



SLR-VB – 3

Seat No.	
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Set **P**

F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicates **full** marks.
 - 2) Assume suitable data **whenever** necessary.
 - 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) In case of Kirchhoff's current law which of the following statement is correct ?
 - a) Algebraic sum of current meeting at node is zero
 - b) Incoming current is greater than outgoing current
 - c) Both a) and b)
 - d) None of the above
- 2) The best suitable magnetic material for construction of transformer core is
 - a) Silicon steel
 - b) Hard steel
 - c) Silicon steel sheet laminations
 - d) Hard steel sheet laminations
- 3) The _____ through all the parts of the series magnetic circuit is same.
 - a) flux
 - b) reluctance
 - c) mmf
 - d) current
- 4) In single phase steps up transformer
 - a) $N_1 < N_2$
 - b) $N_2 < N_1$
 - c) $V_1 < V_2$
 - d) $E_1 < E_2$
- 5) For R-L-C series circuit if $X_L = X_C$ then power factor $\cos \Phi =$
 - a) 1
 - b) 0
 - c) 0.1
 - d) 0.5

P.T.O.



- 6) One unit of electrical energy =
a) One Joule
b) 3.6×10^6 Joules
c) 36×10^6 Joules
d) 1000 Kwh
- 7) The negative peak value of sinusoidal AC current is occurring at an angle
a) 0°
b) 90°
c) 270°
d) 180°
- 8) Phasors are the
a) Vectors rotating in clockwise direction
b) Vectors rotating in anticlockwise direction
c) Non rotating vectors
d) None of these
- 9) The real part of an admittance $Y = 0.1 + j 0.2$ is
a) Resistance
b) Conductance
c) Inductance
d) None of the above
- 10) Hysteresis loop is a graph between
a) Flux and reluctance
b) MMF and reluctance
c) Flux and absolute permeability
d) Flux density and magnetizing force
- 11) The impedance of purely inductive circuit is given by
a) $z = -jX_L$
b) $z = +jX_L$
c) $z = R - jX_L$
d) $z = X_L + jR$
- 12) In DC series motor
a) Armature and field winding are connected in series
b) Armature and field winding are connected in parallel
c) They are not connected
d) None of the above
- 13) Find value of resistance in delta connection from star connected three 20Ω resistances.
a) 20Ω
b) 40Ω
c) 60Ω
d) 80Ω
- 14) A 3 phase supply system is symmetrical if all three phase voltages are _____ apart from each other.
a) 120°
b) 100°
c) 60°
d) 180°



Seat No.	
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**F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Figures to the **right** indicates **full** marks.
2) Assume suitable data **whenever** necessary.

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) A potential difference of 250 V is applied to a field winding at 15°C and the current is 5A. What will be the mean temperature of the winding when the current is fallen to 3.91A, applied vtg being constant ? Assume $R_1 = 50$ (ohm), $R_2 = 63.94$ (ohm), $\alpha_{15} = \frac{1}{245.5}$.
- b) Define the term self inductance and mutual inductance and derive the formula for coefficient of coupling.
- c) Derive the expression for star to delta conversion.
- d) Define and derive expression for average value of sinusoidal alternating current.
- e) State and explain Kirchoff's current and voltage laws.
- f) A sinusoidal voltage records the following instantaneous values at equal intervals (0, 5, 10, 20, 50, 60, 50, 20, 10, 5, 0, -5, -10). Determine average and rms value.

3. Solve the following : **(2×6=12)**

- a) Write similarities and dissimilarities between electrical and magnetic circuit.
- b) A factory has 250 V supply from which the following loads are taken –
Lighting – 10 bulbs of 100 Watt, 20 tubes of 40 W, 20 bulbs of 20 W, all are working for 10 hours per day.
Heating load – 10Kw on for 5 hour per day
Motor load – 22.38Kw (30bhp) 4 hour per day
Others – various load taking a current of 20A and ON for 4 hour per day
Calculate total energy consumption in unit and electrical bill for Nov. 2016 at a rate 10 Rs/unit on Wednesday factory is closed.

OR

- c) Two currents given by the expression $i_1 = 10 \sin (314t + 45)$, $i_2 = 8 \sin (314t - 60)$. Find : 1) $i_1 + i_2$ and 2) $i_1 - i_2$.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) A single phase transformer has a turn ratio of 3000 : 20, the primary winding is connected to a 2200 V, 50 Hz supply. Calculate i) secondary voltage on no load and ii) the max value of flux.
 - b) Three inductive coils, each with resistance of 15Ω and an inductance of 0.03H are connected a) in star and b) in delta, to a 3 phase, 400 V, 50 Hz supply. Calculate for both cases phase current and line current.
 - c) Define following terms :
 - 1) inductive reactance
 - 2) capacitive reactance
 - 3) impedance
 - 4) power factor.
 - d) A resistor and capacitor are connected in series across 150 V ac supply. When frequency is 40 Hz the current is 5A and if frequency is 50 Hz current is 6A. Calculate R and C.
 - e) Derive emf equation of single phase transformer.
 - f) Draw neat diagram of dc series motor and explain armature current versus speed characteristic.
5. Solve **any two** : **(2×6=12)**
- a) Derive the relationship between phase voltage and line voltage in case of balanced star connected load. Draw phaser diagram.
 - b) Draw neat diagram and explain in detail series resonance condition.
 - c) Draw phaser diagram and explain transformer on load.
- The no load current of a transformer is 5 Amp and power factor is 0.3 when supplied from 230 V, 50 Hz single phase ac supply. $N_1 = 200$. Calculate maximum value of flux in core and core loss.
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SLR-VB – 3

Seat No.	
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Set **Q**

**F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicates **full** marks.
 - 2) Assume suitable data **whenever** necessary.
 - 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) Phasors are the
 - a) Vectors rotating in clockwise direction
 - b) Vectors rotating in anticlockwise direction
 - c) Non rotating vectors
 - d) None of these
- 2) The real part of an admittance $Y = 0.1 + j 0.2$ is
 - a) Resistance
 - b) Conductance
 - c) Inductance
 - d) None of the above
- 3) Hysteresis loop is a graph between
 - a) Flux and reluctance
 - b) MMF and reluctance
 - c) Flux and absolute permeability
 - d) Flux density and magnetizing force
- 4) The impedance of purely inductive circuit is given by
 - a) $z = -jX_L$
 - b) $z = +jX_L$
 - c) $z = R - jX_L$
 - d) $z = X_L + jR$

P.T.O.



- 5) In DC series motor
- a) Armature and field winding are connected in series
 - b) Armature and field winding are connected in parallel
 - c) They are not connected
 - d) None of the above
- 6) Find value of resistance in delta connection from star connected three $20\ \Omega$ resistances.
- a) $20\ \Omega$
 - b) $40\ \Omega$
 - c) $60\ \Omega$
 - d) $80\ \Omega$
- 7) A 3 phase supply system is symmetrical if all three phase voltages are _____ apart from each other.
- a) 120°
 - b) 100°
 - c) 60°
 - d) 180°
- 8) In case of Kirchhoff's current law which of the following statement is correct ?
- a) Algebraic sum of current meeting at node is zero
 - b) Incoming current is greater than outgoing current
 - c) Both a) and b)
 - d) None of the above
- 9) The best suitable magnetic material for construction of transformer core is
- a) Silicon steel
 - b) Hard steel
 - c) Silicon steel sheet laminations
 - d) Hard steel sheet laminations
- 10) The _____ through all the parts of the series magnetic circuit is same.
- a) flux
 - b) reluctance
 - c) mmf
 - d) current
- 11) In single phase steps up transformer
- a) $N_1 < N_2$
 - b) $N_2 < N_1$
 - c) $V_1 < V_2$
 - d) $E_1 < E_2$
- 12) For R-L-C series circuit if $X_L = X_C$ then power factor $\cos\phi =$
- a) 1
 - b) 0
 - c) 0.1
 - d) 0.5
- 13) One unit of electrical energy =
- a) One Joule
 - b) 3.6×10^6 Joules
 - c) 36×10^6 Joules
 - d) 1000 Kwh
- 14) The negative peak value of sinusoidal AC current is occurring at an angle
- a) 0°
 - b) 90°
 - c) 270°
 - d) 180°
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Seat No.	
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**F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Figures to the **right** indicates **full** marks.
2) Assume suitable data **whenever** necessary.

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) A potential difference of 250 V is applied to a field winding at 15°C and the current is 5A. What will be the mean temperature of the winding when the current is fallen to 3.91A, applied vtg being constant ? Assume $R_1 = 50$ (ohm), $R_2 = 63.94$ (ohm), $\alpha_{15} = \frac{1}{245.5}$.
- b) Define the term self inductance and mutual inductance and derive the formula for coefficient of coupling.
- c) Derive the expression for star to delta conversion.
- d) Define and derive expression for average value of sinusoidal alternating current.
- e) State and explain Kirchoff's current and voltage laws.
- f) A sinusoidal voltage records the following instantaneous values at equal intervals (0, 5, 10, 20, 50, 60, 50, 20, 10, 5, 0, -5, -10). Determine average and rms value.

3. Solve the following : **(2×6=12)**

- a) Write similarities and dissimilarities between electrical and magnetic circuit.
- b) A factory has 250 V supply from which the following loads are taken –
Lighting – 10 bulbs of 100 Watt, 20 tubes of 40 W, 20 bulbs of 20 W, all are working for 10 hours per day.
Heating load – 10Kw on for 5 hour per day
Motor load – 22.38Kw (30bhp) 4 hour per day
Others – various load taking a current of 20A and ON for 4 hour per day
Calculate total energy consumption in unit and electrical bill for Nov. 2016 at a rate 10 Rs/unit on Wednesday factory is closed.

OR

- c) Two currents given by the expression $i_1 = 10 \sin (314t + 45)$, $i_2 = 8 \sin (314t - 60)$. Find : 1) $i_1 + i_2$ and 2) $i_1 - i_2$.

Set Q



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) A single phase transformer has a turn ratio of 3000 : 20, the primary winding is connected to a 2200 V, 50 Hz supply. Calculate i) secondary voltage on no load and ii) the max value of flux.
 - b) Three inductive coils, each with resistance of 15Ω and an inductance of 0.03H are connected a) in star and b) in delta, to a 3 phase, 400 V, 50 Hz supply. Calculate for both cases phase current and line current.
 - c) Define following terms :
 - 1) inductive reactance
 - 2) capacitive reactance
 - 3) impedance
 - 4) power factor.
 - d) A resistor and capacitor are connected in series across 150 V ac supply. When frequency is 40 Hz the current is 5A and if frequency is 50 Hz current is 6A. Calculate R and C.
 - e) Derive emf equation of single phase transformer.
 - f) Draw neat diagram of dc series motor and explain armature current versus speed characteristic.
5. Solve **any two** : **(2×6=12)**
- a) Derive the relationship between phase voltage and line voltage in case of balanced star connected load. Draw phaser diagram.
 - b) Draw neat diagram and explain in detail series resonance condition.
 - c) Draw phaser diagram and explain transformer on load.
- The no load current of a transformer is 5 Amp and power factor is 0.3 when supplied from 230 V, 50 Hz single phase ac supply. $N_1 = 200$. Calculate maximum value of flux in core and core loss.
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SLR-VB – 3

Seat No.	
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Set **R**

F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicates **full** marks.
 - 2) Assume suitable data **whenever** necessary.
 - 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 R-L-C series circuit if $X_L = X_C$ then power factor $\cos \Phi =$
a) 1 b) 0 c) 0.1 d) 0.5
- 2) One unit of electrical energy =
a) One Joule b) 3.6×10^6 Joules
c) 36×10^6 Joules d) 1000 Kwh
- 3) The negative peak value of sinusoidal AC current is occurring at an angle
a) 0° b) 90° c) 270° d) 180°
- 4) Phasors are the
a) Vectors rotating in clockwise direction
b) Vectors rotating in anticlockwise direction
c) Non rotating vectors
d) None of these
- 5) The real part of an admittance $Y = 0.1 + j 0.2$ is
a) Resistance b) Conductance
c) Inductance d) None of the above

P.T.O.



- 6) Hysteresis loop is a graph between
- Flux and reluctance
 - MMF and reluctance
 - Flux and absolute permeability
 - Flux density and magnetizing force
- 7) The impedance of purely inductive circuit is given by
- $z = -jX_L$
 - $z = +jX_L$
 - $z = R - jX_L$
 - $z = X_L + jR$
- 8) In DC series motor
- Armature and field winding are connected in series
 - Armature and field winding are connected in parallel
 - They are not connected
 - None of the above
- 9) Find value of resistance in delta connection from star connected three 20Ω resistances.
- 20Ω
 - 40Ω
 - 60Ω
 - 80Ω
- 10) A 3 phase supply system is symmetrical if all three phase voltages are _____ apart from each other.
- 120°
 - 100°
 - 60°
 - 180°
- 11) In case of Kirchoff's current law which of the following statement is correct ?
- Algebraic sum of current meeting at node is zero
 - Incoming current is greater than outgoing current
 - Both a) and b)
 - None of the above
- 12) The best suitable magnetic material for construction of transformer core is
- Silicon steel
 - Hard steel
 - Silicon steel sheet laminations
 - Hard steel sheet laminations
- 13) The _____ through all the parts of the series magnetic circuit is same.
- flux
 - reluctance
 - mmf
 - current
- 14) In single phase steps up transformer
- $N_1 < N_2$
 - $N_2 < N_1$
 - $V_1 < V_2$
 - $E_1 < E_2$
-



Seat No.	
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**F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Figures to the **right** indicates **full** marks.
2) Assume suitable data **whenever** necessary.

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) A potential difference of 250 V is applied to a field winding at 15°C and the current is 5A. What will be the mean temperature of the winding when the current is fallen to 3.91A, applied vtg being constant ? Assume $R_1 = 50$ (ohm), $R_2 = 63.94$ (ohm), $\alpha_{15} = \frac{1}{245.5}$.
- b) Define the term self inductance and mutual inductance and derive the formula for coefficient of coupling.
- c) Derive the expression for star to delta conversion.
- d) Define and derive expression for average value of sinusoidal alternating current.
- e) State and explain Kirchoff's current and voltage laws.
- f) A sinusoidal voltage records the following instantaneous values at equal intervals (0, 5, 10, 20, 50, 60, 50, 20, 10, 5, 0, -5, -10). Determine average and rms value.

3. Solve the following : **(2×6=12)**

- a) Write similarities and dissimilarities between electrical and magnetic circuit.
- b) A factory has 250 V supply from which the following loads are taken –
Lighting – 10 bulbs of 100 Watt, 20 tubes of 40 W, 20 bulbs of 20 W, all are working for 10 hours per day.
Heating load – 10Kw on for 5 hour per day
Motor load – 22.38Kw (30bhp) 4 hour per day
Others – various load taking a current of 20A and ON for 4 hour per day
Calculate total energy consumption in unit and electrical bill for Nov. 2016 at a rate 10 Rs/unit on Wednesday factory is closed.

OR

- c) Two currents given by the expression $i_1 = 10 \sin (314t + 45)$, $i_2 = 8 \sin (314t - 60)$. Find : 1) $i_1 + i_2$ and 2) $i_1 - i_2$.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) A single phase transformer has a turn ratio of 3000 : 20, the primary winding is connected to a 2200 V, 50 Hz supply. Calculate i) secondary voltage on no load and ii) the max value of flux.
 - b) Three inductive coils, each with resistance of 15Ω and an inductance of 0.03H are connected a) in star and b) in delta, to a 3 phase, 400 V, 50 Hz supply. Calculate for both cases phase current and line current.
 - c) Define following terms :
 - 1) inductive reactance
 - 2) capacitive reactance
 - 3) impedance
 - 4) power factor.
 - d) A resistor and capacitor are connected in series across 150 V ac supply. When frequency is 40 Hz the current is 5A and if frequency is 50 Hz current is 6A. Calculate R and C.
 - e) Derive emf equation of single phase transformer.
 - f) Draw neat diagram of dc series motor and explain armature current versus speed characteristic.
5. Solve **any two** : **(2×6=12)**
- a) Derive the relationship between phase voltage and line voltage in case of balanced star connected load. Draw phaser diagram.
 - b) Draw neat diagram and explain in detail series resonance condition.
 - c) Draw phaser diagram and explain transformer on load.
- The no load current of a transformer is 5 Amp and power factor is 0.3 when supplied from 230 V, 50 Hz single phase ac supply. $N_1 = 200$. Calculate maximum value of flux in core and core loss.
-



SLR-VB – 3

Seat No.	
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Set **S**

**F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Figures to the **right** indicates **full** marks.
 - 2) Assume suitable data **whenever** necessary.
 - 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) Hysteresis loop is a graph between
 - a) Flux and reluctance
 - b) MMF and reluctance
 - c) Flux and absolute permeability
 - d) Flux density and magnetizing force
- 2) The impedance of purely inductive circuit is given by
 - a) $z = -jX_L$
 - b) $z = +jX_L$
 - c) $z = R - jX_L$
 - d) $z = X_L + jR$
- 3) In DC series motor
 - a) Armature and field winding are connected in series
 - b) Armature and field winding are connected in parallel
 - c) They are not connected
 - d) None of the above
- 4) Find value of resistance in delta connection from star connected three 20 Ω resistances.
 - a) 20 Ω
 - b) 40 Ω
 - c) 60 Ω
 - d) 80 Ω

P.T.O.



- 5) A 3 phase supply system is symmetrical if all three phase voltages are _____ apart from each other.
a) 120° b) 100° c) 60° d) 180°
- 6) In case of Kirchhoff's current law which of the following statement is correct ?
a) Algebraic sum of current meeting at node is zero
b) Incoming current is greater than outgoing current
c) Both a) and b)
d) None of the above
- 7) The best suitable magnetic material for construction of transformer core is
a) Silicon steel
b) Hard steel
c) Silicon steel sheet laminations
d) Hard steel sheet laminations
- 8) The _____ through all the parts of the series magnetic circuit is same.
a) flux b) reluctance c) mmf d) current
- 9) In single phase steps up transformer
a) $N_1 < N_2$ b) $N_2 < N_1$ c) $V_1 < V_2$ d) $E_1 < E_2$
- 10) For R-L-C series circuit if $X_L = X_C$ then power factor $\cos \Phi =$
a) 1 b) 0 c) 0.1 d) 0.5
- 11) One unit of electrical energy =
a) One Joule b) 3.6×10^6 Joules
c) 36×10^6 Joules d) 1000 Kwh
- 12) The negative peak value of sinusoidal AC current is occurring at an angle
a) 0° b) 90° c) 270° d) 180°
- 13) Phasors are the
a) Vectors rotating in clockwise direction
b) Vectors rotating in anticlockwise direction
c) Non rotating vectors
d) None of these
- 14) The real part of an admittance $Y = 0.1 + j 0.2$ is
a) Resistance b) Conductance
c) Inductance d) None of the above



Seat No.	
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**F.E. (New) (Part – I) Examination, 2017
BASIC ELECTRICAL ENGINEERING (CBCS Pattern)**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Figures to the **right** indicates **full** marks.
2) Assume suitable data **whenever** necessary.

SECTION – I

2. Solve **any four** : **(4×4=16)**

- a) A potential difference of 250 V is applied to a field winding at 15°C and the current is 5A. What will be the mean temperature of the winding when the current is fallen to 3.91A, applied vtg being constant ? Assume $R_1 = 50$ (ohm), $R_2 = 63.94$ (ohm), $\alpha_{15} = \frac{1}{245.5}$.
- b) Define the term self inductance and mutual inductance and derive the formula for coefficient of coupling.
- c) Derive the expression for star to delta conversion.
- d) Define and derive expression for average value of sinusoidal alternating current.
- e) State and explain Kirchoff's current and voltage laws.
- f) A sinusoidal voltage records the following instantaneous values at equal intervals (0, 5, 10, 20, 50, 60, 50, 20, 10, 5, 0, -5, -10). Determine average and rms value.

3. Solve the following : **(2×6=12)**

- a) Write similarities and dissimilarities between electrical and magnetic circuit.
- b) A factory has 250 V supply from which the following loads are taken –
Lighting – 10 bulbs of 100 Watt, 20 tubes of 40 W, 20 bulbs of 20 W, all are working for 10 hours per day.
Heating load – 10Kw on for 5 hour per day
Motor load – 22.38Kw (30bhp) 4 hour per day
Others – various load taking a current of 20A and ON for 4 hour per day
Calculate total energy consumption in unit and electrical bill for Nov. 2016 at a rate 10 Rs/unit on Wednesday factory is closed.

OR

- c) Two currents given by the expression $i_1 = 10 \sin (314t + 45)$, $i_2 = 8 \sin (314t - 60)$. Find : 1) $i_1 + i_2$ and 2) $i_1 - i_2$.



SECTION – II

4. Solve **any four** : **(4×4=16)**
- a) A single phase transformer has a turn ratio of 3000 : 20, the primary winding is connected to a 2200 V, 50 Hz supply. Calculate i) secondary voltage on no load and ii) the max value of flux.
 - b) Three inductive coils, each with resistance of 15Ω and an inductance of 0.03H are connected a) in star and b) in delta, to a 3 phase, 400 V, 50 Hz supply. Calculate for both cases phase current and line current.
 - c) Define following terms :
 - 1) inductive reactance
 - 2) capacitive reactance
 - 3) impedance
 - 4) power factor.
 - d) A resistor and capacitor are connected in series across 150 V ac supply. When frequency is 40 Hz the current is 5A and if frequency is 50 Hz current is 6A. Calculate R and C.
 - e) Derive emf equation of single phase transformer.
 - f) Draw neat diagram of dc series motor and explain armature current versus speed characteristic.
5. Solve **any two** : **(2×6=12)**
- a) Derive the relationship between phase voltage and line voltage in case of balanced star connected load. Draw phaser diagram.
 - b) Draw neat diagram and explain in detail series resonance condition.
 - c) Draw phaser diagram and explain transformer on load.
- The no load current of a transformer is 5 Amp and power factor is 0.3 when supplied from 230 V, 50 Hz single phase ac supply. $N_1 = 200$. Calculate maximum value of flux in core and core loss.
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SLR-VB – 4

Seat No.	
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Set	P
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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Total Marks : 70

Time : 10.00 a.m. to 1.00 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) **Neat diagrams must be drawn whenever necessary.**
4) Make **suitable** assumptions if necessary and mention them clearly.
5) Figures to the **right** indicate **full** marks.
6) **Use** of log table and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**
- 1) First law of thermodynamic defines
 - a) Work
 - b) Internal Energy
 - c) Heat
 - d) Entropy
 - 2) In vapour compression refrigeration system heat is rejected from the refrigerant in
 - a) Evaporator
 - b) Condenser
 - c) Compressor
 - d) Capillary Tube
 - 3) System comprising of single phase, is known as
 - a) Open system
 - b) Closed system
 - c) Homogeneous system
 - d) Heterogeneous system
 - 4) When the expansion or compression follows the law $PV^f = C$, the process is
 - a) Isothermal
 - b) Hyperbolic
 - c) Adiabatic
 - d) Polytropic

P.T.O.



- 5) The device used to convert the kinetic energy in to mechanical work.
a) Pump b) Turbine c) Compressor d) None
- 6) Which of the following is an impulse turbine ?
a) Pelton wheel turbine b) Francis turbine
c) Kaplan turbine d) None of these
- 7) Pollution in the form of smoke and ash is associated with
a) Thermal power plant b) Hydro power plant
c) Nuclear power plant d) Diesel power plant
- 8) Spark plug is present in
a) Diesel engine b) Petrol engine
c) Both a and b d) None of these
- 9) Perpendicular shaft can be connected by
a) Flat belt drive b) Chain drive
c) Rope drive d) None of the above
- 10) The cross section of V-Belt is
a) Rectangular b) Square c) Trapezoidal d) Circular
- 11) Factor of safety is defined as
a) Minimum stress/Maximum stress b) Maximum stress/ Minimum stress
c) Minimum stress/Allowable stress d) Maximum stress/Allowable stress
- 12) Which of the following is unit less ?
a) Stress b) Strain
c) Young Modulus d) None
- 13) The process of removing material from face of work piece is called
a) Turning b) Knurling c) Facing d) None of these
- 14) Drilling of work piece can be carried out by
a) Lathe b) Drilling machine
c) Both a and b d) None
-



Seat No.	
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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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. 2 and Q. 4 are short answer type questions.
 - 5) Q. 3 and Q. 5 are long answer type questions.
 - 6) **Use** of log table and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Attempt **any five** of the following : **(5×3=15)**
- a) Define a thermodynamic system and their types.
 - b) Show that enthalpy is a function of temperature.
 - c) Write a short note on Heat and work.
 - d) Show that for adiabatic process $pV^{\gamma} = C$.
 - e) Explain the working of reciprocating compressor.
 - f) Explain with neat sketch Kaplan turbine.
 - g) State advantages and disadvantages of thermal power plant.
3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A system consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle. **5**

Process	Q (kw)	W(kw)	Δu (kw)
1-2	40	....	25
2-3	20	-10	....
3-4	-20	....	....
4-1	0	8	....



- b) Explain in detail hydroelectric power plant. 5
- c) A system contains 0.15 m^3 of a gas at a pressure of 3.8 bar. It is expanded adiabatically till the pressure falls to 1 bar. Determine the total work done.
Take $C_p = 1 \text{ kJ/kg k}$ $C_v = 0.71 \text{ kJ/kg k}$. 4
- d) Write a note on centrifugal pump. 4
- e) Discuss boiling water reactor in detail. 4
- f) A nozzle is used for increasing the velocity of steam. The enthalpy and velocity of steam entering the nozzle are 2750 kJ/kg and 50 m/s respectively. The enthalpy at the exit of nozzle is 2600 kJ/kg. The heat losses from horizontal nozzle are negligible. Find :
- 1) Velocity at exit from the nozzle.
 - 2) Find the area at the exit of nozzle. If the inlet area is 0.1 m^2 and specific volume at inlet is $0.18 \text{ m}^3/\text{kg}$.
 - 3) Find the mass flow rate if the specific volume at outlet is $0.498 \text{ m}^3/\text{kg}$.
 - 4) Find the ration of inlet and exit diameter of nozzle. 4

SECTION – II

4. Attempt **any five** of the following : (5×3=15)
- a) Write a short note on four stroke engine.
 - b) Derive an expression for thermal efficiency of Otto cycle.
 - c) Give types of gear and write note on helical and bevel gear.
 - d) Differentiate between chain drive and belt drive.
 - e) Discuss different mode of failure.
 - f) Write a note on design process.
 - g) Explain with neat sketch spot welding.



5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A belt running over a pulley of diameter 120 cm at 200 rpm. The angle of contact is 165° and coefficient of friction between the belt and pulley is 0.3. If maximum tension in the belt is 3000 N. Find the power transmitted by the belt. **5**
 - b) Describe with schematic diagram center lathe machine. **5**
 - c) In a constant volume Otto cycle the pressure at the end of a compression is 15 times that at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature obtained in the cycle is 1950°C . Determine
 - 1) Thermal Efficiency.
 - 2) Work done.
- Take γ for air = 1.4 **4**
- d) Explain in detail ergonomic consideration. **4**
 - e) Write a note on brazing. **4**
 - f) Explain with neat sketch arc welding. **4**
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SLR-VB – 4

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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Total Marks : 70

Time : 10.00 a.m. to 1.00 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) **Neat diagrams must be drawn whenever necessary.**
4) Make **suitable** assumptions if necessary and mention them clearly.
5) Figures to the **right** indicate **full** marks.
6) **Use** of log table and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**
- 1) Spark plug is present in
 - a) Diesel engine
 - b) Petrol engine
 - c) Both a and b
 - d) None of these
 - 2) Perpendicular shaft can be connected by
 - a) Flat belt drive
 - b) Chain drive
 - c) Rope drive
 - d) None of the above
 - 3) The cross section of V-Belt is
 - a) Rectangular
 - b) Square
 - c) Trapezoidal
 - d) Circular
 - 4) Factor of safety is defined as
 - a) Minimum stress/Maximum stress
 - b) Maximum stress/ Minimum stress
 - c) Minimum stress/Allowable stress
 - d) Maximum stress/Allowable stress

P.T.O.



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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- 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. 2 and Q. 4 are short answer type questions.
 - 5) Q. 3 and Q. 5 are long answer type questions.
 - 6) **Use** of log table and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Attempt **any five** of the following : **(5×3=15)**
- a) Define a thermodynamic system and their types.
 - b) Show that enthalpy is a function of temperature.
 - c) Write a short note on Heat and work.
 - d) Show that for adiabatic process $pv^{\gamma} = C$.
 - e) Explain the working of reciprocating compressor.
 - f) Explain with neat sketch Kaplan turbine.
 - g) State advantages and disadvantages of thermal power plant.
3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A system consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle. **5**

Process	Q (kw)	W(kw)	Δu (kw)
1-2	40	....	25
2-3	20	-10	....
3-4	-20	....	....
4-1	0	8	....



- b) Explain in detail hydroelectric power plant. 5
- c) A system contains 0.15 m^3 of a gas at a pressure of 3.8 bar. It is expanded adiabatically till the pressure falls to 1 bar. Determine the total work done.
Take $C_p = 1 \text{ kJ/kg k}$ $C_v = 0.71 \text{ kJ/kg k}$. 4
- d) Write a note on centrifugal pump. 4
- e) Discuss boiling water reactor in detail. 4
- f) A nozzle is used for increasing the velocity of steam. The enthalpy and velocity of steam entering the nozzle are 2750 kJ/kg and 50 m/s respectively. The enthalpy at the exit of nozzle is 2600 kJ/kg. The heat losses from horizontal nozzle are negligible. Find :
- 1) Velocity at exit from the nozzle.
 - 2) Find the area at the exit of nozzle. If the inlet area is 0.1 m^2 and specific volume at inlet is $0.18 \text{ m}^3/\text{kg}$.
 - 3) Find the mass flow rate if the specific volume at outlet is $0.498 \text{ m}^3/\text{kg}$.
 - 4) Find the ration of inlet and exit diameter of nozzle. 4

SECTION – II

4. Attempt **any five** of the following : (5×3=15)
- a) Write a short note on four stroke engine.
 - b) Derive an expression for thermal efficiency of Otto cycle.
 - c) Give types of gear and write note on helical and bevel gear.
 - d) Differentiate between chain drive and belt drive.
 - e) Discuss different mode of failure.
 - f) Write a note on design process.
 - g) Explain with neat sketch spot welding.



5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A belt running over a pulley of diameter 120 cm at 200 rpm. The angle of contact is 165° and coefficient of friction between the belt and pulley is 0.3. If maximum tension in the belt is 3000 N. Find the power transmitted by the belt. **5**
 - b) Describe with schematic diagram center lathe machine. **5**
 - c) In a constant volume Otto cycle the pressure at the end of a compression is 15 times that at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature obtained in the cycle is 1950°C . Determine
 - 1) Thermal Efficiency.
 - 2) Work done.
- Take γ for air = 1.4 **4**
- d) Explain in detail ergonomic consideration. **4**
 - e) Write a note on brazing. **4**
 - f) Explain with neat sketch arc welding. **4**
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SLR-VB – 4

Seat No.	
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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Total Marks : 70

Time : 10.00 a.m. to 1.00 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) **Neat diagrams must be drawn whenever necessary.**
 - 4) Make **suitable** assumptions if necessary and mention them clearly.
 - 5) Figures to the **right** indicate **full** marks.
 - 6) **Use** of log table and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**
- 1) The device used to convert the kinetic energy in to mechanical work.
a) Pump b) Turbine c) Compressor d) None
 - 2) Which of the following is an impulse turbine ?
a) Pelton wheel turbine b) Francis turbine
c) Kaplan turbine d) None of these
 - 3) Pollution in the form of smoke and ash is associated with
a) Thermal power plant b) Hydro power plant
c) Nuclear power plant d) Diesel power plant
 - 4) Spark plug is present in
a) Diesel engine b) Petrol engine
c) Both a and b d) None of these

P.T.O.



- 5) Perpendicular shaft can be connected by
- a) Flat belt drive
 - b) Chain drive
 - c) Rope drive
 - d) None of the above
- 6) The cross section of V-Belt is
- a) Rectangular
 - b) Square
 - c) Trapezoidal
 - d) Circular
- 7) Factor of safety is defined as
- a) Minimum stress/Maximum stress
 - b) Maximum stress/ Minimum stress
 - c) Minimum stress/Allowable stress
 - d) Maximum stress/Allowable stress
- 8) Which of the following is unit less ?
- a) Stress
 - b) Strain
 - c) Young Modulus
 - d) None
- 9) The process of removing material from face of work piece is called
- a) Turning
 - b) Knurling
 - c) Facing
 - d) None of these
- 10) Drilling of work piece can be carried out by
- a) Lathe
 - b) Drilling machine
 - c) Both a and b
 - d) None
- 11) First law of thermodynamic defines
- a) Work
 - b) Internal Energy
 - c) Heat
 - d) Entropy
- 12) In vapour compression refrigeration system heat is rejected from the refrigerant in
- a) Evaporator
 - b) Condenser
 - c) Compressor
 - d) Capillary Tube
- 13) System comprising of single phase, is known as
- a) Open system
 - b) Closed system
 - c) Homogeneous system
 - d) Heterogeneous system
- 14) When the expansion or compression follows the law $PV^f = C$, the process is
- a) Isothermal
 - b) Hyperbolic
 - c) Adiabatic
 - d) Polytropic
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Seat No.	
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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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. 2 and Q. 4 are short answer type questions.
 - 5) Q. 3 and Q. 5 are long answer type questions.
 - 6) **Use** of log table and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Attempt **any five** of the following : **(5×3=15)**
- a) Define a thermodynamic system and their types.
 - b) Show that enthalpy is a function of temperature.
 - c) Write a short note on Heat and work.
 - d) Show that for adiabatic process $pV^{\gamma} = C$.
 - e) Explain the working of reciprocating compressor.
 - f) Explain with neat sketch Kaplan turbine.
 - g) State advantages and disadvantages of thermal power plant.
3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A system consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle. **5**

Process	Q (kw)	W(kw)	Δu (kw)
1-2	40	....	25
2-3	20	-10	....
3-4	-20	....	....
4-1	0	8	....



- b) Explain in detail hydroelectric power plant. 5
- c) A system contains 0.15 m^3 of a gas at a pressure of 3.8 bar. It is expanded adiabatically till the pressure falls to 1 bar. Determine the total work done.
Take $C_p = 1 \text{ kJ/kg k}$ $C_v = 0.71 \text{ kJ/kg k}$. 4
- d) Write a note on centrifugal pump. 4
- e) Discuss boiling water reactor in detail. 4
- f) A nozzle is used for increasing the velocity of steam. The enthalpy and velocity of steam entering the nozzle are 2750 kJ/kg and 50 m/s respectively. The enthalpy at the exit of nozzle is 2600 kJ/kg. The heat losses from horizontal nozzle are negligible. Find :
- 1) Velocity at exit from the nozzle.
 - 2) Find the area at the exit of nozzle. If the inlet area is 0.1 m^2 and specific volume at inlet is $0.18 \text{ m}^3/\text{kg}$.
 - 3) Find the mass flow rate if the specific volume at outlet is $0.498 \text{ m}^3/\text{kg}$.
 - 4) Find the ration of inlet and exit diameter of nozzle. 4

SECTION – II

4. Attempt **any five** of the following : (5×3=15)
- a) Write a short note on four stroke engine.
 - b) Derive an expression for thermal efficiency of Otto cycle.
 - c) Give types of gear and write note on helical and bevel gear.
 - d) Differentiate between chain drive and belt drive.
 - e) Discuss different mode of failure.
 - f) Write a note on design process.
 - g) Explain with neat sketch spot welding.



5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A belt running over a pulley of diameter 120 cm at 200 rpm. The angle of contact is 165° and coefficient of friction between the belt and pulley is 0.3. If maximum tension in the belt is 3000 N. Find the power transmitted by the belt. **5**
 - b) Describe with schematic diagram center lathe machine. **5**
 - c) In a constant volume Otto cycle the pressure at the end of a compression is 15 times that at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature obtained in the cycle is 1950°C . Determine
 - 1) Thermal Efficiency.
 - 2) Work done.

Take γ for air = 1.4 **4**
 - d) Explain in detail ergonomic consideration. **4**
 - e) Write a note on brazing. **4**
 - f) Explain with neat sketch arc welding. **4**
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SLR-VB – 4

Seat No.	
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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Total Marks : 70

Time : 10.00 a.m. to 1.00 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) **Neat** diagrams must be drawn **whenever** necessary.
 - 4) Make **suitable** assumptions if necessary and mention them clearly.
 - 5) Figures to the **right** indicate **full** marks.
 - 6) **Use** of log table and non-programmable single memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**
- 1) The cross section of V-Belt is
a) Rectangular b) Square c) Trapezoidal d) Circular
 - 2) Factor of safety is defined as
a) Minimum stress/Maximum stress b) Maximum stress/ Minimum stress
c) Minimum stress/Allowable stress d) Maximum stress/Allowable stress
 - 3) Which of the following is unit less ?
a) Stress b) Strain
c) Young Modulus d) None
 - 4) The process of removing material from face of work piece is called
a) Turning b) Knurling c) Facing d) None of these
 - 5) Drilling of work piece can be carried out by
a) Lathe b) Drilling machine
c) Both a and b d) None

P.T.O.



- 6) First law of thermodynamic defines
- a) Work
 - b) Internal Energy
 - c) Heat
 - d) Entropy
- 7) In vapour compression refrigeration system heat is rejected from the refrigerant in
- a) Evaporator
 - b) Condenser
 - c) Compressor
 - d) Capillary Tube
- 8) System comprising of single phase, is known as
- a) Open system
 - b) Closed system
 - c) Homogeneous system
 - d) Heterogeneous system
- 9) When the expansion or compression follows the law $PV^f = C$, the process is
- a) Isothermal
 - b) Hyperbolic
 - c) Adiabatic
 - d) Polytropic
- 10) The device used to convert the kinetic energy in to mechanical work.
- a) Pump
 - b) Turbine
 - c) Compressor
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 - b) Hydro power plant
 - c) Nuclear power plant
 - d) Diesel power plant
- 13) Spark plug is present in
- a) Diesel engine
 - b) Petrol engine
 - c) Both a and b
 - d) None of these
- 14) Perpendicular shaft can be connected by
- a) Flat belt drive
 - b) Chain drive
 - c) Rope drive
 - d) None of the above
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**F.E (Part — I) (New CBCS) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- 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. 2 and Q. 4 are short answer type questions.
 - 5) Q. 3 and Q. 5 are long answer type questions.
 - 6) **Use** of log table and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Attempt **any five** of the following : **(5×3=15)**
- a) Define a thermodynamic system and their types.
 - b) Show that enthalpy is a function of temperature.
 - c) Write a short note on Heat and work.
 - d) Show that for adiabatic process $pV^{\gamma} = C$.
 - e) Explain the working of reciprocating compressor.
 - f) Explain with neat sketch Kaplan turbine.
 - g) State advantages and disadvantages of thermal power plant.
3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A system consist of four processes, the energy transfer in each process is tabulated below. Complete the table and determine the network of the cycle. **5**

Process	Q (kw)	W(kw)	Δu (kw)
1-2	40	....	25
2-3	20	-10	....
3-4	-20	....	.....
4-1	0	8	....



- b) Explain in detail hydroelectric power plant. 5
- c) A system contains 0.15 m^3 of a gas at a pressure of 3.8 bar. It is expanded adiabatically till the pressure falls to 1 bar. Determine the total work done.
Take $C_p = 1 \text{ kJ/kg k}$ $C_v = 0.71 \text{ kJ/kg k}$. 4
- d) Write a note on centrifugal pump. 4
- e) Discuss boiling water reactor in detail. 4
- f) A nozzle is used for increasing the velocity of steam. The enthalpy and velocity of steam entering the nozzle are 2750 kJ/kg and 50 m/s respectively. The enthalpy at the exit of nozzle is 2600 kJ/kg . The heat losses from horizontal nozzle are negligible. Find :
- 1) Velocity at exit from the nozzle.
 - 2) Find the area at the exit of nozzle. If the inlet area is 0.1 m^2 and specific volume at inlet is $0.18 \text{ m}^3/\text{kg}$.
 - 3) Find the mass flow rate if the specific volume at outlet is $0.498 \text{ m}^3/\text{kg}$.
 - 4) Find the ration of inlet and exit diameter of nozzle. 4

SECTION – II

4. Attempt **any five** of the following : (5×3=15)
- a) Write a short note on four stroke engine.
 - b) Derive an expression for thermal efficiency of Otto cycle.
 - c) Give types of gear and write note on helical and bevel gear.
 - d) Differentiate between chain drive and belt drive.
 - e) Discuss different mode of failure.
 - f) Write a note on design process.
 - g) Explain with neat sketch spot welding.



5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) : **13**
- a) A belt running over a pulley of diameter 120 cm at 200 rpm. The angle of contact is 165° and coefficient of friction between the belt and pulley is 0.3. If maximum tension in the belt is 3000 N. Find the power transmitted by the belt. **5**
 - b) Describe with schematic diagram center lathe machine. **5**
 - c) In a constant volume Otto cycle the pressure at the end of a compression is 15 times that at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature obtained in the cycle is 1950°C . Determine
 - 1) Thermal Efficiency.
 - 2) Work done.
- Take γ for air = 1.4 **4**
- d) Explain in detail ergonomic consideration. **4**
 - e) Write a note on brazing. **4**
 - f) Explain with neat sketch arc welding. **4**
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 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) The value of $e^{-i\pi/2}$ is
 - a) i
 - b) $-i$
 - c) -1
 - d) 1
- 2) The modulus of $(\tan \alpha + i)$ is
 - a) $\tan \alpha$
 - b) $\sec \alpha$
 - c) $\cot \alpha$
 - d) $\tan^2 \alpha$
- 3) The hyperbolic $\sinh(x)$ is defined as
 - a) $\frac{e^x + e^{-x}}{2}$
 - b) $\frac{e^x - e^{-x}}{2i}$
 - c) $\frac{e^x - e^{-x}}{2}$
 - d) None
- 4) Which of the following result is correct ?
 - a) $\sinh(-x) = -\sinh x$
 - b) $\cosh(-x) = \cosh x$
 - c) $\tanh(-x) = -\tanh x$
 - d) All are correct
- 5) If $y = \log(ax + b)$ then y_{11} is
 - a) $\frac{(10)!a^{10}}{(ax + b)^{11}}$
 - b) $\frac{(-1)^{10}11!a^{10}}{(ax + b)^{11}}$
 - c) $\frac{(-1)^{10}10!a^{10}}{(ax + b)^{11}}$
 - d) $\frac{(-1)^{10}10!a^{11}}{(ax + b)^{11}}$
- 6) If $y = xe^x$ then $y_n =$
 - a) $xe^{nx} + e^x$
 - b) $e^{nx}.x + ne^x$
 - c) $e^x(x + n)$
 - d) None of these



- 7) The constant term in the expansion of $\log(1 + \tan x)$ is
- a) 1 b) -1 c) $\frac{1}{2}$ d) 0
- 8) The rank of a diagonal matrix $A_{n \times n}$ is
- a) n
b) No. of zeros in the diagonal
c) No. of non-zero elements in the diagonal
d) None of these
- 9) If the rank of the coefficient matrix of the equations $x + y + z = 4$, $2x - y + z = 1$, $x - y + z = 0$ is 3, then the planes
- a) Are parallel to each other b) Intersect in one point
c) Intersect in a line d) Form a prism
- 10) The characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$, then
- a) A^{-1} does not exist b) $A^{-1} = A + I$
c) $A^{-1} = -A - I$ d) $A^{-1} = A - I$
- 11) If X_1, X_2, X_3 are linearly dependent vectors then
- a) $X_1 = X_2 = X_3$ b) $X_1 = kX_2 + lX_3$
c) $X_1 = 0, X_2 = 0, X_3 = 0$, d) None of these
- 12) If $x = r \cos \theta$, $y = r \sin \theta$, then $\left(\frac{\partial r}{\partial x}\right)_y =$
- a) $\frac{r}{x}$ b) $\frac{r}{y}$ c) $\frac{x}{r}$ d) $\frac{y}{r}$
- 13) If $u = x - y$, $v = y - x$, then $\frac{\partial(u, v)}{\partial(x, y)}$
- a) 0 b) 1 c) -1 d) 2
- 14) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to
- a) 1% b) 3% c) 0% d) 2%
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Seat No.	
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F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I

Day and Date : Thursday, 4-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 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. a) Prove that $\log \sec x = \frac{x^2}{2} + \frac{x^4}{12} + \frac{x^6}{45} + \dots$ **3**

b) Expand $\tan^{-1} x$ in power of $(x - 1)$. **3**

c) Find the values of a and b such that **3**

$$\lim_{x \rightarrow 0} \frac{a \sin^2 x + b \log \cos x}{x^4} = \frac{1}{2}$$

3. a) If $u = \log \left[\tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right) \right]$, then prove that $\sinh u = \tan \theta$. **3**

b) If $x + iy = 2 \cosh \left(\alpha + i \frac{\pi}{4} \right)$, prove that $x^2 - y^2 = 2$. **3**

c) If $\cot \left(\frac{\pi}{6} + i\alpha \right) = x + iy$, prove that $x^2 + y^2 - \frac{2}{\sqrt{3}}x = 1$. **3**



4. a) If $\alpha + \beta$ are roots of the equation $x^2 + 2x + 2 = 0$ prove that $\alpha^n \cdot \beta^n = 2^n$. **3**
- b) Prove that $\cos 5\theta = 5 \cos \theta - 20 \cos^3 \theta + 16 \cos^5 \theta$. **3**
- c) Find the continued product of all the values of $\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)^{3/4}$. **3**
5. a) If $y = \frac{x^3}{x^2 - 1}$ then prove that $y_n = 0$ for $x = 0$, when n is even. **3**
- b) If $y = 2^x \sin^2 x \cos x$ find y_n . **3**
- OR
- b) If $y = e^x \cos^3 x$. Find y_n .
- c) If $\sin^{-1} \left(\frac{y}{b} \right) = \log \left(\frac{x}{n} \right)^n$ prove that $x^2 y_{n+2} + (2n + 1) x y_{n+1} + 2n^2 y_n = 0$
(3+1=4)

SECTION – II

6. Attempt the following :

a) Reduce the following matrix to normal form and find its rank :

$$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}. \quad \mathbf{3}$$

b) Test the consistency of the following system of equations

$$2x + 3y + 4z = 11, \quad x + 5y + 7z = 15,$$

$$3x + 11y + 13z = 25$$

If found consistent, solve it. **3**

c) Show that the system of equations $2x - 2y + z = \lambda x$, $2x - 3y + 2z = \lambda y$,
 $-x + 2y = \lambda z$ can possess a non-trivial solution only if $\lambda = 1$, $\lambda = -3$. Obtain
the general solution when $\lambda = 1$. **3**



7. Attempt the following :

a) Show that row vectors of matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ are linearly independent. **3**

b) Find the eigen values and eigen vector corresponding to greatest eigen value of the matrix

$$A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix} \quad \mathbf{3}$$

c) Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A and hence, Obtain A^{-1} . **3**

8. Attempt the following :

a) If $z = x \log (x + r) - r$, where $r^2 = x^2 + y^2$ prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{1}{x+r}$. **5**

b) If $u = \log (x^3 + y^3 - x^2y - xy^2)$, prove that **4**

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$.

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -3$.

9. Attempt the following :

a) The period T of a simple pendulum is $T = 2\pi \sqrt{\frac{l}{g}}$
Find the maximum error in T due to possible errors upto 1% in l and 2% in g. **3**

b) If $x + y + z = u$, $y + z = vu$, $z = uvw$. Prove that $\frac{\partial (x, y, z)}{\partial (u, v, w)} = u^2v$. **3**

c) Divide 120 into three parts so that the sum of their products taken two at a time shall be maximum. **4**



SLR-VB – 5

Seat No.	
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Set	Q
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 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) The rank of a diagonal matrix $A_{n \times n}$ is
 - a) n
 - b) No. of zeros in the diagonal
 - c) No. of non-zero elements in the diagonal
 - d) None of these
- 2) If the rank of the coefficient matrix of the equations $x + y + z = 4$, $2x - y + z = 1$, $x - y + z = 0$ is 3, then the planes
 - a) Are parallel to each other
 - b) Intersect in one point
 - c) Intersect in a line
 - d) Form a prism
- 3) The characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$, then
 - a) A^{-1} does not exist
 - b) $A^{-1} = A + I$
 - c) $A^{-1} = -A - I$
 - d) $A^{-1} = A - I$
- 4) If X_1, X_2, X_3 are linearly dependent vectors then
 - a) $X_1 = X_2 = X_3$
 - b) $X_1 = kX_2 + lX_3$
 - c) $X_1 = 0, X_2 = 0, X_3 = 0,$
 - d) None of these

P.T.O.



- 5) If $x = r \cos \theta$, $y = r \sin \theta$, then $\left(\frac{\partial r}{\partial x}\right)_y =$
- a) $\frac{r}{x}$ b) $\frac{r}{y}$ c) $\frac{x}{r}$ d) $\frac{y}{r}$
- 6) If $u = x - y$, $v = y - x$, then $\frac{\partial(u, v)}{\partial(x, y)}$
- a) 0 b) 1 c) -1 d) 2
- 7) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to
- a) 1% b) 3% c) 0% d) 2%
- 8) The value of $e^{-i\pi/2}$ is
- a) i b) $-i$ c) -1 d) 1
- 9) The modulus of $(\tan \alpha + i)$ is
- a) $\tan \alpha$ b) $\sec \alpha$ c) $\cot \alpha$ d) $\tan^2 \alpha$
- 10) The hyperbolic $\sinh(x)$ is defined as
- a) $\frac{e^x + e^{-x}}{2}$ b) $\frac{e^x - e^{-x}}{2i}$ c) $\frac{e^x - e^{-x}}{2}$ d) None
- 11) Which of the following result is correct ?
- a) $\sinh(-x) = -\sinh x$ b) $\cosh(-x) = \cosh x$
 c) $\tanh(-x) = -\tanh x$ d) All are correct
- 12) If $y = \log(ax + b)$ then y_{11} is
- a) $\frac{(10)!a^{10}}{(ax + b)^{11}}$ b) $\frac{(-1)^{10}11!a^{10}}{(ax + b)^{11}}$ c) $\frac{(-1)^{10}10!a^{10}}{(ax + b)^{11}}$ d) $\frac{(-1)^{10}10!a^{11}}{(ax + b)^{11}}$
- 13) If $y = xe^x$ then $y_n =$
- a) $xe^{nx} + e^x$ b) $e^{nx}.x + ne^x$ c) $e^x(x + n)$ d) None of these
- 14) The constant term in the expansion of $\log(1 + \tan x)$ is
- a) 1 b) -1 c) $\frac{1}{2}$ d) 0



Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 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. a) Prove that $\log \sec x = \frac{x^2}{2} + \frac{x^4}{12} + \frac{x^6}{45} + \dots$ **3**
- b) Expand $\tan^{-1} x$ in power of $(x - 1)$. **3**
- c) Find the values of a and b such that **3**

$$\lim_{x \rightarrow 0} \frac{a \sin^2 x + b \log \cos x}{x^4} = \frac{1}{2}$$

3. a) If $u = \log \left[\tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right) \right]$, then prove that $\sinh u = \tan \theta$. **3**
- b) If $x + iy = 2 \cosh \left(\alpha + i \frac{\pi}{4} \right)$, prove that $x^2 - y^2 = 2$. **3**
- c) If $\cot \left(\frac{\pi}{6} + i\alpha \right) = x + iy$, prove that $x^2 + y^2 - \frac{2}{\sqrt{3}}x = 1$. **3**



4. a) If $\alpha + \beta$ are roots of the equation $x^2 + 2x + 2 = 0$ prove that $\alpha^n \cdot \beta^n = 2^n$. **3**
- b) Prove that $\cos 5\theta = 5 \cos \theta - 20 \cos^3 \theta + 16 \cos^5 \theta$. **3**
- c) Find the continued product of all the values of $\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)^{3/4}$. **3**
5. a) If $y = \frac{x^3}{x^2 - 1}$ then prove that $y_n = 0$ for $x = 0$, when n is even. **3**
- b) If $y = 2^x \sin^2 x \cos x$ find y_n . **3**
- OR
- b) If $y = e^x \cos^3 x$. Find y_n .
- c) If $\sin^{-1} \left(\frac{y}{b} \right) = \log \left(\frac{x}{n} \right)^n$ prove that $x^2 y_{n+2} + (2n + 1) x y_{n+1} + 2n^2 y_n = 0$
(3+1=4)

SECTION – II

6. Attempt the following :

a) Reduce the following matrix to normal form and find its rank :

$$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}. \quad \mathbf{3}$$

b) Test the consistency of the following system of equations

$$2x + 3y + 4z = 11, \quad x + 5y + 7z = 15,$$

$$3x + 11y + 13z = 25$$

If found consistent, solve it. **3**

c) Show that the system of equations $2x - 2y + z = \lambda x$, $2x - 3y + 2z = \lambda y$,
 $-x + 2y = \lambda z$ can possess a non-trivial solution only if $\lambda = 1$, $\lambda = -3$. Obtain
the general solution when $\lambda = 1$. **3**



7. Attempt the following :

a) Show that row vectors of matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ are linearly independent. **3**

b) Find the eigen values and eigen vector corresponding to greatest eigen value of the matrix

$$A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix} \quad \mathbf{3}$$

c) Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A and hence, Obtain A^{-1} . **3**

8. Attempt the following :

a) If $z = x \log (x + r) - r$, where $r^2 = x^2 + y^2$ prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{1}{x+r}$. **5**

b) If $u = \log (x^3 + y^3 - x^2y - xy^2)$, prove that **4**

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$.

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -3$.

9. Attempt the following :

a) The period T of a simple pendulum is $T = 2\pi \sqrt{\frac{l}{g}}$
Find the maximum error in T due to possible errors upto 1% in l and 2% in g. **3**

b) If $x + y + z = u$, $y + z = vu$, $z = uvw$. Prove that $\frac{\partial (x, y, z)}{\partial (u, v, w)} = u^2v$. **3**

c) Divide 120 into three parts so that the sum of their products taken two at a time shall be maximum. **4**



SLR-VB – 5

Seat No.	
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Set	R
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 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) If $y = \log(ax + b)$ then y_{11} is

- a) $\frac{(10)!a^{10}}{(ax + b)^{11}}$ b) $\frac{(-1)^{10}11!a^{10}}{(ax + b)^{11}}$ c) $\frac{(-1)^{10}10!a^{10}}{(ax + b)^{11}}$ d) $\frac{(-1)^{10}10!a^{11}}{(ax + b)^{11}}$

2) If $y = xe^x$ then $y_n =$

- a) $xe^{nx} + e^x$ b) $e^{nx}.x + ne^x$ c) $e^x(x + n)$ d) None of these

3) The constant term in the expansion of $\log(1 + \tan x)$ is

- a) 1 b) -1 c) $\frac{1}{2}$ d) 0

4) The rank of a diagonal matrix $A_{n \times n}$ is

- a) n
b) No. of zeros in the diagonal
c) No. of non-zero elements in the diagonal
d) None of these

P.T.O.



- 5) If the rank of the coefficient matrix of the equations $x + y + z = 4$, $2x - y + z = 1$, $x - y + z = 0$ is 3, then the planes
- a) Are parallel to each other b) Intersect in one point
c) Intersect in a line d) Form a prism
- 6) The characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$, then
- a) A^{-1} does not exist b) $A^{-1} = A + I$
c) $A^{-1} = -A - I$ d) $A^{-1} = A - I$
- 7) If X_1, X_2, X_3 are linearly dependent vectors then
- a) $X_1 = X_2 = X_3$ b) $X_1 = kX_2 + lX_3$
c) $X_1 = 0, X_2 = 0, X_3 = 0,$ d) None of these
- 8) If $x = r \cos \theta$, $y = r \sin \theta$, then $\left(\frac{\partial r}{\partial x} \right)_y =$
- a) $\frac{r}{x}$ b) $\frac{r}{y}$ c) $\frac{x}{r}$ d) $\frac{y}{r}$
- 9) If $u = x - y$, $v = y - x$, then $\frac{\partial(u, v)}{\partial(x, y)}$
- a) 0 b) 1 c) -1 d) 2
- 10) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to
- a) 1% b) 3 % c) 0 % d) 2 %
- 11) The value of $e^{-i\pi/2}$ is
- a) i b) -i c) -1 d) 1
- 12) The modulus of $(\tan \alpha + i)$ is
- a) $\tan \alpha$ b) $\sec \alpha$ c) $\cot \alpha$ d) $\tan^2 \alpha$
- 13) The hyperbolic $\sinh(x)$ is defined as
- a) $\frac{e^x + e^{-x}}{2}$ b) $\frac{e^x - e^{-x}}{2i}$ c) $\frac{e^x - e^{-x}}{2}$ d) None
- 14) Which of the following result is correct ?
- a) $\sinh(-x) = -\sinh x$ b) $\cosh(-x) = \cosh x$
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Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 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. a) Prove that $\log \sec x = \frac{x^2}{2} + \frac{x^4}{12} + \frac{x^6}{45} + \dots$ **3**

b) Expand $\tan^{-1} x$ in power of $(x - 1)$. **3**

c) Find the values of a and b such that **3**

$$\lim_{x \rightarrow 0} \frac{a \sin^2 x + b \log \cos x}{x^4} = \frac{1}{2}$$

3. a) If $u = \log \left[\tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right) \right]$, then prove that $\sinh u = \tan \theta$. **3**

b) If $x + iy = 2 \cosh \left(\alpha + i \frac{\pi}{4} \right)$, prove that $x^2 - y^2 = 2$. **3**

c) If $\cot \left(\frac{\pi}{6} + i\alpha \right) = x + iy$, prove that $x^2 + y^2 - \frac{2}{\sqrt{3}}x = 1$. **3**



4. a) If $\alpha + \beta$ are roots of the equation $x^2 + 2x + 2 = 0$ prove that $\alpha^n \cdot \beta^n = 2^n$. **3**
- b) Prove that $\cos 5\theta = 5 \cos \theta - 20 \cos^3 \theta + 16 \cos^5 \theta$. **3**
- c) Find the continued product of all the values of $\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)^{3/4}$. **3**
5. a) If $y = \frac{x^3}{x^2 - 1}$ then prove that $y_n = 0$ for $x = 0$, when n is even. **3**
- b) If $y = 2^x \sin^2 x \cos x$ find y_n . **3**
- OR
- b) If $y = e^x \cos^3 x$. Find y_n .
- c) If $\sin^{-1} \left(\frac{y}{b} \right) = \log \left(\frac{x}{n} \right)^n$ prove that $x^2 y_{n+2} + (2n + 1) x y_{n+1} + 2n^2 y_n = 0$
(3+1=4)

SECTION – II

6. Attempt the following :

- a) Reduce the following matrix to normal form and find its rank :

$$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}. \quad \mathbf{3}$$

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$$2x + 3y + 4z = 11, \quad x + 5y + 7z = 15,$$

$$3x + 11y + 13z = 25$$

If found consistent, solve it. **3**

- c) Show that the system of equations $2x - 2y + z = \lambda x$, $2x - 3y + 2z = \lambda y$,
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the general solution when $\lambda = 1$. **3**



7. Attempt the following :

a) Show that row vectors of matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ are linearly independent. **3**

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$$A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix} \quad \mathbf{3}$$

c) Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A and hence, Obtain A^{-1} . **3**

8. Attempt the following :

a) If $z = x \log (x + r) - r$, where $r^2 = x^2 + y^2$ prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{1}{x+r}$. **5**

b) If $u = \log (x^3 + y^3 - x^2y - xy^2)$, prove that **4**

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$.

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -3$.

9. Attempt the following :

a) The period T of a simple pendulum is $T = 2\pi \sqrt{\frac{l}{g}}$
Find the maximum error in T due to possible errors upto 1% in l and 2% in g. **3**

b) If $x + y + z = u$, $y + z = vu$, $z = uvw$. Prove that $\frac{\partial (x, y, z)}{\partial (u, v, w)} = u^2v$. **3**

c) Divide 120 into three parts so that the sum of their products taken two at a time shall be maximum. **4**



SLR-VB – 5

Seat No.	
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Set	S
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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) Figures to the **right** indicate **full** marks.
 - 3) Use of calculator is **allowed**.
 - 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) The characteristic equation of the matrix A is $\lambda^2 - \lambda - 1 = 0$, then

- a) A^{-1} does not exist b) $A^{-1} = A + I$
c) $A^{-1} = -A - I$ d) $A^{-1} = A - I$

2) If X_1, X_2, X_3 are linearly dependent vectors then

- a) $X_1 = X_2 = X_3$ b) $X_1 = kX_2 + lX_3$
c) $X_1 = 0, X_2 = 0, X_3 = 0,$ d) None of these

3) If $x = r \cos \theta, y = r \sin \theta$, then $\left(\frac{\partial r}{\partial x} \right)_y =$

- a) $\frac{r}{x}$ b) $\frac{r}{y}$ c) $\frac{x}{r}$ d) $\frac{y}{r}$

4) If $u = x - y, v = y - x$, then $\frac{\partial(u,v)}{\partial(x,y)}$

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

P.T.O.



- 5) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is equal to
 a) 1% b) 3% c) 0% d) 2%
- 6) The value of $e^{-i\pi/2}$ is
 a) i b) $-i$ c) -1 d) 1
- 7) The modulus of $(\tan \alpha + i)$ is
 a) $\tan \alpha$ b) $\sec \alpha$ c) $\cot \alpha$ d) $\tan^2 \alpha$
- 8) The hyperbolic $\sinh(x)$ is defined as
 a) $\frac{e^x + e^{-x}}{2}$ b) $\frac{e^x - e^{-x}}{2i}$ c) $\frac{e^x - e^{-x}}{2}$ d) None
- 9) Which of the following result is correct ?
 a) $\sinh(-x) = -\sinh x$ b) $\cosh(-x) = \cosh x$
 c) $\tanh(-x) = -\tanh x$ d) All are correct
- 10) If $y = \log(ax + b)$ then y_{11} is
 a) $\frac{(10)!a^{10}}{(ax + b)^{11}}$ b) $\frac{(-1)^{10}11!a^{10}}{(ax + b)^{11}}$ c) $\frac{(-1)^{10}10!a^{10}}{(ax + b)^{11}}$ d) $\frac{(-1)^{10}10!a^{11}}{(ax + b)^{11}}$
- 11) If $y = xe^x$ then $y_n =$
 a) $xe^{nx} + e^x$ b) $e^{nx}.x + ne^x$ c) $e^x(x + n)$ d) None of these
- 12) The constant term in the expansion of $\log(1 + \tan x)$ is
 a) 1 b) -1 c) $\frac{1}{2}$ d) 0
- 13) The rank of a diagonal matrix $A_{n \times n}$ is
 a) n
 b) No. of zeros in the diagonal
 c) No. of non-zero elements in the diagonal
 d) None of these
- 14) If the rank of the coefficient matrix of the equations $x + y + z = 4$, $2x - y + z = 1$, $x - y + z = 0$ is 3, then the planes
 a) Are parallel to each other b) Intersect in one point
 c) Intersect in a line d) Form a prism



Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 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. a) Prove that $\log \sec x = \frac{x^2}{2} + \frac{x^4}{12} + \frac{x^6}{45} + \dots$ **3**

b) Expand $\tan^{-1} x$ in power of $(x - 1)$. **3**

c) Find the values of a and b such that **3**

$$\lim_{x \rightarrow 0} \frac{a \sin^2 x + b \log \cos x}{x^4} = \frac{1}{2}$$

3. a) If $u = \log \left[\tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right) \right]$, then prove that $\sinh u = \tan \theta$. **3**

b) If $x + iy = 2 \cosh \left(\alpha + i \frac{\pi}{4} \right)$, prove that $x^2 - y^2 = 2$. **3**

c) If $\cot \left(\frac{\pi}{6} + i\alpha \right) = x + iy$, prove that $x^2 + y^2 - \frac{2}{\sqrt{3}}x = 1$. **3**



4. a) If $\alpha + \beta$ are roots of the equation $x^2 + 2x + 2 = 0$ prove that $\alpha^n \cdot \beta^n = 2^n$. **3**
- b) Prove that $\cos 5\theta = 5 \cos \theta - 20 \cos^3 \theta + 16 \cos^5 \theta$. **3**
- c) Find the continued product of all the values of $\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)^{3/4}$. **3**
5. a) If $y = \frac{x^3}{x^2 - 1}$ then prove that $y_n = 0$ for $x = 0$, when n is even. **3**
- b) If $y = 2^x \sin^2 x \cos x$ find y_n . **3**
- OR
- b) If $y = e^x \cos^3 x$. Find y_n .
- c) If $\sin^{-1} \left(\frac{y}{b} \right) = \log \left(\frac{x}{n} \right)^n$ prove that $x^2 y_{n+2} + (2n + 1) x y_{n+1} + 2n^2 y_n = 0$
(3+1=4)

SECTION – II

6. Attempt the following :

a) Reduce the following matrix to normal form and find its rank :

$$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}. \quad \mathbf{3}$$

b) Test the consistency of the following system of equations

$$2x + 3y + 4z = 11, \quad x + 5y + 7z = 15,$$

$$3x + 11y + 13z = 25$$

If found consistent, solve it. **3**

c) Show that the system of equations $2x - 2y + z = \lambda x$, $2x - 3y + 2z = \lambda y$,
 $-x + 2y = \lambda z$ can possess a non-trivial solution only if $\lambda = 1$, $\lambda = -3$. Obtain
the general solution when $\lambda = 1$. **3**



7. Attempt the following :

a) Show that row vectors of matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ are linearly independent. **3**

b) Find the eigen values and eigen vector corresponding to greatest eigen value of the matrix

$$A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix} \quad \mathbf{3}$$

c) Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A and hence, Obtain A^{-1} . **3**

8. Attempt the following :

a) If $z = x \log (x + r) - r$, where $r^2 = x^2 + y^2$ prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{1}{x+r}$. **5**

b) If $u = \log (x^3 + y^3 - x^2y - xy^2)$, prove that **4**

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$.

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -3$.

9. Attempt the following :

a) The period T of a simple pendulum is $T = 2\pi \sqrt{\frac{l}{g}}$
Find the maximum error in T due to possible errors upto 1% in l and 2% in g. **3**

b) If $x + y + z = u$, $y + z = vu$, $z = uvw$. Prove that $\frac{\partial (x, y, z)}{\partial (u, v, w)} = u^2v$. **3**

c) Divide 120 into three parts so that the sum of their products taken two at a time shall be maximum. **4**



SLR-VB – 6

Seat No.	
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Set	P
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F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS

Day and Date : Friday, 5-5-2017
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.**
 - 3) **Use of non programmable calculator is allowed.**
 - 4) Assume suitable data if **required** and mention **clearly**.
 - 5) Figures to the **right** indicate marks in **full**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) If the reaction of beam at one of its supports is the resultant of horizontal and vertical forces, then it is a
 - a) Simple support
 - b) Roller support
 - c) Hinged support
 - d) Fixed support
- 2) In the analysis of projectile motion, it is assumed that effect of air resistance is
 - a) Important
 - b) Considerable
 - c) Negligible
 - d) None of these
- 3) A truss is made of seven two force members and five joints, then the truss is
 - a) deficient
 - b) redundant
 - c) perfect
 - d) none of these
- 4) A man in a lift will weigh more when the lift is
 - a) accelerated upwards
 - b) accelerated downwards
 - c) descends freely
 - d) lift going up is slowing down
- 5) If the coefficients of friction of an inclined plane be $(1/\sqrt{3})$, then the angle of repose of the plane will be
 - a) 90°
 - b) 60°
 - c) 45°
 - d) 30°
- 6) The moment of inertia of a rectangle of base 'b' and height 'h' about its base is
 - a) $bh^3/36$
 - b) $bh^3/24$
 - c) $bh^3/12$
 - d) $bh^3/3$
- 7) Time required to stop a car moving with velocity 20 m/s within a distance of 40 m is
 - a) 2 sec
 - b) 3 sec
 - c) 4 sec
 - d) 5 sec

P.T.O.



- 8) Pick up the correct statement from the following. The kinetic energy of a body
- a) Before impact is equal to that after impact
 - b) Before impact is less than that after impact
 - c) Before impact is more than that after impact
 - d) Remains constant
- 9) A particle is moving along a circle with constant speed. The acceleration of the particle is
- a) along the circumference
 - b) along the tangent
 - c) along the radius
 - d) zero
- 10) The coefficients of friction depends upon
- a) nature of the surface
 - b) shape of the surface
 - c) area of the contact surface
 - d) weight of the body
- 11) The velocity of a moving body is a
- a) Vector quantity
 - b) Scalar quantity
 - c) Constant quantity
 - d) None of these
- 12) In the method of sections for trusses, the section must be passed so as to cut not more than
- a) two members
 - b) three members
 - c) four members
 - d) five members
- 13) If lines of action of all the forces lie in the same plane and meet at a point, the force system is
- a) Coplanar concurrent force system
 - b) Non coplanar concurrent force system
 - c) Coplanar non concurrent force system
 - d) Non coplanar non concurrent force system
- 14) When a particle is at the highest point of its projectile motion
- a) Its acceleration is zero
 - b) Its velocity is zero
 - c) Its velocity is directed downward
 - d) Its velocity is directed upward
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Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) In Section – I, question No.2 is **compulsory**, solve **any two** questions out of remaining question.
 - 2) In Section – II, solve **any three** questions.
 - 3) **Use** of non programmable calculator is **allowed**.
 - 4) Assume suitable data if **required** and mention **clearly**.
 - 5) Figures to the **right** indicate marks in **full**.

SECTION – I

2. A) State and explain idealization in mechanics. 3
 B) A system of forces acting on a bell crank is as shown in **Figure 1** below. Determine the magnitude, direction and the point of applicaiton of the resultant with respect to point 'O'. 7

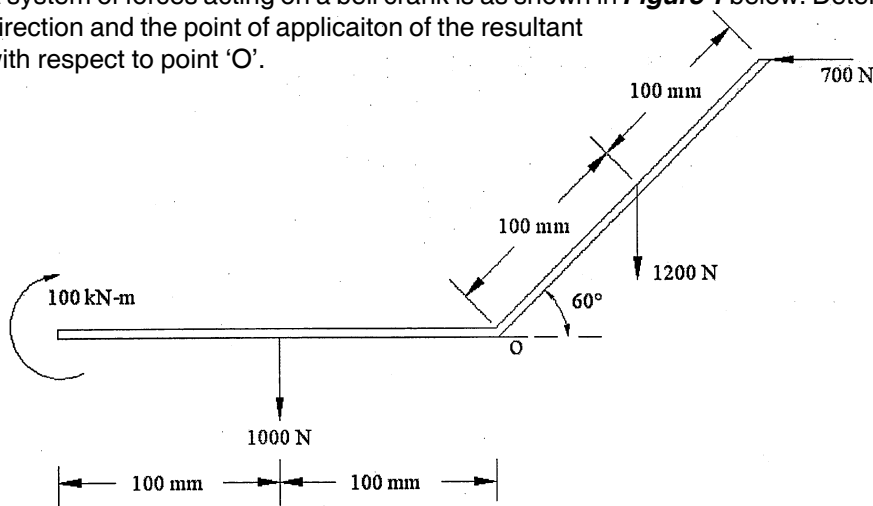


Figure – 1

3. A) What are the assumptions made in the analysis of truss ? 2
 B) Find out the forces in all the members of the truss as shown in **Figure 2** below. 7

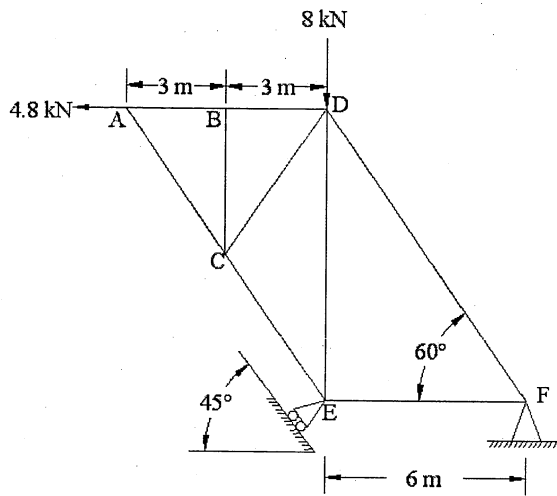


Figure – 2

Set P



4. A) What are the types of support ? Enlist them showing an equivalent supports reactions. 2
 B) A overhand beam has been loaded as shown in **Figure 3** below. Determine the reaction at A and B. 7

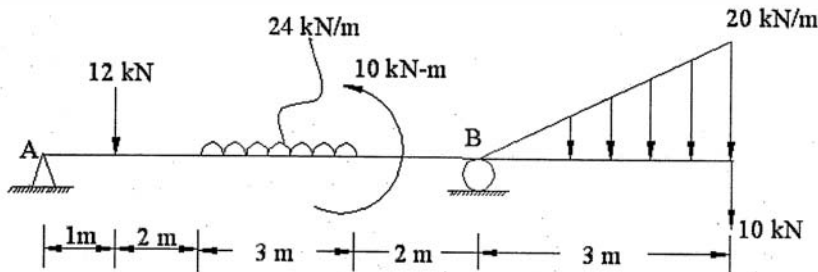


Figure - 3

5. A) Explain the concept of virtual work. 2
 B) Determine the moment of inertia about horizontal centroidal axis XX for a section as shown in **Figure 4** below. 7

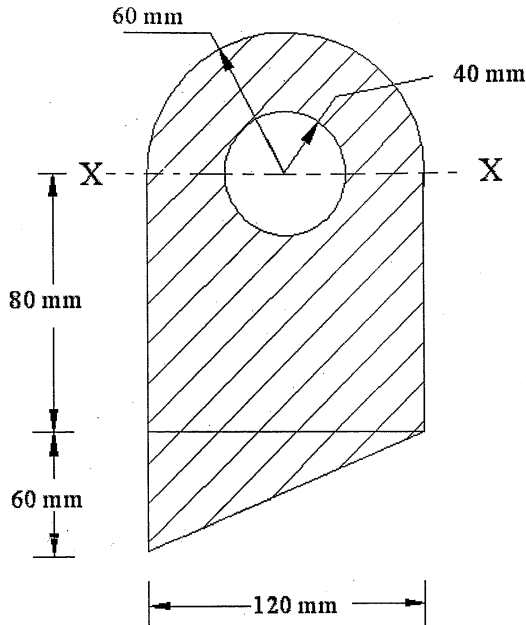


Figure - 4

SECTION – II

6. A) Differentiate between Kinematics and Kinetics. 3
 B) A ball is thrown vertically upward from the base of the tower, with velocity of 90m/s. A boy standing at the top of the tower misses to catch it during its upward motion, but 10 second later he catches it in its downward motion. Find out
 a) Velocity of the ball when it is caught and
 b) The height of the tower. 7



7. A) Derive an expression for time of flight of a projectile projected at an angle of projection α on horizontal ground. 2
- B) An aeroplane is flying in horizontal direction with a velocity of 540 km/hr and at a height of 2100 m as shown in **Figure 5** when it is vertically above the point A on the ground a body is dropped from it. The body strikes the ground at point B. Calculate the distance AB (ignoring air resistance). Also find velocity at B and time taken to reach B. 7

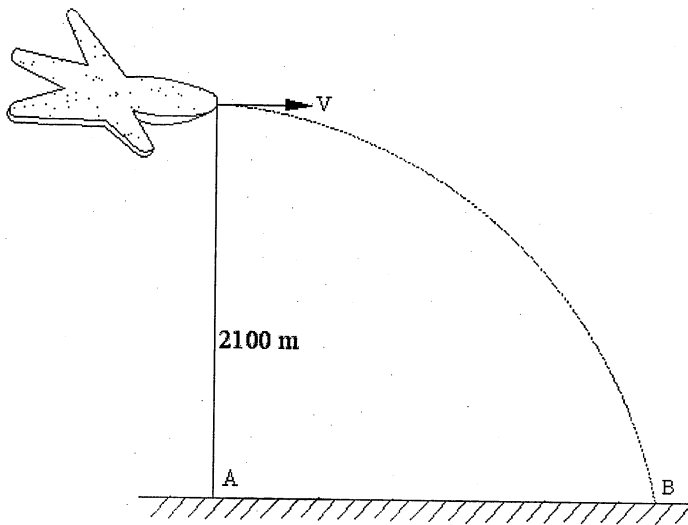


Figure - 5

8. A) What do you understand by banking of roads ? Why it is required ? 2



- B) Determine the tension in the string and acceleration of blocks A and B weighing 150 N and 50 N respectively connected by an inextensible string as shown in **Figure 6** below. Assume pulleys as frictionless and weightless. Also find out the distance travelled by block B in 5 sec. 7

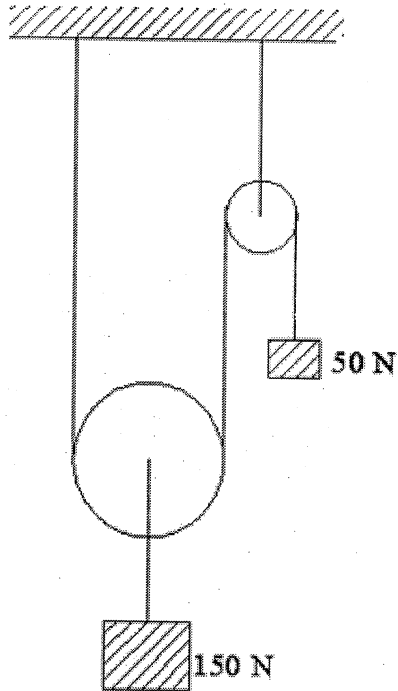


Figure - 6

9. A) State and explain the law of conservation of momentum. 2
- B) A 400 N hammer is used to drive a pile of 600 N into the ground. If the vertical fall of 4 m causes penetration of 0.2 m, calculate :
- a) The common velocity after impact
 - b) The average resistance of ground. 7
-



SLR-VB – 6

Seat No.	
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F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS

Day and Date : Friday, 5-5-2017
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.**
 - 3) **Use** of non programmable calculator is allowed.
 - 4) Assume suitable data if **required** and mention clearly.
 - 5) Figures to the **right** indicate marks in **full**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) Pick up the correct statement from the following. The kinetic energy of a body
 - a) Before impact is equal to that after impact
 - b) Before impact is less than that after impact
 - c) Before impact is more than that after impact
 - d) Remains constant
- 2) A particle is moving along a circle with constant speed. The acceleration of the particle is
 - a) along the circumference
 - b) along the tangent
 - c) along the radius
 - d) zero
- 3) The coefficients of friction depends upon
 - a) nature of the surface
 - b) shape of the surface
 - c) area of the contact surface
 - d) weight of the body
- 4) The velocity of a moving body is a
 - a) Vector quantity
 - b) Scalar quantity
 - c) Constant quantity
 - d) None of these
- 5) In the method of sections for trusses, the section must be passed so as to cut not more than
 - a) two members
 - b) three members
 - c) four members
 - d) five members

P.T.O.



- 6) If lines of action of all the forces lie in the same plane and meet at a point, the force system is
- Coplanar concurrent force system
 - Non coplanar concurrent force system
 - Coplanar non concurrent force system
 - Non coplanar non concurrent force system
- 7) When a particle is at the highest point of its projectile motion
- Its acceleration is zero
 - Its velocity is zero
 - Its velocity is directed downward
 - Its velocity is directed upward
- 8) If the reaction of beam at one of its supports is the resultant of horizontal and vertical forces, then it is a
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- 9) In the analysis of projectile motion, it is assumed that effect of air resistance is
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 - None of these
- 10) A truss is made of seven two force members and five joints, then the truss is
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 - redundant
 - perfect
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 - 45°
 - 30°
- 13) The moment of inertia of a rectangle of base 'b' and height 'h' about its base is
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-



Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) In Section – I, question No.2 is **compulsory**, solve **any two** questions out of remaining question.
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SECTION – I

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 B) A system of forces acting on a bell crank is as shown in **Figure 1** below. Determine the magnitude, direction and the point of applicaiton of the resultant with respect to point 'O'. 7

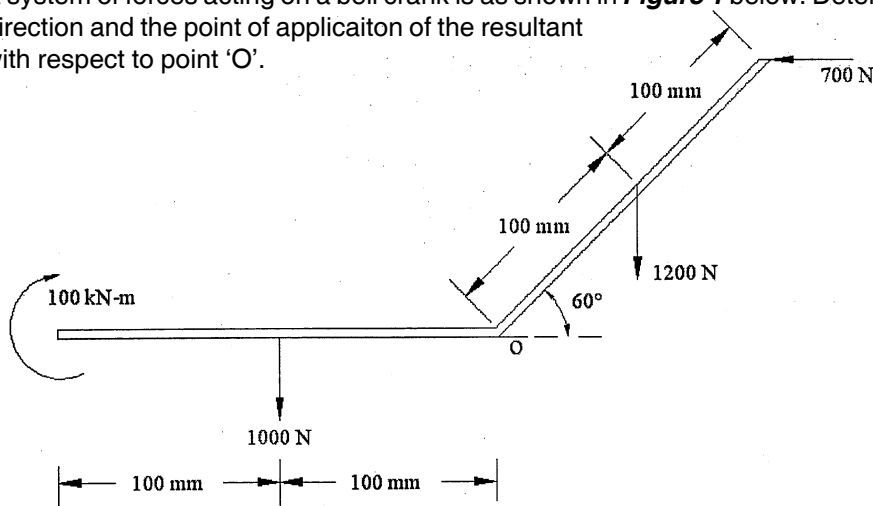


Figure – 1

3. A) What are the assumptions made in the analysis of truss ? 2
 B) Find out the forces in all the members of the truss as shown in **Figure 2** below. 7

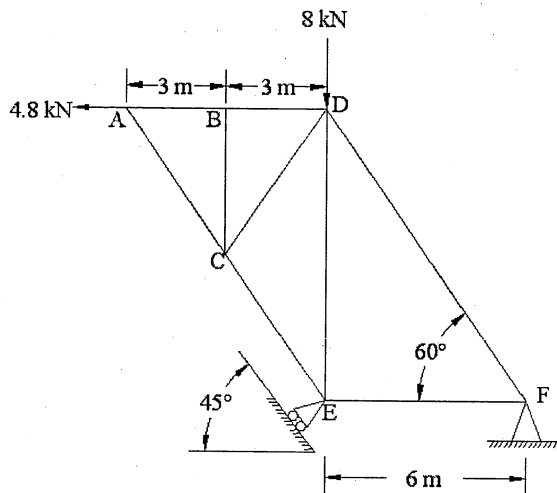


Figure – 2

Set Q



4. A) What are the types of support ? Enlist them showing an equivalent supports reactions. 2
 B) A overhand beam has been loaded as shown in **Figure 3** below. Determine the reaction at A and B. 7

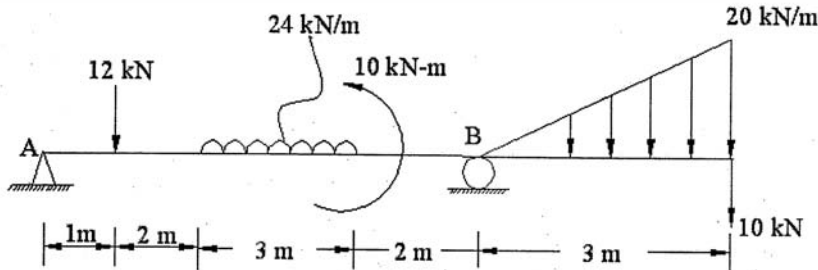


Figure - 3

5. A) Explain the concept of virtual work. 2
 B) Determine the moment of inertia about horizontal centroidal axis XX for a section as shown in **Figure 4** below. 7

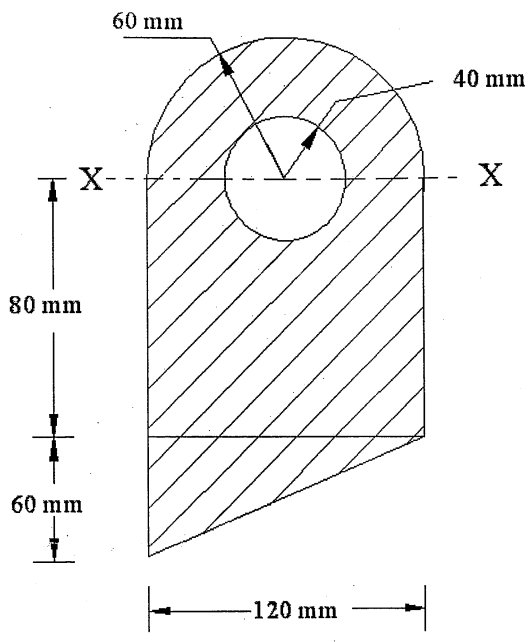


Figure - 4

SECTION – II

6. A) Differentiate between Kinematics and Kinetics. 3
 B) A ball is thrown vertically upward from the base of the tower, with velocity of 90m/s. A boy standing at the top of the tower misses to catch it during its upward motion, but 10 second later he catches it in its downward motion. Find out
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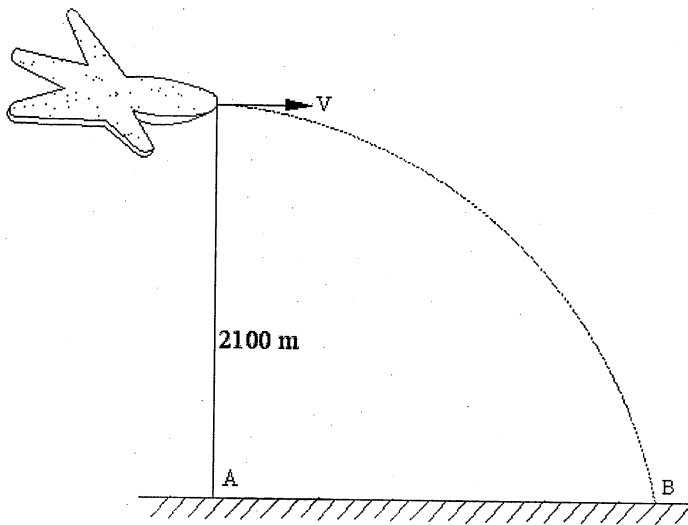


Figure - 5

8. A) What do you understand by banking of roads ? Why it is required ? 2



- B) Determine the tension in the string and acceleration of blocks A and B weighing 150 N and 50 N respectively connected by an inextensible string as shown in **Figure 6** below. Assume pulleys as frictionless and weightless. Also find out the distance travelled by block B in 5 sec. 7

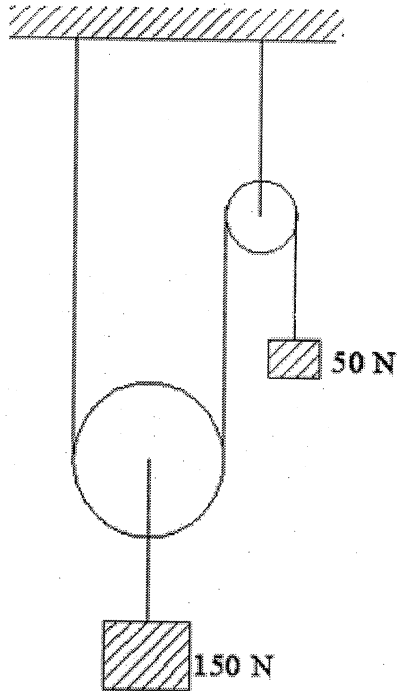


Figure - 6

9. A) State and explain the law of conservation of momentum. 2
- B) A 400 N hammer is used to drive a pile of 600 N into the ground. If the vertical fall of 4 m causes penetration of 0.2 m, calculate :
- The common velocity after impact
 - The average resistance of ground. 7



SLR-VB – 6

Seat No.	
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Set	R
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F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS

Day and Date : Friday, 5-5-2017
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.
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MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) If the coefficients of friction of an inclined plane be $(1/\sqrt{3})$, then the angle of repose of the plane will be
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 - c) $bh^3/12$
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 - a) Before impact is equal to that after impact
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 - b) shape of the surface
 - c) area of the contact surface
 - d) weight of the body
- 7) The velocity of a moving body is a
 - a) Vector quantity
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 - d) None of these

P.T.O.



- 8) In the method of sections for trusses, the section must be passed so as to cut not more than
- a) two members
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-



Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) In Section – I, question No.2 is **compulsory**, solve **any two** questions out of remaining question.
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 - 5) Figures to the **right** indicate marks in **full**.

SECTION – I

2. A) State and explain idealization in mechanics. 3
 B) A system of forces acting on a bell crank is as shown in **Figure 1** below. Determine the magnitude, direction and the point of applicaiton of the resultant with respect to point 'O'. 7

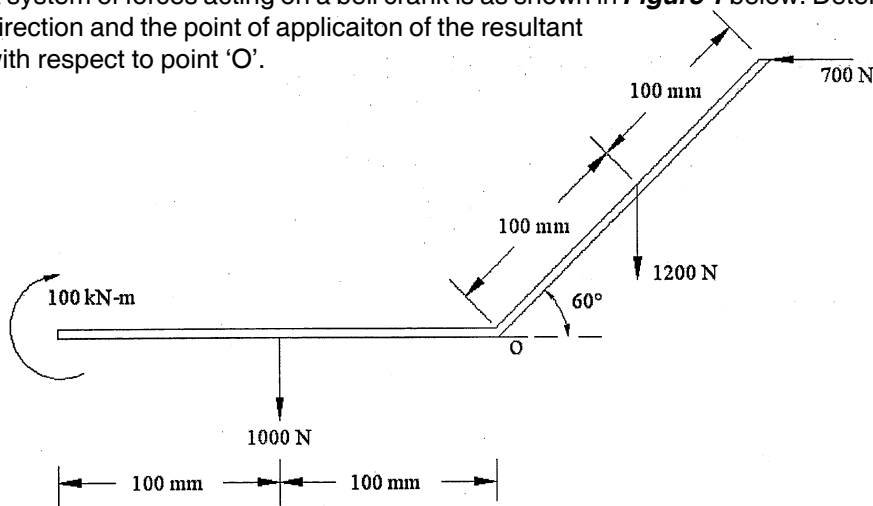


Figure – 1

3. A) What are the assumptions made in the analysis of truss ? 2
 B) Find out the forces in all the members of the truss as shown in **Figure 2** below. 7

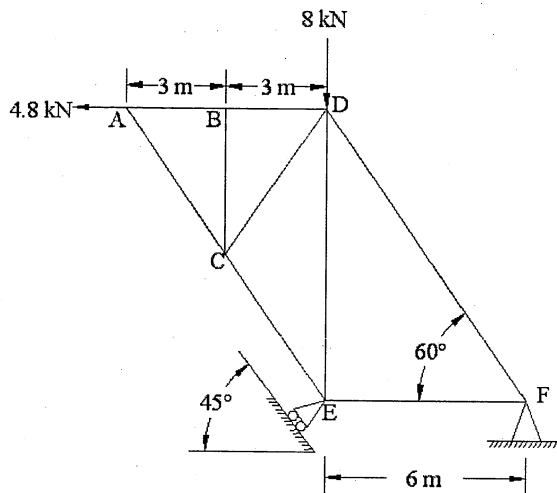


Figure – 2

Set R



4. A) What are the types of support ? Enlist them showing an equivalent supports reactions. 2
 B) A overhand beam has been loaded as shown in **Figure 3** below. Determine the reaction at A and B. 7

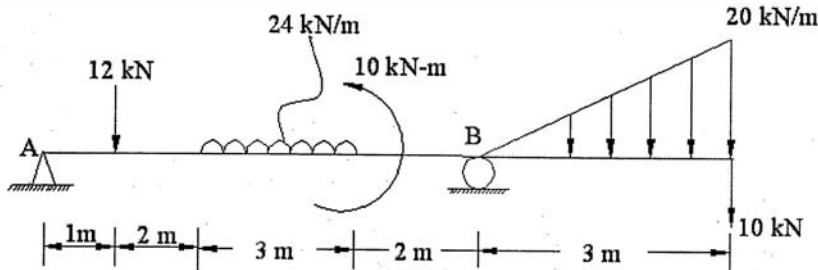


Figure - 3

5. A) Explain the concept of virtual work. 2
 B) Determine the moment of inertia about horizontal centroidal axis XX for a section as shown in **Figure 4** below. 7

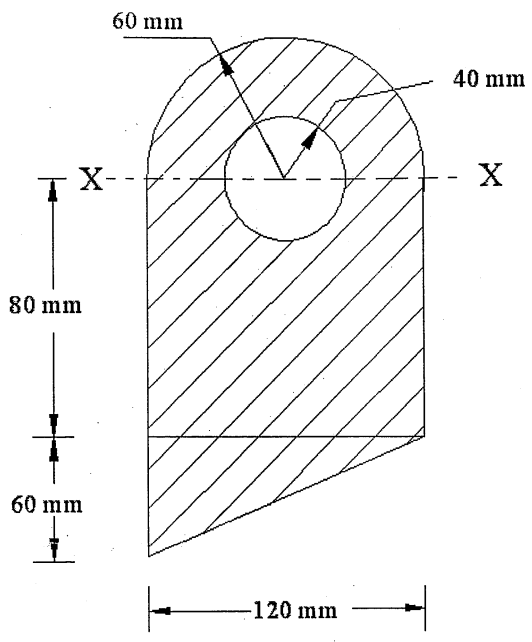


Figure - 4

SECTION – II

6. A) Differentiate between Kinematics and Kinetics. 3
 B) A ball is thrown vertically upward from the base of the tower, with velocity of 90m/s. A boy standing at the top of the tower misses to catch it during its upward motion, but 10 second later he catches it in its downward motion. Find out
 a) Velocity of the ball when it is caught and
 b) The height of the tower. 7



7. A) Derive an expression for time of flight of a projectile projected at an angle of projection α on horizontal ground. 2
- B) An aeroplane is flying in horizontal direction with a velocity of 540 km/hr and at a height of 2100 m as shown in **Figure 5** when it is vertically above the point A on the ground a body is dropped from it. The body strikes the ground at point B. Calculate the distance AB (ignoring air resistance). Also find velocity at B and time taken to reach B. 7

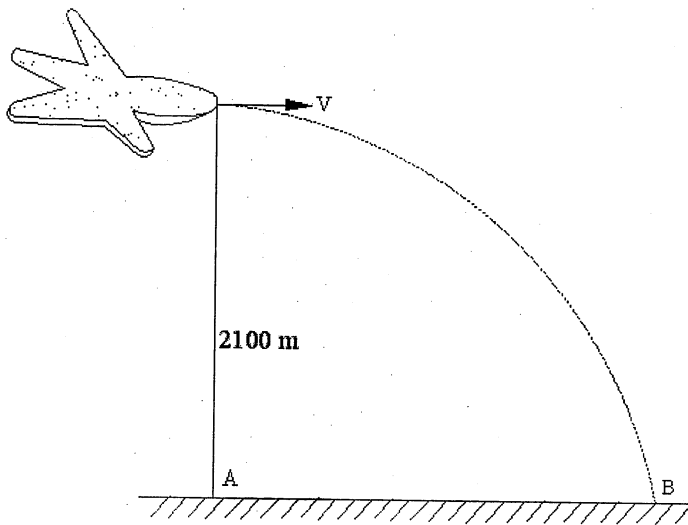


Figure - 5

8. A) What do you understand by banking of roads ? Why it is required ? 2



- B) Determine the tension in the string and acceleration of blocks A and B weighing 150 N and 50 N respectively connected by an inextensible string as shown in **Figure 6** below. Assume pulleys as frictionless and weightless. Also find out the distance travelled by block B in 5 sec. 7

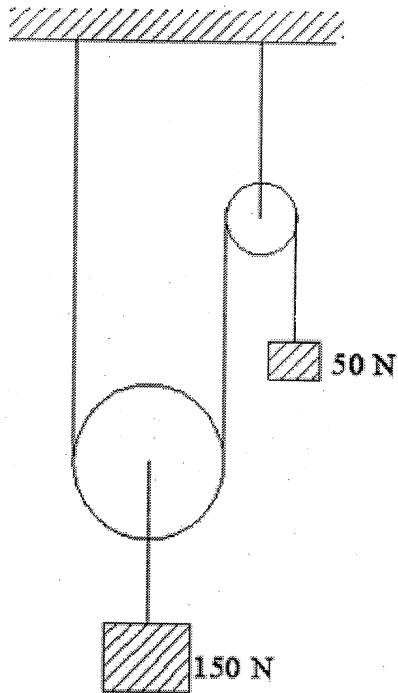


Figure - 6

9. A) State and explain the law of conservation of momentum. 2
- B) A 400 N hammer is used to drive a pile of 600 N into the ground. If the vertical fall of 4 m causes penetration of 0.2 m, calculate :
- a) The common velocity after impact
 - b) The average resistance of ground. 7
-



SLR-VB – 6

Seat No.	
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Set	S
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F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS

Day and Date : Friday, 5-5-2017
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.**
 - 3) **Use** of non programmable calculator is **allowed**.
 - 4) Assume suitable data if **required** and mention clearly.
 - 5) Figures to the **right** indicate marks in **full**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) The coefficients of friction depends upon
 - a) nature of the surface
 - b) shape of the surface
 - c) area of the contact surface
 - d) weight of the body
- 2) The velocity of a moving body is a
 - a) Vector quantity
 - b) Scalar quantity
 - c) Constant quantity
 - d) None of these
- 3) In the method of sections for trusses, the section must be passed so as to cut not more than
 - a) two members
 - b) three members
 - c) four members
 - d) five members
- 4) If lines of action of all the forces lie in the same plane and meet at a point, the force system is
 - a) Coplanar concurrent force system
 - b) Non coplanar concurrent force system
 - c) Coplanar non concurrent force system
 - d) Non coplanar non concurrent force system
- 5) When a particle is at the highest point of its projectile motion
 - a) Its acceleration is zero
 - b) Its velocity is zero
 - c) Its velocity is directed downward
 - d) Its velocity is directed upward

P.T.O.



- 6) If the reaction of beam at one of its supports is the resultant of horizontal and vertical forces, then it is a
- a) Simple support
b) Roller support
c) Hinged support
d) Fixed support
- 7) In the analysis of projectile motion, it is assumed that effect of air resistance is
- a) Important
b) Considerable
c) Negligible
d) None of these
- 8) A truss is made of seven two force members and five joints, then the truss is
- a) deficient
b) redundant
c) perfect
d) none of these
- 9) A man in a lift will weigh more when the lift is
- a) accelerated upwards
b) accelerated downwards
c) descends freely
d) lift going up is slowing down
- 10) If the coefficients of friction of an inclined plane be $(1/\sqrt{3})$, then the angle of repose of the plane will be
- a) 90°
b) 60°
c) 45°
d) 30°
- 11) The moment of inertia of a rectangle of base 'b' and height 'h' about its base is
- a) $bh^3/36$
b) $bh^3/24$
c) $bh^3/12$
d) $bh^3/3$
- 12) Time required to stop a car moving with velocity 20 m/s within a distance of 40 m is
- a) 2 sec
b) 3 sec
c) 4 sec
d) 5 sec
- 13) Pick up the correct statement from the following. The kinetic energy of a body
- a) Before impact is equal to that after impact
b) Before impact is less than that after impact
c) Before impact is more than that after impact
d) Remains constant
- 14) A particle is moving along a circle with constant speed. The acceleration of the particle is
- a) along the circumference
b) along the tangent
c) along the radius
d) zero
-



Seat No.	
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**F.E. (Part – I) (Old-CGPA) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) In Section – I, question No.2 is **compulsory**, solve **any two** questions out of remaining question.
 - 2) In Section – II, solve **any three** questions.
 - 3) **Use** of non programmable calculator is **allowed**.
 - 4) Assume suitable data if **required** and mention **clearly**.
 - 5) Figures to the **right** indicate marks in **full**.

SECTION – I

2. A) State and explain idealization in mechanics. 3
 B) A system of forces acting on a bell crank is as shown in **Figure 1** below. Determine the magnitude, direction and the point of applicaiton of the resultant with respect to point 'O'. 7

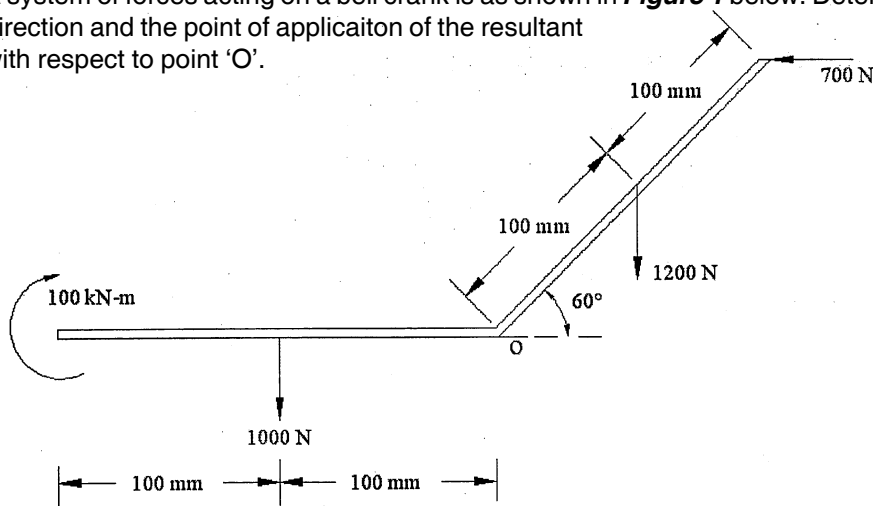


Figure – 1

3. A) What are the assumptions made in the analysis of truss ? 2
 B) Find out the forces in all the members of the truss as shown in **Figure 2** below. 7

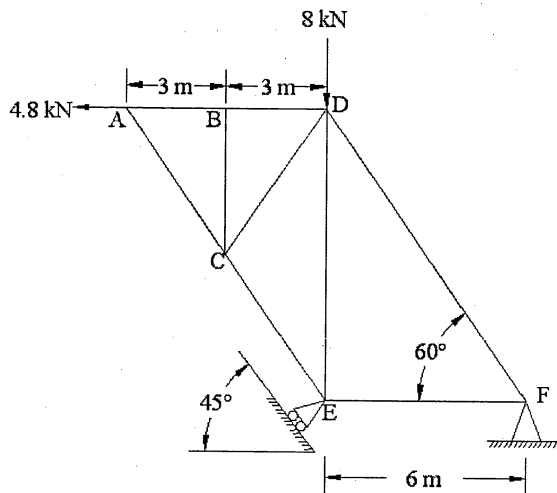


Figure – 2

Set S



4. A) What are the types of support ? Enlist them showing an equivalent supports reactions. 2
 B) A overhand beam has been loaded as shown in **Figure 3** below. Determine the reaction at A and B. 7

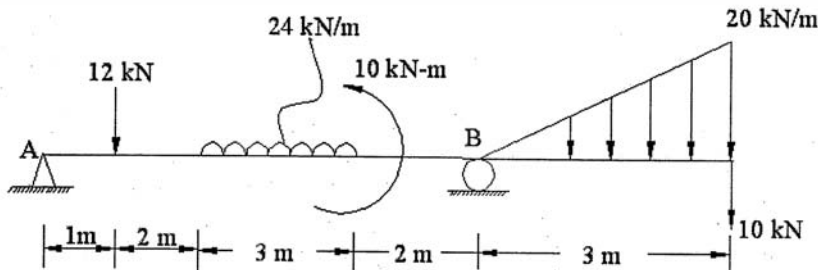


Figure - 3

5. A) Explain the concept of virtual work. 2
 B) Determine the moment of inertia about horizontal centroidal axis XX for a section as shown in **Figure 4** below. 7

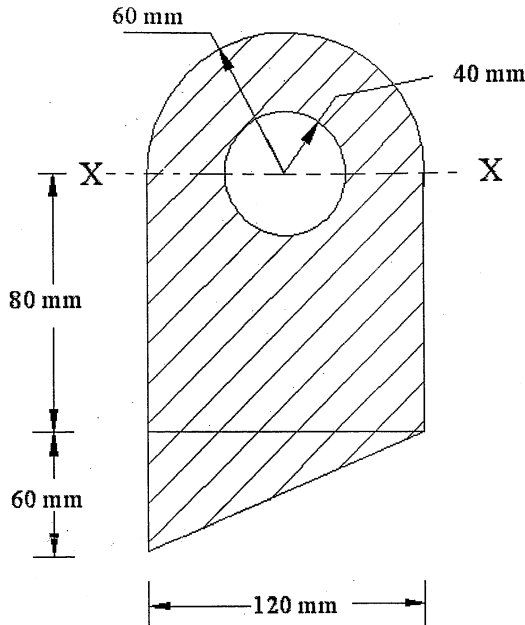


Figure - 4

SECTION – II

6. A) Differentiate between Kinematics and Kinetics. 3
 B) A ball is thrown vertically upward from the base of the tower, with velocity of 90m/s. A boy standing at the top of the tower misses to catch it during its upward motion, but 10 second later he catches it in its downward motion. Find out
 a) Velocity of the ball when it is caught and
 b) The height of the tower. 7



7. A) Derive an expression for time of flight of a projectile projected at an angle of projection α on horizontal ground. 2
- B) An aeroplane is flying in horizontal direction with a velocity of 540 km/hr and at a height of 2100 m as shown in **Figure 5** when it is vertically above the point A on the ground a body is dropped from it. The body strikes the ground at point B. Calculate the distance AB (ignoring air resistance). Also find velocity at B and time taken to reach B. 7

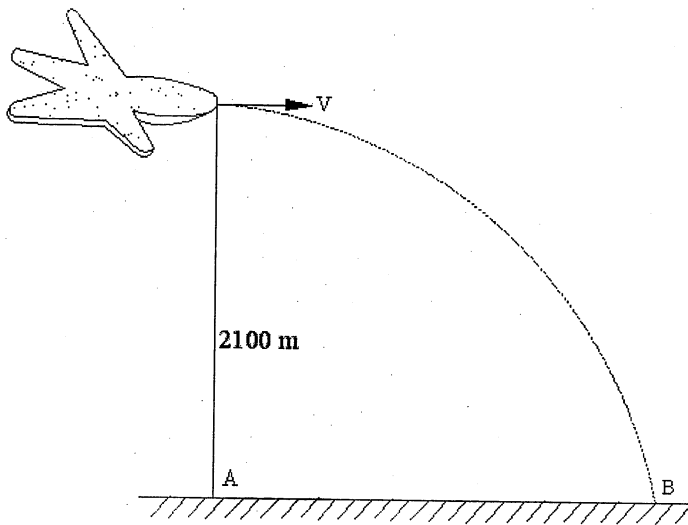


Figure - 5

8. A) What do you understand by banking of roads ? Why it is required ? 2



- B) Determine the tension in the string and acceleration of blocks A and B weighing 150 N and 50 N respectively connected by an inextensible string as shown in **Figure 6** below. Assume pulleys as frictionless and weightless. Also find out the distance travelled by block B in 5 sec. 7

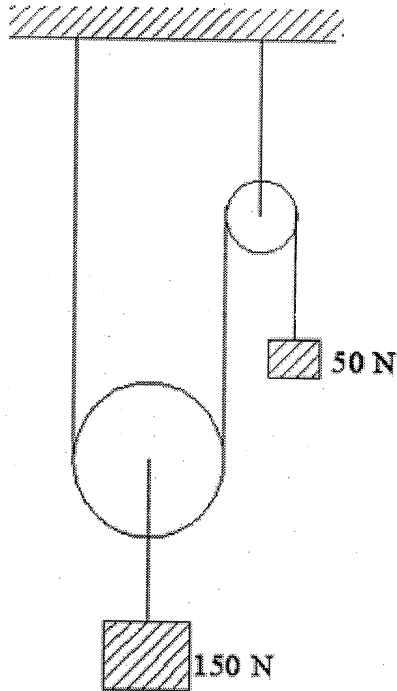


Figure - 6

9. A) State and explain the law of conservation of momentum. 2
- B) A 400 N hammer is used to drive a pile of 600 N into the ground. If the vertical fall of 4 m causes penetration of 0.2 m, calculate :
- a) The common velocity after impact
 - b) The average resistance of ground. 7
-



SLR-VB – 7

Seat No.	
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Set **P**

**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
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) **All** questions are **compulsory**.
- 3) Assume **suitable** data if necessary.
- 4) Draw neat diagrams **wherever** necessary.
- 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=14)**
- 1) The smallest resistance obtained by connecting 50 resistance of $\frac{1}{4}$ ohm each is
- a) $50/4 \Omega$ b) $4/50 \Omega$ c) 200Ω d) $1/200 \Omega$
- 2) 1KWH is equal to _____ KCal.
- a) 860 KCal b) 4186 KCal
c) 4.186 KCal d) None of these
- 3) The rating of electric lamp is 220 V, 100 W. If it is operated at 110 V, the power consumed by it will be
- a) 50 W b) 75 W c) 90 W d) 25 W
- 4) The B-H curves for _____ will be a straight line passing through the origin.
- a) air b) soft iron
c) hardened steel d) silicon steel
- 5) Demagnetizing of magnets can be done by
- a) rough handling b) heating
c) magnetizing in opposite direction d) all the above

P.T.O.



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions compulsory.**
2) Assume **suitable** data if necessary.
3) Draw neat diagrams **wherever** necessary.

SECTION – I

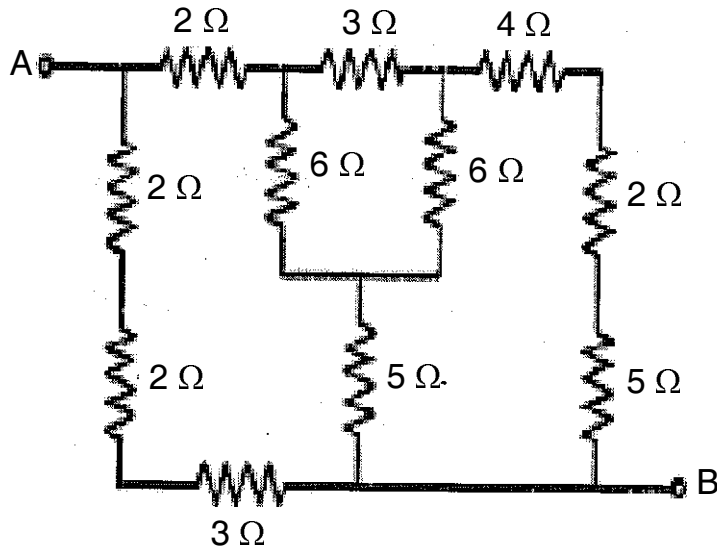
2. Attempt **any four** of the following : **(4×4=16)**
- a) Define the term temperature resistance coefficient. Drive the relations between the temperature coefficient of metal at $t^{\circ}\text{C}$ and 0°C .
 - b) The four arms of a Wheatstone bridge have the following resistances :
 $AB = 100, BC = 10, CD = 4, DA = 50 \Omega$. A galvanometer of 20Ω resistances is connected across BD. Calculate the current through the galvanometer when a potential difference of 10 V is maintained across AC.
 - c) A domestic motor pump set draws water from level 15 meters below the ground and lifts to the height of 15 meters above the ground. The overhead tank has a capacity of 1000 liters; it takes 20 minutes for the set to make the tank full. The motor pump set has efficiency of 60%. Find the motor rating in kW.
 - d) An iron ring has a cross section of 3 cm^2 and a mean diameter of 25 cm. An air gap of 0.4 mm has been cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 2 A is passed. If the total magnetic flux is 0.24 mwb, find the relative permeability of iron, assuming no magnetic leakage.
 - e) "The fringing phenomenon increases with increase in air gap and vice versa." Explain the statement with suitable diagram. And also define the term useful flux and leakage flux.
 - f) Prove that the rms value of sinusoidal alternating current is $\frac{1}{\sqrt{2}}$ times the peak value.



3. Solve **any two** :

(2×6=12)

- a) With neat diagram derive the formula for equivalent star resistance by using delta-star transformation and hence find the equivalent resistance between points A and B, refer sketch.



- b) Draw to scale a phasor diagram showing the following voltage :

$$V_1 = 100 \sin 500 t \quad V_2 = 200 \sin \left(500t + \frac{\pi}{3} \right)$$

$$V_3 = -50 \cos (500 t) \quad V_4 = 150 \sin \left(500t - \frac{\pi}{4} \right)$$

Find the resultant of above voltages.

- c) Discuss in detail the similarities and dissimilarities between electrical circuit and magnetic circuit.

SECTION – II

4. Solve **any four** :

(4×4=16)

- Derive the expression of average power in purely inductive AC circuit.
- With the help of waveforms and phasor diagram explain AC through series RLC circuit.
- With the help of neat sketch explain construction of single phase transformer.
- State various applications of three phase induction motor.



- e) Derive the relationship between line and phase quantities of delta connected load.
- f) Define following terms related to ac circuit.
 - 1) Impedance
 - 2) Admittance
 - 3) Active power
 - 4) Power factor

5. Solve **any two** : **(2×6=12)**

- a) Efficiency of 400 KVA, single phase transformer is 98.77% when delivering full load of 0.8 pf and it is 99.13% at half load unity power factor. Calculate
 - 1) Iron loss
 - 2) Full load copper loss
 - b) A pure inductance of 318 mH is connected in series with a pure resistance of 75 ohm. The circuit is supplied from 250 V, 50 Hz. Source find
 - 1) Impedance
 - 2) Current flowing through circuit
 - 3) Power consumed by circuit.
 - c) Three equal impedances each of $10 \angle 60^\circ$ ohm are connected in star across three phase, 400 V, 50 Hz. Supply. Calculate
 - 1) Line and phase voltage
 - 2) Line and phase current
 - 3) Power consumed in circuit.
-



SLR-VB – 7

Seat No.	
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Set

Q

**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
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) **All** questions are **compulsory**.
- 3) Assume **suitable** data if necessary.
- 4) Draw neat diagrams **wherever** necessary.
- 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=14)

- 1) The ratio N_1/N_2 of a transformer is called as
- a) transformation ratio b) turns ratio
c) reverse turns ratio d) voltage ratio
- 2) In a three phase squirrel cage induction motor
- a) only stator is wound b) only rotor is wound
c) both are not wound d) both are wound
- 3) If $Z_1 = 8 - j9$ ohm and $Y_2 = 4 - j6$ mho then the nature of above two are
- a) 1-capacitive, 2-capacitive b) 1-capacitive, 2-inductive
c) 1-inductive, 2-capacitive d) 1-inductive, 2-inductive
- 4) A step down transformer decreases
- a) power b) current
c) voltage d) frequency
- 5) In purely inductive circuit the power factor is
- a) zero b) zero leading
c) zero lagging d) none of the above

P.T.O.



- 6) In delta connected balanced load
- a) $I_L = I_{PH}$
 - b) $V_L = V_{PH}$
 - c) $I_L = \sqrt{3} I_{PH}$
 - d) none of the above
- 7) For a balanced three phase system total reactive power is given by
- a) $V_{PH} I_{PH} \sin \Phi$
 - b) $V_{PH} I_{PH} \cos \Phi$
 - c) $3V_{PH} I_{PH} \sin \Phi$
 - d) $3V_{PH} I_{PH} \cos \Phi$
- 8) The smallest resistance obtained by connecting 50 resistance of $\frac{1}{4}$ ohm each is
- a) $50/4 \Omega$
 - b) $4/50 \Omega$
 - c) 200Ω
 - d) $1/200 \Omega$
- 9) 1KWH is equal to _____ KCal.
- a) 860 KCal
 - b) 4186 KCal
 - c) 4.186 KCal
 - d) None of these
- 10) The rating of electric lamp is 220 V, 100 W. If it is operated at 110 V, the power consumed by it will be
- a) 50 W
 - b) 75 W
 - c) 90 W
 - d) 25 W
- 11) The B-H curves for _____ will be a straight line passing through the origin.
- a) air
 - b) soft iron
 - c) hardened steel
 - d) silicon steel
- 12) Demagnetizing of magnets can be done by
- a) rough handling
 - b) heating
 - c) magnetizing in opposite direction
 - d) all the above
- 13) The amplitude factor of sinusoidal current is
- a) 1.11
 - b) 1.57
 - c) 1.414
 - d) 0.637
- 14) A complex current wave is given as $i = 5 \pm 5 \sin 100 \pi t$ Amp. It's average value is
- a) 10
 - b) 0
 - c) $5/2$
 - d) 5
-



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions compulsory.**
2) Assume **suitable** data if necessary.
3) Draw neat diagrams **wherever** necessary.

SECTION – I

2. Attempt **any four** of the following : **(4×4=16)**
- a) Define the term temperature resistance coefficient. Drive the relations between the temperature coefficient of metal at $t^{\circ}\text{C}$ and 0°C .
 - b) The four arms of a Wheatstone bridge have the following resistances :
 $AB = 100, BC = 10, CD = 4, DA = 50 \Omega$. A galvanometer of 20Ω resistances is connected across BD. Calculate the current through the galvanometer when a potential difference of 10 V is maintained across AC.
 - c) A domestic motor pump set draws water from level 15 meters below the ground and lifts to the height of 15 meters above the ground. The overhead tank has a capacity of 1000 liters; it takes 20 minutes for the set to make the tank full. The motor pump set has efficiency of 60%. Find the motor rating in kW.
 - d) An iron ring has a cross section of 3 cm^2 and a mean diameter of 25 cm. An air gap of 0.4 mm has been cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 2 A is passed. If the total magnetic flux is 0.24 mwb, find the relative permeability of iron, assuming no magnetic leakage.
 - e) "The fringing phenomenon increases with increase in air gap and vice versa." Explain the statement with suitable diagram. And also define the term useful flux and leakage flux.
 - f) Prove that the rms value of sinusoidal alternating current is $\frac{1}{\sqrt{2}}$ times the peak value.

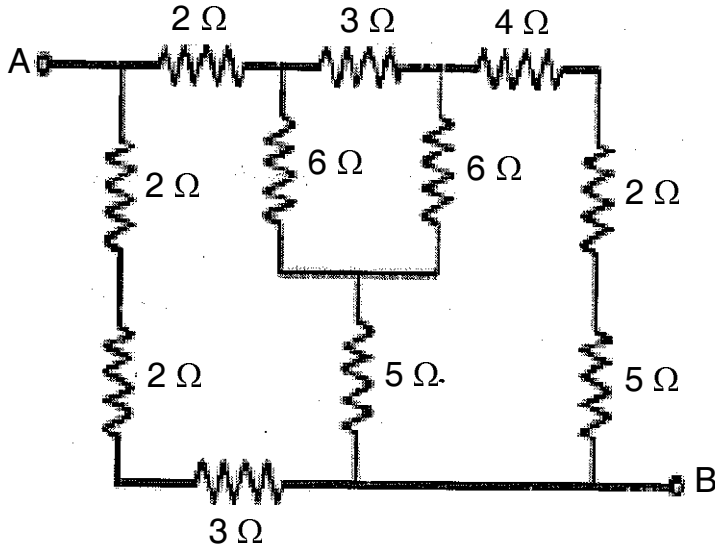
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3. Solve **any two** :

(2×6=12)

- a) With neat diagram derive the formula for equivalent star resistance by using delta-star transformation and hence find the equivalent resistance between points A and B, refer sketch.



- b) Draw to scale a phasor diagram showing the following voltage :

$$V_1 = 100 \sin 500 t \quad V_2 = 200 \sin \left(500t + \frac{\pi}{3} \right)$$

$$V_3 = -50 \cos (500 t) \quad V_4 = 150 \sin \left(500t - \frac{\pi}{4} \right)$$

Find the resultant of above voltages.

- c) Discuss in detail the similarities and dissimilarities between electrical circuit and magnetic circuit.

SECTION – II

4. Solve **any four** :

(4×4=16)

- Derive the expression of average power in purely inductive AC circuit.
- With the help of waveforms and phasor diagram explain AC through series RLC circuit.
- With the help of neat sketch explain construction of single phase transformer.
- State various applications of three phase induction motor.



- e) Derive the relationship between line and phase quantities of delta connected load.
- f) Define following terms related to ac circuit.
 - 1) Impedance
 - 2) Admittance
 - 3) Active power
 - 4) Power factor

5. Solve **any two** :

(2×6=12)

- a) Efficiency of 400 KVA, single phase transformer is 98.77% when delivering full load of 0.8 pf and it is 99.13% at half load unity power factor. Calculate
 - 1) Iron loss
 - 2) Full load copper loss
 - b) A pure inductance of 318 mH is connected in series with a pure resistance of 75 ohm. The circuit is supplied from 250 V, 50 Hz. Source find
 - 1) Impedance
 - 2) Current flowing through circuit
 - 3) Power consumed by circuit.
 - c) Three equal impedances each of $10 \angle 60^\circ$ ohm are connected in star across three phase, 400 V, 50 Hz. Supply. Calculate
 - 1) Line and phase voltage
 - 2) Line and phase current
 - 3) Power consumed in circuit.
-



SLR-VB – 7

Seat No.	
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Set **R**

**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
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) **All** questions are **compulsory**.
3) Assume **suitable** data if necessary.
4) Draw neat diagrams **wherever** necessary.
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=14)**
- 1) Demagnetizing of magnets can be done by
 - a) rough handling
 - b) heating
 - c) magnetizing in opposite direction
 - d) all the above
 - 2) The amplitude factor of sinusoidal current is
 - a) 1.11
 - b) 1.57
 - c) 1.414
 - d) 0.637
 - 3) A complex current wave is given as $i = 5 \pm 5 \sin 100 \pi t$ Amp. It's average value is
 - a) 10
 - b) 0
 - c) $5/2$
 - d) 5
 - 4) The ratio N_1/N_2 of a transformer is called as
 - a) transformation ratio
 - b) turns ratio
 - c) reverse turns ratio
 - d) voltage ratio
 - 5) In a three phase squirrel cage induction motor
 - a) only stator is wound
 - b) only rotor is wound
 - c) both are not wound
 - d) both are wound

P.T.O.



- 6) If $Z_1 = 8 - j9$ ohm and $Y_2 = 4 - j6$ mho then the nature of above two are
- a) 1-capacitive, 2-capacitive b) 1-capacitive, 2-inductive
c) 1-inductive, 2-capacitive d) 1-inductive, 2-inductive
- 7) A step down transformer decreases
- a) power b) current
c) voltage d) frequency
- 8) In purely inductive circuit the power factor is
- a) zero b) zero leading
c) zero lagging d) none of the above
- 9) In delta connected balanced load
- a) $I_L = I_{PH}$ b) $V_L = V_{PH}$
c) $I_L = \sqrt{3} I_{PH}$ d) none of the above
- 10) For a balanced three phase system total reactive power is given by
- a) $V_{PH} I_{PH} \sin \Phi$ b) $V_{PH} I_{PH} \cos \Phi$
c) $3V_{PH} I_{PH} \sin \Phi$ d) $3V_{PH} I_{PH} \cos \Phi$
- 11) The smallest resistance obtained by connecting 50 resistance of $\frac{1}{4}$ ohm each is
- a) $50/4 \Omega$ b) $4/50 \Omega$ c) 200Ω d) $1/200 \Omega$
- 12) 1KWH is equal to _____ KCal.
- a) 860 KCal b) 4186 KCal
c) 4.186 KCal d) None of these
- 13) The rating of electric lamp is 220 V, 100 W. If it is operated at 110 V, the power consumed by it will be
- a) 50 W b) 75 W c) 90 W d) 25 W
- 14) The B-H curves for _____ will be a straight line passing through the origin.
- a) air b) soft iron
c) hardened steel d) silicon steel
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Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions compulsory.**
2) Assume **suitable** data if necessary.
3) Draw neat diagrams **wherever** necessary.

SECTION – I

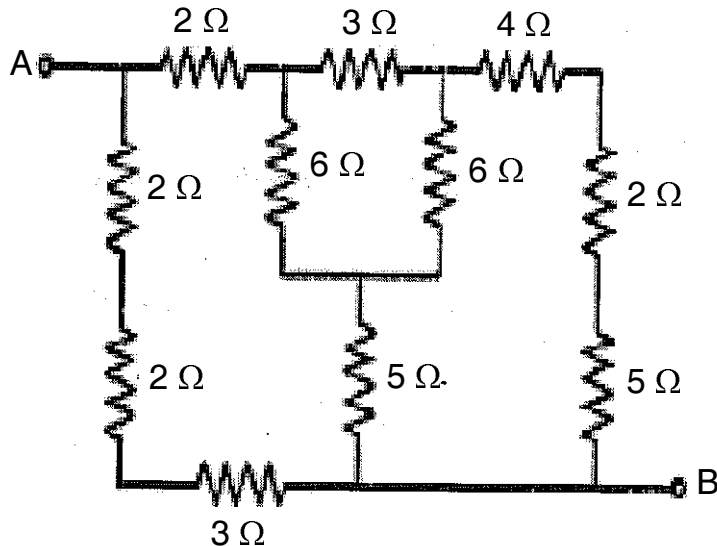
2. Attempt **any four** of the following : **(4×4=16)**
- a) Define the term temperature resistance coefficient. Drive the relations between the temperature coefficient of metal at $t^{\circ} \text{C}$ and 0°C .
 - b) The four arms of a Wheatstone bridge have the following resistances :
 $AB = 100, BC = 10, CD = 4, DA = 50 \Omega$. A galvanometer of 20Ω resistances is connected across BD. Calculate the current through the galvanometer when a potential difference of 10 V is maintained across AC.
 - c) A domestic motor pump set draws water from level 15 meters below the ground and lifts to the height of 15 meters above the ground. The overhead tank has a capacity of 1000 liters; it takes 20 minutes for the set to make the tank full. The motor pump set has efficiency of 60%. Find the motor rating in kW.
 - d) An iron ring has a cross section of 3 cm^2 and a mean diameter of 25 cm. An air gap of 0.4 mm has been cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 2 A is passed. If the total magnetic flux is 0.24 mwb, find the relative permeability of iron, assuming no magnetic leakage.
 - e) "The fringing phenomenon increases with increase in air gap and vice versa." Explain the statement with suitable diagram. And also define the term useful flux and leakage flux.
 - f) Prove that the rms value of sinusoidal alternating current is $\frac{1}{\sqrt{2}}$ times the peak value.



3. Solve **any two** :

(2×6=12)

- a) With neat diagram derive the formula for equivalent star resistance by using delta-star transformation and hence find the equivalent resistance between points A and B, refer sketch.



- b) Draw to scale a phasor diagram showing the following voltage :

$$V_1 = 100 \sin 500 t \quad V_2 = 200 \sin \left(500t + \frac{\pi}{3} \right)$$

$$V_3 = -50 \cos (500 t) \quad V_4 = 150 \sin \left(500t - \frac{\pi}{4} \right)$$

Find the resultant of above voltages.

- c) Discuss in detail the similarities and dissimilarities between electrical circuit and magnetic circuit.

SECTION – II

4. Solve **any four** :

(4×4=16)

- Derive the expression of average power in purely inductive AC circuit.
- With the help of waveforms and phasor diagram explain AC through series RLC circuit.
- With the help of neat sketch explain construction of single phase transformer.
- State various applications of three phase induction motor.



- e) Derive the relationship between line and phase quantities of delta connected load.
- f) Define following terms related to ac circuit.
 - 1) Impedance
 - 2) Admittance
 - 3) Active power
 - 4) Power factor

5. Solve **any two** : **(2×6=12)**

- a) Efficiency of 400 KVA, single phase transformer is 98.77% when delivering full load of 0.8 pf and it is 99.13% at half load unity power factor. Calculate
 - 1) Iron loss
 - 2) Full load copper loss
 - b) A pure inductance of 318 mH is connected in series with a pure resistance of 75 ohm. The circuit is supplied from 250 V, 50 Hz. Source find
 - 1) Impedance
 - 2) Current flowing through circuit
 - 3) Power consumed by circuit.
 - c) Three equal impedances each of $10 \angle 60^\circ$ ohm are connected in star across three phase, 400 V, 50 Hz. Supply. Calculate
 - 1) Line and phase voltage
 - 2) Line and phase current
 - 3) Power consumed in circuit.
-



SLR-VB – 7

Seat No.	
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Set	S
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**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
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) **All** questions are **compulsory**.
- 3) Assume **suitable** data if necessary.
- 4) Draw neat diagrams **wherever** necessary.
- 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=14)**
- 1) If $Z_1 = 8 - j9$ ohm and $Y_2 = 4 - j6$ mho then the nature of above two are
- a) 1-capacitive, 2-capacitive b) 1-capacitive, 2-inductive
c) 1-inductive, 2-capacitive d) 1-inductive, 2-inductive
- 2) A step down transformer decreases
- a) power b) current
c) voltage d) frequency
- 3) In purely inductive circuit the power factor is
- a) zero b) zero leading
c) zero lagging d) none of the above
- 4) In delta connected balanced load
- a) $I_L = I_{PH}$ b) $V_L = V_{PH}$
c) $I_L = \sqrt{3} I_{PH}$ d) none of the above
- 5) For a balanced three phase system total reactive power is given by
- a) $V_{PH} I_{PH} \sin \Phi$ b) $V_{PH} I_{PH} \cos \Phi$
c) $3V_{PH} I_{PH} \sin \Phi$ d) $3V_{PH} I_{PH} \cos \Phi$

P.T.O.



- 6) The smallest resistance obtained by connecting 50 resistance of $\frac{1}{4}$ ohm each is
a) $50/4 \Omega$ b) $4/50 \Omega$ c) 200Ω d) $1/200 \Omega$
- 7) 1KWH is equal to _____ KCal.
a) 860 KCal b) 4186 KCal
c) 4.186 KCal d) None of these
- 8) The rating of electric lamp is 220 V, 100 W. If it is operated at 110 V, the power consumed by it will be
a) 50 W b) 75 W c) 90 W d) 25 W
- 9) The B-H curves for _____ will be a straight line passing through the origin.
a) air b) soft iron
c) hardened steel d) silicon steel
- 10) Demagnetizing of magnets can be done by
a) rough handling b) heating
c) magnetizing in opposite direction d) all the above
- 11) The amplitude factor of sinusoidal current is
a) 1.11 b) 1.57
c) 1.414 d) 0.637
- 12) A complex current wave is given as $i = 5 \pm 5 \sin 100 \pi t$ Amp. It's average value is
a) 10 b) 0 c) $5/2$ d) 5
- 13) The ratio N_1/N_2 of a transformer is called as
a) transformation ratio b) turns ratio
c) reverse turns ratio d) voltage ratio
- 14) In a three phase squirrel cage induction motor
a) only stator is wound b) only rotor is wound
c) both are not wound d) both are wound
-



Seat No.	
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**F.E. (Part – I) (Old CGPA) Examination, 2017
BASIC ELECTRICAL ENGINEERING**

Day and Date : Saturday, 6-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions compulsory.**
2) Assume **suitable** data if necessary.
3) Draw neat diagrams **wherever** necessary.

SECTION – I

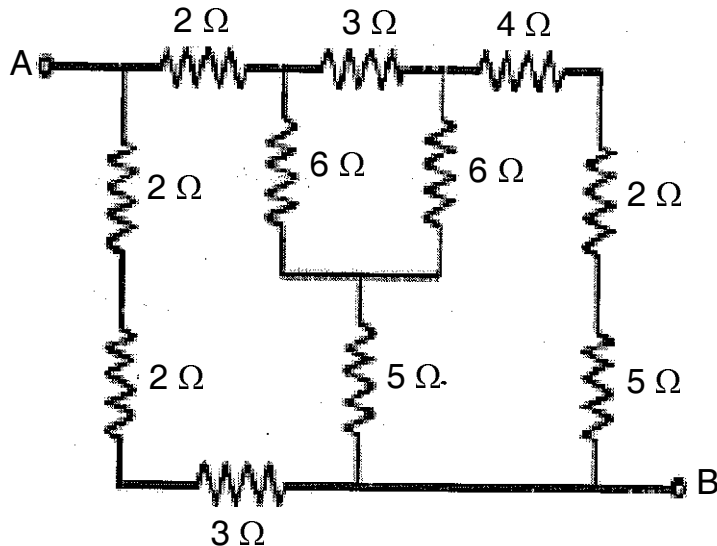
2. Attempt **any four** of the following : **(4×4=16)**
- a) Define the term temperature resistance coefficient. Drive the relations between the temperature coefficient of metal at $t^{\circ}\text{C}$ and 0°C .
 - b) The four arms of a Wheatstone bridge have the following resistances :
 $AB = 100, BC = 10, CD = 4, DA = 50 \Omega$. A galvanometer of 20Ω resistances is connected across BD. Calculate the current through the galvanometer when a potential difference of 10 V is maintained across AC.
 - c) A domestic motor pump set draws water from level 15 meters below the ground and lifts to the height of 15 meters above the ground. The overhead tank has a capacity of 1000 liters; it takes 20 minutes for the set to make the tank full. The motor pump set has efficiency of 60%. Find the motor rating in kW.
 - d) An iron ring has a cross section of 3 cm^2 and a mean diameter of 25 cm. An air gap of 0.4 mm has been cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 2 A is passed. If the total magnetic flux is 0.24 mwb, find the relative permeability of iron, assuming no magnetic leakage.
 - e) “The fringing phenomenon increases with increase in air gap and vice versa.” Explain the statement with suitable diagram. And also define the term useful flux and leakage flux.
 - f) Prove that the rms value of sinusoidal alternating current is $\frac{1}{\sqrt{2}}$ times the peak value.



3. Solve **any two** :

(2×6=12)

- a) With neat diagram derive the formula for equivalent star resistance by using delta-star transformation and hence find the equivalent resistance between points A and B, refer sketch.



- b) Draw to scale a phasor diagram showing the following voltage :

$$V_1 = 100 \sin 500 t \quad V_2 = 200 \sin \left(500t + \frac{\pi}{3} \right)$$

$$V_3 = -50 \cos (500 t) \quad V_4 = 150 \sin \left(500t - \frac{\pi}{4} \right)$$

Find the resultant of above voltages.

- c) Discuss in detail the similarities and dissimilarities between electrical circuit and magnetic circuit.

SECTION – II

4. Solve **any four** :

(4×4=16)

- Derive the expression of average power in purely inductive AC circuit.
- With the help of waveforms and phasor diagram explain AC through series RLC circuit.
- With the help of neat sketch explain construction of single phase transformer.
- State various applications of three phase induction motor.



- e) Derive the relationship between line and phase quantities of delta connected load.
- f) Define following terms related to ac circuit.
 - 1) Impedance
 - 2) Admittance
 - 3) Active power
 - 4) Power factor

5. Solve **any two** :

(2×6=12)

- a) Efficiency of 400 KVA, single phase transformer is 98.77% when delivering full load of 0.8 pf and it is 99.13% at half load unity power factor. Calculate
 - 1) Iron loss
 - 2) Full load copper loss
 - b) A pure inductance of 318 mH is connected in series with a pure resistance of 75 ohm. The circuit is supplied from 250 V, 50 Hz. Source find
 - 1) Impedance
 - 2) Current flowing through circuit
 - 3) Power consumed by circuit.
 - c) Three equal impedances each of $10 \angle 60^\circ$ ohm are connected in star across three phase, 400 V, 50 Hz. Supply. Calculate
 - 1) Line and phase voltage
 - 2) Line and phase current
 - 3) Power consumed in circuit.
-



SLR-VB – 8

Seat No.	
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Set	P
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Total Marks : 70

Time : 10.00 a.m. to 1.00 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) **Neat** diagrams must be drawn **whenever** necessary.
 - 4) Make suitable assumptions, **if necessary** and mention them **clearly**.
 - 5) Figures to the **right** indicate **full** marks.
 - 6) Q. No. 2 and Q. No. 4 are short answer type question.
 - 7) Q. 3 and Q. 5 are long answer type question.
 - 8) **Use** of log tables and non-programmable **single** memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) Area under PV diagram indicates
 - a) Entropy
 - b) Heat
 - c) Work
 - d) Pressure
 - 2) An isothermal process is governed by
 - a) Charle's law
 - b) Boyle's law
 - c) Joule's law
 - d) Gay Lussac law
 - 3) Heat flows from cold substance to hot substance with the aid of external work. This statement is given by
 - a) Kelvin
 - b) Joule
 - c) Gay Lussac
 - d) Clausius
 - 4) Internal energy remains constant in which of the following processes ?
 - a) Adiabatic process
 - b) Polytropic process
 - c) Isothermal process
 - d) Isochoric process

P.T.O.



- 5) A compressor is used
- a) Gas turbine power plant
 - b) For starting and supercharging I.C. Engine
 - c) Pneumatic drill
 - d) All of above
- 6) The draft tube is used
- a) To increase pressure energy of water
 - b) To decrease pressure energy of water
 - c) To increase kinetic energy of water
 - d) None
- 7) Coal is used as fuel in
- a) Hydroelectric power plant
 - b) Nuclear power plant
 - c) Steam power plant
 - d) All of these
- 8) In two stroke engine one power stroke is obtained in
- a) One revolution of crankshaft
 - b) Two revolution of crankshaft
 - c) Four revolution of crankshaft
 - d) None of these
- 9) Compression ratio of diesel engine
- a) 3 to 6
 - b) 15 to 20
 - c) 5 to 8
 - d) 20 to 30
- 10) The property of material which enables it to be drawn into wires is called
- a) Toughness
 - b) Malleability
 - c) Brittleness
 - d) Ductility
- 11) Factor of safety is defined as
- a) Minimum / maximum stress
 - b) Maximum stress / minimum stress
 - c) Minimum stress / allowable stress
 - d) Maximum stress / allowable or working stress
- 12) If for power transmission a gear train consisting of 11 gears is used, then the motion of the drive and follower will be in the
- a) Same direction
 - b) Opposite direction
 - c) Not necessary
 - d) None
- 13) Method of joining two work piece made of two dissimilar material above 450°C is called
- a) Riveting
 - b) Brazing
 - c) Soldering
 - d) None
- 14) A hole can be cut in a component by
- a) Drilling Machine
 - b) Lathe machine
 - c) Both of these
 - d) None of these
-



Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- 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. 2 and Q. No. 4 are short answer type question.**
 - 5) **Q. 3 and Q. 5 are long answer type question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any 5** of the following : **15**
 - a) Explain intensive and extensive properties with suitable examples. **3**
 - b) Explain with neat sketch Vapour Compression Refrigeration system. **3**
 - c) Derive the expression for work done in adiabatic process. **3**
 - d) Draw a neat sketch of steam power plant. Name the parts. **3**
 - e) Distinguish between centrifugal pump and reciprocating pump. **3**
 - f) Explain single stage reciprocating compressor with neat sketch. **3**
 - g) State advantages and disadvantages of nuclear power plant. **3**
3. Answer **any 3** of the following : **13**
 - a) Explain with neat sketch working of Hydro electric power plant. **4**
 - b) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The specific volume of the fluid, pressure and velocity at the inlet are 0.37 m³/kg, 6 bar and 16 m/sec. The inlet is 32 m above the floor and discharge is at the floor level. The discharge conditions are 0.62m³/kg, 1 bar and 270 m/sec respectively. The total heat loss between inlet and discharge is 9 kJ/kg of the fluid. Estimate the change in specific internal energy. **5**



- c) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate final pressure of the gas and heat supplied during the process. **4**
- d) The properties of a closed system change according to law $PV = 3.0$, where P is in bar and V is in m^3 . Calculate the work done when pressure increases from 1.5 bar to 7.5 bar. **4**
- e) Explain with neat centrifugal pump. State the need of priming. **4**

SECTION – II

4. Answer **any 5** of the following : **15**
- a) Differentiate between S.I. engine and C.I. engine. **3**
- b) State different types of gears. Explain any one with neat sketch. **3**
- c) Differentiate between belt drive and chain drive. **3**
- d) What are different modes of failure of mechanical component ? **3**
- e) Differentiate between Brazing and Soldering. **3**
- f) Explain with neat sketch gas welding process. **3**
- g) Define the terms – ductility, malleability, toughness. **3**
5. Answer **any 3** of the following : **13**
- a) Two parallel shafts, connected by a crossed belt drive, are provided with pulleys of 480 mm and 640 mm diameters. The centre distance between shafts is 3 m. Find the change in length of belt required, if the drive is to be changed to open belt drive, to change the direction of motion of the follower. **4**
- b) The temperature and pressure at the beginning in an Otto cycle are 100 kPa and 27°C respectively. Heat addition per cycle is 1500 kJ/kg. Calculate maximum temperature and pressure reached in the cycle. Take $C_V = 0.72 \text{ kJ/kpK}$ and ratio of specific heats as 1.4. **5**
- c) Explain stepwise design procedure for design of a mechanical component. **4**
- d) Explain construction and working of a Lathe machine with a block diagram. **4**



SLR-VB – 8

Seat No.	
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Set	Q
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
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) **Neat** diagrams must be drawn **whenever** necessary.
 - 4) Make suitable assumptions, **if necessary** and mention them **clearly**.
 - 5) Figures to the **right** indicate **full** marks.
 - 6) Q. No. 2 and Q. No. 4 are short answer type question.
 - 7) Q. 3 and Q. 5 are long answer type question.
 - 8) **Use** of log tables and non-programmable **single** memory calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) In two stroke engine one power stroke is obtained in
 - a) One revolution of crankshaft
 - b) Two revolution of crankshaft
 - c) Four revolution of crankshaft
 - d) None of these
 - 2) Compression ratio of diesel engine
 - a) 3 to 6
 - b) 15 to 20
 - c) 5 to 8
 - d) 20 to 30
 - 3) The property of material which enables it to be drawn into wires is called
 - a) Toughness
 - b) Malleability
 - c) Brittleness
 - d) Ductility
 - 4) Factor of safety is defined as
 - a) Minimum / maximum stress
 - b) Maximum stress / minimum stress
 - c) Minimum stress / allowable stress
 - d) Maximum stress / allowable or working stress

P.T.O.



- 5) If for power transmission a gear train consisting of 11 gears is used, then the motion of the drive and follower will be in the
 - a) Same direction
 - b) Opposite direction
 - c) Not necessary
 - d) None

- 6) Method of joining two work piece made of two dissimilar material above 450°C is called
 - a) Riveting
 - b) Brazing
 - c) Soldering
 - d) None

- 7) A hole can be cut in a component by
 - a) Drilling Machine
 - b) Lathe machine
 - c) Both of these
 - d) None of these

- 8) Area under PV diagram indicates
 - a) Entropy
 - b) Heat
 - c) Work
 - d) Pressure

- 9) An isothermal process is governed by
 - a) Charle's law
 - b) Boyle's law
 - c) Joule's law
 - d) Gay Lussac law

- 10) Heat flows from cold substance to hot substance with the aid of external work. This statement is given by
 - a) Kelvin
 - b) Joule
 - c) Gay Lussac
 - d) Clausius

- 11) Internal energy remains constant in which of the following processes ?
 - a) Adiabatic process
 - b) Polytropic process
 - c) Isothermal process
 - d) Isochoric process

- 12) A compressor is used
 - a) Gas turbine power plant
 - b) For starting and supercharging I.C. Engine
 - c) Pneumatic drill
 - d) All of above

- 13) The draft tube is used
 - a) To increase pressure energy of water
 - b) To decrease pressure energy of water
 - c) To increase kinetic energy of water
 - d) None

- 14) Coal is used as fuel in
 - a) Hydroelectric power plant
 - b) Nuclear power plant
 - c) Steam power plant
 - d) All of these



Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- 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. 2 and Q. No. 4 are short answer type question.**
 - 5) **Q. 3 and Q. 5 are long answer type question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any 5** of the following : **15**
 - a) Explain intensive and extensive properties with suitable examples. **3**
 - b) Explain with neat sketch Vapour Compression Refrigeration system. **3**
 - c) Derive the expression for work done in adiabatic process. **3**
 - d) Draw a neat sketch of steam power plant. Name the parts. **3**
 - e) Distinguish between centrifugal pump and reciprocating pump. **3**
 - f) Explain single stage reciprocating compressor with neat sketch. **3**
 - g) State advantages and disadvantages of nuclear power plant. **3**

3. Answer **any 3** of the following : **13**
 - a) Explain with neat sketch working of Hydro electric power plant. **4**
 - b) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The specific volume of the fluid, pressure and velocity at the inlet are 0.37 m³/kg, 6 bar and 16 m/sec. The inlet is 32 m above the floor and discharge is at the floor level. The discharge conditions are 0.62m³/kg, 1 bar and 270 m/sec respectively. The total heat loss between inlet and discharge is 9 kJ/kg of the fluid. Estimate the change in specific internal energy. **5**

Set Q



- c) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate final pressure of the gas and heat supplied during the process. 4
- d) The properties of a closed system change according to law $PV = 3.0$, where P is in bar and V is in m^3 . Calculate the work done when pressure increases from 1.5 bar to 7.5 bar. 4
- e) Explain with neat centrifugal pump. State the need of priming. 4

SECTION – II

4. Answer **any 5** of the following : 15
- a) Differentiate between S.I. engine and C.I. engine. 3
- b) State different types of gears. Explain any one with neat sketch. 3
- c) Differentiate between belt drive and chain drive. 3
- d) What are different modes of failure of mechanical component ? 3
- e) Differentiate between Brazing and Soldering. 3
- f) Explain with neat sketch gas welding process. 3
- g) Define the terms – ductility, malleability, toughness. 3
5. Answer **any 3** of the following : 13
- a) Two parallel shafts, connected by a crossed belt drive, are provided with pulleys of 480 mm and 640 mm diameters. The centre distance between shafts is 3 m. Find the change in length of belt required, if the drive is to be changed to open belt drive, to change the direction of motion of the follower. 4
- b) The temperature and pressure at the beginning in an Otto cycle are 100 kPa and 27°C respectively. Heat addition per cycle is 1500 kJ/kg. Calculate maximum temperature and pressure reached in the cycle. Take $C_V = 0.72 \text{ kJ/kpK}$ and ratio of specific heats as 1.4. 5
- c) Explain stepwise design procedure for design of a mechanical component. 4
- d) Explain construction and working of a Lathe machine with a block diagram. 4



SLR-VB – 8

Seat No.	
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Set	R
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
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) **Neat diagrams must be drawn whenever necessary.**
 - 4) **Make suitable assumptions, if necessary and mention them clearly.**
 - 5) **Figures to the right indicate full marks.**
 - 6) Q. No. 2 and Q. No. 4 are short answer type question.
 - 7) Q. 3 and Q. 5 are long answer type question.
 - 8) **Use of log tables and non-programmable single memory calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) A compressor is used
 - a) Gas turbine power plant
 - b) For starting and supercharging I.C. Engine
 - c) Pneumatic drill
 - d) All of above
 - 2) The draft tube is used
 - a) To increase pressure energy of water
 - b) To decrease pressure energy of water
 - c) To increase kinetic energy of water
 - d) None
 - 3) Coal is used as fuel in
 - a) Hydroelectric power plant
 - b) Nuclear power plant
 - c) Steam power plant
 - d) All of these

P.T.O.



- 4) In two stroke engine one power stroke is obtained in
a) One revolution of crankshaft b) Two revolution of crankshaft
c) Four revolution of crankshaft d) None of these
- 5) Compression ratio of diesel engine
a) 3 to 6 b) 15 to 20 c) 5 to 8 d) 20 to 30
- 6) The property of material which enables it to be drawn into wires is called
a) Toughness b) Malleability c) Brittleness d) Ductility
- 7) Factor of safety is defined as
a) Minimum / maximum stress
b) Maximum stress / minimum stress
c) Minimum stress / allowable stress
d) Maximum stress / allowable or working stress
- 8) If for power transmission a gear train consisting of 11 gears is used, then the motion of the drive and follower will be in the
a) Same direction b) Opposite direction
c) Not necessary d) None
- 9) Method of joining two work piece made of two dissimilar material above 450°C is called
a) Riveting b) Brazing c) Soldering d) None
- 10) A hole can be cut in a component by
a) Drilling Machine b) Lathe machine
c) Both of these d) None of these
- 11) Area under PV diagram indicates
a) Entropy b) Heat
c) Work d) Pressure
- 12) An isothermal process is governed by
a) Charle's law b) Boyle's law
c) Joule's law d) Gay Lussac law
- 13) Heat flows from cold substance to hot substance with the aid of external work. This statement is given by
a) Kelvin b) Joule
c) Gay Lussac d) Clausius
- 14) Internal energy remains constant in which of the following processes ?
a) Adiabatic process b) Polytropic process
c) Isothermal process d) Isochoric process
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Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- 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. 2 and Q. No. 4 are short answer type question.**
 - 5) **Q. 3 and Q. 5 are long answer type question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any 5** of the following : **15**
 - a) Explain intensive and extensive properties with suitable examples. **3**
 - b) Explain with neat sketch Vapour Compression Refrigeration system. **3**
 - c) Derive the expression for work done in adiabatic process. **3**
 - d) Draw a neat sketch of steam power plant. Name the parts. **3**
 - e) Distinguish between centrifugal pump and reciprocating pump. **3**
 - f) Explain single stage reciprocating compressor with neat sketch. **3**
 - g) State advantages and disadvantages of nuclear power plant. **3**

3. Answer **any 3** of the following : **13**
 - a) Explain with neat sketch working of Hydro electric power plant. **4**
 - b) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The specific volume of the fluid, pressure and velocity at the inlet are 0.37 m³/kg, 6 bar and 16 m/sec. The inlet is 32 m above the floor and discharge is at the floor level. The discharge conditions are 0.62m³/kg, 1 bar and 270 m/sec respectively. The total heat loss between inlet and discharge is 9 kJ/kg of the fluid. Estimate the change in specific internal energy. **5**



- c) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate final pressure of the gas and heat supplied during the process. **4**
- d) The properties of a closed system change according to law $PV = 3.0$, where P is in bar and V is in m^3 . Calculate the work done when pressure increases from 1.5 bar to 7.5 bar. **4**
- e) Explain with neat centrifugal pump. State the need of priming. **4**

SECTION – II

4. Answer **any 5** of the following : **15**
- a) Differentiate between S.I. engine and C.I. engine. **3**
- b) State different types of gears. Explain any one with neat sketch. **3**
- c) Differentiate between belt drive and chain drive. **3**
- d) What are different modes of failure of mechanical component ? **3**
- e) Differentiate between Brazing and Soldering. **3**
- f) Explain with neat sketch gas welding process. **3**
- g) Define the terms – ductility, malleability, toughness. **3**
5. Answer **any 3** of the following : **13**
- a) Two parallel shafts, connected by a crossed belt drive, are provided with pulleys of 480 mm and 640 mm diameters. The centre distance between shafts is 3 m. Find the change in length of belt required, if the drive is to be changed to open belt drive, to change the direction of motion of the follower. **4**
- b) The temperature and pressure at the beginning in an Otto cycle are 100 kPa and 27°C respectively. Heat addition per cycle is 1500 kJ/kg. Calculate maximum temperature and pressure reached in the cycle. Take $C_V = 0.72 \text{ kJ/kpK}$ and ratio of specific heats as 1.4. **5**
- c) Explain stepwise design procedure for design of a mechanical component. **4**
- d) Explain construction and working of a Lathe machine with a block diagram. **4**



SLR-VB – 8

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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017

Total Marks : 70

Time : 10.00 a.m. to 1.00 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) **Neat diagrams must be drawn whenever necessary.**
 - 4) **Make suitable assumptions, if necessary and mention them clearly.**
 - 5) **Figures to the right indicate full marks.**
 - 6) Q. No. 2 and Q. No. 4 are short answer type question.
 - 7) Q. 3 and Q. 5 are long answer type question.
 - 8) **Use of log tables and non-programmable single memory calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **14**
- 1) The property of material which enables it to be drawn into wires is called
a) Toughness b) Malleability c) Brittleness d) Ductility
 - 2) Factor of safety is defined as
a) Minimum / maximum stress
b) Maximum stress / minimum stress
c) Minimum stress / allowable stress
d) Maximum stress / allowable or working stress
 - 3) If for power transmission a gear train consisting of 11 gears is used, then the motion of the drive and follower will be in the
a) Same direction b) Opposite direction
c) Not necessary d) None
 - 4) Method of joining two work piece made of two dissimilar material above 450°C is called
a) Riveting b) Brazing c) Soldering d) None

P.T.O.



- 5) A hole can be cut in a component by
a) Drilling Machine b) Lathe machine
c) Both of these d) None of these
- 6) Area under PV diagram indicates
a) Entropy b) Heat
c) Work d) Pressure
- 7) An isothermal process is governed by
a) Charle's law b) Boyle's law
c) Joule's law d) Gay Lussac law
- 8) Heat flows from cold substance to hot substance with the aid of external work. This statement is given by
a) Kelvin b) Joule
c) Gay Lussac d) Clausius
- 9) Internal energy remains constant in which of the following processes ?
a) Adiabatic process b) Polytropic process
c) Isothermal process d) Isochoric process
- 10) A compressor is used
a) Gas turbine power plant
b) For starting and supercharging I.C. Engine
c) Pneumatic drill
d) All of above
- 11) The draft tube is used
a) To increase pressure energy of water
b) To decrease pressure energy of water
c) To increase kinetic energy of water
d) None
- 12) Coal is used as fuel in
a) Hydroelectric power plant
b) Nuclear power plant
c) Steam power plant
d) All of these
- 13) In two stroke engine one power stroke is obtained in
a) One revolution of crankshaft b) Two revolution of crankshaft
c) Four revolution of crankshaft d) None of these
- 14) Compression ratio of diesel engine
a) 3 to 6 b) 15 to 20 c) 5 to 8 d) 20 to 30



Seat No.	
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**F.E. (Part – I) (Old – CGPA) Examination, 2017
BASIC MECHANICAL ENGINEERING**

Day and Date : Monday, 8-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- 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. 2 and Q. No. 4 are short answer type question.**
 - 5) **Q. 3 and Q. 5 are long answer type question.**
 - 6) **Use of log tables and non-programmable single memory calculator is allowed.**

SECTION – I

2. Attempt **any 5** of the following : **15**
 - a) Explain intensive and extensive properties with suitable examples. **3**
 - b) Explain with neat sketch Vapour Compression Refrigeration system. **3**
 - c) Derive the expression for work done in adiabatic process. **3**
 - d) Draw a neat sketch of steam power plant. Name the parts. **3**
 - e) Distinguish between centrifugal pump and reciprocating pump. **3**
 - f) Explain single stage reciprocating compressor with neat sketch. **3**
 - g) State advantages and disadvantages of nuclear power plant. **3**

3. Answer **any 3** of the following : **13**
 - a) Explain with neat sketch working of Hydro electric power plant. **4**
 - b) In a steady flow machine 405 kW of work is done by the machine. The flow rate of fluid is 3 kg/sec. The specific volume of the fluid, pressure and velocity at the inlet are 0.37 m³/kg, 6 bar and 16 m/sec. The inlet is 32 m above the floor and discharge is at the floor level. The discharge conditions are 0.62m³/kg, 1 bar and 270 m/sec respectively. The total heat loss between inlet and discharge is 9 kJ/kg of the fluid. Estimate the change in specific internal energy. **5**



- c) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate final pressure of the gas and heat supplied during the process. **4**
- d) The properties of a closed system change according to law $PV = 3.0$, where P is in bar and V is in m^3 . Calculate the work done when pressure increases from 1.5 bar to 7.5 bar. **4**
- e) Explain with neat centrifugal pump. State the need of priming. **4**

SECTION – II

4. Answer **any 5** of the following : **15**
- a) Differentiate between S.I. engine and C.I. engine. **3**
- b) State different types of gears. Explain any one with neat sketch. **3**
- c) Differentiate between belt drive and chain drive. **3**
- d) What are different modes of failure of mechanical component ? **3**
- e) Differentiate between Brazing and Soldering. **3**
- f) Explain with neat sketch gas welding process. **3**
- g) Define the terms – ductility, malleability, toughness. **3**
5. Answer **any 3** of the following : **13**
- a) Two parallel shafts, connected by a crossed belt drive, are provided with pulleys of 480 mm and 640 mm diameters. The centre distance between shafts is 3 m. Find the change in length of belt required, if the drive is to be changed to open belt drive, to change the direction of motion of the follower. **4**
- b) The temperature and pressure at the beginning in an Otto cycle are 100 kPa and 27°C respectively. Heat addition per cycle is 1500 kJ/kg. Calculate maximum temperature and pressure reached in the cycle. Take $C_V = 0.72 \text{ kJ/kpK}$ and ratio of specific heats as 1.4. **5**
- c) Explain stepwise design procedure for design of a mechanical component. **4**
- d) Explain construction and working of a Lathe machine with a block diagram. **4**



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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 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 :

(14×1=14)

- 1) For the differential equation $\frac{dx}{dt} = -kx^2$, the solution when $x = a$, $t = 0$ is
 a) $x = ae^{-kt}$ b) $\frac{1}{x} = \frac{1}{a} + kt$ c) $x = a(1 - e^{-kt})$ d) $\frac{1}{x} = -\frac{1}{a} + kt$
- 2) If $M(x, y) dx + N(x, y) dy = 0$ is non exact and $\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)/N$ is a function x only, say $f(x)$, then the integrating factor is
 a) $\int M dx$ b) $\int N dy$ c) $\int f(x) dx$ d) $\int f(y) dy$
- 3) The intercept made by the tangent to the curve $y = f(x)$ on X – axis is
 a) $x + y \frac{dx}{dy}$ b) $x + y \frac{dy}{dx}$ c) $y + x \frac{dx}{dy}$ d) $x - y \frac{dx}{dy}$
- 4) The two curves are said to be orthogonal, if the product of their slopes is equals to
 a) 0 b) -1 c) 1 d) 2
- 5) To solve the differential equation $\frac{dy}{dx} = f(x, y)$ by Euler's method, subject to $y(x_0) = y_0$ the Euler's formula is
 a) $y_{n+1} = y_{n-1} + hf(x_n, y_n)$ b) $y_{n+1} = y_n + hf(x_{n-1}, y_{n-1})$
 c) $y_{n+1} = y_n + hf(x_n, y_n)$ d) $y_{n+1} = y_n + \frac{h}{2} f(x_n, y_n)$

P.T.O.



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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- N.B. :** 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. Attempt the following :

- a) Solve : $(x + y + 3) dy = (x + y - 3) dx$. 3
- b) Solve : $y \log y \frac{dx}{dy} + x = \log y$. 3
- c) Solve : $(4x^3y^3dx + 3x^4y^2dy) - (2xydx + x^2dy) = 0$ when $x = 2, y = 1$. 4

OR

- c) Solve : $\left(y + \frac{y^3}{3} + \frac{x^2}{2} \right) dx + \frac{1}{4} (x + xy^2) dy = 0$. 4

3. Attempt the following :

- a) Find the orthogonal trajectories of the family of the curve $x^2 - 3y^2 = a$, where a is a parameter. 3
- b) Find the curve such that at each point on curve, slope of tangent on the curve is equal to sum of abscissa and product of abscissa with ordinate. If the curve passes through $(0, 1)$, find particular equation of curve. 3
- c) In a circuit containing inductance L , resistance R and voltage E , the current i is given by $L \frac{di}{dt} + Ri = E$. Find the current i at any time t , if at $t = 0, i = 0$ and L, R, E are constants. 3

Set P



4. Attempt the following :

a) Apply Picard's method to obtain solution of differential equation $\frac{dy}{dx} = 3x^{-1/2} + y - 1$, $y(0) = 1$ upto third approximation. **3**

b) Solve $\frac{dy}{dx} = y - \frac{2x}{y}$ with $y(0) = 1$ for $x = 0.1$ in one step of Euler's modified method. **3**

c) Solve $\frac{dy}{dx} = x(y + x) - 2$ with $y(1) = 2$ for $x = 1.2$ by Runge-Kutta fourth order method, taking $h = 0.2$. **3**

5. Attempt the following :

a) Find $f'(5)$, $f''(5)$ by divided difference formula from the following data

x	:	4	5	7	10	11	13	4
y = f(x) :		48	100	294	900	1210	2028	

b) Find the first and second derivatives at $x = 10$ and at $x = 20$ from the following data. **5**

x :	0	10	20	30	40
y :	19.96	39.65	58.81	77.21	94.61

SECTION – II

6. a) Evaluate $\int_0^1 x^3 \log\left(\frac{1}{x}\right)^4 dx$. **3**

b) Evaluate $\int_0^1 \frac{x}{\sqrt{1-x^5}} dx$. **3**

c) Prove that $\int_0^1 \frac{x^a - x^b}{\log x} dx = \log\left(\frac{a+1}{b+1}\right)$ where a is parameter. **4**

7. a) Trace the curve $y^2 = x^2(4 - x^2)$. **3**

b) Trace the curve $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$. **3**

c) Find the length of astroid $x = a \cos^3 t$, $y = a \sin^3 t$. **3**

Set P



8. a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} xy \, dy \, dx$. **3**
- b) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} x \, dx \, dy \, dz$. **3**
- c) Change the order and evaluate $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) \, dx \, dy$. **3**

OR

- c) Evaluate $\iint xy \, dx \, dy$ over the area of the circle $x^2 + y^2 = 1$. **3**
9. a) Find the area included between the curves $y = x^2$ and $y = x^3$. **3**
- b) The density at any point of a cardioid $r = a(1 + \cos\theta)$ varies as the square of its distance $r \sin\theta$ from its axis of symmetry. Find its mass. **3**
- c) Find the volume of a sphere generated by revolving a semi circle of $x^2 + y^2 = a^2$ about $x -$ axis. **3**
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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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 :

(14×1=14)

- 1) The asymptote to the curve $xy^2 = a^2(a - x)$ is
 a) x – axis b) y – axis c) line $x = a$ d) line $x = -a$

- 2) The length of the arc of the curve $\theta = f(r)$ from $r = r_1$ to $r = r_2$ is given by

- a) $\int_{r_1}^{r_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$ b) $\int_{r_1}^{r_2} \sqrt{1 + \left(r \frac{d\theta}{dr}\right)^2} dr$
 c) $\int_{r_1}^{r_2} \sqrt{1 + r \left(\frac{d\theta}{dr}\right)^2} dr$ d) None of these

- 3) The gamma function Γ_n converges for
 a) $n > -1$ b) $n > -2$ c) $n > 0$ d) $n = 0$

- 4) $\beta(m+1, n) =$

- a) $\frac{n}{m+n} \beta(m, n)$ b) $\frac{n}{n+1} \beta(m, n)$
 c) $\frac{m}{m+n} \beta(m, n)$ d) $\frac{n}{m+1} \beta(m, n)$

- 5) By changing the order $\int_0^\infty \int_x^\infty f(x, y) dx dy$ is equal to

- a) $\int_x^\infty \int_0^\infty f(x, y) dx dy$ b) $\int_0^\infty \int_0^\infty f(x, y) dx dy$ c) $\int_0^\infty \int_0^y f(x, y) dx dy$ d) $\int_0^\infty \int_0^x f(x, y) dx dy$

P.T.O.



6) $\int_0^1 \int_0^1 \int_0^1 dx dy dz =$

- a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) 0 d) 1

7) Area bounded by curves $y = f_1(x)$, $y = f_2(x)$ intersecting at (a, c) and (b, d) is

- a) $\int_a^b \int_{f_1(x)}^{f_2(x)} dx dy$ b) $\int_b^a \int_{f_1(x)}^{f_2(x)} dx dy$ c) $\int_a^b \int_{f_2(x)}^{f_1(x)} dx dy$ d) None of these

8) For the differential equation $\frac{dx}{dt} = -kx^2$, the solution when $x = a$, $t = 0$ is

- a) $x = ae^{-kt}$ b) $\frac{1}{x} = \frac{1}{a} + kt$ c) $x = a(1 - e^{-kt})$ d) $\frac{1}{x} = -\frac{1}{a} + kt$

9) If $M(x, y) dx + N(x, y) dy = 0$ is non exact and $\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)/N$ is a function x only, say $f(x)$, then the integrating factor is

- a) $\int_e M dx$ b) $\int_e N dy$ c) $\int_e f(x) dx$ d) $\int_e f(y) dy$

10) The intercept made by the tangent to the curve $y = f(x)$ on $X - axis$ is

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11) The two curves are said to be orthogonal, if the product of their slopes is equals to

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

12) To solve the differential equation $\frac{dy}{dx} = f(x, y)$ by Euler's method, subject to $y(x_0) = y_0$ the Euler's formula is

- a) $y_{n+1} = y_{n-1} + hf(x_n, y_n)$ b) $y_{n+1} = y_n + hf(x_{n-1}, y_{n-1})$
 c) $y_{n+1} = y_n + hf(x_n, y_n)$ d) $y_{n+1} = y_n + \frac{h}{2} f(x_n, y_n)$

13) Among the following, which method is step by step iterative method for solving initial value problem ?

- a) Picard's method b) Taylor's Series method
 c) Runge-Kutta method of 4th order d) Euler's Modified method

14) In the Newton's forward difference formula $\left(\frac{d^2y}{dx^2}\right)_{x=x_0} = \frac{1}{h^2} [\Delta_{y_0}^2 - \Delta_{y_0}^3 + K \dots]$, the

value of K is

- a) $\frac{12}{11} \Delta_{y_0}^4$ b) $\frac{11}{12} \Delta_{y_0}^4$ c) $-\Delta_{y_0}^4$ d) $-\frac{11}{12} \Delta_{y_0}^4$



Seat No.	
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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- N.B. :** 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. Attempt the following :

- a) Solve : $(x + y + 3) dy = (x + y - 3) dx$. 3
- b) Solve : $y \log y \frac{dx}{dy} + x = \log y$. 3
- c) Solve : $(4x^3y^3dx + 3x^4y^2dy) - (2xydx + x^2dy) = 0$ when $x = 2, y = 1$. 4

OR

- c) Solve : $\left(y + \frac{y^3}{3} + \frac{x^2}{2} \right) dx + \frac{1}{4} (x + xy^2) dy = 0$. 4

3. Attempt the following :

- a) Find the orthogonal trajectories of the family of the curve $x^2 - 3y^2 = a$, where a is a parameter. 3
- b) Find the curve such that at each point on curve, slope of tangent on the curve is equal to sum of abscissa and product of abscissa with ordinate. If the curve passes through $(0, 1)$, find particular equation of curve. 3
- c) In a circuit containing inductance L , resistance R and voltage E , the current i is given by $L \frac{di}{dt} + Ri = E$. Find the current i at any time t , if at $t = 0, i = 0$ and L, R, E are constants. 3

Set Q



4. Attempt the following :

a) Apply Picard's method to obtain solution of differential equation $\frac{dy}{dx} = 3x^{-1/2} + y - 1$, $y(0) = 1$ upto third approximation. **3**

b) Solve $\frac{dy}{dx} = y - \frac{2x}{y}$ with $y(0) = 1$ for $x = 0.1$ in one step of Euler's modified method. **3**

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5. Attempt the following :

a) Find $f'(5)$, $f''(5)$ by divided difference formula from the following data

x	:	4	5	7	10	11	13	
y = f(x) :		48	100	294	900	1210	2028	4

b) Find the first and second derivatives at $x = 10$ and at $x = 20$ from the following data. **5**

x :	0	10	20	30	40
y :	19.96	39.65	58.81	77.21	94.61

SECTION – II

6. a) Evaluate $\int_0^1 x^3 \log\left(\frac{1}{x}\right)^4 dx$. **3**

b) Evaluate $\int_0^1 \frac{x}{\sqrt{1-x^5}} dx$. **3**

c) Prove that $\int_0^1 \frac{x^a - x^b}{\log x} dx = \log\left(\frac{a+1}{b+1}\right)$ where a is parameter. **4**

7. a) Trace the curve $y^2 = x^2(4 - x^2)$. **3**

b) Trace the curve $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$. **3**

c) Find the length of astroid $x = a \cos^3 t$, $y = a \sin^3 t$. **3**

Set Q



8. a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} xy \, dy \, dx$. **3**
- b) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} x \, dx \, dy \, dz$. **3**
- c) Change the order and evaluate $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) \, dx \, dy$. **3**

OR

- c) Evaluate $\iint xy \, dx \, dy$ over the area of the circle $x^2 + y^2 = 1$. **3**
9. a) Find the area included between the curves $y = x^2$ and $y = x^3$. **3**
- b) The density at any point of a cardioid $r = a(1 + \cos\theta)$ varies as the square of its distance $r \sin\theta$ from its axis of symmetry. Find its mass. **3**
- c) Find the volume of a sphere generated by revolving a semi circle of $x^2 + y^2 = a^2$ about $x -$ axis. **3**
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Seat No.	
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Set	R
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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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 :

(14×1=14)

- 1) To solve the differential equation $\frac{dy}{dx} = f(x, y)$ by Euler's method, subject to $y(x_0) = y_0$ the Euler's formula is

a) $y_{n+1} = y_{n-1} + hf(x_n, y_n)$	b) $y_{n+1} = y_n + hf(x_{n-1}, y_{n-1})$
c) $y_{n+1} = y_n + hf(x_n, y_n)$	d) $y_{n+1} = y_n + \frac{h}{2} f(x_n, y_n)$
- 2) Among the following, which method is step by step iterative method for solving initial value problem ?

a) Picard's method	b) Taylor's Series method
c) Runge-Kutta method of 4 th order	d) Euler's Modified method
- 3) In the Newton's forward difference formula $\left(\frac{d^2y}{dx^2}\right)_{x=x_0} = \frac{1}{h^2} [\Delta_{y_0}^2 - \Delta_{y_0}^3 + K \dots]$, the value of K is

a) $\frac{12}{11} \Delta_{y_0}^4$	b) $\frac{11}{12} \Delta_{y_0}^4$	c) $-\Delta_{y_0}^4$	d) $-\frac{11}{12} \Delta_{y_0}^4$
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- 4) The asymptote to the curve $xy^2 = a^2(a - x)$ is

a) x – axis	b) y – axis	c) line $x = a$	d) line $x = -a$
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- 5) The length of the arc of the curve $\theta = f(r)$ from $r = r_1$ to $r = r_2$ is given by

a) $\int_{r_1}^{r_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$	b) $\int_{r_1}^{r_2} \sqrt{1 + \left(r \frac{d\theta}{dr}\right)^2} dr$
c) $\int_{r_1}^{r_2} \sqrt{1 + r \left(\frac{d\theta}{dr}\right)^2} dr$	d) None of these

P.T.O.



- 6) The gamma function Γ_n converges for
- a) $n > -1$ b) $n > -2$ c) $n > 0$ d) $n = 0$
- 7) $\beta(m+1, n) =$
- a) $\frac{n}{m+n}\beta(m, n)$ b) $\frac{n}{n+1}\beta(m, n)$ c) $\frac{m}{m+n}\beta(m, n)$ d) $\frac{n}{m+1}\beta(m, n)$
- 8) By changing the order $\int_0^\infty \int_x^\infty f(x, y) dx dy$ is equal to
- a) $\int_x^\infty \int_0^\infty f(x, y) dx dy$ b) $\int_0^\infty \int_0^\infty f(x, y) dx dy$ c) $\int_0^\infty \int_0^y f(x, y) dx dy$ d) $\int_0^\infty \int_0^x f(x, y) dx dy$
- 9) $\int_0^1 \int_0^1 \int_0^1 dx dy dz =$
- a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) 0 d) 1
- 10) Area bounded by curves $y = f_1(x)$, $y = f_2(x)$ intersecting at (a, c) and (b, d) is
- a) $\int_a^b \int_{f_1(x)}^{f_2(x)} dx dy$ b) $\int_b^a \int_{f_1(x)}^{f_2(x)} dx dy$ c) $\int_a^b \int_{f_2(x)}^{f_1(x)} dx dy$ d) None of these
- 11) For the differential equation $\frac{dx}{dt} = -kx^2$, the solution when $x = a$, $t = 0$ is
- a) $x = ae^{-kt}$ b) $\frac{1}{x} = \frac{1}{a} + kt$ c) $x = a(1 - e^{-kt})$ d) $\frac{1}{x} = -\frac{1}{a} + kt$
- 12) If $M(x, y) dx + N(x, y) dy = 0$ is non exact and $\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)/N$ is a function x only, say $f(x)$, then the integrating factor is
- a) $\int M dx$ b) $\int N dy$ c) $\int f(x) dx$ d) $\int f(y) dy$
- 13) The intercept made by the tangent to the curve $y = f(x)$ on $X - axis$ is
- a) $x + y \frac{dx}{dy}$ b) $x + y \frac{dy}{dx}$ c) $y + x \frac{dx}{dy}$ d) $x - y \frac{dx}{dy}$
- 14) The two curves are said to be orthogonal, if the product of their slopes is equals to
- a) 0 b) -1 c) 1 d) 2



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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- N.B. :** 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. Attempt the following :

- a) Solve : $(x + y + 3) dy = (x + y - 3) dx$. 3
- b) Solve : $y \log y \frac{dx}{dy} + x = \log y$. 3
- c) Solve : $(4x^3y^3dx + 3x^4y^2dy) - (2xydx + x^2dy) = 0$ when $x = 2, y = 1$. 4

OR

- c) Solve : $\left(y + \frac{y^3}{3} + \frac{x^2}{2} \right) dx + \frac{1}{4} (x + xy^2) dy = 0$. 4

3. Attempt the following :

- a) Find the orthogonal trajectories of the family of the curve $x^2 - 3y^2 = a$, where a is a parameter. 3
- b) Find the curve such that at each point on curve, slope of tangent on the curve is equal to sum of abscissa and product of abscissa with ordinate. If the curve passes through $(0, 1)$, find particular equation of curve. 3
- c) In a circuit containing inductance L , resistance R and voltage E , the current i is given by $L \frac{di}{dt} + Ri = E$. Find the current i at any time t , if at $t = 0, i = 0$ and L, R, E are constants. 3

Set R



4. Attempt the following :

a) Apply Picard's method to obtain solution of differential equation $\frac{dy}{dx} = 3x^{-1/2} + y - 1$, $y(0) = 1$ upto third approximation. **3**

b) Solve $\frac{dy}{dx} = y - \frac{2x}{y}$ with $y(0) = 1$ for $x = 0.1$ in one step of Euler's modified method. **3**

c) Solve $\frac{dy}{dx} = x(y + x) - 2$ with $y(1) = 2$ for $x = 1.2$ by Runge-Kutta fourth order method, taking $h = 0.2$. **3**

5. Attempt the following :

a) Find $f'(5)$, $f''(5)$ by divided difference formula from the following data

x	:	4	5	7	10	11	13	
y = f(x)	:	48	100	294	900	1210	2028	4

b) Find the first and second derivatives at $x = 10$ and at $x = 20$ from the following data. **5**

x	:	0	10	20	30	40
y	:	19.96	39.65	58.81	77.21	94.61

SECTION – II

6. a) Evaluate $\int_0^1 x^3 \log\left(\frac{1}{x}\right)^4 dx$. **3**

b) Evaluate $\int_0^1 \frac{x}{\sqrt{1-x^5}} dx$. **3**

c) Prove that $\int_0^1 \frac{x^a - x^b}{\log x} dx = \log\left(\frac{a+1}{b+1}\right)$ where a is parameter. **4**

7. a) Trace the curve $y^2 = x^2(4 - x^2)$. **3**

b) Trace the curve $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$. **3**

c) Find the length of astroid $x = a \cos^3 t$, $y = a \sin^3 t$. **3**

Set R



8. a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} xy \, dy \, dx$. **3**
- b) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} x \, dx \, dy \, dz$. **3**
- c) Change the order and evaluate $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) \, dx \, dy$. **3**

OR

- c) Evaluate $\iint xy \, dx \, dy$ over the area of the circle $x^2 + y^2 = 1$. **3**
9. a) Find the area included between the curves $y = x^2$ and $y = x^3$. **3**
- b) The density at any point of a cardioid $r = a(1 + \cos\theta)$ varies as the square of its distance $r \sin\theta$ from its axis of symmetry. Find its mass. **3**
- c) Find the volume of a sphere generated by revolving a semi circle of $x^2 + y^2 = a^2$ about $x -$ axis. **3**



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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 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 :

(14×1=14)

- 1) The gamma function Γ_n converges for
a) $n > -1$ b) $n > -2$ c) $n > 0$ d) $n = 0$
- 2) $\beta(m+1, n) =$
a) $\frac{n}{m+n}\beta(m, n)$ b) $\frac{n}{n+1}\beta(m, n)$ c) $\frac{m}{m+n}\beta(m, n)$ d) $\frac{n}{m+1}\beta(m, n)$
- 3) By changing the order $\int_0^\infty \int_x^\infty f(x, y) dx dy$ is equal to
a) $\int_x^\infty \int_0^\infty f(x, y) dx dy$ b) $\int_0^\infty \int_0^\infty f(x, y) dx dy$ c) $\int_0^\infty \int_0^y f(x, y) dx dy$ d) $\int_0^\infty \int_0^x f(x, y) dx dy$
- 4) $\int_0^1 \int_0^1 \int_0^1 dx dy dz =$
a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) 0 d) 1
- 5) Area bounded by curves $y = f_1(x)$, $y = f_2(x)$ intersecting at (a, c) and (b, d) is
a) $\int_a^b \int_{f_1(x)}^{f_2(x)} dx dy$ b) $\int_b^a \int_{f_1(x)}^{f_2(x)} dx dy$ c) $\int_a^b \int_{f_2(x)}^{f_1(x)} dx dy$ d) None of these
- 6) For the differential equation $\frac{dx}{dt} = -kx^2$, the solution when $x = a$, $t = 0$ is
a) $x = ae^{-kt}$ b) $\frac{1}{x} = \frac{1}{a} + kt$ c) $x = a(1 - e^{-kt})$ d) $\frac{1}{x} = -\frac{1}{a} + kt$

P.T.O.



- 7) If $M(x, y) dx + N(x, y) dy = 0$ is non exact and $\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)/N$ is a function x only, say $f(x)$, then the integrating factor is
- a) $\int_e M dx$ b) $\int_e N dy$ c) $\int_e f(x) dx$ d) $\int_e f(y) dy$
- 8) The intercept made by the tangent to the curve $y = f(x)$ on X – axis is
- a) $x + y \frac{dx}{dy}$ b) $x + y \frac{dy}{dx}$ c) $y + x \frac{dx}{dy}$ d) $x - y \frac{dx}{dy}$
- 9) The two curves are said to be orthogonal, if the product of their slopes is equals to
- a) 0 b) -1 c) 1 d) 2
- 10) To solve the differential equation $\frac{dy}{dx} = f(x, y)$ by Euler's method, subject to $y(x_0) = y_0$ the Euler's formula is
- a) $y_{n+1} = y_{n-1} + hf(x_n, y_n)$ b) $y_{n+1} = y_n + hf(x_{n-1}, y_{n-1})$
- c) $y_{n+1} = y_n + hf(x_n, y_n)$ d) $y_{n+1} = y_n + \frac{h}{2} f(x_n, y_n)$
- 11) Among the following, which method is step by step iterative method for solving initial value problem ?
- a) Picard's method b) Taylor's Series method
- c) Runge-Kutta method of 4th order d) Euler's Modified method
- 12) In the Newton's forward difference formula $\left(\frac{d^2y}{dx^2}\right)_{x=x_0} = \frac{1}{h^2} [\Delta_{y_0}^2 - \Delta_{y_0}^3 + K \dots]$, the value of K is
- a) $\frac{12}{11} \Delta_{y_0}^4$ b) $\frac{11}{12} \Delta_{y_0}^4$ c) $-\Delta_{y_0}^4$ d) $-\frac{11}{12} \Delta_{y_0}^4$
- 13) The asymptote to the curve $xy^2 = a^2(a - x)$ is
- a) x – axis b) y – axis c) line $x = a$ d) line $x = -a$
- 14) The length of the arc of the curve $\theta = f(r)$ from $r = r_1$ to $r = r_2$ is given by
- a) $\int_{r_1}^{r_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$ b) $\int_{r_1}^{r_2} \sqrt{1 + \left(r \frac{d\theta}{dr}\right)^2} dr$
- c) $\int_{r_1}^{r_2} \sqrt{1 + r \left(\frac{d\theta}{dr}\right)^2} dr$ d) None of these



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**F.E. (Part – II) (CGPA) (Old) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- N.B. :** 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. Attempt the following :

- a) Solve : $(x + y + 3) dy = (x + y - 3) dx$. 3
- b) Solve : $y \log y \frac{dx}{dy} + x = \log y$. 3
- c) Solve : $(4x^3y^3dx + 3x^4y^2dy) - (2xydx + x^2dy) = 0$ when $x = 2, y = 1$. 4

OR

- c) Solve : $\left(y + \frac{y^3}{3} + \frac{x^2}{2} \right) dx + \frac{1}{4} (x + xy^2) dy = 0$. 4

3. Attempt the following :

- a) Find the orthogonal trajectories of the family of the curve $x^2 - 3y^2 = a$, where a is a parameter. 3
- b) Find the curve such that at each point on curve, slope of tangent on the curve is equal to sum of abscissa and product of abscissa with ordinate. If the curve passes through $(0, 1)$, find particular equation of curve. 3
- c) In a circuit containing inductance L , resistance R and voltage E , the current i is given by $L \frac{di}{dt} + Ri = E$. Find the current i at any time t , if at $t = 0, i = 0$ and L, R, E are constants. 3

Set S



4. Attempt the following :

a) Apply Picard's method to obtain solution of differential equation $\frac{dy}{dx} = 3x^{-1/2} + y - 1$, $y(0) = 1$ upto third approximation. **3**

b) Solve $\frac{dy}{dx} = y - \frac{2x}{y}$ with $y(0) = 1$ for $x = 0.1$ in one step of Euler's modified method. **3**

c) Solve $\frac{dy}{dx} = x(y + x) - 2$ with $y(1) = 2$ for $x = 1.2$ by Runge-Kutta fourth order method, taking $h = 0.2$. **3**

5. Attempt the following :

a) Find $f'(5)$, $f''(5)$ by divided difference formula from the following data

x	:	4	5	7	10	11	13	
y = f(x) :		48	100	294	900	1210	2028	4

b) Find the first and second derivatives at $x = 10$ and at $x = 20$ from the following data. **5**

x :	0	10	20	30	40	
y :	19.96	39.65	58.81	77.21	94.61	

SECTION – II

6. a) Evaluate $\int_0^1 x^3 \log\left(\frac{1}{x}\right)^4 dx$. **3**

b) Evaluate $\int_0^1 \frac{x}{\sqrt{1-x^5}} dx$. **3**

c) Prove that $\int_0^1 \frac{x^a - x^b}{\log x} dx = \log\left(\frac{a+1}{b+1}\right)$ where a is parameter. **4**

7. a) Trace the curve $y^2 = x^2(4 - x^2)$. **3**

b) Trace the curve $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$. **3**

c) Find the length of astroid $x = a \cos^3 t$, $y = a \sin^3 t$. **3**

Set S



8. a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} xy \, dy \, dx$. **3**
- b) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} x \, dx \, dy \, dz$. **3**
- c) Change the order and evaluate $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) \, dx \, dy$. **3**

OR

- c) Evaluate $\iint xy \, dx \, dy$ over the area of the circle $x^2 + y^2 = 1$. **3**
9. a) Find the area included between the curves $y = x^2$ and $y = x^3$. **3**
- b) The density at any point of a cardioid $r = a(1 + \cos\theta)$ varies as the square of its distance $r \sin\theta$ from its axis of symmetry. Find its mass. **3**
- c) Find the volume of a sphere generated by revolving a semi circle of $x^2 + y^2 = a^2$ about $x -$ axis. **3**



SLR-VB – 10

Seat No.	
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Set

P

**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
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) When higher values are outside the loop it indicates a
 - a) Hill
 - b) Pond
 - c) Sloping ground
 - d) Overhanging cliff
- 2) The canal taken directly from reservoir is called as
 - a) Main canal
 - b) Branch canal
 - c) Distributory
 - d) Field canal
- 3) The curvature of earth is considered in
 - a) Geodetic surveying
 - b) Plane surveying
 - c) Hydrographic surveying
 - d) Astronomical surveying
- 4) In water-bound macadam roads
 - a) small broken stone are laid in two layers
 - b) voids between the stones are filled by stone dust
 - c) camber for drainage is given at the formation level itself
 - d) all of the above
- 5) Rain water harvesting is required for
 - a) Ground water table recharge
 - b) Bore well recharge
 - c) Storage for future use
 - d) All of the above
- 6) Parallel and equi spaced contour lines indicate
 - a) Plane flat inclined plane
 - b) Steep slopes
 - c) Overhanging cliff
 - d) Hills and depressions

P.T.O.



- 7) The area of land acquired for the road, along its alignment is called as
- a) Camber or cross slope
 - b) Right of way
 - c) Shoulder
 - d) Formation width
- 8) The substructure consist of
- a) Foundation
 - b) Plinth
 - c) Foundation and Plinth
 - d) None of the above
- 9) In load bearing wall action
- a) Sudden failure is not possible
 - b) Redistribution of stresses is possible
 - c) Strict supervision and skilled manpower is needed
 - d) Initial cost of construction is less
- 10) Arrangement of doors and windows on external walls of a building to take maximum benefit of natural agencies is called
- a) Prospect
 - b) Elegance
 - c) Aspect
 - d) Roominess
- 11) The line parallel to the center line of adjoining street up to which the plinth of the residential building can lawfully extend is
- a) Control line
 - b) Built up line
 - c) Building line
 - d) None of the above
- 12) The maximum water absorption for a 1st class standard brick, after soaking for 24 hours, should not exceed original weight
- a) By 5%
 - b) By 10%
 - c) By 20%
 - d) By 40%
- 13) After the manufacturing date, the cement should be used within the time span of
- a) 7 days
 - b) 28 days
 - c) 3 months
 - d) 1 year
- 14) As per I.S. code, for R.C.C. elements like column, beam and slab, minimum grade of concrete is
- a) M 7.5
 - b) M 165
 - c) M 40
 - d) M 20
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Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instruction : Question No. 2 and Question No. 6 are **compulsory** and solve **any two** questions from **each** Section.

SECTION – I

2. a) What are the temporary adjustments of dumpy level ? 2
b) During Fly levelling operation; the following observations were made : 8
BS = 0.650; 2.155; 1.405; 2.655; 2.435 m
FS = 2.455; 1.305; 0.500; 2.450 m
The first back sight reading was taken on a B.M. of R.L. 90.500 m from the last back sight; it is required to set four pegs each at a distance of 30 m on a falling gradient of 1 in 100. Calculate the RL's of these four pegs.
3. a) Distinguish between Whole circle bearing and Quadrantal bearing system. 4
b) The old map was drawn to a scale of 1cm = 8 m, but now the paper is found to have shrunk. A line originally 200 mm long now measures 190 mm only. The area of a plot now measures 100.5 cm². There was also a note that the 30 m chain used was 100 mm too short. Find the true area of the plot. 5
4. a) Write characteristics of contour map. 2
b) The following bearings were taken in running a closed compass traverse : 7

Line	F.B.	B.B.
AB	80°10'	259°0'
BC	120°20'	301°50'
CD	170°50'	350°50'
DE	230°10'	49°30'
EA	310°20'	130°15'

Compute the interior angles and correct them for observational errors. Assuming the bearing of line CD is to be correct. Adjust the bearing of the remaining sides.



5. a) Enlist types of dam. Explain any one with sketch. 4
b) Draw the neat sketch indicating road width, shoulders, borrow pit, berm, right of way, drains etc. 5

SECTION – II

Note : Question No. 6 is **compulsory**, solve **any two** questions from Q.No. 7 to Q.No. 9.

6. A) Give reasons with “True & False”. 8
1) Load bearing constructions are not suitable in B.C. soil.
2) Load bearing structure cannot be used for multistoried building.
3) Pile foundation is a type of shallow foundation.
4) Lintels are provided over door, window openings.
B) Define : 2
1) Built up area
2) Building line.
7. a) What are the characteristics of Good building bricks ? 5
b) What is meant by building byelaws ? Write down byelaws for, 4
1) Open space requirement
2) Height of building
3) F.S.I.
8. a) Write short note on energy efficient building. 5
b) Why preservation of timber is necessary ? Name the different preservatives. 4
9. a) State and explain Ideal Remote sensing system. 5
b) What is meant by grade of concrete ? State the uses of M 7.5, M 15 & M 20 grade concrete. 4
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SLR-VB – 10

Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
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) The substructure consist of
 - a) Foundation
 - b) Plinth
 - c) Foundation and Plinth
 - d) None of the above
- 2) In load bearing wall action
 - a) Sudden failure is not possible
 - b) Redistribution of stresses is possible
 - c) Strict supervision and skilled manpower is needed
 - d) Initial cost of construction is less
- 3) Arrangement of doors and windows on external walls of a building to take maximum benefit of natural agencies is called
 - a) Prospect
 - b) Elegance
 - c) Aspect
 - d) Roominess
- 4) The line parallel to the center line of adjoining street up to which the plinth of the residential building can lawfully extend is
 - a) Control line
 - b) Built up line
 - c) Building line
 - d) None of the above
- 5) The maximum water absorption for a 1st class standard brick, after soaking for 24 hours, should not exceed original weight
 - a) By 5%
 - b) By 10%
 - c) By 20%
 - d) By 40%
- 6) After the manufacturing date, the cement should be used within the time span of
 - a) 7 days
 - b) 28 days
 - c) 3 months
 - d) 1 year

P.T.O.



- 7) As per I.S. code, for R.C.C. elements like column, beam and slab, minimum grade of concrete is
- a) M 7.5 b) M 165 c) M 40 d) M 20
- 8) When higher values are outside the loop it indicates a
- a) Hill b) Pond
c) Sloping ground d) Overhanging cliff
- 9) The canal taken directly from reservoir is called as
- a) Main canal b) Branch canal c) Distributory d) Field canal
- 10) The curvature of earth is considered in
- a) Geodetic surveying b) Plane surveying
c) Hydrographic surveying d) Astronomical surveying
- 11) In water-bound macadam roads
- a) small broken stone are laid in two layers
b) voids between the stones are filled by stone dust
c) camber for drainage is given at the formation level itself
d) all of the above
- 12) Rain water harvesting is required for
- a) Ground water table recharge b) Bore well recharge
c) Storage for future use d) All of the above
- 13) Parallel and equi spaced contour lines indicate
- a) Plane flat inclined plane b) Steep slopes
c) Overhanging cliff d) Hills and depressions
- 14) The area of land acquired for the road, along its alignment is called as
- a) Camber or cross slope b) Right of way
c) Shoulder d) Formation width
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Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instruction : Question No. 2 and Question No. 6 are **compulsory** and solve **any two** questions from **each** Section.

SECTION – I

2. a) What are the temporary adjustments of dumpy level ? 2
b) During Fly levelling operation; the following observations were made : 8
BS = 0.650; 2.155; 1.405; 2.655; 2.435 m
FS = 2.455; 1.305; 0.500; 2.450 m
The first back sight reading was taken on a B.M. of R.L. 90.500 m from the last back sight; it is required to set four pegs each at a distance of 30 m on a falling gradient of 1 in 100. Calculate the RL's of these four pegs.
3. a) Distinguish between Whole circle bearing and Quadrantal bearing system. 4
b) The old map was drawn to a scale of 1cm = 8 m, but now the paper is found to have shrunk. A line originally 200 mm long now measures 190 mm only. The area of a plot now measures 100.5 cm². There was also a note that the 30 m chain used was 100 mm too short. Find the true area of the plot. 5
4. a) Write characteristics of contour map. 2
b) The following bearings were taken in running a closed compass traverse : 7

Line	F.B.	B.B.
AB	80°10'	259°0'
BC	120°20'	301°50'
CD	170°50'	350°50'
DE	230°10'	49°30'
EA	310°20'	130°15'

Compute the interior angles and correct them for observational errors. Assuming the bearing of line CD is to be correct. Adjust the bearing of the remaining sides.

Set Q



5. a) Enlist types of dam. Explain any one with sketch. 4
b) Draw the neat sketch indicating road width, shoulders, borrow pit, berm, right of way, drains etc. 5

SECTION – II

Note : Question No. 6 is **compulsory**, solve **any two** questions from Q.No. 7 to Q.No. 9.

6. A) Give reasons with “True & False”. 8
1) Load bearing constructions are not suitable in B.C. soil.
2) Load bearing structure cannot be used for multistoried building.
3) Pile foundation is a type of shallow foundation.
4) Lintels are provided over door, window openings.
B) Define : 2
1) Built up area
2) Building line.
7. a) What are the characteristics of Good building bricks ? 5
b) What is meant by building byelaws ? Write down byelaws for, 4
1) Open space requirement
2) Height of building
3) F.S.I.
8. a) Write short note on energy efficient building. 5
b) Why preservation of timber is necessary ? Name the different preservatives. 4
9. a) State and explain Ideal Remote sensing system. 5
b) What is meant by grade of concrete ? State the uses of M 7.5, M 15 & M 20 grade concrete. 4
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SLR-VB – 10

Seat No.	
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Set

R

**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
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) Rain water harvesting is required for
 - a) Ground water table recharge
 - b) Bore well recharge
 - c) Storage for future use
 - d) All of the above
- 2) Parallel and equi spaced contour lines indicate
 - a) Plane flat inclined plane
 - b) Steep slopes
 - c) Overhanging cliff
 - d) Hills and depressions
- 3) The area of land acquired for the road, along its alignment is called as
 - a) Camber or cross slope
 - b) Right of way
 - c) Shoulder
 - d) Formation width
- 4) The substructure consist of
 - a) Foundation
 - b) Plinth
 - c) Foundation and Plinth
 - d) None of the above
- 5) In load bearing wall action
 - a) Sudden failure is not possible
 - b) Redistribution of stresses is possible
 - c) Strict supervision and skilled manpower is needed
 - d) Initial cost of construction is less
- 6) Arrangement of doors and windows on external walls of a building to take maximum benefit of natural agencies is called
 - a) Prospect
 - b) Elegance
 - c) Aspect
 - d) Roominess

P.T.O.



- 7) The line parallel to the center line of adjoining street up to which the plinth of the residential building can lawfully extend is
- a) Control line b) Built up line
c) Building line d) None of the above
- 8) The maximum water absorption for a 1st class standard brick, after soaking for 24 hours, should not exceed original weight
- a) By 5% b) By 10% c) By 20% d) By 40%
- 9) After the manufacturing date, the cement should be used within the time span of
- a) 7 days b) 28 days c) 3 months d) 1 year
- 10) As per I.S. code, for R.C.C. elements like column, beam and slab, minimum grade of concrete is
- a) M 7.5 b) M 165 c) M 40 d) M 20
- 11) When higher values are outside the loop it indicates a
- a) Hill b) Pond
c) Sloping ground d) Overhanging cliff
- 12) The canal taken directly from reservoir is called as
- a) Main canal b) Branch canal c) Distributory d) Field canal
- 13) The curvature of earth is considered in
- a) Geodetic surveying b) Plane surveying
c) Hydrographic surveying d) Astronomical surveying
- 14) In water-bound macadam roads
- a) small broken stone are laid in two layers
b) voids between the stones are filled by stone dust
c) camber for drainage is given at the formation level itself
d) all of the above
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Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instruction : Question No. 2 and Question No. 6 are **compulsory** and solve **any two** questions from **each** Section.

SECTION – I

2. a) What are the temporary adjustments of dumpy level ? 2
b) During Fly levelling operation; the following observations were made : 8
BS = 0.650; 2.155; 1.405; 2.655; 2.435 m
FS = 2.455; 1.305; 0.500; 2.450 m
The first back sight reading was taken on a B.M. of R.L. 90.500 m from the last back sight; it is required to set four pegs each at a distance of 30 m on a falling gradient of 1 in 100. Calculate the RL's of these four pegs.
3. a) Distinguish between Whole circle bearing and Quadrantal bearing system. 4
b) The old map was drawn to a scale of 1cm = 8 m, but now the paper is found to have shrunk. A line originally 200 mm long now measures 190 mm only. The area of a plot now measures 100.5 cm². There was also a note that the 30 m chain used was 100 mm too short. Find the true area of the plot. 5
4. a) Write characteristics of contour map. 2
b) The following bearings were taken in running a closed compass traverse : 7

Line	F.B.	B.B.
AB	80°10'	259°0'
BC	120°20'	301°50'
CD	170°50'	350°50'
DE	230°10'	49°30'
EA	310°20'	130°15'

Compute the interior angles and correct them for observational errors. Assuming the bearing of line CD is to be correct. Adjust the bearing of the remaining sides.

Set R



5. a) Enlist types of dam. Explain any one with sketch. 4
b) Draw the neat sketch indicating road width, shoulders, borrow pit, berm, right of way, drains etc. 5

SECTION – II

Note : Question No. 6 is **compulsory**, solve **any two** questions from Q.No. 7 to Q.No. 9.

6. A) Give reasons with “True & False”. 8
1) Load bearing constructions are not suitable in B.C. soil.
2) Load bearing structure cannot be used for multistoried building.
3) Pile foundation is a type of shallow foundation.
4) Lintels are provided over door, window openings.
B) Define : 2
1) Built up area
2) Building line.
7. a) What are the characteristics of Good building bricks ? 5
b) What is meant by building byelaws ? Write down byelaws for, 4
1) Open space requirement
2) Height of building
3) F.S.I.
8. a) Write short note on energy efficient building. 5
b) Why preservation of timber is necessary ? Name the different preservatives. 4
9. a) State and explain Ideal Remote sensing system. 5
b) What is meant by grade of concrete ? State the uses of M 7.5, M 15 & M 20 grade concrete. 4
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SLR-VB – 10

Seat No.	
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Set

S

**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
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) Arrangement of doors and windows on external walls of a building to take maximum benefit of natural agencies is called
a) Prospect b) Elegance c) Aspect d) Roominess
- 2) The line parallel to the center line of adjoining street up to which the plinth of the residential building can lawfully extend is
a) Control line b) Built up line
c) Building line d) None of the above
- 3) The maximum water absorption for a 1st class standard brick, after soaking for 24 hours, should not exceed original weight
a) By 5% b) By 10% c) By 20% d) By 40%
- 4) After the manufacturing date, the cement should be used within the time span of
a) 7 days b) 28 days c) 3 months d) 1 year
- 5) As per I.S. code, for R.C.C. elements like column, beam and slab, minimum grade of concrete is
a) M 7.5 b) M 165 c) M 40 d) M 20
- 6) When higher values are outside the loop it indicates a
a) Hill b) Pond
c) Sloping ground d) Overhanging cliff
- 7) The canal taken directly from reservoir is called as
a) Main canal b) Branch canal c) Distributory d) Field canal

P.T.O.



- 8) The curvature of earth is considered in
- a) Geodetic surveying
 - b) Plane surveying
 - c) Hydrographic surveying
 - d) Astronomical surveying
- 9) In water-bound macadam roads
- a) small broken stone are laid in two layers
 - b) voids between the stones are filled by stone dust
 - c) camber for drainage is given at the formation level itself
 - d) all of the above
- 10) Rain water harvesting is required for
- a) Ground water table recharge
 - b) Bore well recharge
 - c) Storage for future use
 - d) All of the above
- 11) Parallel and equi spaced contour lines indicate
- a) Plane flat inclined plane
 - b) Steep slopes
 - c) Overhanging cliff
 - d) Hills and depressions
- 12) The area of land acquired for the road, along its alignment is called as
- a) Camber or cross slope
 - b) Right of way
 - c) Shoulder
 - d) Formation width
- 13) The substructure consist of
- a) Foundation
 - b) Plinth
 - c) Foundation and Plinth
 - d) None of the above
- 14) In load bearing wall action
- a) Sudden failure is not possible
 - b) Redistribution of stresses is possible
 - c) Strict supervision and skilled manpower is needed
 - d) Initial cost of construction is less
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Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instruction : Question No. 2 and Question No. 6 are **compulsory** and solve **any two** questions from **each** Section.

SECTION – I

2. a) What are the temporary adjustments of dumpy level ? 2
b) During Fly levelling operation; the following observations were made : 8
BS = 0.650; 2.155; 1.405; 2.655; 2.435 m
FS = 2.455; 1.305; 0.500; 2.450 m
The first back sight reading was taken on a B.M. of R.L. 90.500 m from the last back sight; it is required to set four pegs each at a distance of 30 m on a falling gradient of 1 in 100. Calculate the RL's of these four pegs.
3. a) Distinguish between Whole circle bearing and Quadrantal bearing system. 4
b) The old map was drawn to a scale of 1cm = 8 m, but now the paper is found to have shrunk. A line originally 200 mm long now measures 190 mm only. The area of a plot now measures 100.5 cm². There was also a note that the 30 m chain used was 100 mm too short. Find the true area of the plot. 5
4. a) Write characteristics of contour map. 2
b) The following bearings were taken in running a closed compass traverse : 7

Line	F.B.	B.B.
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BC	120°20'	301°50'
CD	170°50'	350°50'
DE	230°10'	49°30'
EA	310°20'	130°15'

Compute the interior angles and correct them for observational errors. Assuming the bearing of line CD is to be correct. Adjust the bearing of the remaining sides.



5. a) Enlist types of dam. Explain any one with sketch. 4
b) Draw the neat sketch indicating road width, shoulders, borrow pit, berm, right of way, drains etc. 5

SECTION – II

Note : Question No. 6 is **compulsory**, solve **any two** questions from Q.No. 7 to Q.No. 9.

6. A) Give reasons with “True & False”. 8
1) Load bearing constructions are not suitable in B.C. soil.
2) Load bearing structure cannot be used for multistoried building.
3) Pile foundation is a type of shallow foundation.
4) Lintels are provided over door, window openings.
B) Define : 2
1) Built up area
2) Building line.
7. a) What are the characteristics of Good building bricks ? 5
b) What is meant by building byelaws ? Write down byelaws for, 4
1) Open space requirement
2) Height of building
3) F.S.I.
8. a) Write short note on energy efficient building. 5
b) Why preservation of timber is necessary ? Name the different preservatives. 4
9. a) State and explain Ideal Remote sensing system. 5
b) What is meant by grade of concrete ? State the uses of M 7.5, M 15 & M 20 grade concrete. 4
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SLR-VB – 11

Seat No.	
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Set	P
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F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate max marks.**
 - 3) **Use separate ans. sheets for Basic Electronics (Section – I) and Computer Programming (Section – II).**
 - 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

Basic Electronics

(1×7=7)

1. Choose the correct answer :

- 1) Ripple factor of full wave rectifier without filter is
a) 0.2 b) 0.48 c) 0.24 d) 1.21
- 2) Thermocouple is _____ transducer and used for measurement of _____
a) Passive, temperature b) Active, light sensitivity
c) Active, displacement d) Active, temperature
- 3) The Boolean expression $A + AB$ is equal to
a) A b) $A(1+B)$ c) A.A d) All above
- 4) A photo diode is an example of light
a) Source b) Detector c) Coupler d) Isolator
- 5) 2's complement of a number 1010101 is _____
a) 0101010 b) 0101011 c) 1101010 d) 01010111
- 6) Semiconductor material used for LED is
a) Silicon b) Gallium Bromide
c) Gallium Arsenide d) None of these
- 7) _____ is an active transducer.
a) Thermocouple b) Strain gauge
c) LVDT d) None of these

P.T.O.

**Computer Programming****(1×7=7)**

- 8) Who developed the C programming language ?
- a) Bjarne Stroustrup b) James Gosling
c) Dennis Ritchie d) Ray Boyce
- 9) “%f” access specifier is used for
- a) Integer type b) Character type
c) Floating type d) None of the above
- 10) Which of the following function is more appropriate for reading in a multi-word string ?
- a) printf() b) scanf() c) gets() d) puts()
- 11) Standard ANSI C recognizes _____ number of keywords.
- a) 30 b) 32 c) 24 d) 36
- 12) Pointer is special kind of variable which is used to stored _____ of the variable.
- a) Value b) Variable name c) Data type d) Address
- 13) Step by step instructions written to solve any problem is called
- a) Pseudo code b) Algorithm c) Assembler d) Class
- 14) If the two strings are identical, then strcmp() function returns
- a) -1 b) 1 c) 0 d) YES
-



Seat No.	
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**F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Friday, 19-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate max marks.**
 - 3) **Use separate ans. sheets from Basic Electronics (Section – I) and Computer Programming (Section – II).**

**SECTION – I
(Basic Electronics)**

2. Attempt **any 4** questions : **(4×4=16)**
- a) Explain input output characteristics of common emitter configuration.
 - b) State and prove De Morgan's theorem.
 - c) Write types of transducers and explain any one in detail.
 - d) Convert the following numbers into octal, binary :
 $(DEF.BFA)_{16}$, $(72E.CD)_{16}$.
 - e) What is the need of filter ? Explain capacitor filter. Write expression for ripple factor.
 - f) Explain with diagram types of inductor.
3. Attempt **any two** questions : **(2×6=12)**
- a) Explain full wave rectifier. Sketch associated waveforms. And derive an expression for :
 - 1) Average value of dc voltage
 - 2) rms value of dc voltage.
 - b) Perform subtraction using 2's complement :
 - i) $(A.59)_{16} - (B.31)_{16}$
 - ii) $(75)_{10} - (25)_{10}$
 - c) Explain basic and universal logic gates with symbol, equation and truth table.

Set P



SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What is flowchart ? Explain its different components.
 - b) What are the relational operators are used in C ? Explain with example.
 - c) Define – Variable, Constant, Data Type and Array with example.
 - d) Write a program to print all even numbers between 1 to 50, using while loop.
 - e) What is Pointer ? Explain with example.
5. Attempt **any two** : **(2×6=12)**
- a) What is string ? Explain any four string-handling functions in C library.
 - b) Compare Structure and Union in C.
 - c) Write a program to calculate summation of five array element.
-



SLR-VB – 11

Seat No.	
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Set	Q
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F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate max marks.**
 - 3) **Use separate ans. sheets for Basic Electronics (Section – I) and Computer Programming (Section – II).**
 - 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

Basic Electronics

(1×7=7)

1. Choose the correct answer :

- 1) The Boolean expression $A + AB$ is equal to
a) A b) $A(1+B)$ c) $A.A$ d) All above
- 2) A photo diode is an example of light
a) Source b) Detector c) Coupler d) Isolator
- 3) 2's complement of a number 1010101 is _____
a) 0101010 b) 0101011 c) 1101010 d) 01010111
- 4) Semiconductor material used for LED is
a) Silicon b) Gallium Bromide
c) Gallium Arsenide d) None of these
- 5) _____ is an active transducer.
a) Thermocouple b) Strain gauge
c) LVDT d) None of these
- 6) Ripple factor of full wave rectifier without filter is
a) 0.2 b) 0.48 c) 0.24 d) 1.21
- 7) Thermocouple is _____ transducer and used for measurement of _____
a) Passive, temperature b) Active, light sensitivity
c) Active, displacement d) Active, temperature

P.T.O.

**Computer Programming****(1×7=7)**

- 8) Which of the following function is more appropriate for reading in a multi-word string ?
a) printf() b) scanf() c) gets() d) puts()
- 9) Standard ANSI C recognizes _____ number of keywords.
a) 30 b) 32 c) 24 d) 36
- 10) Pointer is special kind of variable which is used to stored _____ of the variable.
a) Value b) Variable name c) Data type d) Address
- 11) Step by step instructions written to solve any problem is called
a) Pseudo code b) Algorithm c) Assembler d) Class
- 12) If the two strings are identical, then strcmp() function returns
a) -1 b) 1 c) 0 d) YES
- 13) Who developed the C programming language ?
a) Bjarne Stroustrup b) James Gosling
c) Dennis Ritchie d) Ray Boyce
- 14) “%f” access specifier is used for
a) Integer type b) Character type
c) Floating type d) None of the above
-



Seat No.	
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**F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Friday, 19-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate max marks.**
 - 3) **Use separate ans. sheets from Basic Electronics (Section – I) and Computer Programming (Section – II).**

**SECTION – I
(Basic Electronics)**

2. Attempt **any 4** questions : **(4×4=16)**
- a) Explain input output characteristics of common emitter configuration.
 - b) State and prove De Morgan's theorem.
 - c) Write types of transducers and explain any one in detail.
 - d) Convert the following numbers into octal, binary :
 $(DEF.BFA)_{16}, (72E.CD)_{16}$.
 - e) What is the need of filter ? Explain capacitor filter. Write expression for ripple factor.
 - f) Explain with diagram types of inductor.
3. Attempt **any two** questions : **(2×6=12)**
- a) Explain full wave rectifier. Sketch associated waveforms. And derive an expression for :
 - 1) Average value of dc voltage
 - 2) rms value of dc voltage.
 - b) Perform subtraction using 2's complement :
 - i) $(A.59)_{16} - (B.31)_{16}$
 - ii) $(75)_{10} - (25)_{10}$
 - c) Explain basic and universal logic gates with symbol, equation and truth table.

Set Q



SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What is flowchart ? Explain its different components.
 - b) What are the relational operators are used in C ? Explain with example.
 - c) Define – Variable, Constant, Data Type and Array with example.
 - d) Write a program to print all even numbers between 1 to 50, using while loop.
 - e) What is Pointer ? Explain with example.
5. Attempt **any two** : **(2×6=12)**
- a) What is string ? Explain any four string-handling functions in C library.
 - b) Compare Structure and Union in C.
 - c) Write a program to calculate summation of five array element.
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SLR-VB – 11

Seat No.	
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Set	R
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**F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **All** questions are **compulsory**.
 - 2) Figures to the **right** indicate max marks.
 - 3) **Use** separate ans. sheets for Basic Electronics (Section – I) and Computer Programming (Section – II).
 - 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

Basic Electronics

(1×7=7)

1. Choose the correct answer :

- 1) 2's complement of a number 1010101 is _____
a) 0101010 b) 0101011 c) 1101010 d) 01010111
- 2) Semiconductor material used for LED is
a) Silicon b) Gallium Bromide
c) Gallium Arsenide d) None of these
- 3) _____ is an active transducer.
a) Thermocouple b) Strain gauge
c) LVDT d) None of these
- 4) Ripple factor of full wave rectifier without filter is
a) 0.2 b) 0.48 c) 0.24 d) 1.21
- 5) Thermocouple is _____ transducer and used for measurement of _____
a) Passive, temperature b) Active, light sensitivity
c) Active, displacement d) Active, temperature
- 6) The Boolean expression $A + AB$ is equal to
a) A b) $A(1+B)$ c) A.A d) All above
- 7) A photo diode is an example of light
a) Source b) Detector c) Coupler d) Isolator

P.T.O.

**Computer Programming****(1×7=7)**

- 8) Pointer is special kind of variable which is used to stored _____ of the variable.
- a) Value b) Variable name c) Data type d) Address
- 9) Step by step instructions written to solve any problem is called
- a) Pseudo code b) Algorithm c) Assembler d) Class
- 10) If the two strings are identical, then strcmp() function returns
- a) -1 b) 1 c) 0 d) YES
- 11) Who developed the C programming language ?
- a) Bjarne Stroustrup b) James Gosling
c) Dennis Ritchie d) Ray Boyce
- 12) “%f” access specifier is used for
- a) Integer type b) Character type
c) Floating type d) None of the above
- 13) Which of the following function is more appropriate for reading in a multi-word string ?
- a) printf() b) scanf() c) gets() d) puts()
- 14) Standard ANSI C recognizes _____ number of keywords.
- a) 30 b) 32 c) 24 d) 36
- _____



Seat No.	
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**F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Friday, 19-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate max marks.**
3) **Use separate ans. sheets from Basic Electronics (Section – I) and Computer Programming (Section – II).**

**SECTION – I
(Basic Electronics)**

2. Attempt **any 4** questions : **(4×4=16)**
- a) Explain input output characteristics of common emitter configuration.
 - b) State and prove De Morgan's theorem.
 - c) Write types of transducers and explain any one in detail.
 - d) Convert the following numbers into octal, binary :
 $(DEF.BFA)_{16}, (72E.CD)_{16}$.
 - e) What is the need of filter ? Explain capacitor filter. Write expression for ripple factor.
 - f) Explain with diagram types of inductor.
3. Attempt **any two** questions : **(2×6=12)**
- a) Explain full wave rectifier. Sketch associated waveforms. And derive an expression for :
 - 1) Average value of dc voltage
 - 2) rms value of dc voltage.
 - b) Perform subtraction using 2's complement :
 - i) $(A.59)_{16} - (B.31)_{16}$
 - ii) $(75)_{10} - (25)_{10}$
 - c) Explain basic and universal logic gates with symbol, equation and truth table.

Set R



SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What is flowchart ? Explain its different components.
 - b) What are the relational operators are used in C ? Explain with example.
 - c) Define – Variable, Constant, Data Type and Array with example.
 - d) Write a program to print all even numbers between 1 to 50, using while loop.
 - e) What is Pointer ? Explain with example.
5. Attempt **any two** : **(2×6=12)**
- a) What is string ? Explain any four string-handling functions in C library.
 - b) Compare Structure and Union in C.
 - c) Write a program to calculate summation of five array element.
-



SLR-VB – 11

Seat No.	
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Set	S
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F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Figures to the right indicate max marks.**
 - 3) **Use separate ans. sheets for Basic Electronics (Section – I) and Computer Programming (Section – II).**
 - 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

Basic Electronics

(1×7=7)

1. Choose the correct answer :

- 1) A photo diode is an example of light
a) Source b) Detector c) Coupler d) Isolator
- 2) 2's complement of a number 1010101 is _____
a) 0101010 b) 0101011 c) 1101010 d) 01010111
- 3) Semiconductor material used for LED is
a) Silicon b) Gallium Bromide
c) Gallium Arsenide d) None of these
- 4) _____ is an active transducer.
a) Thermocouple b) Strain gauge
c) LVDT d) None of these
- 5) Ripple factor of full wave rectifier without filter is
a) 0.2 b) 0.48 c) 0.24 d) 1.21
- 6) Thermocouple is _____ transducer and used for measurement of _____
a) Passive, temperature b) Active, light sensitivity
c) Active, displacement d) Active, temperature
- 7) The Boolean expression $A + AB$ is equal to
a) A b) $A(1+B)$ c) A.A d) All above

P.T.O.

**Computer Programming****(1×7=7)**

- 8) Standard ANSI C recognizes _____ number of keywords.
a) 30 b) 32 c) 24 d) 36
- 9) Pointer is special kind of variable which is used to stored _____ of the variable.
a) Value b) Variable name c) Data type d) Address
- 10) Step by step instructions written to solve any problem is called
a) Pseudo code b) Algorithm c) Assembler d) Class
- 11) If the two strings are identical, then strcmp() function returns
a) -1 b) 1 c) 0 d) YES
- 12) Who developed the C programming language ?
a) Bjarne Stroustrup b) James Gosling
c) Dennis Ritchie d) Ray Boyce
- 13) “%f” access specifier is used for
a) Integer type b) Character type
c) Floating type d) None of the above
- 14) Which of the following function is more appropriate for reading in a multi-word string ?
a) printf() b) scanf() c) gets() d) puts()
- _____



Seat No.	
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**F.E. (Part – II) (Old CGPA) Examination, 2017
BASIC ELECTRONICS AND COMPUTER PROGRAMMING**

Day and Date : Friday, 19-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate max marks.**
3) **Use separate ans. sheets from Basic Electronics (Section – I) and Computer Programming (Section – II).**

**SECTION – I
(Basic Electronics)**

2. Attempt **any 4** questions : **(4×4=16)**
- a) Explain input output characteristics of common emitter configuration.
 - b) State and prove De Morgan's theorem.
 - c) Write types of transducers and explain any one in detail.
 - d) Convert the following numbers into octal, binary :
 $(DEF.BFA)_{16}, (72E.CD)_{16}$.
 - e) What is the need of filter ? Explain capacitor filter. Write expression for ripple factor.
 - f) Explain with diagram types of inductor.
3. Attempt **any two** questions : **(2×6=12)**
- a) Explain full wave rectifier. Sketch associated waveforms. And derive an expression for :
 - 1) Average value of dc voltage
 - 2) rms value of dc voltage.
 - b) Perform subtraction using 2's complement :
 - i) $(A.59)_{16} - (B.31)_{16}$
 - ii) $(75)_{10} - (25)_{10}$
 - c) Explain basic and universal logic gates with symbol, equation and truth table.

Set S



SECTION – II
(Computer Programming)

4. Attempt **any four** : **(4×4=16)**
- a) What is flowchart ? Explain its different components.
 - b) What are the relational operators are used in C ? Explain with example.
 - c) Define – Variable, Constant, Data Type and Array with example.
 - d) Write a program to print all even numbers between 1 to 50, using while loop.
 - e) What is Pointer ? Explain with example.
5. Attempt **any two** : **(2×6=12)**
- a) What is string ? Explain any four string-handling functions in C library.
 - b) Compare Structure and Union in C.
 - c) Write a program to calculate summation of five array element.
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SLR-VB – 13

Seat No.	
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Set	P
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F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, **if necessary**.
 - 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**. **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.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
 - 2) Velocity of light, $c = 3 \times 10^8 m/sec.$
 - 3) Charge of electron, $e = 1.6 \times 10^{-19} C.$

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. Choose the correct answer : (14×1=14)
- 1) Atomic packing factor of BCC structure is
a) 0.68 b) 0.74 c) 0.52 d) 1.00
 - 2) The coordination number of FCC structure is
a) 6 b) 8 c) 12 d) 4
 - 3) Lorentz transformations reduce to Galilean transformation when
a) $v \gg c$ b) $v = c$ c) $v = 0$ d) $v \ll c$
 - 4) The waves used in Sonography are
a) micro waves b) infrared waves
c) ultrasonic waves d) Ultraviolet waves
 - 5) The ultrasonic waves exhibit
a) Large diffraction effect b) Negligible diffraction effect
c) Very long wavelength d) Faster speed than light waves

P.T.O.



- 6) An p-type semiconductor is
- | | |
|-----------------------|-------------------------|
| a) positively charged | b) electrically neutral |
| c) negatively charged | d) none of the above |
- 7) The Unit of Hall coefficient is
- | | |
|--------------------------|---------------------|
| a) $Vm^3 A^{-1} Wb^{-1}$ | b) $Vm^3 A Wb^{-1}$ |
| c) $Vm^3 A^{+1} Wb^{-1}$ | d) $Vm^2 A^{-1} Wb$ |

SECTION – II

- 8) In a plane transmission grating, the condition for secondary maxima is
- | | |
|---|--|
| a) $(a + b) \sin \theta = (2n + 1) \lambda / 2$ | b) $(a + b) \sin 2\theta = (2n - 1) \lambda / 2$ |
| c) $(a + b) \sin \theta = n \lambda$ | d) $(a + b) \sin \theta = (2n - 1) \lambda / 2$ |
- 9) For negative crystal, _____ along other directions.
- | | | | |
|--------------------|--------------------------|--------------------|--------------------|
| a) $\mu_o = \mu_e$ | b) $\mu_o \approx \mu_e$ | c) $\mu_o < \mu_e$ | d) $\mu_o > \mu_e$ |
|--------------------|--------------------------|--------------------|--------------------|
- 10) The process of supplying energy to the laser medium with a view of transfer it into the state of population inversion is known as
- | | |
|------------------|-------------------------|
| a) pumping | b) population inversion |
| c) lasing action | d) depumping |
- 11) The light gathering ability of the fiber depends on two factors
- | |
|---|
| a) launching medium |
| b) core size and the numerical aperture |
| c) length of fiber |
| d) color of fiber |
- 12) Control rods used in nuclear reactors are made up of
- | | | | |
|------------|---------|--------------|-------------|
| a) cadmium | b) iron | c) plutonium | d) graphite |
|------------|---------|--------------|-------------|
- 13) The chirality of helical CNT is
- | | | | |
|-----------|-----------|-----------|-----------|
| a) (a, 0) | b) (a, b) | c) (a, a) | d) (b, b) |
|-----------|-----------|-----------|-----------|
- 14) In He – Ne LASER, _____ atoms are the active centers.
- | | | | |
|-------|-------|-------|-------|
| a) He | b) Ne | c) Al | d) Cd |
|-------|-------|-------|-------|
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Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
2) Figure to the **right** indicate **full** marks.

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol$.
2) Velocity of light, $c = 3 \times 10^8 m/sec$.
3) Charge of electron, $e = 1.6 \times 10^{-19} C$.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Explain Length contraction on the basis of relativity.
 - b) A particle with a mean proper life time of 3μ sec moves through the laboratory with the speed of $0.8 C$. Calculate its life time as measured by an observer in the laboratory.
 - c) Define reverberation time. State and explain Sabine's formula for the reverberation time.
 - d) What are valence band, conduction band and energy gap ? Define it and show with neat diagram.
 - e) Explain with diagram Bragg's Law, $2d \sin \theta = n \lambda$ of X-ray diffraction.
 - f) The density of copper is $8980 kg/m^3$ and unit cell dimension is 3.61 \AA . Atomic weight of copper is 63.54. Determine the crystal structure. Calculate atomic radius and inter-planar spacing of (110) plane.
 - g) Explain effect of impurity concentration on the position of Fermi level in N type semiconductor.
3. Define Miller indices ? Show that in a cubic crystal the spacing between consecutive parallel planes in terms of Miller indices (hkl) is given by

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$



4. Attempt **any two** of the following : 8

- a) Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.
- b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
- c) Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.

SECTION – II

5. Attempt **any five** of the following : 15

- a) State and explain Malus law.
- b) Explain with neat diagram (i) Spontaneous emission (ii) Stimulated emission.
- c) Explain with neat diagram basic principal and structure of optical fiber.
- d) Give applications of nano technology.
- e) A parallel beam of sodium light ($\lambda = 5890 \text{ \AA}$) is allowed to be incident normally on transmission grating and second order spectral lines are found to be derived through 30° . Calculate the number of lines per centimeter on the grating.
- f) A fiber cable has an acceptance angle of 30° and core index of refraction is 1.4. Calculate the cladding index of refraction.
- g) Explain Carbon Nitrogen cycle.

6. Explain how LASER can be produced by Helium-Neon gas. 5

OR

What is nuclear fission reaction ? By taking 1 kg of U^{235} as a fuel show that nuclear fission reaction can be used as a source of nuclear energy.

7. Attempt **any two** of the following : 8

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) Explain positive and negative crystals.
- c) Write a note on : Classification of optical fibers.



SLR-VB – 13

Seat No.	
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Set	Q
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, **if necessary**.
 - 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**. **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.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
 - 2) Velocity of light, $c = 3 \times 10^8$ m/sec.
 - 3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. Choose the correct answer : **(14×1=14)**
- 1) Lorentz transformations reduce to Galilean transformation when
 - a) $v \gg c$
 - b) $v = c$
 - c) $v = 0$
 - d) $v \ll c$
 - 2) The waves used in Sonography are
 - a) micro waves
 - b) infrared waves
 - c) ultrasonic waves
 - d) Ultraviolet waves
 - 3) The ultrasonic waves exhibit
 - a) Large diffraction effect
 - b) Negligible diffraction effect
 - c) Very long wavelength
 - d) Faster speed than light waves
 - 4) An p-type semiconductor is
 - a) positively charged
 - b) electrically neutral
 - c) negatively charged
 - d) none of the above

P.T.O.



- 5) The Unit of Hall coefficient is
 a) $\text{Vm}^3 \text{A}^{-1} \text{Wb}^{-1}$ b) $\text{Vm}^3 \text{A} \text{Wb}^{-1}$
 c) $\text{Vm}^3 \text{A}^{+1} \text{Wb}^{-1}$ d) $\text{Vm}^2 \text{A}^{-1} \text{Wb}$
- 6) Atomic packing factor of BCC structure is
 a) 0.68 b) 0.74 c) 0.52 d) 1.00
- 7) The coordination number of FCC structure is
 a) 6 b) 8 c) 12 d) 4

SECTION – II

- 8) The process of supplying energy to the laser medium with a view of transfer it into the state of population inversion is known as
 a) pumping b) population inversion
 c) lasing action d) depumping
- 9) The light gathering ability of the fiber depends on two factors
 a) launching medium
 b) core size and the numerical aperture
 c) length of fiber
 d) color of fiber
- 10) Control rods used in nuclear reactors are made up of
 a) cadmium b) iron c) plutonium d) graphite
- 11) The chirality of helical CNT is
 a) (a, 0) b) (a, b) c) (a, a) d) (b, b)
- 12) In He – Ne LASER, _____ atoms are the active centers.
 a) He b) Ne c) Al d) Cd
- 13) In a plane transmission grating, the condition for secondary maxima is
 a) $(a + b) \sin \theta = (2n + 1) \lambda / 2$ b) $(a + b) \sin 2\theta = (2n - 1) \lambda / 2$
 c) $(a + b) \sin \theta = n \lambda$ d) $(a + b) \sin \theta = (2n - 1) \lambda / 2$
- 14) For negative crystal, _____ along other directions.
 a) $\mu_0 = \mu_e$ b) $\mu_0 \approx \mu_e$ c) $\mu_0 < \mu_e$ d) $\mu_0 > \mu_e$



Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
2) Figure to the **right** indicate **full** marks.

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol$.
2) Velocity of light, $c = 3 \times 10^8 m/sec$.
3) Charge of electron, $e = 1.6 \times 10^{-19} C$.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Explain Length contraction on the basis of relativity.
 - b) A particle with a mean proper life time of 3μ sec moves through the laboratory with the speed of $0.8 C$. Calculate its life time as measured by an observer in the laboratory.
 - c) Define reverberation time. State and explain Sabine's formula for the reverberation time.
 - d) What are valence band, conduction band and energy gap ? Define it and show with neat diagram.
 - e) Explain with diagram Bragg's Law, $2d \sin \theta = n \lambda$ of X-ray diffraction.
 - f) The density of copper is $8980 kg/m^3$ and unit cell dimension is 3.61 \AA . Atomic weight of copper is 63.54. Determine the crystal structure. Calculate atomic radius and inter-planar spacing of (110) plane.
 - g) Explain effect of impurity concentration on the position of Fermi level in N type semiconductor.
3. Define Miller indices ? Show that in a cubic crystal the spacing between consecutive parallel planes in terms of Miller indices (hkl) is given by

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

5
Set Q



4. Attempt **any two** of the following : 8

- a) Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.
- b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
- c) Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.

SECTION – II

5. Attempt **any five** of the following : 15

- a) State and explain Malus law.
- b) Explain with neat diagram (i) Spontaneous emission (ii) Stimulated emission.
- c) Explain with neat diagram basic principal and structure of optical fiber.
- d) Give applications of nano technology.
- e) A parallel beam of sodium light ($\lambda = 5890 \text{ \AA}$) is allowed to be incident normally on transmission grating and second order spectral lines are found to be derived through 30° . Calculate the number of lines per centimeter on the grating.
- f) A fiber cable has an acceptance angle of 30° and core index of refraction is 1.4. Calculate the cladding index of refraction.
- g) Explain Carbon Nitrogen cycle.

6. Explain how LASER can be produced by Helium-Neon gas. 5

OR

What is nuclear fission reaction ? By taking 1 kg of U^{235} as a fuel show that nuclear fission reaction can be used as a source of nuclear energy.

7. Attempt **any two** of the following : 8

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) Explain positive and negative crystals.
- c) Write a note on : Classification of optical fibers.



SLR-VB – 13

Seat No.	
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Set	R
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F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, **if necessary**.
 - 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**. **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.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
 - 2) Velocity of light, $c = 3 \times 10^8$ m/sec.
 - 3) Charge of electron, $e = 1.6 \times 10^{-19}$ C.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. Choose the correct answer : **(14×1=14)**
- 1) The ultrasonic waves exhibit
 - a) Large diffraction effect
 - b) Negligible diffraction effect
 - c) Very long wavelength
 - d) Faster speed than light waves
 - 2) An p-type semiconductor is
 - a) positively charged
 - b) electrically neutral
 - c) negatively charged
 - d) none of the above
 - 3) The Unit of Hall coefficient is
 - a) $Vm^3 A^{-1} Wb^{-1}$
 - b) $Vm^3 A Wb^{-1}$
 - c) $Vm^3 A^{+1} Wb^{-1}$
 - d) $Vm^2 A^{-1} Wb$
 - 4) Atomic packing factor of BCC structure is
 - a) 0.68
 - b) 0.74
 - c) 0.52
 - d) 1.00

P.T.O.



- 5) The coordination number of FCC structure is
a) 6 b) 8 c) 12 d) 4
- 6) Lorentz transformations reduce to Galilean transformation when
a) $v \gg c$ b) $v = c$ c) $v = 0$ d) $v \ll c$
- 7) The waves used in Sonography are
a) micro waves b) infrared waves
c) ultrasonic waves d) Ultraviolet waves

SECTION – II

- 8) Control rods used in nuclear reactors are made up of
a) cadmium b) iron c) plutonium d) graphite
- 9) The chirality of helical CNT is
a) (a, 0) b) (a, b) c) (a, a) d) (b, b)
- 10) In He – Ne LASER, _____ atoms are the active centers.
a) He b) Ne c) Al d) Cd
- 11) In a plane transmission grating, the condition for secondary maxima is
a) $(a + b) \sin \theta = (2n + 1) \lambda / 2$ b) $(a + b) \sin 2 \theta = (2n - 1) \lambda / 2$
c) $(a + b) \sin \theta = n \lambda$ d) $(a + b) \sin \theta = (2n - 1) \lambda / 2$
- 12) For negative crystal, _____ along other directions.
a) $\mu_o = \mu_e$ b) $\mu_o \approx \mu_e$ c) $\mu_o < \mu_e$ d) $\mu_o > \mu_e$
- 13) The process of supplying energy to the laser medium with a view of transfer it into the state of population inversion is known as
a) pumping b) population inversion
c) lasing action d) depumping
- 14) The light gathering ability of the fiber depends on two factors
a) launching medium
b) core size and the numerical aperture
c) length of fiber
d) color of fiber
-



Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
2) Figure to the **right** indicate **full** marks.

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol$.
2) Velocity of light, $c = 3 \times 10^8 m/sec$.
3) Charge of electron, $e = 1.6 \times 10^{-19} C$.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Explain Length contraction on the basis of relativity.
 - b) A particle with a mean proper life time of 3μ sec moves through the laboratory with the speed of $0.8 C$. Calculate its life time as measured by an observer in the laboratory.
 - c) Define reverberation time. State and explain Sabine's formula for the reverberation time.
 - d) What are valence band, conduction band and energy gap ? Define it and show with neat diagram.
 - e) Explain with diagram Bragg's Law, $2d \sin \theta = n \lambda$ of X-ray diffraction.
 - f) The density of copper is $8980 kg/m^3$ and unit cell dimension is 3.61 \AA . Atomic weight of copper is 63.54. Determine the crystal structure. Calculate atomic radius and inter-planar spacing of (110) plane.
 - g) Explain effect of impurity concentration on the position of Fermi level in N type semiconductor.
3. Define Miller indices ? Show that in a cubic crystal the spacing between consecutive parallel planes in terms of Miller indices (hkl) is given by

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

5
Set R



4. Attempt **any two** of the following : 8

a) Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity

according to the special theory of relativity.

b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.

c) Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.

SECTION – II

5. Attempt **any five** of the following : 15

a) State and explain Malus law.

b) Explain with neat diagram (i) Spontaneous emission (ii) Stimulated emission.

c) Explain with neat diagram basic principal and structure of optical fiber.

d) Give applications of nano technology.

e) A parallel beam of sodium light ($\lambda = 5890 \text{ \AA}$) is allowed to be incident normally on transmission grating and second order spectral lines are found to be derived through 30° . Calculate the number of lines per centimeter on the grating.

f) A fiber cable has an acceptance angle of 30° and core index of refraction is 1.4. Calculate the cladding index of refraction.

g) Explain Carbon Nitrogen cycle.

6. Explain how LASER can be produced by Helium-Neon gas. 5

OR

What is nuclear fission reaction ? By taking 1 kg of U^{235} as a fuel show that nuclear fission reaction can be used as a source of nuclear energy.

7. Attempt **any two** of the following : 8

a) Derive an expression for the resolving power of a plane diffraction grating.

b) Explain positive and negative crystals.

c) Write a note on : Classification of optical fibers.



SLR-VB – 13

Seat No.	
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Set	S
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- 1) Make suitable assumptions, **if necessary**.
 - 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**. **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.**

- Constants :**
- 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol.$
 - 2) Velocity of light, $c = 3 \times 10^8 m/sec.$
 - 3) Charge of electron, $e = 1.6 \times 10^{-19} C.$

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

SECTION – I

1. Choose the correct answer : **(14×1=14)**
- 1) The waves used in Sonography are
 - a) micro waves
 - b) infrared waves
 - c) ultrasonic waves
 - d) Ultraviolet waves
 - 2) The ultrasonic waves exhibit
 - a) Large diffraction effect
 - b) Negligible diffraction effect
 - c) Very long wavelength
 - d) Faster speed than light waves
 - 3) An p-type semiconductor is
 - a) positively charged
 - b) electrically neutral
 - c) negatively charged
 - d) none of the above
 - 4) The Unit of Hall coefficient is
 - a) $Vm^3 A^{-1} Wb^{-1}$
 - b) $Vm^3 A Wb^{-1}$
 - c) $Vm^3 A^{+1} Wb^{-1}$
 - d) $Vm^2 A^{-1} Wb$

P.T.O.



- 5) Atomic packing factor of BCC structure is
a) 0.68 b) 0.74 c) 0.52 d) 1.00
- 6) The coordination number of FCC structure is
a) 6 b) 8 c) 12 d) 4
- 7) Lorentz transformations reduce to Galilean transformation when
a) $v \gg c$ b) $v = c$ c) $v = 0$ d) $v \ll c$

SECTION – II

- 8) The light gathering ability of the fiber depends on two factors
a) launching medium
b) core size and the numerical aperture
c) length of fiber
d) color of fiber
- 9) Control rods used in nuclear reactors are made up of
a) cadmium b) iron c) plutonium d) graphite
- 10) The chirality of helical CNT is
a) (a, 0) b) (a, b) c) (a, a) d) (b, b)
- 11) In He – Ne LASER, _____ atoms are the active centers.
a) He b) Ne c) Al d) Cd
- 12) In a plane transmission grating, the condition for secondary maxima is
a) $(a + b) \sin \theta = (2n + 1) \lambda / 2$ b) $(a + b) \sin 2 \theta = (2n - 1) \lambda / 2$
c) $(a + b) \sin \theta = n \lambda$ d) $(a + b) \sin \theta = (2n - 1) \lambda / 2$
- 13) For negative crystal, _____ along other directions.
a) $\mu_o = \mu_e$ b) $\mu_o \approx \mu_e$ c) $\mu_o < \mu_e$ d) $\mu_o > \mu_e$
- 14) The process of supplying energy to the laser medium with a view of transfer it into the state of population inversion is known as
a) pumping b) population inversion
c) lasing action d) depumping
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Seat No.	
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**F.E. (Part – II) (Old – CGPA) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II
(Group – A)**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Make suitable assumptions, **if necessary**.
2) Figure to the **right** indicate **full** marks.

Constants : 1) Avogadro's no., $N = 6.02 \times 10^{26}/k.mol$.
2) Velocity of light, $c = 3 \times 10^8 m/sec$.
3) Charge of electron, $e = 1.6 \times 10^{-19} C$.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Explain Length contraction on the basis of relativity.
 - b) A particle with a mean proper life time of 3μ sec moves through the laboratory with the speed of $0.8 C$. Calculate its life time as measured by an observer in the laboratory.
 - c) Define reverberation time. State and explain Sabine's formula for the reverberation time.
 - d) What are valence band, conduction band and energy gap ? Define it and show with neat diagram.
 - e) Explain with diagram Bragg's Law, $2d \sin \theta = n \lambda$ of X-ray diffraction.
 - f) The density of copper is $8980 kg/m^3$ and unit cell dimension is 3.61 \AA . Atomic weight of copper is 63.54. Determine the crystal structure. Calculate atomic radius and inter-planar spacing of (110) plane.
 - g) Explain effect of impurity concentration on the position of Fermi level in N type semiconductor.
3. Define Miller indices ? Show that in a cubic crystal the spacing between consecutive parallel planes in terms of Miller indices (hkl) is given by

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

5
Set S



4. Attempt **any two** of the following : 8

- a) Derive the formula, $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ for the variation of mass with velocity according to the special theory of relativity.
- b) State the acoustic requirements of a good auditorium. Explain how these requirements can be achieved.
- c) Show that Fermi level (E_F) in an intrinsic semiconductor lies half way between a valence band and conduction band.

SECTION – II

5. Attempt **any five** of the following : 15

- a) State and explain Malus law.
- b) Explain with neat diagram (i) Spontaneous emission (ii) Stimulated emission.
- c) Explain with neat diagram basic principal and structure of optical fiber.
- d) Give applications of nano technology.
- e) A parallel beam of sodium light ($\lambda = 5890 \text{ \AA}$) is allowed to be incident normally on transmission grating and second order spectral lines are found to be derived through 30° . Calculate the number of lines per centimeter on the grating.
- f) A fiber cable has an acceptance angle of 30° and core index of refraction is 1.4. Calculate the cladding index of refraction.
- g) Explain Carbon Nitrogen cycle.

6. Explain how LASER can be produced by Helium-Neon gas. 5

OR

What is nuclear fission reaction ? By taking 1 kg of U^{235} as a fuel show that nuclear fission reaction can be used as a source of nuclear energy.

7. Attempt **any two** of the following : 8

- a) Derive an expression for the resolving power of a plane diffraction grating.
- b) Explain positive and negative crystals.
- c) Write a note on : Classification of optical fibers.



SLR-VB – 14

Seat No.	
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** i) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **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 disinfectant used for purification of water is
A) Bleaching powder B) Chlorine water
C) Chloramine D) All of these
- 2) Hard water is unfit for use in boilers for steam raising because
A) Its boiling point is higher
B) Steam is generated at high pressure
C) It leads to scale formation inside boiler
D) Water undergoes decomposition into oxygen and hydrogen
- 3) The lowest temperature at which two or more solid substances can coexist in liquid phase is called as
A) Triple point B) Critical point C) Eutectic point D) Melting point
- 4) In order to improve the oiliness of mineral oils the additives used are
A) Vegetable oil B) Animal oil
C) Both A) and B) D) None of these
- 5) The carbon atoms in hexagon layers of graphite structure are in
A) sp hybridized B) sp² hybridized
C) sp³ hybridized D) dsp² hybridized
- 6) During oxidation corrosion the porous oxide film is formed on
A) Iron B) Aluminum C) Copper D) Gold
- 7) Coating of tin over iron sheet is known as
A) Anodic coating B) Cathodic coating
C) Organic coating D) Galvanizing

P.T.O.



- 8) A bullet resistant laminated glass is obtained by
- A) Embedding a wire mesh at the centre of glass sheet
 - B) Pressing together several layers of glass with vinyl resin in alternate layer
 - C) Using two or more plates of glass separated by 6-13 mm thick gap containing dehydrated air
 - D) None of the above
- 9) Ultimate analysis of Fuel is determination of percentage of
- A) C, H, N, S and oxygen
 - B) C, H₂O, ash and volatile matter
 - C) Carbon only
 - D) All of these
- 10) A plastic which can be softened on heating and hardened on cooling is called
- A) Thermoplastic
 - B) Thermo elastic
 - C) Thermo setting
 - D) Thermit
- 11) Which of the following can be used for purification of substances ?
- A) IR spectrometry
 - B) Gas chromatography
 - C) VV spectroscopy
 - D) Colorimetry
- 12) A fuel which can be lighted at a moment's notice is
- A) Coal
 - B) Wood
 - C) Oil gas
 - D) Charcoal
- 13) Glass used extensively for making superior laboratory apparatus is
- A) Soda glass
 - B) Potash glass
 - C) Borosilicate glass
 - D) Flint glass
- 14) Carbon in cast iron
- A) Increases its hardness
 - B) Decreases its hardness
 - C) Imparts softness
 - D) Decreases fluidity
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Seat No.	
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Attempt **all** questions.
ii) Draw **neat** diagram **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : **8**

- a) Describe the process of reverse osmosis of water.
- b) Explain two component Ag – Pb system with phase diagram.
- c) A sample of water on analysis was found to contain following impurities in ppm :

Impurities	Amount	Mole. wt.
Ca(HCO ₃) ₂	32.4	162
Mg(HCO ₃) ₂	29.2	146
CaSO ₄	27.2	136
MgSO ₄	24.0	120

Calculate temporary, permanent and total hardness of water.

B) Attempt **any two** : **6**

- a) Explain extreme pressure lubrication.
- b) Explain wet corrosion by hydrogen evolution and oxygen absorption mechanism.
- c) How proper designing and selection of metal controls the corrosion of machines ?

3. A) i) Define : **3**

- a) Viscosity index
- b) Flash and fire point
- c) Cloud and pour point.

ii) State phase rule. Define phase and component with example. **3**

OR

A) i) Explain the anaerobic process for domestic waste water treatment. **3**

ii) Define lubricant. List the functions of lubricant. **3**

Set P



- B) Attempt **any two** :
- i) Explain tinning process of metallic coating for prevention of corrosion. 4
 - ii) Explain solid and semisolid lubricants. 4
 - iii) Explain different varieties of aerators. 4

SECTION – II

4. A) Attempt **any two** : 8
- i) Discuss transfer method for moulding of plastic into articles. 4
 - ii) Define the term alloy. State any five purposes of alloying with suitable examples. 4
 - iii) The following observations were made in Boy's calorimeter : 4
 - 1) Volume of gas used = 0.15 m^3 at STP
 - 2) Wt. of water heated = 18 kg
 - 3) Initial temperature of water = 20°C
 - 4) Final temperature of water = 31°C
 - 5) Wt. of steam condensed = 0.028 kg
 - 6) Latent heat of steam condensed = 540 kcal/kgCalculate higher and lower calorific value per m^3 at STP.
- B) Attempt **any two** : 6
- i) Write differences between steel and wrought iron. 3
 - ii) Write differences between thermoplastics and thermosetting plastics. 3
 - iii) Draw a neat sketch of Bomb Calorimeter. 3
5. A) i) Write a brief note on setting and hardening of portland cement involving chemical reactions. 4
- ii) Write properties and applications of polyethylene Terephthalate (PET). 2
- OR
- i) What is the wt. of NaCl required to prepare 500 ml of 0.05 N and 0.07 M NaCl solution (mol.wt NaCl = 58.5). 4
 - ii) 28 gm of ethylene gas was polymerised to form polyethylene polymer of mol.wt 15,000. Calculate the degree of polymerization (Dp). 2
- B) Attempt **any two** : 8
- i) Define Thermo Gravimetric Analysis (TGA). Explain its instrumentation with suitable block diagram. 4
 - ii) Explain properties and applications of Fibre Reinforced Plastic (FRP). 4
 - iii) Write characteristics of a good fuel. 4



SLR-VB – 14

Seat No.	
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Set	Q
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** i) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **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) A bullet resistant laminated glass is obtained by
 - A) Embedding a wire mesh at the centre of glass sheet
 - B) Pressing together several layers of glass with vinyl resin in alternate layer
 - C) Using two or more plates of glass separated by 6-13 mm thick gap containing dehydrated air
 - D) None of the above
- 2) Ultimate analysis of Fuel is determination of percentage of
 - A) C, H, N, S and oxygen
 - B) C, H₂O, ash and volatile matter
 - C) Carbon only
 - D) All of these
- 3) A plastic which can be softened on heating and hardened on cooling is called
 - A) Thermoplastic
 - B) Thermo elastic
 - C) Thermo setting
 - D) Thermit
- 4) Which of the following can be used for purification of substances ?
 - A) IR spectrometry
 - B) Gas chromatography
 - C) VV spectroscopy
 - D) Colorimetry
- 5) A fuel which can be lighted at a moment's notice is
 - A) Coal
 - B) Wood
 - C) Oil gas
 - D) Charcoal
- 6) Glass used extensively for making superior laboratory apparatus is
 - A) Soda glass
 - B) Potash glass
 - C) Borosilicate glass
 - D) Flint glass

P.T.O.



- 7) Carbon in cast iron
A) Increases its hardness
B) Decreases its hardness
C) Imparts softness
D) Decreases fluidity
- 8) The disinfectant used for purification of water is
A) Bleaching powder
B) Chlorine water
C) Chloramine
D) All of these
- 9) Hard water is unfit for use in boilers for steam raising because
A) Its boiling point is higher
B) Steam is generated at high pressure
C) It leads to scale formation inside boiler
D) Water undergoes decomposition into oxygen and hydrogen
- 10) The lowest temperature at which two or more solid substances can coexist in liquid phase is called as
A) Triple point
B) Critical point
C) Eutectic point
D) Melting point
- 11) In order to improve the oiliness of mineral oils the additives used are
A) Vegetable oil
B) Animal oil
C) Both A) and B)
D) None of these
- 12) The carbon atoms in hexagon layers of graphite structure are in
A) sp hybridized
B) sp^2 hybridized
C) sp^3 hybridized
D) dsp^2 hybridized
- 13) During oxidation corrosion the porous oxide film is formed on
A) Iron
B) Aluminum
C) Copper
D) Gold
- 14) Coating of tin over iron sheet is known as
A) Anodic coating
B) Cathodic coating
C) Organic coating
D) Galvanizing
-



Seat No.	
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Attempt **all** questions.
ii) Draw **neat** diagram **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : **8**

- a) Describe the process of reverse osmosis of water.
- b) Explain two component Ag – Pb system with phase diagram.
- c) A sample of water on analysis was found to contain following impurities in ppm :

Impurities	Amount	Mole. wt.
Ca(HCO ₃) ₂	32.4	162
Mg(HCO ₃) ₂	29.2	146
CaSO ₄	27.2	136
MgSO ₄	24.0	120

Calculate temporary, permanent and total hardness of water.

B) Attempt **any two** : **6**

- a) Explain extreme pressure lubrication.
- b) Explain wet corrosion by hydrogen evolution and oxygen absorption mechanism.
- c) How proper designing and selection of metal controls the corrosion of machines ?

3. A) i) Define : **3**

- a) Viscosity index
- b) Flash and fire point
- c) Cloud and pour point.

ii) State phase rule. Define phase and component with example. **3**

OR

A) i) Explain the anaerobic process for domestic waste water treatment. **3**

ii) Define lubricant. List the functions of lubricant. **3**

Set Q



- B) Attempt **any two** :
- i) Explain tinning process of metallic coating for prevention of corrosion. 4
 - ii) Explain solid and semisolid lubricants. 4
 - iii) Explain different varieties of aerators. 4

SECTION – II

4. A) Attempt **any two** : 8
- i) Discuss transfer method for moulding of plastic into articles. 4
 - ii) Define the term alloy. State any five purposes of alloying with suitable examples. 4
 - iii) The following observations were made in Boy's calorimeter : 4
 - 1) Volume of gas used = 0.15 m^3 at STP
 - 2) Wt. of water heated = 18 kg
 - 3) Initial temperature of water = 20°C
 - 4) Final temperature of water = 31°C
 - 5) Wt. of steam condensed = 0.028 kg
 - 6) Latent heat of steam condensed = 540 kcal/kgCalculate higher and lower calorific value per m^3 at STP.
- B) Attempt **any two** : 6
- i) Write differences between steel and wrought iron. 3
 - ii) Write differences between thermoplastics and thermosetting plastics. 3
 - iii) Draw a neat sketch of Bomb Calorimeter. 3
5. A) i) Write a brief note on setting and hardening of portland cement involving chemical reactions. 4
- ii) Write properties and applications of polyethylene Terephthalate (PET). 2
- OR
- i) What is the wt. of NaCl required to prepare 500 ml of 0.05 N and 0.07 M NaCl solution (mol.wt NaCl = 58.5). 4
- ii) 28 gm of ethylene gas was polymerised to form polyethylene polymer of mol.wt 15,000. Calculate the degree of polymerization (Dp). 2
- B) Attempt **any two** : 8
- i) Define Thermo Gravimetric Analysis (TGA). Explain its instrumentation with suitable block diagram. 4
 - ii) Explain properties and applications of Fibre Reinforced Plastic (FRP). 4
 - iii) Write characteristics of a good fuel. 4



SLR-VB – 14

Seat No.	
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Set	R
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** i) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
ii) **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

- The carbon atoms in hexagon layers of graphite structure are in
A) sp hybridized B) sp^2 hybridized
C) sp^3 hybridized D) dsp^2 hybridized
- During oxidation corrosion the porous oxide film is formed on
A) Iron B) Aluminum C) Copper D) Gold
- Coating of tin over iron sheet is known as
A) Anodic coating B) Cathodic coating
C) Organic coating D) Galvanizing
- A bullet resistant laminated glass is obtained by
A) Embedding a wire mesh at the centre of glass sheet
B) Pressing together several layers of glass with vinyl resin in alternate layer
C) Using two or more plates of glass separated by 6-13 mm thick gap containing dehydrated air
D) None of the above
- Ultimate analysis of Fuel is determination of percentage of
A) C, H, N, S and oxygen
B) C, H_2O , ash and volatile matter
C) Carbon only
D) All of these
- A plastic which can be softened on heating and hardened on cooling is called
A) Thermoplastic B) Thermo elastic
C) Thermo setting D) Thermit

P.T.O.



- 7) Which of the following can be used for purification of substances ?
A) IR spectrometry B) Gas chromatography
C) VV spectroscopy D) Colorimetry
 - 8) A fuel which can be lighted at a moment's notice is
A) Coal B) Wood C) Oil gas D) Charcoal
 - 9) Glass used extensively for making superior laboratory apparatus is
A) Soda glass B) Potash glass
C) Borosilicate glass D) Flint glass
 - 10) Carbon in cast iron
A) Increases its hardness B) Decreases its hardness
C) Imparts softness D) Decreases fluidity
 - 11) The disinfectant used for purification of water is
A) Bleaching powder B) Chlorine water
C) Chloramine D) All of these
 - 12) Hard water is unfit for use in boilers for steam raising because
A) Its boiling point is higher
B) Steam is generated at high pressure
C) It leads to scale formation inside boiler
D) Water undergoes decomposition into oxygen and hydrogen
 - 13) The lowest temperature at which two or more solid substances can coexist in liquid phase is called as
A) Triple point B) Critical point C) Eutectic point D) Melting point
 - 14) In order to improve the oiliness of mineral oils the additives used are
A) Vegetable oil B) Animal oil
C) Both A) and B) D) None of these
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Seat No.	
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Attempt **all** questions.
ii) Draw **neat** diagram **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : **8**

- a) Describe the process of reverse osmosis of water.
- b) Explain two component Ag – Pb system with phase diagram.
- c) A sample of water on analysis was found to contain following impurities in ppm :

Impurities	Amount	Mole. wt.
Ca(HCO ₃) ₂	32.4	162
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CaSO ₄	27.2	136
MgSO ₄	24.0	120

Calculate temporary, permanent and total hardness of water.

B) Attempt **any two** : **6**

- a) Explain extreme pressure lubrication.
- b) Explain wet corrosion by hydrogen evolution and oxygen absorption mechanism.
- c) How proper designing and selection of metal controls the corrosion of machines ?

3. A) i) Define : **3**

- a) Viscosity index
- b) Flash and fire point
- c) Cloud and pour point.

ii) State phase rule. Define phase and component with example. **3**

OR

A) i) Explain the anaerobic process for domestic waste water treatment. **3**

ii) Define lubricant. List the functions of lubricant. **3**

Set R



- B) Attempt **any two** :
- i) Explain tinning process of metallic coating for prevention of corrosion. 4
 - ii) Explain solid and semisolid lubricants. 4
 - iii) Explain different varieties of aerators. 4

SECTION – II

4. A) Attempt **any two** : 8
- i) Discuss transfer method for moulding of plastic into articles. 4
 - ii) Define the term alloy. State any five purposes of alloying with suitable examples. 4
 - iii) The following observations were made in Boy's calorimeter : 4
 - 1) Volume of gas used = 0.15 m^3 at STP
 - 2) Wt. of water heated = 18 kg
 - 3) Initial temperature of water = 20°C
 - 4) Final temperature of water = 31°C
 - 5) Wt. of steam condensed = 0.028 kg
 - 6) Latent heat of steam condensed = 540 kcal/kgCalculate higher and lower calorific value per m^3 at STP.
- B) Attempt **any two** : 6
- i) Write differences between steel and wrought iron. 3
 - ii) Write differences between thermoplastics and thermosetting plastics. 3
 - iii) Draw a neat sketch of Bomb Calorimeter. 3
5. A) i) Write a brief note on setting and hardening of portland cement involving chemical reactions. 4
- ii) Write properties and applications of polyethylene Terephthalate (PET). 2
- OR
- i) What is the wt. of NaCl required to prepare 500 ml of 0.05 N and 0.07 M NaCl solution (mol.wt NaCl = 58.5). 4
 - ii) 28 gm of ethylene gas was polymerised to form polyethylene polymer of mol.wt 15,000. Calculate the degree of polymerization (Dp). 2
- B) Attempt **any two** : 8
- i) Define Thermo Gravimetric Analysis (TGA). Explain its instrumentation with suitable block diagram. 4
 - ii) Explain properties and applications of Fibre Reinforced Plastic (FRP). 4
 - iii) Write characteristics of a good fuel. 4



SLR-VB – 14

Seat No.	
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** i) Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.
ii) 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

- A plastic which can be softened on heating and hardened on cooling is called
A) Thermoplastic B) Thermo elastic
C) Thermo setting D) Thermit
- Which of the following can be used for purification of substances ?
A) IR spectrometry B) Gas chromatography
C) VV spectroscopy D) Colorimetry
- A fuel which can be lighted at a moment's notice is
A) Coal B) Wood C) Oil gas D) Charcoal
- Glass used extensively for making superior laboratory apparatus is
A) Soda glass B) Potash glass
C) Borosilicate glass D) Flint glass
- Carbon in cast iron
A) Increases its hardness B) Decreases its hardness
C) Imparts softness D) Decreases fluidity
- The disinfectant used for purification of water is
A) Bleaching powder B) Chlorine water
C) Chloramine D) All of these
- Hard water is unfit for use in boilers for steam raising because
A) Its boiling point is higher
B) Steam is generated at high pressure
C) It leads to scale formation inside boiler
D) Water undergoes decomposition into oxygen and hydrogen

P.T.O.



- 8) The lowest temperature at which two or more solid substances can coexist in liquid phase is called as
A) Triple point B) Critical point C) Eutectic point D) Melting point
- 9) In order to improve the oiliness of mineral oils the additives used are
A) Vegetable oil B) Animal oil
C) Both A) and B) D) None of these
- 10) The carbon atoms in hexagon layers of graphite structure are in
A) sp hybridized B) sp² hybridized
C) sp³ hybridized D) dsp² hybridized
- 11) During oxidation corrosion the porous oxide film is formed on
A) Iron B) Aluminum C) Copper D) Gold
- 12) Coating of tin over iron sheet is known as
A) Anodic coating B) Cathodic coating
C) Organic coating D) Galvanizing
- 13) A bullet resistant laminated glass is obtained by
A) Embedding a wire mesh at the centre of glass sheet
B) Pressing together several layers of glass with vinyl resin in alternate layer
C) Using two or more plates of glass separated by 6-13 mm thick gap containing dehydrated air
D) None of the above
- 14) Ultimate analysis of Fuel is determination of percentage of
A) C, H, N, S and oxygen B) C, H₂O, ash and volatile matter
C) Carbon only D) All of these
-



Seat No.	
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F.E. (Part – II) (Old-CGPA) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II
(Group – B)

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** i) Attempt **all** questions.
ii) Draw **neat** diagram **wherever** necessary.
iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Attempt **any two** : **8**

- a) Describe the process of reverse osmosis of water.
- b) Explain two component Ag – Pb system with phase diagram.
- c) A sample of water on analysis was found to contain following impurities in ppm :

Impurities	Amount	Mole. wt.
Ca(HCO ₃) ₂	32.4	162
Mg(HCO ₃) ₂	29.2	146
CaSO ₄	27.2	136
MgSO ₄	24.0	120

Calculate temporary, permanent and total hardness of water.

B) Attempt **any two** : **6**

- a) Explain extreme pressure lubrication.
- b) Explain wet corrosion by hydrogen evolution and oxygen absorption mechanism.
- c) How proper designing and selection of metal controls the corrosion of machines ?

3. A) i) Define : **3**

- a) Viscosity index
- b) Flash and fire point
- c) Cloud and pour point.

ii) State phase rule. Define phase and component with example. **3**

OR

A) i) Explain the anaerobic process for domestic waste water treatment. **3**

ii) Define lubricant. List the functions of lubricant. **3**

Set S



- B) Attempt **any two** :
- i) Explain tinning process of metallic coating for prevention of corrosion. **4**
 - ii) Explain solid and semisolid lubricants. **4**
 - iii) Explain different varieties of aerators. **4**

SECTION – II

4. A) Attempt **any two** : **8**
- i) Discuss transfer method for moulding of plastic into articles. **4**
 - ii) Define the term alloy. State any five purposes of alloying with suitable examples. **4**
 - iii) The following observations were made in Boy's calorimeter : **4**
 - 1) Volume of gas used = 0.15 m^3 at STP
 - 2) Wt. of water heated = 18 kg
 - 3) Initial temperature of water = 20°C
 - 4) Final temperature of water = 31°C
 - 5) Wt. of steam condensed = 0.028 kg
 - 6) Latent heat of steam condensed = 540 kcal/kg
 Calculate higher and lower calorific value per m^3 at STP.
- B) Attempt **any two** : **6**
- i) Write differences between steel and wrought iron. **3**
 - ii) Write differences between thermoplastics and thermosetting plastics. **3**
 - iii) Draw a neat sketch of Bomb Calorimeter. **3**
5. A) i) Write a brief note on setting and hardening of portland cement involving chemical reactions. **4**
- ii) Write properties and applications of polyethylene Terephthalate (PET). **2**

OR

- i) What is the wt. of NaCl required to prepare 500 ml of 0.05 N and 0.07 M NaCl solution (mol.wt NaCl = 58.5). **4**
 - ii) 28 gm of ethylene gas was polymerised to form polyethylene polymer of mol.wt 15,000. Calculate the degree of polymerization (Dp). **2**
- B) Attempt **any two** : **8**
- i) Define Thermo Gravimetric Analysis (TGA). Explain its instrumentation with suitable block diagram. **4**
 - ii) Explain properties and applications of Fibre Reinforced Plastic (FRP). **4**
 - iii) Write characteristics of a good fuel. **4**

Seat
No.

Set

P

F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – IIDay and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to 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 : 14

1. Choose the correct answer :

14

- 1) The differential equation $(x - y)(dx - dy) = dx + dy$ is
 - a) Homogeneous and exact
 - b) Non-homogeneous and exact
 - c) Linear and exact
 - d) Bernoulli's and exact
- 2) The orthogonal trajectories of a family of curve $ay = x^2$ is
 - a) Circle
 - b) Hyperbola
 - c) Ellipse
 - d) Cubical parabola
- 3) Vector \vec{F} is called solenoidal, if
 - a) $\text{curl } \vec{F} = 0$
 - b) $\text{div } \vec{F} \neq 0$
 - c) $\text{grad } \vec{F} = 0$
 - d) $\text{div } \vec{F} = 0$
- 4) If $\vec{r} = xi + yj + zk$ and \vec{a} is constant vector, then $\text{grad} \left(\vec{a} \cdot \vec{r} \right)$ is
 - a) $2\vec{a}$
 - b) \vec{a}
 - c) \vec{r}
 - d) $2\vec{r}$
- 5) The magnitude of acceleration vector of a particle moving along the curve $\vec{r} = ti + t^2j + t^3k$ at $t = 1$ (where t is time) is
 - a) $2\sqrt{5}$
 - b) $\sqrt{14}$
 - c) $2\sqrt{10}$
 - d) $3\sqrt{5}$

P.T.O.



- 6) In D' Alemberts Ratio test, if $\lim_{n \rightarrow \infty} \frac{u_n}{u_{n+1}}$ is greater than one, then
- a) The series $\sum u_n$ is convergent b) The series $\sum u_n$ is divergent
 c) The series $\sum u_n$ is oscillatory d) The test fails
- 7) In a series of positive terms $\sum_{n=1}^{\infty} u_n$, if $\lim_{n \rightarrow \infty} u_n \neq 0$, then series $\sum_{n=1}^{\infty} u_n$ is
- a) Convergent b) Divergent
 c) Oscillatory d) Absolutely convergent
- 8) The value of $\int_0^{\infty} e^{-x} x^{-1/2} dx$ is
- a) π b) $\frac{\pi}{2}$ c) $\sqrt{\pi}$ d) $\frac{\sqrt{\pi}}{2}$
- 9) Which of the following is not true ?
- a) $\sqrt{\frac{1}{2}} = \sqrt{\pi}$ b) $\beta(m+1, n+1) = \frac{m! n!}{(m+n+1)!}$
 c) $\sqrt[n]{n} = \frac{n+1}{n}$ d) $\sqrt{\frac{3}{2}} = \frac{\pi}{2}$
- 10) Tangents at origin to the curve $y^2(a+x) = x^2(a-x)$ are
- a) $y = \pm x$ b) $y = 0$ c) $x = 0$ d) None of these
- 11) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 5$ is
- a) 5 b) $2\sqrt{5}$ c) $\sqrt{5}$ d) $5\sqrt{2}$
- 12) The value of $\int_0^1 \int_0^2 x dx dy$ is
- a) $\frac{1}{3}$ b) 2 c) $\frac{1}{2}$ d) $\frac{1}{4}$
- 13) The double integration $\iint_R dx dy$ gives
- a) Perimeter of the region R b) Volume of the region R
 c) Area of the region R d) None of these
- 14) For integration $\int_0^1 \int_{4y}^4 f(x, y) dx dy$ the change of order is
- a) $\int_0^1 \int_4^{4y} f(x, y) dx dy$ b) $\int_{4y}^4 \int_0^1 f(x, y) dx dy$
 c) $\int_0^1 \int_0^{4y} f(x, y) dx dy$ d) $\int_0^4 \int_0^{x/4} f(x, y) dy dx$



Seat No.	
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F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**
3) **Use of non-programmable calculator is allowed.**

SECTION – I

2. Solve **any three** from the following : 9
- a) Solve $(2x + 3y + 4)dx - (4x + 6y + 5)dy = 0$.
 - b) Find the orthogonal trajectories of a family of curve $r = a \cos^2(\theta)$, where 'a' is parameter.
 - c) Find the magnitude of the velocity vector and acceleration vector of a particle, which moves along the curve $x = 2 \sin(3t)$, $y = 2 \cos(3t)$, $z = 8t$ at any time $t > 0$.
 - d) If $\vec{F} = x^2\mathbf{i} + xz\mathbf{j} + yz\mathbf{k}$ and $\vec{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ then find $\text{div}(\vec{F} \times \vec{r})$ and $\text{curl}(\vec{F} \times \vec{r})$.
 - e) Test the convergence of $\sum(\sqrt{n+1} - \sqrt{n})$ by using comparison test.
3. Solve **any three** from the following : 9
- a) Solve $\left(4x^3y^3 + \frac{1}{x}\right)dx + \left(3x^4y^2 - \frac{1}{y}\right)dy = 0$ given that $y = 1$ when $x = 1$.
 - b) Solve $x \frac{dy}{dx} + y \log y = xy e^x$.
 - c) Show that the vector $\vec{F} = (6xy + z^3)\mathbf{i} + (3x^2 - z)\mathbf{j} + (3xz^2 - y)\mathbf{k}$ is irrotational. Also find scalar function ϕ such that $\vec{F} = \nabla\phi$.
 - d) Solve $\cos x \frac{dy}{dx} + y \sin x = \sec^2 x$.
 - e) Test the convergence of $\sum_{n=1}^{\infty} \frac{n!4^n}{(n+1)^n}$ by using D' Alemberts ratio test.



4. Solve **any two** from the following :

10

a) The charge q on the plate of a condenser of capacity C charged through a resistance R by a steady voltage V satisfies the differential equation

$$R \frac{dq}{dt} + \frac{q}{C} = V. \text{ If } q = 0 \text{ at } t = 0, \text{ then show that the charge } q = CV \left(1 - e^{-\frac{t}{RC}}\right).$$

Find also the current i flowing into the plate.

b) Find the angle between the surfaces $x^2 + y^2 + z^2 - xy = 1$ and $x^2y + y^2z + z = 1$ at $(1, 1, 0)$.

c) Examine for absolute and conditional convergence (i) $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^2 + 1}$ (ii) $\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$.

SECTION – II

5. Attempt **any three** :

9

a) Prove that $\int_0^{\infty} \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log\left(\frac{a}{b}\right)$.

b) Evaluate $\int_0^{\infty} x^{1/2} e^{-x^3} dx$.

c) Trace the curve $r = a(1 + \cos \theta)$.

d) Evaluate $\int_0^{\pi/2} \int_0^{3(1-\cos t)} x^2 \sin t dx dt$.

e) Trace the curve $x = 3(t - \sin t)$, $y = 3(1 + \cos t)$.

6. Attempt **any three** :

9

a) Evaluate $\int_0^1 \sqrt[3]{x} (1 - \sqrt[3]{x})^2 dx$.

b) Change the order and evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{y dx dy}{(1+y^2)\sqrt{1-x^2-y^2}}$.

c) Trace the curve $a^2x^2 = y^3(2a - y)$.

d) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dz dx dy$.

e) Evaluate $\int \int x^2 y^2 dx dy$ over the region of the circle $x^2 + y^2 = 1$.

7. Attempt **any two** :

10

a) State and prove duplication formula.

b) Find the length of the curve $r = \sqrt{1 + \cos 2\theta}$ from $\theta = 0$ to $\theta = 2\pi$.

c) Find the mass of Lamina bounded by the curves $y^2 = ax$ and $x^2 = ay$ if the density of the Lamina at any point varies as the square of its distance from the origin.

Seat
No.Set **Q****F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II**Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Figures to **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 : 14

1. Choose the correct answer :

14

- 1) The value of $\int_0^{\infty} e^{-x} x^{-1/2} dx$ is
a) π b) $\frac{\pi}{2}$ c) $\sqrt{\pi}$ d) $\frac{\sqrt{\pi}}{2}$
- 2) Which of the following is not true ?
a) $\sqrt{\frac{1}{2}} = \sqrt{\pi}$ b) $\beta(m+1, n+1) = \frac{m! n!}{(m+n+1)!}$
c) $\sqrt[n]{n} = \frac{\sqrt[n+1]}{n}$ d) $\sqrt{\frac{3}{2}} = \frac{\pi}{2}$
- 3) Tangents at origin to the curve $y^2(a+x) = x^2(a-x)$ are
a) $y = \pm x$ b) $y = 0$ c) $x = 0$ d) None of these
- 4) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 5$ is
a) 5 b) $2\sqrt{5}$ c) $\sqrt{5}$ d) $5\sqrt{2}$
- 5) The value of $\int_0^1 \int_0^2 x dx dy$ is
a) $\frac{1}{3}$ b) 2 c) $\frac{1}{2}$ d) $\frac{1}{4}$



- 6) The double integration $\iint_R dx dy$ gives
- a) Perimeter of the region R b) Volume of the region R
c) Area of the region R d) None of these
- 7) For integration $\int_0^1 \int_{4y}^4 f(x, y) dx dy$ the change of order is
- a) $\int_0^1 \int_4^{4y} f(x, y) dx dy$ b) $\int_{4y}^4 \int_0^1 f(x, y) dx dy$
c) $\int_0^1 \int_0^{4y} f(x, y) dx dy$ d) $\int_0^4 \int_0^{x/4} f(x, y) dy dx$
- 8) The differential equation $(x - y)(dx - dy) = dx + dy$ is
- a) Homogeneous and exact b) Non-homogeneous and exact
c) Linear and exact d) Bernoulli's and exact
- 9) The orthogonal trajectories of a family of curve $ay = x^2$ is
- a) Circle b) Hyperbola c) Ellipse d) Cubical parabola
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- a) $\text{curl } \vec{F} = 0$ b) $\text{div } \vec{F} \neq 0$ c) $\text{grad } \vec{F} = 0$ d) $\text{div } \vec{F} = 0$
- 11) If $\vec{r} = xi + yj + zk$ and \vec{a} is constant vector, then $\text{grad}(\vec{a} \cdot \vec{r})$ is
- a) $2\vec{a}$ b) \vec{a} c) \vec{r} d) $2\vec{r}$
- 12) The magnitude of acceleration vector of a particle moving along the curve $\vec{r} = ti + t^2j + t^3k$ at $t = 1$ (where t is time) is
- a) $2\sqrt{5}$ b) $\sqrt{14}$ c) $2\sqrt{10}$ d) $3\sqrt{5}$
- 13) In D' Alemberts Ratio test, if $\lim_{n \rightarrow \infty} \frac{u_n}{u_{n+1}}$ is greater than one, then
- a) The series $\sum u_n$ is convergent b) The series $\sum u_n$ is divergent
c) The series $\sum u_n$ is oscillatory d) The test fails
- 14) In a series of positive terms $\sum_{n=1}^{\infty} u_n$, if $\lim_{n \rightarrow \infty} u_n \neq 0$, then series $\sum_{n=1}^{\infty} u_n$ is
- a) Convergent b) Divergent
c) Oscillatory d) Absolutely convergent



Seat No.	
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**F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**
3) **Use of non-programmable calculator is allowed.**

SECTION – I

2. Solve **any three** from the following : **9**
- a) Solve $(2x + 3y + 4)dx - (4x + 6y + 5)dy = 0$.
 - b) Find the orthogonal trajectories of a family of curve $r = a \cos^2(\theta)$, where 'a' is parameter.
 - c) Find the magnitude of the velocity vector and acceleration vector of a particle, which moves along the curve $x = 2 \sin(3t)$, $y = 2 \cos(3t)$, $z = 8t$ at any time $t > 0$.
 - d) If $\vec{F} = x^2\mathbf{i} + xz\mathbf{j} + yz\mathbf{k}$ and $\vec{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ then find $\text{div}(\vec{F} \times \vec{r})$ and $\text{curl}(\vec{F} \times \vec{r})$.
 - e) Test the convergence of $\sum(\sqrt{n+1} - \sqrt{n})$ by using comparison test.
3. Solve **any three** from the following : **9**
- a) Solve $\left(4x^3y^3 + \frac{1}{x}\right)dx + \left(3x^4y^2 - \frac{1}{y}\right)dy = 0$ given that $y = 1$ when $x = 1$.
 - b) Solve $x \frac{dy}{dx} + y \log y = xy e^x$.
 - c) Show that the vector $\vec{F} = (6xy + z^3)\mathbf{i} + (3x^2 - z)\mathbf{j} + (3xz^2 - y)\mathbf{k}$ is irrotational. Also find scalar function ϕ such that $\vec{F} = \nabla\phi$.
 - d) Solve $\cos x \frac{dy}{dx} + y \sin x = \sec^2 x$.
 - e) Test the convergence of $\sum_{n=1}^{\infty} \frac{n!4^n}{(n+1)^n}$ by using D' Alemberts ratio test.



4. Solve **any two** from the following :

10

a) The charge q on the plate of a condenser of capacity C charged through a resistance R by a steady voltage V satisfies the differential equation

$$R \frac{dq}{dt} + \frac{q}{C} = V. \text{ If } q = 0 \text{ at } t = 0, \text{ then show that the charge } q = CV \left(1 - e^{-\frac{t}{RC}}\right).$$

Find also the current i flowing into the plate.

b) Find the angle between the surfaces $x^2 + y^2 + z^2 - xy = 1$ and $x^2y + y^2z + z = 1$ at $(1, 1, 0)$.

c) Examine for absolute and conditional convergence (i) $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^2 + 1}$ (ii) $\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$.

SECTION – II

5. Attempt **any three** :

9

a) Prove that $\int_0^{\infty} \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log\left(\frac{a}{b}\right)$.

b) Evaluate $\int_0^{\infty} x^{1/2} e^{-x^3} dx$.

c) Trace the curve $r = a(1 + \cos \theta)$.

d) Evaluate $\int_0^{\pi/2} \int_0^{3(1-\cos t)} x^2 \sin t dx dt$.

e) Trace the curve $x = 3(t - \sin t), y = 3(1 + \cos t)$.

6. Attempt **any three** :

9

a) Evaluate $\int_0^1 \sqrt[3]{x} (1 - \sqrt[3]{x})^2 dx$.

b) Change the order and evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{y dx dy}{(1+y^2)\sqrt{1-x^2-y^2}}$.

c) Trace the curve $a^2x^2 = y^3(2a - y)$.

d) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dz dx dy$.

e) Evaluate $\int \int x^2 y^2 dx dy$ over the region of the circle $x^2 + y^2 = 1$.

7. Attempt **any two** :

10

a) State and prove duplication formula.

b) Find the length of the curve $r = \sqrt{1 + \cos 2\theta}$ from $\theta = 0$ to $\theta = 2\pi$.

c) Find the mass of Lamina bounded by the curves $y^2 = ax$ and $x^2 = ay$ if the density of the Lamina at any point varies as the square of its distance from the origin.



SLR-VB – 15

Seat No.	
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Set **R**

**F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Figures to **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 : 14

1. Choose the correct answer : 14

1) The magnitude of acceleration vector of a particle moving along the curve $\vec{r} = ti + t^2j + t^3k$ at $t = 1$ (where t is time) is

- a) $2\sqrt{5}$ b) $\sqrt{14}$ c) $2\sqrt{10}$ d) $3\sqrt{5}$

2) In D' Alemberts Ratio test, if $\lim_{n \rightarrow \infty} \frac{u_n}{u_{n+1}}$ is greater than one, then

- a) The series $\sum u_n$ is convergent b) The series $\sum u_n$ is divergent
c) The series $\sum u_n$ is oscillatory d) The test fails

3) In a series of positive terms $\sum_{n=1}^{\infty} u_n$, if $\lim_{n \rightarrow \infty} u_n \neq 0$, then series $\sum_{n=1}^{\infty} u_n$ is

- a) Convergent b) Divergent
c) Oscillatory d) Absolutely convergent

4) The value of $\int_0^{\infty} e^{-x} x^{-1/2} dx$ is

- a) π b) $\frac{\pi}{2}$
c) $\sqrt{\pi}$ d) $\frac{\sqrt{\pi}}{2}$

P.T.O.



5) Which of the following is not true ?

a) $\sqrt{\frac{1}{2}} = \sqrt{\pi}$

b) $\beta(m+1, n+1) = \frac{m! n!}{(m+n+1)!}$

c) $\sqrt[n]{n} = \frac{\sqrt[n+1]}{n}$

d) $\sqrt{\frac{3}{2}} = \frac{\pi}{2}$

6) Tangents at origin to the curve $y^2(a+x) = x^2(a-x)$ are

a) $y = \pm x$

b) $y = 0$

c) $x = 0$

d) None of these

7) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 5$ is

a) 5

b) $2\sqrt{5}$

c) $\sqrt{5}$

d) $5\sqrt{2}$

8) The value of $\int_0^1 \int_0^2 x dx dy$ is

a) $\frac{1}{3}$

b) 2

c) $\frac{1}{2}$

d) $\frac{1}{4}$

9) The double integration $\iint_R dx dy$ gives

a) Perimeter of the region R

b) Volume of the region R

c) Area of the region R

d) None of these

10) For integration $\int_0^1 \int_{4y}^4 f(x, y) dx dy$ the change of order is

a) $\int_0^1 \int_4^{4y} f(x, y) dx dy$

b) $\int_{4y}^4 \int_0^1 f(x, y) dx dy$

c) $\int_0^1 \int_0^{4y} f(x, y) dx dy$

d) $\int_0^4 \int_0^{x/4} f(x, y) dy dx$

11) The differential equation $(x-y)(dx-dy) = dx+dy$ is

a) Homogeneous and exact

b) Non-homogeneous and exact

c) Linear and exact

d) Bernoulli's and exact

12) The orthogonal trajectories of a family of curve $ay = x^2$ is

a) Circle

b) Hyperbola

c) Ellipse

d) Cubical parabola

13) Vector \vec{F} is called solenoidal, if

a) $\text{curl } \vec{F} = 0$

b) $\text{div } \vec{F} \neq 0$

c) $\text{grad } \vec{F} = 0$

d) $\text{div } \vec{F} = 0$

14) If $\vec{r} = xi + yj + zk$ and \vec{a} is constant vector, then $\text{grad}(\vec{a} \cdot \vec{r})$ is

a) $2\vec{a}$

b) \vec{a}

c) \vec{r}

d) $2\vec{r}$



Seat No.	
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**F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II**

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**
3) **Use of non-programmable calculator is allowed.**

SECTION – I

2. Solve **any three** from the following : **9**
- a) Solve $(2x + 3y + 4)dx - (4x + 6y + 5)dy = 0$.
 - b) Find the orthogonal trajectories of a family of curve $r = a \cos^2(\theta)$, where 'a' is parameter.
 - c) Find the magnitude of the velocity vector and acceleration vector of a particle, which moves along the curve $x = 2 \sin(3t)$, $y = 2 \cos(3t)$, $z = 8t$ at any time $t > 0$.
 - d) If $\vec{F} = x^2\mathbf{i} + xz\mathbf{j} + yz\mathbf{k}$ and $\vec{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ then find $\text{div}(\vec{F} \times \vec{r})$ and $\text{curl}(\vec{F} \times \vec{r})$.
 - e) Test the convergence of $\sum(\sqrt{n+1} - \sqrt{n})$ by using comparison test.
3. Solve **any three** from the following : **9**
- a) Solve $\left(4x^3y^3 + \frac{1}{x}\right)dx + \left(3x^4y^2 - \frac{1}{y}\right)dy = 0$ given that $y = 1$ when $x = 1$.
 - b) Solve $x \frac{dy}{dx} + y \log y = xy e^x$.
 - c) Show that the vector $\vec{F} = (6xy + z^3)\mathbf{i} + (3x^2 - z)\mathbf{j} + (3xz^2 - y)\mathbf{k}$ is irrotational. Also find scalar function ϕ such that $\vec{F} = \nabla\phi$.
 - d) Solve $\cos x \frac{dy}{dx} + y \sin x = \sec^2 x$.
 - e) Test the convergence of $\sum_{n=1}^{\infty} \frac{n!4^n}{(n+1)^n}$ by using D' Alemberts ratio test.



4. Solve **any two** from the following : 10
- a) The charge q on the plate of a condenser of capacity C charged through a resistance R by a steady voltage V satisfies the differential equation $R \frac{dq}{dt} + \frac{q}{C} = V$. If $q = 0$ at $t = 0$, then show that the charge $q = CV \left(1 - e^{-\frac{t}{RC}}\right)$. Find also the current i flowing into the plate.
- b) Find the angle between the surfaces $x^2 + y^2 + z^2 - xy = 1$ and $x^2y + y^2z + z = 1$ at $(1, 1, 0)$.
- c) Examine for absolute and conditional convergence (i) $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^2 + 1}$ (ii) $\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$.

SECTION – II

5. Attempt **any three** : 9
- a) Prove that $\int_0^{\infty} \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log\left(\frac{a}{b}\right)$.
- b) Evaluate $\int_0^{\infty} x^{1/2} e^{-x^3} dx$.
- c) Trace the curve $r = a(1 + \cos \theta)$.
- d) Evaluate $\int_0^{\pi/2} \int_0^{3(1-\cos t)} x^2 \sin t dx dt$.
- e) Trace the curve $x = 3(t - \sin t)$, $y = 3(1 + \cos t)$.
6. Attempt **any three** : 9
- a) Evaluate $\int_0^1 \sqrt[3]{x} (1 - \sqrt[3]{x})^2 dx$.
- b) Change the order and evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{y dx dy}{(1+y^2)\sqrt{1-x^2-y^2}}$.
- c) Trace the curve $a^2x^2 = y^3(2a - y)$.
- d) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dz dx dy$.
- e) Evaluate $\int \int x^2 y^2 dx dy$ over the region of the circle $x^2 + y^2 = 1$.

7. Attempt **any two** : 10
- a) State and prove duplication formula.
- b) Find the length of the curve $r = \sqrt{1 + \cos 2\theta}$ from $\theta = 0$ to $\theta = 2\pi$.
- c) Find the mass of Lamina bounded by the curves $y^2 = ax$ and $x^2 = ay$ if the density of the Lamina at any point varies as the square of its distance from the origin.

Seat
No.Set **S****F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II**Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Figures to **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 : 14

1. Choose the correct answer :

14

- 1) Tangents at origin to the curve $y^2(a+x) = x^2(a-x)$ are
a) $y = \pm x$ b) $y = 0$ c) $x = 0$ d) None of these
- 2) The length of the arc of the curve $y = x$ from $x = 0$ to $x = 5$ is
a) 5 b) $2\sqrt{5}$ c) $\sqrt{5}$ d) $5\sqrt{2}$
- 3) The value of $\int_0^1 \int_0^2 x dx dy$ is
a) $\frac{1}{3}$ b) 2 c) $\frac{1}{2}$ d) $\frac{1}{4}$
- 4) The double integration $\iint_R dx dy$ gives
a) Perimeter of the region R b) Volume of the region R
c) Area of the region R d) None of these
- 5) For integration $\int_0^1 \int_{4y}^4 f(x,y) dx dy$ the change of order is
a) $\int_0^1 \int_4^{4y} f(x,y) dx dy$ b) $\int_{4y}^4 \int_0^1 f(x,y) dx dy$
c) $\int_0^1 \int_0^{4y} f(x,y) dx dy$ d) $\int_0^4 \int_0^{x/4} f(x,y) dy dx$

P.T.O.



- 6) The differential equation $(x - y)(dx - dy) = dx + dy$ is
 a) Homogeneous and exact b) Non-homogeneous and exact
 c) Linear and exact d) Bernoulli's and exact
- 7) The orthogonal trajectories of a family of curve $ay = x^2$ is
 a) Circle b) Hyperbola c) Ellipse d) Cubical parabola
- 8) Vector \vec{F} is called solenoidal, if
 a) $\text{curl}\vec{F} = 0$ b) $\text{div}\vec{F} \neq 0$ c) $\text{grad}\vec{F} = 0$ d) $\text{div}\vec{F} = 0$
- 9) If $\vec{r} = xi + yj + zk$ and \vec{a} is constant vector, then $\text{grad}(\vec{a} \cdot \vec{r})$ is
 a) $2\vec{a}$ b) \vec{a} c) \vec{r} d) $2\vec{r}$
- 10) The magnitude of acceleration vector of a particle moving along the curve $\vec{r} = ti + t^2j + t^3k$ at $t = 1$ (where t is time) is
 a) $2\sqrt{5}$ b) $\sqrt{14}$ c) $2\sqrt{10}$ d) $3\sqrt{5}$
- 11) In D' Alemberts Ratio test, if $\lim_{n \rightarrow \infty} \frac{u_n}{u_{n+1}}$ is greater than one, then
 a) The series $\sum u_n$ is convergent b) The series $\sum u_n$ is divergent
 c) The series $\sum u_n$ is oscillatory d) The test fails
- 12) In a series of positive terms $\sum_{n=1}^{\infty} u_n$, if $\lim_{n \rightarrow \infty} u_n \neq 0$, then series $\sum_{n=1}^{\infty} u_n$ is
 a) Convergent b) Divergent
 c) Oscillatory d) Absolutely convergent
- 13) The value of $\int_0^{\infty} e^{-x} x^{-1/2} dx$ is
 a) π b) $\frac{\pi}{2}$ c) $\sqrt{\pi}$ d) $\frac{\sqrt{\pi}}{2}$
- 14) Which of the following is not true ?
 a) $\sqrt{\frac{1}{2}} = \sqrt{\pi}$ b) $\beta(m+1, n+1) = \frac{m! n!}{(m+n+1)!}$
 c) $\sqrt[n]{n} = \frac{\sqrt[n+1]}{n}$ d) $\sqrt{\frac{3}{2}} = \frac{\pi}{2}$



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F.E. (Part – II) (New-CBCS) Examination, 2017
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 15-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**
3) **Use of non-programmable calculator is allowed.**

SECTION – I

2. Solve **any three** from the following : 9
- a) Solve $(2x + 3y + 4)dx - (4x + 6y + 5)dy = 0$.
 - b) Find the orthogonal trajectories of a family of curve $r = a \cos^2(\theta)$, where 'a' is parameter.
 - c) Find the magnitude of the velocity vector and acceleration vector of a particle, which moves along the curve $x = 2 \sin(3t)$, $y = 2 \cos(3t)$, $z = 8t$ at any time $t > 0$.
 - d) If $\vec{F} = x^2\mathbf{i} + xz\mathbf{j} + yz\mathbf{k}$ and $\vec{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ then find $\text{div}(\vec{F} \times \vec{r})$ and $\text{curl}(\vec{F} \times \vec{r})$.
 - e) Test the convergence of $\sum(\sqrt{n+1} - \sqrt{n})$ by using comparison test.
3. Solve **any three** from the following : 9
- a) Solve $\left(4x^3y^3 + \frac{1}{x}\right)dx + \left(3x^4y^2 - \frac{1}{y}\right)dy = 0$ given that $y = 1$ when $x = 1$.
 - b) Solve $x \frac{dy}{dx} + y \log y = xy e^x$.
 - c) Show that the vector $\vec{F} = (6xy + z^3)\mathbf{i} + (3x^2 - z)\mathbf{j} + (3xz^2 - y)\mathbf{k}$ is irrotational. Also find scalar function ϕ such that $\vec{F} = \nabla\phi$.
 - d) Solve $\cos x \frac{dy}{dx} + y \sin x = \sec^2 x$.
 - e) Test the convergence of $\sum_{n=1}^{\infty} \frac{n!4^n}{(n+1)^n}$ by using D' Alemberts ratio test.



4. Solve **any two** from the following :

10

a) The charge q on the plate of a condenser of capacity C charged through a resistance R by a steady voltage V satisfies the differential equation

$$R \frac{dq}{dt} + \frac{q}{C} = V. \text{ If } q = 0 \text{ at } t = 0, \text{ then show that the charge } q = CV \left(1 - e^{-\frac{t}{RC}}\right).$$

Find also the current i flowing into the plate.

b) Find the angle between the surfaces $x^2 + y^2 + z^2 - xy = 1$ and $x^2y + y^2z + z = 1$ at $(1, 1, 0)$.

c) Examine for absolute and conditional convergence (i) $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^2 + 1}$ (ii) $\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$.

SECTION – II

5. Attempt **any three** :

9

a) Prove that $\int_0^{\infty} \frac{\tan^{-1} ax - \tan^{-1} bx}{x} dx = \frac{\pi}{2} \log\left(\frac{a}{b}\right)$.

b) Evaluate $\int_0^{\infty} x^{1/2} e^{-x^3} dx$.

c) Trace the curve $r = a(1 + \cos \theta)$.

d) Evaluate $\int_0^{\pi/2} \int_0^{3(1-\cos t)} x^2 \sin t dx dt$.

e) Trace the curve $x = 3(t - \sin t)$, $y = 3(1 + \cos t)$.

6. Attempt **any three** :

9

a) Evaluate $\int_0^1 \sqrt[3]{x} (1 - \sqrt[3]{x})^2 dx$.

b) Change the order and evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{y dx dy}{(1+y^2)\sqrt{1-x^2-y^2}}$.

c) Trace the curve $a^2x^2 = y^3(2a - y)$.

d) Evaluate $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z dz dx dy$.

e) Evaluate $\int \int x^2 y^2 dx dy$ over the region of the circle $x^2 + y^2 = 1$.

7. Attempt **any two** :

10

a) State and prove duplication formula.

b) Find the length of the curve $r = \sqrt{1 + \cos 2\theta}$ from $\theta = 0$ to $\theta = 2\pi$.

c) Find the mass of Lamina bounded by the curves $y^2 = ax$ and $x^2 = ay$ if the density of the Lamina at any point varies as the square of its distance from the origin.



SLR-VB – 16

Seat No.	
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Set	P
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) **All questions are compulsory.**
 - 2) **Assume suitable data if necessary.**
 - 3) **Non programmable calculators are allowed to use.**
 - 4) **Draw neat figures wherever necessary.**
 - 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 : **(1×14=14)**
- 1) A 30 m chain is divided into
a) 100 links b) 150 links c) 300 links d) None
 - 2) Quadrantal bearings are measured with respect to
a) Nearest North b) Nearest East or West
c) East d) Nearest North or South
 - 3) Dam which resists the water pressure by its own weight is known as
a) Timber dam b) Gravity dam c) Arch dam d) Steel dam
 - 4) The object of surveying is to prepare a
a) Drawing b) Cross-section c) Map d) All of the above
 - 5) Following is the cheapest and largest mode of transportation in India
a) Roadways b) Railways c) Airways d) Ropeways
 - 6) In chain survey the area is divided into
a) Rectangles b) Squares c) Triangles d) None of these
 - 7) Change point is a point on which following instrument/accessory is kept
a) Dumpy level
b) Levelling Staff
c) Both dumpy level and leveling staff
d) None of these

P.T.O.



- 8) One of the following does not affect the FAR
- a) Type of a construction
 - b) Locality of density
 - c) Colour of a building
 - d) Parking facilities
- 9) The lower most part of the structure which transmits the load to the soil is known as
- a) Superstructure
 - b) Plinth
 - c) Foundation
 - d) Basement
- 10) Following element is not an element of Superstructure of a building
- a) Lintel
 - b) Chajja
 - c) Plinth
 - d) Parapet
- 11) In case of kitchen cum dinning room minimum area specified by NBC is
- a) 10 sq.m
 - b) 11 sq.m
 - c) 9.5 sq.m
 - d) 9.0 sq.m
- 12) Compound wall helps to achieve
- a) Circulation
 - b) Aspect
 - c) External privacy
 - d) Prospect
- 13) The identification mark left on bricks during process of moulding are known as
- a) Projections
 - b) Trademark
 - c) Frog
 - d) Fillets
- 14) Initial setting time of cement concrete should not be less than
- a) 30 min.
 - b) 120 min.
 - c) 180 min.
 - d) 360 min.
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Seat No.	
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) *All questions are compulsory.*
2) *Assume suitable data if necessary.*
3) *Non programmable calculators are allowed to use.*
4) *Draw neat figures wherever necessary.*

SECTION – I

2. Solve **any four** questions out of following seven : **(4×3=12)**
- a) Enlist various sub branches of Civil Engineering. Describe any one out of them.
 - b) Write on role of Civil engineer in Construction activity.
 - c) State the principles of Surveying. Explain any one.
 - d) What do you mean by local attraction? How it is eliminated ?
 - e) Write any two characteristics of contour map.
 - f) Explain rain water harvesting concept.
 - g) Write note on pipe transport.
3. Solve **any two** questions out of following three : **(8×2=16)**
- A) A 30 m chain was tested before the commencement of the day's work and found to be correct. After chaining 800 m the chain was found to be 0.04 m too long. At the end day's work, after chaining a total distance of 1600 m the chain was found to be 0.10 m too long. What was true distance chained ?
 - B) The following bearings were observed while running a closed traverse PQRSP

Line	FB	BB
PQ	198° 30'	18° 30'
QR	107° 30'	288° 30'
RS	15° 0'	192° 30'
SP	291° 00'	112° 30'

- i) Find out included angles.
- ii) At what station you suspect local attraction ?
- iii) Find out corrected bearings.

Set P



C) The following consecutive readings were taken on a 4 m level staff with dumpy level.

0.585, 2.955, 1.855, 1.265, 2.925, 0.350, 2.350, 2.855, 1.065, 2.685, 2.435.

The instrument was shifted after taking 2nd, 5th and 9th readings. The first reading was taken on the staff held on a B.M of R.L 100.00 m. Calculate R. Is of all the stations by rise and fall method and apply usual checks.

SECTION – II

4. Solve **any four (Each 04 marks)** : **(4×4=16)**
- a) Define Substructure and Superstructure. Give component of each part.
 - b) Explain principle of load transfer mechanism in load bearing wall action.
 - c) A plot owner proposed G + 1, construction with 150 sq.m construction on each floor on a plot of 14 m × 19 m, find ground coverage and FSI proposed. If margins from all sides are 2 m and FSI = 1 are as per byelaws, state with reason wheather plan will be sanctioned or not ?
 - d) Give properties and uses of good building bricks.
 - e) Give Requirements of good concrete.
 - f) Explain in brief concept of green building.
5. Solve **any two (Each 06 marks)** : **(2×6=12)**
- a) Draw a cross section of a building showing various elements of building.Explain any four in brief.
 - b) What is Building byelaws ? Explain building line, open space, carpet area, builtup area.
 - c) Explain : (i) Geographic Information System (ii) Global Positioning System.
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SLR-VB – 16

Seat No.	
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Set	Q
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) **All questions are compulsory.**
 - 2) **Assume suitable data if necessary.**
 - 3) **Non programmable calculators are allowed to use.**
 - 4) **Draw neat figures wherever necessary.**
 - 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 : **(1×14=14)**
- 1) One of the following does not affect the FAR
 - a) Type of a construction
 - b) Locality of density
 - c) Colour of a building
 - d) Parking facilities
 - 2) The lower most part of the structure which transmits the load to the soil is known as
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 - a) 30 min.
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 - c) 180 min.
 - d) 360 min.

P.T.O.



- 8) A 30 m chain is divided into
a) 100 links b) 150 links c) 300 links d) None
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a) Dumpy level
b) Levelling Staff
c) Both dumpy level and leveling staff
d) None of these
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Seat No.	
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) *All questions are compulsory.*
2) *Assume suitable data if necessary.*
3) *Non programmable calculators are allowed to use.*
4) *Draw neat figures wherever necessary.*

SECTION – I

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 - b) Write on role of Civil engineer in Construction activity.
 - c) State the principles of Surveying. Explain any one.
 - d) What do you mean by local attraction? How it is eliminated ?
 - e) Write any two characteristics of contour map.
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3. Solve **any two** questions out of following three : **(8×2=16)**
- A) A 30 m chain was tested before the commencement of the day's work and found to be correct. After chaining 800 m the chain was found to be 0.04 m too long. At the end day's work, after chaining a total distance of 1600 m the chain was found to be 0.10 m too long. What was true distance chained ?
 - B) The following bearings were observed while running a closed traverse PQRSP

Line	FB	BB
PQ	198° 30'	18° 30'
QR	107° 30'	288° 30'
RS	15° 0'	192° 30'
SP	291° 00'	112° 30'

- i) Find out included angles.
- ii) At what station you suspect local attraction ?
- iii) Find out corrected bearings.

Set Q



C) The following consecutive readings were taken on a 4 m level staff with dumpy level.

0.585, 2.955, 1.855, 1.265, 2.925, 0.350, 2.350, 2.855, 1.065, 2.685, 2.435.

The instrument was shifted after taking 2nd, 5th and 9th readings. The first reading was taken on the staff held on a B.M of R.L 100.00 m. Calculate R. Is of all the stations by rise and fall method and apply usual checks.

SECTION – II

4. Solve **any four (Each 04 marks)** : **(4×4=16)**
- a) Define Substructure and Superstructure. Give component of each part.
 - b) Explain principle of load transfer mechanism in load bearing wall action.
 - c) A plot owner proposed G + 1, construction with 150 sq.m construction on each floor on a plot of 14 m × 19 m, find ground coverage and FSI proposed. If margins from all sides are 2 m and FSI = 1 are as per byelaws, state with reason wheather plan will be sanctioned or not ?
 - d) Give properties and uses of good building bricks.
 - e) Give Requirements of good concrete.
 - f) Explain in brief concept of green building.
5. Solve **any two (Each 06 marks)** : **(2×6=12)**
- a) Draw a cross section of a building showing various elements of building.Explain any four in brief.
 - b) What is Building byelaws ? Explain building line, open space, carpet area, builtup area.
 - c) Explain : (i) Geographic Information System (ii) Global Positioning System.
-



SLR-VB – 16

Seat No.	
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Set	R
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) **All questions are compulsory.**
 - 2) **Assume suitable data if necessary.**
 - 3) **Non programmable calculators are allowed to use.**
 - 4) **Draw neat figures wherever necessary.**
 - 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 : **(1×14=14)**
- 1) Following is the cheapest and largest mode of transportation in India
a) Roadways b) Railways c) Airways d) Ropeways
 - 2) In chain survey the area is divided into
a) Rectangles b) Squares c) Triangles d) None of these
 - 3) Change point is a point on which following instrument/accessory is kept
a) Dumpy level
b) Levelling Staff
c) Both dumpy level and leveling staff
d) None of these
 - 4) One of the following does not affect the FAR
a) Type of a construction b) Locality of density
c) Colour of a building d) Parking facilities
 - 5) The lower most part of the structure which transmits the load to the soil is known as
a) Superstructure b) Plinth c) Foundation d) Basement
 - 6) Following element is not an element of Superstructure of a building
a) Lintel b) Chajja c) Plinth d) Parapet

P.T.O.



- 7) In case of kitchen cum dinning room minimum area specified by NBC is
a) 10 sq.m b) 11 sq.m c) 9.5 sq.m d) 9.0 sq.m
- 8) Compound wall helps to achieve
a) Circulation b) Aspect
c) External privacy d) Prospect
- 9) The identification mark left on bricks during process of moulding are known as
a) Projections b) Trademark c) Frog d) Fillets
- 10) Initial setting time of cement concrete should not be less than
a) 30 min. b) 120 min. c) 180 min. d) 360 min.
- 11) A 30 m chain is divided into
a) 100 links b) 150 links c) 300 links d) None
- 12) Quadrantal bearings are measured with respect to
a) Nearest North b) Nearest East or West
c) East d) Nearest North or South
- 13) Dam which resists the water pressure by its own weight is known as
a) Timber dam b) Gravity dam c) Arch dam d) Steel dam
- 14) The object of surveying is to prepare a
a) Drawing b) Cross-section c) Map d) All of the above
-



Seat No.	
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) *All questions are compulsory.*
2) *Assume suitable data if necessary.*
3) *Non programmable calculators are allowed to use.*
4) *Draw neat figures wherever necessary.*

SECTION – I

2. Solve **any four** questions out of following seven : **(4×3=12)**
- a) Enlist various sub branches of Civil Engineering. Describe any one out of them.
 - b) Write on role of Civil engineer in Construction activity.
 - c) State the principles of Surveying. Explain any one.
 - d) What do you mean by local attraction? How it is eliminated ?
 - e) Write any two characteristics of contour map.
 - f) Explain rain water harvesting concept.
 - g) Write note on pipe transport.
3. Solve **any two** questions out of following three : **(8×2=16)**
- A) A 30 m chain was tested before the commencement of the day's work and found to be correct. After chaining 800 m the chain was found to be 0.04 m too long. At the end day's work, after chaining a total distance of 1600 m the chain was found to be 0.10 m too long. What was true distance chained ?
 - B) The following bearings were observed while running a closed traverse PQRSP

Line	FB	BB
PQ	198° 30'	18° 30'
QR	107° 30'	288° 30'
RS	15° 0'	192° 30'
SP	291° 00'	112° 30'

- i) Find out included angles.
- ii) At what station you suspect local attraction ?
- iii) Find out corrected bearings.

Set R



C) The following consecutive readings were taken on a 4 m level staff with dumpy level.

0.585, 2.955, 1.855, 1.265, 2.925, 0.350, 2.350, 2.855, 1.065, 2.685, 2.435.

The instrument was shifted after taking 2nd, 5th and 9th readings. The first reading was taken on the staff held on a B.M of R.L 100.00 m. Calculate R. Is of all the stations by rise and fall method and apply usual checks.

SECTION – II

4. Solve **any four (Each 04 marks)** : **(4×4=16)**
- Define Substructure and Superstructure. Give component of each part.
 - Explain principle of load transfer mechanism in load bearing wall action.
 - A plot owner proposed G + 1, construction with 150 sq.m construction on each floor on a plot of 14 m × 19 m, find ground coverage and FSI proposed. If margins from all sides are 2 m and FSI = 1 are as per byelaws, state with reason wheather plan will be sanctioned or not ?
 - Give properties and uses of good building bricks.
 - Give Requirements of good concrete.
 - Explain in brief concept of green building.
5. Solve **any two (Each 06 marks)** : **(2×6=12)**
- Draw a cross section of a building showing various elements of building.Explain any four in brief.
 - What is Building byelaws ? Explain building line, open space, carpet area, builtup area.
 - Explain : (i) Geographic Information System (ii) Global Positioning System.
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SLR-VB – 16

Seat No.	
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Set	S
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions:**
- 1) **All questions are compulsory.**
 - 2) **Assume suitable data if necessary.**
 - 3) **Non programmable calculators are allowed to use.**
 - 4) **Draw neat figures wherever necessary.**
 - 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 : **(1×14=14)**
- 1) Following element is not an element of Superstructure of a building
a) Lintel b) Chajja c) Plinth d) Parapet
 - 2) In case of kitchen cum dining room minimum area specified by NBC is
a) 10 sq.m b) 11 sq.m c) 9.5 sq.m d) 9.0 sq.m
 - 3) Compound wall helps to achieve
a) Circulation b) Aspect
c) External privacy d) Prospect
 - 4) The identification mark left on bricks during process of moulding are known as
a) Projections b) Trademark c) Frog d) Fillets
 - 5) Initial setting time of cement concrete should not be less than
a) 30 min. b) 120 min. c) 180 min. d) 360 min.
 - 6) A 30 m chain is divided into
a) 100 links b) 150 links c) 300 links d) None
 - 7) Quadrantal bearings are measured with respect to
a) Nearest North b) Nearest East or West
c) East d) Nearest North or South

P.T.O.



- 8) Dam which resists the water pressure by its own weight is known as
a) Timber dam b) Gravity dam c) Arch dam d) Steel dam
- 9) The object of surveying is to prepare a
a) Drawing b) Cross-section c) Map d) All of the above
- 10) Following is the cheapest and largest mode of transportation in India
a) Roadways b) Railways c) Airways d) Ropeways
- 11) In chain survey the area is divided into
a) Rectangles b) Squares c) Triangles d) None of these
- 12) Change point is a point on which following instrument/accessory is kept
a) Dumpy level
b) Levelling Staff
c) Both dumpy level and leveling staff
d) None of these
- 13) One of the following does not affect the FAR
a) Type of a construction b) Locality of density
c) Colour of a building d) Parking facilities
- 14) The lower most part of the structure which transmits the load to the soil is known as
a) Superstructure b) Plinth c) Foundation d) Basement
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**F.E. (Part – II) (New-CBCS) Examination, 2017
BASIC CIVIL ENGINEERING**

Day and Date : Wednesday, 17-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) *All questions are compulsory.*
2) *Assume suitable data if necessary.*
3) *Non programmable calculators are allowed to use.*
4) *Draw neat figures wherever necessary.*

SECTION – I

2. Solve **any four** questions out of following seven : **(4×3=12)**
- a) Enlist various sub branches of Civil Engineering. Describe any one out of them.
 - b) Write on role of Civil engineer in Construction activity.
 - c) State the principles of Surveying. Explain any one.
 - d) What do you mean by local attraction? How it is eliminated ?
 - e) Write any two characteristics of contour map.
 - f) Explain rain water harvesting concept.
 - g) Write note on pipe transport.
3. Solve **any two** questions out of following three : **(8×2=16)**
- A) A 30 m chain was tested before the commencement of the day's work and found to be correct. After chaining 800 m the chain was found to be 0.04 m too long. At the end day's work, after chaining a total distance of 1600 m the chain was found to be 0.10 m too long. What was true distance chained ?
 - B) The following bearings were observed while running a closed traverse PQRSP

Line	FB	BB
PQ	198° 30'	18° 30'
QR	107° 30'	288° 30'
RS	15° 0'	192° 30'
SP	291° 00'	112° 30'

- i) Find out included angles.
- ii) At what station you suspect local attraction ?
- iii) Find out corrected bearings.

Set S



C) The following consecutive readings were taken on a 4 m level staff with dumpy level.

0.585, 2.955, 1.855, 1.265, 2.925, 0.350, 2.350, 2.855, 1.065, 2.685, 2.435.

The instrument was shifted after taking 2nd, 5th and 9th readings. The first reading was taken on the staff held on a B.M of R.L 100.00 m. Calculate R. Is of all the stations by rise and fall method and apply usual checks.

SECTION – II

4. Solve **any four (Each 04 marks)** : **(4×4=16)**
- Define Substructure and Superstructure. Give component of each part.
 - Explain principle of load transfer mechanism in load bearing wall action.
 - A plot owner proposed G + 1, construction with 150 sq.m construction on each floor on a plot of 14 m × 19 m, find ground coverage and FSI proposed. If margins from all sides are 2 m and FSI = 1 are as per byelaws, state with reason wheather plan will be sanctioned or not ?
 - Give properties and uses of good building bricks.
 - Give Requirements of good concrete.
 - Explain in brief concept of green building.
5. Solve **any two (Each 06 marks)** : **(2×6=12)**
- Draw a cross section of a building showing various elements of building.Explain any four in brief.
 - What is Building byelaws ? Explain building line, open space, carpet area, builtup area.
 - Explain : (i) Geographic Information System (ii) Global Positioning System.
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Seat No.	
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Set

P

**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 35

- Instructions:** a) Q. No. 1 is **compulsory**. It should be solved in **first 15 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
b) **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.**
c) Figure to **right** indicate **full** marks.
d) Assume suitable data **if necessary**.

MCQ/Objective Type Questions

Duration : 15 Minutes

Marks : 7

1. Choose the correct answer :

7

- 1) Barrier potential for silicon PN junction Diode is
 - a) 0.3 V
 - b) 0.7 V
 - c) 1.5 V
 - d) 2 V
- 2) Base layer of transistor is _____ dopped.
 - a) Lightly
 - b) Moderately
 - c) Heavily
 - d) Can't say
- 3) PIV rating of diode in bridge rectifier is
 - a) V_m
 - b) $2V_m$
 - c) $V_m/2$
 - d) $V_m/4$
- 4) Current gain for common emitter configuration is always
 - a) Less than 1
 - b) Greater than 1
 - c) Zero
 - d) Equals to 1

P.T.O.



- 5) LVDT having _____ primary winding and _____ secondary winding.
- a) single, single b) single, two
c) two, single d) two, two
- 6) 2's complement of 1010 is
- a) 1010 b) 1011
c) 0110 d) 0101
- 7) "When one of the input is low output is low" this statement is true for _____ gate.
- a) OR b) AND
c) NAND d) NOR
-



Seat No.	
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**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 28

- Instructions :** a) *All questions are compulsory.*
b) *Figure to right indicate full marks.*
c) *Assume suitable data if necessary.*

SECTION – I

2. Solve **any two**. **6**
a) Draw and explain full wave center tap rectifier with suitable waveforms.
b) Write a short note on light emitting diode.
c) Explain 'Transistor as a switch'.
3. Solve **any two**. **8**
a) Explain VI characteristics of PN junction diode.
b) Explain 'Zener diode as voltage regulator'.
c) Explain input output characteristics of common emitter configuration.

SECTION – II

4. Solve **any two**. **6**
a) Define transducer and its types with suitable example.
b) Explain construction, working and temperature measurement using thermocouple.
c) Subtract using 2's complement $(11001)_2 - (1111)_2$.
5. Solve **any two**. **8**
a) Why NAND and NOR gates are called universal gates ?
b) Write a short note on LVDT.
c) State and prove De-Morgan Theorem.



SLR-VB – 17

Seat No.	
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Set

Q

**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 35

- Instructions:** a) Q. No. 1 is **compulsory**. It should be solved in **first 15 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
b) **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.**
c) Figure to **right** indicate **full** marks.
d) Assume suitable data **if necessary**.

MCQ/Objective Type Questions

Duration : 15 Minutes

Marks : 7

1. Choose the correct answer :

7

1) PIV rating of diode in bridge rectifier is

- | | |
|------------|------------|
| a) V_m | b) $2V_m$ |
| c) $V_m/2$ | d) $V_m/4$ |

2) 2's complement of 1010 is

- | | |
|---------|---------|
| a) 1010 | b) 1011 |
| c) 0110 | d) 0101 |

3) "When one of the input is low output is low" this statement is true for _____ gate.

- | | |
|---------|--------|
| a) OR | b) AND |
| c) NAND | d) NOR |

4) Barrier potential for silicon PN junction Diode is

- | | |
|----------|----------|
| a) 0.3 V | b) 0.7 V |
| c) 1.5 V | d) 2 V |

P.T.O.



- 5) Base layer of transistor is _____ dopped.
- a) Lightly
 - b) Moderately
 - c) Heavily
 - d) Can't say
- 6) Current gain for common emitter configuration is always
- a) Less than 1
 - b) Greater than 1
 - c) Zero
 - d) Equals to 1
- 7) LVDT having _____ primary winding and _____ secondary winding.
- a) single, single
 - b) single, two
 - c) two, single
 - d) two, two



Seat No.	
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**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 28

- Instructions :** a) *All questions are compulsory.*
b) *Figure to **right** indicate **full** marks.*
c) *Assume suitable data **if necessary**.*

SECTION – I

2. Solve **any two**. **6**
a) Draw and explain full wave center tap rectifier with suitable waveforms.
b) Write a short note on light emitting diode.
c) Explain 'Transistor as a switch'.
3. Solve **any two**. **8**
a) Explain VI characteristics of PN junction diode.
b) Explain 'Zener diode as voltage regulator'.
c) Explain input output characteristics of common emitter configuration.

SECTION – II

4. Solve **any two**. **6**
a) Define transducer and its types with suitable example.
b) Explain construction, working and temperature measurement using thermocouple.
c) Subtract using 2's complement $(11001)_2 - (1111)_2$.
5. Solve **any two**. **8**
a) Why NAND and NOR gates are called universal gates ?
b) Write a short note on LVDT.
c) State and prove De-Morgan Theorem.



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Seat No.	
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Set

R

**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 35

- Instructions:** a) Q. No. 1 is **compulsory**. It should be solved in **first 15 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
b) **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.**
c) Figure to **right** indicate **full** marks.
d) Assume suitable data **if necessary**.

MCQ/Objective Type Questions

Duration : 15 Minutes

Marks : 7

1. Choose the correct answer :

7

- 1) Current gain for common emitter configuration is always
 - a) Less than 1
 - b) Greater than 1
 - c) Zero
 - d) Equals to 1
- 2) LVDT having _____ primary winding and _____ secondary winding.
 - a) single, single
 - b) single, two
 - c) two, single
 - d) two, two
- 3) Barrier potential for silicon PN junction Diode is
 - a) 0.3 V
 - b) 0.7 V
 - c) 1.5 V
 - d) 2 V
- 4) Base layer of transistor is _____ dopped.
 - a) Lightly
 - b) Moderately
 - c) Heavily
 - d) Can't say

P.T.O.



- 5) 2's complement of 1010 is
- | | |
|---------|---------|
| a) 1010 | b) 1011 |
| c) 0110 | d) 0101 |
- 6) "When one of the input is low output is low" this statement is true for _____ gate.
- | | |
|---------|--------|
| a) OR | b) AND |
| c) NAND | d) NOR |
- 7) PIV rating of diode in bridge rectifier is
- | | |
|------------|------------|
| a) V_m | b) $2V_m$ |
| c) $V_m/2$ | d) $V_m/4$ |
-



Seat No.	
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**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 28

- Instructions :** a) *All questions are compulsory.*
b) *Figure to **right** indicate **full** marks.*
c) *Assume suitable data **if necessary**.*

SECTION – I

2. Solve **any two**. **6**
a) Draw and explain full wave center tap rectifier with suitable waveforms.
b) Write a short note on light emitting diode.
c) Explain 'Transistor as a switch'.
3. Solve **any two**. **8**
a) Explain VI characteristics of PN junction diode.
b) Explain 'Zener diode as voltage regulator'.
c) Explain input output characteristics of common emitter configuration.

SECTION – II

4. Solve **any two**. **6**
a) Define transducer and its types with suitable example.
b) Explain construction, working and temperature measurement using thermocouple.
c) Subtract using 2's complement $(11001)_2 - (1111)_2$.
5. Solve **any two**. **8**
a) Why NAND and NOR gates are called universal gates ?
b) Write a short note on LVDT.
c) State and prove De-Morgan Theorem.



SLR-VB – 17

Seat No.	
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Set

S

**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 35

- Instructions:**
- a) *Q. No. 1 is compulsory. It should be solved in first 15 minutes in Answer Book Page No. 3. Each question carries one mark.*
 - b) *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.*
 - c) *Figure to right indicate full marks.*
 - d) *Assume suitable data if necessary.*

MCQ/Objective Type Questions

Duration : 15 Minutes

Marks : 7

1. Choose the correct answer :

7

- 1) 2's complement of 1010 is
 - a) 1010
 - b) 1011
 - c) 0110
 - d) 0101
- 2) "When one of the input is low output is low" this statement is true for _____ gate.
 - a) OR
 - b) AND
 - c) NAND
 - d) NOR
- 3) Current gain for common emitter configuration is always
 - a) Less than 1
 - b) Greater than 1
 - c) Zero
 - d) Equals to 1
- 4) LVDT having _____ primary winding and _____ secondary winding.
 - a) single, single
 - b) single, two
 - c) two, single
 - d) two, two

P.T.O.



- 5) PIV rating of diode in bridge rectifier is
- | | |
|------------|------------|
| a) V_m | b) $2V_m$ |
| c) $V_m/2$ | d) $V_m/4$ |
- 6) Barrier potential for silicon PN junction Diode is
- | | |
|----------|----------|
| a) 0.3 V | b) 0.7 V |
| c) 1.5 V | d) 2 V |
- 7) Base layer of transistor is _____ dopped.
- | | |
|------------|---------------|
| a) Lightly | b) Moderately |
| c) Heavily | d) Can't say |
-



Seat No.	
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**F.E. (Part – II) (New – CBCS) Examination, 2017
BASIC ELECTRONICS**

Day and Date : Friday, 19-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 28

- Instructions :** a) *All questions are compulsory.*
b) *Figure to **right** indicate **full** marks.*
c) *Assume suitable data **if necessary**.*

SECTION – I

2. Solve **any two**. **6**
a) Draw and explain full wave center tap rectifier with suitable waveforms.
b) Write a short note on light emitting diode.
c) Explain 'Transistor as a switch'.
3. Solve **any two**. **8**
a) Explain VI characteristics of PN junction diode.
b) Explain 'Zener diode as voltage regulator'.
c) Explain input output characteristics of common emitter configuration.

SECTION – II

4. Solve **any two**. **6**
a) Define transducer and its types with suitable example.
b) Explain construction, working and temperature measurement using thermocouple.
c) Subtract using 2's complement $(11001)_2 - (1111)_2$.
5. Solve **any two**. **8**
a) Why NAND and NOR gates are called universal gates ?
b) Write a short note on LVDT.
c) State and prove De-Morgan Theorem.



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Seat No.	
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Set	P
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**F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Make suitable assumptions, **if necessary**.
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**. **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.

- Constants :** 1) Avogadro's no., $N = 6.02 \times 10^{26}/\text{k.mol}$.
2) Velocity of light, $c = 3 \times 10^8 \text{ m/sec}$.
3) Charge of electron, $e = 1.6 \times 10^{-19} \text{ C}$.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

SECTION – I

- 1) The Fermi direct distribution function is given by _____
a) $f(E) = 1/(1 - \exp(E - E_f)/KT)$ b) $f(E) = 1/(1 + \exp(E - E_f)/KT)$
c) $f(E) = 1/(\exp(E - E_f)/KT)$ d) $f(E) = 1/(1 - \exp(E + E_f)/KT)$
- 2) The number of atoms in primitive cell are _____
a) 1 b) 1/3 c) 3 d) 3/2
- 3) The relation of length of unit cell in monoclinic crystal system is _____
a) $a = b = c$ b) $a = b \neq c$ c) $a \neq b \neq c$ d) $a \neq b = c$
- 4) The persistence of audible sound after the source has stopped to emit sound is known as _____
a) Echo b) Reverberation c) Reflection d) Refraction
- 5) Magnetostriction method is used to produce ultrasonic waves of frequency _____
a) 20 Hz to 20 KHz b) 20 KHz to 100 KHz
c) 20 Hz to 100 Hz d) All of these

P.T.O.



- 6) Einstein's mass energy relation ($E=mc^2$) shows that _____
- Mass disappears to reappear as energy
 - Energy disappears to reappear as mass
 - Mass and energy are two different forms of the same entity
 - All the above statements are correct
- 7) Semiconductor materials are _____ group elements.
- 4th
 - 3rd
 - 5th
 - 6th

SECTION – II

- 8) The bending of light around the edges of an obstacle is known as _____
- Scattering
 - Polarization
 - Diffraction
 - Dispersion
- 9) E-ray is represented by using _____ wave front.
- Spherical
 - Plane
 - Cylindrical
 - Elliptical
- 10) Stimulated emission process is mathematically represented by equation _____
- $A + h\gamma \longrightarrow A^*$
 - $A^* + h\gamma \longrightarrow A + 2h\gamma$
 - $A^* \longrightarrow A + h\gamma$
 - $A^* + h\gamma \longrightarrow A + h\gamma$
- 11) LASER is an acronym for _____
- Light Absorption by Stimulated Emission of Radiation
 - Light Absorption by Spontaneous Emission of Radiation
 - Light Amplification by Stimulated Emission of Radiation
 - Light Amplification by Spontaneous Emission of Radiation
- 12) Choose the correct statement.
- Cladding has higher refractive index than core
 - Core has higher refractive index than cladding
 - Cladding is for providing mechanical strength to the fiber
 - The loss in waveguides without cladding is very low
- 13) Coolant is used in nuclear reactor _____
- To slow down the fast neutrons
 - To absorb excess neutrons
 - To increase speed of neutron
 - To transfer the energy from core to heat exchanger
- 14) The chirality of helical CNT is _____
- (a, b)
 - (a, a)
 - (a, 0)
 - (0, b)



Seat No.	
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**F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions: 1) Make suitable assumptions, **if necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Draw diagrams to indicate the position of Fermi level in
 - i) Intrinsic,
 - ii) n-type and
 - iii) p-type semiconductors.
 - b) Find the relation between atomic radius and lattice constant for SC, BCC and FCC.
 - c) Derive an expression for time dilation in special theory of relativity.
 - d) State and explain postulates of special theory of relativity.
 - e) Define reverberation time and explain Sabine's formula.
 - f) The rest mass of an electron is 9.1×10^{-28} gm. What will be its mass if it moves with $(4/5)^{\text{th}}$ of the speed of light ?
 - g) A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.
3. What is meant by symmetry elements in a crystal ? Discuss the various types of symmetry elements present in a cubic crystal. **5**

OR

What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.

4. Attempt **any two** of the following : **8**
- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) Define Miller indices. Hence derive the relation for interplaner distance in cubic crystal.

Set P



- c) Explain acoustic diffraction method for determination of wavelength of ultrasonic waves.
- d) Deduce Einstein's Energy-Mass equivalence relation.

SECTION – II

5. Attempt **any five** of the following : 15
- a) State and explain Malus law.
 - b) Define the following terms :
 - i) Metastable state
 - ii) Pumping and
 - iii) Population inversion.
 - c) Explain the types of carbon nanotubes with diagrams.
 - d) Explain with neat diagram :
 - i) Stimulated absorption
 - ii) Spontaneous emission.
 - e) Distinguish between Fresnel and Fraunhofer class of diffraction.
 - f) Calculate the numerical aperture and acceptance angle for an optical fiber with core and cladding refractive indices being 1.45 and 1.30 respectively.
 - g) Calculate the specific rotation if the plane of polarization is turned through 26.4° , traversing 20 cm. length of 20% sugar solution.
6. Derive expression for acceptance angle, acceptance cone and NA of an optical fiber. 5

OR

Explain the main features of the design and working of a nuclear fission reactor.

7. Attempt **any two** of the following : 8
- a) Define resolving power of an optical instrument. Derive an expression for the resolving power of a plane diffraction grating.
 - b) Explain classification of nuclear reactor.
 - c) Write a note on Holography.
 - d) Explain the fiber optics communication system with block diagram.
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Seat No.	
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**F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Make suitable assumptions, **if necessary**.
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. **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.**

- Constants :** 1) Avogadro's no., $N = 6.02 \times 10^{26}/\text{k.mol}$.
2) Velocity of light, $c = 3 \times 10^8 \text{ m/sec}$.
3) Charge of electron, $e = 1.6 \times 10^{-19} \text{ C}$.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

SECTION – I

- The relation of length of unit cell in monoclinic crystal system is _____
a) $a = b = c$ b) $a = b \neq c$ c) $a \neq b \neq c$ d) $a \neq b = c$
- The persistence of audible sound after the source has stopped to emit sound is known as _____
a) Echo b) Reverberation c) Reflection d) Refraction
- Magnetostriction method is used to produce ultrasonic waves of frequency _____
a) 20 Hz to 20 KHz b) 20 KHz to 100 KHz
c) 20 Hz to 100 Hz d) All of these
- Einstein's mass energy relation ($E=mc^2$) shows that _____
a) Mass disappears to reappear as energy
b) Energy disappears to reappear as mass
c) Mass and energy are two different forms of the same entity
d) All the above statements are correct

P.T.O.



- 5) Semiconductor materials are _____ group elements.
 a) 4th b) 3rd c) 5th d) 6th
- 6) The Fermi direct distribution function is given by _____
 a) $f(E) = 1/(1 - \exp(E - E_f)/KT)$ b) $f(E) = 1/(1 + \exp(E - E_f)/KT)$
 c) $f(E) = 1/(\exp(E - E_f)/KT)$ d) $f(E) = 1/(1 - \exp(E + E_f)/KT)$
- 7) The number of atoms in primitive cell are _____
 a) 1 b) 1/3 c) 3 d) 3/2

SECTION – II

- 8) Stimulated emission process is mathematically represented by equation _____
 a) $A + h\gamma \longrightarrow A^*$ b) $A^* + h\gamma \longrightarrow A + 2h\gamma$
 c) $A^* \longrightarrow A + h\gamma$ d) $A^* + h\gamma \longrightarrow A + h\gamma$
- 9) LASER is an acronym for _____
 a) Light Absorption by Stimulated Emission of Radiation
 b) Light Absorption by Spontaneous Emission of Radiation
 c) Light Amplification by Stimulated Emission of Radiation
 d) Light Amplification by Spontaneous Emission of Radiation
- 10) Choose the correct statement.
 a) Cladding has higher refractive index than core
 b) Core has higher refractive index than cladding
 c) Cladding is for providing mechanical strength to the fiber
 d) The loss in waveguides without cladding is very low
- 11) Coolant is used in nuclear reactor _____
 a) To slow down the fast neutrons
 b) To absorb excess neutrons
 c) To increase speed of neutron
 d) To transfer the energy from core to heat exchanger
- 12) The chirality of helical CNT is _____
 a) (a, b) b) (a, a) c) (a, 0) d) (0, b)
- 13) The bending of light around the edges of an obstacle is known as _____
 a) Scattering b) Polarization c) Diffraction d) Dispersion
- 14) E-ray is represented by using _____ wave front.
 a) Spherical b) Plane c) Cylindrical d) Elliptical



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F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions: 1) Make suitable assumptions, **if necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : 15

- a) Draw diagrams to indicate the position of Fermi level in
 - i) Intrinsic,
 - ii) n-type and
 - iii) p-type semiconductors.
- b) Find the relation between atomic radius and lattice constant for SC, BCC and FCC.
- c) Derive an expression for time dilation in special theory of relativity.
- d) State and explain postulates of special theory of relativity.
- e) Define reverberation time and explain Sabine's formula.
- f) The rest mass of an electron is 9.1×10^{-28} gm. What will be its mass if it moves with $(4/5)^{\text{th}}$ of the speed of light ?
- g) A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

3. What is meant by symmetry elements in a crystal ? Discuss the various types of symmetry elements present in a cubic crystal. 5

OR

What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.

4. Attempt **any two** of the following : 8

- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
- b) Define Miller indices. Hence derive the relation for interplaner distance in cubic crystal.

Set Q



- c) Explain acoustic diffraction method for determination of wavelength of ultrasonic waves.
- d) Deduce Einstein's Energy-Mass equivalence relation.

SECTION – II

5. Attempt **any five** of the following : 15
- a) State and explain Malus law.
 - b) Define the following terms :
 - i) Metastable state
 - ii) Pumping and
 - iii) Population inversion.
 - c) Explain the types of carbon nanotubes with diagrams.
 - d) Explain with neat diagram :
 - i) Stimulated absorption
 - ii) Spontaneous emission.
 - e) Distinguish between Fresnel and Fraunhofer class of diffraction.
 - f) Calculate the numerical aperture and acceptance angle for an optical fiber with core and cladding refractive indices being 1.45 and 1.30 respectively.
 - g) Calculate the specific rotation if the plane of polarization is turned through 26.4° , traversing 20 cm. length of 20% sugar solution.
6. Derive expression for acceptance angle, acceptance cone and NA of an optical fiber. 5

OR

Explain the main features of the design and working of a nuclear fission reactor.

7. Attempt **any two** of the following : 8
- a) Define resolving power of an optical instrument. Derive an expression for the resolving power of a plane diffraction grating.
 - b) Explain classification of nuclear reactor.
 - c) Write a note on Holography.
 - d) Explain the fiber optics communication system with block diagram.
-



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F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Make suitable assumptions, *if necessary*.
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**. **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.**

- Constants :** 1) Avogadro's no., $N = 6.02 \times 10^{26}/\text{k.mol}$.
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3) Charge of electron, $e = 1.6 \times 10^{-19} \text{ C}$.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

SECTION – I

- Magnetostriction method is used to produce ultrasonic waves of frequency _____
a) 20 Hz to 20 KHz b) 20 KHz to 100 KHz
c) 20 Hz to 100 Hz d) All of these
- Einstein's mass energy relation ($E=mc^2$) shows that _____
a) Mass disappears to reappear as energy
b) Energy disappears to reappear as mass
c) Mass and energy are two different forms of the same entity
d) All the above statements are correct
- Semiconductor materials are _____ group elements.
a) 4th b) 3rd c) 5th d) 6th
- The Fermi direct distribution function is given by _____
a) $f(E) = 1/(1 - \exp(E - E_f)/KT)$ b) $f(E) = 1/(1 + \exp(E - E_f)/KT)$
c) $f(E) = 1/(\exp(E - E_f)/KT)$ d) $f(E) = 1/(1 - \exp(E + E_f)/KT)$

P.T.O.



- 5) The number of atoms in primitive cell are _____
 a) 1 b) 1/3 c) 3 d) 3/2
- 6) The relation of length of unit cell in monoclinic crystal system is _____
 a) $a = b = c$ b) $a = b \neq c$ c) $a \neq b \neq c$ d) $a \neq b = c$
- 7) The persistence of audible sound after the source has stopped to emit sound is known as _____
 a) Echo b) Reverberation c) Reflection d) Refraction

SECTION – II

- 8) Choose the correct statement.
 a) Cladding has higher refractive index than core
 b) Core has higher refractive index than cladding
 c) Cladding is for providing mechanical strength to the fiber
 d) The loss in waveguides without cladding is very low
- 9) Coolant is used in nuclear reactor _____
 a) To slow down the fast neutrons
 b) To absorb excess neutrons
 c) To increase speed of neutron
 d) To transfer the energy from core to heat exchanger
- 10) The chirality of helical CNT is _____
 a) (a, b) b) (a, a) c) (a, 0) d) (0, b)
- 11) The bending of light around the edges of an obstacle is known as _____
 a) Scattering b) Polarization c) Diffraction d) Dispersion
- 12) E-ray is represented by using _____ wave front.
 a) Spherical b) Plane c) Cylindrical d) Elliptical
- 13) Stimulated emission process is mathematically represented by equation _____
 a) $A + h\gamma \longrightarrow A^*$ b) $A^* + h\gamma \longrightarrow A + 2h\gamma$
 c) $A^* \longrightarrow A + h\gamma$ d) $A^* + h\gamma \longrightarrow A + h\gamma$
- 14) LASER is an acronym for _____
 a) Light Absorption by Stimulated Emission of Radiation
 b) Light Absorption by Spontaneous Emission of Radiation
 c) Light Amplification by Stimulated Emission of Radiation
 d) Light Amplification by Spontaneous Emission of Radiation



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F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions: 1) Make suitable assumptions, *if necessary*.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : **15**
- a) Draw diagrams to indicate the position of Fermi level in
 - i) Intrinsic,
 - ii) n-type and
 - iii) p-type semiconductors.
 - b) Find the relation between atomic radius and lattice constant for SC, BCC and FCC.
 - c) Derive an expression for time dilation in special theory of relativity.
 - d) State and explain postulates of special theory of relativity.
 - e) Define reverberation time and explain Sabine's formula.
 - f) The rest mass of an electron is 9.1×10^{-28} gm. What will be its mass if it moves with $(4/5)^{\text{th}}$ of the speed of light ?
 - g) A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.
3. What is meant by symmetry elements in a crystal ? Discuss the various types of symmetry elements present in a cubic crystal. **5**

OR

What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.

4. Attempt **any two** of the following : **8**
- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
 - b) Define Miller indices. Hence derive the relation for interplaner distance in cubic crystal.

Set R



- c) Explain acoustic diffraction method for determination of wavelength of ultrasonic waves.
- d) Deduce Einstein's Energy-Mass equivalence relation.

SECTION – II

5. Attempt **any five** of the following : 15
- a) State and explain Malus law.
 - b) Define the following terms :
 - i) Metastable state
 - ii) Pumping and
 - iii) Population inversion.
 - c) Explain the types of carbon nanotubes with diagrams.
 - d) Explain with neat diagram :
 - i) Stimulated absorption
 - ii) Spontaneous emission.
 - e) Distinguish between Fresnel and Fraunhofer class of diffraction.
 - f) Calculate the numerical aperture and acceptance angle for an optical fiber with core and cladding refractive indices being 1.45 and 1.30 respectively.
 - g) Calculate the specific rotation if the plane of polarization is turned through 26.4° , traversing 20 cm. length of 20% sugar solution.
6. Derive expression for acceptance angle, acceptance cone and NA of an optical fiber. 5

OR

Explain the main features of the design and working of a nuclear fission reactor.

7. Attempt **any two** of the following : 8
- a) Define resolving power of an optical instrument. Derive an expression for the resolving power of a plane diffraction grating.
 - b) Explain classification of nuclear reactor.
 - c) Write a note on Holography.
 - d) Explain the fiber optics communication system with block diagram.
-



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**F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II**

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :** 1) Make suitable assumptions, **if necessary**.
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. **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.**

- Constants :** 1) Avogadro's no., $N = 6.02 \times 10^{26}/\text{k.mol}$.
2) Velocity of light, $c = 3 \times 10^8 \text{ m/sec}$.
3) Charge of electron, $e = 1.6 \times 10^{-19} \text{ C}$.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answers :

14

SECTION – I

- The persistence of audible sound after the source has stopped to emit sound is known as _____
a) Echo b) Reverberation c) Reflection d) Refraction
- Magnetostriction method is used to produce ultrasonic waves of frequency _____
a) 20 Hz to 20 KHz b) 20 KHz to 100 KHz
c) 20 Hz to 100 Hz d) All of these
- Einstein's mass energy relation ($E=mc^2$) shows that _____
a) Mass disappears to reappear as energy
b) Energy disappears to reappear as mass
c) Mass and energy are two different forms of the same entity
d) All the above statements are correct
- Semiconductor materials are _____ group elements.
a) 4th b) 3rd c) 5th d) 6th

P.T.O.



- 5) The Fermi direct distribution function is given by _____
 a) $f(E) = 1/(1 - \exp(E - E_f)/KT)$ b) $f(E) = 1/(1 + \exp(E - E_f)/KT)$
 c) $f(E) = 1/(\exp(E - E_f)/KT)$ d) $f(E) = 1/(1 - \exp(E + E_f)/KT)$
- 6) The number of atoms in primitive cell are _____
 a) 1 b) 1/3 c) 3 d) 3/2
- 7) The relation of length of unit cell in monoclinic crystal system is _____
 a) $a = b = c$ b) $a = b \neq c$ c) $a \neq b \neq c$ d) $a \neq b = c$

SECTION – II

- 8) LASER is an acronym for _____
 a) Light Absorption by Stimulated Emission of Radiation
 b) Light Absorption by Spontaneous Emission of Radiation
 c) Light Amplification by Stimulated Emission of Radiation
 d) Light Amplification by Spontaneous Emission of Radiation
- 9) Choose the correct statement.
 a) Cladding has higher refractive index than core
 b) Core has higher refractive index than cladding
 c) Cladding is for providing mechanical strength to the fiber
 d) The loss in waveguides without cladding is very low
- 10) Coolant is used in nuclear reactor _____
 a) To slow down the fast neutrons
 b) To absorb excess neutrons
 c) To increase speed of neutron
 d) To transfer the energy from core to heat exchanger
- 11) The chirality of helical CNT is _____
 a) (a, b) b) (a, a) c) (a, 0) d) (0, b)
- 12) The bending of light around the edges of an obstacle is known as _____
 a) Scattering b) Polarization c) Diffraction d) Dispersion
- 13) E-ray is represented by using _____ wave front.
 a) Spherical b) Plane c) Cylindrical d) Elliptical
- 14) Stimulated emission process is mathematically represented by equation _____
 a) $A + h\gamma \longrightarrow A^*$ b) $A^* + h\gamma \longrightarrow A + 2h\gamma$
 c) $A^* \longrightarrow A + h\gamma$ d) $A^* + h\gamma \longrightarrow A + h\gamma$



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F.E. (Part – II) (New CBCS) Examination, 2017
ENGINEERING PHYSICS – I AND ENGINEERING PHYSICS – II

Day and Date : Wednesday, 24-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions: 1) Make suitable assumptions, **if necessary**.
2) Figures to the **right** indicate **full** marks.

SECTION – I

2. Attempt **any five** of the following : 15

- a) Draw diagrams to indicate the position of Fermi level in
 - i) Intrinsic,
 - ii) n-type and
 - iii) p-type semiconductors.
- b) Find the relation between atomic radius and lattice constant for SC, BCC and FCC.
- c) Derive an expression for time dilation in special theory of relativity.
- d) State and explain postulates of special theory of relativity.
- e) Define reverberation time and explain Sabine's formula.
- f) The rest mass of an electron is 9.1×10^{-28} gm. What will be its mass if it moves with $(4/5)^{\text{th}}$ of the speed of light ?
- g) A classroom has dimensions $20 \times 15 \times 5 \text{ m}^3$. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient.

3. What is meant by symmetry elements in a crystal ? Discuss the various types of symmetry elements present in a cubic crystal. 5

OR

What is Hall effect ? Derive the relation for Hall voltage and Hall coefficient.

4. Attempt **any two** of the following : 8

- a) Show that Fermi level in an intrinsic semiconductor lies half way between a valence band and conduction band.
- b) Define Miller indices. Hence derive the relation for interplaner distance in cubic crystal.

Set S



- c) Explain acoustic diffraction method for determination of wavelength of ultrasonic waves.
- d) Deduce Einstein's Energy-Mass equivalence relation.

SECTION – II

5. Attempt **any five** of the following : 15
- a) State and explain Malus law.
 - b) Define the following terms :
 - i) Metastable state
 - ii) Pumping and
 - iii) Population inversion.
 - c) Explain the types of carbon nanotubes with diagrams.
 - d) Explain with neat diagram :
 - i) Stimulated absorption
 - ii) Spontaneous emission.
 - e) Distinguish between Fresnel and Fraunhofer class of diffraction.
 - f) Calculate the numerical aperture and acceptance angle for an optical fiber with core and cladding refractive indices being 1.45 and 1.30 respectively.
 - g) Calculate the specific rotation if the plane of polarization is turned through 26.4° , traversing 20 cm. length of 20% sugar solution.
6. Derive expression for acceptance angle, acceptance cone and NA of an optical fiber. 5

OR

Explain the main features of the design and working of a nuclear fission reactor.

7. Attempt **any two** of the following : 8
- a) Define resolving power of an optical instrument. Derive an expression for the resolving power of a plane diffraction grating.
 - b) Explain classification of nuclear reactor.
 - c) Write a note on Holography.
 - d) Explain the fiber optics communication system with block diagram.
-



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Seat No.	
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Set **P**

F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.*
 - 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 option :

14

- A water sample contains 162 mg of $\text{Ca}(\text{HCO}_3)_2$ per litre. Its CaCO_3 equivalent hardness in mg/lit. is
A) 16.2 B) 162 C) 100 D) 10
- The amount of oxygen required by organic matter in a sample of water for its oxidation by a strong chemical oxidizing agent such as $\text{K}_2\text{Cr}_2\text{O}_7$
A) COD B) BOD C) DO D) Aeration
- In the greener pathway of synthesis of Indigo dye, which of the following is used as starting material ?
A) Benzene B) Aniline C) Glucose D) L-tryptophan
- The oiliness of a lubricant can be improved by blending mineral oil with
A) Palm oil B) Castor oil C) Olive oil D) All of these
- The rate of change of viscosity of lubricating oil with temperature is expressed in terms of
A) Aniline point B) Viscosity index
C) Acid value D) Oiliness
- When buried pipeline is protected from corrosion by connecting to Mg metal block, it is called
A) Impressed voltage protection B) Sacrificial cathode protection
C) Sacrificial anode protection D) None of these

P.T.O.



- 7) The rate of corrosion of the metals at the top of the electrochemical series is
A) High B) Low C) Medium D) Can't be predicted
- 8) A good fuel should possess
A) High ignition temperature B) Low ignition temperature
C) High calorific value D) Low calorific value
- 9) Which of the following gas cannot be used as carrier gas in gas chromatography ?
A) Nitrogen B) Oxygen C) Argon D) Helium
- 10) Structural units of high polymers, are called
A) Fibers B) Thermo units C) Monomers D) Fabrics
- 11) A plastic which can be softened on heating and hardened on cooling is called
A) Thermoelastic B) Thermoplastics
C) Thermosetting D) Thermit
- 12) A high molecular weight material that can easily be molded into any desired shape is
A) Graphite B) Greases C) Gelly D) Plastics
- 13) Carbon in cast iron
A) Increases its hardness B) Decreases its hardness
C) Imparts softness D) Decreases fluidity
- 14) Annealing of glass is
A) Cooling glass articles rapidly
B) Passing molten glass between rollers
C) Allowing glass articles to cool gradually
D) Plunging glass articles suddenly into water
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Seat No.	
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F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- i) Attempt **all** questions.
 - ii) Draw **neat** diagram **wherever** necessary.
 - iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Solve **any two** : **8**
- a) Explain thick (fluid) film lubrication.
 - b) Write traditional and greener pathway of synthesis of Adipic acid.
 - c) A sample of water on analysis was found to contain following impurities in ppm :
- | Impurities | Amount (ppm) | Mole. Wt. |
|------------------------------------|--------------|-----------|
| Ca(HCO ₃) ₂ | 54 | 162 |
| Mg(HCO ₃) ₂ | 48.6 | 146 |
| CaCl ₂ | 37 | 111 |
| MgSO ₄ | 40 | 120 |
- Calculate temporary, permanent and total hardness of water sample.
- B) Solve **any two** : **6**
- a) Write any six principles of green chemistry.
 - b) Define Sludge and Scale. What are its disadvantages ?
 - c) How rate of corrosion can be determined by weight loss method ?
3. A) Solve **any two** : **8**
- a) Describe hydrogen evolution and oxygen absorption mechanism of electrochemical corrosion.
 - b) Explain the different varieties of aerators.
 - c) How will you select lubricant for (a) IC engine (b) Refrigeration system ?
- B) Solve the following : **6**
- a) Explain impurities in natural water.
 - b) 9.2 g of oil after saponification with 56 ml of 0.5 N alc. KOH solution and on subsequent titration with 0.5 N HCl gave 15.2 ml as end point. A blank titration was conducted without taking the oil and repeating the same procedure gave 56 ml end point. Calculate the saponification value of oil sample.

Set P



SECTION – II

4. A) Solve **any two** : 8
- a) Explain difference between cast iron, wrought iron and steel.
 - b) Explain construction and working of bomb calorimeter with neat diagram.
 - c) During the determination of calorific value of a gaseous fuel by Boy's calorimeter, the following results were obtained :
Volume of the gaseous fuel burnt at STP = 0.13 m^3
Weight of water used for cooling = 34.2 kg
Weight of steam condensed = 0.051 kg
Temperature of Inlet water = 25.1°C
Temperature of Outlet water = 39.5°C
Determine the gross and net calorific values of gaseous fuel.
(Take latent heat of condensation of steam = 587 kcal/kg)
- B) Solve **any two** : 6
- a) Define composites. Explain properties and applications of FRP.
 - b) Explain characteristics of good fuel.
 - c) What weight of NaCl is required to prepare 700 ml of 0.06 N solution ?
(NaCl Mol. Wt. = 58.5)
5. A) Solve **any two** : 8
- a) Define glass. Explain any three types of glass.
 - b) What is petroleum ? Explain composition and classification of petroleum.
 - c) Explain injection and extrusion molding of plastics into articles.
- B) Solve the following : 6
- a) Define Thermo Gravimetric analysis. Explain instrumentation TGA.
 - b) A polymer has following population :
20 molecules have molecular weight each 6000
25 molecules have molecular weight each 8000
15 molecules have molecular weight each 15000
40 molecules have molecular weight each 16000
Calculate its number average molecular weight.
- OR
- B) Solve the following : 6
- a) Define vulcanization. Explain vulcanization of natural rubber. What are advantages of vulcanization ?
 - b) Degree of polymerization polypropene is 475, calculate its molecular weight.
(Mol. Wt. of propene = 42)



SLR-VB – 20

Seat No.	
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Set **Q**

F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.*
 - 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 option :

14

- A good fuel should possess
 - High ignition temperature
 - Low ignition temperature
 - High calorific value
 - Low calorific value
- Which of the following gas cannot be used as carrier gas in gas chromatography ?
 - Nitrogen
 - Oxygen
 - Argon
 - Helium
- Structural units of high polymers, are called
 - Fibers
 - Thermo units
 - Monomers
 - Fabrics
- A plastic which can be softened on heating and hardened on cooling is called
 - Thermoelastic
 - Thermoplastics
 - Thermosetting
 - Thermite
- A high molecular weight material that can easily be molded into any desired shape is
 - Graphite
 - Greases
 - Gelly
 - Plastics
- Carbon in cast iron
 - Increases its hardness
 - Decreases its hardness
 - Imparts softness
 - Decreases fluidity
- Annealing of glass is
 - Cooling glass articles rapidly
 - Passing molten glass between rollers
 - Allowing glass articles to cool gradually
 - Plunging glass articles suddenly into water

P.T.O.



- 8) A water sample contains 162 mg of $\text{Ca}(\text{HCO}_3)_2$ per litre. Its CaCO_3 equivalent hardness in mg/lit. is
A) 16.2 B) 162 C) 100 D) 10
- 9) The amount of oxygen required by organic matter in a sample of water for its oxidation by a strong chemical oxidizing agent such as $\text{K}_2\text{Cr}_2\text{O}_7$
A) COD B) BOD C) DO D) Aeration
- 10) In the greener pathway of synthesis of Indigo dye, which of the following is used as starting material ?
A) Benzene B) Aniline C) Glucose D) L-tryptophan
- 11) The oiliness of a lubricant can be improved by blending mineral oil with
A) Palm oil B) Castor oil C) Olive oil D) All of these
- 12) The rate of change of viscosity of lubricating oil with temperature is expressed in terms of
A) Aniline point B) Viscosity index
C) Acid value D) Oiliness
- 13) When buried pipeline is protected from corrosion by connecting to Mg metal block, it is called
A) Impressed voltage protection B) Sacrificial cathode protection
C) Sacrificial anode protection D) None of these
- 14) The rate of corrosion of the metals at the top of the electrochemical series is
A) High B) Low C) Medium D) Can't be predicted
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Seat No.	
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F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- i) Attempt **all** questions.
 - ii) Draw **neat** diagram **wherever** necessary.
 - iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Solve **any two** : **8**
- a) Explain thick (fluid) film lubrication.
 - b) Write traditional and greener pathway of synthesis of Adipic acid.
 - c) A sample of water on analysis was found to contain following impurities in ppm :
- | Impurities | Amount (ppm) | Mole. Wt. |
|------------------------------------|--------------|-----------|
| Ca(HCO ₃) ₂ | 54 | 162 |
| Mg(HCO ₃) ₂ | 48.6 | 146 |
| CaCl ₂ | 37 | 111 |
| MgSO ₄ | 40 | 120 |
- Calculate temporary, permanent and total hardness of water sample.
- B) Solve **any two** : **6**
- a) Write any six principles of green chemistry.
 - b) Define Sludge and Scale. What are its disadvantages ?
 - c) How rate of corrosion can be determined by weight loss method ?
3. A) Solve **any two** : **8**
- a) Describe hydrogen evolution and oxygen absorption mechanism of electrochemical corrosion.
 - b) Explain the different varieties of aerators.
 - c) How will you select lubricant for (a) IC engine (b) Refrigeration system ?
- B) Solve the following : **6**
- a) Explain impurities in natural water.
 - b) 9.2 g of oil after saponification with 56 ml of 0.5 N alc. KOH solution and on subsequent titration with 0.5 N HCl gave 15.2 ml as end point. A blank titration was conducted without taking the oil and repeating the same procedure gave 56 ml end point. Calculate the saponification value of oil sample.

Set Q



SECTION – II

4. A) Solve **any two** : 8
- a) Explain difference between cast iron, wrought iron and steel.
 - b) Explain construction and working of bomb calorimeter with neat diagram.
 - c) During the determination of calorific value of a gaseous fuel by Boy's calorimeter, the following results were obtained :
Volume of the gaseous fuel burnt at STP = 0.13 m^3
Weight of water used for cooling = 34.2 kg
Weight of steam condensed = 0.051 kg
Temperature of Inlet water = 25.1°C
Temperature of Outlet water = 39.5°C
Determine the gross and net calorific values of gaseous fuel.
(Take latent heat of condensation of steam = 587 kcal/kg)
- B) Solve **any two** : 6
- a) Define composites. Explain properties and applications of FRP.
 - b) Explain characteristics of good fuel.
 - c) What weight of NaCl is required to prepare 700 ml of 0.06 N solution ?
(NaCl Mol. Wt. = 58.5)
5. A) Solve **any two** : 8
- a) Define glass. Explain any three types of glass.
 - b) What is petroleum ? Explain composition and classification of petroleum.
 - c) Explain injection and extrusion molding of plastics into articles.
- B) Solve the following : 6
- a) Define Thermo Gravimetric analysis. Explain instrumentation TGA.
 - b) A polymer has following population :
20 molecules have molecular weight each 6000
25 molecules have molecular weight each 8000
15 molecules have molecular weight each 15000
40 molecules have molecular weight each 16000
Calculate its number average molecular weight.
- OR
- B) Solve the following : 6
- a) Define vulcanization. Explain vulcanization of natural rubber. What are advantages of vulcanization ?
 - b) Degree of polymerization polypropene is 475, calculate its molecular weight.
(Mol. Wt. of propene = 42)



SLR-VB – 20

Seat
No.

Set **R**

F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.*
 - 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 option :

14

- The rate of change of viscosity of lubricating oil with temperature is expressed in terms of
A) Aniline point
B) Viscosity index
C) Acid value
D) Oiliness
- When buried pipeline is protected from corrosion by connecting to Mg metal block, it is called
A) Impressed voltage protection
B) Sacrificial cathode protection
C) Sacrificial anode protection
D) None of these
- The rate of corrosion of the metals at the top of the electrochemical series is
A) High
B) Low
C) Medium
D) Can't be predicted
- A good fuel should possess
A) High ignition temperature
B) Low ignition temperature
C) High calorific value
D) Low calorific value
- Which of the following gas cannot be used as carrier gas in gas chromatography ?
A) Nitrogen
B) Oxygen
C) Argon
D) Helium
- Structural units of high polymers, are called
A) Fibers
B) Thermo units
C) Monomers
D) Fabrics
- A plastic which can be softened on heating and hardened on cooling is called
A) Thermoelastic
B) Thermoplastics
C) Thermosetting
D) Thermit

P.T.O.



- 8) A high molecular weight material that can easily be molded into any desired shape is
A) Graphite B) Greases C) Gelly D) Plastics
- 9) Carbon in cast iron
A) Increases its hardness B) Decreases its hardness
C) Imparts softness D) Decreases fluidity
- 10) Annealing of glass is
A) Cooling glass articles rapidly
B) Passing molten glass between rollers
C) Allowing glass articles to cool gradually
D) Plunging glass articles suddenly into water
- 11) A water sample contains 162 mg of $\text{Ca}(\text{HCO}_3)_2$ per litre. Its CaCO_3 equivalent hardness in mg/lit. is
A) 16.2 B) 162 C) 100 D) 10
- 12) The amount of oxygen required by organic matter in a sample of water for its oxidation by a strong chemical oxidizing agent such as $\text{K}_2\text{Cr}_2\text{O}_7$
A) COD B) BOD C) DO D) Aeration
- 13) In the greener pathway of synthesis of Indigo dye, which of the following is used as starting material ?
A) Benzene B) Aniline C) Glucose D) L-tryptophan
- 14) The oiliness of a lubricant can be improved by blending mineral oil with
A) Palm oil B) Castor oil C) Olive oil D) All of these
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Seat No.	
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F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- i) Attempt **all** questions.
 - ii) Draw **neat** diagram **wherever** necessary.
 - iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Solve **any two** : **8**
- a) Explain thick (fluid) film lubrication.
 - b) Write traditional and greener pathway of synthesis of Adipic acid.
 - c) A sample of water on analysis was found to contain following impurities in ppm :
- | Impurities | Amount (ppm) | Mole. Wt. |
|------------------------------------|--------------|-----------|
| Ca(HCO ₃) ₂ | 54 | 162 |
| Mg(HCO ₃) ₂ | 48.6 | 146 |
| CaCl ₂ | 37 | 111 |
| MgSO ₄ | 40 | 120 |
- Calculate temporary, permanent and total hardness of water sample.
- B) Solve **any two** : **6**
- a) Write any six principles of green chemistry.
 - b) Define Sludge and Scale. What are its disadvantages ?
 - c) How rate of corrosion can be determined by weight loss method ?
3. A) Solve **any two** : **8**
- a) Describe hydrogen evolution and oxygen absorption mechanism of electrochemical corrosion.
 - b) Explain the different varieties of aerators.
 - c) How will you select lubricant for (a) IC engine (b) Refrigeration system ?
- B) Solve the following : **6**
- a) Explain impurities in natural water.
 - b) 9.2 g of oil after saponification with 56 ml of 0.5 N alc. KOH solution and on subsequent titration with 0.5 N HCl gave 15.2 ml as end point. A blank titration was conducted without taking the oil and repeating the same procedure gave 56 ml end point. Calculate the saponification value of oil sample.



SECTION – II

4. A) Solve **any two** : 8
- a) Explain difference between cast iron, wrought iron and steel.
 - b) Explain construction and working of bomb calorimeter with neat diagram.
 - c) During the determination of calorific value of a gaseous fuel by Boy's calorimeter, the following results were obtained :
Volume of the gaseous fuel burnt at STP = 0.13 m^3
Weight of water used for cooling = 34.2 kg
Weight of steam condensed = 0.051 kg
Temperature of Inlet water = 25.1°C
Temperature of Outlet water = 39.5°C
Determine the gross and net calorific values of gaseous fuel.
(Take latent heat of condensation of steam = 587 kcal/kg)
- B) Solve **any two** : 6
- a) Define composites. Explain properties and applications of FRP.
 - b) Explain characteristics of good fuel.
 - c) What weight of NaCl is required to prepare 700 ml of 0.06 N solution ?
(NaCl Mol. Wt. = 58.5)
5. A) Solve **any two** : 8
- a) Define glass. Explain any three types of glass.
 - b) What is petroleum ? Explain composition and classification of petroleum.
 - c) Explain injection and extrusion molding of plastics into articles.
- B) Solve the following : 6
- a) Define Thermo Gravimetric analysis. Explain instrumentation TGA.
 - b) A polymer has following population :
20 molecules have molecular weight each 6000
25 molecules have molecular weight each 8000
15 molecules have molecular weight each 15000
40 molecules have molecular weight each 16000
Calculate its number average molecular weight.
- OR
- B) Solve the following : 6
- a) Define vulcanization. Explain vulcanization of natural rubber. What are advantages of vulcanization ?
 - b) Degree of polymerization polypropene is 475, calculate its molecular weight.
(Mol. Wt. of propene = 42)



SLR-VB – 20

Seat No.	
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Set **S**

F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- Instructions :**
- Q. No. 1 is compulsory. It should be solved in first 30 minutes in Answer Book Page No. 3. Each question carries one mark.*
 - 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 option :

14

- Structural units of high polymers, are called
A) Fibers B) Thermo units C) Monomers D) Fabrics
- A plastic which can be softened on heating and hardened on cooling is called
A) Thermoelastic B) Thermoplastics
C) Thermosetting D) Thermite
- A high molecular weight material that can easily be molded into any desired shape is
A) Graphite B) Greases C) Gelly D) Plastics
- Carbon in cast iron
A) Increases its hardness B) Decreases its hardness
C) Imparts softness D) Decreases fluidity
- Annealing of glass is
A) Cooling glass articles rapidly
B) Passing molten glass between rollers
C) Allowing glass articles to cool gradually
D) Plunging glass articles suddenly into water
- A water sample contains 162 mg of $\text{Ca}(\text{HCO}_3)_2$ per litre. Its CaCO_3 equivalent hardness in mg/lit. is
A) 16.2 B) 162
C) 100 D) 10

P.T.O.



- 7) The amount of oxygen required by organic matter in a sample of water for its oxidation by a strong chemical oxidizing agent such as $K_2Cr_2O_7$
- A) COD B) BOD C) DO D) Aeration
- 8) In the greener pathway of synthesis of Indigo dye, which of the following is used as starting material ?
- A) Benzene B) Aniline C) Glucose D) L-tryptophan
- 9) The oiliness of a lubricant can be improved by blending mineral oil with
- A) Palm oil B) Castor oil C) Olive oil D) All of these
- 10) The rate of change of viscosity of lubricating oil with temperature is expressed in terms of
- A) Aniline point B) Viscosity index
C) Acid value D) Oiliness
- 11) When buried pipeline is protected from corrosion by connecting to Mg metal block, it is called
- A) Impressed voltage protection B) Sacrificial cathode protection
C) Sacrificial anode protection D) None of these
- 12) The rate of corrosion of the metals at the top of the electrochemical series is
- A) High B) Low C) Medium D) Can't be predicted
- 13) A good fuel should possess
- A) High ignition temperature B) Low ignition temperature
C) High calorific value D) Low calorific value
- 14) Which of the following gas cannot be used as carrier gas in gas chromatography ?
- A) Nitrogen B) Oxygen C) Argon D) Helium
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Seat No.	
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F.E. (Part – II) (New – CBCS) Examination, 2017
ENGINEERING CHEMISTRY – I AND ENGINEERING CHEMISTRY – II

Day and Date : Friday, 26-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- i) Attempt **all** questions.
 - ii) Draw **neat** diagram **wherever** necessary.
 - iii) Figures to **right** indicate **full** marks.

SECTION – I

2. A) Solve **any two** : **8**
- a) Explain thick (fluid) film lubrication.
 - b) Write traditional and greener pathway of synthesis of Adipic acid.
 - c) A sample of water on analysis was found to contain following impurities in ppm :
- | Impurities | Amount (ppm) | Mole. Wt. |
|------------------------------------|--------------|-----------|
| Ca(HCO ₃) ₂ | 54 | 162 |
| Mg(HCO ₃) ₂ | 48.6 | 146 |
| CaCl ₂ | 37 | 111 |
| MgSO ₄ | 40 | 120 |
- Calculate temporary, permanent and total hardness of water sample.
- B) Solve **any two** : **6**
- a) Write any six principles of green chemistry.
 - b) Define Sludge and Scale. What are its disadvantages ?
 - c) How rate of corrosion can be determined by weight loss method ?
3. A) Solve **any two** : **8**
- a) Describe hydrogen evolution and oxygen absorption mechanism of electrochemical corrosion.
 - b) Explain the different varieties of aerators.
 - c) How will you select lubricant for (a) IC engine (b) Refrigeration system ?
- B) Solve the following : **6**
- a) Explain impurities in natural water.
 - b) 9.2 g of oil after saponification with 56 ml of 0.5 N alc. KOH solution and on subsequent titration with 0.5 N HCl gave 15.2 ml as end point. A blank titration was conducted without taking the oil and repeating the same procedure gave 56 ml end point. Calculate the saponification value of oil sample.

Set S



SECTION – II

4. A) Solve **any two** : 8
- a) Explain difference between cast iron, wrought iron and steel.
 - b) Explain construction and working of bomb calorimeter with neat diagram.
 - c) During the determination of calorific value of a gaseous fuel by Boy's calorimeter, the following results were obtained :
Volume of the gaseous fuel burnt at STP = 0.13 m^3
Weight of water used for cooling = 34.2 kg
Weight of steam condensed = 0.051 kg
Temperature of Inlet water = 25.1°C
Temperature of Outlet water = 39.5°C
Determine the gross and net calorific values of gaseous fuel.
(Take latent heat of condensation of steam = 587 kcal/kg)
- B) Solve **any two** : 6
- a) Define composites. Explain properties and applications of FRP.
 - b) Explain characteristics of good fuel.
 - c) What weight of NaCl is required to prepare 700 ml of 0.06 N solution ?
(NaCl Mol. Wt. = 58.5)
5. A) Solve **any two** : 8
- a) Define glass. Explain any three types of glass.
 - b) What is petroleum ? Explain composition and classification of petroleum.
 - c) Explain injection and extrusion molding of plastics into articles.
- B) Solve the following : 6
- a) Define Thermo Gravimetric analysis. Explain instrumentation TGA.
 - b) A polymer has following population :
20 molecules have molecular weight each 6000
25 molecules have molecular weight each 8000
15 molecules have molecular weight each 15000
40 molecules have molecular weight each 16000
Calculate its number average molecular weight.
- OR
- B) Solve the following : 6
- a) Define vulcanization. Explain vulcanization of natural rubber. What are advantages of vulcanization ?
 - b) Degree of polymerization polypropene is 475, calculate its molecular weight.
(Mol. Wt. of propene = 42)



SLR-VB – 800

Seat No.	
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Set	P
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T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

(10×1=10)

- I) Sociology is a _____ science.
a) Material b) Social c) Ideal d) Natural
- II) In ancient period cities were
a) Industrial Centre b) Commercial Centre
c) Political Centre d) Religious Centre
- III) _____ is a basic primary social institution.
a) State b) Education c) Family d) Economy
- IV) Which of the following is called cultural lag ?
a) When non material culture lags behind material culture
b) When material culture lags behind non material culture
c) When technology lags behind
d) When bureaucracy lags behind
- V) Which of the following is the demographic factor of social change ?
a) Migration-immigration
b) Technological innovation
c) Disparity in rural-urban customs
d) Industrial and technological growth

P.T.O.



- VI) Urbanization is associated with
- a) Growth of professional education
 - b) Industrialization
 - c) Growth of smart cities
 - d) All the above
- VII) _____ is a natural and continues process.
- a) Change
 - b) Poverty
 - c) Modernization
 - d) All the above
- VIII) _____ is considered as a vehicle of culture.
- a) Technology
 - b) Man
 - c) Society
 - d) Language
- IX) Anna Hazare was associated with _____ movement.
- a) Save tiger
 - b) India against corruption
 - c) Black money against
 - d) None of the above
- X) Who coined the term “sociology” and is generally considered to be the “founder” of Sociology ?
- a) Karl Marx
 - b) Max Weber
 - c) Auguste Comte
 - d) G.S. Gurhye
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate **full** marks.

2. Define social institution and explain the characteristics of caste. **10**
 3. What is urbanization ? Elucidate the impact of urbanization on Indian cities. **10**
 4. Define industrialization and explain its key features in Indian context. **10**
 5. Define social movements and illuminate the objectives of movements against corruption. **10**
 6. What is formal organization ? Explain the characteristics of bureaucracy. **10**
 7. Define social change and explain the factors responsible for social change. **10**
-



SLR-VB – 800

Seat No.	
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Set	Q
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T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

(10×1=10)

- I) Anna Hazare was associated with _____ movement.
a) Save tiger
b) India against corruption
c) Black money against
d) None of the above
- II) Who coined the term “sociology” and is generally considered to be the “founder” of Sociology ?
a) Karl Marx
b) Max Weber
c) Auguste Comte
d) G.S. Gurhye
- III) _____ is a natural and continues process.
a) Change b) Poverty c) Modernization d) All the above
- IV) _____ is considered as a vehicle of culture.
a) Technology b) Man c) Society d) Language
- V) Sociology is a _____ science.
a) Material b) Social c) Ideal d) Natural

P.T.O.



- VI) In ancient period cities were
- a) Industrial Centre
 - b) Commercial Centre
 - c) Political Centre
 - d) Religious Centre
- VII) _____ is a basic primary social institution.
- a) State
 - b) Education
 - c) Family
 - d) Economy
- VIII) Which of the following is called cultural lag ?
- a) When non material culture lags behind material culture
 - b) When material culture lags behind non material culture
 - c) When technology lags behind
 - d) When bureaucracy lags behind
- IX) Which of the following is the demographic factor of social change ?
- a) Migration-immigration
 - b) Technological innovation
 - c) Disparity in rural-urban customs
 - d) Industrial and technological growth
- X) Urbanization is associated with
- a) Growth of professional education
 - b) Industrialization
 - c) Growth of smart cities
 - d) All the above
-



Seat No.	
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T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate **full** marks.

2. Define social institution and explain the characteristics of caste. **10**
 3. What is urbanization ? Elucidate the impact of urbanization on Indian cities. **10**
 4. Define industrialization and explain its key features in Indian context. **10**
 5. Define social movements and illuminate the objectives of movements against corruption. **10**
 6. What is formal organization ? Explain the characteristics of bureaucracy. **10**
 7. Define social change and explain the factors responsible for social change. **10**
-



SLR-VB – 800

Seat No.	
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Set **R**

T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

(10×1=10)

- I) Which of the following is the demographic factor of social change ?
a) Migration-immigration
b) Technological innovation
c) Disparity in rural-urban customs
d) Industrial and technological growth
- II) Urbanization is associated with
a) Growth of professional education
b) Industrialization
c) Growth of smart cities
d) All the above
- III) Anna Hazare was associated with _____ movement.
a) Save tiger
b) India against corruption
c) Black money against
d) None of the above

P.T.O.



- IV) Who coined the term “sociology” and is generally considered to be the “founder” of Sociology ?
- a) Karl Marx b) Max Weber
c) Auguste Comte d) G.S. Gurhye
- V) _____ is a basic primary social institution.
- a) State b) Education c) Family d) Economy
- VI) Which of the following is called cultural lag ?
- a) When non material culture lags behind material culture
b) When material culture lags behind non material culture
c) When technology lags behind
d) When bureaucracy lags behind
- VII) Sociology is a _____ science.
- a) Material b) Social c) Ideal d) Natural
- VIII) In ancient period cities were
- a) Industrial Centre b) Commercial Centre
c) Political Centre d) Religious Centre
- IX) _____ is a natural and continues process.
- a) Change b) Poverty c) Modernization d) All the above
- X) _____ is considered as a vehicle of culture.
- a) Technology b) Man c) Society d) Language
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Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate **full** marks.

2. Define social institution and explain the characteristics of caste. **10**
 3. What is urbanization ? Elucidate the impact of urbanization on Indian cities. **10**
 4. Define industrialization and explain its key features in Indian context. **10**
 5. Define social movements and illuminate the objectives of movements against corruption. **10**
 6. What is formal organization ? Explain the characteristics of bureaucracy. **10**
 7. Define social change and explain the factors responsible for social change. **10**
-



SLR-VB – 800

Seat No.	
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Set	S
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T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- Instructions:** 1) Q. No. 1 is **compulsory**. It should be solved in Answer Book Page No. 3. **Each** question carries **one** mark.
2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
3) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct answer :

(10×1=10)

- I) _____ is a basic primary social institution.
a) State b) Education c) Family d) Economy
- II) Which of the following is called cultural lag ?
a) When non material culture lags behind material culture
b) When material culture lags behind non material culture
c) When technology lags behind
d) When bureaucracy lags behind
- III) Which of the following is the demographic factor of social change ?
a) Migration-immigration
b) Technological innovation
c) Disparity in rural-urban customs
d) Industrial and technological growth
- IV) Urbanization is associated with
a) Growth of professional education
b) Industrialization
c) Growth of smart cities
d) All the above

P.T.O.



- V) _____ is a natural and continues process.
a) Change b) Poverty c) Modernization d) All the above
- VI) _____ is considered as a vehicle of culture.
a) Technology b) Man c) Society d) Language
- VII) Anna Hazare was associated with _____ movement.
a) Save tiger
b) India against corruption
c) Black money against
d) None of the above
- VIII) Who coined the term “sociology” and is generally considered to be the “founder” of Sociology ?
a) Karl Marx b) Max Weber
c) Auguste Comte d) G.S. Gurhye
- IX) Sociology is a _____ science.
a) Material b) Social c) Ideal d) Natural
- X) In ancient period cities were
a) Industrial Centre b) Commercial Centre
c) Political Centre d) Religious Centre
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
SOCIOLOGY
Introduction to Sociology (Self Learning) HSS**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : I) Attempt **any 4** from the following questions.
II) Figures to the **right** indicate **full** marks.

2. Define social institution and explain the characteristics of caste. **10**
 3. What is urbanization ? Elucidate the impact of urbanization on Indian cities. **10**
 4. Define industrialization and explain its key features in Indian context. **10**
 5. Define social movements and illuminate the objectives of movements against corruption. **10**
 6. What is formal organization ? Explain the characteristics of bureaucracy. **10**
 7. Define social change and explain the factors responsible for social change. **10**
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Seat No.	
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Set **P**

**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :**
- 1) Question No. 1 is **compulsory** and answer **any 4** full questions from remaining. **Each** question carries **equal** marks.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. 1 should be solved in **first 15 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

Marks : 10

1. Choose the correct answer of the following :

(1×10=10)

- 1) When the employee has more than one interest, it is called as
 - a) Job responsibility
 - b) Conflict of interest
 - c) Class social representative
 - d) None of the above
- 2) IPR stands for
 - a) Intelligent Person's Rights
 - b) Industrial Person's Rights
 - c) Intellectual Property Rights
 - d) None of the above
- 3) An identity of specific goods and services permitting the differences to be made among different trades is called as
 - a) Copyright
 - b) Trademark
 - c) Patent
 - d) None of the above
- 4) The bargain by the trade union for improving the economic and other interest is called as
 - a) Strike
 - b) Collective bargaining
 - c) Authority and responsibility
 - d) None of the above

P.T.O.



- 5) 'RIGHTS' theory is related to
 - a) Motivation
 - b) Leadership
 - c) Ethics
 - d) Team building
 - 6) Patent is given to
 - a) Product or a process
 - b) Service
 - c) Art
 - d) None of the above
 - 7) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
 - a) Commitment
 - b) Co-operation
 - c) Empathy
 - d) Confidence
 - 8) 'FMEA' is a tool of
 - a) Financial analysis
 - b) Risk analysis
 - c) Equity analysis
 - d) None of the above
 - 9) HR means
 - a) Human Resource
 - b) Honorary Responsibility
 - c) Head Resource
 - d) Human Resistance
 - 10) Any occupation/job/vocation that requires expertise, skill, knowledge, self regulation and concerned service to the public is called as
 - a) Leadership
 - b) Profession
 - c) Ethics
 - d) None of the above
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Answer **any four** questions from the following. **Each** question carries **equal** marks.

2) Figures to the **right** indicate full marks.

2. Define ethics moral and human value. Explain the objectives of studying these issues. **10**
3. Discuss type of inquiry. **10**
4. Explain the steps involved in carrying out the risk assessment. **10**
5. Explain conflict of interest. **10**
6. Discuss code of ethics of any one professional body such as institution of engineers (India). **10**



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Seat No.	
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Set **Q**

**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :**
- 1) Question No. 1 is **compulsory** and answer **any 4** full questions from remaining. **Each** question carries **equal** marks.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. 1 should be solved in **first 15 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

Marks : 10

1. Choose the correct answer of the following :

(1×10=10)

- 1) HR means
 - a) Human Resource
 - b) Honorary Responsibility
 - c) Head Resource
 - d) Human Resistance
- 2) Any occupation/job/vocation that requires expertise, skill, knowledge, self regulation and concerned service to the public is called as
 - a) Leadership
 - b) Profession
 - c) Ethics
 - d) None of the above
- 3) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
 - a) Commitment
 - b) Co-operation
 - c) Empathy
 - d) Confidence
- 4) 'FMEA' is a tool of
 - a) Financial analysis
 - b) Risk analysis
 - c) Equity analysis
 - d) None of the above

P.T.O.



- 5) When the employee has more than one interest, it is called as
- a) Job responsibility
 - b) Conflict of interest
 - c) Class social representative
 - d) None of the above
- 6) IPR stands for
- a) Intelligent Person's Rights
 - b) Industrial Person's Rights
 - c) Intellectual Property Rights
 - d) None of the above
- 7) An identity of specific goods and services permitting the differences to be made among different trades is called as
- a) Copyright
 - b) Trademark
 - c) Patent
 - d) None of the above
- 8) The bargain by the trade union for improving the economic and other interest is called as
- a) Strike
 - b) Collective bargaining
 - c) Authority and responsibility
 - d) None of the above
- 9) 'RIGHTS' theory is related to
- a) Motivation
 - b) Leadership
 - c) Ethics
 - d) Team building
- 10) Patent is given to
- a) Product or a process
 - b) Service
 - c) Art
 - d) None of the above
-



Seat No.	
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T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Answer **any four** questions from the following. **Each** question carries **equal** marks.

2) Figures to the **right** indicate full marks.

2. Define ethics moral and human value. Explain the objectives of studying these issues. 10
 3. Discuss type of inquiry. 10
 4. Explain the steps involved in carrying out the risk assessment. 10
 5. Explain conflict of interest. 10
 6. Discuss code of ethics of any one professional body such as institution of engineers (India). 10
-



SLR-VB – 801

Seat No.	
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Set **R**

**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :** 1) Question No. 1 is **compulsory** and answer **any 4** full questions from remaining. **Each** question carries **equal** marks.
2) Figures to the **right** indicate **full** marks.
3) Q. No. 1 should be solved in **first 15 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

Marks : 10

1. Choose the correct answer of the following :

(1×10=10)

- 1) 'RIGHTS' theory is related to
- | | |
|---------------|------------------|
| a) Motivation | b) Leadership |
| c) Ethics | d) Team building |
- 2) Patent is given to
- | | |
|-------------------------|----------------------|
| a) Product or a process | b) Service |
| c) Art | d) None of the above |
- 3) HR means
- | | |
|-------------------|----------------------------|
| a) Human Resource | b) Honorary Responsibility |
| c) Head Resource | d) Human Resistance |
- 4) Any occupation/job/vocation that requires expertise, skill, knowledge, self regulation and concerned service to the public is called as
- | | |
|---------------|----------------------|
| a) Leadership | b) Profession |
| c) Ethics | d) None of the above |

P.T.O.



- 5) An identity of specific goods and services permitting the differences to be made among different trades is called as
- a) Copyright
 - b) Trademark
 - c) Patent
 - d) None of the above
- 6) The bargain by the trade union for improving the economic and other interest is called as
- a) Strike
 - b) Collective bargaining
 - c) Authority and responsibility
 - d) None of the above
- 7) When the employee has more than one interest, it is called as
- a) Job responsibility
 - b) Conflict of interest
 - c) Class social representative
 - d) None of the above
- 8) IPR stands for
- a) Intelligent Person's Rights
 - b) Industrial Person's Rights
 - c) Intellectual Property Rights
 - d) None of the above
- 9) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
- a) Commitment
 - b) Co-operation
 - c) Empathy
 - d) Confidence
- 10) 'FMEA' is a tool of
- a) Financial analysis
 - b) Risk analysis
 - c) Equity analysis
 - d) None of the above
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Answer **any four** questions from the following. **Each** question carries **equal** marks.

2) Figures to the **right** indicate full marks.

2. Define ethics moral and human value. Explain the objectives of studying these issues. **10**
3. Discuss type of inquiry. **10**
4. Explain the steps involved in carrying out the risk assessment. **10**
5. Explain conflict of interest. **10**
6. Discuss code of ethics of any one professional body such as institution of engineers (India). **10**



SLR-VB – 801

Seat No.	
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Set **S**

**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017

Max. Marks : 50

Time : 10.00 a.m. to 12.00 noon

- Instructions :**
- 1) Question No. 1 is **compulsory** and answer **any 4** full questions from remaining. **Each** question carries **equal** marks.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) Q. No. 1 should be solved in **first 15 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

Marks : 10

1. Choose the correct answer of the following : **(1×10=10)**

- 1) An identity of specific goods and services permitting the differences to be made among different trades is called as
 - a) Copyright
 - b) Trademark
 - c) Patent
 - d) None of the above
- 2) The bargain by the trade union for improving the economic and other interest is called as
 - a) Strike
 - b) Collective bargaining
 - c) Authority and responsibility
 - d) None of the above
- 3) 'RIGHTS' theory is related to
 - a) Motivation
 - b) Leadership
 - c) Ethics
 - d) Team building
- 4) Patent is given to
 - a) Product or a process
 - b) Service
 - c) Art
 - d) None of the above

P.T.O.



- 5) Alignment to the goals and Adherence to the ethical principles during the activities can be referred as
- a) Commitment
 - b) Co-operation
 - c) Empathy
 - d) Confidence
- 6) 'FMEA' is a tool of
- a) Financial analysis
 - b) Risk analysis
 - c) Equity analysis
 - d) None of the above
- 7) HR means
- a) Human Resource
 - b) Honorary Responsibility
 - c) Head Resource
 - d) Human Resistance
- 8) Any occupation/job/vocation that requires expertise, skill, knowledge, self regulation and concerned service to the public is called as
- a) Leadership
 - b) Profession
 - c) Ethics
 - d) None of the above
- 9) When the employee has more than one interest, it is called as
- a) Job responsibility
 - b) Conflict of interest
 - c) Class social representative
 - d) None of the above
- 10) IPR stands for
- a) Intelligent Person's Rights
 - b) Industrial Person's Rights
 - c) Intellectual Property Rights
 - d) None of the above
-



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
SELF LEARNING (HSS) – PROFESSIONAL ETHICS AND HUMAN
VALUES**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Answer **any four** questions from the following. **Each** question carries **equal** marks.

2) Figures to the **right** indicate full marks.

2. Define ethics moral and human value. Explain the objectives of studying these issues. **10**
3. Discuss type of inquiry. **10**
4. Explain the steps involved in carrying out the risk assessment. **10**
5. Explain conflict of interest. **10**
6. Discuss code of ethics of any one professional body such as institution of engineers (India). **10**



SLR-VB – 802

Seat No.	
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Set	P
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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved 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 at **right** indicate **marks**.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct alternatives :

10

- 1) Which of the following is not a type of elasticity in economics
 - a) Income elasticity
 - b) Price elasticity
 - c) Utility elasticity
 - d) Cross elasticity
- 2) Bread and butter have _____
 - a) Negative cross price elasticity of demand
 - b) Positive cross price elasticity of demand
 - c) Positive income elasticity of demand
 - d) Negative income elasticity of demand
- 3) Competition among few sellers known as _____ market.
 - a) Monopoly
 - b) Monopolistic competition
 - c) Oligopoly
 - d) Duopoly
- 4) A Broadway theater sells weekday show tickets at a lower price than for a weekend show. This is an example of
 - a) Price discrimination
 - b) Peak-load pricing
 - c) All of the above
 - d) None of the above

P.T.O.



- 5) Mr. Rajan an Indian Citizen is working for an Indian MNC in USA. The income earned by Rajan is part of
- The GDP of India and GNP of USA
 - India's GDP and USA's GDP
 - Indian GNP and USA's GDP
 - Indian GNP and USA's GNP
- 6) Circular flow of income can be explained through various models. In the first model only two sectors are considered what are those sectors ?
- Household and business
 - Business and government
 - Household and government
 - Government and international trade
- 7) The MPC can be defined as that fraction of a
- Change in income that is not spent
 - Change in income that is spent
 - Given total income that is not consumed
 - Given total income that is consumed
- 8) In order to control inflation, Reserve Bank of India can _____ Bank rate.
- Decrease
 - Increase
 - Constant
 - None of the above
- 9) Fiscal policy is connected with _____
- Issue of currency
 - Exports and imports
 - Public revenue and expenditure
 - Controls of money supply
- 10) During the period of inflation debtors benefit more than creditors because
- They have to pay less amount
 - Real worth of debt increased
 - Real worth of debt decreases
 - They have to pay more amount



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Attempt **any four** questions out of Question No. **Two** to **Seven**.
2) Figures at **right** indicate **marks**.

2. What is economic problem ? Discuss various basic economic problems. **10**
 3. What is economics ? Distinguish between micro and macro economics. **10**
 4. Discuss price determination through demand and supply forces. **10**
 5. Define consumption function, explain the determinants of consumption. **10**
 6. What is inflation ? Describe the effects of inflation. **10**
 7. Define central banking, explain function of central banking. **10**
-



SLR-VB – 802

Seat No.	
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Set	Q
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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved 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 at **right** indicate **marks**.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct alternatives :

10

- 1) Fiscal policy is connected with _____
 - a) Issue of currency
 - b) Exports and imports
 - c) Public revenue and expenditure
 - d) Controls of money supply
- 2) During the period of inflation debtors benefit more than creditors because
 - a) They have to pay less amount
 - b) Real worth of debt increased
 - c) Real worth of debt decreases
 - d) They have to pay more amount
- 3) The MPC can be defined as that fraction of a
 - a) Change in income that is not spent
 - b) Change in income that is spent
 - c) Given total income that is not consumed
 - d) Given total income that is consumed

P.T.O.



- 4) In order to control inflation, Reserve Bank of India can _____ Bank rate.
- a) Decrease
 - b) Increase
 - c) Constant
 - d) None of the above
- 5) Which of the following is not a type of elasticity in economics
- a) Income elasticity
 - b) Price elasticity
 - c) Utility elasticity
 - d) Cross elasticity
- 6) Bread and butter have _____
- a) Negative cross price elasticity of demand
 - b) Positive cross price elasticity of demand
 - c) Positive income elasticity of demand
 - d) Negative income elasticity of demand
- 7) Competition among few sellers known as _____ market.
- a) Monopoly
 - b) Monopolistic competition
 - c) Oligopoly
 - d) Duopoly
- 8) A Broadway theater sells weekday show tickets at a lower price than for a weekend show. This is an example of
- a) Price discrimination
 - b) Peak-load pricing
 - c) All of the above
 - d) None of the above
- 9) Mr. Rajan an Indian Citizen is working for an Indian MNC in USA. The income earned by Rajan is part of
- a) The GDP of India and GNP of USA
 - b) India's GDP and USA's GDP
 - c) Indian GNP and USA's GDP
 - d) Indian GNP and USA's GNP
- 10) Circular flow of income can be explained through various models. In the first model only two sectors are considered what are those sectors ?
- a) Household and business
 - b) Business and government
 - c) Household and government
 - d) Government and international trade



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Attempt **any four** questions out of Question No. **Two to Seven**.
2) Figures at **right** indicate **marks**.

2. What is economic problem ? Discuss various basic economic problems. **10**
 3. What is economics ? Distinguish between micro and macro economics. **10**
 4. Discuss price determination through demand and supply forces. **10**
 5. Define consumption function, explain the determinants of consumption. **10**
 6. What is inflation ? Describe the effects of inflation. **10**
 7. Define central banking, explain function of central banking. **10**
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SLR-VB – 802

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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved 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 at **right** indicate **marks**.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct alternatives :

10

- 1) Mr. Rajan an Indian Citizen is working for an Indian MNC in USA. The income earned by Rajan is part of
 - a) The GDP of India and GNP of USA
 - b) India's GDP and USA's GDP
 - c) Indian GNP and USA's GDP
 - d) Indian GNP and USA's GNP
- 2) Circular flow of income can be explained through various models. In the first model only two sectors are considered what are those sectors ?
 - a) Household and business
 - b) Business and government
 - c) Household and government
 - d) Government and international trade
- 3) Fiscal policy is connected with _____
 - a) Issue of currency
 - b) Exports and imports
 - c) Public revenue and expenditure
 - d) Controls of money supply

P.T.O.



- 4) During the period of inflation debtors benefit more than creditors because
- a) They have to pay less amount
 - b) Real worth of debt increased
 - c) Real worth of debt decreases
 - d) They have to pay more amount
- 5) Competition among few sellers known as _____ market.
- a) Monopoly
 - b) Monopolistic competition
 - c) Oligopoly
 - d) Duopoly
- 6) A Broadway theater sells weekday show tickets at a lower price than for a weekend show. This is an example of
- a) Price discrimination
 - b) Peak-load pricing
 - c) All of the above
 - d) None of the above
- 7) Which of the following is not a type of elasticity in economics
- a) Income elasticity
 - b) Price elasticity
 - c) Utility elasticity
 - d) Cross elasticity
- 8) Bread and butter have _____
- a) Negative cross price elasticity of demand
 - b) Positive cross price elasticity of demand
 - c) Positive income elasticity of demand
 - d) Negative income elasticity of demand
- 9) The MPC can be defined as that fraction of a
- a) Change in income that is not spent
 - b) Change in income that is spent
 - c) Given total income that is not consumed
 - d) Given total income that is consumed
- 10) In order to control inflation, Reserve Bank of India can _____ Bank rate.
- a) Decrease
 - b) Increase
 - c) Constant
 - d) None of the above



Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Attempt **any four** questions out of Question No. **Two to Seven**.
2) Figures at **right** indicate **marks**.

2. What is economic problem ? Discuss various basic economic problems. **10**
 3. What is economics ? Distinguish between micro and macro economics. **10**
 4. Discuss price determination through demand and supply forces. **10**
 5. Define consumption function, explain the determinants of consumption. **10**
 6. What is inflation ? Describe the effects of inflation. **10**
 7. Define central banking, explain function of central banking. **10**
-



SLR-VB – 802

Seat No.	
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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved 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 at **right** indicate **marks**.

MCQ/Objective Type Questions

Marks : 10

1. Choose the correct alternatives :

10

- 1) Competition among few sellers known as _____ market.
 - a) Monopoly
 - b) Monopolistic competition
 - c) Oligopoly
 - d) Duopoly
- 2) A Broadway theater sells weekday show tickets at a lower price than for a weekend show. This is an example of
 - a) Price discrimination
 - b) Peak-load pricing
 - c) All of the above
 - d) None of the above
- 3) Mr. Rajan an Indian Citizen is working for an Indian MNC in USA. The income earned by Rajan is part of
 - a) The GDP of India and GNP of USA
 - b) India's GDP and USA's GDP
 - c) Indian GNP and USA's GDP
 - d) Indian GNP and USA's GNP

P.T.O.



- 4) Circular flow of income can be explained through various models. In the first model only two sectors are considered what are those sectors ?
- Household and business
 - Business and government
 - Household and government
 - Government and international trade
- 5) The MPC can be defined as that fraction of a
- Change in income that is not spent
 - Change in income that is spent
 - Given total income that is not consumed
 - Given total income that is consumed
- 6) In order to control inflation, Reserve Bank of India can _____ Bank rate.
- Decrease
 - Increase
 - Constant
 - None of the above
- 7) Fiscal policy is connected with _____
- Issue of currency
 - Exports and imports
 - Public revenue and expenditure
 - Controls of money supply
- 8) During the period of inflation debtors benefit more than creditors because
- They have to pay less amount
 - Real worth of debt increased
 - Real worth of debt decreases
 - They have to pay more amount
- 9) Which of the following is not a type of elasticity in economics
- | | |
|-----------------------|---------------------|
| a) Income elasticity | b) Price elasticity |
| c) Utility elasticity | d) Cross elasticity |
- 10) Bread and butter have _____
- Negative cross price elasticity of demand
 - Positive cross price elasticity of demand
 - Positive income elasticity of demand
 - Negative income elasticity of demand



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**T.E. (Part – I) (All Branches) Examination, 2017
ECONOMICS
(Self Learning – H.S.S. Course)**

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

Instructions : 1) Attempt **any four** questions out of Question No. **Two to Seven**.
2) Figures at **right** indicate **marks**.

2. What is economic problem ? Discuss various basic economic problems. **10**
3. What is economics ? Distinguish between micro and macro economics. **10**
4. Discuss price determination through demand and supply forces. **10**
5. Define consumption function, explain the determinants of consumption. **10**
6. What is inflation ? Describe the effects of inflation. **10**
7. Define central banking, explain function of central banking. **10**



Seat No.	
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T.E. (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
STRESS AND COPING

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Total Marks : 50

Note : i) Q. No. 1 is **compulsory**.
ii) Solve **any 4** from Q. No. 2 to Q. No. 7.

1. A) State whether **true** or **false** : **5**
- 1) Financial problem is an example of environmental stress.
 - 2) Stress management is learning about the connection between mind and body.
 - 3) Aches, shallow breathing and sweating, frequent colds are physical symptoms of stress.
 - 4) Moodiness is an emotional symptom of stress.
 - 5) Stress is derived from the Latin word eustress.
- B) Match the pairs : **5**
- | Set – A | Set – B |
|-----------------------------------|--------------------------|
| 1) Individual coping | 1) Sleep disturbances |
| 2) Physiological stressors | 2) Improves performance |
| 3) Meditation and time management | 3) Physical exercise |
| 4) Positive stress | 4) Feels unpleasant |
| 5) Negative stress | 5) Relaxation techniques |
2. Copying methods can be effective way to manage stress. Discuss. **10**
3. Discuss the historical status of stress. **10**
4. Sometimes stress can be is very harmful. Elaborate on this statement. **10**
5. Discuss how social support can plan a role in minimising the effects of stress. **10**
6. Explain the various stress management techniques. **10**
7. State the various sources of stress. **10**
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SLR-VB – 804

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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 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) Attempt **all** questions.
- 4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose correct answers :

- 1) What is the term of a patent ?
 - a) 35 years
 - b) 25 years
 - c) 20 years
 - d) 15 years
- 2) What is copyright meant for ?
 - a) Film Work
 - b) Books
 - c) Essay
 - d) All the above
- 3) A person develops a new process for making cheese from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
 - a) Patent
 - b) Copyright
 - c) Trademarks
 - d) Industrial Design
- 4) The legislation covering intellectual property right in India for Information Technology is
 - a) Information Technology Act 2003
 - b) Information Technology Act 2000
 - c) Information Technology Act 2008
 - d) None of the above

P.T.O.



- 5) The first Patent Law was enacted in India in the year
- a) 1856
 - b) 1880
 - c) 1905
 - d) 1850
- 6) No patent shall be granted in respect of an invention relating to
- a) Atomic Energy
 - b) Bio Energy
 - c) Solar Energy
 - d) Wind Energy
- 7) Which of the following is not specifically protected by intellectual property legislation ?
- a) Industrial Designs
 - b) Trademarks
 - c) Copyrights
 - d) Trade secrets
- 8) All of the following are examples of intellectual property protections EXCEPT
- a) Copyrights
 - b) Patents
 - c) Contracts
 - d) Trademarks
- 9) Intellectual Property Rights are result of
- a) Mental Work
 - b) Physical work
 - c) Technical work
 - d) Communication
- 10) To apply for a patent, an inventor must
- a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above
-



Seat No.	
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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

N.B. : 1) Attempt ***all*** questions.
2) Figures to the ***right*** indicate ***full*** marks.

2. Explain in detail Indian Patent Act, 1970. 10
3. Elaborate the copyright issues in creative works. 10

OR

3. Explain process of granting a patent.
4. Write short notes on **any four** : 20
- 1) Copy rights
 - 2) Trade secrets
 - 3) Bio technology and intellectual property
 - 4) Publication and examination of patent applications
 - 5) Protection of traditional knowledge
 - 6) Essential requirements for granting patent.



SLR-VB – 804

Seat No.	
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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :** 1) *Q. No. 1 is compulsory. It should be solved in first 20 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) *Attempt all questions.*
- 4) *Figures to the right indicate full marks.*

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose correct answers :

- 1) Intellectual Property Rights are result of
 - a) Mental Work
 - b) Physical work
 - c) Technical work
 - d) Communication
- 2) To apply for a patent, an inventor must
 - a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above
- 3) Which of the following is not specifically protected by intellectual property legislation ?
 - a) Industrial Designs
 - b) Trademarks
 - c) Copyrights
 - d) Trade secrets

P.T.O.



- 4) All of the following are examples of intellectual property protections EXCEPT
- | | |
|---------------|---------------|
| a) Copyrights | b) Patents |
| c) Contracts | d) Trademarks |
- 5) What is the term of a patent ?
- | | |
|-------------|-------------|
| a) 35 years | b) 25 years |
| c) 20 years | d) 15 years |
- 6) What is copyright meant for ?
- | | |
|--------------|------------------|
| a) Film Work | b) Books |
| c) Essay | d) All the above |
- 7) A person develops a new process for making cheese from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
- | | |
|---------------|----------------------|
| a) Patent | b) Copyright |
| c) Trademarks | d) Industrial Design |
- 8) The legislation covering intellectual property right in India for Information Technology is
- | |
|------------------------------------|
| a) Information Technology Act 2003 |
| b) Information Technology Act 2000 |
| c) Information Technology Act 2008 |
| d) None of the above |
- 9) The first Patent Law was enacted in India in the year
- | | |
|---------|---------|
| a) 1856 | b) 1880 |
| c) 1905 | d) 1850 |
- 10) No patent shall be granted in respect of an invention relating to
- | | |
|------------------|----------------|
| a) Atomic Energy | b) Bio Energy |
| c) Solar Energy | d) Wind Energy |



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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

N.B. : 1) Attempt ***all*** questions.
2) Figures to the ***right*** indicate ***full*** marks.

2. Explain in detail Indian Patent Act, 1970. **10**

3. Elaborate the copyright issues in creative works. **10**

OR

3. Explain process of granting a patent.

4. Write short notes on **any four** : **20**

1) Copy rights

2) Trade secrets

3) Bio technology and intellectual property

4) Publication and examination of patent applications

5) Protection of traditional knowledge

6) Essential requirements for granting patent.



SLR-VB – 804

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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 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) Attempt **all** questions.
- 4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose correct answers :

- 1) The first Patent Law was enacted in India in the year
 - a) 1856
 - b) 1880
 - c) 1905
 - d) 1850
- 2) No patent shall be granted in respect of an invention relating to
 - a) Atomic Energy
 - b) Bio Energy
 - c) Solar Energy
 - d) Wind Energy
- 3) Intellectual Property Rights are result of
 - a) Mental Work
 - b) Physical work
 - c) Technical work
 - d) Communication
- 4) To apply for a patent, an inventor must
 - a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above

P.T.O.



- 5) A person develops a new process for making cheese from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
- a) Patent
b) Copyright
c) Trademarks
d) Industrial Design
- 6) The legislation covering intellectual property right in India for Information Technology is
- a) Information Technology Act 2003
b) Information Technology Act 2000
c) Information Technology Act 2008
d) None of the above
- 7) What is the term of a patent ?
- a) 35 years
b) 25 years
c) 20 years
d) 15 years
- 8) What is copyright meant for ?
- a) Film Work
b) Books
c) Essay
d) All the above
- 9) Which of the following is not specifically protected by intellectual property legislation ?
- a) Industrial Designs
b) Trademarks
c) Copyrights
d) Trade secrets
- 10) All of the following are examples of intellectual property protections EXCEPT
- a) Copyrights
b) Patents
c) Contracts
d) Trademarks
-



Seat No.	
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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

N.B. : 1) Attempt ***all*** questions.
2) Figures to the ***right*** indicate ***full*** marks.

2. Explain in detail Indian Patent Act, 1970. **10**

3. Elaborate the copyright issues in creative works. **10**

OR

3. Explain process of granting a patent.

4. Write short notes on **any four** : **20**

1) Copy rights

2) Trade secrets

3) Bio technology and intellectual property

4) Publication and examination of patent applications

5) Protection of traditional knowledge

6) Essential requirements for granting patent.



SLR-VB – 804

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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Max. Marks : 50

- N.B. :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 20 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) Attempt **all** questions.
- 4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 20 Minutes

Marks : 10

1. Choose correct answers :

- 1) A person develops a new process for making cheese from milk having low fats and cholesterol. He wishes to protect it. Which form of IPR would be suitable ?
- a) Patent
b) Copyright
c) Trademarks
d) Industrial Design
- 2) The legislation covering intellectual property right in India for Information Technology is
- a) Information Technology Act 2003
b) Information Technology Act 2000
c) Information Technology Act 2008
d) None of the above
- 3) The first Patent Law was enacted in India in the year
- a) 1856
b) 1880
c) 1905
d) 1850

P.T.O.



- 4) No patent shall be granted in respect of an invention relating to
- a) Atomic Energy
 - b) Bio Energy
 - c) Solar Energy
 - d) Wind Energy
- 5) Which of the following is not specifically protected by intellectual property legislation ?
- a) Industrial Designs
 - b) Trademarks
 - c) Copyrights
 - d) Trade secrets
- 6) All of the following are examples of intellectual property protections EXCEPT
- a) Copyrights
 - b) Patents
 - c) Contracts
 - d) Trademarks
- 7) Intellectual Property Rights are result of
- a) Mental Work
 - b) Physical work
 - c) Technical work
 - d) Communication
- 8) To apply for a patent, an inventor must
- a) File an application at a patent office which must comply with formal and technical requirements
 - b) Draft the full specification of the patent they seek, which cannot be later amended
 - c) Demonstrate that their invention works
 - d) None of above
- 9) What is the term of a patent ?
- a) 35 years
 - b) 25 years
 - c) 20 years
 - d) 15 years
- 10) What is copyright meant for ?
- a) Film Work
 - b) Books
 - c) Essay
 - d) All the above
-



Seat No.	
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T.E. – (Part – I) (All Branches) Examination, 2017
Self Learning (HSS)
INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY
DEVELOPMENT AND MANAGEMENT

Day and Date : Saturday, 13-5-2017
Time : 10.00 a.m. to 12.00 noon

Marks : 40

N.B. : 1) Attempt ***all*** questions.
2) Figures to the ***right*** indicate ***full*** marks.

2. Explain in detail Indian Patent Act, 1970. **10**

3. Elaborate the copyright issues in creative works. **10**

OR

3. Explain process of granting a patent.

4. Write short notes on **any four** : **20**

1) Copy rights

2) Trade secrets

3) Bio technology and intellectual property

4) Publication and examination of patent applications

5) Protection of traditional knowledge

6) Essential requirements for granting patent.



Seat No.	
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**F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :**
- 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) **All** questions are **compulsory**.
 - 4) Figure to the **right** indicate **full** marks.
 - 5) Use of calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

1) The n^{th} derivative of $\frac{1}{(2-x)^2}$ is

- a) $\frac{(-1)^n (n+1)!}{(x+2)^{n+2}}$ b) $\frac{(-1)^n (n+1)!}{(2-x)^{n+2}}$ c) $\frac{(n+1)!}{(2-x)^{n+2}}$ d) None of these

2) If $y = x \cdot \log(2x - 3)$ then $y_n =$

a) $\frac{x(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$

b) $x \frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$

c) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$

d) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$

3) Which of the following is true ?

a) $\log(1-x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

b) $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

c) $(1-x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

d) $(1+x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

P.T.O.



- 4) Expansion of $4x^2 + 5x + 12$ in powers of $(x - 1)$ is
 a) $21 + 13(x - 1) + 8(x - 1)^2$ b) $21 + 13(x - 1) + 4(x - 1)^2$
 c) $11 - 3(x - 1) + 4(x - 1)^2$ d) $11 + 3(x - 1) + 4(x - 1)^2$
- 5) The principle value of $\cosh^{-1} z =$
 a) $\log(z + \sqrt{1 - z^2})$ b) $\log(z + \sqrt{z^2 + 1})$
 c) $\log(z + \sqrt{z^2 - 1})$ d) $\log(z - \sqrt{z^2 - 1})$
- 6) $\log(-5) =$
 a) $\log 5 + i\pi$ b) $\log 5 - i\pi$ c) $-\log 5 + i\pi$ d) $\log 5 + \frac{i\pi}{2}$
- 7) $(\sin\theta + i \cos\theta)^n =$
 a) $\sin n\theta + i \cos n\theta$ b) $\cos(n\pi - \theta) + i \sin(n\pi - \theta)$
 c) $\cos n\left(\frac{\pi}{2} - \theta\right) + i \sin\left(\frac{n\pi}{2} - n\theta\right)$ d) $\cos n\left(\theta - \frac{\pi}{2}\right) + i \sin n\left(\theta - \frac{\pi}{2}\right)$
- 8) The rank of a unit matrix of order m is
 a) 1 b) m c) less than m d) greater than m
- 9) The system $AX = B$ has no solution, if
 a) $\rho(A) > \rho(A:B)$ b) $\rho(A) = \rho(A:B)$ c) $\rho(A) < \rho(A:B)$ d) None of these
- 10) If the eigen values of a 3×3 matrix A are 2, 5, 6 then the eigen values of A^2 are
 a) 2, 5, 6 b) 2, 25, 6 c) 4, 5, 6 d) 4, 25, 36
- 11) If $Z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial z}{\partial x} =$
 a) $\frac{x}{x^2 + y^2}$ b) $\frac{y}{x^2 + y^2}$ c) $\frac{-x}{x^2 + y^2}$ d) $\frac{-y}{x^2 + y^2}$
- 12) If $u = \sin^{-1}\left(\frac{x}{y} + \frac{y}{z} + \frac{z}{x}\right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} =$
 a) 0 b) u c) $-u$ d) None of these
- 13) If $u = x - y$, $v = xy$ then $\frac{\partial(u,v)}{\partial(x,y)} =$
 a) $x - y$ b) $y - x$ c) $x + y$ d) 0
- 14) If ∂y is an error in y , then $\frac{\partial y}{y} \times 100$ is called
 a) Absolute error in y b) Percentage error in y
 c) Relative error in y d) None of these



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F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

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

SECTION – I

2. Solve any three :

9

a) Find n^{th} derivative of $\frac{x}{x^3 + 6x^2 + 11x + 6}$.

b) Simplify $\frac{(\cos 3\theta + i \sin 3\theta)^5 (\cos 3\theta - i \sin 3\theta)^2}{(\cos 5\theta + i \sin 5\theta)^2 (\cos \theta - i \sin \theta)^7}$.

c) Solve $x^5 + 1 = 0$.

d) Using Taylors theorem find approximate value of $\sin (30^\circ, 30')$.

e) Prove that $\cos^{-1}\left(\frac{x-x^{-1}}{x+x^{-1}}\right) = \pi - 2\left[x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots\right]$.

3. Solve any three :

9

a) Evaluate $\lim_{x \rightarrow 0} \tan x \cdot \log x$.

b) Evaluate $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{e^x - 1} \right]$.



c) If $\tan\left(\frac{\pi}{6} + i\alpha\right) = x + iy$, prove that $x^2 + y^2 + \frac{2x}{\sqrt{3}} = 1$.

d) Find n^{th} derivative of $e^{2x} \cdot \cos\left(\frac{x}{2}\right) \cdot \sin\left(\frac{x}{2}\right)$.

e) If $(1 + i)^{x + iy} = \alpha + i\beta$, prove that $\tan^{-1}\left(\frac{\beta}{\alpha}\right) = \frac{\pi}{4}x + \frac{y}{2}\log 2$.

4. Solve **any two** :

10

a) If $m \sin^{-1}x = \sin^{-1}y$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$.
Hence deduce that $y_n(0) = 0$ if n is even and $y_n(0) = [(n-2)^2 - m^2] \dots (3^2 - m^2)(1^2 - m^2) \cdot m$ if n is odd.

b) State Maclaurin's series. Prove that $(1+x)^x = 1 + x^2 - \frac{x^3}{2} + \frac{5x^4}{6} \dots$

c) Separate into real and imaginary parts of

I) $\cos^{-1}(i)$

II) $\sin^{-1}(i)$.

SECTION – II

5. Solve **any three** of the following :

9

a) Reduce the following matrix to normal form and hence find its rank

$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}.$$

b) Solve the following system of equations

$$x + 2y - z = 3; 3x - y + 2z = 1; 2x - 2y + 3z = 2; x - y + z = -1.$$



c) If $u = e^x (x \cos y - y \sin y)$, then find $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$.

d) If $u = f(y - z, z - x, x - y)$, then find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$.

e) Find the stationary value of $x^2y^3z^4$ subject to the condition $x + y + z = 5$.

6. Solve **any three** of the following :

9

a) Find the eigen values and eigen vector corresponding to least eigen value of

the matrix $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$.

b) Find the eigen values of the matrix A and also find eigen values of A^{-1}

$$A = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$

c) If $z = f(x, y)$, where $x = u \cos \alpha - v \sin \alpha$, $y = u \sin \alpha + v \cos \alpha$, where α

is constant. Prove that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2$.

d) If $x = e^u \sec u$ and $y = e^v \tan v$ find the Jacobians

$$J = \frac{\partial(x, y)}{\partial(u, v)} \text{ and } J' = \frac{\partial(u, v)}{\partial(x, y)}. \text{ Verify that } JJ' = 1.$$

e) The period of a simple pendulum is given by $T = 2\pi \sqrt{\frac{l}{g}}$. If T is computed by using $l = 8$ ft. and $g = 32$ ft./sec². Find the approximate error in T if the value are $l = 8.05$ ft. and $g = 32.01$ ft./sec².



7. Solve **any two** of the following :

10

a) Examine whether the following vectors are linearly independent to dependent. Find the relation between. Them if dependent $[1, 1, 1, 3]$, $[1, 2, 3, 4]$, $[2, 3, 4, 7]$.

b) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x} + \sqrt{y}}\right)$, prove that

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{1}{4} (\tan^3 u - \tan u)$.

c) Find the maximum and minimum values of the function

$$x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$$



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**F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 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) **All** questions are **compulsory**.
4) Figure to the **right** indicate **full** marks.
5) Use of calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

- 1) The rank of a unit matrix of order m is
a) 1 b) m c) less than m d) greater than m
- 2) The system $AX = B$ has no solution, if
a) $\rho(A) > \rho(A:B)$ b) $\rho(A) = \rho(A:B)$ c) $\rho(A) < \rho(A:B)$ d) None of these
- 3) If the eigen values of a 3×3 matrix A are 2, 5, 6 then the eigen values of A^2 are
a) 2, 5, 6 b) 2, 25, 6 c) 4, 5, 6 d) 4, 25, 36
- 4) If $Z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial Z}{\partial x} =$
a) $\frac{x}{x^2 + y^2}$ b) $\frac{y}{x^2 + y^2}$ c) $\frac{-x}{x^2 + y^2}$ d) $\frac{-y}{x^2 + y^2}$
- 5) If $u = \sin^{-1}\left(\frac{x}{y} + \frac{y}{z} + \frac{z}{x}\right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} =$
a) 0 b) u c) -u d) None of these
- 6) If $u = x - y$, $v = xy$ then $\frac{\partial(u, v)}{\partial(x, y)} =$
a) $x - y$ b) $y - x$ c) $x + y$ d) 0
- 7) If Δy is an error in y, then $\frac{\Delta y}{y} \times 100$ is called
a) Absolute error in y b) Percentage error in y
c) Relative error in y d) None of these

P.T.O.



8) The n^{th} derivative of $\frac{1}{(2-x)^2}$ is

- a) $\frac{(-1)^n (n+1)!}{(x+2)^{n+2}}$ b) $\frac{(-1)^n (n+1)!}{(2-x)^{n+2}}$ c) $\frac{(n+1)!}{(2-x)^{n+2}}$ d) None of these

9) If $y = x \cdot \log(2x - 3)$ then $y_n =$

a) $\frac{x(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$

b) $x \frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$

c) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$

d) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$

10) Which of the following is true ?

a) $\log(1-x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

b) $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

c) $(1-x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

d) $(1+x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

11) Expansion of $4x^2 + 5x + 12$ in powers of $(x - 1)$ is

a) $21 + 13(x-1) + 8(x-1)^2$

b) $21 + 13(x-1) + 4(x-1)^2$

c) $11 - 3(x-1) + 4(x-1)^2$

d) $11 + 3(x-1) + 4(x-1)^2$

12) The principle value of $\cosh^{-1} z =$

a) $\log\left(z + \sqrt{1-z^2}\right)$

b) $\log\left(z + \sqrt{z^2+1}\right)$

c) $\log\left(z + \sqrt{z^2-1}\right)$

d) $\log\left(z - \sqrt{z^2-1}\right)$

13) $\log(-5) =$

a) $\log 5 + i\pi$

b) $\log 5 - i\pi$

c) $-\log 5 + i\pi$

d) $\log 5 + \frac{i\pi}{2}$

14) $(\sin\theta + i\cos\theta)^n =$

a) $\sin n\theta + i\cos n\theta$

b) $\cos(n\pi - \theta) + i\sin(n\pi - \theta)$

c) $\cos n\left(\frac{\pi}{2} - \theta\right) + i\sin\left(\frac{n\pi}{2} - n\theta\right)$

d) $\cos n\left(\theta - \frac{\pi}{2}\right) + i\sin n\left(\theta - \frac{\pi}{2}\right)$



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F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

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

SECTION – I

2. Solve any three :

9

a) Find n^{th} derivative of $\frac{x}{x^3 + 6x^2 + 11x + 6}$.

b) Simplify $\frac{(\cos 3\theta + i \sin 3\theta)^5 (\cos 3\theta - i \sin 3\theta)^2}{(\cos 5\theta + i \sin 5\theta)^2 (\cos \theta - i \sin \theta)^7}$.

c) Solve $x^5 + 1 = 0$.

d) Using Taylors theorem find approximate value of $\sin (30^\circ, 30')$.

e) Prove that $\cos^{-1}\left(\frac{x-x^{-1}}{x+x^{-1}}\right) = \pi - 2\left[x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots\right]$.

3. Solve any three :

9

a) Evaluate $\lim_{x \rightarrow 0} \tan x \cdot \log x$.

b) Evaluate $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{e^x - 1} \right]$.

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c) If $\tan\left(\frac{\pi}{6} + i\alpha\right) = x + iy$, prove that $x^2 + y^2 + \frac{2x}{\sqrt{3}} = 1$.

d) Find n^{th} derivative of $e^{2x} \cdot \cos\left(\frac{x}{2}\right) \cdot \sin\left(\frac{x}{2}\right)$.

e) If $(1 + i)^{x + iy} = \alpha + i\beta$, prove that $\tan^{-1}\left(\frac{\beta}{\alpha}\right) = \frac{\pi}{4}x + \frac{y}{2}\log 2$.

4. Solve **any two** :

10

a) If $m \sin^{-1}x = \sin^{-1}y$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$.
Hence deduce that $y_n(0) = 0$ if n is even and $y_n(0) = [(n-2)^2 - m^2] \dots (3^2 - m^2)(1^2 - m^2) \cdot m$ if n is odd.

b) State Maclaurin's series. Prove that $(1+x)^x = 1 + x^2 - \frac{x^3}{2} + \frac{5x^4}{6} \dots$

c) Separate into real and imaginary parts of

I) $\cos^{-1}(i)$

II) $\sin^{-1}(i)$.

SECTION – II

5. Solve **any three** of the following :

9

a) Reduce the following matrix to normal form and hence find its rank

$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}.$$

b) Solve the following system of equations

$$x + 2y - z = 3; 3x - y + 2z = 1; 2x - 2y + 3z = 2; x - y + z = -1.$$



c) If $u = e^x (x \cos y - y \sin y)$, then find $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$.

d) If $u = f(y - z, z - x, x - y)$, then find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$.

e) Find the stationary value of $x^2 y^3 z^4$ subject to the condition $x + y + z = 5$.

6. Solve **any three** of the following :

9

a) Find the eigen values and eigen vector corresponding to least eigen value of

the matrix $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$.

b) Find the eigen values of the matrix A and also find eigen values of A^{-1}

$$A = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$

c) If $z = f(x, y)$, where $x = u \cos \alpha - v \sin \alpha$, $y = u \sin \alpha + v \cos \alpha$, where α

is constant. Prove that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2$.

d) If $x = e^u \sec u$ and $y = e^v \tan v$ find the Jacobians

$$J = \frac{\partial(x, y)}{\partial(u, v)} \text{ and } J' = \frac{\partial(u, v)}{\partial(x, y)}. \text{ Verify that } JJ' = 1.$$

e) The period of a simple pendulum is given by $T = 2\pi \sqrt{\frac{l}{g}}$. If T is computed by using $l = 8$ ft. and $g = 32$ ft./sec². Find the approximate error in T if the value are $l = 8.05$ ft. and $g = 32.01$ ft./sec².



7. Solve **any two** of the following :

10

a) Examine whether the following vectors are linearly independent to dependent. Find the relation between. Them if dependent $[1, 1, 1, 3], [1, 2, 3, 4], [2, 3, 4, 7]$.

b) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x} + \sqrt{y}}\right)$, prove that

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{1}{4} (\tan^3 u - \tan u)$.

c) Find the maximum and minimum values of the function

$$x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$$



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**F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 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) **All questions are compulsory.**
4) Figure to the **right** indicate **full** marks.
5) **Use of calculator is allowed.**

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

1) The principle value of $\cosh^{-1} z =$

a) $\log(z + \sqrt{1 - z^2})$

b) $\log(z + \sqrt{z^2 + 1})$

c) $\log(z + \sqrt{z^2 - 1})$

d) $\log(z - \sqrt{z^2 - 1})$

2) $\log(-5) =$

a) $\log 5 + i\pi$ b) $\log 5 - i\pi$ c) $-\log 5 + i\pi$ d) $\log 5 + \frac{i\pi}{2}$

3) $(\sin \theta + i \cos \theta)^n =$

a) $\sin n\theta + i \cos n\theta$

b) $\cos(n\pi - \theta) + i \sin(n\pi - \theta)$

c) $\cos n\left(\frac{\pi}{2} - \theta\right) + i \sin\left(\frac{n\pi}{2} - n\theta\right)$

d) $\cos n\left(\theta - \frac{\pi}{2}\right) + i \sin n\left(\theta - \frac{\pi}{2}\right)$

4) The rank of a unit matrix of order m is

a) 1

b) m

c) less than m

d) greater than m

5) The system $AX = B$ has no solution, if

a) $\rho(A) > \rho(A:B)$

b) $\rho(A) = \rho(A:B)$

c) $\rho(A) < \rho(A:B)$

d) None of these

6) If the eigen values of a 3×3 matrix A are 2, 5, 6 then the eigen values of A^2 are

a) 2, 5, 6

b) 2, 25, 6

c) 4, 5, 6

d) 4, 25, 36



- 7) If $Z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial z}{\partial x} =$
- a) $\frac{x}{x^2 + y^2}$ b) $\frac{y}{x^2 + y^2}$ c) $\frac{-x}{x^2 + y^2}$ d) $\frac{-y}{x^2 + y^2}$
- 8) If $u = \sin^{-1}\left(\frac{x}{y} + \frac{y}{z} + \frac{z}{x}\right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} =$
- a) 0 b) u c) -u d) None of these
- 9) If $u = x - y$, $v = xy$ then $\frac{\partial(u, v)}{\partial(x, y)} =$
- a) $x - y$ b) $y - x$ c) $x + y$ d) 0
- 10) If ∂y is an error in y , then $\frac{\partial y}{y} \times 100$ is called
- a) Absolute error in y b) Percentage error in y
 c) Relative error in y d) None of these
- 11) The n^{th} derivative of $\frac{1}{(2-x)^2}$ is
- a) $\frac{(-1)^n (n+1)!}{(x+2)^{n+2}}$ b) $\frac{(-1)^n (n+1)!}{(2-x)^{n+2}}$ c) $\frac{(n+1)!}{(2-x)^{n+2}}$ d) None of these
- 12) If $y = x \cdot \log(2x - 3)$ then $y_n =$
- a) $\frac{x(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$
- b) $x \frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$
- c) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$
- d) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$
- 13) Which of the following is true ?
- a) $\log(1-x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$ b) $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$
- c) $(1-x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$ d) $(1+x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$
- 14) Expansion of $4x^2 + 5x + 12$ in powers of $(x - 1)$ is
- a) $21 + 13(x - 1) + 8(x - 1)^2$ b) $21 + 13(x - 1) + 4(x - 1)^2$
 c) $11 - 3(x - 1) + 4(x - 1)^2$ d) $11 + 3(x - 1) + 4(x - 1)^2$



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F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- N.B. :** 1) **All questions are compulsory.**
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3) Use of calculator is **allowed**.

SECTION – I

2. Solve any three :

9

a) Find n^{th} derivative of $\frac{x}{x^3 + 6x^2 + 11x + 6}$.

b) Simplify $\frac{(\cos 3\theta + i \sin 3\theta)^5 (\cos 3\theta - i \sin 3\theta)^2}{(\cos 5\theta + i \sin 5\theta)^2 (\cos \theta - i \sin \theta)^7}$.

c) Solve $x^5 + 1 = 0$.

d) Using Taylors theorem find approximate value of $\sin (30^\circ, 30')$.

e) Prove that $\cos^{-1}\left(\frac{x-x^{-1}}{x+x^{-1}}\right) = \pi - 2\left[x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots\right]$.

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9

a) Evaluate $\lim_{x \rightarrow 0} \tan x \cdot \log x$.

b) Evaluate $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{e^x - 1} \right]$.



c) If $\tan\left(\frac{\pi}{6} + i\alpha\right) = x + iy$, prove that $x^2 + y^2 + \frac{2x}{\sqrt{3}} = 1$.

d) Find n^{th} derivative of $e^{2x} \cdot \cos\left(\frac{x}{2}\right) \cdot \sin\left(\frac{x}{2}\right)$.

e) If $(1 + i)^{x + iy} = \alpha + i\beta$, prove that $\tan^{-1}\left(\frac{\beta}{\alpha}\right) = \frac{\pi}{4}x + \frac{y}{2}\log 2$.

4. Solve **any two** :

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a) If $m \sin^{-1}x = \sin^{-1}y$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$.
Hence deduce that $y_n(0) = 0$ if n is even and $y_n(0) = [(n-2)^2 - m^2] \dots (3^2 - m^2)(1^2 - m^2)$. m if n is odd.

b) State Maclaurin's series. Prove that $(1+x)^x = 1 + x^2 - \frac{x^3}{2} + \frac{5x^4}{6} \dots$

c) Separate into real and imaginary parts of

I) $\cos^{-1}(i)$

II) $\sin^{-1}(i)$.

SECTION – II

5. Solve **any three** of the following :

9

a) Reduce the following matrix to normal form and hence find its rank

$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}.$$

b) Solve the following system of equations

$$x + 2y - z = 3; 3x - y + 2z = 1; 2x - 2y + 3z = 2; x - y + z = -1.$$



c) If $u = e^x (x \cos y - y \sin y)$, then find $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$.

d) If $u = f(y - z, z - x, x - y)$, then find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$.

e) Find the stationary value of $x^2y^3z^4$ subject to the condition $x + y + z = 5$.

6. Solve **any three** of the following :

9

a) Find the eigen values and eigen vector corresponding to least eigen value of

the matrix $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$.

b) Find the eigen values of the matrix A and also find eigen values of A^{-1}

$$A = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$

c) If $z = f(x, y)$, where $x = u \cos \alpha - v \sin \alpha$, $y = u \sin \alpha + v \cos \alpha$, where α

is constant. Prove that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2$.

d) If $x = e^u \sec u$ and $y = e^v \tan v$ find the Jacobians

$$J = \frac{\partial(x, y)}{\partial(u, v)} \text{ and } J' = \frac{\partial(u, v)}{\partial(x, y)}. \text{ Verify that } JJ' = 1.$$

e) The period of a simple pendulum is given by $T = 2\pi \sqrt{\frac{l}{g}}$. If T is computed by using $l = 8$ ft. and $g = 32$ ft./sec². Find the approximate error in T if the value are $l = 8.05$ ft. and $g = 32.01$ ft./sec².



7. Solve **any two** of the following :

10

a) Examine whether the following vectors are linearly independent to dependent. Find the relation between. Them if dependent $[1, 1, 1, 3], [1, 2, 3, 4], [2, 3, 4, 7]$.

b) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x} + \sqrt{y}}\right)$, prove that

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{1}{4} (\tan^3 u - \tan u)$.

c) Find the maximum and minimum values of the function

$$x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$$



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**F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I**

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Max. Marks : 70

- N.B. :** 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) **All questions are compulsory.**
4) Figure to the **right** indicate **full** marks.
5) Use of calculator is **allowed**.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternative :

(14×1=14)

- 1) If the eigen values of a 3×3 matrix A are 2, 5, 6 then the eigen values of A^2 are
a) 2, 5, 6 b) 2, 25, 6 c) 4, 5, 6 d) 4, 25, 36
- 2) If $Z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial Z}{\partial x} =$
a) $\frac{x}{x^2 + y^2}$ b) $\frac{y}{x^2 + y^2}$ c) $\frac{-x}{x^2 + y^2}$ d) $\frac{-y}{x^2 + y^2}$
- 3) If $u = \sin^{-1}\left(\frac{x}{y} + \frac{y}{z} + \frac{z}{x}\right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} =$
a) 0 b) u c) -u d) None of these
- 4) If $u = x - y$, $v = xy$ then $\frac{\partial(u, v)}{\partial(x, y)} =$
a) $x - y$ b) $y - x$ c) $x + y$ d) 0
- 5) If ∂y is an error in y, then $\frac{\partial y}{y} \times 100$ is called
a) Absolute error in y b) Percentage error in y
c) Relative error in y d) None of these
- 6) The n^{th} derivative of $\frac{1}{(2-x)^2}$ is
a) $\frac{(-1)^n (n+1)!}{(x+2)^{n+2}}$ b) $\frac{(-1)^n (n+1)!}{(2-x)^{n+2}}$ c) $\frac{(n+1)!}{(2-x)^{n+2}}$ d) None of these



7) If $y = x \cdot \log(2x - 3)$ then $y_n =$

a) $\frac{x(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$

b) $x \frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$

c) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n} + \frac{n(-1)^{n-2}(n-2)!2^{n-1}}{(2x-3)^{n-1}}$

d) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-3)^n}$

8) Which of the following is true ?

a) $\log(1-x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

b) $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

c) $(1-x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

d) $(1+x)^{-1} = x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots$

9) Expansion of $4x^2 + 5x + 12$ in powers of $(x-1)$ is

a) $21 + 13(x-1) + 8(x-1)^2$

b) $21 + 13(x-1) + 4(x-1)^2$

c) $11 - 3(x-1) + 4(x-1)^2$

d) $11 + 3(x-1) + 4(x-1)^2$

10) The principle value of $\cosh^{-1} z =$

a) $\log\left(z + \sqrt{1-z^2}\right)$

b) $\log\left(z + \sqrt{z^2+1}\right)$

c) $\log\left(z + \sqrt{z^2-1}\right)$

d) $\log\left(z - \sqrt{z^2-1}\right)$

11) $\log(-5) =$

a) $\log 5 + i\pi$

b) $\log 5 - i\pi$

c) $-\log 5 + i\pi$

d) $\log 5 + \frac{i\pi}{2}$

12) $(\sin\theta + i\cos\theta)^n =$

a) $\sin n\theta + i\cos n\theta$

b) $\cos(n\pi - \theta) + i\sin(n\pi - \theta)$

c) $\cos n\left(\frac{\pi}{2} - \theta\right) + i\sin\left(\frac{n\pi}{2} - n\theta\right)$

d) $\cos n\left(\theta - \frac{\pi}{2}\right) + i\sin n\left(\theta - \frac{\pi}{2}\right)$

13) The rank of a unit matrix of order m is

a) 1

b) m

c) less than m

d) greater than m

14) The system $AX = B$ has no solution, if

a) $\rho(A) > \rho(A:B)$

b) $\rho(A) = \rho(A:B)$

c) $\rho(A) < \rho(A:B)$

d) None of these



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F.E. (Part – I) (New CBCS) Examination, 2017
ENGINEERING MATHEMATICS – I

Day and Date : Thursday, 4-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

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

SECTION – I

2. Solve any three :

9

a) Find n^{th} derivative of $\frac{x}{x^3 + 6x^2 + 11x + 6}$.

b) Simplify $\frac{(\cos 3\theta + i \sin 3\theta)^5 (\cos 3\theta - i \sin 3\theta)^2}{(\cos 5\theta + i \sin 5\theta)^2 (\cos \theta - i \sin \theta)^7}$.

c) Solve $x^5 + 1 = 0$.

d) Using Taylors theorem find approximate value of $\sin (30^\circ, 30')$.

e) Prove that $\cos^{-1}\left(\frac{x-x^{-1}}{x+x^{-1}}\right) = \pi - 2\left[x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots\right]$.

3. Solve any three :

9

a) Evaluate $\lim_{x \rightarrow 0} \tan x \cdot \log x$.

b) Evaluate $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{e^x - 1} \right]$.

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c) If $\tan\left(\frac{\pi}{6} + i\alpha\right) = x + iy$, prove that $x^2 + y^2 + \frac{2x}{\sqrt{3}} = 1$.

d) Find n^{th} derivative of $e^{2x} \cdot \cos\left(\frac{x}{2}\right) \cdot \sin\left(\frac{x}{2}\right)$.

e) If $(1 + i)^{x + iy} = \alpha + i\beta$, prove that $\tan^{-1}\left(\frac{\beta}{\alpha}\right) = \frac{\pi}{4}x + \frac{y}{2}\log 2$.

4. Solve **any two** :

10

a) If $m \sin^{-1}x = \sin^{-1}y$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$.
Hence deduce that $y_n(0) = 0$ if n is even and $y_n(0) = [(n-2)^2 - m^2] \dots (3^2 - m^2)(1^2 - m^2)$. m if n is odd.

b) State Maclaurin's series. Prove that $(1+x)^x = 1 + x^2 - \frac{x^3}{2} + \frac{5x^4}{6} \dots$

c) Separate into real and imaginary parts of

I) $\cos^{-1}(i)$

II) $\sin^{-1}(i)$.

SECTION – II

5. Solve **any three** of the following :

9

a) Reduce the following matrix to normal form and hence find its rank

$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}.$$

b) Solve the following system of equations

$$x + 2y - z = 3; 3x - y + 2z = 1; 2x - 2y + 3z = 2; x - y + z = -1.$$



c) If $u = e^x (x \cos y - y \sin y)$, then find $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$.

d) If $u = f(y - z, z - x, x - y)$, then find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$.

e) Find the stationary value of $x^2y^3z^4$ subject to the condition $x + y + z = 5$.

6. Solve **any three** of the following :

9

a) Find the eigen values and eigen vector corresponding to least eigen value of

the matrix $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$.

b) Find the eigen values of the matrix A and also find eigen values of A^{-1}

$$A = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$

c) If $z = f(x, y)$, where $x = u \cos \alpha - v \sin \alpha$, $y = u \sin \alpha + v \cos \alpha$, where α

is constant. Prove that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2$.

d) If $x = e^u \sec u$ and $y = e^v \tan v$ find the Jacobians

$$J = \frac{\partial(x, y)}{\partial(u, v)} \text{ and } J' = \frac{\partial(u, v)}{\partial(x, y)}. \text{ Verify that } JJ' = 1.$$

e) The period of a simple pendulum is given by $T = 2\pi \sqrt{\frac{l}{g}}$. If T is computed by using $l = 8$ ft. and $g = 32$ ft/sec². Find the approximate error in T if the value are $l = 8.05$ ft. and $g = 32.01$ ft./sec².



7. Solve **any two** of the following :

10

a) Examine whether the following vectors are linearly independent to dependent. Find the relation between. Them if dependent $[1, 1, 1, 3], [1, 2, 3, 4], [2, 3, 4, 7]$.

b) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x} + \sqrt{y}}\right)$, prove that

i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{1}{4} (\tan^3 u - \tan u)$.

c) Find the maximum and minimum values of the function

$$x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$$



SLR-VB – 2

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**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
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) Use of nonprogrammable scientific calculators is **allowed**.
4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : **(1×14=14)**
- 1) The ratio of static friction to dynamic friction is always
a) =1 b) <1 c) >1 d) None of these
 - 2) A system of two forces can be in equilibrium only if both the forces are
a) Equal in magnitude
b) Opposite in direction
c) Equal in magnitude and opposite in direction
d) None of the above
 - 3) In a simply supported beam carrying symmetrical triangular load, the reactions will be
a) vertical b) horizontal c) inclined d) none of these
 - 4) A framed structure of triangular shape is
a) Perfect b) Imperfect c) Difficult d) Redundant
 - 5) The M.I. of a triangular section of base (b) and height (h) about an axis passing through its base is given by
a) $bh^3/12$ b) $bh^3/18$ c) $bh^3/36$ d) $bh^3/64$
 - 6) To solve a truss by the method of joints, the number of unknown forces at a joint should not be
a) Less than two b) More than two
c) More than three d) Cannot said

P.T.O.



- 7) Co-efficient of friction depends upon
- a) Area of contact only b) Nature of surface only
c) Both a and b d) None of these
- 8) Area under velocity time graph gives
- a) displacement b) change in velocity
c) change in acceleration d) none of these
- 9) Two trains A and B are moving on a parallel track in the same direction having velocity 100 kmph and 65 kmph respectively. The relative velocity of train A will respective to B is
- a) –35 kmph b) 35 kmph c) 100 kmph d) 165 kmph
- 10) A particle moves along a straight line such that its displacement at any time t is given by:
- $s = 3t^3 + 7t^2 + 14t + 5$. The acceleration of particle at t = 1 sec is
- a) 18 m/s² b) 32 m/s² c) 29 m/s² d) 24 m/s²
- 11) For a motion along circular path of radius r, centripetal acceleration is
- a) $\frac{dv}{dt}$ b) $\frac{v^2}{r}$ c) $v^2 r$ d) v^3/r
- 12) A stone is whirled in a vertical circle. The tension in the string is greatest when the stone is
- a) in the lowest position
b) in the highest position
c) in the position when string is horizontal
d) tension is equal in all position
- 13) The motion of a bicycle wheel is
- a) Linear b) Rotary
c) Translatory d) Rotary as well as translatory
- 14) The apparent weight of a man in a lift is less than the real weight when lift is going
- a) downwith some acceleration b) up with some acceleration
c) with constant velocity d) none of above
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**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Use of nonprogrammable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full marks**.

SECTION – I

2. Solve **any four** questions out of six. (4×3=12)
- a) State and explain Principle of Transmissibility of forces. 3
 - b) Define the terms :
 - 1) Perfect frame
 - 2) Deficient frame
 - 3) Redundant frame. 3
 - c) State and prove 'Theorem of Parallel Axis', for calculating moment of inertia of a plane lamina. 3
 - d) The beams AB is loaded and supported as shown in figure (1). B is a hinge support and A is a roller support. Determine only, the support reactions at B due to forces acting on the beam. 3

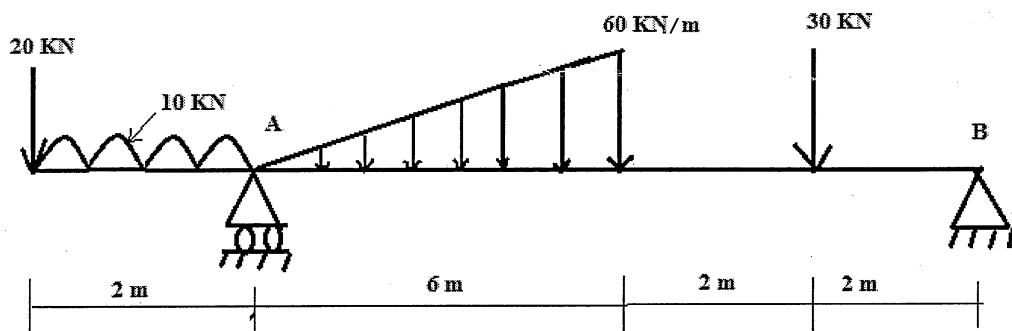


Fig. (1)



- e) A 'T' section is to be strengthened by adding a 10 mm thick plate on the upper side of the flange as shown in figure (2). Determine the top width 'W' of the plate, so that the centroid of the modified composite section, will lie at 200 mm distance from the bottom of the web.

3

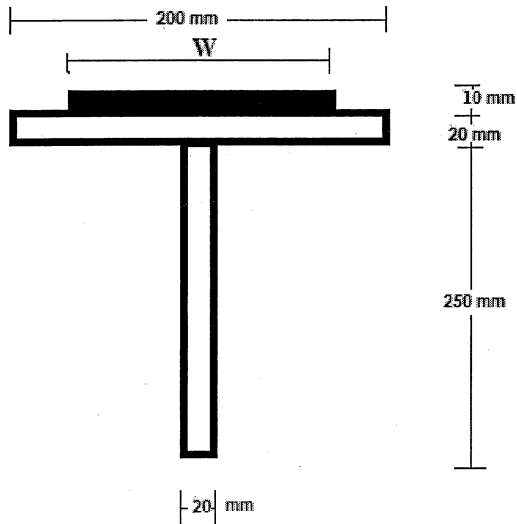


Fig. (2)

- f) Four forces are acting on equilateral plate of side 200 mm as shown in figure (3). Points D and E are the midpoints of the respective sides. Calculate only, the magnitude of the resultant of the force system.

3

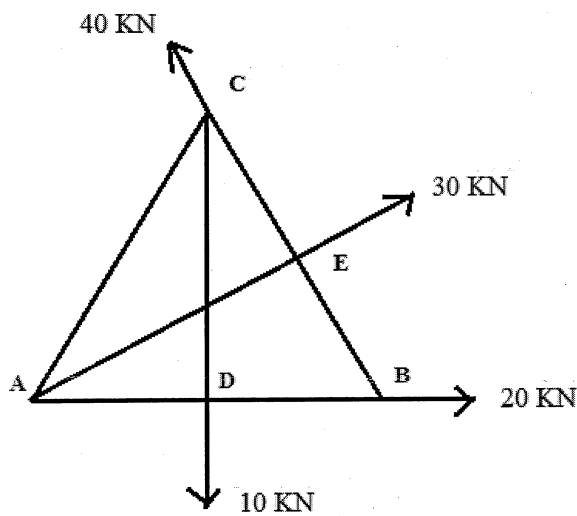


Fig. (3)



3. Solve **any two** questions of the following. (8×2=16)

- a) Two smooth cylinders with radius and weights as enlisted in table, are kept in a groove with slanting surfaces, as shown in figure (4). Determine the reactions at contact points. 8

Cylinder	Radius	Weight
1	125 mm	500 N
2	200 mm	800 N

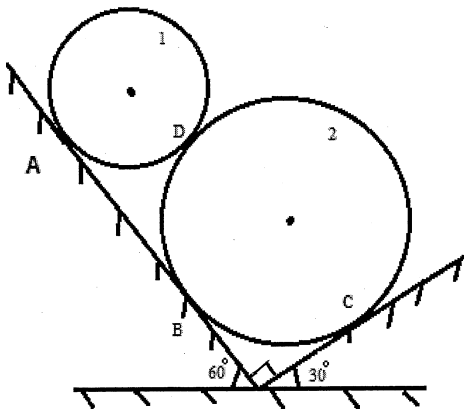


Fig. (4)

- b) Find forces in all the members of the truss, loaded as shown in figure (5). Support A in hinged support and support E is a roller support. 8

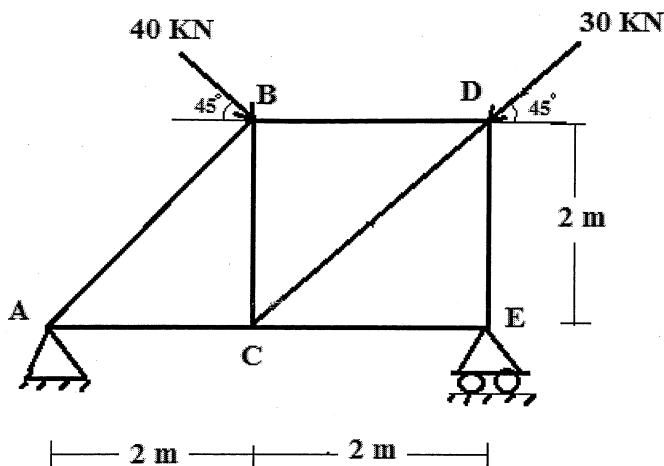


Fig. (5)



- c) Determine the moment of inertia of the L-Section as shown in figure (6) about its centroidal axes XX and YY, parallel to the legs. Also find the Polar moment of inertia of the section.

8

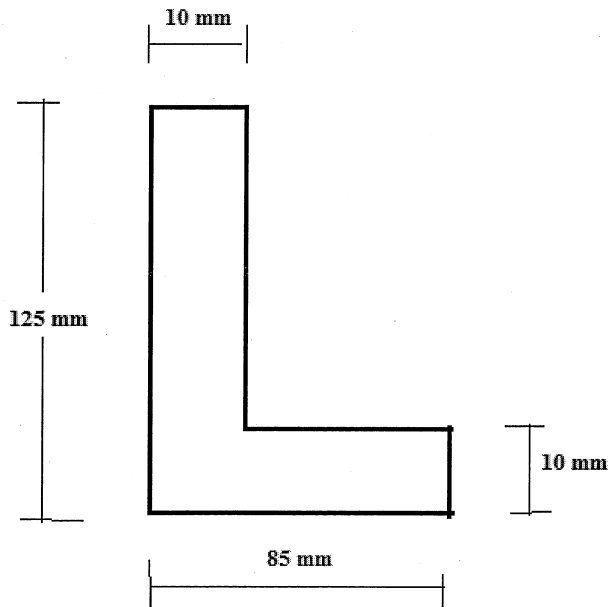


Fig. (6)

SECTION – II

4. Solve **any four** of the following. (4×3=12)
- Distinguish between Rectilinear motion and curvilinear motion. 3
 - Two balls having masses 10 kg and 30 kg are moving along a straight line towards each other at velocities 4 m/sec and 1 m/sec respectively. If coefficient of restitution $e = 0.6$, determine velocities of balls immediately after their collision. 3
 - Derive the general equation of projectile motion. 3
 - State and explain the D'Alembert's Principle. 3
 - A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find average torque exerted on it, if radius of gyration of flywheel is 60 cm. 3
 - A train of total mass 300 ton descends an incline 1 in 120 with uniform velocity of 8 m/sec. If the frictional resistance to the train is 250 N/ton of mass, determine the power applied by the engine. 3

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5. Solve **any two** of the following. (8×2=16)

a) An aeroplane is flying on a straight level course at 200 km per hour, at a height 1000 m above the ground. An anti aircraft gun located on the ground fires a shell with an initial velocity 300 m/sec, at the instant when the aeroplane is vertically above it. At what inclination to the horizontal, should the gun be fired to hit the aeroplane ? What time after firing, the gun shell will hit the aeroplane ? What will then be the horizontal distance of the aeroplane from the gun ? 8

b) Two weights $W_1 = 400\text{ N}$ and $W_2 = 100\text{ N}$ are connected by a string and move along a horizontal plane under the action of a force $P = 200\text{ N}$ applied horizontally to the weight W_1 as shown in figure. (Refer figure No. 7). The coefficient of friction between the weights and the plane is 0.25. Determine the acceleration of the weights and the tension in the string connecting the two weights. 8

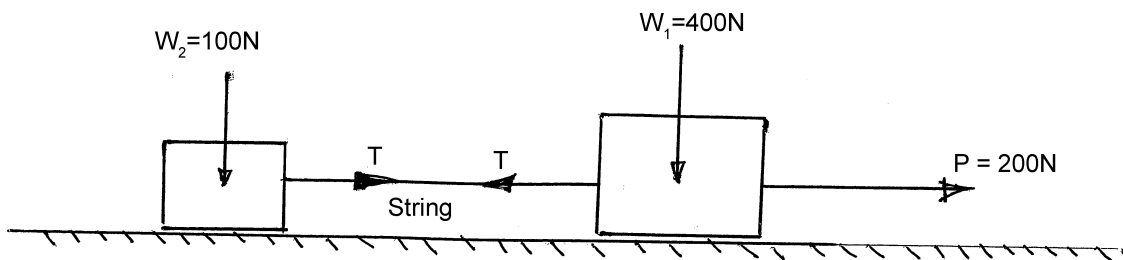


Fig. (7)

c) A car of mass 2 ton is powered by engine of 40 kW capacity. It starts from rest and attains maximum speed in 30 seconds. If the frictional resistance to the motion is 750 N/ ton mass, determine the maximum speed the car can attain. If after attaining the maximum speed, the engine is switched off; determine the distance it would travel, before coming to rest. 8



SLR-VB – 2

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F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS

Day and Date : Friday, 5-5-2017
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) *Use of nonprogrammable scientific calculators is allowed.*
4) *Figures to the right indicate full marks.*

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

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

1) Area under velocity time graph gives

- | | |
|---------------------------|-----------------------|
| a) displacement | b) change in velocity |
| c) change in acceleration | d) none of these |

2) Two trains A and B are moving on a parallel track in the same direction having velocity 100 kmph and 65 kmph respectively. The relative velocity of train A will be respective to B is

- | | | | |
|-------------|------------|-------------|-------------|
| a) –35 kmph | b) 35 kmph | c) 100 kmph | d) 165 kmph |
|-------------|------------|-------------|-------------|

3) A particle moves along a straight line such that its displacement at any time t is given by:

$s = 3t^3 + 7t^2 + 14t + 5$. The acceleration of particle at $t = 1$ sec is

- | | | | |
|------------------------|------------------------|------------------------|------------------------|
| a) 18 m/s ² | b) 32 m/s ² | c) 29 m/s ² | d) 24 m/s ² |
|------------------------|------------------------|------------------------|------------------------|

4) For a motion along circular path of radius r , centripetal acceleration is

- | | | | |
|--------------------|--------------------|------------|------------|
| a) $\frac{dv}{dt}$ | b) $\frac{v^2}{r}$ | c) $v^2 r$ | d) v^3/r |
|--------------------|--------------------|------------|------------|

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- 5) A stone is whirled in a vertical circle. The tension in the string is greatest when the stone is
- in the lowest position
 - in the highest position
 - in the position when string is horizontal
 - tension is equal in all position
- 6) The motion of a bicycle wheel is
- Linear
 - Rotary
 - Translatory
 - Rotary as well as translatory
- 7) The apparent weight of a man in a lift is less than the real weight when lift is going
- downwith some acceleration
 - up with some acceleration
 - with constant velocity
 - none of above
- 8) The ratio of static friction to dynamic friction is always
- =1
 - <1
 - >1
 - None of these
- 9) A system of two forces can be in equilibrium only if both the forces are
- Equal in magnitude
 - Opposite in direction
 - Equal in magnitude and opposite in direction
 - None of the above
- 10) In a simply supported beam carrying symmetrical triangular load, the reactions will be
- vertical
 - horizontal
 - inclined
 - none of these
- 11) A framed structure of triangular shape is
- Perfect
 - Imperfect
 - Difficult
 - Redundant
- 12) The M.I. of a triangular section of base (b) and height (h) about an axis passing through its base is given by
- $bh^3/12$
 - $bh^3/18$
 - $bh^3/36$
 - $bh^3/64$
- 13) To solve a truss by the method of joints, the number of unknown forces at a joint should not be
- Less than two
 - More than two
 - More than three
 - Cannot said
- 14) Co-efficient of friction depends upon
- Area of contact only
 - Nature of surface only
 - Both a and b
 - None of these



Seat No.	
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**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

Instructions : 1) Use of nonprogrammable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full marks**.

SECTION – I

2. Solve **any four** questions out of six. (4×3=12)
- a) State and explain Principle of Transmissibility of forces. 3
 - b) Define the terms :
 - 1) Perfect frame
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 - 3) Redundant frame. 3
 - c) State and prove 'Theorem of Parallel Axis', for calculating moment of inertia of a plane lamina. 3
 - d) The beams AB is loaded and supported as shown in figure (1). B is a hinge support and A is a roller support. Determine only, the support reactions at B due to forces acting on the beam. 3

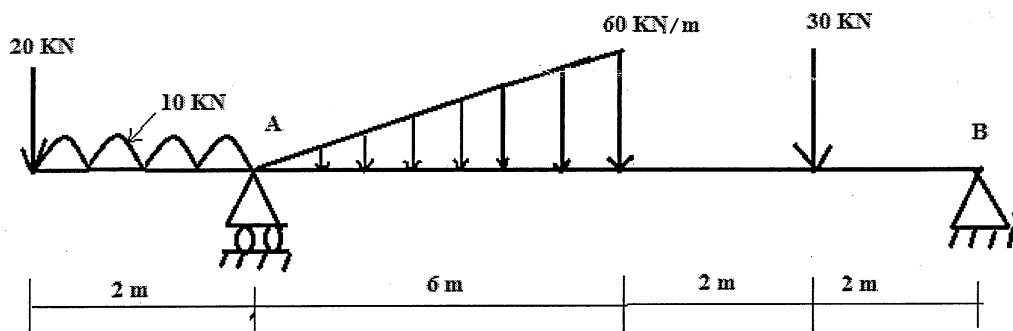


Fig. (1)



- e) A 'T' section is to be strengthened by adding a 10 mm thick plate on the upper side of the flange as shown in figure (2). Determine the top width 'W' of the plate, so that the centroid of the modified composite section, will lie at 200 mm distance from the bottom of the web.

3

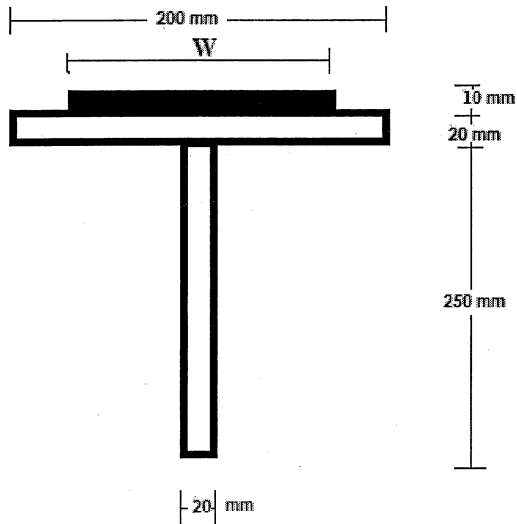


Fig. (2)

- f) Four forces are acting on equilateral plate of side 200 mm as shown in figure (3). Points D and E are the midpoints of the respective sides. Calculate only, the magnitude of the resultant of the force system.

3

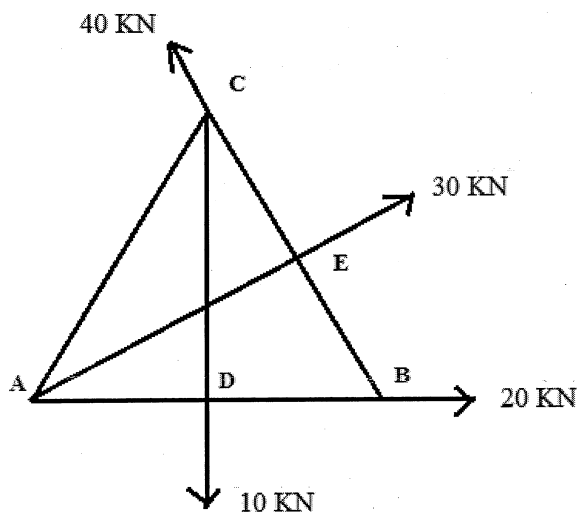


Fig. (3)



3. Solve **any two** questions of the following. (8×2=16)

- a) Two smooth cylinders with radius and weights as enlisted in table, are kept in a groove with slanting surfaces, as shown in figure (4). Determine the reactions at contact points. 8

Cylinder	Radius	Weight
1	125 mm	500 N
2	200 mm	800 N

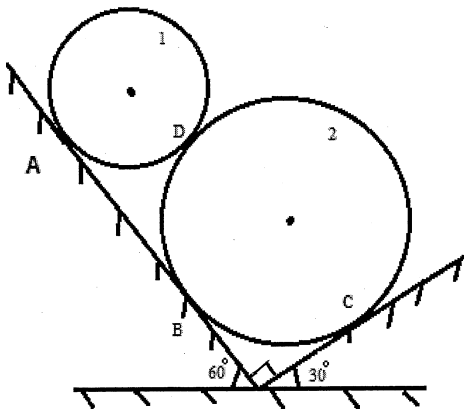


Fig. (4)

- b) Find forces in all the members of the truss, loaded as shown in figure (5). Support A in hinged support and support E is a roller support. 8

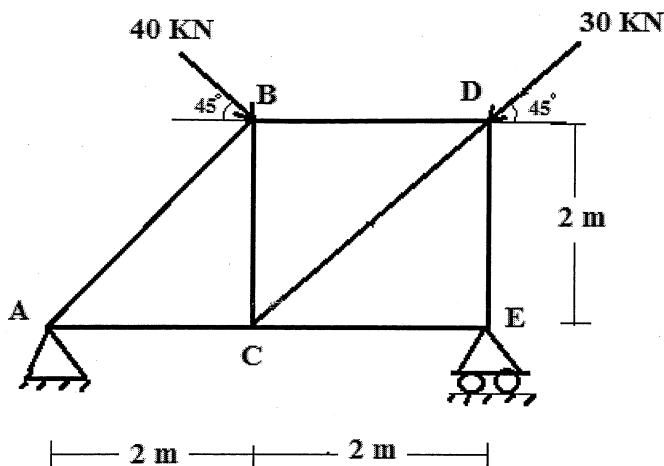


Fig. (5)



- c) Determine the moment of inertia of the L-Section as shown in figure (6) about its centroidal axes XX and YY, parallel to the legs. Also find the Polar moment of inertia of the section.

8

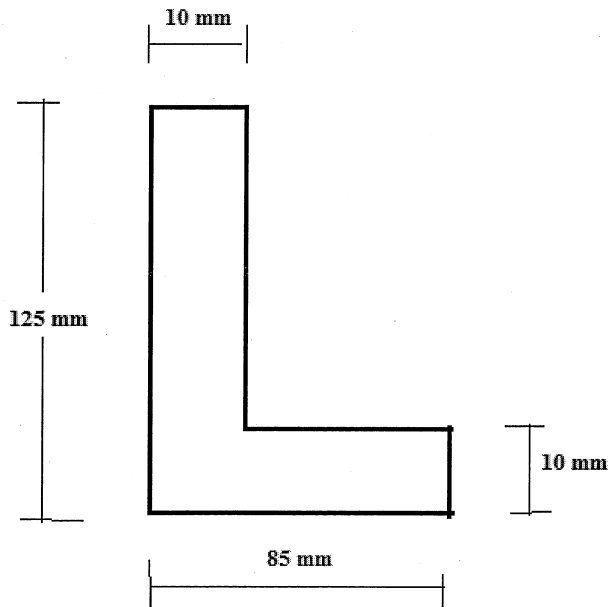


Fig. (6)

SECTION – II

4. Solve **any four** of the following. (4×3=12)
- Distinguish between Rectilinear motion and curvilinear motion. 3
 - Two balls having masses 10 kg and 30 kg are moving along a straight line towards each other at velocities 4 m/sec and 1 m/sec respectively. If coefficient of restitution $e = 0.6$, determine velocities of balls immediately after their collision. 3
 - Derive the general equation of projectile motion. 3
 - State and explain the D'Alembert's Principle. 3
 - A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find average torque exerted on it, if radius of gyration of flywheel is 60 cm. 3
 - A train of total mass 300 ton descends an incline 1 in 120 with uniform velocity of 8 m/sec. If the frictional resistance to the train is 250 N/ton of mass, determine the power applied by the engine. 3

Set Q



5. Solve **any two** of the following. (8×2=16)

a) An aeroplane is flying on a straight level course at 200 km per hour, at a height 1000 m above the ground. An anti aircraft gun located on the ground fires a shell with an initial velocity 300 m/sec, at the instant when the aeroplane is vertically above it. At what inclination to the horizontal, should the gun be fired to hit the aeroplane ? What time after firing, the gun shell will hit the aeroplane ? What will then be the horizontal distance of the aeroplane from the gun ? 8

b) Two weights $W_1 = 400\text{ N}$ and $W_2 = 100\text{ N}$ are connected by a string and move along a horizontal plane under the action of a force $P = 200\text{ N}$ applied horizontally to the weight W_1 as shown in figure. (Refer figure No. 7). The coefficient of friction between the weights and the plane is 0.25. Determine the acceleration of the weights and the tension in the string connecting the two weights. 8

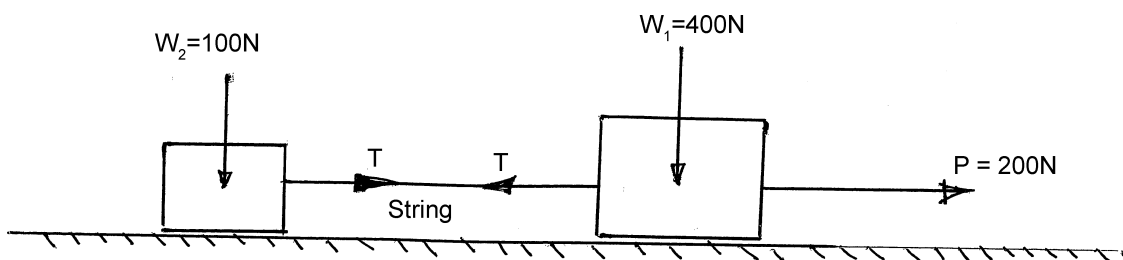


Fig. (7)

c) A car of mass 2 ton is powered by engine of 40 kW capacity. It starts from rest and attains maximum speed in 30 seconds. If the frictional resistance to the motion is 750 N/ ton mass, determine the maximum speed the car can attain. If after attaining the maximum speed, the engine is switched off; determine the distance it would travel, before coming to rest. 8



SLR-VB – 2

Seat No.	
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Set

R

**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
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) Use of nonprogrammable scientific calculators is **allowed**.
4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer : (1×14=14)
- 1) The M.I. of a triangular section of base (b) and height (h) about an axis passing through its base is given by
a) $bh^3/12$ b) $bh^3/18$ c) $bh^3/36$ d) $bh^3/64$
 - 2) To solve a truss by the method of joints, the number of unknown forces at a joint should not be
a) Less than two b) More than two
c) More than three d) Cannot said
 - 3) Co-efficient of friction depends upon
a) Area of contact only b) Nature of surface only
c) Both a and b d) None of these
 - 4) Area under velocity time graph gives
a) displacement b) change in velocity
c) change in acceleration d) none of these
 - 5) Two trains A and B are moving on a parallel track in the same direction having velocity 100 kmph and 65 kmph respectively. The relative velocity of train A will respective to B is
a) -35 kmph b) 35 kmph c) 100 kmph d) 165 kmph

P.T.O.



- 6) A particle moves along a straight line such that its displacement at any time t is given by:
 $s = 3t^3 + 7t^2 + 14t + 5$. The acceleration of particle at $t = 1$ sec is
a) 18 m/s^2 b) 32 m/s^2 c) 29 m/s^2 d) 24 m/s^2
- 7) For a motion along circular path of radius r , centripetal acceleration is
a) $\frac{dv}{dt}$ b) $\frac{v^2}{r}$ c) $v^2 r$ d) v^3/r
- 8) A stone is whirled in a vertical circle. The tension in the string is greatest when the stone is
a) in the lowest position
b) in the highest position
c) in the position when string is horizontal
d) tension is equal in all position
- 9) The motion of a bicycle wheel is
a) Linear b) Rotary
c) Translatory d) Rotary as well as translatory
- 10) The apparent weight of a man in a lift is less than the real weight when lift is going
a) down with some acceleration b) up with some acceleration
c) with constant velocity d) none of above
- 11) The ratio of static friction to dynamic friction is always
a) $=1$ b) <1 c) >1 d) None of these
- 12) A system of two forces can be in equilibrium only if both the forces are
a) Equal in magnitude
b) Opposite in direction
c) Equal in magnitude and opposite in direction
d) None of the above
- 13) In a simply supported beam carrying symmetrical triangular load, the reactions will be
a) vertical b) horizontal c) inclined d) none of these
- 14) A framed structure of triangular shape is
a) Perfect b) Imperfect c) Difficult d) Redundant
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Seat No.	
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**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Use of nonprogrammable scientific calculators is **allowed**.
2) Figures to the **right** indicate **full marks**.

SECTION – I

2. Solve **any four** questions out of six. (4×3=12)
- a) State and explain Principle of Transmissibility of forces. 3
 - b) Define the terms :
 - 1) Perfect frame
 - 2) Deficient frame
 - 3) Redundant frame. 3
 - c) State and prove 'Theorem of Parallel Axis', for calculating moment of inertia of a plane lamina. 3
 - d) The beams AB is loaded and supported as shown in figure (1). B is a hinge support and A is a roller support. Determine only, the support reactions at B due to forces acting on the beam. 3

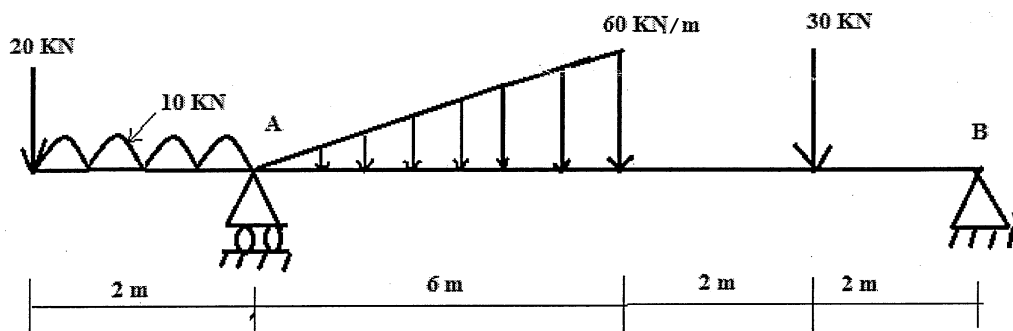


Fig. (1)



- e) A 'T' section is to be strengthened by adding a 10 mm thick plate on the upper side of the flange as shown in figure (2). Determine the top width 'W' of the plate, so that the centroid of the modified composite section, will lie at 200 mm distance from the bottom of the web.

3

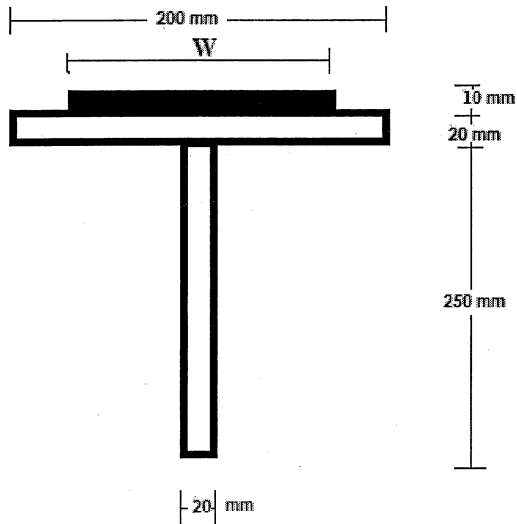


Fig. (2)

- f) Four forces are acting on equilateral plate of side 200 mm as shown in figure (3). Points D and E are the midpoints of the respective sides. Calculate only, the magnitude of the resultant of the force system.

3

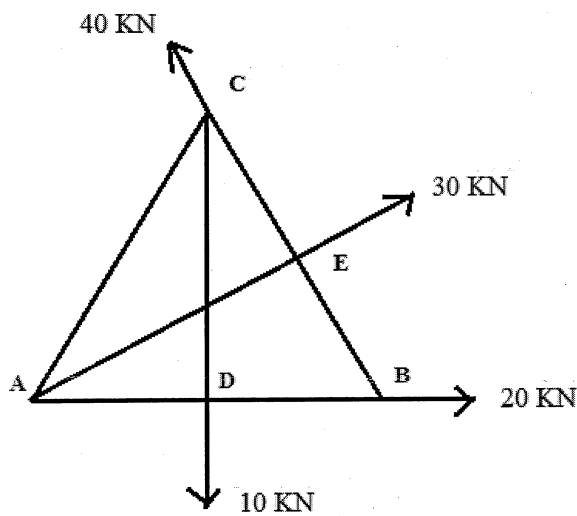


Fig. (3)



3. Solve **any two** questions of the following. (8×2=16)

- a) Two smooth cylinders with radius and weights as enlisted in table, are kept in a groove with slanting surfaces, as shown in figure (4). Determine the reactions at contact points. 8

Cylinder	Radius	Weight
1	125 mm	500 N
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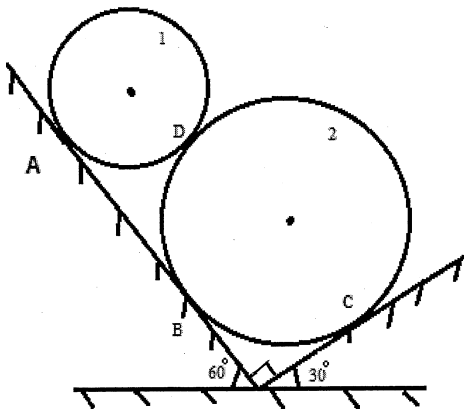


Fig. (4)

- b) Find forces in all the members of the truss, loaded as shown in figure (5). Support A in hinged support and support E is a roller support. 8

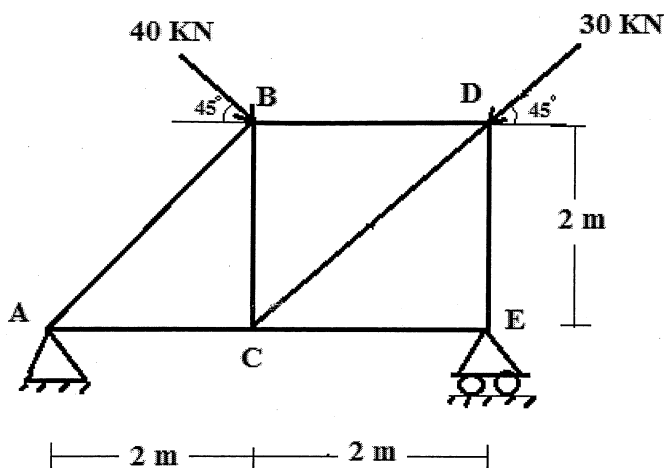


Fig. (5)



- c) Determine the moment of inertia of the L-Section as shown in figure (6) about its centroidal axes XX and YY, parallel to the legs. Also find the Polar moment of inertia of the section.

8

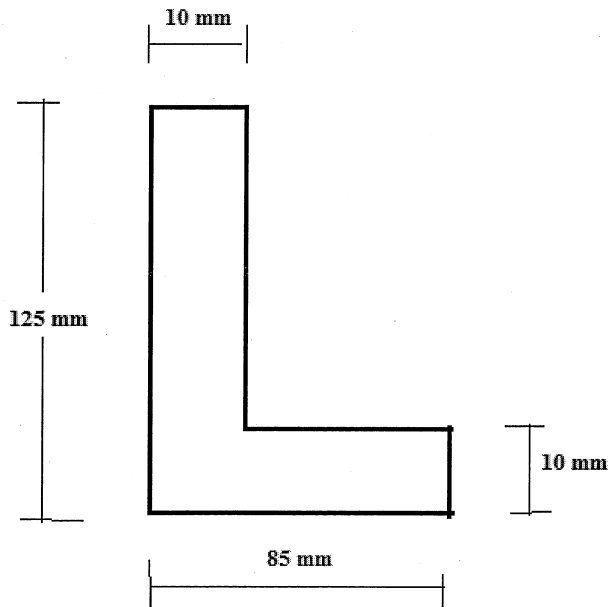


Fig. (6)

SECTION – II

4. Solve **any four** of the following. (4×3=12)
- Distinguish between Rectilinear motion and curvilinear motion. 3
 - Two balls having masses 10 kg and 30 kg are moving along a straight line towards each other at velocities 4 m/sec and 1 m/sec respectively. If coefficient of restitution $e = 0.6$, determine velocities of balls immediately after their collision. 3
 - Derive the general equation of projectile motion. 3
 - State and explain the D'Alembert's Principle. 3
 - A flywheel of mass 8 tonnes starts from rest and gets up a speed of 180 rpm in 3 minutes. Find average torque exerted on it, if radius of gyration of flywheel is 60 cm. 3
 - A train of total mass 300 ton descends an incline 1 in 120 with uniform velocity of 8 m/sec. If the frictional resistance to the train is 250 N/ton of mass, determine the power applied by the engine. 3

Set R



5. Solve **any two** of the following. (8×2=16)

a) An aeroplane is flying on a straight level course at 200 km per hour, at a height 1000 m above the ground. An anti aircraft gun located on the ground fires a shell with an initial velocity 300 m/sec, at the instant when the aeroplane is vertically above it. At what inclination to the horizontal, should the gun be fired to hit the aeroplane ? What time after firing, the gun shell will hit the aeroplane ? What will then be the horizontal distance of the aeroplane from the gun ? 8

b) Two weights $W_1 = 400\text{ N}$ and $W_2 = 100\text{ N}$ are connected by a string and move along a horizontal plane under the action of a force $P = 200\text{ N}$ applied horizontally to the weight W_1 as shown in figure. (Refer figure No. 7). The coefficient of friction between the weights and the plane is 0.25. Determine the acceleration of the weights and the tension in the string connecting the two weights. 8

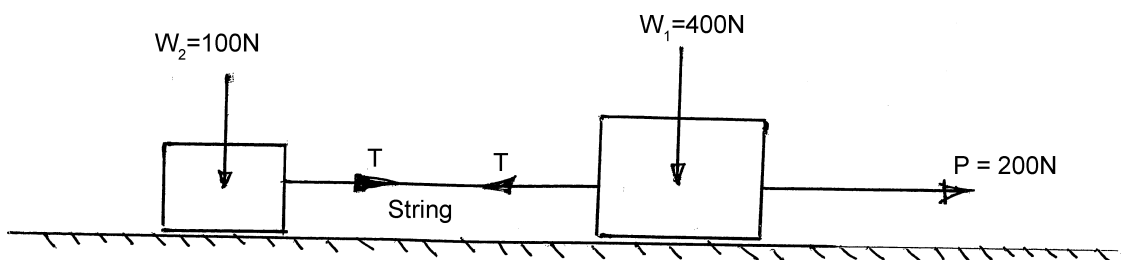


Fig. (7)

c) A car of mass 2 ton is powered by engine of 40 kW capacity. It starts from rest and attains maximum speed in 30 seconds. If the frictional resistance to the motion is 750 N/ ton mass, determine the maximum speed the car can attain. If after attaining the maximum speed, the engine is switched off; determine the distance it would travel, before coming to rest. 8



SLR-VB – 2

Set

S

Seat No.	
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**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017
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.
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MCQ/Objective Type Questions

Duration : 30 Minutes

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(1×14=14)

- 1) A particle moves along a straight line such that its displacement at any time t is given by:
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P.T.O.



- 6) The ratio of static friction to dynamic friction is always
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- 7) A system of two forces can be in equilibrium only if both the forces are
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b) Opposite in direction
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d) None of the above
- 8) In a simply supported beam carrying symmetrical triangular load, the reactions will be
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Seat No.	
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**F.E. (Part – I) (New-CBCS) Examination, 2017
APPLIED MECHANICS**

Day and Date : Friday, 5-5-2017

Marks : 56

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Use of nonprogrammable scientific calculators is **allowed**.
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SECTION – I

2. Solve **any four** questions out of six. (4×3=12)
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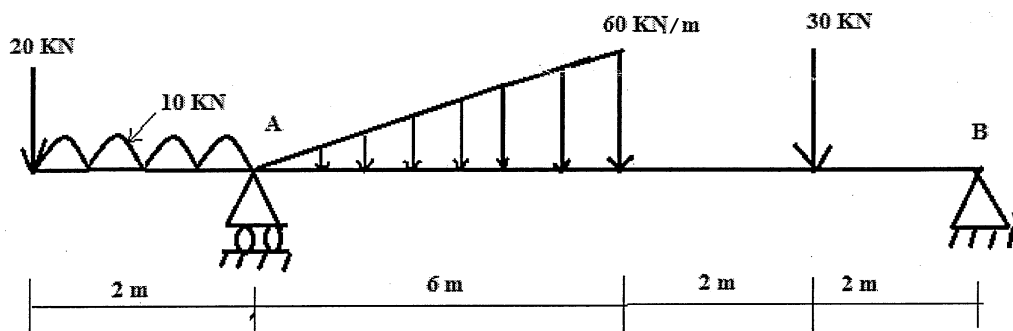


Fig. (1)



- e) A 'T' section is to be strengthened by adding a 10 mm thick plate on the upper side of the flange as shown in figure (2). Determine the top width 'W' of the plate, so that the centroid of the modified composite section, will lie at 200 mm distance from the bottom of the web.

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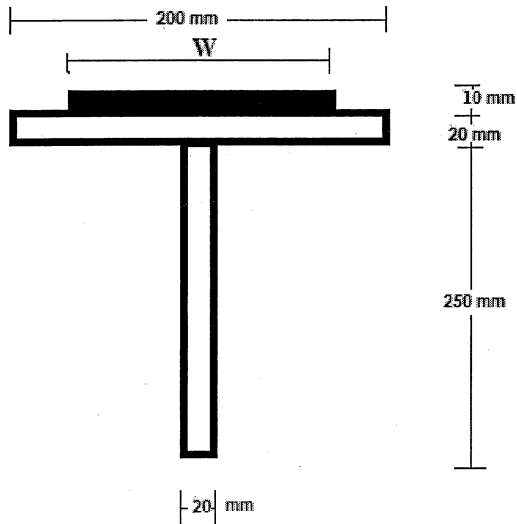


Fig. (2)

- f) Four forces are acting on equilateral plate of side 200 mm as shown in figure (3). Points D and E are the midpoints of the respective sides. Calculate only, the magnitude of the resultant of the force system.

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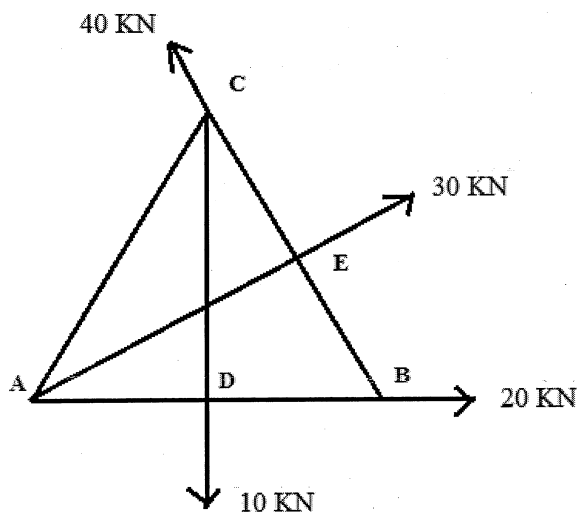


Fig. (3)



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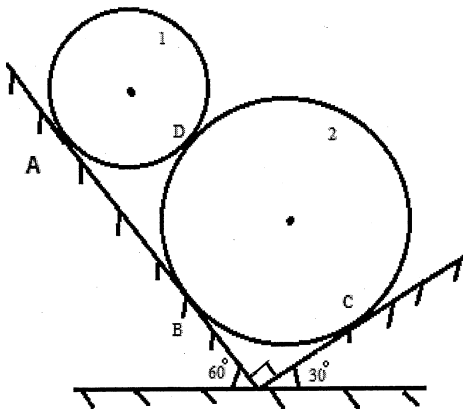


Fig. (4)

- b) Find forces in all the members of the truss, loaded as shown in figure (5). Support A in hinged support and support E is a roller support. 8

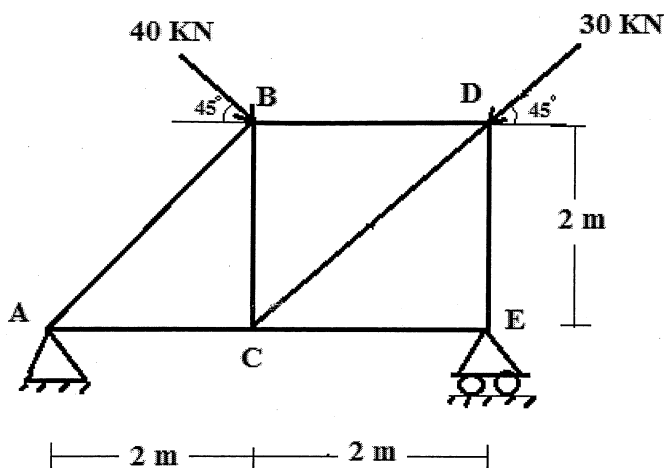


Fig. (5)



- c) Determine the moment of inertia of the L-Section as shown in figure (6) about its centroidal axes XX and YY, parallel to the legs. Also find the Polar moment of inertia of the section.

8

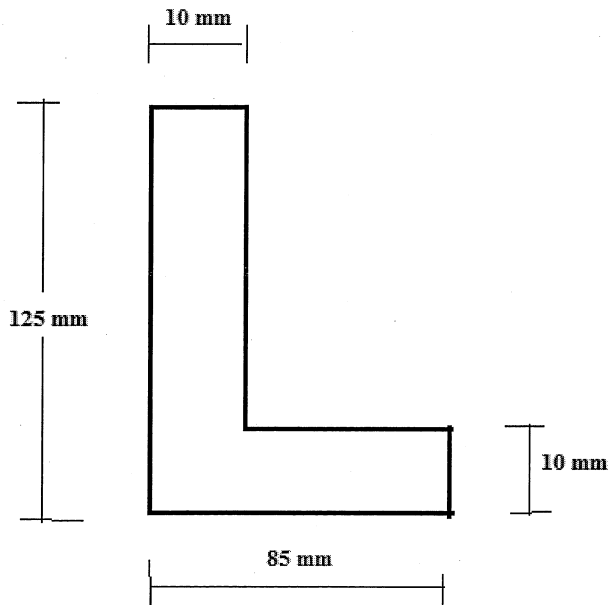


Fig. (6)

SECTION – II

4. Solve **any four** of the following. (4×3=12)
- Distinguish between Rectilinear motion and curvilinear motion. 3
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 - A train of total mass 300 ton descends an incline 1 in 120 with uniform velocity of 8 m/sec. If the frictional resistance to the train is 250 N/ton of mass, determine the power applied by the engine. 3

Set S



5. Solve **any two** of the following. (8×2=16)

a) An aeroplane is flying on a straight level course at 200 km per hour, at a height 1000 m above the ground. An anti aircraft gun located on the ground fires a shell with an initial velocity 300 m/sec, at the instant when the aeroplane is vertically above it. At what inclination to the horizontal, should the gun be fired to hit the aeroplane ? What time after firing, the gun shell will hit the aeroplane ? What will then be the horizontal distance of the aeroplane from the gun ? 8

b) Two weights $W_1 = 400\text{ N}$ and $W_2 = 100\text{ N}$ are connected by a string and move along a horizontal plane under the action of a force $P = 200\text{ N}$ applied horizontally to the weight W_1 as shown in figure. (Refer figure No. 7). The coefficient of friction between the weights and the plane is 0.25. Determine the acceleration of the weights and the tension in the string connecting the two weights. 8

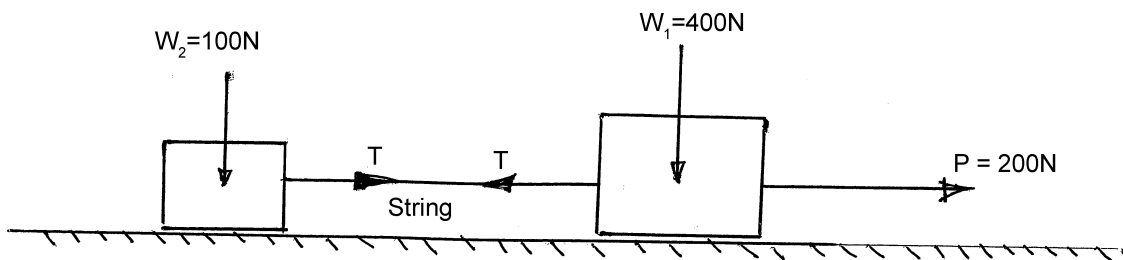


Fig. (7)

c) A car of mass 2 ton is powered by engine of 40 kW capacity. It starts from rest and attains maximum speed in 30 seconds. If the frictional resistance to the motion is 750 N/ ton mass, determine the maximum speed the car can attain. If after attaining the maximum speed, the engine is switched off; determine the distance it would travel, before coming to rest. 8

