefficient of blades is 0.9. Steam leaves turbine blades axially. Determine nozzle and blade angles at entry and exit ? **5**
- c) Write a note on : **4**
- i) FAD
- ii) Intercooling and aftercooling.
-



SLR-TJ – 92

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

Set	Q
-----	---

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.
 - 4) Make suitable assumptions **wherever** necessary and state them **clearly**.
 - 5) Draw **neat** diagram **wherever** necessary.
 - 6) **Use of steam stables and Mollier diagram is allowed.**
 - 7) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : 14
- 1) In a nozzle
 - a) Flow decelerates
 - b) Flow is steady
 - c) Flow accelerates
 - d) None
 - 2) For same overall pressure ratio, leakage of air past the piston for multistage compression as compared to single stage compression.
 - a) More
 - b) Less
 - c) Constant
 - d) May be more or less
 - 3) For a given pressure and temperature of stream, the thermal efficiency of engine with condenser as compared to that without condenser is
 - a) More
 - b) Less
 - c) Same
 - d) None
 - 4) Work input to air compressor is minimum if compression law is
 - a) Polytropic
 - b) Isothermal
 - c) Isentropic
 - d) None of the above
 - 5) Parson's reaction steam turbine, degree of reaction is
 - a) 3/4
 - b) 1
 - c) 1/2
 - d) 1/3

P.T.O.



- 6) The Zoelly turbine belongs to the category of
a) Pressure compounded turbine b) Reaction turbine
c) Velocity compounded turbine d) Radial flow turbine
- 7) Effect of friction in nozzle for same pressure ratio causes
a) Increases exit velocity and decrease in dryness fraction
b) Decrease exit velocity and increase in dryness fraction
c) Increases exit velocity and increase in dryness fraction
d) Decrease exit velocity and decrease in dryness fraction
- 8) A Carnot cycle is having an efficiency of 0.75. If the temperature of the high temperature reservoir is 727°C , what is the temperature of low temperature reservoir ?
a) 23°C b) -23°C c) 0°C d) 250°C
- 9) Heat and work are
a) Intensive properties b) Extensive properties
c) Point functions d) Path functions
- 10) Steam rate of a power plant is expressed as
a) Wp/Wt b) 3600 Q(KJ)/Wnet
c) $3600 \text{ (Kg)/Wnet (KWh)}$ d) None
- 11) A gas having a negative Joule-Thomson coefficient ($\mu_{JT} < 0$), when throttled, will
a) Become cooler
b) Become warmer
c) Remain at the same temperature
d) Either be cooler or warmer depending on the type of gas
- 12) In Rankine cycle, regeneration results in higher efficiency because
a) Pressure inside the boiler increases
b) Heat is added before steam enters the low pressure turbine
c) Average temperature of heat addition in the boiler increases
d) Total work delivered by the turbine increases
- 13) If a closed system is undergoing an irreversible process, the entropy of the system
a) Must increase
b) Always remains constant
c) Must decrease
d) Can increase, decrease or remain constant
- 14) Cochran boiler is of type
a) Water tube b) Fire tube c) Vertical d) Internally fired



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

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from the remaining question from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Make suitable assumptions **wherever** necessary and state them **clearly**.
 - 4) Draw **neat** diagram **wherever** necessary.
 - 5) **Use of steam tables and Mollier diagram is allowed.**
 - 6) **Use of scientific calculator is allowed.**

SECTION – I

2. a) Write a note on available and unavailable energy. 4
b) Write complete combustion equation for pentane (C_5H_{12})_g with oxygen and air, find air, fuel ratio and calculate standard heat of reaction.
Standard heat of formation for
(C_5H_{12})_g = – 146.5 kJ/mol, (CO_2)_g = – 393.8 kJ/mol, (H_2O)_g = – 242 kJ/mol. 6
c) Write a note on Clausius inequality and what are its significance ? 4
3. a) In a Rankine cycle dry steam enters in a turbine at a pressure of 40 bar and leaves at pressure of 0.25 bar ? Compare the efficiency of Carnot and Rankine cycle. 5
b) Differentiate between Rankine and Carnot cycle. 5
c) Write the classification of boiler. 4
4. a) In a Carnot cycle heat is added at 480°C producing change in entropy of 5.65 kJ/k. The work delivered per cycle is 2300 kJ. Determine temperature at which heat is rejected. 5
b) 1000 kg/hr wet steam is generated in boiler at a pressure of 8 bar having dryness fraction 0.90. The feed water temperature is 15°C. Determine amount of coal consumed per hour if efficiency of boiler is 74% and calorific value is 32200 kJ/kg ? 5
c) What are applications of throttling process write any one in detail. 4

Set Q



SECTION – II

5. a) Dry saturated steam at 2.8 bar is expanded through a convergent nozzle to 1.7 bar. The exit area is 3 cm^2 . Estimate the exit velocity and mass flow rate, assuming isentropic expansion ? **5**
- b) Derive equation for optimum inter-stage pressure for two stage compressors with perfect inter cooling. **5**
- c) Distinguish between jet condenser and surface condenser. **4**
6. a) Define steam turbine and write the classification of turbine. **5**
- b) A double acting single stage reciprocating air compressor has a piston displacement of 0.015 m^3 per revolution, operates at 500 rpm and has 5% clearance. The air is received at 1 bar and delivers at 6 bar. The compression and expansion are polytropic with $n = 1.3$. Determine volumetric efficiency and power required ? **5**
- c) What is metastable flow through nozzle and its significance ? **4**
7. a) Derive an expression for mass flow rate through nozzle. **5**
- b) A single row impulse turbine develops 132.4 kW at a blade speed of 175 m/s, using 2 kg of steam per second. Steam leaves the nozzle at 400 m/s. Velocity coefficient of blades is 0.9. Steam leaves turbine blades axially. Determine nozzle and blade angles at entry and exit ? **5**
- c) Write a note on : **4**
- i) FAD
- ii) Intercooling and aftercooling.
-



SLR-TJ – 92

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

Set	R
-----	---

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.
- 4) Make suitable assumptions **wherever** necessary and state them **clearly**.
- 5) Draw **neat** diagram **wherever** necessary.
- 6) **Use of steam stables and Mollier diagram is allowed.**
- 7) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : 14
- 1) In Rankine cycle, regeneration results in higher efficiency because
- Pressure inside the boiler increases
 - Heat is added before steam enters the low pressure turbine
 - Average temperature of heat addition in the boiler increases
 - Total work delivered by the turbine increases
- 2) If a closed system is undergoing an irreversible process, the entropy of the system
- Must increase
 - Always remains constant
 - Must decrease
 - Can increase, decrease or remain constant
- 3) Cochran boiler is of type
- | | | | |
|---------------|--------------|-------------|---------------------|
| a) Water tube | b) Fire tube | c) Vertical | d) Internally fired |
|---------------|--------------|-------------|---------------------|
- 4) In a nozzle
- | | |
|---------------------|-------------------|
| a) Flow decelerates | b) Flow is steady |
| c) Flow accelerates | d) None |

P.T.O.



- 5) For same overall pressure ratio, leakage of air past the piston for multistage compression as compared to single stage compression.
- a) More
 - b) Less
 - c) Constant
 - d) May be more or less
- 6) For a given pressure and temperature of stream, the thermal efficiency of engine with condenser as compared to that without condenser is
- a) More
 - b) Less
 - c) Same
 - d) None
- 7) Work input to air compressor is minimum if compression law is
- a) Polytropic
 - b) Isothermal
 - c) Isentropic
 - d) None of the above
- 8) Parson's reaction steam turbine, degree of reaction is
- a) 3/4
 - b) 1
 - c) 1/2
 - d) 1/3
- 9) The Zoelly turbine belongs to the category of
- a) Pressure compounded turbine
 - b) Reaction turbine
 - c) Velocity compounded turbine
 - d) Radial flow turbine
- 10) Effect of friction in nozzle for same pressure ratio causes
- a) Increases exit velocity and decrease in dryness fraction
 - b) Decrease exit velocity and increase in dryness fraction
 - c) Increases exit velocity and increase in dryness fraction
 - d) Decrease exit velocity and decrease in dryness fraction
- 11) A Carnot cycle is having an efficiency of 0.75. If the temperature of the high temperature reservoir is 727°C , what is the temperature of low temperature reservoir ?
- a) 23°C
 - b) -23°C
 - c) 0°C
 - d) 250°C
- 12) Heat and work are
- a) Intensive properties
 - b) Extensive properties
 - c) Point functions
 - d) Path functions
- 13) Steam rate of a power plant is expressed as
- a) W_p/W_t
 - b) $3600 Q(\text{KJ})/W_{\text{net}}$
 - c) $3600 (\text{Kg})/W_{\text{net}} (\text{KWh})$
 - d) None
- 14) A gas having a negative Joule-Thomson coefficient ($\mu_{\text{JT}} < 0$), when throttled, will
- a) Become cooler
 - b) Become warmer
 - c) Remain at the same temperature
 - d) Either be cooler or warmer depending on the type of gas



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

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from the remaining question from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Make suitable assumptions **wherever** necessary and state them **clearly**.
 - 4) Draw **neat** diagram **wherever** necessary.
 - 5) **Use of steam tables and Mollier diagram is allowed.**
 - 6) **Use of scientific calculator is allowed.**

SECTION – I

2. a) Write a note on available and unavailable energy. 4
b) Write complete combustion equation for pentane (C_5H_{12})_g with oxygen and air, find air, fuel ratio and calculate standard heat of reaction.
Standard heat of formation for
(C_5H_{12})_g = – 146.5 kJ/mol, (CO_2)_g = – 393.8 kJ/mol, (H_2O)_g = – 242 kJ/mol. 6
c) Write a note on Clausius inequality and what are its significance ? 4
3. a) In a Rankine cycle dry steam enters in a turbine at a pressure of 40 bar and leaves at pressure of 0.25 bar ? Compare the efficiency of Carnot and Rankine cycle. 5
b) Differentiate between Rankine and Carnot cycle. 5
c) Write the classification of boiler. 4
4. a) In a Carnot cycle heat is added at 480°C producing change in entropy of 5.65 kJ/k. The work delivered per cycle is 2300 kJ. Determine temperature at which heat is rejected. 5
b) 1000 kg/hr wet steam is generated in boiler at a pressure of 8 bar having dryness fraction 0.90. The feed water temperature is 15°C. Determine amount of coal consumed per hour if efficiency of boiler is 74% and calorific value is 32200 kJ/kg ? 5
c) What are applications of throttling process write any one in detail. 4

Set R



SECTION – II

5. a) Dry saturated steam at 2.8 bar is expanded through a convergent nozzle to 1.7 bar. The exit area is 3 cm^2 . Estimate the exit velocity and mass flow rate, assuming isentropic expansion ? **5**
- b) Derive equation for optimum inter-stage pressure for two stage compressors with perfect inter cooling. **5**
- c) Distinguish between jet condenser and surface condenser. **4**
6. a) Define steam turbine and write the classification of turbine. **5**
- b) A double acting single stage reciprocating air compressor has a piston displacement of 0.015 m^3 per revolution, operates at 500 rpm and has 5% clearance. The air is received at 1 bar and delivers at 6 bar. The compression and expansion are polytropic with $n = 1.3$. Determine volumetric efficiency and power required ? **5**
- c) What is metastable flow through nozzle and its significance ? **4**
7. a) Derive an expression for mass flow rate through nozzle. **5**
- b) A single row impulse turbine develops 132.4 kW at a blade speed of 175 m/s, using 2 kg of steam per second. Steam leaves the nozzle at 400 m/s. Velocity coefficient of blades is 0.9. Steam leaves turbine blades axially. Determine nozzle and blade angles at entry and exit ? **5**
- c) Write a note on : **4**
- i) FAD
- ii) Intercooling and aftercooling.
-



SLR-TJ – 92

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

Set	S
-----	---

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.
- 4) Make suitable assumptions **wherever** necessary and state them **clearly**.
- 5) Draw **neat** diagram **wherever** necessary.
- 6) **Use of steam stables and Mollier diagram is allowed.**
- 7) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) For a given pressure and temperature of steam, the thermal efficiency of engine with condenser as compared to that without condenser is
a) More b) Less c) Same d) None
- 2) Work input to air compressor is minimum if compression law is
a) Polytropic b) Isothermal
c) Isentropic d) None of the above
- 3) Parson's reaction steam turbine, degree of reaction is
a) 3/4 b) 1 c) 1/2 d) 1/3
- 4) The Zoelly turbine belongs to the category of
a) Pressure compounded turbine b) Reaction turbine
c) Velocity compounded turbine d) Radial flow turbine
- 5) Effect of friction in nozzle for same pressure ratio causes
a) Increases exit velocity and decrease in dryness fraction
b) Decrease exit velocity and increase in dryness fraction
c) Increases exit velocity and increase in dryness fraction
d) Decrease exit velocity and decrease in dryness fraction

P.T.O.



- 6) A Carnot cycle is having an efficiency of 0.75. If the temperature of the high temperature reservoir is 727°C , what is the temperature of low temperature reservoir ?
a) 23°C b) -23°C c) 0°C d) 250°C
- 7) Heat and work are
a) Intensive properties b) Extensive properties
c) Point functions d) Path functions
- 8) Steam rate of a power plant is expressed as
a) Wp/Wt b) 3600 Q(KJ)/Wnet
c) $3600 \text{ (Kg)/Wnet (KWh)}$ d) None
- 9) A gas having a negative Joule-Thomson coefficient ($\mu_{JT} < 0$), when throttled, will
a) Become cooler
b) Become warmer
c) Remain at the same temperature
d) Either be cooler or warmer depending on the type of gas
- 10) In Rankine cycle, regeneration results in higher efficiency because
a) Pressure inside the boiler increases
b) Heat is added before steam enters the low pressure turbine
c) Average temperature of heat addition in the boiler increases
d) Total work delivered by the turbine increases
- 11) If a closed system is undergoing an irreversible process, the entropy of the system
a) Must increase
b) Always remains constant
c) Must decrease
d) Can increase, decrease or remain constant
- 12) Cochran boiler is of type
a) Water tube b) Fire tube c) Vertical d) Internally fired
- 13) In a nozzle
a) Flow decelerates b) Flow is steady
c) Flow accelerates d) None
- 14) For same overall pressure ratio, leakage of air past the piston for multistage compression as compared to single stage compression.
a) More b) Less
c) Constant d) May be more or less
-



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

**S.E. (Mechanical) (Part – I) (Old CGPA) Examination, 2017
APPLIED THERMODYNAMICS**

Day and Date : Thursday, 14-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- 1) Solve **any two** questions from the remaining question from **each** Section.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Make suitable assumptions **wherever** necessary and state them **clearly**.
 - 4) Draw **neat** diagram **wherever** necessary.
 - 5) **Use of steam tables and Mollier diagram is allowed.**
 - 6) **Use of scientific calculator is allowed.**

SECTION – I

2. a) Write a note on available and unavailable energy. 4
b) Write complete combustion equation for pentane (C_5H_{12})_g with oxygen and air, find air, fuel ratio and calculate standard heat of reaction.
Standard heat of formation for
(C_5H_{12})_g = – 146.5 kJ/mol, (CO_2)_g = – 393.8 kJ/mol, (H_2O)_g = – 242 kJ/mol. 6
c) Write a note on Clausius inequality and what are its significance ? 4
3. a) In a Rankine cycle dry steam enters in a turbine at a pressure of 40 bar and leaves at pressure of 0.25 bar ? Compare the efficiency of Carnot and Rankine cycle. 5
b) Differentiate between Rankine and Carnot cycle. 5
c) Write the classification of boiler. 4
4. a) In a Carnot cycle heat is added at 480°C producing change in entropy of 5.65 kJ/k. The work delivered per cycle is 2300 kJ. Determine temperature at which heat is rejected. 5
b) 1000 kg/hr wet steam is generated in boiler at a pressure of 8 bar having dryness fraction 0.90. The feed water temperature is 15°C. Determine amount of coal consumed per hour if efficiency of boiler is 74% and calorific value is 32200 kJ/kg ? 5
c) What are applications of throttling process write any one in detail. 4

Set S



SECTION – II

5. a) Dry saturated steam at 2.8 bar is expanded through a convergent nozzle to 1.7 bar. The exit area is 3 cm^2 . Estimate the exit velocity and mass flow rate, assuming isentropic expansion ? **5**
- b) Derive equation for optimum inter-stage pressure for two stage compressors with perfect inter cooling. **5**
- c) Distinguish between jet condenser and surface condenser. **4**
6. a) Define steam turbine and write the classification of turbine. **5**
- b) A double acting single stage reciprocating air compressor has a piston displacement of 0.015 m^3 per revolution, operates at 500 rpm and has 5% clearance. The air is received at 1 bar and delivers at 6 bar. The compression and expansion are polytropic with $n = 1.3$. Determine volumetric efficiency and power required ? **5**
- c) What is metastable flow through nozzle and its significance ? **4**
7. a) Derive an expression for mass flow rate through nozzle. **5**
- b) A single row impulse turbine develops 132.4 kW at a blade speed of 175 m/s, using 2 kg of steam per second. Steam leaves the nozzle at 400 m/s. Velocity coefficient of blades is 0.9. Steam leaves turbine blades axially. Determine nozzle and blade angles at entry and exit ? **5**
- c) Write a note on : **4**
- i) FAD
- ii) Intercooling and aftercooling.
-



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

Set

P

**S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
5) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose correct answer :

(14×1=14)

1) $\frac{1}{D-3}x$ is equal to

a) $\frac{x}{2} + \frac{1}{8}$

b) $-\frac{x}{9} - \frac{1}{9}$

c) $e^x \frac{x}{2}$

d) $e^{-x}x$

2) The particular integral of $(D^4 - 16)y = \cos 2x$ is

a) $-\frac{x}{32} \cos 2x$

b) $-\frac{x}{32} \sin 2x$

c) $\frac{x}{32} \sin 2x$

d) $\frac{x}{32} \cos 2x$

3) The general solution of $(x+2)^2 \frac{d^2y}{dx^2} - 4(x+2) \frac{dy}{dx} + 6y = 0$ is $y =$

a) $(C_1 + C_2x) e^x$

b) $C_1(x+2)^2 + C_2(x+2)^3$

c) $(C_1x + C_2x^2) \log x$

d) $C_1(x+1) + C_2(x+2)^2$

4) The direction derivative of $\phi = x^2 - y^2 + 2z^2$ at $(1, 2, 3)$ along z-axis is

a) -4

b) 12

c) 2

d) 0

5) If $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$, then $\text{div } \vec{F} =$

a) 1

b) -1

c) 0

d) 2

P.T.O.



- 6) The solution of $q = e^{-p}$ is
 a) $z = ax + by + c$
 b) $z = a^x + b^y + c$
 c) $z = ax + e^{-ay} + c$
 d) None of the above
- 7) The solution of $ap + bq = c$ is
 a) $\phi(bx + ay, cy + bz) = 0$
 b) $\phi(ax + by, by + cz) = 0$
 c) $\phi(ay + by, ay + cz) = 0$
 d) $\phi(bx - ay, cy - bz) = 0$
- 8) If $f(z)$ is analytic inside and on a closed curve C of a simply connected region

R and if z_0 is any point within C , then $\int_C \frac{f(z)}{z - z_0} dz =$

- a) $2\pi i$
 b) $f(z_0)$
 c) $\frac{\pi}{2} f(z_0)$
 d) $2\pi i f(z_0)$
- 9) The mean and the standard deviation of a standard normal variate is
 a) 1 and 0
 b) 0 and 1
 c) 1 and 1
 d) -1 and 1
- 10) For a discrete probability distribution which of the following is true ?
 a) $-1 \leq p_i \leq 1$
 b) $0 < p_i < 1$
 c) $0 \leq p_i \leq 1$
 d) $-1 \leq p_i \leq 0$
- 11) Critical value of z for one tailed test at level of significance α is same for two tailed test at level of significance.
 a) 2α
 b) α
 c) $\frac{\alpha}{2}$
 d) α^2
- 12) If \bar{X} is the mean of random sample of size n taken from a population of size N having mean μ and standard deviation σ then mean and variance of the distribution \bar{X} are
 a) \bar{X}, σ^2
 b) $\bar{X}, \frac{\sigma^2}{n}$
 c) μ, σ^2
 d) $\mu, \frac{\sigma^2}{n}$
- 13) χ^2 - distribution is defined by
 a) $\sum \frac{(O - E)}{E}$
 b) $\sum \frac{(O - E)^2}{E}$
 c) $\sum \frac{O - E}{E^2}$
 d) $\sum \left(\frac{O - E}{E} \right)^2$
- 14) For testing hypothesis using left tailed test null hypothesis is accepted when
 a) $Z > Z_\alpha$
 b) $Z < Z_\alpha$
 c) $Z = Z_\alpha$
 d) None of these



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

**S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Solve $(D^4 + 8D^2 + 16)y = 2 \cos^2 x$. 3
b) Solve $(D^2 + 16)y = x \sin 3x$. 3
c) Solve $\frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} + 9y = \frac{e^{-3x}}{1+x^2}$. 3
3. a) Solve $(x+1)^2 \frac{d^2 y}{dx^2} + (x+1) \frac{dy}{dx} + y = 4 \cos [\log(x+1)]$. 4
- OR
- a) Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = x^2 \log x$. 4
b) Solve $(D^2 + 4D + 3)y = e^{-x}$, subject to the conditions $y(0) = 1 = \frac{dy}{dx}(0)$. 5
4. a) Solve $z(p^2 - q^2) = x - y$. 3
b) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. 3
c) Solve by using the method of separation of variables $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$. 4
5. a) Prove that $\nabla \cdot \left(r \nabla \left(\frac{1}{r^3} \right) \right) = \frac{3}{r^4}$, where $r = |\vec{r}|$ and \vec{r} is position vector. 3
b) Find a, b, c if $\vec{v} = (axy + bz^3)\hat{i} + (3x^2 + cz)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational. 3
c) Find the directional derivative of $\phi = x^2 y^2 z^2$ at $(1, 1, -1)$ in the direction of the tangent to the curve $x = e^t, y = 2 \sin t + 1, z = t - \cos t$ at $t = 0$. 3

Set P



SECTION – II

6. a) Two batches of 12 animals each are given test of inoculation. One batch was inoculated and other was not. The number of dead and surviving animals are given in the following table for both cases. Can the inoculation be regarded as effective against the disease at 5% L.O.S.

	Dead	Surviving	Total
Inoculated	2	10	12
Not inoculated	8	4	12
Total	10	14	24

(Given : The table value of χ^2 at 1D.F. = 3.81)

3

- b) If two independent random sample of sizes 15 and 8 have respectively the following means and population standard deviations.

$$\bar{x}_1 = 980, \bar{x}_2 = 1012, \sigma_1 = 75, \sigma_2 = 80.$$

Test the hypothesis that $\mu_1 = \mu_2$ at 5% L.O.S.

(Given : Critical value at 5% L.O.S. = 1.96).

3

- c) Evaluate $\int_C \frac{3z^2 + z}{z^2 - 1} dz$ where C is the circle $|z| = 2$.

3

7. a) Show that $u = \cos x \cosh y$ is a harmonic function, find its harmonic conjugate.

3

- b) Construct an analytic function whose real part is $x^4 - 6x^2y^2 + y^4$.

3

- c) Samples of three shipments A, B, C of defective items gave the following results.

	Shipment A	Shipment B	Shipment C	Total
Defective	5	8	9	21
Non-defective	35	42	51	129
Total	40	50	60	150

Test whether the proportion of defective items is same in the three shipments at 0.05 level of significance.

(Given : The table value of χ^2 at 5% L.O.S. with 2 D.F. = 5.991).

4



8. a) A candidate at an election claims that, in a locality 90% voters support him. Verify his claim if in a random sample of 400 voters from a locality, 320 supported him.
(Given : Critical value of Z at 5% L.O.S. for two tailed test = 1.96). **3**
- b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.
(Given : Critical value of Z at 1% L.O.S. for two tailed test = 2.58). **3**
- c) A firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson variate with mean 1.5. Calculate the probable number of days in a year on which demand is refused. **3**
9. a) In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5. Assuming the distribution to be normal, find the number of students getting marks
i) Between 12 and 15 ii) Above 18 iii) Below 8.
(Given : For a S.N.V. z area between z = 0 and z = 0.4 is 0.1554 that between z = 0 and z = 0.8 is 0.2881, that between z = 0 and z = 1.6 is 0.4452 and that between z = 0 and z = 2.4 is 0.4918). **5**
- b) Evaluate the integral $\int_0^{1+i} (x - y + ix^2) dz$ along the real axis from z = 0 to z = 1 and then along the line parallel to the imaginary axis from z = 1 to z = 1 + i. **4**
- OR
- b) In a certain city 400 business executives out of 500 were found to be regular drinkers. When taxes on alcohols were heavily increased it was found that out of a sample of 600 business executives 400 were drinkers. Was the difference in the proportion significant ?
(Given : Critical value of z at 5% L.O.S. for two tailed test = 1.96). **4**
-



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

Set

Q

**S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
5) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose correct answer :

(14×1=14)1) If $f(z)$ is analytic inside and on a closed curve C of a simply connected regionR and if z_0 is any point within C , then $\int_C \frac{f(z)}{z - z_0} dz =$

- a)
- $2\pi i$
- b)
- $f(z_0)$
- c)
- $\frac{\pi}{2} f(z_0)$
- d)
- $2\pi i f(z_0)$

2) The mean and the standard deviation of a standard normal variate is

- a) 1 and 0 b) 0 and 1 c) 1 and 1 d) -1 and 1

3) For a discrete probability distribution which of the following is true ?

- a)
- $-1 \leq p_i \leq 1$
- b)
- $0 < p_i < 1$
- c)
- $0 \leq p_i \leq 1$
- d)
- $-1 \leq p_i \leq 0$

4) Critical value of z for one tailed test at level of significance α is same for two tailed test at level of significance.

- a)
- 2α
- b)
- α
- c)
- $\frac{\alpha}{2}$
- d)
- α^2

5) If \bar{X} is the mean of random sample of size n taken from a population of size N having mean μ and standard deviation σ then mean and variance of the distribution \bar{X} are

- a)
- \bar{X}, σ^2
- b)
- $\bar{X}, \frac{\sigma^2}{n}$
- c)
- μ, σ^2
- d)
- $\mu, \frac{\sigma^2}{n}$

P.T.O.



6) χ^2 – distribution is defined by

a) $\sum \frac{(O-E)}{E}$ b) $\sum \frac{(O-E)^2}{E}$ c) $\sum \frac{O-E}{E^2}$ d) $\sum \left(\frac{O-E}{E} \right)^2$

7) For testing hypothesis using left tailed test null hypothesis is accepted when

a) $Z > Z_\alpha$ b) $Z < Z_\alpha$ c) $Z = Z_\alpha$ d) None of these

8) $\frac{1}{D-3} x$ is equal to

a) $\frac{x}{2} + \frac{1}{8}$ b) $-\frac{x}{9} - \frac{1}{9}$ c) $e^x \frac{x}{2}$ d) $e^{-x} x$

9) The particular integral of $(D^4 - 16) y = \cos 2x$ is

a) $-\frac{x}{32} \cos 2x$ b) $-\frac{x}{32} \sin 2x$ c) $\frac{x}{32} \sin 2x$ d) $\frac{x}{32} \cos 2x$

10) The general solution of $(x+2)^2 \frac{d^2y}{dx^2} - 4(x+2) \frac{dy}{dx} + 6y = 0$ is $y =$

a) $(C_1 + C_2x) e^x$ b) $C_1(x+2)^2 + C_2(x+2)^3$
 c) $(C_1x + C_2x^2) \log x$ d) $C_1(x+1) + C_2(x+2)^2$

11) The direction derivative of $\phi = x^2 - y^2 + 2z^2$ at $(1, 2, 3)$ along z-axis is

a) -4 b) 12 c) 2 d) 0

12) If $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$, then $\text{div } \vec{F} =$

a) 1 b) -1 c) 0 d) 2

13) The solution of $q = e^{-p}$ is

a) $z = ax + by + c$ b) $z = a^x + b^y + c$
 c) $z = ax + e^{-ay} + c$ d) None of the above

14) The solution of $ap + bq = c$ is

a) $\phi (bx + ay, cy + bz) = 0$ b) $\phi (ax + by, by + cz) = 0$
 c) $\phi (ay + by, ay + cz) = 0$ d) $\phi (bx - ay, cy - bz) = 0$



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

**S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Solve $(D^4 + 8D^2 + 16)y = 2 \cos^2 x$. 3
b) Solve $(D^2 + 16)y = x \sin 3x$. 3
c) Solve $\frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} + 9y = \frac{e^{-3x}}{1+x^2}$. 3
3. a) Solve $(x+1)^2 \frac{d^2 y}{dx^2} + (x+1) \frac{dy}{dx} + y = 4 \cos [\log(x+1)]$. 4
- OR
- a) Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = x^2 \log x$. 4
b) Solve $(D^2 + 4D + 3)y = e^{-x}$, subject to the conditions $y(0) = 1 = \frac{dy}{dx}(0)$. 5
4. a) Solve $z(p^2 - q^2) = x - y$. 3
b) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. 3
c) Solve by using the method of separation of variables $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$. 4
5. a) Prove that $\nabla \cdot \left(r \nabla \left(\frac{1}{r^3} \right) \right) = \frac{3}{r^4}$, where $r = |\vec{r}|$ and \vec{r} is position vector. 3
b) Find a, b, c if $\vec{v} = (axy + bz^3)\hat{i} + (3x^2 + cz)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational. 3
c) Find the directional derivative of $\phi = x^2 y^2 z^2$ at $(1, 1, -1)$ in the direction of the tangent to the curve $x = e^t, y = 2 \sin t + 1, z = t - \cos t$ at $t = 0$. 3

Set Q



SECTION – II

6. a) Two batches of 12 animals each are given test of inoculation. One batch was inoculated and other was not. The number of dead and surviving animals are given in the following table for both cases. Can the inoculation be regarded as effective against the disease at 5% L.O.S.

	Dead	Surviving	Total
Inoculated	2	10	12
Not inoculated	8	4	12
Total	10	14	24

(Given : The table value of χ^2 at 1D.F. = 3.81)

3

- b) If two independent random sample of sizes 15 and 8 have respectively the following means and population standard deviations.

$$\bar{x}_1 = 980, \bar{x}_2 = 1012, \sigma_1 = 75, \sigma_2 = 80.$$

Test the hypothesis that $\mu_1 = \mu_2$ at 5% L.O.S.

(Given : Critical value at 5% L.O.S. = 1.96).

3

- c) Evaluate $\int_C \frac{3z^2 + z}{z^2 - 1} dz$ where C is the circle $|z| = 2$.

3

7. a) Show that $u = \cos x \cosh y$ is a harmonic function, find its harmonic conjugate. 3
 b) Construct an analytic function whose real part is $x^4 - 6x^2y^2 + y^4$. 3
 c) Samples of three shipments A, B, C of defective items gave the following results.

	Shipment A	Shipment B	Shipment C	Total
Defective	5	8	9	21
Non-defective	35	42	51	129
Total	40	50	60	150

Test whether the proportion of defective items is same in the three shipments at 0.05 level of significance.

(Given : The table value of χ^2 at 5% L.O.S. with 2 D.F. = 5.991).

4



8. a) A candidate at an election claims that, in a locality 90% voters support him. Verify his claim if in a random sample of 400 voters from a locality, 320 supported him.
(Given : Critical value of Z at 5% L.O.S. for two tailed test = 1.96). **3**
- b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.
(Given : Critical value of Z at 1% L.O.S. for two tailed test = 2.58). **3**
- c) A firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson variate with mean 1.5. Calculate the probable number of days in a year on which demand is refused. **3**
9. a) In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5. Assuming the distribution to be normal, find the number of students getting marks
i) Between 12 and 15 ii) Above 18 iii) Below 8.
(Given : For a S.N.V. z area between z = 0 and z = 0.4 is 0.1554 that between z = 0 and z = 0.8 is 0.2881, that between z = 0 and z = 1.6 is 0.4452 and that between z = 0 and z = 2.4 is 0.4918). **5**
- b) Evaluate the integral $\int_0^{1+i} (x - y + ix^2) dz$ along the real axis from z = 0 to z = 1 and then along the line parallel to the imaginary axis from z = 1 to z = 1 + i. **4**
- OR
- b) In a certain city 400 business executives out of 500 were found to be regular drinkers. When taxes on alcohols were heavily increased it was found that out of a sample of 600 business executives 400 were drinkers. Was the difference in the proportion significant ?
(Given : Critical value of z at 5% L.O.S. for two tailed test = 1.96). **4**
-



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

Set

R

S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
5) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose correct answer :

(14×1=14)

- 1) If $\vec{F} = (y + z)\hat{i} + (z + x)\hat{j} + (x + y)\hat{k}$, then $\text{div } \vec{F} =$
a) 1 b) -1 c) 0 d) 2
- 2) The solution of $q = e^{-p}$ is
a) $z = ax + by + c$ b) $z = a^x + b^y + c$
c) $z = ax + e^{-ay} + c$ d) None of the above
- 3) The solution of $ap + bq = c$ is
a) $\phi (bx + ay, cy + bz) = 0$ b) $\phi (ax + by, by + cz) = 0$
c) $\phi (ay + by, ay + cz) = 0$ d) $\phi (bx - ay, cy - bz) = 0$
- 4) If $f(z)$ is analytic inside and on a closed curve C of a simply connected region R and if z_0 is any point within C , then $\int_C \frac{f(z)}{z - z_0} dz =$
a) $2\pi i$ b) $f(z_0)$ c) $\frac{\pi}{2} f(z_0)$ d) $2\pi i f(z_0)$
- 5) The mean and the standard deviation of a standard normal variate is
a) 1 and 0 b) 0 and 1 c) 1 and 1 d) -1 and 1
- 6) For a discrete probability distribution which of the following is true ?
a) $-1 \leq p_i \leq 1$ b) $0 < p_i < 1$ c) $0 \leq p_i \leq 1$ d) $-1 \leq p_i \leq 0$

P.T.O.



7) Critical value of z for one tailed test at level of significance α is same for two tailed test at level of significance.

- a) 2α b) α c) $\frac{\alpha}{2}$ d) α^2

8) If \bar{X} is the mean of random sample of size n taken from a population of size N having mean μ and standard deviation σ then mean and variance of the distribution \bar{X} are

- a) \bar{X}, σ^2 b) $\bar{X}, \frac{\sigma^2}{n}$ c) μ, σ^2 d) $\mu, \frac{\sigma^2}{n}$

9) χ^2 – distribution is defined by

- a) $\sum \frac{(O-E)}{E}$ b) $\sum \frac{(O-E)^2}{E}$ c) $\sum \frac{O-E}{E^2}$ d) $\sum \left(\frac{O-E}{E} \right)^2$

10) For testing hypothesis using left tailed test null hypothesis is accepted when

- a) $Z > Z_\alpha$ b) $Z < Z_\alpha$ c) $Z = Z_\alpha$ d) None of these

11) $\frac{1}{D-3} x$ is equal to

- a) $\frac{x}{2} + \frac{1}{8}$ b) $-\frac{x}{9} - \frac{1}{9}$ c) $e^x \frac{x}{2}$ d) $e^{-x} x$

12) The particular integral of $(D^4 - 16) y = \cos 2x$ is

- a) $-\frac{x}{32} \cos 2x$ b) $-\frac{x}{32} \sin 2x$ c) $\frac{x}{32} \sin 2x$ d) $\frac{x}{32} \cos 2x$

13) The general solution of $(x+2)^2 \frac{d^2y}{dx^2} - 4(x+2) \frac{dy}{dx} + 6y = 0$ is $y =$

- a) $(C_1 + C_2x) e^x$ b) $C_1(x+2)^2 + C_2(x+2)^3$
 c) $(C_1x + C_2x^2) \log x$ d) $C_1(x+1) + C_2(x+2)^2$

14) The direction derivative of $\phi = x^2 - y^2 + 2z^2$ at $(1, 2, 3)$ along z -axis is

- a) -4 b) 12 c) 2 d) 0



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

**S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Solve $(D^4 + 8D^2 + 16)y = 2 \cos^2 x$. **3**
 b) Solve $(D^2 + 16)y = x \sin 3x$. **3**
 c) Solve $\frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} + 9y = \frac{e^{-3x}}{1+x^2}$. **3**
3. a) Solve $(x+1)^2 \frac{d^2 y}{dx^2} + (x+1) \frac{dy}{dx} + y = 4 \cos [\log(x+1)]$. **4**
- OR
- a) Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = x^2 \log x$. **4**
 b) Solve $(D^2 + 4D + 3)y = e^{-x}$, subject to the conditions $y(0) = 1 = \frac{dy}{dx}(0)$. **5**
4. a) Solve $z(p^2 - q^2) = x - y$. **3**
 b) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. **3**
 c) Solve by using the method of separation of variables $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$. **4**
5. a) Prove that $\nabla \cdot \left(r \nabla \left(\frac{1}{r^3} \right) \right) = \frac{3}{r^4}$, where $r = |\vec{r}|$ and \vec{r} is position vector. **3**
 b) Find a, b, c if $\vec{v} = (axy + bz^3)\hat{x} + (3x^2 + cz)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational. **3**
 c) Find the directional derivative of $\phi = x^2 y^2 z^2$ at $(1, 1, -1)$ in the direction of the tangent to the curve $x = e^t, y = 2 \sin t + 1, z = t - \cos t$ at $t = 0$. **3**

Set R



SECTION – II

6. a) Two batches of 12 animals each are given test of inoculation. One batch was inoculated and other was not. The number of dead and surviving animals are given in the following table for both cases. Can the inoculation be regarded as effective against the disease at 5% L.O.S.

	Dead	Surviving	Total
Inoculated	2	10	12
Not inoculated	8	4	12
Total	10	14	24

(Given : The table value of χ^2 at 1D.F. = 3.81)

3

- b) If two independent random sample of sizes 15 and 8 have respectively the following means and population standard deviations.

$$\bar{x}_1 = 980, \bar{x}_2 = 1012, \sigma_1 = 75, \sigma_2 = 80.$$

Test the hypothesis that $\mu_1 = \mu_2$ at 5% L.O.S.

(Given : Critical value at 5% L.O.S. = 1.96).

3

- c) Evaluate $\int_C \frac{3z^2 + z}{z^2 - 1} dz$ where C is the circle $|z| = 2$.

3

7. a) Show that $u = \cos x \cosh y$ is a harmonic function, find its harmonic conjugate.

3

- b) Construct an analytic function whose real part is $x^4 - 6x^2y^2 + y^4$.

3

- c) Samples of three shipments A, B, C of defective items gave the following results.

	Shipment A	Shipment B	Shipment C	Total
Defective	5	8	9	21
Non-defective	35	42	51	129
Total	40	50	60	150

Test whether the proportion of defective items is same in the three shipments at 0.05 level of significance.

(Given : The table value of χ^2 at 5% L.O.S. with 2 D.F. = 5.991).

4



8. a) A candidate at an election claims that, in a locality 90% voters support him. Verify his claim if in a random sample of 400 voters from a locality, 320 supported him.
(Given : Critical value of Z at 5% L.O.S. for two tailed test = 1.96). **3**
- b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.
(Given : Critical value of Z at 1% L.O.S. for two tailed test = 2.58). **3**
- c) A firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson variate with mean 1.5. Calculate the probable number of days in a year on which demand is refused. **3**
9. a) In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5. Assuming the distribution to be normal, find the number of students getting marks
i) Between 12 and 15 ii) Above 18 iii) Below 8.
(Given : For a S.N.V. z area between z = 0 and z = 0.4 is 0.1554 that between z = 0 and z = 0.8 is 0.2881, that between z = 0 and z = 1.6 is 0.4452 and that between z = 0 and z = 2.4 is 0.4918). **5**
- b) Evaluate the integral $\int_0^{1+i} (x - y + ix^2) dz$ along the real axis from z = 0 to z = 1 and then along the line parallel to the imaginary axis from z = 1 to z = 1 + i. **4**
- OR
- b) In a certain city 400 business executives out of 500 were found to be regular drinkers. When taxes on alcohols were heavily increased it was found that out of a sample of 600 business executives 400 were drinkers. Was the difference in the proportion significant ?
(Given : Critical value of z at 5% L.O.S. for two tailed test = 1.96). **4**
-



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

Set	S
-----	---

S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.
4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
5) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose correct answer :

(14×1=14)

- 1) For a discrete probability distribution which of the following is true ?
a) $-1 \leq p_i \leq 1$ b) $0 < p_i < 1$ c) $0 \leq p_i \leq 1$ d) $-1 \leq p_i \leq 0$
- 2) Critical value of z for one tailed test at level of significance α is same for two tailed test at level of significance.
a) 2α b) α c) $\frac{\alpha}{2}$ d) α^2
- 3) If \bar{X} is the mean of random sample of size n taken from a population of size N having mean μ and standard deviation σ then mean and variance of the distribution \bar{X} are
a) \bar{X}, σ^2 b) $\bar{X}, \frac{\sigma^2}{n}$ c) μ, σ^2 d) $\mu, \frac{\sigma^2}{n}$
- 4) χ^2 – distribution is defined by
a) $\sum \frac{(O-E)}{E}$ b) $\sum \frac{(O-E)^2}{E}$ c) $\sum \frac{O-E}{E^2}$ d) $\sum \left(\frac{O-E}{E} \right)^2$
- 5) For testing hypothesis using left tailed test null hypothesis is accepted when
a) $Z > Z_\alpha$ b) $Z < Z_\alpha$ c) $Z = Z_\alpha$ d) None of these



6) $\frac{1}{D-3}x$ is equal to

- a) $\frac{x}{2} + \frac{1}{8}$ b) $-\frac{x}{9} - \frac{1}{9}$ c) $e^x \frac{x}{2}$ d) $e^{-x}x$

7) The particular integral of $(D^4 - 16)y = \cos 2x$ is

- a) $-\frac{x}{32}\cos 2x$ b) $-\frac{x}{32}\sin 2x$ c) $\frac{x}{32}\sin 2x$ d) $\frac{x}{32}\cos 2x$

8) The general solution of $(x+2)^2 \frac{d^2y}{dx^2} - 4(x+2) \frac{dy}{dx} + 6y = 0$ is $y =$

- a) $(C_1 + C_2x)e^x$ b) $C_1(x+2)^2 + C_2(x+2)^3$
 c) $(C_1x + C_2x^2)\log x$ d) $C_1(x+1) + C_2(x+2)^2$

9) The direction derivative of $\phi = x^2 - y^2 + 2z^2$ at $(1, 2, 3)$ along z-axis is

- a) -4 b) 12 c) 2 d) 0

10) If $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$, then $\text{div } \vec{F} =$

- a) 1 b) -1 c) 0 d) 2

11) The solution of $q = e^{-p}$ is

- a) $z = ax + by + c$ b) $z = a^x + b^y + c$
 c) $z = ax + e^{-a}y + c$ d) None of the above

12) The solution of $ap + bq = c$ is

- a) $\phi(bx + ay, cy + bz) = 0$ b) $\phi(ax + by, by + cz) = 0$
 c) $\phi(ay + by, ay + cz) = 0$ d) $\phi(bx - ay, cy - bz) = 0$

13) If $f(z)$ is analytic inside and on a closed curve C of a simply connected region

R and if z_0 is any point within C , then $\int_C \frac{f(z)}{z - z_0} dz =$

- a) $2\pi i$ b) $f(z_0)$ c) $\frac{\pi}{2}f(z_0)$ d) $2\pi i f(z_0)$

14) The mean and the standard deviation of a standard normal variate is

- a) 1 and 0 b) 0 and 1 c) 1 and 1 d) -1 and 1



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

**S.E. (Part – I) (Mechanical) (Old CGPA) Examination, 2017
ENGINEERING MATHEMATICS – III**

Day and Date : Saturday, 16-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Attempt **any three** questions from **each** Section.
2) **Use** of calculator and statistical tables are **allowed**.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Solve $(D^4 + 8D^2 + 16)y = 2 \cos^2 x$. **3**
 b) Solve $(D^2 + 16)y = x \sin 3x$. **3**
 c) Solve $\frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} + 9y = \frac{e^{-3x}}{1+x^2}$. **3**
3. a) Solve $(x+1)^2 \frac{d^2 y}{dx^2} + (x+1) \frac{dy}{dx} + y = 4 \cos [\log(x+1)]$. **4**
- OR
- a) Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = x^2 \log x$. **4**
 b) Solve $(D^2 + 4D + 3)y = e^{-x}$, subject to the conditions $y(0) = 1 = \frac{dy}{dx}(0)$. **5**
4. a) Solve $z(p^2 - q^2) = x - y$. **3**
 b) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. **3**
 c) Solve by using the method of separation of variables $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$. **4**
5. a) Prove that $\nabla \cdot \left(r \nabla \left(\frac{1}{r^3} \right) \right) = \frac{3}{r^4}$, where $r = |\vec{r}|$ and \vec{r} is position vector. **3**
 b) Find a, b, c if $\vec{v} = (axy + bz^3)\hat{x} + (3x^2 + cz)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational. **3**
 c) Find the directional derivative of $\phi = x^2 y^2 z^2$ at $(1, 1, -1)$ in the direction of the tangent to the curve $x = e^t, y = 2 \sin t + 1, z = t - \cos t$ at $t = 0$. **3**

Set S



SECTION – II

6. a) Two batches of 12 animals each are given test of inoculation. One batch was inoculated and other was not. The number of dead and surviving animals are given in the following table for both cases. Can the inoculation be regarded as effective against the disease at 5% L.O.S.

	Dead	Surviving	Total
Inoculated	2	10	12
Not inoculated	8	4	12
Total	10	14	24

(Given : The table value of χ^2 at 1D.F. = 3.81)

3

- b) If two independent random sample of sizes 15 and 8 have respectively the following means and population standard deviations.

$$\bar{x}_1 = 980, \bar{x}_2 = 1012, \sigma_1 = 75, \sigma_2 = 80.$$

Test the hypothesis that $\mu_1 = \mu_2$ at 5% L.O.S.

(Given : Critical value at 5% L.O.S. = 1.96).

3

- c) Evaluate $\int_C \frac{3z^2 + z}{z^2 - 1} dz$ where C is the circle $|z| = 2$.

3

7. a) Show that $u = \cos x \cosh y$ is a harmonic function, find its harmonic conjugate.

3

- b) Construct an analytic function whose real part is $x^4 - 6x^2y^2 + y^4$.

3

- c) Samples of three shipments A, B, C of defective items gave the following results.

	Shipment A	Shipment B	Shipment C	Total
Defective	5	8	9	21
Non-defective	35	42	51	129
Total	40	50	60	150

Test whether the proportion of defective items is same in the three shipments at 0.05 level of significance.

(Given : The table value of χ^2 at 5% L.O.S. with 2 D.F. = 5.991).

4



8. a) A candidate at an election claims that, in a locality 90% voters support him. Verify his claim if in a random sample of 400 voters from a locality, 320 supported him.
(Given : Critical value of Z at 5% L.O.S. for two tailed test = 1.96). **3**
- b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.
(Given : Critical value of Z at 1% L.O.S. for two tailed test = 2.58). **3**
- c) A firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson variate with mean 1.5. Calculate the probable number of days in a year on which demand is refused. **3**
9. a) In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5. Assuming the distribution to be normal, find the number of students getting marks
i) Between 12 and 15 ii) Above 18 iii) Below 8.
(Given : For a S.N.V. z area between z = 0 and z = 0.4 is 0.1554 that between z = 0 and z = 0.8 is 0.2881, that between z = 0 and z = 1.6 is 0.4452 and that between z = 0 and z = 2.4 is 0.4918). **5**
- b) Evaluate the integral $\int_0^{1+i} (x - y + ix^2) dz$ along the real axis from z = 0 to z = 1 and then along the line parallel to the imaginary axis from z = 1 to z = 1 + i. **4**
- OR
- b) In a certain city 400 business executives out of 500 were found to be regular drinkers. When taxes on alcohols were heavily increased it was found that out of a sample of 600 business executives 400 were drinkers. Was the difference in the proportion significant ?
(Given : Critical value of z at 5% L.O.S. for two tailed test = 1.96). **4**
-



SLR-TJ – 94

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

Set	P
-----	----------

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 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) **Full marks will be given to correct answer only.**
 - 4) **No negative or partial marking.**
 - 5) **All objective questions are compulsory.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. **Type 1** : Match the following pairs :

(1×3=3)

- | | |
|---------------------------------|---|
| a) Cylindrical grinding machine | p) The work rotates and tool is stationary |
| b) Planning machine | q) The tool rotates and work in stationary |
| c) Lathe machine | r) The work and tool both rotates |
| | s) The tool is stationary and work reciprocates |

Type 2 : Identify the correct statement :

(2×1=2)

- 1) a) In the set over tail stock taper turning method the tail stock is offset by the set screw.
- b) During set over tail stock taper turning operation the tool is pass parallel to the axis of the machine.
 - a) Statement a) is correct and statement b) is incorrect
 - b) Statement a) is incorrect and statement b) correct
 - c) Statement a) and b) both are correct
 - d) Statement a) and b) both are incorrect

P.T.O.



- 2) a) The EDM machine is best suitable for operation in ceramic materials. **(2×1=2)**
b) In EDM machine the dielectric fluid is used to dip the workpiece during the operation.
a) Statement a) is correct and statement b) is incorrect
b) Statement a) is incorrect and statement b) correct
c) Statement a) and b) both are correct
d) Statement a) and b) both are incorrect

Type 3 : Multiple correct answers. **(2×1=2)**

- 1) Tapping operation can be performed in
a) Drilling machine
b) Lathe machine
c) Milling machine
d) Boring machine

OR

- 2) External threading can be performed by **(2×1=2)**
a) Single point tool
b) Knurling tool
c) Form tool
d) Multiple edge cutter

Type 4 : Classical objective question : **(1×5=5)**

- 1) End mill cutters are used in
a) Lathe machine
b) Vertical milling machine
c) Horizontal milling machine
d) Slotting machine
- 2) The direction of rotation of tool is against to the motion of the work in
a) Climb milling
b) Form milling
c) Up milling
d) None of these
- 3) Broaching operation will be performed in
a) Single stroke
b) Multiple stroke
c) Both
d) None of above
- 4) In the grinding wheel specification, WC20M6V18 what V stands for ?
a) Abrasive
b) Structure
c) Grade
d) Bond
- 5) Gear shaving is the process of
a) Gear generation
b) Gear parting
c) Gear finishing
d) All the above
-



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

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

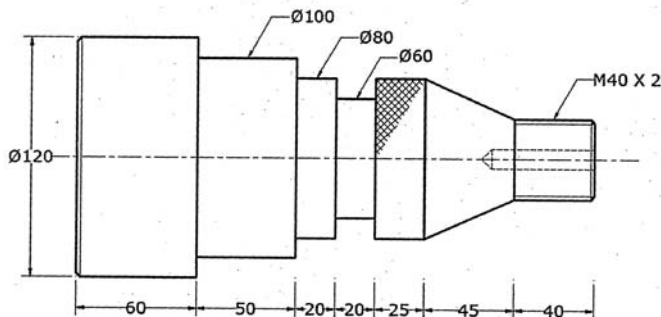
Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** i) Attempt **any three** questions from **each** Sections.
ii) **Draw** the appropriate sketches **wherever** required.
iii) **Assume** suitable data **if** required.

SECTION – I

- 2. a) List the different types of accessories used on Lathe machine, briefly explain three jaw Chuck. 5
- b) Explain the working and construction of pillar type drilling machine. 4
- 3. a) Write the difference between Steady rest and follower rest. 4
- b) Explain the construction and working of slotting machine. 5
- 4. a) Explain the working and construction of Electric Discharge Machine (EDM), with its advantages and disadvantages. 5
- b) For a given figure write the sequence of operation and work layout. 5





5. Write short note on **any three** : **(3×3=9)**
- a) Job holding devices used on drilling machine.
 - b) Difference between Capstan and turret lathe machine
 - c) Classification of manufacturing process.
 - d) Specification of Lathe machine.

SECTION – II

6. a) Explain the construction and working principles of Horizontal type boring machine with the appropriate sketch. **5**
- b) Briefly explain UP milling and Down Milling process. **4**
7. a) Explain the construction and working of gear Hobbing machine. **5**
- b) Explain the construction and working of surface grinding machine. **5**
8. a) Explain simple indexing method, divide the periphery of a cylinder into 56 equal parts by simple indexing method. **5**
- Plate 1 : 15, 16, 17, 18, 19, 20
- Plate 2 : 21, 23, 27, 29, 31, 33
- Plate 3 : 37, 39, 41, 43, 47, 49
- b) Explain the following terms, Glazing, Loading, Dressing and Truing. **4**
9. Write the short notes on **any three** : **(3×3=9)**
- a) Operation on Broaching Machine.
 - b) Introduction to CNC Machine.
 - c) Classification of milling machines.
 - d) Jig boring machine.
-



SLR-TJ – 94

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

Set	Q
-----	---

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 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) **Full marks will be given to correct answer only.**
 - 4) **No negative or partial marking.**
 - 5) **All objective questions are compulsory.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. **Type 1** : Multiple correct answers. **(2×1=2)**

- 1) Tapping operation can be performed in
 - a) Drilling machine
 - b) Lathe machine
 - c) Milling machine
 - d) Boring machine

OR

- 2) External threading can be performed by **(2×1=2)**
 - a) Single point tool
 - b) Knurling tool
 - c) Form tool
 - d) Multiple edge cutter

Type 2 : Classical objective question : **(1×5=5)**

- 1) End mill cutters are used in
 - a) Lathe machine
 - b) Vertical milling machine
 - c) Horizontal milling machine
 - d) Slotting machine
- 2) The direction of rotation of tool is against to the motion of the work in
 - a) Climb milling
 - b) Form milling
 - c) Up milling
 - d) None of these
- 3) Broaching operation will be performed in
 - a) Single stroke
 - b) Multiple stroke
 - c) Both
 - d) None of above

P.T.O.



- 4) In the grinding wheel specification, WC20M6V18 what V stands for ?
- a) Abrasive
 - b) Structure
 - c) Grade
 - d) Bond
- 5) Gear shaving is the process of
- a) Gear generation
 - b) Gear parting
 - c) Gear finishing
 - d) All the above

Type 3 : Match the following pairs :

(1×3=3)

- a) Cylindrical grinding machine
- b) Planning machine
- c) Lathe machine
- p) The work rotates and tool is stationary
- q) The tool rotates and work in stationary
- r) The work and tool both rotates
- s) The tool is stationary and work reciprocates

Type 4 : Identify the correct statement :

(2×1=2)

- 1) a) In the set over tail stock taper turning method the tail stock is offset by the set screw.
- b) During set over tail stock taper turning operation the tool is pass parallel to the axis of the machine.
- a) Statement a) is correct and statement b) is incorrect
 - b) Statement a) is incorrect and statement b) correct
 - c) Statement a) and b) both are correct
 - d) Statement a) and b) both are incorrect
- 2) a) The EDM machine is best suitable for operation in ceramic materials. **(2×1=2)**
- b) In EDM machine the dielectric fluid is used to dip the workpiece during the operation.
- a) Statement a) is correct and statement b) is incorrect
 - b) Statement a) is incorrect and statement b) correct
 - c) Statement a) and b) both are correct
 - d) Statement a) and b) both are incorrect
-



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

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

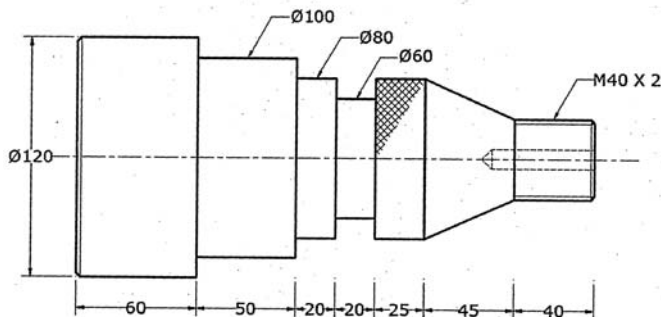
Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** i) Attempt **any three** questions from **each** Sections.
ii) **Draw** the appropriate sketches **wherever** required.
iii) **Assume** suitable data **if** required.

SECTION – I

2. a) List the different types of accessories used on Lathe machine, briefly explain three jaw Chuck. 5
b) Explain the working and construction of pillar type drilling machine. 4
3. a) Write the difference between Steady rest and follower rest. 4
b) Explain the construction and working of slotting machine. 5
4. a) Explain the working and construction of Electric Discharge Machine (EDM), with its advantages and disadvantages. 5
b) For a given figure write the sequence of operation and work layout. 5





5. Write short note on **any three** : **(3×3=9)**
- a) Job holding devices used on drilling machine.
 - b) Difference between Capstan and turret lathe machine
 - c) Classification of manufacturing process.
 - d) Specification of Lathe machine.

SECTION – II

6. a) Explain the construction and working principles of Horizontal type boring machine with the appropriate sketch. **5**
- b) Briefly explain UP milling and Down Milling process. **4**
7. a) Explain the construction and working of gear Hobbing machine. **5**
- b) Explain the construction and working of surface grinding machine. **5**
8. a) Explain simple indexing method, divide the periphery of a cylinder into 56 equal parts by simple indexing method. **5**
- Plate 1 : 15, 16, 17, 18, 19, 20
- Plate 2 : 21, 23, 27, 29, 31, 33
- Plate 3 : 37, 39, 41, 43, 47, 49
- b) Explain the following terms, Glazing, Loading, Dressing and Truing. **4**
9. Write the short notes on **any three** : **(3×3=9)**
- a) Operation on Broaching Machine.
 - b) Introduction to CNC Machine.
 - c) Classification of milling machines.
 - d) Jig boring machine.
-



SLR-TJ – 94

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

Set	R
-----	----------

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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) **Full marks will be given to correct answer only.**
4) **No negative or partial marking.**
5) **All objective questions are compulsory.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. **Type 1** : Identify the correct statement : **(2×1=2)**

- 1) a) In the set over tail stock taper turning method the tail stock is offset by the set screw.
b) During set over tail stock taper turning operation the tool is pass parallel to the axis of the machine.
a) Statement a) is correct and statement b) is incorrect
b) Statement a) is incorrect and statement b) correct
c) Statement a) and b) both are correct
d) Statement a) and b) both are incorrect
- 2) a) The EDM machine is best suitable for operation in ceramic materials. **(2×1=2)**
b) In EDM machine the dielectric fluid is used to dip the workpiece during the operation.
a) Statement a) is correct and statement b) is incorrect
b) Statement a) is incorrect and statement b) correct
c) Statement a) and b) both are correct
d) Statement a) and b) both are incorrect

P.T.O.



Type 2 : Multiple correct answers.

(2×1=2)

- 1) Tapping operation can be performed in
- a) Drilling machine
 - b) Lathe machine
 - c) Milling machine
 - d) Boring machine

OR

- 2) External threading can be performed by **(2×1=2)**
- a) Single point tool
 - b) Knurling tool
 - c) Form tool
 - d) Multiple edge cutter

Type 3 : Classical objective question :

(1×5=5)

- 1) End mill cutters are used in
- a) Lathe machine
 - b) Vertical milling machine
 - c) Horizontal milling machine
 - d) Slotting machine
- 2) The direction of rotation of tool is against to the motion of the work in
- a) Climb milling
 - b) Form milling
 - c) Up milling
 - d) None of these
- 3) Broaching operation will be performed in
- a) Single stroke
 - b) Multiple stroke
 - c) Both
 - d) None of above
- 4) In the grinding wheel specification, WC20M6V18 what V stands for ?
- a) Abrasive
 - b) Structure
 - c) Grade
 - d) Bond
- 5) Gear shaving is the process of
- a) Gear generation
 - b) Gear parting
 - c) Gear finishing
 - d) All the above

Type 4 : Match the following pairs :

(1×3=3)

- a) Cylindrical grinding machine
 - b) Planning machine
 - c) Lathe machine
 - p) The work rotates and tool is stationary
 - q) The tool rotates and work in stationary
 - r) The work and tool both rotates
 - s) The tool is stationary and work reciprocates
-



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

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

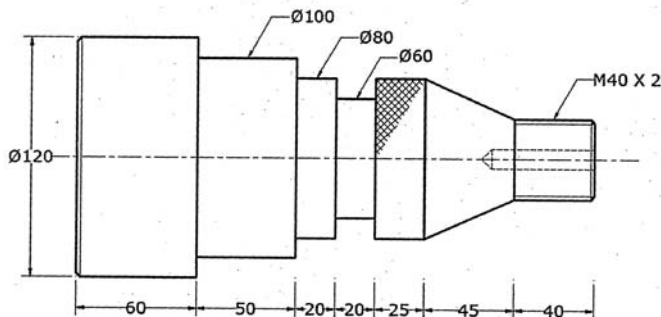
Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** i) Attempt **any three** questions from **each** Sections.
ii) **Draw** the appropriate sketches **wherever** required.
iii) **Assume** suitable data **if** required.

SECTION – I

2. a) List the different types of accessories used on Lathe machine, briefly explain three jaw Chuck. 5
b) Explain the working and construction of pillar type drilling machine. 4
3. a) Write the difference between Steady rest and follower rest. 4
b) Explain the construction and working of slotting machine. 5
4. a) Explain the working and construction of Electric Discharge Machine (EDM), with its advantages and disadvantages. 5
b) For a given figure write the sequence of operation and work layout. 5





5. Write short note on **any three** : **(3×3=9)**
- a) Job holding devices used on drilling machine.
 - b) Difference between Capstan and turret lathe machine
 - c) Classification of manufacturing process.
 - d) Specification of Lathe machine.

SECTION – II

6. a) Explain the construction and working principles of Horizontal type boring machine with the appropriate sketch. **5**
- b) Briefly explain UP milling and Down Milling process. **4**
7. a) Explain the construction and working of gear Hobbing machine. **5**
- b) Explain the construction and working of surface grinding machine. **5**
8. a) Explain simple indexing method, divide the periphery of a cylinder into 56 equal parts by simple indexing method. **5**
- Plate 1 : 15, 16, 17, 18, 19, 20
- Plate 2 : 21, 23, 27, 29, 31, 33
- Plate 3 : 37, 39, 41, 43, 47, 49
- b) Explain the following terms, Glazing, Loading, Dressing and Truing. **4**
9. Write the short notes on **any three** : **(3×3=9)**
- a) Operation on Broaching Machine.
 - b) Introduction to CNC Machine.
 - c) Classification of milling machines.
 - d) Jig boring machine.
-



SLR-TJ – 94

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

Set	S
-----	----------

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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) **Full marks will be given to correct answer only.**
4) **No negative or partial marking.**
5) **All objective questions are compulsory.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. **Type 1** : Classical objective question :

(1×5=5)

- 1) End mill cutters are used in
 - a) Lathe machine
 - b) Vertical milling machine
 - c) Horizontal milling machine
 - d) Slotting machine
- 2) The direction of rotation of tool is against to the motion of the work in
 - a) Climb milling
 - b) Form milling
 - c) Up milling
 - d) None of these
- 3) Broaching operation will be performed in
 - a) Single stroke
 - b) Multiple stroke
 - c) Both
 - d) None of above
- 4) In the grinding wheel specification, WC20M6V18 what V stands for ?
 - a) Abrasive
 - b) Structure
 - c) Grade
 - d) Bond
- 5) Gear shaving is the process of
 - a) Gear generation
 - b) Gear parting
 - c) Gear finishing
 - d) All the above

P.T.O.



Type 2 : Match the following pairs :

(1×3=3)

- | | |
|---------------------------------|---|
| a) Cylindrical grinding machine | p) The work rotates and tool is stationary |
| b) Planning machine | q) The tool rotates and work in stationary |
| c) Lathe machine | r) The work and tool both rotates |
| | s) The tool is stationary and work reciprocates |

Type 3 : Identify the correct statement :

(2×1=2)

- 1) a) In the set over tail stock taper turning method the tail stock is offset by the set screw.
- b) During set over tail stock taper turning operation the tool is pass parallel to the axis of the machine.
 - a) Statement a) is correct and statement b) is incorrect
 - b) Statement a) is incorrect and statement b) correct
 - c) Statement a) and b) both are correct
 - d) Statement a) and b) both are incorrect
- 2) a) The EDM machine is best suitable for operation in ceramic materials. **(2×1=2)**
- b) In EDM machine the dielectric fluid is used to dip the workpiece during the operation.
 - a) Statement a) is correct and statement b) is incorrect
 - b) Statement a) is incorrect and statement b) correct
 - c) Statement a) and b) both are correct
 - d) Statement a) and b) both are incorrect

Type 4 : Multiple correct answers.

(2×1=2)

- 1) Tapping operation can be performed in

a) Drilling machine	b) Lathe machine
c) Milling machine	d) Boring machine

OR

- 2) External threading can be performed by **(2×1=2)**

a) Single point tool	b) Knurling tool
c) Form tool	d) Multiple edge cutter



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

**S.E. (Mech.) (Part – I) (Old-CGPA) Examination, 2017
MACHINE TOOLS AND PROCESSES**

Day and Date : Tuesday, 19-12-2017

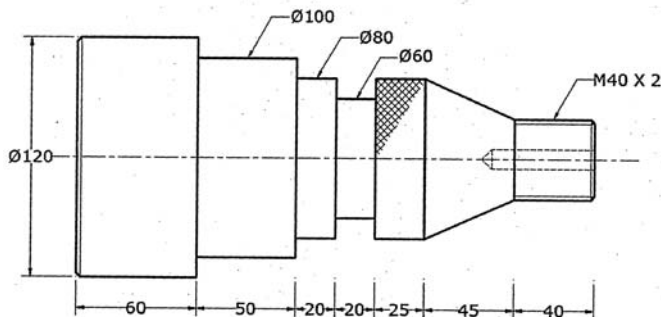
Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** i) Attempt **any three** questions from **each** Sections.
ii) **Draw** the appropriate sketches **wherever** required.
iii) **Assume** suitable data **if** required.

SECTION – I

2. a) List the different types of accessories used on Lathe machine, briefly explain three jaw Chuck. 5
b) Explain the working and construction of pillar type drilling machine. 4
3. a) Write the difference between Steady rest and follower rest. 4
b) Explain the construction and working of slotting machine. 5
4. a) Explain the working and construction of Electric Discharge Machine (EDM), with its advantages and disadvantages. 5
b) For a given figure write the sequence of operation and work layout. 5





5. Write short note on **any three** : **(3×3=9)**
- a) Job holding devices used on drilling machine.
 - b) Difference between Capstan and turret lathe machine
 - c) Classification of manufacturing process.
 - d) Specification of Lathe machine.

SECTION – II

6. a) Explain the construction and working principles of Horizontal type boring machine with the appropriate sketch. **5**
- b) Briefly explain UP milling and Down Milling process. **4**
7. a) Explain the construction and working of gear Hobbing machine. **5**
- b) Explain the construction and working of surface grinding machine. **5**
8. a) Explain simple indexing method, divide the periphery of a cylinder into 56 equal parts by simple indexing method. **5**
- Plate 1 : 15, 16, 17, 18, 19, 20
- Plate 2 : 21, 23, 27, 29, 31, 33
- Plate 3 : 37, 39, 41, 43, 47, 49
- b) Explain the following terms, Glazing, Loading, Dressing and Truing. **4**
9. Write the short notes on **any three** : **(3×3=9)**
- a) Operation on Broaching Machine.
 - b) Introduction to CNC Machine.
 - c) Classification of milling machines.
 - d) Jig boring machine.
-



SLR-TJ – 95

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

Set **P**

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.
 - 5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Match the pairs (**Each bit one mark each**).

Column – A	Column – B
Geometric Tolerance	Symbol
A. Perpendicularity	P. \circ
B. Circularity (roundness)	Q. \perp
C. Position	R. \oplus

Type – II : Correct OR Incorrect (Attempt **any two**) (**Each bit one mark each**).

- A) Δ is symbol of seam weld.
- B) A pivot bearing is used for vertical shafts with axial load.
- C) Auxiliary Inclined Plane (A.I.P.) is always inclined to Vertical Plane (V.P.).

P.T.O.



Type – III : Multiple correct ans. type (**Each** correct bit **2** marks **each**).

- A) The basic principal involved in arriving at the sheet sizes of drawing sheets are _____, where X and Y are the sides of the sheet.
- p) $X : Y = 1 : \sqrt{2}$ q) $X^2 : Y = 1 : \sqrt{2}$
r) $XY = 1$ s) None of the above
- B) Which of the following pairs denote transition fit ?
- p) 65H7p6 q) 65H7n6
r) 65H7k6 s) 65H7g6

Type – IV : Straight Objective Type/Classical MCQ (**Each** bit **one** mark **each**).

- A) Sectional views reveal
- a) Inner details b) External features
c) Overall size of the object d) All of the above
- B) Welding produces a _____ joint.
- a) Temporary b) Permanent
c) Semi-permanent d) None of the above
- C) The height of hexagonal nut is
- a) D b) 1.1 D
c) 1.3 D d) 1.5 D
- D) The angle of worm thread is _____ degrees.
- a) 45 b) 29
c) 55 d) 47
- E) The extreme permissible size for any dimension of a part is
- a) Limit b) Nominal size
c) Tolerance d) None of the above
-



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

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017

Marks : 56

Time : 3.00 p.m. to 7.00 p.m.

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.

2. Figure 1 shows the assembly drawing of SQUARE TOOL POST. Draw the details of the following parts also give the dimensions. **23**

- 1) Tool Holder (Sectional Front View and Top View)
- 2) Base Plate (Sectional Front View and Top View)
- 3) Clamp (Sectional Front View and Top View)
- 4) Screw (One View)
- 5) Stud (One View).

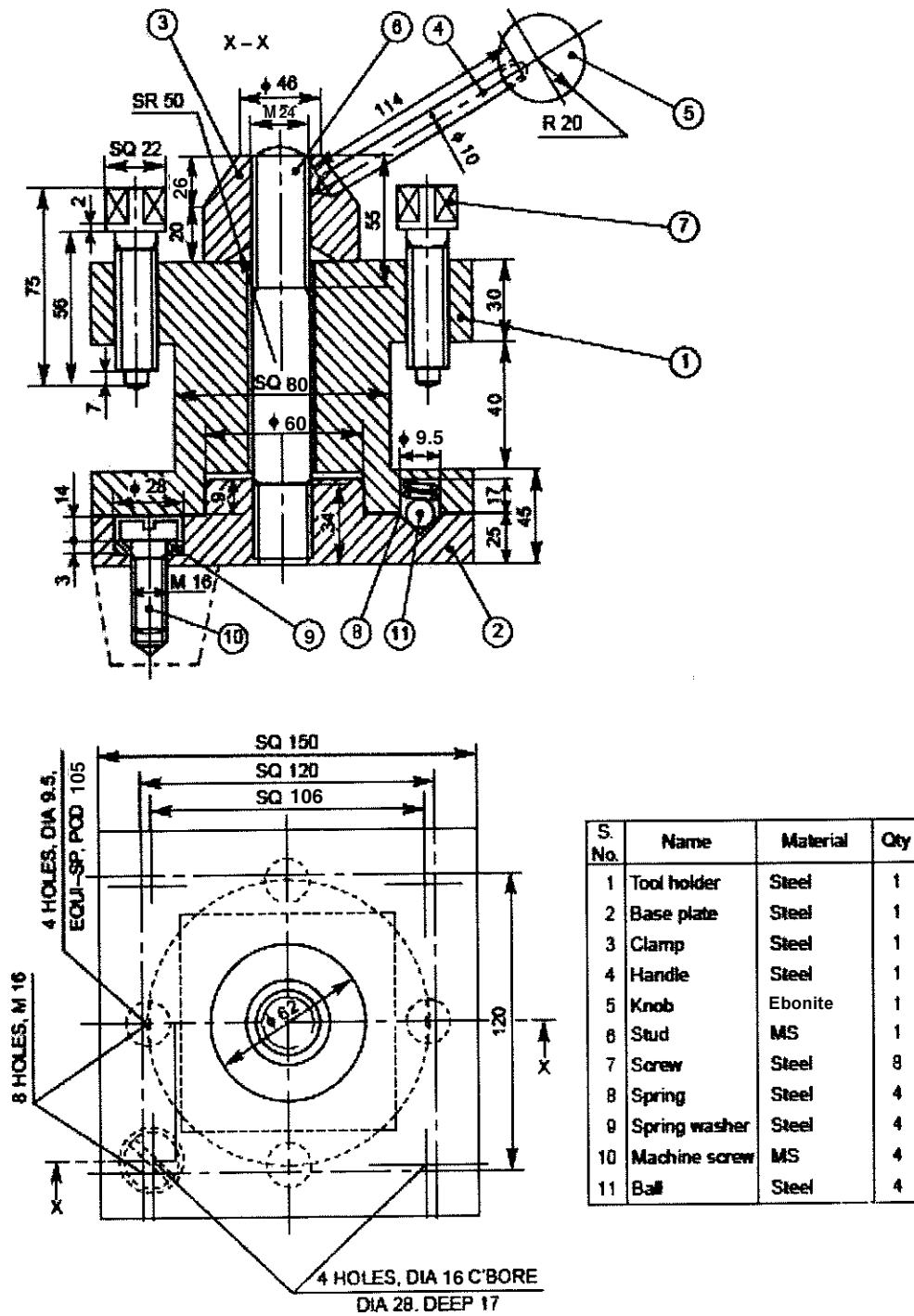


Figure 1 : SQUARE TOOL POST



3. A) Draw the B.I.S. conventions for the following (**any three**) : **6**
- i) White metal
 - ii) Bearings
 - iii) Ratchet and pinion
 - iv) Diamond knurling.
- B) Draw freehand sketching for the following (**any one**) : **5**
- i) Knuckle Joint
 - ii) Protected Flanged Coupling.
4. A) Draw the B.I.S. conventions for the following : **4**
- i) Splined Shaft
 - ii) Packaging and insulating material.
- B) Draw freehand sketching for the following (**any one**) : **7**
- i) Oldham Coupling
 - ii) Fast and loose pulley.
5. Solve the following :
- a) Represent the following fit graphically and identify type of fit (**any one**) : **5**
- i) $\phi 35 G8-h7$
 - ii) $\phi 45 H6-k5$
- b) Redraw the given views from Figure 2 and show the following tolerance symbols on it : **6**
- i) Surface C and D parallel to each other within 0.2 mm.
 - ii) Axis of holes $\phi 15$ perpendicular to the axis of $\phi 24$ hole within 0.2 mm.



iii) Surface 'E' is to be milled with two triangle finish.

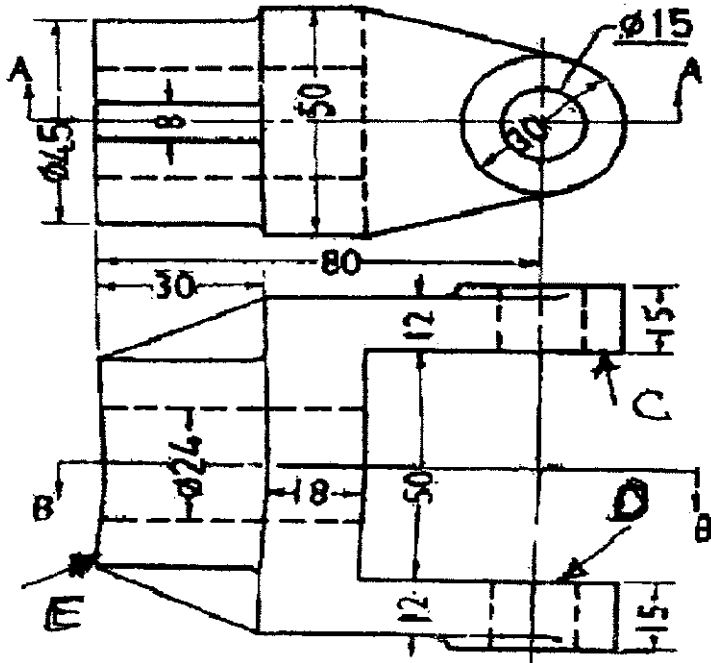


Figure 2

6. Figure 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 11

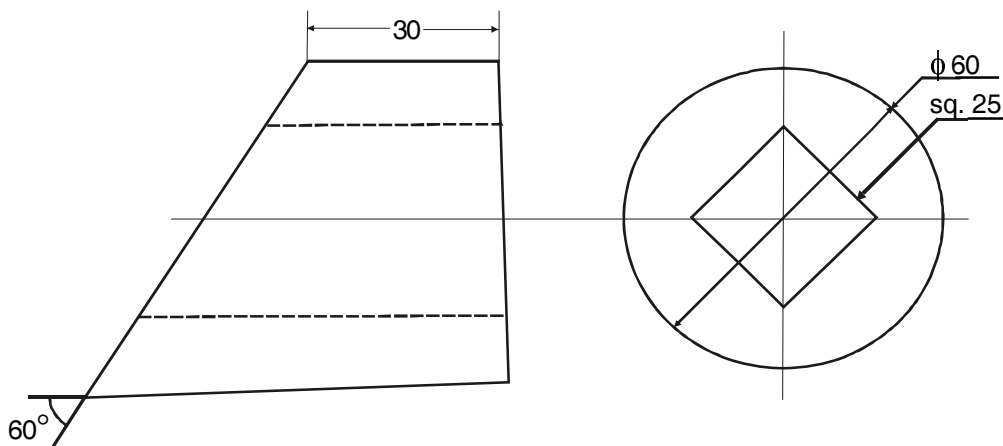


Figure 3



Table 15.1 : Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 : Fundamental deviations for shafts of types a to k of sizes upto 500 mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
		a	b	c	d	e	f	g	h		j	k			
over	upto	All grades									5,6	7	8	4 to 7	≤3, >7
—	*3	-270	-140	-60	-20	-14	-6	-2	0	± IT/2	-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18														
18	24	-300	-160	-110	-65	-40	-20	-7	0		-4	-8	—	+2	0
24	30														
30	40	-310	-170	-120	-80	-50	-25	-9	0		-5	-10	—	+2	0
40	50	-320	-180	-130											
50	65	-340	-190	-140	-100	-60	-30	-10	0		-7	-12	—	+2	0
65	80	-360	-200	-150											
80	100	-380	-220	-170	-120	-72	-36	-12	0		-9	-15	—	+3	0
100	120	-410	-240	-180											
120	140	-460	-260	-200											
140	160	-520	-280	-210	-145	-85	-43	-14	0	-11	-18	—	+3	0	
160	180	-580	-310	-230											



Table 15.3 : Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

Fundamental deviation in microns											(1 micron = 0.001 mm)										
Diameter steps in mm		Lower deviations (\bar{E}_i)										Upper deviations (\bar{E}_s)									
		A*	B	C	D	E	F	G	H	J _s	J			K		M		N			
Over	Upto	All grades										6	7	8	≤ 8	> 8	≤ 8 ⁺	> 8	≤ 8	> 8 ⁺	≤ 7
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades > 7 + Δ	
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0		
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0		
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0		
14	18																				
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0		
24	30																				
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0		
40	50	+320	+180	+130																	
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0		
65	80	+360	+200	+150																	
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0		
100	120	+410	+240	+180																	



SLR-TJ – 95

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

Set **Q**

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions:** 1) Question No. 1 and 2 are **compulsory**.
2) Out of Question No. 3 to 6, attempt **any three**.
3) Assume suitable dimensions if **not** given.
4) Use first angle Method of projections.
5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Straight Objective Type/Classical MCQ (**Each bit one mark each**).

A) Sectional views reveal

- | | |
|-------------------------------|----------------------|
| a) Inner details | b) External features |
| c) Overall size of the object | d) All of the above |

B) Welding produces a _____ joint.

- | | |
|-------------------|----------------------|
| a) Temporary | b) Permanent |
| c) Semi-permanent | d) None of the above |

C) The height of hexagonal nut is

- | | |
|----------|----------|
| a) D | b) 1.1 D |
| c) 1.3 D | d) 1.5 D |

P.T.O.



- D) The angle of worm thread is _____ degrees.
- | | |
|-------|-------|
| a) 45 | b) 29 |
| c) 55 | d) 47 |
- E) The extreme permissible size for any dimension of a part is
- | | |
|--------------|----------------------|
| a) Limit | b) Nominal size |
| c) Tolerance | d) None of the above |

Type – II : Multiple correct ans. type (**Each** correct bit **2** marks **each**).

- A) The basic principal involved in arriving at the sheet sizes of drawing sheets are _____, where X and Y are the sides of the sheet.
- | | |
|---------------------------|-----------------------------|
| p) $X : Y = 1 : \sqrt{2}$ | q) $X^2 : Y = 1 : \sqrt{2}$ |
| r) $XY = 1$ | s) None of the above |
- B) Which of the following pairs denote transition fit ?
- | | |
|-----------|-----------|
| p) 65H7p6 | q) 65H7n6 |
| r) 65H7k6 | s) 65H7g6 |

Type – III : Correct OR Incorrect (Attempt **any two**) (**Each** bit **one** mark **each**).

- A) Δ is symbol of seam weld.
- B) A pivot bearing is used for vertical shafts with axial load.
- C) Auxiliary Inclined Plane (A.I.P.) is always inclined to Vertical Plane (V.P.).

Type – IV : Match the pairs (**Each** bit **one** mark **each**).

Column – A	Column – B
Geometric Tolerance	Symbol
A. Perpendicularity	P. \bigcirc
B. Circularity (roundness)	Q. \perp
C. Position	R. \oplus



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

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017

Marks : 56

Time : 3.00 p.m. to 7.00 p.m.

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.

2. Figure 1 shows the assembly drawing of SQUARE TOOL POST. Draw the details of the following parts also give the dimensions. **23**

- 1) Tool Holder (Sectional Front View and Top View)
- 2) Base Plate (Sectional Front View and Top View)
- 3) Clamp (Sectional Front View and Top View)
- 4) Screw (One View)
- 5) Stud (One View).

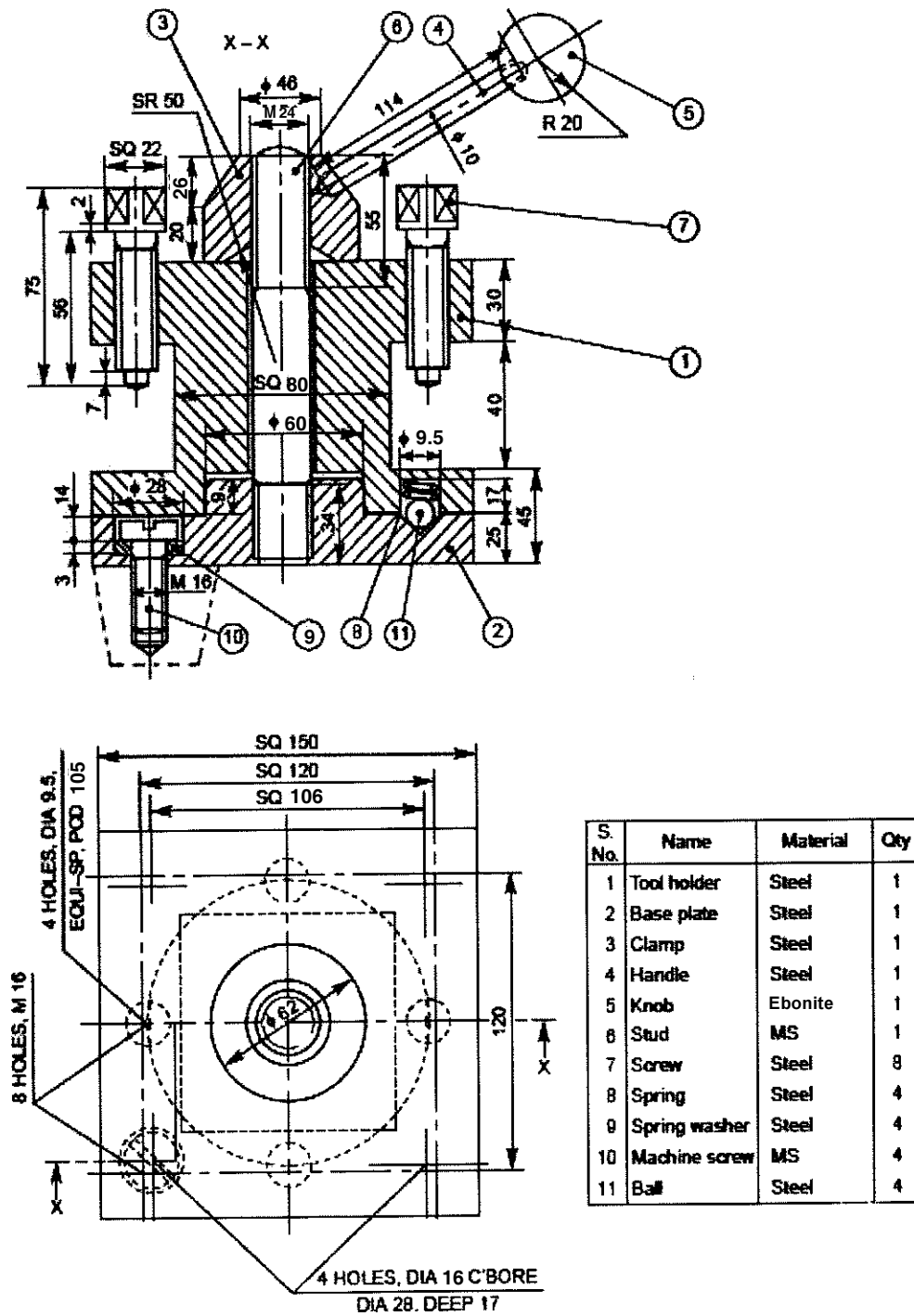


Figure 1 : SQUARE TOOL POST



3. A) Draw the B.I.S. conventions for the following (**any three**) : **6**
- i) White metal
 - ii) Bearings
 - iii) Ratchet and pinion
 - iv) Diamond knurling.
- B) Draw freehand sketching for the following (**any one**) : **5**
- i) Knuckle Joint
 - ii) Protected Flanged Coupling.
4. A) Draw the B.I.S. conventions for the following : **4**
- i) Splined Shaft
 - ii) Packaging and insulating material.
- B) Draw freehand sketching for the following (**any one**) : **7**
- i) Oldham Coupling
 - ii) Fast and loose pulley.
5. Solve the following :
- a) Represent the following fit graphically and identify type of fit (**any one**) : **5**
- i) $\phi 35 G8-h7$
 - ii) $\phi 45 H6-k5$
- b) Redraw the given views from Figure 2 and show the following tolerance symbols on it : **6**
- i) Surface C and D parallel to each other within 0.2 mm.
 - ii) Axis of holes $\phi 15$ perpendicular to the axis of $\phi 24$ hole within 0.2 mm.



iii) Surface 'E' is to be milled with two triangle finish.

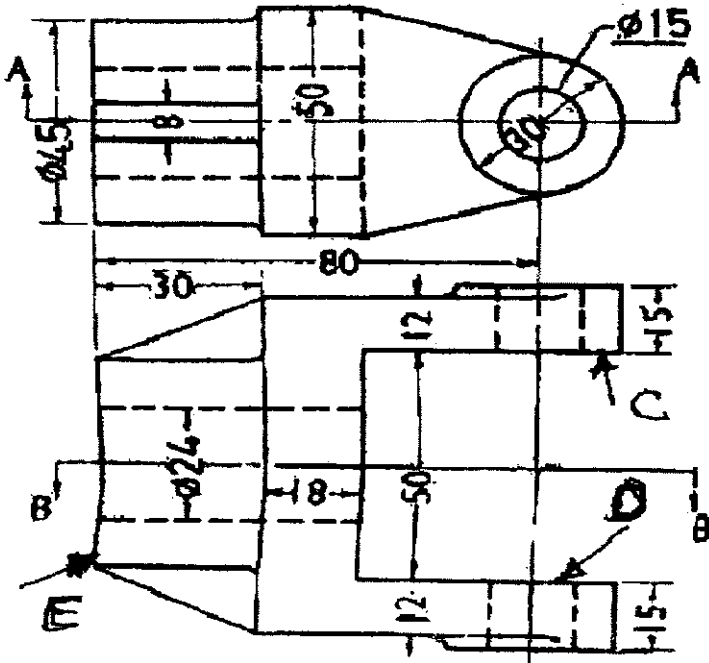


Figure 2

6. Figure 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 11

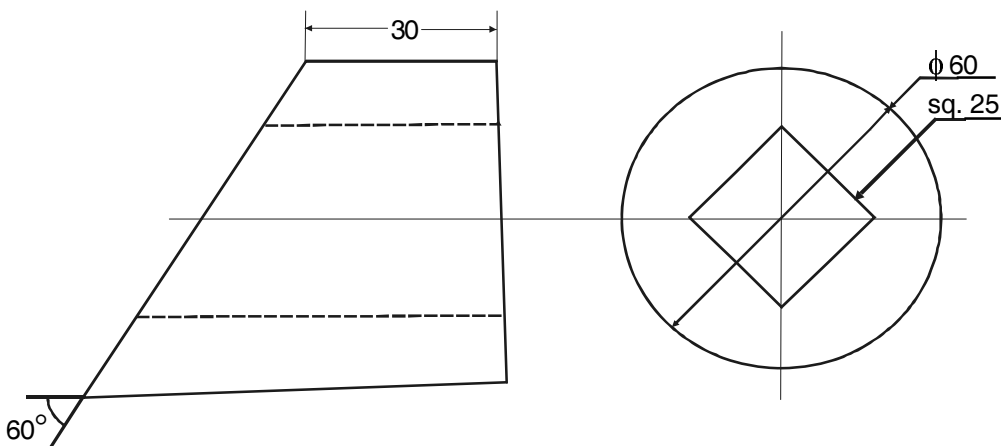


Figure 3



Table 15.1 : Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 : Fundamental deviations for shafts of types a to k of sizes upto 500 mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)										
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)									
over	upto	a	b	c	d	e	f	g	h		j	k								
		All grades								± IT/2	5,6	7	8	4 to 7	≤ 3, > 7					
—	*3	-270	-140	-60	-20	-14	-6	-2	0		-2	-4	-6	-0	-0					
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0					
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0					
10	14	-290	-150	-95	-50	-32	-16	-6	0		± IT/2	-3	-6	—	+1	0				
14	18																			
18	24	-300	-160	-110	-65	-40	-20	-7	0			± IT/2	-4	-8	—	+2	0			
24	30																			
30	40	-310	-170	-120	-80	-50	-25	-9	0				± IT/2	-5	-10	—	+2	0		
40	50																		-320	-180
50	65	-340	-190	-140	-100	-60	-30	-10	0					± IT/2	-7	-12	—	+2	0	
65	80																			-360
80	100	-380	-220	-170	-120	-72	-36	-12	0						± IT/2	-9	-15	—	+3	0
100	120																			
120	140	-460	-260	-200	-145	-85	-43	-14	0							± IT/2	-11	-18	—	+3
140	160									-520										
160	180	-580	-310	-230																



Table 15.3 : Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

Fundamental deviation in microns											(1 micron = 0.001 mm)										
Diameter steps in mm		Lower deviations ($\bar{E}i$)										Upper deviations ($\bar{E}s$)									
		A*	B*	C	D	E	F	G	H	J _s	J			K		M		N			
Over	Upto	All grades										6	7	8	≤ 8	> 8	≤ 8 ⁺	> 8	≤ 8	> 8 ⁺	≤ 7
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades > 7 + Δ	
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0		
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0		
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0		
14	18																				
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0		
24	30																				
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0		
40	50	+320	+180	+130																	
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0		
65	80	+360	+200	+150																	
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0		
100	120	+410	+240	+180																	



SLR-TJ – 95

Seat
No.

Set **R**

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.
 - 5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Correct OR Incorrect (Attempt **any two**) (**Each bit one mark each**).

- A) Δ is symbol of seam weld.
- B) A pivot bearing is used for vertical shafts with axial load.
- C) Auxiliary Inclined Plane (A.I.P.) is always inclined to Vertical Plane (V.P.).

Type – II : Straight Objective Type/Classical MCQ (**Each bit one mark each**).

- A) Sectional views reveal
 - a) Inner details
 - b) External features
 - c) Overall size of the object
 - d) All of the above
- B) Welding produces a _____ joint.
 - a) Temporary
 - b) Permanent
 - c) Semi-permanent
 - d) None of the above

P.T.O.



- C) The height of hexagonal nut is
- | | |
|----------|----------|
| a) D | b) 1.1 D |
| c) 1.3 D | d) 1.5 D |
- D) The angle of worm thread is _____ degrees.
- | | |
|-------|-------|
| a) 45 | b) 29 |
| c) 55 | d) 47 |
- E) The extreme permissible size for any dimension of a part is
- | | |
|--------------|----------------------|
| a) Limit | b) Nominal size |
| c) Tolerance | d) None of the above |

Type – III : Match the pairs (**Each bit one mark each**).

Column – A	Column – B
Geometric Tolerance	Symbol
A. Perpendicularity	P. \circ
B. Circularity (roundness)	Q. \perp
C. Position	R. \oplus

Type – IV : Multiple correct ans. type (**Each correct bit 2 marks each**).

- A) The basic principal involved in arriving at the sheet sizes of drawing sheets are _____, where X and Y are the sides of the sheet.
- | | |
|---------------------------|-----------------------------|
| p) $X : Y = 1 : \sqrt{2}$ | q) $X^2 : Y = 1 : \sqrt{2}$ |
| r) $XY = 1$ | s) None of the above |
- B) Which of the following pairs denote transition fit ?
- | | |
|-----------|-----------|
| p) 65H7p6 | q) 65H7n6 |
| r) 65H7k6 | s) 65H7g6 |



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

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017

Marks : 56

Time : 3.00 p.m. to 7.00 p.m.

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.

2. Figure 1 shows the assembly drawing of SQUARE TOOL POST. Draw the details of the following parts also give the dimensions. **23**

- 1) Tool Holder (Sectional Front View and Top View)
- 2) Base Plate (Sectional Front View and Top View)
- 3) Clamp (Sectional Front View and Top View)
- 4) Screw (One View)
- 5) Stud (One View).

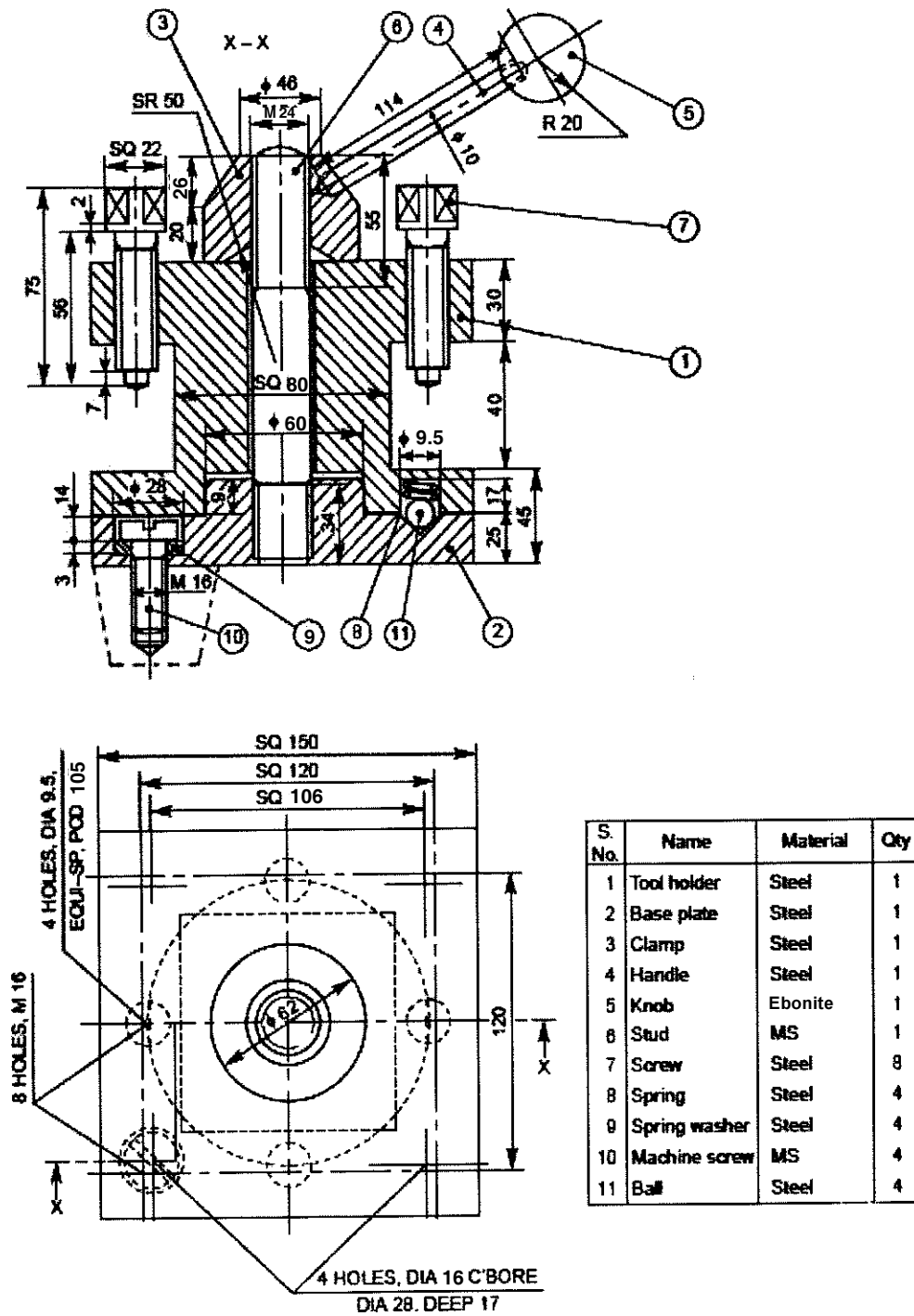


Figure 1 : SQUARE TOOL POST



3. A) Draw the B.I.S. conventions for the following (**any three**) : **6**
- i) White metal
 - ii) Bearings
 - iii) Ratchet and pinion
 - iv) Diamond knurling.
- B) Draw freehand sketching for the following (**any one**) : **5**
- i) Knuckle Joint
 - ii) Protected Flanged Coupling.
4. A) Draw the B.I.S. conventions for the following : **4**
- i) Splined Shaft
 - ii) Packaging and insulating material.
- B) Draw freehand sketching for the following (**any one**) : **7**
- i) Oldham Coupling
 - ii) Fast and loose pulley.
5. Solve the following :
- a) Represent the following fit graphically and identify type of fit (**any one**) : **5**
- i) $\phi 35 G8-h7$
 - ii) $\phi 45 H6-k5$
- b) Redraw the given views from Figure 2 and show the following tolerance symbols on it : **6**
- i) Surface C and D parallel to each other within 0.2 mm.
 - ii) Axis of holes $\phi 15$ perpendicular to the axis of $\phi 24$ hole within 0.2 mm.



iii) Surface 'E' is to be milled with two triangle finish.

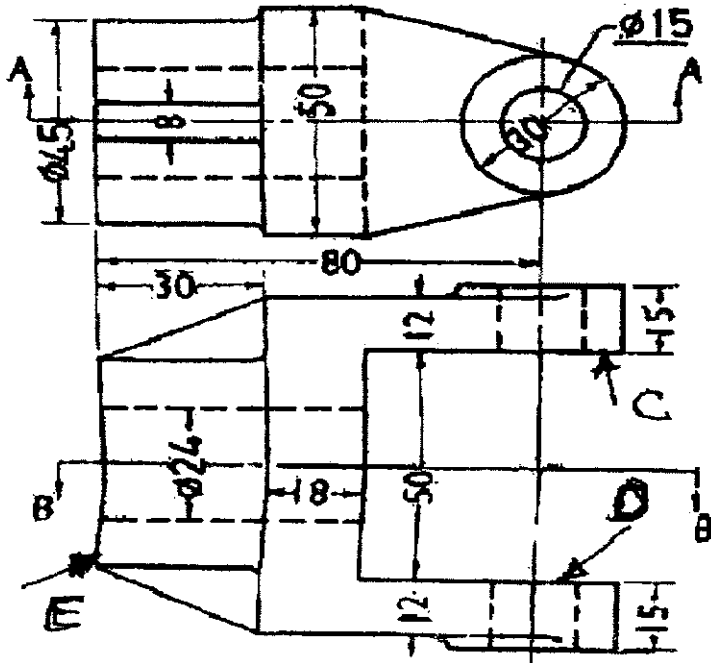


Figure 2

6. Figure 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 11

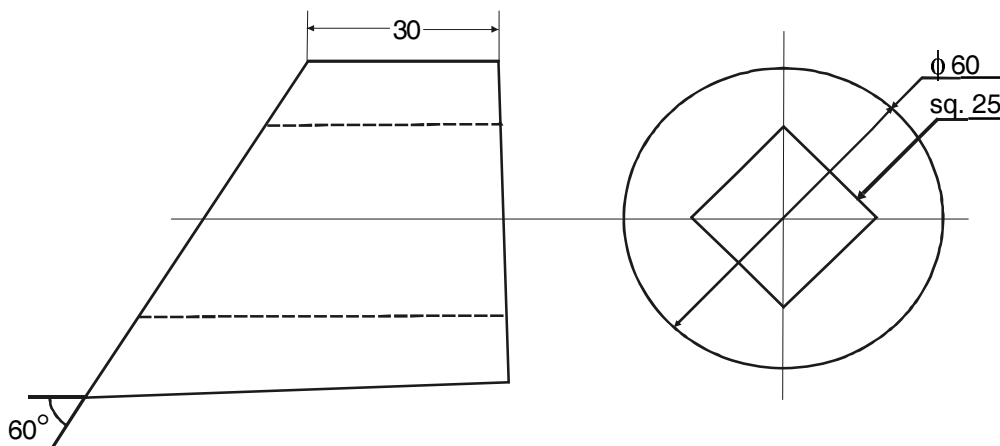


Figure 3



Table 15.1 : Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 : Fundamental deviations for shafts of types a to k of sizes upto 500 mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
over	upto	a	b	c	d	e	f	g	h		j	k			
All grades										5,6	7	8	4 to 7	≤3, >7	
—	*3	-270	-140	-60	-20	-14	-6	-2	0	± IT/2	-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18										-4	-8	—	+2	0
18	24	-300	-160	-110	-65	-40	-20	-7	0		-5	-10	—	+2	0
24	30										-7	-12	—	+2	0
30	40	-310	-170	-120	-80	-50	-25	-9	0		-9	-15	—	+3	0
40	50										-320	-180	-130	-11	-18
50	65	-340	-190	-140	-100	-60	-30	-10	0		-11	-18	—	+3	0
65	80										-360	-200	-150	-145	-85
80	100	-380	-220	-170	-120	-72	-36	-12	0		-11	-18	—	+3	0
100	120										-410	-240	-180	-145	-85
120	140	-460	-260	-200	-145	-85	-43	-14	0		-11	-18	—	+3	0
140	160										-520	-280	-210	-145	-85
160	180	-580	-310	-230	-145	-85	-43	-14	0	-11	-18	—	+3	0	



Table 15.3 : Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

Fundamental deviation in microns											(1 micron = 0.001 mm)										
Diameter steps in mm		Lower deviations (\bar{E}_i)										Upper deviations (\bar{E}_s)									
		A*	B*	C	D	E	F	G	H	J _s	J			K		M		N			
Over	Upto	All grades										6	7	8	≤ 8	> 8	≤ 8 ⁺	> 8	≤ 8	> 8 ⁺	≤ 7
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades > 7 + Δ	
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0		
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0		
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0		
14	18																				
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0		
24	30																				
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0		
40	50	+320	+180	+130																	
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0		
65	80	+360	+200	+150																	
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0		
100	120	+410	+240	+180																	



SLR-TJ – 95

Seat
No.

Set

S

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017
Time : 3.00 p.m. to 7.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.
 - 5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

Type – I : Multiple correct ans. type (**Each** correct bit **2** marks **each**).

A) The basic principal involved in arriving at the sheet sizes of drawing sheets are _____, where X and Y are the sides of the sheet.

- p) $X : Y = 1 : \sqrt{2}$
- q) $X^2 : Y = 1 : \sqrt{2}$
- r) $XY = 1$
- s) None of the above

B) Which of the following pairs denote transition fit ?

- p) 65H7p6
- q) 65H7n6
- r) 65H7k6
- s) 65H7g6

P.T.O.



Type – II : Match the pairs (**Each bit one mark each**).

Column – A	Column – B
Geometric Tolerance	Symbol
A. Perpendicularity	P. \bigcirc
B. Circularity (roundness)	Q. \perp
C. Position	R. \oplus

Type – III : Straight Objective Type/Classical MCQ (**Each bit one mark each**).

- A) Sectional views reveal
- | | |
|-------------------------------|----------------------|
| a) Inner details | b) External features |
| c) Overall size of the object | d) All of the above |
- B) Welding produces a _____ joint.
- | | |
|-------------------|----------------------|
| a) Temporary | b) Permanent |
| c) Semi-permanent | d) None of the above |
- C) The height of hexagonal nut is
- | | |
|----------|----------|
| a) D | b) 1.1 D |
| c) 1.3 D | d) 1.5 D |
- D) The angle of worm thread is _____ degrees.
- | | |
|-------|-------|
| a) 45 | b) 29 |
| c) 55 | d) 47 |
- E) The extreme permissible size for any dimension of a part is
- | | |
|--------------|----------------------|
| a) Limit | b) Nominal size |
| c) Tolerance | d) None of the above |

Type – IV : Correct OR Incorrect (Attempt **any two**) (**Each bit one mark each**).

- A) Δ is symbol of seam weld.
- B) A pivot bearing is used for vertical shafts with axial load.
- C) Auxiliary Inclined Plane (A.I.P.) is always inclined to Vertical Plane (V.P.).



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

**S.E. (Mech.) (Part – I) (Old – CGPA) Examination, 2017
MACHINE DRAWING**

Day and Date : Thursday, 21-12-2017

Marks : 56

Time : 3.00 p.m. to 7.00 p.m.

- Instructions :**
- 1) Question No. 1 and 2 are **compulsory**.
 - 2) Out of Question No. 3 to 6, attempt **any three**.
 - 3) Assume suitable dimensions if **not** given.
 - 4) Use first angle Method of projections.

2. Figure 1 shows the assembly drawing of SQUARE TOOL POST. Draw the details of the following parts also give the dimensions. **23**

- 1) Tool Holder (Sectional Front View and Top View)
- 2) Base Plate (Sectional Front View and Top View)
- 3) Clamp (Sectional Front View and Top View)
- 4) Screw (One View)
- 5) Stud (One View).

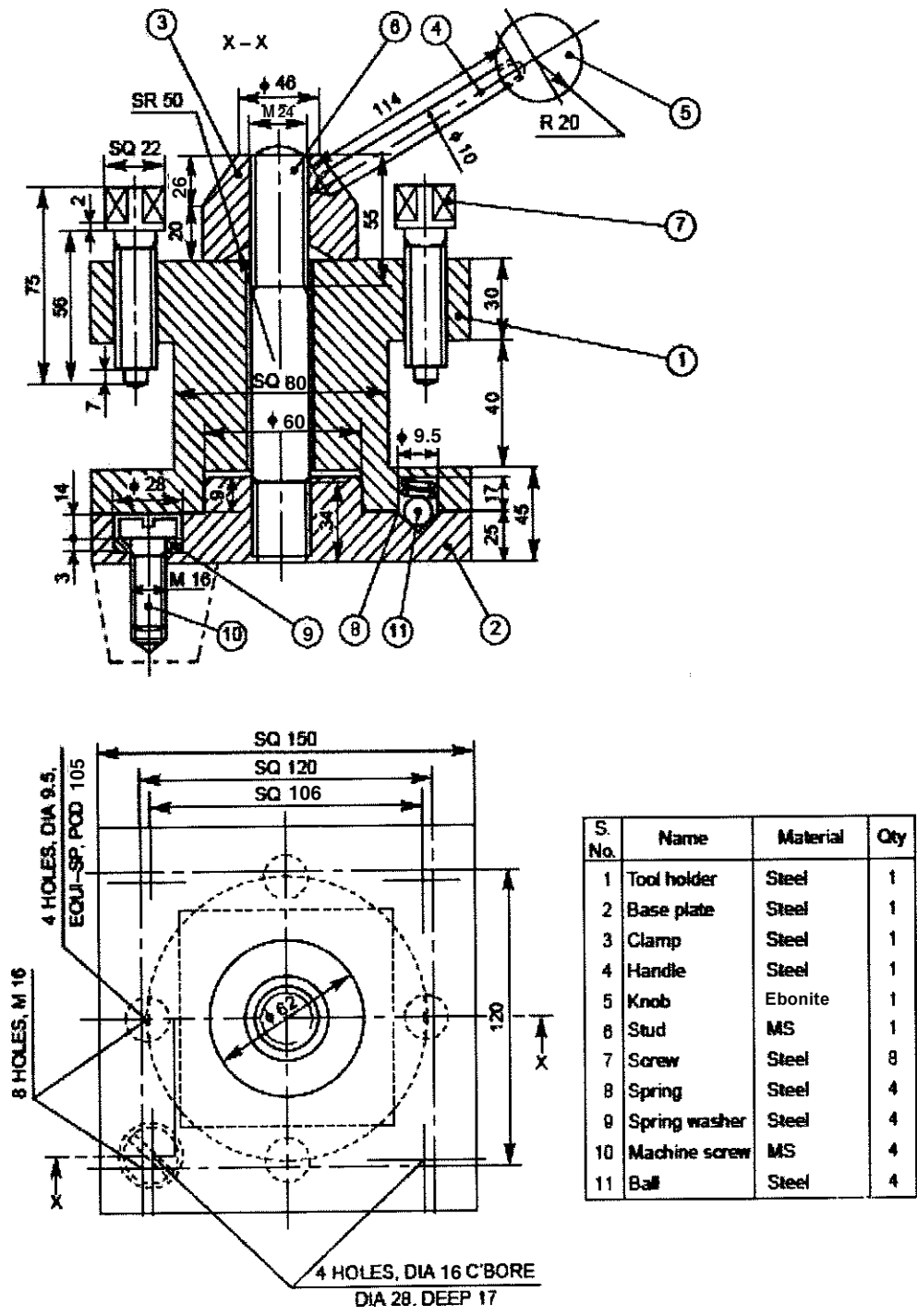


Figure 1 : SQUARE TOOL POST



3. A) Draw the B.I.S. conventions for the following (**any three**) : **6**
- i) White metal
 - ii) Bearings
 - iii) Ratchet and pinion
 - iv) Diamond knurling.
- B) Draw freehand sketching for the following (**any one**) : **5**
- i) Knuckle Joint
 - ii) Protected Flanged Coupling.
4. A) Draw the B.I.S. conventions for the following : **4**
- i) Splined Shaft
 - ii) Packaging and insulating material.
- B) Draw freehand sketching for the following (**any one**) : **7**
- i) Oldham Coupling
 - ii) Fast and loose pulley.
5. Solve the following :
- a) Represent the following fit graphically and identify type of fit (**any one**) : **5**
- i) $\phi 35 G8-h7$
 - ii) $\phi 45 H6-k5$
- b) Redraw the given views from Figure 2 and show the following tolerance symbols on it : **6**
- i) Surface C and D parallel to each other within 0.2 mm.
 - ii) Axis of holes $\phi 15$ perpendicular to the axis of $\phi 24$ hole within 0.2 mm.



iii) Surface 'E' is to be milled with two triangle finish.

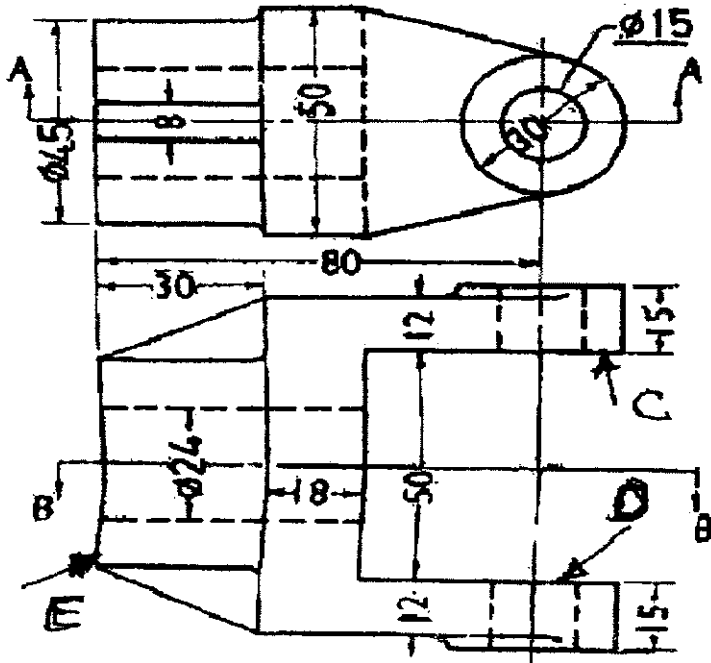


Figure 2

6. Figure 3 shows two views of an object. Redraw the given views and draw the auxiliary view of the object from direction X (perpendicular to inclined surface). 11

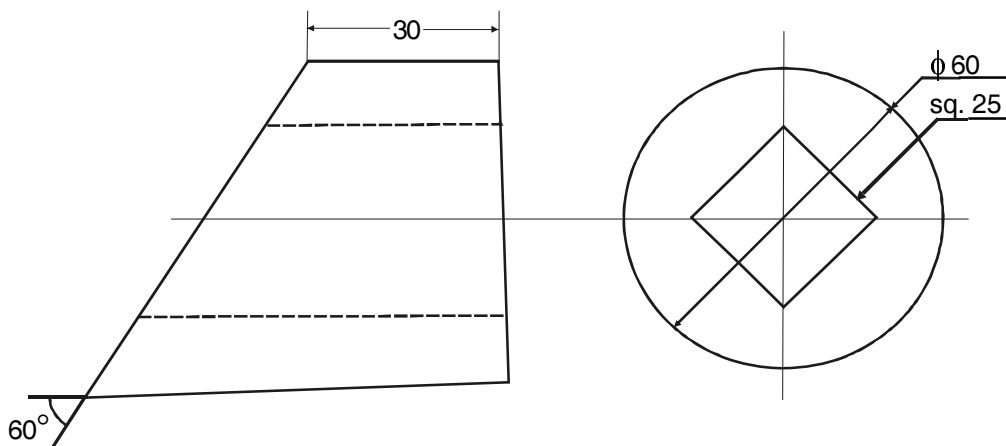


Figure 3



Table 15.1 : Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
To and inc 3	0.3	0.5	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250	400	600
Over 3																		
To and inc 6	0.4	0.6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300	480	750
Over 6																		
To and inc 10	0.4	0.6	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360	580	900
Over 10																		
To and inc 18	0.5	0.8	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430	700	1100
Over 18																		
To and inc 30	0.6	1	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520	840	1300
Over 30																		
To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50																		
To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80																		
To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120																		
To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500
Over 180																		
To and inc 250	2	3	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150	1850	2900
Over 250																		
To and inc 315	2.5	4	6	8	12	16	23	32	52	81	130	210	320	520	810	1300	2100	3200
Over 315																		
To and inc 400	3	5	7	9	13	18	25	36	57	89	140	230	360	570	890	1400	2300	3600
Over 400																		
To and inc 500	4	6	8	10	15	20	27	40	63	97	155	250	400	630	970	1550	2500	4000



Table 15.2 : Fundamental deviations for shafts of types a to k of sizes upto 500 mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (es)								js ⁺	Lower deviation (ei)				
over	upto	a	b	c	d	e	f	g	h		j	k			
All grades										5,6	7	8	4 to 7	≤3, >7	
—	*3	-270	-140	-60	-20	-14	-6	-2	0	± IT/2	-2	-4	-6	-0	-0
3	6	-270	-140	-70	-30	-20	-10	-4	0		-2	-4	—	+1	0
6	10	-280	-150	-80	-40	-25	-13	-5	0		-2	-5	—	+1	0
10	14	-290	-150	-95	-50	-32	-16	-6	0		-3	-6	—	+1	0
14	18										-4	-8	—	+2	0
18	24	-300	-160	-110	-65	-40	-20	-7	0		-5	-10	—	+2	0
24	30										-7	-12	—	+2	0
30	40	-310	-170	-120	-80	-50	-25	-9	0		-9	-15	—	+3	0
40	50	-320	-180	-130							-11	-18	—	+3	0
50	65	-340	-190	-140	-100	-60	-30	-10	0		-11	-18	—	+3	0
65	80	-360	-200	-150							-145	-85	-43	-14	0
80	100	-380	-220	-170	-120	-72	-36	-12	0		-11	-18	—	+3	0
100	120	-410	-240	-180							-145	-85	-43	-14	0
120	140	-460	-260	-200	-145	-85	-43	-14	0		-11	-18	—	+3	0
140	160	-520	-280	-210						-145	-85	-43	-14	0	
160	180	-580	-310	-230	-145	-85	-43	-14	0	-11	-18	—	+3	0	



Table 15.3 : Fundamental deviations for holes of types A to N for sizes upto 500 mm (contd.)

Fundamental deviation in microns											(1 micron = 0.001 mm)										
Diameter steps in mm		Lower deviations (\bar{E}_i)										Upper deviations (\bar{E}_s)									
		A*	B*	C	D	E	F	G	H	J _s	J			K		M		N			
Over	Upto	All grades										6	7	8	≤ 8	> 8	≤ 8 ⁺	> 8	≤ 8	> 8 ⁺	≤ 7
—	3*	+270	+140	+60	+20	+14	+6	+2	0	± IT/2	+2	+4	+6	0	0	-2	-2	-4	-4	Same deviation as for grades > 7 + Δ	
3	6	+270	+140	+70	+30	+20	+10	+4	0		+5	+6	+10	-1+Δ	—	-4+Δ	-4+Δ	-8+Δ	0		
6	10	+280	+150	+80	+40	+25	+13	+5	0		+5	+8	+12	-1+Δ	—	-6+Δ	-6+Δ	-10+Δ	0		
10	14	+290	+150	+95	+50	+32	+16	+6	0		+6	+10	+15	-1+Δ	—	-7+Δ	-7	-12+Δ	0		
14	18																				
18	24	+300	+160	+110	+65	+40	+20	+7	0		+8	+12	+20	-2+Δ	—	-8+Δ	-8	-15+Δ	0		
24	30																				
30	40	+310	+170	+120	+80	+50	+25	+9	0		+10	+14	+24	-2+Δ	—	-9+Δ	-9	-17+Δ	0		
40	50	+320	+180	+130																	
50	65	+340	+190	+140	+100	+60	+30	+10	0		+13	+18	+28	-2+Δ	—	-11+Δ	-11	-20+Δ	0		
65	80	+360	+200	+150																	
80	100	+380	+220	+170	+120	+72	+36	+12	0		+16	+22	+34	-3+Δ	—	-13+Δ	-13	-23+Δ	0		
100	120	+410	+240	+180																	



SLR-TJ – 96

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

Set	P
-----	----------

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries 1 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) **Neat diagrams must be drawn wherever necessary.**
- 4) **Use of single memory non-programmable calculator is allowed.**
- 5) **Assume suitable data if necessary and state it clearly.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) Atmospheric pressure head in terms of water column is
a) 7.5 m b) 8.5 m c) 9.81 m d) 10.3 m
- 2) Stoke is the unit of
a) surface tension b) viscosity
c) kinematic viscosity d) none of the above
- 3) The velocity component x and y directions in terms of velocity potential function are

a) $u = -\frac{\partial\phi}{\partial x}, v = \frac{\partial\phi}{\partial y}$

b) $u = \frac{\partial\phi}{\partial y}, v = \frac{\partial\phi}{\partial x}$

c) $u = \frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$

d) $u = -\frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$

- 4) The velocity components in x and y directions in terms of stream function (ψ) are

a) $u = \frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$

b) $u = -\frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$

c) $u = \frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$

d) $u = -\frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$

P.T.O.



- 5) Venturimeter is used for measurement of
- pressure
 - temperature
 - velocity at a point
 - discharge
- 6) Bernoulli's theorem deals with the law of conservation of
- mass
 - momentum
 - energy
 - none of the above
- 7) The condition of stable equilibrium for a floating body is
- the metacentre M coincides with the centre of gravity G
 - the metacentre M is below centre of gravity G
 - the metacentre M is above with the centre of gravity G
 - the centre of buoyancy B is above centre of gravity G
- 8) Reynolds number is the ratio of
- inertia force to pressure force
 - inertia force to elastic force
 - inertia force to viscous force
 - none of the above
- 9) The friction factor in fluid flowing through pipe depends upon
- Reynold's number
 - Relative roughness of pipe surface
 - Both a and b
 - None of the above
- 10) Minor losses occur due to
- sudden enlargement in pipe
 - sudden contraction in pipe
 - bends in pipe
 - all of the above
- 11) The total drag on the body is sum of
- Pressure drag and velocity drag
 - Pressure drag and friction drag
 - Friction drag and velocity drag
 - None of above
- 12) The boundary layer separation takes place if
- Pressure gradient is zero
 - Pressure gradient is negative
 - Pressure gradient is positive
 - None of above
- 13) The body is called stream lined body when it is placed in a flow and surface of the body
- Coincides with the stream lines
 - Does not coincides with the stream lines
 - Is perpendicular to the stream lines
 - None of above
- 14) Dynamic viscosity (μ) has the dimensions as
- MLT^{-2}
 - $ML^{-1}T^{-1}$
 - $ML^{-1}T^{-2}$
 - $M^{-1}L^{-1}T^{-1}$
-



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

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Answer **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**.

SECTION – I

2. Attempt the following questions :
- a) Explain Archimedes principle and centre of Buoyancy. 4
 - b) Derive an expression for resultant force and the depth of center of pressure from free surface of liquid for plane vertical surface submerged in the liquid. 5
 - c) A rectangular plane surface 3 m wide, 4 m deep lies in a water in such a way that plane makes an angle 30° with the free surface of water. Determine the total pressure force and position of centre of pressure when the upper edge is 2 m below the free surface. 5
3. Attempt the following questions :
- a) What are different types of fluid flow ? Explain with an example. 4
 - b) What is venturimeter ? Derive an expression for the discharge through a venturimeter. 5
 - c) The fluid flow is described by the velocity field as given $V = 2x^3 i - 5x^2 yj + 4t k$. Find the velocity and acceleration components at point (1, 2, 3) in the field at $t = 1$ and total acceleration also. 5
4. Attempt the following questions :
- a) A nozzle is situated at a distance of 1 m above the ground level and is inclined at an angle of 45° to the horizontal. The diameter of the nozzle is 50 mm and the jet of water from the nozzle strikes is ground at a horizontal distance of 4 m. Find the rate of flow of water. 4



- b) What is pitot tube ? How will you determine the velocity at any point with the help of pitot tube ? 5
- c) A crude oil of viscosity of 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and 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. 5

SECTION – II

5. Attempt the following questions :
- a) What is syphon ? Explain its working with sketch. 4
- b) Derive Darcy-Weisbach equation for finding loss of head due to friction in pipes. 5
- c) The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and diameters 300 mm, 200 mm and 400 mm is 12 m. If respective co-efficient of frictions of pipes are 0.005, 0.0052 and 0.0048. Calculate discharge through the pipe by considering minor losses. 5
6. Attempt the following questions :
- a) What do you mean by separation of boundary layer ? What are the different methods of preventing separation of boundary layer ? 4
- b) A partially submerged body is towed in water. The resistance (R) or force to its motion can be expressed in the form $R = \rho L^2 V^2 \phi \left[\frac{\mu}{\rho VL}, \frac{Lg}{V^2} \right]$ where density (ρ), viscosity of water (μ), length of the body (L), velocity of the body (V) and acceleration due to gravity (g). 5
- c) Define the following : 5
- 1) Displacement thickness
 - 2) Momentum thickness
 - 3) Energy thickness
7. Attempt the following questions :
- a) A kite of 60 cm × 60 cm weighing 2.943 N assumed an angle of 10° to the horizontal. If the pull on string is 29.43 N. When the wind is flowing at a speed of 40 km/hr. Find corresponding co-efficient of drag and lift. Density of air is 1.25 kg/m³. Angle made by string of kite with horizontal is 45°. 4
- b) Derive an expression for drag and lift on a stationary solid body in a stream of real fluid moving with uniform velocity. 5
- c) What is CFD ? Explain solution procedure for CFD analysis. 5



SLR-TJ – 96

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

Set	Q
-----	---

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries 1 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) **Neat diagrams must be drawn wherever necessary.**
- 4) **Use of single memory non-programmable calculator is allowed.**
- 5) **Assume suitable data if necessary and state it clearly.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) Reynolds number is the ratio of
 - a) inertia force to pressure force
 - b) inertia force to elastic force
 - c) inertia force to viscous force
 - d) none of the above
- 2) The friction factor in fluid flowing through pipe depends upon
 - a) Reynold's number
 - b) Relative roughness of pipe surface
 - c) Both a and b
 - d) None of the above
- 3) Minor losses occur due to
 - a) sudden enlargement in pipe
 - b) sudden contraction in pipe
 - c) bends in pipe
 - d) all of the above
- 4) The total drag on the body is sum of
 - a) Pressure drag and velocity drag
 - b) Pressure drag and friction drag
 - c) Friction drag and velocity drag
 - d) None of above
- 5) The boundary layer separation takes place if
 - a) Pressure gradient is zero
 - b) Pressure gradient is negative
 - c) Pressure gradient is positive
 - d) None of above

P.T.O.



- 6) The body is called stream lined body when it is placed in a flow and surface of the body
- Coincides with the stream lines
 - Does not coincides with the stream lines
 - Is perpendicular to the stream lines
 - None of above
- 7) Dynamic viscosity (μ) has the dimensions as
- MLT^{-2}
 - $ML^{-1}T^{-1}$
 - $ML^{-1}T^{-2}$
 - $M^{-1}L^{-1}T^{-1}$
- 8) Atmospheric pressure head in terms of water column is
- 7.5 m
 - 8.5 m
 - 9.81 m
 - 10.3 m
- 9) Stoke is the unit of
- surface tension
 - viscosity
 - kinematic viscosity
 - none of the above
- 10) The velocity component x and y directions in terms of velocity potential function are
- $u = -\frac{\partial\phi}{\partial x}, v = \frac{\partial\phi}{\partial y}$
 - $u = \frac{\partial\phi}{\partial y}, v = \frac{\partial\phi}{\partial x}$
 - $u = \frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$
 - $u = -\frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$
- 11) The velocity components in x and y directions in terms of stream function (ψ) are
- $u = \frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$
 - $u = -\frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$
 - $u = \frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$
 - $u = -\frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$
- 12) Venturimeter is used for measurement of
- pressure
 - temperature
 - velocity at a point
 - discharge
- 13) Bernoulli's theorem deals with the law of conservation of
- mass
 - momentum
 - energy
 - none of the above
- 14) The condition of stable equilibrium for a floating body is
- the metacentre M coincides with the centre of gravity G
 - the metacentre M is below centre of gravity G
 - the metacentre M is above with the centre of gravity G
 - the centre of buoyancy B is above centre of gravity G



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

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Answer **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**.

SECTION – I

2. Attempt the following questions :
- a) Explain Archimedes principle and centre of Buoyancy. 4
 - b) Derive an expression for resultant force and the depth of center of pressure from free surface of liquid for plane vertical surface submerged in the liquid. 5
 - c) A rectangular plane surface 3 m wide, 4 m deep lies in a water in such a way that plane makes an angle 30° with the free surface of water. Determine the total pressure force and position of centre of pressure when the upper edge is 2 m below the free surface. 5
3. Attempt the following questions :
- a) What are different types of fluid flow ? Explain with an example. 4
 - b) What is venturimeter ? Derive an expression for the discharge through a venturimeter. 5
 - c) The fluid flow is described by the velocity field as given $V = 2x^3 i - 5x^2 yj + 4t k$. Find the velocity and acceleration components at point (1, 2, 3) in the field at $t = 1$ and total acceleration also. 5
4. Attempt the following questions :
- a) A nozzle is situated at a distance of 1 m above the ground level and is inclined at an angle of 45° to the horizontal. The diameter of the nozzle is 50 mm and the jet of water from the nozzle strikes is ground at a horizontal distance of 4 m. Find the rate of flow of water. 4



- b) What is pitot tube ? How will you determine the velocity at any point with the help of pitot tube ? 5
- c) A crude oil of viscosity of 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and 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. 5

SECTION – II

5. Attempt the following questions :
- a) What is syphon ? Explain its working with sketch. 4
- b) Derive Darcy-Weisbach equation for finding loss of head due to friction in pipes. 5
- c) The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and diameters 300 mm, 200 mm and 400 mm is 12 m. If respective co-efficient of frictions of pipes are 0.005, 0.0052 and 0.0048. Calculate discharge through the pipe by considering minor losses. 5
6. Attempt the following questions :
- a) What do you mean by separation of boundary layer ? What are the different methods of preventing separation of boundary layer ? 4
- b) A partially submerged body is towed in water. The resistance (R) or force to its motion can be expressed in the form $R = \rho L^2 V^2 \phi \left[\frac{\mu}{\rho VL}, \frac{Lg}{V^2} \right]$ where density (ρ), viscosity of water (μ), length of the body (L), velocity of the body (V) and acceleration due to gravity (g). 5
- c) Define the following : 5
- 1) Displacement thickness
 - 2) Momentum thickness
 - 3) Energy thickness
7. Attempt the following questions :
- a) A kite of 60 cm × 60 cm weighing 2.943 N assumed an angle of 10° to the horizontal. If the pull on string is 29.43 N. When the wind is flowing at a speed of 40 km/hr. Find corresponding co-efficient of drag and lift. Density of air is 1.25 kg/m³. Angle made by string of kite with horizontal is 45°. 4
- b) Derive an expression for drag and lift on a stationary solid body in a stream of real fluid moving with uniform velocity. 5
- c) What is CFD ? Explain solution procedure for CFD analysis. 5



SLR-TJ – 96

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

Set	R
-----	---

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries 1 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) **Neat diagrams must be drawn wherever necessary.**
 - 4) **Use of single memory non-programmable calculator is allowed.**
 - 5) **Assume suitable data if necessary and state it clearly.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) Venturimeter is used for measurement of
 - a) pressure
 - b) temperature
 - c) velocity at a point
 - d) discharge
- 2) Bernoulli's theorem deals with the law of conservation of
 - a) mass
 - b) momentum
 - c) energy
 - d) none of the above
- 3) The condition of stable equilibrium for a floating body is
 - a) the metacentre M coincides with the centre of gravity G
 - b) the metacentre M is below centre of gravity G
 - c) the metacentre M is above with the centre of gravity G
 - d) the centre of buoyancy B is above centre of gravity G
- 4) Reynolds number is the ratio of
 - a) inertia force to pressure force
 - b) inertia force to elastic force
 - c) inertia force to viscous force
 - d) none of the above
- 5) The friction factor in fluid flowing through pipe depends upon
 - a) Reynold's number
 - b) Relative roughness of pipe surface
 - c) Both a and b
 - d) None of the above

P.T.O.



- 6) Minor losses occur due to
- a) sudden enlargement in pipe b) sudden contraction in pipe
c) bends in pipe d) all of the above
- 7) The total drag on the body is sum of
- a) Pressure drag and velocity drag b) Pressure drag and friction drag
c) Friction drag and velocity drag d) None of above
- 8) The boundary layer separation takes place if
- a) Pressure gradient is zero b) Pressure gradient is negative
c) Pressure gradient is positive d) None of above
- 9) 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
- 10) Dynamic viscosity (μ) has the dimensions as
- a) MLT^{-2} b) $ML^{-1}T^{-1}$ c) $ML^{-1}T^{-2}$ d) $M^{-1}L^{-1}T^{-1}$
- 11) Atmospheric pressure head in terms of water column is
- a) 7.5 m b) 8.5 m c) 9.81 m d) 10.3 m
- 12) Stoke is the unit of
- a) surface tension b) viscosity
c) kinematic viscosity d) none of the above
- 13) The velocity component x and y directions in terms of velocity potential function are
- a) $u = -\frac{\partial\phi}{\partial x}, v = \frac{\partial\phi}{\partial y}$ b) $u = \frac{\partial\phi}{\partial y}, v = \frac{\partial\phi}{\partial x}$
c) $u = \frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$ d) $u = -\frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$
- 14) The velocity components in x and y directions in terms of stream function (ψ) are
- a) $u = \frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$ b) $u = -\frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$
c) $u = \frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$ d) $u = -\frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$



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

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Answer **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**.

SECTION – I

2. Attempt the following questions :
- a) Explain Archimedes principle and centre of Buoyancy. 4
 - b) Derive an expression for resultant force and the depth of center of pressure from free surface of liquid for plane vertical surface submerged in the liquid. 5
 - c) A rectangular plane surface 3 m wide, 4 m deep lies in a water in such a way that plane makes an angle 30° with the free surface of water. Determine the total pressure force and position of centre of pressure when the upper edge is 2 m below the free surface. 5
3. Attempt the following questions :
- a) What are different types of fluid flow ? Explain with an example. 4
 - b) What is venturimeter ? Derive an expression for the discharge through a venturimeter. 5
 - c) The fluid flow is described by the velocity field as given $V = 2x^3 i - 5x^2 yj + 4t k$. Find the velocity and acceleration components at point (1, 2, 3) in the field at $t = 1$ and total acceleration also. 5
4. Attempt the following questions :
- a) A nozzle is situated at a distance of 1 m above the ground level and is inclined at an angle of 45° to the horizontal. The diameter of the nozzle is 50 mm and the jet of water from the nozzle strikes is ground at a horizontal distance of 4 m. Find the rate of flow of water. 4



- b) What is pitot tube ? How will you determine the velocity at any point with the help of pitot tube ? 5
- c) A crude oil of viscosity of 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and 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. 5

SECTION – II

5. Attempt the following questions :
- a) What is syphon ? Explain its working with sketch. 4
- b) Derive Darcy-Weisbach equation for finding loss of head due to friction in pipes. 5
- c) The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and diameters 300 mm, 200 mm and 400 mm is 12 m. If respective co-efficient of frictions of pipes are 0.005, 0.0052 and 0.0048. Calculate discharge through the pipe by considering minor losses. 5
6. Attempt the following questions :
- a) What do you mean by separation of boundary layer ? What are the different methods of preventing separation of boundary layer ? 4
- b) A partially submerged body is towed in water. The resistance (R) or force to its motion can be expressed in the form $R = \rho L^2 V^2 \phi \left[\frac{\mu}{\rho VL}, \frac{Lg}{V^2} \right]$ where density (ρ), viscosity of water (μ), length of the body (L), velocity of the body (V) and acceleration due to gravity (g). 5
- c) Define the following : 5
- 1) Displacement thickness
 - 2) Momentum thickness
 - 3) Energy thickness
7. Attempt the following questions :
- a) A kite of 60 cm × 60 cm weighing 2.943 N assumed an angle of 10° to the horizontal. If the pull on string is 29.43 N. When the wind is flowing at a speed of 40 km/hr. Find corresponding co-efficient of drag and lift. Density of air is 1.25 kg/m³. Angle made by string of kite with horizontal is 45°. 4
- b) Derive an expression for drag and lift on a stationary solid body in a stream of real fluid moving with uniform velocity. 5
- c) What is CFD ? Explain solution procedure for CFD analysis. 5



SLR-TJ – 96

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

Set	S
-----	---

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries 1 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) **Neat diagrams must be drawn wherever necessary.**
- 4) **Use of single memory non-programmable calculator is allowed.**
- 5) **Assume suitable data if necessary and state it clearly.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) Minor losses occur due to
- a) sudden enlargement in pipe b) sudden contraction in pipe
c) bends in pipe d) all of the above
- 2) The total drag on the body is sum of
- a) Pressure drag and velocity drag b) Pressure drag and friction drag
c) Friction drag and velocity drag d) None of above
- 3) The boundary layer separation takes place if
- a) Pressure gradient is zero b) Pressure gradient is negative
c) Pressure gradient is positive d) None of above
- 4) 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
- 5) Dynamic viscosity (μ) has the dimensions as
- a) MLT^{-2} b) $ML^{-1}T^{-1}$ c) $ML^{-1}T^{-2}$ d) $M^{-1}L^{-1}T^{-1}$

P.T.O.



- 6) Atmospheric pressure head in terms of water column is
 a) 7.5 m b) 8.5 m c) 9.81 m d) 10.3 m
- 7) Stoke is the unit of
 a) surface tension b) viscosity
 c) kinematic viscosity d) none of the above
- 8) The velocity component x and y directions in terms of velocity potential function are
 a) $u = -\frac{\partial\phi}{\partial x}, v = \frac{\partial\phi}{\partial y}$ b) $u = \frac{\partial\phi}{\partial y}, v = \frac{\partial\phi}{\partial x}$
 c) $u = \frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$ d) $u = -\frac{\partial\phi}{\partial x}, v = -\frac{\partial\phi}{\partial y}$
- 9) The velocity components in x and y directions in terms of stream function (ψ) are
 a) $u = \frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$ b) $u = -\frac{\partial\psi}{\partial x}, v = \frac{\partial\psi}{\partial y}$
 c) $u = \frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$ d) $u = -\frac{\partial\psi}{\partial y}, v = \frac{\partial\psi}{\partial x}$
- 10) Venturimeter is used for measurement of
 a) pressure b) temperature
 c) velocity at a point d) discharge
- 11) Bernoulli's theorem deals with the law of conservation of
 a) mass b) momentum
 c) energy d) none of the above
- 12) The condition of stable equilibrium for a floating body is
 a) the metacentre M coincides with the centre of gravity G
 b) the metacentre M is below centre of gravity G
 c) the metacentre M is above with the centre of gravity G
 d) the centre of buoyancy B is above centre of gravity G
- 13) Reynolds number is the ratio of
 a) inertia force to pressure force b) inertia force to elastic force
 c) inertia force to viscous force d) none of the above
- 14) The friction factor in fluid flowing through pipe depends upon
 a) Reynold's number b) Relative roughness of pipe surface
 c) Both a and b d) None of the above



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

**S.E. (Mech.) (Part – II) (CGPA) Examination, 2017
FLUID MECHANICS**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Answer **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**.

SECTION – I

2. Attempt the following questions :
- a) Explain Archimedes principle and centre of Buoyancy. 4
 - b) Derive an expression for resultant force and the depth of center of pressure from free surface of liquid for plane vertical surface submerged in the liquid. 5
 - c) A rectangular plane surface 3 m wide, 4 m deep lies in a water in such a way that plane makes an angle 30° with the free surface of water. Determine the total pressure force and position of centre of pressure when the upper edge is 2 m below the free surface. 5
3. Attempt the following questions :
- a) What are different types of fluid flow ? Explain with an example. 4
 - b) What is venturimeter ? Derive an expression for the discharge through a venturimeter. 5
 - c) The fluid flow is described by the velocity field as given $V = 2x^3 i - 5x^2 yj + 4t k$. Find the velocity and acceleration components at point (1, 2, 3) in the field at $t = 1$ and total acceleration also. 5
4. Attempt the following questions :
- a) A nozzle is situated at a distance of 1 m above the ground level and is inclined at an angle of 45° to the horizontal. The diameter of the nozzle is 50 mm and the jet of water from the nozzle strikes is ground at a horizontal distance of 4 m. Find the rate of flow of water. 4



- b) What is pitot tube ? How will you determine the velocity at any point with the help of pitot tube ? 5
- c) A crude oil of viscosity of 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and 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. 5

SECTION – II

5. Attempt the following questions :
- a) What is syphon ? Explain its working with sketch. 4
- b) Derive Darcy-Weisbach equation for finding loss of head due to friction in pipes. 5
- c) The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and diameters 300 mm, 200 mm and 400 mm is 12 m. If respective co-efficient of frictions of pipes are 0.005, 0.0052 and 0.0048. Calculate discharge through the pipe by considering minor losses. 5
6. Attempt the following questions :
- a) What do you mean by separation of boundary layer ? What are the different methods of preventing separation of boundary layer ? 4
- b) A partially submerged body is towed in water. The resistance (R) or force to its motion can be expressed in the form $R = \rho L^2 V^2 \phi \left[\frac{\mu}{\rho VL}, \frac{Lg}{V^2} \right]$ where density (ρ), viscosity of water (μ), length of the body (L), velocity of the body (V) and acceleration due to gravity (g). 5
- c) Define the following : 5
- 1) Displacement thickness
 - 2) Momentum thickness
 - 3) Energy thickness
7. Attempt the following questions :
- a) A kite of 60 cm × 60 cm weighing 2.943 N assumed an angle of 10° to the horizontal. If the pull on string is 29.43 N. When the wind is flowing at a speed of 40 km/hr. Find corresponding co-efficient of drag and lift. Density of air is 1.25 kg/m³. Angle made by string of kite with horizontal is 45°. 4
- b) Derive an expression for drag and lift on a stationary solid body in a stream of real fluid moving with uniform velocity. 5
- c) What is CFD ? Explain solution procedure for CFD analysis. 5



SLR-TJ – 97

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

Set	P
-----	----------

**S.E. Mechanical Engineering (Part – II) (CGPA) Examination, 2017
THEORY OF MACHINES – I**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

- 1) The lead screw of a lathe with nut forms a
 - a) Sliding pair
 - b) Rolling pair
 - c) Screw pair
 - d) Turning pair
- 2) In a kinematic chain, a quaternary joint is equivalent to
 - a) One binary joint
 - b) Two binary joints
 - c) Three binary joints
 - d) Four binary joints
- 3) A combination of kinematic pairs, joined in such a way that the relative motion between the links is completely constrained, is called a
 - a) Structure
 - b) Mechanism
 - c) Kinematic chain
 - d) Inversion
- 4) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a
 - a) Straight line
 - b) Parabolic curve
 - c) Ellipse
 - d) None of these
- 5) 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

P.T.O.



- 6) In a pantograph, all the pairs are
- a) Turning pairs
 - b) Sliding pairs
 - c) Spherical pairs
 - d) Self-closed pairs
- 7) When the crank is at the inner dead centre, in a horizontal reciprocating steam engine, then the velocity of the piston will be
- a) Zero
 - b) Minimum
 - c) Maximum
 - d) None of these
- 8) The pressure angle of the cam _____ with increase in the base circle diameter.
- a) Decreases
 - b) Increases
 - c) Does not change
 - d) May decrease or increase
- 9) The point on the cam with maximum pressure angle is known as the
- a) Cam centre
 - b) Pitch point
 - c) Trace point
 - d) Prime point
- 10) Path described by the trace point is known as the
- a) Pitch curve
 - b) Pitch circle
 - c) Prime circle
 - d) Prime curve
- 11) The efficiency of a screw jack depends on
- a) Pitch of threads
 - b) Load
 - c) Both pitch and load
 - d) Neither pitch nor load
- 12) The efficiency of a screw jack increases with
- a) Decrease in load
 - b) Increase in load
 - c) Decrease in pitch
 - d) Increase in pitch
- 13) Which of the following brakes is commonly used in motor cars ?
- a) Band brake
 - b) Shoe brake
 - c) Band and block brake
 - d) Internal expanding shoe brake
- 14) A Hartnell governor is a/an _____ governor.
- a) Dead weight
 - b) Pendulum type
 - c) Inertia
 - d) Spring-loaded
-



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

S.E. Mechanical Engineering (Part – II) (CGPA)
Examination, 2017
THEORY OF MACHINES – I

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Use of calculator is allowed.**
 - 3) Figures to the **right** indicates **full** marks.
 - 4) Draw **neat sketches wherever** necessary.
 - 5) Assume suitable data if necessary and state it **clearly**.

SECTION – I

2. a) Explain inversions of single slider crank chain with neat sketches. 6
- b) In a pin jointed four bar mechanism, as shown in Fig. II (a), $AB = 300$ mm, $BC = CD = 360$ mm and $AD = 600$ mm. The angle $BAD = 60^\circ$. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC . 8

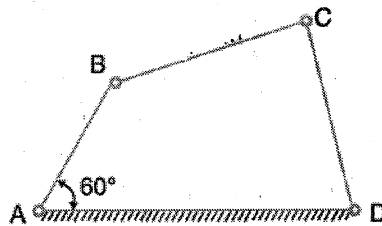


Fig. II (b)

3. a) In the toggle mechanism, as shown in Fig.III (a), the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. The dimensions of various links are as follows :



OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm.

For the given configuration, find : 1) Velocity of slider D, 2) Angular velocity of links AB, CB and BD.

7

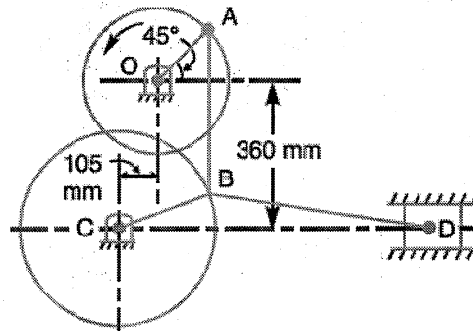


Fig. III (a)

- b) Explain Ackerman steering mechanism with neat sketch. 7
4. a) Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. 6
- b) The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm^2 . The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 8
- 1) Pressure on slide bars
 - 2) Thrust in the connecting rod
 - 3) Tangential force on the crank-pin and
 - 4) Turning moment on the crank shaft.

SECTION – II

5. a) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below:
- 1) To raise the valve through 50 mm during 120° rotation of the cam;
 - 2) To keep the valve fully raised through next 30° ;
 - 3) To lower the valve during next 60° ; and



4) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when (a) the line of stroke of the valve rod passes through the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.

8

b) Derive an expression for torque required to lower the load in case of a screw jack.

6

6. a) A conical pivot bearing 150 mm in diameter has a cone angle of 120°. If the shaft supports an axial load of 20 kN and the coefficient of friction is 0.03, find the power lost in friction when the shaft rotates at 200 r.p.m., assuming

6

1) Uniform pressure, and 2) Uniform wear.

b) Fig. VI (b) shows a brake shoe applied to a drum by a lever AB which is pivoted at a fixed point A and rigidly fixed to the shoe. The radius of the drum is 160 mm. The coefficient of friction at the brake lining is 0.3. If the drum rotates clockwise, find the braking torque due to the horizontal force of 600 N at B.

8

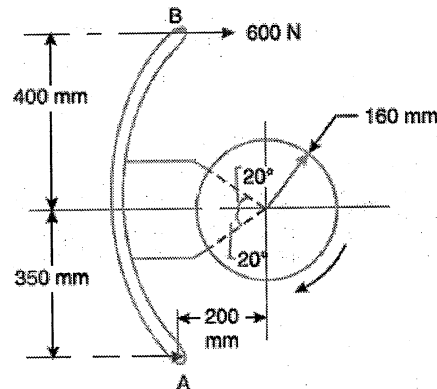


Fig. VI (b)

7. a) A conical friction clutch is used to transmit 90 KW at 1500 r.p.m. The semi cone angle is 20° and the coefficient of friction is 0.2. If the mean diameter of the bearing surface is 375 mm and the intensity of normal pressure is not to exceed 0.25 N/mm², find the dimensions of the conical bearing surface and the axial load required.

8

b) In a Hartnell governor, the extreme radii of rotations of the balls are 40 mm and 60 mm and the corresponding speeds are 210 rpm and 230 rpm. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the central spring.

6



SLR-TJ – 97

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

Set	Q
-----	---

**S.E. Mechanical Engineering (Part – II) (CGPA) Examination, 2017
THEORY OF MACHINES – I**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

- 1) The pressure angle of the cam _____ with increase in the base circle diameter.
 - a) Decreases
 - b) Increases
 - c) Does not change
 - d) May decrease or increase
- 2) The point on the cam with maximum pressure angle is known as the
 - a) Cam centre
 - b) Pitch point
 - c) Trace point
 - d) Prime point
- 3) Path described by the trace point is known as the
 - a) Pitch curve
 - b) Pitch circle
 - c) Prime circle
 - d) Prime curve
- 4) The efficiency of a screw jack depends on
 - a) Pitch of threads
 - b) Load
 - c) Both pitch and load
 - d) Neither pitch nor load
- 5) The efficiency of a screw jack increases with
 - a) Decrease in load
 - b) Increase in load
 - c) Decrease in pitch
 - d) Increase in pitch
- 6) Which of the following brakes is commonly used in motor cars ?
 - a) Band brake
 - b) Shoe brake
 - c) Band and block brake
 - d) Internal expanding shoe brake

P.T.O.



- 7) A Hartnell governor is a/an _____ governor.
- a) Dead weight b) Pendulum type
c) Inertia d) Spring-loaded
- 8) The lead screw of a lathe with nut forms a
- a) Sliding pair b) Rolling pair
c) Screw pair d) Turning pair
- 9) In a kinematic chain, a quaternary joint is equivalent to
- a) One binary joint b) Two binary joints
c) Three binary joints d) Four binary joints
- 10) A combination of kinematic pairs, joined in such a way that the relative motion between the links is completely constrained, is called a
- a) Structure b) Mechanism
c) Kinematic chain d) Inversion
- 11) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a
- a) Straight line 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
- 13) In a pantograph, all the pairs are
- a) Turning pairs b) Sliding pairs
c) Spherical pairs d) Self-closed pairs
- 14) When the crank is at the inner dead centre, in a horizontal reciprocating steam engine, then the velocity of the piston will be
- a) Zero b) Minimum
c) Maximum d) None of these



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

S.E. Mechanical Engineering (Part – II) (CGPA)
Examination, 2017
THEORY OF MACHINES – I

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Solve **any two** questions from **each** Section.
2) **Use of calculator is allowed.**
3) Figures to the **right** indicates **full** marks.
4) Draw **neat sketches wherever** necessary.
5) Assume suitable data if necessary and state it **clearly.**

SECTION – I

2. a) Explain inversions of single slider crank chain with neat sketches. **6**
- b) In a pin jointed four bar mechanism, as shown in Fig. II (a), $AB = 300$ mm, $BC = CD = 360$ mm and $AD = 600$ mm. The angle $BAD = 60^\circ$. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC . **8**

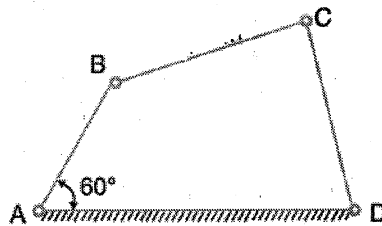


Fig. II (b)

3. a) In the toggle mechanism, as shown in Fig.III (a), the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. The dimensions of various links are as follows :



OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm.

For the given configuration, find : 1) Velocity of slider D, 2) Angular velocity of links AB, CB and BD.

7

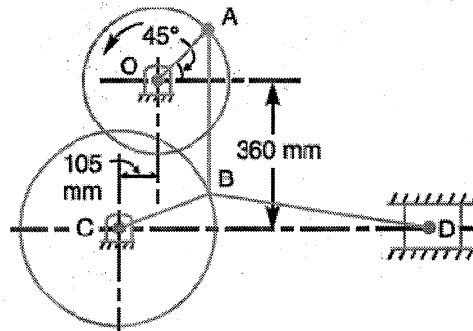


Fig. III (a)

- b) Explain Ackerman steering mechanism with neat sketch. 7
4. a) Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. 6
- b) The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm^2 . The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 8
- 1) Pressure on slide bars
 - 2) Thrust in the connecting rod
 - 3) Tangential force on the crank-pin and
 - 4) Turning moment on the crank shaft.

SECTION – II

5. a) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below:
- 1) To raise the valve through 50 mm during 120° rotation of the cam;
 - 2) To keep the valve fully raised through next 30° ;
 - 3) To lower the valve during next 60° ; and



4) To keep the valve closed during rest of the revolution i.e. 150° ;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when (a) the line of stroke of the valve rod passes through the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.

8

b) Derive an expression for torque required to lower the load in case of a screw jack.

6

6. a) A conical pivot bearing 150 mm in diameter has a cone angle of 120° . If the shaft supports an axial load of 20 kN and the coefficient of friction is 0.03, find the power lost in friction when the shaft rotates at 200 r.p.m., assuming

1) Uniform pressure, and 2) Uniform wear.

6

b) Fig. VI (b) shows a brake shoe applied to a drum by a lever AB which is pivoted at a fixed point A and rigidly fixed to the shoe. The radius of the drum is 160 mm. The coefficient of friction at the brake lining is 0.3. If the drum rotates clockwise, find the braking torque due to the horizontal force of 600 N at B.

8

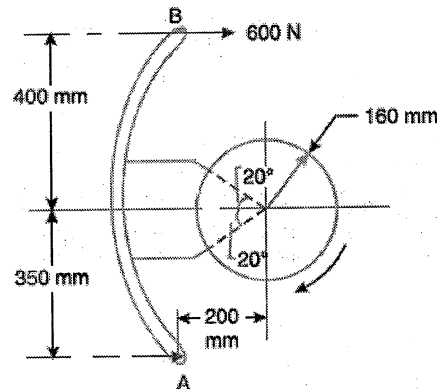


Fig. VI (b)

7. a) A conical friction clutch is used to transmit 90 KW at 1500 r.p.m. The semi cone angle is 20° and the coefficient of friction is 0.2. If the mean diameter of the bearing surface is 375 mm and the intensity of normal pressure is not to exceed 0.25 N/mm^2 , find the dimensions of the conical bearing surface and the axial load required.

8

b) In a Hartnell governor, the extreme radii of rotations of the balls are 40 mm and 60 mm and the corresponding speeds are 210 rpm and 230 rpm. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the central spring.

6



SLR-TJ – 97

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

Set	R
-----	---

**S.E. Mechanical Engineering (Part – II) (CGPA) Examination, 2017
THEORY OF MACHINES – I**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

- 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 pantograph, all the pairs are
 - a) Turning pairs
 - b) Sliding pairs
 - c) Spherical pairs
 - d) Self-closed pairs
- 3) When the crank is at the inner dead centre, in a horizontal reciprocating steam engine, then the velocity of the piston will be
 - a) Zero
 - b) Minimum
 - c) Maximum
 - d) None of these
- 4) The pressure angle of the cam _____ with increase in the base circle diameter.
 - a) Decreases
 - b) Increases
 - c) Does not change
 - d) May decrease or increase
- 5) The point on the cam with maximum pressure angle is known as the
 - a) Cam centre
 - b) Pitch point
 - c) Trace point
 - d) Prime point

P.T.O.



- 6) Path described by the trace point is known as the
- a) Pitch curve
 - b) Pitch circle
 - c) Prime circle
 - d) Prime curve
- 7) The efficiency of a screw jack depends on
- a) Pitch of threads
 - b) Load
 - c) Both pitch and load
 - d) Neither pitch nor load
- 8) The efficiency of a screw jack increases with
- a) Decrease in load
 - b) Increase in load
 - c) Decrease in pitch
 - d) Increase in pitch
- 9) Which of the following brakes is commonly used in motor cars ?
- a) Band brake
 - b) Shoe brake
 - c) Band and block brake
 - d) Internal expanding shoe brake
- 10) A Hartnell governor is a/an _____governor.
- a) Dead weight
 - b) Pendulum type
 - c) Inertia
 - d) Spring-loaded
- 11) The lead screw of a lathe with nut forms a
- a) Sliding pair
 - b) Rolling pair
 - c) Screw pair
 - d) Turning pair
- 12) In a kinematic chain, a quaternary joint is equivalent to
- a) One binary joint
 - b) Two binary joints
 - c) Three binary joints
 - d) Four binary joints
- 13) A combination of kinematic pairs, joined in such a way that the relative motion between the links is completely constrained, is called a
- a) Structure
 - b) Mechanism
 - c) Kinematic chain
 - d) Inversion
- 14) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a
- a) Straight line
 - b) Parabolic curve
 - c) Ellipse
 - d) None of these
-



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

S.E. Mechanical Engineering (Part – II) (CGPA)
Examination, 2017
THEORY OF MACHINES – I

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Use of calculator is allowed.**
 - 3) Figures to the **right** indicates **full** marks.
 - 4) Draw **neat sketches wherever** necessary.
 - 5) Assume suitable data if necessary and state it **clearly**.

SECTION – I

2. a) Explain inversions of single slider crank chain with neat sketches. 6
- b) In a pin jointed four bar mechanism, as shown in Fig. II (a), $AB = 300$ mm, $BC = CD = 360$ mm and $AD = 600$ mm. The angle $BAD = 60^\circ$. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC . 8

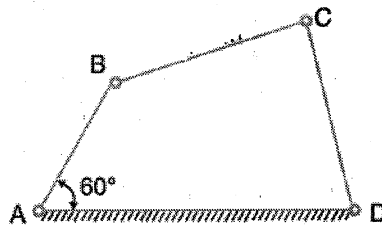


Fig. II (b)

3. a) In the toggle mechanism, as shown in Fig.III (a), the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. The dimensions of various links are as follows :



OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm.

For the given configuration, find : 1) Velocity of slider D, 2) Angular velocity of links AB, CB and BD.

7

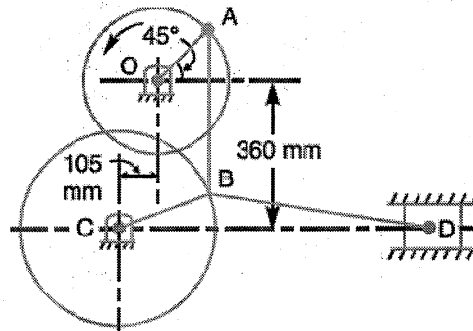


Fig. III (a)

- b) Explain Ackerman steering mechanism with neat sketch. 7
4. a) Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. 6
- b) The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm^2 . The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 8
- 1) Pressure on slide bars
 - 2) Thrust in the connecting rod
 - 3) Tangential force on the crank-pin and
 - 4) Turning moment on the crank shaft.

SECTION – II

5. a) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below:
- 1) To raise the valve through 50 mm during 120° rotation of the cam;
 - 2) To keep the valve fully raised through next 30° ;
 - 3) To lower the valve during next 60° ; and



4) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when (a) the line of stroke of the valve rod passes through the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.

8

b) Derive an expression for torque required to lower the load in case of a screw jack.

6

6. a) A conical pivot bearing 150 mm in diameter has a cone angle of 120°. If the shaft supports an axial load of 20 kN and the coefficient of friction is 0.03, find the power lost in friction when the shaft rotates at 200 r.p.m., assuming

6

1) Uniform pressure, and 2) Uniform wear.

b) Fig. VI (b) shows a brake shoe applied to a drum by a lever AB which is pivoted at a fixed point A and rigidly fixed to the shoe. The radius of the drum is 160 mm. The coefficient of friction at the brake lining is 0.3. If the drum rotates clockwise, find the braking torque due to the horizontal force of 600 N at B.

8

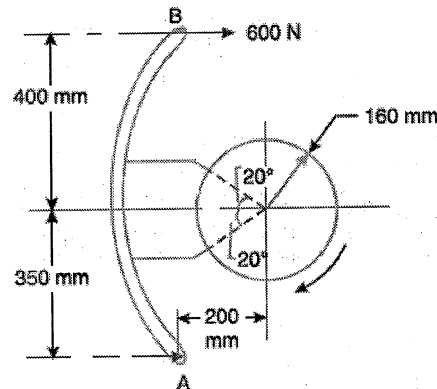


Fig. VI (b)

7. a) A conical friction clutch is used to transmit 90 KW at 1500 r.p.m. The semi cone angle is 20° and the coefficient of friction is 0.2. If the mean diameter of the bearing surface is 375 mm and the intensity of normal pressure is not to exceed 0.25 N/mm², find the dimensions of the conical bearing surface and the axial load required.

8

b) In a Hartnell governor, the extreme radii of rotations of the balls are 40 mm and 60 mm and the corresponding speeds are 210 rpm and 230 rpm. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the central spring.

6



SLR-TJ – 97

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

Set	S
-----	---

**S.E. Mechanical Engineering (Part – II) (CGPA) Examination, 2017
THEORY OF MACHINES – I**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

- 1) Path described by the trace point is known as the
 - a) Pitch curve
 - b) Pitch circle
 - c) Prime circle
 - d) Prime curve
- 2) The efficiency of a screw jack depends on
 - a) Pitch of threads
 - b) Load
 - c) Both pitch and load
 - d) Neither pitch nor load
- 3) The efficiency of a screw jack increases with
 - a) Decrease in load
 - b) Increase in load
 - c) Decrease in pitch
 - d) Increase in pitch
- 4) Which of the following brakes is commonly used in motor cars ?
 - a) Band brake
 - b) Shoe brake
 - c) Band and block brake
 - d) Internal expanding shoe brake
- 5) A Hartnell governor is a/an _____ governor.
 - a) Dead weight
 - b) Pendulum type
 - c) Inertia
 - d) Spring-loaded
- 6) The lead screw of a lathe with nut forms a
 - a) Sliding pair
 - b) Rolling pair
 - c) Screw pair
 - d) Turning pair

P.T.O.



- 7) In a kinematic chain, a quaternary joint is equivalent to
- a) One binary joint
 - b) Two binary joints
 - c) Three binary joints
 - d) Four binary joints
- 8) A combination of kinematic pairs, joined in such a way that the relative motion between the links is completely constrained, is called a
- a) Structure
 - b) Mechanism
 - c) Kinematic chain
 - d) Inversion
- 9) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a
- a) Straight line
 - b) Parabolic curve
 - 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 pantograph, all the pairs are
- a) Turning pairs
 - b) Sliding pairs
 - c) Spherical pairs
 - d) Self-closed pairs
- 12) When the crank is at the inner dead centre, in a horizontal reciprocating steam engine, then the velocity of the piston will be
- a) Zero
 - b) Minimum
 - c) Maximum
 - d) None of these
- 13) The pressure angle of the cam _____ with increase in the base circle diameter.
- a) Decreases
 - b) Increases
 - c) Does not change
 - d) May decrease or increase
- 14) The point on the cam with maximum pressure angle is known as the
- a) Cam centre
 - b) Pitch point
 - c) Trace point
 - d) Prime point
-



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

S.E. Mechanical Engineering (Part – II) (CGPA)
Examination, 2017
THEORY OF MACHINES – I

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Use of calculator is allowed.**
 - 3) Figures to the **right** indicates **full** marks.
 - 4) Draw **neat sketches wherever** necessary.
 - 5) Assume suitable data if necessary and state it **clearly**.

SECTION – I

2. a) Explain inversions of single slider crank chain with neat sketches. 6
- b) In a pin jointed four bar mechanism, as shown in Fig. II (a), $AB = 300$ mm, $BC = CD = 360$ mm and $AD = 600$ mm. The angle $BAD = 60^\circ$. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC . 8

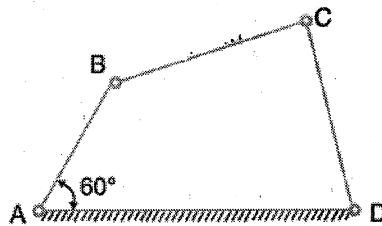


Fig. II (b)

3. a) In the toggle mechanism, as shown in Fig.III (a), the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. The dimensions of various links are as follows :



OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm.

For the given configuration, find : 1) Velocity of slider D, 2) Angular velocity of links AB, CB and BD.

7

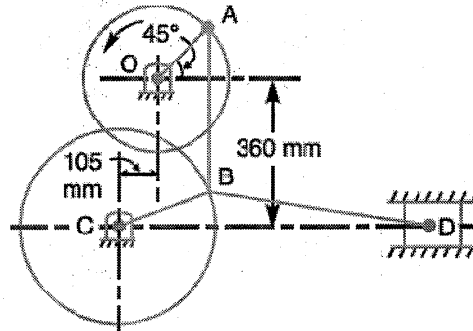


Fig. III (a)

- b) Explain Ackerman steering mechanism with neat sketch. 7
4. a) Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. 6
- b) The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm^2 . The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 8
- 1) Pressure on slide bars
 - 2) Thrust in the connecting rod
 - 3) Tangential force on the crank-pin and
 - 4) Turning moment on the crank shaft.

SECTION – II

5. a) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below:
- 1) To raise the valve through 50 mm during 120° rotation of the cam;
 - 2) To keep the valve fully raised through next 30° ;
 - 3) To lower the valve during next 60° ; and



4) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when (a) the line of stroke of the valve rod passes through the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.

8

b) Derive an expression for torque required to lower the load in case of a screw jack.

6

6. a) A conical pivot bearing 150 mm in diameter has a cone angle of 120°. If the shaft supports an axial load of 20 kN and the coefficient of friction is 0.03, find the power lost in friction when the shaft rotates at 200 r.p.m., assuming

6

1) Uniform pressure, and 2) Uniform wear.

b) Fig. VI (b) shows a brake shoe applied to a drum by a lever AB which is pivoted at a fixed point A and rigidly fixed to the shoe. The radius of the drum is 160 mm. The coefficient of friction at the brake lining is 0.3. If the drum rotates clockwise, find the braking torque due to the horizontal force of 600 N at B.

8

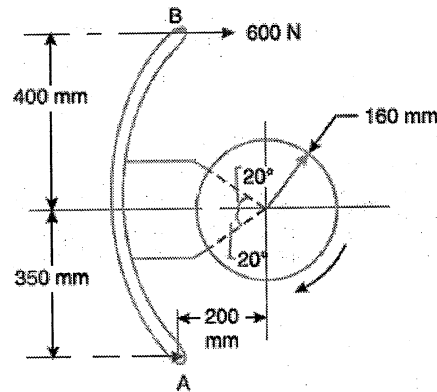


Fig. VI (b)

7. a) A conical friction clutch is used to transmit 90 KW at 1500 r.p.m. The semi cone angle is 20° and the coefficient of friction is 0.2. If the mean diameter of the bearing surface is 375 mm and the intensity of normal pressure is not to exceed 0.25 N/mm², find the dimensions of the conical bearing surface and the axial load required.

8

b) In a Hartnell governor, the extreme radii of rotations of the balls are 40 mm and 60 mm and the corresponding speeds are 210 rpm and 230 rpm. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the central spring.

6



SLR-TJ – 98

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

Set	P
-----	---

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1.A) MCQ with only **one** answer correct (1 mark **each**) **(1×6=6)**

- 1) Sand which forms the surface of mould is
 - a) Backing sand
 - b) Facing sand
 - c) Green sand
 - d) All of these
- 2) Feeder should solidify
 - a) After solidification of casting
 - b) Along with casting
 - c) Before casting
 - d) Any time during solidification of casting
- 3) The chock area is generally provided at
 - a) Gate
 - b) Pouring cup
 - c) Feeder
 - d) Mould cavity
- 4) Spanner is manufactured by
 - a) Rolling
 - b) Open die forging
 - c) Direct extrusion
 - d) Closed die forging
- 5) Which of the following is backward type extrusion ?
 - a) Direct
 - b) Impact
 - c) Hydrostatic
 - d) None of above
- 6) Permanent mould casting is used for manufacturing of
 - a) Carburetor of two wheeler
 - b) Turbine blades
 - c) Electric motor body
 - d) 6 cylinder engine body

P.T.O.



B) MCQ with more than **one** answer correct (**2** marks **each**): **(2×4=8)**

- 1) For joining of two parts without use of extra filler metal, following processes are used
 - a) Brazing
 - b) TIG welding
 - c) MIG welding
 - d) Resistance welding

 - 2) Investment casting
 - a) Uses metal pattern
 - b) Suitable for mass production
 - c) Does not uses core
 - d) Used for manufacturing of lathe bed

 - 3) Among the following, properties of moulding sand are
 - a) High refractoriness
 - b) High thermal expansion coefficient
 - c) High cohesiveness
 - d) Reactive to metal

 - 4) Which of the following are cold working processes ?
 - a) Impact extrusion
 - b) Piercing
 - c) Wire drawing
 - d) Open die forging
-



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

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:** 1) Attempt **any two** questions from **each** Section.
2) **Neat** sketches must be drawn **wherever** necessary.
3) **Assume** additional suitable data **wherever** necessary and mention in **clearly**.
4) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Enlist various properties of green sand. What is facing sand ? **5**
b) Explain steps in casting process with flow chart. **4**
c) Explain CO₂ process of core making. What are its advantages and limitations ? **5**
3. a) What is pattern ? Enlist the types of patterns and draw the sketch of match plated cope and drag pattern. **6**
b) Explain advantages and limitations of centrifugal casting process. **4**
c) Explain the process of gravity die casting with neat sketch. **4**
4. a) Explain the process of compression molding of plastics with neat sketch. What are its advantages ? **6**
b) Enlist the charge materials added to cupolas. What is flux ? **4**
c) Explain stages in fettling of casting. **4**

Set P



SECTION – II

5. a) Enlist any four components produced by rolling and forging respectively. 4
b) Explain the process of cold rolling of sheet with flow chart. 5
c) Explain basic hand forging operations and their applications. 5
6. a) Explain the process of impact extrusion with its advantages, limitations and applications. 5
b) Explain the process of multi pass wire drawing with neat sketch. 5
c) Compare between tube extrusion and tube drawing. 4
7. a) Explain the process of TIG welding pointing out its advantages, limitations and applications. 5
b) Explain the process of resistance spot welding. What are its types ? Explain its application. 5
c) Compare between gas welding and arc welding. 4
-



SLR-TJ – 98

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

Set	Q
-----	---

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

Instructions: 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) MCQ with only **one** answer correct (1 mark **each**) **(1×6=6)**

- 1) Which of the following is backward type extrusion ?
a) Direct b) Impact c) Hydrostatic d) None of above
- 2) Permanent mould casting is used for manufacturing of
a) Carburetor of two wheeler b) Turbine blades
c) Electric motor body d) 6 cylinder engine body
- 3) Spanner is manufactured by
a) Rolling b) Open die forging
c) Direct extrusion d) Closed die forging
- 4) The chock area is generally provided at
a) Gate b) Pouring cup c) Feeder d) Mould cavity
- 5) Sand which forms the surface of mould is
a) Backing sand b) Facing sand
c) Green sand d) All of these
- 6) Feeder should solidify
a) After solidification of casting
b) Along with casting
c) Before casting
d) Any time during solidification of casting

P.T.O.



B) MCQ with more than **one** answer correct (**2** marks **each**): **(2×4=8)**

- 1) Which of the following are cold working processes ?
 - a) Impact extrusion
 - b) Piercing
 - c) Wire drawing
 - d) Open die forging

 - 2) For joining of two parts without use of extra filler metal, following processes are used
 - a) Brazing
 - b) TIG welding
 - c) MIG welding
 - d) Resistance welding

 - 3) Investment casting
 - a) Uses metal pattern
 - b) Suitable for mass production
 - c) Does not uses core
 - d) Used for manufacturing of lathe bed

 - 4) Among the following, properties of moulding sand are
 - a) High refractoriness
 - b) High thermal expansion coefficient
 - c) High cohesiveness
 - d) Reactive to metal
-



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

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:** 1) Attempt **any two** questions from **each** Section.
2) **Neat** sketches must be drawn **wherever** necessary.
3) **Assume** additional suitable data **wherever** necessary and mention in **clearly**.
4) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Enlist various properties of green sand. What is facing sand ? **5**
b) Explain steps in casting process with flow chart. **4**
c) Explain CO₂ process of core making. What are its advantages and limitations ? **5**
3. a) What is pattern ? Enlist the types of patterns and draw the sketch of match plated cope and drag pattern. **6**
b) Explain advantages and limitations of centrifugal casting process. **4**
c) Explain the process of gravity die casting with neat sketch. **4**
4. a) Explain the process of compression molding of plastics with neat sketch. What are its advantages ? **6**
b) Enlist the charge materials added to cupolas. What is flux ? **4**
c) Explain stages in fettling of casting. **4**

Set Q



SECTION – II

5. a) Enlist any four components produced by rolling and forging respectively. 4
b) Explain the process of cold rolling of sheet with flow chart. 5
c) Explain basic hand forging operations and their applications. 5
6. a) Explain the process of impact extrusion with its advantages, limitations and applications. 5
b) Explain the process of multi pass wire drawing with neat sketch. 5
c) Compare between tube extrusion and tube drawing. 4
7. a) Explain the process of TIG welding pointing out its advantages, limitations and applications. 5
b) Explain the process of resistance spot welding. What are its types ? Explain its application. 5
c) Compare between gas welding and arc welding. 4
-



SLR-TJ – 98

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

Set	R
-----	---

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

Instructions: 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1.A) MCQ with only **one** answer correct (1 mark **each**) (1×6=6)

- 1) The chock area is generally provided at
 - a) Gate
 - b) Pouring cup
 - c) Feeder
 - d) Mould cavity
- 2) Sand which forms the surface of mould is
 - a) Backing sand
 - b) Facing sand
 - c) Green sand
 - d) All of these
- 3) Feeder should solidify
 - a) After solidification of casting
 - b) Along with casting
 - c) Before casting
 - d) Any time during solidification of casting
- 4) Which of the following is backward type extrusion ?
 - a) Direct
 - b) Impact
 - c) Hydrostatic
 - d) None of above
- 5) Permanent mould casting is used for manufacturing of
 - a) Carburetor of two wheeler
 - b) Turbine blades
 - c) Electric motor body
 - d) 6 cylinder engine body
- 6) Spanner is manufactured by
 - a) Rolling
 - b) Open die forging
 - c) Direct extrusion
 - d) Closed die forging

P.T.O.



B) MCQ with more than **one** answer correct (2 marks **each**):

(2×4=8)

- 1) Investment casting
 - a) Uses metal pattern
 - b) Suitable for mass production
 - c) Does not uses core
 - d) Used for manufacturing of lathe bed

 - 2) Among the following, properties of moulding sand are
 - a) High refractoriness
 - b) High thermal expansion coefficient
 - c) High cohesiveness
 - d) Reactive to metal

 - 3) Which of the following are cold working processes ?

a) Impact extrusion	b) Piercing
c) Wire drawing	d) Open die forging

 - 4) For joining of two parts without use of extra filler metal, following processes are used

a) Brazing	b) TIG welding
c) MIG welding	d) Resistance welding
-



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

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:** 1) Attempt **any two** questions from **each** Section.
2) **Neat** sketches must be drawn **wherever** necessary.
3) **Assume** additional suitable data **wherever** necessary and mention in **clearly**.
4) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Enlist various properties of green sand. What is facing sand ? **5**
b) Explain steps in casting process with flow chart. **4**
c) Explain CO₂ process of core making. What are its advantages and limitations ? **5**
3. a) What is pattern ? Enlist the types of patterns and draw the sketch of match plated cope and drag pattern. **6**
b) Explain advantages and limitations of centrifugal casting process. **4**
c) Explain the process of gravity die casting with neat sketch. **4**
4. a) Explain the process of compression molding of plastics with neat sketch. What are its advantages ? **6**
b) Enlist the charge materials added to cupolas. What is flux ? **4**
c) Explain stages in fettling of casting. **4**

Set R



SECTION – II

5. a) Enlist any four components produced by rolling and forging respectively. 4
b) Explain the process of cold rolling of sheet with flow chart. 5
c) Explain basic hand forging operations and their applications. 5
6. a) Explain the process of impact extrusion with its advantages, limitations and applications. 5
b) Explain the process of multi pass wire drawing with neat sketch. 5
c) Compare between tube extrusion and tube drawing. 4
7. a) Explain the process of TIG welding pointing out its advantages, limitations and applications. 5
b) Explain the process of resistance spot welding. What are its types ? Explain its application. 5
c) Compare between gas welding and arc welding. 4
-



SLR-TJ – 98

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

Set	S
-----	---

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

Instructions: 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1.A) MCQ with only **one** answer correct (1 mark **each**)

(1×6=6)

- 1) Permanent mould casting is used for manufacturing of
 - a) Carburetor of two wheeler
 - b) Turbine blades
 - c) Electric motor body
 - d) 6 cylinder engine body
- 2) Which of the following is backward type extrusion ?
 - a) Direct
 - b) Impact
 - c) Hydrostatic
 - d) None of above
- 3) Sand which forms the surface of mould is
 - a) Backing sand
 - b) Facing sand
 - c) Green sand
 - d) All of these
- 4) Feeder should solidify
 - a) After solidification of casting
 - b) Along with casting
 - c) Before casting
 - d) Any time during solidification of casting
- 5) Spanner is manufactured by
 - a) Rolling
 - b) Open die forging
 - c) Direct extrusion
 - d) Closed die forging
- 6) The chock area is generally provided at
 - a) Gate
 - b) Pouring cup
 - c) Feeder
 - d) Mould cavity

P.T.O.



B) MCQ with more than **one** answer correct (2 marks **each**):

(2×4=8)

- 1) Among the following, properties of moulding sand are
 - a) High refractoriness
 - b) High thermal expansion coefficient
 - c) High cohesiveness
 - d) Reactive to metal
 - 2) Which of the following are cold working processes ?
 - a) Impact extrusion
 - b) Piercing
 - c) Wire drawing
 - d) Open die forging
 - 3) For joining of two parts without use of extra filler metal, following processes are used
 - a) Brazing
 - b) TIG welding
 - c) MIG welding
 - d) Resistance welding
 - 4) Investment casting
 - a) Uses metal pattern
 - b) Suitable for mass production
 - c) Does not uses core
 - d) Used for manufacturing of lathe bed
-



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

**S.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
MANUFACTURING PROCESSES**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:** 1) Attempt **any two** questions from **each** Section.
2) **Neat** sketches must be drawn **wherever** necessary.
3) **Assume** additional suitable data **wherever** necessary and mention in **clearly**.
4) Figures to the **right** indicate **full** marks.

SECTION – I

2. a) Enlist various properties of green sand. What is facing sand ? 5
b) Explain steps in casting process with flow chart. 4
c) Explain CO₂ process of core making. What are its advantages and limitations ? 5
3. a) What is pattern ? Enlist the types of patterns and draw the sketch of match plated cope and drag pattern. 6
b) Explain advantages and limitations of centrifugal casting process. 4
c) Explain the process of gravity die casting with neat sketch. 4
4. a) Explain the process of compression molding of plastics with neat sketch. What are its advantages ? 6
b) Enlist the charge materials added to cupolas. What is flux ? 4
c) Explain stages in fettling of casting. 4

Set S



SECTION – II

5. a) Enlist any four components produced by rolling and forging respectively. 4
b) Explain the process of cold rolling of sheet with flow chart. 5
c) Explain basic hand forging operations and their applications. 5
6. a) Explain the process of impact extrusion with its advantages, limitations and applications. 5
b) Explain the process of multi pass wire drawing with neat sketch. 5
c) Compare between tube extrusion and tube drawing. 4
7. a) Explain the process of TIG welding pointing out its advantages, limitations and applications. 5
b) Explain the process of resistance spot welding. What are its types ? Explain its application. 5
c) Compare between gas welding and arc welding. 4
-



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

Set

P

S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.**
 - 4) **Use of calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

- 1) Rate of convergence of False-position method is
a) 0.5 b) 1.62 c) 2 d) 2.5
- 2) To fit a polynomial $y = a_0 + a_1x + a_2x^2$ for the given data of n observations by least square principle, the required number of normal equations are
a) 3 b) 2 c) 4 d) n
- 3) If $y = x^2$, then the first divided difference of the arguments -1 and 2 is
a) 2 b) 3 c) 1 d) 0
- 4) Which of the following statement applies to Bisection method ?
a) Converges within few iterations
b) It is faster than Newtons Raphson method
c) Rate of converges is 2
d) It requires that there will be no error in determining the sign of function $f(x)$ in each approximation
- 5) The Power method is used to
a) Fit the curve
b) Find coefficient of correlation between bivariate data
c) Find dominant Eigen value and corresponding eigen vector of the matrix
d) Solve non-linear simultaneous equations
- 6) Using Newton's Raphson method, the first approximation to the root of the equation $2x^3 - 3x - 6 = 0$ near to $x_0 = 2$ is
a) 1.908 b) 1.809 c) 1.709 d) 1.609
- 7) The value of coefficient of correlation r between two variables is lies between
a) -2 and 2 b) 1 and 2 c) -3 and 3 d) -1 and 1

P.T.O.



- 8) If I_1 and I_2 denotes approximate value of $I = \int_a^b f(x)dx$ in the Romberg's method then $I =$
- a) $I = I_2 \left[\frac{I_2 - I_1}{3} \right]$ b) $I = \frac{1}{4} [3 I_2 - I_1]$ c) $I = I_1 + \left[\frac{I_1 + I_2}{3} \right]$ d) None of these
- 9) If $f(0) = 1, f(1) = 2.7, f(2) = 7.4, f(3) = 20.1, f(4) = 54.6$ and $h = 1$, then $\int_0^4 f(x) dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule is
- a) 38.6667 b) 38.5556 c) 38.3333 d) None of these
- 10) The finite difference approximation to the first order derivative y' at $x = x_i$ is
- a) $\frac{1}{2h}(y_{i+1} - y_{i-1})$ b) $\frac{1}{2h}(y_{i+1} + y_{i-1})$ c) $\frac{1}{2h^2}(y_{i+1} - y_{i-1})$ d) $\frac{1}{2h^2}(y_{i+1} + y_{i-1})$
- 11) In solving a set of simultaneous ordinary differential equations $\frac{dy}{dx} = f(x, y, z), \frac{dz}{dx} = \phi(x, y, z)$ by Runge-Kutta method, which of the following is correct ?
- a) $k_1 = \phi(x_0, y_0, z_0), l_1 = f(x_0, y_0, z_0)$
- b) $k_2 = hf \left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}, z_0 + \frac{l_1}{2} \right), l_2 = h\phi \left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}, z_0 + \frac{l_1}{2} \right)$
- c) $k_1 = \frac{h}{2} f(x_0, y_0, z_0), l_1 = \frac{h}{2} \phi(x_0, y_0, z_0)$
- d) $k_2 = hf(x_0 + h, y_0 + k_1, z_0 + l_1), l_2 = h \phi(x_0 + h, y_0 + k_1, z_0 + l_1)$
- 12) For the PDE $U_{xx} + U_{yx} + U_{yy} = 0$, which of the following statement is true ?
- a) It is parabolic when $x = 0$ b) It is hyperbolic when $x > 0$
- c) It is elliptic for all values of x and y d) None of these
- 13) Which of the following is not the method of numerical solution of partial differential equation ?
- a) Crank-Nichelson method b) Bendre-Schmidt's method
- c) Picard's method d) Liebmann's method
- 14) In solving Laplace equation $\nabla^2 u = 0$ the formula used
- $u_{ij} = \frac{1}{4} u_{i-1, j+1} + u_{j+1, j-1} + u_{i+1, j+1} + u_{i-1, j-1}$ is called
- a) Standard five point formula b) Crank-Nichelson formula
- c) Diagonal five point formula d) None of these



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

**S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS**

Day and Date : Friday, 24-11-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Attempt **any three** questions from **each** Section.
 2) Figures to the **right** indicate **full** marks.
 3) Use of calculator is **allowed**.

SECTION – I

2. Solve the following.
- a) Find the greatest positive real root of the equation $x^3 - 4x + 1 = 0$ correct to three decimal places by Regula-Falsi method. 4
 - b) Using Newton's Raphson iterative formula, find approximate value of $\sqrt{29}$ correct to four places of decimals. 3
 - c) Solve the non-linear simultaneous equations $x^2 + y - 11 = 0$ and $y^2 + x - 7 = 0$ by Newton's Raphson method in one step, taking initial approximations $x_0 = 3.5, y_0 = -1.8$. 3
3. a) Apply Gauss Jordan method to find the solution of the system of equations 4
 $x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13$.
- b) Solve **any one** from the following : 5
- i) Solve the following system of equations by Jacobi's method (perform five iterations).
 $x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$
 - ii) Find the coefficient of correlation and equation of line of regression of y on x from the following data.
- | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| x : | 62 | 64 | 65 | 69 | 70 | 71 | 72 | 74 |
| y : | 126 | 125 | 139 | 145 | 165 | 152 | 180 | 208 |
4. Solve the following :
- a) Using least square principle fit the straight line $y = ax + b$ to the data given below. 3
- | | | | | | | |
|----------|---|----|----|----|----|----|
| x | : | 5 | 10 | 15 | 20 | 25 |
| y | : | 15 | 19 | 23 | 26 | 30 |



- b) Using Newton's Divided difference formula, find the cubical function $f(x)$ for the data given below. **3**

$$x : 4 \quad 7 \quad 9 \quad 12$$

$$f(x) : -43 \quad 83 \quad 327 \quad 1053$$

- c) Equations giving the two lines of regression of y on x and of x on y are $7x - 16y + 9 = 0$ and $5y - 4x - 3 = 0$ respectively. Find the means of x and y and the coefficient of correlation. **3**

5. a) Solve the following system of equation by Factorization method. **5**

$$x + 5y + z = 14, \quad 2x + y + 3z = 13, \quad 3x + y + 4z = 17$$

- b) Using Lagrange's formula of interpolation, find $f(z)$ from the given data **4**

$$x : 0 \quad 1 \quad 3 \quad 4$$

$$f(x) : 5 \quad 6 \quad 50 \quad 105$$

SECTION – II

6. Solve **any three** : **9**

a) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x+y) \, dx \, dy$ by Simpson's rule. (Take $h = k = \pi/4$)

b) Using three point Gaussian quadrature formula evaluate $\int_2^4 (1+x^3) \, dx$.

c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using trapezoidal rule and compare the result with its actual value. (Take $h = 1$)

d) Evaluate the integral $I = \int_4^{5.2} \log_e x \, dx$ using Weddle's rule. (Take $h = 0.2$)

7. a) Apply Picard's method to find the second approximation to the values of y and z given that $\frac{dy}{dx} = z$

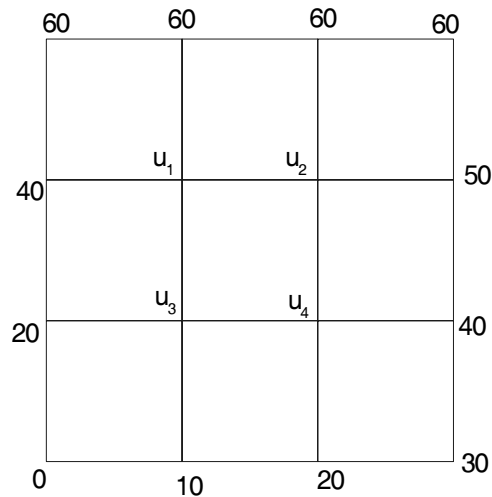
$$\frac{dz}{dx} = x^2 (y+z), \text{ given } y = 1, z = \frac{1}{2} \text{ when } x = 0. \text{ Hence find } y(0.1) \text{ and } z(0.1). \quad \mathbf{4}$$

- b) Determine values of y at the pivotal points of the interval (0.1) if y satisfies the boundary value problem $y^{iv} + 81y = 81x^2$, $y(0) = y(1) = y''(0) = y''(1) = 0$. Take $n = 3$. **5**



8. a) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as shown in figure. (perform five iterations)

6



- b) Use Romberg's method to compute $\int_0^{0.5} \left(\frac{x}{\sin x} \right) dx$ correct to 3 decimal places. (Take $h = 0.25$ and 0.125)

4

9. a) Using Bendre-Schmidt's method find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$

and boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{x^2}{2}$ at the points

$x = i, i = 0, 1, 2, \dots, 7$ and $t = j, j = 0, 1, 2, \dots, 5$.

5

- b) Solve $16 \frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 1, t \geq 0$ given that $u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t$. Compute u for the one time step with $h = 1$ by Crank- Nicholson method .

4



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

**S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.
 - 4) Use of calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(1×14=14)

1) If I_1 and I_2 denotes approximate value of $I = \int_a^b f(x)dx$ in the Romberg's method then $I =$

- a) $I = I_2 \left[\frac{I_2 - I_1}{3} \right]$ b) $I = \frac{1}{4} [3 I_2 - I_1]$ c) $I = I_1 + \left[\frac{I_1 + I_2}{3} \right]$ d) None of these

2) If $f(0) = 1, f(1) = 2.7, f(2) = 7.4, f(3) = 20.1, f(4) = 54.6$ and $h = 1$, then $\int_0^4 f(x) dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule is

- a) 38.6667 b) 38.5556 c) 38.3333 d) None of these

3) The finite difference approximation to the first order derivative y' at $x = x_i$ is

- a) $\frac{1}{2h}(y_{i+1} - y_{i-1})$ b) $\frac{1}{2h}(y_{i+1} + y_{i-1})$ c) $\frac{1}{2h^2}(y_{i+1} - y_{i-1})$ d) $\frac{1}{2h^2}(y_{i+1} + y_{i-1})$

4) In solving a set of simultaneous ordinary differential equations $\frac{dy}{dx} = f(x, y, z), \frac{dz}{dx} = \phi(x, y, z)$ by Runge-Kutta method, which of the following is correct ?

- a) $k_1 = \phi(x_0, y_0, z_0), I_1 = f(x_0, y_0, z_0)$
- b) $k_2 = hf \left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}, z_0 + \frac{l_1}{2} \right), I_2 = h\phi \left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}, z_0 + \frac{l_1}{2} \right)$
- c) $k_1 = \frac{h}{2} f(x_0, y_0, z_0), I_1 = \frac{h}{2} \phi(x_0, y_0, z_0)$
- d) $k_2 = h f(x_0 + h, y_0 + k_1, z_0 + l_1), I_2 = h \phi(x_0 + h, y_0 + k_1, z_0 + l_1)$



- 5) For the PDE $U_{xx} + U_{yx} + U_{yy} = 0$, which of the following statement is true ?
- a) It is parabolic when $x = 0$ b) It is hyperbolic when $x > 0$
 c) It is elliptic for all values of x and y d) None of these
- 6) Which of the following is not the method of numerical solution of partial differential equation ?
- a) Crank-Nichelson method b) Bendre-Schmidt's method
 c) Picard's method d) Liebmann's method
- 7) In solving Laplace equation $\nabla^2 u = 0$ the formula used
- $$u_{ij} = \frac{1}{4} u_{i-1,j+1} + u_{j+1,j-1} + u_{i+1,j+1} + u_{i-1,j-1}$$
- is called
- a) Standard five point formula b) Crank-Nichelson formula
 c) Diagonal five point formula d) None of these
- 8) Rate of convergence of False-position method is
- a) 0.5 b) 1.62 c) 2 d) 2.5
- 9) To fit a polynomial $y = a_0 + a_1x + a_2x^2$ for the given data of n observations by least square principle, the required number of normal equations are
- a) 3 b) 2 c) 4 d) n
- 10) If $y = x^2$, then the first divided difference of the arguments -1 and 2 is
- a) 2 b) 3 c) 1 d) 0
- 11) Which of the following statement applies to Bisection method ?
- a) Converges within few iterations
 b) It is faster than Newtons Raphson method
 c) Rate of converges is 2
 d) It requires that there will be no error in determining the sign of function $f(x)$ in each approximation
- 12) The Power method is used to
- a) Fit the curve
 b) Find coefficient of correlation between bivariate data
 c) Find dominant Eigen value and corresponding eigen vector of the matrix
 d) Solve non-linear simultaneous equations
- 13) Using Newton's Raphson method, the first approximation to the root of the equation $2x^3 - 3x - 6 = 0$ near to $x_0 = 2$ is
- a) 1.908 b) 1.809 c) 1.709 d) 1.609
- 14) The value of coefficient of correlation r between two variables is lies between
- a) -2 and 2 b) 1 and 2 c) -3 and 3 d) -1 and 1



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

**S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS**

Day and Date : Friday, 24-11-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Attempt **any three** questions from **each** Section.
 2) Figures to the **right** indicate **full** marks.
 3) Use of calculator is **allowed**.

SECTION – I

2. Solve the following.
- a) Find the greatest positive real root of the equation $x^3 - 4x + 1 = 0$ correct to three decimal places by Regula-Falsi method. 4
 - b) Using Newton's Raphson iterative formula, find approximate value of $\sqrt{29}$ correct to four places of decimals. 3
 - c) Solve the non-linear simultaneous equations $x^2 + y - 11 = 0$ and $y^2 + x - 7 = 0$ by Newton's Raphson method in one step, taking initial approximations $x_0 = 3.5, y_0 = -1.8$. 3
3. a) Apply Gauss Jordan method to find the solution of the system of equations 4
 $x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13$.
- b) Solve **any one** from the following : 5
- i) Solve the following system of equations by Jacobi's method (perform five iterations).
 $x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$
 - ii) Find the coefficient of correlation and equation of line of regression of y on x from the following data.
- | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| x : | 62 | 64 | 65 | 69 | 70 | 71 | 72 | 74 |
| y : | 126 | 125 | 139 | 145 | 165 | 152 | 180 | 208 |
4. Solve the following :
- a) Using least square principle fit the straight line $y = ax + b$ to the data given below. 3
- | | | | | | | |
|----------|---|----|----|----|----|----|
| x | : | 5 | 10 | 15 | 20 | 25 |
| y | : | 15 | 19 | 23 | 26 | 30 |



- b) Using Newton's Divided difference formula, find the cubical function $f(x)$ for the data given below. **3**

x	:	4	7	9	12
$f(x)$:	-43	83	327	1053

- c) Equations giving the two lines of regression of y on x and of x on y are $7x - 16y + 9 = 0$ and $5y - 4x - 3 = 0$ respectively. Find the means of x and y and the coefficient of correlation. **3**

5. a) Solve the following system of equation by Factorization method. **5**

$$x + 5y + z = 14, 2x + y + 3z = 13, 3x + y + 4z = 17$$

- b) Using Lagrange's formula of interpolation, find $f(z)$ from the given data **4**

x	:	0	1	3	4
$f(x)$:	5	6	50	105

SECTION – II

6. Solve **any three** : **9**

- a) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x+y) dx dy$ by Simpson's rule. (Take $h = k = \pi/4$)

- b) Using three point Gaussian quadrature formula evaluate $\int_2^4 (1+x^3) dx$.

- c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using trapezoidal rule and compare the result with its actual value. (Take $h = 1$)

- d) Evaluate the integral $I = \int_4^{5.2} \log_e x dx$ using Weddle's rule. (Take $h = 0.2$)

7. a) Apply Picard's method to find the second approximation to the values of y and z given that $\frac{dy}{dx} = z$

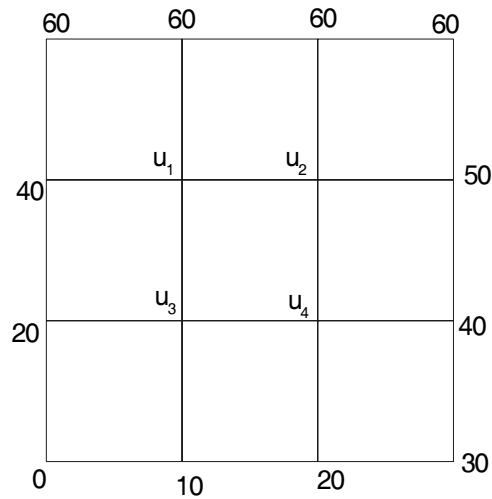
$$\frac{dz}{dx} = x^2(y+z), \text{ given } y = 1, z = \frac{1}{2} \text{ when } x = 0. \text{ Hence find } y(0.1) \text{ and } z(0.1). \quad \mathbf{4}$$

- b) Determine values of y at the pivotal points of the interval (0.1) if y satisfies the boundary value problem $y^{iv} + 81y = 81x^2$, $y(0) = y(1) = y''(0) = y''(1) = 0$. Take $n = 3$. **5**



8. a) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as shown in figure. (perform five iterations)

6



- b) Use Romberg's method to compute $\int_0^{0.5} \left(\frac{x}{\sin x} \right) dx$ correct to 3 decimal places. (Take $h = 0.25$ and 0.125)

4

9. a) Using Bendre-Schmidt's method find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$

and boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{x^2}{2}$ at the points

$x = i, i = 0, 1, 2, \dots, 7$ and $t = j, j = 0, 1, 2, \dots, 5$.

5

- b) Solve $16 \frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 1, t \geq 0$ given that $u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t$. Compute u for the one time step with $h=1$ by Crank- Nicholson method .

4



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

S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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.
 - 4) Use of calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

(1×14=14)

1. Choose the correct answer :

- 1) The Power method is used to
 - a) Fit the curve
 - b) Find coefficient of correlation between bivariate data
 - c) Find dominant Eigen value and corresponding eigen vector of the matrix
 - d) Solve non-linear simultaneous equations
- 2) Using Newton's Raphson method, the first approximation to the root of the equation $2x^3 - 3x - 6 = 0$ near to $x_0 = 2$ is
 - a) 1.908
 - b) 1.809
 - c) 1.709
 - d) 1.609
- 3) The value of coefficient of correlation r between two variables is lies between
 - a) -2 and 2
 - b) 1 and 2
 - c) -3 and 3
 - d) -1 and 1

- 4) If I_1 and I_2 denotes approximate value of $I = \int_a^b f(x)dx$ in the Romberg's method then $I =$

a) $I = I_2 \left[\frac{I_2 - I_1}{3} \right]$ b) $I = \frac{1}{4} [3 I_2 - I_1]$ c) $I = I_1 + \left[\frac{I_1 + I_2}{3} \right]$ d) None of these

- 5) If $f(0) = 1, f(1) = 2.7, f(2) = 7.4, f(3) = 20.1, f(4) = 54.6$ and $h = 1$, then $\int_0^4 f(x) dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule is

a) 38.6667 b) 38.5556 c) 38.3333 d) None of these

- 6) The finite difference approximation to the first order derivative y' at $x = x_i$ is

a) $\frac{1}{2h}(y_{i+1} - y_{i-1})$ b) $\frac{1}{2h}(y_{i+1} + y_{i-1})$ c) $\frac{1}{2h^2}(y_{i+1} - y_{i-1})$ d) $\frac{1}{2h^2}(y_{i+1} + y_{i-1})$

P.T.O.



- 7) In solving a set of simultaneous ordinary differential equations $\frac{dy}{dx} = f(x, y, z)$, $\frac{dz}{dx} = \phi(x, y, z)$ by Runge-Kutta method, which of the following is correct ?
- a) $k_1 = \phi(x_0, y_0, z_0)$, $l_1 = f(x_0, y_0, z_0)$
- b) $k_2 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}, z_0 + \frac{l_1}{2}\right)$, $l_2 = h\phi\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}, z_0 + \frac{l_1}{2}\right)$
- c) $k_1 = \frac{h}{2} f(x_0, y_0, z_0)$, $l_1 = \frac{h}{2} \phi(x_0, y_0, z_0)$
- d) $k_2 = hf(x_0 + h, y_0 + k_1, z_0 + l_1)$, $l_2 = h\phi(x_0 + h, y_0 + k_1, z_0 + l_1)$
- 8) For the PDE $U_{xx} + U_{yx} + U_{yy} = 0$, which of the following statement is true ?
- a) It is parabolic when $x = 0$ b) It is hyperbolic when $x > 0$
- c) It is elliptic for all values of x and y d) None of these
- 9) Which of the following is not the method of numerical solution of partial differential equation ?
- a) Crank-Nichelson method b) Bendre-Schmidt's method
- c) Picard's method d) Liebmann's method
- 10) In solving Laplace equation $\nabla^2 u = 0$ the formula used
- $$u_{ij} = \frac{1}{4} u_{i-1,j+1} + u_{j+1,j-1} + u_{i+1,j+1} + u_{i-1,j-1}$$
- is called
- a) Standard five point formula b) Crank-Nichelson formula
- c) Diagonal five point formula d) None of these
- 11) Rate of convergence of False-position method is
- a) 0.5 b) 1.62 c) 2 d) 2.5
- 12) To fit a polynomial $y = a_0 + a_1x + a_2x^2$ for the given data of n observations by least square principle, the required number of normal equations are
- a) 3 b) 2 c) 4 d) n
- 13) If $y = x^2$, then the first divided difference of the arguments -1 and 2 is
- a) 2 b) 3 c) 1 d) 0
- 14) Which of the following statement applies to Bisection method ?
- a) Converges within few iterations
- b) It is faster than Newtons Raphson method
- c) Rate of converges is 2
- d) It requires that there will be no error in determining the sign of function $f(x)$ in each approximation



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

**S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS**

Day and Date : Friday, 24-11-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Attempt **any three** questions from **each** Section.
 2) Figures to the **right** indicate **full** marks.
 3) Use of calculator is **allowed**.

SECTION – I

2. Solve the following.
- a) Find the greatest positive real root of the equation $x^3 - 4x + 1 = 0$ correct to three decimal places by Regula-Falsi method. 4
 - b) Using Newton's Raphson iterative formula, find approximate value of $\sqrt{29}$ correct to four places of decimals. 3
 - c) Solve the non-linear simultaneous equations $x^2 + y - 11 = 0$ and $y^2 + x - 7 = 0$ by Newton's Raphson method in one step, taking initial approximations $x_0 = 3.5, y_0 = -1.8$. 3
3. a) Apply Gauss Jordan method to find the solution of the system of equations 4
 $x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13$.
- b) Solve **any one** from the following : 5
- i) Solve the following system of equations by Jacobi's method (perform five iterations).
 $x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$
 - ii) Find the coefficient of correlation and equation of line of regression of y on x from the following data.
- | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| x : | 62 | 64 | 65 | 69 | 70 | 71 | 72 | 74 |
| y : | 126 | 125 | 139 | 145 | 165 | 152 | 180 | 208 |
4. Solve the following :
- a) Using least square principle fit the straight line $y = ax + b$ to the data given below. 3
- | | | | | | | |
|----------|---|----|----|----|----|----|
| x | : | 5 | 10 | 15 | 20 | 25 |
| y | : | 15 | 19 | 23 | 26 | 30 |



- b) Using Newton's Divided difference formula, find the cubical function $f(x)$ for the data given below. **3**

$$x : 4 \quad 7 \quad 9 \quad 12$$

$$f(x) : -43 \quad 83 \quad 327 \quad 1053$$

- c) Equations giving the two lines of regression of y on x and of x on y are $7x - 16y + 9 = 0$ and $5y - 4x - 3 = 0$ respectively. Find the means of x and y and the coefficient of correlation. **3**

5. a) Solve the following system of equation by Factorization method. **5**

$$x + 5y + z = 14, \quad 2x + y + 3z = 13, \quad 3x + y + 4z = 17$$

- b) Using Lagrange's formula of interpolation, find $f(z)$ from the given data **4**

$$x : 0 \quad 1 \quad 3 \quad 4$$

$$f(x) : 5 \quad 6 \quad 50 \quad 105$$

SECTION – II

6. Solve **any three** : **9**

a) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x+y) \, dx \, dy$ by Simpson's rule. (Take $h = k = \pi/4$)

b) Using three point Gaussian quadrature formula evaluate $\int_2^4 (1+x^3) \, dx$.

c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using trapezoidal rule and compare the result with its actual value. (Take $h = 1$)

d) Evaluate the integral $I = \int_4^{5.2} \log_e x \, dx$ using Weddle's rule. (Take $h = 0.2$)

7. a) Apply Picard's method to find the second approximation to the values of y and z given that $\frac{dy}{dx} = z$

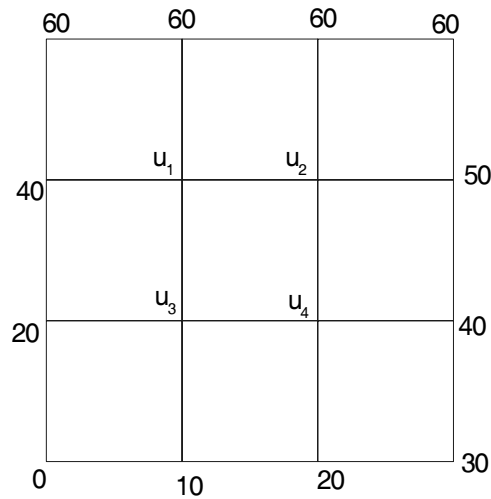
$$\frac{dz}{dx} = x^2 (y+z), \text{ given } y = 1, z = \frac{1}{2} \text{ when } x = 0. \text{ Hence find } y(0.1) \text{ and } z(0.1). \quad \mathbf{4}$$

- b) Determine values of y at the pivotal points of the interval (0.1) if y satisfies the boundary value problem $y^{iv} + 81y = 81x^2$, $y(0) = y(1) = y''(0) = y''(1) = 0$. Take $n = 3$. **5**



8. a) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as shown in figure. (perform five iterations)

6



- b) Use Romberg's method to compute $\int_0^{0.5} \left(\frac{x}{\sin x} \right) dx$ correct to 3 decimal places. (Take $h = 0.25$ and 0.125)

4

9. a) Using Bendre-Schmidt's method find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$

and boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{x^2}{2}$ at the points

$x = i, i = 0, 1, 2, \dots, 7$ and $t = j, j = 0, 1, 2, \dots, 5$.

5

- b) Solve $16 \frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 1, t \geq 0$ given that $u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t$. Compute u for the one time step with $h=1$ by Crank- Nicholson method .

4



5) In solving Laplace equation $\nabla^2 u = 0$ the formula used

$$u_{ij} = \frac{1}{4} u_{i-1,j+1} + u_{j+1,j-1} + u_{i+1,j+1} + u_{i-1,j-1} \text{ is called}$$

- a) Standard five point formula b) Crank-Nichelson formula
 c) Diagonal five point formula d) None of these
- 6) Rate of convergence of False-position method is
 a) 0.5 b) 1.62 c) 2 d) 2.5
- 7) To fit a polynomial $y = a_0 + a_1x + a_2x^2$ for the given data of n observations by least square principle, the required number of normal equations are
 a) 3 b) 2 c) 4 d) n
- 8) If $y = x^2$, then the first divided difference of the arguments -1 and 2 is
 a) 2 b) 3 c) 1 d) 0
- 9) Which of the following statement applies to Bisection method ?
 a) Converges within few iterations
 b) It is faster than Newtons Raphson method
 c) Rate of converges is 2
 d) It requires that there will be no error in determining the sign of function $f(x)$ in each approximation
- 10) The Power method is used to
 a) Fit the curve
 b) Find coefficient of correlation between bivariate data
 c) Find dominant Eigen value and corresponding eigen vector of the matrix
 d) Solve non-linear simultaneous equations
- 11) Using Newton's Raphson method, the first approximation to the root of the equation $2x^3 - 3x - 6 = 0$ near to $x_0 = 2$ is
 a) 1.908 b) 1.809 c) 1.709 d) 1.609
- 12) The value of coefficient of correlation r between two variables is lies between
 a) -2 and 2 b) 1 and 2 c) -3 and 3 d) -1 and 1
- 13) If I_1 and I_2 denotes approximate value of $I = \int_a^b f(x)dx$ in the Romberg's method then $I =$
 a) $I = I_2 \left[\frac{I_2 - I_1}{3} \right]$ b) $I = \frac{1}{4} [3 I_2 - I_1]$ c) $I = I_1 + \left[\frac{I_1 + I_2}{3} \right]$ d) None of these
- 14) If $f(0) = 1, f(1) = 2.7, f(2) = 7.4, f(3) = 20.1, f(4) = 54.6$ and $h = 1$, then $\int_0^4 f(x) dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule is
 a) 38.6667 b) 38.5556 c) 38.3333 d) None of these



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

**S.E. (Part – II) Mechanical (CGPA) Examination, 2017
NUMERICAL METHODS**

Day and Date : Friday, 24-11-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Attempt **any three** questions from **each** Section.
 2) Figures to the **right** indicate **full** marks.
 3) Use of calculator is **allowed**.

SECTION – I

2. Solve the following.
- a) Find the greatest positive real root of the equation $x^3 - 4x + 1 = 0$ correct to three decimal places by Regula-Falsi method. 4
 - b) Using Newton's Raphson iterative formula, find approximate value of $\sqrt{29}$ correct to four places of decimals. 3
 - c) Solve the non-linear simultaneous equations $x^2 + y - 11 = 0$ and $y^2 + x - 7 = 0$ by Newton's Raphson method in one step, taking initial approximations $x_0 = 3.5, y_0 = -1.8$. 3
3. a) Apply Gauss Jordan method to find the solution of the system of equations 4
- $$x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13.$$
- b) Solve **any one** from the following : 5
- i) Solve the following system of equations by Jacobi's method (perform five iterations). 3
- $$x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$$
- ii) Find the coefficient of correlation and equation of line of regression of y on x from the following data.
- | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| x : | 62 | 64 | 65 | 69 | 70 | 71 | 72 | 74 |
| y : | 126 | 125 | 139 | 145 | 165 | 152 | 180 | 208 |
4. Solve the following :
- a) Using least square principle fit the straight line $y = ax + b$ to the data given below. 3
- | | | | | | | |
|----------|---|----|----|----|----|----|
| x | : | 5 | 10 | 15 | 20 | 25 |
| y | : | 15 | 19 | 23 | 26 | 30 |



- b) Using Newton's Divided difference formula, find the cubical function $f(x)$ for the data given below. 3

x	:	4	7	9	12
$f(x)$:	-43	83	327	1053

- c) Equations giving the two lines of regression of y on x and of x on y are $7x - 16y + 9 = 0$ and $5y - 4x - 3 = 0$ respectively. Find the means of x and y and the coefficient of correlation. 3

5. a) Solve the following system of equation by Factorization method. 5

$$x + 5y + z = 14, 2x + y + 3z = 13, 3x + y + 4z = 17$$

- b) Using Lagrange's formula of interpolation, find $f(z)$ from the given data 4

x	:	0	1	3	4
$f(x)$:	5	6	50	105

SECTION – II

6. Solve **any three** : 9

- a) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x+y) dx dy$ by Simpson's rule. (Take $h = k = \pi/4$)

- b) Using three point Gaussian quadrature formula evaluate $\int_2^4 (1+x^3) dx$.

- c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using trapezoidal rule and compare the result with its actual value. (Take $h = 1$)

- d) Evaluate the integral $I = \int_4^{5.2} \log_e x dx$ using Weddle's rule. (Take $h = 0.2$)

7. a) Apply Picard's method to find the second approximation to the values of y and z given that $\frac{dy}{dx} = z$

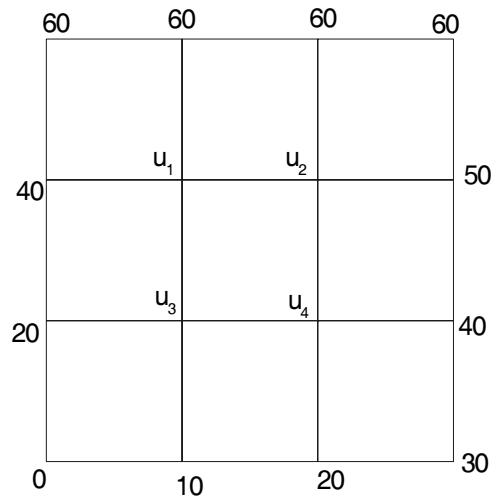
$$\frac{dz}{dx} = x^2 (y+z), \text{ given } y = 1, z = \frac{1}{2} \text{ when } x = 0. \text{ Hence find } y(0.1) \text{ and } z(0.1). \quad 4$$

- b) Determine values of y at the pivotal points of the interval (0.1) if y satisfies the boundary value problem $y^{iv} + 81y = 81x^2$, $y(0) = y(1) = y''(0) = y''(1) = 0$. Take $n = 3$. 5



8. a) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as shown in figure. (perform five iterations)

6



- b) Use Romberg's method to compute $\int_0^{0.5} \left(\frac{x}{\sin x} \right) dx$ correct to 3 decimal places. (Take $h = 0.25$ and 0.125)

4

9. a) Using Bendre-Schmidt's method find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$

and boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{x^2}{2}$ at the points

$x = i, i = 0, 1, 2, \dots, 7$ and $t = j, j = 0, 1, 2, \dots, 5$.

5

- b) Solve $16 \frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 1, t \geq 0$ given that $u(x, 0) = 0, u(0, t) = 0, u(1, t) = 100t$. Compute u for the one time step with $h = 1$ by Crank- Nicholson method .

4



SLR-TJ – 100

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

Set	P
-----	----------

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) Assume suitable data **if** necessary.
4) Draw **neat diagrams wherever** necessary.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

I. Choose the correct answer :

(14×1=14)

- 1) The main application of indirect arc furnace is to melt.
 - a) non-ferrous metals
 - b) steel
 - c) iron
 - d) none of these
- 2) The power factor will be leading in case of
 - a) Induction Heating
 - b) Resistance heating
 - c) Dielectric heating
 - d) Electric Arc heating
- 3) Shape of the torque slip curve is
 - a) Rectangular Hyperbola
 - b) Parabola
 - c) Sine
 - d) Cosine
- 4) Motor is a _____ device.
 - a) Mechanical
 - b) Electromechanical
 - c) Electrical
 - d) None of these
- 5) In dc motor back emf induced in
 - a) Field winding
 - b) Commutator
 - c) Armature winding
 - d) Damper winding

P.T.O.



- 6) Stator of 3 phase induction motor produces _____ Magnetic field.
a) steady b) rotating c) alternating d) none of these
- 7) A single phase induction motor employs _____ Rotor.
a) squirrel cage b) wound
c) both a) and b) d) none of these
- 8) An ideal Op-comp is characterized by _____ gain, _____ input impedance and _____ output impedance.
a) zero, zero, infinite b) infinite, zero, zero
c) zero, infinite, zero d) infinite, infinite, zero
- 9) Op-Amp uses :
a) Only + ve Voltage b) Only – ve voltage
c) Dual supply, i.e, $\pm V_{cc}$ d) None of the above
- 10) Which of the following memory is non volatile and may be written only once ?
a) RAM b) EEPROM c) EPROM d) PROM
- 11) Asynchronous counters are known as
a) ripple counters b) multiple clock counters
c) decade counters d) modulus counters
- 12) In 8085 name of the 16 bit registers is
a) stack pointer b) program counter
c) both a) and b) d) none of these
- 13) The number of I/O pins of 8051 is
a) 16 b) 32 c) 8 d) 4
- 14) The data bus is
a) unidirectional b) bidirectional c) parallel d) serial
-



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

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Assume suitable data *if* necessary.
2) Draw **neat** diagrams **wherever** necessary.
3) Separate answer books for **each** Section.

SECTION – I

II. Attempt **any four** of the following : **(4×4=16)**

- a) Write comparison between direct induction heating and indirect induction heating.
- b) Explain construction and operation of single phase shaded pole motor with suitable diagram.
- c) A 50 Hz, 4 pole, 3-phase induction motor has a rotor current of frequency 2 Hz. Determine
 - i) the slip
 - ii) speed of motor.
- d) With a neat vector diagrams explain the production of rotating magnetic field, when 3-phase supply voltage is given to the stator winding in 3-phase induction motor.
- e) Write properties of heating element and explain principle of working of resistance and arc welding.
- f) Write comparison between squirrel cage induction motor and slip ring induction motor.

III. Attempt **any two** of the following : **(2×6=12)**

- a) Explain working principle, construction and types of DC motors with diagrams.
- b) Derive an expression for starting torque, running torque and derive the condition for maximum torque in case of 3 induction motor torque.

Set P



- c) A dc motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohm. The machine has 6 poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate
- the speed
 - the gross torque developed by the motor.

SECTION – II

IV. Attempt **any four** of the following : **(4×4=16)**

- Explain operation of Mod 6 counter with neat diagram.
- Explain working of JK flip flop in detail.
- What are ideal characteristics of op-amp ? Give block diagram representation of op-amp.
- Explain the similarities and differences between microprocessor and microcontroller.
- Write a short note on Op-amp as differentiator.
- Explain the steps used in executing an interrupt for 8051.

V. Attempt **any two** of the following : **(2×6=12)**

- Explain working of basic 4-bit register with D flipflop in detail.
 - Explain binary ladder type D/A converter.
 - Draw the block diagram of architecture of microcontroller 8051 and explain the function of each block.
-



SLR-TJ – 100

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

Set	Q
-----	---

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) Assume suitable data **if necessary**.
4) Draw **neat diagrams wherever necessary**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

I. Choose the correct answer :

(14×1=14)

- 1) An ideal Op-comp is characterized by _____ gain, _____ input impedance and _____ output impedance.
a) zero, zero, infinite b) infinite, zero, zero
c) zero, infinite, zero d) infinite, infinite, zero
- 2) Op-Amp uses :
a) Only + ve Voltage b) Only – ve voltage
c) Dual supply, i.e, $\pm V_{cc}$ d) None of the above
- 3) Which of the following memory is non volatile and may be written only once ?
a) RAM b) EEPROM c) EPROM d) PROM
- 4) Asynchronous counters are known as
a) ripple counters b) multiple clock counters
c) decade counters d) modulus counters
- 5) In 8085 name of the 16 bit registers is
a) stack pointer b) program counter
c) both a) and b) d) none of these

P.T.O.



- 6) The number of I/O pins of 8051 is
a) 16 b) 32 c) 8 d) 4
- 7) The data bus is
a) unidirectional b) bidirectional c) parallel d) serial
- 8) The main application of indirect arc furnace is to melt.
a) non-ferrous metals b) steel
c) iron d) none of these
- 9) The power factor will be leading in case of
a) Induction Heating b) Resistance heating
c) Dielectric heating d) Electric Arc heating
- 10) Shape of the torque slip curve is
a) Rectangular Hyperbola b) Parabola
c) Sine d) Cosine
- 11) Motor is a _____ device.
a) Mechanical b) Electromechanical
c) Electrical d) None of these
- 12) In dc motor back emf induced in
a) Field winding b) Commutator
c) Armature winding d) Damper winding
- 13) Stator of 3 phase induction motor produces _____ Magnetic field.
a) steady b) rotating c) alternating d) none of these
- 14) A single phase induction motor employs _____ Rotor.
a) squirrel cage b) wound
c) both a) and b) d) none of these
-



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

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Assume suitable data *if* necessary.
2) Draw **neat** diagrams **wherever** necessary.
3) Separate answer books for **each** Section.

SECTION – I

II. Attempt **any four** of the following : **(4×4=16)**

- a) Write comparison between direct induction heating and indirect induction heating.
- b) Explain construction and operation of single phase shaded pole motor with suitable diagram.
- c) A 50 Hz, 4 pole, 3-phase induction motor has a rotor current of frequency 2 Hz. Determine
 - i) the slip
 - ii) speed of motor.
- d) With a neat vector diagrams explain the production of rotating magnetic field, when 3-phase supply voltage is given to the stator winding in 3-phase induction motor.
- e) Write properties of heating element and explain principle of working of resistance and arc welding.
- f) Write comparison between squirrel cage induction motor and slip ring induction motor.

III. Attempt **any two** of the following : **(2×6=12)**

- a) Explain working principle, construction and types of DC motors with diagrams.
- b) Derive an expression for starting torque, running torque and derive the condition for maximum torque in case of 3 induction motor torque.

Set Q



- c) A dc motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohm. The machine has 6 poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate
- the speed
 - the gross torque developed by the motor.

SECTION – II

IV. Attempt **any four** of the following :

(4×4=16)

- Explain operation of Mod 6 counter with neat diagram.
- Explain working of JK flip flop in detail.
- What are ideal characteristics of op-amp ? Give block diagram representation of op-amp.
- Explain the similarities and differences between microprocessor and microcontroller.
- Write a short note on Op-amp as differentiator.
- Explain the steps used in executing an interrupt for 8051.

V. Attempt **any two** of the following :

(2×6=12)

- Explain working of basic 4-bit register with D flipflop in detail.
 - Explain binary ladder type D/A converter.
 - Draw the block diagram of architecture of microcontroller 8051 and explain the function of each block.
-



SLR-TJ – 100

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

Set	R
-----	----------

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) Assume suitable data **if necessary**.
4) Draw **neat diagrams wherever necessary**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

I. Choose the correct answer :

(14×1=14)

- 1) In dc motor back emf induced in
 - a) Field winding
 - b) Commutator
 - c) Armature winding
 - d) Damper winding
- 2) Stator of 3 phase induction motor produces _____ Magnetic field.
 - a) steady
 - b) rotating
 - c) alternating
 - d) none of these
- 3) A single phase induction motor employs _____ Rotor.
 - a) squirrel cage
 - b) wound
 - c) both a) and b)
 - d) none of these
- 4) An ideal Op-comp is characterized by _____ gain, _____ input impedance and _____ output impedance.
 - a) zero, zero, infinite
 - b) infinite, zero, zero
 - c) zero, infinite, zero
 - d) infinite, infinite, zero
- 5) Op-Amp uses :
 - a) Only + ve Voltage
 - b) Only – ve voltage
 - c) Dual supply, i.e, $\pm V_{cc}$
 - d) None of the above

P.T.O.



- 6) Which of the following memory is non volatile and may be written only once ?
a) RAM b) EEPROM c) EPROM d) PROM
- 7) Asynchronous counters are known as
a) ripple counters b) multiple clock counters
c) decade counters d) modulus counters
- 8) In 8085 name of the 16 bit registers is
a) stack pointer b) program counter
c) both a) and b) d) none of these
- 9) The number of I/O pins of 8051 is
a) 16 b) 32 c) 8 d) 4
- 10) The data bus is
a) unidirectional b) bidirectional c) parallel d) serial
- 11) The main application of indirect arc furnace is to melt.
a) non-ferrous metals b) steel
c) iron d) none of these
- 12) The power factor will be leading in case of
a) Induction Heating b) Resistance heating
c) Dielectric heating d) Electric Arc heating
- 13) Shape of the torque slip curve is
a) Rectangular Hyperbola b) Parabola
c) Sine d) Cosine
- 14) Motor is a _____ device.
a) Mechanical b) Electromechanical
c) Electrical d) None of these
-



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

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Assume suitable data *if* necessary.
2) Draw **neat** diagrams **wherever** necessary.
3) Separate answer books for **each** Section.

SECTION – I

II. Attempt **any four** of the following : **(4×4=16)**

- a) Write comparison between direct induction heating and indirect induction heating.
- b) Explain construction and operation of single phase shaded pole motor with suitable diagram.
- c) A 50 Hz, 4 pole, 3-phase induction motor has a rotor current of frequency 2 Hz. Determine
 - i) the slip
 - ii) speed of motor.
- d) With a neat vector diagrams explain the production of rotating magnetic field, when 3-phase supply voltage is given to the stator winding in 3-phase induction motor.
- e) Write properties of heating element and explain principle of working of resistance and arc welding.
- f) Write comparison between squirrel cage induction motor and slip ring induction motor.

III. Attempt **any two** of the following : **(2×6=12)**

- a) Explain working principle, construction and types of DC motors with diagrams.
- b) Derive an expression for starting torque, running torque and derive the condition for maximum torque in case of 3 induction motor torque.

Set R



- c) A dc motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohm. The machine has 6 poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate
- the speed
 - the gross torque developed by the motor.

SECTION – II

IV. Attempt **any four** of the following : **(4×4=16)**

- Explain operation of Mod 6 counter with neat diagram.
- Explain working of JK flip flop in detail.
- What are ideal characteristics of op-amp ? Give block diagram representation of op-amp.
- Explain the similarities and differences between microprocessor and microcontroller.
- Write a short note on Op-amp as differentiator.
- Explain the steps used in executing an interrupt for 8051.

V. Attempt **any two** of the following : **(2×6=12)**

- Explain working of basic 4-bit register with D flipflop in detail.
 - Explain binary ladder type D/A converter.
 - Draw the block diagram of architecture of microcontroller 8051 and explain the function of each block.
-



SLR-TJ – 100

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

Set	S
-----	---

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) Assume suitable data **if necessary**.
4) Draw **neat diagrams wherever necessary**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

I. Choose the correct answer :

(14×1=14)

- 1) Which of the following memory is non volatile and may be written only once ?
a) RAM b) EEPROM c) EPROM d) PROM
- 2) Asynchronous counters are known as
a) ripple counters b) multiple clock counters
c) decade counters d) modulus counters
- 3) In 8085 name of the 16 bit registers is
a) stack pointer b) program counter
c) both a) and b) d) none of these
- 4) The number of I/O pins of 8051 is
a) 16 b) 32 c) 8 d) 4
- 5) The data bus is
a) unidirectional b) bidirectional c) parallel d) serial
- 6) The main application of indirect arc furnace is to melt.
a) non-ferrous metals b) steel
c) iron d) none of these

P.T.O.



- 7) The power factor will be leading in case of
- a) Induction Heating
 - b) Resistance heating
 - c) Dielectric heating
 - d) Electric Arc heating
- 8) Shape of the torque slip curve is
- a) Rectangular Hyperbola
 - b) Parabola
 - c) Sine
 - d) Cosine
- 9) Motor is a _____ device.
- a) Mechanical
 - b) Electromechanical
 - c) Electrical
 - d) None of these
- 10) In dc motor back emf induced in
- a) Field winding
 - b) Commutator
 - c) Armature winding
 - d) Damper winding
- 11) Stator of 3 phase induction motor produces _____ Magnetic field.
- a) steady
 - b) rotating
 - c) alternating
 - d) none of these
- 12) A single phase induction motor employs _____ Rotor.
- a) squirrel cage
 - b) wound
 - c) both a) and b)
 - d) none of these
- 13) An ideal Op-comp is characterized by _____ gain, _____ input impedance and _____ output impedance.
- a) zero, zero, infinite
 - b) infinite, zero, zero
 - c) zero, infinite, zero
 - d) infinite, infinite, zero
- 14) Op-Amp uses :
- a) Only + ve Voltage
 - b) Only – ve voltage
 - c) Dual supply, i.e, $\pm V_{cc}$
 - d) None of the above
-



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

**S.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
ELECTRICAL AND ELECTRONICS TECHNOLOGY**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Assume suitable data *if* necessary.
2) Draw **neat** diagrams **wherever** necessary.
3) Separate answer books for **each** Section.

SECTION – I

II. Attempt **any four** of the following : **(4×4=16)**

- a) Write comparison between direct induction heating and indirect induction heating.
- b) Explain construction and operation of single phase shaded pole motor with suitable diagram.
- c) A 50 Hz, 4 pole, 3-phase induction motor has a rotor current of frequency 2 Hz. Determine
 - i) the slip
 - ii) speed of motor.
- d) With a neat vector diagrams explain the production of rotating magnetic field, when 3-phase supply voltage is given to the stator winding in 3-phase induction motor.
- e) Write properties of heating element and explain principle of working of resistance and arc welding.
- f) Write comparison between squirrel cage induction motor and slip ring induction motor.

III. Attempt **any two** of the following : **(2×6=12)**

- a) Explain working principle, construction and types of DC motors with diagrams.
- b) Derive an expression for starting torque, running torque and derive the condition for maximum torque in case of 3 induction motor torque.

Set S



- c) A dc motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohm. The machine has 6 poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate
- the speed
 - the gross torque developed by the motor.

SECTION – II

IV. Attempt **any four** of the following : **(4×4=16)**

- Explain operation of Mod 6 counter with neat diagram.
- Explain working of JK flip flop in detail.
- What are ideal characteristics of op-amp ? Give block diagram representation of op-amp.
- Explain the similarities and differences between microprocessor and microcontroller.
- Write a short note on Op-amp as differentiator.
- Explain the steps used in executing an interrupt for 8051.

V. Attempt **any two** of the following : **(2×6=12)**

- Explain working of basic 4-bit register with D flipflop in detail.
 - Explain binary ladder type D/A converter.
 - Draw the block diagram of architecture of microcontroller 8051 and explain the function of each block.
-



SLR-TJ – 101

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

Set	P
-----	---

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) The maximum length of arc of contact of two mating gears in order to avoid interference is
 - a) $(r + R) \sin \phi$
 - b) $(r + R) \cos \phi$
 - c) $(r + R) \tan \phi$
 - d) None of these
- 2) Type of gears used to connect two non parallel non intersecting shafts are
 - a) Spiral gears
 - b) Helical gears
 - c) Spur gears
 - d) None of above
- 3) Main difference in reverted gear train and epicyclic gear train is
 - a) speed ratio factor
 - b) shaft position
 - c) direction of first and last gear
 - d) no difference
- 4) In reverted gear train, direction of first and last gear
 - a) may be same or opposite
 - b) is opposite
 - c) cant say
 - d) is same
- 5) Gyroscopic effect occurs when
 - a) axis of spin and axis of pitch are perpendicular
 - b) axis of spin and precession are perpendicular
 - c) axis of spin and precession coincides
 - d) axis of spin and couple are perpendicular
- 6) The condition of correct gearing is
 - a) pitch line velocities of teeth be same
 - b) common normal to the pitch surface cuts the line of centre at a fixed point
 - c) radius of curvature of two profiles be same
 - d) none of the above

P.T.O.



- 7) In V-engine balancing, if $2\alpha = 90^\circ$, value of F_p is
- a) $\sqrt{2}mr\omega^2 \cdot \sin 2\theta/n$ b) $mr\omega^2/2$
c) $mr\omega^2/\sqrt{2}$ d) $mr\omega^2$
- 8) When the primary direct crank of reciprocating engine makes an angle θ with the line of stroke, then the secondary direct crank will make angle of _____ with the line of stroke.
- a) 2θ b) θ c) $\theta/2$ d) 4θ
- 9) Natural frequency of free torsional vibration of shaft is
- a) $\frac{1}{2}\pi\sqrt{q/l}$ b) $2\pi\sqrt{ql}$
c) $2\pi\sqrt{q/l}$ d) $\frac{1}{2}\pi\sqrt{ql}$
- 10) The equation of motion for a vibrating system with viscous damping is $d^2x/dt^2 + c/m \cdot dx/dt + s/mx = 0$
If the roots of this equation are real, then the system will be
- a) Under damped b) Over damped
c) Critically damped d) Adequately damped
- 11) For dry friction of perfectly smooth surface value of coefficient of friction is
- a) directly proportional to velocity
b) inversely proportional to velocity
c) decreases initially then remains constant
d) independent of velocity
- 12) Deflection of simply supported shaft with load at dist a from one end can be given as
- a) $wl^3/48 EI$ b) $wl^4/84 EI$
c) $wa^2b^2/3EIL$ d) $wl^3/84 EI$
- 13) The partial balancing means
- a) Balancing partially the revolving masses
b) Net balancing of engine
c) Balancing partially the reciprocating masses
d) All of the above
- 14) In flywheel rim Hoop's stress can be found out by
- a) ρ^2v b) ρv
c) ρv^2 d) $m/\pi DA^2$



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) Use of calculator is **allowed**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) Assume additional data if **necessary** and mention it clearly.

SECTION – I

- | | | |
|----|--|---|
| 2. | a) Differentiate different forms of tooth profile. | 5 |
| | b) Explain Tabular method for epicyclic gear trains. | 3 |
| | c) The turbine rotor of a ship having a mass of 200 kg rotates at 2000 rpm and its radius of gyration is 0.3 m. If the rotation of the rotor is clockwise looking from stern, determine the gyroscopic couple set by the rotor when | |
| | i) Ship takes a left turn at a radius of 300 m at a speed of 30 km/hr. | |
| | ii) Ship pitches with bow rising at angular velocity of 1 rad/sec. | |
| | iii) Ship rolls at an angular velocity of 0.1 rad/sec. | 6 |
| 3. | a) Define Turning moment diagram, coefficient of fluctuation of speed, coefficient of fluctuation of energy. | 3 |
| | b) Define precessional angular motion, angle of Heel, right hand screw rule. | 3 |
| | c) Two spiral gears A and B have 45 and 15 teeth at spiral angles of 20° and 50° respectively. Both wheels are of same hand. A is 15 cm in diameter. Find the distance between the shafts and angle between shafts. If the teeth are of 20° involute form and coefficient of friction is 0.08, find the efficiency of gears. | 8 |
| 4. | a) An epicyclic gear train consist of sunwheel S a stationary internal gear E and three identical planet wheels P carried on a star-shaped planet carrier C. The size of different tooth wheels are such that the planet carrier C rotates $\frac{1}{5}$ of speed of the sunwheels no. of teeth on sunwheel are 16. The driving torque on the sunwheel is 100 Nm. Determine no. of teeth on different wheels, torque necessary to keep internal gear stationary. | 8 |

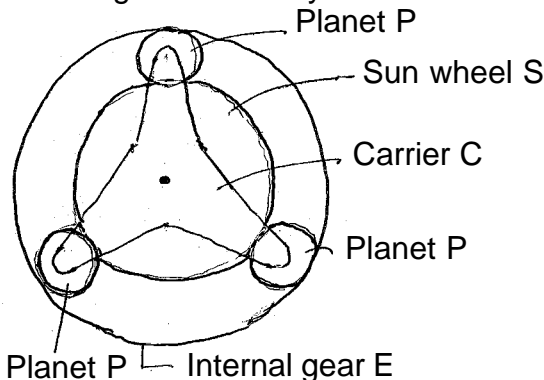


Fig. 4-a

Set P



- b) A flywheel of a steam engine weighs 2000 N and has a radius of gyration of 76 cm. The starting torque of steam engine is 1274 Nm and is assumed constant. Determine angular acceleration of flywheel alongwith speed and kinetic energy after 10 sec.

6

SECTION – II

5. A) Explain balancing of several masses in same plane. 4
 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. 10
6. A) Derive equivalent stiffness of following system. 4

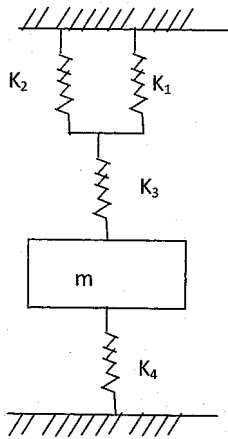
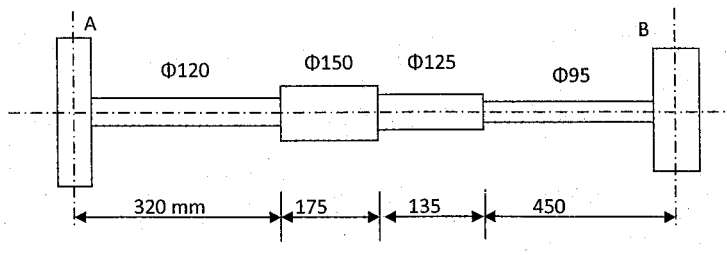


Fig. Q. 6A

- B) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find :
- 1) Critical damping coefficient.
 - 2) Damping factor
 - 3) Logarithmic decrement, and
 - 4) Ratio of two consecutive amplitudes. 10
7. A) Explain vibration isolation and transmissibility. 6
 B) A shaft in fig. carries two masses. The mass A is 600 kg with radius of gyration of 0.75 m and mass B is 900 kg with a radius of gyration of 0.9 m. Determine the frequency of torsional vibrations. The modulus of rigidity of shaft material is 80 GN/m². 8





SLR-TJ – 101

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

Set	Q
-----	---

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) When the primary direct crank of reciprocating engine makes an angle θ with the line of stroke, then the secondary direct crank will make angle of _____ with the line of stroke.
a) 2θ b) θ c) $\theta/2$ d) 4θ
- 2) Natural frequency of free torsional vibration of shaft is
a) $\frac{1}{2}\pi\sqrt{q/l}$ b) $2\pi\sqrt{ql}$
c) $2\pi\sqrt{q/l}$ d) $\frac{1}{2}\pi\sqrt{ql}$
- 3) The equation of motion for a vibrating system with viscous damping is $d^2x/dt^2 + c/m \cdot dx/dt + s/mx = 0$
If the roots of this equation are real, then the system will be
a) Under damped b) Over damped
c) Critically damped d) Adequately damped
- 4) For dry friction of perfectly smooth surface value of coefficient of friction is
a) directly proportional to velocity
b) inversely proportional to velocity
c) decreases initially then remains constant
d) independent of velocity
- 5) Deflection of simply supported shaft with load at dist a from one end can be given as
a) $wl^3/48 EI$ b) $wl^4/84 EI$
c) $wa^2b^2/3EIL$ d) $wl^3/84 EI$
- 6) The partial balancing means
a) Balancing partially the revolving masses
b) Net balancing of engine
c) Balancing partially the reciprocating masses
d) All of the above

P.T.O.



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) Use of calculator is **allowed**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) Assume additional data if **necessary** and mention it clearly.

SECTION – I

- | | | |
|----|--|---|
| 2. | a) Differentiate different forms of tooth profile. | 5 |
| | b) Explain Tabular method for epicyclic gear trains. | 3 |
| | c) The turbine rotor of a ship having a mass of 200 kg rotates at 2000 rpm and its radius of gyration is 0.3 m. If the rotation of the rotor is clockwise looking from stern, determine the gyroscopic couple set by the rotor when | |
| | i) Ship takes a left turn at a radius of 300 m at a speed of 30 km/hr. | |
| | ii) Ship pitches with bow rising at angular velocity of 1 rad/sec. | |
| | iii) Ship rolls at an angular velocity of 0.1 rad/sec. | 6 |
| 3. | a) Define Turning moment diagram, coefficient of fluctuation of speed, coefficient of fluctuation of energy. | 3 |
| | b) Define precessional angular motion, angle of Heel, right hand screw rule. | 3 |
| | c) Two spiral gears A and B have 45 and 15 teeth at spiral angles of 20° and 50° respectively. Both wheels are of same hand. A is 15 cm in diameter. Find the distance between the shafts and angle between shafts. If the teeth are of 20° involute form and coefficient of friction is 0.08, find the efficiency of gears. | 8 |
| 4. | a) An epicyclic gear train consist of sunwheel S a stationary internal gear E and three identical planet wheels P carried on a star-shaped planet carrier C. The size of different tooth wheels are such that the planet carrier C rotates $\frac{1}{5}$ of speed of the sunwheels no. of teeth on sunwheel are 16. The driving torque on the sunwheel is 100 Nm. Determine no. of teeth on different wheels, torque necessary to keep internal gear stationary. | 8 |

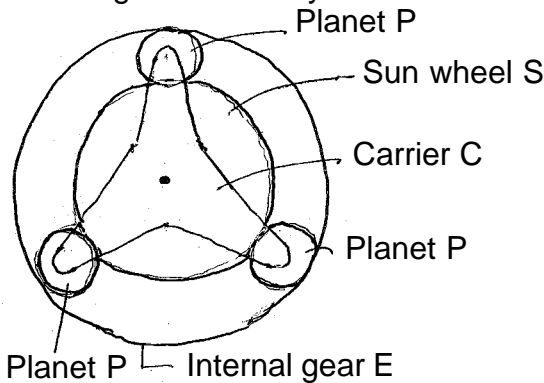


Fig. 4-a

Set Q



- b) A flywheel of a steam engine weighs 2000 N and has a radius of gyration of 76 cm. The starting torque of steam engine is 1274 Nm and is assumed constant. Determine angular acceleration of flywheel alongwith speed and kinetic energy after 10 sec.

6

SECTION – II

5. A) Explain balancing of several masses in same plane. 4
 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. 10
6. A) Derive equivalent stiffness of following system. 4

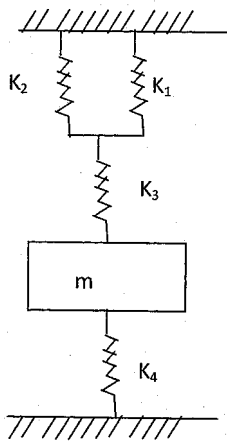
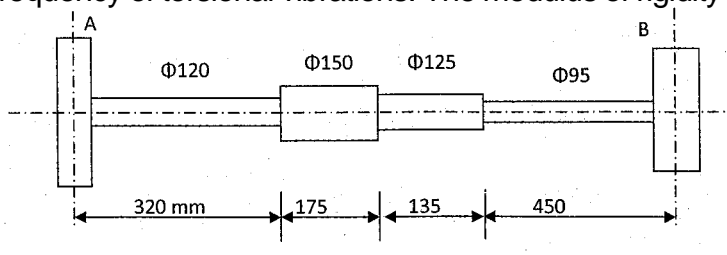


Fig. Q. 6A

- B) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find :
- 1) Critical damping coefficient.
 - 2) Damping factor
 - 3) Logarithmic decrement, and
 - 4) Ratio of two consecutive amplitudes. 10
7. A) Explain vibration isolation and transmissibility. 6
 B) A shaft in fig. carries two masses. The mass A is 600 kg with radius of gyration of 0.75 m and mass B is 900 kg with a radius of gyration of 0.9 m. Determine the frequency of torsional vibrations. The modulus of rigidity of shaft material is 80 GN/m². 8





SLR-TJ – 101

Seat
No.

--

Set

R

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) Gyroscopic effect occurs when
 - a) axis of spin and axis of pitch are perpendicular
 - b) axis of spin and precession are perpendicular
 - c) axis of spin and precession coincides
 - d) axis of spin and couple are perpendicular
- 2) The condition of correct gearing is
 - a) pitch line velocities of teeth be same
 - b) common normal to the pitch surface cuts the line of centre at a fixed point
 - c) radius of curvature of two profiles be same
 - d) none of the above
- 3) In V-engine balancing, if $2\alpha = 90^\circ$, value of F_p is
 - a) $\sqrt{2}m\omega^2 \cdot \sin 2\theta / n$
 - b) $m\omega^2 / 2$
 - c) $m\omega^2 / 2$
 - d) $m\omega^2$
- 4) When the primary direct crank of reciprocating engine makes an angle θ with the line of stroke, then the secondary direct crank will make angle of _____ with the line of stroke.
 - a) 2θ
 - b) θ
 - c) $\theta/2$
 - d) 4θ
- 5) Natural frequency of free torsional vibration of shaft is
 - a) $\frac{1}{2}\pi\sqrt{q/l}$
 - b) $2\pi\sqrt{ql}$
 - c) $2\pi\sqrt{q/l}$
 - d) $\frac{1}{2}\pi\sqrt{ql}$

P.T.O.



- 6) The equation of motion for a vibrating system with viscous damping is $d^2x/dt^2 + c/m \cdot dx/dt + s/mx = 0$
If the roots of this equation are real, then the system will be
- Under damped
 - Over damped
 - Critically damped
 - Adequately damped
- 7) For dry friction of perfectly smooth surface value of coefficient of friction is
- directly proportional to velocity
 - inversely proportional to velocity
 - decreases initially then remains constant
 - independent of velocity
- 8) Deflection of simply supported shaft with load at dist a from one end can be given as
- $wl^3/48 EI$
 - $wl^4/84 EI$
 - $wa^2b^2/3EIL$
 - $wl^3/84 EI$
- 9) The partial balancing means
- Balancing partially the revolving masses
 - Net balancing of engine
 - Balancing partially the reciprocating masses
 - All of the above
- 10) In flywheel rim Hoop's stress can be found out by
- $\rho^2 v$
 - ρv
 - ρv^2
 - $m/\pi DA^2$
- 11) The maximum length of arc of contact of two mating gears in order to avoid interference is
- $(r + R) \sin \phi$
 - $(r + R) \cos \phi$
 - $(r + R) \tan \phi$
 - None of these
- 12) Type of gears used to connect two non parallel non intersecting shafts are
- Spiral gears
 - Helical gears
 - Spur gears
 - None of above
- 13) Main difference in reverted gear train and epicyclic gear train is
- speed ratio factor
 - shaft position
 - direction of first and last gear
 - no difference
- 14) In reverted gear train, direction of first and last gear
- may be same or opposite
 - is opposite
 - cant say
 - is same



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) Use of calculator is **allowed**.
 - 3) **Figures to the right indicate full marks.**
 - 4) Assume additional data if **necessary** and mention it clearly.

SECTION – I

- | | | |
|----|--|---|
| 2. | a) Differentiate different forms of tooth profile. | 5 |
| | b) Explain Tabular method for epicyclic gear trains. | 3 |
| | c) The turbine rotor of a ship having a mass of 200 kg rotates at 2000 rpm and its radius of gyration is 0.3 m. If the rotation of the rotor is clockwise looking from stern, determine the gyroscopic couple set by the rotor when | |
| | i) Ship takes a left turn at a radius of 300 m at a speed of 30 km/hr. | |
| | ii) Ship pitches with bow rising at angular velocity of 1 rad/sec. | |
| | iii) Ship rolls at an angular velocity of 0.1 rad/sec. | 6 |
| 3. | a) Define Turning moment diagram, coefficient of fluctuation of speed, coefficient of fluctuation of energy. | 3 |
| | b) Define precessional angular motion, angle of Heel, right hand screw rule. | 3 |
| | c) Two spiral gears A and B have 45 and 15 teeth at spiral angles of 20° and 50° respectively. Both wheels are of same hand. A is 15 cm in diameter. Find the distance between the shafts and angle between shafts. If the teeth are of 20° involute form and coefficient of friction is 0.08, find the efficiency of gears. | 8 |
| 4. | a) An epicyclic gear train consist of sunwheel S a stationary internal gear E and three identical planet wheels P carried on a star-shaped planet carrier C. The size of different tooth wheels are such that the planet carrier C rotates $\frac{1}{5}$ of speed of the sunwheels no. of teeth on sunwheel are 16. The driving torque on the sunwheel is 100 Nm. Determine no. of teeth on different wheels, torque necessary to keep internal gear stationary. | 8 |

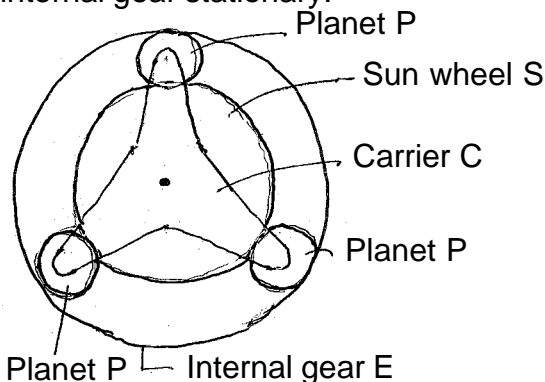


Fig. 4-a

Set R



- b) A flywheel of a steam engine weighs 2000 N and has a radius of gyration of 76 cm. The starting torque of steam engine is 1274 Nm and is assumed constant. Determine angular acceleration of flywheel alongwith speed and kinetic energy after 10 sec.

6

SECTION – II

5. A) Explain balancing of several masses in same plane. 4
 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. 10
6. A) Derive equivalent stiffness of following system. 4

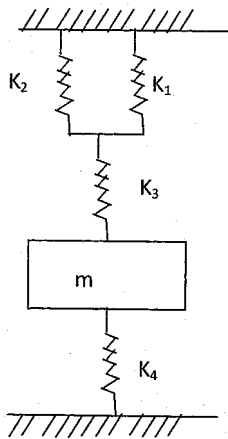
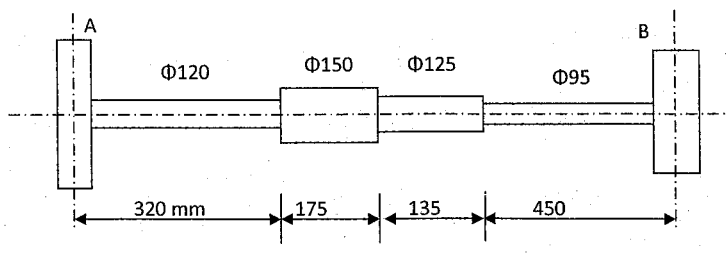


Fig. Q. 6A

- B) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find :
- 1) Critical damping coefficient.
 - 2) Damping factor
 - 3) Logarithmic decrement, and
 - 4) Ratio of two consecutive amplitudes. 10
7. A) Explain vibration isolation and transmissibility. 6
 B) A shaft in fig. carries two masses. The mass A is 600 kg with radius of gyration of 0.75 m and mass B is 900 kg with a radius of gyration of 0.9 m. Determine the frequency of torsional vibrations. The modulus of rigidity of shaft material is 80 GN/m². 8





SLR-TJ – 101

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

Set	S
-----	---

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) The equation of motion for a vibrating system with viscous damping is $d^2x/dt^2 + c/m \cdot dx/dt + s/mx = 0$
If the roots of this equation are real, then the system will be
 - a) Under damped
 - b) Over damped
 - c) Critically damped
 - d) Adequately damped
- 2) For dry friction of perfectly smooth surface value of coefficient of friction is
 - a) directly proportional to velocity
 - b) inversely proportional to velocity
 - c) decreases initially then remains constant
 - d) independent of velocity
- 3) Deflection of simply supported shaft with load at dist a from one end can be given as
 - a) $wl^3/48 EI$
 - b) $wl^4/84 EI$
 - c) $wa^2b^2/3EIL$
 - d) $wl^3/84 EI$
- 4) The partial balancing means
 - a) Balancing partially the revolving masses
 - b) Net balancing of engine
 - c) Balancing partially the reciprocating masses
 - d) All of the above
- 5) In flywheel rim Hoop's stress can be found out by
 - a) ρ^2v
 - b) ρv
 - c) ρv^2
 - d) $m/\pi DA^2$

P.T.O.



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
THEORY OF MACHINE – II**

Day and Date : Wednesday, 29-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) Use of calculator is **allowed**.
 - 3) **Figures to the right indicate full marks.**
 - 4) Assume additional data if **necessary** and mention it clearly.

SECTION – I

- | | | |
|----|--|---|
| 2. | a) Differentiate different forms of tooth profile. | 5 |
| | b) Explain Tabular method for epicyclic gear trains. | 3 |
| | c) The turbine rotor of a ship having a mass of 200 kg rotates at 2000 rpm and its radius of gyration is 0.3 m. If the rotation of the rotor is clockwise looking from stern, determine the gyroscopic couple set by the rotor when | |
| | i) Ship takes a left turn at a radius of 300 m at a speed of 30 km/hr. | |
| | ii) Ship pitches with bow rising at angular velocity of 1 rad/sec. | |
| | iii) Ship rolls at an angular velocity of 0.1 rad/sec. | 6 |
| 3. | a) Define Turning moment diagram, coefficient of fluctuation of speed, coefficient of fluctuation of energy. | 3 |
| | b) Define precessional angular motion, angle of Heel, right hand screw rule. | 3 |
| | c) Two spiral gears A and B have 45 and 15 teeth at spiral angles of 20° and 50° respectively. Both wheels are of same hand. A is 15 cm in diameter. Find the distance between the shafts and angle between shafts. If the teeth are of 20° involute form and coefficient of friction is 0.08, find the efficiency of gears. | 8 |
| 4. | a) An epicyclic gear train consist of sunwheel S a stationary internal gear E and three identical planet wheels P carried on a star-shaped planet carrier C. The size of different tooth wheels are such that the planet carrier C rotates $\frac{1}{5}$ of speed of the sunwheels no. of teeth on sunwheel are 16. The driving torque on the sunwheel is 100 Nm. Determine no. of teeth on different wheels, torque necessary to keep internal gear stationary. | 8 |

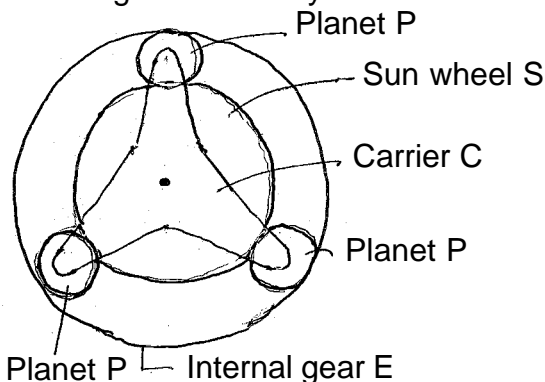


Fig. 4-a

Set S



- b) A flywheel of a steam engine weighs 2000 N and has a radius of gyration of 76 cm. The starting torque of steam engine is 1274 Nm and is assumed constant. Determine angular acceleration of flywheel alongwith speed and kinetic energy after 10 sec.

6

SECTION – II

5. A) Explain balancing of several masses in same plane. 4
 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. 10
 6. A) Derive equivalent stiffness of following system. 4

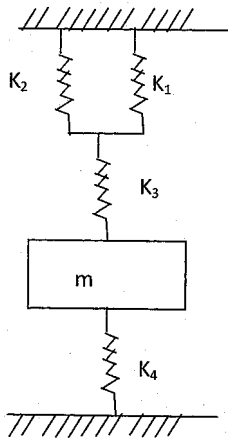
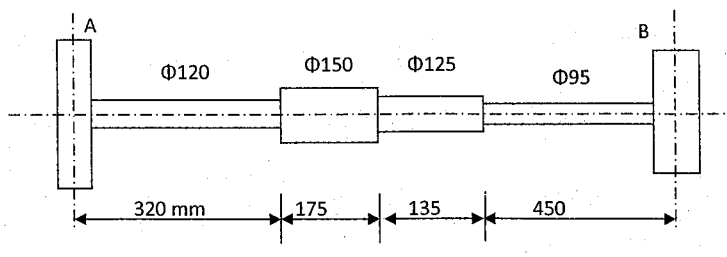


Fig. Q. 6A

- B) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find :
 1) Critical damping coefficient.
 2) Damping factor
 3) Logarithmic decrement, and
 4) Ratio of two consecutive amplitudes. 10
 7. A) Explain vibration isolation and transmissibility. 6
 B) A shaft in fig. carries two masses. The mass A is 600 kg with radius of gyration of 0.75 m and mass B is 900 kg with a radius of gyration of 0.9 m. Determine the frequency of torsional vibrations. The modulus of rigidity of shaft material is 80 GN/m². 8





SLR-TJ – 102

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

Set

P

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) The velocity profile for fully developed flow in a tube is
 - a) Hyperbolic
 - b) Linear
 - c) Parabolic
 - d) Exponential
- 2) Thermal conductivity of solid metals _____ with rise in temperature.
 - a) Decreases
 - b) Increases
 - c) Remains same
 - d) Unpredictable
- 3) The overall heat transfer co-efficient is used in case of
 - a) Conduction
 - b) Convection
 - c) Radiation
 - d) Conduction and convection
- 4) Why baffles are provided in heat exchangers ?
 - a) to reduce heat transfer rate
 - b) to improve heat transfer rate
 - c) to remove dirt
 - d) to reduce vibration
- 5) Fins are provided on surface to
 - a) To increase temperature gradient
 - b) To increase heat transfer co-efficient
 - c) To increase heat transfer area
 - d) All of these
- 6) _____ number gives an indication of ratio internal (conduction) resistance to surface (convection) resistance.
 - a) Stanton
 - b) Biot
 - c) Nusselt
 - d) Fourier

P.T.O.



- 7) Forced convection in liquid bath is caused by
- Density difference caused due to temperature difference
 - Molecular energy interaction
 - Flow of free electrons in random fashion
 - Intense stirring by external agency
- 8) In a heat exchanger with one fluid condensing or evaporating, the surface area required is least in
- Parallel flow
 - Counter flow
 - Cross flow
 - Same in all above arrangements
- 9) Heat transfer takes place according to _____ law of thermodynamics.
- Zeroth
 - First
 - Second
 - Third
- 10) Which one of dimensionless number has a significant role in forced convection ?
- Stanton
 - Reynolds
 - Grashoff
 - None
- 11) In the lumped parameter model, the temperature variation with time is
- linear
 - hyperbolic
 - parabolic
 - exponential
- 12) Up to critical radius of insulation
- Heat loss decrease with addition of insulation
 - Heat loss increases with addition of insulation
 - Heat loss remains constant
 - There occurs a decrease in heat flux
- 13) Value of Prandlt number for air is
- 0.1
 - 0.4
 - 0.7
 - 1.1
- 14) The free convection heat transfer is significantly affected by
- Reynolds number
 - Grashoff number
 - Stanton number
 - None of the above
-



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Out of remaining questions, attempt **any two** questions from **each** Section.
2) Assume suitable data if **required**.
3) Use of scientific calculator is **allowed**.
4) Figures to **right** indicates **full** marks.

SECTION – I

2. Solve **any four** out of the following questions : **(4×4=16)**
- A) Define thermal conductivity, what are its units ? Explain the effect of temperature on thermal conductivity for metals and non-metals.
 - B) Derive an expression for temperature distribution for a body subjected to heating or cooling for lumped heat capacity analysis.
 - C) Explain with neat sketch velocity boundary layer and thermal boundary layer.
 - D) Define the fin effectiveness and fin efficiency. Write the equation of heat flow rate for
 - a) Infinite long fin
 - b) Finite length and insulated tip
 - c) Finite length and convective tip
 - E) It is required to heat the oil to 300°C for frying purpose. A long ladle is used in frying pan. The section of the ladle is 5 mm × 18 mm. The surrounding air is at 30°C. The thermal conductivity of the material is 205 W/mK. If the temperature at a distance of 380 mm from the oil should not exceed 40°C, determine the convective heat transfer coefficient.
 - F) Assuming the man can be represented by a cylinder of 30 cm diameter and 1.7 m height with a surface temperature of 37°C. Calculate the heat he would lose while standing in air flowing at 36 km/ph and at 13°C. The properties of air at 25°C are $k = 0.0259 \text{ W/m}^\circ\text{C}$, $\gamma = 5 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.707$, $Nu = 0.027 (Re)^{0.8} (Pr)^{0.3}$.

Set P



3. Solve **any two** out of the following questions : **(2×6=12)**

- A) A person is found dead at 5 pm in a room whose temperature is 20°C. The temperature of body is measured to be 25°C when found, and heat transfer coefficient is estimated to be 8 W/m²K. Modelling a human body a 30 cm diameter and 1.7 m long cylinder. Calculate actual time of death of person. Take thermo physical properties of body $k = 6.08 \text{ W/mK}$, density 900 m³/kg, $C = 4000 \text{ J/kgK}$. (Assume health human body temperature = 37°C).
- B) Derive an expression for temperature distribution and heat dissipation in a straight fin of rectangular profile for infinite long fin.
- C) Calculate heat transfer coefficient by free convection and maximum current intensity for the wire 0.5 mm diameter with conduction that its temperature should not exceed 300°C. The wire is exposed to air at 20°C and resistance per meter length of the wire is 6 ohm per meter. The properties of air at 160°C are $k = 0.0338 \text{ W/m°C}$, $\rho = 0.8711 \text{ kg/m}^3$, $C_p = 1.014 \text{ kJ/kgK}$, $\gamma = 26.41 \times 10^{-6} \text{ m}^2/\text{s}$, $\alpha = 38.3 \times 10^{-6} \text{ m}^2/\text{s}$, $Nu = 1.18 (\text{Gr. Pr})^{1/8}$.

SECTION – II

4. Solve **any four** out of the following questions : **(4×4=16)**

- A) Explain with neat sketch boiling curve and its different regimes.
- B) Explain the following :
- i) Steffan Boltzmann law.
 - ii) Wein's displacement law.
- C) Define mass transfer and explain Fick's law of diffusion.
- D) Write a short note on finite difference methods for solving conduction and convection problems.
- E) Explain fouling factor and write the equation for overall heat transfer coefficient in heat exchanger.
- F) Define the following terms :
- i) Emissive power
 - ii) Emissivity
 - iii) Monochromatic Emissive Power
 - iv) Monochromatic Emissivity.



5. Solve **any two** out of the following questions : (2×6=12)

- A) Derive an expression for LMTD of counter flow heat exchanger.
- B) Consider two large parallel plates at $T_1 = 727^\circ\text{C}$ with emissivity of 0.8 and other at $T_2 = 227^\circ\text{C}$ with emissivity of 0.4. An aluminium radiation shield with an emissivity of 0.05, on both sides is placed between the two plates as a result of the shield. Calculate temperature of radiation shield. (Take $\sigma = 5.678 \times 10^{-8} \text{ W/m}^2\text{K}^4$).
- C) A counter flow heat exchanger is employed to cool 0.55 kg/s ($C_p = 2.45 \text{ kJ/kgK}$) of oil from 150°C to 40°C by use of water. The inlet and outlet temperatures of cooling water are 15°C and 75°C , respectively. The overall heat transfer coefficient is expected to be $1450 \text{ w/m}^2\text{C}$. Using NTU method, Calculate :
 - i) The mass flow rate of water,
 - ii) The effectiveness of the heat exchanger, and
 - iii) The surface area required.



SLR-TJ – 102

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

Set	Q
-----	---

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) In a heat exchanger with one fluid condensing or evaporating, the surface area required is least in
 - a) Parallel flow
 - b) Counter flow
 - c) Cross flow
 - d) Same in all above arrangements
- 2) Heat transfer takes place according to _____ law of thermodynamics.
 - a) Zeroth
 - b) First
 - c) Second
 - d) Third
- 3) Which one of dimensionless number has a significant role in forced convection ?
 - a) Stanton
 - b) Reynolds
 - c) Grashoff
 - d) None
- 4) In the lumped parameter model, the temperature variation with time is
 - a) linear
 - b) hyperbolic
 - c) parabolic
 - d) exponential
- 5) Up to critical radius of insulation
 - a) Heat loss decrease with addition of insulation
 - b) Heat loss increases with addition of insulation
 - c) Heat loss remains constant
 - d) There occurs a decrease in heat flux
- 6) Value of Prandlt number for air is
 - a) 0.1
 - b) 0.4
 - c) 0.7
 - d) 1.1
- 7) The free convection heat transfer is significantly affected by
 - a) Reynolds number
 - b) Grashoff number
 - c) Stanton number
 - d) None of the above

P.T.O.



- 8) The velocity profile for fully developed flow in a tube is
- a) Hyperbolic
 - b) Linear
 - c) Parabolic
 - d) Exponential
- 9) Thermal conductivity of solid metals _____ with rise in temperature.
- a) Decreases
 - b) Increases
 - c) Remains same
 - d) Unpredictable
- 10) The overall heat transfer co-efficient is used in case of
- a) Conduction
 - b) Convection
 - c) Radiation
 - d) Conduction and convection
- 11) Why baffles are provided in heat exchangers ?
- a) to reduce heat transfer rate
 - b) to improve heat transfer rate
 - c) to remove dirt
 - d) to reduce vibration
- 12) Fins are provided on surface to
- a) To increase temperature gradient
 - b) To increase heat transfer co-efficient
 - c) To increase heat transfer area
 - d) All of these
- 13) _____ number gives an indication of ratio internal (conduction) resistance to surface (convection) resistance.
- a) Stanton
 - b) Biot
 - c) Nusselt
 - d) Fourier
- 14) Forced convection in liquid bath is caused by
- a) Density difference caused due to temperature difference
 - b) Molecular energy interaction
 - c) Flow of free electrons in random fashion
 - d) Intense stirring by external agency
-



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Out of remaining questions, attempt **any two** questions from **each** Section.
2) Assume suitable data if **required**.
3) Use of scientific calculator is **allowed**.
4) Figures to **right** indicates **full** marks.

SECTION – I

2. Solve **any four** out of the following questions : **(4×4=16)**
- A) Define thermal conductivity, what are its units ? Explain the effect of temperature on thermal conductivity for metals and non-metals.
 - B) Derive an expression for temperature distribution for a body subjected to heating or cooling for lumped heat capacity analysis.
 - C) Explain with neat sketch velocity boundary layer and thermal boundary layer.
 - D) Define the fin effectiveness and fin efficiency. Write the equation of heat flow rate for
 - a) Infinite long fin
 - b) Finite length and insulated tip
 - c) Finite length and convective tip
 - E) It is required to heat the oil to 300°C for frying purpose. A long ladle is used in frying pan. The section of the ladle is 5 mm × 18 mm. The surrounding air is at 30°C. The thermal conductivity of the material is 205 W/mK. If the temperature at a distance of 380 mm from the oil should not exceed 40°C, determine the convective heat transfer coefficient.
 - F) Assuming the man can be represented by a cylinder of 30 cm diameter and 1.7 m height with a surface temperature of 37°C. Calculate the heat he would lose while standing in air flowing at 36 km/ph and at 13°C. The properties of air at 25°C are $k = 0.0259 \text{ W/m}^\circ\text{C}$, $\gamma = 5 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.707$, $Nu = 0.027 (Re)^{0.8} (Pr)^{0.3}$.

Set Q



3. Solve **any two** out of the following questions : **(2×6=12)**

- A) A person is found dead at 5 pm in a room whose temperature is 20°C. The temperature of body is measured to be 25°C when found, and heat transfer coefficient is estimated to be 8 W/m²K. Modelling a human body a 30 cm diameter and 1.7 m long cylinder. Calculate actual time of death of person. Take thermo physical properties of body $k = 6.08 \text{ W/mK}$, density 900 m³/kg, $C = 4000 \text{ J/kgK}$. (Assume health human body temperature = 37°C).
- B) Derive an expression for temperature distribution and heat dissipation in a straight fin of rectangular profile for infinite long fin.
- C) Calculate heat transfer coefficient by free convection and maximum current intensity for the wire 0.5 mm diameter with conduction that its temperature should not exceed 300°C. The wire is exposed to air at 20°C and resistance per meter length of the wire is 6 ohm per meter. The properties of air at 160°C are $k = 0.0338 \text{ W/m°C}$, $\rho = 0.8711 \text{ kg/m}^3$, $C_p = 1.014 \text{ kJ/kgK}$, $\gamma = 26.41 \times 10^{-6} \text{ m}^2/\text{s}$, $\alpha = 38.3 \times 10^{-6} \text{ m}^2/\text{s}$, $Nu = 1.18 (\text{Gr. Pr})^{1/8}$.

SECTION – II

4. Solve **any four** out of the following questions : **(4×4=16)**

- A) Explain with neat sketch boiling curve and its different regimes.
- B) Explain the following :
- i) Steffan Boltzmann law.
 - ii) Wein's displacement law.
- C) Define mass transfer and explain Fick's law of diffusion.
- D) Write a short note on finite difference methods for solving conduction and convection problems.
- E) Explain fouling factor and write the equation for overall heat transfer coefficient in heat exchanger.
- F) Define the following terms :
- i) Emissive power
 - ii) Emissivity
 - iii) Monochromatic Emissive Power
 - iv) Monochromatic Emissivity.



5. Solve **any two** out of the following questions : (2×6=12)

- A) Derive an expression for LMTD of counter flow heat exchanger.
 - B) Consider two large parallel plates at $T_1 = 727^\circ\text{C}$ with emissivity of 0.8 and other at $T_2 = 227^\circ\text{C}$ with emissivity of 0.4. An aluminium radiation shield with an emissivity of 0.05, on both sides is placed between the two plates as a result of the shield. Calculate temperature of radiation shield. (Take $\sigma = 5.678 \times 10^{-8} \text{ W/m}^2\text{K}^4$).
 - C) A counter flow heat exchanger is employed to cool 0.55 kg/s ($C_p = 2.45 \text{ kJ/kgK}$) of oil from 150°C to 40°C by use of water. The inlet and outlet temperatures of cooling water are 15°C and 75°C , respectively. The overall heat transfer coefficient is expected to be $1450 \text{ w/m}^2\text{C}$. Using NTU method, Calculate :
 - i) The mass flow rate of water,
 - ii) The effectiveness of the heat exchanger, and
 - iii) The surface area required.
-



SLR-TJ – 102

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

Set

R

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) Fins are provided on surface to
 - a) To increase temperature gradient
 - b) To increase heat transfer co-efficient
 - c) To increase heat transfer area
 - d) All of these
 - 2) _____ number gives an indication of ratio internal (conduction) resistance to surface (convection) resistance.
 - a) Stanton
 - b) Biot
 - c) Nusselt
 - d) Fourier
 - 3) Forced convection in liquid bath is caused by
 - a) Density difference caused due to temperature difference
 - b) Molecular energy interaction
 - c) Flow of free electrons in random fashion
 - d) Intense stirring by external agency
 - 4) In a heat exchanger with one fluid condensing or evaporating, the surface area required is least in
 - a) Parallel flow
 - b) Counter flow
 - c) Cross flow
 - d) Same in all above arrangements
 - 5) Heat transfer takes place according to _____ law of thermodynamics.
 - a) Zeroth
 - b) First
 - c) Second
 - d) Third

P.T.O.



- 6) Which one of dimensionless number has a significant role in forced convection ?
a) Stanton b) Reynolds c) Grashoff d) None
- 7) In the lumped parameter model, the temperature variation with time is
a) linear b) hyperbolic c) parabolic d) exponential
- 8) Up to critical radius of insulation
a) Heat loss decrease with addition of insulation
b) Heat loss increases with addition of insulation
c) Heat loss remains constant
d) There occurs a decrease in heat flux
- 9) Value of Prandtl number for air is
a) 0.1 b) 0.4
c) 0.7 d) 1.1
- 10) The free convection heat transfer is significantly affected by
a) Reynolds number b) Grashoff number
c) Stanton number d) None of the above
- 11) The velocity profile for fully developed flow in a tube is
a) Hyperbolic b) Linear
c) Parabolic d) Exponential
- 12) Thermal conductivity of solid metals _____ with rise in temperature.
a) Decreases b) Increases
c) Remains same d) Unpredictable
- 13) The overall heat transfer co-efficient is used in case of
a) Conduction b) Convection
c) Radiation d) Conduction and convection
- 14) Why baffles are provided in heat exchangers ?
a) to reduce heat transfer rate b) to improve heat transfer rate
c) to remove dirt d) to reduce vibration
-



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Out of remaining questions, attempt **any two** questions from **each** Section.
2) Assume suitable data if **required**.
3) Use of scientific calculator is **allowed**.
4) Figures to **right** indicates **full** marks.

SECTION – I

2. Solve **any four** out of the following questions : **(4×4=16)**
- A) Define thermal conductivity, what are its units ? Explain the effect of temperature on thermal conductivity for metals and non-metals.
 - B) Derive an expression for temperature distribution for a body subjected to heating or cooling for lumped heat capacity analysis.
 - C) Explain with neat sketch velocity boundary layer and thermal boundary layer.
 - D) Define the fin effectiveness and fin efficiency. Write the equation of heat flow rate for
 - a) Infinite long fin
 - b) Finite length and insulated tip
 - c) Finite length and convective tip
 - E) It is required to heat the oil to 300°C for frying purpose. A long ladle is used in frying pan. The section of the ladle is 5 mm × 18 mm. The surrounding air is at 30°C. The thermal conductivity of the material is 205 W/mK. If the temperature at a distance of 380 mm from the oil should not exceed 40°C, determine the convective heat transfer coefficient.
 - F) Assuming the man can be represented by a cylinder of 30 cm diameter and 1.7 m height with a surface temperature of 37°C. Calculate the heat he would lose while standing in air flowing at 36 km/ph and at 13°C. The properties of air at 25°C are $k = 0.0259 \text{ W/m}^\circ\text{C}$, $\gamma = 5 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.707$, $Nu = 0.027 (Re)^{0.8} (Pr)^{0.3}$.

Set R



3. Solve **any two** out of the following questions : **(2×6=12)**

- A) A person is found dead at 5 pm in a room whose temperature is 20°C. The temperature of body is measured to be 25°C when found, and heat transfer coefficient is estimated to be 8 W/m²K. Modelling a human body a 30 cm diameter and 1.7 m long cylinder. Calculate actual time of death of person. Take thermo physical properties of body $k = 6.08 \text{ W/mK}$, density 900 m³/kg, $C = 4000 \text{ J/kgK}$. (Assume health human body temperature = 37°C).
- B) Derive an expression for temperature distribution and heat dissipation in a straight fin of rectangular profile for infinite long fin.
- C) Calculate heat transfer coefficient by free convection and maximum current intensity for the wire 0.5 mm diameter with conduction that its temperature should not exceed 300°C. The wire is exposed to air at 20°C and resistance per meter length of the wire is 6 ohm per meter. The properties of air at 160°C are $k = 0.0338 \text{ W/m°C}$, $\rho = 0.8711 \text{ kg/m}^3$, $C_p = 1.014 \text{ kJ/kgK}$, $\gamma = 26.41 \times 10^{-6} \text{ m}^2/\text{s}$, $\alpha = 38.3 \times 10^{-6} \text{ m}^2/\text{s}$, $Nu = 1.18 (\text{Gr. Pr})^{1/8}$.

SECTION – II

4. Solve **any four** out of the following questions : **(4×4=16)**

- A) Explain with neat sketch boiling curve and its different regimes.
- B) Explain the following :
- i) Steffan Boltzmann law.
 - ii) Wein's displacement law.
- C) Define mass transfer and explain Fick's law of diffusion.
- D) Write a short note on finite difference methods for solving conduction and convection problems.
- E) Explain fouling factor and write the equation for overall heat transfer coefficient in heat exchanger.
- F) Define the following terms :
- i) Emissive power
 - ii) Emissivity
 - iii) Monochromatic Emissive Power
 - iv) Monochromatic Emissivity.



5. Solve **any two** out of the following questions : (2×6=12)

- A) Derive an expression for LMTD of counter flow heat exchanger.
 - B) Consider two large parallel plates at $T_1 = 727^\circ\text{C}$ with emissivity of 0.8 and other at $T_2 = 227^\circ\text{C}$ with emissivity of 0.4. An aluminium radiation shield with an emissivity of 0.05, on both sides is placed between the two plates as a result of the shield. Calculate temperature of radiation shield. (Take $\sigma = 5.678 \times 10^{-8} \text{ W/m}^2\text{K}^4$).
 - C) A counter flow heat exchanger is employed to cool 0.55 kg/s ($C_p = 2.45 \text{ kJ/kgK}$) of oil from 150°C to 40°C by use of water. The inlet and outlet temperatures of cooling water are 15°C and 75°C , respectively. The overall heat transfer coefficient is expected to be $1450 \text{ w/m}^2\text{C}$. Using NTU method, Calculate :
 - i) The mass flow rate of water,
 - ii) The effectiveness of the heat exchanger, and
 - iii) The surface area required.
-



SLR-TJ – 102

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

Set **S**

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**

- 1) Which one of dimensionless number has a significant role in forced convection ?
a) Stanton b) Reynolds c) Grashoff d) None
- 2) In the lumped parameter model, the temperature variation with time is
a) linear b) hyperbolic c) parabolic d) exponential
- 3) Up to critical radius of insulation
a) Heat loss decrease with addition of insulation
b) Heat loss increases with addition of insulation
c) Heat loss remains constant
d) There occurs a decrease in heat flux
- 4) Value of Prandlt number for air is
a) 0.1 b) 0.4
c) 0.7 d) 1.1
- 5) The free convection heat transfer is significantly affected by
a) Reynolds number b) Grashoff number
c) Stanton number d) None of the above
- 6) The velocity profile for fully developed flow in a tube is
a) Hyperbolic b) Linear
c) Parabolic d) Exponential
- 7) Thermal conductivity of solid metals _____ with rise in temperature.
a) Decreases b) Increases
c) Remains same d) Unpredictable

P.T.O.



- 8) The overall heat transfer co-efficient is used in case of
- a) Conduction
 - b) Convection
 - c) Radiation
 - d) Conduction and convection
- 9) Why baffles are provided in heat exchangers ?
- a) to reduce heat transfer rate
 - b) to improve heat transfer rate
 - c) to remove dirt
 - d) to reduce vibration
- 10) Fins are provided on surface to
- a) To increase temperature gradient
 - b) To increase heat transfer co-efficient
 - c) To increase heat transfer area
 - d) All of these
- 11) _____ number gives an indication of ratio internal (conduction) resistance to surface (convection) resistance.
- a) Stanton
 - b) Biot
 - c) Nusselt
 - d) Fourier
- 12) Forced convection in liquid bath is caused by
- a) Density difference caused due to temperature difference
 - b) Molecular energy interaction
 - c) Flow of free electrons in random fashion
 - d) Intense stirring by external agency
- 13) In a heat exchanger with one fluid condensing or evaporating, the surface area required is least in
- a) Parallel flow
 - b) Counter flow
 - c) Cross flow
 - d) Same in all above arrangements
- 14) Heat transfer takes place according to _____ law of thermodynamics.
- a) Zeroth
 - b) First
 - c) Second
 - d) Third
-



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
HEAT AND MASS TRANSFER**

Day and Date : Saturday, 2-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Out of remaining questions, attempt **any two** questions from **each** Section.
2) Assume suitable data if **required**.
3) Use of scientific calculator is **allowed**.
4) Figures to **right** indicates **full** marks.

SECTION – I

2. Solve **any four** out of the following questions : **(4×4=16)**
- A) Define thermal conductivity, what are its units ? Explain the effect of temperature on thermal conductivity for metals and non-metals.
 - B) Derive an expression for temperature distribution for a body subjected to heating or cooling for lumped heat capacity analysis.
 - C) Explain with neat sketch velocity boundary layer and thermal boundary layer.
 - D) Define the fin effectiveness and fin efficiency. Write the equation of heat flow rate for
 - a) Infinite long fin
 - b) Finite length and insulated tip
 - c) Finite length and convective tip
 - E) It is required to heat the oil to 300°C for frying purpose. A long ladle is used in frying pan. The section of the ladle is 5 mm × 18 mm. The surrounding air is at 30°C. The thermal conductivity of the material is 205 W/mK. If the temperature at a distance of 380 mm from the oil should not exceed 40°C, determine the convective heat transfer coefficient.
 - F) Assuming the man can be represented by a cylinder of 30 cm diameter and 1.7 m height with a surface temperature of 37°C. Calculate the heat he would lose while standing in air flowing at 36 km/ph and at 13°C. The properties of air at 25°C are $k = 0.0259 \text{ W/m}^\circ\text{C}$, $\gamma = 5 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.707$, $Nu = 0.027 (Re)^{0.8} (Pr)^{0.3}$.

Set S



3. Solve **any two** out of the following questions : **(2×6=12)**

- A) A person is found dead at 5 pm in a room whose temperature is 20°C. The temperature of body is measured to be 25°C when found, and heat transfer coefficient is estimated to be 8 W/m²K. Modelling a human body a 30 cm diameter and 1.7 m long cylinder. Calculate actual time of death of person. Take thermo physical properties of body $k = 6.08 \text{ W/mK}$, density 900 m³/kg, $C = 4000 \text{ J/kgK}$. (Assume health human body temperature = 37°C).
- B) Derive an expression for temperature distribution and heat dissipation in a straight fin of rectangular profile for infinite long fin.
- C) Calculate heat transfer coefficient by free convection and maximum current intensity for the wire 0.5 mm diameter with conduction that its temperature should not exceed 300°C. The wire is exposed to air at 20°C and resistance per meter length of the wire is 6 ohm per meter. The properties of air at 160°C are $k = 0.0338 \text{ W/m°C}$, $\rho = 0.8711 \text{ kg/m}^3$, $C_p = 1.014 \text{ kJ/kgK}$, $\gamma = 26.41 \times 10^{-6} \text{ m}^2/\text{s}$, $\alpha = 38.3 \times 10^{-6} \text{ m}^2/\text{s}$, $Nu = 1.18 (\text{Gr. Pr})^{1/8}$.

SECTION – II

4. Solve **any four** out of the following questions : **(4×4=16)**

- A) Explain with neat sketch boiling curve and its different regimes.
- B) Explain the following :
- i) Steffan Boltzmann law.
 - ii) Wein's displacement law.
- C) Define mass transfer and explain Fick's law of diffusion.
- D) Write a short note on finite difference methods for solving conduction and convection problems.
- E) Explain fouling factor and write the equation for overall heat transfer coefficient in heat exchanger.
- F) Define the following terms :
- i) Emissive power
 - ii) Emissivity
 - iii) Monochromatic Emissive Power
 - iv) Monochromatic Emissivity.



5. Solve **any two** out of the following questions : (2×6=12)

- A) Derive an expression for LMTD of counter flow heat exchanger.
- B) Consider two large parallel plates at $T_1 = 727^\circ\text{C}$ with emissivity of 0.8 and other at $T_2 = 227^\circ\text{C}$ with emissivity of 0.4. An aluminium radiation shield with an emissivity of 0.05, on both sides is placed between the two plates as a result of the shield. Calculate temperature of radiation shield. (Take $\sigma = 5.678 \times 10^{-8} \text{ W/m}^2\text{K}^4$).
- C) A counter flow heat exchanger is employed to cool 0.55 kg/s ($C_p = 2.45 \text{ kJ/kgK}$) of oil from 150°C to 40°C by use of water. The inlet and outlet temperatures of cooling water are 15°C and 75°C , respectively. The overall heat transfer coefficient is expected to be $1450 \text{ w/m}^2\text{C}$. Using NTU method, Calculate :
 - i) The mass flow rate of water,
 - ii) The effectiveness of the heat exchanger, and
 - iii) The surface area required.



SLR-TJ – 103

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

Set	P
-----	---

**T.E. (Mechanical Engineering) (Part – I) (CGPA) Examination, 2017
METALLURGY**

Day and Date : Tuesday, 5-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

A) MCQ with only **one** answer correct :

(1×6=6)

- 1) Pearlite is product of _____ transformation.
a) Monotectic b) Eutectic c) Eutectoid d) Peritectic
- 2) Which of the following alloy is having best casting properties ?
a) Eutectic alloy b) Eutectoid alloy
c) Peritectic alloy d) Solid solution alloy
- 3) Which of the following treatments is carried out to improve machinability of hyper eutectoid steels ?
a) Homogenisation b) Spherodising
c) Recovery d) Recrystallisation annealing
- 4) In α brass which of the following is solute ?
a) Zn b) Cu_3Zn c) Cu d) Tin
- 5) True toughness of material can be measured by _____ test.
a) Impact test b) Creep test c) Fatigue test d) Tensile test
- 6) Stainless steel powder is frequently produced by _____
a) Reduction method b) Carbonyl method
c) Electrodeposition d) Atomisation

P.T.O.



B) MCQ with more than **one** answer correct :

(2×4=8)

- 1) Which of the following steels essentially contain 'Manganese' as an alloying element ?
 - a) HCHC steel
 - b) Hadfield steel
 - c) Free cutting steel
 - d) HSLA steel
 - 2) Which of the following treatments will result in formation of Martensite in structure of steel ?
 - a) Patenting
 - b) Austempering
 - c) Martempering
 - d) Hardening
 - 3) Which of the following alloys are hardened by precipitation hardening ?
 - a) Beryllium bronze
 - b) Tin bronze
 - c) Al Bronze
 - d) Duralumin
 - 4) Which of the following methods of powder manufacture are regarded as mechanical methods of powder mfg. ?
 - a) Reduction
 - b) Condensation
 - c) Atomisation
 - d) Milling
-



SECTION – II

- | | |
|--|---|
| 5. a) Draw T-T-T diagram for eutectoid steel. | 4 |
| b) Explain the purposes and application of full annealing. | 4 |
| c) What is critical cooling rate ? What is its significance ? | 3 |
| d) Explain the significance of austenitic grain size. | 3 |
| 6. a) Explain mechanism of heat removal during quenching. | 4 |
| b) Explain the factors affecting hardenability of steels. | 3 |
| c) Compare between carburising and nitriding. | 4 |
| d) Compare between induction hardening and flame hardening. | 3 |
| 7. a) Draw stress-strain curve for mild steel and cast irons. | 4 |
| b) What are the factors affecting fatigue life of component ? How fatigue life can be improved ? | 3 |
| c) Explain the advantages and limitations of Dye penetrant test. | 3 |
| d) Draw flow chart for manufacture of self lubricated bearings. | 4 |
-



SLR-TJ – 103

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

Set	Q
-----	---

**T.E. (Mechanical Engineering) (Part – I) (CGPA) Examination, 2017
METALLURGY**

Day and Date : Tuesday, 5-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

A) MCQ with only **one** answer correct : **(1×6=6)**

- 1) True toughness of material can be measured by _____ test.
a) Impact test b) Creep test c) Fatigue test d) Tensile test
- 2) Stainless steel powder is frequently produced by _____
a) Reduction method b) Carbonyl method
c) Electrodeposition d) Atomisation
- 3) Pearlite is product of _____ transformation.
a) Monotectic b) Eutectic c) Eutectoid d) Peritectic
- 4) Which of the following alloy is having best casting properties ?
a) Eutectic alloy b) Eutectoid alloy
c) Peritectic alloy d) Solid solution alloy
- 5) Which of the following treatments is carried out to improve machinability of hyper eutectoid steels ?
a) Homogenisation b) Spherodising
c) Recovery d) Recrystallisation annealing
- 6) In α brass which of the following is solute ?
a) Zn b) Cu_3Zn c) Cu d) Tin

P.T.O.



B) MCQ with more than **one** answer correct :

(2×4=8)

- 1) Which of the following methods of powder manufacture are regarded as mechanical methods of powder mfg. ?
 - a) Reduction
 - b) Condensation
 - c) Atomisation
 - d) Milling
 - 2) Which of the following alloys are hardened by precipitation hardening ?
 - a) Beryllium bronze
 - b) Tin bronze
 - c) Al Bronze
 - d) Duralumin
 - 3) Which of the following steels essentially contain 'Manganese' as an alloying element ?
 - a) HCHC steel
 - b) Hadfield steel
 - c) Free cutting steel
 - d) HSLA steel
 - 4) Which of the following treatments will result in formation of Martensite in structure of steel ?
 - a) Patenting
 - b) Austempering
 - c) Martempering
 - d) Hardening
-



SECTION – II

- | | |
|--|---|
| 5. a) Draw T-T-T diagram for eutectoid steel. | 4 |
| b) Explain the purposes and application of full annealing. | 4 |
| c) What is critical cooling rate ? What is its significance ? | 3 |
| d) Explain the significance of austenitic grain size. | 3 |
| 6. a) Explain mechanism of heat removal during quenching. | 4 |
| b) Explain the factors affecting hardenability of steels. | 3 |
| c) Compare between carburising and nitriding. | 4 |
| d) Compare between induction hardening and flame hardening. | 3 |
| 7. a) Draw stress-strain curve for mild steel and cast irons. | 4 |
| b) What are the factors affecting fatigue life of component ? How fatigue life can be improved ? | 3 |
| c) Explain the advantages and limitations of Dye penetrant test. | 3 |
| d) Draw flow chart for manufacture of self lubricated bearings. | 4 |
-



SLR-TJ – 103

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

Set	R
-----	---

**T.E. (Mechanical Engineering) (Part – I) (CGPA) Examination, 2017
METALLURGY**

Day and Date : Tuesday, 5-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

A) MCQ with only **one** answer correct : **(1×6=6)**

- 1) Which of the following treatments is carried out to improve machinability of hyper eutectoid steels ?
 - a) Homogenisation
 - b) Spheroidising
 - c) Recovery
 - d) Recrystallisation annealing
- 2) In α brass which of the following is solute ?
 - a) Zn
 - b) Cu_3Zn
 - c) Cu
 - d) Tin
- 3) True toughness of material can be measured by _____ test.
 - a) Impact test
 - b) Creep test
 - c) Fatigue test
 - d) Tensile test
- 4) Stainless steel powder is frequently produced by _____
 - a) Reduction method
 - b) Carbonyl method
 - c) Electrodeposition
 - d) Atomisation
- 5) Pearlite is product of _____ transformation.
 - a) Monotectic
 - b) Eutectic
 - c) Eutectoid
 - d) Peritectic
- 6) Which of the following alloy is having best casting properties ?
 - a) Eutectic alloy
 - b) Eutectoid alloy
 - c) Peritectic alloy
 - d) Solid solution alloy

P.T.O.



B) MCQ with more than **one** answer correct : **(2×4=8)**

- 1) Which of the following alloys are hardened by precipitation hardening ?
 - a) Beryllium bronze
 - b) Tin bronze
 - c) Al Bronze
 - d) Duralumin
 - 2) Which of the following methods of powder manufacture are regarded as mechanical methods of powder mfg. ?
 - a) Reduction
 - b) Condensation
 - c) Atomisation
 - d) Milling
 - 3) Which of the following treatments will result in formation of Martensite in structure of steel ?
 - a) Patenting
 - b) Austempering
 - c) Martempering
 - d) Hardening
 - 4) Which of the following steels essentially contain 'Manganese' as an alloying element ?
 - a) HCHC steel
 - b) Hadfield steel
 - c) Free cutting steel
 - d) HSLA steel
-



SECTION – II

- | | |
|--|---|
| 5. a) Draw T-T-T diagram for eutectoid steel. | 4 |
| b) Explain the purposes and application of full annealing. | 4 |
| c) What is critical cooling rate ? What is its significance ? | 3 |
| d) Explain the significance of austenitic grain size. | 3 |
| 6. a) Explain mechanism of heat removal during quenching. | 4 |
| b) Explain the factors affecting hardenability of steels. | 3 |
| c) Compare between carburising and nitriding. | 4 |
| d) Compare between induction hardening and flame hardening. | 3 |
| 7. a) Draw stress-strain curve for mild steel and cast irons. | 4 |
| b) What are the factors affecting fatigue life of component ? How fatigue life can be improved ? | 3 |
| c) Explain the advantages and limitations of Dye penetrant test. | 3 |
| d) Draw flow chart for manufacture of self lubricated bearings. | 4 |
-



SLR-TJ – 103

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

Set	S
-----	---

**T.E. (Mechanical Engineering) (Part – I) (CGPA) Examination, 2017
METALLURGY**

Day and Date : Tuesday, 5-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

A) MCQ with only **one** answer correct :

(1×6=6)

- 1) In α brass which of the following is solute ?
a) Zn b) Cu_3Zn c) Cu d) Tin
- 2) True toughness of material can be measured by _____ test.
a) Impact test b) Creep test c) Fatigue test d) Tensile test
- 3) Stainless steel powder is frequently produced by _____
a) Reduction method b) Carbonyl method
c) Electrodeposition d) Atomisation
- 4) Pearlite is product of _____ transformation.
a) Monotectic b) Eutectic c) Eutectoid d) Peritectic
- 5) Which of the following alloy is having best casting properties ?
a) Eutectic alloy b) Eutectoid alloy
c) Peritectic alloy d) Solid solution alloy
- 6) Which of the following treatments is carried out to improve machinability of hyper eutectoid steels ?
a) Homogenisation b) Spherodising
c) Recovery d) Recrystallisation annealing

P.T.O.



B) MCQ with more than **one** answer correct :

(2×4=8)

- 1) Which of the following treatments will result in formation of Martensite in structure of steel ?
 - a) Patenting
 - b) Austempering
 - c) Martempering
 - d) Hardening
 - 2) Which of the following steels essentially contain 'Manganese' as an alloying element ?
 - a) HCHC steel
 - b) Hadfield steel
 - c) Free cutting steel
 - d) HSLA steel
 - 3) Which of the following methods of powder manufacture are regarded as mechanical methods of powder mfg. ?
 - a) Reduction
 - b) Condensation
 - c) Atomisation
 - d) Milling
 - 4) Which of the following alloys are hardened by precipitation hardening ?
 - a) Beryllium bronze
 - b) Tin bronze
 - c) Al Bronze
 - d) Duralumin
-



SECTION – II

- | | |
|--|---|
| 5. a) Draw T-T-T diagram for eutectoid steel. | 4 |
| b) Explain the purposes and application of full annealing. | 4 |
| c) What is critical cooling rate ? What is its significance ? | 3 |
| d) Explain the significance of austenitic grain size. | 3 |
| 6. a) Explain mechanism of heat removal during quenching. | 4 |
| b) Explain the factors affecting hardenability of steels. | 3 |
| c) Compare between carburising and nitriding. | 4 |
| d) Compare between induction hardening and flame hardening. | 3 |
| 7. a) Draw stress-strain curve for mild steel and cast irons. | 4 |
| b) What are the factors affecting fatigue life of component ? How fatigue life can be improved ? | 3 |
| c) Explain the advantages and limitations of Dye penetrant test. | 3 |
| d) Draw flow chart for manufacture of self lubricated bearings. | 4 |
-



SLR-TJ – 104

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

Set	P
-----	---

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in first 30 minutes in Answer Book Page No. 3.
 - 2) Solve **any two** questions from **each** Section I and II.
 - 3) Make necessary assumptions, **if** required and mention it **clearly**.
 - 4) Figures to the **right** indicate **full** marks.
 - 5) **Use** of non-programmable calculator is **permitted**.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answers :

8

(Note : All responses must be correct, that carries 2 marks otherwise zero marks)

- i) Tensile force along axis can cause
 - a) Linear strain
 - b) Lateral strain
 - c) Increase in lateral dimension
 - d) None of the above
- ii) Theories of failure are required to
 - a) Correlate results of standard tension test on specimen to a component
 - b) Predict the effect of combined loading in a complex load system
 - c) Predict factor of safety
 - d) Estimate the load acting on component
- iii) Eye end of knuckle joint can fail under
 - a) Tension
 - b) Shear
 - c) Crushing
 - d) Bending
- iv) In split muff or compression coupling
 - a) Nut bolts are used to have a compression force on shaft
 - b) Muff is joined by bolting
 - c) Ease of assembly compared to muff coupling
 - d) Shafts are mis-aligned

P.T.O.



B) Choose the correct answers :

6

(Note : One option is correct, that carries 1 mark)

- i) As per distortion theory, S_{sy} is taken as _____ times S_{yt} .
- a) 5
 - b) 0.5
 - c) 0.577
 - d) 0.557
- ii) For fulcrum pin in lever, design is carried out on the basis of
- a) Shear-bearing
 - b) Shear-tensile
 - c) Tensile-buckling
 - d) None of a), b), c)
- iii) In steel, FeE-250, as per BIS designation
- a) Maximum Yield Strength is 250 N/mm^2
 - b) Minimum Yield Strength is 250 N/mm^2
 - c) Maximum Shear Strength is 250 N/mm^2
 - d) None of a), b), c)
- iv) Spindles are generally designed for
- a) Bending and torsion
 - b) Bending and crushing
 - c) Torsion and tensile
 - d) None of a), b), c)
- v) Number of active turns in helical compression spring with squared and ground ends are
- a) Total turns – 1
 - b) Total turns – 2
 - c) Total turns + 1
 - d) Total turns + 2
- vi) Degradation of plastic elements is related to design for
- a) Casting
 - b) Machining
 - c) Forging
 - d) None of a), b), c)
-



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

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017

Max. Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **permitted**.

SECTION – I

2. a) Explain modes of failure. 3
- b) Explain any two theories of failure. 4
- c) It is required to select a flat belt drive for a fan running at 360 r.p.m. Which is driven by a 10 kW, 1440 rpm motor. The belt drive is open type and space is available for a centre distance of 2 m approximately. The belt velocity should be between 17.8 to 22.9 m/s. The power transmitting capacity of the belt per mm width per ply at 180° arc of contact and at a belt velocity of 5.08 m/s is 0.0118 kW. The load correction factor can be taken as 1.2. Suggest preferred diameters for motor and fan pulleys and give complete specifications of belting. 7
3. a) Explain the following terms : 7
 - i) Endurance limit
 - ii) Notch sensitivity
 - iii) Cyclic stresses
 - iv) Stress concentration factor.
- b) A transmission shaft of cold drawn steel 27 Mn2 ($S_{ut} = 500$ MPa and $S_{yt} = 300$ MPa) is subjected to a fluctuating torque which varies from -100 N.m to $+400$ N.m. The factor of safety is 2 and expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft. 7
Assume the distortion energy theory of failure. Assume given data
 $K_a = 0.8$, $K_b = 0.85$ and $K_c = 0.897$.
4. a) Write down the strength equations for various failure modes to be considered for design of knuckle joint with necessary sketches. 7
- b) The pull in the tie rod of an iron roof truss is 38.46 KN. Design a suitable adjustable screwed joint. The permissible stresses for rod are 80 MPa in tension and 40 MPa in shear. Assume maximum load is 1.3 times normal load. Permissible stress for coupler is 40 MPa in tension. (Refer table data for obtaining the thread dimensions). 7

Designation	Pitch (p) mm	Minor diameter (dc)	Tensile stress Area (mm ²)
M24	3.00	20.319	353
M30	3.50	25.706	561
M36	4.00	31.093	817
M42	4.50	36.479	1120
M48	5.00	41.866	1470
M56	5.50	56.639	2030

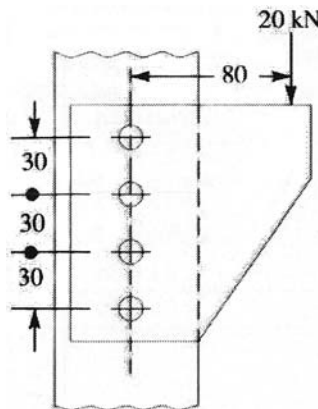


SECTION – II

- 5. a) Discuss design with non-metals plastic and rubber. 3
- b) Write the strength equation for key. 4
- c) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft can be considered as the half of the external diameter. Both the shafts have the same material and length. 7

- 6. a) Discuss the design considerations for forging. 3
- b) Discuss the two springs connected in parallel. 4
- c) A railway wagon moving at a velocity of 2 m/s is brought to rest by a bumper consisting of two helical compression springs arranged in parallel. The springs are compresses by 150 mm in bringing the wagon to rest. The mass of the wagon is 1000 kg. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire with ultimate tensile strength of 1500 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate :
 - i) Maximum force on each spring
 - ii) Wire diameter
 - iii) Mean coil diameter and
 - iv) Number active coils. 7

- 7. a) Give the merits of welded joints. 3
- b) Discuss the failure modes for a rivet. 4
- c) A bracket is supported by means of 4 rivets of same size as shown in Fig. Determine the diameter of the rivet if the maximum shear stress is 130 N/mm². (Dimensions are in mm). 7



Design data for Selection of Flat-Belt

Arc of Contact factor

α_s	120	130	140	150	160	170	180	190	200
F _d	1.33	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

Standard with of belts

3-Ply	25	40	50	63	76				
4-Ply	40	44	50	63	76	90	100	112	125
5-Ply	76	100	112	125	152				
6-Ply	112	125	152	180	200				

Power Transmitting Capacities

HI-SPEED	0.0118 kW per mm width per ply
FORT	0.0147 kW per mm width per ply

Preferred Pulley Diameters

Pitch Diameter (mm)	125	132	140	150	160	170	180	190	200
212	224	236	250	265	280	300	315	355	375
400	425	450	475	500	530	560	600	630	670
710	750	800	900	1000					



SLR-TJ – 104

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

Set	Q
-----	---

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in first 30 minutes in Answer Book Page No. 3.
 - 2) Solve **any two** questions from **each** Section I and II.
 - 3) Make necessary assumptions, **if** required and mention it **clearly**.
 - 4) Figures to the **right** indicate **full** marks.
 - 5) **Use** of non-programmable calculator is **permitted**.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answers :

8

(Note : All responses must be correct, that carries 2 marks otherwise zero marks)

- i) In split muff or compression coupling
 - a) Nut bolts are used to have a compression force on shaft
 - b) Muff is joined by bolting
 - c) Ease of assembly compared to muff coupling
 - d) Shafts are mis-aligned
- ii) Eye end of knuckle joint can fail under
 - a) Tension
 - b) Shear
 - c) Crushing
 - d) Bending
- iii) Theories of failure are required to
 - a) Correlate results of standard tension test on specimen to a component
 - b) Predict the effect of combined loading in a complex load system
 - c) Predict factor of safety
 - d) Estimate the load acting on component
- iv) Tensile force along axis can cause
 - a) Linear strain
 - b) Lateral strain
 - c) Increase in lateral dimension
 - d) None of the above

P.T.O.



B) Choose the correct answers :

(Note : One option is correct, that carries 1 mark)

- i) Degradation of plastic elements is related to design for
 - a) Casting
 - b) Machining
 - c) Forging
 - d) None of a), b), c)
 - ii) Number of active turns in helical compression spring with squared and ground ends are
 - a) Total turns – 1
 - b) Total turns – 2
 - c) Total turns + 1
 - d) Total turns + 2
 - iii) Spindles are generally designed for
 - a) Bending and torsion
 - b) Bending and crushing
 - c) Torsion and tensile
 - d) None of a), b), c)
 - iv) In steel, FeE-250, as per BIS designation
 - a) Maximum Yield Strength is 250 N/mm²
 - b) Minimum Yield Strength is 250 N/mm²
 - c) Maximum Shear Strength is 250 N/mm²
 - d) None of a), b), c)
 - v) For fulcrum pin in lever, design is carried out on the basis of
 - a) Shear-bearing
 - b) Shear-tensile
 - c) Tensile-buckling
 - d) None of a), b), c)
 - vi) As per distortion theory, S_{sy} is taken as _____ times S_{yt} .
 - a) 5
 - b) 0.5
 - c) 0.577
 - d) 0.557
-



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

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017

Max. Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **permitted**.

SECTION – I

2. a) Explain modes of failure. 3
- b) Explain any two theories of failure. 4
- c) It is required to select a flat belt drive for a fan running at 360 r.p.m. Which is driven by a 10 kW, 1440 rpm motor. The belt drive is open type and space is available for a centre distance of 2 m approximately. The belt velocity should be between 17.8 to 22.9 m/s. The power transmitting capacity of the belt per mm width per ply at 180° arc of contact and at a belt velocity of 5.08 m/s is 0.0118 kW. The load correction factor can be taken as 1.2. Suggest preferred diameters for motor and fan pulleys and give complete specifications of belting. 7
3. a) Explain the following terms : 7
 - i) Endurance limit
 - ii) Notch sensitivity
 - iii) Cyclic stresses
 - iv) Stress concentration factor.
- b) A transmission shaft of cold drawn steel 27 Mn2 ($S_{ut} = 500$ MPa and $S_{yt} = 300$ MPa) is subjected to a fluctuating torque which varies from $- 100$ N.m to $+ 400$ N.m. The factor of safety is 2 and expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft. 7
Assume the distortion energy theory of failure. Assume given data
 $K_a = 0.8$, $K_b = 0.85$ and $K_c = 0.897$.
4. a) Write down the strength equations for various failure modes to be considered for design of knuckle joint with necessary sketches. 7
- b) The pull in the tie rod of an iron roof truss is 38.46 KN. Design a suitable adjustable screwed joint. The permissible stresses for rod are 80 MPa in tension and 40 MPa in shear. Assume maximum load is 1.3 times normal load. Permissible stress for coupler is 40 MPa in tension. (Refer table data for obtaining the thread dimensions). 7

Designation	Pitch (p) mm	Minor diameter (dc)	Tensile stress Area (mm ²)
M24	3.00	20.319	353
M30	3.50	25.706	561
M36	4.00	31.093	817
M42	4.50	36.479	1120
M48	5.00	41.866	1470
M56	5.50	56.639	2030

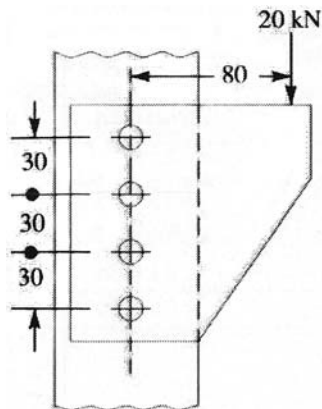


SECTION – II

- 5. a) Discuss design with non-metals plastic and rubber. 3
- b) Write the strength equation for key. 4
- c) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft can be considered as the half of the external diameter. Both the shafts have the same material and length. 7

- 6. a) Discuss the design considerations for forging. 3
- b) Discuss the two springs connected in parallel. 4
- c) A railway wagon moving at a velocity of 2 m/s is brought to rest by a bumper consisting of two helical compression springs arranged in parallel. The springs are compressed by 150 mm in bringing the wagon to rest. The mass of the wagon is 1000 kg. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire with ultimate tensile strength of 1500 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate :
 - i) Maximum force on each spring
 - ii) Wire diameter
 - iii) Mean coil diameter and
 - iv) Number active coils. 7

- 7. a) Give the merits of welded joints. 3
- b) Discuss the failure modes for a rivet. 4
- c) A bracket is supported by means of 4 rivets of same size as shown in Fig. Determine the diameter of the rivet if the maximum shear stress is 130 N/mm². (Dimensions are in mm). 7



Design data for Selection of Flat-Belt

Arc of Contact factor

α_s	120	130	140	150	160	170	180	190	200
F _d	1.33	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

Standard with of belts

3-Ply	25	40	50	63	76				
4-Ply	40	44	50	63	76	90	100	112	125
5-Ply	76	100	112	125	152				
6-Ply	112	125	152	180	200				

Power Transmitting Capacities

HI-SPEED	0.0118 kW per mm width per ply
FORT	0.0147 kW per mm width per ply

Preferred Pulley Diameters

Pitch Diameter (mm)	125	132	140	150	160	170	180	190	200
212	224	236	250	265	280	300	315	355	375
400	425	450	475	500	530	560	600	630	670
710	750	800	900	1000					



SLR-TJ – 104

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

Set	R
-----	---

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in first 30 minutes in Answer Book Page No. 3.
 - 2) Solve **any two** questions from **each** Section I and II.
 - 3) Make necessary assumptions, **if** required and mention it **clearly**.
 - 4) Figures to the **right** indicate **full** marks.
 - 5) **Use** of non-programmable calculator is **permitted**.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answers :

8

(Note : All responses must be correct, that carries 2 marks otherwise zero marks)

- i) Theories of failure are required to
 - a) Correlate results of standard tension test on specimen to a component
 - b) Predict the effect of combined loading in a complex load system
 - c) Predict factor of safety
 - d) Estimate the load acting on component
- ii) In split muff or compression coupling
 - a) Nut bolts are used to have a compression force on shaft
 - b) Muff is joined by bolting
 - c) Ease of assembly compared to muff coupling
 - d) Shafts are mis-aligned
- iii) Tensile force along axis can cause
 - a) Linear strain
 - b) Lateral strain
 - c) Increase in lateral dimension
 - d) None of the above
- iv) Eye end of knuckle joint can fail under
 - a) Tension
 - b) Shear
 - c) Crushing
 - d) Bending

P.T.O.



B) Choose the correct answers :

(Note : One option is correct, that carries 1 mark)

- i) For fulcrum pin in lever, design is carried out on the basis of
 - a) Shear-bearing
 - b) Shear-tensile
 - c) Tensile-buckling
 - d) None of a), b), c)
 - ii) Spindles are generally designed for
 - a) Bending and torsion
 - b) Bending and crushing
 - c) Torsion and tensile
 - d) None of a), b), c)
 - iii) Degradation of plastic elements is related to design for
 - a) Casting
 - b) Machining
 - c) Forging
 - d) None of a), b), c)
 - iv) As per distortion theory, S_{sy} is taken as _____ times S_{yt} .
 - a) 5
 - b) 0.5
 - c) 0.577
 - d) 0.557
 - v) In steel, FeE-250, as per BIS designation
 - a) Maximum Yield Strength is 250 N/mm^2
 - b) Minimum Yield Strength is 250 N/mm^2
 - c) Maximum Shear Strength is 250 N/mm^2
 - d) None of a), b), c)
 - vi) Number of active turns in helical compression spring with squared and ground ends are
 - a) Total turns – 1
 - b) Total turns – 2
 - c) Total turns + 1
 - d) Total turns + 2
-



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

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017

Max. Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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** indicate **full** marks.
 4) **Use** of non-programmable calculator is **permitted**.

SECTION – I

2. a) Explain modes of failure. 3
 b) Explain any two theories of failure. 4
 c) It is required to select a flat belt drive for a fan running at 360 r.p.m. Which is driven by a 10 kW, 1440 rpm motor. The belt drive is open type and space is available for a centre distance of 2 m approximately. The belt velocity should be between 17.8 to 22.9 m/s. The power transmitting capacity of the belt per mm width per ply at 180° arc of contact and at a belt velocity of 5.08 m/s is 0.0118 kW. The load correction factor can be taken as 1.2. Suggest preferred diameters for motor and fan pulleys and give complete specifications of belting. 7
3. a) Explain the following terms : 7
 i) Endurance limit
 ii) Notch sensitivity
 iii) Cyclic stresses
 iv) Stress concentration factor.
 b) A transmission shaft of cold drawn steel 27 Mn2 ($S_{ut} = 500$ MPa and $S_{yt} = 300$ MPa) is subjected to a fluctuating torque which varies from -100 N.m to $+400$ N.m. The factor of safety is 2 and expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft. 7
 Assume the distortion energy theory of failure. Assume given data
 $K_a = 0.8$, $K_b = 0.85$ and $K_c = 0.897$.
4. a) Write down the strength equations for various failure modes to be considered for design of knuckle joint with necessary sketches. 7
 b) The pull in the tie rod of an iron roof truss is 38.46 KN. Design a suitable adjustable screwed joint. The permissible stresses for rod are 80 MPa in tension and 40 MPa in shear. Assume maximum load is 1.3 times normal load. Permissible stress for coupler is 40 MPa in tension. (Refer table data for obtaining the thread dimensions). 7

Designation	Pitch (p) mm	Minor diameter (dc)	Tensile stress Area (mm ²)
M24	3.00	20.319	353
M30	3.50	25.706	561
M36	4.00	31.093	817
M42	4.50	36.479	1120
M48	5.00	41.866	1470
M56	5.50	56.639	2030

Set R

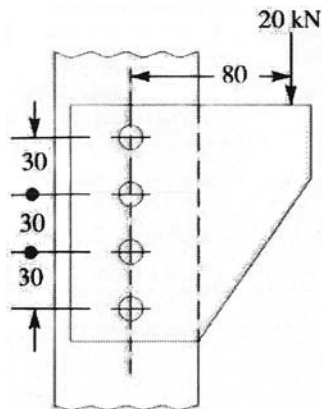


SECTION – II

- 5. a) Discuss design with non-metals plastic and rubber. 3
- b) Write the strength equation for key. 4
- c) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft can be considered as the half of the external diameter. Both the shafts have the same material and length. 7

- 6. a) Discuss the design considerations for forging. 3
- b) Discuss the two springs connected in parallel. 4
- c) A railway wagon moving at a velocity of 2 m/s is brought to rest by a bumper consisting of two helical compression springs arranged in parallel. The springs are compresses by 150 mm in bringing the wagon to rest. The mass of the wagon is 1000 kg. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire with ultimate tensile strength of 1500 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate :
 - i) Maximum force on each spring
 - ii) Wire diameter
 - iii) Mean coil diameter and
 - iv) Number active coils. 7

- 7. a) Give the merits of welded joints. 3
- b) Discuss the failure modes for a rivet. 4
- c) A bracket is supported by means of 4 rivets of same size as shown in Fig. Determine the diameter of the rivet if the maximum shear stress is 130 N/mm². (Dimensions are in mm). 7



Design data for Selection of Flat-Belt

Arc of Contact factor

α_s	120	130	140	150	160	170	180	190	200
F _d	1.33	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

Standard with of belts

3-Ply	25	40	50	63	76				
4-Ply	40	44	50	63	76	90	100	112	125
5-Ply	76	100	112	125	152				
6-Ply	112	125	152	180	200				

Power Transmitting Capacities

HI-SPEED	0.0118 kW per mm width per ply
FORT	0.0147 kW per mm width per ply

Preferred Pulley Diameters

Pitch Diameter (mm)	125	132	140	150	160	170	180	190	200
212	224	236	250	265	280	300	315	355	375
400	425	450	475	500	530	560	600	630	670
710	750	800	900	1000					



SLR-TJ – 104

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

Set	S
-----	---

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in first 30 minutes in Answer Book Page No. 3.
 - 2) Solve **any two** questions from **each** Section I and II.
 - 3) Make necessary assumptions, **if** required and mention it **clearly**.
 - 4) Figures to the **right** indicate **full** marks.
 - 5) **Use** of non-programmable calculator is **permitted**.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct answers :

8

(Note : All responses must be correct, that carries 2 marks otherwise zero marks)

- i) Eye end of knuckle joint can fail under
 - a) Tension
 - b) Shear
 - c) Crushing
 - d) Bending
- ii) Tensile force along axis can cause
 - a) Linear strain
 - b) Lateral strain
 - c) Increase in lateral dimension
 - d) None of the above
- iii) In split muff or compression coupling
 - a) Nut bolts are used to have a compression force on shaft
 - b) Muff is joined by bolting
 - c) Ease of assembly compared to muff coupling
 - d) Shafts are mis-aligned
- iv) Theories of failure are required to
 - a) Correlate results of standard tension test on specimen to a component
 - b) Predict the effect of combined loading in a complex load system
 - c) Predict factor of safety
 - d) Estimate the load acting on component

P.T.O.



B) Choose the correct answers :

6

(Note : One option is correct, that carries 1 mark)

- i) In steel, FeE-250, as per BIS designation
 - a) Maximum Yield Strength is 250 N/mm²
 - b) Minimum Yield Strength is 250 N/mm²
 - c) Maximum Shear Strength is 250 N/mm²
 - d) None of a), b), c)
 - ii) As per distortion theory, S_{sy} is taken as _____ times S_{yt} .
 - a) 5
 - b) 0.5
 - c) 0.577
 - d) 0.557
 - iii) Number of active turns in helical compression spring with squared and ground ends are
 - a) Total turns – 1
 - b) Total turns – 2
 - c) Total turns + 1
 - d) Total turns + 2
 - iv) For fulcrum pin in lever, design is carried out on the basis of
 - a) Shear-bearing
 - b) Shear-tensile
 - c) Tensile-buckling
 - d) None of a), b), c)
 - v) Degradation of plastic elements is related to design for
 - a) Casting
 - b) Machining
 - c) Forging
 - d) None of a), b), c)
 - vi) Spindles are generally designed for
 - a) Bending and torsion
 - b) Bending and crushing
 - c) Torsion and tensile
 - d) None of a), b), c)
-



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

**T.E. (Mechanical) (Part – I) Examination, 2017
(CGPA)
MACHINE DESIGN – I**

Day and Date : Thursday, 7-12-2017

Max. Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **permitted**.

SECTION – I

2. a) Explain modes of failure. 3
- b) Explain any two theories of failure. 4
- c) It is required to select a flat belt drive for a fan running at 360 r.p.m. Which is driven by a 10 kW, 1440 rpm motor. The belt drive is open type and space is available for a centre distance of 2 m approximately. The belt velocity should be between 17.8 to 22.9 m/s. The power transmitting capacity of the belt per mm width per ply at 180° arc of contact and at a belt velocity of 5.08 m/s is 0.0118 kW. The load correction factor can be taken as 1.2. Suggest preferred diameters for motor and fan pulleys and give complete specifications of belting. 7
3. a) Explain the following terms : 7
 - i) Endurance limit
 - ii) Notch sensitivity
 - iii) Cyclic stresses
 - iv) Stress concentration factor.
- b) A transmission shaft of cold drawn steel 27 Mn2 ($S_{ut} = 500$ MPa and $S_{yt} = 300$ MPa) is subjected to a fluctuating torque which varies from $- 100$ N.m to $+ 400$ N.m. The factor of safety is 2 and expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft. 7
Assume the distortion energy theory of failure. Assume given data
 $K_a = 0.8$, $K_b = 0.85$ and $K_c = 0.897$.
4. a) Write down the strength equations for various failure modes to be considered for design of knuckle joint with necessary sketches. 7
- b) The pull in the tie rod of an iron roof truss is 38.46 KN. Design a suitable adjustable screwed joint. The permissible stresses for rod are 80 MPa in tension and 40 MPa in shear. Assume maximum load is 1.3 times normal load. Permissible stress for coupler is 40 MPa in tension. (Refer table data for obtaining the thread dimensions). 7

Designation	Pitch (p) mm	Minor diameter (dc)	Tensile stress Area (mm ²)
M24	3.00	20.319	353
M30	3.50	25.706	561
M36	4.00	31.093	817
M42	4.50	36.479	1120
M48	5.00	41.866	1470
M56	5.50	56.639	2030

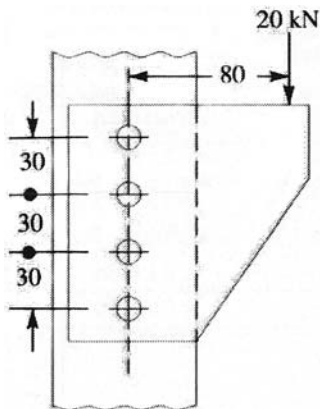


SECTION – II

- 5. a) Discuss design with non-metals plastic and rubber. 3
- b) Write the strength equation for key. 4
- c) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft can be considered as the half of the external diameter. Both the shafts have the same material and length. 7

- 6. a) Discuss the design considerations for forging. 3
- b) Discuss the two springs connected in parallel. 4
- c) A railway wagon moving at a velocity of 2 m/s is brought to rest by a bumper consisting of two helical compression springs arranged in parallel. The springs are compresses by 150 mm in bringing the wagon to rest. The mass of the wagon is 1000 kg. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire with ultimate tensile strength of 1500 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate :
 - i) Maximum force on each spring
 - ii) Wire diameter
 - iii) Mean coil diameter and
 - iv) Number active coils. 7

- 7. a) Give the merits of welded joints. 3
- b) Discuss the failure modes for a rivet. 4
- c) A bracket is supported by means of 4 rivets of same size as shown in Fig. Determine the diameter of the rivet if the maximum shear stress is 130 N/mm². (Dimensions are in mm). 7



Design data for Selection of Flat-Belt

Arc of Contact factor

α_s	120	130	140	150	160	170	180	190	200
F _d	1.33	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

Standard with of belts

3-Ply	25	40	50	63	76				
4-Ply	40	44	50	63	76	90	100	112	125
5-Ply	76	100	112	125	152				
6-Ply	112	125	152	180	200				

Power Transmitting Capacities

HI-SPEED	0.0118 kW per mm width per ply
FORT	0.0147 kW per mm width per ply

Preferred Pulley Diameters

Pitch Diameter (mm)	125	132	140	150	160	170	180	190	200
212	224	236	250	265	280	300	315	355	375
400	425	450	475	500	530	560	600	630	670
710	750	800	900	1000					



SLR-TJ – 105

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

Set	P
-----	----------

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicate **full** marks.
 - 2) **Assume** suitable data if necessary and mention **its clearly**.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. MCQ **All** questions are **compulsory** :

- A) Match the pair of function and symbol used on control panel **4**
- | | |
|--------------------|------|
| a) Break On | p) ! |
| b) Break Off | q) |
| c) Increase of RPM | r) |
| d) Attention | s) |

B) Objective type questions : **10(1 each)**

- 1) Symbol indicates in control panel
 - a) Increase
 - b) Decrease
 - c) On-Off
 - d) None of the above
- 2) For surface grinding machine the type of slide way profile is
 - a) Open V + open V
 - b) Closed V
 - c) Open flat + open V
 - d) Closed flat + closed V
- 3) In hydrodynamic journal bearing, the recommended L/D ratio is
 - a) > 1
 - b) < 1
 - c) 1
 - d) 0.121
- 4) Which of the following material has maximum strength ?
 - a) gray cast iron
 - b) plain carbon steel
 - c) alloy steel
 - d) aluminum alloy

P.T.O.



- 5) When large force is require to, the type of control used is
- a) Knobs and switches
 - b) Levers and wheels
 - c) Push buttons
 - d) None of the above
- 6) Which of the following is a mechanism for mechanized movements of the carriage along longitudinal axis ?
- a) Cross-slide
 - b) Compound rest
 - c) Apron
 - d) Saddle
- 7) The limiting value of transmission intervals for $1.06^{\oplus} = 1.06$ in speed increment is
- a) 2
 - b) 6
 - c) 3
 - d) 12
- 8) The meaning of orange colour is
- a) the component is hot
 - b) the component is cold
 - c) the component is safe
 - d) there is possible danger
- 9) What is function of cone pulley drive in Lathe Machines ?
- a) Drive the Lead Screw
 - b) Change the spindle speed
 - c) Drive the tail stock
 - d) All of above
- 10) A self-locking screw has
- a) Fine threads
 - b) Coarse threads
 - c) Two nuts
 - d) Coefficient of friction more than tangent of load angle
-



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

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Solve **any two** question from **each** Section.
3) **Assume** suitable data if necessary and mention **its clearly**.

SECTION – I

2. a) Explain in detail working and auxiliary motion in machine tools. **7**
b) What are the materials for machine tool structures ? Explain in brief giving example for each. **7**
3. a) Explain step less regulation in PIV drives with neat sketch. **7**
b) Compare the stiffness of different sections having equal cross Sectional area in machine tool structure. **7**
4. What is function of spindle unit in machine tool and with neat sketches, explain different spindle ends with remarks and their applications ? **14**

SECTION – II

5. a) What are commonly used bed sections and wall arrangement and what are their applications in machine tool ? **7**
b) With neat sketch explain manual control system in machine tool. **7**
6. a) How ergonomic considerations are applied to design push button and knob in machine tool ? **7**
b) Describe design procedure for ball bearing from manufacturing catalog. **7**

Set P



7. Write a short note on following (**any two**) :

14

- i) Bearings and spindles
 - ii) Forced vibrations of machine tools
 - iii) Spindle unit and requirements
 - iv) Design of antifriction slideways.
-



SLR-TJ – 105

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

Set	Q
-----	---

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicate **full** marks.
 - 2) **Assume** suitable data if necessary and mention **its clearly**.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. MCQ **All** questions are **compulsory** :

A) Objective type questions :

10(1 each)

- 1) What is function of cone pulley drive in Lathe Machines ?
 - a) Drive the Lead Screw
 - b) Change the spindle speed
 - c) Drive the tail stock
 - d) All of above
- 2) A self-locking screw has
 - a) Fine threads
 - b) Coarse threads
 - c) Two nuts
 - d) Coefficient of friction more than tangent of load angle
- 3) The limiting value of transmission intervals for $1.06^{\oplus} = 1.06$ in speed increment is
 - a) 2
 - b) 6
 - c) 3
 - d) 12
- 4) The meaning of orange colour is
 - a) the component is hot
 - b) the component is cold
 - c) the component is safe
 - d) there is possible danger

P.T.O.



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

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Solve **any two** question from **each** Section.
3) **Assume** suitable data if necessary and mention **its clearly**.

SECTION – I

2. a) Explain in detail working and auxiliary motion in machine tools. **7**
b) What are the materials for machine tool structures ? Explain in brief giving example for each. **7**
3. a) Explain step less regulation in PIV drives with neat sketch. **7**
b) Compare the stiffness of different sections having equal cross Sectional area in machine tool structure. **7**
4. What is function of spindle unit in machine tool and with neat sketches, explain different spindle ends with remarks and their applications ? **14**

SECTION – II

5. a) What are commonly used bed sections and wall arrangement and what are their applications in machine tool ? **7**
b) With neat sketch explain manual control system in machine tool. **7**
6. a) How ergonomic considerations are applied to design push button and knob in machine tool ? **7**
b) Describe design procedure for ball bearing from manufacturing catalog. **7**



7. Write a short note on following (**any two**) :

14

- i) Bearings and spindles
 - ii) Forced vibrations of machine tools
 - iii) Spindle unit and requirements
 - iv) Design of antifriction slideways.
-



SLR-TJ – 105

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

Set	R
-----	---

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) **Assume** suitable data if necessary and mention **its clearly**.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. MCQ **All** questions are **compulsory** :

A) Match the pair of function and symbol used on control panel 4

- | | |
|--------------------|------|
| a) Break On | p) ! |
| b) Break Off | q) |
| c) Increase of RPM | r) |
| d) Attention | s) |


B) Objective type questions :

10(1 each)

- 1) When large force is require to, the type of control used is
 - a) Knobs and switches
 - b) Levers and wheels
 - c) Push buttons
 - d) None of the above
- 2) Which of the following is a mechanism for mechanized movements of the carriage along longitudinal axis ?
 - a) Cross-slide
 - b) Compound rest
 - c) Apron
 - d) Saddle
- 3) What is function of cone pulley drive in Lathe Machines ?
 - a) Drive the Lead Screw
 - b) Change the spindle speed
 - c) Drive the tail stock
 - d) All of above

P.T.O.



- 4) A self-locking screw has
- a) Fine threads
 - b) Coarse threads
 - c) Two nuts
 - d) Coefficient of friction more than tangent of load angle
- 5) In hydrodynamic journal bearing, the recommended L/D ratio is
- a) > 1
 - b) < 1
 - c) 1
 - d) 0.121
- 6) Which of the following material has maximum strength ?
- a) gray cast iron
 - b) plain carbon steel
 - c) alloy steel
 - d) aluminum alloy
- 7)  Symbol indicates in control panel
- a) Increase
 - b) Decrease
 - c) On-Off
 - d) None of the above
- 8) For surface grinding machine the type of slide way profile is
- a) Open V + open V
 - b) Closed V
 - c) Open flat + open V
 - d) Closed flat + closed V
- 9) The limiting value of transmission intervals for $1.06 \phi = 1.06$ in speed increment is
- a) 2
 - b) 6
 - c) 3
 - d) 12
- 10) The meaning of orange colour is
- a) the component is hot
 - b) the component is cold
 - c) the component is safe
 - d) there is possible danger
-



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

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Solve **any two** question from **each** Section.
3) **Assume** suitable data if necessary and mention **its clearly**.

SECTION – I

2. a) Explain in detail working and auxiliary motion in machine tools. **7**
b) What are the materials for machine tool structures ? Explain in brief giving example for each. **7**
3. a) Explain step less regulation in PIV drives with neat sketch. **7**
b) Compare the stiffness of different sections having equal cross Sectional area in machine tool structure. **7**
4. What is function of spindle unit in machine tool and with neat sketches, explain different spindle ends with remarks and their applications ? **14**

SECTION – II

5. a) What are commonly used bed sections and wall arrangement and what are their applications in machine tool ? **7**
b) With neat sketch explain manual control system in machine tool. **7**
6. a) How ergonomic considerations are applied to design push button and knob in machine tool ? **7**
b) Describe design procedure for ball bearing from manufacturing catalog. **7**

Set R



7. Write a short note on following (**any two**) :

14

- i) Bearings and spindles
 - ii) Forced vibrations of machine tools
 - iii) Spindle unit and requirements
 - iv) Design of antifriction slideways.
-



SLR-TJ – 105

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

Set	S
-----	----------

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicate **full** marks.
 - 2) **Assume** suitable data if necessary and mention **its clearly**.
 - 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 4) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. MCQ **All** questions are **compulsory** :





A) Objective type questions :

10(1 each)

- 1) In hydrodynamic journal bearing, the recommended L/D ratio is
 - a) > 1
 - b) < 1
 - c) 1
 - d) 0.121
- 2) Which of the following material has maximum strength ?
 - a) gray cast iron
 - b) plain carbon steel
 - c) alloy steel
 - d) aluminum alloy
- 3) When large force is require to, the type of control used is
 - a) Knobs and switches
 - b) Levers and wheels
 - c) Push buttons
 - d) None of the above
- 4) Which of the following is a mechanism for mechanized movements of the carriage along longitudinal axis ?
 - a) Cross-slide
 - b) Compound rest
 - c) Apron
 - d) Saddle
- 5) The limiting value of transmission intervals for $1.06^{\oplus} = 1.06$ in speed increment is
 - a) 2
 - b) 6
 - c) 3
 - d) 12

P.T.O.



- 6) The meaning of orange colour is
- a) the component is hot b) the component is cold
c) the component is safe d) there is possible danger
- 7) What is function of cone pulley drive in Lathe Machines ?
- a) Drive the Lead Screw b) Change the spindle speed
c) Drive the tail stock d) All of above
- 8) A self-locking screw has
- a) Fine threads
b) Coarse threads
c) Two nuts
d) Coefficient of friction more than tangent of load angle
- 9)  Symbol indicates in control panel
- a) Increase b) Decrease
c) On-Off d) None of the above
- 10) For surface grinding machine the type of slide way profile is
- a) Open V + open V b) Closed V
c) Open flat + open V d) Closed flat + closed V
- B) Match the pair of function and symbol used on control panel 4
- a) Break On p) !
b) Break Off q) 
c) Increase of RPM r) 
d) Attention s) 
-



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

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
Professional Elective – I
MACHINE TOOL DESIGN

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Solve **any two** question from **each** Section.
3) **Assume** suitable data if necessary and mention **its clearly**.

SECTION – I

2. a) Explain in detail working and auxiliary motion in machine tools. **7**
b) What are the materials for machine tool structures ? Explain in brief giving example for each. **7**
3. a) Explain step less regulation in PIV drives with neat sketch. **7**
b) Compare the stiffness of different sections having equal cross Sectional area in machine tool structure. **7**
4. What is function of spindle unit in machine tool and with neat sketches, explain different spindle ends with remarks and their applications ? **14**

SECTION – II

5. a) What are commonly used bed sections and wall arrangement and what are their applications in machine tool ? **7**
b) With neat sketch explain manual control system in machine tool. **7**
6. a) How ergonomic considerations are applied to design push button and knob in machine tool ? **7**
b) Describe design procedure for ball bearing from manufacturing catalog. **7**

Set S



7. Write a short note on following (**any two**) :

14

- i) Bearings and spindles
 - ii) Forced vibrations of machine tools
 - iii) Spindle unit and requirements
 - iv) Design of antifriction slideways.
-



SLR-TJ – 106

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

Set

P

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)**

FLUID MACHINERY AND FLUID POWER

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat** sketches **wherever** necessary.
3) Use of non-programmable calculators is **permitted**.
4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative : **(14×1=14)**
- The following method (s) can be used to improve the thermal efficiency of open cycle gas turbine plant
a) Inter-cooling b) Reheating c) Regeneration d) All of the above
 - Gas turbine is shut down by
a) Turning off starter b) Stopping the compressor
c) Fuel is cut off from the combustor d) None of the above
 - The discharge through a Francis turbine is given by
a) $Q = \frac{\pi}{4} d^2 \times \sqrt{2gH}$ b) $Q = \pi D_1 B_1 \times V_{f1}$
c) $Q = \frac{\pi}{4} (D_o^2 - D_b^2) \times V_{f1}$ d) None of these
 - _____ is defined as the phenomenon of formation of vapour bubbles and sudden collapsing of the vapour bubbles.
a) Priming b) Model Testing c) Multistage d) Cavitation

P.T.O.



- 5) The foot valve helps
- Priming the pump
 - To remove the foreign material from liquid before entering in the suction
 - Stopping the pump
 - All of the above
- 6) A pelton turbine develops 500kW under a net head of 30 m. If the overall efficiency η_0 of the turbine is 0.83. The discharge through the turbine in (m³/s) is
- 2.50
 - 2.05
 - 1.41
 - 1.04
- 7) The speed ratio for Pelton turbine is given by
- $\frac{U}{\sqrt{2gH}}$
 - $\frac{V_f}{\sqrt{2gH}}$
 - $\frac{V_w}{\sqrt{2gH}}$
 - $\frac{\sqrt{2gH}}{U}$
- 8) Pressure rating for stainless steel pipe is
- 250 bar
 - 125 bar
 - 200 bar
 - 2500-4500 bar
- 9) In symbol like 4/2 direction control valve, the first symbol indicates the number of
- Functional opening or connections
 - Distinct position
 - a) and b)
 - None of above
- 10) Mostly FRL Unit is used at
- Compressor outlet
 - Compressor inlet
 - Pump outlet
 - All of the above
- 11) Speed control circuit is
- Meter in circuit
 - Counter balancing circuit
 - Regenerative circuit
 - None of above
- 12) Mostly in Railways following brake used
- Pneumatic brake system
 - Hydraulic brake system
 - All of the above
 - None of above
- 13) Metallic seals are suitable for
- Low pressure system
 - High pressure and temperature system
 - Extremely low temperature application
 - Dynamic application
- 14) Pressure relief valves are normally _____ valve.
- Closed
 - Open
 - a) and b)
 - None of the above
-



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)
FLUID MACHINERY AND FLUID POWER**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat sketches wherever necessary**.
3) **Use of non-programmable calculators is permitted**.

SECTION – I

2. a) A pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres/s under a head of 30 meters. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. 5
- b) What are the various methods for improving the thermal efficiency of open cycle gas turbines ? Explain Re-heating method. 4
- c) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62 m. The peripheral velocity = $0.26 \sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96 \sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine :
- i) The guide blade angle
- ii) The wheel vane angle at inlet. 5
3. a) A gas turbine works on an ideal Brayton cycle. The initial condition of the air is 25°C and 1 bar. The maximum pressure and temperature are limited to 3 bar and 650°C . Determine the following :
- i) Cycle efficiency
- ii) Heat supplied and heat rejected per kg of air. 5

Set P



- b) A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 5
- c) Differentiate between :
- i) The impulse and reaction turbines
 - ii) Radial and axial flow turbines. 4
4. a) Air enters the compressor of a gas turbine plant operating on Brayton cycle at 1.01325 bar, 27°C . The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the cycle efficiency. Assume $W_T = 2.5 W_C$ where W_T and W_C are the turbine and the compressor work respectively. Take $\gamma = 1.4$. 5
- b) Obtain an expression for the work done per second by water on the runner of a Pelton wheel. 4
- c) What is the basis of selection of a turbine at a particular place ? 5

SECTION – II

5. a) Explain with neat sketch of hydraulic intensifier. 5
- b) Explain with neat sketch of filter used in pneumatic system. 5
- c) Explain with neat sketch of hydraulic accumulator. 4
6. a) Explain meter in circuit. 5
- b) Explain cushioning effect in hydraulic system. 5
- c) Explain construction and working of pressure reducing valve used in hydraulic system. 4
7. a) Explain with neat sketch and symbol of Tandem cylinder. 4
- b) Explain with neat sketch construction, working of 4/2 direction control valve in hydraulic system. 5
- c) Explain with neat sketch of Vane type air motor. 5



SLR-TJ – 106

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

Set

Q

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)

FLUID MACHINERY AND FLUID POWER

Day and Date : Saturday, 9-12-2017

Max. Marks : 70

Time : 10.00 a.m. to 1.00 p.m.

- Instructions:**
- 1) Solve **any two** questions from **each** Section out of the remaining questions.
 - 2) Draw **neat** sketches **wherever** necessary.
 - 3) Use of non-programmable calculators is **permitted**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

- 1) Pressure rating for stainless steel pipe is
a) 250 bar b) 125 bar c) 200 bar d) 2500-4500 bar
- 2) In symbol like 4/2 direction control valve, the first symbol indicates the number of
a) Functional opening or connections b) Distinct position
c) a) and b) d) None of above
- 3) Mostly FRL Unit is used at
a) Compressor outlet b) Compressor inlet
c) Pump outlet d) All of the above
- 4) Speed control circuit is
a) Meter in circuit b) Counter balancing circuit
c) Regenerative circuit d) None of above
- 5) Mostly in Railways following brake used
a) Pneumatic brake system b) Hydraulic brake system
c) All of the above d) None of above

P.T.O.



- 6) Metallic seals are suitable for
- Low pressure system
 - High pressure and temperature system
 - Extremely low temperature application
 - Dynamic application
- 7) Pressure relief valves are normally _____ valve.
- Closed
 - Open
 - a) and b)
 - None of the above
- 8) The following method (s) can be used to improve the thermal efficiency of open cycle gas turbine plant
- Inter-cooling
 - Reheating
 - Regeneration
 - All of the above
- 9) Gas turbine is shut down by
- Turning off starter
 - Stopping the compressor
 - Fuel is cut off from the combustor
 - None of the above
- 10) The discharge through a Francis turbine is given by
- $Q = \frac{\pi}{4} d^2 \times \sqrt{2gH}$
 - $Q = \pi D_1 B_1 \times V_{f1}$
 - $Q = \frac{\pi}{4} (D_o^2 - D_b^2) \times V_{f1}$
 - None of these
- 11) _____ is defined as the phenomenon of formation of vapour bubbles and sudden collapsing of the vapour bubbles.
- Priming
 - Model Testing
 - Multistage
 - Cavitation
- 12) The foot valve helps
- Priming the pump
 - To remove the foreign material from liquid before entering in the suction
 - Stopping the pump
 - All of the above
- 13) A pelton turbine develops 500kW under a net head of 30 m. If the overall efficiency η_0 of the turbine is 0.83. The discharge through the turbine in (m³/s) is
- 2.50
 - 2.05
 - 1.41
 - 1.04
- 14) The speed ratio for Pelton turbine is given by
- $\frac{U}{\sqrt{2gH}}$
 - $\frac{V_f}{\sqrt{2gH}}$
 - $\frac{V_w}{\sqrt{2gH}}$
 - $\frac{\sqrt{2gH}}{U}$



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)
FLUID MACHINERY AND FLUID POWER**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat sketches wherever necessary**.
3) **Use of non-programmable calculators is permitted**.

SECTION – I

2. a) A pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres/s under a head of 30 meters. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. 5
- b) What are the various methods for improving the thermal efficiency of open cycle gas turbines ? Explain Re-heating method. 4
- c) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62 m. The peripheral velocity = $0.26 \sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96 \sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine :
- i) The guide blade angle
- ii) The wheel vane angle at inlet. 5
3. a) A gas turbine works on an ideal Brayton cycle. The initial condition of the air is 25°C and 1 bar. The maximum pressure and temperature are limited to 3 bar and 650°C . Determine the following :
- i) Cycle efficiency
- ii) Heat supplied and heat rejected per kg of air. 5

Set Q



- b) A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 5
- c) Differentiate between :
- i) The impulse and reaction turbines 4
 - ii) Radial and axial flow turbines. 4
4. a) Air enters the compressor of a gas turbine plant operating on Brayton cycle at 1.01325 bar, 27°C . The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the cycle efficiency. Assume $W_T = 2.5 W_C$ where W_T and W_C are the turbine and the compressor work respectively. Take $\gamma = 1.4$. 5
- b) Obtain an expression for the work done per second by water on the runner of a Pelton wheel. 4
- c) What is the basis of selection of a turbine at a particular place ? 5

SECTION – II

5. a) Explain with neat sketch of hydraulic intensifier. 5
- b) Explain with neat sketch of filter used in pneumatic system. 5
- c) Explain with neat sketch of hydraulic accumulator. 4
6. a) Explain meter in circuit. 5
- b) Explain cushioning effect in hydraulic system. 5
- c) Explain construction and working of pressure reducing valve used in hydraulic system. 4
7. a) Explain with neat sketch and symbol of Tandem cylinder. 4
- b) Explain with neat sketch construction, working of 4/2 direction control valve in hydraulic system. 5
- c) Explain with neat sketch of Vane type air motor. 5



SLR-TJ – 106

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

Set **R**

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)

FLUID MACHINERY AND FLUID POWER

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat** sketches **wherever** necessary.
3) Use of non-programmable calculators is **permitted**.
4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

- 1) The foot valve helps
 - a) Priming the pump
 - b) To remove the foreign material from liquid before entering in the suction
 - c) Stopping the pump
 - d) All of the above
- 2) A pelton turbine develops 500kW under a net head of 30 m. If the overall efficiency η_0 of the turbine is 0.83. The discharge through the turbine in (m³/s) is
 - a) 2.50
 - b) 2.05
 - c) 1.41
 - d) 1.04
- 3) The speed ratio for Pelton turbine is given by
 - a) $\frac{U}{\sqrt{2gH}}$
 - b) $\frac{V_f}{\sqrt{2gH}}$
 - c) $\frac{V_w}{\sqrt{2gH}}$
 - d) $\frac{\sqrt{2gH}}{U}$
- 4) Pressure rating for stainless steel pipe is
 - a) 250 bar
 - b) 125 bar
 - c) 200 bar
 - d) 2500-4500 bar

P.T.O.



- 5) In symbol like 4/2 direction control valve, the first symbol indicates the number of
- a) Functional opening or connections
 - b) Distinct position
 - c) a) and b)
 - d) None of above
- 6) Mostly FRL Unit is used at
- a) Compressor outlet
 - b) Compressor inlet
 - c) Pump outlet
 - d) All of the above
- 7) Speed control circuit is
- a) Meter in circuit
 - b) Counter balancing circuit
 - c) Regenerative circuit
 - d) None of above
- 8) Mostly in Railways following brake used
- a) Pneumatic brake system
 - b) Hydraulic brake system
 - c) All of the above
 - d) None of above
- 9) Metallic seals are suitable for
- a) Low pressure system
 - b) High pressure and temperature system
 - c) Extremely low temperature application
 - d) Dynamic application
- 10) Pressure relief valves are normally _____ valve.
- a) Closed
 - b) Open
 - c) a) and b)
 - d) None of the above
- 11) The following method (s) can be used to improve the thermal efficiency of open cycle gas turbine plant
- a) Inter-cooling
 - b) Reheating
 - c) Regeneration
 - d) All of the above
- 12) Gas turbine is shut down by
- a) Turning off starter
 - b) Stopping the compressor
 - c) Fuel is cut off from the combustor
 - d) None of the above
- 13) The discharge through a Francis turbine is given by
- a) $Q = \frac{\pi}{4} d^2 \times \sqrt{2gH}$
 - b) $Q = \pi D_1 B_1 \times V_{f1}$
 - c) $Q = \frac{\pi}{4} (D_o^2 - D_b^2) \times V_{f1}$
 - d) None of these
- 14) _____ is defined as the phenomenon of formation of vapour bubbles and sudden collapsing of the vapour bubbles.
- a) Priming
 - b) Model Testing
 - c) Multistage
 - d) Cavitation
-



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)
FLUID MACHINERY AND FLUID POWER**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat** sketches **wherever** necessary.
3) **Use** of non-programmable calculators is **permitted**.

SECTION – I

2. a) A pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres/s under a head of 30 meters. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. 5
- b) What are the various methods for improving the thermal efficiency of open cycle gas turbines ? Explain Re-heating method. 4
- c) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62 m. The peripheral velocity = $0.26 \sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96 \sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine :
- i) The guide blade angle
- ii) The wheel vane angle at inlet. 5
3. a) A gas turbine works on an ideal Brayton cycle. The initial condition of the air is 25°C and 1 bar. The maximum pressure and temperature are limited to 3 bar and 650°C . Determine the following :
- i) Cycle efficiency
- ii) Heat supplied and heat rejected per kg of air. 5

Set R



- b) A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 5
- c) Differentiate between :
- i) The impulse and reaction turbines
 - ii) Radial and axial flow turbines. 4
4. a) Air enters the compressor of a gas turbine plant operating on Brayton cycle at 1.01325 bar, 27°C . The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the cycle efficiency. Assume $W_T = 2.5 W_C$ where W_T and W_C are the turbine and the compressor work respectively. Take $\gamma = 1.4$. 5
- b) Obtain an expression for the work done per second by water on the runner of a Pelton wheel. 4
- c) What is the basis of selection of a turbine at a particular place ? 5

SECTION – II

5. a) Explain with neat sketch of hydraulic intensifier. 5
- b) Explain with neat sketch of filter used in pneumatic system. 5
- c) Explain with neat sketch of hydraulic accumulator. 4
6. a) Explain meter in circuit. 5
- b) Explain cushioning effect in hydraulic system. 5
- c) Explain construction and working of pressure reducing valve used in hydraulic system. 4
7. a) Explain with neat sketch and symbol of Tandem cylinder. 4
- b) Explain with neat sketch construction, working of 4/2 direction control valve in hydraulic system. 5
- c) Explain with neat sketch of Vane type air motor. 5



SLR-TJ – 106

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

Set

S

T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)

FLUID MACHINERY AND FLUID POWER

Day and Date : Saturday, 9-12-2017

Max. Marks : 70

Time : 10.00 a.m. to 1.00 p.m.

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat** sketches **wherever** necessary.
3) Use of non-programmable calculators is **permitted**.
4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

- 1) Mostly FRL Unit is used at
 - a) Compressor outlet
 - b) Compressor inlet
 - c) Pump outlet
 - d) All of the above
- 2) Speed control circuit is
 - a) Meter in circuit
 - b) Counter balancing circuit
 - c) Regenerative circuit
 - d) None of above
- 3) Mostly in Railways following brake used
 - a) Pneumatic brake system
 - b) Hydraulic brake system
 - c) All of the above
 - d) None of above
- 4) Metallic seals are suitable for
 - a) Low pressure system
 - b) High pressure and temperature system
 - c) Extremely low temperature application
 - d) Dynamic application

P.T.O.



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

**T.E. (Mechanical) (Part – I) (CGPA) Examination, 2017
(Elective – I)
FLUID MACHINERY AND FLUID POWER**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions:** 1) Solve **any two** questions from **each** Section out of the remaining questions.
2) Draw **neat sketches wherever necessary**.
3) **Use of non-programmable calculators is permitted**.

SECTION – I

2. a) A pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres/s under a head of 30 meters. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. 5
- b) What are the various methods for improving the thermal efficiency of open cycle gas turbines ? Explain Re-heating method. 4
- c) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62 m. The peripheral velocity = $0.26 \sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96 \sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine :
- i) The guide blade angle
- ii) The wheel vane angle at inlet. 5
3. a) A gas turbine works on an ideal Brayton cycle. The initial condition of the air is 25°C and 1 bar. The maximum pressure and temperature are limited to 3 bar and 650°C . Determine the following :
- i) Cycle efficiency
- ii) Heat supplied and heat rejected per kg of air. 5

Set S



- b) A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 5
- c) Differentiate between :
- i) The impulse and reaction turbines
 - ii) Radial and axial flow turbines. 4
4. a) Air enters the compressor of a gas turbine plant operating on Brayton cycle at 1.01325 bar, 27°C . The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the cycle efficiency. Assume $W_T = 2.5 W_C$ where W_T and W_C are the turbine and the compressor work respectively. Take $\gamma = 1.4$. 5
- b) Obtain an expression for the work done per second by water on the runner of a Pelton wheel. 4
- c) What is the basis of selection of a turbine at a particular place ? 5

SECTION – II

5. a) Explain with neat sketch of hydraulic intensifier. 5
- b) Explain with neat sketch of filter used in pneumatic system. 5
- c) Explain with neat sketch of hydraulic accumulator. 4
6. a) Explain meter in circuit. 5
- b) Explain cushioning effect in hydraulic system. 5
- c) Explain construction and working of pressure reducing valve used in hydraulic system. 4
7. a) Explain with neat sketch and symbol of Tandem cylinder. 4
- b) Explain with neat sketch construction, working of 4/2 direction control valve in hydraulic system. 5
- c) Explain with neat sketch of Vane type air motor. 5



SLR-TJ – 107

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

Set	P
-----	----------

T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Conveyors are used for _____ type industry.
 - a) Process layout
 - b) Line layout
 - c) Fixed layout
 - d) None of the above
- 2) _____ equipments are worked on counterbalanced principle.
 - a) Gravity Conveyor
 - b) Fork lift Trucks
 - c) Picking Robot
 - d) Warehouse Trolley
- 3) OSHA stands for
 - a) Occupational Safety and Human Administration
 - b) Occupational Safety and Health Administration
 - c) Occupational Safety and House Administration
 - d) None of above
- 4) 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
- 5) Conveyors and industrial trucks are the _____ equipment.
 - a) Transport
 - b) Positioning
 - c) Storage
 - d) Identification and control Equipment

P.T.O.



- 6) 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
- 7) Symbol \Rightarrow represents for
- a) Operation
 - b) Store
 - c) Inspection
 - d) Transport
- 8) A diagram showing the path followed by men and materials while performing a task is known as
- a) String diagram
 - b) Flow process chart
 - c) Travel chart
 - d) Flow diagram
- 9) Equipment evaluation sheet consist of equipment characteristic utilization and
- a) Safety
 - b) Vendor characteristics
 - c) Flexibility
 - d) Unit load
- 10) For single storey building when the flat floor area is available then _____ system is used.
- a) Horizontal flow
 - b) Vertical
 - c) Zig-zag
 - d) Inclined
- 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) In AGV system path on the floor used for guidance is
- a) Fixed
 - b) Variable
 - c) Physical guide
 - d) None of these
- 13) Hand truck are characterized by
- a) Non-Pallet + Walk + No Stack + Manual
 - b) Pallet + Walk + No Stack + Manual
 - c) Non-Pallet + Walk + Stack + Powered
 - d) Pallet + Walk + No Stack + Powered
- 14) Storage equipment used for _____ or _____ material over a period of time.
- a) Catching or stocking
 - b) Holding or buffering
 - c) Storing or hanging
 - d) All of these
-



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

**T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.
3) Solve **any two** questions in **each** Section.

SECTION – I

2. a) Explain the objectives, benefits and scope of material handling system. **5**
b) Explain the relation of Plant layout and Material handling. **5**
c) Give the classification of material handling equipments. **4**
3. a) Explain the general characteristics of Crane and describe with Fig. any one types of Cranes. **5**
b) Explain principles of material handling system in industry. **5**
c) Compare conventional and CIMS material handling system. **4**
4. Write a short notes (**any three**) : **14**
a) Decking and order picking. **5**
b) Hoisting Equipments. **5**
c) Industrial truck. **5**
d) CIMS in material handling. **4**

SECTION – II

5. a) Discuss the important of material handling safety. **5**
b) Explain with figure string diagram. **5**
c) Explain different factors affecting on selection of material handling equipment. **4**

Set P



- | | |
|---|----|
| 6. a) Explain selection criteria for material handling equipment. | 5 |
| b) Explain with Fig. assembly chart. | 5 |
| c) Explain with figure procedure chart. | 4 |
| 7. Write a short notes (any three) : | 14 |
| a) From TO chart. | 5 |
| b) Selection of material handling equipment in sugar industry. | 5 |
| c) Material flow patterns. | 5 |
| d) Fork lift accidents. | 4 |
-



SLR-TJ – 107

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

Set	Q
-----	---

T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : (14×1=14)
- 1) A diagram showing the path followed by men and materials while performing a task is known as
 - a) String diagram
 - b) Flow process chart
 - c) Travel chart
 - d) Flow diagram
 - 2) Equipment evaluation sheet consist of equipment characteristic utilization and
 - a) Safety
 - b) Vendor characteristics
 - c) Flexibility
 - d) Unit load
 - 3) For single storey building when the flat floor area is available then _____ system is used.
 - a) Horizontal flow
 - b) Vertical
 - c) Zig-zag
 - d) Inclined
 - 4) 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
 - 5) In AGV system path on the floor used for guidance is
 - a) Fixed
 - b) Variable
 - c) Physical guide
 - d) None of these
 - 6) Hand truck are characterized by
 - a) Non-Pallet + Walk + No Stack + Manual
 - b) Pallet + Walk + No Stack + Manual
 - c) Non-Pallet + Walk + Stack + Powered
 - d) Pallet + Walk + No Stack + Powered

P.T.O.



- 7) Storage equipment used for _____ or _____ material over a period of time.
- a) Catching or stocking
 - b) Holding or buffering
 - c) Storing or hanging
 - d) All of these
- 8) Conveyors are used for _____ type industry.
- a) Process layout
 - b) Line layout
 - c) Fixed layout
 - d) None of the above
- 9) _____ equipments are worked on counterbalanced principle.
- a) Gravity Conveyor
 - b) Fork lift Trucks
 - c) Picking Robot
 - d) Warehouse Trolley
- 10) OSHA stands for
- a) Occupational Safety and Human Administration
 - b) Occupational Safety and Health Administration
 - c) Occupational Safety and House Administration
 - d) None of above
- 11) 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
- 12) Conveyors and industrial trucks are the _____ equipment.
- a) Transport
 - b) Positioning
 - c) Storage
 - d) Identification and control Equipment
- 13) 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
- 14) Symbol \Rightarrow represents for
- a) Operation
 - b) Store
 - c) Inspection
 - d) Transport
-



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

**T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.
3) Solve **any two** questions in **each** Section.

SECTION – I

2. a) Explain the objectives, benefits and scope of material handling system. **5**
b) Explain the relation of Plant layout and Material handling. **5**
c) Give the classification of material handling equipments. **4**
3. a) Explain the general characteristics of Crane and describe with Fig. any one types of Cranes. **5**
b) Explain principles of material handling system in industry. **5**
c) Compare conventional and CIMS material handling system. **4**
4. Write a short notes (**any three**) : **14**
a) Decking and order picking. **5**
b) Hoisting Equipments. **5**
c) Industrial truck. **5**
d) CIMS in material handling. **4**

SECTION – II

5. a) Discuss the important of material handling safety. **5**
b) Explain with figure string diagram. **5**
c) Explain different factors affecting on selection of material handling equipment. **4**

Set Q



- | | |
|---|----|
| 6. a) Explain selection criteria for material handling equipment. | 5 |
| b) Explain with Fig. assembly chart. | 5 |
| c) Explain with figure procedure chart. | 4 |
| 7. Write a short notes (any three) : | 14 |
| a) From TO chart. | 5 |
| b) Selection of material handling equipment in sugar industry. | 5 |
| c) Material flow patterns. | 5 |
| d) Fork lift accidents. | 4 |
-



SLR-TJ – 107

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

Set	R
-----	---

**T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Conveyors and industrial trucks are the _____ equipment.
 - a) Transport
 - b) Positioning
 - c) Storage
 - d) Identification and control Equipment
- 2) 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
- 3) Symbol \Rightarrow represents for
 - a) Operation
 - b) Store
 - c) Inspection
 - d) Transport
- 4) A diagram showing the path followed by men and materials while performing a task is known as
 - a) String diagram
 - b) Flow process chart
 - c) Travel chart
 - d) Flow diagram
- 5) Equipment evaluation sheet consist of equipment characteristic utilization and
 - a) Safety
 - b) Vendor characteristics
 - c) Flexibility
 - d) Unit load
- 6) For single storey building when the flat floor area is available then _____ system is used.
 - a) Horizontal flow
 - b) Vertical
 - c) Zig-zag
 - d) Inclined

P.T.O.



- 7) Flat belt conveyor are characterized by
- Bulk + On-Floor + No accumulation
 - Unit + Overhead + Accumulation
 - Unit + On-Floor + No Accumulation
 - Bulk + Overhead + No Accumulation
- 8) In AGV system path on the floor used for guidance is
- Fixed
 - Variable
 - Physical guide
 - None of these
- 9) Hand truck are characterized by
- Non-Pallet + Walk + No Stack + Manual
 - Pallet + Walk + No Stack + Manual
 - Non-Pallet + Walk + Stack + Powered
 - Pallet + Walk + No Stack + Powered
- 10) Storage equipment used for _____ or _____ material over a period of time.
- Catching or stocking
 - Holding or buffering
 - Storing or hanging
 - All of these
- 11) Conveyors are used for _____ type industry.
- Process layout
 - Line layout
 - Fixed layout
 - None of the above
- 12) _____ equipments are worked on counterbalanced principle.
- Gravity Conveyor
 - Fork lift Trucks
 - Picking Robot
 - Warehouse Trolley
- 13) OSHA stands for
- Occupational Safety and Human Administration
 - Occupational Safety and Health Administration
 - Occupational Safety and House Administration
 - None of above
- 14) Economy in material handling can be achieved by
- Maximizing distance and time of travel
 - Minimizing distance and time of travel
 - Manual material handling
 - All of above
-



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

**T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.
3) Solve **any two** questions in **each** Section.

SECTION – I

2. a) Explain the objectives, benefits and scope of material handling system. **5**
b) Explain the relation of Plant layout and Material handling. **5**
c) Give the classification of material handling equipments. **4**
3. a) Explain the general characteristics of Crane and describe with Fig. any one types of Cranes. **5**
b) Explain principles of material handling system in industry. **5**
c) Compare conventional and CIMS material handling system. **4**
4. Write a short notes (**any three**) : **14**
a) Decking and order picking. **5**
b) Hoisting Equipments. **5**
c) Industrial truck. **5**
d) CIMS in material handling. **4**

SECTION – II

5. a) Discuss the important of material handling safety. **5**
b) Explain with figure string diagram. **5**
c) Explain different factors affecting on selection of material handling equipment. **4**

Set R



- | | |
|---|----|
| 6. a) Explain selection criteria for material handling equipment. | 5 |
| b) Explain with Fig. assembly chart. | 5 |
| c) Explain with figure procedure chart. | 4 |
| 7. Write a short notes (any three) : | 14 |
| a) From TO chart. | 5 |
| b) Selection of material handling equipment in sugar industry. | 5 |
| c) Material flow patterns. | 5 |
| d) Fork lift accidents. | 4 |
-



SLR-TJ – 107

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

Set	S
-----	---

T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : (14×1=14)
- 1) For single storey building when the flat floor area is available then _____ system is used.
a) Horizontal flow b) Vertical c) Zig-zag d) Inclined
 - 2) 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
 - 3) In AGV system path on the floor used for guidance is
a) Fixed b) Variable
c) Physical guide d) None of these
 - 4) Hand truck are characterized by
a) Non-Pallet + Walk + No Stack + Manual
b) Pallet + Walk + No Stack + Manual
c) Non-Pallet + Walk + Stack + Powered
d) Pallet + Walk + No Stack + Powered
 - 5) Storage equipment used for _____ or _____ material over a period of time.
a) Catching or stocking b) Holding or buffering
c) Storing or hanging d) All of these

P.T.O.



- 6) Conveyors are used for _____ type industry.
- a) Process layout
 - b) Line layout
 - c) Fixed layout
 - d) None of the above
- 7) _____ equipments are worked on counterbalanced principle.
- a) Gravity Conveyor
 - b) Fork lift Trucks
 - c) Picking Robot
 - d) Warehouse Trolley
- 8) OSHA stands for
- a) Occupational Safety and Human Administration
 - b) Occupational Safety and Health Administration
 - c) Occupational Safety and House Administration
 - d) None of above
- 9) 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
- 10) Conveyors and industrial trucks are the _____ equipment.
- a) Transport
 - b) Positioning
 - c) Storage
 - d) Identification and control Equipment
- 11) 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
- 12) Symbol \Rightarrow represents for
- a) Operation
 - b) Store
 - c) Inspection
 - d) Transport
- 13) A diagram showing the path followed by men and materials while performing a task is known as
- a) String diagram
 - b) Flow process chart
 - c) Travel chart
 - d) Flow diagram
- 14) Equipment evaluation sheet consist of equipment characteristic utilization and
- a) Safety
 - b) Vendor characteristics
 - c) Flexibility
 - d) Unit load



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

**T.E. (Mech.) (Part – I) (CGPA) Examination, 2017
MATERIAL HANDLING SYSTEM
(Professional Elective – I)**

Day and Date : Saturday, 9-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.
3) Solve **any two** questions in **each** Section.

SECTION – I

2. a) Explain the objectives, benefits and scope of material handling system. **5**
b) Explain the relation of Plant layout and Material handling. **5**
c) Give the classification of material handling equipments. **4**
3. a) Explain the general characteristics of Crane and describe with Fig. any one types of Cranes. **5**
b) Explain principles of material handling system in industry. **5**
c) Compare conventional and CIMS material handling system. **4**
4. Write a short notes (**any three**) : **14**
a) Decking and order picking. **5**
b) Hoisting Equipments. **5**
c) Industrial truck. **5**
d) CIMS in material handling. **4**

SECTION – II

5. a) Discuss the important of material handling safety. **5**
b) Explain with figure string diagram. **5**
c) Explain different factors affecting on selection of material handling equipment. **4**

Set S



- | | |
|---|----|
| 6. a) Explain selection criteria for material handling equipment. | 5 |
| b) Explain with Fig. assembly chart. | 5 |
| c) Explain with figure procedure chart. | 4 |
| 7. Write a short notes (any three) : | 14 |
| a) From TO chart. | 5 |
| b) Selection of material handling equipment in sugar industry. | 5 |
| c) Material flow patterns. | 5 |
| d) Fork lift accidents. | 4 |
-



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

Set	P
------------	----------

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
METROLOGY AND MECHANICAL MEASUREMENTS**

Day and Date : Tuesday, 21-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) Attempt **any two** questions from **each** Section – I and Section – II.
 - 2) Figures to **right** indicate **full** marks.
 - 3) Assume **suitable** data if necessary and mention it **clearly**.
 - 4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 5) **Answer MCQ/Objective type questions on Page No. 3 only.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

PART – A

(Objective Type Questions)

Instructions :

I. General :

- 1) All questions from objective type question paper are compulsory.
- 2) There is no negative and partial marking system for objective type questions.
- 3) Instructions for all four types of objective questions are as per the particulars given below.

II. Particulars:

Read the following instructions carefully before you bubble your answer.

1) Type 1 : Matrix-Match Type.

All questions are compulsory. There are two questions carrying three marks each. Each question contains statements given in two Columns, which have to be matched. Statements in Column I are labeled as A, B and C, whereas statements in Column II are labeled as p, q, r and s. The statements in Column I may have no match in Column II or may have one or more than one correct matches. The answers to these questions have to be appropriately bubbled as illustrated in the following example ; if the correct matches are A-q, A-r, B-p, B-r, C-p, C-r, C-s.

	p	q	r	s
A	○	●	●	○
B	●	○	●	○
C	●	○	●	●

2) Type 2 : Assertion and Reasoning Type. Solve **any one** of the following :

It consists of two statements, one labelled as statements 1 and other labelled as statement 2. Select the answer using the following code :

- A) Both statement 1 and statement 2 are true, and statement 2 is the correct explanation of statement 1.
- B) Both statement 1 and statement 2 are true but statement 2 is not correct explanation of statement 1.
- C) Statement 1 is true, but statement 2 is false.
- D) Statement 1 is false, but statement 2 is true.

3) Type 3 : Multiple Correct Answer Type.

There are two multiple correct answer type questions. **All** questions are **compulsory**. Each question has four choices (A), (B), (C) and (D), out of which one or more is/are correct. For example, if choices (B) and (C) are correct. Then bubble as below.

A	B	C	D
○	●	●	○

4) Type 4 : Straight Objective Type :

There are two questions of this type. **All** are **compulsory**. **Each** question has **four** choices (A), (B), (C) and (D), out of which **only one** is correct. For example, if choice (C) are correct, then bubble as below :

A	B	C	D
○	○	●	○



Objective Type Questions

Marks : 14

1. Type 1 : Matrix Match Type :

(3×2=6)

Sr. No. Column I

Column II

- | | |
|-----------------------------|--|
| i) A) Measurement of angle | p) Solex pneumatic gauge |
| B) Screw thread measurement | q) Sine instruments |
| C) Comparators | r) Floating carriage micrometer |
| | s) Michelsons interferometer |
| ii) A) Calibration | p) The minimum value of input which causes detectable change |
| B) Accuracy | q) Closeness between output and true value |
| C) Threshold | r) Performance comparison against precise standard |
| | s) Marking, checking or adjusting the scale |

Type 2 : Assertion and reasoning type.

2

- iii) **Statement 1** : LVDT is self generating type of transducer.
Statement 2 : LVDT is used for pressure measurement.

OR

- iv) **Statement 1** : Hole base system of limits, fits and tolerances is more popularly used than shaft base system.
Statement 2 : Variety reduction of hole making tools is easily possible due to use of hole base system.

Type 3 : Multiple correct answer type :

(2×2=4)

- v) In hole basis system fit is obtained by
 A) Choosing a basic hole
 B) Varying the shaft size
 C) Basic shaft is chosen
 D) None of the above
- vi) Mechanical strain gauges can measure
 A) Static strains
 B) Dynamic strains
 C) Quasi-static strains
 D) Both static and dynamic strains

Type 4 : Straight objective type :

(1×2=2)

- vii) Which of following thermometer is suitable for measuring furnace temperature ?
 A) Liquid in glass thermometer
 B) Thermocouples
 C) Thermistors
 D) Resistance thermometers
- viii) Following are the examples of end standards
 A) Tailor's tape
 B) Meter rule
 C) End bars
 D) Angle gauges



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
METROLOGY AND MECHANICAL MEASUREMENTS**

Day and Date : Tuesday, 21-11-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions:** 1) Attempt **any two** questions from **each** Section – I and Section – II.
2) Figures to **right** indicate **full** marks.
3) Assume **suitable** data if necessary and mention it **clearly**.

PART – B

SECTION – I

2. A) What are wavelength standards ? Explain in brief their advantages and limitations. **7**
B) Select minimum number of slip gauges to form a dimension of 87.563 mm using M45 and M87 sets. **7**
3. A) Distinguish between Hole basis and shaft basis system. **6**
B) In a hole and shaft assembly of 30 mm nominal size, the tolerances for hole and shaft are as specified below
Hole : $30_{-0.00}^{+0.002}$ mm Shaft : $30_{-0.070}^{-0.040}$ mm.
Determine :
i) Maximum and minimum clearances obtainable
ii) Allowance
iii) Hole and Shaft tolerance
iv) MML shaft and hole
v) Type of fit **8**
4. A) Explain working principle of gear tooth vernier caliper. What are the two methods used for the measurement of gear tooth thickness with that instrument ? Which method is better and why ? **7**
B) Explain how sine bar is used to measure angle of a component with sketch. **7**

SECTION – II

5. A) Explain the function of each element in the generalised measurement system with suitable example. **8**
B) Distinguish between RTD and Thermistor. **6**
6. A) Explain with neat sketch working of Photoelectric pick-up. **6**
B) Derive the expression for Gauge factor of resistance strain gauge. Sketch the Wheatstone's bridge circuit with balance mode. **8**
7. A) Explain the law of intermediate metal in case of thermocouple. State its application. **4**
B) Explain the working of the following devices with sketch (**any two**) : **10**
i) Diaphragm Gauge
ii) Electric Stroboscope
iii) Gas flow meter.



SLR-TJ – 110

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

Set	P
-----	----------

**T.E. Mechanical (Part – II) (CGPA) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Wednesday, 22-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) Compression ratio in diesel engine is of the order of
a) 5 – 7 b) 7 – 10 c) 10 – 12 d) 14 – 20
 - 2) Choke is used to
a) Providing rich mixture to cylinder at starting
b) Providing rich mixture to cylinder during acceleration
c) Increase the speed of the engine
d) Maintain constant height of petrol
 - 3) MPFI stands for
a) Multi Point Fuel Injection
b) Multi Port Fuel Injection
c) Manifold Point Fuel Injection
d) Manifold Port Fuel Injection
 - 4) If the engine continue to fire when ignition system is switched off is called
a) Run-away surface ignition
b) Rumble
c) Run-on surface ignition
d) Pre-ignition

P.T.O.



- 5) In fuel injector fuel injection pressure is adjusted on
 - a) Locking nut
 - b) Adjusting screw
 - c) Spindle
 - d) None of the above
 - 6) Fuel injection pressure in solid injection system is around
 - a) 5 – 10 bar
 - b) 10 – 20 bar
 - c) 30 – 50 bar
 - d) 200 – 250 bar
 - 7) Bendix drive in starting system is
 - a) Pre-engaged drive
 - b) Inertia drive
 - c) Overdrive
 - d) None of the above
 - 8) The purpose of the thermostat is to keep the engine
 - a) Hot
 - b) Cool
 - c) At desired temperature
 - d) None of the above
 - 9) The function of quench area in wedge shaped combustion chamber is
 - 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) Most effective antiknock agent for SI engine is
 - a) Paraffin's
 - b) Tetraethyl lead
 - c) Pentane
 - d) None of the above
 - 11) Brake thermal efficiency of SI engines usually varies between
 - a) 25% to 30%
 - b) 30% to 60 %
 - c) 60% to 80%
 - d) More than 80%
 - 12) Friction power of IC engine is measured by
 - a) Burette test
 - b) Dynamometer test
 - c) Volume test
 - d) Morse test
 - 13) In supercharging air compressor is driven by
 - a) Exhaust gas turbine
 - b) Engine itself
 - c) Separate electrical motor
 - d) None of the above
 - 14) Octane number of iso-octane is
 - a) 0
 - b) 30
 - c) 60
 - d) 100
-



SECTION – II

5. a) What is flame propagation stage in SI engine combustion ? Explain effect of various operating factors on it. **4**
- b) Explain the factors affecting on diesel knock. **4**
- c) Explain detonation in SI engine. **6**
6. a) A 4 cylinder, 4 stroke petrol engine 6 cm bore and 9 cm stroke was tested at constant speed of 500 rpm. When plug of 4 cylinders were successfully short circuited without change in speed, the torque measurement were as follows : **8**
- With all cylinders working = 310 Nm
- With number 1 cylinder cut off = 220 Nm
- With number 2 cylinder cut off = 222 Nm
- With number 3 cylinder cut off = 223 Nm
- With number 4 cylinder cut off = 220 Nm
- Find :
- a) BP when all cylinders are working
- b) IP of cylinder when all cylinders are working
- c) Mechanical efficiency
- d) Friction power of engine.
- b) Explain working of catalytic convertor in detail. **6**
7. a) Explain limitation of supercharging in SI engine. **4**
- b) Explain Cetane and Octane number in detail. **6**
- c) Write short note on carbon credit system. **4**
-



SLR-TJ – 110

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

Set	Q
-----	----------

**T.E. Mechanical (Part – II) (CGPA) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Wednesday, 22-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The purpose of the thermostat is to keep the engine
 - a) Hot
 - b) Cool
 - c) At desired temperature
 - d) None of the above
- 2) The function of quench area in wedge shaped combustion chamber is
 - a) Improve the compression ratio
 - b) Cool the end gas
 - c) Decrease the volume of combustion chamber
 - d) Increase the area of combustion chamber
- 3) Most effective antiknock agent for SI engine is
 - a) Paraffin's
 - b) Tetraethyl lead
 - c) Pentane
 - d) None of the above
- 4) Brake thermal efficiency of SI engines usually varies between
 - a) 25% to 30%
 - b) 30% to 60 %
 - c) 60% to 80%
 - d) More than 80%
- 5) Friction power of IC engine is measured by
 - a) Burette test
 - b) Dynamometer test
 - c) Volume test
 - d) Morse test

P.T.O.



- 6) In supercharging air compressor is driven by
a) Exhaust gas turbine b) Engine itself
c) Separate electrical motor d) None of the above
- 7) Octane number of iso-octane is
a) 0 b) 30 c) 60 d) 100
- 8) Compression ratio in diesel engine is of the order of
a) 5 – 7 b) 7 – 10 c) 10 – 12 d) 14 – 20
- 9) Choke is used to
a) Providing rich mixture to cylinder at starting
b) Providing rich mixture to cylinder during acceleration
c) Increase the speed of the engine
d) Maintain constant height of petrol
- 10) MPFI stands for
a) Multi Point Fuel Injection
b) Multi Port Fuel Injection
c) Manifold Point Fuel Injection
d) Manifold Port Fuel Injection
- 11) If the engine continue to fire when ignition system is switched off is called
a) Run-away surface ignition
b) Rumble
c) Run-on surface ignition
d) Pre-ignition
- 12) In fuel injector fuel injection pressure is adjusted on
a) Locking nut b) Adjusting screw
c) Spindle d) None of the above
- 13) Fuel injection pressure in solid injection system is around
a) 5 – 10 bar b) 10 – 20 bar c) 30 – 50 bar d) 200 – 250 bar
- 14) Bendix drive in starting system is
a) Pre-engaged drive b) Inertia drive
c) Overdrive d) None of the above
-



SECTION – II

5. a) What is flame propagation stage in SI engine combustion ? Explain effect of various operating factors on it. **4**
- b) Explain the factors affecting on diesel knock. **4**
- c) Explain detonation in SI engine. **6**
6. a) A 4 cylinder, 4 stroke petrol engine 6 cm bore and 9 cm stroke was tested at constant speed of 500 rpm. When plug of 4 cylinders were successfully short circuited without change in speed, the torque measurement were as follows : **8**
- With all cylinders working = 310 Nm
- With number 1 cylinder cut off = 220 Nm
- With number 2 cylinder cut off = 222 Nm
- With number 3 cylinder cut off = 223 Nm
- With number 4 cylinder cut off = 220 Nm
- Find :
- a) BP when all cylinders are working
- b) IP of cylinder when all cylinders are working
- c) Mechanical efficiency
- d) Friction power of engine.
- b) Explain working of catalytic convertor in detail. **6**
7. a) Explain limitation of supercharging in SI engine. **4**
- b) Explain Cetane and Octane number in detail. **6**
- c) Write short note on carbon credit system. **4**
-



SLR-TJ – 110

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

Set	R
-----	----------

**T.E. Mechanical (Part – II) (CGPA) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Wednesday, 22-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) In fuel injector fuel injection pressure is adjusted on
 - a) Locking nut
 - b) Adjusting screw
 - c) Spindle
 - d) None of the above
 - 2) Fuel injection pressure in solid injection system is around
 - a) 5 – 10 bar
 - b) 10 – 20 bar
 - c) 30 – 50 bar
 - d) 200 – 250 bar
 - 3) Bendix drive in starting system is
 - a) Pre-engaged drive
 - b) Inertia drive
 - c) Overdrive
 - d) None of the above
 - 4) The purpose of the thermostat is to keep the engine
 - a) Hot
 - b) Cool
 - c) At desired temperature
 - d) None of the above
 - 5) The function of quench area in wedge shaped combustion chamber is
 - a) Improve the compression ratio
 - b) Cool the end gas
 - c) Decrease the volume of combustion chamber
 - d) Increase the area of combustion chamber

P.T.O.



SECTION – II

5. a) What is flame propagation stage in SI engine combustion ? Explain effect of various operating factors on it. **4**
- b) Explain the factors affecting on diesel knock. **4**
- c) Explain detonation in SI engine. **6**
6. a) A 4 cylinder, 4 stroke petrol engine 6 cm bore and 9 cm stroke was tested at constant speed of 500 rpm. When plug of 4 cylinders were successfully short circuited without change in speed, the torque measurement were as follows : **8**
- With all cylinders working = 310 Nm
- With number 1 cylinder cut off = 220 Nm
- With number 2 cylinder cut off = 222 Nm
- With number 3 cylinder cut off = 223 Nm
- With number 4 cylinder cut off = 220 Nm
- Find :
- a) BP when all cylinders are working
- b) IP of cylinder when all cylinders are working
- c) Mechanical efficiency
- d) Friction power of engine.
- b) Explain working of catalytic convertor in detail. **6**
7. a) Explain limitation of supercharging in SI engine. **4**
- b) Explain Cetane and Octane number in detail. **6**
- c) Write short note on carbon credit system. **4**
-



SLR-TJ – 110

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

Set	S
-----	----------

**T.E. Mechanical (Part – II) (CGPA) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Wednesday, 22-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Most effective antiknock agent for SI engine is
 - a) Paraffin's
 - b) Tetraethyl lead
 - c) Pentane
 - d) None of the above
- 2) Brake thermal efficiency of SI engines usually varies between
 - a) 25% to 30%
 - b) 30% to 60 %
 - c) 60% to 80%
 - d) More than 80%
- 3) Friction power of IC engine is measured by
 - a) Burette test
 - b) Dynamometer test
 - c) Volume test
 - d) Morse test
- 4) In supercharging air compressor is driven by
 - a) Exhaust gas turbine
 - b) Engine itself
 - c) Separate electrical motor
 - d) None of the above
- 5) Octane number of iso-octane is
 - a) 0
 - b) 30
 - c) 60
 - d) 100
- 6) Compression ratio in diesel engine is of the order of
 - a) 5 – 7
 - b) 7 – 10
 - c) 10 – 12
 - d) 14 – 20

P.T.O.



- 7) Choke is used to
- Providing rich mixture to cylinder at starting
 - Providing rich mixture to cylinder during acceleration
 - Increase the speed of the engine
 - Maintain constant height of petrol
- 8) MPFI stands for
- Multi Point Fuel Injection
 - Multi Port Fuel Injection
 - Manifold Point Fuel Injection
 - Manifold Port Fuel Injection
- 9) If the engine continue to fire when ignition system is switched off is called
- Run-away surface ignition
 - Rumble
 - Run-on surface ignition
 - Pre-ignition
- 10) In fuel injector fuel injection pressure is adjusted on
- Locking nut
 - Adjusting screw
 - Spindle
 - None of the above
- 11) Fuel injection pressure in solid injection system is around
- 5 – 10 bar
 - 10 – 20 bar
 - 30 – 50 bar
 - 200 – 250 bar
- 12) Bendix drive in starting system is
- Pre-engaged drive
 - Inertia drive
 - Overdrive
 - None of the above
- 13) The purpose of the thermostat is to keep the engine
- Hot
 - Cool
 - At desired temperature
 - None of the above
- 14) The function of quench area in wedge shaped combustion chamber is
- Improve the compression ratio
 - Cool the end gas
 - Decrease the volume of combustion chamber
 - Increase the area of combustion chamber
-



SECTION – II

5. a) What is flame propagation stage in SI engine combustion ? Explain effect of various operating factors on it. **4**
- b) Explain the factors affecting on diesel knock. **4**
- c) Explain detonation in SI engine. **6**
6. a) A 4 cylinder, 4 stroke petrol engine 6 cm bore and 9 cm stroke was tested at constant speed of 500 rpm. When plug of 4 cylinders were successfully short circuited without change in speed, the torque measurement were as follows : **8**
- With all cylinders working = 310 Nm
- With number 1 cylinder cut off = 220 Nm
- With number 2 cylinder cut off = 222 Nm
- With number 3 cylinder cut off = 223 Nm
- With number 4 cylinder cut off = 220 Nm
- Find :
- a) BP when all cylinders are working
- b) IP of cylinder when all cylinders are working
- c) Mechanical efficiency
- d) Friction power of engine.
- b) Explain working of catalytic convertor in detail. **6**
7. a) Explain limitation of supercharging in SI engine. **4**
- b) Explain Cetane and Octane number in detail. **6**
- c) Write short note on carbon credit system. **4**
-



SLR-TJ – 111

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

Set

P

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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) Figures to the **right** indicate **full** marks.
 - 4) Assume **suitable** data if necessary and mention it **clearly**.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) Listing of relative cutter and work piece positions in manual part programming is
A) Manuscript
B) Programming
C) Automation
D) None
 - 2) Master cam is _____ software.
A) CAD
B) CAM
C) CAE
D) All the above
 - 3) Windowing transformation means
A) Window to viewport transformation
B) Geometric transformation
C) Vertices transformation
D) None of the above
 - 4) A comparator is required in
A) Open loop system
B) Closed loop system
C) Both A) and B)
D) None of the above
 - 5) Calculation of physical properties such as volume, surface area, center of gravity, M.I. etc is possible using
A) Solid modeling
B) Wire frame modeling
C) Surface modeling
D) All the above

P.T.O.



- 6) In NC tool the following function may not be automatic
- A) Feed rate
 - B) Speed rate
 - C) Loading and unloading the work piece
 - D) All of the above
- 7) FANUC is the name of
- A) CNC tool
 - B) CNC controller
 - C) CNC job holding device
 - D) Machine tool
- 8) _____ is a display device.
- A) Floppy
 - B) Printer
 - C) Plotter
 - D) CRT
- 9) Commercial CAD software package available for kinematics analysis and virtual prototyping
- A) CATIA V5
 - B) Hypermesh
 - C) ADAMS
 - D) CREO
- 10) Reflection about X axis is
- A) Y flips
 - B) X flips
 - C) X-Y flips
 - D) None of the above
- 11) G 90 preparatory code is used for
- A) Absolute presetting
 - B) Absolute co-ordinate setting
 - C) Metric unit setting
 - D) None
- 12) Miscellaneous function used for Coolant off is
- A) M 07
 - B) M 08
 - C) M 09
 - D) None
- 13) Following curve interpolates all control points
- A) Hermite
 - B) Bezier
 - C) β -spline
 - D) None
- 14) In CNC machine job holding and work piece change is done through
- A) ATC
 - B) MDI
 - C) APC
 - D) All the above
-



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

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 56

- 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) Figures to the **right** indicate **full** marks.
4) Assume **suitable** data if necessary and mention it **clearly**.

SECTION – I

2. a) What is CAD/CAM ? Discuss the concept of integration of CAD to CAM. **7**
b) Write types of modeling and state various schemes for solid modeling. Explain CSG scheme. **7**
3. a) Define automation. What are its advantage and disadvantages ? Give various types of automations with suitable example. **7**
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 degree. Find the new position of the triangle. Explain your answer with a neat sketch. **7**
4. Answer the following (**any four**) : **14**
- a) Properties of β Spline and Bezire curve.
 - b) CAPP and its types.
 - c) Types of database.
 - d) Commercially available CAD/CAM software packages with applications.
 - e) Design workstation.

Set P



SECTION – II

5. a) Prepare a part program for stepped component given below. The various details are

Speed : 400 rpm

Feed rate : 200 mm/min

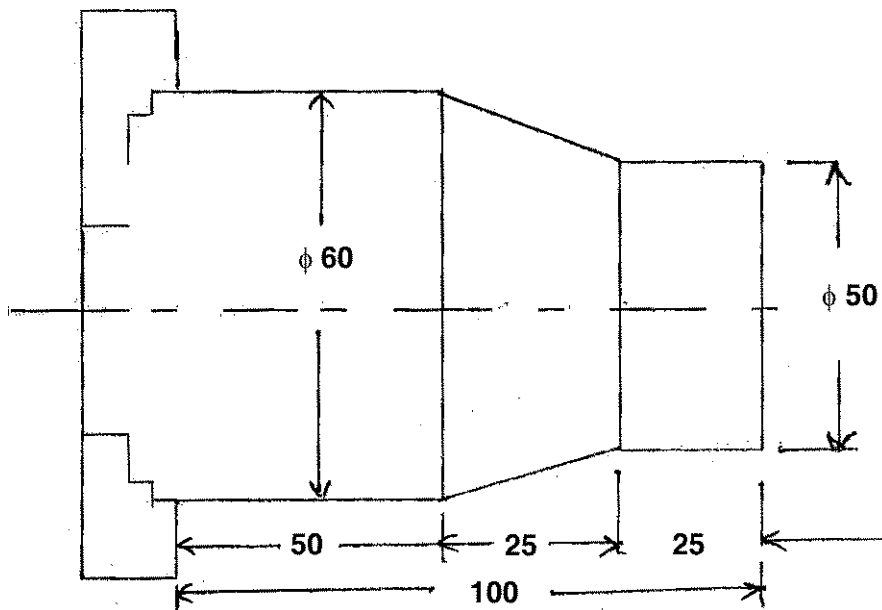
Work material : Mild steel

Tool Material : HSS

Work piece size : ϕ 60 \times 100

Tool type : Right hand facing tool.

8



b) Enlist any four G code and M code. Explain functioning of any two G and M code.

6

6. a) What is part programming ? Explain the procedure associated with NC part programming.

6

b) Explain adaptive control.

4

c) Explain drives used for table movement in a NC/CNC.

4

7. a) Describe EIA standards of parameter of Punched Tape with neat sketch.

6

b) Differentiate between NC and CNC machine tools.

4

c) Write a short note on DNC.

4



SLR-TJ – 111

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

Set **Q**

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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) Figures to the **right** indicate **full** marks.
 - 4) Assume **suitable** data if necessary and mention it **clearly**.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) _____ is a display device.
A) Floppy B) Printer C) Plotter D) CRT
 - 2) Commercial CAD software package available for kinematics analysis and virtual prototyping
A) CATIA V5 B) Hypermesh C) ADAMS D) CREO
 - 3) Reflection about X axis is
A) Y flips B) X flips
C) X-Y flips D) None of the above
 - 4) G 90 preparatory code is used for
A) Absolute presetting B) Absolute co-ordinate setting
C) Metric unit setting D) None
 - 5) Miscellaneous function used for Coolant off is
A) M 07 B) M 08 C) M 09 D) None
 - 6) Following curve interpolates all control points
A) Hermite B) Bezier C) β -spline D) None

P.T.O.



- 7) In CNC machine job holding and work piece change is done through
A) ATC B) MDI C) APC D) All the above
- 8) Listing of relative cutter and work piece positions in manual part programming is
A) Manuscript B) Programming
C) Automation D) None
- 9) Master cam is _____ software.
A) CAD B) CAM C) CAE D) All the above
- 10) Windowing transformation means
A) Window to viewport transformation
B) Geometric transformation
C) Vertices transformation
D) None of the above
- 11) A comparator is required in
A) Open loop system B) Closed loop system
C) Both A) and B) D) None of the above
- 12) Calculation of physical properties such as volume, surface area, center of gravity, M.I. etc is possible using
A) Solid modeling B) Wire frame modeling
C) Surface modeling D) All the above
- 13) In NC tool the following function may not be automatic
A) Feed rate
B) Speed rate
C) Loading and unloading the work piece
D) All of the above
- 14) FANUC is the name of
A) CNC tool B) CNC controller
C) CNC job holding device D) Machine tool
-



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

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 56

- 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) Figures to the **right** indicate **full** marks.
4) Assume **suitable** data if necessary and mention it **clearly**.

SECTION – I

2. a) What is CAD/CAM ? Discuss the concept of integration of CAD to CAM. **7**
b) Write types of modeling and state various schemes for solid modeling.
Explain CSG scheme. **7**
3. a) Define automation. What are its advantage and disadvantages ? Give various types of automations with suitable example. **7**
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 degree. Find the new position of the triangle. Explain your answer with a neat sketch. **7**
4. Answer the following (**any four**) : **14**
- a) Properties of β Spline and Bezire curve.
b) CAPP and its types.
c) Types of database.
d) Commercially available CAD/CAM software packages with applications.
e) Design workstation.

Set Q



SECTION – II

5. a) Prepare a part program for stepped component given below. The various details are

Speed : 400 rpm

Feed rate : 200 mm/min

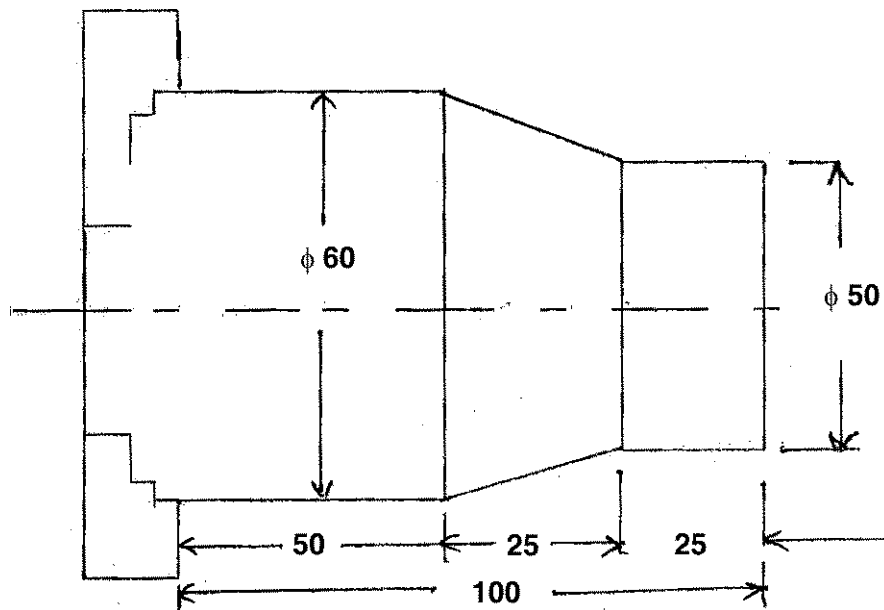
Work material : Mild steel

Tool Material : HSS

Work piece size : ϕ 60 \times 100

Tool type : Right hand facing tool.

8



b) Enlist any four G code and M code. Explain functioning of any two G and M code.

6

6. a) What is part programming ? Explain the procedure associated with NC part programming.

6

b) Explain adaptive control.

4

c) Explain drives used for table movement in a NC/CNC.

4

7. a) Describe EIA standards of parameter of Punched Tape with neat sketch.

6

b) Differentiate between NC and CNC machine tools.

4

c) Write a short note on DNC.

4



SLR-TJ – 111

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

Set **R**

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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) Figures to the **right** indicate **full** marks.
 - 4) Assume **suitable** data if necessary and mention it **clearly**.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) Calculation of physical properties such as volume, surface area, center of gravity, M.I. etc is possible using
 - A) Solid modeling
 - B) Wire frame modeling
 - C) Surface modeling
 - D) All the above
 - 2) In NC tool the following function may not be automatic
 - A) Feed rate
 - B) Speed rate
 - C) Loading and unloading the work piece
 - D) All of the above
 - 3) FANUC is the name of
 - A) CNC tool
 - B) CNC controller
 - C) CNC job holding device
 - D) Machine tool
 - 4) _____ is a display device.
 - A) Floppy
 - B) Printer
 - C) Plotter
 - D) CRT
 - 5) Commercial CAD software package available for kinematics analysis and virtual prototyping
 - A) CATIA V5
 - B) Hypermesh
 - C) ADAMS
 - D) CREO

P.T.O.



- 6) Reflection about X axis is
A) Y flips
B) X flips
C) X-Y flips
D) None of the above
- 7) G 90 preparatory code is used for
A) Absolute presetting
B) Absolute co-ordinate setting
C) Metric unit setting
D) None
- 8) Miscellaneous function used for Coolant off is
A) M 07
B) M 08
C) M 09
D) None
- 9) Following curve interpolates all control points
A) Hermite
B) Bezier
C) β -spline
D) None
- 10) In CNC machine job holding and work piece change is done through
A) ATC
B) MDI
C) APC
D) All the above
- 11) Listing of relative cutter and work piece positions in manual part programming is
A) Manuscript
B) Programming
C) Automation
D) None
- 12) Master cam is _____ software.
A) CAD
B) CAM
C) CAE
D) All the above
- 13) Windowing transformation means
A) Window to viewport transformation
B) Geometric transformation
C) Vertices transformation
D) None of the above
- 14) A comparator is required in
A) Open loop system
B) Closed loop system
C) Both A) and B)
D) None of the above
-



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

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 56

- 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) Figures to the **right** indicate **full** marks.
4) Assume **suitable** data if necessary and mention it **clearly**.

SECTION – I

2. a) What is CAD/CAM ? Discuss the concept of integration of CAD to CAM. **7**
b) Write types of modeling and state various schemes for solid modeling. Explain CSG scheme. **7**
3. a) Define automation. What are its advantage and disadvantages ? Give various types of automations with suitable example. **7**
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 degree. Find the new position of the triangle. Explain your answer with a neat sketch. **7**
4. Answer the following (**any four**) : **14**
- a) Properties of β Spline and Bezire curve.
b) CAPP and its types.
c) Types of database.
d) Commercially available CAD/CAM software packages with applications.
e) Design workstation.

Set R



SECTION – II

5. a) Prepare a part program for stepped component given below. The various details are

Speed : 400 rpm

Feed rate : 200 mm/min

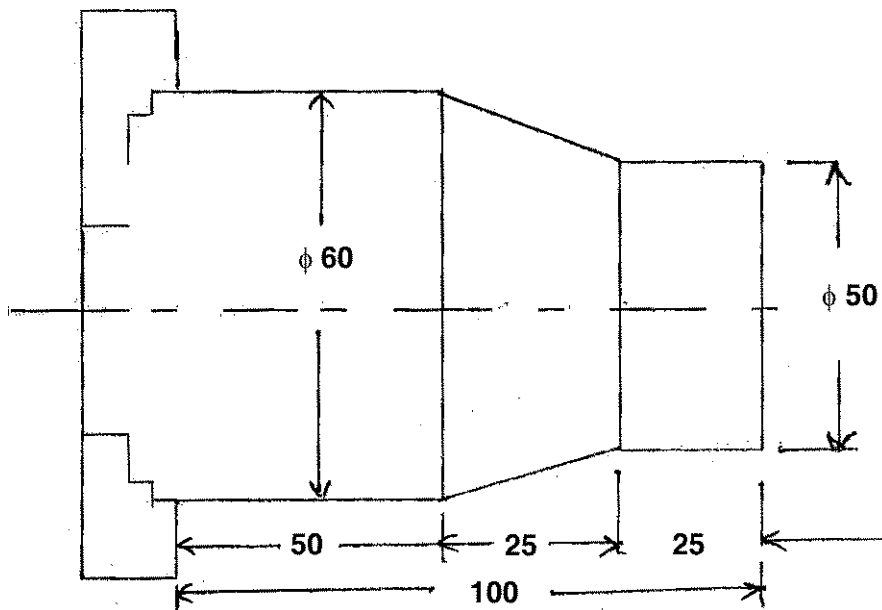
Work material : Mild steel

Tool Material : HSS

Work piece size : ϕ 60 \times 100

Tool type : Right hand facing tool.

8



b) Enlist any four G code and M code. Explain functioning of any two G and M code.

6

6. a) What is part programming ? Explain the procedure associated with NC part programming.

6

b) Explain adaptive control.

4

c) Explain drives used for table movement in a NC/CNC.

4

7. a) Describe EIA standards of parameter of Punched Tape with neat sketch.

6

b) Differentiate between NC and CNC machine tools.

4

c) Write a short note on DNC.

4



SLR-TJ – 111

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

Set

S

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- 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) Figures to the **right** indicate **full** marks.
 - 4) Assume **suitable** data if necessary and mention it **clearly**.
 - 5) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 6) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Reflection about X axis is
 - A) Y flips
 - B) X flips
 - C) X-Y flips
 - D) None of the above
- 2) G 90 preparatory code is used for
 - A) Absolute presetting
 - B) Absolute co-ordinate setting
 - C) Metric unit setting
 - D) None
- 3) Miscellaneous function used for Coolant off is
 - A) M 07
 - B) M 08
 - C) M 09
 - D) None
- 4) Following curve interpolates all control points
 - A) Hermite
 - B) Bezier
 - C) β -spline
 - D) None
- 5) In CNC machine job holding and work piece change is done through
 - A) ATC
 - B) MDI
 - C) APC
 - D) All the above
- 6) Listing of relative cutter and work piece positions in manual part programming is
 - A) Manuscript
 - B) Programming
 - C) Automation
 - D) None

P.T.O.



- 7) Master cam is _____ software.
A) CAD B) CAM C) CAE D) All the above
- 8) Windowing transformation means
A) Window to viewport transformation
B) Geometric transformation
C) Vertices transformation
D) None of the above
- 9) A comparator is required in
A) Open loop system B) Closed loop system
C) Both A) and B) D) None of the above
- 10) Calculation of physical properties such as volume, surface area, center of gravity, M.I. etc is possible using
A) Solid modeling B) Wire frame modeling
C) Surface modeling D) All the above
- 11) In NC tool the following function may not be automatic
A) Feed rate
B) Speed rate
C) Loading and unloading the work piece
D) All of the above
- 12) FANUC is the name of
A) CNC tool B) CNC controller
C) CNC job holding device D) Machine tool
- 13) _____ is a display device.
A) Floppy B) Printer C) Plotter D) CRT
- 14) Commercial CAD software package available for kinematics analysis and virtual prototyping
A) CATIA V5 B) Hypermesh C) ADAMS D) CREO
-



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

**T.E. (Mechanical Engineering) (Part – II) (CGPA)
Examination, 2017
CAD/CAM**

Day and Date : Thursday, 23-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 56

- 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) Figures to the **right** indicate **full** marks.
4) Assume **suitable** data if necessary and mention it **clearly**.

SECTION – I

2. a) What is CAD/CAM ? Discuss the concept of integration of CAD to CAM. **7**
b) Write types of modeling and state various schemes for solid modeling. Explain CSG scheme. **7**
3. a) Define automation. What are its advantage and disadvantages ? Give various types of automations with suitable example. **7**
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 degree. Find the new position of the triangle. Explain your answer with a neat sketch. **7**
4. Answer the following (**any four**) : **14**
- a) Properties of β Spline and Bezire curve.
b) CAPP and its types.
c) Types of database.
d) Commercially available CAD/CAM software packages with applications.
e) Design workstation.

Set S



SECTION – II

5. a) Prepare a part program for stepped component given below. The various details are

Speed : 400 rpm

Feed rate : 200 mm/min

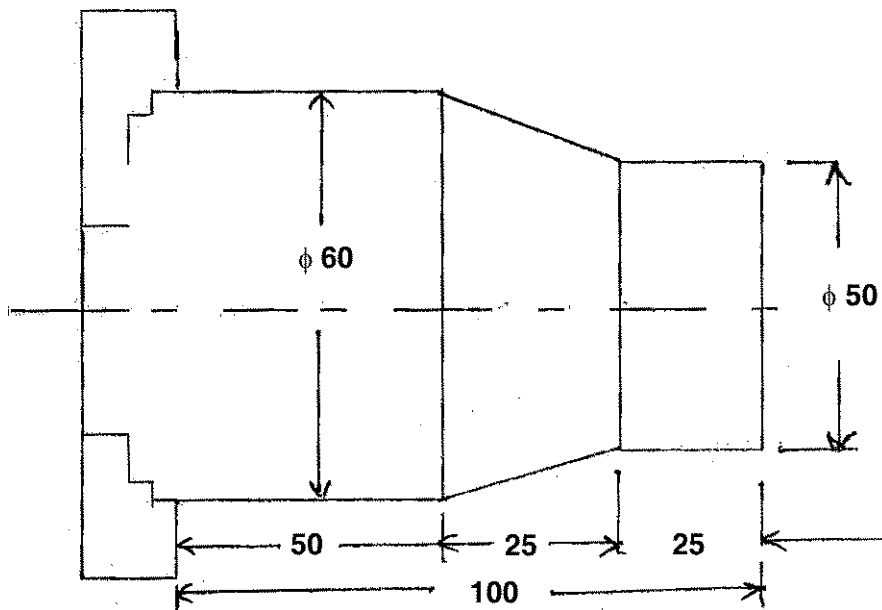
Work material : Mild steel

Tool Material : HSS

Work piece size : ϕ 60 \times 100

Tool type : Right hand facing tool.

8



b) Enlist any four G code and M code. Explain functioning of any two G and M code.

6

6. a) What is part programming ? Explain the procedure associated with NC part programming.

6

b) Explain adaptive control.

4

c) Explain drives used for table movement in a NC/CNC.

4

7. a) Describe EIA standards of parameter of Punched Tape with neat sketch.

6

b) Differentiate between NC and CNC machine tools.

4

c) Write a short note on DNC.

4



SLR-TJ – 112

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

Set	P
-----	----------

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) *Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book on Page No. 3.*
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.*

MCQ/Objective Type Questions

Duration : 30 Minutes

14

1. Choose the correct answer :

I) Match the pairs :

4

List – I

List – II

- | | |
|----------------------|--|
| A) Worm Gears | P) Non-parallel, non-intersecting shafts |
| B) Rack and pinion | Q) Non-parallel intersecting shafts |
| C) Bevel Gears | R) No axial thrust |
| D) Herringbone gears | S) Axes are parallel and one of the gear has infinite radius |
| | T) Parallel intersecting shafts |

II) Multiple correct answer type questions, carrying **two** marks **each** :

6

- A) Which of the following bearings can take load in both radial and axial direction ?
- | | |
|-------------------------------|-----------------------------|
| a) Cylindrical Roller Bearing | b) Taper Roller Bearing |
| c) Thrust Ball Bearing | d) Deep Groove Ball Bearing |
- B) In case of helical gears
- | |
|--|
| a) Hand of helix is same |
| b) Hand of helix is opposite |
| c) The helix angle of pinion and gear is same |
| d) The helix angle of pinion and gear is different |
- C) Rolling contact bearings are classified according to
- | | |
|----------------------------|---------------------------------|
| a) Type of rolling element | b) Magnitude of load |
| c) Direction of load | d) Diameter of balls or rollers |

P.T.O.



III) Single correct answer type questions, carrying **one** mark **each** :

4

- A) Twenty degree full depth involute profiled 19 tooth pinion and 37 tooth gear are in mesh. If the module is 5 mm, the center distance between the gear pair will be
- | | |
|-----------|-----------|
| a) 140 mm | b) 150 mm |
| c) 280 mm | d) 300 mm |
- B) In involute gear teeth, the base circle must be
- | | |
|---------------------------|---------------------------|
| a) under the root circle | b) at the root circle |
| c) above the pitch circle | d) under the pitch circle |
- C) A cylinder is considered thin when the ratio of its inner diameter to the wall thickness is
- | | |
|-----------------|-----------------|
| a) Less than 15 | b) More than 15 |
| c) More than 20 | d) Less than 20 |
- D) Reducing pressure angle on gears results in
- | | |
|------------------------|----------------------|
| a) Weaker teeth | b) Stronger teeth |
| c) High velocity ratio | d) None of the above |
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Make necessary assumptions, **if** required.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non programmable calculator is **permitted**.

SECTION – I

2. a) Explain the terms static and dynamic load acting on meshing teeth of gears. **4**
- b) Define the beam strength and wear strength of gear tooth. **3**
- c) A spur gear pinion having 18 teeth is to mesh with a gear having 43 teeth. The pinion and gear are made of plain carbon steels having ultimate tensile strength of 600 N/mm² and 420 N/mm² respectively. The pinion is supplied with 10 kW power at 1440 rpm. The starting torque is twice the rated torque. The facewidth is 10 times the module and tooth system is 20 degree full depth involute. Both the gears are case hardened to 400 B.H.N. Factor of safety is 1.5. Assume velocity factor to account for the dynamic load and determine the module of the gears.
- Use $C_v = 0.375$
- Y for 18 teeth = 0.308
- Y for 43 teeth = 0.396. **7**
3. a) Derive the expression for virtual number of teeth for helical gears. **3**
- b) A parallel helical gear pair with a centre distance of 240 mm transmits 7.5 kW power from a 22 teeth right hand pinion rotating at 1500 rpm to a gear rotating at 375 rpm. The normal pressure angle is 20° and the helix angle is 23°. Determine the components of resultant force acting on meshing teeth. If the pinion is rotating in anticlockwise direction when viewed from left, draw the free body diagram of force components acting on both pinion and gear meshing tooth. **6**
- c) An air receiver consists of a cylinder having length twice its inside diameter. It is closed by the hemispherical end closures. It has a storage capacity of 0.30 m³ and inside pressure of 5 MPa. The material used is plain carbon steel ($S_{ut} = 360 \text{ N/mm}^2$). Use factor of safety of design as 4. Determine the thickness of cylinder and hemispherical end closures considering the joint efficiency of 85%. **5**

Set P



4. a) Explain adequate design and optimum design with suitable examples. **3**
- b) Formulate the PDE, SDE and LE for a shaft subjected to torque T. The objective of design is minimum weight of the shaft. **4**
- c) A high pressure compound cylinder consists of inner steel cylinder with inside and outside diameters of 100 mm and 150 mm respectively. It is reinforced by shrinking a steel cylinder of outer diameter of 200 mm. The difference between the outer diameter of inner cylinder and inner diameter of outer cylinder is 0.15 mm. If the modulus of elasticity of the steel is $2.07 \times 10^5 \text{ N/mm}^2$, Calculate
- The shrinkage pressure
 - Maximum hoop stress induced in any of the cylinders. **7**

SECTION – II

5. a) Draw neat sketch of bevel gear indicating its terminology. **3**
- b) Derive the relation for efficiency of worm gear. **4**
- c) Pair of bevel gears, with 20° pressure angle, consists of 20 teeth pinion meshing with 30 teeth gear. The module is 4 mm while the face width is 20 mm. Material for the pinion and gear is steel 50c4 ($S_{ut} = 660 \text{ N/mm}^2$) gears are machined to meet the specifications of grade 8 and the surface hardness is 400 B.H.N. the pinion rotates at 400 r.p.m. and receives power from the electric motor. The starting torque of the motor is 150 % of the rated torque. Assuming F.S. = 2, determine the rated power that the gear can transmit. Take
- $$Y = 0.337, e = 16 + 1.25 (m + 0.25 \sqrt{2(rm)})$$
- Where r_m – mean radius. **7**
6. a) Explain equivalent bearing load, load life relationship of rolling contact bearing. **3**
- b) Explain desirable properties of good bearing material for sliding contact bearing. **4**
- c) 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 normal pressure angle is 20° . Determine the components of gear tooth force acting on the worm and worm wheel. **7**
7. a) Explain formative number of teeth in bevel gear. **3**
- b) Explain working of hydrostatic journal bearing with neat sketch. **4**
- c) The following data is given for a 360° hydrodynamic bearing :
- Length to diameter ratio = 1
 Journal speed = 1350 rpm
 Journal diameter = 100 mm
 Diametral clearance = 100 microns
 External load = 9 kN
 Sommerfeld no. = 0.0828
 The value of minimum film thickness variable is 0.3. Find the viscosity of oil that need be used. **7**



SLR-TJ – 112

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

Set	Q
-----	---

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book on Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

14

1. Choose the correct answer :

I) Multiple correct answer type questions, carrying **two** marks **each** :

6

- A) In case of helical gears
a) Hand of helix is same
b) Hand of helix is opposite
c) The helix angle of pinion and gear is same
d) The helix angle of pinion and gear is different
- B) Rolling contact bearings are classified according to
a) Type of rolling element b) Magnitude of load
c) Direction of load d) Diameter of balls or rollers
- C) Which of the following bearings can take load in both radial and axial direction ?
a) Cylindrical Roller Bearing b) Taper Roller Bearing
c) Thrust Ball Bearing d) Deep Groove Ball Bearing

II) Match the pairs :

4

List – I

List – II

- | | |
|----------------------|--|
| A) Worm Gears | P) Non-parallel, non-intersecting shafts |
| B) Rack and pinion | Q) Non-parallel intersecting shafts |
| C) Bevel Gears | R) No axial thrust |
| D) Herringbone gears | S) Axes are parallel and one of the gear has infinite radius |
| | T) Parallel intersecting shafts |

P.T.O.



III) Single correct answer type questions, carrying **one** mark **each** :

4

- A) In involute gear teeth, the base circle must be
- a) under the root circle
 - b) at the root circle
 - c) above the pitch circle
 - d) under the pitch circle
- B) A cylinder is considered thin when the ratio of its inner diameter to the wall thickness is
- a) Less than 15
 - b) More than 15
 - c) More than 20
 - d) Less than 20
- C) Reducing pressure angle on gears results in
- a) Weaker teeth
 - b) Stronger teeth
 - c) High velocity ratio
 - d) None of the above
- D) Twenty degree full depth involute profiled 19 tooth pinion and 37 tooth gear are in mesh. If the module is 5 mm, the center distance between the gear pair will be
- a) 140 mm
 - b) 150 mm
 - c) 280 mm
 - d) 300 mm
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Make necessary assumptions, **if** required.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non programmable calculator is **permitted**.

SECTION – I

2. a) Explain the terms static and dynamic load acting on meshing teeth of gears. **4**
- b) Define the beam strength and wear strength of gear tooth. **3**
- c) A spur gear pinion having 18 teeth is to mesh with a gear having 43 teeth. The pinion and gear are made of plain carbon steels having ultimate tensile strength of 600 N/mm² and 420 N/mm² respectively. The pinion is supplied with 10 kW power at 1440 rpm. The starting torque is twice the rated torque. The facewidth is 10 times the module and tooth system is 20 degree full depth involute. Both the gears are case hardened to 400 B.H.N. Factor of safety is 1.5. Assume velocity factor to account for the dynamic load and determine the module of the gears.
- Use $C_v = 0.375$
- Y for 18 teeth = 0.308
- Y for 43 teeth = 0.396. **7**
3. a) Derive the expression for virtual number of teeth for helical gears. **3**
- b) A parallel helical gear pair with a centre distance of 240 mm transmits 7.5 kW power from a 22 teeth right hand pinion rotating at 1500 rpm to a gear rotating at 375 rpm. The normal pressure angle is 20° and the helix angle is 23°. Determine the components of resultant force acting on meshing teeth. If the pinion is rotating in anticlockwise direction when viewed from left, draw the free body diagram of force components acting on both pinion and gear meshing tooth. **6**
- c) An air receiver consists of a cylinder having length twice its inside diameter. It is closed by the hemispherical end closures. It has a storage capacity of 0.30 m³ and inside pressure of 5 MPa. The material used is plain carbon steel ($S_{ut} = 360 \text{ N/mm}^2$). Use factor of safety of design as 4. Determine the thickness of cylinder and hemispherical end closures considering the joint efficiency of 85%. **5**

Set Q



4. a) Explain adequate design and optimum design with suitable examples. **3**
- b) Formulate the PDE, SDE and LE for a shaft subjected to torque T. The objective of design is minimum weight of the shaft. **4**
- c) A high pressure compound cylinder consists of inner steel cylinder with inside and outside diameters of 100 mm and 150 mm respectively. It is reinforced by shrinking a steel cylinder of outer diameter of 200 mm. The difference between the outer diameter of inner cylinder and inner diameter of outer cylinder is 0.15 mm. If the modulus of elasticity of the steel is 2.07×10^5 N/mm², Calculate
- The shrinkage pressure
 - Maximum hoop stress induced in any of the cylinders. **7**

SECTION – II

5. a) Draw neat sketch of bevel gear indicating its terminology. **3**
- b) Derive the relation for efficiency of worm gear. **4**
- c) Pair of bevel gears, with 20° pressure angle, consists of 20 teeth pinion meshing with 30 teeth gear. The module is 4 mm while the face width is 20 mm. Material for the pinion and gear is steel 50c4 ($S_{ut} = 660$ N/mm²) gears are machined to meet the specifications of grade 8 and the surface hardness is 400 B.H.N. the pinion rotates at 400 r.p.m. and receives power from the electric motor. The starting torque of the motor is 150 % of the rated torque. Assuming F.S. = 2, determine the rated power that the gear can transmit. Take
- $$Y = 0.337, e = 16 + 1.25 (m + 0.25 \sqrt{2(rm)})$$
- Where r_m – mean radius. **7**
6. a) Explain equivalent bearing load, load life relationship of rolling contact bearing. **3**
- b) Explain desirable properties of good bearing material for sliding contact bearing. **4**
- c) 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 normal pressure angle is 20°. Determine the components of gear tooth force acting on the worm and worm wheel. **7**
7. a) Explain formative number of teeth in bevel gear. **3**
- b) Explain working of hydrostatic journal bearing with neat sketch. **4**
- c) The following data is given for a 360° hydrodynamic bearing :
- Length to diameter ratio = 1
 - Journal speed = 1350 rpm
 - Journal diameter = 100 mm
 - Diametral clearance = 100 microns
 - External load = 9 kN
 - Sommerfeld no. = 0.0828
- The value of minimum film thickness variable is 0.3. Find the viscosity of oil that need be used. **7**



SLR-TJ – 112

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

Set	R
-----	---

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book on Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

14

1. Choose the correct answer :

I) Multiple correct answer type questions, carrying **two** marks **each** :

6

A) Rolling contact bearings are classified according to

- | | |
|----------------------------|---------------------------------|
| a) Type of rolling element | b) Magnitude of load |
| c) Direction of load | d) Diameter of balls or rollers |

B) Which of the following bearings can take load in both radial and axial direction ?

- | | |
|-------------------------------|-----------------------------|
| a) Cylindrical Roller Bearing | b) Taper Roller Bearing |
| c) Thrust Ball Bearing | d) Deep Groove Ball Bearing |

C) In case of helical gears

- | |
|--|
| a) Hand of helix is same |
| b) Hand of helix is opposite |
| c) The helix angle of pinion and gear is same |
| d) The helix angle of pinion and gear is different |

II) Single correct answer type questions, carrying **one** mark **each** :

4

A) A cylinder is considered thin when the ratio of its inner diameter to the wall thickness is

- | | |
|-----------------|-----------------|
| a) Less than 15 | b) More than 15 |
| c) More than 20 | d) Less than 20 |

B) Reducing pressure angle on gears results in

- | | |
|------------------------|----------------------|
| a) Weaker teeth | b) Stronger teeth |
| c) High velocity ratio | d) None of the above |

P.T.O.



C) Twenty degree full depth involute profiled 19 tooth pinion and 37 tooth gear are in mesh. If the module is 5 mm, the center distance between the gear pair will be

- a) 140 mm
- b) 150 mm
- c) 280 mm
- d) 300 mm

D) In involute gear teeth, the base circle must be

- a) under the root circle
- b) at the root circle
- c) above the pitch circle
- d) under the pitch circle

III) Match the pairs :

4

List – I

- A) Worm Gears
- B) Rack and pinion
- C) Bevel Gears
- D) Herringbone gears

List – II

- P) Non-parallel, non-intersecting shafts
 - Q) Non-parallel intersecting shafts
 - R) No axial thrust
 - S) Axes are parallel and one of the gear has infinite radius
 - T) Parallel intersecting shafts
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Make necessary assumptions, **if** required.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non programmable calculator is **permitted**.

SECTION – I

2. a) Explain the terms static and dynamic load acting on meshing teeth of gears. **4**
- b) Define the beam strength and wear strength of gear tooth. **3**
- c) A spur gear pinion having 18 teeth is to mesh with a gear having 43 teeth. The pinion and gear are made of plain carbon steels having ultimate tensile strength of 600 N/mm² and 420 N/mm² respectively. The pinion is supplied with 10 kW power at 1440 rpm. The starting torque is twice the rated torque. The facewidth is 10 times the module and tooth system is 20 degree full depth involute. Both the gears are case hardened to 400 B.H.N. Factor of safety is 1.5. Assume velocity factor to account for the dynamic load and determine the module of the gears.
- Use $C_v = 0.375$
- Y for 18 teeth = 0.308
- Y for 43 teeth = 0.396. **7**
3. a) Derive the expression for virtual number of teeth for helical gears. **3**
- b) A parallel helical gear pair with a centre distance of 240 mm transmits 7.5 kW power from a 22 teeth right hand pinion rotating at 1500 rpm to a gear rotating at 375 rpm. The normal pressure angle is 20° and the helix angle is 23°. Determine the components of resultant force acting on meshing teeth. If the pinion is rotating in anticlockwise direction when viewed from left, draw the free body diagram of force components acting on both pinion and gear meshing tooth. **6**
- c) An air receiver consists of a cylinder having length twice its inside diameter. It is closed by the hemispherical end closures. It has a storage capacity of 0.30 m³ and inside pressure of 5 MPa. The material used is plain carbon steel ($S_{ut} = 360 \text{ N/mm}^2$). Use factor of safety of design as 4. Determine the thickness of cylinder and hemispherical end closures considering the joint efficiency of 85%. **5**

Set R



4. a) Explain adequate design and optimum design with suitable examples. **3**
- b) Formulate the PDE, SDE and LE for a shaft subjected to torque T. The objective of design is minimum weight of the shaft. **4**
- c) A high pressure compound cylinder consists of inner steel cylinder with inside and outside diameters of 100 mm and 150 mm respectively. It is reinforced by shrinking a steel cylinder of outer diameter of 200 mm. The difference between the outer diameter of inner cylinder and inner diameter of outer cylinder is 0.15 mm. If the modulus of elasticity of the steel is 2.07×10^5 N/mm², Calculate
- i) The shrinkage pressure
- ii) Maximum hoop stress induced in any of the cylinders. **7**

SECTION – II

5. a) Draw neat sketch of bevel gear indicating its terminology. **3**
- b) Derive the relation for efficiency of worm gear. **4**
- c) Pair of bevel gears, with 20° pressure angle, consists of 20 teeth pinion meshing with 30 teeth gear. The module is 4 mm while the face width is 20 mm. Material for the pinion and gear is steel 50c4 (Sut = 660 N/mm²) gears are machined to meet the specifications of grade 8 and the surface hardness is 400 B.H.N. the pinion rotates at 400 r.p.m. and receives power from the electric motor. The starting torque of the motor is 150 % of the rated torque. Assuming F.S. = 2, determine the rated power that the gear can transmit. Take
- $Y = 0.337$, $e = 16 + 1.25 (m + 0.25 \sqrt{2(rm)})$. Where r_m – mean radius. **7**
6. a) Explain equivalent bearing load, load life relationship of rolling contact bearing. **3**
- b) Explain desirable properties of good bearing material for sliding contact bearing. **4**
- c) 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 normal pressure angle is 20°. Determine the components of gear tooth force acting on the worm and worm wheel. **7**
7. a) Explain formative number of teeth in bevel gear. **3**
- b) Explain working of hydrostatic journal bearing with neat sketch. **4**
- c) The following data is given for a 360° hydrodynamic bearing :
- Length to diameter ratio = 1
 Journal speed = 1350 rpm
 Journal diameter = 100 mm
 Diametral clearance = 100 microns
 External load = 9 kN
 Sommerfeld no. = 0.0828
 The value of minimum film thickness variable is 0.3. Find the viscosity of oil that need be used. **7**



SLR-TJ – 112

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

Set	S
-----	----------

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book on Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

14

1. Choose the correct answer :

I) Match the pairs :

4

List – I

List – II

- | | |
|----------------------|--|
| A) Worm Gears | P) Non-parallel, non-intersecting shafts |
| B) Rack and pinion | Q) Non-parallel intersecting shafts |
| C) Bevel Gears | R) No axial thrust |
| D) Herringbone gears | S) Axes are parallel and one of the gear has infinite radius |
| | T) Parallel intersecting shafts |

II) Multiple correct answer type questions, carrying **two** marks **each** :

6

- A) Rolling contact bearings are classified according to
- | | |
|----------------------------|---------------------------------|
| a) Type of rolling element | b) Magnitude of load |
| c) Direction of load | d) Diameter of balls or rollers |
- B) In case of helical gears
- | |
|--|
| a) Hand of helix is same |
| b) Hand of helix is opposite |
| c) The helix angle of pinion and gear is same |
| d) The helix angle of pinion and gear is different |
- C) Which of the following bearings can take load in both radial and axial direction ?
- | | |
|-------------------------------|-----------------------------|
| a) Cylindrical Roller Bearing | b) Taper Roller Bearing |
| c) Thrust Ball Bearing | d) Deep Groove Ball Bearing |

P.T.O.



III) Single correct answer type questions, carrying **one** mark **each** :

4

- A) Reducing pressure angle on gears results in
- a) Weaker teeth
 - b) Stronger teeth
 - c) High velocity ratio
 - d) None of the above
- B) Twenty degree full depth involute profiled 19 tooth pinion and 37 tooth gear are in mesh. If the module is 5 mm, the center distance between the gear pair will be
- a) 140 mm
 - b) 150 mm
 - c) 280 mm
 - d) 300 mm
- C) In involute gear teeth, the base circle must be
- a) under the root circle
 - b) at the root circle
 - c) above the pitch circle
 - d) under the pitch circle
- D) A cylinder is considered thin when the ratio of its inner diameter to the wall thickness is
- a) Less than 15
 - b) More than 15
 - c) More than 20
 - d) Less than 20
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
MACHINE DESIGN – II**

Day and Date : Friday, 24-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Make necessary assumptions, **if** required.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non programmable calculator is **permitted**.

SECTION – I

2. a) Explain the terms static and dynamic load acting on meshing teeth of gears. **4**
- b) Define the beam strength and wear strength of gear tooth. **3**
- c) A spur gear pinion having 18 teeth is to mesh with a gear having 43 teeth. The pinion and gear are made of plain carbon steels having ultimate tensile strength of 600 N/mm² and 420 N/mm² respectively. The pinion is supplied with 10 kW power at 1440 rpm. The starting torque is twice the rated torque. The facewidth is 10 times the module and tooth system is 20 degree full depth involute. Both the gears are case hardened to 400 B.H.N. Factor of safety is 1.5. Assume velocity factor to account for the dynamic load and determine the module of the gears.
- Use $C_v = 0.375$
- Y for 18 teeth = 0.308
- Y for 43 teeth = 0.396. **7**
3. a) Derive the expression for virtual number of teeth for helical gears. **3**
- b) A parallel helical gear pair with a centre distance of 240 mm transmits 7.5 kW power from a 22 teeth right hand pinion rotating at 1500 rpm to a gear rotating at 375 rpm. The normal pressure angle is 20° and the helix angle is 23°. Determine the components of resultant force acting on meshing teeth. If the pinion is rotating in anticlockwise direction when viewed from left, draw the free body diagram of force components acting on both pinion and gear meshing tooth. **6**
- c) An air receiver consists of a cylinder having length twice its inside diameter. It is closed by the hemispherical end closures. It has a storage capacity of 0.30 m³ and inside pressure of 5 MPa. The material used is plain carbon steel ($S_{ut} = 360 \text{ N/mm}^2$). Use factor of safety of design as 4. Determine the thickness of cylinder and hemispherical end closures considering the joint efficiency of 85%. **5**

Set S



4. a) Explain adequate design and optimum design with suitable examples. **3**
- b) Formulate the PDE, SDE and LE for a shaft subjected to torque T. The objective of design is minimum weight of the shaft. **4**
- c) A high pressure compound cylinder consists of inner steel cylinder with inside and outside diameters of 100 mm and 150 mm respectively. It is reinforced by shrinking a steel cylinder of outer diameter of 200 mm. The difference between the outer diameter of inner cylinder and inner diameter of outer cylinder is 0.15 mm. If the modulus of elasticity of the steel is $2.07 \times 10^5 \text{ N/mm}^2$, Calculate
- The shrinkage pressure
 - Maximum hoop stress induced in any of the cylinders. **7**

SECTION – II

5. a) Draw neat sketch of bevel gear indicating its terminology. **3**
- b) Derive the relation for efficiency of worm gear. **4**
- c) Pair of bevel gears, with 20° pressure angle, consists of 20 teeth pinion meshing with 30 teeth gear. The module is 4 mm while the face width is 20 mm. Material for the pinion and gear is steel 50c4 ($S_{ut} = 660 \text{ N/mm}^2$) gears are machined to meet the specifications of grade 8 and the surface hardness is 400 B.H.N. the pinion rotates at 400 r.p.m. and receives power from the electric motor. The starting torque of the motor is 150 % of the rated torque. Assuming F.S. = 2, determine the rated power that the gear can transmit. Take $Y = 0.337$, $e = 16 + 1.25 (m + 0.25 \sqrt{2(rm)})$. Where r_m – mean radius. **7**
6. a) Explain equivalent bearing load, load life relationship of rolling contact bearing. **3**
- b) Explain desirable properties of good bearing material for sliding contact bearing. **4**
- c) 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 normal pressure angle is 20° . Determine the components of gear tooth force acting on the worm and worm wheel. **7**
7. a) Explain formative number of teeth in bevel gear. **3**
- b) Explain working of hydrostatic journal bearing with neat sketch. **4**
- c) The following data is given for a 360° hydrodynamic bearing :
- Length to diameter ratio = 1
 - Journal speed = 1350 rpm
 - Journal diameter = 100 mm
 - Diametral clearance = 100 microns
 - External load = 9 kN
 - Sommerfeld no. = 0.0828
- The value of minimum film thickness variable is 0.3. Find the viscosity of oil that need be used. **7**



SLR-TJ – 113

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

Set	P
-----	----------

T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 2) Make necessary assumptions, **if required** and mention it **clearly**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Match the pairs :

(4×1=4)

Column (1)

Column (2)

- | | |
|---|--|
| a) Circular polariscope light field arrangement | p) Fractional fringe order determination |
| b) Differential shunt balance | q) Half order fringe determination |
| c) Tardy's method | r) Coarse balance |
| d) Direct shunt balance | s) Fine balance |

B) Solve multiple choice answers :

(3×2=6)

- 1) The resistance of electrical resistance strain gauge is
 - a) Directly proportional to specific resistance
 - b) Inversely proportional to cross sectional area
 - c) Directly proportional to cross sectional area
 - d) Directly proportional to length
- 2) Strain gauges are broadly classified as
 - a) Electrical resistance type
 - b) Pressure operated type
 - c) Semiconductor type
 - d) Flow operated type
- 3) Principal stresses can be separated using
 - a) Oblique incidence method
 - b) Electrical analogy method
 - c) Method based on Hooke's law
 - d) Babinet Soleil method

P.T.O.



C) Solve classical objectives :

(4×1=4)

- 1) Gauge factor is defined as ratio of
 - a) Applied strain to resistance change per unit of initial resistance
 - b) Lateral strain to the linear strain
 - c) Resistance change per unit of initial resistance to applied strain
 - d) Stress to Young's modulus
 - 2) In Plane Polariscopes arrangement _____ are seen.
 - a) Isoclinics
 - b) Isochromatics
 - c) Isothermals
 - d) Isobars
 - 3) The Babinet-Soleil method compensator is inserted between
 - a) Polariser and photo-elastic model
 - b) Photo-elastic model and quarter wave plate – II
 - c) Quarter wave plate – II and analyser
 - d) Quarter wave plate – I and photo-elastic model
 - 4) A strain gauge transducer using proving ring measures
 - a) Pressure
 - b) Torque
 - c) Load
 - d) Temperature
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Draw **neat** diagrams **wherever** necessary.
 - 4) Make necessary assumptions, **if required** and mention it **clearly**.

SECTION – I

2. a) Explain in brief :
 - i) Polarization of light
 - ii) Isoclinics
 - iii) Isochromatics. 6
- b) Derive the expression for the light intensity seen through analyzer when the stressed model is kept in the light field circular polariscope. 8
3. a) Explain, with arrangement, Tardy's method. 6
- b) A loaded two dimensional photo elastic model of 8 mm thickness is observed in circular polariscope. The isochromatic fringe pattern revealed that the point of interest lies between 4th and 5th order fringe. On rotation of analyzer through 150°, the 5th order fringe passed through the point of interest. Calculate the fractional fringe order and maximum shear stress if material fringe value is 14.5 N/mm. 8
4. a) Explain the method based on Hooke's law. 8
- b) Explain the properties of different photo elastic materials. 6

Set P



SECTION – II

5. a) Explain the method of bonding and moisture proofing of strain gauge. **6**
- b) The strain readings as measured by a three element rectangular rosette at a point in the stressed body are as follows :
- $\varepsilon_a = -550 \mu\text{m/m}$, $\varepsilon_b = -250 \mu\text{m/m}$ and $\varepsilon_c = 450 \mu\text{m/m}$.
- Determine the maximum principal strain direction, the principal stresses, principal strains and the maximum shear stress. Given : $E = 210 \text{ GPa}$ and $\mu = 0.3$. **8**
6. a) Explain measurement of pressure by using strain gauges. **6**
- b) Derive an expression for output voltage of : **8**
- i) Wheatstone Bridge with two equal magnitude strains of the same nature.
- ii) Wheatstone Bridge with all four arms sensitive to strain with equal magnitude and opposite natures of strain.
7. a) Explain Moire Fringe method. What are the merits and demerits ? **8**
- b) Derive an expression for condition of balancing of Wheatstone Bridge. **6**
8. a) Derive expression to determine transverse sensitivity of a strain gauge. **8**
- b) Explain Brittle coating method and its applications. **6**
-



SLR-TJ – 113

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

Set	Q
-----	----------

T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 2) Make necessary assumptions, **if required** and mention it **clearly**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Solve classical objectives : **(4×1=4)**
- 1) Gauge factor is defined as ratio of
 - a) Applied strain to resistance change per unit of initial resistance
 - b) Lateral strain to the linear strain
 - c) Resistance change per unit of initial resistance to applied strain
 - d) Stress to Young's modulus
 - 2) In Plane Polariscope arrangement _____ are seen.
 - a) Isoclinics
 - b) Isochromatics
 - c) Isothermals
 - d) Isobars
 - 3) The Babinet-Soleil method compensator is inserted between
 - a) Polariser and photo-elastic model
 - b) Photo-elastic model and quarter wave plate – II
 - c) Quarter wave plate – II and analyser
 - d) Quarter wave plate – I and photo-elastic model
 - 4) A strain gauge transducer using proving ring measures
 - a) Pressure
 - b) Torque
 - c) Load
 - d) Temperature

P.T.O.



B) Match the pairs :

(4×1=4)

Column (1)

Column (2)

- | | |
|---|--|
| a) Circular polariscope light field arrangement | p) Fractional fringe order determination |
| b) Differential shunt balance | q) Half order fringe determination |
| c) Tardy's method | r) Coarse balance |
| d) Direct shunt balance | s) Fine balance |

C) Solve multiple choice answers :

(3×2=6)

- 1) The resistance of electrical resistance strain gauge is
 - a) Directly proportional to specific resistance
 - b) Inversely proportional to cross sectional area
 - c) Directly proportional to cross sectional area
 - d) Directly proportional to length
 - 2) Strain gauges are broadly classified as
 - a) Electrical resistance type
 - b) Pressure operated type
 - c) Semiconductor type
 - d) Flow operated type
 - 3) Principal stresses can be separated using
 - a) Oblique incidence method
 - b) Electrical analogy method
 - c) Method based on Hooke's law
 - d) Babinet Soleil method
-



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

T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Draw **neat** diagrams **wherever** necessary.
 - 4) Make necessary assumptions, **if required** and mention it **clearly**.

SECTION – I

2. a) Explain in brief :
 - i) Polarization of light
 - ii) Isoclinics
 - iii) Isochromatics. 6
- b) Derive the expression for the light intensity seen through analyzer when the stressed model is kept in the light field circular polariscope. 8
3. a) Explain, with arrangement, Tardy's method. 6
- b) A loaded two dimensional photo elastic model of 8 mm thickness is observed in circular polariscope. The isochromatic fringe pattern revealed that the point of interest lies between 4th and 5th order fringe. On rotation of analyzer through 150°, the 5th order fringe passed through the point of interest. Calculate the fractional fringe order and maximum shear stress if material fringe value is 14.5 N/mm. 8
4. a) Explain the method based on Hooke's law. 8
- b) Explain the properties of different photo elastic materials. 6

Set Q



SECTION – II

5. a) Explain the method of bonding and moisture proofing of strain gauge. **6**
- b) The strain readings as measured by a three element rectangular rosette at a point in the stressed body are as follows :
- $\varepsilon_a = -550 \mu\text{m/m}$, $\varepsilon_b = -250 \mu\text{m/m}$ and $\varepsilon_c = 450 \mu\text{m/m}$.
- Determine the maximum principal strain direction, the principal stresses, principal strains and the maximum shear stress. Given : $E = 210 \text{ GPa}$ and $\mu = 0.3$. **8**
6. a) Explain measurement of pressure by using strain gauges. **6**
- b) Derive an expression for output voltage of : **8**
- i) Wheatstone Bridge with two equal magnitude strains of the same nature.
- ii) Wheatstone Bridge with all four arms sensitive to strain with equal magnitude and opposite natures of strain.
7. a) Explain Moire Fringe method. What are the merits and demerits ? **8**
- b) Derive an expression for condition of balancing of Wheatstone Bridge. **6**
8. a) Derive expression to determine transverse sensitivity of a strain gauge. **8**
- b) Explain Brittle coating method and its applications. **6**
-



SLR-TJ – 113

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

Set	R
-----	---

T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 2) Make necessary assumptions, **if required** and mention it **clearly**.
 - 3) Figures to the **right** indicate **full marks**.
 - 4) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Solve multiple choice answers : **(3×2=6)**
- 1) The resistance of electrical resistance strain gauge is
 - a) Directly proportional to specific resistance
 - b) Inversely proportional to cross sectional area
 - c) Directly proportional to cross sectional area
 - d) Directly proportional to length
 - 2) Strain gauges are broadly classified as
 - a) Electrical resistance type
 - b) Pressure operated type
 - c) Semiconductor type
 - d) Flow operated type
 - 3) Principal stresses can be separated using
 - a) Oblique incidence method
 - b) Electrical analogy method
 - c) Method based on Hooke's law
 - d) Babinet Soleil method
- B) Solve classical objectives : **(4×1=4)**
- 1) Gauge factor is defined as ratio of
 - a) Applied strain to resistance change per unit of initial resistance
 - b) Lateral strain to the linear strain
 - c) Resistance change per unit of initial resistance to applied strain
 - d) Stress to Young's modulus
 - 2) In Plane Polariscope arrangement _____ are seen.
 - a) Isoclinics
 - b) Isochromatics
 - c) Isothermals
 - d) Isobars

P.T.O.



- 3) The Babinet-Soleil method compensator is inserted between
- a) Polariser and photo-elastic model
 - b) Photo-elastic model and quarter wave plate – II
 - c) Quarter wave plate – II and analyser
 - d) Quarter wave plate – I and photo-elastic model
- 4) A strain gauge transducer using proving ring measures
- a) Pressure
 - b) Torque
 - c) Load
 - d) Temperature

C) Match the pairs :

(4×1=4)

Column (1)

Column (2)

- | | |
|---|--|
| a) Circular polariscope light field arrangement | p) Fractional fringe order determination |
| b) Differential shunt balance | q) Half order fringe determination |
| c) Tardy's method | r) Coarse balance |
| d) Direct shunt balance | s) Fine balance |
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Draw **neat** diagrams **wherever** necessary.
 - 4) Make necessary assumptions, **if required** and mention it **clearly**.

SECTION – I

2. a) Explain in brief :
 - i) Polarization of light
 - ii) Isoclinics
 - iii) Isochromatics. 6
- b) Derive the expression for the light intensity seen through analyzer when the stressed model is kept in the light field circular polariscope. 8
3. a) Explain, with arrangement, Tardy's method. 6
- b) A loaded two dimensional photo elastic model of 8 mm thickness is observed in circular polariscope. The isochromatic fringe pattern revealed that the point of interest lies between 4th and 5th order fringe. On rotation of analyzer through 150°, the 5th order fringe passed through the point of interest. Calculate the fractional fringe order and maximum shear stress if material fringe value is 14.5 N/mm. 8
4. a) Explain the method based on Hooke's law. 8
- b) Explain the properties of different photo elastic materials. 6

Set R



SECTION – II

5. a) Explain the method of bonding and moisture proofing of strain gauge. **6**
- b) The strain readings as measured by a three element rectangular rosette at a point in the stressed body are as follows :
- $\varepsilon_a = -550 \mu\text{m/m}$, $\varepsilon_b = -250 \mu\text{m/m}$ and $\varepsilon_c = 450 \mu\text{m/m}$.
- Determine the maximum principal strain direction, the principal stresses, principal strains and the maximum shear stress. Given : $E = 210 \text{ GPa}$ and $\mu = 0.3$. **8**
6. a) Explain measurement of pressure by using strain gauges. **6**
- b) Derive an expression for output voltage of : **8**
- i) Wheatstone Bridge with two equal magnitude strains of the same nature.
- ii) Wheatstone Bridge with all four arms sensitive to strain with equal magnitude and opposite natures of strain.
7. a) Explain Moire Fringe method. What are the merits and demerits ? **8**
- b) Derive an expression for condition of balancing of Wheatstone Bridge. **6**
8. a) Derive expression to determine transverse sensitivity of a strain gauge. **8**
- b) Explain Brittle coating method and its applications. **6**
-



SLR-TJ – 113

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

Set	S
-----	----------

T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
 - 2) Make necessary assumptions, **if required** and mention it **clearly**.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Solve classical objectives : **(4×1=4)**
- 1) The Babinet-Soleil method compensator is inserted between
 - a) Polariser and photo-elastic model
 - b) Photo-elastic model and quarter wave plate – II
 - c) Quarter wave plate – II and analyser
 - d) Quarter wave plate – I and photo-elastic model
 - 2) A strain gauge transducer using proving ring measures
 - a) Pressure
 - b) Torque
 - c) Load
 - d) Temperature
 - 3) Gauge factor is defined as ratio of
 - a) Applied strain to resistance change per unit of initial resistance
 - b) Lateral strain to the linear strain
 - c) Resistance change per unit of initial resistance to applied strain
 - d) Stress to Young's modulus
 - 4) In Plane Polariscope arrangement _____ are seen.
 - a) Isoclinics
 - b) Isochromatics
 - c) Isothermals
 - d) Isobars

P.T.O.



B) Match the pairs :

(4×1=4)

Column (1)

Column (2)

- | | |
|---|--|
| a) Circular polariscope light field arrangement | p) Fractional fringe order determination |
| b) Differential shunt balance | q) Half order fringe determination |
| c) Tardy's method | r) Coarse balance |
| d) Direct shunt balance | s) Fine balance |

C) Solve multiple choice answers :

(3×2=6)

- 1) Principal stresses can be separated using
 - a) Oblique incidence method
 - b) Electrical analogy method
 - c) Method based on Hooke's law
 - d) Babinet Soleil method
 - 2) Strain gauges are broadly classified as
 - a) Electrical resistance type
 - b) Pressure operated type
 - c) Semiconductor type
 - d) Flow operated type
 - 3) The resistance of electrical resistance strain gauge is
 - a) Directly proportional to specific resistance
 - b) Inversely proportional to cross sectional area
 - c) Directly proportional to cross sectional area
 - d) Directly proportional to length
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
Professional Elective II : EXPERIMENTAL STRESS ANALYSIS**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) Solve **any two** questions from **each** Section I and II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Draw **neat** diagrams **wherever** necessary.
 - 4) Make necessary assumptions, **if required** and mention it **clearly**.

SECTION – I

2. a) Explain in brief :
 - i) Polarization of light
 - ii) Isoclinics
 - iii) Isochromatics. 6
- b) Derive the expression for the light intensity seen through analyzer when the stressed model is kept in the light field circular polariscope. 8
3. a) Explain, with arrangement, Tardy's method. 6
- b) A loaded two dimensional photo elastic model of 8 mm thickness is observed in circular polariscope. The isochromatic fringe pattern revealed that the point of interest lies between 4th and 5th order fringe. On rotation of analyzer through 150°, the 5th order fringe passed through the point of interest. Calculate the fractional fringe order and maximum shear stress if material fringe value is 14.5 N/mm. 8
4. a) Explain the method based on Hooke's law. 8
- b) Explain the properties of different photo elastic materials. 6

Set S



SECTION – II

5. a) Explain the method of bonding and moisture proofing of strain gauge. **6**
- b) The strain readings as measured by a three element rectangular rosette at a point in the stressed body are as follows :
- $\varepsilon_a = -550 \mu\text{m/m}$, $\varepsilon_b = -250 \mu\text{m/m}$ and $\varepsilon_c = 450 \mu\text{m/m}$.
- Determine the maximum principal strain direction, the principal stresses, principal strains and the maximum shear stress. Given : $E = 210 \text{ GPa}$ and $\mu = 0.3$. **8**
6. a) Explain measurement of pressure by using strain gauges. **6**
- b) Derive an expression for output voltage of : **8**
- i) Wheatstone Bridge with two equal magnitude strains of the same nature.
- ii) Wheatstone Bridge with all four arms sensitive to strain with equal magnitude and opposite natures of strain.
7. a) Explain Moire Fringe method. What are the merits and demerits ? **8**
- b) Derive an expression for condition of balancing of Wheatstone Bridge. **6**
8. a) Derive expression to determine transverse sensitivity of a strain gauge. **8**
- b) Explain Brittle coating method and its applications. **6**
-



SLR-TJ – 114

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

Set

P

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers. 14
- 1) The commercial sources of energy are
 - a) Solar, Wind, Biomass
 - b) Fossil fuel, Hydropower and nuclear energy
 - c) Wood, animal waste and agriculture energy
 - d) None of the above
 - 2) A curve showing the variation of load on a power station with respect to time is known as
 - a) Load curve
 - b) Load duration curve
 - c) Performance curve
 - d) Flow chart
 - 3) 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
 - 4) For a power plant, the cost of labour is considered as _____ cost.
 - a) Fixed
 - b) Variable
 - c) Progressive
 - d) Major

P.T.O.



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Answer **any two** questions from **each** Section.
ii) Make suitable assumption **if necessary** and state it **clearly**.
iii) Figures to the **right** indicate **full** marks.
iv) **Neat** diagrams must be drawn **whenever** necessary.

SECTION – I

2. a) Discuss the role of private sector in energy Management. **5**
b) Define load curve and what different load curves are considered in designing a power plant ? **5**
c) The peak load on power station is 35 MW. The load having maximum demands of 20 MW, 10 MW and 7 MW are connected to the power station. The capacity of power station is 40 MW and annual load factor is 55%. Find;
i) Average load on the power station.
ii) Demand factor.
iii) Diversity factor. **4**
3. a) Elaborate the cost of electric energy. How to find out depreciation cost of power plant ? **8**
b) Find the cost of generation per kW-hr from the following data :
Capacity of the plant = 120 MW
Capital Cost = Rs. 12,000 per kW installed
Interest and Depreciation = 10% on capital
Fuel Consumption = 1.2 kg/kW-hr
Fuel Cost = Rs. 400 per tonne
Salaries, wages, repairs and maintenance = 6,00,000 per year.
The maximum demand is 80 MW and load factor is 40%. **6**

Set P



4. a) Discuss the impact of energy sources on environment. 5
b) Write a note on compressed air storage plant. 4
c) What are the effect of variable load on power plant design and operation ? 5

SECTION – II

5. a) With neat sketch explain pyreheliometer. 5
b) Define altitude angle, surface azimuth angle and declination angle with neat sketch. 5
c) Define in detail energy Audit. 4
6. a) Discuss basic components of 'WECS'. 5
b) Give detail information about single basin system of tidal power plant. 5
c) Write short note on OTEC. 4
7. a) Explain horizontal axis wind mill in detail. 5
b) What are the features of Energy Conservation Act, 2001 ? 5
c) Define Energy Audit and discuss energy conservation in household sector. 4
-



SLR-TJ – 114

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

Set

Q

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers. 14
- 1) 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
 - 2) The value of solar constant observed by world radiation centre
 - a) 1361 W/m^2
 - b) 1363 W/m^2
 - c) 1367 W/m^2
 - d) 1367 KW/m
 - 3) Maximum wind energy available is proportional to
 - a) Square of the diameter of rotor
 - b) Air density
 - c) Cube of the wind velocity
 - d) All of the above
 - 4) Non-conventional energy sources are available in the form of
 - a) Solar energy, biomass energy, ocean energy, wind energy
 - b) Bio energy, ocean energy, wind energy, wood energy
 - c) Ocean energy, wind energy, geothermal energy, wood energy
 - d) Wood energy, geothermal energy, wind energy, Ocean energy

P.T.O.



- 5) Conservation of energy means using _____ energy for the same level of activity.
- a) More b) Less c) Partial d) Zero
- 6) Approximately _____ of all energy is accounted for during the detailed energy audit.
- a) 95% b) 85% c) 75% d) 65%
- 7) The objective of Energy Audit is to
- a) Spend energy b) Conduct formal survey
c) Save energy d) Promote energy usage
- 8) The commercial sources of energy are
- a) Solar, Wind, Biomass
b) Fossil fuel, Hydropower and nuclear energy
c) Wood, animal waste and agriculture energy
d) None of the above
- 9) A curve showing the variation of load on a power station with respect to time is known as
- a) Load curve b) Load duration curve
c) Performance curve d) Flow chart
- 10) 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
- 11) For a power plant, the cost of labour is considered as _____ cost.
- a) Fixed b) Variable
c) Progressive d) Major
- 12) _____ tariff method is used for industrial customers.
- a) Two part tariff b) Three part tariff
c) Block meter rate d) Straight line meter
- 13) Load factor of power station is generally
- a) Equal to unity b) Less than unity
c) More than unity d) None of the above
- 14) Geothermal plant is suitable for
- a) Base load power b) Peak load power
c) Both a) and b) d) None of the above
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Answer **any two** questions from **each** Section.
ii) Make suitable assumption **if necessary** and state it **clearly**.
iii) Figures to the **right** indicate **full** marks.
iv) **Neat** diagrams must be drawn **whenever** necessary.

SECTION – I

2. a) Discuss the role of private sector in energy Management. 5
b) Define load curve and what different load curves are considered in designing a power plant ? 5
c) The peak load on power station is 35 MW. The load having maximum demands of 20 MW, 10 MW and 7 MW are connected to the power station. The capacity of power station is 40 MW and annual load factor is 55%. Find;
i) Average load on the power station.
ii) Demand factor.
iii) Diversity factor. 4
3. a) Elaborate the cost of electric energy. How to find out depreciation cost of power plant ? 8
b) Find the cost of generation per kW-hr from the following data :
Capacity of the plant = 120 MW
Capital Cost = Rs. 12,000 per kW installed
Interest and Depreciation = 10% on capital
Fuel Consumption = 1.2 kg/kW-hr
Fuel Cost = Rs. 400 per tonne
Salaries, wages, repairs and maintenance = 6,00,000 per year.
The maximum demand is 80 MW and load factor is 40%. 6

Set Q



4. a) Discuss the impact of energy sources on environment. 5
b) Write a note on compressed air storage plant. 4
c) What are the effect of variable load on power plant design and operation ? 5

SECTION – II

5. a) With neat sketch explain pyreheliometer. 5
b) Define altitude angle, surface azimuth angle and declination angle with neat sketch. 5
c) Define in detail energy Audit. 4
6. a) Discuss basic components of 'WECS'. 5
b) Give detail information about single basin system of tidal power plant. 5
c) Write short note on OTEC. 4
7. a) Explain horizontal axis wind mill in detail. 5
b) What are the features of Energy Conservation Act, 2001 ? 5
c) Define Energy Audit and discuss energy conservation in household sector. 4
-



SLR-TJ – 114

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

Set **R**

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers. 14
- 1) _____ tariff method is used for industrial customers.
 - a) Two part tariff
 - b) Three part tariff
 - c) Block meter rate
 - d) Straight line meter
 - 2) Load factor of power station is generally
 - a) Equal to unity
 - b) Less than unity
 - c) More than unity
 - d) None of the above
 - 3) Geothermal plant is suitable for
 - a) Base load power
 - b) Peak load power
 - c) Both a) and b)
 - d) None of the above
 - 4) 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
 - 5) The value of solar constant observed by world radiation centre
 - a) 1361 W/m²
 - b) 1363 W/m²
 - c) 1367 W/m²
 - d) 1367 KW/m

P.T.O.



- 6) Maximum wind energy available is proportional to
- Square of the diameter of rotor
 - Air density
 - Cube of the wind velocity
 - All of the above
- 7) Non-conventional energy sources are available in the form of
- Solar energy, biomass energy, ocean energy, wind energy
 - Bio energy, ocean energy, wind energy, wood energy
 - Ocean energy, wind energy, geothermal energy, wood energy
 - Wood energy, geothermal energy, wind energy, Ocean energy
- 8) Conservation of energy means using _____ energy for the same level of activity.
- More
 - Less
 - Partial
 - Zero
- 9) Approximately _____ of all energy is accounted for during the detailed energy audit.
- 95%
 - 85%
 - 75%
 - 65%
- 10) The objective of Energy Audit is to
- Spend energy
 - Conduct formal survey
 - Save energy
 - Promote energy usage
- 11) The commercial sources of energy are
- Solar, Wind, Biomass
 - Fossil fuel, Hydropower and nuclear energy
 - Wood, animal waste and agriculture energy
 - None of the above
- 12) A curve showing the variation of load on a power station with respect to time is known as
- Load curve
 - Load duration curve
 - Performance curve
 - Flow chart
- 13) Low utilization factor for a power plant indicates that
- Plant is under maintenance
 - Plant is used for base load only
 - Plant is used for stand by purpose only
 - Plant is used for peak load as well as base load
- 14) For a power plant, the cost of labour is considered as _____ cost.
- Fixed
 - Variable
 - Progressive
 - Major



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Answer **any two** questions from **each** Section.
ii) Make suitable assumption **if necessary** and state it **clearly**.
iii) Figures to the **right** indicate **full** marks.
iv) **Neat** diagrams must be drawn **whenever** necessary.

SECTION – I

2. a) Discuss the role of private sector in energy Management. 5
b) Define load curve and what different load curves are considered in designing a power plant ? 5
c) The peak load on power station is 35 MW. The load having maximum demands of 20 MW, 10 MW and 7 MW are connected to the power station. The capacity of power station is 40 MW and annual load factor is 55%. Find;
i) Average load on the power station.
ii) Demand factor.
iii) Diversity factor. 4
3. a) Elaborate the cost of electric energy. How to find out depreciation cost of power plant ? 8
b) Find the cost of generation per kW-hr from the following data :
Capacity of the plant = 120 MW
Capital Cost = Rs. 12,000 per kW installed
Interest and Depreciation = 10% on capital
Fuel Consumption = 1.2 kg/kW-hr
Fuel Cost = Rs. 400 per tonne
Salaries, wages, repairs and maintenance = 6,00,000 per year.
The maximum demand is 80 MW and load factor is 40%. 6

Set R



4. a) Discuss the impact of energy sources on environment. 5
b) Write a note on compressed air storage plant. 4
c) What are the effect of variable load on power plant design and operation ? 5

SECTION – II

5. a) With neat sketch explain pyreheliometer. 5
b) Define altitude angle, surface azimuth angle and declination angle with neat sketch. 5
c) Define in detail energy Audit. 4
6. a) Discuss basic components of 'WECS'. 5
b) Give detail information about single basin system of tidal power plant. 5
c) Write short note on OTEC. 4
7. a) Explain horizontal axis wind mill in detail. 5
b) What are the features of Energy Conservation Act, 2001 ? 5
c) Define Energy Audit and discuss energy conservation in household sector. 4
-



SLR-TJ – 114

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

Set

S

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **Neat diagrams must be drawn whenever necessary.**
 - 2) **Make suitable assumptions if necessary and mention them clearly.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers. 14
- 1) Maximum wind energy available is proportional to
 - a) Square of the diameter of rotor
 - b) Air density
 - c) Cube of the wind velocity
 - d) All of the above
 - 2) Non-conventional energy sources are available in the form of
 - a) Solar energy, biomass energy, ocean energy, wind energy
 - b) Bio energy, ocean energy, wind energy, wood energy
 - c) Ocean energy, wind energy, geothermal energy, wood energy
 - d) Wood energy, geothermal energy, wind energy, Ocean energy
 - 3) Conservation of energy means using _____ energy for the same level of activity.
 - a) More
 - b) Less
 - c) Partial
 - d) Zero
 - 4) Approximately _____ of all energy is accounted for during the detailed energy audit.
 - a) 95%
 - b) 85%
 - c) 75%
 - d) 65%

P.T.O.



- 5) The objective of Energy Audit is to
- a) Spend energy
 - b) Conduct formal survey
 - c) Save energy
 - d) Promote energy usage
- 6) The commercial sources of energy are
- a) Solar, Wind, Biomass
 - b) Fossil fuel, Hydropower and nuclear energy
 - c) Wood, animal waste and agriculture energy
 - d) None of the above
- 7) A curve showing the variation of load on a power station with respect to time is known as
- a) Load curve
 - b) Load duration curve
 - c) Performance curve
 - d) Flow chart
- 8) 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
- 9) For a power plant, the cost of labour is considered as _____ cost.
- a) Fixed
 - b) Variable
 - c) Progressive
 - d) Major
- 10) _____ tariff method is used for industrial customers.
- a) Two part tariff
 - b) Three part tariff
 - c) Block meter rate
 - d) Straight line meter
- 11) Load factor of power station is generally
- a) Equal to unity
 - b) Less than unity
 - c) More than unity
 - d) None of the above
- 12) Geothermal plant is suitable for
- a) Base load power
 - b) Peak load power
 - c) Both a) and b)
 - d) None of the above
- 13) 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
- 14) The value of solar constant observed by world radiation centre
- a) 1361 W/m²
 - b) 1363 W/m²
 - c) 1367 W/m²
 - d) 1367 KW/m
-



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

**T.E. (Mechanical) (Part – II) (CGPA) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING
(Professional Elective – II)**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Answer **any two** questions from **each** Section.
ii) Make suitable assumption **if necessary** and state it **clearly**.
iii) Figures to the **right** indicate **full** marks.
iv) **Neat** diagrams must be drawn **whenever** necessary.

SECTION – I

2. a) Discuss the role of private sector in energy Management. 5
b) Define load curve and what different load curves are considered in designing a power plant ? 5
c) The peak load on power station is 35 MW. The load having maximum demands of 20 MW, 10 MW and 7 MW are connected to the power station. The capacity of power station is 40 MW and annual load factor is 55%. Find;
i) Average load on the power station.
ii) Demand factor.
iii) Diversity factor. 4
3. a) Elaborate the cost of electric energy. How to find out depreciation cost of power plant ? 8
b) Find the cost of generation per kW-hr from the following data :
Capacity of the plant = 120 MW
Capital Cost = Rs. 12,000 per kW installed
Interest and Depreciation = 10% on capital
Fuel Consumption = 1.2 kg/kW-hr
Fuel Cost = Rs. 400 per tonne
Salaries, wages, repairs and maintenance = 6,00,000 per year.
The maximum demand is 80 MW and load factor is 40%. 6

Set S



4. a) Discuss the impact of energy sources on environment. 5
b) Write a note on compressed air storage plant. 4
c) What are the effect of variable load on power plant design and operation ? 5

SECTION – II

5. a) With neat sketch explain pyreheliometer. 5
b) Define altitude angle, surface azimuth angle and declination angle with neat sketch. 5
c) Define in detail energy Audit. 4
6. a) Discuss basic components of 'WECS'. 5
b) Give detail information about single basin system of tidal power plant. 5
c) Write short note on OTEC. 4
7. a) Explain horizontal axis wind mill in detail. 5
b) What are the features of Energy Conservation Act, 2001 ? 5
c) Define Energy Audit and discuss energy conservation in household sector. 4
-



SLR-TJ – 115

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

Set	P
-----	----------

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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) *Solve any three questions from each Section – I and Section – II.*
- 4) *Figures to the right indicate full marks.*
- 5) *Make suitable assumptions if necessary and state them clearly.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :
- 1) If mass of body increases 9 times
 - a) Frequency decreases 3 times
 - b) Frequency increases 3 times
 - c) Frequency does not change
 - d) Zero
 - 2) A system is said to be critically damped if damping factor for the system is
 - a) more than one
 - b) equal to one
 - c) less than one
 - d) equal to zero
 - 3) During resonance
 - a) high amplitude of vibration occurs
 - b) low amplitude of vibration occurs
 - c) no vibration occurs
 - d) vibration remain unaffected
 - 4) Dynamic vibration absorber is suitable for
 - a) constant speed machine
 - b) varying speed machines
 - c) zero speed range machines
 - d) none of above

P.T.O.



- 5) A spring mass system the mass 'm' and spring stiffness 'k' is taken at very high altitude, the natural frequency of longitudinal vibrations.
- increases
 - remain unchanged
 - decreases
 - may increase or decrease depends on value spring mass
- 6) The amount of damping, necessary for critically damped system is called
- damping factor
 - magnification factor
 - critical damping coefficient
 - logarithmic decrement
- 7) A harmonic motion is
- necessarily periodic motion
 - non-periodic motion
 - a motion described in a circle
 - a random motion
- 8) In a dynamic vibration absorber system, under tuned conditions which of following
- $K_1K_2 = M_1M_2$
 - $K_1M_2 = M_1K_2$
 - $K_1M_1 = M_2K_2$
 - None
- 9) Main properties of vibrating system
- Mass and stiffness
 - Mass, stiffness and damping
 - Stiffness and damping
 - Damping and stiffness
- 10) Number of degrees of freedom of a continuous system is
- zero
 - one
 - infinite
 - depends on system
- 11) Accelerometer is designed with
- low frequency
 - high frequency
 - zero frequency
 - none
- 12) Vibrometers have natural frequency of order
- 4 Hz
 - 100 Hz
 - 1000 Hz
 - above 10 kHz
- 13) The material normally used for vibration isolation is
- rubber
 - metallic spring
 - both a) and b)
 - glass
- 14) The frequency of vibration in case of nonlinear system
- is constant
 - is not constant
 - cannot be predicted
 - none



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

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Solve **any two** questions from **each** Section – I and Section – II.
2) Figures to the **right** indicate **full** marks.
3) Make suitable assumptions **if necessary** and state them **clearly**.

SECTION – I

2. a) Define following terms : 8
i) Simple Harmonic Motion
ii) Resonance
iii) Stiffness
iv) Forced vibration.
- b) State types of damping and explain any one type of damping system. 6
3. a) Explain steps involved in vibration analysis. 7
b) Discuss various ways to derive equation of motion for single degree of freedom systems. 7
4. a) Three Rail bogies are connected by two springs of stiffness 40×10^5 N/mm each as shown in figure (1). The mass of each bogie is 20×10^3 kg. Determine the frequencies of vibration. Neglect the friction between the wheels and rails. 7

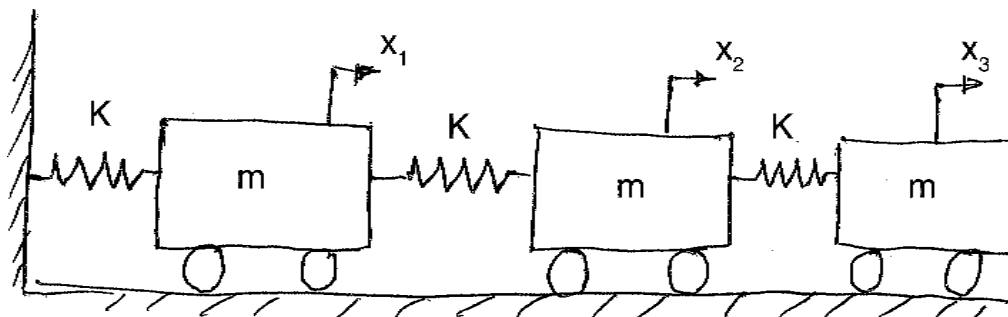


Figure (1)

- b) Explain in short different types of vibrations. 7



SECTION – II

5. a) Explain in brief probability distribution and probability density function. **5**
b) Explain FFT analyzer in brief. **5**
c) Write a short note on Vibration Isolation. **4**
6. a) What is dynamic vibration absorber and show effect of mass ratio on frequency ratio of undamped dynamic vibration absorber ? **7**
b) Explain in brief Random Variable and Random Process in random vibration. **7**
7. Write a short note on (attempt **any two**) : **14**
a) Deterministic and random vibration
b) Accelerometer
c) Time and frequency signal analysis.
-



SLR-TJ – 115

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

Set	Q
-----	---

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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) *Solve any three questions from each Section – I and Section – II.*
4) *Figures to the right indicate full marks.*
5) *Make suitable assumptions if necessary and state them clearly.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) In a dynamic vibration absorber system, under tuned conditions which of following
 - a) $K_1K_2 = M_1M_2$
 - b) $K_1M_2 = M_1K_2$
 - c) $K_1M_1 = M_2K_2$
 - d) None
- 2) Main properties of vibrating system
 - a) Mass and stiffness
 - b) Mass, stiffness and damping
 - c) Stiffness and damping
 - d) Damping and stiffness
- 3) Number of degrees of freedom of a continuous system is
 - a) zero
 - b) one
 - c) infinite
 - d) depends on system
- 4) Accelerometer is designed with
 - a) low frequency
 - b) high frequency
 - c) zero frequency
 - d) none
- 5) Vibrometers have natural frequency of order
 - a) 4 Hz
 - b) 100 Hz
 - c) 1000 Hz
 - d) above 10 kHz

P.T.O.



- 6) The material normally used for vibration isolation is
- a) rubber
 - b) metallic spring
 - c) both a) and b)
 - d) glass
- 7) The frequency of vibration in case of nonlinear system
- a) is constant
 - b) is not constant
 - c) cannot be predicted
 - d) none
- 8) If mass of body increases 9 times
- a) Frequency decreases 3 times
 - b) Frequency increases 3 times
 - c) Frequency does not change
 - d) Zero
- 9) A system is said to be critically damped if damping factor for the system is
- a) more than one
 - b) equal to one
 - c) less than one
 - d) equal to zero
- 10) During resonance
- a) high amplitude of vibration occurs
 - b) low amplitude of vibration occurs
 - c) no vibration occurs
 - d) vibration remain unaffected
- 11) Dynamic vibration absorber is suitable for
- a) constant speed machine
 - b) varying speed machines
 - c) zero speed range machines
 - d) none of above
- 12) A spring mass system the mass 'm' and spring stiffness 'k' is taken at very high altitude, the natural frequency of longitudinal vibrations.
- a) increases
 - b) remain unchanged
 - c) decreases
 - d) may increase or decrease depends on value spring mass
- 13) The amount of damping, necessary for critically damped system is called
- a) damping factor
 - b) magnification factor
 - c) critical damping coefficient
 - d) logarithmic decrement
- 14) A harmonic motion is
- a) necessarily periodic motion
 - b) non-periodic motion
 - c) a motion described in a circle
 - d) a random motion



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

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Solve **any two** questions from **each** Section – I and Section – II.
2) Figures to the **right** indicate **full** marks.
3) Make suitable assumptions **if necessary** and state them **clearly**.

SECTION – I

2. a) Define following terms : 8
i) Simple Harmonic Motion
ii) Resonance
iii) Stiffness
iv) Forced vibration.
- b) State types of damping and explain any one type of damping system. 6
3. a) Explain steps involved in vibration analysis. 7
b) Discuss various ways to derive equation of motion for single degree of freedom systems. 7
4. a) Three Rail bogies are connected by two springs of stiffness 40×10^5 N/mm each as shown in figure (1). The mass of each bogie is 20×10^3 kg. Determine the frequencies of vibration. Neglect the friction between the wheels and rails. 7

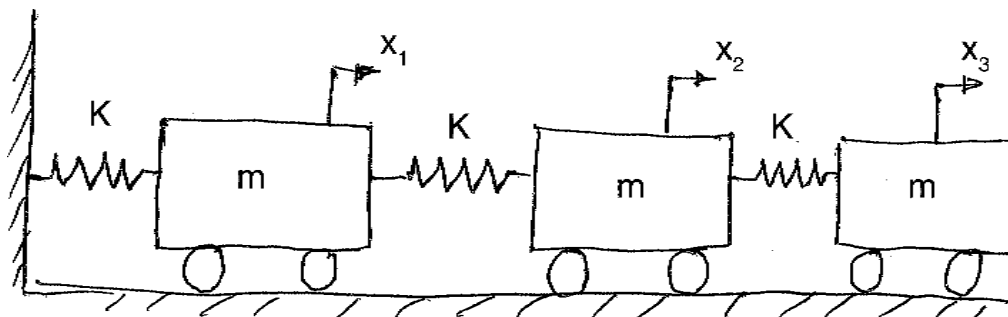


Figure (1)

- b) Explain in short different types of vibrations. 7



SECTION – II

5. a) Explain in brief probability distribution and probability density function. **5**
b) Explain FFT analyzer in brief. **5**
c) Write a short note on Vibration Isolation. **4**
6. a) What is dynamic vibration absorber and show effect of mass ratio on frequency ratio of undamped dynamic vibration absorber ? **7**
b) Explain in brief Random Variable and Random Process in random vibration. **7**
7. Write a short note on (attempt **any two**) : **14**
a) Deterministic and random vibration
b) Accelerometer
c) Time and frequency signal analysis.
-



SLR-TJ – 115

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

Set **R**

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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) *Solve any three questions from each Section – I and Section – II.*
4) *Figures to the right indicate full marks.*
5) *Make suitable assumptions if necessary and state them clearly.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) A spring mass system the mass 'm' and spring stiffness 'k' is taken at very high altitude, the natural frequency of longitudinal vibrations.
 - a) increases
 - b) remain unchanged
 - c) decreases
 - d) may increase or decrease depends on value spring mass
- 2) The amount of damping, necessary for critically damped system is called
 - a) damping factor
 - b) magnification factor
 - c) critical damping coefficient
 - d) logarithmic decrement
- 3) A harmonic motion is
 - a) necessarily periodic motion
 - b) non-periodic motion
 - c) a motion described in a circle
 - d) a random motion
- 4) In a dynamic vibration absorber system, under tuned conditions which of following
 - a) $K_1K_2 = M_1M_2$
 - b) $K_1M_2 = M_1K_2$
 - c) $K_1M_1 = M_2K_2$
 - d) None

P.T.O.



- 5) Main properties of vibrating system
- a) Mass and stiffness
 - b) Mass, stiffness and damping
 - c) Stiffness and damping
 - d) Damping and stiffness
- 6) Number of degrees of freedom of a continuous system is
- a) zero
 - b) one
 - c) infinite
 - d) depends on system
- 7) Accelerometer is designed with
- a) low frequency
 - b) high frequency
 - c) zero frequency
 - d) none
- 8) Vibrometers have natural frequency of order
- a) 4 Hz
 - b) 100 Hz
 - c) 1000 Hz
 - d) above 10 kHz
- 9) The material normally used for vibration isolation is
- a) rubber
 - b) metallic spring
 - c) both a) and b)
 - d) glass
- 10) The frequency of vibration in case of nonlinear system
- a) is constant
 - b) is not constant
 - c) cannot be predicted
 - d) none
- 11) If mass of body increases 9 times
- a) Frequency decreases 3 times
 - b) Frequency increases 3 times
 - c) Frequency does not change
 - d) Zero
- 12) A system is said to be critically damped if damping factor for the system is
- a) more than one
 - b) equal to one
 - c) less than one
 - d) equal to zero
- 13) During resonance
- a) high amplitude of vibration occurs
 - b) low amplitude of vibration occurs
 - c) no vibration occurs
 - d) vibration remain unaffected
- 14) Dynamic vibration absorber is suitable for
- a) constant speed machine
 - b) varying speed machines
 - c) zero speed range machines
 - d) none of above
-



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

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Solve **any two** questions from **each** Section – I and Section – II.
2) Figures to the **right** indicate **full** marks.
3) Make suitable assumptions **if necessary** and state them **clearly**.

SECTION – I

2. a) Define following terms : 8
i) Simple Harmonic Motion
ii) Resonance
iii) Stiffness
iv) Forced vibration.
- b) State types of damping and explain any one type of damping system. 6
3. a) Explain steps involved in vibration analysis. 7
b) Discuss various ways to derive equation of motion for single degree of freedom systems. 7
4. a) Three Rail bogies are connected by two springs of stiffness 40×10^5 N/mm each as shown in figure (1). The mass of each bogie is 20×10^3 kg. Determine the frequencies of vibration. Neglect the friction between the wheels and rails. 7

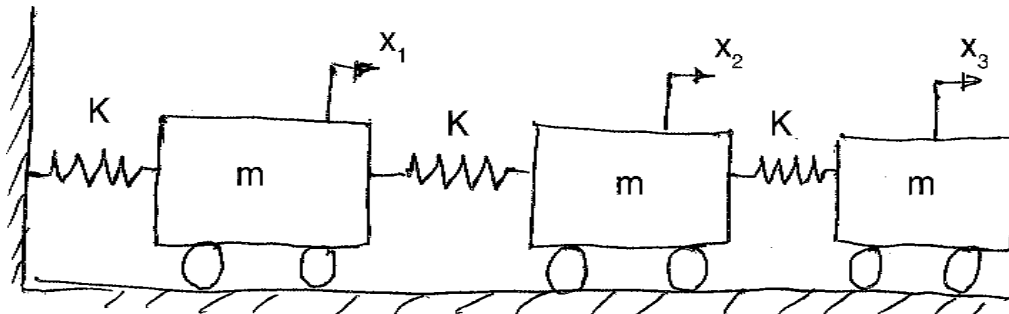


Figure (1)

- b) Explain in short different types of vibrations. 7



SECTION – II

5. a) Explain in brief probability distribution and probability density function. **5**
b) Explain FFT analyzer in brief. **5**
c) Write a short note on Vibration Isolation. **4**
6. a) What is dynamic vibration absorber and show effect of mass ratio on frequency ratio of undamped dynamic vibration absorber ? **7**
b) Explain in brief Random Variable and Random Process in random vibration. **7**
7. Write a short note on (attempt **any two**) : **14**
a) Deterministic and random vibration
b) Accelerometer
c) Time and frequency signal analysis.
-



SLR-TJ – 115

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

Set	S
-----	----------

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- 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) *Solve any three questions from each Section – I and Section – II.*
4) *Figures to the right indicate full marks.*
5) *Make suitable assumptions if necessary and state them clearly.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- 1) Number of degrees of freedom of a continuous system is
 - a) zero
 - b) one
 - c) infinite
 - d) depends on system
- 2) Accelerometer is designed with
 - a) low frequency
 - b) high frequency
 - c) zero frequency
 - d) none
- 3) Vibrometers have natural frequency of order
 - a) 4 Hz
 - b) 100 Hz
 - c) 1000 Hz
 - d) above 10 kHz
- 4) The material normally used for vibration isolation is
 - a) rubber
 - b) metallic spring
 - c) both a) and b)
 - d) glass
- 5) The frequency of vibration in case of nonlinear system
 - a) is constant
 - b) is not constant
 - c) cannot be predicted
 - d) none

P.T.O.



- 6) If mass of body increases 9 times
- a) Frequency decreases 3 times b) Frequency increases 3 times
c) Frequency does not change d) Zero
- 7) A system is said to be critically damped if damping factor for the system is
- a) more than one b) equal to one
c) less than one d) equal to zero
- 8) During resonance
- a) high amplitude of vibration occurs
b) low amplitude of vibration occurs
c) no vibration occurs
d) vibration remain unaffected
- 9) Dynamic vibration absorber is suitable for
- a) constant speed machine b) varying speed machines
c) zero speed range machines d) none of above
- 10) A spring mass system the mass 'm' and spring stiffness 'k' is taken at very high altitude, the natural frequency of longitudinal vibrations.
- a) increases
b) remain unchanged
c) decreases
d) may increase or decrease depends on value spring mass
- 11) The amount of damping, necessary for critically damped system is called
- a) damping factor b) magnification factor
c) critical damping coefficient d) logarithmic decrement
- 12) A harmonic motion is
- a) necessarily periodic motion b) non-periodic motion
c) a motion described in a circle d) a random motion
- 13) In a dynamic vibration absorber system, under tuned conditions which of following
- a) $K_1K_2 = M_1M_2$ b) $K_1M_2 = M_1K_2$
c) $K_1M_1 = M_2K_2$ d) None
- 14) Main properties of vibrating system
- a) Mass and stiffness b) Mass, stiffness and damping
c) Stiffness and damping d) Damping and stiffness



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

**T.E. (Mech.) (Part – II) (Professional Elective – II) (CGPA)
Examination, 2017
MECHANICAL VIBRATION**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Solve **any two** questions from **each** Section – I and Section – II.
2) Figures to the **right** indicate **full** marks.
3) Make suitable assumptions **if necessary** and state them **clearly**.

SECTION – I

2. a) Define following terms : 8
i) Simple Harmonic Motion
ii) Resonance
iii) Stiffness
iv) Forced vibration.
- b) State types of damping and explain any one type of damping system. 6
3. a) Explain steps involved in vibration analysis. 7
b) Discuss various ways to derive equation of motion for single degree of freedom systems. 7
4. a) Three Rail bogies are connected by two springs of stiffness 40×10^5 N/mm each as shown in figure (1). The mass of each bogie is 20×10^3 kg. Determine the frequencies of vibration. Neglect the friction between the wheels and rails. 7

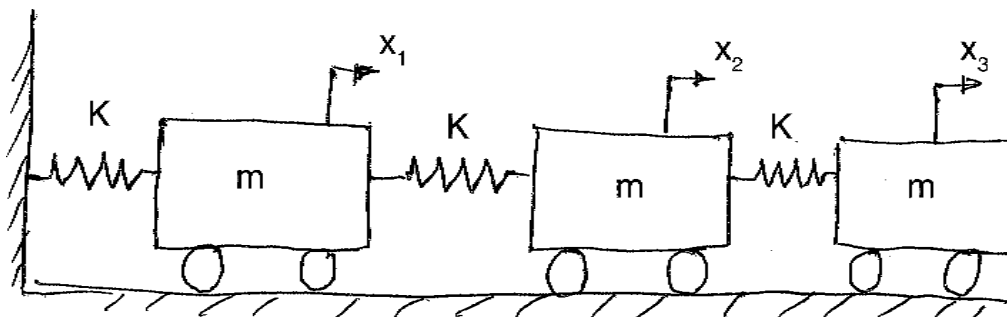


Figure (1)

- b) Explain in short different types of vibrations. 7



SECTION – II

5. a) Explain in brief probability distribution and probability density function. **5**
b) Explain FFT analyzer in brief. **5**
c) Write a short note on Vibration Isolation. **4**
6. a) What is dynamic vibration absorber and show effect of mass ratio on frequency ratio of undamped dynamic vibration absorber ? **7**
b) Explain in brief Random Variable and Random Process in random vibration. **7**
7. Write a short note on (attempt **any two**) : **14**
a) Deterministic and random vibration
b) Accelerometer
c) Time and frequency signal analysis.
-



SLR-TJ – 116

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

Set	P
-----	----------

**T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
- 2) **Assume** suitable data **wherever** necessary and state **it clearly**.
- 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3.
- 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- A) A diamond locating pin is used in jigs and fixture because **1**
- a) It has long life
 - b) It is easy to machine
 - c) It does not wear fast
 - d) Center distance of hole is taken care of
- B) In sheet metal blanking, shear is provided on die so that **1**
- a) Press load is reduced
 - b) Good cut edge is obtained
 - c) Warping of sheet is minimized
 - d) None of the above
- C) Orthogonal cutting system is called **1**
- a) Two dimensional cutting system
 - b) Multidimensional cutting system
 - c) Three dimensional cutting system
 - d) None of the above

P.T.O.



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

**T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
2) **Assume** suitable data wherever **necessary** and state it clearly.

SECTION – I

2. a) Design the press tool for production of component in Fig No.1 giving following details :
- 1) Cutting force
 - 2) Clearance between die and punch
 - 3) Strip layout.

14

Also draw one sectional view of assembly showing all details.

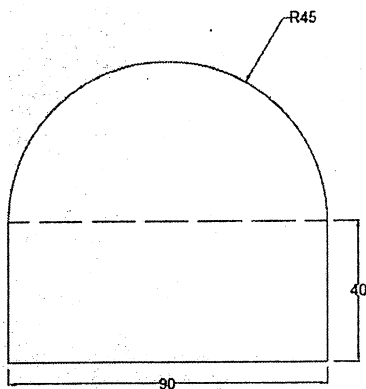


Fig.No. 1

Material: Mild Steel
Thickness: 6 mm
Shear strength=36 Kg/mm²

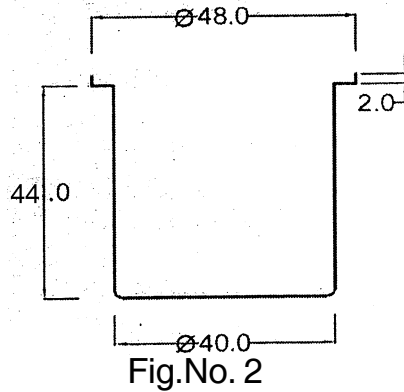
OR

- b) Design the drawing tool for production of component in Fig. No. 2 and determine the following :
- 1) Blank size
 - 2) No. of draws
 - 3) Drawing force

Set P



- 4) % reduction
- 5) Press capacity
- 6) Blank holding force



Material M.S.
Thickness = 1mm
Yield stress = 46 kg/mm²

Also draw one Sectional view of assembly showing all details.

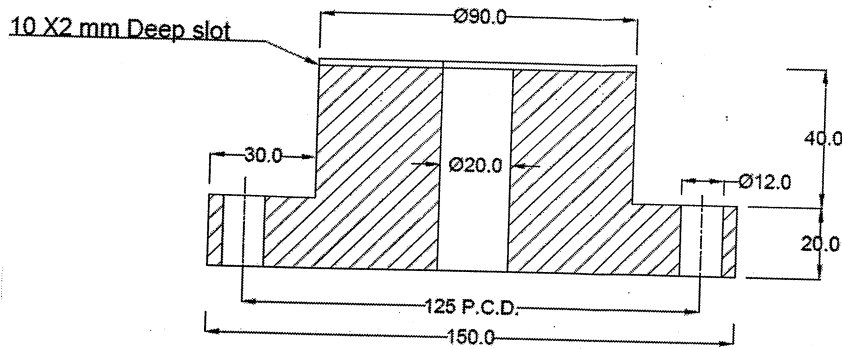
* At sharp corner minimum radius = material thickness

3. a) In orthogonal cutting : 4
 Feed = 1.25 mm/rev
 Chip thickness after cutting = 2 mm
 Rank angle = 10°
 Shear strength = 6000 kg/cm²
 Width of cut = 10 mm
 Cutting speed = 30 m/min.
 Determine the following :
 a) Chip thickness ratio
 b) Shear angle
 c) Shear force.
- b) Define the term tool life and machinability list the factors with which tool life and machinability Associated. 3
4. a) Explain in brief about bending dies. 4
 b) Discuss the various types of chip produced during metal cutting. 3
5. Write note on (**any two**) : 7
 a) Combination die
 b) Cutting fluids
 c) Tool dynamometer
 d) Strip layout.



SECTION – II

6. a) Design a drill Jig for drilling ϕ 12 mm (4 holes) and draw one view (should be sectional view) : 14



OR

- b) Design a fixture for milling slot 10x2 and draw one view (should be sectional view).
7. a) Describe the nomenclature of plain milling cutting with neat sketch. 4
b) Explain in brief about single point tool geometry and tool signature as per ASA system and effect of geometry on tool life. 3
8. a) What is fool proofing and redundant location ? Explain in brief about one example. 4
b) Write in brief about depreciation and their types. 3
9. Write short note on (**any two**) : 7
- 1) Break-even analysis
 - 2) Economic order quantity
 - 3) Drilling bushes
 - 4) Setting block and Tenon.



SLR-TJ – 116

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

Set	Q
-----	---

T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
- 2) **Assume** suitable data **wherever** necessary and state **it clearly**.
- 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3.
- 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- A) A washer having internal diameter ϕ 50 mm and thickness 5 mm it is manufactured by 1
- a) Compound die b) Bending die
- c) Combination die d) Draw die
- B) In ASA system if the tool nomenclature is 8, 6, 5, 5, 10, 15, 2 then the side rake angle will be 1
- a) 5° b) 6° c) 8° d) 10°
- C) Economic order quantity is the quantity, at which the cost carrying is 1
- a) Minimum b) Less than cost of ordering
- c) Equal to cost of ordering d) None of the above

P.T.O.



- D) Orthogonal cutting system is called 1
a) Two dimensional cutting system b) Multidimensional cutting system
c) Three dimensional cutting system d) None of the above
- E) A diamond locating pin is used in jigs and fixture because 1
a) It has long life
b) It is easy to machine
c) It does not wear fast
d) Center distance of hole is taken care of
- F) In sheet metal blanking, shear is provided on die so that 1
a) Press load is reduced b) Good cut edge is obtained
c) Warping of sheet is minimized d) None of the above

II. Multiple correct answers type questions :

- A) At break-even point 2
a) Profit = loss
b) Selling price = total cost of production
c) Profit > loss
d) None of the above
- B) Main function of stripper in press tool, 2
a) To guide strip b) To guide punch
c) To strip out material d) None of the above
- C) In fixture major elements are 2
a) Guide bush b) Tenon
c) Setting block d) None of the above
- D) In blanking operation die size is 2
a) Component size and clearance is provided on punch
b) Component size + 1/2 clearance
c) Punch size + total clearance
d) None of the above
-



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

**T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
2) **Assume** suitable data wherever **necessary** and state it clearly.

SECTION – I

2. a) Design the press tool for production of component in Fig No.1 giving following details :
- 1) Cutting force
 - 2) Clearance between die and punch
 - 3) Strip layout.

14

Also draw one sectional view of assembly showing all details.

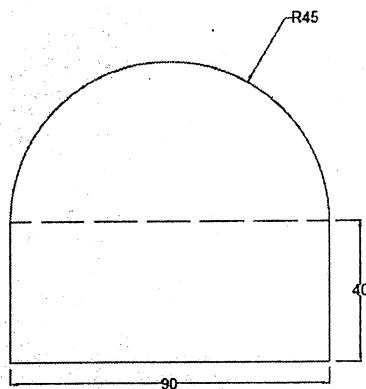


Fig.No. 1

Material: Mild Steel
Thickness: 6 mm
Shear strength=36 Kg/mm²

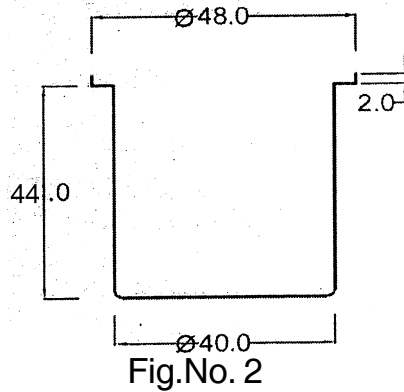
OR

- b) Design the drawing tool for production of component in Fig. No. 2 and determine the following :
- 1) Blank size
 - 2) No. of draws
 - 3) Drawing force

Set Q



- 4) % reduction
- 5) Press capacity
- 6) Blank holding force



Material M.S.
Thickness = 1mm
Yield stress = 46 kg/mm²

Also draw one Sectional view of assembly showing all details.

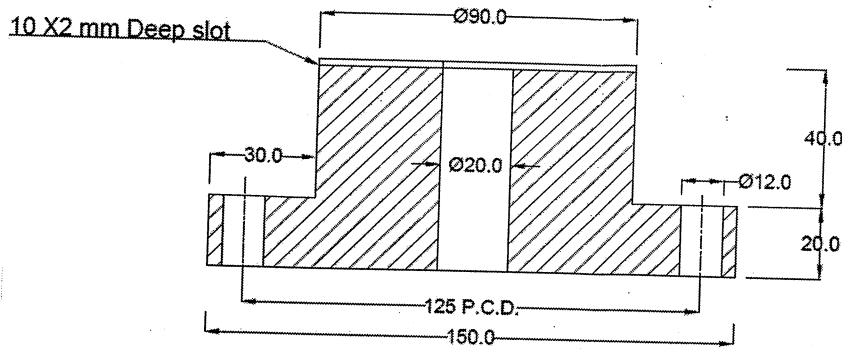
* At sharp corner minimum radius = material thickness

3. a) In orthogonal cutting : 4
 Feed = 1.25 mm/rev
 Chip thickness after cutting = 2 mm
 Rank angle = 10°
 Shear strength = 6000 kg/cm²
 Width of cut = 10 mm
 Cutting speed = 30 m/min.
 Determine the following :
 a) Chip thickness ratio
 b) Shear angle
 c) Shear force.
- b) Define the term tool life and machinability list the factors with which tool life and machinability Associated. 3
4. a) Explain in brief about bending dies. 4
 b) Discuss the various types of chip produced during metal cutting. 3
5. Write note on (**any two**) : 7
 a) Combination die
 b) Cutting fluids
 c) Tool dynamometer
 d) Strip layout.



SECTION – II

6. a) Design a drill Jig for drilling ϕ 12 mm (4 holes) and draw one view (should be sectional view) : 14



OR

- b) Design a fixture for milling slot 10x2 and draw one view (should be sectional view).
7. a) Describe the nomenclature of plain milling cutting with neat sketch. 4
b) Explain in brief about single point tool geometry and tool signature as per ASA system and effect of geometry on tool life. 3
8. a) What is fool proofing and redundant location ? Explain in brief about one example. 4
b) Write in brief about depreciation and their types. 3
9. Write short note on (**any two**) : 7
- 1) Break-even analysis
 - 2) Economic order quantity
 - 3) Drilling bushes
 - 4) Setting block and Tenon.



SLR-TJ – 116

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

Set	R
-----	----------

T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
- 2) **Assume** suitable data **wherever** necessary and state **it clearly**.
- 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3.
- 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- A) Orthogonal cutting system is called 1
a) Two dimensional cutting system b) Multidimensional cutting system
c) Three dimensional cutting system d) None of the above
- B) A diamond locating pin is used in jigs and fixture because 1
a) It has long life
b) It is easy to machine
c) It does not wear fast
d) Center distance of hole is taken care of
- C) In sheet metal blanking, shear is provided on die so that 1
a) Press load is reduced b) Good cut edge is obtained
c) Warping of sheet is minimized d) None of the above

P.T.O.



- D) A washer having internal diameter ϕ 50 mm and thickness 5 mm it is manufactured by 1
- a) Compound die b) Bending die
c) Combination die d) Draw die
- E) In ASA system if the tool nomenclature is 8, 6, 5, 5, 10, 15, 2 then the side rake angle will be 1
- a) 5° b) 6° c) 8° d) 10°
- F) Economic order quantity is the quantity, at which the cost carrying is 1
- a) Minimum b) Less than cost of ordering
c) Equal to cost of ordering d) None of the above

II. Multiple correct answers type questions :

- A) In fixture major elements are 2
- a) Guide bush b) Tenon
c) Setting block d) None of the above
- B) In blanking operation die size is 2
- a) Component size and clearance is provided on punch
b) Component size + 1/2 clearance
c) Punch size + total clearance
d) None of the above
- C) At break-even point 2
- a) Profit = loss
b) Selling price = total cost of production
c) Profit > loss
d) None of the above
- D) Main function of stripper in press tool, 2
- a) To guide strip b) To guide punch
c) To strip out material d) None of the above



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

**T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
2) **Assume** suitable data wherever **necessary** and state it clearly.

SECTION – I

2. a) Design the press tool for production of component in Fig No.1 giving following details :
- 1) Cutting force
 - 2) Clearance between die and punch
 - 3) Strip layout.

14

Also draw one sectional view of assembly showing all details.

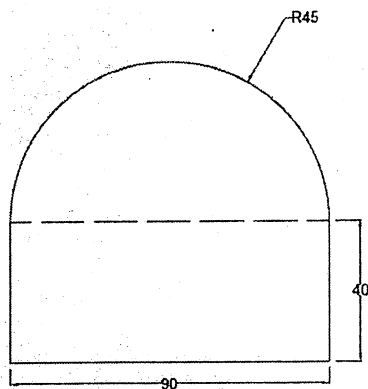


Fig.No. 1

Material: Mild Steel
Thickness: 6 mm
Shear strength=36 Kg/mm²

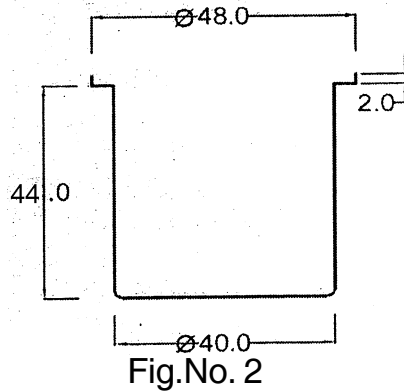
OR

- b) Design the drawing tool for production of component in Fig. No. 2 and determine the following :
- 1) Blank size
 - 2) No. of draws
 - 3) Drawing force

Set R



- 4) % reduction
- 5) Press capacity
- 6) Blank holding force



Material M.S.
Thickness = 1mm
Yield stress = 46 kg/mm²

Also draw one Sectional view of assembly showing all details.

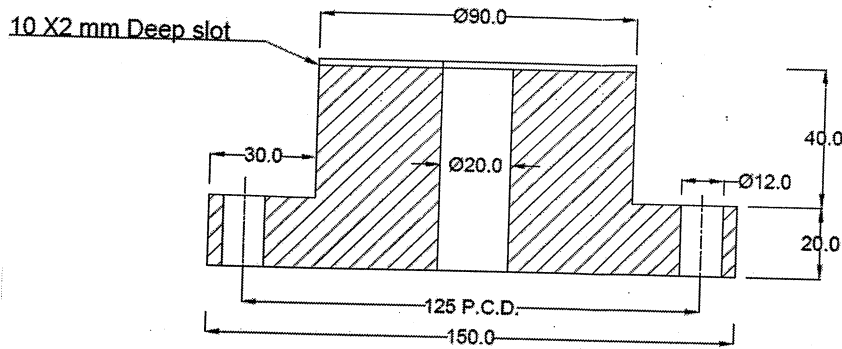
* At sharp corner minimum radius = material thickness

3. a) In orthogonal cutting : 4
 Feed = 1.25 mm/rev
 Chip thickness after cutting = 2 mm
 Rank angle = 10°
 Shear strength = 6000 kg/cm²
 Width of cut = 10 mm
 Cutting speed = 30 m/min.
 Determine the following :
 a) Chip thickness ratio
 b) Shear angle
 c) Shear force.
- b) Define the term tool life and machinability list the factors with which tool life and machinability Associated. 3
4. a) Explain in brief about bending dies. 4
 b) Discuss the various types of chip produced during metal cutting. 3
5. Write note on (**any two**) : 7
 a) Combination die
 b) Cutting fluids
 c) Tool dynamometer
 d) Strip layout.



SECTION – II

6. a) Design a drill Jig for drilling ϕ 12 mm (4 holes) and draw one view (should be sectional view) : 14



OR

- b) Design a fixture for milling slot 10x2 and draw one view (should be sectional view).
7. a) Describe the nomenclature of plain milling cutting with neat sketch. 4
b) Explain in brief about single point tool geometry and tool signature as per ASA system and effect of geometry on tool life. 3
8. a) What is fool proofing and redundant location ? Explain in brief about one example. 4
b) Write in brief about depreciation and their types. 3
9. Write short note on (**any two**) : 7
- 1) Break-even analysis
 - 2) Economic order quantity
 - 3) Drilling bushes
 - 4) Setting block and Tenon.



SLR-TJ – 116

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

Set	S
-----	----------

**T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
- 2) **Assume** suitable data **wherever** necessary and state **it clearly**.
- 3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer book Page No. 3.
- 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

- A) In ASA system if the tool nomenclature is 8, 6, 5, 5, 10, 15, 2 then the side rake angle will be **1**
a) 5° b) 6° c) 8° d) 10°
- B) A washer having internal diameter ϕ 50 mm and thickness 5 mm it is manufactured by **1**
a) Compound die b) Bending die
c) Combination die d) Draw die
- C) A diamond locating pin is used in jigs and fixture because **1**
a) It has long life
b) It is easy to machine
c) It does not wear fast
d) Center distance of hole is taken care of

P.T.O.



- D) In sheet metal blanking, shear is provided on die so that **1**
a) Press load is reduced b) Good cut edge is obtained
c) Warping of sheet is minimized d) None of the above
- E) Economic order quantity is the quantity, at which the cost carrying is **1**
a) Minimum b) Less than cost of ordering
c) Equal to cost of ordering d) None of the above
- F) Orthogonal cutting system is called **1**
a) Two dimensional cutting system b) Multidimensional cutting system
c) Three dimensional cutting system d) None of the above

II. Multiple correct answers type questions :

- A) In blanking operation die size is **2**
a) Component size and clearance is provided on punch
b) Component size+1/2 clearance
c) Punch size + total clearance
d) None of the above
- B) At break-even point **2**
a) Profit = loss
b) Selling price = total cost of production
c) Profit > loss
d) None of the above
- C) Main function of stripper in press tool, **2**
a) To guide strip b) To guide punch
c) To strip out material d) None of the above
- D) In fixture major elements are **2**
a) Guide bush b) Tenon
c) Setting block d) None of the above
-



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

**T.E. (Mech.) (Part – II) (CGPA) Examination, 2017
Professional (Elective – II)
TOOL ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) Q. No. 2 and 6 are **compulsory**. Attempt **any two** questions out of Q. No. 3, 4 and 5 from Section – I and attempt **any two** questions out of Q. No. 7, 8 and 9 from Section – II.
2) **Assume** suitable data wherever **necessary** and state it clearly.

SECTION – I

2. a) Design the press tool for production of component in Fig No.1 giving following details :
- 1) Cutting force
 - 2) Clearance between die and punch
 - 3) Strip layout.

14

Also draw one sectional view of assembly showing all details.

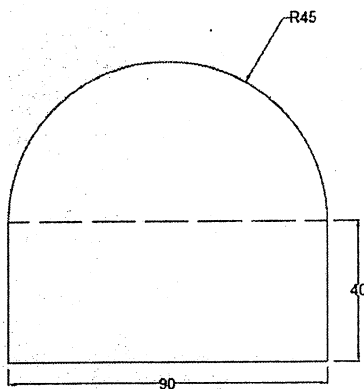


Fig.No. 1

Material: Mild Steel
Thickness: 6 mm
Shear strength=36 Kg/mm²

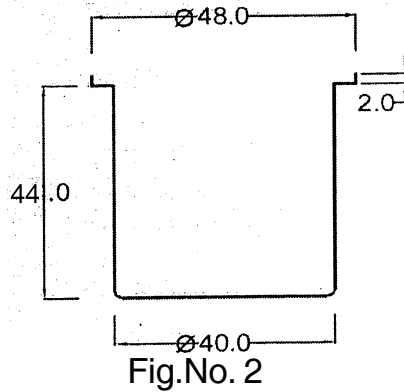
OR

- b) Design the drawing tool for production of component in Fig. No. 2 and determine the following :
- 1) Blank size
 - 2) No. of draws
 - 3) Drawing force

Set S



- 4) % reduction
- 5) Press capacity
- 6) Blank holding force



Material M.S.
Thickness = 1mm
Yield stress = 46 kg/mm²

Also draw one Sectional view of assembly showing all details.

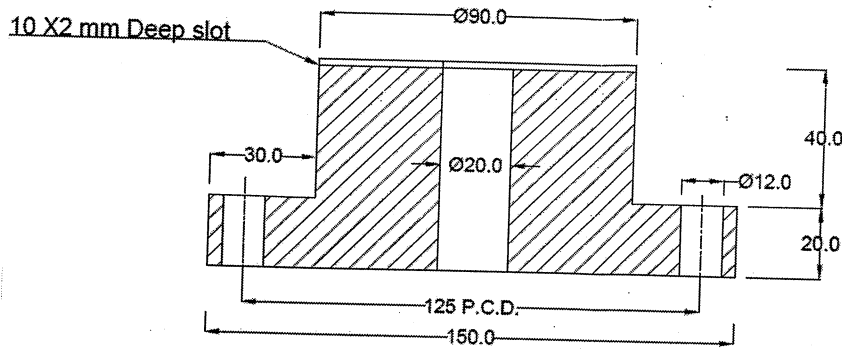
* At sharp corner minimum radius = material thickness

3. a) In orthogonal cutting : 4
 Feed = 1.25 mm/rev
 Chip thickness after cutting = 2 mm
 Rank angle = 10°
 Shear strength = 6000 kg/cm²
 Width of cut = 10 mm
 Cutting speed = 30 m/min.
 Determine the following :
 a) Chip thickness ratio
 b) Shear angle
 c) Shear force.
- b) Define the term tool life and machinability list the factors with which tool life and machinability Associated. 3
4. a) Explain in brief about bending dies. 4
 b) Discuss the various types of chip produced during metal cutting. 3
5. Write note on (**any two**) : 7
 a) Combination die
 b) Cutting fluids
 c) Tool dynamometer
 d) Strip layout.



SECTION – II

6. a) Design a drill Jig for drilling ϕ 12 mm (4 holes) and draw one view (should be sectional view) : 14



OR

- b) Design a fixture for milling slot 10x2 and draw one view (should be sectional view).
7. a) Describe the nomenclature of plain milling cutting with neat sketch. 4
b) Explain in brief about single point tool geometry and tool signature as per ASA system and effect of geometry on tool life. 3
8. a) What is fool proofing and redundant location ? Explain in brief about one example. 4
b) Write in brief about depreciation and their types. 3
9. Write short note on (**any two**) : 7
- 1) Break-even analysis
 - 2) Economic order quantity
 - 3) Drilling bushes
 - 4) Setting block and Tenon.



SLR-TJ – 117

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

Set	P
-----	----------

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Demand for electricity always _____ supply in India in past as well as present.
a) exceeds b) lessons c) equals d) none
- 2) Highest energy producing sector in India is _____
a) Nuclear b) Thermal c) Hydro d) Diesel
- 3) Per capita consumption in _____ is behind the developed countries.
a) India b) United states
c) United kingdom d) France
- 4) Low utilization factor indicates that plant is
a) has no maintenance b) peak as well as base loads
c) stand by unit d) has to take more load
- 5) Highest point on the load curve, represents
a) Max. demand b) Max. rating c) Max. load d) Max. utilization
- 6) Choose the example of base load power plant.
a) Nuclear b) Hydro c) Thermal d) All of the above
- 7) Low power factor effect cause
a) Inadequate voltage regulation b) Huge amount of copper losses
c) Bulky kVA ratings of transformers d) All of the above
- 8) In the incremental rate vs. output graph, as the output increases, incremental rate curve
a) Decreases b) Increases
c) Remains constant d) Becomes parallel to X-axis

P.T.O.



- 9) The general form of tariff is
a) $ax + b$ b) $by + c$ c) $ax + by + c$ d) $ax^2 + by + c$
- 10) In Hopkinson demand rate fixed charges are dependent upon
a) the max. demand of the consumer b) energy consumed
c) none of the above d) Both a) and b)
- 11) Pyranometer is used to measure
a) Local radiation b) Diffused radiation
c) Global radiation d) Terrestrial radiation
- 12) Maximum value of declination angle is
a) 21.5° b) 27.5° c) 25.5° d) 23.5°
- 13) Altitude angle is subsequent to
a) Zenith angle b) Azimuth angle
c) Hour angle d) All of these
- 14) Wind turbine efficiency can not be increased beyond
a) 30% b) 36% c) 59% d) 50%
- 15) Principle of ocean thermal energy conversion is based on
a) Ocean wave b) Ocean tides
c) Moon attraction d) Temperature difference between layer
- 16) Energy from earth's crust is the
a) Geothermal energy b) Tidal energy
c) Solar energy d) Wave energy
- 17) Tidal energy is effect of
a) Wave energy b) Wind energy
c) Gravitational force d) Ocean thermal energy
- 18) Initial inspection and energy survey as well as analysis is called as
a) Energy management b) Energy conservation
c) Energy consumption d) Energy audit
- 19) The Energy Conservation Act, 2001 requires designated consumers to
a) Appoint/designate certified energy manager
b) Conduct an energy audit through an accredited energy auditor
c) Comply with energy consumption norms and standards
d) All of the above
- 20) Improvement in public transport system is related to the
a) energy conservation b) support automobile industry
c) aware pedestrians d) energy audit



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

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 80

- 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**.

SECTION – I

2. a) Describe the future energy demands in India. **7**
b) Describe electric energy growth in India. **6**
c) The maximum (peak) load on a thermal power plant of 210 mW capacity is 200 mW at an annual load factor of 50%. The loads having maximum demands of 85 mW, 70 mW, 55 mW and 40 mW are connected to the power station. Determine : **7**
a) Average load on power station
b) Energy generated per year
c) Demand factor
d) Diversity factor.
3. a) Describe requirement of peak load plant. **6**
b) Explain in short measurement and improvement methods of power factor. **6**
c) Illustrate the requirement of peak load plant. **4**
d) Give significant points on Tariff methods of power plants. **4**
4. Write short note on the following :
a) Performance and operation characteristics of power plants. **4**
b) Operating and fixed cost **4**
c) Compressed air storage plants **4**
d) Selection and type of generation **4**
e) Variable load effect on power plant. **4**

Set P



SECTION – II

5. a) With neat sketch describe sun shine recorder and solar radiation geometry. 7
b) Discuss the effects of various parameters on liquid flat plate collector. 7
c) With neat sketch describe in detail solar radiation and effect on tilted surface. 6
6. a) Explain in detail forces on blades and thrust of turbines. 6
b) Describe in detail types of geothermal resources. 6
c) Derive expression for wind turbine efficiency. 8
7. Write short note on the following :
- a) Strategy of energy audit. 4
b) Heating ventilation and air conditioning system. 4
c) Energy conservation in electrical generation. 4
d) Energy conservation in house hold and commercial sectors. 4
e) Ocean thermal energy-open and closed systems. 4
-



SLR-TJ – 117

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

Set	Q
-----	---

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Energy from earth's crust is the
 - a) Geothermal energy
 - b) Tidal energy
 - c) Solar energy
 - d) Wave energy
- 2) Tidal energy is effect of
 - a) Wave energy
 - b) Wind energy
 - c) Gravitational force
 - d) Ocean thermal energy
- 3) Initial inspection and energy survey as well as analysis is called as
 - a) Energy management
 - b) Energy conservation
 - c) Energy consumption
 - d) Energy audit
- 4) The Energy Conservation Act, 2001 requires designated consumers to
 - a) Appoint/designate certified energy manager
 - b) Conduct an energy audit through an accredited energy auditor
 - c) Comply with energy consumption norms and standards
 - d) All of the above
- 5) Improvement in public transport system is related to the
 - a) energy conservation
 - b) support automobile industry
 - c) aware pedestrians
 - d) energy audit
- 6) Demand for electricity always _____ supply in India in past as well as present.
 - a) exceeds
 - b) lessons
 - c) equals
 - d) none
- 7) Highest energy producing sector in India is _____
 - a) Nuclear
 - b) Thermal
 - c) Hydro
 - d) Diesel

P.T.O.



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

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 80

- 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**.

SECTION – I

2. a) Describe the future energy demands in India. 7
b) Describe electric energy growth in India. 6
c) The maximum (peak) load on a thermal power plant of 210 mW capacity is 200 mW at an annual load factor of 50%. The loads having maximum demands of 85 mW, 70 mW, 55 mW and 40 mW are connected to the power station. Determine : 7
a) Average load on power station
b) Energy generated per year
c) Demand factor
d) Diversity factor.
3. a) Describe requirement of peak load plant. 6
b) Explain in short measurement and improvement methods of power factor. 6
c) Illustrate the requirement of peak load plant. 4
d) Give significant points on Tariff methods of power plants. 4
4. Write short note on the following :
a) Performance and operation characteristics of power plants. 4
b) Operating and fixed cost 4
c) Compressed air storage plants 4
d) Selection and type of generation 4
e) Variable load effect on power plant. 4

Set Q



SECTION – II

5. a) With neat sketch describe sun shine recorder and solar radiation geometry. 7
b) Discuss the effects of various parameters on liquid flat plate collector. 7
c) With neat sketch describe in detail solar radiation and effect on tilted surface. 6
6. a) Explain in detail forces on blades and thrust of turbines. 6
b) Describe in detail types of geothermal resources. 6
c) Derive expression for wind turbine efficiency. 8
7. Write short note on the following :
- a) Strategy of energy audit. 4
b) Heating ventilation and air conditioning system. 4
c) Energy conservation in electrical generation. 4
d) Energy conservation in house hold and commercial sectors. 4
e) Ocean thermal energy-open and closed systems. 4
-



SLR-TJ – 117

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

Set	R
-----	---

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Pyranometer is used to measure
 - a) Local radiation
 - b) Diffused radiation
 - c) Global radiation
 - d) Terrestrial radiation
- 2) Maximum value of declination angle is
 - a) 21.5°
 - b) 27.5°
 - c) 25.5°
 - d) 23.5°
- 3) Altitude angle is subsequent to
 - a) Zenith angle
 - b) Azimuth angle
 - c) Hour angle
 - d) All of these
- 4) Wind turbine efficiency can not be increased beyond
 - a) 30%
 - b) 36%
 - c) 59%
 - d) 50%
- 5) Principle of ocean thermal energy conversion is based on
 - a) Ocean wave
 - b) Ocean tides
 - c) Moon attraction
 - d) Temperature difference between layer
- 6) Energy from earth's crust is the
 - a) Geothermal energy
 - b) Tidal energy
 - c) Solar energy
 - d) Wave energy
- 7) Tidal energy is effect of
 - a) Wave energy
 - b) Wind energy
 - c) Gravitational force
 - d) Ocean thermal energy
- 8) Initial inspection and energy survey as well as analysis is called as
 - a) Energy management
 - b) Energy conservation
 - c) Energy consumption
 - d) Energy audit

P.T.O.



- 9) The Energy Conservation Act, 2001 requires designated consumers to
- a) Appoint/designate certified energy manager
 - b) Conduct an energy audit through an accredited energy auditor
 - c) Comply with energy consumption norms and standards
 - d) All of the above
- 10) Improvement in public transport system is related to the
- a) energy conservation
 - b) support automobile industry
 - c) aware pedestrians
 - d) energy audit
- 11) Demand for electricity always _____ supply in India in past as well as present.
- a) exceeds
 - b) lessons
 - c) equals
 - d) none
- 12) Highest energy producing sector in India is _____
- a) Nuclear
 - b) Thermal
 - c) Hydro
 - d) Diesel
- 13) Per capita consumption in _____ is behind the developed countries.
- a) India
 - b) United states
 - c) United kingdom
 - d) France
- 14) Low utilization factor indicates that plant is
- a) has no maintenance
 - b) peak as well as base loads
 - c) stand by unit
 - d) has to take more load
- 15) Highest point on the load curve, represents
- a) Max. demand
 - b) Max. rating
 - c) Max. load
 - d) Max. utilization
- 16) Choose the example of base load power plant.
- a) Nuclear
 - b) Hydro
 - c) Thermal
 - d) All of the above
- 17) Low power factor effect cause
- a) Inadequate voltage regulation
 - b) Huge amount of copper losses
 - c) Bulky kVA ratings of transformers
 - d) All of the above
- 18) In the incremental rate vs. output graph, as the output increases, incremental rate curve
- a) Decreases
 - b) Increases
 - c) Remains constant
 - d) Becomes parallel to X-axis
- 19) The general form of tariff is
- a) $ax + b$
 - b) $by + c$
 - c) $ax + by + c$
 - d) $ax^2 + by + c$
- 20) In Hopkinson demand rate fixed charges are dependent upon
- a) the max. demand of the consumer
 - b) energy consumed
 - c) none of the above
 - d) Both a) and b)



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

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 80

- 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**.

SECTION – I

2. a) Describe the future energy demands in India. 7
b) Describe electric energy growth in India. 6
c) The maximum (peak) load on a thermal power plant of 210 mW capacity is 200 mW at an annual load factor of 50%. The loads having maximum demands of 85 mW, 70 mW, 55 mW and 40 mW are connected to the power station. Determine : 7
a) Average load on power station
b) Energy generated per year
c) Demand factor
d) Diversity factor.
3. a) Describe requirement of peak load plant. 6
b) Explain in short measurement and improvement methods of power factor. 6
c) Illustrate the requirement of peak load plant. 4
d) Give significant points on Tariff methods of power plants. 4
4. Write short note on the following :
a) Performance and operation characteristics of power plants. 4
b) Operating and fixed cost 4
c) Compressed air storage plants 4
d) Selection and type of generation 4
e) Variable load effect on power plant. 4

Set R



SECTION – II

5. a) With neat sketch describe sun shine recorder and solar radiation geometry. 7
b) Discuss the effects of various parameters on liquid flat plate collector. 7
c) With neat sketch describe in detail solar radiation and effect on tilted surface. 6
6. a) Explain in detail forces on blades and thrust of turbines. 6
b) Describe in detail types of geothermal resources. 6
c) Derive expression for wind turbine efficiency. 8
7. Write short note on the following :
- a) Strategy of energy audit. 4
b) Heating ventilation and air conditioning system. 4
c) Energy conservation in electrical generation. 4
d) Energy conservation in house hold and commercial sectors. 4
e) Ocean thermal energy-open and closed systems. 4
-



SLR-TJ – 117

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

Set	S
-----	---

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Choose the example of base load power plant.
a) Nuclear b) Hydro c) Thermal d) All of the above
- 2) Low power factor effect cause
a) Inadequate voltage regulation b) Huge amount of copper losses
c) Bulky kVA ratings of transformers d) All of the above
- 3) In the incremental rate vs. output graph, as the output increases, incremental rate curve
a) Decreases b) Increases
c) Remains constant d) Becomes parallel to X-axis
- 4) The general form of tariff is
a) $ax + b$ b) $by + c$ c) $ax + by + c$ d) $ax^2 + by + c$
- 5) In Hopkinson demand rate fixed charges are dependent upon
a) the max. demand of the consumer b) energy consumed
c) none of the above d) Both a) and b)
- 6) Pyranometer is used to measure
a) Local radiation b) Diffused radiation
c) Global radiation d) Terrestrial radiation
- 7) Maximum value of declination angle is
a) 21.5° b) 27.5° c) 25.5° d) 23.5°
- 8) Altitude angle is subsequent to
a) Zenith angle b) Azimuth angle
c) Hour angle d) All of these

P.T.O.



- 9) Wind turbine efficiency can not be increased beyond
a) 30% b) 36% c) 59% d) 50%
- 10) Principle of ocean thermal energy conversion is based on
a) Ocean wave b) Ocean tides
c) Moon attraction d) Temperature difference between layer
- 11) Energy from earth's crust is the
a) Geothermal energy b) Tidal energy
c) Solar energy d) Wave energy
- 12) Tidal energy is effect of
a) Wave energy b) Wind energy
c) Gravitational force d) Ocean thermal energy
- 13) Initial inspection and energy survey as well as analysis is called as
a) Energy management b) Energy conservation
c) Energy consumption d) Energy audit
- 14) The Energy Conservation Act, 2001 requires designated consumers to
a) Appoint/designate certified energy manager
b) Conduct an energy audit through an accredited energy auditor
c) Comply with energy consumption norms and standards
d) All of the above
- 15) Improvement in public transport system is related to the
a) energy conservation b) support automobile industry
c) aware pedestrians d) energy audit
- 16) Demand for electricity always _____ supply in India in past as well as present.
a) exceeds b) lessons c) equals d) none
- 17) Highest energy producing sector in India is _____
a) Nuclear b) Thermal c) Hydro d) Diesel
- 18) Per capita consumption in _____ is behind the developed countries.
a) India b) United states
c) United kingdom d) France
- 19) Low utilization factor indicates that plant is
a) has no maintenance b) peak as well as base loads
c) stand by unit d) has to take more load
- 20) Highest point on the load curve, represents
a) Max. demand b) Max. rating c) Max. load d) Max. utilization



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

**B.E. (Part – I) Mechanical Examination, 2017
POWER PLANT AND ENERGY ENGINEERING (Old)**

Day and Date : Tuesday, 12-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 80

- 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**.

SECTION – I

2. a) Describe the future energy demands in India. 7
b) Describe electric energy growth in India. 6
c) The maximum (peak) load on a thermal power plant of 210 mW capacity is 200 mW at an annual load factor of 50%. The loads having maximum demands of 85 mW, 70 mW, 55 mW and 40 mW are connected to the power station. Determine : 7
a) Average load on power station
b) Energy generated per year
c) Demand factor
d) Diversity factor.
3. a) Describe requirement of peak load plant. 6
b) Explain in short measurement and improvement methods of power factor. 6
c) Illustrate the requirement of peak load plant. 4
d) Give significant points on Tariff methods of power plants. 4
4. Write short note on the following :
a) Performance and operation characteristics of power plants. 4
b) Operating and fixed cost 4
c) Compressed air storage plants 4
d) Selection and type of generation 4
e) Variable load effect on power plant. 4

Set S



SECTION – II

5. a) With neat sketch describe sun shine recorder and solar radiation geometry. 7
b) Discuss the effects of various parameters on liquid flat plate collector. 7
c) With neat sketch describe in detail solar radiation and effect on tilted surface. 6
6. a) Explain in detail forces on blades and thrust of turbines. 6
b) Describe in detail types of geothermal resources. 6
c) Derive expression for wind turbine efficiency. 8
7. Write short note on the following :
- a) Strategy of energy audit. 4
b) Heating ventilation and air conditioning system. 4
c) Energy conservation in electrical generation. 4
d) Energy conservation in house hold and commercial sectors. 4
e) Ocean thermal energy-open and closed systems. 4
-



SLR-TJ – 118

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

Set	P
-----	----------

B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume suitable data if necessary.**
 - 2) **Use of non-programmable calculator is allowed.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) The rotational speed of cam shaft with respect to crankshaft is
a) half b) double c) equal d) four times
- 2) For same compression ratio and heat rejection Otto cycle efficiency with respect to diesel cycle efficiency is
a) Greater than b) Smaller than c) Equal to d) None of above
- 3) Normal range of compression ratio for Otto cycle is
a) 2 – 4 b) 6 – 10 c) Greater than 10 d) None of above
- 4) Dissociation of CO₂ and H₂O takes place in range
a) 200°C and 400°C b) 1000°C and 1300°C
c) 600°C and 800°C d) None of above
- 5) The choke is closed when engine is
a) accelerating b) hot c) cold d) idling
- 6) The mean droplet size in the fuel spray by an injection nozzle decreases with
a) Increase in injection pressure b) Decrease in air density
c) Increase in fuel viscosity d) All of above
- 7) Multi point fuel injection system uses
a) Direct injection b) Port injection
c) Throttle body injection d) Both b) and c)
- 8) In turbochargers compressor is driven by
a) exhaust gas turbine b) engine
c) electric motor d) none of above

P.T.O.



- 9) Very high powered engines used for ship propulsion are generally
- a) two stroke petrol engines b) four stroke petrol engines
c) four stroke diesel engines d) two stroke diesel engines
- 10) The component which converts reciprocatory motion into rotary motion in engines is
- a) gudgeon pin b) piston rings c) crank shaft d) camshaft
- 11) Increasing the compression ratio in SI engines the knocking tendency
- a) Decreases b) Increases
c) Not affected d) None of the above
- 12) The function of quench area in a wedge shaped SI engine combustion chamber
- a) Improve the compression ratio
b) Cool the end gas
c) Decrease the volume of combustion chamber
d) Increase the area of combustion chamber
- 13) The octane number iso-octane is
- a) 0 b) 10 c) 80 d) 100
- 14) In CI engines with increase in compression ratio the delay period
- a) increases b) decreases
c) first increase then decreases d) not affected
- 15) Brake thermal efficiency of SI engine is in the range
- a) 35% to 60% b) 25% to 35% c) 60% to 80% d) none of the above
- 16) Which one of the following quantities is assumed constant for an internal combustion engine while estimating its friction power by extrapolation through Willan's line ?
- a) Brake thermal efficiency b) Indicated thermal efficiency
c) Mechanical efficiency d) Volumetric efficiency
- 17) Reference fuels for knock rating of SI engine fuels would include
- a) iso-octane and alpha-methyl naphthalene
b) normal octane and aniline
c) iso-octane and n-hexane
d) n-heptane and iso-octane
- 18) Which of the following factors increase detonation in the SI engine ?
- a) Increased spark advance
b) Increased speed
c) Increased air-fuel ratio beyond stoichiometric strength
d) Increased compression ratio
- 19) Due to high temperature pollutants produced are
- a) CO b) HC c) NO_x d) None of above
- 20) In SI engine Fuel detonation chances are more for
- a) benzene b) toluene c) iso-octane d) n-heptane



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

**B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 80

- 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

2. a) Discuss the effect of the following on the fuel air cycle analysis : 6
i) Variation of specific heat with temperature.
ii) Dissociation of gases.
- b) Explain valve timing diagram for four stroke engine, also discuss valve overlap. 6
- c) Compare Diesel Cycle with Otto cycle. 8
3. a) List the compensating devices used in carburetor and explain any one with sketch. 10
- b) The diameter of a venture of a simple carburetor is 2 cm and its Cd is 0.85. The fuel nozzle diameter is 1.25 mm and Cdf is 0.66. The tip of the fuel nozzle is 5 mm. Find
1) Air fuel ratio for pressure drop of 0.07 bar when nozzle lip is neglected
2) Air fuel ratio when nozzle lip is considered.
- Take $\rho_a = 1.2 \text{ kg/m}^3$, $\rho_f = 750 \text{ kg/m}^3$ and 1 cm head of water is 98 N/m². 10
4. a) Determine quantity of fuel to be injected per cycle per cylinder for a 6 cylinder 4 stroke diesel engine having bsfc 245 gm/kW.hr and developing 89 kW at 2500 rpm. Take specific gravity as 0.84. 6
- b) Explain the effect of supercharging with PV diagram on performance of an engine. 6
- c) Discuss the requirements of an injection system and explain common rail injection system. 8

Set P



SECTION – II

5. a) Explain detonation in SI engine. **6**
- b) What is Ignition lag ? Explain effect of various operating factors on Ignition lag. **6**
- c) Explain working of catalytic convertor in detail. **8**
6. a) The air flow to four cylinder four stroke petrol engine is measured by means of a 7.5 cm diameter sharp edge orifice, $C_d = 0.6$. 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 = 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 :
- i) Thermal efficiency on brake power basis
- ii) Brake mean effective pressure
- iii) Volumetric efficiency based on free air condition. **8**
- b) Write short notes on : **4**
- 1) HUCR
- 2) Additives used for petrol fuel.
- c) Explain various stages of combustion in CI engine in detail with a neat $p-\theta$ diagram. **8**
7. a) Write note on Engine Electronics. **6**
- b) Discuss spray formation, atomization and penetration. **6**
- c) Write short notes on : **8**
- 1) Heat balance sheet
- 2) Variable valve timing.
-



SLR-TJ – 118

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

Set	Q
-----	---

B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume suitable data if necessary.**
 - 2) **Use of non-programmable calculator is allowed.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) Which one of the following quantities is assumed constant for an internal combustion engine while estimating its friction power by extrapolation through Willan's line ?
 - a) Brake thermal efficiency
 - b) Indicated thermal efficiency
 - c) Mechanical efficiency
 - d) Volumetric efficiency
 - 2) Reference fuels for knock rating of SI engine fuels would include
 - a) iso-octane and alpha-methyl naphthalene
 - b) normal octane and aniline
 - c) iso-octane and n-hexane
 - d) n-heptane and iso-octane
 - 3) Which of the following factors increase detonation in the SI engine ?
 - a) Increased spark advance
 - b) Increased speed
 - c) Increased air-fuel ratio beyond stoichiometric strength
 - d) Increased compression ratio
 - 4) Due to high temperature pollutants produced are
 - a) CO
 - b) HC
 - c) NO_x
 - d) None of above
 - 5) In SI engine Fuel detonation chances are more for
 - a) benzene
 - b) toluene
 - c) iso-octane
 - d) n-heptane
 - 6) The rotational speed of cam shaft with respect to crankshaft is
 - a) half
 - b) double
 - c) equal
 - d) four times

P.T.O.



- 7) For same compression ratio and heat rejection Otto cycle efficiency with respect to diesel cycle efficiency is
a) Greater than b) Smaller than c) Equal to d) None of above
- 8) Normal range of compression ratio for Otto cycle is
a) 2 – 4 b) 6 – 10 c) Greater than 10 d) None of above
- 9) Dissociation of CO_2 and H_2O takes place in range
a) 200°C and 400°C b) 1000°C and 1300°C
c) 600°C and 800°C d) None of above
- 10) The choke is closed when engine is
a) accelerating b) hot c) cold d) idling
- 11) The mean droplet size in the fuel spray by an injection nozzle decreases with
a) Increase in injection pressure b) Decrease in air density
c) Increase in fuel viscosity d) All of above
- 12) Multi point fuel injection system uses
a) Direct injection b) Port injection
c) Throttle body injection d) Both b) and c)
- 13) In turbochargers compressor is driven by
a) exhaust gas turbine b) engine
c) electric motor d) none of above
- 14) Very high powered engines used for ship propulsion are generally
a) two stroke petrol engines b) four stroke petrol engines
c) four stroke diesel engines d) two stroke diesel engines
- 15) The component which converts reciprocatory motion into rotary motion in engines is
a) gudgeon pin b) piston rings c) crank shaft d) camshaft
- 16) Increasing the compression ratio in SI engines the knocking tendency
a) Decreases b) Increases
c) Not affected d) None of the above
- 17) The function of quench area in a wedge shaped SI engine combustion chamber
a) Improve the compression ratio
b) Cool the end gas
c) Decrease the volume of combustion chamber
d) Increase the area of combustion chamber
- 18) The octane number iso-octane is
a) 0 b) 10 c) 80 d) 100
- 19) In CI engines with increase in compression ratio the delay period
a) increases b) decreases
c) first increase then decreases d) not affected
- 20) Brake thermal efficiency of SI engine is in the range
a) 35% to 60% b) 25% to 35% c) 60% to 80% d) none of the above



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

**B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 80

- 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

2. a) Discuss the effect of the following on the fuel air cycle analysis : 6
i) Variation of specific heat with temperature.
ii) Dissociation of gases.
- b) Explain valve timing diagram for four stroke engine, also discuss valve overlap. 6
- c) Compare Diesel Cycle with Otto cycle. 8
3. a) List the compensating devices used in carburetor and explain any one with sketch. 10
- b) The diameter of a venture of a simple carburetor is 2 cm and its Cd is 0.85. The fuel nozzle diameter is 1.25 mm and Cdf is 0.66. The tip of the fuel nozzle is 5 mm. Find
1) Air fuel ratio for pressure drop of 0.07 bar when nozzle lip is neglected
2) Air fuel ratio when nozzle lip is considered.
Take $\rho_a = 1.2 \text{ kg/m}^3$, $\rho_f = 750 \text{ kg/m}^3$ and 1 cm head of water is 98 N/m². 10
4. a) Determine quantity of fuel to be injected per cycle per cylinder for a 6 cylinder 4 stroke diesel engine having bsfc 245 gm/kW.hr and developing 89 kW at 2500 rpm. Take specific gravity as 0.84. 6
- b) Explain the effect of supercharging with PV diagram on performance of an engine. 6
- c) Discuss the requirements of an injection system and explain common rail injection system. 8



SECTION – II

5. a) Explain detonation in SI engine. 6
- b) What is Ignition lag ? Explain effect of various operating factors on Ignition lag. 6
- c) Explain working of catalytic convertor in detail. 8
6. a) The air flow to four cylinder four stroke petrol engine is measured by means of a 7.5 cm diameter sharp edge orifice, $C_d = 0.6$. 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 = 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 :
- i) Thermal efficiency on brake power basis
- ii) Brake mean effective pressure
- iii) Volumetric efficiency based on free air condition. 8
- b) Write short notes on : 4
- 1) HUCR
- 2) Additives used for petrol fuel.
- c) Explain various stages of combustion in CI engine in detail with a neat $p-\theta$ diagram. 8
7. a) Write note on Engine Electronics. 6
- b) Discuss spray formation, atomization and penetration. 6
- c) Write short notes on : 8
- 1) Heat balance sheet
- 2) Variable valve timing.
-



SLR-TJ – 118

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

Set	R
-----	---

B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

- Instructions :** 1) **Assume suitable data if necessary.**
2) **Use of non-programmable calculator is allowed.**
3) **Figures to the right indicate full marks.**
4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Increasing the compression ratio in SI engines the knocking tendency
 - a) Decreases
 - b) Increases
 - c) Not affected
 - d) None of the above
- 2) The function of quench area in a wedge shaped SI engine combustion chamber
 - a) Improve the compression ratio
 - b) Cool the end gas
 - c) Decrease the volume of combustion chamber
 - d) Increase the area of combustion chamber
- 3) The octane number iso-octane is
 - a) 0
 - b) 10
 - c) 80
 - d) 100
- 4) In CI engines with increase in compression ratio the delay period
 - a) increases
 - b) decreases
 - c) first increase then decreases
 - d) not affected
- 5) Brake thermal efficiency of SI engine is in the range
 - a) 35% to 60%
 - b) 25% to 35%
 - c) 60% to 80%
 - d) none of the above
- 6) Which one of the following quantities is assumed constant for an internal combustion engine while estimating its friction power by extrapolation through Willan's line ?
 - a) Brake thermal efficiency
 - b) Indicated thermal efficiency
 - c) Mechanical efficiency
 - d) Volumetric efficiency
- 7) Reference fuels for knock rating of SI engine fuels would include
 - a) iso-octane and alpha-methyl naphthalene
 - b) normal octane and aniline
 - c) iso-octane and n-hexane
 - d) n-heptane and iso-octane

P.T.O.



- 8) Which of the following factors increase detonation in the SI engine ?
a) Increased spark advance
b) Increased speed
c) Increased air-fuel ratio beyond stoichiometric strength
d) Increased compression ratio
- 9) Due to high temperature pollutants produced are
a) CO b) HC c) NO_x d) None of above
- 10) In SI engine Fuel detonation chances are more for
a) benzene b) toluene c) iso-octane d) n-heptane
- 11) The rotational speed of cam shaft with respect to crankshaft is
a) half b) double c) equal d) four times
- 12) For same compression ratio and heat rejection Otto cycle efficiency with respect to diesel cycle efficiency is
a) Greater than b) Smaller than c) Equal to d) None of above
- 13) Normal range of compression ratio for Otto cycle is
a) 2 – 4 b) 6 – 10 c) Greater than 10 d) None of above
- 14) Dissociation of CO₂ and H₂O takes place in range
a) 200°C and 400°C b) 1000°C and 1300°C
c) 600°C and 800°C d) None of above
- 15) The choke is closed when engine is
a) accelerating b) hot c) cold d) idling
- 16) The mean droplet size in the fuel spray by an injection nozzle decreases with
a) Increase in injection pressure b) Decrease in air density
c) Increase in fuel viscosity d) All of above
- 17) Multi point fuel injection system uses
a) Direct injection b) Port injection
c) Throttle body injection d) Both b) and c)
- 18) In turbochargers compressor is driven by
a) exhaust gas turbine b) engine
c) electric motor d) none of above
- 19) Very high powered engines used for ship propulsion are generally
a) two stroke petrol engines b) four stroke petrol engines
c) four stroke diesel engines d) two stroke diesel engines
- 20) The component which converts reciprocatory motion into rotary motion in engines is
a) gudgeon pin b) piston rings c) crank shaft d) camshaft
-



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

**B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 80

- 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

2. a) Discuss the effect of the following on the fuel air cycle analysis : 6
i) Variation of specific heat with temperature.
ii) Dissociation of gases.
- b) Explain valve timing diagram for four stroke engine, also discuss valve overlap. 6
- c) Compare Diesel Cycle with Otto cycle. 8
3. a) List the compensating devices used in carburetor and explain any one with sketch. 10
- b) The diameter of a venturi of a simple carburetor is 2 cm and its Cd is 0.85. The fuel nozzle diameter is 1.25 mm and Cdf is 0.66. The tip of the fuel nozzle is 5 mm. Find
1) Air fuel ratio for pressure drop of 0.07 bar when nozzle lip is neglected
2) Air fuel ratio when nozzle lip is considered.
- Take $\rho_a = 1.2 \text{ kg/m}^3$, $\rho_f = 750 \text{ kg/m}^3$ and 1 cm head of water is 98 N/m². 10
4. a) Determine quantity of fuel to be injected per cycle per cylinder for a 6 cylinder 4 stroke diesel engine having bsfc 245 gm/kW.hr and developing 89 kW at 2500 rpm. Take specific gravity as 0.84. 6
- b) Explain the effect of supercharging with PV diagram on performance of an engine. 6
- c) Discuss the requirements of an injection system and explain common rail injection system. 8

Set R



SECTION – II

5. a) Explain detonation in SI engine. **6**
- b) What is Ignition lag ? Explain effect of various operating factors on Ignition lag. **6**
- c) Explain working of catalytic convertor in detail. **8**
6. a) The air flow to four cylinder four stroke petrol engine is measured by means of a 7.5 cm diameter sharp edge orifice, $C_d = 0.6$. 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 = 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 :
- i) Thermal efficiency on brake power basis
- ii) Brake mean effective pressure
- iii) Volumetric efficiency based on free air condition. **8**
- b) Write short notes on : **4**
- 1) HUCR
- 2) Additives used for petrol fuel.
- c) Explain various stages of combustion in CI engine in detail with a neat $p-\theta$ diagram. **8**
7. a) Write note on Engine Electronics. **6**
- b) Discuss spray formation, atomization and penetration. **6**
- c) Write short notes on : **8**
- 1) Heat balance sheet
- 2) Variable valve timing.
-



SLR-TJ – 118

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

Set	S
-----	----------

B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume suitable data if necessary.**
 - 2) **Use of non-programmable calculator is allowed.**
 - 3) **Figures to the right indicate full marks.**
 - 4) **Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.**
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) The mean droplet size in the fuel spray by an injection nozzle decreases with
 - a) Increase in injection pressure
 - b) Decrease in air density
 - c) Increase in fuel viscosity
 - d) All of above
- 2) Multi point fuel injection system uses
 - a) Direct injection
 - b) Port injection
 - c) Throttle body injection
 - d) Both b) and c)
- 3) In turbochargers compressor is driven by
 - a) exhaust gas turbine
 - b) engine
 - c) electric motor
 - d) none of above
- 4) Very high powered engines used for ship propulsion are generally
 - a) two stroke petrol engines
 - b) four stroke petrol engines
 - c) four stroke diesel engines
 - d) two stroke diesel engines
- 5) The component which converts reciprocatory motion into rotary motion in engines is
 - a) gudgeon pin
 - b) piston rings
 - c) crank shaft
 - d) camshaft
- 6) Increasing the compression ratio in SI engines the knocking tendency
 - a) Decreases
 - b) Increases
 - c) Not affected
 - d) None of the above
- 7) The function of quench area in a wedge shaped SI engine combustion chamber
 - a) Improve the compression ratio
 - b) Cool the end gas
 - c) Decrease the volume of combustion chamber
 - d) Increase the area of combustion chamber

P.T.O.



- 8) The octane number iso-octane is
a) 0 b) 10 c) 80 d) 100
- 9) In CI engines with increase in compression ratio the delay period
a) increases b) decreases
c) first increase then decreases d) not affected
- 10) Brake thermal efficiency of SI engine is in the range
a) 35% to 60% b) 25% to 35% c) 60% to 80% d) none of the above
- 11) Which one of the following quantities is assumed constant for an internal combustion engine while estimating its friction power by extrapolation through Willan's line ?
a) Brake thermal efficiency b) Indicated thermal efficiency
c) Mechanical efficiency d) Volumetric efficiency
- 12) Reference fuels for knock rating of SI engine fuels would include
a) iso-octane and alpha-methyl naphthalene
b) normal octane and aniline
c) iso-octane and n-hexane
d) n-heptane and iso-octane
- 13) Which of the following factors increase detonation in the SI engine ?
a) Increased spark advance
b) Increased speed
c) Increased air-fuel ratio beyond stoichiometric strength
d) Increased compression ratio
- 14) Due to high temperature pollutants produced are
a) CO b) HC c) NO_x d) None of above
- 15) In SI engine Fuel detonation chances are more for
a) benzene b) toluene c) iso-octane d) n-heptane
- 16) The rotational speed of cam shaft with respect to crankshaft is
a) half b) double c) equal d) four times
- 17) For same compression ratio and heat rejection Otto cycle efficiency with respect to diesel cycle efficiency is
a) Greater than b) Smaller than c) Equal to d) None of above
- 18) Normal range of compression ratio for Otto cycle is
a) 2 – 4 b) 6 – 10 c) Greater than 10 d) None of above
- 19) Dissociation of CO₂ and H₂O takes place in range
a) 200°C and 400°C b) 1000°C and 1300°C
c) 600°C and 800°C d) None of above
- 20) The choke is closed when engine is
a) accelerating b) hot c) cold d) idling



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

**B.E. (Mechanical) Part – I (Old) Examination, 2017
INTERNAL COMBUSTION ENGINE**

Day and Date : Thursday, 14-12-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 80

- 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

2. a) Discuss the effect of the following on the fuel air cycle analysis : 6
i) Variation of specific heat with temperature.
ii) Dissociation of gases.
- b) Explain valve timing diagram for four stroke engine, also discuss valve overlap. 6
- c) Compare Diesel Cycle with Otto cycle. 8
3. a) List the compensating devices used in carburetor and explain any one with sketch. 10
- b) The diameter of a venture of a simple carburetor is 2 cm and its Cd is 0.85. The fuel nozzle diameter is 1.25 mm and Cdf is 0.66. The tip of the fuel nozzle is 5 mm. Find
1) Air fuel ratio for pressure drop of 0.07 bar when nozzle lip is neglected
2) Air fuel ratio when nozzle lip is considered.
- Take $\rho_a = 1.2 \text{ kg/m}^3$, $\rho_f = 750 \text{ kg/m}^3$ and 1 cm head of water is 98 N/m². 10
4. a) Determine quantity of fuel to be injected per cycle per cylinder for a 6 cylinder 4 stroke diesel engine having bsfc 245 gm/kW.hr and developing 89 kW at 2500 rpm. Take specific gravity as 0.84. 6
- b) Explain the effect of supercharging with PV diagram on performance of an engine. 6
- c) Discuss the requirements of an injection system and explain common rail injection system. 8

Set S



SECTION – II

5. a) Explain detonation in SI engine. **6**
- b) What is Ignition lag ? Explain effect of various operating factors on Ignition lag. **6**
- c) Explain working of catalytic convertor in detail. **8**
6. a) The air flow to four cylinder four stroke petrol engine is measured by means of a 7.5 cm diameter sharp edge orifice, $C_d = 0.6$. 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 = 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 :
- i) Thermal efficiency on brake power basis
- ii) Brake mean effective pressure
- iii) Volumetric efficiency based on free air condition. **8**
- b) Write short notes on : **4**
- 1) HUCR
- 2) Additives used for petrol fuel.
- c) Explain various stages of combustion in CI engine in detail with a neat $p-\theta$ diagram. **8**
7. a) Write note on Engine Electronics. **6**
- b) Discuss spray formation, atomization and penetration. **6**
- c) Write short notes on : **8**
- 1) Heat balance sheet
- 2) Variable valve timing.
-



SLR-TJ – 119

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

Set	P
-----	----------

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.
4) Solve **any two** questions from **each** Section.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

A) Type I Questions. One mark each :

8

- 1) OR is said to be
 - a) Only art
 - b) Only science
 - c) Art as well as science
 - d) None of these
- 2) If the slope of objective function equation in LPP is same as that of one of the binding constraints, then the problem has
 - a) Unique solution
 - b) Two solutions
 - c) Infeasible solution
 - d) Infinite solutions
- 3) A game with two players where gain of one player is equal to loss of other player is called as
 - a) Two person zero sum game
 - b) Multi person zero sum game
 - c) Two person judgemental game
 - d) Zero gain game
- 4) Which of the following criteria is also called as weighted average criterion ?
 - a) Hurwitz criterion
 - b) Laplace criterion
 - c) Minimax regret criterion
 - d) Maximin criterion
- 5) Operations Research was developed
 - a) Just before World War – I
 - b) Just before World War – II
 - c) Before the year 1900
 - d) By around 1910

P.T.O.



- 6) The value of the coefficient of optimism (α) is needed while using the criterion of
- a) Equal probability
 - b) Realism
 - c) Maximin
 - d) Minimax
- 7) For a given objective function z , which one of the following is true in solving OR problems ?
- a) Maximize $z =$ Minimize z
 - b) Maximize $z =$ Minimize $(-z)$
 - c) Maximize $z =$ Maximize $(-z)$
 - d) None of these
- 8) A state of degeneracy in transportation problem with 'm' rows and 'n' columns, means that number of allocations are
- a) less than $(m + n - 1)$
 - b) more than $(m + n - 1)$
 - c) exactly equal to $(m + n - 1)$
 - d) equal to $(m + n)$

B) Type – II : questions (2 marks each \times 3 questions = 6)

6

- 1) Re order level for inventory item depends upon
- a) Safety stock
 - b) Economic order quantity
 - c) Lead time
 - d) All of these
- 2) In the network diagram
- a) An activity and an event are represented by an arrow
 - b) An activity and an event are represented by a circle
 - c) An activity is represented by a circle and an event by an arrow
 - d) An activity is represented by an arrow and an event by a circle
- 3) Maximization assignment problem is transformed into a minimization problem
- a) Adding each entry in a column from the maximum value in that column
 - b) Subtracting each entry in a column from the maximum value in that column
 - c) Subtracting each entry in the table from the maximum value in that table
 - d) None of the above
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instructions : 1) Solve **any two** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.

SECTION – I

- 2. a) Write in brief on application of OR in industry. 5
- b) Solve following LPP by simplex method. 9

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

- 3. a) Discuss Cargo Loading problems in Dynamic programming. 6
- b) Solve using Hungarian method. The matrix entries represents the processing time in hours. 8

Job	Operator				
	A	B	C	D	E
1	10	12	15	12	8
2	7	16	14	14	11
3	13	14	7	9	9
4	12	10	11	13	10
5	8	13	15	11	15



4. a) Explain in brief the various phases of OR. 5
 b) Find the optimum solution to the following by using VAM. 9

		To Destination					Capacity
		A	B	C	D	E	
From Origin	I	3	4	6	8	8	20
	II	2	10	1	5	30	30
	III	7	11	20	40	15	15
	IV	2	1	9	14	18	13
Requirement		40	6	8	18	6	

SECTION – II

5. a) Use dominance principle to reduce the following game to 2×2 games and hence solve. 5

		Player B		
		I	II	III
Player A	I	2	0	3
	II	3	-1	1
	III	5	2	-1

- b) Solve the following 2×3 game graphically. 6

		B		
		I	II	III
A	I	1	3	11
	II	8	5	2

- c) Define following terms : 3
 1) Project
 2) Mixed strategy
 3) Saddle point.



6. a) Given the following payoff matrix (profit in Rs.), suggest which action is to be taken on the basis of 6
- 1) Hurwitz criterion (coefficient of optimism = 0.7)
 - 2) Criteria of optimism (maximax)

Alternatives	States of nature (Product Demand)			
	High (Rs.)	Moderate (Rs.)	Low (Rs.)	Nil
Expand	50,000	25,000	-25,000	-45,000
Construct	70,000	30,000	-40,000	-80,000
Subcontract	30,000	15,000	-1,000	-10,000

- b) The purchase price of a machine is Rs. 52,000. The installation charges amount to Rs. 14,400 and its scrap value is only Rs. 6,400. The main cost in various years is given below. 5

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	1,000	3,000	4,000	6,000	8,400	11,600	16,000	19,200

- c) Distinguish between PERT and CPM. 3

7. a) A project consists of the following activities given with their three time estimates in days. 8

Activity	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
Optimistic time	3	2	6	2	5	3	1	3	4
Most likely time	6	5	12	5	11	6	4	9	19
Pessimistic time	15	14	30	8	17	15	7	27	28

- 1) Draw the project network.
- 2) Determine expected project duration.
- 3) What is probability that project will be completed in 41 days ?

Z	0.8	0.9	1	1.2
Probability	0.78	0.81	0.84	0.88

- b) Write note on following (**any two**) : 6
- 1) Group replacement policy.
 - 2) Types of floats.
 - 3) Inventory model with instantaneous replenishment.



SLR-TJ – 119

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.
4) Solve **any two** questions from **each** Section.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

A) Type I Questions. One mark each :

8

- 1) If the slope of objective function equation in LPP is same as that of one of the binding constraints, then the problem has
 - a) Unique solution
 - b) Two solutions
 - c) Infeasible solution
 - d) Infinite solutions
- 2) Which of the following criteria is also called as weighted average criterion ?
 - a) Hurwitz criterion
 - b) Laplace criterion
 - c) Minimax regret criterion
 - d) Maximin criterion
- 3) The value of the coefficient of optimism (α) is needed while using the criterion of
 - a) Equal probability
 - b) Realism
 - c) Maximin
 - d) Minimax
- 4) A state of degeneracy in transportation problem with 'm' rows and 'n' columns, means that number of allocations are
 - a) less than $(m + n - 1)$
 - b) more than $(m + n - 1)$
 - c) exactly equal to $(m + n - 1)$
 - d) equal to $(m + n)$
- 5) OR is said to be
 - a) Only art
 - b) Only science
 - c) Art as well as science
 - d) None of these

P.T.O.



- 6) A game with two players where gain of one player is equal to loss of other player is called as
- a) Two person zero sum game b) Multi person zero sum game
c) Two person judgemental game d) Zero gain game
- 7) Operations Research was developed
- a) Just before World War – I b) Just before World War – II
c) Before the year 1900 d) By around 1910
- 8) For a given objective function z , which one of the following is true in solving OR problems ?
- a) Maximize z = Minimize z b) Maximize z = Minimize $(-z)$
c) Maximize z = Maximize $(-z)$ d) None of these

B) Type – II : questions (2 marks each × 3 questions = 6)**6**

- 1) In the network diagram
- a) An activity and an event are represented by an arrow
b) An activity and an event are represented by a circle
c) An activity is represented by a circle and an event by an arrow
d) An activity is represented by an arrow and an event by a circle
- 2) Maximization assignment problem is transformed into a minimization problem
- a) Adding each entry in a column from the maximum value in that column
b) Subtracting each entry in a column from the maximum value in that column
c) Subtracting each entry in the table from the maximum value in that table
d) None of the above
- 3) Re order level for inventory item depends upon
- a) Safety stock b) Economic order quantity
c) Lead time d) All of these
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instructions : 1) Solve **any two** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.

SECTION – I

- 2. a) Write in brief on application of OR in industry. 5
- b) Solve following LPP by simplex method. 9

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

- 3. a) Discuss Cargo Loading problems in Dynamic programming. 6
- b) Solve using Hungarian method. The matrix entries represents the processing time in hours. 8

Job	Operator				
	A	B	C	D	E
1	10	12	15	12	8
2	7	16	14	14	11
3	13	14	7	9	9
4	12	10	11	13	10
5	8	13	15	11	15



4. a) Explain in brief the various phases of OR. 5
 b) Find the optimum solution to the following by using VAM. 9

		To Destination					Capacity
		A	B	C	D	E	
From Origin	I	3	4	6	8	8	20
	II	2	10	1	5	30	30
	III	7	11	20	40	15	15
	IV	2	1	9	14	18	13
Requirement		40	6	8	18	6	

SECTION – II

5. a) Use dominance principle to reduce the following game to 2×2 games and hence solve. 5

		Player B		
		I	II	III
Player A	I	2	0	3
	II	3	-1	1
	III	5	2	-1

- b) Solve the following 2×3 game graphically. 6

		B		
		I	II	III
A	I	1	3	11
	II	8	5	2

- c) Define following terms : 3
 1) Project
 2) Mixed strategy
 3) Saddle point.



6. a) Given the following payoff matrix (profit in Rs.), suggest which action is to be taken on the basis of 6

- 1) Hurwitz criterion (coefficient of optimism = 0.7)
- 2) Criteria of optimism (maximax)

Alternatives	States of nature (Product Demand)			
	High (Rs.)	Moderate (Rs.)	Low (Rs.)	Nil
Expand	50,000	25,000	-25,000	-45,000
Construct	70,000	30,000	-40,000	-80,000
Subcontract	30,000	15,000	-1,000	-10,000

b) The purchase price of a machine is Rs. 52,000. The installation charges amount to Rs. 14,400 and its scrap value is only Rs. 6,400. The main cost in various years is given below. 5

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	1,000	3,000	4,000	6,000	8,400	11,600	16,000	19,200

c) Distinguish between PERT and CPM. 3

7. a) A project consists of the following activities given with their three time estimates in days. 8

Activity	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
Optimistic time	3	2	6	2	5	3	1	3	4
Most likely time	6	5	12	5	11	6	4	9	19
Pessimistic time	15	14	30	8	17	15	7	27	28

- 1) Draw the project network.
- 2) Determine expected project duration.
- 3) What is probability that project will be completed in 41 days ?

Z	0.8	0.9	1	1.2
Probability	0.78	0.81	0.84	0.88

b) Write note on following (any two) : 6

- 1) Group replacement policy.
- 2) Types of floats.
- 3) Inventory model with instantaneous replenishment.



SLR-TJ – 119

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

Set	R
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.
4) Solve **any two** questions from **each** Section.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

A) Type I Questions. One mark each :

8

- 1) The value of the coefficient of optimism (α) is needed while using the criterion of
 - a) Equal probability
 - b) Realism
 - c) Maximin
 - d) Minimax
- 2) A state of degeneracy in transportation problem with 'm' rows and 'n' columns, means that number of allocations are
 - a) less than $(m + n - 1)$
 - b) more than $(m + n - 1)$
 - c) exactly equal to $(m + n - 1)$
 - d) equal to $(m + n)$
- 3) OR is said to be
 - a) Only art
 - b) Only science
 - c) Art as well as science
 - d) None of these
- 4) A game with two players where gain of one player is equal to loss of other player is called as
 - a) Two person zero sum game
 - b) Multi person zero sum game
 - c) Two person judgemental game
 - d) Zero gain game
- 5) For a given objective function z, which one of the following is true in solving OR problems ?
 - a) Maximize z = Minimize z
 - b) Maximize z = Minimize $(-z)$
 - c) Maximize z = Maximize $(-z)$
 - d) None of these

P.T.O.



- 6) Operations Research was developed
- a) Just before World War – I
 - b) Just before World War – II
 - c) Before the year 1900
 - d) By around 1910
- 7) If the slope of objective function equation in LPP is same as that of one of the binding constraints, then the problem has
- a) Unique solution
 - b) Two solutions
 - c) Infeasible solution
 - d) Infinite solutions
- 8) Which of the following criteria is also called as weighted average criterion ?
- a) Hurwitz criterion
 - b) Laplace criterion
 - c) Minimax regret criterion
 - d) Maximin criterion

B) Type – II : questions (2 marks each × 3 questions = 6)

6

- 1) Maximization assignment problem is transformed into a minimization problem
- a) Adding each entry in a column from the maximum value in that column
 - b) Subtracting each entry in a column from the maximum value in that column
 - c) Subtracting each entry in the table from the maximum value in that table
 - d) None of the above
- 2) Re order level for inventory item depends upon
- a) Safety stock
 - b) Economic order quantity
 - c) Lead time
 - d) All of these
- 3) In the network diagram
- a) An activity and an event are represented by an arrow
 - b) An activity and an event are represented by a circle
 - c) An activity is represented by a circle and an event by an arrow
 - d) An activity is represented by an arrow and an event by a circle
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instructions : 1) Solve **any two** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.

SECTION – I

- 2. a) Write in brief on application of OR in industry. 5
- b) Solve following LPP by simplex method. 9

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

- 3. a) Discuss Cargo Loading problems in Dynamic programming. 6
- b) Solve using Hungarian method. The matrix entries represents the processing time in hours. 8

Job	Operator				
	A	B	C	D	E
1	10	12	15	12	8
2	7	16	14	14	11
3	13	14	7	9	9
4	12	10	11	13	10
5	8	13	15	11	15



4. a) Explain in brief the various phases of OR. 5
 b) Find the optimum solution to the following by using VAM. 9

		To Destination					Capacity
		A	B	C	D	E	
From Origin	I	3	4	6	8	8	20
	II	2	10	1	5	30	30
	III	7	11	20	40	15	15
	IV	2	1	9	14	18	13
Requirement		40	6	8	18	6	

SECTION – II

5. a) Use dominance principle to reduce the following game to 2×2 games and hence solve. 5

		Player B		
		I	II	III
Player A	I	2	0	3
	II	3	-1	1
	III	5	2	-1

- b) Solve the following 2×3 game graphically. 6

		B		
		I	II	III
A	I	1	3	11
	II	8	5	2

- c) Define following terms : 3
 1) Project
 2) Mixed strategy
 3) Saddle point.



6. a) Given the following payoff matrix (profit in Rs.), suggest which action is to be taken on the basis of 6
- 1) Hurwitz criterion (coefficient of optimism = 0.7)
 - 2) Criteria of optimism (maximax)

Alternatives	States of nature (Product Demand)			
	High (Rs.)	Moderate (Rs.)	Low (Rs.)	Nil
Expand	50,000	25,000	-25,000	-45,000
Construct	70,000	30,000	-40,000	-80,000
Subcontract	30,000	15,000	-1,000	-10,000

- b) The purchase price of a machine is Rs. 52,000. The installation charges amount to Rs. 14,400 and its scrap value is only Rs. 6,400. The main cost in various years is given below. 5

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	1,000	3,000	4,000	6,000	8,400	11,600	16,000	19,200

- c) Distinguish between PERT and CPM. 3

7. a) A project consists of the following activities given with their three time estimates in days. 8

Activity	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
Optimistic time	3	2	6	2	5	3	1	3	4
Most likely time	6	5	12	5	11	6	4	9	19
Pessimistic time	15	14	30	8	17	15	7	27	28

- 1) Draw the project network.
- 2) Determine expected project duration.
- 3) What is probability that project will be completed in 41 days ?

Z	0.8	0.9	1	1.2
Probability	0.78	0.81	0.84	0.88

- b) Write note on following (any two) : 6
- 1) Group replacement policy.
 - 2) Types of floats.
 - 3) Inventory model with instantaneous replenishment.



SLR-TJ – 119

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

Set	S
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.
4) Solve **any two** questions from **each** Section.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

A) Type I Questions. One mark each :

8

- 1) A game with two players where gain of one player is equal to loss of other player is called as
 - a) Two person zero sum game
 - b) Multi person zero sum game
 - c) Two person judgemental game
 - d) Zero gain game
- 2) Operations Research was developed
 - a) Just before World War – I
 - b) Just before World War – II
 - c) Before the year 1900
 - d) By around 1910
- 3) For a given objective function z , which one of the following is true in solving OR problems ?
 - a) Maximize z = Minimize z
 - b) Maximize z = Minimize $(-z)$
 - c) Maximize z = Maximize $(-z)$
 - d) None of these
- 4) If the slope of objective function equation in LPP is same as that of one of the binding constraints, then the problem has
 - a) Unique solution
 - b) Two solutions
 - c) Infeasible solution
 - d) Infinite solutions

P.T.O.



- 5) Which of the following criteria is also called as weighted average criterion ?
- a) Hurwitz criterion b) Laplace criterion
c) Minimax regret criterion d) Maximin criterion
- 6) A state of degeneracy in transportation problem with 'm' rows and 'n' columns, means that number of allocations are
- a) less than $(m + n - 1)$ b) more than $(m + n - 1)$
c) exactly equal to $(m + n - 1)$ d) equal to $(m + n)$
- 7) The value of the coefficient of optimism (α) is needed while using the criterion of
- a) Equal probability b) Realism
c) Maximin d) Minimax
- 8) OR is said to be
- a) Only art b) Only science
c) Art as well as science d) None of these

B) Type – II : questions (2 marks each × 3 questions = 6)

6

- 1) Maximization assignment problem is transformed into a minimization problem
- a) Adding each entry in a column from the maximum value in that column
b) Subtracting each entry in a column from the maximum value in that column
c) Subtracting each entry in the table from the maximum value in that table
d) None of the above
- 2) In the network diagram
- a) An activity and an event are represented by an arrow
b) An activity and an event are represented by a circle
c) An activity is represented by a circle and an event by an arrow
d) An activity is represented by an arrow and an event by a circle
- 3) Re order level for inventory item depends upon
- a) Safety stock b) Economic order quantity
c) Lead time d) All of these
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
OPERATIONS RESEARCH**

Day and Date : Tuesday, 28-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instructions : 1) Solve **any two** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.

SECTION – I

- 2. a) Write in brief on application of OR in industry. 5
- b) Solve following LPP by simplex method. 9

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

- 3. a) Discuss Cargo Loading problems in Dynamic programming. 6
- b) Solve using Hungarian method. The matrix entries represents the processing time in hours. 8

Job	Operator				
	A	B	C	D	E
1	10	12	15	12	8
2	7	16	14	14	11
3	13	14	7	9	9
4	12	10	11	13	10
5	8	13	15	11	15



4. a) Explain in brief the various phases of OR. 5
 b) Find the optimum solution to the following by using VAM. 9

		To Destination					Capacity
		A	B	C	D	E	
From Origin	I	3	4	6	8	8	20
	II	2	10	1	5	30	30
	III	7	11	20	40	15	15
	IV	2	1	9	14	18	13
Requirement		40	6	8	18	6	

SECTION – II

5. a) Use dominance principle to reduce the following game to 2×2 games and hence solve. 5

		Player B		
		I	II	III
Player A	I	2	0	3
	II	3	-1	1
	III	5	2	-1

- b) Solve the following 2×3 game graphically. 6

		B		
		I	II	III
A	I	1	3	11
	II	8	5	2

- c) Define following terms : 3
 1) Project
 2) Mixed strategy
 3) Saddle point.



6. a) Given the following payoff matrix (profit in Rs.), suggest which action is to be taken on the basis of 6
- 1) Hurwitz criterion (coefficient of optimism = 0.7)
 - 2) Criteria of optimism (maximax)

Alternatives	States of nature (Product Demand)			
	High (Rs.)	Moderate (Rs.)	Low (Rs.)	Nil
Expand	50,000	25,000	-25,000	-45,000
Construct	70,000	30,000	-40,000	-80,000
Subcontract	30,000	15,000	-1,000	-10,000

- b) The purchase price of a machine is Rs. 52,000. The installation charges amount to Rs. 14,400 and its scrap value is only Rs. 6,400. The main cost in various years is given below. 5

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	1,000	3,000	4,000	6,000	8,400	11,600	16,000	19,200

- c) Distinguish between PERT and CPM. 3

7. a) A project consists of the following activities given with their three time estimates in days. 8

Activity	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
Optimistic time	3	2	6	2	5	3	1	3	4
Most likely time	6	5	12	5	11	6	4	9	19
Pessimistic time	15	14	30	8	17	15	7	27	28

- 1) Draw the project network.
- 2) Determine expected project duration.
- 3) What is probability that project will be completed in 41 days ?

Z	0.8	0.9	1	1.2
Probability	0.78	0.81	0.84	0.88

- b) Write note on following (any two) : 6
- 1) Group replacement policy.
 - 2) Types of floats.
 - 3) Inventory model with instantaneous replenishment.



SLR-TJ – 120

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

Set	P
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **cannot** be changed **once** it is marked.
 - 4) Don't forget to mention Que. Paper Set on the top of the page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Liquid level control in overhead tank with float is an example of
 - a) Automatic control system
 - b) Manual control system
 - c) Hybrid system
 - d) None of these
- 2) In rotational mechanical system inertia is represented by
 - a) Mass
 - b) Mass moment of inertia
 - c) Area moment of inertia
 - d) Torsional spring
- 3) In direct analogy between electric and mechanical system, charge is analogous to
 - a) Force
 - b) Velocity
 - c) Displacement
 - d) Acceleration
- 4) Hydraulic amplifier acts as a
 - a) Differentiator
 - b) Comparator
 - c) Integrator
 - d) None of these
- 5) Flux vs field current curves for field controlled D.C. motor are _____ for unsaturated core.
 - a) Logarithmic
 - b) Exponential
 - c) Linear
 - d) Sinusoidal
- 6) For unity negative feedback system with forward path TF as G, the system Transfer function is
 - a) $G/(1 + G)$
 - b) $1/(1 + G)$
 - c) $G/(1 - G)$
 - d) $1/(1 - G)$

P.T.O.



- 7) For a control system, 'c', 'u' and 'v' denote change in output, change in disturbance and change in input respectively from operating point. The differential equation relating these variables is given by, $c = \frac{2}{D^2 + 2D + 2}v + \frac{D}{D^2 + 2D + 2}u$. The steady state equation of the system is
- a) $c = v + u$ b) $c = u$ c) $c = v$ d) $c = v - u$
- 8) The transfer function of a system is given by $\frac{4}{s^2 + 4}$. The system is
- a) Overdamped b) Underdamped
c) Critically Damped d) Undamped
- 9) Dead band or differential gap or neutral zone is associated with _____ control mode or action.
- a) Proportional b) Integral c) On Off d) Derivative
- 10) For a unity feedback system with $G(s) = \frac{s(s+3)}{(s+1)(s+2)}$, _____ number of branches will be terminating at infinity.
- a) 2 b) 1 c) 3 d) 0
- 11) The root locus of unity feedback system with $G(s) = \frac{k}{(s+1)}$ will have
- a) One branch starting from -1 and terminating at $-\infty$
b) One branch starting from 1 and terminating at K
c) One branch starting from 1 and terminating at $-K$
d) One branch starting from 1 and terminating at $-\infty$
- 12) For a marginal stable system, this is true.
- a) $GM > PM$ b) $GM < PM$
c) GM positive and PM negative d) $\omega_{gc} = \omega_{pc}$
- 13) For $0 < K < 1$, magnitude plot will be _____. K is gain of the system.
- a) above 0 db line b) below 0 db line
c) 0 db line d) none of these
- 14) In direct programming state space model, state variable X_1 is taken as
- a) Given differential equation with numerator as 1
b) Given differential equation
c) Residue of partial fraction
d) None of these
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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 and semi-log paper if **required**.

SECTION – I

2. a) Explain the manual control system in detail with suitable example. Also represent that example by block diagram. 5
- b) Find overall transfer function of a system represented by block diagram in Fig. (2-a). 5

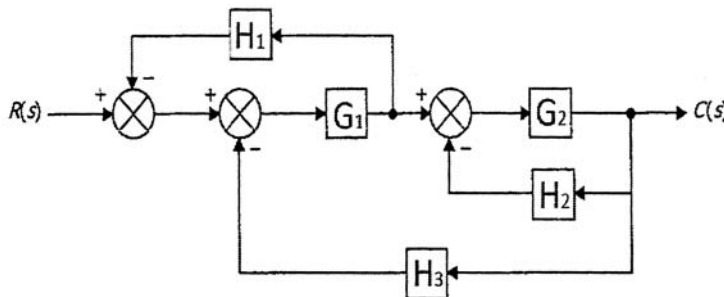


Fig. (2-a)

- c) Find the differential equation relating V_{in} and V_{out} for a electrical system shown in Fig. (2-c). 4

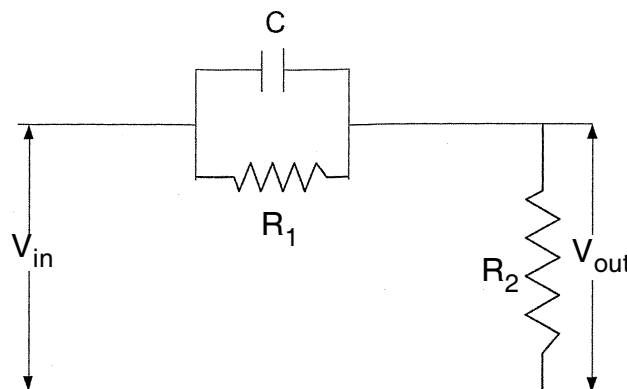


Fig. (2-c)



3. a) Explain field controlled DC motor in detail and derive its transfer function. 5
 b) For a mechanical system shown in Fig. (3-b) find the relation between 6
 i) f & X ii) f & Y iii) X & Y

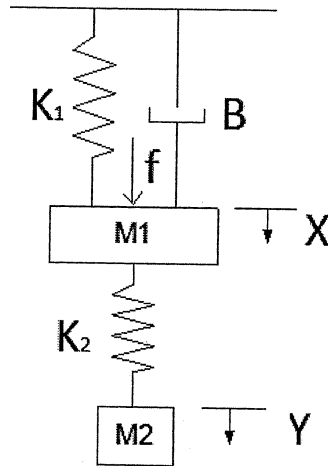


Fig. (3-b)

- c) Explain the rules for shifting take off point before and after summing point. 3
 4. a) Determine the linear approximation for the equation $Z = \sin X \cos Y$. For $X_i = 60^\circ$, and $Y_i = 30^\circ$. What is the approximate value of Z when $X = 63^\circ$ and $Y = 28^\circ$? 4
 b) The characteristics of an engine are described by the family of curves shown in Fig. (4-b). Determine the linear approximation for torque 'T' delivered by the engine. $n_i = 3000$, $T_i = 100$, $Q_i = 50$. 4

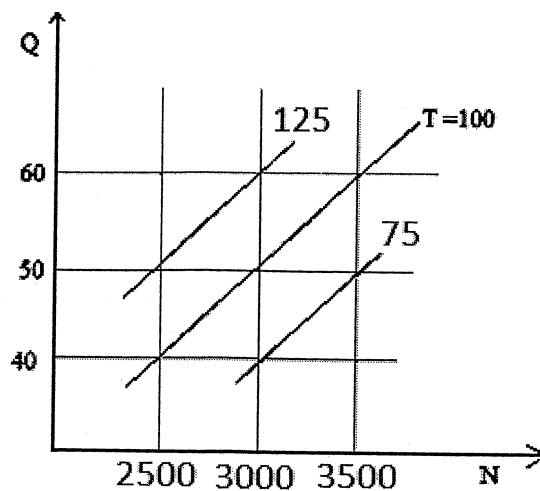


Fig. (4-b)



- c) Derive the steady state relation from the system block diagram at steady state and also derive different slopes to construct controller and system characteristics. 6

SECTION – II

- 5. a) Explain P + D control action in detail. Write the equation of controller output when controller is subjected to ramp error input and show the respective plots. 5
- b) For a system shown in Fig. (5-b), using Routh's Stability criteria find the range of the gain for which system is stable. $G(S) = \frac{K(s+1)}{s(s+2)(s+3)}$. Also find the frequency of oscillation for marginal stable system. 6

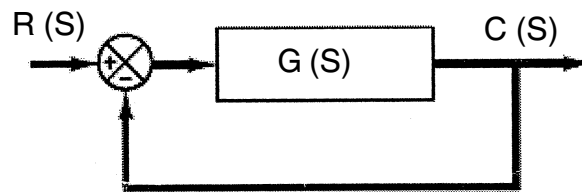


Fig. (5-b)

- c) Write a standard transfer function of a first order system and show its response curves for $\tau = 0.2, 2, 1$ when the system is subjected to unit step input. τ is the time constant of the system. Show the time constants in response plot when $t = \tau$. 3
- 6. a) For a unity feedback system, $G(S) = \frac{K}{s(s+1)(s+2)(s+3)}$. Construct the root locus for this system and comment on the stability of the system. 7
- b) Write the general predictions for the presence of breakaway point on real axis. Draw the sketches for each prediction by taking suitable example. 3
- c) Explain the bode plot for simple pole and simple zero in detail. 4



7. a) For a system in Fig. (7-a). Draw the bode diagram and comment on the stability of

the system. $G(S) = \frac{200(1+0.1s)}{s(1+0.2s)(1+0.05s)}$.

8

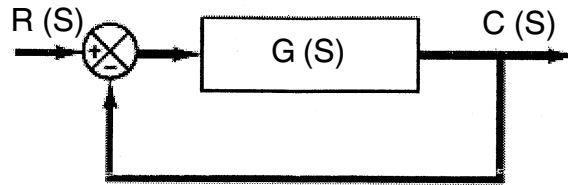


Fig. (7-a)

- b) The speed of an automobile which is being controlled by the cruise control is

described by the differential equation $y(t) = \frac{2(D+5)}{(D+2)(D+3)(D+4)} f(t)$.

Determine the computer diagram and state space representation using series programming.

6



SLR-TJ – 120

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **cannot** be changed **once** it is marked.
 - 4) Don't forget to mention Que. Paper Set on the top of the page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) The transfer function of a system is given by $\frac{4}{s^2 + 4}$. The system is
 - a) Overdamped
 - b) Underdamped
 - c) Critically Damped
 - d) Undamped
- 2) Dead band or differential gap or neutral zone is associated with _____ control mode or action.
 - a) Proportional
 - b) Integral
 - c) On Off
 - d) Derivative
- 3) For a unity feedback system with $G(s) = \frac{s(s+3)}{(s+1)(s+2)}$, _____ number of branches will be terminating at infinity.
 - a) 2
 - b) 1
 - c) 3
 - d) 0
- 4) The root locus of unity feedback system with $G(s) = \frac{k}{(s+1)}$ will have
 - a) One branch starting from -1 and terminating at $-\infty$
 - b) One branch starting from 1 and terminating at K
 - c) One branch starting from 1 and terminating at $-K$
 - d) One branch starting from 1 and terminating at $-\infty$

P.T.O.



- 5) For a marginal stable system, this is true.
- | | |
|--------------------------------|--------------------------------|
| a) $GM > PM$ | b) $GM < PM$ |
| c) GM positive and PM negative | d) $\omega_{gc} = \omega_{pc}$ |
- 6) For $0 < K < 1$, magnitude plot will be _____. K is gain of the system.
- | | |
|--------------------|--------------------|
| a) above 0 db line | b) below 0 db line |
| c) 0 db line | d) none of these |
- 7) In direct programming state space model, state variable X_1 is taken as
- Given differential equation with numerator as 1
 - Given differential equation
 - Residue of partial fraction
 - None of these
- 8) Liquid level control in overhead tank with float is an example of
- | | |
|-----------------------------|--------------------------|
| a) Automatic control system | b) Manual control system |
| c) Hybrid system | d) None of these |
- 9) In rotational mechanical system inertia is represented by
- | | |
|---------------------------|---------------------------|
| a) Mass | b) Mass moment of inertia |
| c) Area moment of inertia | d) Torsional spring |
- 10) In direct analogy between electric and mechanical system, charge is analogous to
- | | | | |
|----------|-------------|-----------------|-----------------|
| a) Force | b) Velocity | c) Displacement | d) Acceleration |
|----------|-------------|-----------------|-----------------|
- 11) Hydraulic amplifier acts as a
- | | | | |
|-------------------|---------------|---------------|------------------|
| a) Differentiator | b) Comparator | c) Integrator | d) None of these |
|-------------------|---------------|---------------|------------------|
- 12) Flux vs field current curves for field controlled D.C. motor are _____ for unsaturated core.
- | | | | |
|----------------|----------------|-----------|---------------|
| a) Logarithmic | b) Exponential | c) Linear | d) Sinusoidal |
|----------------|----------------|-----------|---------------|
- 13) For unity negative feedback system with forward path TF as G, the system Transfer function is
- | | | | |
|----------------|----------------|----------------|----------------|
| a) $G/(1 + G)$ | b) $1/(1 + G)$ | c) $G/(1 - G)$ | d) $1/(1 - G)$ |
|----------------|----------------|----------------|----------------|
- 14) For a control system, 'c', 'u' and 'v' denote change in output, change in disturbance and change in input respectively from operating point. The differential equation relating these variables is given by, $c = \frac{2}{D^2 + 2D + 2}v + \frac{D}{D^2 + 2D + 2}u$. The steady state equation of the system is
- | | | | |
|----------------|------------|------------|----------------|
| a) $c = v + u$ | b) $c = u$ | c) $c = v$ | d) $c = v - u$ |
|----------------|------------|------------|----------------|
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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 and semi-log paper if **required**.

SECTION – I

2. a) Explain the manual control system in detail with suitable example. Also represent that example by block diagram. **5**
b) Find overall transfer function of a system represented by block diagram in Fig. (2-a). **5**

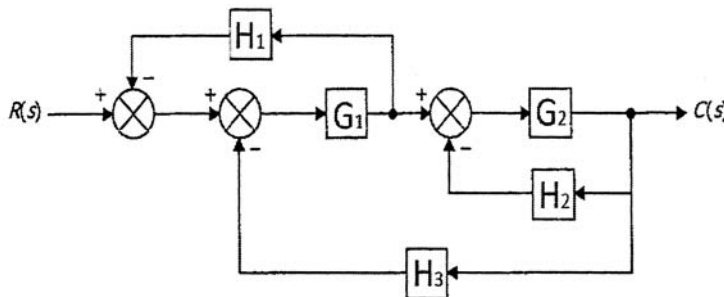


Fig. (2-a)

- c) Find the differential equation relating V_{in} and V_{out} for an electrical system shown in Fig. (2-c). **4**

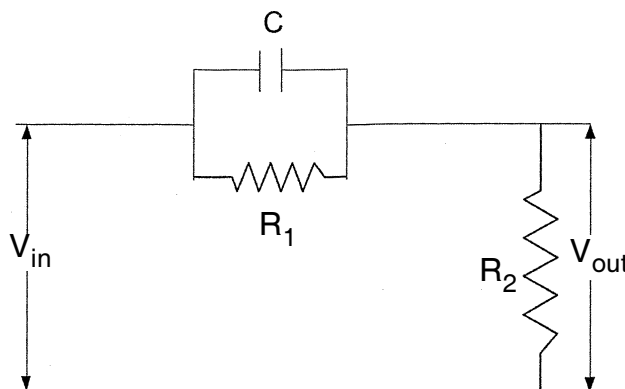


Fig. (2-c)



3. a) Explain field controlled DC motor in detail and derive its transfer function. 5
 b) For a mechanical system shown in Fig. (3-b) find the relation between 6
 i) f & X ii) f & Y iii) X & Y

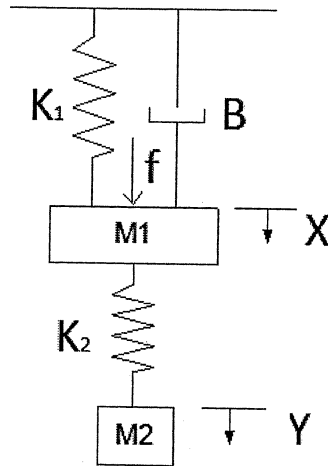


Fig. (3-b)

- c) Explain the rules for shifting take off point before and after summing point. 3
 4. a) Determine the linear approximation for the equation $Z = \sin X \cos Y$. For $X_i = 60^\circ$, and $Y_i = 30^\circ$. What is the approximate value of Z when $X = 63^\circ$ and $Y = 28^\circ$? 4
 b) The characteristics of an engine are described by the family of curves shown in Fig. (4-b). Determine the linear approximation for torque 'T' delivered by the engine. $n_i = 3000$, $T_i = 100$, $Q_i = 50$. 4

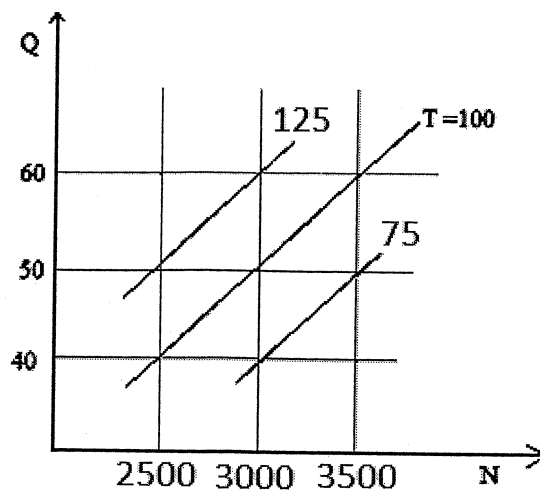


Fig. (4-b)



- c) Derive the steady state relation from the system block diagram at steady state and also derive different slopes to construct controller and system characteristics. **6**

SECTION – II

- 5. a) Explain P + D control action in detail. Write the equation of controller output when controller is subjected to ramp error input and show the respective plots. **5**
- b) For a system shown in Fig. (5-b), using Routh's Stability criteria find the range of the gain for which system is stable. $G(S) = \frac{K(s+1)}{s(s+2)(s+3)}$. Also find the frequency of oscillation for marginal stable system. **6**

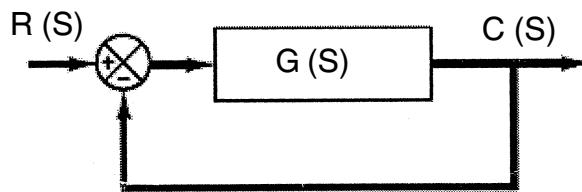


Fig. (5-b)

- c) Write a standard transfer function of a first order system and show its response curves for $\tau = 0.2, 2, 1$ when the system is subjected to unit step input. τ is the time constant of the system. Show the time constants in response plot when $t = \tau$. **3**
- 6. a) For a unity feedback system, $G(S) = \frac{K}{s(s+1)(s+2)(s+3)}$. Construct the root locus for this system and comment on the stability of the system. **7**
- b) Write the general predictions for the presence of breakaway point on real axis. Draw the sketches for each prediction by taking suitable example. **3**
- c) Explain the bode plot for simple pole and simple zero in detail. **4**



7. a) For a system in Fig. (7-a). Draw the bode diagram and comment on the stability of

the system. $G(S) = \frac{200(1+0.1s)}{s(1+0.2s)(1+0.05s)}$.

8

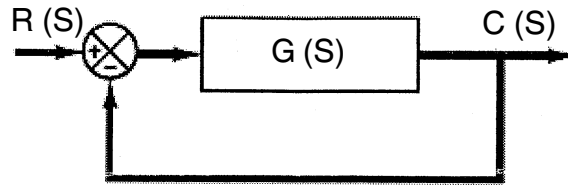


Fig. (7-a)

- b) The speed of an automobile which is being controlled by the cruise control is

described by the differential equation $y(t) = \frac{2(D+5)}{(D+2)(D+3)(D+4)} f(t)$.

Determine the computer diagram and state space representation using series programming.

6



SLR-TJ – 120

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

Set	R
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **cannot** be changed **once** it is marked.
 - 4) Don't forget to mention Que. Paper Set on the top of the page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**

- 1) Flux vs field current curves for field controlled D.C. motor are _____ for unsaturated core.
a) Logarithmic b) Exponential c) Linear d) Sinusoidal
- 2) For unity negative feedback system with forward path TF as G, the system Transfer function is
a) $G/(1 + G)$ b) $1/(1 + G)$ c) $G/(1 - G)$ d) $1/(1 - G)$
- 3) For a control system, 'c', 'u' and 'v' denote change in output, change in disturbance and change in input respectively from operating point. The differential equation relating these variables is given by, $c = \frac{2}{D^2 + 2D + 2}v + \frac{D}{D^2 + 2D + 2}u$. The steady state equation of the system is
a) $c = v + u$ b) $c = u$ c) $c = v$ d) $c = v - u$
- 4) The transfer function of a system is given by $\frac{4}{s^2 + 4}$. The system is
a) Overdamped b) Underdamped
c) Critically Damped d) Undamped
- 5) Dead band or differential gap or neutral zone is associated with _____ control mode or action.
a) Proportional b) Integral c) On Off d) Derivative

P.T.O.



- 6) For a unity feedback system with $G(s) = \frac{s(s+3)}{(s+1)(s+2)}$, _____ number of branches will be terminating at infinity.
a) 2 b) 1 c) 3 d) 0
- 7) The root locus of unity feedback system with $G(s) = \frac{k}{(s+1)}$ will have
a) One branch starting from -1 and terminating at $-\infty$
b) One branch starting from 1 and terminating at K
c) One branch starting from 1 and terminating at $-K$
d) One branch starting from 1 and terminating at $-\infty$
- 8) For a marginal stable system, this is true.
a) $GM > PM$ b) $GM < PM$
c) GM positive and PM negative d) $\omega_{gc} = \omega_{pc}$
- 9) For $0 < K < 1$, magnitude plot will be _____. K is gain of the system.
a) above 0 db line b) below 0 db line
c) 0 db line d) none of these
- 10) In direct programming state space model, state variable X_1 is taken as
a) Given differential equation with numerator as 1
b) Given differential equation
c) Residue of partial fraction
d) None of these
- 11) Liquid level control in overhead tank with float is an example of
a) Automatic control system b) Manual control system
c) Hybrid system d) None of these
- 12) In rotational mechanical system inertia is represented by
a) Mass b) Mass moment of inertia
c) Area moment of inertia d) Torsional spring
- 13) In direct analogy between electric and mechanical system, charge is analogous to
a) Force b) Velocity c) Displacement d) Acceleration
- 14) Hydraulic amplifier acts as a
a) Differentiator b) Comparator c) Integrator d) None of these
-



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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 and semi-log paper if **required**.

SECTION – I

2. a) Explain the manual control system in detail with suitable example. Also represent that example by block diagram. 5
- b) Find overall transfer function of a system represented by block diagram in Fig. (2-a). 5

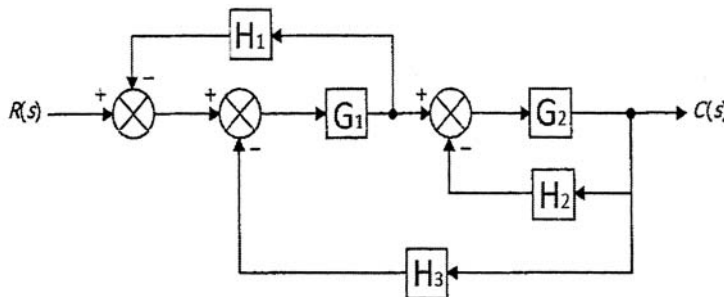


Fig. (2-a)

- c) Find the differential equation relating V_{in} and V_{out} for a electrical system shown in Fig. (2-c). 4

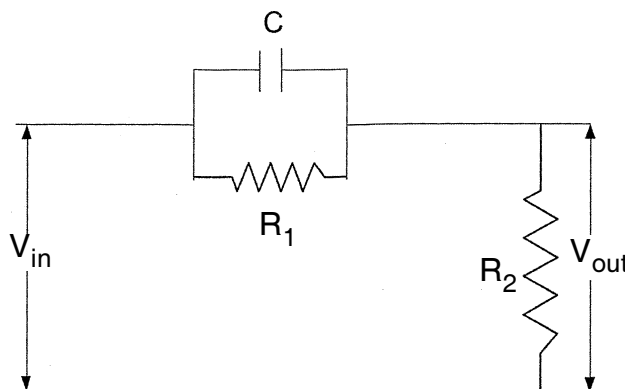


Fig. (2-c)



3. a) Explain field controlled DC motor in detail and derive its transfer function. 5
 b) For a mechanical system shown in Fig. (3-b) find the relation between 6
 i) f & X ii) f & Y iii) X & Y

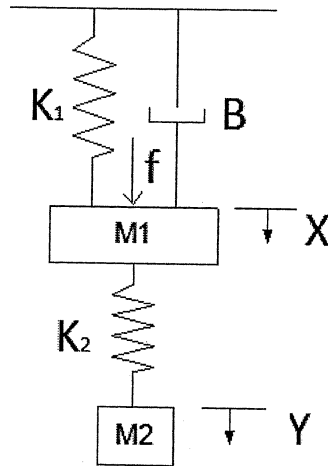


Fig. (3-b)

- c) Explain the rules for shifting take off point before and after summing point. 3
 4. a) Determine the linear approximation for the equation $Z = \sin X \cos Y$. For $X_i = 60^\circ$, and $Y_i = 30^\circ$. What is the approximate value of Z when $X = 63^\circ$ and $Y = 28^\circ$? 4
 b) The characteristics of an engine are described by the family of curves shown in Fig. (4-b). Determine the linear approximation for torque 'T' delivered by the engine. $n_i = 3000$, $T_i = 100$, $Q_i = 50$. 4

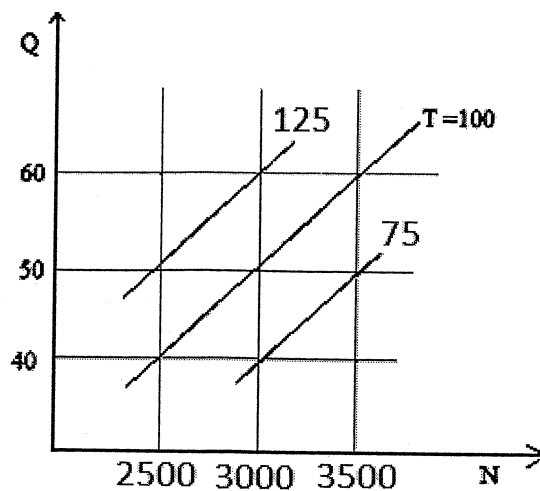


Fig. (4-b)



- c) Derive the steady state relation from the system block diagram at steady state and also derive different slopes to construct controller and system characteristics. 6

SECTION – II

- 5. a) Explain P + D control action in detail. Write the equation of controller output when controller is subjected to ramp error input and show the respective plots. 5
- b) For a system shown in Fig. (5-b), using Routh's Stability criteria find the range of the gain for which system is stable. $G(S) = \frac{K(s+1)}{s(s+2)(s+3)}$. Also find the frequency of oscillation for marginal stable system. 6

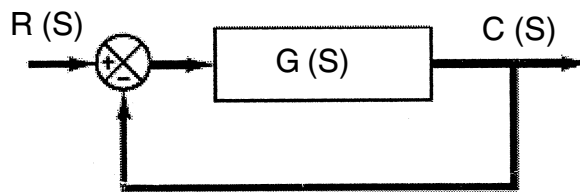


Fig. (5-b)

- c) Write a standard transfer function of a first order system and show its response curves for $\tau = 0.2, 2, 1$ when the system is subjected to unit step input. τ is the time constant of the system. Show the time constants in response plot when $t = \tau$. 3
- 6. a) For a unity feedback system, $G(S) = \frac{K}{s(s+1)(s+2)(s+3)}$. Construct the root locus for this system and comment on the stability of the system. 7
- b) Write the general predictions for the presence of breakaway point on real axis. Draw the sketches for each prediction by taking suitable example. 3
- c) Explain the bode plot for simple pole and simple zero in detail. 4



7. a) For a system in Fig. (7-a). Draw the bode diagram and comment on the stability of

the system. $G(S) = \frac{200(1+0.1s)}{s(1+0.2s)(1+0.05s)}$.

8

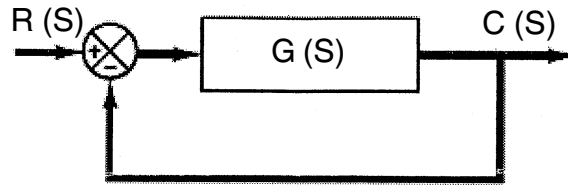


Fig. (7-a)

- b) The speed of an automobile which is being controlled by the cruise control is

described by the differential equation $y(t) = \frac{2(D+5)}{(D+2)(D+3)(D+4)} f(t)$.

Determine the computer diagram and state space representation using series programming.

6



SLR-TJ – 120

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

Set	S
-----	---

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **cannot** be changed **once** it is marked.
 - 4) Don't forget to mention Que. Paper Set on the top of the page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) For a unity feedback system with $G(s) = \frac{s(s+3)}{(s+1)(s+2)}$, _____ number of branches will be terminating at infinity.
a) 2 b) 1 c) 3 d) 0
- 2) The root locus of unity feedback system with $G(s) = \frac{k}{(s+1)}$ will have
a) One branch starting from -1 and terminating at $-\infty$
b) One branch starting from 1 and terminating at K
c) One branch starting from 1 and terminating at $-K$
d) One branch starting from 1 and terminating at $-\infty$
- 3) For a marginal stable system, this is true.
a) $GM > PM$
b) $GM < PM$
c) GM positive and PM negative
d) $\omega_{gc} = \omega_{pc}$
- 4) For $0 < K < 1$, magnitude plot will be _____. K is gain of the system.
a) above 0 db line b) below 0 db line
c) 0 db line d) none of these

P.T.O.



- 5) In direct programming state space model, state variable X_1 is taken as
- Given differential equation with numerator as 1
 - Given differential equation
 - Residue of partial fraction
 - None of these
- 6) Liquid level control in overhead tank with float is an example of
- Automatic control system
 - Manual control system
 - Hybrid system
 - None of these
- 7) In rotational mechanical system inertia is represented by
- Mass
 - Mass moment of inertia
 - Area moment of inertia
 - Torsional spring
- 8) In direct analogy between electric and mechanical system, charge is analogous to
- Force
 - Velocity
 - Displacement
 - Acceleration
- 9) Hydraulic amplifier acts as a
- Differentiator
 - Comparator
 - Integrator
 - None of these
- 10) Flux vs field current curves for field controlled D.C. motor are _____ for unsaturated core.
- Logarithmic
 - Exponential
 - Linear
 - Sinusoidal
- 11) For unity negative feedback system with forward path TF as G , the system Transfer function is
- $G/(1 + G)$
 - $1/(1 + G)$
 - $G/(1 - G)$
 - $1/(1 - G)$
- 12) For a control system, 'c', 'u' and 'v' denote change in output, change in disturbance and change in input respectively from operating point. The differential equation relating these variables is given by, $c = \frac{2}{D^2 + 2D + 2}v + \frac{D}{D^2 + 2D + 2}u$. The steady state equation of the system is
- $c = v + u$
 - $c = u$
 - $c = v$
 - $c = v - u$
- 13) The transfer function of a system is given by $\frac{4}{s^2 + 4}$. The system is
- Overdamped
 - Underdamped
 - Critically Damped
 - Undamped
- 14) Dead band or differential gap or neutral zone is associated with _____ control mode or action.
- Proportional
 - Integral
 - On Off
 - Derivative



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

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
AUTOMATIC CONTROL ENGINEERING**

Day and Date : Thursday, 30-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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 and semi-log paper if **required**.

SECTION – I

2. a) Explain the manual control system in detail with suitable example. Also represent that example by block diagram. 5
- b) Find overall transfer function of a system represented by block diagram in Fig. (2-a). 5

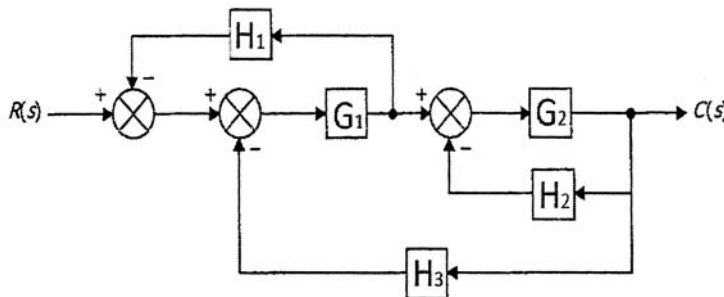


Fig. (2-a)

- c) Find the differential equation relating V_{in} and V_{out} for an electrical system shown in Fig. (2-c). 4

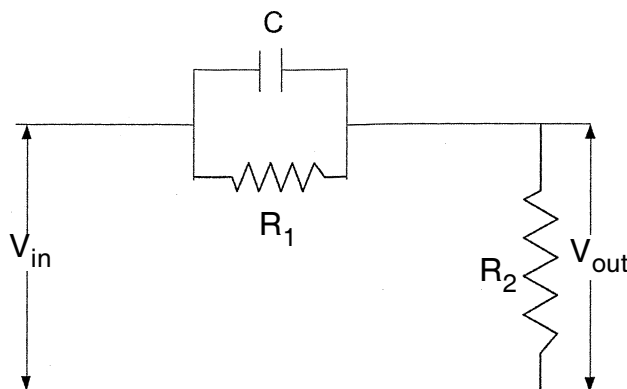


Fig. (2-c)



3. a) Explain field controlled DC motor in detail and derive its transfer function. 5
 b) For a mechanical system shown in Fig. (3-b) find the relation between 6
 i) f & X ii) f & Y iii) X & Y

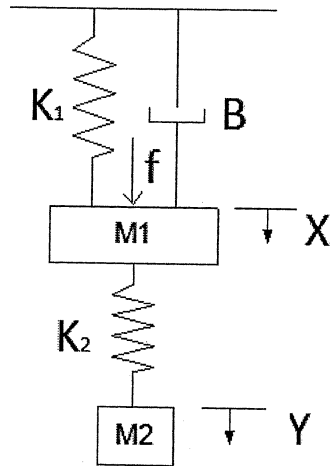


Fig. (3-b)

- c) Explain the rules for shifting take off point before and after summing point. 3
 4. a) Determine the linear approximation for the equation $Z = \sin X \cos Y$. For $X_i = 60^\circ$, and $Y_i = 30^\circ$. What is the approximate value of Z when $X = 63^\circ$ and $Y = 28^\circ$? 4
 b) The characteristics of an engine are described by the family of curves shown in Fig. (4-b). Determine the linear approximation for torque ' T ' delivered by the engine. $n_i = 3000$, $T_i = 100$, $Q_i = 50$. 4

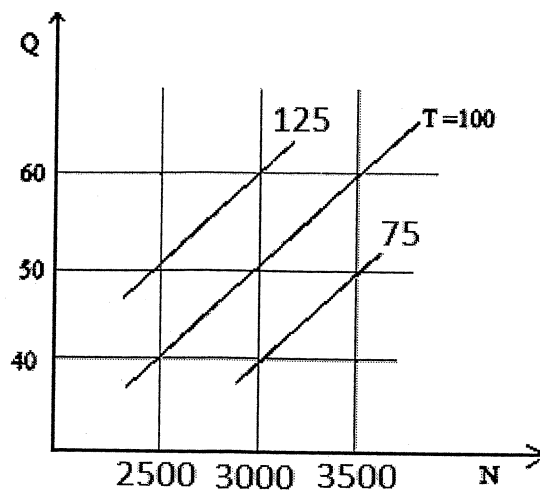


Fig. (4-b)



- c) Derive the steady state relation from the system block diagram at steady state and also derive different slopes to construct controller and system characteristics. 6

SECTION – II

- 5. a) Explain P + D control action in detail. Write the equation of controller output when controller is subjected to ramp error input and show the respective plots. 5
- b) For a system shown in Fig. (5-b), using Routh's Stability criteria find the range of the gain for which system is stable. $G(S) = \frac{K(s+1)}{s(s+2)(s+3)}$. Also find the frequency of oscillation for marginal stable system. 6

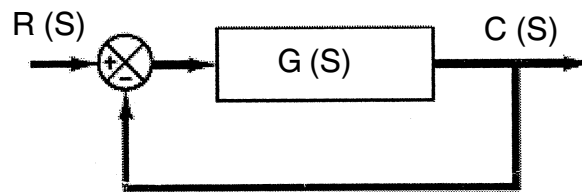


Fig. (5-b)

- c) Write a standard transfer function of a first order system and show its response curves for $\tau = 0.2, 2, 1$ when the system is subjected to unit step input. τ is the time constant of the system. Show the time constants in response plot when $t = \tau$. 3
- 6. a) For a unity feedback system, $G(S) = \frac{K}{s(s+1)(s+2)(s+3)}$. Construct the root locus for this system and comment on the stability of the system. 7
- b) Write the general predictions for the presence of breakaway point on real axis. Draw the sketches for each prediction by taking suitable example. 3
- c) Explain the bode plot for simple pole and simple zero in detail. 4



7. a) For a system in Fig. (7-a). Draw the bode diagram and comment on the stability of

$$\text{the system. } G(S) = \frac{200(1+0.1s)}{s(1+0.2s)(1+0.05s)}.$$

8

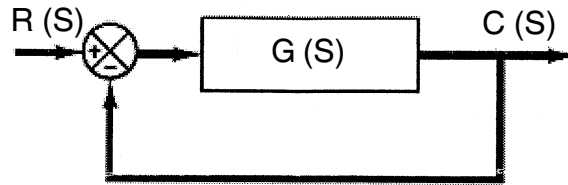


Fig. (7-a)

b) The speed of an automobile which is being controlled by the cruise control is

$$\text{described by the differential equation } y(t) = \frac{2(D+5)}{(D+2)(D+3)(D+4)} f(t).$$

Determine the computer diagram and state space representation using series programming.

6



SLR-TJ – 121

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

Set	P
-----	----------

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use** of non-programmable calculator, steam table, psychrometry chart are **allowed**.
 - 3) **Assume** suitable data **wherever** necessary.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) When water inter cooling is used in multistage compression, it
 - a) Reduces the work to be done in high pressure compressor
 - b) Reduces the specific volume of refrigerant
 - c) Requires a compressor of less stroke volume
 - d) All of the above
- 2) In a three 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
- 3) The sub-cooling in VCC system is used
 - a) Before compression
 - b) Before throttling
 - c) After compression
 - d) After throttling

P.T.O.



- 4) CFC based refrigerants are being replaced as they are found to
- Cause ozone layer depletion
 - Consume more energy
 - React with several material of construction
 - Expensive
- 5) In aqua-ammonia and Lithium-bromide water absorption refrigeration systems, the refrigerants are respectively
- Water and water
 - Water and lithium bromide
 - Ammonia and lithium bromide
 - Ammonia and water
- 6) A boot-strap air cooling system has
- One heat exchanger
 - Two heat exchanger
 - Three heat exchanger
 - Four and water
- 7) For ammonia refrigerating systems, the tubes of a shell and tube condenser are made of
- Copper
 - Aluminium
 - Steel
 - Brass
- 8) The value of degree of saturation for saturated air is
- 0.1
 - 0
 - 0.5
 - 1
- 9) If relative humidity is 100%, then
- DBT is greater than WBT
 - DBT is less than WBT
 - DBT is equal to WBT
 - DBT is less than DPT
- 10) In a psychrometric process, the sensible heat added is 30 kJ/s and the latent heat added is 20 kJ/s. The sensible heat factor for the process will be
- 0.3
 - 0.67
 - 0.6
 - 1.5
- 11) The alignment circle is marked on the psychrometric chart at
- 20°C DBT and 50% RH
 - 26°C DBT and 50% RH
 - 20°C DBT and 60% RH
 - 26°C DBT and 60% RH
- 12) Human beings need air conditioning as
- They continuously dissipate heat due to metabolic activity
 - Body regulatory mechanisms need stable internal temperatures
 - Efficiency improves under controlled conditions
 - All of the above
- 13) Equivalent length (L_e) for calculation of dynamic pressure loss is given by equation
- $\frac{f}{C_m}$
 - $\frac{fC}{m}$
 - $\frac{fm}{C}$
 - $\frac{Cm}{f}$
- 14) Linde system for liquefaction of air is also known as
- Claude system
 - Cascade system
 - Hampson system
 - Carnot system



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

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use of non-programmable calculator, steam table, psychrometry chart are allowed.**
 - 3) **Assume suitable data wherever necessary.**

SECTION – I

2. a) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under-cooling of the liquid before the expansion valve. Determine : 8
- i) C.O.P. of the cycle;
 - ii) Dryness fraction of refrigerant at the inlet of compressor;
 - iii) Capacity of refrigerator in KW and in TR, if the fluid flow is at the rate of 5 kg/min.
- Data :

Pressure (bar)	Saturation Temperature (K)	Enthalpy (KJ/Kg)		Entropy (KJ/KgK)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

- b) Explain by flow diagram and on p-h diagram the compound compression with flash inter cooling with single expansion valve along the flow line to evaporator. 6
3. a) Draw neat diagram of Reduced Ambient Air Cooling System for air craft refrigeration and explain it with the help of its T-S diagram. 5
- b) Explain with the help of neat diagram Electrolux Refrigeration System. 5
 - c) Explain designation system for halocarbon refrigerants. Find chemical formula for R-12 and R-22. 4
4. a) Draw the P-V and T-S diagram for Bell Coleman cycle and with the help of it show that for bell Coleman cycle

$$\text{COP} = \frac{1}{R_p \left(\frac{\gamma-1}{\gamma} \right) - 1} \text{ where } R_p = \text{pressure ratio.} \quad \text{5}$$



- b) Describe the simple Aqua-Ammonia Vapour absorption system with the help of neat diagram. 5
- c) Write a short note on Alternative Refrigerant. 4

SECTION – II

5. a) Define GSHF, RSHF and ERSHF and show those line on layout of psychrometric chart. 7
- b) For DBT of 38°C and RH of 70%, calculate the following for air if barometric pressure is 1 bar. 7
- i) Specific humidity ii) Enthalpy of air
- iii) DPT iv) Partial pressure of dry air.

Data.

Saturation Temp. (°C)	Absolute Pressure (bar)	Enthalpy (KJ/Kg)			Entropy (KJ/KgK)		
		h_f	h_{fg}	h_g	S_f	S_{fg}	S_g
30	0.0425	125.8	2430.1	2556.3	0.437	8.016	8.453
31	0.0450	130.0	2428.1	2558.1	0.451	7.982	8.433
32	0.0476	134.2	2425.7	2559.9	0.464	7.948	8.413
33	0.0503	138.3	2423.4	2561.7	0.478	7.915	8.393
38	0.0663	159.2	2411.5	2570.7	0.546	7.749	8.295

6. a) Explain Two Stage Cascade Refrigeration System with its P-h Diagram. 5
- b) Write down general rules in designing the duct. 5
- c) Define the following : 4
- i) DPT ii) GSHF
- iii) Equivalent Diameter iv) Relative Humidity.
7. a) Air is flowing at the rate of 100 m³/min at 40°C dry bulb temperature and 50% Relative humidity is mixed with another air stream flowing at the rate of 20 m³/min at 26°C dry bulb temperature and 50% relative humidity. The mixture flows over a cooling coil whose apparatus dew point temperature is 10°C and by-pass factor is 0.2. Find the dry bulb temperature and relative humidity of air leaving the coil. If this air is supplied to an air-conditioned room where dry bulb temperature of 26°C and relative humidity of 50% is maintained, also estimate : 8
- i) Room sensible heat factor ii) Cooling load capacity of the coil in TR.
- b) Explain the thermal exchange of human body with environment. 6



SLR-TJ – 121

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use** of non-programmable calculator, steam table, psychrometry chart are **allowed**.
 - 3) **Assume** suitable data **wherever** necessary.
 - 4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) The value of degree of saturation for saturated air is
a) 0.1 b) 0 c) 0.5 d) 1
- 2) If relative humidity is 100%, then
a) DBT is greater than WBT b) DBT is less than WBT
c) DBT is equal to WBT d) DBT is less than DPT
- 3) In a psychrometric process, the sensible heat added is 30 kJ/s and the latent heat added is 20 kJ/s. The sensible heat factor for the process will be
a) 0.3 b) 0.67 c) 0.6 d) 1.5
- 4) The alignment circle is marked on the psychrometric chart at
a) 20°C DBT and 50% RH b) 26°C DBT and 50% RH
c) 20°C DBT and 60% RH d) 26°C DBT and 60% RH
- 5) Human beings need air conditioning as
a) They continuously dissipate heat due to metabolic activity
b) Body regulatory mechanisms need stable internal temperatures
c) Efficiency improves under controlled conditions
d) All of the above
- 6) Equivalent length (Le) for calculation of dynamic pressure loss is given by equation
a) $\frac{f}{C_m}$ b) $\frac{fC}{m}$ c) $\frac{fm}{C}$ d) $\frac{C_m}{f}$

P.T.O.



- 7) Linde system for liquefaction of air is also known as
- a) Claude system
 - b) Cascade system
 - c) Hampson system
 - d) Carnot system
- 8) When water inter cooling is used in multistage compression, it
- a) Reduces the work to be done in high pressure compressor
 - b) Reduces the specific volume of refrigerant
 - c) Requires a compressor of less stroke volume
 - d) All of the above
- 9) In a three 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
- 10) The sub-cooling in VCC system is used
- a) Before compression
 - b) Before throttling
 - c) After compression
 - d) After throttling
- 11) CFC based refrigerants are being replaced as they are found to
- a) Cause ozone layer depletion
 - b) Consume more energy
 - c) React with several material of construction
 - d) Expensive
- 12) In aqua-ammonia and Lithium-bromide water absorption refrigeration systems, the refrigerants are respectively
- a) Water and water
 - b) Water and lithium bromide
 - c) Ammonia and lithium bromide
 - d) Ammonia and water
- 13) A boot-strap air cooling system has
- a) One heat exchanger
 - b) Two heat exchanger
 - c) Three heat exchanger
 - d) Four and water
- 14) For ammonia refrigerating systems, the tubes of a shell and tube condenser are made of
- a) Copper
 - b) Aluminium
 - c) Steel
 - d) Brass
-



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

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use of non-programmable calculator, steam table, psychrometry chart are allowed.**
 - 3) **Assume suitable data wherever necessary.**

SECTION – I

2. a) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under-cooling of the liquid before the expansion valve. Determine : 8
- i) C.O.P. of the cycle;
 - ii) Dryness fraction of refrigerant at the inlet of compressor;
 - iii) Capacity of refrigerator in KW and in TR, if the fluid flow is at the rate of 5 kg/min.
- Data :

Pressure (bar)	Saturation Temperature (K)	Enthalpy (KJ/Kg)		Entropy (KJ/KgK)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

- b) Explain by flow diagram and on p-h diagram the compound compression with flash inter cooling with single expansion valve along the flow line to evaporator. 6
3. a) Draw neat diagram of Reduced Ambient Air Cooling System for air craft refrigeration and explain it with the help of its T-S diagram. 5
- b) Explain with the help of neat diagram Electrolux Refrigeration System. 5
- c) Explain designation system for halocarbon refrigerants. Find chemical formula for R-12 and R-22. 4
4. a) Draw the P-V and T-S diagram for Bell Coleman cycle and with the help of it show that for bell Coleman cycle

$$\text{COP} = \frac{1}{R_p \left(\frac{\gamma-1}{\gamma} \right) - 1} \text{ where } R_p = \text{pressure ratio.} \quad \text{5}$$



- b) Describe the simple Aqua-Ammonia Vapour absorption system with the help of neat diagram. 5
- c) Write a short note on Alternative Refrigerant. 4

SECTION – II

5. a) Define GSHF, RSHF and ERSHF and show those line on layout of psychrometric chart. 7
- b) For DBT of 38°C and RH of 70%, calculate the following for air if barometric pressure is 1 bar. 7
- i) Specific humidity ii) Enthalpy of air
- iii) DPT iv) Partial pressure of dry air.

Data.

Saturation Temp. (°C)	Absolute Pressure (bar)	Enthalpy (KJ/Kg)			Entropy (KJ/KgK)		
		h_f	h_{fg}	h_g	S_f	S_{fg}	S_g
30	0.0425	125.8	2430.1	2556.3	0.437	8.016	8.453
31	0.0450	130.0	2428.1	2558.1	0.451	7.982	8.433
32	0.0476	134.2	2425.7	2559.9	0.464	7.948	8.413
33	0.0503	138.3	2423.4	2561.7	0.478	7.915	8.393
38	0.0663	159.2	2411.5	2570.7	0.546	7.749	8.295

6. a) Explain Two Stage Cascade Refrigeration System with its P-h Diagram. 5
- b) Write down general rules in designing the duct. 5
- c) Define the following : 4
- i) DPT ii) GSHF
- iii) Equivalent Diameter iv) Relative Humidity.
7. a) Air is flowing at the rate of 100 m³/min at 40°C dry bulb temperature and 50% Relative humidity is mixed with another air stream flowing at the rate of 20 m³/min at 26°C dry bulb temperature and 50% relative humidity. The mixture flows over a cooling coil whose apparatus dew point temperature is 10°C and by-pass factor is 0.2. Find the dry bulb temperature and relative humidity of air leaving the coil. If this air is supplied to an air-conditioned room where dry bulb temperature of 26°C and relative humidity of 50% is maintained, also estimate : 8
- i) Room sensible heat factor ii) Cooling load capacity of the coil in TR.
- b) Explain the thermal exchange of human body with environment. 6



SLR-TJ – 121

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

Set	R
-----	---

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use** of non-programmable calculator, steam table, psychrometry chart are **allowed**.
 - 3) **Assume** suitable data **wherever** necessary.
 - 4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) In aqua-ammonia and Lithium-bromide water absorption refrigeration systems, the refrigerants are respectively
 - a) Water and water
 - b) Water and lithium bromide
 - c) Ammonia and lithium bromide
 - d) Ammonia and water
- 2) A boot-strap air cooling system has
 - a) One heat exchanger
 - b) Two heat exchanger
 - c) Three heat exchanger
 - d) Four and water
- 3) For ammonia refrigerating systems, the tubes of a shell and tube condenser are made of
 - a) Copper
 - b) Aluminium
 - c) Steel
 - d) Brass
- 4) The value of degree of saturation for saturated air is
 - a) 0.1
 - b) 0
 - c) 0.5
 - d) 1
- 5) If relative humidity is 100%, then
 - a) DBT is greater than WBT
 - b) DBT is less than WBT
 - c) DBT is equal to WBT
 - d) DBT is less than DPT
- 6) In a psychrometric process, the sensible heat added is 30 kJ/s and the latent heat added is 20 kJ/s. The sensible heat factor for the process will be
 - a) 0.3
 - b) 0.67
 - c) 0.6
 - d) 1.5

P.T.O.



- 7) The alignment circle is marked on the psychrometric chart at
- a) 20°C DBT and 50% RH
 - b) 26°C DBT and 50% RH
 - c) 20°C DBT and 60% RH
 - d) 26°C DBT and 60% RH
- 8) Human beings need air conditioning as
- a) They continuously dissipate heat due to metabolic activity
 - b) Body regulatory mechanisms need stable internal temperatures
 - c) Efficiency improves under controlled conditions
 - d) All of the above
- 9) Equivalent length (L_e) for calculation of dynamic pressure loss is given by equation
- a) $\frac{f}{C_m}$
 - b) $\frac{fC}{m}$
 - c) $\frac{fm}{C}$
 - d) $\frac{C_m}{f}$
- 10) Linde system for liquefaction of air is also known as
- a) Claude system
 - b) Cascade system
 - c) Hampson system
 - d) Carnot system
- 11) When water inter cooling is used in multistage compression, it
- a) Reduces the work to be done in high pressure compressor
 - b) Reduces the specific volume of refrigerant
 - c) Requires a compressor of less stroke volume
 - d) All of the above
- 12) In a three 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
- 13) The sub-cooling in VCC system is used
- a) Before compression
 - b) Before throttling
 - c) After compression
 - d) After throttling
- 14) CFC based refrigerants are being replaced as they are found to
- a) Cause ozone layer depletion
 - b) Consume more energy
 - c) React with several material of construction
 - d) Expensive
-



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

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use of non-programmable calculator, steam table, psychrometry chart are allowed.**
 - 3) **Assume suitable data wherever necessary.**

SECTION – I

2. a) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under-cooling of the liquid before the expansion valve. Determine : 8
- i) C.O.P. of the cycle;
 - ii) Dryness fraction of refrigerant at the inlet of compressor;
 - iii) Capacity of refrigerator in KW and in TR, if the fluid flow is at the rate of 5 kg/min.
- Data :

Pressure (bar)	Saturation Temperature (K)	Enthalpy (KJ/Kg)		Entropy (KJ/KgK)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

- b) Explain by flow diagram and on p-h diagram the compound compression with flash inter cooling with single expansion valve along the flow line to evaporator. 6
3. a) Draw neat diagram of Reduced Ambient Air Cooling System for air craft refrigeration and explain it with the help of its T-S diagram. 5
- b) Explain with the help of neat diagram Electrolux Refrigeration System. 5
- c) Explain designation system for halocarbon refrigerants. Find chemical formula for R-12 and R-22. 4
4. a) Draw the P-V and T-S diagram for Bell Coleman cycle and with the help of it show that for bell Coleman cycle

$$\text{COP} = \frac{1}{R_p \left(\frac{\gamma-1}{\gamma} \right) - 1} \text{ where } R_p = \text{pressure ratio.} \quad \text{5}$$



- b) Describe the simple Aqua-Ammonia Vapour absorption system with the help of neat diagram. 5
- c) Write a short note on Alternative Refrigerant. 4

SECTION – II

5. a) Define GSHF, RSHF and ERSHF and show those line on layout of psychrometric chart. 7
- b) For DBT of 38°C and RH of 70%, calculate the following for air if barometric pressure is 1 bar. 7
- i) Specific humidity ii) Enthalpy of air
- iii) DPT iv) Partial pressure of dry air.

Data.

Saturation Temp. (°C)	Absolute Pressure (bar)	Enthalpy (KJ/Kg)			Entropy (KJ/KgK)		
		h_f	h_{fg}	h_g	S_f	S_{fg}	S_g
30	0.0425	125.8	2430.1	2556.3	0.437	8.016	8.453
31	0.0450	130.0	2428.1	2558.1	0.451	7.982	8.433
32	0.0476	134.2	2425.7	2559.9	0.464	7.948	8.413
33	0.0503	138.3	2423.4	2561.7	0.478	7.915	8.393
38	0.0663	159.2	2411.5	2570.7	0.546	7.749	8.295

6. a) Explain Two Stage Cascade Refrigeration System with its P-h Diagram. 5
- b) Write down general rules in designing the duct. 5
- c) Define the following : 4
- i) DPT ii) GSHF
- iii) Equivalent Diameter iv) Relative Humidity.
7. a) Air is flowing at the rate of 100 m³/min at 40°C dry bulb temperature and 50% Relative humidity is mixed with another air stream flowing at the rate of 20 m³/min at 26°C dry bulb temperature and 50% relative humidity. The mixture flows over a cooling coil whose apparatus dew point temperature is 10°C and by-pass factor is 0.2. Find the dry bulb temperature and relative humidity of air leaving the coil. If this air is supplied to an air-conditioned room where dry bulb temperature of 26°C and relative humidity of 50% is maintained, also estimate : 8
- i) Room sensible heat factor ii) Cooling load capacity of the coil in TR.
- b) Explain the thermal exchange of human body with environment. 6



SLR-TJ – 121

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

Set	S
-----	---

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use** of non-programmable calculator, steam table, psychrometry chart are **allowed**.
 - 3) **Assume** suitable data **wherever** necessary.
 - 4) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

- 1) In a psychrometric process, the sensible heat added is 30 kJ/s and the latent heat added is 20 kJ/s. The sensible heat factor for the process will be
a) 0.3 b) 0.67 c) 0.6 d) 1.5
- 2) The alignment circle is marked on the psychrometric chart at
a) 20°C DBT and 50% RH b) 26°C DBT and 50% RH
c) 20°C DBT and 60% RH d) 26°C DBT and 60% RH
- 3) Human beings need air conditioning as
a) They continuously dissipate heat due to metabolic activity
b) Body regulatory mechanisms need stable internal temperatures
c) Efficiency improves under controlled conditions
d) All of the above
- 4) Equivalent length (L_e) for calculation of dynamic pressure loss is given by equation
a) $\frac{f}{C_m}$ b) $\frac{fC}{m}$ c) $\frac{fm}{C}$ d) $\frac{C_m}{f}$
- 5) Linde system for liquefaction of air is also known as
a) Claude system b) Cascade system
c) Hampson system d) Carnot system

P.T.O.



- 6) When water inter cooling is used in multistage compression, it
- Reduces the work to be done in high pressure compressor
 - Reduces the specific volume of refrigerant
 - Requires a compressor of less stroke volume
 - All of the above
- 7) In a three fluid vapour absorption refrigeration system, the hydrogen gas is used to
- Improve system performance
 - Reduce the partial pressure of refrigerant in evaporator
 - Circulate the refrigerant
 - Provide a vapour seal
- 8) The sub-cooling in VCC system is used
- Before compression
 - Before throttling
 - After compression
 - After throttling
- 9) CFC based refrigerants are being replaced as they are found to
- Cause ozone layer depletion
 - Consume more energy
 - React with several material of construction
 - Expensive
- 10) In aqua-ammonia and Lithium-bromide water absorption refrigeration systems, the refrigerants are respectively
- | | |
|--------------------------------|------------------------------|
| a) Water and water | b) Water and lithium bromide |
| c) Ammonia and lithium bromide | d) Ammonia and water |
- 11) A boot-strap air cooling system has
- | | |
|-------------------------|-----------------------|
| a) One heat exchanger | b) Two heat exchanger |
| c) Three heat exchanger | d) Four and water |
- 12) For ammonia refrigerating systems, the tubes of a shell and tube condenser are made of
- | | | | |
|-----------|--------------|----------|----------|
| a) Copper | b) Aluminium | c) Steel | d) Brass |
|-----------|--------------|----------|----------|
- 13) The value of degree of saturation for saturated air is
- | | | | |
|--------|------|--------|------|
| a) 0.1 | b) 0 | c) 0.5 | d) 1 |
|--------|------|--------|------|
- 14) If relative humidity is 100%, then
- | | |
|----------------------------|-------------------------|
| a) DBT is greater than WBT | b) DBT is less than WBT |
| c) DBT is equal to WBT | d) DBT is less than DPT |
-



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

**B.E. (Mechanical) (Part – I) (New CGPA) Examination, 2017
REFRIGERATION AND AIR CONDITIONING**

Day and Date : Monday, 4-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions:**
- 1) Attempt **any two** questions from **each** Section.
 - 2) **Use of non-programmable calculator, steam table, psychrometry chart are allowed.**
 - 3) **Assume suitable data wherever necessary.**

SECTION – I

2. a) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under-cooling of the liquid before the expansion valve. Determine : 8
- i) C.O.P. of the cycle;
 - ii) Dryness fraction of refrigerant at the inlet of compressor;
 - iii) Capacity of refrigerator in KW and in TR, if the fluid flow is at the rate of 5 kg/min.
- Data :

Pressure (bar)	Saturation Temperature (K)	Enthalpy (KJ/Kg)		Entropy (KJ/KgK)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

- b) Explain by flow diagram and on p-h diagram the compound compression with flash inter cooling with single expansion valve along the flow line to evaporator. 6
3. a) Draw neat diagram of Reduced Ambient Air Cooling System for air craft refrigeration and explain it with the help of its T-S diagram. 5
- b) Explain with the help of neat diagram Electrolux Refrigeration System. 5
- c) Explain designation system for halocarbon refrigerants. Find chemical formula for R-12 and R-22. 4
4. a) Draw the P-V and T-S diagram for Bell Coleman cycle and with the help of it show that for bell Coleman cycle

$$\text{COP} = \frac{1}{R_p \left(\frac{\gamma-1}{\gamma} \right) - 1} \text{ where } R_p = \text{pressure ratio.} \quad \text{5}$$



- b) Describe the simple Aqua-Ammonia Vapour absorption system with the help of neat diagram. 5
- c) Write a short note on Alternative Refrigerant. 4

SECTION – II

5. a) Define GSHF, RSHF and ERSHF and show those line on layout of psychrometric chart. 7
- b) For DBT of 38°C and RH of 70%, calculate the following for air if barometric pressure is 1 bar. 7
- i) Specific humidity ii) Enthalpy of air
- iii) DPT iv) Partial pressure of dry air.

Data.

Saturation Temp. (°C)	Absolute Pressure (bar)	Enthalpy (KJ/Kg)			Entropy (KJ/KgK)		
		h_f	h_{fg}	h_g	S_f	S_{fg}	S_g
30	0.0425	125.8	2430.1	2556.3	0.437	8.016	8.453
31	0.0450	130.0	2428.1	2558.1	0.451	7.982	8.433
32	0.0476	134.2	2425.7	2559.9	0.464	7.948	8.413
33	0.0503	138.3	2423.4	2561.7	0.478	7.915	8.393
38	0.0663	159.2	2411.5	2570.7	0.546	7.749	8.295

6. a) Explain Two Stage Cascade Refrigeration System with its P-h Diagram. 5
- b) Write down general rules in designing the duct. 5
- c) Define the following : 4
- i) DPT ii) GSHF
- iii) Equivalent Diameter iv) Relative Humidity.
7. a) Air is flowing at the rate of 100 m³/min at 40°C dry bulb temperature and 50% Relative humidity is mixed with another air stream flowing at the rate of 20 m³/min at 26°C dry bulb temperature and 50% relative humidity. The mixture flows over a cooling coil whose apparatus dew point temperature is 10°C and by-pass factor is 0.2. Find the dry bulb temperature and relative humidity of air leaving the coil. If this air is supplied to an air-conditioned room where dry bulb temperature of 26°C and relative humidity of 50% is maintained, also estimate : 8
- i) Room sensible heat factor ii) Cooling load capacity of the coil in TR.
- b) Explain the thermal exchange of human body with environment. 6



SLR-TJ – 122

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

Set	P
-----	----------

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Note :**
- 1) Answer **any two** questions from Section I and Section II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Assume** suitable data if necessary and mention **it clearly**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The function which dictate the nodal contribution of field variable is
 - A) Stress function
 - B) Displacement function
 - C) Force function
 - D) Shape function
- 2) A measure of distortion of a element is
 - A) bandwidth
 - B) damping ratio
 - C) aspect ratio
 - D) shape function
- 3) The bandwidth of a matrix after node numbering where 'D' is largest difference between nodes in a single element and 'f' is the number of degrees of freedom at each node is
 - A) $D \times f$
 - B) $D + f$
 - C) $(D + 1) f$
 - D) $(D - 1) f$
- 4) A problem which is not a function of a time
 - A) Eigen value problem
 - B) Steady state problem
 - C) Transient problem
 - D) Propagation problem
- 5) The equations defining the approximating distribution are known as
 - A) Interpolation
 - B) Integration
 - C) Extrapolation
 - D) Decomposition

P.T.O.



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

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Note :** 1) Answer **any two** questions from Section I and Section II.
2) Figures to the **right** indicate **full** marks.
3) **Assume** suitable data if necessary and mention **it clearly**.

SECTION – I

2. a) Explain formulation of the elements characteristics matrices and vectors for 1D pin jointed bar element. 7
b) Solve by subdomain and Galerkin method and compare with exact solution
- $$\frac{d^2u}{dx^2} - 4u - x^2 = 0$$
- BCS $u(0) = 0$ $\frac{du}{dx}(1) = 1$
- $u(0.8) = ?$ 7
3. a) Explain one dimensional elasticity. 7
b) State and explain properties of global stiffness matrix. 7
4. Write short notes on **any three** : 14
a) Explain axi-symmetric elasticity.
b) Explain any four choice of element type with application.
c) Simplification using symmetry.
d) Method of weighted residuals.



SECTION – II

5. a) Explain isoparametric, subparametric and superparametric elements. **7**
b) Explain element distortions. **7**
6. a) Explain the following element checks offered by finite element packages. **7**
i) Mid side node position
ii) Internal angle.
- b) Differentiate linear FEA and non linear FEA. **7**
7. Write short notes on **any three** : **14**
a) Geometric non-linearity
b) Explain numerical integration
c) Mesh refinement
d) Modal analysis.
-



SLR-TJ – 122

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

Set	Q
-----	---

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Note :**
- 1) Answer **any two** questions from Section I and Section II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Assume** suitable data if necessary and mention **it clearly**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) 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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Each node of beam element is having
 - A) 2 Dof
 - B) 3 Dof
 - C) 4 Dof
 - D) 1 Dof
- 2) Finite element analysis of pressure vessels are carried out using
 - A) Shell element
 - B) Plate element
 - C) Beam element
 - D) None of above
- 3) Preprocessing consist of
 - A) Building geometry
 - B) Check the results
 - C) Define material properties
 - D) Assign boundary conditions
- 4) The matrix showing relation between strain vector and displacement vector or temperature vector and temperature gradient is
 - A) [D]
 - B) [K]
 - C) [C]
 - D) [B]
- 5) The material property matrix is represented as
 - A) [D]
 - B) [K]
 - C) [C]
 - D) [B]

P.T.O.



- 6) 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
- 7) The brick element or hexahedral element of quadratic version is having
A) 4 nodes B) 8 nodes
C) 32 nodes D) 20 nodes
- 8) The function which dictate the nodal contribution of field variable is
A) Stress function B) Displacement function
C) Force function D) Shape function
- 9) A measure of distortion of a element is
A) bandwidth B) damping ratio
C) aspect ratio D) shape function
- 10) The bandwidth of a matrix after node numbering where 'D' is largest difference between nodes in a single element and 'f' is the number of degrees of freedom at each node is
A) $D \times f$ B) $D + f$
C) $(D + 1) f$ D) $(D - 1) f$
- 11) A problem which is not a function of a time
A) Eigen value problem B) Steady state problem
C) Transient problem D) Propagation problem
- 12) The equations defining the approximating distribution are known as
A) Interpolation B) Integration
C) Extrapolation D) Decomposition
- 13) If L_1 is the natural coordinate of nodes l , the value of L_1 on the element joining nodes j and k is
A) One B) Two
C) Zero D) 0.5
- 14) The potential energy in a spring is given by the equation
A) $\pi = \frac{1}{2}KU^2 - FU$ B) $\pi = mg$
C) $\pi = MC^2$ D) $\pi = MK^2$
-



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

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Note :** 1) Answer **any two** questions from Section I and Section II.
2) Figures to the **right** indicate **full** marks.
3) **Assume** suitable data if necessary and mention **it clearly**.

SECTION – I

2. a) Explain formulation of the elements characteristics matrices and vectors for 1D pin jointed bar element. 7
b) Solve by subdomain and Galerkin method and compare with exact solution
- $$\frac{d^2u}{dx^2} - 4u - x^2 = 0$$
- BCS $u(0) = 0$ $\frac{du}{dx}(1) = 1$
- $u(0.8) = ?$ 7
3. a) Explain one dimensional elasticity. 7
b) State and explain properties of global stiffness matrix. 7
4. Write short notes on **any three** : 14
a) Explain axi-symmetric elasticity.
b) Explain any four choice of element type with application.
c) Simplification using symmetry.
d) Method of weighted residuals.



SECTION – II

5. a) Explain isoparametric, subparametric and superparametric elements. **7**
b) Explain element distortions. **7**
6. a) Explain the following element checks offered by finite element packages. **7**
i) Mid side node position
ii) Internal angle.
- b) Differentiate linear FEA and non linear FEA. **7**
7. Write short notes on **any three** : **14**
a) Geometric non-linearity
b) Explain numerical integration
c) Mesh refinement
d) Modal analysis.
-



SLR-TJ – 122

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

Set	R
-----	----------

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Note :**
- 1) Answer **any two** questions from Section I and Section II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Assume** suitable data if necessary and mention **it clearly**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The equations defining the approximating distribution are known as
 - A) Interpolation
 - B) Integration
 - C) Extrapolation
 - D) Decomposition
- 2) If L_1 is the natural coordinate of nodes I , the value of L_1 on the element joining nodes j and k is
 - A) One
 - B) Two
 - C) Zero
 - D) 0.5
- 3) The potential energy in a spring is given by the equation
 - A) $\pi = \frac{1}{2}KU^2 - FU$
 - B) $\pi = mg$
 - C) $\pi = MC^2$
 - D) $\pi = MK^2$
- 4) Each node of beam element is having
 - A) 2 Dof
 - B) 3 Dof
 - C) 4 Dof
 - D) 1 Dof
- 5) Finite element analysis of pressure vessels are carried out using
 - A) Shell element
 - B) Plate element
 - C) Beam element
 - D) None of above

P.T.O.



- 6) Preprocessing consist of
- A) Building geometry B) Check the results
C) Define material properties D) Assign boundary conditions
- 7) The matrix showing relation between strain vector and displacement vector or temperature vector and temperature gradient is
- A) [D] B) [K]
C) [C] D) [B]
- 8) The material property matrix is represented as
- A) [D] B) [K]
C) [C] D) [B]
- 9) 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
- 10) The brick element or hexahedral element of quadratic version is having
- A) 4 nodes B) 8 nodes
C) 32 nodes D) 20 nodes
- 11) The function which dictate the nodal contribution of field variable is
- A) Stress function B) Displacement function
C) Force function D) Shape function
- 12) A measure of distortion of a element is
- A) bandwidth B) damping ratio
C) aspect ratio D) shape function
- 13) The bandwidth of a matrix after node numbering where 'D' is largest difference between nodes in a single element and 'f' is the number of degrees of freedom at each node is
- A) $D \times f$ B) $D + f$
C) $(D + 1) f$ D) $(D - 1) f$
- 14) A problem which is not a function of a time
- A) Eigen value problem B) Steady state problem
C) Transient problem D) Propagation problem
-



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

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Note :** 1) Answer **any two** questions from Section I and Section II.
2) Figures to the **right** indicate **full** marks.
3) **Assume** suitable data if necessary and mention **it clearly**.

SECTION – I

2. a) Explain formulation of the elements characteristics matrices and vectors for 1D pin jointed bar element. 7
b) Solve by subdomain and Galerkin method and compare with exact solution
- $$\frac{d^2u}{dx^2} - 4u - x^2 = 0$$
- BCS $u(0) = 0$ $\frac{du}{dx}(1) = 1$
- $u(0.8) = ?$ 7
3. a) Explain one dimensional elasticity. 7
b) State and explain properties of global stiffness matrix. 7
4. Write short notes on **any three** : 14
a) Explain axi-symmetric elasticity.
b) Explain any four choice of element type with application.
c) Simplification using symmetry.
d) Method of weighted residuals.



SECTION – II

5. a) Explain isoparametric, subparametric and superparametric elements. **7**
b) Explain element distortions. **7**
6. a) Explain the following element checks offered by finite element packages. **7**
i) Mid side node position
ii) Internal angle.
- b) Differentiate linear FEA and non linear FEA. **7**
7. Write short notes on **any three** : **14**
a) Geometric non-linearity
b) Explain numerical integration
c) Mesh refinement
d) Modal analysis.
-



SLR-TJ – 122

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

Set	S
-----	----------

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Note :**
- 1) Answer **any two** questions from Section I and Section II.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Assume** suitable data if necessary and mention **it clearly**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Preprocessing consist of
 - A) Building geometry
 - B) Check the results
 - C) Define material properties
 - D) Assign boundary conditions
- 2) The matrix showing relation between strain vector and displacement vector or temperature vector and temperature gradient is
 - A) [D]
 - B) [K]
 - C) [C]
 - D) [B]
- 3) The material property matrix is represented as
 - A) [D]
 - B) [K]
 - C) [C]
 - D) [B]
- 4) 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
- 5) The brick element or hexahedral element of quadratic version is having
 - A) 4 nodes
 - B) 8 nodes
 - C) 32 nodes
 - D) 20 nodes

P.T.O.



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

**B.E. (Mechanical Engineering) (Part – I) (New) (CGPA) Examination, 2017
FINITE ELEMENT METHOD
Professional Elective – 3**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Note :** 1) Answer **any two** questions from Section I and Section II.
2) Figures to the **right** indicate **full** marks.
3) **Assume** suitable data if necessary and mention **it clearly**.

SECTION – I

2. a) Explain formulation of the elements characteristics matrices and vectors for 1D pin jointed bar element. 7
b) Solve by subdomain and Galerkin method and compare with exact solution
- $$\frac{d^2u}{dx^2} - 4u - x^2 = 0$$
- BCS $u(0) = 0$ $\frac{du}{dx}(1) = 1$
- $$u(0.8) = ? .$$
3. a) Explain one dimensional elasticity. 7
b) State and explain properties of global stiffness matrix. 7
4. Write short notes on **any three** : 14
a) Explain axi-symmetric elasticity.
b) Explain any four choice of element type with application.
c) Simplification using symmetry.
d) Method of weighted residuals.



SECTION – II

5. a) Explain isoparametric, subparametric and superparametric elements. **7**
b) Explain element distortions. **7**
6. a) Explain the following element checks offered by finite element packages. **7**
i) Mid side node position
ii) Internal angle.
- b) Differentiate linear FEA and non linear FEA. **7**
7. Write short notes on **any three** : **14**
a) Geometric non-linearity
b) Explain numerical integration
c) Mesh refinement
d) Modal analysis.
-



SLR-TJ – 123

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

Set	P
-----	---

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 6) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) The maximum value of axial force at the clutch which a driver can apply while driving, without getting fatigued is approximately
a) 10 N b) 100 N c) 500 N d) 5000 N
 - 2) Two advantages of using helical gears rather than spur gears in a transmission are
a) High strength and low cost b) High strength and less end thrust
c) Low noise level and high strength d) Low noise level and economy
 - 3) In a simple planetary gear set, the output member to increase torque is always the
a) sun gear b) ring gear
c) planet carrier d) none of the above
 - 4) The inner end of the axle shaft is splined to the
a) sun gear b) planet pinion
c) crown wheel d) differential cage
 - 5) The function of a shackle with a leaf spring is to
a) allow pivoting of spring end b) allow spring length to change
c) control sides way d) control rear torque

P.T.O.



- 6) The coil spring in wishbone suspension is placed between the
 - a) two wishbones
 - b) upper wishbone and the cross-member
 - c) lower wishbone and the cross-member
 - d) shock absorber and the cross-member
 - 7) The included angle is the sum of the
 - a) camber and castor
 - b) castor and steering axis inclination
 - c) camber and steering axis inclination
 - d) camber and toe-in
 - 8) On cars having rack and pinion steering, the gear rack is attached to
 - a) relay rod
 - b) pitman axis
 - c) cross shaft
 - d) tie rod
 - 9) The type of wheel which cannot be used with a tubeless tyre is
 - a) disc wheel
 - b) wire wheel
 - c) light alloy wheel
 - d) composite wheel
 - 10) An underinflated tyre will wear the tread most
 - a) near centre
 - b) near the edges
 - c) in the lateral direction
 - d) in the cross direction
 - 11) The brake efficiency of a new vehicle is about
 - a) 30 per cent
 - b) 50 per cent
 - c) 80 per cent
 - d) 100 per cent
 - 12) Intake port in the master cylinder allows brake fluid to flow
 - a) into the reservoir
 - b) through the fluid check valve
 - c) around the recessed section of piston
 - d) all of the above
 - 13) The number of points at which the engine-clutch-gear box unit is supported on the chassis frame is
 - a) one
 - b) two
 - c) three
 - d) four
 - 14) Function of overdrive is
 - a) Give stability
 - b) Give ride control
 - c) Give high power
 - d) Give high speed
-



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

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) Explain in detail the front engine rear wheel drive arrangement with a neat sketch and write its advantages and disadvantages. **6**
- b) Discuss functions and requirements of clutch and explain fluid flywheel with a neat sketch. **4**
- c) Discuss necessity of gear box with the help of vehicle performance curves. **4**
3. a) A motor vehicle total weight 11144 N has road wheels of 0.61 m effective diameter. The effective moment of inertia of the four road wheels and the rear axle together is 62.0 N-m², while that of the engine and flywheel is 6.2 N-m². The transmission efficiency is 90% and tractive resistance at a speed of 24 km/hr. is 222.5 N. The total available engine torque is 203.6 N-m.
- i) Determine the gear ratio, engine to back axle to provide maximum acceleration on 1 in 4 grade, when travelling at 24 km/hr.
- ii) What is the maximum acceleration ?
- iii) Determine the engine rpm and power under these conditions. **10**
- b) Write short notes on **any one** : **4**
- 1) Necessity of differential
- 2) Double declutching.
4. a) Discuss various requirements of a gear box in automobile. Explain with neat sketch working of sliding mesh gear box. **6**
- b) Explain the working with a neat sketch a differential used in automobiles. **4**
- c) Write a short note on **any one** : **4**
- i) Automobile battery
- ii) Automobile charging system.

Set P



SECTION – II

5. a) What are various types of steering gear box ? Explain any one of them with figure. **6**
- b) Explain steering layout with figure. **4**
- c) Write short note on Power steering. **4**
6. a) A motor car has wheel base of 2.64 m, the height of its center of gravity above the ground is 0.61 m and it is 1.12 m in front of rear axle. If car is travelling at 40 km/hr on a level track, determine the minimum distance in which car may stop, when
- i) The front wheels are braked,
 - ii) The rear wheels are braked,
 - iii) All wheels are braked,
- The co-efficient of friction between tyre and road may be taken as 0.6. **6**
- b) Write note on antilock braking system. **4**
- c) Explain with neat sketch Air braking system. List advantage and disadvantages of it. **4**
7. a) What is need of solar vehicle ? Explain working of solar vehicle with figure. **6**
- b) Explain stabilizer bar with figure. **4**
- c) Differentiate between independent suspension and conventional system. **4**
-



- 7) Function of overdrive is
- a) Give stability
 - b) Give ride control
 - c) Give high power
 - d) Give high speed
- 8) The maximum value of axial force at the clutch which a driver can apply while driving, without getting fatigued is approximately
- a) 10 N
 - b) 100 N
 - c) 500 N
 - d) 5000 N
- 9) Two advantages of using helical gears rather than spur gears in a transmission are
- a) High strength and low cost
 - b) High strength and less end thrust
 - c) Low noise level and high strength
 - d) Low noise level and economy
- 10) In a simple planetary gear set, the output member to increase torque is always the
- a) sun gear
 - b) ring gear
 - c) planet carrier
 - d) none of the above
- 11) The inner end of the axle shaft is splined to the
- a) sun gear
 - b) planet pinion
 - c) crown wheel
 - d) differential cage
- 12) The function of a shackle with a leaf spring is to
- a) allow pivoting of spring end
 - b) allow spring length to change
 - c) control sides way
 - d) control rear torque
- 13) The coil spring in wishbone suspension is placed between the
- a) two wishbones
 - b) upper wishbone and the cross-member
 - c) lower wishbone and the cross-member
 - d) shock absorber and the cross-member
- 14) The included angle is the sum of the
- a) camber and castor
 - b) castor and steering axis inclination
 - c) camber and steering axis inclination
 - d) camber and toe-in
-



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

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) Explain in detail the front engine rear wheel drive arrangement with a neat sketch and write its advantages and disadvantages. **6**
- b) Discuss functions and requirements of clutch and explain fluid flywheel with a neat sketch. **4**
- c) Discuss necessity of gear box with the help of vehicle performance curves. **4**
3. a) A motor vehicle total weight 11144 N has road wheels of 0.61 m effective diameter. The effective moment of inertia of the four road wheels and the rear axle together is 62.0 N-m², while that of the engine and flywheel is 6.2 N-m². The transmission efficiency is 90% and tractive resistance at a speed of 24 km/hr. is 222.5 N. The total available engine torque is 203.6 N-m.
- i) Determine the gear ratio, engine to back axle to provide maximum acceleration on 1 in 4 grade, when travelling at 24 km/hr.
- ii) What is the maximum acceleration ?
- iii) Determine the engine rpm and power under these conditions. **10**
- b) Write short notes on **any one** : **4**
- 1) Necessity of differential
- 2) Double declutching.
4. a) Discuss various requirements of a gear box in automobile. Explain with neat sketch working of sliding mesh gear box. **6**
- b) Explain the working with a neat sketch a differential used in automobiles. **4**
- c) Write a short note on **any one** : **4**
- i) Automobile battery
- ii) Automobile charging system.

Set Q



SECTION – II

5. a) What are various types of steering gear box ? Explain any one of them with figure. **6**
- b) Explain steering layout with figure. **4**
- c) Write short note on Power steering. **4**
6. a) A motor car has wheel base of 2.64 m, the height of its center of gravity above the ground is 0.61 m and it is 1.12 m in front of rear axle. If car is travelling at 40 km/hr on a level track, determine the minimum distance in which car may stop, when
- i) The front wheels are braked,
 - ii) The rear wheels are braked,
 - iii) All wheels are braked,
- The co-efficient of friction between tyre and road may be taken as 0.6. **6**
- b) Write note on antilock braking system. **4**
- c) Explain with neat sketch Air braking system. List advantage and disadvantages of it. **4**
7. a) What is need of solar vehicle ? Explain working of solar vehicle with figure. **6**
- b) Explain stabilizer bar with figure. **4**
- c) Differentiate between independent suspension and conventional system. **4**
-



SLR-TJ – 123

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

Set	R
-----	---

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 6) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) The function of a shackle with a leaf spring is to
 - a) allow pivoting of spring end
 - b) allow spring length to change
 - c) control sides way
 - d) control rear torque
 - 2) The coil spring in wishbone suspension is placed between the
 - a) two wishbones
 - b) upper wishbone and the cross-member
 - c) lower wishbone and the cross-member
 - d) shock absorber and the cross-member
 - 3) The included angle is the sum of the
 - a) camber and castor
 - b) castor and steering axis inclination
 - c) camber and steering axis inclination
 - d) camber and toe-in
 - 4) On cars having rack and pinion steering, the gear rack is attached to
 - a) relay rod
 - b) pitman axis
 - c) cross shaft
 - d) tie rod
 - 5) The type of wheel which cannot be used with a tubeless tyre is
 - a) disc wheel
 - b) wire wheel
 - c) light alloy wheel
 - d) composite wheel

P.T.O.



- 6) An underinflated tyre will wear the tread most
- a) near centre
 - b) near the edges
 - c) in the lateral direction
 - d) in the cross direction
- 7) The brake efficiency of a new vehicle is about
- a) 30 per cent
 - b) 50 per cent
 - c) 80 per cent
 - d) 100 per cent
- 8) Intake port in the master cylinder allows brake fluid to flow
- a) into the reservoir
 - b) through the fluid check valve
 - c) around the recessed section of piston
 - d) all of the above
- 9) The number of points at which the engine-clutch-gear box unit is supported on the chassis frame is
- a) one
 - b) two
 - c) three
 - d) four
- 10) Function of overdrive is
- a) Give stability
 - b) Give ride control
 - c) Give high power
 - d) Give high speed
- 11) The maximum value of axial force at the clutch which a driver can apply while driving, without getting fatigued is approximately
- a) 10 N
 - b) 100 N
 - c) 500 N
 - d) 5000 N
- 12) Two advantages of using helical gears rather than spur gears in a transmission are
- a) High strength and low cost
 - b) High strength and less end thrust
 - c) Low noise level and high strength
 - d) Low noise level and economy
- 13) In a simple planetary gear set, the output member to increase torque is always the
- a) sun gear
 - b) ring gear
 - c) planet carrier
 - d) none of the above
- 14) The inner end of the axle shaft is splined to the
- a) sun gear
 - b) planet pinion
 - c) crown wheel
 - d) differential cage
-



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

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) Explain in detail the front engine rear wheel drive arrangement with a neat sketch and write its advantages and disadvantages. **6**
- b) Discuss functions and requirements of clutch and explain fluid flywheel with a neat sketch. **4**
- c) Discuss necessity of gear box with the help of vehicle performance curves. **4**
3. a) A motor vehicle total weight 11144 N has road wheels of 0.61 m effective diameter. The effective moment of inertia of the four road wheels and the rear axle together is 62.0 N-m², while that of the engine and flywheel is 6.2 N-m². The transmission efficiency is 90% and tractive resistance at a speed of 24 km/hr. is 222.5 N. The total available engine torque is 203.6 N-m.
- i) Determine the gear ratio, engine to back axle to provide maximum acceleration on 1 in 4 grade, when travelling at 24 km/hr.
- ii) What is the maximum acceleration ?
- iii) Determine the engine rpm and power under these conditions. **10**
- b) Write short notes on **any one** : **4**
- 1) Necessity of differential
- 2) Double declutching.
4. a) Discuss various requirements of a gear box in automobile. Explain with neat sketch working of sliding mesh gear box. **6**
- b) Explain the working with a neat sketch a differential used in automobiles. **4**
- c) Write a short note on **any one** : **4**
- i) Automobile battery
- ii) Automobile charging system.

Set R



SECTION – II

5. a) What are various types of steering gear box ? Explain any one of them with figure. **6**
- b) Explain steering layout with figure. **4**
- c) Write short note on Power steering. **4**
6. a) A motor car has wheel base of 2.64 m, the height of its center of gravity above the ground is 0.61 m and it is 1.12 m in front of rear axle. If car is travelling at 40 km/hr on a level track, determine the minimum distance in which car may stop, when
- i) The front wheels are braked,
 - ii) The rear wheels are braked,
 - iii) All wheels are braked,
- The co-efficient of friction between tyre and road may be taken as 0.6. **6**
- b) Write note on antilock braking system. **4**
- c) Explain with neat sketch Air braking system. List advantage and disadvantages of it. **4**
7. a) What is need of solar vehicle ? Explain working of solar vehicle with figure. **6**
- b) Explain stabilizer bar with figure. **4**
- c) Differentiate between independent suspension and conventional system. **4**
-



SLR-TJ – 123

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

Set	S
-----	---

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 70

- 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.
 - 5) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
 - 6) **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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) An underinflated tyre will wear the tread most
 - a) near centre
 - b) near the edges
 - c) in the lateral direction
 - d) in the cross direction
 - 2) The brake efficiency of a new vehicle is about
 - a) 30 per cent
 - b) 50 per cent
 - c) 80 per cent
 - d) 100 per cent
 - 3) Intake port in the master cylinder allows brake fluid to flow
 - a) into the reservoir
 - b) through the fluid check valve
 - c) around the recessed section of piston
 - d) all of the above
 - 4) The number of points at which the engine-clutch-gear box unit is supported on the chassis frame is
 - a) one
 - b) two
 - c) three
 - d) four
 - 5) Function of overdrive is
 - a) Give stability
 - b) Give ride control
 - c) Give high power
 - d) Give high speed

P.T.O.



- 6) The maximum value of axial force at the clutch which a driver can apply while driving, without getting fatigued is approximately
- a) 10 N b) 100 N c) 500 N d) 5000 N
- 7) Two advantages of using helical gears rather than spur gears in a transmission are
- a) High strength and low cost b) High strength and less end thrust
c) Low noise level and high strength d) Low noise level and economy
- 8) In a simple planetary gear set, the output member to increase torque is always the
- a) sun gear b) ring gear
c) planet carrier d) none of the above
- 9) The inner end of the axle shaft is splined to the
- a) sun gear b) planet pinion
c) crown wheel d) differential cage
- 10) The function of a shackle with a leaf spring is to
- a) allow pivoting of spring end b) allow spring length to change
c) control sides way d) control rear torque
- 11) The coil spring in wishbone suspension is placed between the
- a) two wishbones
b) upper wishbone and the cross-member
c) lower wishbone and the cross-member
d) shock absorber and the cross-member
- 12) The included angle is the sum of the
- a) camber and castor
b) castor and steering axis inclination
c) camber and steering axis inclination
d) camber and toe-in
- 13) On cars having rack and pinion steering, the gear rack is attached to
- a) relay rod b) pitman axis c) cross shaft d) tie rod
- 14) The type of wheel which cannot be used with a tubeless tyre is
- a) disc wheel b) wire wheel
c) light alloy wheel d) composite wheel
-



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

B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
Professional (Elective – 3)
AUTOMOBILE ENGINEERING

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- 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

2. a) Explain in detail the front engine rear wheel drive arrangement with a neat sketch and write its advantages and disadvantages. **6**
- b) Discuss functions and requirements of clutch and explain fluid flywheel with a neat sketch. **4**
- c) Discuss necessity of gear box with the help of vehicle performance curves. **4**
3. a) A motor vehicle total weight 11144 N has road wheels of 0.61 m effective diameter. The effective moment of inertia of the four road wheels and the rear axle together is 62.0 N-m², while that of the engine and flywheel is 6.2 N-m². The transmission efficiency is 90% and tractive resistance at a speed of 24 km/hr. is 222.5 N. The total available engine torque is 203.6 N-m.
- i) Determine the gear ratio, engine to back axle to provide maximum acceleration on 1 in 4 grade, when travelling at 24 km/hr.
- ii) What is the maximum acceleration ?
- iii) Determine the engine rpm and power under these conditions. **10**
- b) Write short notes on **any one** : **4**
- 1) Necessity of differential
- 2) Double declutching.
4. a) Discuss various requirements of a gear box in automobile. Explain with neat sketch working of sliding mesh gear box. **6**
- b) Explain the working with a neat sketch a differential used in automobiles. **4**
- c) Write a short note on **any one** : **4**
- i) Automobile battery
- ii) Automobile charging system.

Set S



SECTION – II

5. a) What are various types of steering gear box ? Explain any one of them with figure. **6**
- b) Explain steering layout with figure. **4**
- c) Write short note on Power steering. **4**
6. a) A motor car has wheel base of 2.64 m, the height of its center of gravity above the ground is 0.61 m and it is 1.12 m in front of rear axle. If car is travelling at 40 km/hr on a level track, determine the minimum distance in which car may stop, when
- i) The front wheels are braked,
 - ii) The rear wheels are braked,
 - iii) All wheels are braked,
- The co-efficient of friction between tyre and road may be taken as 0.6. **6**
- b) Write note on antilock braking system. **4**
- c) Explain with neat sketch Air braking system. List advantage and disadvantages of it. **4**
7. a) What is need of solar vehicle ? Explain working of solar vehicle with figure. **6**
- b) Explain stabilizer bar with figure. **4**
- c) Differentiate between independent suspension and conventional system. **4**
-



SLR-TJ – 124

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

Set	P
-----	----------

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- Note :**
- 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) Question Number 2 and 6 are **compulsory**.
 - 4) Answer **any two full** questions from the remaining in **each** Section.
 - 5) Figures to **right** indicate **full** marks.
 - 6) Make suitable assumptions, if required and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct alternatives : **(1×11=11)**
- 1) Which of the following process is used to manufacture products with controlled porosity ?
A) Casting
B) Forming
C) Welding
D) Powder metallurgy
 - 2) In process picture locator is considered as
A) Cube
B) Triangle
C) Cone
D) Pyramid
 - 3) Sequence of operation is decided by
A) Product engineer
B) Process engineer
C) Time study engineer
D) Method engineer
 - 4) Which of the following dept. is the core of organization ?
A) Marketing Engineering
B) Tool Room
C) Production Engineering
D) Process Engineering

P.T.O.



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

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

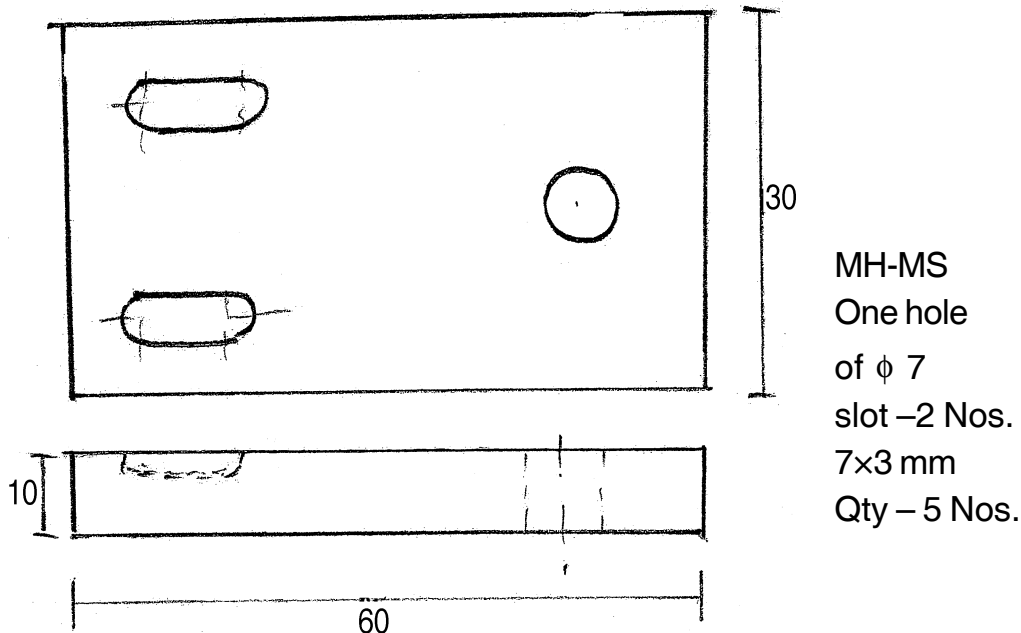
Marks : 56

- Note :**
- 1) Q. No. 2 and 6 are **compulsory**.
 - 2) Answer **any two full** questions from the remaining in **each** Section.
 - 3) Figures to **right** indicate **full** marks.
 - 4) Make suitable assumption, if required and state them **clearly**.

SECTION – I

2. Prepare a process plan for manufacturing the component in Figure 1 w.r.t. data supplied there in along following lines :
- A) Route sheet
 - B) Operations list indicating sequence of operation indicating machine selected, holding methods, tool specifications and machining parameters per set up.
 - C) Gauges and inspection methods and instruments.

14





3. a) Discuss manufacturing system, input and output of manufacturing system and characteristics of manufacturing system. **7**
- b) Explain part print analysis by taking a suitable example. **7**
4. Explain the position and function of product and process engineer in the organization. Write note on skills required by a process engineer. **14**
5. a) Explain in detail input and output of process planning. **7**
- b) What is basic process planning terminology-process, operation and cut. **7**

SECTION – II

6. Draw the process picture sheet for any four operations for manufacturing the component in Figure 1 w.r.t. sequence. Use standard symbols for locating, clamping along with material removal. **14**
 7. a) Explain factors in tool selection, constraints in tool selection, operating requirements for tool selection. **7**
 - b) What are the technical considerations for equipment selection ? Explain. **7**
 8. a) Write note on classification of operation. **7**
 - b) How to select proper sequence of operation ? **7**
 9. a) What are the general guidelines for process selection ? Explain. **7**
 - b) Write a note on process picture. **7**
-



SLR-TJ – 124

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

Set	Q
-----	----------

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Note :**
- 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) Question Number 2 and 6 are **compulsory**.
 - 4) Answer **any two full** questions from the remaining in **each** Section.
 - 5) Figures to **right** indicate **full** marks.
 - 6) Make suitable assumptions, if required and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Match the pair : **3**
- | | |
|--------------------|------------------------------------|
| a) Investment cost | p) Material and labour costs |
| b) Operating cost | q) Cost of dies, jigs and fixtures |
| c) Intangible cost | r) Down time cost |
- B) Choose the correct alternatives : **(1×11=11)**
- 1) Which of the following product is not continuous/process mfg. system ?

A) Automobile	B) Fertilizer
C) Petrochemical	D) Steel
 - 2) Qualifying operation is associated with

A) Basic process operation	B) Principal process operation
C) Auxiliary process	D) Supplementary process operation
 - 3) Operation that bring raw part out of "rough" is

A) Major operation	B) Originating operation
C) Qualifying operation	D) Auxiliary operation

P.T.O.



- 4) Standard time is calculated by
- A) Process department B) Work measurement Dept.
C) Product department D) All of the above
- 5) In method study inspection is indicated by
- A) Square B) Triangle
C) Circle D) Rectangle
- 6) Special purpose machines are selected for
- A) Project manufacturing B) Job production
C) Batch manufacturing D) Mass production
- 7) Which of the following process is used to manufacture products with controlled porosity ?
- A) Casting B) Forming
C) Welding D) Powder metallurgy
- 8) In process picture locator is considered as
- A) Cube B) Triangle
C) Cone D) Pyramid
- 9) Sequence of operation is decided by
- A) Product engineer B) Process engineer
C) Time study engineer D) Method engineer
- 10) Which of the following dept. is the core of organization ?
- A) Marketing Engineering B) Tool Room
C) Production Engineering D) Process Engineering
- 11) In product type of layout all machines are in
- A) In-line B) In group
C) In random D) Fixed position
-



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

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

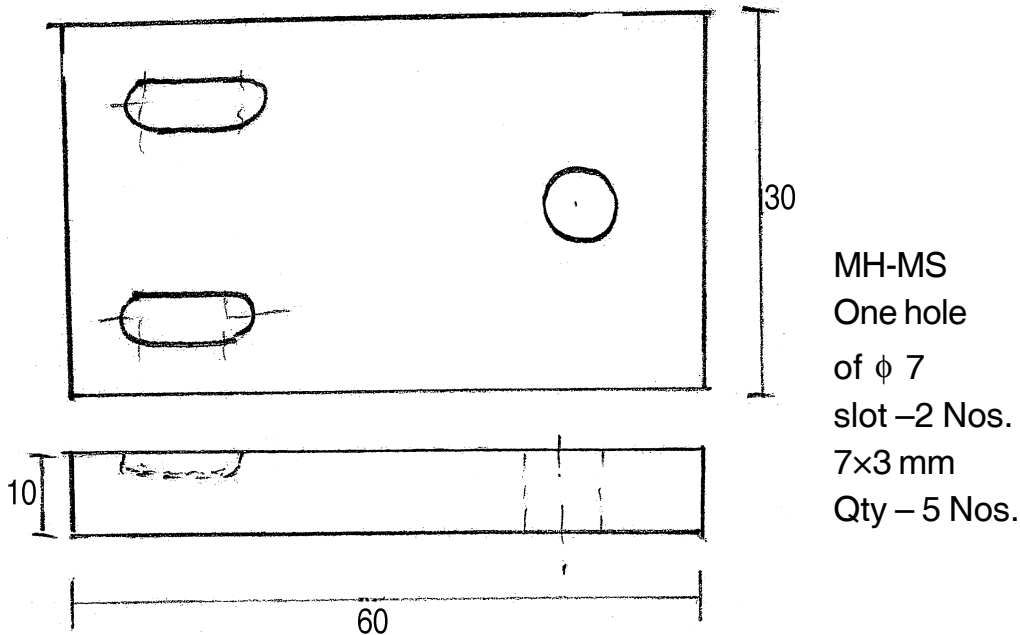
Marks : 56

- Note :**
- 1) Q. No. 2 and 6 are **compulsory**.
 - 2) Answer **any two full** questions from the remaining in **each** Section.
 - 3) Figures to **right** indicate **full** marks.
 - 4) Make suitable assumption, if required and state them **clearly**.

SECTION – I

2. Prepare a process plan for manufacturing the component in Figure 1 w.r.t. data supplied there in along following lines :
- A) Route sheet
 - B) Operations list indicating sequence of operation indicating machine selected, holding methods, tool specifications and machining parameters per set up.
 - C) Gauges and inspection methods and instruments.

14





3. a) Discuss manufacturing system, input and output of manufacturing system and characteristics of manufacturing system. **7**
- b) Explain part print analysis by taking a suitable example. **7**
4. Explain the position and function of product and process engineer in the organization. Write note on skills required by a process engineer. **14**
5. a) Explain in detail input and output of process planning. **7**
- b) What is basic process planning terminology-process, operation and cut. **7**

SECTION – II

6. Draw the process picture sheet for any four operations for manufacturing the component in Figure 1 w.r.t. sequence. Use standard symbols for locating, clamping along with material removal. **14**
 7. a) Explain factors in tool selection, constraints in tool selection, operating requirements for tool selection. **7**
 - b) What are the technical considerations for equipment selection ? Explain. **7**
 8. a) Write note on classification of operation. **7**
 - b) How to select proper sequence of operation ? **7**
 9. a) What are the general guidelines for process selection ? Explain. **7**
 - b) Write a note on process picture. **7**
-



SLR-TJ – 124

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

Set	R
-----	---

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Note :**
- 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) Question Number 2 and 6 are **compulsory**.
 - 4) Answer **any two full** questions from the remaining in **each** Section.
 - 5) Figures to **right** indicate **full** marks.
 - 6) Make suitable assumptions, if required and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Choose the correct alternatives : **(1×11=11)**
- 1) Operation that bring raw part out of “rough” is
 - A) Major operation
 - B) Originating operation
 - C) Qualifying operation
 - D) Auxiliary operation
 - 2) Standard time is calculated by
 - A) Process department
 - B) Work measurement Dept.
 - C) Product department
 - D) All of the above
 - 3) In method study inspection is indicated by
 - A) Square
 - B) Triangle
 - C) Circle
 - D) Rectangle
 - 4) Special purpose machines are selected for
 - A) Project manufacturing
 - B) Job production
 - C) Batch manufacturing
 - D) Mass production

P.T.O.



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

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

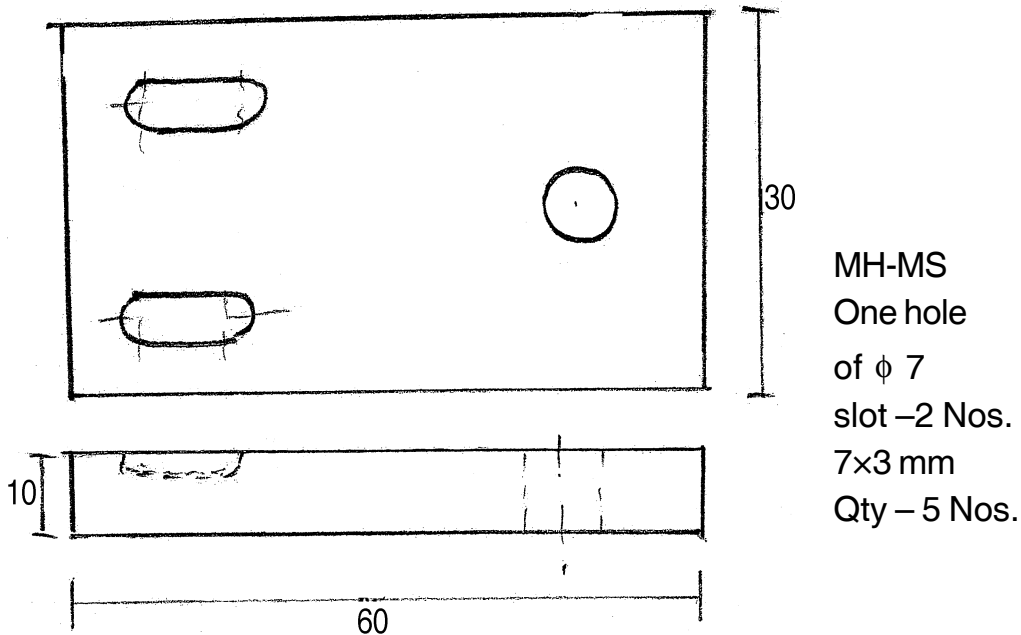
Marks : 56

- Note :**
- 1) Q. No. 2 and 6 are **compulsory**.
 - 2) Answer **any two full** questions from the remaining in **each** Section.
 - 3) Figures to **right** indicate **full** marks.
 - 4) Make suitable assumption, if required and state them **clearly**.

SECTION – I

2. Prepare a process plan for manufacturing the component in Figure 1 w.r.t. data supplied there in along following lines :
- A) Route sheet
 - B) Operations list indicating sequence of operation indicating machine selected, holding methods, tool specifications and machining parameters per set up.
 - C) Gauges and inspection methods and instruments.

14





3. a) Discuss manufacturing system, input and output of manufacturing system and characteristics of manufacturing system. **7**
- b) Explain part print analysis by taking a suitable example. **7**
4. Explain the position and function of product and process engineer in the organization. Write note on skills required by a process engineer. **14**
5. a) Explain in detail input and output of process planning. **7**
- b) What is basic process planning terminology-process, operation and cut. **7**

SECTION – II

6. Draw the process picture sheet for any four operations for manufacturing the component in Figure 1 w.r.t. sequence. Use standard symbols for locating, clamping along with material removal. **14**
 7. a) Explain factors in tool selection, constraints in tool selection, operating requirements for tool selection. **7**
 - b) What are the technical considerations for equipment selection ? Explain. **7**
 8. a) Write note on classification of operation. **7**
 - b) How to select proper sequence of operation ? **7**
 9. a) What are the general guidelines for process selection ? Explain. **7**
 - b) Write a note on process picture. **7**
-



SLR-TJ – 124

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

Set	S
-----	----------

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017

Max. Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- Note :** 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) Question Number 2 and 6 are **compulsory**.
- 4) Answer **any two full** questions from the remaining in **each** Section.
- 5) Figures to **right** indicate **full** marks.
- 6) Make suitable assumptions, if required and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. A) Match the pair : **3**
- | | |
|--------------------|------------------------------------|
| a) Investment cost | p) Material and labour costs |
| b) Operating cost | q) Cost of dies, jigs and fixtures |
| c) Intangible cost | r) Down time cost |
- B) Choose the correct alternatives : **(1×11=11)**
- 1) In method study inspection is indicated by
- | | |
|-----------|--------------|
| A) Square | B) Triangle |
| C) Circle | D) Rectangle |
- 2) Special purpose machines are selected for
- | | |
|--------------------------|--------------------|
| A) Project manufacturing | B) Job production |
| C) Batch manufacturing | D) Mass production |
- 3) Which of the following process is used to manufacture products with controlled porosity ?
- | | |
|------------|----------------------|
| A) Casting | B) Forming |
| C) Welding | D) Powder metallurgy |

P.T.O.



- 4) In process picture locator is considered as
 - A) Cube
 - B) Triangle
 - C) Cone
 - D) Pyramid
 - 5) Sequence of operation is decided by
 - A) Product engineer
 - B) Process engineer
 - C) Time study engineer
 - D) Method engineer
 - 6) Which of the following dept. is the core of organization ?
 - A) Marketing Engineering
 - B) Tool Room
 - C) Production Engineering
 - D) Process Engineering
 - 7) In product type of layout all machines are in
 - A) In-line
 - B) In group
 - C) In random
 - D) Fixed position
 - 8) Which of the following product is not continuous/process mfg. system ?
 - A) Automobile
 - B) Fertilizer
 - C) Petrochemical
 - D) Steel
 - 9) Qualifying operation is associated with
 - A) Basic process operation
 - B) Principal process operation
 - C) Auxiliary process
 - D) Supplementary process operation
 - 10) Operation that bring raw part out of “rough” is
 - A) Major operation
 - B) Originating operation
 - C) Qualifying operation
 - D) Auxiliary operation
 - 11) Standard time is calculated by
 - A) Process department
 - B) Work measurement Dept.
 - C) Product department
 - D) All of the above
-



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

**B.E. (Mechanical) (Part – I) (New – CGPA) Examination, 2017
PROCESS ENGINEERING (Professional Elective – III)**

Day and Date : Wednesday, 6-12-2017
Time : 3.00 p.m. to 6.00 p.m.

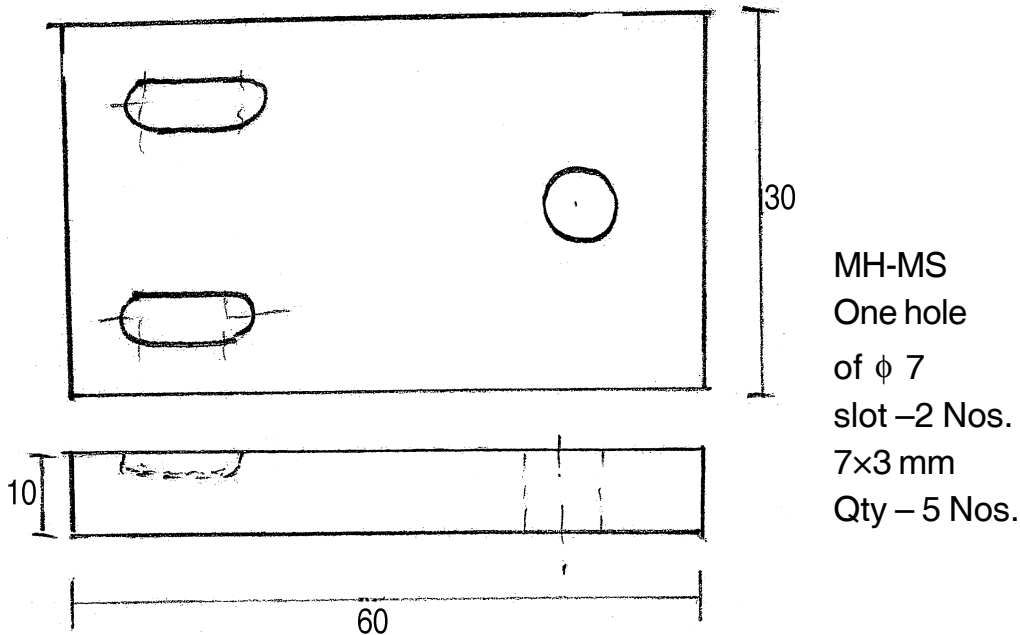
Marks : 56

- Note :**
- 1) Q. No. 2 and 6 are **compulsory**.
 - 2) Answer **any two full** questions from the remaining in **each** Section.
 - 3) Figures to **right** indicate **full** marks.
 - 4) Make suitable assumption, if required and state them **clearly**.

SECTION – I

2. Prepare a process plan for manufacturing the component in Figure 1 w.r.t. data supplied there in along following lines :
- A) Route sheet
 - B) Operations list indicating sequence of operation indicating machine selected, holding methods, tool specifications and machining parameters per set up.
 - C) Gauges and inspection methods and instruments.

14





3. a) Discuss manufacturing system, input and output of manufacturing system and characteristics of manufacturing system. **7**
b) Explain part print analysis by taking a suitable example. **7**
4. Explain the position and function of product and process engineer in the organization. Write note on skills required by a process engineer. **14**
5. a) Explain in detail input and output of process planning. **7**
b) What is basic process planning terminology-process, operation and cut. **7**

SECTION – II

6. Draw the process picture sheet for any four operations for manufacturing the component in Figure 1 w.r.t. sequence. Use standard symbols for locating, clamping along with material removal. **14**
7. a) Explain factors in tool selection, constraints in tool selection, operating requirements for tool selection. **7**
b) What are the technical considerations for equipment selection ? Explain. **7**
8. a) Write note on classification of operation. **7**
b) How to select proper sequence of operation ? **7**
9. a) What are the general guidelines for process selection ? Explain. **7**
b) Write a note on process picture. **7**
-



SLR-TJ – 125

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

Set	P
-----	----------

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) The order of the polynomial used for formulating the robot trajectory is usually a _____ order polynomial.
a) First b) Second c) Third d) Fourth
 - 2) The acronym UGV stands for _____
a) Unarmed Guided Vehicle b) Unmanned Guided Vehicle
c) Unarmed Ground Vehicle d) Unmanned Ground Vehicle
 - 3) Today, almost all industrial robots used for high speed assembly operations in the electronics industry are built in _____ configuration.
a) Cartesian b) Delta c) SCARA d) Jointed Arm
 - 4) A robot has to be designed for an arc welding operation. This requires that the robot must possess very high repeatability, typically less than 0.5 mm. Expected payload is less than 25 kg. Which drive system is the best suited for this application ?
a) Magnetic b) Hydraulic c) Pneumatic d) Electric
 - 5) A gripper needs to be selected for an application involving assembly of a circular dowel peg in a cylindrical blind hole of the base part. Which of the following grippers is the best suited for the task ?
a) 2 finger parallel b) Magnetic c) Adhesive d) Vacuum

P.T.O.



- 6) The acronym 'CCD' in CCD image sensor stands for _____
a) Charged Coupled Device b) Complementary Charged Device
c) Coupled Charged Device d) Charged Complementary Device
- 7) A gripper used in assembly operations needs to be equipped with an arrangement which will allow a certain amount of flexibility in its wrist. This is to ensure assembly even if the axis of the part during insertion is slightly off-center. This type of compliance is _____ compliance.
a) Active b) Passive c) Mutual d) Progressive
- 8) An image which contains two distinct intensity levels between black and white is a _____ image.
a) Color b) Grayscale c) Binary d) Monochrome
- 9) The term 'Robot' was coined by _____
a) Issac Asimov b) Issac Newton c) Karl Capek d) Karl Urban
- 10) If a robot cannot reach a point even when it is located within its workspace, the configuration of the manipulator is said to be _____
a) Redundant b) Revolute c) Singular d) Spiral
- 11) The process of transforming variables from joint space to Cartesian space is called _____
a) Forward Kinematics b) Inward Kinematics
c) Inverse Kinematics d) Reverse Kinematics
- 12) The workcell layout in which a series of robots tend to parts moving along a conveyor is called _____
a) Mobile Robot Workcell b) Stranded Robot Workcell
c) Inline Robots Workcell d) Robot Centered Workcell
- 13) The process of _____ is the technique which removes noise from the image before any image processing algorithms are applied on the image.
a) Filtering b) Thresholding c) Segmentation d) Calibration
- 14) The minimum number of wheels required for both static and dynamic balance of wheeled robots is _____
a) 2 b) 3 c) 4 d) 6
-



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

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

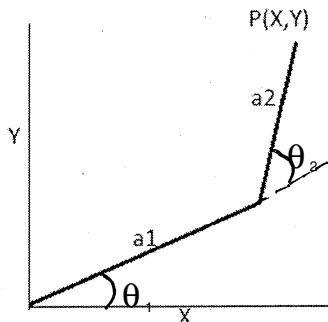
Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.
2) Non-programmable calculators are allowed.
3) Figures to the extreme right of the page indicate marks allotted to the question.
4) Assume suitable data if necessary and state it clearly.
5) Draw neat sketches/figures to support your answers and label them correctly.

SECTION – 1

- 2. a) Define “Industrial Robot”. List the reasons why and where industrial robots must be deployed in place of humans in the industrial workspace. State possible issues associated with the use of industrial robots in place of human operators. 8
- b) What are the different factors to be considered when selecting grippers as EOAT (End of Arm Tooling) attachment for industrial robots ? 6
- 3. a) Discuss sensor classification for Industrial Robots. 8
- b) Derive the inverse kinematic equations for a 2 DOF jointed arm robot. 6
- 4. a) Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. In the figure given below the lengths of the links a1 and a2 of the manipulator are 200 mm each. Link angles θ_1 and θ_2 measure 20 degrees and 30 degrees respectively. If the tool velocity is 100 mm/s in both x and y directions calculate rotational speeds of link 1 and link 2 in degrees/sec. 8



- b) Discuss with neat sketches the Cartesian and jointed arm configuration for industrial robots. 6



SECTION – 2

5. a) What do you understand by the term image segmentation ? Discuss two techniques of image segmentation. **8**
- b) Explain with the help of neat sketch a typical control architecture for industrial robots. **6**
6. a) What is an AGV ? Discuss are the different navigation techniques used for industrial AGVs. **8**
- b) Explain in briefly offline programming, teach through method and walk through method of robot programming. **6**
7. a) Discuss use of industrial robots for welding applications. State the robot configuration DOF, choice of drives and sensors clearly and given justification for the same. **8**
- b) Compare wheeled and tracked robots. **6**
-



SLR-TJ – 125

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

Set	Q
-----	---

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

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) **Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) An image which contains two distinct intensity levels between black and white is a _____ image.
a) Color b) Grayscale c) Binary d) Monochrome
- 2) The term 'Robot' was coined by _____
a) Issac Asimov b) Issac Newton c) Karl Capek d) Karl Urban
- 3) If a robot cannot reach a point even when it is located within its workspace, the configuration of the manipulator is said to be _____
a) Redundant b) Revolute c) Singular d) Spiral
- 4) The process of transforming variables from joint space to Cartesian space is called _____
a) Forward Kinematics b) Inward Kinematics
c) Inverse Kinematics d) Reverse Kinematics
- 5) The workcell layout in which a series of robots tend to parts moving along a conveyor is called _____
a) Mobile Robot Workcell b) Stranded Robot Workcell
c) Inline Robots Workcell d) Robot Centered Workcell
- 6) The process of _____ is the technique which removes noise from the image before any image processing algorithms are applied on the image.
a) Filtering b) Thresholding c) Segmentation d) Calibration

P.T.O.



- 7) The minimum number of wheels required for both static and dynamic balance of wheeled robots is _____
a) 2 b) 3 c) 4 d) 6
- 8) The order of the polynomial used for formulating the robot trajectory is usually a _____ order polynomial.
a) First b) Second c) Third d) Fourth
- 9) The acronym UGV stands for _____
a) Unarmed Guided Vehicle b) Unmanned Guided Vehicle
c) Unarmed Ground Vehicle d) Unmanned Ground Vehicle
- 10) Today, almost all industrial robots used for high speed assembly operations in the electronics industry are built in _____ configuration.
a) Cartesian b) Delta c) SCARA d) Jointed Arm
- 11) A robot has to be designed for an arc welding operation. This requires that the robot must possess very high repeatability, typically less than 0.5 mm. Expected payload is less than 25 kg. Which drive system is the best suited for this application ?
a) Magnetic b) Hydraulic c) Pneumatic d) Electric
- 12) A gripper needs to be selected for an application involving assembly of a circular dowel peg in a cylindrical blind hole of the base part. Which of the following grippers is the best suited for the task ?
a) 2 finger parallel b) Magnetic c) Adhesive d) Vacuum
- 13) The acronym 'CCD' in CCD image sensor stands for _____
a) Charged Coupled Device b) Complementary Charged Device
c) Coupled Charged Device d) Charged Complementary Device
- 14) A gripper used in assembly operations needs to be equipped with an arrangement which will allow a certain amount of flexibility in its wrist. This is to ensure assembly even if the axis of the part during insertion is slightly off-center. This type of compliance is _____ compliance.
a) Active b) Passive c) Mutual d) Progressive
-



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

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

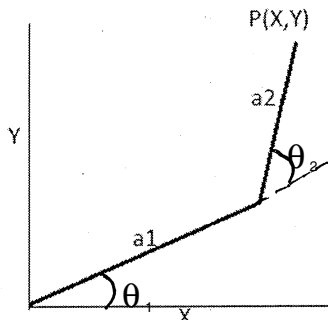
Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.
2) Non-programmable calculators are allowed.
3) Figures to the extreme right of the page indicate marks allotted to the question.
4) Assume suitable data if necessary and state it clearly.
5) Draw neat sketches/figures to support your answers and label them correctly.

SECTION – 1

2. a) Define “Industrial Robot”. List the reasons why and where industrial robots must be deployed in place of humans in the industrial workspace. State possible issues associated with the use of industrial robots in place of human operators. **8**
b) What are the different factors to be considered when selecting grippers as EOAT (End of Arm Tooling) attachment for industrial robots ? **6**
3. a) Discuss sensor classification for Industrial Robots. **8**
b) Derive the inverse kinematic equations for a 2 DOF jointed arm robot. **6**
4. a) Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. In the figure given below the lengths of the links a_1 and a_2 of the manipulator are 200 mm each. Link angles θ_1 and θ_2 measure 20 degrees and 30 degrees respectively. If the tool velocity is 100 mm/s in both x and y directions calculate rotational speeds of link 1 and link 2 in degrees/sec. **8**



- b) Discuss with neat sketches the Cartesian and jointed arm configuration for industrial robots. **6**



SECTION – 2

5. a) What do you understand by the term image segmentation ? Discuss two techniques of image segmentation. **8**
- b) Explain with the help of neat sketch a typical control architecture for industrial robots. **6**
6. a) What is an AGV ? Discuss are the different navigation techniques used for industrial AGVs. **8**
- b) Explain in briefly offline programming, teach through method and walk through method of robot programming. **6**
7. a) Discuss use of industrial robots for welding applications. State the robot configuration DOF, choice of drives and sensors clearly and given justification for the same. **8**
- b) Compare wheeled and tracked robots. **6**
-



SLR-TJ – 125

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

Set	R
-----	---

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : 14
- 1) A gripper needs to be selected for an application involving assembly of a circular dowel peg in a cylindrical blind hole of the base part. Which of the following grippers is the best suited for the task ?
a) 2 finger parallel b) Magnetic c) Adhesive d) Vacuum
 - 2) The acronym 'CCD' in CCD image sensor stands for _____
a) Charged Coupled Device b) Complementary Charged Device
c) Coupled Charged Device d) Charged Complementary Device
 - 3) A gripper used in assembly operations needs to be equipped with an arrangement which will allow a certain amount of flexibility in its wrist. This is to ensure assembly even if the axis of the part during insertion is slightly off-center. This type of compliance is _____ compliance.
a) Active b) Passive c) Mutual d) Progressive
 - 4) An image which contains two distinct intensity levels between black and white is a _____ image.
a) Color b) Grayscale c) Binary d) Monochrome
 - 5) The term 'Robot' was coined by _____
a) Issac Asimov b) Issac Newton c) Karl Capek d) Karl Urban
 - 6) If a robot cannot reach a point even when it is located within its workspace, the configuration of the manipulator is said to be _____
a) Redundant b) Revolute c) Singular d) Spiral

P.T.O.



- 7) The process of transforming variables from joint space to Cartesian space is called _____
- a) Forward Kinematics b) Inward Kinematics
c) Inverse Kinematics d) Reverse Kinematics
- 8) The workcell layout in which a series of robots tend to parts moving along a conveyor is called _____
- a) Mobile Robot Workcell b) Stranded Robot Workcell
c) Inline Robots Workcell d) Robot Centered Workcell
- 9) The process of _____ is the technique which removes noise from the image before any image processing algorithms are applied on the image.
- a) Filtering b) Thresholding c) Segmentation d) Calibration
- 10) The minimum number of wheels required for both static and dynamic balance of wheeled robots is _____
- a) 2 b) 3 c) 4 d) 6
- 11) The order of the polynomial used for formulating the robot trajectory is usually a _____ order polynomial.
- a) First b) Second c) Third d) Fourth
- 12) The acronym UGV stands for _____
- a) Unarmed Guided Vehicle b) Unmanned Guided Vehicle
c) Unarmed Ground Vehicle d) Unmanned Ground Vehicle
- 13) Today, almost all industrial robots used for high speed assembly operations in the electronics industry are built in _____ configuration.
- a) Cartesian b) Delta c) SCARA d) Jointed Arm
- 14) A robot has to be designed for an arc welding operation. This requires that the robot must possess very high repeatability, typically less than 0.5 mm. Expected payload is less than 25 kg. Which drive system is the best suited for this application ?
- a) Magnetic b) Hydraulic c) Pneumatic d) Electric
-



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

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

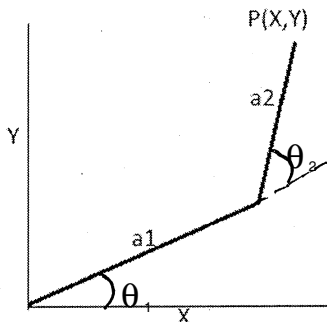
Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Section 1 and 2 includes 3 question worth 14 marks each. Solve **any two** questions from **each** Section.
 2) Non-programmable calculators are allowed.
 3) Figures to the extreme **right** of the page indicate marks allotted to the question.
 4) **Assume** suitable data if necessary and state **it clearly**.
 5) Draw **neat** sketches/figures to support your answers and label them correctly.

SECTION – 1

2. a) Define “Industrial Robot”. List the reasons why and where industrial robots must be deployed in place of humans in the industrial workspace. State possible issues associated with the use of industrial robots in place of human operators. 8
- b) What are the different factors to be considered when selecting grippers as EOAT (End of Arm Tooling) attachment for industrial robots ? 6
3. a) Discuss sensor classification for Industrial Robots. 8
- b) Derive the inverse kinematic equations for a 2 DOF jointed arm robot. 6
4. a) Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. In the figure given below the lengths of the links a1 and a2 of the manipulator are 200 mm each. Link angles θ_1 and θ_2 measure 20 degrees and 30 degrees respectively. If the tool velocity is 100 mm/s in both x and y directions calculate rotational speeds of link 1 and link 2 in degrees/sec. 8



- b) Discuss with neat sketches the Cartesian and jointed arm configuration for industrial robots.



SECTION – 2

5. a) What do you understand by the term image segmentation ? Discuss two techniques of image segmentation. **8**
- b) Explain with the help of neat sketch a typical control architecture for industrial robots. **6**
6. a) What is an AGV ? Discuss are the different navigation techniques used for industrial AGVs. **8**
- b) Explain in briefly offline programming, teach through method and walk through method of robot programming. **6**
7. a) Discuss use of industrial robots for welding applications. State the robot configuration DOF, choice of drives and sensors clearly and given justification for the same. **8**
- b) Compare wheeled and tracked robots. **6**
-



SLR-TJ – 125

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

Set	S
-----	---

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : 14
- 1) If a robot cannot reach a point even when it is located within its workspace, the configuration of the manipulator is said to be _____
a) Redundant b) Revolute c) Singular d) Spiral
 - 2) The process of transforming variables from joint space to Cartesian space is called _____
a) Forward Kinematics b) Inward Kinematics
c) Inverse Kinematics d) Reverse Kinematics
 - 3) The workcell layout in which a series of robots tend to parts moving along a conveyor is called _____
a) Mobile Robot Workcell b) Stranded Robot Workcell
c) Inline Robots Workcell d) Robot Centered Workcell
 - 4) The process of _____ is the technique which removes noise from the image before any image processing algorithms are applied on the image.
a) Filtering b) Thresholding c) Segmentation d) Calibration
 - 5) The minimum number of wheels required for both static and dynamic balance of wheeled robots is _____
a) 2 b) 3 c) 4 d) 6

P.T.O.



- 6) The order of the polynomial used for formulating the robot trajectory is usually a _____ order polynomial.
a) First b) Second c) Third d) Fourth
- 7) The acronym UGV stands for _____.
a) Unarmed Guided Vehicle b) Unmanned Guided Vehicle
c) Unarmed Ground Vehicle d) Unmanned Ground Vehicle
- 8) Today, almost all industrial robots used for high speed assembly operations in the electronics industry are built in _____ configuration.
a) Cartesian b) Delta c) SCARA d) Jointed Arm
- 9) A robot has to be designed for an arc welding operation. This requires that the robot must possess very high repeatability, typically less than 0.5 mm. Expected payload is less than 25 kg. Which drive system is the best suited for this application ?
a) Magnetic b) Hydraulic c) Pneumatic d) Electric
- 10) A gripper needs to be selected for an application involving assembly of a circular dowel peg in a cylindrical blind hole of the base part. Which of the following grippers is the best suited for the task ?
a) 2 finger parallel b) Magnetic c) Adhesive d) Vacuum
- 11) The acronym 'CCD' in CCD image sensor stands for _____.
a) Charged Coupled Device b) Complementary Charged Device
c) Coupled Charged Device d) Charged Complementary Device
- 12) A gripper used in assembly operations needs to be equipped with an arrangement which will allow a certain amount of flexibility in its wrist. This is to ensure assembly even if the axis of the part during insertion is slightly off-center. This type of compliance is _____ compliance.
a) Active b) Passive c) Mutual d) Progressive
- 13) An image which contains two distinct intensity levels between black and white is a _____ image.
a) Color b) Grayscale c) Binary d) Monochrome
- 14) The term 'Robot' was coined by _____.
a) Issac Asimov b) Issac Newton c) Karl Capek d) Karl Urban
-



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

**B.E. Mechanical (Part – I) (CGPA) Examination, 2017
Elective – I : INDUSTRIAL ROBOTICS (New)**

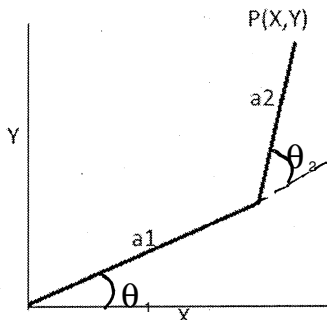
Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

- Instructions :** 1) Section 1 and 2 includes 3 question worth 14 marks each. Solve any two questions from each Section.
2) Non-programmable calculators are allowed.
3) Figures to the extreme right of the page indicate marks allotted to the question.
4) Assume suitable data if necessary and state it clearly.
5) Draw neat sketches/figures to support your answers and label them correctly.

SECTION – 1

- 2. a) Define “Industrial Robot”. List the reasons why and where industrial robots must be deployed in place of humans in the industrial workspace. State possible issues associated with the use of industrial robots in place of human operators. 8
- b) What are the different factors to be considered when selecting grippers as EOAT (End of Arm Tooling) attachment for industrial robots ? 6
- 3. a) Discuss sensor classification for Industrial Robots. 8
- b) Derive the inverse kinematic equations for a 2 DOF jointed arm robot. 6
- 4. a) Derive the equation for the Jacobean of a 2 DOF jointed arm manipulator. In the figure given below the lengths of the links a1 and a2 of the manipulator are 200 mm each. Link angles θ_1 and θ_2 measure 20 degrees and 30 degrees respectively. If the tool velocity is 100 mm/s in both x and y directions calculate rotational speeds of link 1 and link 2 in degrees/sec. 8



- b) Discuss with neat sketches the Cartesian and jointed arm configuration for industrial robots. 6



SECTION – 2

5. a) What do you understand by the term image segmentation ? Discuss two techniques of image segmentation. **8**
- b) Explain with the help of neat sketch a typical control architecture for industrial robots. **6**
6. a) What is an AGV ? Discuss are the different navigation techniques used for industrial AGVs. **8**
- b) Explain in briefly offline programming, teach through method and walk through method of robot programming. **6**
7. a) Discuss use of industrial robots for welding applications. State the robot configuration DOF, choice of drives and sensors clearly and given justification for the same. **8**
- b) Compare wheeled and tracked robots. **6**
-



SLR-TJ – 126

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

Set	P
-----	----------

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)**

Day and Date : Friday, 8-12-2017

Total Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **any two** questions from **each** Section.
 - 4) Figure to the **right** indicates **full** marks.
 - 5) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Mill setting means
 - a) Opening between top and feed roller
 - b) Opening between top and discharge roller
 - c) Opening between top and two bottom rollers
 - d) None of the above
- 2) Cane kicker is used for
 - a) Even distribution of the cane on the carrier
 - b) Complete the preparation of the cane
 - c) Cutting the cane in to fine pieces
 - d) None of the above
- 3) The term Maceration means
 - a) Spraying of hot water on the bagasse
 - b) Weighing of juice
 - c) Spraying of last mill juice on the first mill
 - d) Immersion of bagasse in the diluted juice
- 4) Mill roller peripheral speed
 - a) 7.5 to 8.5 rpm
 - b) 1.5 to 2.5 rpm
 - c) 12.5 to 13.5 rpm
 - d) 4.5 to 5.5 rpm

P.T.O.



- 5) In juice, lime is added
 - a) For settling of mud
 - b) To bring the whiteness of sugar
 - c) Increase the brix
 - d) Increase the temperature of the juice
- 6) Clear juice heater is used for
 - a) Heating the juice from 550 to 650
 - b) Increase the juice brix up to 640
 - c) Increase the temperature of the juice up to the boiling point
 - d) None of the above
- 7) Mother liquid obtained during centrifugal operation with application of water
 - a) Heavy molasses
 - b) Final molasses
 - c) Light molasses
 - d) Masecute
- 8) Batch type centrifugal machine is mainly used for
 - a) 'B' masecute
 - b) 'A' masecute
 - c) 'C' masecute
 - d) None of the above
- 9) The problem associated with the continuous centrifugal machine
 - a) Conglomerates
 - b) False grain
 - c) Crystal breakage
 - d) Uniform crystal
- 10) The object of 'Catchall'
 - a) To see the masecute level in the pan
 - b) Discharge the masecute in to the crystalliser
 - c) To separate the sugar traces from vapours
 - d) None of the above
- 11) Sugar discharged from centrifugal machine contains moisture from
 - a) 1 to 2 %
 - b) 0.75 to 1.00 %
 - c) 0.5 to 1.5%
 - d) None of the above
- 12) Gravity factor for 'A' Masecute
 - a) 1200 to 1500
 - b) 600 to 800
 - c) 2000 to 2500
 - d) 1100 to 1300
- 13) In rotary dryer hot air and sugar flows in
 - a) Same direction
 - b) Bottom direction
 - c) Counter current direction
 - d) All of the above
- 14) In air pollution control wet scrubber is used
 - a) Removal of SO₂ from the flue gas
 - b) Removal CO₂
 - c) Removal CO from the flue gas
 - d) None of the above



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

B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)

Day and Date : Friday, 8-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Answer **any two** questions from **each** Section.
2) Figure to the **right** indicates **full** marks.
3) **Use** of scientific calculator is **allowed**.

SECTION – I

2. a) Describe the fibrizer with neat sketch. **6**
b) Why mill imbibition is required ? **4**
c) Explain the construction and working of evaporator. **4**
3. a) Explain the juice clarifier with neat sketch. **6**
b) Explain Messchaert and Chevron roller groves. **4**
c) Explain lever and counter weight juice weighing system with neat sketch. **4**
4. Write short notes on (**any three**) : **14**
a) Cane kicker
b) Pressure in milling
c) Multiple effect evaporators
d) Syrup sulphiter.



SECTION – II

5. a) Describe vacuum pan with neat sketch. **6**
- b) Explain water cooled crystallizer with neat sketch. **4**
- c) Describe continuous centrifugal machine with neat sketch. **4**
6. a) Explain rotary drier with neat sketch. **6**
- b) Describe Ravalgaon sugar grader. **4**
- c) Explain the necessity of sugar storage godowns. **4**
7. Write short notes on **(any three)** : **14**
- a) Theory of pan boiling
- b) Three massecute boiling scheme
- c) Industrial waste water treatment
- d) Sugar dust catchers.
-



SLR-TJ – 126

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

Set	Q
-----	----------

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)**

Day and Date : Friday, 8-12-2017

Total Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **any two** questions from **each** Section.
 - 4) Figure to the **right** indicates **full** marks.
 - 5) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) Batch type centrifugal machine is mainly used for
 - a) 'B' massecute
 - b) 'A' massecute
 - c) 'C' massecute
 - d) None of the above
- 2) The problem associated with the continuous centrifugal machine
 - a) Conglomerates
 - b) False grain
 - c) Crystal breakage
 - d) Uniform crystal
- 3) The object of 'Catchall'
 - a) To see the massecute level in the pan
 - b) Discharge the massecute in to the crystalliser
 - c) To separate the sugar traces from vapours
 - d) None of the above
- 4) Sugar discharged from centrifugal machine contains moisture from
 - a) 1 to 2 %
 - b) 0.75 to 1.00 %
 - c) 0.5 to 1.5%
 - d) None of the above
- 5) Gravity factor for 'A' Massecute
 - a) 1200 to 1500
 - b) 600 to 800
 - c) 2000 to 2500
 - d) 1100 to 1300
- 6) In rotary dryer hot air and sugar flows in
 - a) Same direction
 - b) Bottom direction
 - c) Counter current direction
 - d) All of the above

P.T.O.



- 7) In air pollution control wet scrubber is used
- Removal of SO₂ from the flue gas
 - Removal CO₂
 - Removal CO from the flue gas
 - None of the above
- 8) Mill setting means
- Opening between top and feed roller
 - Opening between top and discharge roller
 - Opening between top and two bottom rollers
 - None of the above
- 9) Cane kicker is used for
- Even distribution of the cane on the carrier
 - Complete the preparation of the cane
 - Cutting the cane in to fine pieces
 - None of the above
- 10) The term Maceration means
- Spraying of hot water on the bagasse
 - Weighing of juice
 - Spraying of last mill juice on the first mill
 - Immersion of bagasse in the diluted juice
- 11) Mill roller peripheral speed
- | | |
|---------------------|--------------------|
| a) 7.5 to 8.5 rpm | b) 1.5 to 2.5 rpm |
| c) 12.5 to 13.5 rpm | d) 4.5 to 5.5. rpm |
- 12) In juice, lime is added
- For settling of mud
 - To bring the whiteness of sugar
 - Increase the brix
 - Increase the temperature of the juice
- 13) Clear juice heater is used for
- Heating the juice from 550 to 650
 - Increase the juice brix up to 640
 - Increase the temperature of the juice up to the boiling point
 - None of the above
- 14) Mother liquid obtained during centrifugal operation with application of water
- | | |
|-------------------|-------------------|
| a) Heavy molasses | b) Final molasses |
| c) Light molasses | d) Masecute |
-



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

B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)

Day and Date : Friday, 8-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Answer **any two** questions from **each** Section.
2) Figure to the **right** indicates **full** marks.
3) **Use** of scientific calculator is **allowed**.

SECTION – I

2. a) Describe the fibrizer with neat sketch. **6**
b) Why mill imbibition is required ? **4**
c) Explain the construction and working of evaporator. **4**
3. a) Explain the juice clarifier with neat sketch. **6**
b) Explain Messchaert and Chevron roller groves. **4**
c) Explain lever and counter weight juice weighing system with neat sketch. **4**
4. Write short notes on (**any three**) : **14**
a) Cane kicker
b) Pressure in milling
c) Multiple effect evaporators
d) Syrup sulphiter.



SECTION – II

5. a) Describe vacuum pan with neat sketch. **6**
- b) Explain water cooled crystallizer with neat sketch. **4**
- c) Describe continuous centrifugal machine with neat sketch. **4**
6. a) Explain rotary drier with neat sketch. **6**
- b) Describe Ravalgaon sugar grader. **4**
- c) Explain the necessity of sugar storage godowns. **4**
7. Write short notes on (**any three**) : **14**
- a) Theory of pan boiling
- b) Three massecute boiling scheme
- c) Industrial waste water treatment
- d) Sugar dust catchers.
-



SLR-TJ – 126

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

Set	R
-----	----------

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 70

- 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) Answer **any two** questions from **each** Section.
4) Figure to the **right** indicates **full** marks.
5) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) In juice, lime is added
 - a) For settling of mud
 - b) To bring the whiteness of sugar
 - c) Increase the brix
 - d) Increase the temperature of the juice
 - 2) Clear juice heater is used for
 - a) Heating the juice from 550 to 650
 - b) Increase the juice brix up to 640
 - c) Increase the temperature of the juice up to the boiling point
 - d) None of the above
 - 3) Mother liquid obtained during centrifugal operation with application of water
 - a) Heavy molasses
 - b) Final molasses
 - c) Light molasses
 - d) Masecute
 - 4) Batch type centrifugal machine is mainly used for
 - a) 'B' masecute
 - b) 'A' masecute
 - c) 'C' masecute
 - d) None of the above
 - 5) The problem associated with the continuous centrifugal machine
 - a) Conglomerates
 - b) False grain
 - c) Crystal breakage
 - d) Uniform crystal

P.T.O.



- 6) The object of 'Catchall'
- a) To see the massecute level in the pan
 - b) Discharge the massecute in to the crystalliser
 - c) To separate the sugar traces from vapours
 - d) None of the above
- 7) Sugar discharged from centrifugal machine contains moisture from
- a) 1 to 2 %
 - b) 0.75 to 1.00 %
 - c) 0.5 to 1.5%
 - d) None of the above
- 8) Gravity factor for 'A' Massecute
- a) 1200 to 1500
 - b) 600 to 800
 - c) 2000 to 2500
 - d) 1100 to 1300
- 9) In rotary dryer hot air and sugar flows in
- a) Same direction
 - b) Bottom direction
 - c) Counter current direction
 - d) All of the above
- 10) In air pollution control wet scrubber is used
- a) Removal of SO₂ from the flue gas
 - b) Removal CO₂
 - c) Removal CO from the flue gas
 - d) None of the above
- 11) Mill setting means
- a) Opening between top and feed roller
 - b) Opening between top and discharge roller
 - c) Opening between top and two bottom rollers
 - d) None of the above
- 12) Cane kicker is used for
- a) Even distribution of the cane on the carrier
 - b) Complete the preparation of the cane
 - c) Cutting the cane in to fine pieces
 - d) None of the above
- 13) The term Maceration means
- a) Spraying of hot water on the bagasse
 - b) Weighing of juice
 - c) Spraying of last mill juice on the first mill
 - d) Immersion of bagasse in the diluted juice
- 14) Mill roller peripheral speed
- a) 7.5 to 8.5 rpm
 - b) 1.5 to 2.5 rpm
 - c) 12.5 to 13.5 rpm
 - d) 4.5 to 5.5. rpm



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

B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)

Day and Date : Friday, 8-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Answer **any two** questions from **each** Section.
2) Figure to the **right** indicates **full** marks.
3) **Use** of scientific calculator is **allowed**.

SECTION – I

2. a) Describe the fibrizer with neat sketch. **6**
b) Why mill imbibition is required ? **4**
c) Explain the construction and working of evaporator. **4**
3. a) Explain the juice clarifier with neat sketch. **6**
b) Explain Messchaert and Chevron roller groves. **4**
c) Explain lever and counter weight juice weighing system with neat sketch. **4**
4. Write short notes on (**any three**) : **14**
a) Cane kicker
b) Pressure in milling
c) Multiple effect evaporators
d) Syrup sulphiter.



SECTION – II

5. a) Describe vacuum pan with neat sketch. **6**
- b) Explain water cooled crystallizer with neat sketch. **4**
- c) Describe continuous centrifugal machine with neat sketch. **4**
6. a) Explain rotary drier with neat sketch. **6**
- b) Describe Ravalgaon sugar grader. **4**
- c) Explain the necessity of sugar storage godowns. **4**
7. Write short notes on (**any three**) : **14**
- a) Theory of pan boiling
- b) Three massecute boiling scheme
- c) Industrial waste water treatment
- d) Sugar dust catchers.
-



SLR-TJ – 126

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

Set	S
-----	----------

**B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)**

Day and Date : Friday, 8-12-2017

Total Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

- 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) Answer **any two** questions from **each** Section.
 - 4) Figure to the **right** indicates **full** marks.
 - 5) **Use of scientific calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

14

- 1) The object of 'Catchall'
 - a) To see the massecute level in the pan
 - b) Discharge the massecute in to the crystalliser
 - c) To separate the sugar traces from vapours
 - d) None of the above
- 2) Sugar discharged from centrifugal machine contains moisture from
 - a) 1 to 2 %
 - b) 0.75 to 1.00 %
 - c) 0.5 to 1.5%
 - d) None of the above
- 3) Gravity factor for 'A' Massecute
 - a) 1200 to 1500
 - b) 600 to 800
 - c) 2000 to 2500
 - d) 1100 to 1300
- 4) In rotary dryer hot air and sugar flows in
 - a) Same direction
 - b) Bottom direction
 - c) Counter current direction
 - d) All of the above
- 5) In air pollution control wet scrubber is used
 - a) Removal of SO₂ from the flue gas
 - b) Removal CO₂
 - c) Removal CO from the flue gas
 - d) None of the above

P.T.O.



- 6) Mill setting means
 - a) Opening between top and feed roller
 - b) Opening between top and discharge roller
 - c) Opening between top and two bottom rollers
 - d) None of the above
- 7) Cane kicker is used for
 - a) Even distribution of the cane on the carrier
 - b) Complete the preparation of the cane
 - c) Cutting the cane in to fine pieces
 - d) None of the above
- 8) The term Maceration means
 - a) Spraying of hot water on the bagasse
 - b) Weighing of juice
 - c) Spraying of last mill juice on the first mill
 - d) Immersion of bagasse in the diluted juice
- 9) Mill roller peripheral speed
 - a) 7.5 to 8.5 rpm
 - b) 1.5 to 2.5 rpm
 - c) 12.5 to 13.5 rpm
 - d) 4.5 to 5.5. rpm
- 10) In juice, lime is added
 - a) For settling of mud
 - b) To bring the whiteness of sugar
 - c) Increase the brix
 - d) Increase the temperature of the juice
- 11) Clear juice heater is used for
 - a) Heating the juice from 550 to 650
 - b) Increase the juice brix up to 640
 - c) Increase the temperature of the juice up to the boiling point
 - d) None of the above
- 12) Mother liquid obtained during centrifugal operation with application of water
 - a) Heavy molasses
 - b) Final molasses
 - c) Light molasses
 - d) Masecute
- 13) Batch type centrifugal machine is mainly used for
 - a) 'B' masecute
 - b) 'A' masecute
 - c) 'C' masecute
 - d) None of the above
- 14) The problem associated with the continuous centrifugal machine
 - a) Conglomerates
 - b) False grain
 - c) Crystal breakage
 - d) Uniform crystal



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

B.E. (Mechanical) (Part – I) (New) (CGPA) Examination, 2017
SUGAR ENGINEERING (Elective – I)

Day and Date : Friday, 8-12-2017

Marks : 56

Time : 3.00 p.m. to 6.00 p.m.

- Instructions:** 1) Answer **any two** questions from **each** Section.
2) Figure to the **right** indicates **full** marks.
3) **Use** of scientific calculator is **allowed**.

SECTION – I

2. a) Describe the fibrizer with neat sketch. **6**
b) Why mill imbibition is required ? **4**
c) Explain the construction and working of evaporator. **4**
3. a) Explain the juice clarifier with neat sketch. **6**
b) Explain Messchaert and Chevron roller groves. **4**
c) Explain lever and counter weight juice weighing system with neat sketch. **4**
4. Write short notes on (**any three**) : **14**
a) Cane kicker
b) Pressure in milling
c) Multiple effect evaporators
d) Syrup sulphiter.



SECTION – II

5. a) Describe vacuum pan with neat sketch. **6**
- b) Explain water cooled crystallizer with neat sketch. **4**
- c) Describe continuous centrifugal machine with neat sketch. **4**
6. a) Explain rotary drier with neat sketch. **6**
- b) Describe Ravalgaon sugar grader. **4**
- c) Explain the necessity of sugar storage godowns. **4**
7. Write short notes on **(any three)** : **14**
- a) Theory of pan boiling
- b) Three massecute boiling scheme
- c) Industrial waste water treatment
- d) Sugar dust catchers.
-



SLR-TJ – 128

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

Set	P
-----	---

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Answer any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Refusal to adopt and use opportunities to make changes in production _____ entrepreneurs.
A) Fabian B) Imitative C) Innovative D) Drone
- 2) Individuals are motivated by psychological and economic rewards
A) Pure B) Induced C) Motivated D) Spontaneous
- 3) Which of the following is the reason for business failure
A) Lack of market research B) Poor financial control
C) Poor management D) All the above
- 4) A business arrangement where one party allows another party to use a business name and sell its products or services is known as
A) A cooperative B) A franchise
C) An owner-manager business D) A limited company
- 5) 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

P.T.O.



- 6) Entrepreneurs are motivated by
A) Money
B) Personal values
C) Pull influences
D) All the above
- 7) EDPs course contents contains
A) General introduction to entrepreneurs
B) Motivation training
C) Managerial skills
D) All the above
- 8) Decisions taken by an entrepreneur on behalf of his enterprise are known as
A) Organizational decisions
B) Personal decisions
C) Routine decisions
D) Strategic decisions
- 9) One of the disadvantages of a franchise business for a franchisee is
A) Lack of independence
B) Franchise business typically have a high failure rate
C) Lack of brand identity
D) Training is not normally provided by the franchiser
- 10) Which of the following is a psychological factor affecting entrepreneurial growth ?
A) Legitimacy of entrepreneurship
B) Social status
C) Need for achievement
D) None of these
- 11) Business risks can be
A) Avoided
B) Reduced
C) Erased
D) None of the above
- 12) Which of the following is not an aspect of appraisal of term loans by commercial banks ?
A) Financial feasibility
B) Technical feasibility
C) Economic feasibility
D) Societal feasibility
- 13) 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
- 14) SIDBI was set up as a subsidiary of
A) IDBI
B) IFCI
C) ICICI
D) SFC
-



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

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Answer any two questions from each Section.

SECTION – I

2. a) Explain the classification and types of entrepreneur. 7
b) Explain evolution of entrepreneurship. 7
3. a) Explain the factors influencing entrepreneurial development. 7
b) Explain the contents and phases of EDP. 7
4. a) Explain different definitions of entrepreneur. 7
b) Write a short note on : 7
 - 1) Franchising
 - 2) Mergers.

SECTION – II

5. a) Explain the sources and methods of idea generation. 7
b) Explain contents of project report. 7
6. a) Write steps in setting up a small unit in detail. 7
b) Describe organization structure of a small scale industries with the help of suitable example. 7
7. a) Write a note on Micro Small Medium Enterprises (MSMEs) and Tax benefits to SMEs. 7
b) Write notes on SISI and SIDBI. 7



SLR-TJ – 128

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

Set	Q
-----	---

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Answer any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) Decisions taken by an entrepreneur on behalf of his enterprise are known as
A) Organizational decisions B) Personal decisions
C) Routine decisions D) Strategic decisions
 - 2) One of the disadvantages of a franchise business for a franchisee is
A) Lack of independence
B) Franchise business typically have a high failure rate
C) Lack of brand identity
D) Training is not normally provided by the franchiser
 - 3) Which of the following is a psychological factor affecting entrepreneurial growth ?
A) Legitimacy of entrepreneurship B) Social status
C) Need for achievement D) None of these
 - 4) Business risks can be
A) Avoided B) Reduced C) Erased D) None of the above
 - 5) Which of the following is not an aspect of appraisal of term loans by commercial banks ?
A) Financial feasibility B) Technical feasibility
C) Economic feasibility D) Societal feasibility

P.T.O.



- 6) 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
- 7) SIDBI was set up as a subsidiary of
- A) IDBI B) IFCI C) ICICI D) SFC
- 8) Refusal to adopt and use opportunities to make changes in production _____ entrepreneurs.
- A) Fabian B) Imitative C) Innovative D) Drone
- 9) Individuals are motivated by psychological and economic rewards
- A) Pure B) Induced C) Motivated D) Spontaneous
- 10) Which of the following is the reason for business failure
- A) Lack of market research B) Poor financial control
C) Poor management D) All the above
- 11) A business arrangement where one party allows another party to use a business name and sell its products or services is known as
- A) A cooperative B) A franchise
C) An owner-manager business D) A limited company
- 12) 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
- 13) Entrepreneurs are motivated by
- A) Money B) Personal values
C) Pull influences D) All the above
- 14) EDPs course contents contains
- A) General introduction to entrepreneurs
B) Motivation training
C) Managerial skills
D) All the above
-



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

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Answer any two questions from each Section.

SECTION – I

2. a) Explain the classification and types of entrepreneur. 7
b) Explain evolution of entrepreneurship. 7
3. a) Explain the factors influencing entrepreneurial development. 7
b) Explain the contents and phases of EDP. 7
4. a) Explain different definitions of entrepreneur. 7
b) Write a short note on : 7
 - 1) Franchising
 - 2) Mergers.

SECTION – II

5. a) Explain the sources and methods of idea generation. 7
b) Explain contents of project report. 7
6. a) Write steps in setting up a small unit in detail. 7
b) Describe organization structure of a small scale industries with the help of suitable example. 7
7. a) Write a note on Micro Small Medium Enterprises (MSMEs) and Tax benefits to SMEs. 7
b) Write notes on SISI and SIDBI. 7



SLR-TJ – 128

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

Set	R
-----	---

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Answer any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) 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
- 2) Entrepreneurs are motivated by
 - A) Money
 - B) Personal values
 - C) Pull influences
 - D) All the above
- 3) EDPs course contents contains
 - A) General introduction to entrepreneurs
 - B) Motivation training
 - C) Managerial skills
 - D) All the above
- 4) Decisions taken by an entrepreneur on behalf of his enterprise are known as
 - A) Organizational decisions
 - B) Personal decisions
 - C) Routine decisions
 - D) Strategic decisions

P.T.O.



- 5) One of the disadvantages of a franchise business for a franchisee is
- A) Lack of independence
 - B) Franchise business typically have a high failure rate
 - C) Lack of brand identity
 - D) Training is not normally provided by the franchiser
- 6) Which of the following is a psychological factor affecting entrepreneurial growth ?
- A) Legitimacy of entrepreneurship
 - B) Social status
 - C) Need for achievement
 - D) None of these
- 7) Business risks can be
- A) Avoided
 - B) Reduced
 - C) Erased
 - D) None of the above
- 8) Which of the following is not an aspect of appraisal of term loans by commercial banks ?
- A) Financial feasibility
 - B) Technical feasibility
 - C) Economic feasibility
 - D) Societal feasibility
- 9) 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
- 10) SIDBI was set up as a subsidiary of
- A) IDBI
 - B) IFCI
 - C) ICICI
 - D) SFC
- 11) Refusal to adopt and use opportunities to make changes in production _____ entrepreneurs.
- A) Fabian
 - B) Imitative
 - C) Innovative
 - D) Drone
- 12) Individuals are motivated by psychological and economic rewards
- A) Pure
 - B) Induced
 - C) Motivated
 - D) Spontaneous
- 13) Which of the following is the reason for business failure
- A) Lack of market research
 - B) Poor financial control
 - C) Poor management
 - D) All the above
- 14) A business arrangement where one party allows another party to use a business name and sell its products or services is known as
- A) A cooperative
 - B) A franchise
 - C) An owner-manager business
 - D) A limited company
-



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

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Answer any two questions from each Section.

SECTION – I

2. a) Explain the classification and types of entrepreneur. 7
b) Explain evolution of entrepreneurship. 7
3. a) Explain the factors influencing entrepreneurial development. 7
b) Explain the contents and phases of EDP. 7
4. a) Explain different definitions of entrepreneur. 7
b) Write a short note on : 7
 - 1) Franchising
 - 2) Mergers.

SECTION – II

5. a) Explain the sources and methods of idea generation. 7
b) Explain contents of project report. 7
6. a) Write steps in setting up a small unit in detail. 7
b) Describe organization structure of a small scale industries with the help of suitable example. 7
7. a) Write a note on Micro Small Medium Enterprises (MSMEs) and Tax benefits to SMEs. 7
b) Write notes on SISI and SIDBI. 7

Set R



SLR-TJ – 128

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

Set	S
-----	---

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 70

- 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) **Answer any two questions from each Section.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(14×1=14)**
- 1) Which of the following is a psychological factor affecting entrepreneurial growth ?
A) Legitimacy of entrepreneurship B) Social status
C) Need for achievement D) None of these
 - 2) Business risks can be
A) Avoided B) Reduced C) Erased D) None of the above
 - 3) Which of the following is not an aspect of appraisal of term loans by commercial banks ?
A) Financial feasibility B) Technical feasibility
C) Economic feasibility D) Societal feasibility
 - 4) 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
 - 5) SIDBI was set up as a subsidiary of
A) IDBI B) IFCI C) ICICI D) SFC

P.T.O.



- 6) Refusal to adopt and use opportunities to make changes in production _____ entrepreneurs.
A) Fabian B) Imitative C) Innovative D) Drone
- 7) Individuals are motivated by psychological and economic rewards
A) Pure B) Induced C) Motivated D) Spontaneous
- 8) Which of the following is the reason for business failure
A) Lack of market research B) Poor financial control
C) Poor management D) All the above
- 9) A business arrangement where one party allows another party to use a business name and sell its products or services is known as
A) A cooperative B) A franchise
C) An owner-manager business D) A limited company
- 10) 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
- 11) Entrepreneurs are motivated by
A) Money B) Personal values
C) Pull influences 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) Decisions taken by an entrepreneur on behalf of his enterprise are known as
A) Organizational decisions B) Personal decisions
C) Routine decisions D) Strategic decisions
- 14) One of the disadvantages of a franchise business for a franchisee is
A) Lack of independence
B) Franchise business typically have a high failure rate
C) Lack of brand identity
D) Training is not normally provided by the franchiser
-



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

**B.E. (Mech.) (Part – I) (New – CGPA) Examination, 2017
ENTREPRENEURSHIP DEVELOPMENT
(Elective – I)**

Day and Date : Friday, 8-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 56

Instruction : Answer any two questions from each Section.

SECTION – I

2. a) Explain the classification and types of entrepreneur. 7
b) Explain evolution of entrepreneurship. 7
3. a) Explain the factors influencing entrepreneurial development. 7
b) Explain the contents and phases of EDP. 7
4. a) Explain different definitions of entrepreneur. 7
b) Write a short note on : 7
 - 1) Franchising
 - 2) Mergers.

SECTION – II

5. a) Explain the sources and methods of idea generation. 7
b) Explain contents of project report. 7
6. a) Write steps in setting up a small unit in detail. 7
b) Describe organization structure of a small scale industries with the help of suitable example. 7
7. a) Write a note on Micro Small Medium Enterprises (MSMEs) and Tax benefits to SMEs. 7
b) Write notes on SISI and SIDBI. 7



SLR-TJ – 129

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

Set

P

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:** 1) Figures to the **right** indicate **full** marks.
2) Solve objectives on answer sheet **separately** provided with object question paper **only**.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) Entrepreneurial role, disturbance-handler role are _____ managerial roles.
A) Interpersonal B) Informational C) Decision D) Leading
 - 2) _____ means the intentional structure of roles in a formally organized enterprise.
A) Formal organisation B) Policy
C) Informal organisation D) Code of conduct
 - 3) _____ is the ability of individual or groups to induce or influence the beliefs or action of other persons or groups.
A) Power B) Authority C) Post D) Leadership
 - 4) _____ are distinct little businesses set up as units in a larger company to ensure that a certain product reaches the market.
A) Business Small Units B) Strategic Business Units
C) Small Business Units D) Business Branches Units
 - 5) _____ involves the introduction of new employees to the enterprise, its function, tasks and people.
A) Planning B) Orienting
C) Probation D) Acclimatization
 - 6) Self-esteem, status affiliation with others, affection these comes under _____ needs.
A) Basic B) Primary C) Third level D) Secondary
 - 7) _____ management called country club management.
A) 9.1 B) 9.9 C) 5.5 D) 1.9

P.T.O.



- 8) _____ Maslow regards this as the highest needs in his hierarchy.
A) Physiological needs B) Safety needs
C) Need for self actualisation D) Acceptance needs
- 9) In _____ concept product enjoys the supreme importance.
A) Selling B) Marketing C) Manufacturing D) Business
- 10) _____ is any paid form of non personnel presentation and promotion of goods and services or ideas by an identified sponsored.
A) Marketing B) Selling C) Advertising D) None of above
- 11) In single sampling plan if 'c' is the acceptance number then the rejection number is
A) c B) c – 1 C) c + 2 D) c + 1
- 12) The success of sampling inspection depends upon
A) Lot size B) Sample size
C) Acceptance number D) All
- 13) In double sampling plan second sample is taken when the number of defective
A) exceeds c1 but doesn't exceeds c2
B) doesn't exceeds c1
C) exceeds both c1 and c2
D) exceeds c2
- 14) The producers risk is denoted by
A) ρ B) β C) α D) δ
- 15) For any given 'n' and 'c' there is maximum value of _____ beyond which the average fraction defective passed forward will not rise.
A) AQL B) AOQL C) AOQ D) OK lot
- 16) LTPD stands for
A) Lot Tolerance Perfect Defective B) Lot Tolerance Percent Defective
C) Lot Tolerable Percent Defective D) Lot Tolerance Piece Defective
- 17) AQL stands for
A) Average Quality Level B) Acceptance Quality Level
C) Acceptable Quality Limit D) Average Quality Limit
- 18) In double sampling plan 'C₂' is the acceptance number for the
A) First and last combined B) First and second sample combined
C) Last two combined D) First three combined
- 19) The larger the sample size and acceptance number _____ is the slope of OC curve.
A) Straight B) Curve C) Steeper D) Horizontal
- 20) The probability of accepting a bad lot which otherwise would have been rejected is called as
A) Rework B) Consumer's risk
C) Producer's risk D) OK goods



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

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any three** questions from Section – I.
2) Solve **any three** questions from Section – II.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. A) What are managerial skills and managerial roles ? **6**
B) Explain selection process in detail. **7**
3. A) Explain communication process and barriers in communication. **7**
B) Distinguish between narrow span and wide span. **6**
4. A) Explain Maslow's theory and McGregor's theory. **7**
B) Explain the source of finance and classification of finance. **6**
5. A) Explain the function of marketing department. **6**
B) Explain steps in planning and list types of plans. **8**

SECTION – II

6. a) What is acceptance sampling ? Explain sampling plans and its types. **7**
b) Name any three quality gurus and their contribution in quality. **6**
7. a) Write note on continuous improvement process. **7**
b) Write short note on six sigma. **6**

Set P



8. a) Differentiate between : Cost of quality and value of quality. **6**
- b) Explain actual and ideal OC curve for a sampling plan. Also explain all concepts such as producer's risk, consumer's risk, AQL, LTPD, AOQL, related to OC curve. **7**
9. a) Write short note on X and R chart with limitations. **8**
- b) Write short note on 7 Quality Tools. **6**
-



SLR-TJ – 129

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

Set

Q

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:**
- 1) Figures to the **right** indicate **full** marks.
 - 2) Solve objectives on answer sheet **separately** provided with object question paper **only**.
 - 3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) LTPD stands for
A) Lot Tolerance Perfect Defective B) Lot Tolerance Percent Defective
C) Lot Tolerable Percent Defective D) Lot Tolerance Piece Defective
 - 2) AQL stands for
A) Average Quality Level B) Acceptance Quality Level
C) Acceptable Quality Limit D) Average Quality Limit
 - 3) In double sampling plan 'C₂' is the acceptance number for the
A) First and last combined B) First and second sample combined
C) Last two combined D) First three combined
 - 4) The larger the sample size and acceptance number _____ is the slope of OC curve.
A) Straight B) Curve C) Steeper D) Horizontal
 - 5) The probability of accepting a bad lot which otherwise would have been rejected is called as
A) Rework B) Consumer's risk
C) Producer's risk D) OK goods
 - 6) Entrepreneurial role, disturbance-handler role are _____ managerial roles.
A) Interpersonal B) Informational C) Decision D) Leading
 - 7) _____ means the intentional structure of roles in a formally organized enterprise.
A) Formal organisation B) Policy
C) Informal organisation D) Code of conduct

P.T.O.



- 8) _____ is the ability of individual or groups to induce or influence the beliefs or action of other persons or groups.
A) Power B) Authority C) Post D) Leadership
- 9) _____ are distinct little businesses set up as units in a larger company to ensure that a certain product reaches the market.
A) Business Small Units B) Strategic Business Units
C) Small Business Units D) Business Branches Units
- 10) _____ involves the introduction of new employees to the enterprise, its function, tasks and people.
A) Planning B) Orienting
C) Probation D) Acclimatization
- 11) Self-esteem, status affiliation with others, affection these comes under _____ needs.
A) Basic B) Primary C) Third level D) Secondary
- 12) _____ management called country club management.
A) 9.1 B) 9.9 C) 5.5 D) 1.9
- 13) _____ Maslow regards this as the highest needs in his hierarchy.
A) Physiological needs B) Safety needs
C) Need for self actualisation D) Acceptance needs
- 14) In _____ concept product enjoys the supreme importance.
A) Selling B) Marketing C) Manufacturing D) Business
- 15) _____ is any paid form of non personnel presentation and promotion of goods and services or ideas by an identified sponsored.
A) Marketing B) Selling C) Advertising D) None of above
- 16) In single sampling plan if 'c' is the acceptance number then the rejection number is
A) c B) c – 1 C) c + 2 D) c + 1
- 17) The success of sampling inspection depends upon
A) Lot size B) Sample size
C) Acceptance number D) All
- 18) In double sampling plan second sample is taken when the number of defective
A) exceeds c1 but doesn't exceeds c2
B) doesn't exceeds c1
C) exceeds both c1 and c2
D) exceeds c2
- 19) The producers risk is denoted by
A) ρ B) β C) α D) δ
- 20) For any given 'n' and 'c' there is maximum value of _____ beyond which the average fraction defective passed forward will not rise.
A) AQL B) AOQL C) AOQ D) OK lot



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

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any three** questions from Section – I.
2) Solve **any three** questions from Section – II.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. A) What are managerial skills and managerial roles ? **6**
B) Explain selection process in detail. **7**
3. A) Explain communication process and barriers in communication. **7**
B) Distinguish between narrow span and wide span. **6**
4. A) Explain Maslow's theory and McGregor's theory. **7**
B) Explain the source of finance and classification of finance. **6**
5. A) Explain the function of marketing department. **6**
B) Explain steps in planning and list types of plans. **8**

SECTION – II

6. a) What is acceptance sampling ? Explain sampling plans and its types. **7**
b) Name any three quality gurus and their contribution in quality. **6**
7. a) Write note on continuous improvement process. **7**
b) Write short note on six sigma. **6**

Set Q



8. a) Differentiate between : Cost of quality and value of quality. **6**
- b) Explain actual and ideal OC curve for a sampling plan. Also explain all concepts such as producer's risk, consumer's risk, AQL, LTPD, AOQL, related to OC curve. **7**
9. a) Write short note on X and R chart with limitations. **8**
- b) Write short note on 7 Quality Tools. **6**
-



SLR-TJ – 129

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

Set

R

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:**
- 1) Figures to the **right** indicate **full** marks.
 - 2) Solve objectives on answer sheet **separately** provided with object question paper **only**.
 - 3) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) In single sampling plan if 'c' is the acceptance number then the rejection number is
A) c B) c – 1 C) c + 2 D) c + 1
 - 2) The success of sampling inspection depends upon
A) Lot size B) Sample size
C) Acceptance number D) All
 - 3) In double sampling plan second sample is taken when the number of defective
A) exceeds c1 but doesn't exceeds c2
B) doesn't exceeds c1
C) exceeds both c1 and c2
D) exceeds c2
 - 4) The producers risk is denoted by
A) ρ B) β C) α D) δ
 - 5) For any given 'n' and 'c' there is maximum value of _____ beyond which the average fraction defective passed forward will not rise.
A) AQL B) AOQL C) AOQ D) OK lot
 - 6) LTPD stands for
A) Lot Tolerance Perfect Defective B) Lot Tolerance Percent Defective
C) Lot Tolerable Percent Defective D) Lot Tolerance Piece Defective
 - 7) AQL stands for
A) Average Quality Level B) Acceptance Quality Level
C) Acceptable Quality Limit D) Average Quality Limit

P.T.O.



- 8) In double sampling plan 'C₂' is the acceptance number for the
A) First and last combined B) First and second sample combined
C) Last two combined D) First three combined
- 9) The larger the sample size and acceptance number _____ is the slope of OC curve.
A) Straight B) Curve C) Steeper D) Horizontal
- 10) The probability of accepting a bad lot which otherwise would have been rejected is called as
A) Rework B) Consumer's risk
C) Producer's risk D) OK goods
- 11) Entrepreneurial role, disturbance-handler role are _____ managerial roles.
A) Interpersonal B) Informational C) Decision D) Leading
- 12) _____ means the intentional structure of roles in a formally organized enterprise.
A) Formal organisation B) Policy
C) Informal organisation D) Code of conduct
- 13) _____ is the ability of individual or groups to induce or influence the beliefs or action of other persons or groups.
A) Power B) Authority C) Post D) Leadership
- 14) _____ are distinct little businesses set up as units in a larger company to ensure that a certain product reaches the market.
A) Business Small Units B) Strategic Business Units
C) Small Business Units D) Business Branches Units
- 15) _____ involves the introduction of new employees to the enterprise, its function, tasks and people.
A) Planning B) Orienting
C) Probation D) Acclimatization
- 16) Self-esteem, status affiliation with others, affection these comes under _____ needs.
A) Basic B) Primary C) Third level D) Secondary
- 17) _____ management called country club management.
A) 9.1 B) 9.9 C) 5.5 D) 1.9
- 18) _____ Maslow regards this as the highest needs in his hierarchy.
A) Physiological needs B) Safety needs
C) Need for self actualisation D) Acceptance needs
- 19) In _____ concept product enjoys the supreme importance.
A) Selling B) Marketing C) Manufacturing D) Business
- 20) _____ is any paid form of non personnel presentation and promotion of goods and services or ideas by an identified sponsored.
A) Marketing B) Selling C) Advertising D) None of above



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

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any three** questions from Section – I.
2) Solve **any three** questions from Section – II.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. A) What are managerial skills and managerial roles ? **6**
B) Explain selection process in detail. **7**
3. A) Explain communication process and barriers in communication. **7**
B) Distinguish between narrow span and wide span. **6**
4. A) Explain Maslow's theory and McGregor's theory. **7**
B) Explain the source of finance and classification of finance. **6**
5. A) Explain the function of marketing department. **6**
B) Explain steps in planning and list types of plans. **8**

SECTION – II

6. a) What is acceptance sampling ? Explain sampling plans and its types. **7**
b) Name any three quality gurus and their contribution in quality. **6**
7. a) Write note on continuous improvement process. **7**
b) Write short note on six sigma. **6**

Set R



8. a) Differentiate between : Cost of quality and value of quality. **6**
- b) Explain actual and ideal OC curve for a sampling plan. Also explain all concepts such as producer's risk, consumer's risk, AQL, LTPD, AOQL, related to OC curve. **7**
9. a) Write short note on X and R chart with limitations. **8**
- b) Write short note on 7 Quality Tools. **6**
-



SLR-TJ – 129

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

Set

S

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:** 1) Figures to the **right** indicate **full** marks.
2) Solve objectives on answer sheet **separately** provided with object question paper **only**.
3) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
4) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Self-esteem, status affiliation with others, affection these comes under _____ needs.
A) Basic B) Primary C) Third level D) Secondary
- 2) _____ management called country club management.
A) 9.1 B) 9.9 C) 5.5 D) 1.9
- 3) _____ Maslow regards this as the highest needs in his hierarchy.
A) Physiological needs B) Safety needs
C) Need for self actualisation D) Acceptance needs
- 4) In _____ concept product enjoys the supreme importance.
A) Selling B) Marketing C) Manufacturing D) Business
- 5) _____ is any paid form of non personnel presentation and promotion of goods and services or ideas by an identified sponsored.
A) Marketing B) Selling C) Advertising D) None of above
- 6) In single sampling plan if 'c' is the acceptance number then the rejection number is
A) c B) c – 1 C) c + 2 D) c + 1
- 7) The success of sampling inspection depends upon
A) Lot size B) Sample size
C) Acceptance number D) All
- 8) In double sampling plan second sample is taken when the number of defective
A) exceeds c1 but doesn't exceeds c2
B) doesn't exceeds c1
C) exceeds both c1 and c2
D) exceeds c2

P.T.O.



- 9) The producers risk is denoted by
A) ρ B) β C) α D) δ
- 10) For any given 'n' and 'c' there is maximum value of _____ beyond which the average fraction defective passed forward will not rise.
A) AQL B) AOQL C) AOQ D) OK lot
- 11) LTPD stands for
A) Lot Tolerance Perfect Defective B) Lot Tolerance Percent Defective
C) Lot Tolerable Percent Defective D) Lot Tolerance Piece Defective
- 12) AQL stands for
A) Average Quality Level B) Acceptance Quality Level
C) Acceptable Quality Limit D) Average Quality Limit
- 13) In double sampling plan 'C₂' is the acceptance number for the
A) First and last combined B) First and second sample combined
C) Last two combined D) First three combined
- 14) The larger the sample size and acceptance number _____ is the slope of OC curve.
A) Straight B) Curve C) Steeper D) Horizontal
- 15) The probability of accepting a bad lot which otherwise would have been rejected is called as
A) Rework B) Consumer's risk
C) Producer's risk D) OK goods
- 16) Entrepreneurial role, disturbance-handler role are _____ managerial roles.
A) Interpersonal B) Informational C) Decision D) Leading
- 17) _____ means the intentional structure of roles in a formally organized enterprise.
A) Formal organisation B) Policy
C) Informal organisation D) Code of conduct
- 18) _____ is the ability of individual or groups to induce or influence the beliefs or action of other persons or groups.
A) Power B) Authority C) Post D) Leadership
- 19) _____ are distinct little businesses set up as units in a larger company to ensure that a certain product reaches the market.
A) Business Small Units B) Strategic Business Units
C) Small Business Units D) Business Branches Units
- 20) _____ involves the introduction of new employees to the enterprise, its function, tasks and people.
A) Planning B) Orienting
C) Probation D) Acclimatization
-



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

**B.E. (Mech.) (Part – II) Examination, 2017
INDUSTRIAL AND QUALITY MANAGEMENT**

Day and Date : Tuesday, 21-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :** 1) Solve **any three** questions from Section – I.
2) Solve **any three** questions from Section – II.
3) Figures to the **right** indicate **full** marks.

SECTION – I

2. A) What are managerial skills and managerial roles ? **6**
B) Explain selection process in detail. **7**
3. A) Explain communication process and barriers in communication. **7**
B) Distinguish between narrow span and wide span. **6**
4. A) Explain Maslow's theory and McGregor's theory. **7**
B) Explain the source of finance and classification of finance. **6**
5. A) Explain the function of marketing department. **6**
B) Explain steps in planning and list types of plans. **8**

SECTION – II

6. a) What is acceptance sampling ? Explain sampling plans and its types. **7**
b) Name any three quality gurus and their contribution in quality. **6**
7. a) Write note on continuous improvement process. **7**
b) Write short note on six sigma. **6**

Set S



8. a) Differentiate between : Cost of quality and value of quality. **6**
- b) Explain actual and ideal OC curve for a sampling plan. Also explain all concepts such as producer's risk, consumer's risk, AQL, LTPD, AOQL, related to OC curve. **7**
9. a) Write short note on X and R chart with limitations. **8**
- b) Write short note on 7 Quality Tools. **6**
-



SLR-TJ – 130

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

Set	P
-----	----------

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

- I. 1) Objectives of work study 1
 - A) Lower cost
 - B) Increase productivity
 - C) Establish standards
 - D) All the above
- 2) Work study comprises two main techniques 1
 - A) Time study and job evaluation
 - B) Value analysis and work measurement
 - C) Method study and work measurement
 - D) None of the above
- 3) In method study the symbol ∇ presents 1
 - A) Operation
 - B) Storage
 - C) Delay
 - D) Inspection
- 4) Father of time study was 1
 - A) F.B. Gilberth
 - B) F.W. Tylor
 - C) H.L. Gantt
 - D) None of the above
- 5) M.T.M. stands for 1
 - A) Motion Time Measurement
 - B) Methods Time Measurement
 - C) Movement Time Measurement
 - D) None of the above
- 6) In _____ layout machines and other manufacturing facilities are located in the sequence required to manufacture the product. 1
 - A) product
 - B) process
 - C) functional
 - D) none of the above
- 7) A diagram showing the path followed by men and materials while performing a task is known 1
 - A) string diagram
 - B) flow process chart
 - C) travel chart
 - D) flow diagram

P.T.O.



- 8) Job evaluation is the method of determining the 1
A) relative values of a job B) workers performance on a job
C) worth of the machine D) value of overall production
- 9) Merit rating is true method of determining the 1
A) worker's performance B) relative values of a job
C) worth or a machine D) none of the above
- 10) Which of the following charts used for plant layout design ? 1
A) operation process chart B) man and machine chart
C) travel chart D) all of these
- 11) The production scheduling is simpler and high volume of output and high labour efficiency are achieved in the case of 1
A) product layout B) process layout
C) fixed position layout D) none of the above
- 12) A systematic job improvement sequence will consist of 1
A) motion study B) time study C) job enrichment D) all of these
- 13) Which one of the following techniques is used for determining allowances in time study ? 1
A) work sampling B) merit rating of the worker
C) fixation of incentive rate D) none of the above
- 14) Main objectives of job evaluation 1
A) uniform wage structure
B) improve employer-employee relations
C) identify need for training of the employees
D) all of above
- 15) Which are methods of merit rating ? 1
A) ranking method B) check list plan
C) scale plan D) all above
- 16) In job analysis the data may be classified on 1
A) job identification B) nature of the job
C) relations with other jobs D) all of the above
- II. Match the correct answer 4
- | | |
|-------------------------|--|
| a) Ball bearing | 1) process layout |
| b) Tools and gauges | 2) product layout |
| c) Large boilers | 3) combination of product and process layout |
| d) Motor cycle assembly | 4) fixed position layout |
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time :3.00 p.m. to 6.00 p.m.

Marks : 80

Note : Solve any two from each Section.

SECTION – I

2. a) Define work study and differentiate between method study and work measurement. 7
- b) Name the various recording techniques used in method study. Give the various symbols used in recording techniques with their meaning. 7
- c) Explain with sketch ergonomic consideration for milling machine. 6
3. a) Describe briefly simo chart and state its applications. 6
- b) What is a flow process chart ? Discuss its utility for method study engineer. 7
- c) What are multiple activity charts ? What are their objectives ? 7
4. a) Define accident. What are the prime sources of major accidents and suggest practical measures to Minimize them. 7
- b) Explain in brief the general safety rates to be observed in industry and state the various first aid equipments for the treatment of an injured person. 7
- c) Explain with diagram design of work place layout. 6

SECTION – II

5. a) Define the work measurement and state its objectives and explain in brief the basic procedure of Work measurement. 7
- b) State and explain in brief the various allowances to be considered while estimating the standard time. 7
- c) Explain in brief about of MTS. 6

Set P



- 6. a) Explain briefly the concept of work sampling with suitable example and state its application. **7**
 - b) Explain in brief about types of plant layout. **6**
 - c) What is merit rating and explain in about any two methods of merit rating. **7**
 - 7. a) Explain in brief about selection of material handling equipment. **7**
 - b) Write short notes on : **6**
 - 1) Standard time calculation
 - 2) Objectives of job evaluation.
 - c) Describe the point method of job evaluation with its advantages. **7**
-



SLR-TJ – 130

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

I. Match the correct answer

- | | |
|-------------------------|--|
| a) Ball bearing | 1) process layout |
| b) Tools and gauges | 2) product layout |
| c) Large boilers | 3) combination of product and process layout |
| d) Motor cycle assembly | 4) fixed position layout |

4

II. 1) M.T.M. stands for

- | | |
|------------------------------|-----------------------------|
| A) Motion Time Measurement | B) Methods Time Measurement |
| C) Movement Time Measurement | D) None of the above |

1

2) In _____ layout machines and other manufacturing facilities are located in the sequence required to manufacture the product.

- | | |
|---------------|----------------------|
| A) product | B) process |
| C) functional | D) none of the above |

1

3) A diagram showing the path followed by men and materials while performing a task is known

- | | |
|-------------------|-----------------------|
| A) string diagram | B) flow process chart |
| C) travel chart | D) flow diagram |

1

4) Job evaluation is the method of determining the

- | | |
|-----------------------------|---------------------------------|
| A) relative values of a job | B) workers performance on a job |
| C) worth of the machine | D) value of overall production |

1

5) Merit rating is true method of determining the

- | | |
|-------------------------|-----------------------------|
| A) worker's performance | B) relative values of a job |
| C) worth or a machine | D) none of the above |

1

P.T.O.



- 6) Which of the following charts used for plant layout design ? **1**
A) operation process chart B) man and machine chart
C) travel chart D) all of these
- 7) The production scheduling is simpler and high volume of output and high labour efficiency are achieved in the case of **1**
A) product layout B) process layout
C) fixed position layout D) none of the above
- 8) A systematic job improvement sequence will consist of **1**
A) motion study B) time study C) job enrichment D) all of these
- 9) Which one of the following techniques is used for determining allowances in time study ? **1**
A) work sampling B) merit rating of the worker
C) fixation of incentive rate D) none of the above
- 10) Main objectives of job evaluation **1**
A) uniform wage structure
B) improve employer-employee relations
C) identify need for training of the employees
D) all of above
- 11) Which are methods of merit rating ? **1**
A) ranking method B) check list plan
C) scale plan D) all above
- 12) In job analysis the data may be classified on **1**
A) job identification B) nature of the job
C) relations with other jobs D) all of the above
- 13) Objectives of work study **1**
A) Lower cost B) Increase productivity
C) Establish standards D) All the above
- 14) Work study comprises two main techniques **1**
A) Time study and job evaluation
B) Value analysis and work measurement
C) Method study and work measurement
D) None of the above
- 15) In method study the symbol ∇ presents **1**
A) Operation B) Storage C) Delay D) Inspection
- 16) Father of time study was **1**
A) F.B. Gilberth B) F.W. Tylor
C) H.L. Gantt D) None of the above



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

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time :3.00 p.m. to 6.00 p.m.

Marks : 80

Note : Solve any two from each Section.

SECTION – I

2. a) Define work study and differentiate between method study and work measurement. 7
- b) Name the various recording techniques used in method study. Give the various symbols used in recording techniques with their meaning. 7
- c) Explain with sketch ergonomic consideration for milling machine. 6
3. a) Describe briefly simo chart and state its applications. 6
- b) What is a flow process chart ? Discuss its utility for method study engineer. 7
- c) What are multiple activity charts ? What are their objectives ? 7
4. a) Define accident. What are the prime sources of major accidents and suggest practical measures to Minimize them. 7
- b) Explain in brief the general safety rates to be observed in industry and state the various first aid equipments for the treatment of an injured person. 7
- c) Explain with diagram design of work place layout. 6

SECTION – II

5. a) Define the work measurement and state its objectives and explain in brief the basic procedure of Work measurement. 7
- b) State and explain in brief the various allowances to be considered while estimating the standard time. 7
- c) Explain in brief about of MTS. 6

Set Q



- 6. a) Explain briefly the concept of work sampling with suitable example and state its application. **7**
 - b) Explain in brief about types of plant layout. **6**
 - c) What is merit rating and explain in about any two methods of merit rating. **7**
 - 7. a) Explain in brief about selection of material handling equipment. **7**
 - b) Write short notes on : **6**
 - 1) Standard time calculation
 - 2) Objectives of job evaluation.
 - c) Describe the point method of job evaluation with its advantages. **7**
-



SLR-TJ – 130

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

Set	R
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

- I. 1) Merit rating is true method of determining the 1
 - A) worker's performance
 - B) relative values of a job
 - C) worth or a machine
 - D) none of the above
- 2) Which of the following charts used for plant layout design ? 1
 - A) operation process chart
 - B) man and machine chart
 - C) travel chart
 - D) all of these
- 3) The production scheduling is simpler and high volume of output and high labour efficiency are achieved in the case of 1
 - A) product layout
 - B) process layout
 - C) fixed position layout
 - D) none of the above
- 4) A systematic job improvement sequence will consist of 1
 - A) motion study
 - B) time study
 - C) job enrichment
 - D) all of these
- 5) Which one of the following techniques is used for determining allowances in time study ? 1
 - A) work sampling
 - B) merit rating of the worker
 - C) fixation of incentive rate
 - D) none of the above
- 6) Main objectives of job evaluation 1
 - A) uniform wage structure
 - B) improve employer-employee relations
 - C) identify need for training of the employees
 - D) all of above

P.T.O.



- 7) Which are methods of merit rating ? 1
 A) ranking method B) check list plan
 C) scale plan D) all above
- 8) In job analysis the data may be classified on 1
 A) job identification B) nature of the job
 C) relations with other jobs D) all of the above
- 9) Objectives of work study 1
 A) Lower cost B) Increase productivity
 C) Establish standards D) All the above
- 10) Work study comprises two main techniques 1
 A) Time study and job evaluation
 B) Value analysis and work measurement
 C) Method study and work measurement
 D) None of the above
- 11) In method study the symbol ∇ presents 1
 A) Operation B) Storage C) Delay D) Inspection
- 12) Father of time study was 1
 A) F.B. Gilberth B) F.W. Tylor
 C) H.L. Gantt D) None of the above
- 13) M.T.M. stands for 1
 A) Motion Time Measurement B) Methods Time Measurement
 C) Movement Time Measurement D) None of the above
- 14) In _____ layout machines and other manufacturing facilities are located in the sequence required to manufacture the product. 1
 A) product B) process
 C) functional D) none of the above
- 15) A diagram showing the path followed by men and materials while performing a task is known 1
 A) string diagram B) flow process chart
 C) travel chart D) flow diagram
- 16) Job evaluation is the method of determining the 1
 A) relative values of a job B) workers performance on a job
 C) worth of the machine D) value of overall production
- II. Match the correct answer 4
- | | |
|-------------------------|--|
| a) Ball bearing | 1) process layout |
| b) Tools and gauges | 2) product layout |
| c) Large boilers | 3) combination of product and process layout |
| d) Motor cycle assembly | 4) fixed position layout |



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

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Note : Solve any two from each Section.

SECTION – I

2. a) Define work study and differentiate between method study and work measurement. 7
- b) Name the various recording techniques used in method study. Give the various symbols used in recording techniques with their meaning. 7
- c) Explain with sketch ergonomic consideration for milling machine. 6
3. a) Describe briefly simo chart and state its applications. 6
- b) What is a flow process chart ? Discuss its utility for method study engineer. 7
- c) What are multiple activity charts ? What are their objectives ? 7
4. a) Define accident. What are the prime sources of major accidents and suggest practical measures to Minimize them. 7
- b) Explain in brief the general safety rates to be observed in industry and state the various first aid equipments for the treatment of an injured person. 7
- c) Explain with diagram design of work place layout. 6

SECTION – II

5. a) Define the work measurement and state its objectives and explain in brief the basic procedure of Work measurement. 7
- b) State and explain in brief the various allowances to be considered while estimating the standard time. 7
- c) Explain in brief about of MTS. 6

Set R



- 6. a) Explain briefly the concept of work sampling with suitable example and state its application. **7**
 - b) Explain in brief about types of plant layout. **6**
 - c) What is merit rating and explain in about any two methods of merit rating. **7**
 - 7. a) Explain in brief about selection of material handling equipment. **7**
 - b) Write short notes on : **6**
 - 1) Standard time calculation
 - 2) Objectives of job evaluation.
 - c) Describe the point method of job evaluation with its advantages. **7**
-



SLR-TJ – 130

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

Set	S
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3.
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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

- I. Match the correct answer 4
- | | |
|-------------------------|--|
| a) Ball bearing | 1) process layout |
| b) Tools and gauges | 2) product layout |
| c) Large boilers | 3) combination of product and process layout |
| d) Motor cycle assembly | 4) fixed position layout |
- II. 1) A systematic job improvement sequence will consist of 1
A) motion study B) time study C) job enrichment D) all of these
- 2) Which one of the following techniques is used for determining allowances in time study ? 1
A) work sampling B) merit rating of the worker
C) fixation of incentive rate D) none of the above
- 3) Main objectives of job evaluation 1
A) uniform wage structure
B) improve employer-employee relations
C) identify need for training of the employees
D) all of above
- 4) Which are methods of merit rating ? 1
A) ranking method B) check list plan
C) scale plan D) all above
- 5) In job analysis the data may be classified on 1
A) job identification B) nature of the job
C) relations with other jobs D) all of the above

P.T.O.



- 6) Objectives of work study 1
A) Lower cost B) Increase productivity
C) Establish standards D) All the above
- 7) Work study comprises two main techniques 1
A) Time study and job evaluation
B) Value analysis and work measurement
C) Method study and work measurement
D) None of the above
- 8) In method study the symbol ∇ presents 1
A) Operation B) Storage C) Delay D) Inspection
- 9) Father of time study was 1
A) F.B. Gilberth B) F.W. Tylor
C) H.L. Gantt D) None of the above
- 10) M.T.M. stands for 1
A) Motion Time Measurement B) Methods Time Measurement
C) Movement Time Measurement D) None of the above
- 11) In _____ layout machines and other manufacturing facilities are located in the sequence required to manufacture the product. 1
A) product B) process
C) functional D) none of the above
- 12) A diagram showing the path followed by men and materials while performing a task is known 1
A) string diagram B) flow process chart
C) travel chart D) flow diagram
- 13) Job evaluation is the method of determining the 1
A) relative values of a job B) workers performance on a job
C) worth of the machine D) value of overall production
- 14) Merit rating is true method of determining the 1
A) worker's performance B) relative values of a job
C) worth or a machine D) none of the above
- 15) Which of the following charts used for plant layout design ? 1
A) operation process chart B) man and machine chart
C) travel chart D) all of these
- 16) The production scheduling is simpler and high volume of output and high labour efficiency are achieved in the case of 1
A) product layout B) process layout
C) fixed position layout D) none of the above
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
INDUSTRIAL ENGINEERING**

Day and Date : Wednesday, 22-11-2017
Time :3.00 p.m. to 6.00 p.m.

Marks : 80

Note : Solve any two from each Section.

SECTION – I

2. a) Define work study and differentiate between method study and work measurement. 7
- b) Name the various recording techniques used in method study. Give the various symbols used in recording techniques with their meaning. 7
- c) Explain with sketch ergonomic consideration for milling machine. 6
3. a) Describe briefly simo chart and state its applications. 6
- b) What is a flow process chart ? Discuss its utility for method study engineer. 7
- c) What are multiple activity charts ? What are their objectives ? 7
4. a) Define accident. What are the prime sources of major accidents and suggest practical measures to Minimize them. 7
- b) Explain in brief the general safety rates to be observed in industry and state the various first aid equipments for the treatment of an injured person. 7
- c) Explain with diagram design of work place layout. 6

SECTION – II

5. a) Define the work measurement and state its objectives and explain in brief the basic procedure of Work measurement. 7
- b) State and explain in brief the various allowances to be considered while estimating the standard time. 7
- c) Explain in brief about of MTS. 6

Set S



- 6. a) Explain briefly the concept of work sampling with suitable example and state its application. **7**
 - b) Explain in brief about types of plant layout. **6**
 - c) What is merit rating and explain in about any two methods of merit rating. **7**
 - 7. a) Explain in brief about selection of material handling equipment. **7**
 - b) Write short notes on : **6**
 - 1) Standard time calculation
 - 2) Objectives of job evaluation.
 - c) Describe the point method of job evaluation with its advantages. **7**
-

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

**B.E. (Part - II) Examination 2017
Mechanical Engineering
INDUSTRIAL ENGINEERING**

Day & Date: Wednesday, 13-12-2017
Time: 10.00 AM to 01.00 PM

Max. Marks: 100

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Q. No. 1 is compulsory. It should be solved in first 30 minutes in answer book page no.3.
4) 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.

MCQ/Objective Type Questions.

Duration: 30 minutes

Marks: 20

Q.1 Choose the correct answer:

20

- 1) Women require _____ allowance than men.
 - a) Smaller personal
 - b) Longer personal
 - c) 5% less personal
 - d) None of the above
- 2) Gilbreth contributed to _____.
 - a) Value Engg
 - b) Motion study
 - c) Project study
 - d) Time study
- 3) Contingency allowance should be exceed _____.
 - a) 0%
 - b) 5%
 - c) 10%
 - d) None of the above
- 4) Basic fatigue allowance is _____.
 - a) 6%
 - b) 7%
 - c) 2%
 - d) 4%
- 5) Productivity of an enterprise refers to which of the following?
 - a) Turnover in specified period
 - b) The ratio of gross income to gross expenditure
 - c) Yearly gross income
 - d) Rate of growth of capital
- 6) In method study critical examination is done through
 - a) Stop watch tech
 - b) Work sampling tech
 - c) Questioning tech
 - d) Flow process chart
- 7) Therblig, in Micro motion study is described by _____.
 - a) Standard symbol and colour
 - b) An activity
 - c) An event
 - d) None of the above
- 8) Light source is required for _____.
 - a) Template
 - b) String diagram
 - c) Chronocycle graph
 - d) SIMO chart
- 9) Work sampling is used for _____.
 - a) Performance analysis
 - b) Accuracy
 - c) Finding utilization of machine
 - d) Job analysis

- 10) Selection of material handling equipment is an important decision as it affects _____ of handling system.
- a) Cost
 - b) Efficiency
 - c) Both cost and efficiency
 - d) None of the above
- 11) Removing the chips is an example of _____.
- a) Foreign element
 - b) Fixed element
 - c) Occasional element
 - d) Constant element
- 12) Ergonomics deals with _____.
- a) Aesthetic design
 - b) Anthropometry
 - c) Time measurement
 - d) None of the above
- 13) Mental effort is observed in _____.
- a) Motion study
 - b) Job evaluation
 - c) Method study
 - d) Performance appraisal
- 14) _____ are not the genuine part of the time study and should be used with utmost care and only in clearly defined circumstances.
- a) Relaxation allowances
 - b) Contingency allowances
 - c) Policy allowances
 - d) Interference allowance
- 15) Tangible factor for facility locations are _____.
- a) Transportation utilities
 - b) Community attitude
 - c) Environmental factors
 - d) Recreational attitude
- 16) Check list method is technique of _____.
- a) Merit rating
 - b) Method study
 - c) Job evaluation
 - d) Incentive scheme
- 17) Intangible factor for facility locations are _____.
- a) Site cost
 - b) Material cost
 - c) Transportation utilities
 - d) Community attitude
- 18) _____ is given to compensate for energy expended during working.
- a) Interference allowance
 - b) Allowance for personal needs
 - c) Allowance for basic fatigue
 - d) Contingency allowance
- 19) Flow Process Chart is used in _____.
- a) Method study
 - b) Micromotion study
 - c) Merit rating
 - d) Work sampling
- 20) _____ allowance is discretion of the management.
- a) Fatigue
 - b) Personal
 - c) Policy
 - d) Relaxation

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

**B.E. (Part - II) Examination 2017
Mechanical Engineering
INDUSTRIAL ENGINEERING**

Day & Date: Wednesday, 13-12-2017
Time: 10.00 AM to 01.00 PM

Max. Marks: 80

Instructions: 1) Solve any two from each section.
2) Figures to the right indicate full marks.

SECTION – I

- Q.2** **A)** Explain the factors affecting productivity. **07**
 B) Explain benefits of productivity to the employee, employer and society. **06**
 C) Discuss Indian Factory Act, 1948 – Safety Provisions. **07**
- Q.3** **A)** How environmental factors affect the man-machine system? List types of **07**
 displays.
 B) Explain with sketch design of workplace layout. **07**
 C) Explain with sketch multiple activity charts. **06**
- Q.4** **A)** Explain in detail Anthropometry. **07**
 B) Explain with sketch Ergonomic consideration for Centre lathe. **07**
 C) Give the definition of an accident and explain the causes and prevention of **06**
 accident.

SECTION – II

- Q.5** **A)** Define work sampling and procedure for conduction work sampling study. **07**
 B) Explain how to calculate the standard time of the job. **06**
 C) What is job evaluation? Explain any two methods of it. **07**
- Q.6** **A)** Explain fixed layout with suitable examples. What are the advantages and **07**
 limitations of fixed layout?
 B) Explain in brief Principles of Plant layout. **07**
 C) Explain merit rating methods. **06**
- Q.7** **A)** Explain PMTS. **06**
 B) What are the factors to be considered for the selection of plant location? **07**
 C) What is work study? How it is carried out. **07**



SLR-TJ – 131

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

Set	P
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Solve **any two** of the **three** questions from **each** Section.
 - 4) Support your answers with **neat** sketches wherever **required**.
 - 5) Make **suitable assumptions** if necessary and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) A buffer amplifier has gain of
 - a) Infinity
 - b) Unity
 - c) Zero
 - d) Dependent upon the circuit parameters
- 2) Filters that transmit all frequencies above a defined cut-off frequency are known as
 - a) Low pass filters
 - b) High pass filters
 - c) Band pass filters
 - d) All pass filters
- 3) The 8051 has _____ bytes of program memory and _____ bytes of data memory.
 - a) 4096, 128
 - b) 128, 4096
 - c) 2048, 4096
 - d) 4096, 2048
- 4) The clock frequency and the supply voltage for the 8051 microcontroller is
 - a) –3 MHz and +5 V
 - b) 5 MHz and +5 V
 - c) 12 MHz and –12 V
 - d) 5 MHz and –5 V
- 5) The registers in the 8085 used as memory pointer in indirect addressing mode
 - a) A register and B register
 - b) B register and C register
 - c) D register and E register
 - d) H register and L register
- 6) When it comes to cost effectiveness which of the following actuators is the preferred choice ?
 - a) Electric
 - b) Hydraulic
 - c) Mechanical
 - d) Pneumatic
- 7) Fluid power systems are preferred for continuous control because
 - a) they allows linear movements at high speed over longer lengths
 - b) maintains system under load with excessive use of control devices
 - c) they have higher bandwidth
 - d) all of the above

P.T.O.



- 8) Any inductive device such as LVDT is based of _____ law.
a) Lorentz b) Newton c) Tesla d) Faraday's
- 9) The time taken for a sensor output to stabilize within a fixed range around the steady state value is called
a) rise time b) settling time c) response time d) time constant
- 10) The sensor which does not require an external source of energy for measurement is called a _____ sensor.
a) analog b) digital c) passive d) active
- 11) EEPROM memory data can be erased by
a) using ultraviolet rays b) applying relatively high voltage
c) using PSEN pin d) none of the above
- 12) In PLC the requirement of sequence of operation is fulfilled by
a) Flag register b) Shift register
c) Status register d) None of the above
- 13) In a current sinking DC input module
a) The current flows out of the input field device
b) Requires that a AC sources be used with mechanical switches
c) Current flows out of the input module
d) Current can flows in either direction at the input module
- 14) The most commonly used interface in parallel data communication
a) R232 b) General Purpose Instrument Bus (GPIB)
c) CAN d) USB
- 15) In this topology if central hub fails the entire system fails
a) Mesh b) Ring c) Star d) Tree
- 16) In OSI model this layer deals with hardware issues
a) Data link layer b) Physical layer
c) Transport layer d) Application layer
- 17) Micro-sensor for humidity measurement consists of
a) Cross-linked cellulose acetate b) Thermoelectric material
c) Metallic diaphragm d) Humidity junctions
- 18) In artificial intelligence the term cognition means
a) Perception b) Pattern recognition
c) Reasoning d) None of the above
- 19) The most commonly used crystal frequency for 8051 microcontroller
a) 12 MHz b) 9 MHz c) 7 MHz d) 15 MHz
- 20) Which of the basic parts of a Robot unit would include the computer circuitry that could be programmed to determine what the robot would do ?
a) Sensor b) Controller c) Drive d) End effectors
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** of the remaining **three** questions from **each** Section.
 - 2) Support your answers with **neat** sketches wherever **required**.
 - 3) Make **suitable assumptions** if necessary and state them **clearly**.

SECTION – I

2. a) Discuss stepper motor and piezoelectric actuator in detail. Mention their advantages, possible limitations and applications. 8
- b) Discuss how engine control system works by using microprocessor. 6
- c) Define the following terms with regards to the 8051 microcontroller. Address Latch Enable, Program Memory, Data Memory and UART. 6
3. a) What are the different types of AC motors ? Give typical area of application of each type. 8
- b) Using the case of a typical washing machine as an example, explain how you will interface sensors and actuators to the 8051 microcontroller. 6
- c) What is signal processing ? Explain with example. 6
4. Solve **any four** questions : (4×5=20)
 - a) What are the key elements of a mechatronic system ? Explain with neat block diagram.
 - b) Discuss the characteristics of sensor.
 - c) What are signal filters ? Explain in brief types of filters.
 - d) Explain with neat sketch the 8085 architecture.
 - e) Discuss ADC, DAC and signal conditioning.
 - f) Discuss in brief about flow sensors.

SECTION – II

5. a) Explain with neat sketch, the architecture of a programmable logic controller. 8
- b) Device timing circuits that will switch on an output for 10s then switch it off. 6
- c) Discuss PLC internal relays. 6

Set P



6. a) What is interfacing ? What are its requirements ? 8
b) Discuss network topologies. 6
c) Explain artificial intelligence in mechatronics. 6
7. Write short notes on **(any four)** : **(5×4=20)**
a) Delay On and Delay Off timer.
b) PLC input/output processing.
c) OSI Model.
d) SCADA system.
e) Communication interfaces.
f) MEMS.
-



SLR-TJ – 131

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Solve **any two** of the **three** questions from **each** Section.
 - 4) Support your answers with **neat** sketches wherever **required**.
 - 5) Make **suitable assumptions** if necessary and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) In OSI model this layer deals with hardware issues
 - a) Data link layer
 - b) Physical layer
 - c) Transport layer
 - d) Application layer
- 2) Micro-sensor for humidity measurement consists of
 - a) Cross-linked cellulose acetate
 - b) Thermoelectric material
 - c) Metallic diaphragm
 - d) Humidity junctions
- 3) In artificial intelligence the term cognition means
 - a) Perception
 - b) Pattern recognition
 - c) Reasoning
 - d) None of the above
- 4) The most commonly used crystal frequency for 8051 microcontroller
 - a) 12 MHz
 - b) 9 MHz
 - c) 7 MHz
 - d) 15 MHz
- 5) Which of the basic parts of a Robot unit would include the computer circuitry that could be programmed to determine what the robot would do ?
 - a) Sensor
 - b) Controller
 - c) Drive
 - d) End effectors
- 6) A buffer amplifier has gain of
 - a) Infinity
 - b) Unity
 - c) Zero
 - d) Dependent upon the circuit parameters
- 7) Filters that transmit all frequencies above a defined cut-off frequency are known as
 - a) Low pass filters
 - b) High pass filters
 - c) Band pass filters
 - d) All pass filters
- 8) The 8051 has _____ bytes of program memory and _____ bytes of data memory.
 - a) 4096, 128
 - b) 128, 4096
 - c) 2048, 4096
 - d) 4096, 2048

P.T.O.



- 9) The clock frequency and the supply voltage for the 8051 microcontroller is
a) -3 MHz and $+5$ V b) 5 MHz and $+5$ V
c) 12 MHz and -12 V d) 5 MHz and -5 V
- 10) The registers in the 8085 used as memory pointer in indirect addressing mode
a) A register and B register b) B register and C register
c) D register and E register d) H register and L register
- 11) When it comes to cost effectiveness which of the following actuators is the preferred choice ?
a) Electric b) Hydraulic
c) Mechanical d) Pneumatic
- 12) Fluid power systems are preferred for continuous control because
a) they allows linear movements at high speed over longer lengths
b) maintains system under load with excessive use of control devices
c) they have higher bandwidth
d) all of the above
- 13) Any inductive device such as LVDT is based of _____ law.
a) Lorentz b) Newton c) Tesla d) Faraday's
- 14) The time taken for a sensor output to stabilize within a fixed range around the steady state value is called
a) rise time b) settling time c) response time d) time constant
- 15) The sensor which does not require an external source of energy for measurement is called a _____ sensor.
a) analog b) digital c) passive d) active
- 16) EEPROM memory data can be erased by
a) using ultraviolet rays b) applying relatively high voltage
c) using PSEN pin d) none of the above
- 17) In PLC the requirement of sequence of operation is fulfilled by
a) Flag register b) Shift register
c) Status register d) None of the above
- 18) In a current sinking DC input module
a) The current flows out of the input field device
b) Requires that a AC sources be used with mechanical switches
c) Current flows out of the input module
d) Current can flows in either direction at the input module
- 19) The most commonly used interface in parallel data communication
a) R232 b) General Purpose Instrument Bus (GPIB)
c) CAN d) USB
- 20) In this topology if central hub fails the entire system fails
a) Mesh b) Ring c) Star d) Tree



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

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** of the remaining **three** questions from **each** Section.
 - 2) Support your answers with **neat** sketches wherever **required**.
 - 3) Make **suitable assumptions** if necessary and state them **clearly**.

SECTION – I

2. a) Discuss stepper motor and piezoelectric actuator in detail. Mention their advantages, possible limitations and applications. 8
- b) Discuss how engine control system works by using microprocessor. 6
- c) Define the following terms with regards to the 8051 microcontroller. Address Latch Enable, Program Memory, Data Memory and UART. 6
3. a) What are the different types of AC motors ? Give typical area of application of each type. 8
- b) Using the case of a typical washing machine as an example, explain how you will interface sensors and actuators to the 8051 microcontroller. 6
- c) What is signal processing ? Explain with example. 6
4. Solve **any four** questions : (4×5=20)
 - a) What are the key elements of a mechatronic system ? Explain with neat block diagram.
 - b) Discuss the characteristics of sensor.
 - c) What are signal filters ? Explain in brief types of filters.
 - d) Explain with neat sketch the 8085 architecture.
 - e) Discuss ADC, DAC and signal conditioning.
 - f) Discuss in brief about flow sensors.

SECTION – II

5. a) Explain with neat sketch, the architecture of a programmable logic controller. 8
- b) Device timing circuits that will switch on an output for 10s then switch it off. 6
- c) Discuss PLC internal relays. 6

Set Q



6. a) What is interfacing ? What are its requirements ? 8
b) Discuss network topologies. 6
c) Explain artificial intelligence in mechatronics. 6
7. Write short notes on **(any four)** : **(5×4=20)**
a) Delay On and Delay Off timer.
b) PLC input/output processing.
c) OSI Model.
d) SCADA system.
e) Communication interfaces.
f) MEMS.
-



SLR-TJ – 131

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

Set	R
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Solve **any two** of the **three** questions from **each** Section.
 - 4) Support your answers with **neat** sketches wherever **required**.
 - 5) Make **suitable assumptions** if necessary and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) EEPROM memory data can be erased by
 - a) using ultraviolet rays
 - b) applying relatively high voltage
 - c) using PSEN pin
 - d) none of the above
- 2) In PLC the requirement of sequence of operation is fulfilled by
 - a) Flag register
 - b) Shift register
 - c) Status register
 - d) None of the above
- 3) In a current sinking DC input module
 - a) The current flows out of the input field device
 - b) Requires that a AC sources be used with mechanical switches
 - c) Current flows out of the input module
 - d) Current can flows in either direction at the input module
- 4) The most commonly used interface in parallel data communication
 - a) R232
 - b) General Purpose Instrument Bus (GPIB)
 - c) CAN
 - d) USB
- 5) In this topology if central hub fails the entire system fails
 - a) Mesh
 - b) Ring
 - c) Star
 - d) Tree
- 6) In OSI model this layer deals with hardware issues
 - a) Data link layer
 - b) Physical layer
 - c) Transport layer
 - d) Application layer
- 7) Micro-sensor for humidity measurement consists of
 - a) Cross-linked cellulose acetate
 - b) Thermoelectric material
 - c) Metallic diaphragm
 - d) Humidity junctions
- 8) In artificial intelligence the term cognition means
 - a) Perception
 - b) Pattern recognition
 - c) Reasoning
 - d) None of the above

P.T.O.



- 9) The most commonly used crystal frequency for 8051 microcontroller
a) 12 MHz b) 9 MHz c) 7 MHz d) 15 MHz
- 10) Which of the basic parts of a Robot unit would include the computer circuitry that could be programmed to determine what the robot would do ?
a) Sensor b) Controller c) Drive d) End effectors
- 11) A buffer amplifier has gain of
a) Infinity
b) Unity
c) Zero
d) Dependent upon the circuit parameters
- 12) Filters that transmit all frequencies above a defined cut-off frequency are known as
a) Low pass filters b) High pass filters
c) Band pass filters d) All pass filters
- 13) The 8051 has _____ bytes of program memory and _____ bytes of data memory.
a) 4096, 128 b) 128, 4096
c) 2048, 4096 d) 4096, 2048
- 14) The clock frequency and the supply voltage for the 8051 microcontroller is
a) –3 MHz and +5 V b) 5 MHz and +5 V
c) 12 MHz and –12 V d) 5 MHz and –5 V
- 15) The registers in the 8085 used as memory pointer in indirect addressing mode
a) A register and B register b) B register and C register
c) D register and E register d) H register and L register
- 16) When it comes to cost effectiveness which of the following actuators is the preferred choice ?
a) Electric b) Hydraulic
c) Mechanical d) Pneumatic
- 17) Fluid power systems are preferred for continuous control because
a) they allows linear movements at high speed over longer lengths
b) maintains system under load with excessive use of control devices
c) they have higher bandwidth
d) all of the above
- 18) Any inductive device such as LVDT is based of _____ law.
a) Lorentz b) Newton c) Tesla d) Faraday's
- 19) The time taken for a sensor output to stabilize within a fixed range around the steady state value is called
a) rise time b) settling time c) response time d) time constant
- 20) The sensor which does not require an external source of energy for measurement is called a _____ sensor.
a) analog b) digital c) passive d) active
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** of the remaining **three** questions from **each** Section.
 - 2) Support your answers with **neat** sketches wherever **required**.
 - 3) Make **suitable assumptions** if necessary and state them **clearly**.

SECTION – I

2. a) Discuss stepper motor and piezoelectric actuator in detail. Mention their advantages, possible limitations and applications. **8**
- b) Discuss how engine control system works by using microprocessor. **6**
- c) Define the following terms with regards to the 8051 microcontroller. Address Latch Enable, Program Memory, Data Memory and UART. **6**
3. a) What are the different types of AC motors ? Give typical area of application of each type. **8**
- b) Using the case of a typical washing machine as an example, explain how you will interface sensors and actuators to the 8051 microcontroller. **6**
- c) What is signal processing ? Explain with example. **6**
4. Solve **any four** questions : **(4×5=20)**
 - a) What are the key elements of a mechatronic system ? Explain with neat block diagram.
 - b) Discuss the characteristics of sensor.
 - c) What are signal filters ? Explain in brief types of filters.
 - d) Explain with neat sketch the 8085 architecture.
 - e) Discuss ADC, DAC and signal conditioning.
 - f) Discuss in brief about flow sensors.

SECTION – II

5. a) Explain with neat sketch, the architecture of a programmable logic controller. **8**
- b) Device timing circuits that will switch on an output for 10s then switch it off. **6**
- c) Discuss PLC internal relays. **6**

Set R



6. a) What is interfacing ? What are its requirements ? 8
b) Discuss network topologies. 6
c) Explain artificial intelligence in mechatronics. 6
7. Write short notes on **(any four)** : **(5×4=20)**
a) Delay On and Delay Off timer.
b) PLC input/output processing.
c) OSI Model.
d) SCADA system.
e) Communication interfaces.
f) MEMS.
-



SLR-TJ – 131

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

Set	S
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Solve **any two** of the **three** questions from **each** Section.
 - 4) Support your answers with **neat** sketches wherever **required**.
 - 5) Make **suitable assumptions** if necessary and state them **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) When it comes to cost effectiveness which of the following actuators is the preferred choice ?
 - a) Electric
 - b) Hydraulic
 - c) Mechanical
 - d) Pneumatic
- 2) Fluid power systems are preferred for continuous control because
 - a) they allows linear movements at high speed over longer lengths
 - b) maintains system under load with excessive use of control devices
 - c) they have higher bandwidth
 - d) all of the above
- 3) Any inductive device such as LVDT is based of _____ law.
 - a) Lorentz
 - b) Newton
 - c) Tesla
 - d) Faraday's
- 4) The time taken for a sensor output to stabilize within a fixed range around the steady state value is called
 - a) rise time
 - b) settling time
 - c) response time
 - d) time constant
- 5) The sensor which does not require an external source of energy for measurement is called a _____ sensor.
 - a) analog
 - b) digital
 - c) passive
 - d) active
- 6) EEPROM memory data can be erased by
 - a) using ultraviolet rays
 - b) applying relatively high voltage
 - c) using PSEN pin
 - d) none of the above
- 7) In PLC the requirement of sequence of operation is fulfilled by
 - a) Flag register
 - b) Shift register
 - c) Status register
 - d) None of the above

P.T.O.



- 8) In a current sinking DC input module
 - a) The current flows out of the input field device
 - b) Requires that a AC sources be used with mechanical switches
 - c) Current flows out of the input module
 - d) Current can flows in either direction at the input module
- 9) The most commonly used interface in parallel data communication
 - a) R232
 - b) General Purpose Instrument Bus (GPIB)
 - c) CAN
 - d) USB
- 10) In this topology if central hub fails the entire system fails
 - a) Mesh
 - b) Ring
 - c) Star
 - d) Tree
- 11) In OSI model this layer deals with hardware issues
 - a) Data link layer
 - b) Physical layer
 - c) Transport layer
 - d) Application layer
- 12) Micro-sensor for humidity measurement consists of
 - a) Cross-linked cellulose acetate
 - b) Thermoelectric material
 - c) Metallic diaphragm
 - d) Humidity junctions
- 13) In artificial intelligence the term cognition means
 - a) Perception
 - b) Pattern recognition
 - c) Reasoning
 - d) None of the above
- 14) The most commonly used crystal frequency for 8051 microcontroller
 - a) 12 MHz
 - b) 9 MHz
 - c) 7 MHz
 - d) 15 MHz
- 15) Which of the basic parts of a Robot unit would include the computer circuitry that could be programmed to determine what the robot would do ?
 - a) Sensor
 - b) Controller
 - c) Drive
 - d) End effectors
- 16) A buffer amplifier has gain of
 - a) Infinity
 - b) Unity
 - c) Zero
 - d) Dependent upon the circuit parameters
- 17) Filters that transmit all frequencies above a defined cut-off frequency are known as
 - a) Low pass filters
 - b) High pass filters
 - c) Band pass filters
 - d) All pass filters
- 18) The 8051 has _____ bytes of program memory and _____ bytes of data memory.
 - a) 4096, 128
 - b) 128, 4096
 - c) 2048, 4096
 - d) 4096, 2048
- 19) The clock frequency and the supply voltage for the 8051 microcontroller is
 - a) –3 MHz and +5 V
 - b) 5 MHz and +5 V
 - c) 12 MHz and –12 V
 - d) 5 MHz and –5 V
- 20) The registers in the 8085 used as memory pointer in indirect addressing mode
 - a) A register and B register
 - b) B register and C register
 - c) D register and E register
 - d) H register and L register



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

**B.E. (Mechanical) (Part – II) Examination, 2017
MECHATRONICS (Professional Elective – IV)**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** of the remaining **three** questions from **each** Section.
 - 2) Support your answers with **neat** sketches wherever **required**.
 - 3) Make **suitable assumptions** if necessary and state them **clearly**.

SECTION – I

2. a) Discuss stepper motor and piezoelectric actuator in detail. Mention their advantages, possible limitations and applications. 8
- b) Discuss how engine control system works by using microprocessor. 6
- c) Define the following terms with regards to the 8051 microcontroller. Address Latch Enable, Program Memory, Data Memory and UART. 6
3. a) What are the different types of AC motors ? Give typical area of application of each type. 8
- b) Using the case of a typical washing machine as an example, explain how you will interface sensors and actuators to the 8051 microcontroller. 6
- c) What is signal processing ? Explain with example. 6
4. Solve **any four** questions : (4×5=20)
 - a) What are the key elements of a mechatronic system ? Explain with neat block diagram.
 - b) Discuss the characteristics of sensor.
 - c) What are signal filters ? Explain in brief types of filters.
 - d) Explain with neat sketch the 8085 architecture.
 - e) Discuss ADC, DAC and signal conditioning.
 - f) Discuss in brief about flow sensors.

SECTION – II

5. a) Explain with neat sketch, the architecture of a programmable logic controller. 8
- b) Device timing circuits that will switch on an output for 10s then switch it off. 6
- c) Discuss PLC internal relays. 6

Set S



6. a) What is interfacing ? What are its requirements ? 8
b) Discuss network topologies. 6
c) Explain artificial intelligence in mechatronics. 6
7. Write short notes on **(any four)** : **(5×4=20)**
a) Delay On and Delay Off timer.
b) PLC input/output processing.
c) OSI Model.
d) SCADA system.
e) Communication interfaces.
f) MEMS.
-



SLR-TJ – 132

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

Set	P
-----	----------

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume** suitable data if necessary.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Use** of non-programmable calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) The grids generation term are generally used for
 - a) Selection of physical model
 - b) Definition of fluid property
 - c) Specification of boundary condition
 - d) Sub-division of domain into a no. of smaller sub-domain
- 2) In Finite Control Volume moving with fluid, as the fixed mass moves downstream the shape and volume of finite control volume is
 - a) It may change
 - b) Does not change
 - c) Cannot be predict
 - d) Change depend upon flowing mass or not change
- 3) CFD is a
 - a) Design tool
 - b) Research tool
 - c) Numerical tool
 - d) All of the above
- 4) Generally modeling is involved in which of _____ CFD step.
 - a) Pre-processor
 - b) Post processor
 - c) Solver
 - d) All of the above
- 5) Physical principal of continuity equation is
 - a) Mass is conserved
 - b) Energy is transferred
 - c) Energy is created
 - d) None of the above
- 6) Moment and couple are formed at respective points Contour plot gives the advantage as companied to other is
 - a) It illustrates global nature of set of CFD result all in one view
 - b) It gives clear view
 - c) It gives faster plot
 - d) It gives 2D representation
- 7) Many of different categories of different plot can be combined into a single plot called as
 - a) Contour plot
 - b) Vector plot
 - c) Mesh plot
 - d) Composite plot

P.T.O.



- 8) Method of approximating differential equations by a system of algebraic equations for variables at some set of discrete locations in space and time is called
- a) Localization b) Margin c) Discretization d) None of these
- 9) The K- ϵ model is
- a) Zero equation model b) One equation model
c) Two equation model d) Three equation model
- 10) FDM solution of transient heat transfer problems requires discretization in
- a) Time as well as space b) Time
c) Space d) None of above
- 11) 2D heat transfer finite difference formulation of an interior node is obtained by the temperature of the _____ nearest neighbours of the node.
- a) 2 b) 3 c) 4 d) 5
- 12) Finite volume method is an _____ scheme.
- a) Differential b) Integral
c) Integral and differential d) None of these
- 13) The test used to check accuracy of solution is called
- a) Grid independence test b) Solution test
c) Optimal test d) Aspect test
- 14) The boundary condition is specified as a derivative where the derivative is function of unknown and constant value is in
- a) Robin boundary condition b) Neumann boundary condition
c) Dirichet boundary condition d) None of above
- 15) In backward difference scheme use the information at the
- a) Right of grid point b) Left of grid point
c) Bottom of grid point d) Top of grid point
- 16) The technique used for solution of elliptical partial differential equation is
- a) Lax Wendroff technique b) Relaxation technique
c) Maccormack's technique d) ADI technique
- 17) In central difference scheme the information is used for forming the equation is comes from
- a) Both side of a grid point b) Right side of grid point
c) Left side of grid point d) All of the above
- 18) The system which calculate the state of system at a lateral time from the state of system at the current time is known as
- a) Implicit approach b) Explicit approach
c) Current approach d) Lateral approach
- 19) Measure advantage of the CFD over the experimental analysis is
- a) It required less work
b) It required less space
c) It provides comprehensive information in the region of interest
d) It required more time
- 20) If the numbers of nodes are M, then the nodal spacing Δx can be calculated by
- a) $\Delta x = L/M - 1$ b) $\Delta x = M/L - 1$ c) $\Delta x = L/M$ d) $\Delta x = L/M + 1$



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

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

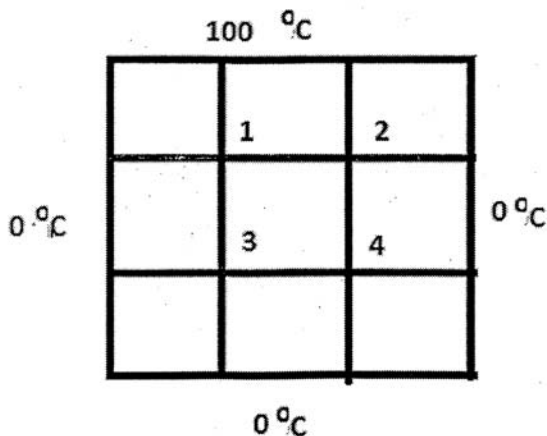
Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Assume** suitable data if necessary.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **allowed**.

SECTION – I

2. a) Derive the Navier-Stokes equations in non-conservation forms. 7
b) What is an implicit approach ? Explain with the help of example. 7
c) What is CFD ? Explain how it can be used as a research tool. 6
3. a) 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 $\Delta x = \Delta y = 1\text{cm}$ determine the temperatures at the indicated points in the medium. 10

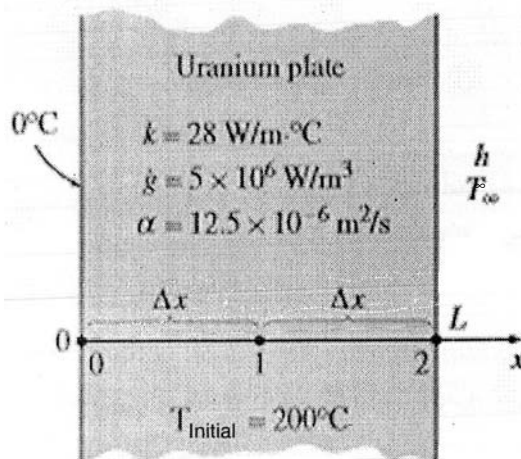


- b) Consider a large plane wall of thickness $L = 0.4\text{ m}$. Thermal conductivity $K = 2.5\text{ W/M}^\circ\text{C}$ and the left side of the wall is maintained at a constant temperature of 70°C while the right side loses heat by convection to the surrounding air $T_\infty = 20^\circ\text{C}$ with a heat transfer of $h = 28\text{ W/M}^2\text{C}$. Assuming steady one dimensional heat transfer and taking the nodal spacing to be 0.1m .
 - i) Obtain the finite difference formulation for all nodes.
 - ii) Determine the nodal temperatures by solving those equations.

10
Set P



4. a) Write a short note on models of the flow. 5
- b) Consider a large uranium plate of thickness $L = 4\text{cm}$, $K = 28\text{ W/M}^\circ\text{C}$ and $\alpha = 12.5 \times 10^{-6}\text{m}^2/\text{s}$, that is initially at a uniform temperature of 200°C . Heat is generated uniformly in the plate at a constant rate of $(e) = 5 \times 10^6\text{ w/m}^3$. At time $t = 0$, one side of the plate is brought into contact with iced water and maintained at 0°C at all times while the other side is subjected to convection to an environment at $T_\infty = 30^\circ\text{C}$ with a heat transfer coefficient $h = 45\text{ w/m}^2\text{C}$, as shown in Fig. below considering a total of three equally spaced node in the medium, two at the boundaries and 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. 10



- c) Explain grid independence test with help of example. 5

SECTION – II

5. a) Explain the Lax-Wendorff techniques with its advantages and disadvantages. 7
- b) Explain the following computer graphics plots. 6
- i) X-Y Plot ii) Vector plot iii) Mesh plot.
- c) Explain structured and unstructured grids for viscous flows. 7
6. a) Consider transient heat conduction in a plane wall with variable heat generation and constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5 and 6 with a uniform nodal spacing of Δx . 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_0 at the left boundary (node 0) and convection at the right boundary (node 6) with a convection coefficient of h and ambient temperature of T_∞ . 7
- b) Explain the FVM for one-dimensional steady state diffusion. 7
- c) Write short note on computation of boundary layer flow. 6
7. a) Explain the difference between wall turbulence and free turbulence flow. Give two examples of each. 6
- b) What is turbulence ? Explain K- ϵ models. 7
- c) Explain the FVM with help diagram. 7



SLR-TJ – 132

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

Set	Q
-----	----------

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume** suitable data if necessary.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Use** of non-programmable calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) The technique used for solution of elliptical partial differential equation is
 - a) Lax Wendroff technique
 - b) Relaxation technique
 - c) Maccormack's technique
 - d) ADI technique
- 2) In central difference scheme the information is used for forming the equation is comes from
 - a) Both side of a grid point
 - b) Right side of grid point
 - c) Left side of grid point
 - d) All of the above
- 3) The system which calculate the state of system at a lateral time from the state of system at the current time is known as
 - a) Implicit approach
 - b) Explicit approach
 - c) Current approach
 - d) Lateral approach
- 4) Measure advantage of the CFD over the experimental analysis is
 - a) It required less work
 - b) It required less space
 - c) It provides comprehensive information in the region of interest
 - d) It required more time
- 5) If the numbers of nodes are M, then the nodal spacing Δx can be calculated by
 - a) $\Delta x = L/M - 1$
 - b) $\Delta x = M/L - 1$
 - c) $\Delta x = L/M$
 - d) $\Delta x = L/M + 1$
- 6) The grids generation term are generally used for
 - a) Selection of physical model
 - b) Definition of fluid property
 - c) Specification of boundary condition
 - d) Sub-division of domain into a no. of smaller sub-domain

P.T.O.



- 7) In Finite Control Volume moving with fluid, as the fixed mass moves downstream the shape and volume of finite control volume is
- It may change
 - Does not change
 - Cannot be predict
 - Change depend upon flowing mass or not change
- 8) CFD is a
- Design tool
 - Research tool
 - Numerical tool
 - All of the above
- 9) Generally modeling is involved in which of _____ CFD step.
- Pre-processor
 - Post processor
 - Solver
 - All of the above
- 10) Physical principal of continuity equation is
- Mass is conserved
 - Energy is transferred
 - Energy is created
 - None of the above
- 11) Moment and couple are formed at respective points Contour plot gives the advantage as compared to other is
- It illustrates global nature of set of CFD result all in one view
 - It gives clear view
 - It gives faster plot
 - It gives 2D representation
- 12) Many of different categories of different plot can be combined into a single plot called as
- Contour plot
 - Vector plot
 - Mesh plot
 - Composite plot
- 13) Method of approximating differential equations by a system of algebraic equations for variables at some set of discrete locations in space and time is called
- Localization
 - Margin
 - Discretization
 - None of these
- 14) The K- ϵ model is
- Zero equation model
 - One equation model
 - Two equation model
 - Three equation model
- 15) FDM solution of transient heat transfer problems requires discretization in
- Time as well as space
 - Time
 - Space
 - None of above
- 16) 2D heat transfer finite difference formulation of an interior node is obtained by the temperature of the _____ nearest neighbours of the node.
- 2
 - 3
 - 4
 - 5
- 17) Finite volume method is an _____ scheme.
- Differential
 - Integral
 - Integral and differential
 - None of these
- 18) The test used to check accuracy of solution is called
- Grid independence test
 - Solution test
 - Optimal test
 - Aspect test
- 19) The boundary condition is specified as a derivative where the derivative is function of unknown and constant value is in
- Robin boundary condition
 - Neumann boundary condition
 - Dirichet boundary condition
 - None of above
- 20) In backward difference scheme use the information at the
- Right of grid point
 - Left of grid point
 - Bottom of grid point
 - Top of grid point



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

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

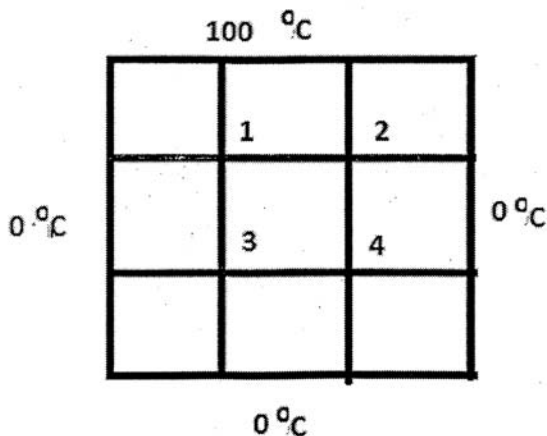
Day and Date : Thursday, 23-11-2017
 Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Assume** suitable data if necessary.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **allowed**.

SECTION – I

2. a) Derive the Navier-Stokes equations in non-conservation forms. 7
- b) What is an implicit approach ? Explain with the help of example. 7
- c) What is CFD ? Explain how it can be used as a research tool. 6
3. a) 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 $\Delta x = \Delta y = 1\text{cm}$ determine the temperatures at the indicated points in the medium. 10



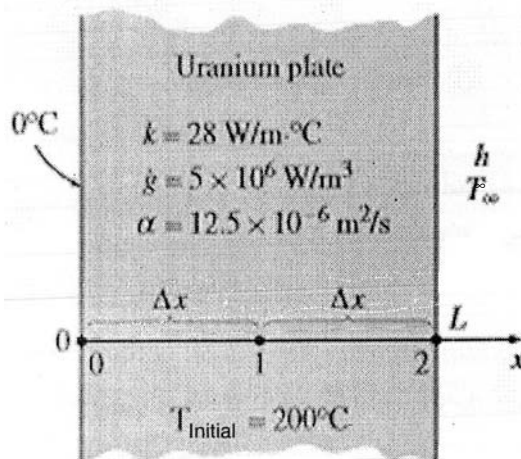
- b) Consider a large plane wall of thickness $L = 0.4\text{ m}$. Thermal conductivity $K = 2.5\text{ W/M}^\circ\text{C}$ and the left side of the wall is maintained at a constant temperature of 70°C while the right side loses heat by convection to the surrounding air $T_\infty = 20^\circ\text{C}$ with a heat transfer of $h = 28\text{ W/M}^2\text{C}$. Assuming steady one dimensional heat transfer and taking the nodal spacing to be 0.1m .

- i) Obtain the finite difference formulation for all nodes.
- ii) Determine the nodal temperatures by solving those equations.

10
Set Q



4. a) Write a short note on models of the flow. 5
- b) Consider a large uranium plate of thickness $L = 4\text{cm}$, $K = 28\text{ W/M}^\circ\text{C}$ and $\alpha = 12.5 \times 10^{-6}\text{m}^2/\text{s}$, that is initially at a uniform temperature of 200°C . Heat is generated uniformly in the plate at a constant rate of $(e) = 5 \times 10^6\text{ w/m}^3$. At time $t = 0$, one side of the plate is brought into contact with iced water and maintained at 0°C at all times while the other side is subjected to convection to an environment at $T_\infty = 30^\circ\text{C}$ with a heat transfer coefficient $h = 45\text{ w/m}^2\text{C}$, as shown in Fig. below considering a total of three equally spaced node in the medium, two at the boundaries and 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. 10



- c) Explain grid independence test with help of example. 5

SECTION – II

5. a) Explain the Lax-Wendorff techniques with its advantages and disadvantages. 7
- b) Explain the following computer graphics plots. 6
- i) X-Y Plot ii) Vector plot iii) Mesh plot.
- c) Explain structured and unstructured grids for viscous flows. 7
6. a) Consider transient heat conduction in a plane wall with variable heat generation and constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5 and 6 with a uniform nodal spacing of Δx . 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_0 at the left boundary (node 0) and convection at the right boundary (node 6) with a convection coefficient of h and ambient temperature of T_∞ . 7
- b) Explain the FVM for one-dimensional steady state diffusion. 7
- c) Write short note on computation of boundary layer flow. 6
7. a) Explain the difference between wall turbulence and free turbulence flow. Give two examples of each. 6
- b) What is turbulence ? Explain K- ϵ models. 7
- c) Explain the FVM with help diagram. 7



SLR-TJ – 132

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

Set	R
-----	---

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume** suitable data if necessary.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Use** of non-programmable calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) 2D heat transfer finite difference formulation of an interior node is obtained by the temperature of the _____ nearest neighbours of the node.
a) 2 b) 3 c) 4 d) 5
- 2) Finite volume method is an _____ scheme.
a) Differential b) Integral
c) Integral and differential d) None of these
- 3) The test used to check accuracy of solution is called
a) Grid independence test b) Solution test
c) Optimal test d) Aspect test
- 4) The boundary condition is specified as a derivative where the derivative is function of unknown and constant value is in
a) Robin boundary condition b) Neumann boundary condition
c) Dirichet boundary condition d) None of above
- 5) In backward difference scheme use the information at the
a) Right of grid point b) Left of grid point
c) Bottom of grid point d) Top of grid point
- 6) The technique used for solution of elliptical partial differential equation is
a) Lax Wendroff technique b) Relaxation technique
c) Maccormack's technique d) ADI technique
- 7) In central difference scheme the information is used for forming the equation is comes from
a) Both side of a grid point b) Right side of grid point
c) Left side of grid point d) All of the above
- 8) The system which calculate the state of system at a lateral time from the state of system at the current time is known as
a) Implicit approach b) Explicit approach
c) Current approach d) Lateral approach

P.T.O.



- 9) Measure advantage of the CFD over the experimental analysis is
- It required less work
 - It required less space
 - It provides comprehensive information in the region of interest
 - It required more time
- 10) If the numbers of nodes are M, then the nodal spacing Δx can be calculated by
- $\Delta x = L/M - 1$
 - $\Delta x = M/L - 1$
 - $\Delta x = L/M$
 - $\Delta x = L/M + 1$
- 11) The grids generation term are generally used for
- Selection of physical model
 - Definition of fluid property
 - Specification of boundary condition
 - Sub-division of domain into a no. of smaller sub-domain
- 12) In Finite Control Volume moving with fluid, as the fixed mass moves downstream the shape and volume of finite control volume is
- It may change
 - Does not change
 - Cannot be predict
 - Change depend upon flowing mass or not change
- 13) CFD is a
- Design tool
 - Research tool
 - Numerical tool
 - All of the above
- 14) Generally modeling is involved in which of _____ CFD step.
- Pre-processor
 - Post processor
 - Solver
 - All of the above
- 15) Physical principal of continuity equation is
- Mass is conserved
 - Energy is transferred
 - Energy is created
 - None of the above
- 16) Moment and couple are formed at respective points Contour plot gives the advantage as companied to other is
- It illustrates global nature of set of CFD result all in one view
 - It gives clear view
 - It gives faster plot
 - It gives 2D representation
- 17) Many of different categories of different plot can be combined into a single plot called as
- Contour plot
 - Vector plot
 - Mesh plot
 - Composite plot
- 18) Method of approximating differential equations by a system of algebraic equations for variables at some set of discrete locations in space and time is called
- Localization
 - Margin
 - Discretization
 - None of these
- 19) The K- ϵ model is
- Zero equation model
 - One equation model
 - Two equation model
 - Three equation model
- 20) FDM solution of transient heat transfer problems requires discretization in
- Time as well as space
 - Time
 - Space
 - None of above
-



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

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

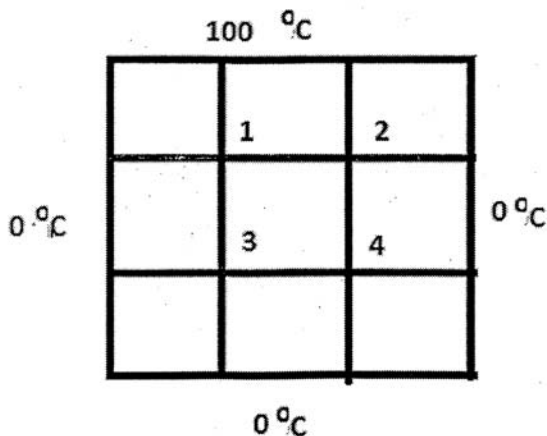
Day and Date : Thursday, 23-11-2017
 Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Assume** suitable data if necessary.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **allowed**.

SECTION – I

2. a) Derive the Navier-Stokes equations in non-conservation forms. 7
- b) What is an implicit approach ? Explain with the help of example. 7
- c) What is CFD ? Explain how it can be used as a research tool. 6
3. a) 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 $\Delta x = \Delta y = 1\text{cm}$ determine the temperatures at the indicated points in the medium. 10



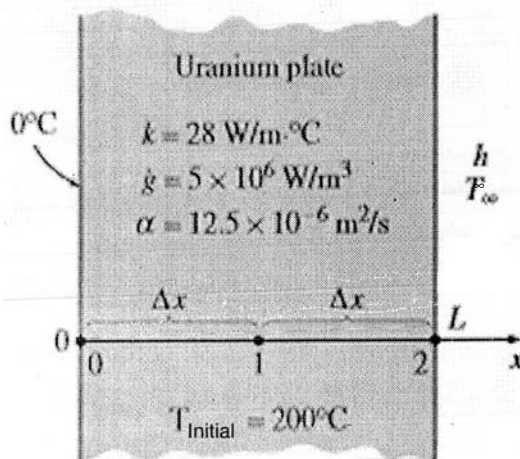
- b) Consider a large plane wall of thickness $L = 0.4\text{ m}$. Thermal conductivity $K = 2.5\text{ W/M}^\circ\text{C}$ and the left side of the wall is maintained at a constant temperature of 70°C while the right side loses heat by convection to the surrounding air $T_\infty = 20^\circ\text{C}$ with a heat transfer of $h = 28\text{ W/M}^2\text{C}$. Assuming steady one dimensional heat transfer and taking the nodal spacing to be 0.1m .

- i) Obtain the finite difference formulation for all nodes.
- ii) Determine the nodal temperatures by solving those equations.

10
Set R



4. a) Write a short note on models of the flow. 5
- b) Consider a large uranium plate of thickness $L = 4\text{cm}$, $K = 28 \text{ W/M}^\circ\text{C}$ and $\alpha = 12.5 \times 10^{-6} \text{ m}^2/\text{s}$, that is initially at a uniform temperature of 200°C . Heat is generated uniformly in the plate at a constant rate of $(e) = 5 \times 10^6 \text{ w/m}^3$. At time $t = 0$, one side of the plate is brought into contact with iced water and maintained at 0°C at all times while the other side is subjected to convection to an environment at $T_\infty = 30^\circ\text{C}$ with a heat transfer coefficient $h = 45 \text{ w/m}^2\text{C}$, as shown in Fig. below considering a total of three equally spaced node in the medium, two at the boundaries and 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. 10



- c) Explain grid independence test with help of example. 5

SECTION – II

5. a) Explain the Lax-Wendorff techniques with its advantages and disadvantages. 7
- b) Explain the following computer graphics plots. 6
- i) X-Y Plot ii) Vector plot iii) Mesh plot.
- c) Explain structured and unstructured grids for viscous flows. 7
6. a) Consider transient heat conduction in a plane wall with variable heat generation and constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5 and 6 with a uniform nodal spacing of Δx . 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_0 at the left boundary (node 0) and convection at the right boundary (node 6) with a convection coefficient of h and ambient temperature of T_∞ . 7
- b) Explain the FVM for one-dimensional steady state diffusion. 7
- c) Write short note on computation of boundary layer flow. 6
7. a) Explain the difference between wall turbulence and free turbulence flow. Give two examples of each. 6
- b) What is turbulence ? Explain K- ϵ models. 7
- c) Explain the FVM with help diagram. 7



SLR-TJ – 132

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

Set	S
-----	---

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- Instructions :**
- 1) **Assume** suitable data if necessary.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Use** of non-programmable calculator is **allowed**.
 - 4) Q. No. **1** is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. **3**. **Each** question carries **one** mark.
 - 5) **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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Moment and couple are formed at respective points Contour plot gives the advantage as compared to other is
 - a) It illustrates global nature of set of CFD result all in one view
 - b) It gives clear view
 - c) It gives faster plot
 - d) It gives 2D representation
- 2) Many of different categories of different plot can be combined into a single plot called as
 - a) Contour plot
 - b) Vector plot
 - c) Mesh plot
 - d) Composite plot
- 3) Method of approximating differential equations by a system of algebraic equations for variables at some set of discrete locations in space and time is called
 - a) Localization
 - b) Margin
 - c) Discretization
 - d) None of these
- 4) The K- ϵ model is
 - a) Zero equation model
 - b) One equation model
 - c) Two equation model
 - d) Three equation model
- 5) FDM solution of transient heat transfer problems requires discretization in
 - a) Time as well as space
 - b) Time
 - c) Space
 - d) None of above
- 6) 2D heat transfer finite difference formulation of an interior node is obtained by the temperature of the _____ nearest neighbours of the node.
 - a) 2
 - b) 3
 - c) 4
 - d) 5
- 7) Finite volume method is an _____ scheme.
 - a) Differential
 - b) Integral
 - c) Integral and differential
 - d) None of these
- 8) The test used to check accuracy of solution is called
 - a) Grid independence test
 - b) Solution test
 - c) Optimal test
 - d) Aspect test

P.T.O.



- 9) The boundary condition is specified as a derivative where the derivative is function of unknown and constant value is in
- a) Robin boundary condition
 - b) Neumann boundary condition
 - c) Dirichet boundary condition
 - d) None of above
- 10) In backward difference scheme use the information at the
- a) Right of grid point
 - b) Left of grid point
 - c) Bottom of grid point
 - d) Top of grid point
- 11) The technique used for solution of elliptical partial differential equation is
- a) Lax Wendroff technique
 - b) Relaxation technique
 - c) Maccormack's technique
 - d) ADI technique
- 12) In central difference scheme the information is used for forming the equation is comes from
- a) Both side of a grid point
 - b) Right side of grid point
 - c) Left side of grid point
 - d) All of the above
- 13) The system which calculate the state of system at a lateral time from the state of system at the current time is known as
- a) Implicit approach
 - b) Explicit approach
 - c) Current approach
 - d) Lateral approach
- 14) Measure advantage of the CFD over the experimental analysis is
- a) It required less work
 - b) It required less space
 - c) It provides comprehensive information in the region of interest
 - d) It required more time
- 15) If the numbers of nodes are M, then the nodal spacing Δx can be calculated by
- a) $\Delta x = L/M - 1$
 - b) $\Delta x = M/L - 1$
 - c) $\Delta x = L/M$
 - d) $\Delta x = L/M + 1$
- 16) The grids generation term are generally used for
- a) Selection of physical model
 - b) Definition of fluid property
 - c) Specification of boundary condition
 - d) Sub-division of domain into a no. of smaller sub-domain
- 17) In Finite Control Volume moving with fluid, as the fixed mass moves downstream the shape and volume of finite control volume is
- a) It may change
 - b) Does not change
 - c) Cannot be predict
 - d) Change depend upon flowing mass or not change
- 18) CFD is a
- a) Design tool
 - b) Research tool
 - c) Numerical tool
 - d) All of the above
- 19) Generally modeling is involved in which of _____ CFD step.
- a) Pre-processor
 - b) Post processor
 - c) Solver
 - d) All of the above
- 20) Physical principal of continuity equation is
- a) Mass is conserved
 - b) Energy is transferred
 - c) Energy is created
 - d) None of the above



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

B.E. (Mech.) (Part – II) Examination, 2017
COMPUTATIONAL FLUID DYNAMICS (Professional Elective – IV)

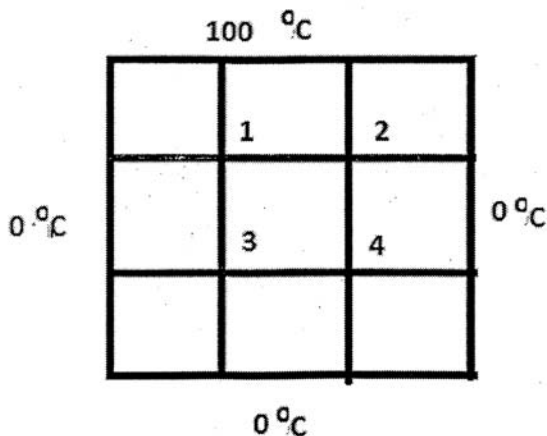
Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :**
- 1) Solve **any two** questions from **each** Section.
 - 2) **Assume** suitable data if necessary.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) **Use** of non-programmable calculator is **allowed**.

SECTION – I

2. a) Derive the Navier-Stokes equations in non-conservation forms. 7
b) What is an implicit approach ? Explain with the help of example. 7
c) What is CFD ? Explain how it can be used as a research tool. 6
3. a) 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 $\Delta x = \Delta y = 1\text{cm}$ determine the temperatures at the indicated points in the medium. 10

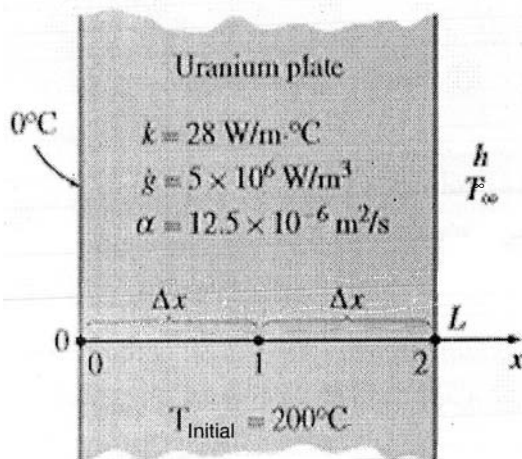


- b) Consider a large plane wall of thickness $L = 0.4\text{ m}$. Thermal conductivity $K = 2.5\text{ W/M}^\circ\text{C}$ and the left side of the wall is maintained at a constant temperature of 70°C while the right side loses heat by convection to the surrounding air $T_\infty = 20^\circ\text{C}$ with a heat transfer of $h = 28\text{ W/M}^2\text{C}$. Assuming steady one dimensional heat transfer and taking the nodal spacing to be 0.1m .
 - i) Obtain the finite difference formulation for all nodes.
 - ii) Determine the nodal temperatures by solving those equations.

10
Set S



4. a) Write a short note on models of the flow. 5
- b) Consider a large uranium plate of thickness $L = 4\text{cm}$, $K = 28 \text{ W/M}^\circ\text{C}$ and $\alpha = 12.5 \times 10^{-6} \text{ m}^2/\text{s}$, that is initially at a uniform temperature of 200°C . Heat is generated uniformly in the plate at a constant rate of $(e) = 5 \times 10^6 \text{ w/m}^3$. At time $t = 0$, one side of the plate is brought into contact with iced water and maintained at 0°C at all times while the other side is subjected to convection to an environment at $T_\infty = 30^\circ\text{C}$ with a heat transfer coefficient $h = 45 \text{ w/m}^2\text{C}$, as shown in Fig. below considering a total of three equally spaced node in the medium, two at the boundaries and 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. 10



- c) Explain grid independence test with help of example. 5

SECTION – II

5. a) Explain the Lax-Wendorff techniques with its advantages and disadvantages. 7
- b) Explain the following computer graphics plots. 6
- i) X-Y Plot ii) Vector plot iii) Mesh plot.
- c) Explain structured and unstructured grids for viscous flows. 7
6. a) Consider transient heat conduction in a plane wall with variable heat generation and constant thermal conductivity. The nodal network of the medium consists of nodes 0, 1, 2, 3, 4, 5 and 6 with a uniform nodal spacing of Δx . 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_0 at the left boundary (node 0) and convection at the right boundary (node 6) with a convection coefficient of h and ambient temperature of T_∞ . 7
- b) Explain the FVM for one-dimensional steady state diffusion. 7
- c) Write short note on computation of boundary layer flow. 6
7. a) Explain the difference between wall turbulence and free turbulence flow. Give two examples of each. 6
- b) What is turbulence ? Explain K- ϵ models. 7
- c) Explain the FVM with help diagram. 7



SLR-TJ – 133

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

Set	P
-----	---

B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) OEE in TPM means
 - a) Overall engine effectiveness
 - b) Overall engine emission
 - c) Overall equipment efficiency
 - d) None of these
- 2) Long term forecasting considers a period of
 - a) One year or less
 - b) One to three years
 - c) More than three years
 - d) None of these
- 3) Delphi technique of forecasting is
 - a) Qualitative technique
 - b) Quantitative technique
 - c) Both a) and b)
 - d) None of these
- 4) 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
- 5) Job shop production system is characterized by
 - a) High variety of products and low volume
 - b) Less variety of products and high volume
 - c) High variety of products and high volume
 - d) Low variety of products and low volume
- 6) Mass production system is having
 - a) Large volume of products
 - b) Special purpose machines
 - c) Balanced production line
 - d) All above
- 7) Inputs to MRP can be
 - a) MPS
 - b) Inventory records
 - c) Bill of materials
 - d) All above

P.T.O.



- 8) Condition based maintenance is used in
a) Breakdown maintenance b) Preventive maintenance
c) Predictive maintenance d) None of above
- 9) Penalty cost is included in
a) Shortage cost b) Ordering cost c) Holding cost d) None of these
- 10) Interest cost on the material bought is considered in
a) Ordering cost b) Inventory carrying cost
c) Shortage cost d) None of above
- 11) When the ordering cost is increased to 4 times, the EOQ will be increased to
a) 2 times b) 3 times c) 8 times d) 4 times
- 12) The value of α (smoothing constant) in exponential smoothing method is
a) Between -1 to $+1$ b) Between 0 to 1
c) Between -2 to $+2$ d) Can't be defined
- 13) Services are
a) Tangible b) Intangible c) Both a) and b) d) None of these
- 14) Payback period criteria is used for
a) Capacity planning b) Forecasting
c) Production control d) Investment decisions
- 15) The word Kanban is associated with
a) EOQ b) JIT
c) Capacity planning d) Product design
- 16) JIT is targeted for
a) Average inventory b) Zero inventory
c) High inventory d) None of above
- 17) Comparing actual production output with production schedule and reporting the deviation is
a) Capacity planning b) Forecasting
c) Progressing d) Inventory management
- 18) Regression analysis is a
a) Delphi model b) Group technique
c) Causal model d) Time series model
- 19) TPM means
a) Total Production Management b) Total Process Management
c) Total Product Mix d) None of these
- 20) In ABC analysis A stands for
a) Components having high cost and high usage
b) Components having low cost and low usage
c) Components having high cost and low usage
d) Components having low cost and high usage



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

**B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

N.B. : Solve any two questions from each Section.

SECTION – I

2. a) Explain the objectives and scope of production and operations management in detail. **7**
b) Explain in detail procedure for capacity planning. **7**
c) Explain the different types of capacities. **6**
3. a) Explain in detail what do you mean by aggregate planning. **7**
b) Explain moving average method of forecasting. **6**
c) Compare production planning with production control. **7**
4. Write notes on (**five marks each**) : **20**
 - i) Need for Demand forecasting.
 - ii) Functions of PPC.
 - iii) Line Balancing.
 - iv) Functions of dispatching and related documents.

SECTION – II

5. a) Give in detail classification of inventory models, explain EBQ model in detail. **7**
b) Explain the fixed order quantity system related with material planning. **7**
c) Explain various costs associated with inventory. **6**
6. a) Explain the need and functions of maintenance department. **7**
b) Explain preventive maintenance and its benefits. **6**
c) Explain in detail the term Kanban. **7**
7. Write notes on (**five marks each**) : **20**
 - i) ABC analysis.
 - ii) Phases of value analysis.
 - iii) Six sigma.
 - iv) KAIZEN.

Set P



SLR-TJ – 133

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

Set	Q
-----	---

B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) JIT is targeted for
 - a) Average inventory
 - b) Zero inventory
 - c) High inventory
 - d) None of above
- 2) Comparing actual production output with production schedule and reporting the deviation is
 - a) Capacity planning
 - b) Forecasting
 - c) Progressing
 - d) Inventory management
- 3) Regression analysis is a
 - a) Delphi model
 - b) Group technique
 - c) Causal model
 - d) Time series model
- 4) TPM means
 - a) Total Production Management
 - b) Total Process Management
 - c) Total Product Mix
 - d) None of these
- 5) In ABC analysis A stands for
 - a) Components having high cost and high usage
 - b) Components having low cost and low usage
 - c) Components having high cost and low usage
 - d) Components having low cost and high usage
- 6) OEE in TPM means
 - a) Overall engine effectiveness
 - b) Overall engine emission
 - c) Overall equipment efficiency
 - d) None of these
- 7) Long term forecasting considers a period of
 - a) One year or less
 - b) One to three years
 - c) More than three years
 - d) None of these

P.T.O.



- 8) Delphi technique of forecasting is
- a) Qualitative technique
 - b) Quantitative technique
 - c) Both a) and b)
 - d) None of these
- 9) 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
- 10) Job shop production system is characterized by
- a) High variety of products and low volume
 - b) Less variety of products and high volume
 - c) High variety of products and high volume
 - d) Low variety of products and low volume
- 11) Mass production system is having
- a) Large volume of products
 - b) Special purpose machines
 - c) Balanced production line
 - d) All above
- 12) Inputs to MRP can be
- a) MPS
 - b) Inventory records
 - c) Bill of materials
 - d) All above
- 13) Condition based maintenance is used in
- a) Breakdown maintenance
 - b) Preventive maintenance
 - c) Predictive maintenance
 - d) None of above
- 14) Penalty cost is included in
- a) Shortage cost
 - b) Ordering cost
 - c) Holding cost
 - d) None of these
- 15) Interest cost on the material bought is considered in
- a) Ordering cost
 - b) Inventory carrying cost
 - c) Shortage cost
 - d) None of above
- 16) When the ordering cost is increased to 4 times, the EOQ will be increased to
- a) 2 times
 - b) 3 times
 - c) 8 times
 - d) 4 times
- 17) The value of α (smoothing constant) in exponential smoothing method is
- a) Between -1 to $+1$
 - b) Between 0 to 1
 - c) Between -2 to $+2$
 - d) Can't be defined
- 18) Services are
- a) Tangible
 - b) Intangible
 - c) Both a) and b)
 - d) None of these
- 19) Payback period criteria is used for
- a) Capacity planning
 - b) Forecasting
 - c) Production control
 - d) Investment decisions
- 20) The word Kanban is associated with
- a) EOQ
 - b) JIT
 - c) Capacity planning
 - d) Product design
-



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

**B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4**

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

N.B. : Solve any two questions from each Section.

SECTION – I

2. a) Explain the objectives and scope of production and operations management in detail. **7**
b) Explain in detail procedure for capacity planning. **7**
c) Explain the different types of capacities. **6**
3. a) Explain in detail what do you mean by aggregate planning. **7**
b) Explain moving average method of forecasting. **6**
c) Compare production planning with production control. **7**
4. Write notes on **(five marks each)** : **20**
 - i) Need for Demand forecasting.
 - ii) Functions of PPC.
 - iii) Line Balancing.
 - iv) Functions of dispatching and related documents.

SECTION – II

5. a) Give in detail classification of inventory models, explain EBQ model in detail. **7**
b) Explain the fixed order quantity system related with material planning. **7**
c) Explain various costs associated with inventory. **6**
6. a) Explain the need and functions of maintenance department. **7**
b) Explain preventive maintenance and its benefits. **6**
c) Explain in detail the term Kanban. **7**
7. Write notes on **(five marks each)** : **20**
 - i) ABC analysis.
 - ii) Phases of value analysis.
 - iii) Six sigma.
 - iv) KAIZEN.

Set Q



SLR-TJ – 133

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

Set	R
-----	---

B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) When the ordering cost is increased to 4 times, the EOQ will be increased to
 - a) 2 times
 - b) 3 times
 - c) 8 times
 - d) 4 times
- 2) The value of α (smoothing constant) in exponential smoothing method is
 - a) Between -1 to +1
 - b) Between 0 to 1
 - c) Between -2 to +2
 - d) Can't be defined
- 3) Services are
 - a) Tangible
 - b) Intangible
 - c) Both a) and b)
 - d) None of these
- 4) Payback period criteria is used for
 - a) Capacity planning
 - b) Forecasting
 - c) Production control
 - d) Investment decisions
- 5) The word Kanban is associated with
 - a) EOQ
 - b) JIT
 - c) Capacity planning
 - d) Product design
- 6) JIT is targeted for
 - a) Average inventory
 - b) Zero inventory
 - c) High inventory
 - d) None of above
- 7) Comparing actual production output with production schedule and reporting the deviation is
 - a) Capacity planning
 - b) Forecasting
 - c) Progressing
 - d) Inventory management
- 8) Regression analysis is a
 - a) Delphi model
 - b) Group technique
 - c) Causal model
 - d) Time series model

P.T.O.



- 9) TPM means
a) Total Production Management b) Total Process Management
c) Total Product Mix d) None of these
- 10) In ABC analysis A stands for
a) Components having high cost and high usage
b) Components having low cost and low usage
c) Components having high cost and low usage
d) Components having low cost and high usage
- 11) OEE in TPM means
a) Overall engine effectiveness b) Overall engine emission
c) Overall equipment efficiency d) None of these
- 12) Long term forecasting considers a period of
a) One year or less b) One to three years
c) More than three years d) None of these
- 13) Delphi technique of forecasting is
a) Qualitative technique b) Quantitative technique
c) Both a) and b) d) None of these
- 14) 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
- 15) Job shop production system is characterized by
a) High variety of products and low volume
b) Less variety of products and high volume
c) High variety of products and high volume
d) Low variety of products and low volume
- 16) Mass production system is having
a) Large volume of products b) Special purpose machines
c) Balanced production line d) All above
- 17) Inputs to MRP can be
a) MPS b) Inventory records
c) Bill of materials d) All above
- 18) Condition based maintenance is used in
a) Breakdown maintenance b) Preventive maintenance
c) Predictive maintenance d) None of above
- 19) Penalty cost is included in
a) Shortage cost b) Ordering cost c) Holding cost d) None of these
- 20) Interest cost on the material bought is considered in
a) Ordering cost b) Inventory carrying cost
c) Shortage cost d) None of above
-



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

B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

N.B. : Solve any two questions from each Section.

SECTION – I

2. a) Explain the objectives and scope of production and operations management in detail. **7**
b) Explain in detail procedure for capacity planning. **7**
c) Explain the different types of capacities. **6**
3. a) Explain in detail what do you mean by aggregate planning. **7**
b) Explain moving average method of forecasting. **6**
c) Compare production planning with production control. **7**
4. Write notes on (**five marks each**) : **20**
 - i) Need for Demand forecasting.
 - ii) Functions of PPC.
 - iii) Line Balancing.
 - iv) Functions of dispatching and related documents.

SECTION – II

5. a) Give in detail classification of inventory models, explain EBQ model in detail. **7**
b) Explain the fixed order quantity system related with material planning. **7**
c) Explain various costs associated with inventory. **6**
6. a) Explain the need and functions of maintenance department. **7**
b) Explain preventive maintenance and its benefits. **6**
c) Explain in detail the term Kanban. **7**
7. Write notes on (**five marks each**) : **20**
 - i) ABC analysis.
 - ii) Phases of value analysis.
 - iii) Six sigma.
 - iv) KAIZEN.

Set R



SLR-TJ – 133

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

Set	S
-----	---

B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Mass production system is having
 - a) Large volume of products
 - b) Special purpose machines
 - c) Balanced production line
 - d) All above
- 2) Inputs to MRP can be
 - a) MPS
 - b) Inventory records
 - c) Bill of materials
 - d) All above
- 3) Condition based maintenance is used in
 - a) Breakdown maintenance
 - b) Preventive maintenance
 - c) Predictive maintenance
 - d) None of above
- 4) Penalty cost is included in
 - a) Shortage cost
 - b) Ordering cost
 - c) Holding cost
 - d) None of these
- 5) Interest cost on the material bought is considered in
 - a) Ordering cost
 - b) Inventory carrying cost
 - c) Shortage cost
 - d) None of above
- 6) When the ordering cost is increased to 4 times, the EOQ will be increased to
 - a) 2 times
 - b) 3 times
 - c) 8 times
 - d) 4 times
- 7) The value of α (smoothing constant) in exponential smoothing method is
 - a) Between -1 to $+1$
 - b) Between 0 to 1
 - c) Between -2 to $+2$
 - d) Can't be defined
- 8) Services are
 - a) Tangible
 - b) Intangible
 - c) Both a) and b)
 - d) None of these
- 9) Payback period criteria is used for
 - a) Capacity planning
 - b) Forecasting
 - c) Production control
 - d) Investment decisions

P.T.O.



- 10) The word Kanban is associated with
a) EOQ
b) JIT
c) Capacity planning
d) Product design
- 11) JIT is targeted for
a) Average inventory
b) Zero inventory
c) High inventory
d) None of above
- 12) Comparing actual production output with production schedule and reporting the deviation is
a) Capacity planning
b) Forecasting
c) Progressing
d) Inventory management
- 13) Regression analysis is a
a) Delphi model
b) Group technique
c) Causal model
d) Time series model
- 14) TPM means
a) Total Production Management
b) Total Process Management
c) Total Product Mix
d) None of these
- 15) In ABC analysis A stands for
a) Components having high cost and high usage
b) Components having low cost and low usage
c) Components having high cost and low usage
d) Components having low cost and high usage
- 16) OEE in TPM means
a) Overall engine effectiveness
b) Overall engine emission
c) Overall equipment efficiency
d) None of these
- 17) Long term forecasting considers a period of
a) One year or less
b) One to three years
c) More than three years
d) None of these
- 18) Delphi technique of forecasting is
a) Qualitative technique
b) Quantitative technique
c) Both a) and b)
d) None of these
- 19) 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
- 20) Job shop production system is characterized by
a) High variety of products and low volume
b) Less variety of products and high volume
c) High variety of products and high volume
d) Low variety of products and low volume
-



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

B.E. (Mech.) (Part – II) Examination, 2017
PRODUCTION AND OPERATIONS MANAGEMENT
Professional Elective – 4

Day and Date : Thursday, 23-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

N.B. : Solve any two questions from each Section.

SECTION – I

2. a) Explain the objectives and scope of production and operations management in detail. **7**
b) Explain in detail procedure for capacity planning. **7**
c) Explain the different types of capacities. **6**
3. a) Explain in detail what do you mean by aggregate planning. **7**
b) Explain moving average method of forecasting. **6**
c) Compare production planning with production control. **7**
4. Write notes on (**five marks each**) : **20**
 - i) Need for Demand forecasting.
 - ii) Functions of PPC.
 - iii) Line Balancing.
 - iv) Functions of dispatching and related documents.

SECTION – II

5. a) Give in detail classification of inventory models, explain EBQ model in detail. **7**
b) Explain the fixed order quantity system related with material planning. **7**
c) Explain various costs associated with inventory. **6**
6. a) Explain the need and functions of maintenance department. **7**
b) Explain preventive maintenance and its benefits. **6**
c) Explain in detail the term Kanban. **7**
7. Write notes on (**five marks each**) : **20**
 - i) ABC analysis.
 - ii) Phases of value analysis.
 - iii) Six sigma.
 - iv) KAIZEN.

Set S



SLR-TJ – 135

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

Set	P
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) **Neat diagrams must be drawn whenever necessary.**
 - 4) **Make suitable assumptions, if necessary and mention them clearly.**
 - 5) **Figures to the right indicate full mark.**
 - 6) **Use of non-programmable single memory calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) A perfect seeding gives
 - i) Correct amount of seed per unit area
 - ii) Correct depth at which seed is placed in the soil
 - iii) Correct spacing between row-to-row and plant-to-plant

a) only i b) only ii c) i and iii d) all of the above
- 2) Seed metering mechanism is mainly used for
 - a) Supporting the parts of seed drill
 - b) Opening the furrows
 - c) Covering the soil on the seed
 - d) Delivers the seeds at selected rate
- 3) Main function of Interculture equipment is
 - a) To destroy weed
 - b) To supply water to the plants
 - c) Protect the plant from high heat of sun
 - d) None of these
- 4) Interculture equipments are
 - 1) Cultivator 2) Weeders 3) Rotary hoe 4) Thresher
 - a) only 1 b) 1, 2 and 3 c) only 2 d) all of above
- 5) The angle made by a disc of disc plough with the direction of motion is known as
 - a) Tilt angle b) Plough angle c) Disc angle d) None of these
- 6) 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
- 7) 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

P.T.O.



- 8) Function of star wheel of reaper
- a) Cutting the crops
 - b) Guiding the crops towards the cutter bar
 - c) Provide supports to the crops
 - d) Blocking the crops
- 9) Separating Sieves is used for
- a) Separating chaff from grain
 - b) Rotating the winnowing unit
 - c) Providing cutting action
 - d) None of the above
- 10) Stirrup pump sprayer is also called as
- a) Foot sprayer
 - b) Knapsack sprayer
 - c) Bucket sprayer
 - d) Rocking Sprayer
- 11) Duster are mostly used in arid region because
- a) Large amount of water is available
 - b) Very less amount of water is available
 - c) Large amount of power source is available
 - d) None of the above
- 12) In Mould Board plough function of Gauge wheel is
- a) To joint the jointer to the frame
 - b) To provide sharing action
 - c) To control depth of ploughing
 - d) To prevent weed to stick with share
- 13) Single Action Disc harrow having
- a) Two gangs are placed end to end
 - b) Two gangs are placed one behind the other
 - c) There is no gang
 - d) Three gangs are placed one behind the other
- 14) The function of Float of Cono weeder is
- a) To provide cutting action
 - b) To guide the operator
 - c) To prevent the unit from sinking into the soil
 - d) Uniform placement of seed
- 15) The main advantages of using long handle weeder is
- a) Less area of coverage
 - b) Cheaper cost of weeder
 - c) Less drudgery of operator
 - d) Tradition tool
- 16) Rocking Sprayer is generally operated by
- a) Operating lever
 - b) Foot pedal
 - c) External engine
 - d) Tractor engine
- 17) 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
 - c) Sprayer
 - d) Flame thrower
- 18) _____ transmit the reciprocating motion to the knife head of mower.
- a) Pitman
 - b) Differential
 - c) Star wheel
 - d) Crop divider
- 19) _____ is a tool which breaks the ground at greater depth, will break the hard pan and will not pulverize the surface soil as much as other tools.
- a) Sub-Soiler
 - b) Plough
 - c) Harrow
 - d) Rotavator
- 20) _____ is the main purpose of puddling.
- a) To reduce leaching of water
 - b) To reduce transpiration
 - c) To reduce evaporation
 - d) None of the above
-



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

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- i) Answer **any two** questions from **each** Section.
 - ii) Figures to **right** indicate **full** mark.
 - iii) Make suitable assumption if necessary and state it **clearly**.

SECTION – I

2. Solve the following :
- a) Write a short note on Atterberg. 7
 - b) What is meant by tillage ? What is the objective of tillage ? 6
 - c) Explain construction features and working of Mould Board plough with neat labeled diagram. 7
3. Solve the following :
- a) Write a short note on force acting on tillage tool and their measurement. 7
 - b) Explain construction features of Disc harrow with neat labeled diagram. 7
 - c) Explain with neat sketch different types of hitches. 6
4. Solve the following :
- a) Write a short note on : 6
 - i) Rotavators
 - ii) Subsoiler
 - iii) Paddy puddler.
 - b) Explain various types of Mould Board plough. 7
 - c) Explain single axis and double axis hitch implements. 7

Set P



SECTION – II

5. Solve the following : **(4×5=20)**
- a) Explain construction and working of seed drill. **6**
 - b) The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data : **8**
 - i) No. of furrow openers = 10
 - ii) Spacing between furrow = 20 cm
 - iii) Diameter of drive wheel = 1.5 m
 - iv) rpm = 500
 - v) Seed collected = 20 kg
 - c) Write a short note on Rotary hoes. **6**
6. Solve the following :
- a) Explain construction and working principle of any one type of sprayer. **7**
 - b) Explain different types of mowers. **7**
 - c) Explain how to select Plant protection equipments. **6**
7. Solve the following :
- a) Explain different types Threshers in brief. **6**
 - b) Explain construction and working principle of Power Tiller operated reaper. **7**
 - c) Write a short note on covering devices of seed drill. **7**
-



SLR-TJ – 135

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

Set	Q
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) **Neat diagrams must be drawn whenever necessary.**
 - 4) **Make suitable assumptions, if necessary and mention them clearly.**
 - 5) **Figures to the right indicate full mark.**
 - 6) **Use of non-programmable single memory calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Rocking Sprayer is generally operated by
a) Operating lever b) Foot pedal c) External engine d) Tractor engine
- 2) 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 c) Sprayer d) Flame thrower
- 3) _____ transmit the reciprocating motion to the knife head of mower.
a) Pitman b) Differential c) Star wheel d) Crop divider
- 4) _____ is a tool which breaks the ground at greater depth, will break the hard pan and will not pulverize the surface soil as much as other tools.
a) Sub-Soiler b) Plough c) Harrow d) Rotavator
- 5) _____ is the main purpose of puddling.
a) To reduce leaching of water b) To reduce transpiration
c) To reduce evaporation d) None of the above
- 6) A perfect seeding gives
i) Correct amount of seed per unit area
ii) Correct depth at which seed is placed in the soil
iii) Correct spacing between row-to-row and plant-to-plant
a) only i b) only ii c) i and iii d) all of the above
- 7) Seed metering mechanism is mainly used for
a) Supporting the parts of seed drill b) Opening the furrows
c) Covering the soil on the seed d) Delivers the seeds at selected rate
- 8) Main function of Interculture equipment is
a) To destroy weed b) To supply water to the plants
c) Protect the plant from high heat of sun d) None of these

P.T.O.



- 9) Interculture equipments are
- | | | | |
|---------------|---------------|---------------|-----------------|
| 1) Cultivator | 2) Weeders | 3) Rotary hoe | 4) Thresher |
| a) only 1 | b) 1, 2 and 3 | c) only 2 | d) all of above |
- 10) The angle made by a disc of disc plough with the direction of motion is known as
- | | | | |
|---------------|-----------------|---------------|------------------|
| a) Tilt angle | b) Plough angle | c) Disc angle | d) None of these |
|---------------|-----------------|---------------|------------------|
- 11) 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 |
- 12) 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 |
- 13) Function of star wheel of reaper
- | | |
|----------------------------------|---|
| a) Cutting the crops | b) Guiding the crops towards the cutter bar |
| c) Provide supports to the crops | d) Blocking the crops |
- 14) Separating Sieves is used for
- | | |
|--------------------------------|--------------------------------|
| a) Separating chaff from grain | b) Rotating the winnowing unit |
| c) Providing cutting action | d) None of the above |
- 15) Stirrup pump sprayer is also called as
- | | |
|-------------------|---------------------|
| a) Foot sprayer | b) Knapsack sprayer |
| c) Bucket sprayer | d) Rocking Sprayer |
- 16) Duster are mostly used in arid region because
- | |
|--|
| a) Large amount of water is available |
| b) Very less amount of water is available |
| c) Large amount of power source is available |
| d) None of the above |
- 17) In Mould Board plough function of Gauge wheel is
- | | |
|--------------------------------------|--|
| a) To joint the jointer to the frame | b) To provide sharing action |
| c) To control depth of ploughing | d) To prevent weed to stick with share |
- 18) Single Action Disc harrow having
- | | |
|------------------------------------|--|
| a) Two gangs are placed end to end | b) Two gangs are placed one behind the other |
| c) There is no gang | d) Three gangs are placed one behind the other |
- 19) The function of Float of Cono weeder is
- | |
|---|
| a) To provide cutting action |
| b) To guide the operator |
| c) To prevent the unit from sinking into the soil |
| d) Uniform placement of seed |
- 20) The main advantages of using long handle weeder is
- | | |
|------------------------------|---------------------------|
| a) Less area of coverage | b) Cheaper cost of weeder |
| c) Less drudgery of operator | d) Tradition tool |



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

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- i) Answer **any two** questions from **each** Section.
 - ii) Figures to **right** indicate **full** mark.
 - iii) Make suitable assumption if necessary and state it **clearly**.

SECTION – I

2. Solve the following :
- a) Write a short note on Atterberg. 7
 - b) What is meant by tillage ? What is the objective of tillage ? 6
 - c) Explain construction features and working of Mould Board plough with neat labeled diagram. 7
3. Solve the following :
- a) Write a short note on force acting on tillage tool and their measurement. 7
 - b) Explain construction features of Disc harrow with neat labeled diagram. 7
 - c) Explain with neat sketch different types of hitches. 6
4. Solve the following :
- a) Write a short note on : 6
 - i) Rotavators
 - ii) Subsoiler
 - iii) Paddy puddler.
 - b) Explain various types of Mould Board plough. 7
 - c) Explain single axis and double axis hitch implements. 7

Set Q



SECTION – II

5. Solve the following :
- a) Explain construction and working of seed drill. 6
 - b) The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data : 8
 - i) No. of furrow openers = 10
 - ii) Spacing between furrow = 20 cm
 - iii) Diameter of drive wheel = 1.5 m
 - iv) rpm = 500
 - v) Seed collected = 20 kg
 - c) Write a short note on Rotary hoes. 6
6. Solve the following :
- a) Explain construction and working principle of any one type of sprayer. 7
 - b) Explain different types of mowers. 7
 - c) Explain how to select Plant protection equipments. 6
7. Solve the following :
- a) Explain different types Threshers in brief. 6
 - b) Explain construction and working principle of Power Tiller operated reaper. 7
 - c) Write a short note on covering devices of seed drill. 7
-



SLR-TJ – 135

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

Set	R
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) **Neat diagrams must be drawn whenever necessary.**
 - 4) **Make suitable assumptions, if necessary and mention them clearly.**
 - 5) **Figures to the right indicate full mark.**
 - 6) **Use of non-programmable single memory calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Duster are mostly used in arid region because
 - a) Large amount of water is available
 - b) Very less amount of water is available
 - c) Large amount of power source is available
 - d) None of the above
- 2) In Mould Board plough function of Gauge wheel is
 - a) To joint the jointer to the frame
 - b) To provide sharing action
 - c) To control depth of ploughing
 - d) To prevent weed to stick with share
- 3) Single Action Disc harrow having
 - a) Two gangs are placed end to end
 - b) Two gangs are placed one behind the other
 - c) There is no gang
 - d) Three gangs are placed one behind the other
- 4) The function of Float of Cono weeder is
 - a) To provide cutting action
 - b) To guide the operator
 - c) To prevent the unit from sinking into the soil
 - d) Uniform placement of seed
- 5) The main advantages of using long handle weeder is
 - a) Less area of coverage
 - b) Cheaper cost of weeder
 - c) Less drudgery of operator
 - d) Tradition tool
- 6) Rocking Sprayer is generally operated by
 - a) Operating lever
 - b) Foot pedal
 - c) External engine
 - d) Tractor engine
- 7) 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
 - c) Sprayer
 - d) Flame thrower

P.T.O.



- 8) _____ transmit the reciprocating motion to the knife head of mower.
a) Pitman b) Differential c) Star wheel d) Crop divider
- 9) _____ is a tool which breaks the ground at greater depth, will break the hard pan and will not pulverize the surface soil as much as other tools.
a) Sub-Soiler b) Plough c) Harrow d) Rotavator
- 10) _____ is the main purpose of puddling.
a) To reduce leaching of water b) To reduce transpiration
c) To reduce evaporation d) None of the above
- 11) A perfect seeding gives
i) Correct amount of seed per unit area
ii) Correct depth at which seed is placed in the soil
iii) Correct spacing between row-to-row and plant-to-plant
a) only i b) only ii c) i and iii d) all of the above
- 12) Seed metering mechanism is mainly used for
a) Supporting the parts of seed drill b) Opening the furrows
c) Covering the soil on the seed d) Delivers the seeds at selected rate
- 13) Main function of Interculture equipment is
a) To destroy weed b) To supply water to the plants
c) Protect the plant from high heat of sun d) None of these
- 14) Interculture equipments are
1) Cultivator 2) Weeders 3) Rotary hoe 4) Thresher
a) only 1 b) 1, 2 and 3 c) only 2 d) all of above
- 15) The angle made by a disc of disc plough with the direction of motion is known as
a) Tilt angle b) Plough angle c) Disc angle d) None of these
- 16) 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
- 17) 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
- 18) Function of star wheel of reaper
a) Cutting the crops b) Guiding the crops towards the cutter bar
c) Provide supports to the crops d) Blocking the crops
- 19) Separating Sieves is used for
a) Separating chaff from grain b) Rotating the winnowing unit
c) Providing cutting action d) None of the above
- 20) Stirrup pump sprayer is also called as
a) Foot sprayer b) Knapsack sprayer
c) Bucket sprayer d) Rocking Sprayer



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

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- i) Answer **any two** questions from **each** Section.
 - ii) Figures to **right** indicate **full** mark.
 - iii) Make suitable assumption if necessary and state it **clearly**.

SECTION – I

2. Solve the following :
- a) Write a short note on Atterberg. 7
 - b) What is meant by tillage ? What is the objective of tillage ? 6
 - c) Explain construction features and working of Mould Board plough with neat labeled diagram. 7
3. Solve the following :
- a) Write a short note on force acting on tillage tool and their measurement. 7
 - b) Explain construction features of Disc harrow with neat labeled diagram. 7
 - c) Explain with neat sketch different types of hitches. 6
4. Solve the following :
- a) Write a short note on : 6
 - i) Rotavators
 - ii) Subsoiler
 - iii) Paddy puddler.
 - b) Explain various types of Mould Board plough. 7
 - c) Explain single axis and double axis hitch implements. 7

Set R



SECTION – II

5. Solve the following :
- a) Explain construction and working of seed drill. 6
 - b) The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data : 8
 - i) No. of furrow openers = 10
 - ii) Spacing between furrow = 20 cm
 - iii) Diameter of drive wheel = 1.5 m
 - iv) rpm = 500
 - v) Seed collected = 20 kg
 - c) Write a short note on Rotary hoes. 6
6. Solve the following :
- a) Explain construction and working principle of any one type of sprayer. 7
 - b) Explain different types of mowers. 7
 - c) Explain how to select Plant protection equipments. 6
7. Solve the following :
- a) Explain different types Threshers in brief. 6
 - b) Explain construction and working principle of Power Tiller operated reaper. 7
 - c) Write a short note on covering devices of seed drill. 7
-



SLR-TJ – 135

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

Set	S
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) **Neat diagrams must be drawn whenever necessary.**
 - 4) **Make suitable assumptions, if necessary and mention them clearly.**
 - 5) **Figures to the right indicate full mark.**
 - 6) **Use of non-programmable single memory calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) 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
- 2) 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
- 3) Function of star wheel of reaper
 - a) Cutting the crops
 - b) Guiding the crops towards the cutter bar
 - c) Provide supports to the crops
 - d) Blocking the crops
- 4) Separating Sieves is used for
 - a) Separating chaff from grain
 - b) Rotating the winnowing unit
 - c) Providing cutting action
 - d) None of the above
- 5) Stirrup pump sprayer is also called as
 - a) Foot sprayer
 - b) Knapsack sprayer
 - c) Bucket sprayer
 - d) Rocking Sprayer
- 6) Duster are mostly used in arid region because
 - a) Large amount of water is available
 - b) Very less amount of water is available
 - c) Large amount of power source is available
 - d) None of the above

P.T.O.



- 7) In Mould Board plough function of Gauge wheel is
a) To joint the jointer to the frame b) To provide sharing action
c) To control depth of ploughing d) To prevent weed to stick with share
- 8) Single Action Disc harrow having
a) Two gangs are placed end to end b) Two gangs are placed one behind the other
c) There is no gang d) Three gangs are placed one behind the other
- 9) The function of Float of Cono weeder is
a) To provide cutting action
b) To guide the operator
c) To prevent the unit from sinking into the soil
d) Uniform placement of seed
- 10) The main advantages of using long handle weeder is
a) Less area of coverage b) Cheaper cost of weeder
c) Less drudgery of operator d) Tradition tool
- 11) Rocking Sprayer is generally operated by
a) Operating lever b) Foot pedal c) External engine d) Tractor engine
- 12) 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 c) Sprayer d) Flame thrower
- 13) _____ transmit the reciprocating motion to the knife head of mower.
a) Pitman b) Differential c) Star wheel d) Crop divider
- 14) _____ is a tool which breaks the ground at greater depth, will break the hard pan and will not pulverize the surface soil as much as other tools.
a) Sub-Soiler b) Plough c) Harrow d) Rotavator
- 15) _____ is the main purpose of puddling.
a) To reduce leaching of water b) To reduce transpiration
c) To reduce evaporation d) None of the above
- 16) A perfect seeding gives
i) Correct amount of seed per unit area
ii) Correct depth at which seed is placed in the soil
iii) Correct spacing between row-to-row and plant-to-plant
a) only i b) only ii c) i and iii d) all of the above
- 17) Seed metering mechanism is mainly used for
a) Supporting the parts of seed drill b) Opening the furrows
c) Covering the soil on the seed d) Delivers the seeds at selected rate
- 18) Main function of Interculture equipment is
a) To destroy weed b) To supply water to the plants
c) Protect the plant from high heat of sun d) None of these
- 19) Interculture equipments are
1) Cultivator 2) Weeders 3) Rotary hoe 4) Thresher
a) only 1 b) 1, 2 and 3 c) only 2 d) all of above
- 20) The angle made by a disc of disc plough with the direction of motion is known as
a) Tilt angle b) Plough angle c) Disc angle d) None of these



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

**B.E. (Part – II) (Mechanical) Examination, 2017
AGRO MACHINE ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017

Marks : 80

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- i) Answer **any two** questions from **each** Section.
 - ii) Figures to **right** indicate **full** mark.
 - iii) Make suitable assumption if necessary and state it **clearly**.

SECTION – I

2. Solve the following :
- a) Write a short note on Atterberg. 7
 - b) What is meant by tillage ? What is the objective of tillage ? 6
 - c) Explain construction features and working of Mould Board plough with neat labeled diagram. 7
3. Solve the following :
- a) Write a short note on force acting on tillage tool and their measurement. 7
 - b) Explain construction features of Disc harrow with neat labeled diagram. 7
 - c) Explain with neat sketch different types of hitches. 6
4. Solve the following :
- a) Write a short note on : 6
 - i) Rotavators
 - ii) Subsoiler
 - iii) Paddy puddler.
 - b) Explain various types of Mould Board plough. 7
 - c) Explain single axis and double axis hitch implements. 7

Set S



SECTION – II

5. Solve the following :
- a) Explain construction and working of seed drill. 6
 - b) The following results are obtained while calibrating a seed drill. Calculate seed rate per hectare. Given data : 8
 - i) No. of furrow openers = 10
 - ii) Spacing between furrow = 20 cm
 - iii) Diameter of drive wheel = 1.5 m
 - iv) rpm = 500
 - v) Seed collected = 20 kg
 - c) Write a short note on Rotary hoes. 6
6. Solve the following :
- a) Explain construction and working principle of any one type of sprayer. 7
 - b) Explain different types of mowers. 7
 - c) Explain how to select Plant protection equipments. 6
7. Solve the following :
- a) Explain different types Threshers in brief. 6
 - b) Explain construction and working principle of Power Tiller operated reaper. 7
 - c) Write a short note on covering devices of seed drill. 7
-



SLR-TJ – 136

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

Set

P

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) Assume suitable data **whenever** necessary and state it **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer.

(20×1=20)

- 1) Which of the following is a thermosetting material ?
 - a) polyester
 - b) polyethylene
 - c) polypropylene
 - d) cellulose
- 2) Which of the following moulding method is used to make long piece of constant cross section ?
 - a) casting
 - b) injection moulding
 - c) compression moulding
 - d) extrusion
- 3) Which of the following moulding method is used to make a plastic material garden pipe (for water supply) of long length and constant cross section ?
 - a) casting
 - b) injection moulding
 - c) compression moulding
 - d) extrusion
- 4) Which gas is used commonly in hot gas welding ?
 - a) hot air
 - b) inert gas
 - c) both a and b
 - d) none of above
- 5) Which of the following is a plastic additive ?
 - a) graphite
 - b) pigments
 - c) silver
 - d) none of these
- 6) In which of the following moulding method is used to make long hollow pipes ?
 - a) casting
 - b) injection moulding
 - c) compression moulding
 - d) extrusion moulding
- 7) Which of the welding process is used for thermoplastic ?
 - a) hot gas welding
 - b) induction heating
 - c) heated tool
 - d) all of the above
- 8) Polymers have very _____ thermal conductivity.
 - a) high
 - b) medium
 - c) low
 - d) very high

P.T.O.



- 9) 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) Equal d) None of the above
- 10) For the manufacturing of thick walled components of thermoset plastics which following method is used
a) casting b) injection moulding
c) compression moulding d) extrusion
- 11) The process of producing thin sheets by squeezing a thermoplastic material between revolving cylinders is known as
a) transfer moulding b) injection moulding
c) blow moulding d) calendaring
- 12) Which of the polymerization reaction is also called as chain polymerization ?
a) condensation polymerization b) addition polymerization
c) step polymerization d) none of the above
- 13) _____ are the materials added to plastics to raise the mechanical properties.
a) fillers b) plasticizers
c) rain post agent d) none of above
- 14) Water comes out as byproduct in _____ reaction.
a) condensation b) addition
c) ionic polymerization d) none of above
- 15) The plastic which can be moulded and remoulded repeatedly
a) thermosetting b) thermoplastic c) binders d) none of above
- 16) The moulding with metallic inserts is possible with
a) extrusion moulding b) transfer moulding
c) blow moulding d) none of above
- 17) Successful heated tool welding depends on the _____ of the heated tool surface.
a) temperature b) pressure c) a and b d) none of above
- 18) An example of biodegradable polymer is
a) PHBV b) PVC c) Polyethylene d) Polyacetylene
- 19) Polymers can be very _____ to chemicals.
a) resistant b) similar c) opposite d) none of above
- 20) Epoxy resin is the example of _____ plastic.
a) thermoplastic b) elastomer c) thermosetting d) none of the above
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Assume suitable data **whenever** necessary and state it **clearly**.
2) Attempt **any 3** questions from Q. 2, Q. 3, Q. 4, Q. 5 and 3 questions from Q. 6, Q. 7, Q. 8, Q. 9.

SECTION – I

- 2. a) Classify different types of plastics. 6
b) Explain comparison between addition polymerization and condensation polymerization. 7
- 3. a) Explain with neat sketch injection moulding process. 6
b) Classify different types of welding processes for plastics. Explain induction welding process with neat sketch. 7
- 4. a) Explain with neat sketch transfer mouldings. 6
b) What is principle of infrared welding ? Explain with neat sketch. 7
- 5. a) A product has to be designed for the assembly with a steel stool of weight 6 kg. The four leg support requires a plastic bottom support bush, the plastic bush has to be fitted to pipe leg of stool by 4 mm diameter full threaded slotted cheesehead screw. The pipe is 50 mm in diameter with flat support on ground. Use PolyVinyl Chloride with FOS 2, tensile strength 450 kg/mm² with shrinkage allowance 0.5% to 0.7%. 8

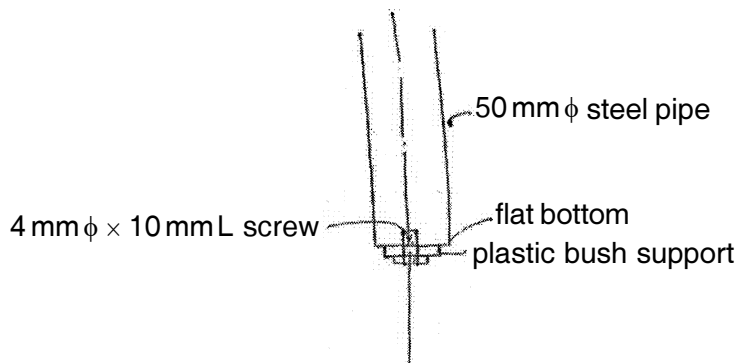


Figure 5(a)

- b) Discuss parameters to select shrinkage and wrapage allowance for plastics. 6

Set P



SECTION – II

6. a) Explain the methods of heating of the compression moulds. 6
- b) Design the parameters of the compression moulding for the half spherical product as shown in Fig. 6b. Also specify dimensions of Punch. Take : Bulk Factor = 3, Compression pressure = 2 KN/cm². 7
- (Volume of sphere = $4\pi r^3$, Surface area = $4\pi r^2$).

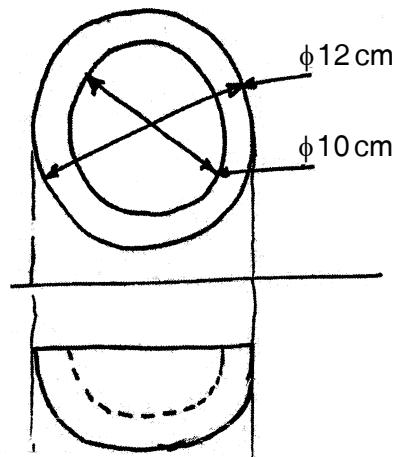


Figure 6b

7. a) Explain the different types of gates used in the injection moulding with neat sketches. 6
- b) What is significance of diameter of Pin in Ejector Mechanism ? Explain Pin Ejector system with neat sketch. 7
8. a) Find out the amount of water circulated per hour if it is entering at 30°C to the cooling system and leaving at 80°C. The total heat absorbed per minute is 325 KJ, and heat transfer efficiency constant is 30 and latent heat of fusion is 100 KJ/Kg. 5
- b) What is significance of effective cooling system ? 4
- c) Explain Bolster plate z-circuit cooling system used for injection moulds. 4
9. Attempt the following questions : 14
- a) Write a note on biodegradable polymers.
- b) What are the applications of plastics in transportation sector ?
- c) Explain the parameters required for calculation of cooling time and their relation.



SLR-TJ – 136

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) Assume suitable data **whenever** necessary and state it **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer. **(20×1=20)**

- 1) The moulding with metallic inserts is possible with
 - a) extrusion moulding
 - b) transfer moulding
 - c) blow moulding
 - d) none of above
- 2) Successful heated tool welding depends on the _____ of the heated tool surface.
 - a) temperature
 - b) pressure
 - c) a and b
 - d) none of above
- 3) An example of biodegradable polymer is
 - a) PHBV
 - b) PVC
 - c) Polyethylene
 - d) Polyacetylene
- 4) Polymers can be very _____ to chemicals.
 - a) resistant
 - b) similar
 - c) opposite
 - d) none of above
- 5) Epoxy resin is the example of _____ plastic.
 - a) thermoplastic
 - b) elastomer
 - c) thermosetting
 - d) none of the above
- 6) Which of the following is a thermosetting material ?
 - a) polyester
 - b) polyethylene
 - c) polypropylene
 - d) cellulose
- 7) Which of the following moulding method is used to make long piece of constant cross section ?
 - a) casting
 - b) injection moulding
 - c) compression moulding
 - d) extrusion
- 8) Which of the following moulding method is used to make a plastic material garden pipe (for water supply) of long length and constant cross section ?
 - a) casting
 - b) injection moulding
 - c) compression moulding
 - d) extrusion

P.T.O.



- 9) Which gas is used commonly in hot gas welding ?
a) hot air b) inert gas c) both a and b d) none of above
- 10) Which of the following is a plastic additive ?
a) graphite b) pigments c) silver d) none of these
- 11) In which of the following moulding method is used to make long hollow pipes ?
a) casting b) injection moulding
c) compression moulding d) extrusion moulding
- 12) Which of the welding process is used for thermoplastic ?
a) hot gas welding b) induction heating
c) heated tool d) all of the above
- 13) Polymers have very _____ thermal conductivity.
a) high b) medium c) low d) very high
- 14) 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) Equal d) None of the above
- 15) For the manufacturing of thick walled components of thermoset plastics which following method is used
a) casting b) injection moulding
c) compression moulding d) extrusion
- 16) The process of producing thin sheets by squeezing a thermoplastic material between revolving cylinders is known as
a) transfer moulding b) injection moulding
c) blow moulding d) calendaring
- 17) Which of the polymerization reaction is also called as chain polymerization ?
a) condensation polymerization b) addition polymerization
c) step polymerization d) none of the above
- 18) _____ are the materials added to plastics to raise the mechanical properties.
a) fillers b) plasticizers
c) rain post agent d) none of above
- 19) Water comes out as byproduct in _____ reaction.
a) condensation b) addition
c) ionic polymerization d) none of above
- 20) The plastic which can be moulded and remoulded repeatedly
a) thermosetting b) thermoplastic c) binders d) none of above
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Assume suitable data **whenever** necessary and state it **clearly**.
2) Attempt **any 3** questions from Q. 2, Q. 3, Q. 4, Q. 5 and 3 questions from Q. 6, Q. 7, Q. 8, Q. 9.

SECTION – I

- 2. a) Classify different types of plastics. 6
b) Explain comparison between addition polymerization and condensation polymerization. 7
- 3. a) Explain with neat sketch injection moulding process. 6
b) Classify different types of welding processes for plastics. Explain induction welding process with neat sketch. 7
- 4. a) Explain with neat sketch transfer mouldings. 6
b) What is principle of infrared welding ? Explain with neat sketch. 7
- 5. a) A product has to be designed for the assembly with a steel stool of weight 6 kg. The four leg support requires a plastic bottom support bush, the plastic bush has to be fitted to pipe leg of stool by 4 mm diameter full threaded slotted cheesehead screw. The pipe is 50 mm in diameter with flat support on ground. Use PolyVinyl Chloride with FOS 2, tensile strength 450 kg/mm² with shrinkage allowance 0.5% to 0.7%. 8

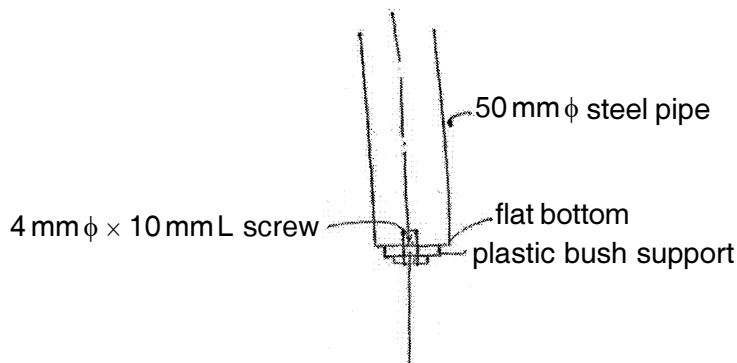


Figure 5(a)

- b) Discuss parameters to select shrinkage and wrapage allowance for plastics. 6

Set Q



SECTION – II

6. a) Explain the methods of heating of the compression moulds. 6
- b) Design the parameters of the compression moulding for the half spherical product as shown in Fig. 6b. Also specify dimensions of Punch. Take : Bulk Factor = 3, Compression pressure = 2 KN/cm². 7
- (Volume of sphere = $4 \pi r^3$, Surface area = $4 \pi r^2$).

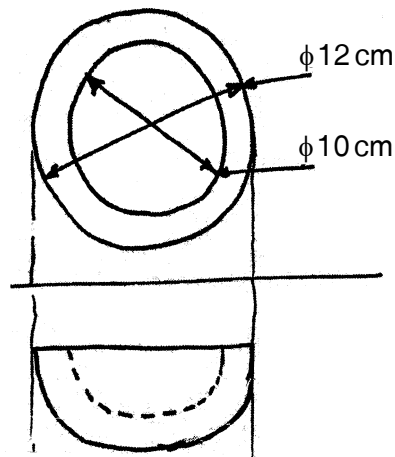


Figure 6b

7. a) Explain the different types of gates used in the injection moulding with neat sketches. 6
- b) What is significance of diameter of Pin in Ejector Mechanism ? Explain Pin Ejector system with neat sketch. 7
8. a) Find out the amount of water circulated per hour if it is entering at 30°C to the cooling system and leaving at 80°C. The total heat absorbed per minute is 325 KJ, and heat transfer efficiency constant is 30 and latent heat of fusion is 100 KJ/Kg. 5
- b) What is significance of effective cooling system ? 4
- c) Explain Bolster plate z-circuit cooling system used for injection moulds. 4
9. Attempt the following questions : 14
- a) Write a note on biodegradable polymers.
- b) What are the applications of plastics in transportation sector ?
- c) Explain the parameters required for calculation of cooling time and their relation.



SLR-TJ – 136

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

Set **R**

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) Assume suitable data **whenever** necessary and state it **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer. **(20×1=20)**
- 1) The process of producing thin sheets by squeezing a thermoplastic material between revolving cylinders is known as
 - a) transfer moulding
 - b) injection moulding
 - c) blow moulding
 - d) calendaring
 - 2) Which of the polymerization reaction is also called as chain polymerization ?
 - a) condensation polymerization
 - b) addition polymerization
 - c) step polymerization
 - d) none of the above
 - 3) _____ are the materials added to plastics to raise the mechanical properties.
 - a) fillers
 - b) plasticizers
 - c) rain post agent
 - d) none of above
 - 4) Water comes out as byproduct in _____ reaction.
 - a) condensation
 - b) addition
 - c) ionic polymerization
 - d) none of above
 - 5) The plastic which can be moulded and remoulded repeatedly
 - a) thermosetting
 - b) thermoplastic
 - c) binders
 - d) none of above
 - 6) The moulding with metallic inserts is possible with
 - a) extrusion moulding
 - b) transfer moulding
 - c) blow moulding
 - d) none of above
 - 7) Successful heated tool welding depends on the _____ of the heated tool surface.
 - a) temperature
 - b) pressure
 - c) a and b
 - d) none of above
 - 8) An example of biodegradable polymer is
 - a) PHBV
 - b) PVC
 - c) Polyethylene
 - d) Polyacetylene

P.T.O.



- 9) Polymers can be very _____ to chemicals.
a) resistant b) similar c) opposite d) none of above
- 10) Epoxy resin is the example of _____ plastic.
a) thermoplastic b) elastomer c) thermosetting d) none of the above
- 11) Which of the following is a thermosetting material ?
a) polyester b) polyethylene
c) polypropylene d) cellulose
- 12) Which of the following moulding method is used to make long piece of constant cross section ?
a) casting b) injection moulding
c) compression moulding d) extrusion
- 13) Which of the following moulding method is used to make a plastic material garden pipe (for water supply) of long length and constant cross section ?
a) casting b) injection moulding
c) compression moulding d) extrusion
- 14) Which gas is used commonly in hot gas welding ?
a) hot air b) inert gas c) both a and b d) none of above
- 15) Which of the following is a plastic additive ?
a) graphite b) pigments c) silver d) none of these
- 16) In which of the following moulding method is used to make long hollow pipes ?
a) casting b) injection moulding
c) compression moulding d) extrusion moulding
- 17) Which of the welding process is used for thermoplastic ?
a) hot gas welding b) induction heating
c) heated tool d) all of the above
- 18) Polymers have very _____ thermal conductivity.
a) high b) medium c) low d) very high
- 19) 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) Equal d) None of the above
- 20) For the manufacturing of thick walled components of thermoset plastics which following method is used
a) casting b) injection moulding
c) compression moulding d) extrusion
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Assume suitable data **whenever** necessary and state it **clearly**.
2) Attempt **any 3** questions from Q. 2, Q. 3, Q. 4, Q. 5 and 3 questions from Q. 6, Q. 7, Q. 8, Q. 9.

SECTION – I

- 2. a) Classify different types of plastics. 6
b) Explain comparison between addition polymerization and condensation polymerization. 7
- 3. a) Explain with neat sketch injection moulding process. 6
b) Classify different types of welding processes for plastics. Explain induction welding process with neat sketch. 7
- 4. a) Explain with neat sketch transfer mouldings. 6
b) What is principle of infrared welding ? Explain with neat sketch. 7
- 5. a) A product has to be designed for the assembly with a steel stool of weight 6 kg. The four leg support requires a plastic bottom support bush, the plastic bush has to be fitted to pipe leg of stool by 4 mm diameter full threaded slotted cheesehead screw. The pipe is 50 mm in diameter with flat support on ground. Use PolyVinyl Chloride with FOS 2, tensile strength 450 kg/mm² with shrinkage allowance 0.5% to 0.7%. 8

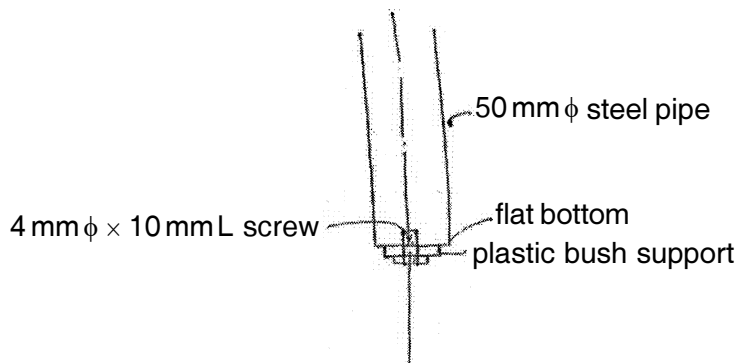


Figure 5(a)

- b) Discuss parameters to select shrinkage and wrapage allowance for plastics. 6

Set R



SECTION – II

6. a) Explain the methods of heating of the compression moulds. 6
- b) Design the parameters of the compression moulding for the half spherical product as shown in Fig. 6b. Also specify dimensions of Punch. Take : Bulk Factor = 3, Compression pressure = 2 KN/cm². 7
- (Volume of sphere = $4 \pi r^3$, Surface area = $4 \pi r^2$).

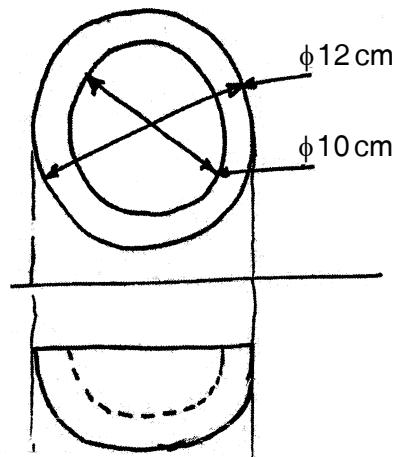


Figure 6b

7. a) Explain the different types of gates used in the injection moulding with neat sketches. 6
- b) What is significance of diameter of Pin in Ejector Mechanism ? Explain Pin Ejector system with neat sketch. 7
8. a) Find out the amount of water circulated per hour if it is entering at 30°C to the cooling system and leaving at 80°C. The total heat absorbed per minute is 325 KJ, and heat transfer efficiency constant is 30 and latent heat of fusion is 100 KJ/Kg. 5
- b) What is significance of effective cooling system ? 4
- c) Explain Bolster plate z-circuit cooling system used for injection moulds. 4
9. Attempt the following questions : 14
- a) Write a note on biodegradable polymers.
- b) What are the applications of plastics in transportation sector ?
- c) Explain the parameters required for calculation of cooling time and their relation.



SLR-TJ – 136

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

Set	S
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 100

- 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) Assume suitable data **whenever** necessary and state it **clearly**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer.

(20×1=20)

- 1) In which of the following moulding method is used to make long hollow pipes ?
a) casting
b) injection moulding
c) compression moulding
d) extrusion moulding
- 2) Which of the welding process is used for thermoplastic ?
a) hot gas welding
b) induction heating
c) heated tool
d) all of the above
- 3) Polymers have very _____ thermal conductivity.
a) high
b) medium
c) low
d) very high
- 4) 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) Equal
d) None of the above
- 5) For the manufacturing of thick walled components of thermoset plastics which following method is used
a) casting
b) injection moulding
c) compression moulding
d) extrusion
- 6) The process of producing thin sheets by squeezing a thermoplastic material between revolving cylinders is known as
a) transfer moulding
b) injection moulding
c) blow moulding
d) calendaring
- 7) Which of the polymerization reaction is also called as chain polymerization ?
a) condensation polymerization
b) addition polymerization
c) step polymerization
d) none of the above
- 8) _____ are the materials added to plastics to raise the mechanical properties.
a) fillers
b) plasticizers
c) rain post agent
d) none of above

P.T.O.



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

**B.E. (Mechanical) (Part – II) Examination, 2017
PLASTIC ENGINEERING (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Assume suitable data **whenever** necessary and state it **clearly**.
2) Attempt **any 3** questions from Q. 2, Q. 3, Q. 4, Q. 5 and 3 questions from Q. 6, Q. 7, Q. 8, Q. 9.

SECTION – I

- 2. a) Classify different types of plastics. 6
b) Explain comparison between addition polymerization and condensation polymerization. 7
- 3. a) Explain with neat sketch injection moulding process. 6
b) Classify different types of welding processes for plastics. Explain induction welding process with neat sketch. 7
- 4. a) Explain with neat sketch transfer mouldings. 6
b) What is principle of infrared welding ? Explain with neat sketch. 7
- 5. a) A product has to be designed for the assembly with a steel stool of weight 6 kg. The four leg support requires a plastic bottom support bush, the plastic bush has to be fitted to pipe leg of stool by 4 mm diameter full threaded slotted cheesehead screw. The pipe is 50 mm in diameter with flat support on ground. Use PolyVinyl Chloride with FOS 2, tensile strength 450 kg/mm² with shrinkage allowance 0.5% to 0.7%. 8

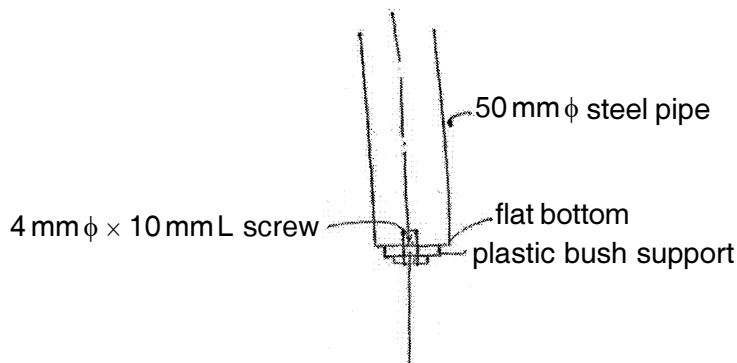


Figure 5(a)

- b) Discuss parameters to select shrinkage and wrapage allowance for plastics. 6

Set S



SECTION – II

6. a) Explain the methods of heating of the compression moulds. 6
- b) Design the parameters of the compression moulding for the half spherical product as shown in Fig. 6b. Also specify dimensions of Punch. Take : Bulk Factor = 3, Compression pressure = 2 KN/cm². 7
- (Volume of sphere = $4 \pi r^3$, Surface area = $4 \pi r^2$).

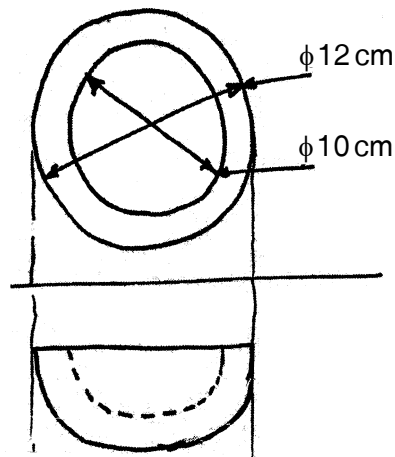


Figure 6b

7. a) Explain the different types of gates used in the injection moulding with neat sketches. 6
- b) What is significance of diameter of Pin in Ejector Mechanism ? Explain Pin Ejector system with neat sketch. 7
8. a) Find out the amount of water circulated per hour if it is entering at 30°C to the cooling system and leaving at 80°C. The total heat absorbed per minute is 325 KJ, and heat transfer efficiency constant is 30 and latent heat of fusion is 100 KJ/Kg. 5
- b) What is significance of effective cooling system ? 4
- c) Explain Bolster plate z-circuit cooling system used for injection moulds. 4
9. Attempt the following questions : 14
- a) Write a note on biodegradable polymers.
- b) What are the applications of plastics in transportation sector ?
- c) Explain the parameters required for calculation of cooling time and their relation.



SLR-TJ – 137

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

Set	P
-----	----------

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Answer **cannot** be changed once it is **marked**.
- 4) Don't forget to mention Que. Paper Set on the top of the page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) If two products are substitutes, their CPED will be
a) Positive b) Negative c) Zero d) Infinity
 - 2) If demand for a product is elastic,
a) $PED = 1$ b) $PED < 1$ c) $PED > 1$ d) $PED = 0$
 - 3) If supply curve shifts leftwards for the same demand curve, equilibrium quantity will
a) Decrease b) Remain same
c) Increase or decrease d) Increase
 - 4) If supply and demand both shift outward, but supply shifts outward more than demand, the equilibrium price _____
a) Will increase and quantity will increase
b) Will increase and quantity will decrease
c) Will decrease and quantity will decrease
d) Will decrease and quantity will increase
 - 5) Sum of all direct costs and direct expenses is known as
a) Total cost b) Production cost
c) Prime cost d) Marginal cost
 - 6) Total production is maximum when
a) $MP = 0$ b) MP is increasing
c) MP is decreasing d) MP is constant

P.T.O.



- 7) Cost that cannot be shown in a statement is known as
a) Opportunity cost b) Incremental cost
c) Direct cost d) Current cost
- 8) Which of the following is an example of variable cost of production ?
a) Cost of buildings b) Cost of product copy rights
c) Salaries of top level managers d) Salaries of temporary staff
- 9) Finding the current value from future sum is known as
a) Future worth method b) Present worth method
c) Rate of return method d) Annual equivalent method
- 10) Analysis which deals with determination of rate of interest is known as
a) Present worth analysis b) Rate of return analysis
c) Future worth analysis d) Annual cash flow analysis
- 11) Which of the following favours 'Buy' decision ?
a) High production volume b) Higher fixed cost
c) Lower fixed cost d) Large production capacity
- 12) The various production sectors are mutually
a) Interdependent b) Independent c) Exclusive d) Inclusive
- 13) Decision to 'Buy' is preferred
a) To the right of BEP b) To the left of BEP
c) Above BEP d) Below BEP
- 14) _____ is the intangible fixed asset of the company.
a) Plant and machinery b) Goodwill
c) Patent d) Royalty
- 15) Which of the following is unplanned maintenance ?
a) Preventive b) Predictive c) Breakdown d) Routine
- 16) C.B.M. stands for
a) Cost Based Maintenance b) Condition Based Monitoring
c) Condition Based Maintenance d) Cost Based Monitoring
- 17) For an asset
a) Economic life < useful life b) Useful life < economic life
c) Physical life < useful life d) Physical life < economic life
- 18) A new equipment to be purchased is known as a
a) Challenger b) Survivor c) Defender d) Competitor
- 19) CBA stands for
a) Critical Benefit Analysis b) Cost Break-Even Analysis
c) Cost Borrowing Analysis d) Cost Benefit Analysis
- 20) _____ is the first step in 'Risk Management'.
a) Classification of risks b) Risk Analysis
c) Risk Identification d) Finding cost of risks



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

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m

Marks : 80

- Instructions :** 1) Solve **any three** 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

2. a) Explain IED with examples. 8
b) Explain direct and indirect costs with suitable examples. 6
3. a) What do you mean by 'Consumer's Surplus' and 'Producer's Surplus' ?
Discuss with the help of graphs. 6
b) Explain Break Even Analysis with the help of a graph. 7
4. a) Explain in brief the following terms : 8
i) Fixed cost
ii) Variable cost
iii) Marginal cost
iv) Sunk cost
b) Explain future worth method. 5
5. a) What do you mean by "Equilibrium Price and Equilibrium Quantity" ? Explain
with the help of 'Demand- Supply' . Curve. 7
b) What do you mean by 'Sinking Fund' ?
Explain 'Uniform Series Compound Interest Formula' in the context of above. 6

Set P



SECTION – II

- 6. a) Explain the various factors affecting make or buy decision. **8**
 - b) State significance of maintenance management and explain its objectives. **6**
 - 7. a) Explain the various lives of an asset. **7**
 - b) What do you mean by design modification and why is it needed ? **6**
 - 8. a) Write a note on process and equipment selection. **6**
 - b) What do you mean by a project ? What are the essential features of a project ? **7**
 - 9. a) Explain graphically 'Cost of Maintenance'. **6**
 - b) Write a note on 'Cost Effectiveness Analysis'. **7**
-



SLR-TJ – 137

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

Set	Q
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Answer **cannot** be changed once it is **marked**.
4) **Don't forget to mention Que. Paper Set on the top of the page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) C.B.M. stands for
 - a) Cost Based Maintenance
 - b) Condition Based Monitoring
 - c) Condition Based Maintenance
 - d) Cost Based Monitoring
- 2) For an asset
 - a) Economic life < useful life
 - b) Useful life < economic life
 - c) Physical life < useful life
 - d) Physical life < economic life
- 3) A new equipment to be purchased is known as a
 - a) Challenger
 - b) Survivor
 - c) Defender
 - d) Competitor
- 4) CBA stands for
 - a) Critical Benefit Analysis
 - b) Cost Break-Even Analysis
 - c) Cost Borrowing Analysis
 - d) Cost Benefit Analysis
- 5) _____ is the first step in 'Risk Management'.
 - a) Classification of risks
 - b) Risk Analysis
 - c) Risk Identification
 - d) Finding cost of risks
- 6) If two products are substitutes, their CPED will be
 - a) Positive
 - b) Negative
 - c) Zero
 - d) Infinity
- 7) If demand for a product is elastic,
 - a) $PED = 1$
 - b) $PED < 1$
 - c) $PED > 1$
 - d) $PED = 0$
- 8) If supply curve shifts leftwards for the same demand curve, equilibrium quantity will
 - a) Decrease
 - b) Remain same
 - c) Increase or decrease
 - d) Increase

P.T.O.



- 9) If supply and demand both shift outward, but supply shifts outward more than demand, the equilibrium price _____
- a) Will increase and quantity will increase
 - b) Will increase and quantity will decrease
 - c) Will decrease and quantity will decrease
 - d) Will decrease and quantity will increase
- 10) Sum of all direct costs and direct expenses is known as
- a) Total cost
 - b) Production cost
 - c) Prime cost
 - d) Marginal cost
- 11) Total production is maximum when
- a) $MP = 0$
 - b) MP is increasing
 - c) MP is decreasing
 - d) MP is constant
- 12) Cost that cannot be shown in a statement is known as
- a) Opportunity cost
 - b) Incremental cost
 - c) Direct cost
 - d) Current cost
- 13) Which of the following is an example of variable cost of production ?
- a) Cost of buildings
 - b) Cost of product copy rights
 - c) Salaries of top level managers
 - d) Salaries of temporary staff
- 14) Finding the current value from future sum is known as
- a) Future worth method
 - b) Present worth method
 - c) Rate of return method
 - d) Annual equivalent method
- 15) Analysis which deals with determination of rate of interest is known as
- a) Present worth analysis
 - b) Rate of return analysis
 - c) Future worth analysis
 - d) Annual cash flow analysis
- 16) Which of the following favours 'Buy' decision ?
- a) High production volume
 - b) Higher fixed cost
 - c) Lower fixed cost
 - d) Large production capacity
- 17) The various production sectors are mutually
- a) Interdependent
 - b) Independent
 - c) Exclusive
 - d) Inclusive
- 18) Decision to 'Buy' is preferred
- a) To the right of BEP
 - b) To the left of BEP
 - c) Above BEP
 - d) Below BEP
- 19) _____ is the intangible fixed asset of the company.
- a) Plant and machinery
 - b) Goodwill
 - c) Patent
 - d) Royalty
- 20) Which of the following is unplanned maintenance ?
- a) Preventive
 - b) Predictive
 - c) Breakdown
 - d) Routine
-



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

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :** 1) Solve **any three** 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

2. a) Explain IED with examples. 8
b) Explain direct and indirect costs with suitable examples. 6
3. a) What do you mean by 'Consumer's Surplus' and 'Producer's Surplus' ?
Discuss with the help of graphs. 6
b) Explain Break Even Analysis with the help of a graph. 7
4. a) Explain in brief the following terms : 8
i) Fixed cost
ii) Variable cost
iii) Marginal cost
iv) Sunk cost
b) Explain future worth method. 5
5. a) What do you mean by "Equilibrium Price and Equilibrium Quantity" ? Explain
with the help of 'Demand- Supply' . Curve. 7
b) What do you mean by 'Sinking Fund' ?
Explain 'Uniform Series Compound Interest Formula' in the context of above. 6

Set Q



SECTION – II

- | | |
|---|---|
| 6. a) Explain the various factors affecting make or buy decision. | 8 |
| b) State significance of maintenance management and explain its objectives. | 6 |
| 7. a) Explain the various lives of an asset. | 7 |
| b) What do you mean by design modification and why is it needed ? | 6 |
| 8. a) Write a note on process and equipment selection. | 6 |
| b) What do you mean by a project ? What are the essential features of a project ? | 7 |
| 9. a) Explain graphically 'Cost of Maintenance'. | 6 |
| b) Write a note on 'Cost Effectiveness Analysis'. | 7 |
-



SLR-TJ – 137

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

Set	R
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Answer **cannot** be changed once it is **marked**.
- 4) Don't forget to mention Que. Paper Set on the top of the page.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) Which of the following favours 'Buy' decision ?
 - a) High production volume
 - b) Higher fixed cost
 - c) Lower fixed cost
 - d) Large production capacity
 - 2) The various production sectors are mutually
 - a) Interdependent
 - b) Independent
 - c) Exclusive
 - d) Inclusive
 - 3) Decision to 'Buy' is preferred
 - a) To the right of BEP
 - b) To the left of BEP
 - c) Above BEP
 - d) Below BEP
 - 4) _____ is the intangible fixed asset of the company.
 - a) Plant and machinery
 - b) Goodwill
 - c) Patent
 - d) Royalty
 - 5) Which of the following is unplanned maintenance ?
 - a) Preventive
 - b) Predictive
 - c) Breakdown
 - d) Routine
 - 6) C.B.M. stands for
 - a) Cost Based Maintenance
 - b) Condition Based Monitoring
 - c) Condition Based Maintenance
 - d) Cost Based Monitoring
 - 7) For an asset
 - a) Economic life < useful life
 - b) Useful life < economic life
 - c) Physical life < useful life
 - d) Physical life < economic life

P.T.O.



- 8) A new equipment to be purchased is known as a
a) Challenger b) Survivor c) Defender d) Competitor
- 9) CBA stands for
a) Critical Benefit Analysis b) Cost Break-Even Analysis
c) Cost Borrowing Analysis d) Cost Benefit Analysis
- 10) _____ is the first step in 'Risk Management'.
a) Classification of risks b) Risk Analysis
c) Risk Identification d) Finding cost of risks
- 11) If two products are substitutes, their CPED will be
a) Positive b) Negative c) Zero d) Infinity
- 12) If demand for a product is elastic,
a) $PED = 1$ b) $PED < 1$ c) $PED > 1$ d) $PED = 0$
- 13) If supply curve shifts leftwards for the same demand curve, equilibrium quantity will
a) Decrease b) Remain same
c) Increase or decrease d) Increase
- 14) If supply and demand both shift outward, but supply shifts outward more than demand, the equilibrium price _____
a) Will increase and quantity will increase
b) Will increase and quantity will decrease
c) Will decrease and quantity will decrease
d) Will decrease and quantity will increase
- 15) Sum of all direct costs and direct expenses is known as
a) Total cost b) Production cost
c) Prime cost d) Marginal cost
- 16) Total production is maximum when
a) $MP = 0$ b) MP is increasing
c) MP is decreasing d) MP is constant
- 17) Cost that cannot be shown in a statement is known as
a) Opportunity cost b) Incremental cost
c) Direct cost d) Current cost
- 18) Which of the following is an example of variable cost of production ?
a) Cost of buildings b) Cost of product copy rights
c) Salaries of top level managers d) Salaries of temporary staff
- 19) Finding the current value from future sum is known as
a) Future worth method b) Present worth method
c) Rate of return method d) Annual equivalent method
- 20) Analysis which deals with determination of rate of interest is known as
a) Present worth analysis b) Rate of return analysis
c) Future worth analysis d) Annual cash flow analysis



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

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :** 1) Solve **any three** 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

2. a) Explain IED with examples. 8
b) Explain direct and indirect costs with suitable examples. 6
3. a) What do you mean by 'Consumer's Surplus' and 'Producer's Surplus' ?
Discuss with the help of graphs. 6
b) Explain Break Even Analysis with the help of a graph. 7
4. a) Explain in brief the following terms : 8
i) Fixed cost
ii) Variable cost
iii) Marginal cost
iv) Sunk cost
b) Explain future worth method. 5
5. a) What do you mean by "Equilibrium Price and Equilibrium Quantity" ? Explain
with the help of 'Demand- Supply' . Curve. 7
b) What do you mean by 'Sinking Fund' ?
Explain 'Uniform Series Compound Interest Formula' in the context of above. 6

Set R



SECTION – II

- | | |
|---|---|
| 6. a) Explain the various factors affecting make or buy decision. | 8 |
| b) State significance of maintenance management and explain its objectives. | 6 |
| 7. a) Explain the various lives of an asset. | 7 |
| b) What do you mean by design modification and why is it needed ? | 6 |
| 8. a) Write a note on process and equipment selection. | 6 |
| b) What do you mean by a project ? What are the essential features of a project ? | 7 |
| 9. a) Explain graphically 'Cost of Maintenance'. | 6 |
| b) Write a note on 'Cost Effectiveness Analysis'. | 7 |
-



SLR-TJ – 137

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

Set	S
-----	---

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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) Answer **cannot** be changed once it is **marked**.
4) **Don't forget to mention Que. Paper Set on the top of the page.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer : **(20×1=20)**
- 1) Total production is maximum when
 - a) $MP = 0$
 - b) MP is increasing
 - c) MP is decreasing
 - d) MP is constant
 - 2) Cost that cannot be shown in a statement is known as
 - a) Opportunity cost
 - b) Incremental cost
 - c) Direct cost
 - d) Current cost
 - 3) Which of the following is an example of variable cost of production ?
 - a) Cost of buildings
 - b) Cost of product copy rights
 - c) Salaries of top level managers
 - d) Salaries of temporary staff
 - 4) Finding the current value from future sum is known as
 - a) Future worth method
 - b) Present worth method
 - c) Rate of return method
 - d) Annual equivalent method
 - 5) Analysis which deals with determination of rate of interest is known as
 - a) Present worth analysis
 - b) Rate of return analysis
 - c) Future worth analysis
 - d) Annual cash flow analysis
 - 6) Which of the following favours 'Buy' decision ?
 - a) High production volume
 - b) Higher fixed cost
 - c) Lower fixed cost
 - d) Large production capacity
 - 7) The various production sectors are mutually
 - a) Interdependent
 - b) Independent
 - c) Exclusive
 - d) Inclusive

P.T.O.



- 8) Decision to 'Buy' is preferred
a) To the right of BEP b) To the left of BEP
c) Above BEP d) Below BEP
- 9) _____ is the intangible fixed asset of the company.
a) Plant and machinery b) Goodwill
c) Patent d) Royalty
- 10) Which of the following is unplanned maintenance ?
a) Preventive b) Predictive c) Breakdown d) Routine
- 11) C.B.M. stands for
a) Cost Based Maintenance b) Condition Based Monitoring
c) Condition Based Maintenance d) Cost Based Monitoring
- 12) For an asset
a) Economic life < useful life b) Useful life < economic life
c) Physical life < useful life d) Physical life < economic life
- 13) A new equipment to be purchased is known as a
a) Challenger b) Survivor c) Defender d) Competitor
- 14) CBA stands for
a) Critical Benefit Analysis b) Cost Break-Even Analysis
c) Cost Borrowing Analysis d) Cost Benefit Analysis
- 15) _____ is the first step in 'Risk Management'.
a) Classification of risks b) Risk Analysis
c) Risk Identification d) Finding cost of risks
- 16) If two products are substitutes, their CPED will be
a) Positive b) Negative c) Zero d) Infinity
- 17) If demand for a product is elastic,
a) $PED = 1$ b) $PED < 1$ c) $PED > 1$ d) $PED = 0$
- 18) If supply curve shifts leftwards for the same demand curve, equilibrium quantity will
a) Decrease b) Remain same
c) Increase or decrease d) Increase
- 19) If supply and demand both shift outward, but supply shifts outward more than demand, the equilibrium price _____
a) Will increase and quantity will increase
b) Will increase and quantity will decrease
c) Will decrease and quantity will decrease
d) Will decrease and quantity will increase
- 20) Sum of all direct costs and direct expenses is known as
a) Total cost b) Production cost
c) Prime cost d) Marginal cost



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

**B.E. (Mechanical) (Part – II) Examination, 2017
ECONOMICS FOR ENGINEERS (Elective – II)**

Day and Date : Friday, 24-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- Instructions :** 1) Solve **any three** 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

2. a) Explain IED with examples. 8
b) Explain direct and indirect costs with suitable examples. 6
3. a) What do you mean by 'Consumer's Surplus' and 'Producer's Surplus' ?
Discuss with the help of graphs. 6
b) Explain Break Even Analysis with the help of a graph. 7
4. a) Explain in brief the following terms : 8
i) Fixed cost
ii) Variable cost
iii) Marginal cost
iv) Sunk cost
b) Explain future worth method. 5
5. a) What do you mean by "Equilibrium Price and Equilibrium Quantity" ? Explain
with the help of 'Demand- Supply' . Curve. 7
b) What do you mean by 'Sinking Fund' ?
Explain 'Uniform Series Compound Interest Formula' in the context of above. 6

Set S



SECTION – II

- | | |
|---|---|
| 6. a) Explain the various factors affecting make or buy decision. | 8 |
| b) State significance of maintenance management and explain its objectives. | 6 |
| 7. a) Explain the various lives of an asset. | 7 |
| b) What do you mean by design modification and why is it needed ? | 6 |
| 8. a) Write a note on process and equipment selection. | 6 |
| b) What do you mean by a project ? What are the essential features of a project ? | 7 |
| 9. a) Explain graphically 'Cost of Maintenance'. | 6 |
| b) Write a note on 'Cost Effectiveness Analysis'. | 7 |
-



SLR-TJ – 138

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

Set	P
-----	----------

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Select the correct relation from given
 - a) Average load = (load factor) × (max. demand)
 - b) Max. demand = (demand factor) × (utilization factor)
 - c) Max. demand = connected load
 - d) Capacity factor = (utilization factor) × (maximum demand)
- 2) Power production economy is always high when the power plant is
 - a) Totally unloaded
 - b) Totally loaded
 - c) 75% loaded
 - d) 90% loaded
- 3) In an air storage plant, during the off-peak hours
 - a) The compressor works
 - b) The turbine only works
 - c) Air is emptied from reservoir
 - d) Respective grids are interconnected
- 4) Quick response indicates that plant is
 - a) Interfacing controlled by remotely
 - b) Peak load plants
 - c) Variable response
 - d) Slow response
- 5) kVA unite describes the _____ capacity.
 - a) Current
 - b) Electrical
 - c) Magnetic
 - d) Transformer
- 6) The pumped storage plant essentially consists of a
 - a) Single basin
 - b) Head and a tail reservoir pond
 - c) Bottom small reservoir
 - d) Pressure amplifier
- 7) To make best possible use of generating capacities the power stations are
 - a) Isolated
 - b) Demarked into straight boundaries
 - c) Interconnected
 - d) Interminantly earthed
- 8) In Hopkinson demand rate or two-part tariff the demand rate or fixed charges are
 - a) Independent upon energy consumed
 - b) Not required
 - c) Independent on consumer demand
 - d) Depend upon the max. demand of the consumer

P.T.O.



- 9) Peak load plants essentially should have a
- Variable response
 - Slow response
 - Interfacing which can only be remotely controlled
 - Quick response
- 10) Declination angle has maximum value
- $\sqrt{23.5^\circ}$
 - 27.5°
 - 23.5°
 - -66.5°
- 11) If ρ is density, then wind power is always proportional to
- ρ^2
 - $1/\rho^2$
 - ρ
 - $\rho^{1/2}$
- 12) The objective of energy management aims in
- Prevention of pollution
 - Pollution management
 - Prevent the energy use
 - Regulating the pollution levels
- 13) Energy conservation always guides to
- To improve public transport system
 - To encourage two-wheeler industry
 - To use an individual transport system
 - All of the above
- 14) _____ drag to lift ratio is considered as a good airfoil.
- Low
 - Medium
 - Zero
 - High
- 15) The Energy Conservation Act, 2001 requires designated consumers to
- Appoint/designate certified energy manager
 - Conduct an energy audit through an accredited energy auditor
 - Comply with energy consumption norms and standards
 - All of the above
- 16) Energy management emphasizes on
- Controlling the supply and consumption of energy
 - Maximizing productivity and comfort levels and minimize energy costs and pollution with effective use of energy
 - Both a) and b)
 - None of the above
- 17) Lift Forces Act on rotor blade _____ to the air stream.
- Parallel
 - Inline
 - Perpendicular
 - Inclined to 60°
- 18) The purpose of all types of solar collector is to convert available solar energy in
- Electricity
 - Thermal energy
 - Instrument working
 - Both electrical and thermal energy
- 19) In a wind turbine, the speed of the shaft to the generator has to be
- Decreased
 - Increased
 - Maintained constant
 - Cyclically reversed in direction
- 20) Tidal energy source mainly makes use of
- Kinetic energy of water
 - Potential energy of water
 - Both a) and b)
 - None of the above



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

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- 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**.

SECTION – I

2. a) Describe the electric energy growth in India. **7**
b) Describe load factors and effect of variable load on power plant design. **7**
c) The maximum (peak) load on a thermal power plant to 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. Determine :
a) Average load on power station, b) Energy generated per year,
c) Demand factor d) Diversity factor. **6**
3. a) Describe future energy demands in India. **7**
b) Explain the economic analysis of power plant in terms of selection and type of generation. **7**
c) Describe in detail the cost of electric energy. **3**
d) Illustrate the significant points on performance characteristics of power plants. **3**
4. Write short note on the following :
a) Generator and exciter short circuit and its limiting methods. **4**
b) Power factor and its measurement. **4**
c) Requirement of peak load plant. **4**
d) Starters, relays and power transformer. **4**
e) Tariff methods. **4**

Set P



SECTION – II

5. a) Describe solar radiation outside the earth's atmosphere and at the earth's surface. 7
b) Describe the performance analysis of liquid flat plate collector. 7
c) Describe the following terminology :
a) Latitude, b) Declination angle, c) Hour angle, d) Altitude angle,
e) Azimuth angle and f) Incident angle. 6
6. a) Give detailed classification of WEC systems. 4
b) Introduce open and closed ocean thermal systems. 3
c) Brief on energy conservation legislation. 3
d) Describe in detail energy audit of Air Conditioning System. 3
e) Derive the relation for maximum power efficiency in a wind turbine. 7
7. Write short note on the following :
a) Types of geothermal resources. 4
b) Wave energy conversion devices. 4
c) Energy conservation planning. 4
d) Energy audit instruments. 4
e) Energy conservation in house hold and commercial sectors. 4
-



SLR-TJ – 138

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

Set	Q
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) Energy management emphasizes on
 - a) Controlling the supply and consumption of energy
 - b) Maximizing productivity and comfort levels and minimize energy costs and pollution with effective use of energy
 - c) Both a) and b)
 - d) None of the above
- 2) Lift Forces Act on rotor blade _____ to the air stream.
 - a) Parallel
 - b) Inline
 - c) Perpendicular
 - d) Inclined to 60°
- 3) The purpose of all types of solar collector is to convert available solar energy in
 - a) Electricity
 - b) Thermal energy
 - c) Instrument working
 - d) Both electrical and thermal energy
- 4) In a wind turbine, the speed of the shaft to the generator has to be
 - a) Decreased
 - b) Increased
 - c) Maintained constant
 - d) Cyclically reversed in direction
- 5) Tidal energy source mainly makes use of
 - a) Kinetic energy of water
 - b) Potential energy of water
 - c) Both a) and b)
 - d) None of the above
- 6) Select the correct relation from given
 - a) Average load = (load factor) × (max. demand)
 - b) Max. demand = (demand factor) × (utilization factor)
 - c) Max. demand = connected load
 - d) Capacity factor = (utilization factor) × (maximum demand)
- 7) Power production economy is always high when the power plant is
 - a) Totally unloaded
 - b) Totally loaded
 - c) 75% loaded
 - d) 90% loaded

P.T.O.



- 8) In an air storage plant, during the off-peak hours
a) The compressor works b) The turbine only works
c) Air is emptied from reservoir d) Respective grids are interconnected
- 9) Quick response indicates that plant is
a) Interfacing controlled by remotely b) Peak load plants
c) Variable response d) Slow response
- 10) kVA unite describes the _____ capacity.
a) Current b) Electrical c) Magnetic d) Transformer
- 11) The pumped storage plant essentially consists of a
a) Single basin b) Head and a tail reservoir pond
c) Bottom small reservoir d) Pressure amplifier
- 12) To make best possible use of generating capacities the power stations are
a) Isolated b) Demarked into straight boundaries
c) Interconnected d) Interminantly earthed
- 13) In Hopkinson demand rate or two-part tariff the demand rate or fixed charges are
a) Independent upon energy consumed
b) Not required
c) Independent on consumer demand
d) Depend upon the max. demand of the consumer
- 14) Peak load plants essentially should have a
a) Variable response
b) Slow response
c) Interfacing which can only be remotely controlled
d) Quick response
- 15) Declination angle has maximum value
a) $\sqrt{23.5^\circ}$ b) 27.5° c) 23.5° d) -66.5°
- 16) If ρ is density, then wind power is always proportional to
a) ρ^2 b) $1/\rho^2$ c) ρ d) $\rho^{1/2}$
- 17) The objective of energy management aims in
a) Prevention of pollution b) Pollution management
c) Prevent the energy use d) Regulating the pollution levels
- 18) Energy conservation always guides to
a) To improve public transport system b) To encourage two-wheeler industry
c) To use an individual transport system d) All of the above
- 19) _____ drag to lift ratio is considered as a good airfoil.
a) Low b) Medium c) Zero d) High
- 20) The Energy Conservation Act, 2001 requires designated consumers to
a) Appoint/designate certified energy manager
b) Conduct an energy audit through an accredited energy auditor
c) Comply with energy consumption norms and standards
d) All of the above



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

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- 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**.

SECTION – I

2. a) Describe the electric energy growth in India. **7**
b) Describe load factors and effect of variable load on power plant design. **7**
c) The maximum (peak) load on a thermal power plant to 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. Determine :
a) Average load on power station, b) Energy generated per year,
c) Demand factor d) Diversity factor. **6**
3. a) Describe future energy demands in India. **7**
b) Explain the economic analysis of power plant in terms of selection and type of generation. **7**
c) Describe in detail the cost of electric energy. **3**
d) Illustrate the significant points on performance characteristics of power plants. **3**
4. Write short note on the following :
a) Generator and exciter short circuit and its limiting methods. **4**
b) Power factor and its measurement. **4**
c) Requirement of peak load plant. **4**
d) Starters, relays and power transformer. **4**
e) Tariff methods. **4**

Set Q



SECTION – II

5. a) Describe solar radiation outside the earth's atmosphere and at the earth's surface. 7
b) Describe the performance analysis of liquid flat plate collector. 7
c) Describe the following terminology :
a) Latitude, b) Declination angle, c) Hour angle, d) Altitude angle,
e) Azimuth angle and f) Incident angle. 6
6. a) Give detailed classification of WEC systems. 4
b) Introduce open and closed ocean thermal systems. 3
c) Brief on energy conservation legislation. 3
d) Describe in detail energy audit of Air Conditioning System. 3
e) Derive the relation for maximum power efficiency in a wind turbine. 7
7. Write short note on the following :
a) Types of geothermal resources. 4
b) Wave energy conversion devices. 4
c) Energy conservation planning. 4
d) Energy audit instruments. 4
e) Energy conservation in house hold and commercial sectors. 4
-



SLR-TJ – 138

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

Set	R
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) If ρ is density, then wind power is always proportional to
a) ρ^2 b) $1/\rho^2$ c) ρ d) $\rho^{1/2}$
- 2) The objective of energy management aims in
a) Prevention of pollution b) Pollution management
c) Prevent the energy use d) Regulating the pollution levels
- 3) Energy conservation always guides to
a) To improve public transport system b) To encourage two-wheeler industry
c) To use an individual transport system d) All of the above
- 4) _____ drag to lift ratio is considered as a good airfoil.
a) Low b) Medium c) Zero d) High
- 5) The Energy Conservation Act, 2001 requires designated consumers to
a) Appoint/designate certified energy manager
b) Conduct an energy audit through an accredited energy auditor
c) Comply with energy consumption norms and standards
d) All of the above
- 6) Energy management emphasizes on
a) Controlling the supply and consumption of energy
b) Maximizing productivity and comfort levels and minimize energy costs and pollution with effective use of energy
c) Both a) and b)
d) None of the above
- 7) Lift Forces Act on rotor blade _____ to the air stream.
a) Parallel b) Inline c) Perpendicular d) Inclined to 60°

P.T.O.



- 8) The purpose of all types of solar collector is to convert available solar energy in
a) Electricity
b) Thermal energy
c) Instrument working
d) Both electrical and thermal energy
- 9) In a wind turbine, the speed of the shaft to the generator has to be
a) Decreased
b) Increased
c) Maintained constant
d) Cyclically reversed in direction
- 10) Tidal energy source mainly makes use of
a) Kinetic energy of water
b) Potential energy of water
c) Both a) and b)
d) None of the above
- 11) Select the correct relation from given
a) Average load = (load factor) × (max. demand)
b) Max. demand = (demand factor) × (utilization factor)
c) Max. demand = connected load
d) Capacity factor = (utilization factor) × (maximum demand)
- 12) Power production economy is always high when the power plant is
a) Totally unloaded
b) Totally loaded
c) 75% loaded
d) 90% loaded
- 13) In an air storage plant, during the off-peak hours
a) The compressor works
b) The turbine only works
c) Air is emptied from reservoir
d) Respective grids are interconnected
- 14) Quick response indicates that plant is
a) Interfacing controlled by remotely
b) Peak load plants
c) Variable response
d) Slow response
- 15) kVA unite describes the _____ capacity.
a) Current
b) Electrical
c) Magnetic
d) Transformer
- 16) The pumped storage plant essentially consists of a
a) Single basin
b) Head and a tail reservoir pond
c) Bottom small reservoir
d) Pressure amplifier
- 17) To make best possible use of generating capacities the power stations are
a) Isolated
b) Demarked into straight boundaries
c) Interconnected
d) Interminantly earthed
- 18) In Hopkinson demand rate or two-part tariff the demand rate or fixed charges are
a) Independent upon energy consumed
b) Not required
c) Independent on consumer demand
d) Depend upon the max. demand of the consumer
- 19) Peak load plants essentially should have a
a) Variable response
b) Slow response
c) Interfacing which can only be remotely controlled
d) Quick response
- 20) Declination angle has maximum value
a) $\sqrt{23.5^\circ}$
b) 27.5°
c) 23.5°
d) -66.5°



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

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- 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**.

SECTION – I

2. a) Describe the electric energy growth in India. **7**
b) Describe load factors and effect of variable load on power plant design. **7**
c) The maximum (peak) load on a thermal power plant to 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. Determine :
a) Average load on power station, b) Energy generated per year,
c) Demand factor d) Diversity factor. **6**
3. a) Describe future energy demands in India. **7**
b) Explain the economic analysis of power plant in terms of selection and type of generation. **7**
c) Describe in detail the cost of electric energy. **3**
d) Illustrate the significant points on performance characteristics of power plants. **3**
4. Write short note on the following :
a) Generator and exciter short circuit and its limiting methods. **4**
b) Power factor and its measurement. **4**
c) Requirement of peak load plant. **4**
d) Starters, relays and power transformer. **4**
e) Tariff methods. **4**

Set R



SECTION – II

5. a) Describe solar radiation outside the earth's atmosphere and at the earth's surface. 7
b) Describe the performance analysis of liquid flat plate collector. 7
c) Describe the following terminology :
a) Latitude, b) Declination angle, c) Hour angle, d) Altitude angle,
e) Azimuth angle and f) Incident angle. 6
6. a) Give detailed classification of WEC systems. 4
b) Introduce open and closed ocean thermal systems. 3
c) Brief on energy conservation legislation. 3
d) Describe in detail energy audit of Air Conditioning System. 3
e) Derive the relation for maximum power efficiency in a wind turbine. 7
7. Write short note on the following :
a) Types of geothermal resources. 4
b) Wave energy conversion devices. 4
c) Energy conservation planning. 4
d) Energy audit instruments. 4
e) Energy conservation in house hold and commercial sectors. 4
-



SLR-TJ – 138

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

Set	S
-----	---

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer :

(20×1=20)

- 1) The pumped storage plant essentially consists of a
 - a) Single basin
 - b) Head and a tail reservoir pond
 - c) Bottom small reservoir
 - d) Pressure amplifier
- 2) To make best possible use of generating capacities the power stations are
 - a) Isolated
 - b) Demarked into straight boundaries
 - c) Interconnected
 - d) Interminantly earthed
- 3) In Hopkinson demand rate or two-part tariff the demand rate or fixed charges are
 - a) Independent upon energy consumed
 - b) Not required
 - c) Independent on consumer demand
 - d) Depend upon the max. demand of the consumer
- 4) Peak load plants essentially should have a
 - a) Variable response
 - b) Slow response
 - c) Interfacing which can only be remotely controlled
 - d) Quick response
- 5) Declination angle has maximum value
 - a) $\sqrt{23.5^\circ}$
 - b) 27.5°
 - c) 23.5°
 - d) -66.5°
- 6) If ρ is density, then wind power is always proportional to
 - a) ρ^2
 - b) $1/\rho^2$
 - c) ρ
 - d) $\rho^{1/2}$
- 7) The objective of energy management aims in
 - a) Prevention of pollution
 - b) Pollution management
 - c) Prevent the energy use
 - d) Regulating the pollution levels

P.T.O.



- 8) Energy conservation always guides to
a) To improve public transport system b) To encourage two-wheeler industry
c) To use an individual transport system d) All of the above
- 9) _____ drag to lift ratio is considered as a good airfoil.
a) Low b) Medium c) Zero d) High
- 10) The Energy Conservation Act, 2001 requires designated consumers to
a) Appoint/designate certified energy manager
b) Conduct an energy audit through an accredited energy auditor
c) Comply with energy consumption norms and standards
d) All of the above
- 11) Energy management emphasizes on
a) Controlling the supply and consumption of energy
b) Maximizing productivity and comfort levels and minimize energy costs and pollution with effective use of energy
c) Both a) and b)
d) None of the above
- 12) Lift Forces Act on rotor blade _____ to the air stream.
a) Parallel b) Inline c) Perpendicular d) Inclined to 60°
- 13) The purpose of all types of solar collector is to convert available solar energy in
a) Electricity b) Thermal energy
c) Instrument working d) Both electrical and thermal energy
- 14) In a wind turbine, the speed of the shaft to the generator has to be
a) Decreased b) Increased
c) Maintained constant d) Cyclically reversed in direction
- 15) Tidal energy source mainly makes use of
a) Kinetic energy of water b) Potential energy of water
c) Both a) and b) d) None of the above
- 16) Select the correct relation from given
a) Average load = (load factor) × (max. demand)
b) Max. demand = (demand factor) × (utilization factor)
c) Max. demand = connected load
d) Capacity factor = (utilization factor) × (maximum demand)
- 17) Power production economy is always high when the power plant is
a) Totally unloaded b) Totally loaded c) 75% loaded d) 90% loaded
- 18) In an air storage plant, during the off-peak hours
a) The compressor works b) The turbine only works
c) Air is emptied from reservoir d) Respective grids are interconnected
- 19) Quick response indicates that plant is
a) Interfacing controlled by remotely b) Peak load plants
c) Variable response d) Slow response
- 20) kVA unite describes the _____ capacity.
a) Current b) Electrical c) Magnetic d) Transformer



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

**B.E. (Part – II) (Mechanical) Examination, 2017
POWER PLANT AND ENERGY ENGINEERING**

Day and Date : Saturday, 25-11-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

- 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**.

SECTION – I

2. a) Describe the electric energy growth in India. **7**
b) Describe load factors and effect of variable load on power plant design. **7**
c) The maximum (peak) load on a thermal power plant to 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. Determine :
a) Average load on power station, b) Energy generated per year,
c) Demand factor d) Diversity factor. **6**
3. a) Describe future energy demands in India. **7**
b) Explain the economic analysis of power plant in terms of selection and type of generation. **7**
c) Describe in detail the cost of electric energy. **3**
d) Illustrate the significant points on performance characteristics of power plants. **3**
4. Write short note on the following :
a) Generator and exciter short circuit and its limiting methods. **4**
b) Power factor and its measurement. **4**
c) Requirement of peak load plant. **4**
d) Starters, relays and power transformer. **4**
e) Tariff methods. **4**

Set S



SECTION – II

5. a) Describe solar radiation outside the earth's atmosphere and at the earth's surface. 7
b) Describe the performance analysis of liquid flat plate collector. 7
c) Describe the following terminology :
a) Latitude, b) Declination angle, c) Hour angle, d) Altitude angle,
e) Azimuth angle and f) Incident angle. 6
6. a) Give detailed classification of WEC systems. 4
b) Introduce open and closed ocean thermal systems. 3
c) Brief on energy conservation legislation. 3
d) Describe in detail energy audit of Air Conditioning System. 3
e) Derive the relation for maximum power efficiency in a wind turbine. 7
7. Write short note on the following :
a) Types of geothermal resources. 4
b) Wave energy conversion devices. 4
c) Energy conservation planning. 4
d) Energy audit instruments. 4
e) Energy conservation in house hold and commercial sectors. 4
-



SLR-TJ – 139

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

Set	P
-----	----------

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer (1 mark each) : **20**
- 1) From to chart gives the information about
 - a) Density of moves between dept
 - b) Equipment
 - c) Selection procedure
 - d) None of these
 - 2) Flow diagram is used to study
 - a) Back tracking
 - b) Sequence of operation
 - c) m/c maintenance
 - d) Operator skill
 - 3) The material handling equation consist of the material characteristics, the move material and
 - a) The method capability
 - b) Human capacity
 - c) Load
 - d) Gravity
 - 4) To transport ferrous material vertically _____ conveyor is used.
 - a) Wheel
 - b) Magnetic
 - c) Chain
 - d) Chute
 - 5) Hoisting equipment works in conjunction with _____ and workstation cranes.
 - a) Roller
 - b) Industrial trucks
 - c) Elevator
 - d) Overhead cranes
 - 6) For automated material handling system _____ materials are required.
 - a) Low volume
 - b) Medium volume
 - c) High volume
 - d) None of these

P.T.O.



- 7) Instead of a 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
- 8) In power equipment automatic correction is done according to _____
a) Gravity b) Manual c) Signal d) Equipment
- 9) _____ is used to move the material between two specific point.
a) Cranes b) Conveyors c) Bin d) Trolley
- 10) _____ is storing equipment.
a) Decking b) Hoist c) Trolley d) Elevator
- 11) Loads are supported by arms in _____ rack.
a) Sliding b) Push back c) Drive in d) Cantilever
- 12) Material handling consists of the movement of material from _____
a) One machine to another b) One shop to another shop
c) Stores to shop d) All of these
- 13) Symbol ∇ represents for _____
a) Operation b) Storage c) Inspection d) Transport
- 14) The equipment used to handle material at a single location so that it is in the correct positioning for machining is _____
a) Transport b) Storage c) Positioning d) None of these
- 15) Roller conveyor are characterized by
a) Unit + On-Floor + Accumulate b) Bulk + On-Floor + Accumulate
c) Unit + On-Floor + not Accumulate d) Bulk + On-Floor + Not Accumulate
- 16) Conveyors are used for _____ type industry.
a) Process layout b) Line layout c) Fixed layout d) None of these
- 17) A device used for lifting or lowering objects suspended from a hook at the end of retractable chains or cable is called
a) Hoist b) Jib cranes
c) Portable elevators d) Chain conveyors
- 18) As the distance or time factor increases, the cost per unit of product handled _____
a) Increases b) Decreases c) Remains same d) None of these
- 19) Trolley conveyors are characterized by
a) Bulk + Floor + Accumulation b) Unit + Overhead + No Accumulation
c) Bulk + Overhead + Accumulation d) None of the above
- 20) The equipment used to move the material from one location to another is called as
a) Positioning b) Transport c) Storage d) None of these



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

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.

SECTION – I

Solve **any two** questions :

2. a) Define, classify and explain conveyors with neat sketch and applications. **7**
- b) Explain the benefits and principles of material handling. **7**
- c) Define the material handling system and classify the equipments with application. **6**
3. a) Explain the term cranes. Write down any two types of cranes with sketch. **7**
- b) Explain the industrial Robots. **6**
- c) Define storing equipments. Explain any two types of storing equipments. **7**
4. Write a short notes (**any three**) : **20**
- a) Automated Guided Vehicles. **7**
- b) Hoisting equipment. **7**
- c) Elevators **6**
- d) Unit load containerization and palletization. **6**

SECTION – II

Solve **any two** questions :

5. a) Explain the selection of material handling equipment in foundry. **7**
- b) Discuss the importance of material handling safety. **7**
- c) Describe different activities at the shipping to improve efficiency of MHS. **6**

Set P



- | | |
|--|----|
| 6. a) Explain with figure assembly chart. | 7 |
| b) Describe with figure material handling equation. | 7 |
| c) Explain in detail equipment evaluation sheet ? | 6 |
| 7. Write a short notes (any three) : | 20 |
| a) Types of material flow pattern. | 7 |
| b) General procedure for selection of material handling equipment. | 7 |
| c) Basic analytic techniques in material handling. | 6 |
| d) Choices of material handling equipments. | 6 |
-



SLR-TJ – 139

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

Set	Q
-----	---

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

- 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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer (1 mark each) : **20**
- 1) Conveyors are used for _____ type industry.
a) Process layout b) Line layout c) Fixed layout d) None of these
 - 2) A device used for lifting or lowering objects suspended from a hook at the end of retractable chains or cable is called
a) Hoist b) Jib cranes
c) Portable elevators d) Chain conveyors
 - 3) As the distance or time factor increases, the cost per unit of product handled _____
a) Increases b) Decreases c) Remains same d) None of these
 - 4) Trolley conveyors are characterized by
a) Bulk + Floor + Accumulation b) Unit + Overhead + No Accumulation
c) Bulk + Overhead + Accumulation d) None of the above
 - 5) The equipment used to move the material from one location to another is called as
a) Positioning b) Transport c) Storage d) None of these
 - 6) From to chart gives the information about
a) Density of moves between dept b) Equipment
c) Selection procedure d) None of these

P.T.O.



- 7) Flow diagram is used to study
- a) Back tracking
 - b) Sequence of operation
 - c) m/c maintenance
 - d) Operator skill
- 8) The material handling equation consist of the material characteristics, the move material and
- a) The method capability
 - b) Human capacity
 - c) Load
 - d) Gravity
- 9) To transport ferrous material vertically _____ conveyor is used.
- a) Wheel
 - b) Magnetic
 - c) Chain
 - d) Chute
- 10) Hoisting equipment works in conjunction with _____ and workstation cranes.
- a) Roller
 - b) Industrial trucks
 - c) Elevator
 - d) Overhead cranes
- 11) For automated material handling system _____ materials are required.
- a) Low volume
 - b) Medium volume
 - c) High volume
 - d) None of these
- 12) Instead of a 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
- 13) In power equipment automatic correction is done according to _____
- a) Gravity
 - b) Manual
 - c) Signal
 - d) Equipment
- 14) _____ is used to move the material between two specific point.
- a) Cranes
 - b) Conveyors
 - c) Bin
 - d) Trolley
- 15) _____ is storing equipment.
- a) Decking
 - b) Hoist
 - c) Trolley
 - d) Elevator
- 16) Loads are supported by arms in _____ rack.
- a) Sliding
 - b) Push back
 - c) Drive in
 - d) Cantilever
- 17) Material handling consists of the movement of material from _____
- a) One machine to another
 - b) One shop to another shop
 - c) Stores to shop
 - d) All of these
- 18) Symbol ∇ represents for _____
- a) Operation
 - b) Storage
 - c) Inspection
 - d) Transport
- 19) The equipment used to handle material at a single location so that it is in the correct positioning for machining is _____
- a) Transport
 - b) Storage
 - c) Positioning
 - d) None of these
- 20) Roller conveyor are characterized by
- a) Unit + On-Floor + Accumulate
 - b) Bulk + On-Floor + Accumulate
 - c) Unit + On-Floor + not Accumulate
 - d) Bulk + On-Floor + Not Accumulate



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

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.

SECTION – I

Solve **any two** questions :

2. a) Define, classify and explain conveyors with neat sketch and applications. **7**
b) Explain the benefits and principles of material handling. **7**
c) Define the material handling system and classify the equipments with application. **6**
3. a) Explain the term cranes. Write down any two types of cranes with sketch. **7**
b) Explain the industrial Robots. **6**
c) Define storing equipments. Explain any two types of storing equipments. **7**
4. Write a short notes (**any three**) : **20**
a) Automated Guided Vehicles. **7**
b) Hoisting equipment. **7**
c) Elevators **6**
d) Unit load containerization and palletization. **6**

SECTION – II

Solve **any two** questions :

5. a) Explain the selection of material handling equipment in foundry. **7**
b) Discuss the importance of material handling safety. **7**
c) Describe different activities at the shipping to improve efficiency of MHS. **6**

Set Q



- | | |
|--|----|
| 6. a) Explain with figure assembly chart. | 7 |
| b) Describe with figure material handling equation. | 7 |
| c) Explain in detail equipment evaluation sheet ? | 6 |
| 7. Write a short notes (any three) : | 20 |
| a) Types of material flow pattern. | 7 |
| b) General procedure for selection of material handling equipment. | 7 |
| c) Basic analytic techniques in material handling. | 6 |
| d) Choices of material handling equipments. | 6 |
-



SLR-TJ – 139

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

Set	R
-----	---

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Max. Marks : 100

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.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 20

1. Choose the correct answer (1 mark each) : **20**
- 1) Loads are supported by arms in _____ rack.
a) Sliding b) Push back c) Drive in d) Cantilever
 - 2) Material handling consists of the movement of material from _____
a) One machine to another b) One shop to another shop
c) Stores to shop d) All of these
 - 3) Symbol ∇ represents for _____
a) Operation b) Storage c) Inspection d) Transport
 - 4) The equipment used to handle material at a single location so that it is in the correct positioning for machining is _____
a) Transport b) Storage c) Positioning d) None of these
 - 5) Roller conveyor are characterized by
a) Unit + On-Floor + Accumulate b) Bulk + On-Floor + Accumulate
c) Unit + On-Floor + not Accumulate d) Bulk + On-Floor + Not Accumulate
 - 6) Conveyors are used for _____ type industry.
a) Process layout b) Line layout c) Fixed layout d) None of these
 - 7) A device used for lifting or lowering objects suspended from a hook at the end of retractable chains or cable is called
a) Hoist b) Jib cranes
c) Portable elevators d) Chain conveyors

P.T.O.



- 8) As the distance or time factor increases, the cost per unit of product handled _____
a) Increases b) Decreases c) Remains same d) None of these
- 9) Trolley conveyors are characterized by
a) Bulk + Floor + Accumulation b) Unit + Overhead + No Accumulation
c) Bulk + Overhead + Accumulation d) None of the above
- 10) The equipment used to move the material from one location to another is called as
a) Positioning b) Transport c) Storage d) None of these
- 11) From to chart gives the information about
a) Density of moves between dept b) Equipment
c) Selection procedure d) None of these
- 12) Flow diagram is used to study
a) Back tracking b) Sequence of operation
c) m/c maintenance d) Operator skill
- 13) The material handling equation consist of the material characteristics, the move material and
a) The method capability b) Human capacity
c) Load d) Gravity
- 14) To transport ferrous material vertically _____ conveyor is used.
a) Wheel b) Magnetic c) Chain d) Chute
- 15) Hoisting equipment works in conjunction with _____ and workstation cranes.
a) Roller b) Industrial trucks
c) Elevator d) Overhead cranes
- 16) For automated material handling system _____ materials are required.
a) Low volume b) Medium volume
c) High volume d) None of these
- 17) Instead of a 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
- 18) In power equipment automatic correction is done according to _____
a) Gravity b) Manual c) Signal d) Equipment
- 19) _____ is used to move the material between two specific point.
a) Cranes b) Conveyors c) Bin d) Trolley
- 20) _____ is storing equipment.
a) Decking b) Hoist c) Trolley d) Elevator



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

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.

SECTION – I

Solve **any two** questions :

2. a) Define, classify and explain conveyors with neat sketch and applications. **7**
- b) Explain the benefits and principles of material handling. **7**
- c) Define the material handling system and classify the equipments with application. **6**
3. a) Explain the term cranes. Write down any two types of cranes with sketch. **7**
- b) Explain the industrial Robots. **6**
- c) Define storing equipments. Explain any two types of storing equipments. **7**
4. Write a short notes (**any three**) : **20**
- a) Automated Guided Vehicles. **7**
- b) Hoisting equipment. **7**
- c) Elevators **6**
- d) Unit load containerization and palletization. **6**

SECTION – II

Solve **any two** questions :

5. a) Explain the selection of material handling equipment in foundry. **7**
- b) Discuss the importance of material handling safety. **7**
- c) Describe different activities at the shipping to improve efficiency of MHS. **6**

Set R



- | | |
|--|----|
| 6. a) Explain with figure assembly chart. | 7 |
| b) Describe with figure material handling equation. | 7 |
| c) Explain in detail equipment evaluation sheet ? | 6 |
| 7. Write a short notes (any three) : | 20 |
| a) Types of material flow pattern. | 7 |
| b) General procedure for selection of material handling equipment. | 7 |
| c) Basic analytic techniques in material handling. | 6 |
| d) Choices of material handling equipments. | 6 |
-



- 9) The equipment used to handle material at a single location so that it is in the correct positioning for machining is _____
a) Transport b) Storage c) Positioning d) None of these
- 10) Roller conveyor are characterized by
a) Unit + On-Floor + Accumulate b) Bulk + On-Floor + Accumulate
c) Unit + On-Floor + not Accumulate d) Bulk + On-Floor + Not Accumulate
- 11) Conveyors are used for _____ type industry.
a) Process layout b) Line layout c) Fixed layout d) None of these
- 12) A device used for lifting or lowering objects suspended from a hook at the end of retractable chains or cable is called
a) Hoist b) Jib cranes
c) Portable elevators d) Chain conveyors
- 13) As the distance or time factor increases, the cost per unit of product handled _____
a) Increases b) Decreases c) Remains same d) None of these
- 14) Trolley conveyors are characterized by
a) Bulk + Floor + Accumulation b) Unit + Overhead + No Accumulation
c) Bulk + Overhead + Accumulation d) None of the above
- 15) The equipment used to move the material from one location to another is called as
a) Positioning b) Transport c) Storage d) None of these
- 16) From to chart gives the information about
a) Density of moves between dept b) Equipment
c) Selection procedure d) None of these
- 17) Flow diagram is used to study
a) Back tracking b) Sequence of operation
c) m/c maintenance d) Operator skill
- 18) The material handling equation consist of the material characteristics, the move material and
a) The method capability b) Human capacity
c) Load d) Gravity
- 19) To transport ferrous material vertically _____ conveyor is used.
a) Wheel b) Magnetic c) Chain d) Chute
- 20) Hoisting equipment works in conjunction with _____ and workstation cranes.
a) Roller b) Industrial trucks
c) Elevator d) Overhead cranes



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

**B.E. (Mech.) (Part – II) Examination, 2017
MATERIAL HANDLING SYSTEM (Old)**

Day and Date : Thursday, 14-12-2017
Time : 3.00 p.m. to 6.00 p.m.

Marks : 80

Instructions : 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagram **where** necessary.

SECTION – I

Solve **any two** questions :

2. a) Define, classify and explain conveyors with neat sketch and applications. **7**
- b) Explain the benefits and principles of material handling. **7**
- c) Define the material handling system and classify the equipments with application. **6**
3. a) Explain the term cranes. Write down any two types of cranes with sketch. **7**
- b) Explain the industrial Robots. **6**
- c) Define storing equipments. Explain any two types of storing equipments. **7**
4. Write a short notes (**any three**) : **20**
- a) Automated Guided Vehicles. **7**
- b) Hoisting equipment. **7**
- c) Elevators **6**
- d) Unit load containerization and palletization. **6**

SECTION – II

Solve **any two** questions :

5. a) Explain the selection of material handling equipment in foundry. **7**
- b) Discuss the importance of material handling safety. **7**
- c) Describe different activities at the shipping to improve efficiency of MHS. **6**

Set S



- | | |
|--|----|
| 6. a) Explain with figure assembly chart. | 7 |
| b) Describe with figure material handling equation. | 7 |
| c) Explain in detail equipment evaluation sheet ? | 6 |
| 7. Write a short notes (any three) : | 20 |
| a) Types of material flow pattern. | 7 |
| b) General procedure for selection of material handling equipment. | 7 |
| c) Basic analytic techniques in material handling. | 6 |
| d) Choices of material handling equipments. | 6 |
-