Total No. of Questions : 8]

SEAT No. : ____

PE-4230

[Total No. of Pages : 2

[6582]-1
S.E. (Civil)
GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester - IV) (201008)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary and mention it clearly.***
5) ***Use of Calculator is allowed.***

Q1) a) Define Compaction. Compare between Compaction and consolidation. **[6]**

b) A soil sample has specific gravity 2.62 and Maximum Dry Density 1650 kg/m^3 at a moisture content of 10%. Find Degree of Saturation, air content and percentage air voids at Maximum Dry density. **[6]**

c) What is pressure bulb? Explain its significance and draw neat sketch of pressure bulb for concentrated point loading. **[5]**

OR

Q2) a) Write the equation for stresses in soil for point loading by Boussinesq's and Westergaard's theory and assumptions of these theorise. **[5]**

b) A concentrated load of 450 kN is applied at a ground surface compute the vertical pressure : **[6]**

i) At a depth 6m below the load

ii) At a distance 6m at same depth.

c) Explain standard proctor compaction test. **[6]**

Q3) a) Explain in detail Skempton's Pore pressure parameters. **[5]**

b) A soil sample fails under an axial stress of 250 kN/m^2 when laterally unconfined. The failure wedge is making an angle of 50° with horizontal. Calculate Cohesion & angle of internal friction of soil. **[6]**

c) Write short note on Thixotropy and Sensitivity of clay. **[6]**

OR

P.T.O.

Q4) a) Explain in detail factors affecting shear strength of soil. **[5]**

b) In vane shear test on clay, the following observations are made Applied Torgue : 180 kg cm, Height of vane : 10cm Diameter of Vane : 5cm, calculate shear strength of clay. **[6]**

c) Explain in detail Triaxial Compression Test. **[6]**

Q5) a) Explain in detail earth pressure at rest. Draw pressure distribution diagram for retaining wall with height h and Unit weight of soil in backfill = γ. **[6]**

b) Write short note on Coulomb's Wedge Theory in detail. **[6]**

c) A smooth vertical wall retains a level backfill with γ = 20 kN/m^3, $\Phi = 32^o$ and C=0 to a depth of 8m. Draw lateral pressure diagram and compute the total thrust on the retaining wall. What will be active pressure if water stands at a depth of 3.5m? **[6]**

OR

Q6) a) Explain Rebhann's graphical method for determination of earth pressure on retaining wall. **[6]**

b) In a cohesionless soil deposit having unit weight of 20 kN/m^3 and $\Phi = 32^o$. Determine active and passive lateral pressure intensities at depth of 8m. **[6]**

c) Discuss points of difference between Rankines and Coulombs theory of earth pressure. **[6]**

Q7) a) Determine the critical height of excavation for vertical cut in cohesive soil, if C=20kN/m^3 and γ = 20kN/m^3. **[6]**

b) Differentiate between Finite and Infinite slopes. **[6]**

c) What is stability number? What is its utility in the analysis of stability of slopes. **[6]**

OR

Q8) a) Determine the stability number for vertical cut in a cohesive soil with following details, γ = 18 kN/m^3, C = 15 kN/m^3, $\Phi = 32^o$. **[6]**

b) What are the assumptions that are generally made in the analysis of slopes? Discuss validity of such assumptions in brief. **[6]**

c) Discuss various types of slope failures in detail. **[6]**

❖❖❖

Total No. of Questions : 8]

SEAT No. : ____

PE-4231

[Total No. of Pages : 3

[6582]-2
S.E. (Civil)
SURVEY
(2019 Pattern) (Semester - IV) (201009)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

Q1) a) State the principle of stadia techometry? What are the types of stadia. **[6]**

b) What do you mean by Profile Levelling and Cross Sectioning? **[5]**

c) Determine the grandient from a point A to a point B from the following observations made with tachometer fitted with an anallactic lens. The constant of the instrument was 100 and staff was held vertically: **[7]**

Inst Point	Staff point	Bearing	Vertical Angle	Staff Readings
p	A	134º	+10º32'	1.360, 1.915,2.470
	B	224º	+5º6'	1.065, 1.885, 2.705

OR

Q2) a) Explain the procedure for finding out tachometric constant. **[6]**

b) Enlist & explain various errors in the tachometric survey. **[5]**

c) A tachometer is set up at an intermediate point on a traverse course PQ and the following observations are made on a vertically held staff : **[7]**

Staff Station	Vertical Angle	Staff Intercept	Axial Hair readings
P	+8º36'	2.350	2.105
Q	+6º6'	2.055	1.895

The instrument is fitted with an anallactic lens and the constant is 100. Compute the length of PQ and reduced level of Q, that of P being 321.50 meters.

P.T.O.

Q3) a) Explain the method of setting out curve by Rankine's method. **[5]**

b) State various obstacles in setting out curves. Explain the procedure of setting out simple curve when point of intersection is inaccessible. **[5]**

c) The chainage of the intersection point of two straights is 1060 m and the angle of intersection is 120º. If radius of a circular curve to be set out is 570 m and peg interval is 30m. Determine the tangent length, the length of the curve, the chainage at the beginning and end of the curve, the length of the long chord, the length of the sub-chords and the total number of chords. **[7]**

OR

Q4) a) Draw compound curve with its all components. **[5]**

b) Enlist various linear methods of setting out curves and explain any one with sketch. **[5]**

c) A circular curve of 250 m radius is to be set out between two straights having deflection angle of 45º20' right and chainage of the point of intersection as 2250 m. Calculate the necessary data for setting out the curve by the method of offsets from the chords produced taking the peg interval as 20 m. **[7]**

Q5) a) Explain with neat sketch-setting out of Tunnels. **[6]**

b) State applications of Space-Based Positioning System (SBPS). **[6]**

c) Explain the need of establishing horizontal and vertical controls. **[6]**

OR

Q6) a) Explain the conduction of open traversing surveying work. **[6]**

b) State the names of satellites and write note on GLONASS. **[6]**

c) Write note on checking verticality of tall building. **[6]**

Q7) a) Differentiate between Terrestrial photogrammetry and Aerial photogrammetry. **[5]**

b) What do you mean by triangulation and trilateration in geodetic survey? **[6]**

c) State the classification and application of photogrammetry in surveying. **[6]**

OR

Q8) a) What are objectives of hydrographic survey? **[5]**

b) What are different methods of sounding. State any one method in detail. **[6]**

c) State the working principle and applications of total station. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4232

[Total No. of Pages : 4

[6582]-3
S.E. (Civil Engineering)
CONCRETE TECHNOLOGY
(2019 Pattern) (Semester - IV) (201010)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable calculator is allowed.***
5) ***If necessary, assume suitable data and indicate clearly.***

Q1) a) Explain importance of abrasion testing also explain abrasion testing. **[6]**

b) Explain rebound hammer test with its limitations. **[6]**

c) Explain the relationship between compressive strength and tensilestrength of concrete. **[6]**

OR

Q2) a) State the various types of non-destructive tests carried on hardened concrete. Explain ultrasonic pulse velocity test with its limitations. **[6]**

b) Explain the compressive strength of concrete. How it is determined in laboratory **[6]**

c) Explain the stress-strain relationship of concrete with neat sketch. **[6]**

Q3) a) Define concrete mix design. Enlist objectives in mix design. **[6]**

b) Explain DOE method of concrete mix design. **[6]**

c) What do you mean by : **[6]**

i) Mean strength

ii) Variance

iii) Standard deviation

iv) Coefficient of variation

P.T.O.

OR

Q4) a) Using Indian Standard recommended guidelines, design a concrete mixfor a reinforced concrete structure to be subjected to the mild exposure conditions for the following requirements: **[13]**

A) Stipulations for proportioning
   i) Grade designation: M30
   ii) Standard deviation, s = 5
   iii) Type of cement: OPC 53 grade conforming to IS 8112
   iv) Workability : 75 mm (slump)
   v) Degree of supervision: Good
   vi) Exposure condition: Moderate
   vii) Type of aggregate: Angular coarse 20 mm aggregate,
   viii) Minimum and maximum cement content 300 kg/m3and 450 kg/m^3 respectively

B) Test data for materials
   i) Specific gravity of cement: 3.15
   ii) Specific gravity of:
      (I) Coarse aggregate - 2.74
      (II) Fine aggregates - 2.74
   iii) Water absorption:
      (I) Coarse aggregates - 0.5 %
      (II) Fine aggregates - 1.00 %
   iv) Free surface moisture :
      (I) Coarse aggregates - Nil (absorbed moisturealso nil)
      (II) Fine aggregates - Nil
   v) Sieve analysis
      (I) Coarse aggregate :

IS Sieve sizes in mm	Analysis of coarse aggregate fraction		Percentage of different fractions			Remarks
	I	II	I (60%)	II (40%)	Combined (100%)	Confirming of table 2 of IS 383
20	100	100	60	40	100	
10	0	71.2	0	28.5	28.5	
4.75		9.40		3.7	3.7	
2.36		0				

(II) Fine aggreatate : Conforming to grading zone I

(III) Design considerations :

Table 1: From IS 10262: Maximum water content per cubic meter ofconcrete :

Sr. No.	Nominal Maximum Size of aggregate in mm	Maximum water content in kg
1	10	208
2	20	186
3	30	165

Table 2: From IS 10262; Volume of Coarse Aggregate per UnitVolume of Total Aggregate:

Sr.No	Nominal Maximum size of aggregate in mm	Volume of coarse aggregate per unit volume of total aggregate for differentzone of fine aggregate			
		Zone I	Zone II	Zone III	Zone IV
1	10	0.50	0.48	0.46	0.44
2	20	0.66	0.64	0.62	0.60
3	30	0.75	0.73	0.71	0.69

Table 3: From IS 456, Different Exposure conditions for reinforcedconcrete

Exposure	Minimum cement content (kg/m^3)	Maximum water cement ratio	Minimum grade of concrete
Mild	300	0.55	M20
Moderate	300	0.50	M25
Severe	320	0.45	M30
Very Severe	340	0.45	M35
Extreme	340	0.40	M40

b) Enlist the factors influencing concrete mix design and explain in detail. **[5]**

Q5) a) Describe the cold and hot weather concreting. **[6]**

b) Discuss the self-compacting concrete (SCC) with its advantages. **[6]**

c) Describe the types of vibrators used for compaction of concrete. **[6]**

OR

Q6) a) Write short note on : **[12]**

i) Roller compacted concrete

ii) Under water concreting

iii) Ready mix concrete

b) Explain the ferrocement technology with its applications. **[6]**

Q7) a) Define durability of concrete. Explain its significance and discuss thefactors affecting the durability of concrete. **[6]**

b) What do you mean by retrofitting of concrete and explain use of fiber reinforced polymer concrete for retrofitting. **[5]**

c) Write short note on Carbonation of concrete. **[5]**

OR

Q8) a) Write short note on : **[6]**

i) Sulphate attack on concrete

ii) Chloride attack on concrete

b) Explain in detail corrosion monitoring techniques of reinforcement andpreventive measures against corrosion. **[5]**

c) Define the term permeability of concrete. What measures should be taken to reduce permeability of concrete? **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-4233

[Total No. of Pages : 5

[6582]-4
S.E. (Civil Engineering)
STRUCTURAL ANALYSIS
(2019 Pattern) (Semester - IV) (201011)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) Analyze the continuous beam by slope deflection method as shown in Fig. 1a. **[8]**

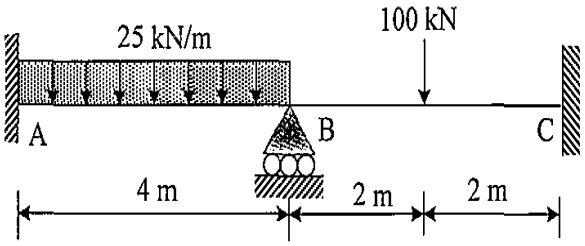


Fig. 1 a

b) Analyze the portal frame by slope deflection method as shown in Fig. 1b. **[10]**

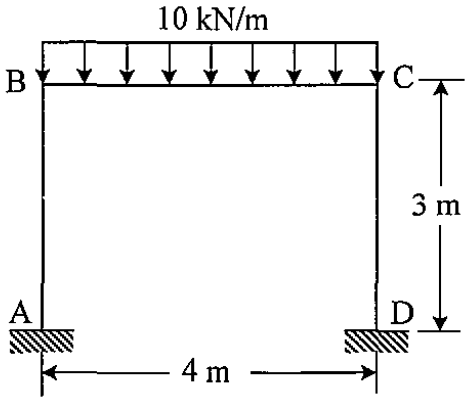


Fig. 1 b

P.T.O.

OR

Q2) a) Analyze the propped cantilever by slope deflection method as shown in Fig. 2 a. **[8]**

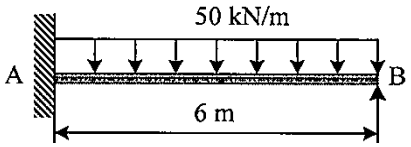


Fig. 2a

b) Analyze the portal frame by slope deflection method as shown in Fig. 2 b. **[10]**

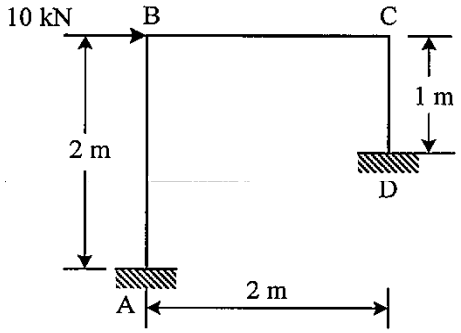


Fig. 2 b

Q3) a) Analyze the continuous beam by moment distribution method as shown in Fig. 3 a. **[8]**

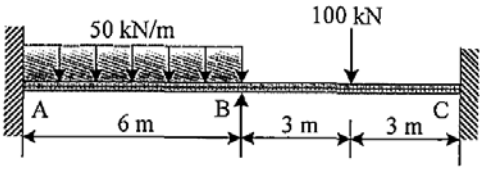


Fig. 3 a

b) Analyze the portal frame by moment distribution method as shown in Fig. 3 b **[10]**

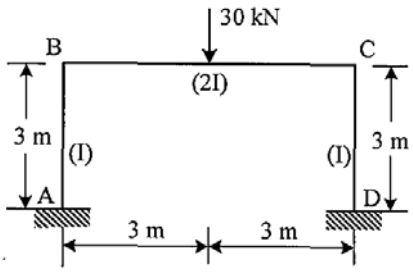


Fig. 3 b

OR

Q4) a) Analyze the propped cantilever by moment distribution method as shown in Fig. 4 a and draw bending moment diagram. **[8]**

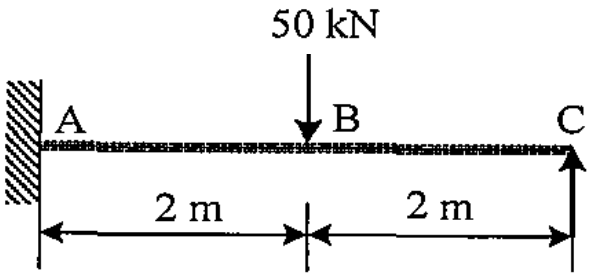


Fig. 4a

b) Analyze the portal frame by moment distribution method as shown in Fig. 4 b. **[10]**

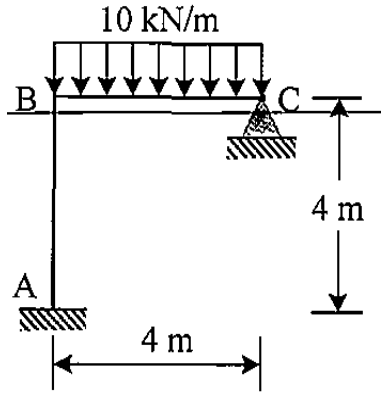


Fig. 4 b

Q5) a) Analyze the continuous beam by stiffness method as shown in Fig. 5a. **[12]**

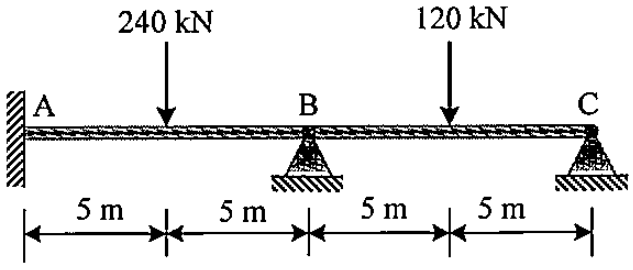


Fig. 5 a

b) Generate the stiffness matrix for the bent as shown in Fig. 5 b. **[5]**

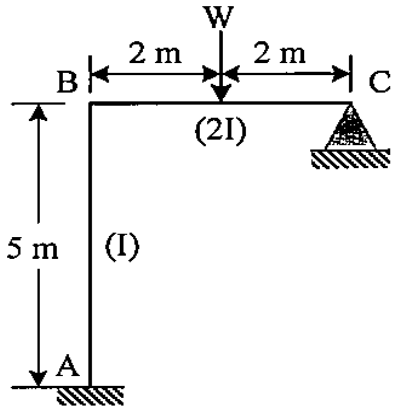


Fig. 5 b

OR

Q6) a) Analyze the continuous beam by stiffness method as shown in Fig. 6 a. **[12]**

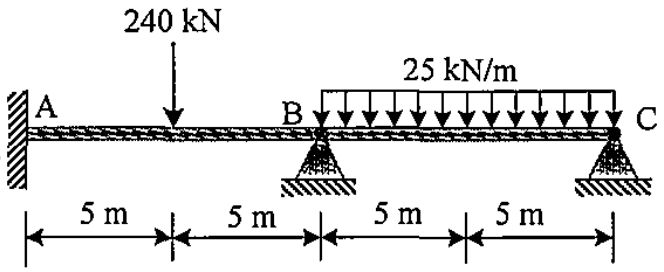


Fig. 6a

b) Generate the stiffness matrix for the frame as shown in Fig. 6 b. **[5]**

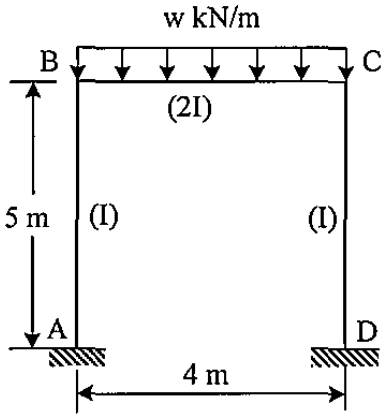


Fig. 6 b

Q7) a) Explain in details idealized stress strain curve. **[5]**

b) A propped cantilever is loaded with ultimate load as shown in Fig. 7 b. Find the collapse load and draw B M diagram. **[12]**

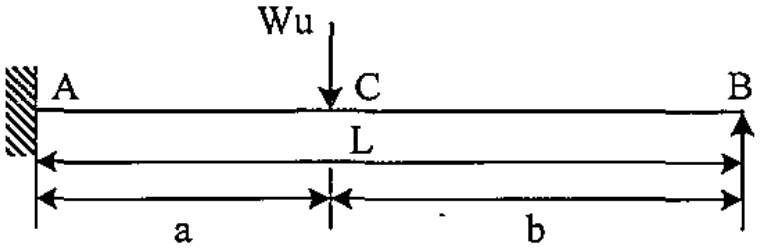


Fig. 7 b

OR

Q8) a) State and explain classification of cross section with stress distribution. **[5]**

b) Calculate shape factor of I- section as per following dimension. Top and bottom flange: 150 mm wide and 10 mm thick Web : 280 mm deep and 10 mm thick **[12]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4234

[Total No. of Pages : 3

[6582]-5
S. E. (Civil)
PROJECT MANAGEMENT
(2019 Pattern) (Semester - IV) (201012)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams where necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain any six safety programms that you are going to implement on construction of a Tunnel site _____ **[6]**

b) Explain what do you understand by fleet management. **[6]**

c) The construction company situated in Pune is in Sus. The annual demand for the correct is 3500 units. The unit cost is 8 Rs and the inventory carrying cost is 25% of the average inventory cost. If the cost of procurement is Rs 75. Determine **[6]**

i) Economic order quantity

ii) Number of orders per Annum

iii) Total cost of purchasing

OR

Q2) a) Define the term **[6]**

i) Lead time

ii) Procurement

iii) Indents

iv) ABC

b) Explain the various factors to be considered for an equipment management of a construction of an flyover. **[6]**

c) Give an site layout of a construction site you have visited and explain any 4 points of the site layout. **[6]**

P.T.O.

Q3) a) Explain what do you understand by Earned Value Analysis. **[6]**

b) State various methods of project monitoring. Explain any one in brief. **[6]**

c) What are the various benefits of project management software. **[6]**

OR

Q4) a) Explain the case study that you have studied for a small project and explain any 6 Activities. **[6]**

b) Explain what do you understand by Network crashing. **[6]**

c) Differentiate between Primavera & MS project. **[6]**

Q5) a) Explain the law of Diminishing Marginal utility with suitable example. **[6]**

b) Explain the various sources of project finance. **[6]**

c) A Reputed construction company borrowed Rs 15,00,000 Lakhs from State Bank of India Katraj Branch for its Industrial project. They have to pay 12% interest P.A. for 6 years. Find out the total Amount to be paid by the construction company after 6 years by Compounding Interest & Simple Interest. **[5]**

OR

Q6) a) Define the terms **[6]**

i) Cost

ii) Value

iii) Price

iv) Rent

v) Simple interest

vi) Compound interest

b) Write short note on Equity Share and Debentures. **[6]**

c) Rushi purchased a car for Rs 3,20,000 he spend Rs 20,000 for Repair and 10,300 for other. At what price should be sell the car to cost earn the profit for Rs 15,000. **[5]**

Q7) a) Explain any 6 points for the project selection of a dam. **[6]**

b) Write short note on **[6]**

i) Break Even Analysis

ii) Benefit Cost Analysis

c) Explain the Role of Project Manager in Past Tender. **[5]**

OR

Q8) a) Explain IRR method with formula and selection criteria. **[6]**

b) Write short note on **[6]**

i) Social Appraisal

ii) Economical Appraisal

c) Explain pay back period method with formula and suitable method. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE4235

[Total No. of Pages : 3

[6582]-6

S.E. (Civil)

BUILDING TECHNOLOGY AND ARCHITECTURAL PLANNING

(2019 Pattern) (Semester - III) (201001) (Theory)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat Diagram must be drawn wherever necessary.***
4) ***Assume Suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Explain paneled door with a neat labelled sketch. **[6]**

b) State the various requirements of good roof. **[6]**

c) Explain the defects in plastering. **[5]**

OR

Q2) a) Enlist various types of fixtures for door and explain anyone with a neat sketch. **[6]**

b) Write a short note on protective coatings, its necessity and types. **[6]**

c) Explain in brief, the following : **[5]**

i) Timber Lintel

ii) Stone lintel

Q3) a) A ground floor line plan is to be proposed to a client. Following are requirements **[13]**

Living room - 25 sq. mt
Kitchen plus Dining - 15 sq. mt
Bedroom - 20 sq. mt
Master Bedroom - 20 sq. mt
Common Bathroom - 2.5 sq. mt
Common WC - 1.2 sq. mt
Assume Circulation width, staircase, etc. as per the bye laws.
Also mention opening schedule. Assume suitable scale and suitable data if necessary.

b) Write a short note on Green Building certification in India. **[5]**

OR

P.T.O.

Q4) a) Write a note on rating system for green building. **[6]**

b) Draw a neat labeled sketch of following stairs, **[6]**

i) Spiral stair

ii) Half turn geometrical stair

iii) Three-Quarter-Turn stair

c) What are the salient features of Green Building? **[6]**

Q5) a) Draw a line plan of the Post Office using suitable scale. **[13]**

Entrance and circulation area - 30 sq. mt

Counters - Height 1.6 m, Width 0.7m

Post Master Cabin - 15 sq. mt

Staff working area - 30 sq. mt

Post Sorting area - 30 sq. mt

Sanitary block for staffs - 7.5 sq. mt

Custody area - 10 sq. mt

Speed Post section - 12 sq. mt

Cash transaction room - 12 sq. mt

b) Explain in brief functional components and dimensions of Cinema Hall.**[5]**

OR

Q6) a) It is proposed to construct a bungalow for a Superintendent of Police.**[13]**

The following are the requirements for accommodation :

i) A drawing hall - 20 m^2

ii) Living room - 30 m^2

iii) Kitchen cum dining room - 20 m^2

iv) Guest bedroom - 20 m^2

v) Children's room - 20 m^2

vi) Master bedroom - 20 m^2

- Provide adequate verandahs, passages, sanitary units, staircase etc.
- The structure may be planned as G + 1 RCC framed structure.
- Draw detailed "ground floor plan" and give schedule of openings and minimum three construction notes.

b) What are the salient features of engineering student's hostel building?**[5]**

Q7) a) What do you understand by Master Plan? **[5]**

b) Write a short note on TDR explaining eligibility criteria and documents required for the same. **[6]**

c) What are Acoustic Defects? Explain any two in short. **[6]**

OR

Q8) a) Write a short note on 7/12 abstract, it's important and meaning of every term on it? **[6]**

b) Explain with sketches, wind and stack effect. **[6]**

c) Write a short note on land use zoning and mention the requirements of each. **[5]**

x x x

Total No. of Questions : 8]

SEAT No. :

PE4236

[Total No. of Pages : 4

[6582]-7
S.E. (Civil Engineering)
MECHANICS OF STRUCTURES
(2019 Pattern) (Semester - III) (201002)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q. 6, Q.7 or Q.8.***
2) ***Assume suitable data, if necessary.***
3) ***Use of Non-programmable calculator is allowed.***

Q1) a) A cantilever beam of span 1.5m is carrying uniformly distributed load of 50kN/m on entire span. The beam is rectangular having 230mm width and 450 mm depth.

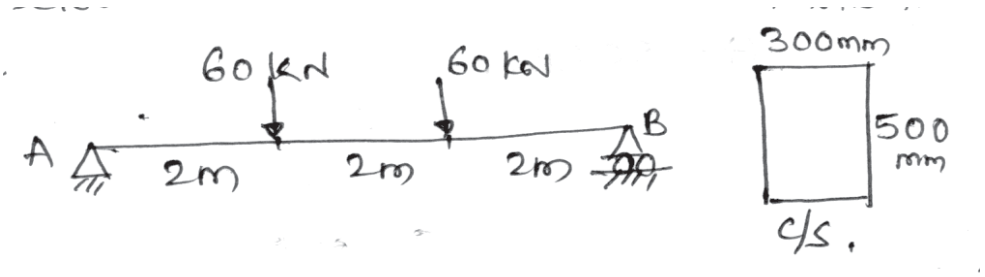
Determine maximum bending stress and draw Bending stress Distribution diagram. **[8]**

b) A beam of 'T' section having flange of 800 mm × 50 mm and web of 600 mm × 30mm, is subjected to load, due to which shear force of 100kN is induced in the beam.

Draw shear stress Distribution diagram. **[9]**

OR

Q2) a) A simply supported beam of rectangular cross section is carrying two point loads of 60 kN, each at 2m from each support as shown. The cross section of the beam is shown below. Draw Bending stress Distribution diagram. **[8]**



b) Draw shear stress Distribution diagram for the beam having maximum shear force 150kN. The beam is symmetric 'I' section having- **[9]**

flanges : 600 mm × 40 mm

web : 800 mm × 40 mm

P.T.O.

Q3) a) A solid circular shaft is used to transmit 50 kW at 220 rpm.

The maximum permissible shear stress is 110 N/mm^2 and the angle of twist is not to exceed 1° in the length of 2m. Calculate the diameter of the shaft for safe transmission of the power. **[9]**

b) The principal stresses at a point across two mutually perpendicular planes are 110 N/mm^2 and 85 N/mm^2, both are tensile, Determine the normal, tangential and resultant stress on a plane 30° with major principal plane.**[8]**

OR

Q4) a) A hollow circular shaft of 250 mm exrernal diameter and thickness 20 mm is rotating at 150 rpm. The angle of twist in 4m length was found to be 0.8^o. Calculate the power transmitted by the shaft and the maximum shear stress induced.

G = 80 Gpa. **[9]**

b) Direct stresses of 200 N/mm^2 tensile & 100 N/mm^2 compressive are acting on two perpendicular planes at a point in a body. These stresses are accompanied by shear stresses on the planes. The major principal stress is 250 N/mm^2 Determine the magnitude of shear stresses on the planes also calculate maximum shear stress at the point. **[8]**

Q5) a) State the assumptions made in Euler's theory and its limitations. **[4]**

b) Determine the crippling load given by Rankine's formula for a tubular strut 3.5m long having outer diameter 50mm and inner diameter 40 mm.**[7]**

Assume both ends pinjointed. Consider f_y = 315 mpa and $\alpha = \frac{1}{7000}$

c) A rectangular column of 500 mm ×300 mm is carrying a compressive load of 150 kN acting at an eccentricity of 40 mm in a plane bisecting 300 mm side. Determine maximum and minimum stresses. **[7]**

OR

Q6) a) Explain core of a section. Determine core of section for a rectangular column of size B×D. **[6]**

b) Determine crippling load by Euler's formula for a column 5m long with one end fixed and other end hinged. The diameter of the solid column is 60 mm E = 210 Gpa. **[6]**

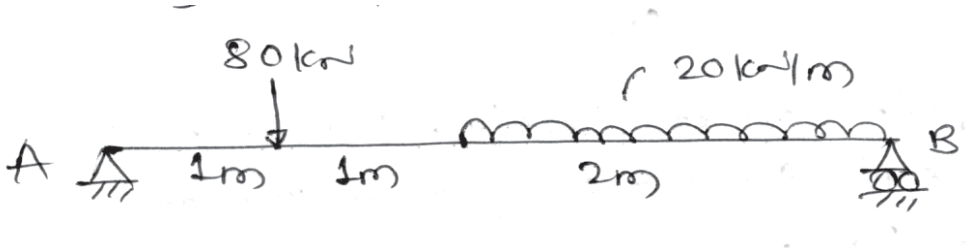
c) A hollw tabular steel strut is 3m long and having outer diameter 60mm and inner diameter 50 mm. **[6]**

Both end of the column are hinged. Consider yield stress as 315 N/mm^2 and Rankines constant as $\frac{1}{7500}$ modulus of elasticity is 205 Gpa.

Determine crippling load by using Rankine's formula.

Q7) a) A cantilever beam of span 'L' is carrying uniformly distributed load of 'W' kN/m on entire span of the beam. Determine maximum slope and deflection in the beam. Use strain Energy method or MaCaulay's method. **[9]**

b) Determine maximum slope and central deflection for a simply supported beam, shown in the figure below. **[9]**



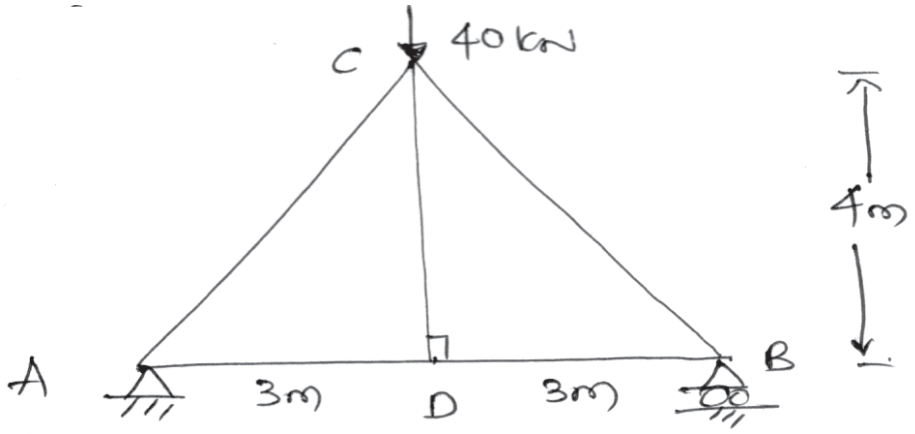
OR

Q8) a) Determine slope and deflection for a cantilever beam at its free end. The span of the beam is 1m and it is carrying a uniformly distributed load of 30kN/m on entire span, along with a point load of 60 kN at its free end. Use MaCaulay's method. **[9]**

b) Determine horizontal displacement at joint ‘C’ of th truss. **[9]**

The cross sectional area of each member is 250 mm^2

E = 200 Gpa



Total No. of Questions : 8]

SEAT No. : ____

PE4237

[Total No. of Pages : 3

[6582]-8
S.E. (Civil)
FLUID MECHANICS
(2019 Pattern) (Semester - III) (201003)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Answers to the all questions should be written in single answer-book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator (non programmable) and steam tables is allowed.***
6) ***Assume Suitable data if necessary.***

Q1) a) A 7.25 m height and 15.5 m long spillway discharges 95 m^3/s discharge under a head of 2.1 m. If a 1 : 9 scale model of this spillway is to be constructed, determine model dimensions, head over the spillway model and the model discharge. If model experiences a force of 7550 N, determine the force on prototype. **[9]**

b) Explain in brief : **[8]**

i) Boundary layer thickness

ii) Displacement thickness

iii) Momentum thickness and Energy thickness

OR

Q2) a) What is meant by Similitude? Explain in brief : **[9]**

i) Dynamic similarity

ii) Kinematic similarity and

iii) Geometric similarity

b) Find the momentum thickness, displacement thickness and energy thickness for velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u = U at $y = \delta$, where δ = boundary layer thickness. Also calculate the value of $\frac{\delta^*}{\theta}$. **[8]**

P.T.O.

Q3) a) In case of flow of viscous fluid through circular pipe, show that the ratio of maximum velocity to average velocity = 2.0. **[9]**

b) Explain the procedure of Hardy Cross method for the analysis of pipe network. **[8]**

OR

Q4) a) In case of velocity distribution in turbulent flow in pipes, derive the following equation with usual notations. **[9]**

$$\frac{u_{max} - u}{u_*} = 5.75 \log_{10}\left(\frac{R}{y}\right)$$

b) A pipe line of 0.6 m diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in the discharge if $4f = 0.04$. The head at the inlet is 310mm. **[8]**

Q5) a) Derive with usual notations the basic governing "Continuity Equation" of channel flow. **[9]**

b) Derive the conditions for most economical triangular channel section. **[9]**

OR

Q6) a) A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 41 m^2. Find the dimensions of the section and draw the sketch of it, if it is most economical. Determine the discharge of the most economical section if C = 50. **[9]**

b) i) Explain with neta sketch "Velocity distribution in open channel". **[4]**

ii) Derive with usual notations the following expression for critical depth. **[5]**

$$h_c = \left(\frac{q^2}{g}\right)^{1/3}$$

Q7) a) Derive the following equation of GVF with usual notations. State also the assumption made for it. **[10]**

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - \frac{Q^2 T}{g A^3}}$$

b) A jet plane which weighs 29450 N and has a wing area of 20 m^2 flies at a velocity of 250 km/hr. When the engine delivers 7358 kW, 65% of the power is used to overcome the drag resistance of the wing. Calculate the co-efficient of lift and co-efficient of drag for the wing. Take density of air equal to 1.21 kg/m^3. **[8]**

OR

Q8) a) A wide rectangular channel carries a flow of 11 $m^3/s/m$ width of the channel with bed slope of 1 in 3500 and Manning's n = 0.015. If the depth at a section is 4.5m, determine how far upstream or downstream of the section, the depth of flow would be within 5% of the normal depth. Use direct step method with two steps. Classify and sketch the profile. **[12]**

b) Explain with neat sketch :

i) Karman Vortex Trail **[3]**

ii) Polar Diagram **[3]**



Total No. of Questions : 9]

SEAT No. : ____

PE4238

[Total No. of Pages : 5

[6582]-9

S.E. (Civil)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - III) (207001)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Answer Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt the following :

a) If $\Sigma xy = 190, \bar{x} = 4, \bar{y} = 4, n = 10, \sigma_x = 1.732, \sigma_y = 2$ then correlation coefficient $r(x\,y)$ is **[2]**

i) 0.91287 ii) 0.8660

iii) 0.7548 iv) 0.5324

b) The mean and standard deviation of binomial probability distribution are 36 and 3 respectively. Number of trials n is **[2]**

i) 42 ii) 36

iii) 48 iv) 24

c) The curl of vector field $\bar{F} = x^2 y\,\bar{j} + xyz\,\bar{j} + z^2 y\,\bar{k}$ at point (0, 1, 2) is **[2]**

i) $4\bar{i} - 2\bar{j} + 2\bar{k}$ ii) $4\bar{i} + 2\bar{j} + 2\bar{k}$

iii) $4\bar{i} + 2\bar{k}$ iv) $2\bar{i} + 4\bar{k}$

d) ∇r^n is _____. **[2]**

i) nr^{n-1} ii) $\frac{r^{n+1}}{n+1}\bar{r}$

iii) $\frac{3r^{n-2}}{r}$ iv) $n\,r^{n-2}\bar{r}$

P.T.O.

e) $\nabla \times \bar{r}$ is **[1]**

i) $\bar{r}$ ii) 3

iii) $\frac{\bar{r}}{r}$ iv) $\bar{0}$

f) Line of regression y on x is **[1]**

i) $y - \bar{y} = r\frac{\sigma_y}{\sigma_x}(x - \bar{x})$ ii) $y + \bar{y} = r\frac{\sigma_y}{\sigma_x}(x + \bar{x})$

iii) $x - \bar{x} = r\frac{\sigma_x}{\sigma_y}(y - \bar{y})$ iv) $x - \bar{x} = r\frac{\sigma_y}{\sigma_x}(y - \bar{y})$

Q2) a) The first four moments of a distribution about the value 2 are 2, 10, 20 and 25. Find first four moments about mean, coefficient of skewness and kurtosis. **[5]**

b) Calculate the coefficient of correlation for the following data. **[5]**

x	–1	1	2	4	6	7
y	–1	2	3	3	5	8

c) An unbiased coin is thrown 10 times. Find probability of getting. **[5]**

i) Exactly 6 heads.

ii) At least 6 heads

OR

Q3) a) Obtain regression line y on x for the following data **[5]**

x	6	2	10	4	8
y	9	11	5	8	7

b) On an average 180 cars per hour pass a specified point on a particular road. Using poission distribution. Find the probability that at least two cars pass the point in any one minute. **[5]**

c) In a sample of 1000 cases, the mean score in a certain examination is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find the expected number of students scoring between 12 and 15 (both inclusive). **[5]**

(Given : $Z_1 = 0.4$, $A_1 = 0.1554$; $Z_2 = 0.8$, $A_2 = 0.2881$)

Q4) a) Find the angle between the tangent to the curve **[5]**

$\bar{r} = \left(t^3 + 2\right)\bar{i} + \left(4t - 5\right)\bar{j} + \left(2t^2 - 6t\right)\bar{k}$ at $t = 0$ and $t = 1$.

b) Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at point (2, –1, 2) in the direction $2\bar{i} - 3\bar{j} + 6\bar{k}$. **[5]**

c) Given $\bar{u} = xyz\bar{i} + \left(2x^2z - y^2x\right)\bar{j} + xz^3\bar{k}$ **[5]**

$\phi = xy + yz + z^2$ at point (1,0,–1)

Find

i) $\nabla \cdot \bar{u}$

ii) $\nabla \times \bar{u}$

iii) $\nabla \cdot \left(\phi\bar{u}\right)$

OR

Q5) a) If $\bar{r}\left(t\right) = t^2\bar{i} + t\bar{j} - 2t^3\bar{k}$ then evaluate $\int_0^1 \bar{r} \times \frac{d^2\bar{r}}{dt^2} dt$. **[5]**

b) Show that vector field $\bar{F} = \left(x^2 - yz\right)\bar{i} + \left(y^2 - zx\right)\bar{j} + \left(z^2 - xy\right)\bar{k}$ is irrotational. Find the scalar potential ϕ such that $\bar{F} = \nabla\phi$. **[5]**

c) For constant vector $\bar{a}$. Show that **[5]**

i) $\nabla\left(\bar{a} \cdot \bar{r}\right) = \bar{a}$

ii) $\nabla \times \left(\bar{a} \times \bar{r}\right) = 2\bar{a}$

Q6) a) Evaluate the line integral $\int_C \bar{F} \cdot \overline{dr}$ around the parabolic are $y^2 = x$ joining points (0, 0) and (1, 1). **[5]**

b) Evaluate $\iint_S \bar{F} \cdot \hat{n}\, ds$ where 's' is the surface of cylinder $x^2 + y^2 = 4$, $z = 0$, $z = 3$ and $\bar{F} = 4xi - 2y^2 j + z^2 k$. **[5]**

c) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot \hat{n}\, ds$ for $\bar{F} = yi + 3j + xk$ where 's' is the surface of the paraboloid $z = 1 - x^2 - y^2$, $z \geq 0$. **[5]**

OR

Q7) a) Using Green's theorem evaluate $\int_C \cos y\, dx + x(1 - \sin y)\, dy$ where 'c' is the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$, $z = 0$. **[5]**

b) Find the workdone in moving a particle once round the ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1,\ z = 0$ under the force field given by **[5]**

$$\bar{F} = (2x - y + z)i + (x + y - z^2)\, j + (3x - 2y + 4z)k$$

c) Evaluate $\iint_S \bar{F} \cdot \hat{n}\, ds$ where $\bar{F} = x^3 i + y^3 j + z^3 k$ and 'S' is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ in the first octant. **[5]**

Q8) a) Solve $\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2}$ with boundary conditions **[8]**

i) $y(0,t) = 0$

ii) $y(l,t) = 0$

iii) $\left[\frac{\partial y}{\partial t}\right]_{t=0} = 0$

iv) $y(x,0) = k(lx - x^2)$; $0 \le x \le l$

b) Solve $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, $u(x, t)$ satisfies the conditions **[7]**

i) u is finite $\forall$ t

ii) $u(0, t) = 0$

iii) $u(l, t) = 0$

iv) $u(x, 0) = u_0$ for $0 < x < l$

OR

Q9) a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to conditions **[8]**

i) u is finite for all 't'

ii) $u\ (0, t) = 0$

iii) $u\ (l, t) = 0$

iv) $u(x,t) = \frac{3x}{l}$ for $0 \le x \le l$

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions **[7]**

i) $u\ (x, \infty) = 0$, $y \to \infty$

ii) $u\ (0, y) = 0$

iii) $u\ (10, y) = 0$

iv) $u(x,0) = 100.\sin\frac{\pi x}{10}; 0 \le x \le 10$

Total No. of Questions : 8]

SEAT No. :

PE4239

[Total No. of Pages : 2

[6582]-10
S.E. (Civil)
ENGINEERING GEOLOGY
(2019 Pattern) (Semester-III) (207009)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Define unconformity and Describe various types of unconformities. **[6]**

b) Describe types of mountains building activity. **[6]**

c) Write short notes on: **[5]**

i) Parts of Fold

ii) Strike and Dip of rocks

OR

Q2) a) Define fold and explain any three types of folds. **[6]**

b) Define fault and Describe the types of fault with their engineering significances. **[6]**

c) What is plate tectonics? Explain divergent and convergent plates. **[5]**

Q3) a) Explain the concept of RQD and its importance in Civil Engineering. **[6]**

b) Explain importance of preliminary geological exploration in civil engineering. **[6]**

c) Define Remote Sensing? Explain its applications in civil engineering. **[6]**

OR

Q4) a) What is GIS? Explain components of GIS. **[6]**

b) Discuss in detail core drilling method of subsurface geological exploration with its significance. **[6]**

c) Explain methods of subsurface investigation. **[6]**

P.T.O.

Q5) a) Explain with appropriate example the feasibility of dam alignment which is crossing DYKE. **[6]**

b) What are the geological requirements for the foundation of dam? **[6]**

c) A site is proposed for excavation of tunnel along A-B and M-N, passing through axial and limb region of fold respectively. Justify the suitability of tunnel is such conditions. **[5]**

OR

Q6) a) Explain Preliminary Geological Investigations carried out for Tunneling. **[6]**

b) Discuss on the dam located in folded geological structure. **[6]**

c) Explain tunneling conditions in Deccan trap region. **[5]**

Q7) a) Explain geological conditions favorable for natural springs and artesian wells. **[6]**

b) Explain in brief the geological work done by groundwater. **[6]**

c) Define aquifers. Explain in brief the types of aquifers. **[6]**

OR

Q8) a) Describe in brief the various preventive measures against landslides. **[6]**

b) Define Earthquakes and What are the causes of earthquakes. **[6]**

c) Discuss on good building stones. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-4240

[Total No. of Pages : 3

[6582]-11
S.E. (Electrical Engineering)
POWER SYSTEM - I
(2019 Pattern) (Semester - IV) (203145)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Non-Programmable Calculator is allowed.***

Q1) a) Enlist the main components of overhead lines, and discuss any one in detail. **[4]**

b) Define string efficiency. Derive the expression for string efficiency of a suspension insulator consisting of three discs. **[6]**

c) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself. Also find the string efficiency. **[8]**

OR

Q2) a) Explain methods of improving string efficiency. **[4]**

b) Derive an expression for sag in case of overhead transmission line when the supports are at equal level. **[6]**

c) An insulator string consists of three units, each having a safe working voltage of 15kV. The ratio of self-capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of the string. Also find the string efficiency. **[8]**

P.T.O.

Q3) a) Write a short note on : **[3]**

i) Skin effect

ii) Proximity effect.

b) What are bundled conductors? Discuss the advantages of bundled conductors when used for overhead lines. **[6]**

c) Derive an expression for inductance of three phase transmission line with symmetrical spacing. Draw a neat diagram. **[8]**

OR

Q4) a) Explain the concept of GMD and GMR for inductance calculation. **[3]**

b) Derive an expression for capacitance per kilometre of single phase overhead line having distance 'd' between the conductors and 'r' is the radius of each conductor. **[6]**

c) A3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2cm. If the line length is 100 km, calculate the charging current per phase assuming complete transposition. **[8]**

Q5) a) Derive an expression for capacitance per kilometre of single phase overhead line. **[4]**

b) What do you understand by electric potential? Derive an expression for Electric potential at conductor in a group of charged conductors. **[6]**

c) Derive an expression for the capacitance to neutral of a three phase line with equilateral spacing. **[8]**

OR

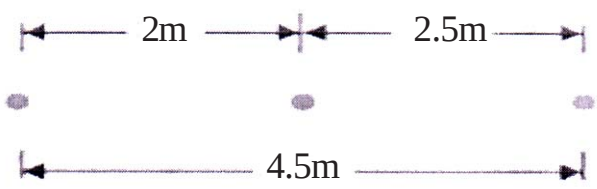
Q6) a) What is the need of transposition for Capacitance calculation? **[4]**

b) Derive the expression for capacitance of single phase transmission line considering effect of earth. **[6]**

c) A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Fig. The conductor diameter is 1.25 cm. If the line length is 100km, calculate **[8]**

i) Capacitance per phase

ii) Charging current per phase, Assuming complete transposition of the line



Q7) a) State and expalin in short Ferranti effect? **[3]**

b) Derive an expression for ABCD constants of short transmission line. **[6]**

c) Obtain the relationship between sending end voltage and current in terms of receiving end voltage and current for a medium transmission line using 'nominal T' method. Draw a neat phasor diagram. **[8]**

OR

Q8) a) Classify transmission lines based on length and voltage levels. **[3]**

b) Derive the expression for ABCD constants of medium transmission line considering nominal 'π' model of the line. **[6]**

c) An overhead 3-phase transmission line delivers 5000 kw at 22 kV at 0.8 p.f. lagging . The resistance and reactance of each conductor is 4 Ω and 6Ω. Respectively. Determine **[8]**

i) Sending end voltage

ii) Percentage regulation

iii) Transmission efficiency

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-4241

[Total No. of Pages : 3

[6582]-12
S.E. (Electrical Engineering)
ELECTRICAL MACHINES - I
(2019 Pattern) (Semester - IV) (203146)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right additional indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of a non-programmable Calculator is allowed.***

Q1) a) Draw the diagram showing the constructional details of the DC machine. Label all the parts. Write the functions and the material used for the following parts. **[9]**

i) Commutator

ii) Interpole

b) A 500 V DC Shunt Motor has an armature resistance of 1 ohm and a shunt field resistance of 300 ohm. On no load, it runs at 1000 RPM and draws a current of 4A from the supply. Find the speed of the motor when it is loaded and takes a current of 25 A. Also, find its speed when an additional resistance of 2.3 ohm is connected with the armature. The current taken by the motor in this condition is 25A. **[9]**

OR

Q2) a) Derive the torque equation of the DC motor. Name the various torques of DC Motor. **[9]**

b) A 500 V 6 Pole DC shunt motor has the armature and the shunt field resistance of 1 ohm and 300 ohms respectively. It draws a total current of 25 A from the supply. If the rotational losses are 900 watts. Calculate the efficiency of the motor. Also, find the back EMF generated at full load condition. **[9]**

P.T.O.

Q3) a) Draw and explain the following characteristics of the DC series Motor: **[9]**

i) Torque vs. armature current

ii) Speed vs. armature current

iii) Speed vs. torque

b) Compare the armature voltage control method with the field current control method of speed control of the DC motor. **[8]**

OR

Q4) a) What is the necessity of the starter in a DC motor? Explain with a neat labeled sketch the working of a three-point starter. **[9]**

b) A DC shunt motor operating on a 220 V supply draws a current of 28 Amp and runs at 1000 RPM. Its armature resistance is 1 ohm and its field resistance is 150 ohm. Calculate the

i) additonal resistance to be inserted in series with armature to reduce the speed to 700 RPM keeping the load constant.

ii) Find the speed of the motor if the 25-ohm resistance is inserted in series with the field winding. **[8]**

Q5) a) Draw a power flow diagram of a 3-phase induction motor. Write respective mathematical expressions for each stage. **[6]**

b) Derive the relationship between rotor input, rotor copper loss and gross mechanical power developed. **[8]**

c) Define the slip of an Inducation Motor. What are the effects of slip on rotor parameters of an Induction Motor. **[4]**

OR

Q6) a) The power input to a 440 V, 50 Hz, 6 pole three phase Induction motor running at 980 RPM is 40kW. The stator lossers are 1.25kW and friction and windage losses are 2kW. Find **[6]**

i) the slip

ii) the rotor copper losses

iii) the efficiency of the motor

b) Prove the following **[8]**

i) $\frac{T_{st}}{T_{\max}} = \frac{2a}{1+a^2}$

ii) $\frac{T_{fl}}{T_{\max}} = \frac{2as_{fl}}{a^2 + s^2 fl}$

c) Sketch the torque-slip characteristics of a 3-phase induction motot. Mark the following torque points on it. **[4]**

i) Starting Torque

ii) Maximum torque

Q7) a) State the types of starters used for induction motors. Explain the DOL starter with a suitable diagram. **[9]**

b) With a suitable curcuit diagram explain the No load Blocked rotor test carried out on a 3-phase induction motor. Also, write the respctive formulae involved in the calculation part for determining the equivalent circuit parameters. **[8]**

OR

Q8) a) Explain the testing of 3-phase induction motors by IS 325 and IS 4029. **[8]**

b) Sketch and explain the step-by-step procedure of the circule diagram of the 3-phase induction motor. Indicate the following quantities in it. **[9]**

i) No Load Current

ii) Output line

iii) Rotor copper Loss

iv) Torque line



Total No. of Questions : 8]

SEAT No. : [ ]

PE-4242

[Total No. of Pages : 3

[6582]-13

S.E. (Electrical Engineering)

NETWORK ANALYSIS

(2019 Pattern) (Semester - IV) (203147)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) A series R-L circuit with initial current I_0 in the inductor is connected to a d.c. voltage V at t = 0. Derive the expression for the instantaneous current through the inductor for t > 0. **[7]**

b) Find current i(t) through inductor using conventional method. The switch is closed at time t = 0. Refer fig. no. 1. **[5]**

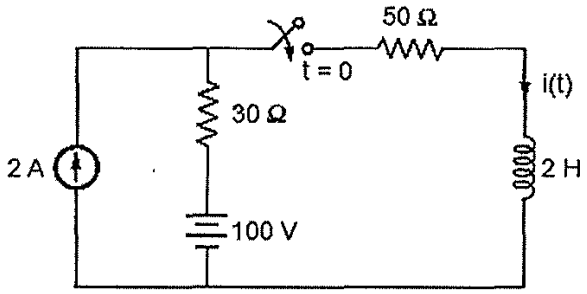


Fig. No. 1

c) Obtain the expression for current in series RL circuit connected to a d. c. voltage V for t > 0. Assume initial current through inductor as zero. **[5]**

OR

P.T.O.

Q2) a) What is time constant? Explain time constant in case of series R-L and series R-C circuit. **[7]**

b) A series R-C circuit shown in fig. 2 consists of R = 10 ohm and C = 0.1 F. Initially switch K is kept open for very long time. At t = 0 it is closed. Find the expression for $v_c(t)$. **[10]**

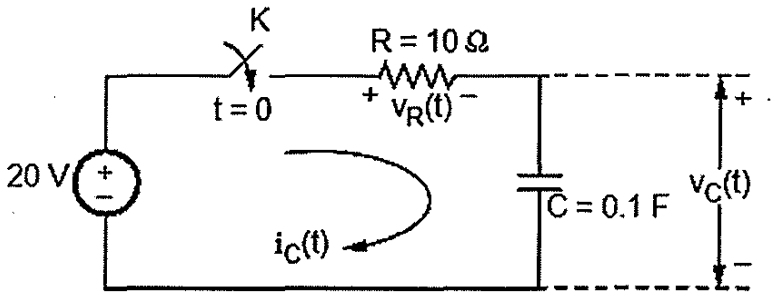


Fig.No.2

Q3) a) Explain the properties of Laplace Transform. **[6]**

b) Obtain inverse Laplace transform of **[6]**

$$F(s) = \frac{1}{s(s+2)}$$

by using convolution integral.

c) Explain advantages and disadvantage of Laplace transform. **[6]**

OR

Q4) a) Define and explain the characteristics if **[6]**

i) Unit step function

ii) Unit ramp function

iii) Unit impulse function

b) Find the Laplace transform of cos ωt. **[6]**

c) Obtain F(s) for the signal shown in fig. no. 3. Also determine its Laplace transform. **[6]**

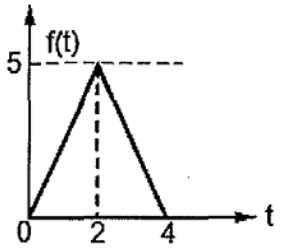


Fig. No. 3

Q5) a) Express z-parameters in terms of y-parameters. **[9]**

b) Find Y parameters of the network shown in figure no. 4 **[8]**

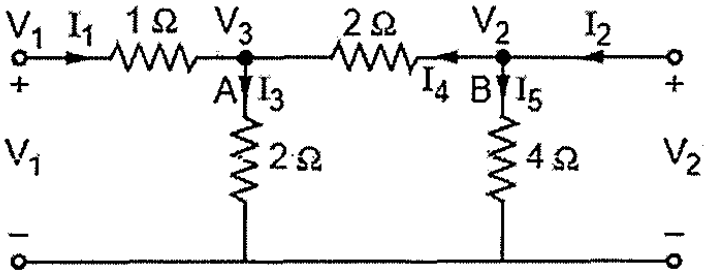


Fig. No. 4

OR

Q6) a) What is low pass filter? Derive the expression for the cut-off frequency of prototype low pass filter in terms of L and C. **[9]**

b) Design a prototype low pass filter sections if design impedance R_0 = 500 ohm and cut-off frequency f_c = 2 kHz. **[8]**

Q7) a) Explain the necessary conditions for transfer function. **[9]**

b) Find the network functions Z11(s) and Z21(s) for the network shown in fig. No.5. **[9]**

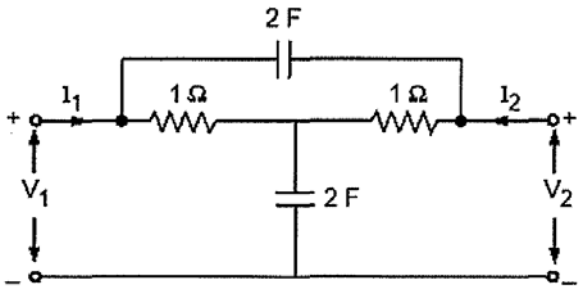


Fig. No. 5

OR

Q8) a) Explain the significance of poles and zeros. **[9]**

b) How to obtain time domain behaviour from a pole-zero plot? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-4243

[Total No. of Pages : 4

[6582]-14
S.E. (Electrical Engineering)
NUMERICAL METHODS AND COMPUTER PROGRAMMING
(2019 Pattern) (Semester - IV) (203148)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Following table give the relation between x and y, determine $y(3.5)$ using Newton's forward interpolation method **[7]**

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

b) For the following data find f(1.1) using Lagrange's interpolation **[6]**

x	1	1.2	1.3	1.4
y	1	1.095	1.140	1.183

c) Obtain the divided difference table for the following data point **[4]**

x	2	4	9	10
y	4	56	711	980

OR

Q2) a) For the given data, Find the value of y at $x = 4.5$ using Newton's backward interpolation formula **[7]**

x	1	2	3	4	5
y	2.38	3.65	5.85	9.95	14.85

b) Derive Lagrange's interpolation formula for unequally spaced data with n number of values. **[6]**

c) Write the formula for Stirling's and Bessel's central difference interpolation. **[4]**

P.T.O.

Q3) a) Derive an expression for finding 1st order and 2nd order differentiation using Newton's forward difference interpolation formula for equal interval data points **[7]**

b) Evaluate $\int_1^{1.8} \frac{e^x + e^{-x}}{2} dx$ using Simpson's 1/3 rule by taking h = 0.2 **[7]**

c) Evaluate the value of the integral **[4]**

$\int_0^2 \frac{x}{\sqrt{2+x^2}}$ using Trapezoidal rule. The values for the integral are tabulated as below :

x	0	0.5	1	1.5	2
y	0	0.33333	0.57735	0.727606	0.81645

OR

Q4) a) The following table gives the velocity of the particle for 20 seconds at an interval of 5 seconds, find the acceleration at time t = 0 **[7]**

time t(sec)	0	5	10	15	20
Velocity v(m/s)	0	3	14	69	228

b) Apply trapezoidal rule to evaluate **[7]**

$\int_1^5 \int_1^5 \frac{dx\,dy}{\sqrt{x^2+y^2}}$

Take h = k = 2

c) For the difference table given below, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 0.4$ **[4]**

x	y	∇y	$\nabla^2 y$	$\nabla^3 y$
0.1	2			
		4		
0.2	6		-1	
		3		1
0.3	9		0	
		3		
0.4	12			

Q5) a) Using Gauss - Elimination method solve. **[6]**

$$2x - y - z = 2$$
$$x + 2y + z = 2$$
$$4x - 7y - 3z = 2$$

b) Using Gauss - Seidal method solve **[6]**

$$4x + y + 2z = 16$$
$$x + 3y + z = 10$$
$$x + 2y + 5z = 12$$

Using $x = y = z = 0$. Show 4 iterations

c) What is pivoting? Why is it used? What are the types of pivoting **[5]**

OR

Q6) a) Find the inverse of the given matrix using Gauss Jordan method **[6]**

$$A = \begin{bmatrix} 5 & -2 & 1 \\ 7 & 1 & -5 \\ 3 & 7 & 4 \end{bmatrix}$$

b) Using Gauss - Jacobi method solve **[6]**

$4x + y + 2z = 16$

$x + 3y + z = 10$

$x + 2y + 5z = 12$

Using $x = y = z = 0$. Show 5 iterations.

c) Compare Gauss Seidal and Gauss Jordan methods for solution linear simultaneous equations. **[5]**

Q7) a) Solve using RK 4th order method. **[7]**

$\frac{dy}{dx} = \sqrt{x+y}$. Given that $y(0) = 1$ get y at $x = 0.2$ take $h = 0.2$

b) Explain Euler's method giving its graphical representation to solve ordinary differential equation : $\frac{dy}{dx} = f(x, y)$ **[5]**

c) Use Taylor series method to solve **[6]**

$\frac{dy}{dx} = 1 + xy$, $y(0) = 1$ to find value at $x = 0.1$. Take step size as $h = 0.1$.

Consider only 4 terms of the series.

OR

Q8) a) Solve using RK 4th order method **[7]**

$\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for $x = 0.2$. Initial conditions are $x = 0$, $y = 0$ and $\frac{dy}{dx} = 0$

b) Use Modifies Euler's method to solve $\frac{dy}{dx} = x + y$, y(0) = 1 to find value at $x = 0.05$ Take step size as $h = 0.05$. Answer correct upto 4 decimal places **[6]**

c) Explain Taylor series method for the solution of ordinary differential equations. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4244

[Total No. of Pages : 2

[6582]-15
S.E. (Electrical Engineering)
FUNDAMENTALS OF MICROCONTROLLER AND APPLICATIONS
(2019 Pattern) (Semester - IV) (203149)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable additional data if necessary.***
5) ***Use of a non-programmable Calculator is allowed.***

Q1) a) Draw & explain TMOD register. **[6]**

b) Explain Data Types in C. **[6]**

c) Write a program to generate square wave of 50Hz frequency with 50 % duty cycle on pin 2.1. Assume XTAL=11.0592MHz & use timer 0 in mode 1. **[6]**

OR

Q2) a) Draw & explain TCON register. **[6]**

b) Explain the Timer modes in 8051 microcontrollers. **[6]**

c) Write C Program to make ON & OFF bit P1.4 of port P1, 5000 times. **[6]**

Q3) a) Write short note on Interrupt Priority Register. **[6]**

b) Explain the SOC, EOC, & OE pin of ADC 0809. **[6]**

c) Write a program to turn off LED for connected to Port 0 when interrupt 0 occurs and turn it on when interrupt 1 occurs. **[5]**

OR

P.T.O.

Q4) a) Explain interrupt structure of 8051 microcontroller. **[6]**

b) Write short note on Interrupt enable register. **[6]**

c) Explain interfacing of ADC 0809 with 8051 microcontrollers. **[5]**

Q5) a) Explain Steps to Transfer Data Serially in 8051 microcontroller. **[6]**

b) Write Short note on SCON register. **[6]**

c) Write program to transfer letter 'A' serially 10 times at baud rate of 4800. Use serial port in mode 1. XTAL=12MHz. **[6]**

OR

Q6) a) Explain Steps to Receive Data Serially in 8051 microcontroller. **[6]**

b) Explain Serial port structure of 8051 microcontroller. **[6]**

c) Write short note AT commands required for GSM. **[6]**

Q7) a) Draw & Explain Power measurement using 8051. **[6]**

b) Draw interfacing diagram of a stepper motor with 8051 and write program to rotate stepper motor. **[6]**

c) Explain LED interfacing with 8051 microcontroller. **[5]**

OR

Q8) a) Explain relay interfacing with 8051 microcontroller. **[6]**

b) Write short note on current & Voltage measurement using 8051. **[6]**

c) Explain Key interfacing using 8051with diagram. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PE4245

[Total No. of Pages : 2

[6582]-16
S.E. (Electrical Engineering)
POWER GENERATION TECHNOLOGIES
(2019 Pattern) (Semester - III) (203141)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat Diagram must be drawn wherever necessary.***
4) ***Assume Suitable additional data if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Describe important points for site selection of hydro power station. **[4]**

b) Explain the function of following component in Hydro Power Plant **[6]**

i) Penstock

ii) Surge tank

iii) Dam

c) Explain the different types of turbine used in hydro power plant. **[8]**

OR

Q2) a) Explain Hydrograph **[4]**

b) Explain advantages & disadvantages of hydro power plant. **[6]**

c) Draw the schematic layout of a hydroelectric power plant and elaborate functions of each component and its operation. **[8]**

Q3) a) Write advantages & disadvantages of wind energy. **[3]**

b) Explain how the wind pattern affects power generation in wind energy system. **[6]**

c) Explain grid connected wind energy conversion system with the help of neat diagram. **[8]**

OR

P.T.O.

Q4) a) Describe the historical development of wind turbine on global level. **[3]**

b) Define cut in, cut out & rated speed as applied in wind energy system with suitable diagram. **[6]**

c) Derive the relation for the power in the wind & describe the Environmental impact of Wind Turbines. **[8]**

Q5) a) Explain impact of temperature & isolation on I-V curves of PV cells. **[4]**

b) Define the terms in solar energy system **[6]**

i) Solar Constant

ii) Cloudy index

iii) Concentration Ratio

c) With the help of diagram explain the concept of solar thermal power plant. **[8]**

OR

Q6) a) What is the need of solar hybrid system? **[4]**

b) Explain the shading impact on I-V curves of PV cells. **[6]**

c) Explain the working of PV cell and Simplest Equivalent Circuit for a Photovoltaic cell. **[8]**

Q7) a) Write a short note on Biomass energy. **[3]**

b) Explain grid connected renewable systems & their requirements. **[6]**

c) Describe the following systems used in renewable energy systems : **[8]**

i) Stand alone

ii) Hybrid stands alone

OR

Q8) a) Write short note on Ocean thermal energy conversion. **[3]**

b) What is geothermal energy? Explain with sketch how it can be harnessed to generate electricity? **[6]**

c) Explain the process of municipal solid waste to energy conversion with diagram. **[8]**



Total No. of Questions : 8]

SEAT No. : ____

PE4246

[Total No. of Pages : 2

[6582]-17
S.E. (Electrical Engineering)
MATERIAL SCIENCE
(2019 Pattern) (Semester - III) (203142)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) State the characteristics of good insulating materials. **[4]**

b) Give thermal classification of solid insulating materials with examples. **[6]**

c) State the properties and applications of **[8]**

i) transformer oil &

ii) air

OR

Q2) a) List out the insulating materials with their properties used in **[4]**

i) Power transformer

ii) Capacitors.

b) What is Ceramic? State its properties and applications. **[6]**

c) State the properties and applications of **[8]**

i) Paper &

ii) SF6 gas

Q3) a) State the following terms **[3]**

i) Magnetic dipole moment

ii) Magnetic flux density

iii) Magnetic susceptibility

b) Write a short note on ferrites. **[6]**

c) Explain the behaviour of Ferromagnetic materials below the curie temperature. **[8]**

OR

P.T.O.

Q4) a) Which material is used to make the transformer core? Why? **[3]**

b) State the difference between soft and hard magnetic materials. **[6]**

c) State the properties and applications of antiferromagnetic materials. **[8]**

Q5) a) State the properties of **[4]**

i) brass and

ii) bronze

b) State the properties and applications of **[6]**

i) Copper

ii) Aluminium.

c) Write a short note on thermal bimetal. **[8]**

OR

Q6) a) State the properties and applications of carbon material. **[4]**

b) Give the name and properties of conducting materials used for **[6]**

i) Making lamp filaments

ii) Solder

c) Write a short note on thermocouple. **[8]**

Q7) a) Draw neat diagram of energy bands in insulator, semiconductor and conductor. **[3]**

b) Explain with neat diagram carbon nano clusters. **[6]**

c) Define carbon nanotubes and explain types of carbon nanotubes. **[8]**

OR

Q8) a) State any three applications of nanomaterials in electrical engineering. **[3]**

b) Compare CNT and BNT. **[6]**

c) Write short note on **[8]**

i) Molecular machine

ii) SET



Total No. of Questions : 8]

SEAT No. : ____

PE4247

[Total No. of Pages : 2

[6582]-18

S.E. (Electrical Engineering)

ANALOG AND DIGITAL ELECTRONICS

(2019 Pattern) (Semester - III) (203143)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Write a comparison between CPLD and FPGA. **[4]**

b) Draw a circuit of basic static MOS RAM cell. Explain how information is stored in it. **[6]**

c) State two advantages of PLD over fixed function IC and application specific IC. What is the difference between PLA, PAL and PROM. **[8]**

OR

Q2) a) What do you mean by configurable device. **[4]**

b) What is FPGA? Explain its basic structure. **[6]**

c) Design a 3-bit Gray to Binary code converter. Implement it using suitable PROM. Draw the PROM table and logic Diagram. **[8]**

Q3) a) What is the role of OP-AMP as an instrumentation amplifier? **[3]**

b) Explain how OP-AMP work as a closed loop inverting amplifier, Draw neat waveforms. Also derive gain of OP-AMP for the same. **[6]**

c) Explain with neat diagram Schmitt trigger as an application of OP-AMP. **[8]**

OR

Q4) a) Write classification of open loop configuration of OP-AMP? Explain any one form it. **[3]**

b) Draw neat diagram. Explain OP-AMP as a Peak detector. **[6]**

c) Explain voltage and current converter for grounded type load. **[8]**

P.T.O.

Q5) a) Explain the function of 78XX. **[4]**

b) Draw and explain IC 555 as an Astable multivibrator with neat connection diagram. **[6]**

c) Explain how triangular waveform can be generated using OP-AMP? Also draw waveform. **[8]**

OR

Q6) a) Draw the diagram and waveform of IC 555 as monostable multivibrator. **[4]**

b) Explain the operation of low pass filter with a neat circuit diagram. **[6]**

c) Explain the function of LM 317 as a voltage regulator. **[8]**

Q7) a) Define for half wave rectifier : **[3]**

i) Efficiency

ii) Form factor

iii) Ripple factor

b) Explain the working of single phase half wave rectifier with RL load with neat sketch and draw its waveform. **[6]**

c) Draw and explain three-phase bridge rectifier with R-Load. Also draw input voltage and output voltage waveform. **[8]**

OR

Q8) a) Define for Full wave rectifier : - **[3]**

i) Average output voltage

ii) RMS output voltage

iii) Peak inverse voltage

b) Compare single phase half-wave and full - wave rectifier. **[6]**

c) Draw and explain three-phase half wave rectifier with R load with adequate wave form. **[8]**



Total No. of Questions : 8]

SEAT No. : ____

PE4248

[Total No. of Pages : 2

[6582]-19

S.E. (Electrical Engineering)

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

(2019 Pattern) (Semester - III) (203144)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***

Q1) a) Explain one wattmeter method for measuring active power in a 3-phase balanced R & L load. Draw respective circuit diagram. **[8]**

b) A 3 phase 500V motor load has a power factor of 0.4, Two watt meters are connected to measure power. They show total power of 30 kW, find reading of each wattmeter. **[6]**

c) Explain low power factor wattmeter. **[4]**

OR

Q2) a) A 3 phase, 10 KVA has a power factor of 0.342 the power is measured by two wattmeter method find reading of each wattmeter when PF is **[8]**

i) Lagging

ii) Leading

b) Draw the possible method of connecting the pressure coil of a wattmeter and compare the errors. Explain the use of "compensation winding" in a wattmeter. **[6]**

c) What is Blonded theorem explain briefly. **[4]**

Q3) a) With suitable block diagram explain working of electronic energy meter. **[6]**

b) Explain in detail the working and construction of single phase induction type energy meter with a neat diagram. **[8]**

c) Explain in brief TOD Meter. **[3]**

OR

P.T.O.

Q4) a) A single phase energy meter rated 200 volt, 50 Hz, 3200 impulses per kWh is connected across 200 volt supply and the load consists of 40Ω resistance. This circuit is on for 30 minutes. The energy meter completes 1590 blinks during this time. Determine percentage error in the energy meter. **[8]**

b) With a suitable circuit diagram explain calibration of single phase energy meter. **[6]**

c) Define energy, explain in brief energy measurement. **[3]**

Q5) a) With suitable diagrams explain phase angle and frequency measurement using Lissajous pattern in CRO. **[4]**

b) Explain any one electrical transducer used for pressure measurement. **[6]**

c) With suitable diagram explain constructional details of CRT. **[8]**

OR

Q6) a) With suitable diagrams explain working of resistive transducers and inductive transducers. **[8]**

b) Explain capacitive transducers for pressure measurement with a neat diagram. **[6]**

c) On CRO screen sinusoidal signal of total occupancy vertical 3cm and horizontal 2cm. The front panel control of Volts/div & Times/div are 2 v/div & 2 ms/div respectively. Calculate **[4]**

i) r.m.s. value of voltage

ii) Frequency

Q7) a) With suitable diagram explain construction and working of semiconductor strain gauge. State any two advantages of it. **[8]**

b) Explain any one Electrical method for measurement of level. **[6]**

c) Draw a schematic diagram of LVDT. Label all the parts. **[3]**

OR

Q8) a) Explain level measurement by mechanical method. **[3]**

b) With suitable diagram explain ultrasonic method of level measurement. **[6]**

c) What are the advantages and disadvantages of a Linear Variable Differential Transformer (LVDT)? Explain how the magnitude and direction of displacement of core of an LVDT detected? **[8]**



Total No. of Questions : 9]

SEAT No. :

PE4249

[Total No. of Pages : 4

[6582]-20

S.E. (Electrical)

ENGINEERING MATHEMATICS-III

(2019 Pattern) (Semester-III) (207006)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Question No.1 is compulsory.***
2) ***Answer Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q9.***
3) ***Figures to the right indicates full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of electronic pocket calcualtor is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Write the correct option:

a) The Z-transform of $f(k) = 1$; $k \geq 0$ is _____. **[2]**

i) $\frac{z}{1-z};|z|<1$ ii) $\frac{1}{z-1};|z|>1$

iii) $\frac{z}{z-1};|z|>1$ iv) $\frac{1}{1-z};|z|<1$

b) The standard deviation and arithmetic mean of a distribution are 12 and 45.5 respectively. Then, the coefficient of variation is _____. **[2]**

i) 26.37 ii) 32.43

iii) 379.16 iv) 22.15

c) The value of $\nabla \log r$ = _____. **[2]**

i) $\frac{\overline{r}}{r^2}$ ii) $\frac{1}{r^2}$

iii) $\overline{r}$ iv) $\frac{\overline{r}}{r}$

d) If 'C' is the circle $|z-1| = 1$, then $\oint_C \frac{z}{z-1} dz$ = _____. **[2]**

i) 0 ii) π

iii) πi iv) $2\pi i$

P.T.O.

e) For a Poisson distribution, $n = 100$ and P = 0.01 then P $(x = 0)$ = _____. **[1]**

i) $\frac{4}{e}$ ii) $\frac{3}{e}$

iii) $\frac{2}{e}$ iv) $\frac{1}{e}$

f) The Fourier cosine transform of the function $f(x)$ defined in $(0, \infty)$ is $F_c(\lambda)$ = _____. **[1]**

i) $\frac{1}{2\pi}\int_0^\infty f(x)\cos\lambda dx$ ii) $2\int_{-\infty}^\infty f(x)e^{i\lambda x}dx$

iii) $\frac{1}{2\pi}\int_{-\infty}^\infty f(u)e^{i\lambda u}du$ iv) $\int_0^\infty f(u)\cos\lambda u\,du$

Q2) a) Solve any one. **[5]**

i) Find z-transform of $f(k)=\cos\frac{\pi}{2}k;\ k\geq 0$

ii) Find inverse z-transform of $f(z)=\frac{1}{(z+2)(z+5)}, |z|>2$

b) Solve $f(k+1)+\frac{1}{2}f(k)=\left(\frac{1}{2}\right)^k, f(0)=0, k\geq 0$ **[5]**

c) Find the Fourier cosine transform of **[5]**

$$f(x)=\begin{cases}0 & , \quad x<0\\ \pi e^{-x} & , \quad x>0\end{cases}$$

OR

Q3) a) Solve any one. **[5]**

i) Find z-transform of $f(k)=k2^k,\ k>0$

ii) Find inverse z-transform of $f(z)=\left(\frac{1}{z-5}-\frac{1}{z-4}\right);\ 4<|z|<5$

b) Find the Fourier cosine transform of $F(x)=e^{-2x}-e^{-3x},\ x>0$. **[5]**

c) Solve the integral equation. **[5]**

$$\int_0^\infty F(x)\cos\lambda x\,dx=\begin{cases}1-\lambda & , \quad 0\leq\lambda\leq 1\\ 0 & , \quad \lambda\geq 1\end{cases}$$

Q4) a) The four moments of a distribution about the value 10 are 3, 40, 100 and 400 respectively. Obtain the first four central moments, β_1 and β_2. **[5]**

b) Find the correlation coefficient between the load (X) and extension(Y) on five occasions of a spring as given in the following data. **[5]**

X	1	5	7	3	9
Y	5	30	50	15	75

c) A fair coin is tossed five times. What is the probability of getting at least two heads? **[5]**

OR

Q5) a) The two regression lines of a bivariate data are $3x + 2y = 26$ and $6x + y = 31$. Find : **[5]**

i) The mean values of x and y

ii) The correlation coefficient between x and y.

b) On an average, 120 cars per hour pass a specified point on a particular road. Using poisson distribution, find the probability that at most one car passes the point in a minute. **[5]**

c) The lifetime of a certain component has a normal distribution with mean 400 hours and standard deviation 50 hours. Assuming normal distribution, determine approximately the expected number of components in a sample of 1,000 components whose lifetime lies between 340 hours to 465 hours. [Given: Z_1=1.2, A_1=0.3849; Z_2=1.3, A_2=0.4032] **[5]**

Q6) a) Find the directional derivative of $\phi = xy^2 + yz^3$ at (1, –1, 1) towards the point (α, 1, –1). **[5]**

b) Show that: **[5]**

$\overline{F} = (y\sin z - \sin x)\overline{i} + (x\sin z + 2yz)\overline{j} + (xy\cos z + y^2)\overline{k}$ is irrotational.

Find the scalar ϕ such that $\overline{F} = \nabla\phi$.

c) If $\overline{F} = (2x + y^2)\overline{i} + (3y - 4x)\overline{j}$ then evaluate $\int_C \overline{F} \cdot d\overline{r}$ around the parabolic arc $y^2 = x$ joining (0, 0) and (1.1). **[5]**

OR

Q7) a) Find the directional derivative of $\phi = 3 \log (x + y + z)$ at (1, 1, 1) in the direction of tangent to the curve. $x = b\sin t, \quad y = b\cos t, \quad z = bt,$ at $t = 0$. **[5]**

b) Prove (any one). **[5]**

i) $$\nabla\left(\bar{a}\cdot\nabla\frac{1}{r}\right)=\frac{3(\bar{a}\cdot\bar{r})\bar{r}}{r^5}-\frac{\bar{a}}{r^3}$$

ii) $$\nabla^2\left(\nabla\cdot\frac{\bar{r}}{r^2}\right)=\frac{2}{r^4}$$

c) Using Green's theorem $\oint_C (xy - y^2)dx + x^2y\,dy$ along the closed curve formed by $y = 0$, $x = 1$ and $y = x$. **[5]**

Q8) a) If $f(z) = u + iv$ is analytic function and $V = \frac{-y}{x^2 + y^2}$ then find its harmonic conjugate u and express $f(z)$ in terms of z. **[5]**

b) Evaluate $\oint_C \frac{z^2}{(z-1)^2}dz$ where 'C' is $|z|=2$ using Cauchy's integral formula. **[5]**

c) Find the bilinear transformation which sends the points 1, i, -1 from z-plane into the points i, 0, $-i$ of the w-plane. **[5]**

OR

Q9) a) If $f(z) = u + iv$ is analytic function find $f(z)$ if $u + v = e^{-x}(\cos y - \sin y)$ **[5]**

b) Evaluate $\oint_C \frac{z^2}{(z-1)(z-2)^2}dz,$ where 'C' is the circle $|z|=3$, using Cauchy's residue theorem. **[5]**

c) Show that the transformation $w = z + \frac{1}{z}$ maps the circle $|z|=2$ into an ellipse. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-4250

[Total No. of Pages : 4

[6582]-21

S.E. (Electronics/E&Tc/Electronics & Computer/ Electronics (VLSI Design & Tech.)/E.C (A.C.T.))

SIGNALS AND SYSTEMS

(2019 Pattern) (Semester - IV) (204191)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) State the following properties of CT Fourier Series. **[6]**

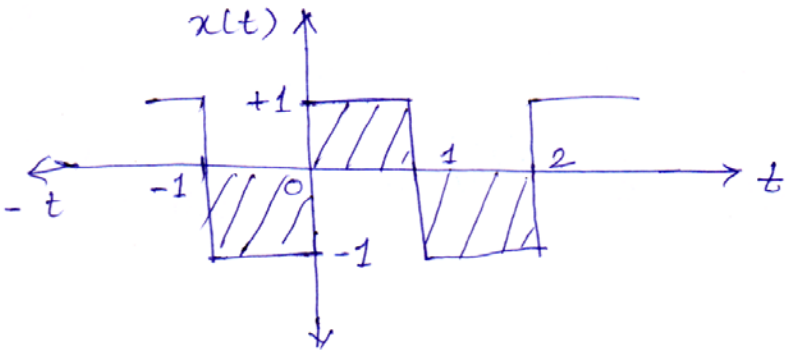
i) Linearity

ii) Time shifting

iii) Convolution

Also, give physical significance of above properties.

b) Find the Trignometric Fourier series for the bidirectional symmetric square waveform shown below. **[6]**



c) State and Explain Dirichlet conditions for the existance of Fourier Series. **[6]**

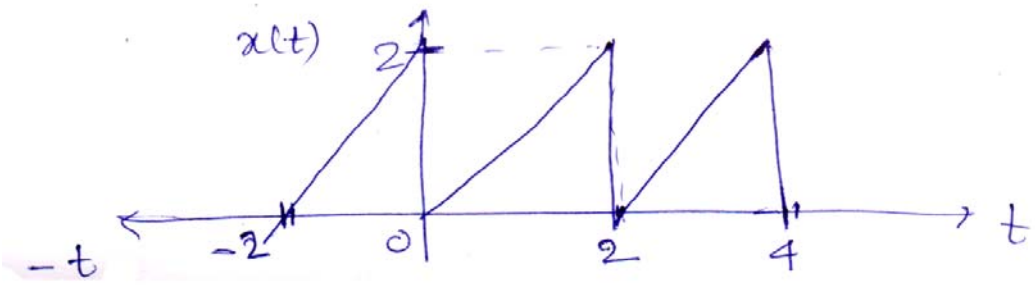
OR

Q2) a) Write a short note on Gibb's phenomenon for Fourier series. **[6]**

b) Check whether the two signals sin(wt) and cos(2wt) are orthogonal to each other. **[6]**

P.T.O.

c) Find the exponential FS for the periodic signal shown below. **[6]**



Q3) a) Find the Fourier Transform of the signal $x(t) = e^{-2t}u(t)$. Also sketch magnitude and phase response. **[6]**

b) Obtain the Fourier Transform using properties. **[6]**

i) $x(t) = e^{-2t}u(t + 2)$

ii) $x(t) = \delta(t) * \text{sgn}(t)$

c) State and explain the physical significance of following CTFT properties. **[5]**

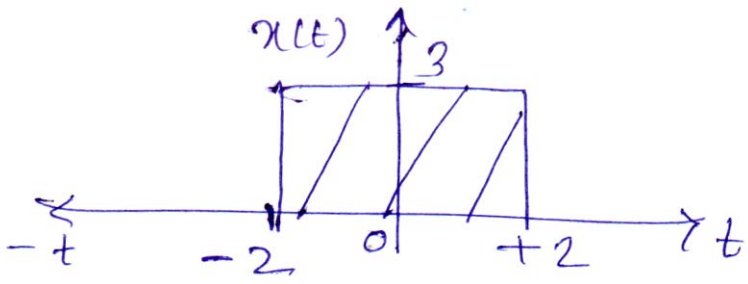
i) Time scaling

ii) Modulation

iii) Time Differentiation

OR

Q4) a) Find the Fourier Transform of a signal shown below. **[6]**



b) Find the Fourier Transform of $x(t) = \cos(wot)$ using frequency shifting property of CTFT. **[6]**

c) Define magnitude response and phase response. Explain with one example. **[5]**

Q5) a) Define ROC in Laplace Transform. Also, state the properties of ROC. **[6]**

b) Find the Laplace Transform using properties of i) $x(t-2)$ and ii) $\frac{d}{dt}x(t)$ **[6]**

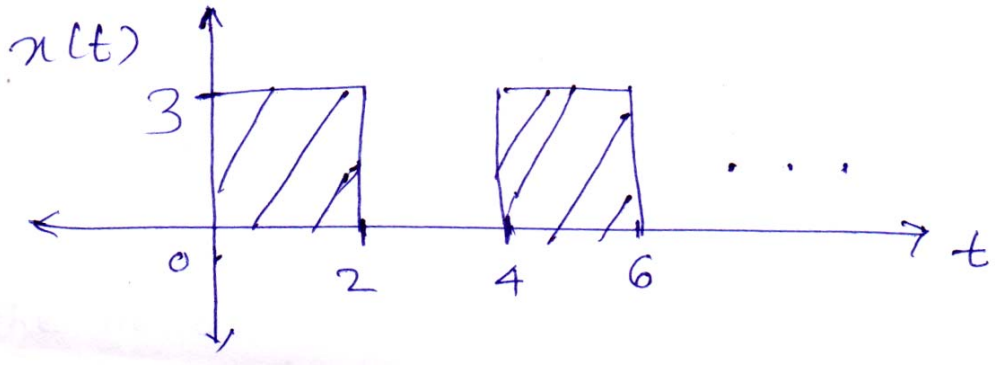
If $X(s)=\frac{2s}{s^2+2}$,

c) Find the Initial and Final values of $X(s)=\frac{5s+3}{s^2+2s+4}$ **[6]**

OR

Q6) a) Find the Inverse Laplace Transform of $X(s)=\frac{3}{(s+4)(s-2)}$ with given ROC, –4 ≤ ROC ≤ + 2 **[6]**

b) Find the Laplace Transform of given periodic signal. **[6]**



c) Compare Fourier Transform and Laplace Transform. **[6]**

Q7) a) State and Explain properties of PDF and CDF. **[6]**

b) Two dice are thrown simultaneously. Find the probability of following: **[6]**

i) Throwing a sum of 11

ii) Throwing two 7's

iii) Throwing a pair

c) Determine mean, mean square, variance for the given Probability Density Function (PDF). **[5]**

$F_x(x)= x^2$ for $0 \le x \le 1$

$= 0$ otherwise

OR

Q8) a) A certain random variable has the CDF. **[6]**

$$F_x(x) = \begin{cases} 0, & x \leq 0 \\ kx^2, & 0 < x \leq 10 \\ 100k, & \text{for } x > 10 \end{cases}$$

Evaluate k, P(X ≤ 5) and P(5 < X ≤ 7)

b) A coin is tossed three times. A random variable X which represents the no. of tails. Obtained after the toss. Find the probabilities of X and plot the CDF. **[6]**

c) Write a short note on uniform Distribution Function. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4251

[Total No. of Pages : 3

[6582]-22

S.E. (Electronics/ET&C/Electronics (VLSI Design & Tech.)/E.C (A.C.T.))

CONTROL SYSTEMS

(2019 Pattern) (Semester - IV) (204192)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Investigate the stability of the system using Routh Hurwitz criterion

$$G(s) = \frac{100}{s^4 + 6s^3 + 30s^2 + 60s + 100}$$ **[8]**

b) The O.L.T.F of unity gain negative feedback system given **[10]**

$$G(s) = \frac{k}{s(s+4)(s^2+s+1)}$$

i) Calculate the range of k for system to be in stable state when stability of closed loop system is concerned.

ii) Calculate the value of k for system to become marginally stable, also calculate the frequency of oscillation.

OR

Q2) a) For the given unity feedback system find the value of 'k' and 'q' such that the system will oscillates with frequency 2 rad/sec **[8]**

$$G(s) = \frac{k(s+1)}{s^3 + qs^2 + 2s + 1}$$

b) Sketch the root locus of the system with open loop transfer function

$$G(s)H(s) = \frac{k}{s(s^2+6s+25)}$$ **[10]**

P.T.O.

Q3) a) For an unity feedback system with open loop transfer function $G(s)=\frac{100}{s(s+9)}$. Determine Damping factor, Undamped natural frequency, resonant peak and resonant frequency. **[9]**

b) The open loop transfer function of a unity feedback system is given by $G(s)=\frac{12}{s(s+1)(s+2)}$. Sketch the polar plot and determine the gain and phase margin. Also comment on the stability. **[9]**

OR

Q4) a) Investigate the stability closed loop system whose open loop transfer function is $G(s)H(s)=\frac{10}{s(10s+1)}$ using Nyquist stability criteria. **[9]**

b) For the unity feedback system with open loop transfer function $G(s)=\frac{40}{s(s+5)(s+8)}$ Sketch the bode plot. Determine gain crossover frequency, phase crossover frequency, gain margin and phase margin. Also investigate the stability. **[9]**

Q5) a) A feedback system with transfer function $G(s)=\frac{s^2+3s+3}{s^3+2s^2+3s+1}$

Construct a state model for the system. **[9]**

b) Find Controllability and Observability of the system given by state model. **[9]**

$$A=\begin{bmatrix}-2 & 1 & 0\\ 1 & -3 & 2\\ 10 & 0 & -8\end{bmatrix} \quad B=\begin{bmatrix}0\\ 0.1\\ 1\end{bmatrix}$$ C = [1 0 1] D = [0]

OR

Q6) a) Explain advantages and disadvantages of Conventional Control Theory. **[9]**

b) Determine the State transition matrix of state equation $\dot{X}=\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$x(t) **[9]**

Q7) a) What do you mean by On-Off control? Explain with suitable example. **[8]**

b) What do you mean dead zone? Explain with suitable example. **[8]**

OR

Q8) a) How IoT helps in Industrial Automation? What are the essentials of an Industrial IoT solution? Give two examples of Industrial IoT. **[8]**

b) Draw and explain the block diagram of digital control system and write advantages of DCS. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-4252

[Total No. of Pages : 2

[6582]-23

S.E. (Electronics/E & TC/Electronics & Computer) (Electronics VLSI Design & Technology)

PRINCIPLES OF COMMUNICATION SYSTEMS

(2019 Pattern) (Semester - IV) (204193)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Use of Non-programmable scientific calculators is allowed.***

Q1) a) Define modulation index and frequency deviation in frequency modulation. Calculate modulation index and frequency deviation if a sinusoidal modulating signal of 15 V, 10 KHz is applied to a FM system. Assume frequency deviation constant is 5 KHz/V. **[6]**

b) Draw and explain wideband FM generation using Armstrong's indirect method. **[6]**

c) Compare phase modulation with frequency modulation. **[6]**

OR

Q2) a) Distinguish between narrowband and wideband FM. **[6]**

b) Describe the role of limiter and de-emphasis circuits in FM super heterodyne receiver. **[6]**

c) For the FM wave represented by the following equation, **[6]**

$V=15 \sin [3\times10^{8}t + 50 \sin (2500)t]$

Calculate i) Carrier and modulating frequencies, ii) Modulation index, iii) Maximum frequency deviation, and iv) Power delivered to 75 Ω resistor.

Q3) a) Explain different types of sampling techniques clearly stating advantages and disadvantages of each technique. **[6]**

b) Compare Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM) techniques. **[6]**

c) Describe Pulse Position Modulation (PPM) generation with the help of neat diagram. **[5]**

OR

P.T.O.

Q4) a) Draw the spectrum showing aliasing in sampling. Elaborate the significance of nyquist criteria to avoid aliasing in sampling. **[6]**

b) Describe PWM generation with help of neat diagram. **[6]**

c) Explain Time Division Multiplexing (TDM) scheme with the help of neat diagram. **[5]**

Q5) a) With the help of neat block diagram explain the working of Adaptive Delta modulator. **[6]**

b) What is need of non-uniform quantization? Explain μ law compander in PCM. **[6]**

c) A 1 KHz signal of voice channel is sampled at 4 KHz sampling frequency and transmitted using 12-bit PCM , Calculate i) Signaling rate and ii) Bandwidth required for the PCM system. Now if the same signal with the same sampling frequency is transmitted using DM , Calculate i) Signaling rate and ii) Bandwidth required for the DM system. **[6]**

OR

Q6) a) With the help of neat block diagram explain the working of Pulse Code Modulation transmitter. **[6]**

b) Compare Delta Modulation and Adaptive Delta Modulation. **[6]**

c) Define quantization. Draw and explain the characteristics of midtread type of uniform quantizer. **[6]**

Q7) a) Draw any six data formats for representation of digital bit pattern 10110011. **[6]**

b) Draw and explain AT & T hierarchy digital multiplexing system. **[6]**

c) Write a note on scrambling and unscrambling techniques. **[5]**

OR

Q8) a) Define Inter Symbol Interference (ISI). Explain the use of equalizers to remove the effect of ISI. **[6]**

b) Describe working of closed loop bit synchronizer in a digital communication system with the help of block diagram and waveforms. **[6]**

c) Compare unipolar NRZ and split phase manchester data formats with respect to following parameters i) transmission of DC component, ii) Noise immunity, iii) Synchronization capability, iv) Bandwidth and v) Crosstalk. **[5]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PE-4253

[Total No. of Pages : 2

[6582]-24

S.E. (Electronics / E & TC/EE(VLSI Design & Tech. / E.C(A.C.T.)

OBJECT ORIENTED PROGRAMMING (2019 Pattern) (Semester - IV) (204194)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) What is operator overloading? Why it is necessary to overload an operator? **[6]**

b) Write a program to demonstrate friend function in C++ **[6]**

c) What are the rules for overloading operators? **[6]**

OR

Q2) a) Explain friend function with example? **[6]**

b) Write a program to overload pre and post increment operators for Complex class. **[6]**

c) Give a programming example that overloads = = operator with its use. **[6]**

Q3) a) Explain virtual base class and virtual function with example? **[6]**

b) Discuss the ways in which inheritance promotes software reuse, saves time during program development and helps prevent errors. **[6]**

c) What does inheritance mean in C++? What are different forms of inheritance? Give an example of each. **[5]**

OR

P.T.O.

Q4) a) Write a C++ program demonstrating use of the pure virtual function with the use of base and derived classes. **[6]**

b) Discuss the role of access specifiers in inheritance and show their visibility when they are inherited as public, private and protected. **[6]**

c) What is the ambiguity that arises in multiple inheritance? How it can be overcome. Explain with example. **[5]**

Q5) a) Explain exception handling mechanism in C++? Write a program in C++ to handle divide by zero exception. **[6]**

b) Explain class template using multiple parameters? Write a program in C++. **[6]**

c) What is stream? Explain types of streams available in C++? **[6]**

OR

Q6) a) Explain Namespace in C++ with example? **[6]**

b) Write a C++ program using function template to find the product of two integer or floating-point type of data. **[6]**

c) What is a user defined exception? Write down the scenario where we require user defined exceptions. **[6]**

Q7) a) Write a program using the open(), eof (), and getline() member function to open and read a file content line by line. **[6]**

b) Explain the role of seekg(),seekp(),tellg(),tellp( ),function in the process of random access in a file. **[5]**

c) What is file mode? Explain any four file modes supported by C++. **[6]**

OR

Q8) a) Write a program using put( ) to write characters to a file until user enters a dollar sign. **[6]**

b) What is the difference between opening a file with constructor function and opening a file with open ( ) function. **[5]**

c) Explain error handling during file operation. **[6]**



Total No. of Questions : 9]

SEAT No. :

PE4254 **[6582]-25** [Total No. of Pages : 4

S.E. (Electronics/E & TC) (Electronics & Computer/ Electronics (VLSI Design & Tech.)/E.C (A.C.T.))

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - III) (207005)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1, Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Black figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Write the correct option for the following multiple choice questions. **[10]**

a) Lagrange's polynomial through the points

x	0	1	2
y	4	0	6

is given by

i) $y = 5x^2 - 3x + 4$ ii) $y = 5x^3 + 3x + 4$

iii) $y = 5x^2 - 9x + 4$ iv) $y = x^2 - 9x + 4$

b) The curl of the vector field

$\bar{F} = z^2\bar{i} + x^2\bar{j} + y^2\bar{k}$ at (1, 0, –1) is

i) $2\bar{j} + 2\bar{k}$ ii) $2\bar{i} + 2\bar{j} + 2\bar{k}$

iii) $\bar{j} + \bar{k}$ iv) $\bar{i} + \bar{j} + \bar{k}$

c) For $\bar{F} = y\bar{i} + z\bar{j}$ the value of $\int \bar{F}.dr$ along the curve $x = t^2$, $y = t$, $z = 2t$ from $t = 0$ to $t = 1$

i) 7/3 ii) 5/3

iii) 3/2 iv) 2/3

d) The value of $\int_c \frac{z+1}{z-3} dz$ where C is $|z-2| = 2$

i) $2\pi i$ ii) $4\pi i$

iii) $6\pi i$ iv) $8\pi i$

P.T.O.

e) In Runge-kutta method k_1, k_2, k_3, k_4 are Calculated then $y = y_0 + k$, where k is calculated from **[1]**

i) $k = \frac{1}{4}(k_1 + k_2 + k_3 + k_4)$ ii) $k = \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$

iii) $k = \frac{1}{8}(k_1 + 2k_2 + k_3 + k_4)$ iv) $k = \frac{1}{10}(k_1 + 2k_2 + 2k_3 + k_4)$

f) Vector field $\bar{F}$ is solenoidal if **[1]**

i) $\nabla \times \bar{F} = 0$ ii) $\nabla . \bar{F} = 0$

iii) $\nabla^2 \bar{F} = 0$ iv) $\bar{F} . \nabla = 0$

Q2) a) Apply Lagrange's interpolating formula to find polynomial passing through set of points. **[5]**

x	0	1	2
y	4	3	6

Also Find Value of y at $x = 1.5$.

b) Use Trapezodial rule to evaluate $\int_0^1 xe^{x^2} dx$ by taking h = 0.1 with **[5]**

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
$f(x) = xe^{x^2}$	0	0.101	0.208	0.328	0.469	0.642	0.86	1.14	1.16	2.203	2.7

c) Using Runge Kutta Fourth order method to solve $\frac{dy}{dx} = \sqrt{x+y}$, $y(0) = 1$ to find y at $x = 0.2$ taking $h = 0.2$. **[5]**

OR

Q3) a) Using Newton's Forward difference formula, For following data & find polynomial **[5]**

x	0	2	4	6	8
y	5	29	125	341	725

b) Evaluate $\int_0^{\pi/2} \frac{\sin x}{x} dx$ by using simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by dividing interval into four parts. **[5]**

c) By using Euler's method, find y at $x = 0.4$ for $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ with $h = 0.1$. **[5]**

Q4) a) Find the directional derivative of $\phi = x^2y + yz^3$ at (1, –1, 1) along the direction $\bar{i} + 2\bar{j} + 2\bar{k}$. **[5]**

b) Show that $\bar{F} = (4xy + z^3)\bar{i} + (2x^2 - z)\bar{j} + (3xz^2 - y)\bar{k}$ is irrotational. Also find the scalar potential ϕ such that $\bar{F} = \nabla\phi$. **[5]**

c) Find the angle between the tangents to the curve $\bar{r} = (t^2 + 1)\bar{i} + (4t - 3)\bar{j} + (2t^2 - 6t)\bar{k}$ at the points t = 1and t = 2. **[5]**

OR

Q5) a) Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at (2, –1, 2) along the tangent to the curve $x = e^t$ cost, $y = e^t \sin t$, $z = e^t$ at t = 0. **[5]**

b) Find the constants a & b such that the surface $ax^2 - byz = (a + 2)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at the point (1, –1, 2). **[5]**

c) $\nabla.\left(\mathrm{r}\,\nabla\frac{1}{r^n}\right) = \frac{n(\mathrm{n}-2)}{r^{n+1}}$. **[5]**

Q6) a) Using Green's theorem, show that Area bounded by a simple closed curve C is given by $\frac{1}{2}\int xdy - ydx$. Hence find the area of ellipse $x = a\cos(\theta), y = b\sin(\theta)$. **[5]**

b) Evaluate $\iint_s (x\bar{i} + y\bar{j} + z^2\bar{k}).d\bar{s}$ where S is the curved surface of the cylinder $x^2 + y^2 = 4$, bounded by the planes z = 0 and z = 2. **[5]**

c) Apply stoke's theorem to calculate $\int_c 4y\,dx + 2z\,dy + 6ydz$, where C is the curve of intersection of $x^2 + y^2 + z^2 = 6z$ and $z = x + 3$. **[5]**

OR

Q7) a) Evaluate $\int_c \bar{F}.d\bar{r}$ for $\bar{F}=(2xy+3z^2)\bar{i}+(x^2+4yz)\bar{j}+(2y^2+6xz)\bar{k}$ along the straight line joining (0, 0, 0) and (1, 1, 1). **[5]**

b) Show that $\iint \frac{\bar{r}}{r^3}\hat{n}\, ds=0$. **[5]**

c) Evaluate $\iint_s \nabla\times\bar{F}.d\bar{s}$ for $\bar{F}=y\bar{i}+z\bar{j}+x\bar{k}$ where S is the surface of the paraboloid $Z=1-x^2-y^2, Z\geq 0$. **[5]**

Q8) a) If $u=x^h-6x^2y^2+y^4$, then find it's harmonic conjugate '*v*' such that $f(z)=u+iv$ is analytic. **[5]**

b) Evaluate $\oint_c \frac{e^z}{(z+1)^2(z-1)^2}dz$, where 'C' is the contour $|z+1|=\frac{1}{2}$, using Cauchy's integral formula. **[5]**

c) Find the bilinear transformation, which send S the points 1, i, –1 from z-plane into the points i, o, –i of the w-plane. **[5]**

OR

Q9) a) If $v=3x^2y-y^3$, then find it's harmonic conjugate 'u'. **[5]**

b) Apply residue theorem to evaluate $\oint_c \frac{z^2+2z}{(z+1)^3(z^2-9)}dz$, where 'C' is $|z-3|=3$. **[5]**

c) Show that the transformation $w=z+\frac{1}{z}-2i$ maps the circle $|z|=2$ into an ellipse. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE4255 **[6582]-26** [Total No. of Pages : 2

S.E. (Electronics /E &TC/Electronics (VLSI Design & Tech.)/E.C (A.C.T.))

ELECTRONIC CIRCUITS (EC)

(2019 Pattern) (Semester - III) (204181)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagram must be drawn wherever necessary.***

Q1) a) Define Voltage regulation. Explain Concept of Low drop out Voltage regulator. **[6]**

b) IC Voltage Regulator using IC 317, Calculate values of R2 for the output voltage 5v to 10v, assume R1=240Ω and Iadj = 100μA. **[6]**

c) Draw and explain with Block diagram Switch Mode Power Supply (SMPS). **[6]**

OR

Q2) a) Draw and explain the block diagram of Power Supply. **[6]**

b) IC Voltage Regulator using IC 317, Calculate values of R2 for the output voltage 15v to 30 v, assume R1=240Ω and Iadj = 100μA. **[6]**

c) Write a Short note on "Current boosting Voltage regulator". **[6]**

Q3) a) Draw Block diagram of OP-AMP. And explain the function of each block. **[6]**

b) Define the following Characteristics of OP-AMP **[6]**

i) Input offset Current

ii) Input offset voltage

iii) Slew Rate

c) Compare Concept of open loop and Close loop configuration of OP-AMP. **[5]**

OR

Q4) a) State Ideal and Typical values of OP-AMP parameters (IC 741). **[6]**

b) Draw the equivalent circuit of OP-AMP with ideal transfer curve. **[6]**

c) Explain the need of level shifting in OP-AMP. **[5]**

P.T.O.

Q5) a) Draw and explain non-Inverting amplifier with its input and output waveforms. **[6]**

b) Design a Practical differentiator circuit for the input signal having maximum frequency of operation 150 Hz. **[6]**

c) Draw and explain Instrumentation amplifier circuit using three OP-AMP. **[6]**

OR

Q6) a) Compare Inverting and Non-Inverting amplifier in OP-AMP. **[6]**

b) Design a Practical Integrator circuit to operate at f = 2 KHz and gain equal to 4. **[6]**

c) Draw and explain Zero Crossing detector using OP-AMP. **[6]**

Q7) a) Draw and explain V to I Converter using grounded load using OP- AMP. **[5]**

b) Explain the disadvantages of binary weighted resistor circuit over R/2R DAC using OP-AMP. **[6]**

c) With the help of neat block diagram explain operation of PLL. **[6]**

OR

Q8) a) Draw and explain I to V Converter using OP-AMP. **[5]**

b) Draw and explain the circuit of flash type ADC using OP-AMP. **[6]**

c) Define the following specifications of ADC **[6]**

i) Resolution

ii) Accuracy

iii) Quantization errors



Total No. of Questions : 8]

SEAT No. :

PE4256

[Total No. of Pages : 2

[6582]-27

S.E. (Electronics/E & TC) (Electronics & Computer Engg.Electronics (VLSI Design & Tech.)/E.C(A.C.T.))

DIGITAL CIRCUITS

(2019 Pattern) (Semester - III) (204182)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Design of one-bit magnitude comparator. **[6]**

b) Implement the following expression using single 8 : 1 multiplexer **[6]**

$$Y = \sum m(0,1,2,5,7,8,9,14,15)$$

c) Write a short note on Look ahead carry generator. **[6]**

OR

Q2) a) Design of 3 bit even parity generator. **[6]**

b) Implement the following function using 1 : 8 De-multiplexer. **[6]**

F1(A,B,C) = $\Sigma m(0,3,7)$

F2(A,B,C) = $\Sigma m(1,2,5)$

F3(A,B,C) = $\Sigma m(1,3,6)$

c) Write a short note on ALU. **[6]**

Q3) a) Define the following terms as applied to flip-flop. **[6]**

i) Set up time

ii) Hold time

iii) Propagation Delays

b) Perform the JK flip-flop to D flip-flop conversion. **[6]**

c) Design and implement a MOD 6 asynchronous counter IC 7490. **[5]**

OR

P.T.O.

Q4) a) Design a sequence generator to generate sequence 11001 using shift register. **[6]**

b) Design and implement a MOD 4 synchronous counter using D flipflop. **[6]**

c) Explain the various modes of shift Register. **[5]**

Q5) a) Design sequence detector to detect a sequence 101... using D flip-flops. Use mealy machine. **[9]**

b) Draw an ASM chart for a 2-bit binary counter having enable line E such that E=1 (counting enabled) and E = 0 (hold present count). **[8]**

OR

Q6) a) Design sequence detector to detect a sequence 110... using T flip-flops. Use mealy machine. **[9]**

b) Draw an ASM chart and state table for a 2-bit up-down counter having mode control input : **[8]**

M = 1 : Up counting

M = 0 : Down counting

The circuit should generate a output 1 whenever count becomes minimum or maximum.

Q7) a) Compare between PROM, PAL, PLA **[6]**

b) Design following functions using PLA. **[6]**

$F_1 = \sum m(1,3,5)\ F_2 = \sum m(5,6,7)$

Implement the circuit with a PLA having 3 inputs, 3 product terms and 2 output.

c) Draw and explain the architecture of CPLD. **[6]**

OR

Q8) a) Draw a neat diagram of one cell of staticRAM and explain its working. **[6]**

b) Design following functions using PLA : **[6]**

$F_1 = \sum m(3,5,7)\ F_2 = \sum m(4,5,7)$

c) Draw and explain the architecture of FPGA. **[6]**



Total No. of Questions : 8]

SEAT No. : [ ]

PE4257

[Total No. of Pages : 3

[6582]-28

S.E. (Electronics/E & TC Engineering)

ELECTRICAL CIRCUITS

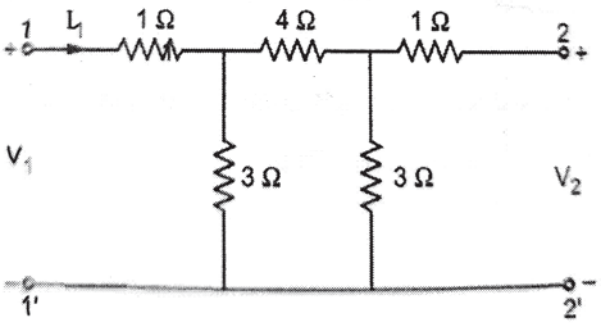
(2019 Pattern) (Semester - III) (204183)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Find y-parameters of the network shown **[6]**

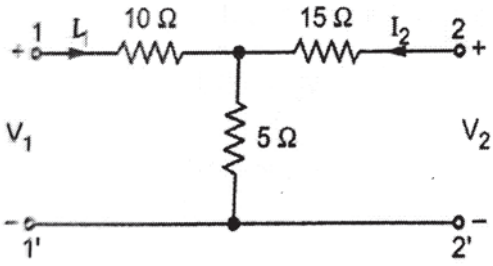


b) Explain the significance of pole and zeros. How the locations of poles and zeros of networks affect the network stability? **[6]**

c) Define Z-parameters and draw its equivalent circuit. **[6]**

OR

Q2) a) Find z-parameters of the network shown **[6]**



b) Define Y-parameters and draw its equivalent circuit. **[6]**

c) Explain the condition of reciprocity and symmetry by giving examples. **[6]**

P.T.O.

Q3) a) Derive the emf equation of DC generator. **[6]**

b) Explain the methods of speed control of DC shunt motors. Draw the necessary circuit diagrams. **[6]**

c) A 4 pole, lap wound, DC generator has 42 coils with 8 turns per coil. It is driven at 1200 rpm. If useful flux per pole is 21 mWb, calculate the generated emf. Find the speed at which it is to be driven to generate the same emf as calculated above with same wave wound armature. **[5]**

OR

Q4) a) Derive an expression for torque of a DC motor. **[6]**

b) Explain the torque speed and torque current characteristic of DC shunt motor. **[6]**

c) Find the useful flux per pole on no-load of a 250V, 6 pole shunt motor having a two circuit connected armature winding with 220 conductors. At normal working temperature, the overall armature resistance including brushes is 0.2Ω. The armature current is 13.3 A at the no-load speed of 908rpm. **[5]**

Q5) a) Explain the construction and working principle of three phase induction motor. **[6]**

b) A 4 pole, 3 phase induction motor is supplied from 50Hz supply. Determine its synchronous speed. On full load, its speed is observed to be 1410 rpm. Calculate its full load slip. **[6]**

c) Explain speed control with v/f method. **[6]**

OR

Q6) a) Compare squirrel cage rotor and slip ring rotor. **[6]**

b) The input to 3-phase, 400V, 6 pole, 50Hz induction motor is 10kW, while running at 950rpm. The stator losses are 600 watt and mechanical losses are 400 watt/Calculate motor output and its efficiency. **[6]**

c) Derive the relationship between P2, Pm and Pc. **[6]**

Q7) a) Explain the construction of brushless DC motor. Draw and explain it's torque-speed characteristics. **[6]**

b) What are stepper motors? How they are classified? **[6]**

c) Compare EV and IC engine vehicles. **[5]**

OR

Q8) a) Define the following terms related to stepper motor: **[6]**

i) Holding torque

ii) Detent Torque

iii) Step Angle

iv) Critical torque

v) Limiting Torque

vi) Slew Rate

b) Explain construction and working of EV. **[6]**

c) Compare variable reluctance and permanent magnet stepper motor. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE-5969

[Total No. of Pages : 3

[6582]-29

S.E. (Electronics/ET&C/Electronics (VLSI Design & Tech.)/E.C (A.C.T.))

DATA STRUCTURES

(2019 Pattern) (Semester - III) (204184)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable additional data if necessary.***
5) ***Use of Calculator is allowed.***

Q1) a) Write a short note on circular queue. Compare it with linear queue. **[5]**

b) Convert the following prefix expression into infix form. Show all the steps and stack contents: **[6]**

*-A/BC-/AKL

c) Write ADD and DETETE function in 'C' for Queue using array. **[6]**

OR

Q2) a) Compare Stack and Queue. What are the advantages of circular queue over liner queue? **[6]**

b) Write a function PUSH and POP in 'C' for stack using linked list. **[6]**

c) What are the applications of Queue? Explain two applications in detail. **[5]**

Q3) a) Draw and explain circular linked list. State the limitations of single linked list. **[5]**

b) Write a 'C' function to insert a number at end in to the singly linked list. **[6]**

c) Differentiate singly linked list and doubly linked list. **[6]**

OR

Q4) a) Compare array and linked list. **[5]**

b) Write a 'C' function to delete a number from singly linked list. **[6]**

c) Explain doubly linked list (DLL). What are the advantages of DLL over SLL. **[6]**

P.T.O.

Q5) a) Define BST? Create a BST for the following data: **[6]**

14, 15, 4, 9, 7, 18, 3, 5, 7.

b) Define binary tree. Name and explain with suitable example the following terms : **[6]**

i) Root node

ii) Left sub tree and right sub tree

iii) Depth of tree

c) Construct the binary search tree from the following elements: **[6]**

15, 4, 16, 8, 2, 18, 14

Also show preorder, inorder and postorder traversal for the same.

OR

Q6) a) Construct Binary search tree for the following : **[6]**

MAR, OCT, JAN, APR, NOV, FEB, MAY, DEC, JUN, AUG, JUL, SEP

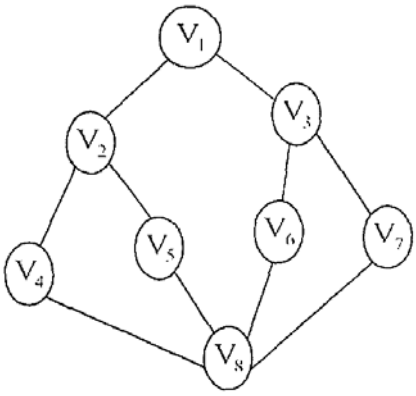
b) Write a pseudo code to search an element in binary search tree using arrays. **[6]**

c) Explain with suitable example how binary tree can be represented using:

i) Array

ii) Linked List **[6]**

Q7) a) Draw adjacency list and adjacency matrix for the following graph: **[6]**

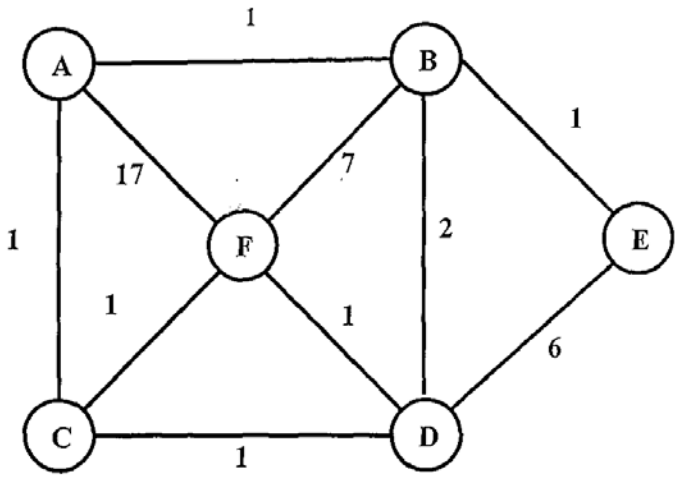


b) What is MST? Explain with suitable example Kruskal's Algorithm to find out. MST **[6]**

c) Define DFS and BFS graph with example. **[6]**

OR

Q8) a) Explain Kruskal algorithm? Find the minimum spanning tree for below figure. Using Kruskal's Algorithm. **[6]**



b) Explain Dijkstra's algorithm with example. **[6]**

c) Explain with suitable example the techniques to represent a Graph. **[6]**
Note: consider graph of minimum 5 vertices

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Total No. of Questions : 8]

SEAT No. :

PE-4258

[Total No. of Pages : 2

[6582]-30

S.E. (Electronics & Computer Engineering)

PRINCIPLES OF PROGRAMMING LANGUAGE

(2019 Pattern) (Semester - IV) (204206)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain functional and logic programming paradigms. **[5]**

b) Explain in detail about **[6]**

i) Abstraction.

ii) Modularity.

c) Explain Interface in Java with examples. **[6]**

OR

Q2) a) What is meant by modularity? Which concepts are supported to achieve modularity in any programming language? **[6]**

b) Explain the concept of Encapsulation in detail with example. **[6]**

c) What is Generic data structures? Explain with examples. **[5]**

Q3) a) Explain Java Virtual Machine. **[6]**

b) Difference between Users defined and Primitive data types. **[6]**

c) Explain any Java Iterative statement with example **[6]**

i) Loop statement

ii) Jump statement

OR

P.T.O.

Q4) a) Explain architecture of Java virtual machine. **[6]**

b) Explain the concept of any two arrays. How to declare an array in Java? Compare arrays in C and Java. **[6]**

c) Explain data types and sign in Java with examples. **[6]**

Q5) a) What is difference between method overriding and method overloading. **[5]**

b) Explain various forms of implementing an interface in Java. How multiple inheritance is supported in Java? **[6]**

c) What is use of package in Java? How CLASSPATH helps to store and retrieve the classes? How is access protection provided for packages?**[6]**

OR

Q6) a) What is an interface in Java? How is this different than a class? Give example of interface. **[6]**

b) Explain concept of method overloading in Java with suitable example. **[5]**

c) What is method overriding? In Java, what is advantage of using overriding? Demonstrate method overriding with example. **[6]**

Q7) a) What are uncaught exceptions? State the use of try(), catch(), throw() methods. **[6]**

b) Explain the method of file input stream and file output stream classes in Java. **[6]**

c) What are stream classes in Java? List and explain the methods of Character Array output Stream class. **[6]**

OR

Q8) a) Write a program for use of multiple catch blocks in Java. **[6]**

b) State the use of following methods for programming applet. Give an example of using each of these init(), Start(), Paint(), Stop(), Destroy(), Update(). **[6]**

c) Explain in detail about applet architecture. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4259

[Total No. of Pages : 3

[6582]-31

S.E. (Electronics and Computer Engineering)

SYSTEM PROGRAMMING AND OPERATING SYSTEMS

(2019 Pattern) (Semester - IV) (204207)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain architecture of Multitasking Operating Systems. **[6]**

b) Consider the following processes arrival time and burst time are as shown. Calculate average waiting time and average turnaround time using FCFS scheduling algorithm. **[6]**

Process	Arrival time	Burst time
P1	02	02
P2	00	01
P3	02	03
P4	03	05
P5	04	05

c) Define Process. Draw process state transition diagram in operating system and explain different process states in detail. **[8]**

OR

Q2) a) In the following example, there are five processes named as P1, P2, P3, P4 and P5. Their arrival time and burst time are given in the table below. Calculate average waiting time and average turnaround time for SJF (Non-preemptive) scheduling algorithm. **[6]**

Process	Arrival time	Burst time
P1	02	06
P2	05	02
P3	01	08
P4	00	03
P5	04	04

b) Draw and explain architecture of Batch Operating Systems. **[6]**

c) Draw and explain Microkernel Operating System. Differentiate between Microkernel and Monolithic Kernel. **[8]**

P.T.O.

Q3) a) Explain any two Classical Problems of Synchronization in detail. **[8]**

b) What is semaphore? Explain different types of Semaphore. State the advantages of Semaphore. **[8]**

OR

Q4) a) What is dead lock in operating system? What are the three ways to handle deadlock explain it with example. **[8]**

b) What is Mutual Exclusion? Explain any three mutual exclusion techniques in detail. **[8]**

Q5) a) Explain the concept of Paging and Segmentation. Differentiate between Paging and Segmentation. **[8]**

b) Explain the terms Shared Memory and Message passing for IPC. Give the difference between shared memory and message passing. **[8]**

OR

Q6) a) i) Explain concept of paging with suitable diagram.

ii) Calculate the number of page faults and page hits for the page replacement policies FIFO for the given reference string 1, 3, 0, 3, 5, 6, 3 with 3 page frames. **[8]**

b) What is Fragmentation? Explain Internal fragmentation and External fragmentation and differentiate between them. **[8]**

Q7) a) Differentiate between Programmed I/O and Interrupt Driven I/O. **[6]**

b) What is I/O buffering? Explain different types of I/O buffering. **[6]**

c) Explain the following File allocation methods **[6]**

i) Contiguous File allocation

ii) Linked File Allocation

OR

Q8) a) Explain the following Directory structure in OS **[6]**

i) Single-level directory

ii) Two-level directory

b) Consider the following disk request sequence for a disk with 200 tracks Request

sequence = {176, 79, 34, 60, 92, 11,41, 114)

Head pointer is starting at 50 and moving in left direction. Find the number of head movements (total seek length) in cylinders using FCFS scheduling. **[6]**

c) Explain file management concept. What are the functions of file management in operating system? **[6]**

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Total No. of Questions : 8] **SEAT No. :**

PE4260 **[Total No. of Pages : 2**

[6582]-32
S.E. (Electronics and Computer Engineering)
ELECTRONIC CIRCUITS
(2019 Pattern) (Semester - III) (204202)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain the block diagram of LM317. **[6]**

b) Define the line and load regulation in case of voltage regulator. What are the ideal values for same? **[6]**

c) Write the short note on low drop out voltage regulator. **[6]**

OR

Q2) a) Explain current boosting voltage regulator using LM317. **[6]**

b) Determine the range over which voltage range can varied in LM317 voltage regulator if the values of R_1 is 240 ohm and R2 taken as 5K potentiometer. Assume I_{adj} =100uA. Draw the typical connection diagram. **[6]**

c) Compare linear and switching power supply. **[6]**

Q3) a) Draw internal the block diagram of OPAMP and explain in detail. **[6]**

b) Explain the following op-amp parameters: **[6]**

i) Input offset voltage

ii) CMRR

iii) Slew Rate

c) What is current mirror? Why it is used? **[5]**

OR

Q4) a) Explain the following parameter of Op-Amp **[6]**

i) Slew rate

ii) PSRR

iii) Gain bandwidth product

b) Explain the level shifter stage of Op-Amp in detail. **[5]**

c) Justify, how constant current source used in placed of R_E to improve the CMRR in differential Amplifier. **[6]**

P.T.O.

Q5) a) Draw neat circuit diagram of: **[6]**

i) Schmitt trigger

ii) Precision amplifier

b) Explain Zero crossing Detectors using op-amp with necessary waveforms. **[6]**

c) List important characteristics of comparator. What are the advantages of Schmitt trigger over comparator? **[6]**

OR

Q6) a) Draw circuit diagram of three op-amp instrumentation amplifier and write its output equation. **[6]**

b) Explain Practical differentiator circuit with neat circuit diagram. What are the limitations of ideal differentiator? **[6]**

c) Draw the circuit diagram of practical differentiator and write equation for output voltage (Vo). **[6]**

Q7) a) Define the following terms w.r.t PLL: **[6]**

i) Free running Frequency

ii) Lock range

iii) Capture range

iv) Pull in Time

b) Draw the block schematic of PLL and explain each block in detail. **[5]**

c) List the various methods of A/D Conversion. Compare them and explain which one is fastest. **[6]**

OR

Q8) a) Draw block diagram and explain any one application of ICPLL 565 in detail. **[6]**

b) Write short notes on application of PLL : **[6]**

i) Frequency Multiplier

ii) FM Demodulator

c) Draw and explain successive approximation A/D converter. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE4261

[Total No. of Pages : 3

[6582]-33

S.E. (Electronics and Computer Engineering)

DATA STRUCTURES AND ALGORITHMS

(2019 Pattern) (Semester - III) (204184)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) What is Queue? Explain basic operations (initialization, enqueue and dequeue) on queue. **[6]**

b) Write 'C' functions to Push and Pop elements from a stack of integers using array. **[6]**

c) Write a 'C' structure for a queue of integers using array. Explain queue as an Abstract Data Type (ADT). **[6]**

OR

Q2) a) State limitations of linear queue. What is a circular queue? Explain how a circular queue overcomes limitations of linear queue. **[6]**

b) Identify the expressions and convert them into remaining two **[6]**

i) a*b/c*d-e/f

ii) (a+b)/(c+d)

c) Explain Stack operations PUSH and POP with example. State the stack empty and stack full conditions. **[6]**

Q3) a) Write short notes on **[6]**

i) Circular Linked List

ii) Doubly Link List

b) Represent the following polynomials using linked list. **[5]**

i) $5x^4 + 100x^3 + 15x^2 + 2x + 25$

ii) $6x^5 - 9x^4 + 5x^2 - 99x$

c) Write a 'C' structure of a node of a doubly linked list. Differentiate between Array and Linked list. **[6]**

OR

P.T.O.

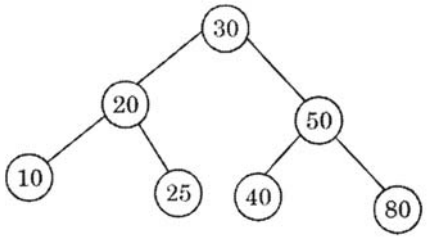
Q4) a) Write 'C' function to delete node from singly linked list. **[6]**

b) Differentiate between SLL and DLL. **[6]**

c) A doubly linked list with numbers to be created. Write algorithm to create the list. **[5]**

Q5) a) Define Binary Tree. What are its types? Explain with suitable figures. **[6]**

b) Write inorder, preorder, Postorder traversal for the following tree. **[6]**



c) Construct a binary search tree for the following data. **[5]**
SNOOPY, TOM, JERRY, MICKY, MOUSE, BUGS, BUNNY, WINNIE.

OR

Q6) a) Define the following terms : **[6]**

i) Root
ii) Subtree
iii) Level of Node
iv) Depth of Tree
v) Siblings
vi) Height of tree

b) Explain with suitable example how binary tree can be represented using **[6]**

i) Array
ii) Linked List

c) Construct the binary search tree (BST) from the following elements :
10, 60, 40, 28, 14, 50, 5 **[5]**

Q7) a) Give the adjacency matrix and adjacency list as shown in figure (1). **[6]**

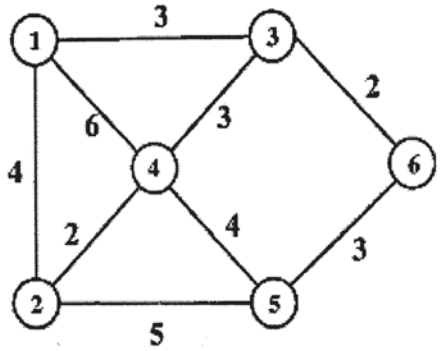
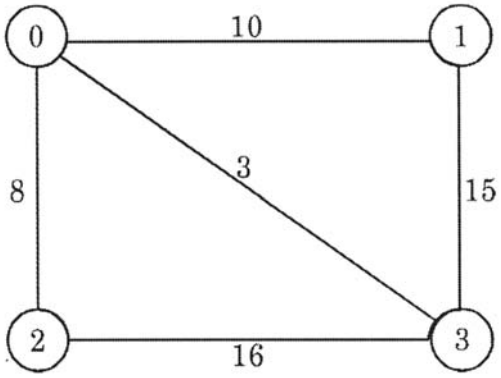


Fig. 1

b) Explain Dijkstra's shortest path algorithm with example. **[6]**

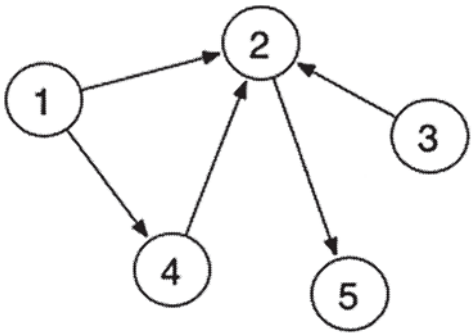
c) What do you mean by spanning tree of a graph? Find minimal spanning tree of the following graph using Kruskal's algorithm. **[6]**



OR

Q8) a) Define Graph. Differentiate between DFS & BFS. **[6]**

b) Define indegree and outdegree of a vertex in graph. Find the indegree and the outdegree for the following graph. **[6]**



c) Explain following types of graph with appropriate diagrams. **[6]**

i) Undirected graph

ii) Directed graph

iii) Weighted graph

Total No. of Questions : 8]

SEAT No. :

PE4262

[Total No. of Pages : 2

[6582]-34

S.E. (Electronics & Computer Engineering)

COMPUTER ORGANIZATION

(2019 Pattern) (Semester-III) (204203)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Compare memory mapped I/O with I/O mapped I/O. **[5]**

b) Explain in detail Direct Memory Access (DMA). **[6]**

c) What are the evolutionary steps of I/O channel? Explain types of I/O channel? **[6]**

OR

Q2) a) Differentiate between programmed I/O and Interrupt driven I/O. **[5]**

b) What is the use of DMA? Explain cycle stealing in DMA? **[6]**

c) Discuss the following I/O mechanisms for transferring data with a neat flowchart: Programmed I/O and Interrupt Driven I/O. **[6]**

Q3) a) Explain different addressing modes with example. Discuss drawback of relative addressing mode. **[5]**

b) Explain the following addressing modes with one example such. **[6]**

i) Immediate

ii) Register Indirect

iii) Direct

c) What is displacement addressing? Explain its types with calculation of effective address. **[6]**

OR

P.T.O.

Q4) a) What is machine instruction? Explain any three types of operations. **[5]**

b) List the features of 8086 microprocessors. **[6]**

c) Explain the following addressing modes along with suitable example: **[6]**

i) Direct addressing

ii) Indirect addressing

iii) Displacement addressing mode

Q5) a) Explain with example working of multistage pipeline. **[5]**

b) What are various hazards in instruction pipelining? Explain with example. **[6]**

c) Explain the instruction cycle in detail. **[7]**

OR

Q6) a) List and explain various ways in which an instruction pipeline can deal with conditional branch instructions. **[5]**

b) What is register organization? What are different types of registers? Explain in detail. **[6]**

c) Write a short note on superscalar execution and superscalar implementation. **[7]**

Q7) a) Write control sequence for execution of the instruction Add (R3), R1. **[5]**

b) Explain the design of multiplier control unit using Delay Element method. **[6]**

c) What is microprogrammed control unit design? Draw and explain basic structure of micro-programmed control unit. **[7]**

OR

Q8) a) Compare hardwired control and microprogrammed control unit. **[5]**

b) Write a control sequence for the following instruction for single bus organization: SUB (R3), R1. **[6]**

c) Explain in detail microinstruction sequencing organization. **[7]**



Total No. of Questions : 9]

SEAT No. :

PE-4263

[Total No. of Pages : 5

[6582]-35

S.E. (Computer Engineering / IT / Computer Science & Design / AI & ML)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - IV) (207003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Q. 1 is compulsory.***
2) ***Attempt Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of Electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) Write the correct option for the following multiple choice questions :

i) Coefficient of correlation between the variables x and y is 0.8 and their covariance is 20, the variance of x is 16. The standard deviation of y is _____. **[2]**

a) 6.75 b) 6.25

c) 7.5 d) 8.25

ii) The mean and variance of binomial probability distribution are $\frac{5}{4}$ and $\frac{15}{16}$ respectively. Probability of success in a single trial p is equal to **[2]**

a) $\frac{1}{2}$ b) $\frac{15}{16}$

c) $\frac{1}{4}$ d) $\frac{3}{4}$

P.T.O.

iii) Using Gauss elimination method the solution of system of equations $x+\frac{1}{4}y+\frac{1}{4}z=1, \frac{15}{4}y-\frac{9}{4}z=3, \frac{5}{4}y-\frac{19}{4}z=3$ is _____. **[2]**

a) $x = 1, y = 2, z = 3$

b) $x=\frac{1}{2}, y=1, z=\frac{1}{2}$

c) $x=2, y=\frac{1}{2}, z=2$

d) $x=1, y=\frac{1}{2}, z=-\frac{1}{2}$

iv) If Langrange's interpolation polynomial passes through the points

x	0	2	3
y	1	3	2

then the value of y at $x = 1$ is **[2]**

a) $\frac{2}{3}$

b) $\frac{5}{3}$

c) $\frac{8}{3}$

d) $\frac{5}{4}$

v) Given equation is $\frac{dy}{dx}=f(x,y)$ with initial conditions $x=x_0, y=y_0$ and h is step size Euler's formula to calculate y, at $x = x_0 + h$ is given by _____. **[1]**

a) $y_1 = y_0 + hf(x_0, y_0)$

b) $y_1 = y_0 + hf(x_1, y_1)$

c) $y_1 = y_1 + hf(x_0, y_0)$

d) $y_1 = hf(x_0, y_0)$

vi) Coefficient of kurtosis β_2 is given by **[1]**

a) $\frac{\mu_4}{\mu_3}$

b) $\frac{\mu_4}{\mu_2^2}$

c) $\frac{\mu_3}{\mu_2^2}$

d) $\frac{\mu_4}{\mu_2^3}$

Q2) a) The first four moments of a distribution about the value 3.5 are 0.0375, 0.4546, 0.0609 and 0.5074. Find the first four central moments about the mean. **[5]**

b) Obtain regression line of x on y for the following data : **[5]**

x	6	2	10	4	8
y	9	11	5	8	7

c) Fit a linear curve $y = ap + b$ by using least square criteria **[5]**

p	100	120	140	160	180	200
y	0.90	1.10	1.20	1.40	1.60	1.70

OR

Q3) a) Calculate the coefficient of correlation from the information $n = 5$, $\Sigma x = 100$, $\Sigma x^2 = 230000$, $\Sigma y^2 = 80$, $\Sigma xy = 500$, $\Sigma y = 2$. **[5]**

b) Fit $y = ax^2 + bx + c$ to the given data where a, b, c are constants. **[5]**

x	–3	–2	–1	0	1	2	3
y	12	4	1	2	7	15	30

c) The line of regression of y on x is $8x - 10y + 66 = 0$ and the line of regression of x on y is $40x - 18y = 214$. Find **[5]**

i) the mean values of x and y

ii) correlation coefficient between x & y

Q4) a) A throw is made with two dice. Find the probability that : **[5]**

i) the sum is 7 or less

ii) the sum is a perfect square

b) The mean and variance of a binomial distribution are 4 and 2 respectively, find $p(r \leq 2)$. **[5]**

c) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515 cm and standard deviation 0.0020 cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004 cm? **[5]**

[Given A(2.25) = 0.4878, A(1.75) = 0.4599]

OR

Q5) a) An unbiased coin is thrown 10 times. Find the probability of getting **[5]**

i) exactly 8 Heads

ii) at least 8 heads

b) The number of breakdowns of a computer in a week is a Poisson variable with $z = np = 0.3$. What is the probability that the computer will operate **[5]**

i) with no breakdown

ii) at most one breakdown

c) Demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained. **[5]**

Days	Mon	Tue	Wed	Thurs	Fri	Sat
No. of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

(Given : $\chi^2_{5,0.05} = 11.07$)

Q6) a) Using the bisection method, find an approximate root of the equation $x\sin x - 1$, that lies between $x = 1$ and $x = 1.5$ (measured in radians). Perform six iterations. **[5]**

b) Obtain the root of the equation $x^3 - 4x - 9 = 0$ correct to four decimal places by using Newton-Raphson method. **[5]**

c) Solve by Gauss - Seidel method, the following system of equations. **[5]**

$$20x_1 + x_2 - 2x_3 = 17$$

$$3x_1 + 20x_2 - x_3 = -18$$

$$2x_1 - 3x_2 + 20x_3 = 25$$

OR

Q7) a) Solve the following system by Gauss - elimination method : **[5]**

$$4x_1 + x_2 + x_3 = 4$$

$$x_1 + 4x_2 - 2x_3 = 4$$

$$3x_1 + 2x_2 - 4x_3 = 6$$

b) Solve the following system of equations by Jacobi - iteration method : **[5]**

$$6x_1 + 2x_2 - x_3 = 4$$
$$x_1 + 5x_2 + x_3 = 3$$
$$2x_1 + x_2 + 4x_3 = 27$$

c) Use method of false position to find the root of the equation $x^4 - 32 = 0$ correct to three decimal places. **[5]**

Q8) a) Find the value of y at $x = 1.5$ for the following data using Newton's forward difference formula. **[5]**

x	0	2	4	6	8
y	5	29	125	341	725

b) Find the value of $\int_0^3 \frac{1}{1+x}dx$ by using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. Take $h = 0.5$ and correct the solution upto four decimal places. **[5]**

c) Use Euler's method to solve the equation $\frac{dy}{dx} = 1 + xy$ with y(0) = 1 and tabulate the solution for $x = 0$ to $x = 0.4$. Take $h = 0.1$ and correct the solution upto fourth decimal place. **[5]**

OR

Q9) a) Use Runge - Kutta method of fourth order to solve $\frac{dy}{dx} = \frac{1}{x+y}, y(0) = 1$ in the interval (0, 0.2) with $h = 0.2$ correct the solution upto fourth decimal place. **[5]**

b) Given $\frac{dy}{dx} = x^2 + y, y(0) = 1$ determine using modified Euler's method the value of y when $x = 0.05$. Take $h = 0.05$ and correct the solution upto fourth decimal place. Use two iterations only. **[5]**

c) Using Newton's backward difference formula find the value of y at $x = 3.5$ for the following data. **[5]**

x	0	1	2	3	4
y	3	2	3	6	11

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Total No. of Questions : 8]

SEAT No. :

PE-4264

[Total No. of Pages : 4

[6582]-36

S.E. (Computer Engineering / AI & DS)

DATA STRUCTURES AND ALGORITHMS

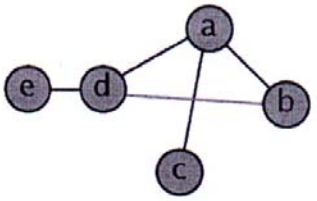
(2019 Pattern) (Semester - IV) (210252)

Time : 2½ Hours] *[Max. Marks : 70*

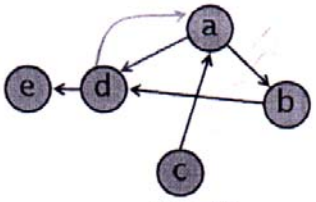
Instructions to the candidates :

1) ***Answer to the questions Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No.4, Q. No. 5 or Q. No. 6. Q. No. 7 or Q. No, 8.***
2) ***Assume suitable data, if necessary.***
3) ***Draw neat labelled diagram wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Represent the following graphs using adjacency matrix. **[6]**



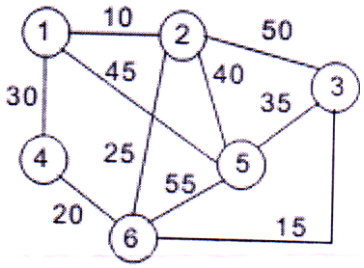
Graph1



Graph2

b) Explain Floyd Warshall algorithm to calculate shortest paths. **[6]**

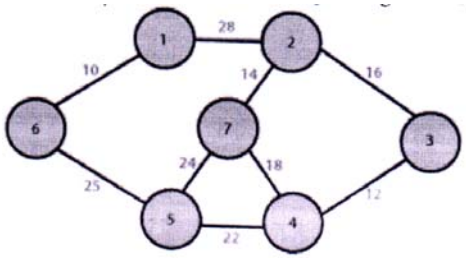
c) Construct the minimal spanning tree for the graph shown below using Kruskal's algorithm. **[6]**



OR

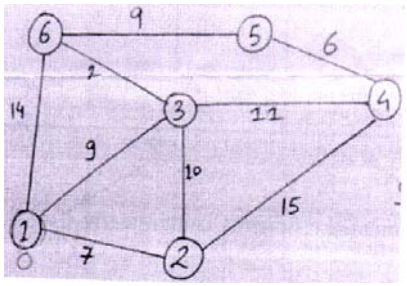
P.T.O.

Q2) a) Find the MST for the following graph using Prims algorithm. **[6]**



b) Explain Depth first traversal of a graph with example. **[6]**

c) Find Single source shortest path using Dijkstra's Algorithm. Select source as vertex 1. **[6]**



Q3) a) What is K-D tree? Show creation of 2-D tree with example. **[6]**

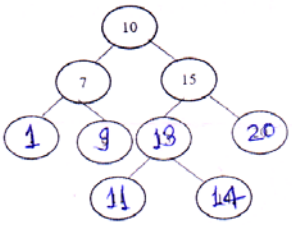
b) Consider following : **[6]**

Input: keys[] = {10, 12, 20}, freq[] = {34, 8, 50}

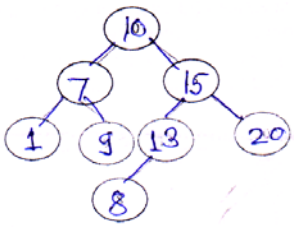
Draw all possible BSTs. Find minimum cost of the BST.

c) Do the following operations on the tree : **[6]**

i) Zig Zag Rotation



ii) Zag Zig Rotation



OR

Q4) a) Construct a AVL tree for the following data: **[6]**

5, 12, 10, 9, 8, 14, 23, 29, 28, 17

b) Define Red- Black tree, state its properties and give suitable example. **[6]**

c) i) Illustrate AA tree.

ii) Define splay tree. List the operations and rotations that can be performed on splay tree.

[6]

Q5) a) Explain the various cases of node deletion in B- tree. **[6]**

b) Build B+ tree of order 4 for the following data: **[6]**

1, 3, 5, 7, 9, 2, 4, 6, 8, 10.

c) Explain indexing and types of indexing techniques. **[5]**

OR

Q6) a) Construct a B tree of order 3 for following data: **[6]**

10, 34, 78, 45, 123, 341, 234, 167, 159, 52.83

b) Answer the following questions w.r.t. trie tree: **[6]**

i) Which of the following is not true?

a) Trie requires less storage space than hashing

b) Trie allows listing of all the words with same prefix

c) Tries are collision free

d) Trie is also known as prefix tree

ii) What can be the maximum depth of the trie with n strings and m as the maximum sting the length?

a) log2n b) log2m

c) n d) m

iii) Which of the following is true about the trie?

a) root is letter a

b) path from root to the leaf yields the string

c) children of nodes are randomly ordered

d) each node stores the associated keys

iv) Auto complete and spell checkers can be implemented efficiently using the trie.

a) True b) False

v) What traversal over trie gives the lexicographical sorting of the set of the strings?

a) postorder b) preorders

c) inorder d) level order

vi) What is/are the key feature(s) of trie tree?

a) Fast String Operations b) Efficient Prefix Searches

c) Memory Compactness d) All of the above

c) What are multiway search trees? Explain its need and applications. **[5]**

Q7) a) Differentiate between sequential & linked organization. **[6]**

b) What is indexed sequential access file organization? Write two advantages & disadvantages of it. **[6]**

c) What is Direct access file? State its advantages. **[5]**

OR

Q8) a) Differentiate between dense & sparse indices. **[6]**

b) Explain Sequential file organization and discuss their advantages and disadvantages. **[6]**

c) Describe inverted files. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4265

[Total No. of Pages : 2

[6582]-37

S.E. (Computer Engineering/AI & DS/Computer Science)

SOFTWARE ENGINEERING

(2019 Pattern) (Semester - IV) (210253)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain LOC based estimation with example. **[6]**

b) What is the need of project estimation? Explain the steps for estimation of software. **[6]**

c) Define timeline chart. Explain it with suitable example. **[6]**

OR

Q2) a) Compare Lines of Code(LOC) and Function Point (FP) based estimation techniques with suitable example. **[6]**

b) Explain COCOMO model for project estimation with suitable example. **[6]**

c) Define project scheduling. Explain basic principles of project scheduling. **[6]**

Q3) a) Explain in detail layered architecture style. **[6]**

b) State and explain the golden rules of User Interface design. **[6]**

c) Different between cohesion and coupling. **[5]**

OR

Q4) a) Describe the data centered architecture with merits and demerits. **[6]**

b) Why software engineering should have high cohesion and low coupling? Justify. **[6]**

c) List the design concepts. Explain importance of refactoring in improving the quality of software. **[5]**

P.T.O.

Q5) a) List the advantages of SCM Repository. Explain functions performed by SCM Repository. **[6]**

b) Define software risk in detail. Explain the different types of software risks. **[6]**

c) Explain risk identification and assessment process for software project. **[6]**

OR

Q6) a) Explain Software Configuration Management (SCM) process. **[6]**

b) Discuss any two of the following. **[6]**

i) Risk Refinement

ii) Risk Mitigation

iii) Risk Management

c) Write a short note on change control mechanism in SCM. **[6]**

Q7) a) Define software testing. Explain software testing strategies for software development. **[6]**

b) Explain any two of the following in detail : **[6]**

i) System testing

ii) Acceptance testing

iii) Smoke testing

c) Differentiate between verification and validation. **[5]**

OR

Q8) a) Explain integration testing and its objectives. **[6]**

b) What is Test plan? Explain Validation testing in details. How configuration Review is Important? **[6]**

c) Differentiate between white box and black box testing. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-4266

[Total No. of Pages : 2

[6582]-38

S.E. (Computer Engineering)

MICROPROCESSOR

(2019 Pattern) (Semester - IV)(210254)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Black Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain following in detail **[6]**

i) Global Descriptor Table

ii) Interrupt Descriptor Table

b) Draw and explain segment selector format. **[6]**

c) With the necessary flowchart, explain the complete address translation process in 80386. **[6]**

OR

Q2) a) Explain the use of following instructions in detail. **[6]**

i) SGDT

ii) LLDT

iii) SIDT

b) Draw and explain the general descriptor format. **[6]**

c) With the necessary diagram, explain the logical to linear address translation process of 80386. **[6]**

Q3) a) Explain different levels of protection? State the rules of protection check. **[6]**

b) Write a short note on CPL, DPL, and EPL. **[6]**

c) Explain conforming and non-conforming code segments. **[5]**

OR

P.T.O.

Q4) a) Explore the need for a protection mechanism in 80386. **[6]**

b) Define the functions of Type Checking and Limit Checking in protection. **[6]**

c) Explore the role of various fields in page level protection. **[5]**

Q5) a) Define task switching and explain the steps involved in task switching operation. **[6]**

b) Explain the TSS descriptor of 80386 with a neat diagram. **[6]**

c) Differentiate between real mode and virtual mode. **[6]**

OR

Q6) a) Draw and explain task gate desciptor of 80386. **[6]**

b) Draw and Explain the Task State Segment of 80386. **[6]**

c) With the necessary diagram, explain entering and leaving the virtual mode of 80386. **[6]**

Q7) a) With the help of neat diagram explain the process of handling interrupts in protected mode. **[6]**

b) Differentiate and Explain the Interrupt gate and Trap gate descriptor. **[6]**

c) Explain various features of the 8051 microcontroller. **[5]**

OR

Q8) a) Explain the following exception conditions with an example. Faults, Traps, and Aborts. **[6]**

b) What is the error code? Explain with the necessary diagram. **[6]**

c) List and elaborate on different applications of microcontrollers. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-4267

[Total No. of Pages : 2

[6582]-39

S.E. (Computer Engineering)

PRINCIPLES OF PROGRAMMING LANGUAGES

(2019 Pattern) (Semester-IV) (210255)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary***

Q1) a) What is String in Java? Write the functions for following operations of class String in Java with example. **[6]**

i) To find length of String

ii) To Compare two String

iii) Extraction of character from string

b) Define Constructor. List its different types. Demonstrate with suitable example the different types of constructors used in Java. **[6]**

c) Write a program in Java using switch-case statement to perform addition, subtraction, Multiplication and Division of given two numbers and print the result. **[6]**

OR

Q2) a) Describe primitive data types. List the primitive data types in Java and their respective storage capacity. **[6]**

b) Explain the uses of final Keyword in Java with example. **[6]**

c) Explain the following in brief: **[6]**

i) this keyword

ii) Garbage collection

iii) finalize ( ) method

P.T.O.

Q3) a) What are the different types of exceptions? Illustrate how exception are handled in Java with example. **[8]**

b) List and explain different types of inheritance. Demonstrate how Java supports Multiple Inheritance. **[9]**

OR

Q4) a) State the use of Abstract class in java. Explain with program. **[8]**

b) Compare the Package and Interface in java. Write the program for package and Interface. **[9]**

Q5) a) What is Java thread model? **[6]**

b) Explain in details creating multiple threads using isAlive ( ) and join ( ). **[6]**

c) Write two ways to create thread using example. **[6]**

OR

Q6) a) Interpret the terms multitasking and multithreading in Java with example. **[6]**

b) List the advantages and features and limitations of ReactJS, AngularJs. **[6]**

c) State the term thread synchronization. Explain how to achieve thread synchronization in Java **[6]**

Q7) a) What are characteristics of functional programming? **[6]**

b) List and explain predicates in LISP. **[5]**

c) Explain the concept of "Structures" in Prolog with example. **[6]**

OR

Q8) a) List and explain LISP manipulation functions. **[6]**

b) Compare functional and Logic programming. **[5]**

c) Write short note on **[6]**

i) Local Variable

ii) Global variable



Total No. of Questions : 8]

SEAT No. : ____

PE4268

[Total No. of Pages : 4

[6582]-40

S.E. (Computer Engg./Artificial Intelligence and Data Science) (Computer Science & Design Engineering)

DISCRETE MATHEMATICS

(2019 Pattern) (Semester - III) (210241)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) A committee including 3 boys and 4 girls is to be formed from a group of 10 boys and 12 girls. How many different committees can be formed from the group? **[6]**

b) In a certain country, the car number plate is formed by 4 digits from the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 followed by 3 letters from the alphabet. How many number plates can be formed if neither the digits nor the letters are repeated? **[6]**

c) How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed? **[6]**

OR

Q2) a) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done? **[6]**

b) How many 6-digit odd numbers greater than 6,00,000 can be formed from the digits 5, 6, 7, 8, 9, and 0 **[6]**

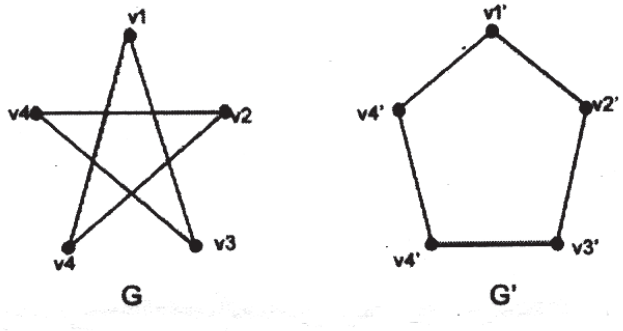
i) if repetition is allowed

ii) if repetition is not allowed

c) A box contains 4 red, 3 white and 2 blue balls. Three balls are drawn at random. Find out the number of ways of selecting the balls of different colours? **[6]**

P.T.O.

Q3) a) Show that the following graphs are isomorphic. **[7]**

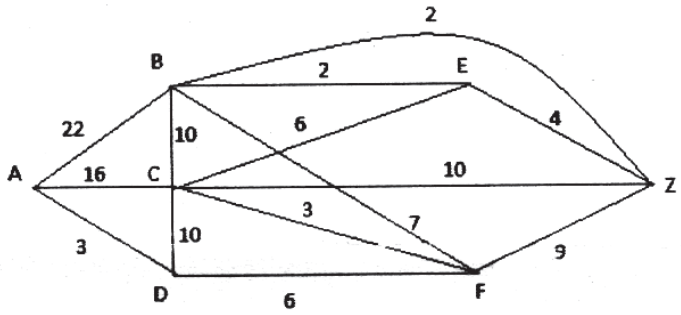


b) List and explain the necessary and sufficient conditions for Hamiltonian and eulerian path with suitable exmples. **[5]**

c) Explain the terms adjacency matrix and incidence matrix. **[5]**

OR

Q4) a) Use dijkstras algorithm to find the shortest path between A and Z in figure. **[7]**



b) Show that in a connected planar graph with 6 vertices and 12 edges, each of the regions is bounded by 3 edges. **[5]**

c) Under what condition $k_{m,n}$ will have eulerian circuit. **[5]**

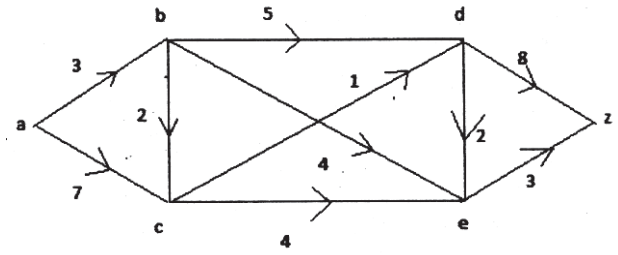
Q5) a) Define following terms. **[6]**

i) Level of a tree

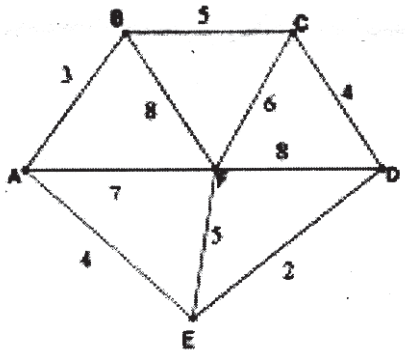
ii) Height of a tree

iii) Fundamental circuit

b) Use labeling procedure to find a maximum flow in the transport network given in the following figure. Determine the corresponding minimum cut. **[6]**



c) Construct Minimal spanning tree for the following graphs using prims algorithm. **[6]**



OR

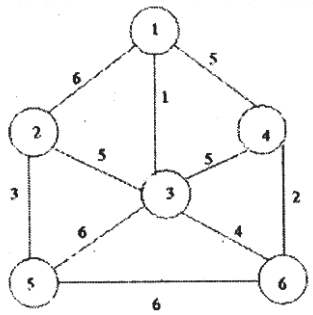
Q6) a) Define following terms **[6]**

i) Forest

ii) Fundamental cutsets

iii) Game tree

b) Construct Minimal spanning tree for the following graphs using kruskals algorithm. **[6]**



c) Construct an optimal tree for 8,9,10,11,13,15,22 using Huffman coding. **[6]**

Q7) a) Define : **[6]**

i) Semi-group

ii) Field

iii) Monoid

b) Let(A,*)be an algebraic system where * is a binary operation such that for any a, b, belongs to A, $a*b = a$. **[6]**

i) show that * is an associative operation

ii) can *ever be a commutative operation?

c) Let (A,*) be a group, show that (A,*) is an abelian group iff $a^2 * b^2 = (a*b)^2$. **[5]**

OR

Q8) a) Define : **[6]**

i) Ring

ii) Ring Homorphism

iii) Integral domain

b) Let $Z_n = \{0,1,2,.....,n\text{-}1\}$. Construct the multiplication table for with $n = 6$. Is $(Zn,*)$ an abelian group. Where * is a binary operation on Z_n such that $a*b$ = remainder of a*b divided by n. **[6]**

c) Prove that the set Z of all integers with binary operation * defined by $a*b = a + b + 1$ such that for all a, b belonging to Z is an abelian group.**[5]**

Total No. of Questions : 8] **SEAT No. :**

PE4269 **[Total No. of Pages : 2**

[6582]-41
S.E. (Computer Engineering) (AI & DS)
FUNDAMENTALS OF DATA STRUCTURES
(2019 Pattern) (Semester - III) (210242)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer to the questions (Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.)***
2) ***Assume suitable data, if necessary.***
3) ***Draw neat labelled diagram wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Given numbers 49, 47, 37, 29, 26, 10, 65, 78, 21, 49. Sort stepwise using radix sort. When it is appropriate to use radix sort? Write time Complexity. **[9]**

b) Write pseudocode/Function for Binary Search algorithm. Explain with suitable example. **[9]**

OR

Q2) a) Write short note on **[9]**

i) Binary Search
ii) Index sequential search
iii) Linear Search

b) Explain Quick sort technique with suitable solved example. Comment on time complexity. **[9]**

Q3) a) Write pseudo code/function using Doubly Linked List of Employees (Emp-number, name and age stored in every node) for: **[9]**

i) Search given Emp_no and update the age
ii) Add given Emp_no after specified number in the list

b) Write and explain use of Generalized linked list for representation of multivariable polynomial with suitable example. Explain node structure. **[9]**

OR

Q4) a) How polynomial can be represented using Singly Linked List?
Write pseudocode to perform addition of two polynomials using singly linked lists into third list. **[9]**

b) Draw and explain structure of Circular Doubly Linked List.
What are advantages of Circular Linked List over Singly Linked List?
Write pseudocode/function for insertion of a node in Circular doubly linked lists. **[9]**

P.T.O.

Q5) a) What are the rules to convert infix expression to postfix expression using stack. Convert expression (E* (F– (G + H * I)) ^ (J * K + L)) stepwise using above rules.

Where ^ is - exponential operator **[8]**

b) Write short notes on **[9]**

i) Backtracking

ii) Tree Recursion

iii) Tail recursion.

OR

Q6) a) What are polish notations? What is the need to convert infix expression into postfix form? Explain postfix evaluation with suitable example. **[8]**

b) Write pseudo-C/C++ code to implement stack using Singly linked list with overflow and underflow conditions. **[9]**

Q7) a) Write short notes on: **[8]**

i) Comparison of Linear queue and Circular queue

ii) Priority queue

b) What is Doubly Ended Queue? Which two data structures are combined in it? Explain input restricted and output restricted queue with operations. **[9]**

OR

Q8) a) Write short note on: **[8]**

i) Circular Queue using Singly Linked List

ii) Descending priority queue and it's applications

b) Draw and explain implementation of Doubly ended Queue using Doubly Linked List. Explain Add, Remove operations. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE4270

[Total No. of Pages : 2

[6582]-42

S.E. (Computer Engg.) (Computer Science & Design Engg.)/(AI & DS)

OBJECT ORIENTED PROGRAMMING (OOP)

(2019 Pattern) (Semester - III) (210243)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw Neat and Clean Diagram.***
4) ***Assume Suitable data if necessary.***

Q1) a) How do you declare and define a pure virtual function in C++? Explain with help of a program. **[5]**

b) Explain need of operator overloading. What are the rules to be followed when overloading an operator in C++? **[6]**

c) Write a program to overload insertion (<<) and extraction (>>) operator in C++. **[6]**

OR

Q2) a) How do we achieve run time polymorphim? **[5]**

b) What is abstract base class in C++ polymorphism? Explain with program. **[6]**

c) Write C++ program to demonstrate use of binary operator overloading using member function. **[6]**

Q3) a) Explain the command line argument in C++. Write a program to explain the same. **[5]**

b) Explain the following file handling functions **[6]**

seekg ( )

c) What do you mean by File Handling? Explain following functions with syntax and an example. **[7]**

i) open()

ii) read()

iii) write()

OR

P.T.O.

Q4) a) Explain what is fstreem, ifstream and ofstream with help of example? Provide the hierarchy of stream classes in C++. **[5]**

b) List and explain different Mode bits used in open() function, while opening a file. **[6]**

c) Define a class Student that has three attributes viz name, roll_no and mark. Write a C++ Program that writers an object to a file and reads an object from a file. **[7]**

Q5) a) What is generic programming? How its is implemented in C++? **[5]**

b) Discuss class template with suitable example in C++. **[6]**

c) What do you mean by rethrowing exceptions. Write a program for the same. **[6]**

OR

Q6) a) What is template function? Explain with suitable example. **[5]**

b) Write a program to demonstrate user defined exception in C++. **[6]**

c) Write a program in C++ to demonstrate Divide by Zero exception. **[6]**

Q7) a) What is STL? Enlist and explain various components of STL. **[5]**

b) What are the various algorithms available in STL? Explain any one with C++ program. **[6]**

c) What is a vector? Write a C++ program to explain various functions. **[7]**

OR

Q8) a) What is an iterator? What are types of iterators? **[5]**

b) What is container? List the container classes in C++. Explain any one of them using program. **[6]**

c) What is Map? Enlist and explain various functions of map. **[7]**



Total No. of Questions : 8]

SEAT No. : ____

PE4271

[Total No. of Pages : 2

[6582]-43

S.E. (Computer Engineering/AIDS/Computer Science and Design Engg.)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - III) (210244)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Consider a Square P(0, 0), Q(0, 10), R(10, 10), S(10, 0). Illustrate Rotation of the Square anticlockwise about fixed point R(10, 10) by an angle of 45 deg. **[6]**

b) What are the types of projection and write in brief about Perspective projection? **[6]**

c) Write transformation matrix for **[6]**

i) 2-D Rotation clockwise direction
ii) 2-D Scaling
iii) 2-D translation
iv) 2-D reflection wrt X-axis
v) 3-D rotation about Y-axis

OR

Q2) a) Explain Parallel and Perspective projections. **[6]**

b) Given a triangle A(1,1), B(3,1), C(2,2) **[6]**
Perform SCALING as follows :
i) Sx = 2, Sy = 2
ii) Sx = 2, Sy = 4 Obtain the new coordinates of A, B, C.

c) Explain rotation about arbitrary point in 2D Transformations. **[6]**

Q3) a) Write a short note on **[6]**

i) HSV color model
ii) Properties of light

b) Explain specular reflection. Discuss its advantages. **[6]**

c) Explain Back-face Removal algorithm. **[6]**

OR

P.T.O.

Q4) a) Explain the CIE chromaticity diagram. **[6]**

b) Explain Halftone method for shading. **[6]**

c) Explain Painter's algorithm. **[6]**

Q5) a) Write a short note on snowflakes fractals seen in real life. **[5]**

b) What are fractals? Explain Triadic Koch in detail. **[6]**

c) Explain Interpolation and approximation in curves. **[6]**

OR

Q6) a) Explain B-Spline Curve. **[5]**

b) Explain the Bezier curve. List its properties. **[6]**

c) Explain Hilbert's curve with an example. **[6]**

Q7) a) Explain the structure of a segment table with example. **[5]**

b) Explain **[6]**

i) Design of animation sequence

ii) Key Frames

c) Discuss NVIDIA as a gaming platform in detail. **[6]**

OR

Q8) a) Write short note on Motion Specifications. **[5]**

b) Explain architecture of i860. **[6]**

c) Explain algorithm for Deletion of Segment. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE4272

[Total No. of Pages : 2

[6582]-44

S.E. (Computer Engineering)

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2019 Pattern) (Semester-III) (210245)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Design and explain 2-bit Synchronous up counter using JK FlipFlop. Also draw necessary timing diagram. **[6]**

b) Convert the following FlipFlops: **[6]**

i) D to T

ii) JK to D

c) Explain types of shift registers & state any two applications. **[6]**

OR

Q2) a) Draw basic internal structure of decade counter IC 7490. Draw the diagram for MOD-26 counter using IC7490. **[6]**

b) Explain working of MS JK-FlipFlop. **[6]**

c) Draw & Explain Johnson counters with initial state "1010", from initial states explain all possible states. **[6]**

Q3) a) What is an ASM chart? Name the elements of an ASM chart. What is difference between ASM chart & conventional flow chart? **[6]**

b) Implement the following boolean function using PAL. **[6]**

$I_1 = \Sigma m (0, 1, 2, 3, 5, 7, 8, 10, 15)$

$I_2 = \Sigma m (1, 2, 8, 12, 13)$

c) What is difference between ROM, PAL & PLA. **[5]**

OR

P.T.O.

Q4) a) Draw the state diagram, state table & ASM chart for 3-bit binary UP counter having one enable E, such that. **[6]**

E = 1, counting enabled

E = 0, counting disabled

b) Implement the following function using PLA. **[6]**

F_1 (A, B, C) = Σm (1, 2, 4, 6)

F_2 (A, B, C) = Σm (0, 1, 6, 7)

c) Draw and explain the general structure of DLA. **[5]**

Q5) a) State the following characteristics of digital IC logic family TTL and CMOS: **[6]**

i) Noise margin

ii) Propagation delay

iii) Power dissipation

b) Draw & explain two input TTL NAND gate with active pull up. **[6]**

c) Draw & explain the circuit diagram CMOS-Inverter. **[6]**

OR

Q6) a) Explain tristate logic with respect to logic families. **[6]**

b) Give the classification of logic family also write voltage & current parameters of CMOS-logic family. **[6]**

c) Explain TTL open collector with neat diagram. **[6]**

Q7) a) Explain basic arithmatic operation using ALU IC 74181. **[6]**

b) What is microprocessor? List different applications of Microprocessor (any 4). **[6]**

c) Write a short note on with respect to Microprocessor. **[5]**

i) Address bus

ii) Control bus

OR

Q8) a) With the help of block diagram explain fundamental units of microprocessor. **[6]**

b) Explain memory organization of microprocessor in detail. **[6]**

c) Draw & explain 4 bit multiplier circuit using ALU & shift registers. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4273

[Total No. of Pages : 4

[6582]-45
S.E. (Artificial Intelligence & Data Science)
STATISTICS
(2019 Pattern) (Semester - IV) (217528)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Calculator is allowed.***

Q1) a) Calculate Mean and standard deviation from the following data. **[9]**

Marks obtained	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of Students	2	5	7	13	21	16	8	3

b) Calculate the coefficient of correlation for the ages of husbands and wives **[9]**

Ages of Husband (Years)	23	27	28	29	30	31	33	35	36	39
Ages of Wife (Years)	18	22	23	24	25	26	28	29	30	32

OR

Q2) a) Determine the equation of regression lines for the following data. Also find the value of **[9]**

i) y for $x = 12$

ii) x for $y = 8$

x	5	1	10	3	9
y	10	11	5	10	6

b) The first four moments of a distribution at x = 2 are 1, 2.5, 5.5 & 16 then **[9]**

i) Calculate the first central moments

ii) Find mean and standard deviation

iii) Find the coefficient of skewness and kurtosis

P.T.O.

Q3) a) Out of 2000 families with 4 children each how many would expect to have **[6]**

i) at least a boy

ii) Two boys

iii) No girls

b) Fit a Poisson's distribution to the following data and calculate theoretical frequencies. **[6]**

x	0	1	2	3	4	Total
f	109	65	22	3	1	200

c) In a certain company install 2000 LED bulbs on each floor. If LED bulbs have average life of 1000 burning hours with standard deviation of 200 hours using normal distribution find what number of LED bulbs might to expected to fail in 700 hours **[5]**

(Given $p(0 < z < 1.5) = 0.4332$)

OR

Q4) a) A Random variable X with following probability distribution **[5]**

X	-2	-1	0	1	2	3
P(X)	0.1	K	0.2	2K	0.3	3K

Find

i) k

ii) P(X<2)

iii) P(-2<X<2)

b) In a continuous distribution density function **[6]**

$$f(x) = \begin{cases} kx^2(1-x^3) & 0 \le x \le 1 \\ 0 & otherwise \end{cases}$$

Then find value of

i) k

ii) Mean

c) For a normal distribution when mean = 1, standard deviation = 4, find the probabilities of the following intervals : **[6]**

i) $4.43 \le x \le 7.29$

ii) $-0.43 \le x \le 5.39$

[Given: $A(z = 0.61) = 0.2291, A(z = 1.32) = 0.4066, A(z = 0.85) = 0.3023$]

Q5) a) A set of five similar coins is tossed 210 times and the result is given in the following table. **[6]**

No.of heads	0	1	2	3	4	5
frequency	2	5	20	60	100	31

Use chi-square test to test the hypothesis that data follows a binomial distribution

(chi-square = 11.07 at 5% level of significance)

b) The height of college students in the city are normally distributed with S.D. 6 cms. A sample of 1000 students has mean height 158 cms test the hypothesis mean height of college students in the city is 160 cms? **[6]**

(Given $Z_{\alpha} = 1.96$ at 5% level of significance)

c) The following table gives the number of units produced per day by 2 workers A and B for some days can we say that worker A is more stable than worker B? **[6]**

Worker A	40	30	38	41	38	35		
Worker B	39	38	41	33	32	49	49	34

[Given $F_{0.05} = 4.88$ at degree of freedom (7,5)]

OR

Q6) a) Following table shows number of books issued on the various days of week from a certain library At 5% level of significance test the null hypothesis that number of books issued in department of the day **[6]**

Day	Mon.	Tue.	Wed.	Thurs.	Fri.	Sat
No. of Books	120	130	110	115	135	110

Given: Chi-square =11.071 at 5% level of significance for degrees of freedom 5

b) Before increasing the excise duty it is observed that out of a sample 1000 persons 800 were coffee drinkers After an increase in the duty out of 1200 persons, 800 were found to be coffee drinkers. Is there a significance decrease in coffee consumption after increasing the excise duty **[6]**

(Given $Z_{\alpha} = 1.96$ at 5% level of significance)

c) Sample of size 10 and 14 were taken from two normal population with standard deviation 3.5 and 5.2 The sample means were found to be 20.3 and 18.6 test whether the means of two population are at the means of two population are at the same level? **[6]**

Given $t_{0.05, 22} = 2.07$

Q7) a) State & Prove Neyman-Pearson Fundamental Lemma. **[9]**

b) Let p be the probability that a coin will fall head in a single toss in order to test $H_0 : P = \frac{1}{2}$ Vs. $H_1 : P = \frac{3}{4}$ The coin is toss 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probabilities of Type I and Type II error. **[8]**

OR

Q8) a) Write short notes on : **[8]**

i) Critical region

ii) Type I and Type II error

iii) Level of significance θ

iv) Most powerful test

b) If $x \geq 1$ is the critical region for testing H_0: $\theta = 2$ against the alternative H_1: $\theta = 1$ on the basis of the single observation from the population. $f(x,\theta) = \theta\, e^{-\theta x}$, $0 \leq x < \infty$, obtain the values of type I, type II error and also find power of function of the test. **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-4274

[Total No. of Pages : 2

[6582]-46

S.E. (AI & DS)

INTERNET OF THINGS

(2019 Pattern) (Semester - IV)(217529)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat and Clean diagrams.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the Role of IoT in logistics management and smart vending machines in detail? **[9]**

b) With the help of the following sector justify how IoT technology impacts end-to-end User. **[9]**

i) Supply Chain Management

ii) Industry 4.0

iii) Smart Cars

OR

Q2) a) Explain the RequestResponse model, Publish Subscribe model and Push/Pull Model? **[9]**

b) Explain in brief SCADA with a block diagram and SCADA funtionality with middleware structure? **[9]**

Q3) a) Explain any four IoT network protocols? **[8]**

b) Explain Zigbee and Z-Wave Protocol in detail? **[9]**

OR

Q4) a) Explain Underground Wireless Sensor Networks and Terrestrial Wireless Sensor Networks. **[8]**

b) Explain the Block diagram of RFID system with frequency ranges? Explain any two strengths and weaknesses of RFID over Barcode? **[9]**

P.T.O.

Q5) a) What are the different security parameters considered while designing any IoT system? **[9]**

b) Explain Various IoT SIM card Technologies. **[9]**

OR

Q6) a) Explain Analog and digital sensors with 2 examples each? **[9]**

b) Enlist and Explain Any 4 Attacks on IoT System? **[9]**

Q7) a) Discuss various IoT applications in the Agriculture domain. **[8]**

b) How IoT plays a great role in the development of the Automotive Sector. **[9]**

OR

Q8) a) Write applications of the Internet of Things for e-health body area networks. **[8]**

b) Explain why Amazon Web Service Cloud is popular in the World as compared to Google App Engine and Microsoft Azure. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-4275

[Total No. of Pages : 2

[6582]-47

S.E. (Artificial Intelligence and Data Science)

MANAGEMENT INFORMATION SYSTEMS

(2019 Pattern) (Semester - IV) (217530)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8***
2) ***Neat diagrams must be drawn wherever necessary***
3) ***Figures to the right indicate full marks***
4) ***Assume suitable data, if necessary***

Q1) a) Explain how to Secure information systems with system vulnerability? Explain the value of security and control in Business. **[6]**

b) What are the current trends in computer hardware platforms? **[6]**

c) What is IT infrastructure? Explain in brief its components.? **[6]**

OR

Q2) a) How do the Internet and Internet technology work and how do they support communication and e-business? **[6]**

b) Discuss Management Issues. Explain Hardware and Software Platform trends **[6]**

c) What is Business Intelligence? Explain its foundations database and Information management? **[6]**

Q3) a) Explain Enterprise resources planning (ERP) systems with the goals? **[6]**

b) Explain the importance of project management and its objectives? **[6]**

c) Define Enterprise Application and explain with examples? **[5]**

OR

P.T.O.

Q4) a) Describe Unique Features of E-Commerce Technology with suitable examples? **[6]**

b) Write a note on managing global systems. Explain technology issues and opportunities for global value chain? **[6]**

c) Explain importance of project management and how to manage project risk? **[5]**

Q5) a) What is Decision Support system? How it is used in Business? **[6]**

b) Explain Concept of Supply Chain management (SCM) with suitable examples? **[6]**

c) What is a strategic information system? What is the difference between a firm level strategy and business level strategy? **[5]**

OR

Q6) a) Elaborate Customer Relationship Management in detail with a suitable case study? **[6]**

b) What is Electronic Commerce System? Explain it types with suitable examples? **[6]**

c) Explain decision support system in businesses with its different components and role of OLTP systems under DSS? **[5]**

Q7) a) What is Expert System? Explain with Example? **[6]**

b) How does Virtual Reality Work? **[6]**

c) Write short note on **[6]**

i) Neural Network ii) Virtual Reality iii) Expert System

OR

Q8) a) Write short note on: **[6]**

i) Business Intelligence ii) Genetic Algorithms iii) Fuzzy Logic

b) What are the different tools used for generation of Reports? **[6]**

c) Explain Artificial Neural Networks and give Example of Artificial Neural Networks? **[6]**

Total No. of Questions : 8]

SEAT No. :

PE4276

[Total No. of Pages : 2

[6582]-48

S.E. (Artificial Intelligence and Data Science)

OPERATING SYSTEMS

(2019 Pattern) (Semester-III) (217521)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) What is deadlock? Explain necessary conditions for deadlock. **[6]**

b) Give a semaphore solution for producer-consumer problem. **[6]**

c) Short note on Mutual exclusion. **[5]**

OR

Q2) a) Write a semaphore solution for readers-writers problem. **[6]**

b) Explain different inter-process communication mechanism. **[6]**

c) What is deadlock? Write deadlock prevention policies. **[5]**

Q3) a) Explain: **[6]**

i) Internal fragmentation

ii) External fragmentation

b) Explain dynamic partitioning placement algorithms. **[6]**

c) Write a short note on Buddy System. **[5]**

OR

Q4) a) Explain fixed and dynamic memory partitioning. **[6]**

b) Explain the concept of Virtual memory. **[6]**

c) Explain paging mechanism. **[5]**

P.T.O.

Q5) a) Explain different file organization techniques. **[6]**

b) Explain free space management techniques. **[6]**

c) List and Explain directory management techniques. **[6]**

OR

Q6) a) Write a short note on Directory Structure. **[6]**

b) List and Explain any two file allocation mechanisms. **[6]**

c) Write a short note on I/O buffering. **[6]**

Q7) a) How Memory management is done in Linux. **[6]**

b) Write short note on Linux file system. **[6]**

c) Explain Process management in Linux. **[6]**

OR

Q8) a) Explain Process Scheduling in Linux. **[6]**

b) State and explain different Linux inter-process communication mechanism. **[6]**

c) Write short note on Kernel Modules. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-4277

[Total No. of Pages : 3

[6582]-49

S.E. (Computer Science and Design)

DATA STRUCTURES AND FILES

(2021 Pattern) (Semester - IV) (218253)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q1 or Q2 ,Q3 or Q4, Q5 or Q6 ,Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Consider the graph represented by the following adjacency matrix : **[6]**

	A	B	C	D	E
A	0	5	0	6	4
B	5	0	8	0	7
C	0	8	0	0	9
D	6	0	0	0	5
E	4	7	9	5	0

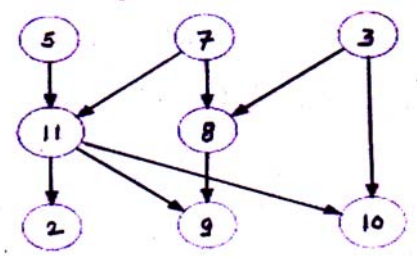
Find minimum spanning tree of this graph using prim's Algorithm.

b) Write pseudo code to display BFS of a graph and explain it with suitable example. **[6]**

c) What are connected components of a graph? Explain with example. State the applications of graph. **[6]**

OR

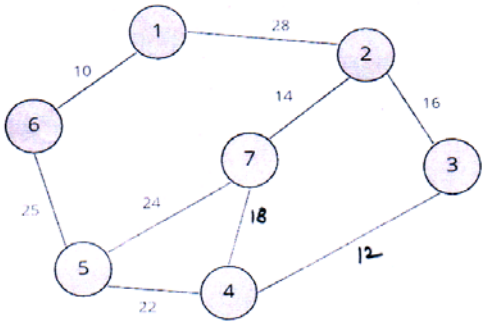
Q2) a) What is topological ordering? List their applications. Find the topological sorting of a given graph: **[6]**



P.T.O.

b) Explain with suitable example the three storage structures for the graph. **[6]**

c) Find MST of the following graph using kruskals Algorithm. **[6]**



Q3) a) Obtain AVL trees from the following data: **[6]**

30, 50, 110, 80, 40, 10, 120, 60, 20, 70, 100, 90

b) Explain the following: **[6]**

i) Static and dynamic tree tables with suitable example.

ii) Dynamic programming with principle of optimality.

c) Explain splay Tree techniques. **[5]**

OR

Q4) a) Explain following terms w.r.t. height balance tree LL, RR, LR, RL. **[6]**

b) Construct the AVL tree for the following data by inserting each of the following data item one at a time : **[6]**

10, 20, 15, 12, 25, 30, 14, 22, 35, 40

c) Explain the following trees using suitable example : **[5]**

i) K-dimensional tree

ii) Red-black tree.

Q5) a) Construct B+ tree of order 4 for the following data : **[6]**

C, N, G, A, H, E, K, Q, M, F, W, L, T, Z, D, P, R, X, Y

b) Create Min Heap (Binary) for **[6]**

10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13

After creating Min Heap delete element 1 from Heap and repair it.

c) Explain with example Trie tree. Give advantage and applications of Trie tree. **[6]**

OR

Q6) a) Write an algorithm to arrange numbers in ascending order using heapsort. Arrange the following numbers in ascending order using heapsort: **[6]**

48, 0, –1, 82, 10,2, 100

b) Insert the following keys to a 5-ways B-tree: **[6]**

3, 7, 9, 23, 45, 1, 5, 14, 25, 24, 13, 11, 8,19, 4, 31, 35, 56

c) What is Max Heap? Explain Basic operations of Max heap with example. **[6]**

Q7) a) What is index sequential file organization? State its advantages and disadvantages. **[6]**

b) Explain linked organization with respect to file handling. **[6]**

c) What is a File? List different file opening modes in C++. Explain the concept of inverted files. **[5]**

OR

Q8) a) Write a C++ program to create a file. Insert records in the file by opening file in append mode. Search for a Specific record entered by user. **[6]**

b) Explain K-way merge algorithm. **[6]**

c) Compare index sequential and direct access files. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4278

[Total No. of Pages : 2

[6582]-50

S.E. (Computer Science and Design Engineering)

OPERATING SYSTEMS

(2019 Pattern) (Semester - IV) (218254)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q 6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the Principle of Concurrency? **[6]**

b) Explain : **[6]**

i) Critical section

ii) Race Condition

c) What is Semaphores? Explain Semaphore solution of problem solving? **[6]**

OR

Q2) a) Write a short note on : **[6]**

i) Mutual Exclusion

ii) Synchronization

b) What is Deadlock? What is the necessary condition for deadlock? **[6]**

c) Explain Bankers Algorithm with suitable example. **[6]**

Q3) a) What are the difference between Internal and External Fragmentation? **[6]**

b) What is paging? Explain the address translation mechanism in paging. **[6]**

c) Write a note on Compaction. **[6]**

OR

P.T.O.

Q4) a) Explain Fixed and Variable Partitions Scheme in detail? **[6]**

b) What is the common technique for structuring the page table? Explain at least three of the technique in short. **[6]**

c) For the following reference string 7,0,1,2,0,3,0,4,2,3,0,3,2 Count number of page faults that occurs with 4 frames using LRU page replacement methods. **[6]**

Q5) a) Explain DMA with the help of suitable diagram. What are its advantage and disadvantage? **[9]**

b) Briefly explain file operations and types of files. Explain the key feature of File System? **[8]**

OR

Q6) a) The requested Track in order received are: 98,183,41,122,14,124,65,67 Starting Read/write head is at 53. Perform the computation for the following disk scheduling algorithm? **[9]**

i) SSTF

ii) SCAN

iii) CSCAN

b) Explain Buffering in detail? Explain its types. **[8]**

Q7) a) List and explain the components of LINUX system. **[6]**

b) Explain Process state transition diagram of LINUX. **[6]**

c) Write short note on Shell. **[5]**

OR

Q8) a) What is kernel module? Explain Module management system. **[6]**

b) Explain LINUX booting with master boot record. **[6]**

c) Explain process management in LINUX? **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4279

[Total No. of Pages : 2

[6582]-51

S.E. (Computer Science and Design Engineering)

COMPUTER NETWORKS

(2021 Pattern) (Semester - IV) (218255)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Black Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What is fragmentation? What are different strategies for fragmentation? **[5]**

b) Draw and Explain IPV6 header. Explain the significance of extension header. **[6]**

c) What is difference between classful and classless IP addressing? **[6]**

OR

Q2) a) List and explain functions of Network Layer. **[5]**

b) Give short note on: **[6]**

i) Mobile IP

ii) MPLS

c) 192.168.5.131/26 for given address find out the **[6]**

i) Subnet mask

ii) What is first is first ip address for given series?

iii) What is last ip address for given series?

Q3) a) What is Leaky bucket algorithm? What are the drawbacks of this algorithm? **[7]**

b) Explain RTP protocol in detail. **[7]**

c) Explain flow control in TCP. **[4]**

OR

P.T.O.

Q4) a) What causes silly window syndrome? How is avoided? Explain **[7]**

b) 06 32 000D 001 C E2 17 using this UDP hexadecimal dump find out. **[7]**

i) Source port no

ii) Destination port no

iii) Total length of user datagram

c) Explain significance of following flags in TCP header SYN,RST,FIN,PSH. **[4]**

Q5) a) Explain functionality of file server, web server. **[4]**

b) What is the differences between persistent & non persistent HTTP? Explain HTTP request and reply message format. **[6]**

c) Write short notes on TELNET and Webmail. **[8]**

OR

Q6) a) Explain how DNS query resolved? **[4]**

b) Differentiate between POP & IMAP protocol. **[6]**

c) Explain FTP w.r.t control and data connection? Explain any two FTP commands. **[8]**

Q7) a) List and explain various elements of Information Security. **[4]**

b) Explain model for network security. **[6]**

c) Describe in brief DES. **[7]**

OR

Q8) a) Explain IPSec in detail. **[4]**

b) Give short note on Firewalls. **[6]**

c) Define S/MIME with types. **[7]**



Total No. of Questions : 8]

SEAT No. :

PE-4280

[Total No. of Pages : 2

[6582]-52
S.E. (Computer Science and Design)
DESIGN THINKING
(2021 Pattern) (Semester-IV) (218256)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q1 or Q2 ,Q3 or Q4, Q5 or Q6 ,Q7 or Q8***
2) ***Figures to the right indicate full marks***
3) ***Assume suitable data, if necessary.***

Q1) a) What is brainstorming? What are the rules to be followed for productive and better ideas while brainstorming. **[5]**

b) Briefly explain various techniques of idea generation. **[6]**

c) How do you evaluate the ideas? **[6]**

OR

Q2) a) When do designers think in preposition and colours? Explain with example **[5]**

b) How humours can be used in designs? Design a poster in an humours way that shows sport requires accurate vision to achieve a high level of performance. **[6]**

c) How to use story telling in design process? What are the elements of good story telling? How to reach the users through story? **[6]**

Q3) a) How Visualization techniques can be used for understanding any problem? Mention and describe any three techniques **[7]**

b) What is story boarding? Why is story boarding essential? Give an example of story boarding. **[7]**

c) Write short notes on quick and dirty prototype. **[4]**

OR

P.T.O.

Q4) a) Explain the importance of presentation technique in design thinking process. Explain the different presentation types **[7]**

b) What is meant by lean start up method? How to lean start up? **[7]**

c) What is a mock up in design thinking? Give example. **[4]**

Q5) a) How would you test a design thinking strategy? **[4]**

b) What is testing? Why and When to conduct user testing? **[6]**

c) Explain Kano model of testing. **[8]**

OR

Q6) a) How to use customer's feedback in product development? **[4]**

b) What are the principles of usability testing? **[6]**

c) Explain with suitable example desirability testing. **[8]**

Q7) a) How do design thinking and innovation relate? **[4]**

b) Differentiate among idea, invention and innovation. **[6]**

c) What is the importance of design activism? Explain types of activism. **[7]**

OR

Q8) a) What is the new social contract for a new era? **[4]**

b) What is innovation portfolio? How do you create an innovation portfolio. **[6]**

c) How to introduce design thinking into your organization? **[7]**

Total No. of Questions : 8] **SEAT No. :**

PE4281 **[Total No. of Pages : 3**

[6582]-53

S.E. (Computer Science & Design Engineering)

DATA STRUCTURES AND ALGORITHMS

(2019 Pattern) (Semester - III) (218242)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is a queue? Explain the insertion and deletion operations in the queue with a suitable example. **[6]**

b) Evaluate the following postfix expression with the help of a stack. 53+62/*35*+ **[6]**

c) Compare stacks and queues. **[6]**

OR

Q2) a) Write an algorithm for evaluating a postfix expression using stack. **[6]**

b) Identify the expressions and convert them into the remaining two **[6]**

i) a*b/c*d-e/f

ii) (a+b)/(c+d)

c) Define Queue. Explain its implementation using any one method. **[6]**

Q3) a) Construct BST for following elements:12, 8, 25, 14, 9, 6, 18 **[6]**

Also how pre-order, post - order traversal for the same

b) Explain the traversing of a binary tree. **[6]**

c) Explain the following terms related to tree. **[5]**

i) Root

ii) Sub-tree

iii) Level of Node

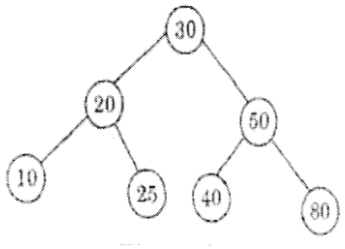
iv) Siblings

v) Height of tree

OR

P.T.O.

Q4) a) Write Inorder, Preorder, and Postorder traversal for the following tree **[6]**

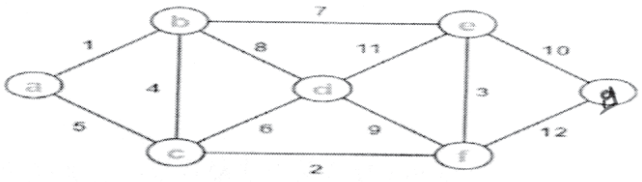


b) Define Binary Tree. What are its types? Explain with suitable figures. **[6]**

c) Explain the different cases to delete the element in binary search tree. **[5]**

Q5) a) With the help of a suitable example, explain the adjacency matrix and adjacency list representation of a graph. **[6]**

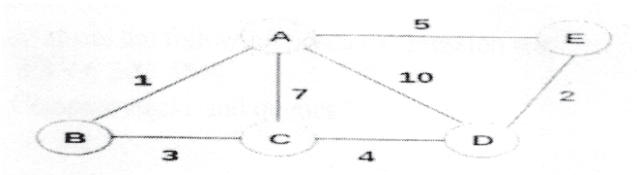
b) Using Prim's Algorithm, find the cost of the minimum spanning tree (MST) of the given graph starting from vertex 'a' – **[6]**



c) Write algorithm for Breadth First Traversal of the graph. Also write its complexity. **[6]**

OR

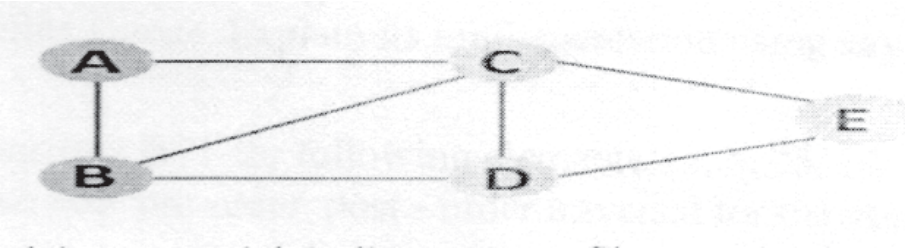
Q6) a) Construct a minimum spanning tree for the following graph using Kruskal's Algorithm. **[6]**



b) Explain with a suitable example the techniques to represent a Graph. **[6]**

Note: Consider a graph of at least 6 vertices

c) Perform depth first search algorithm on the following graph. **[6]**



Q7) a) Explain sequential & direct access file organization. Also list two advantages & disadvantages of same. **[6]**

b) Compare the following file organization techniques: **[6]**

i) Sequential

ii) Index Sequential

iii) Direct Access

c) Define hashing. What is a hash table? Explain its importance in data storage and retrieval. **[5]**

OR

Q8) a) Explain the following key-to-address transformation techniques used in hashing with examples: **[6]**

i) Division Method

ii) Mid-Square Method

iii) Folding Method

b) Explain linear probing with an example. What is the primary disadvantage of this method? **[6]**

c) Describe rehashing. When is rehashing needed? Explain the concept with a small example. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE4282

[Total No. of Pages : 2

[6582]-54

S.E. (Computer Science & Design Engg.)

LOGIC DESIGN AND COMPUTER ARCHITECTURE

(2019 Pattern) (Semester-III) (218245)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw & Explain 4 bit SIPO Shift register using D flip flop. **[5]**

b) Convert T to D Flipflop. **[6]**

c) Design 2 Bit Synchronous counter using JK flip flop. **[6]**

OR

Q2) a) Explain difference between Synchronous counter & Asynchronous counter. **[5]**

b) Design MOD 56 counter using IC7490. **[6]**

c) Draw & Explain 4 bit SISO Shift register using D flip flop. **[6]**

Q3) a) Explain Address Register, Data Register and Flag register. **[5]**

b) Explain micro programmed control unit along with neat Diagram. **[6]**

c) Draw & Explain Processor Organization. **[6]**

OR

Q4) a) Explain Von Neumann Computer Architecture with neat diagram. **[5]**

b) With Neat diagram explain Instruction Cycle. **[6]**

c) Draw diagram of single bus processor organization and explain. **[6]**

P.T.O.

Q5) a) Write a key features of CISC. **[6]**

b) Explain features multi core intel corei7 processor. **[6]**

c) Explain Interrupt handling. **[6]**

OR

Q6) a) Write a key features of RISC. **[6]**

b) List down Addressing Modes with an example. **[6]**

c) Explain 0-1-2-3 address instruction. **[6]**

Q7) a) Explain the different Bus arbitration Techniques. **[6]**

b) Compare Direct, set associative & fully associative cache memory mapping. **[6]**

c) Explain Interrupt Driven I/O and Module Programmed I/O. **[6]**

OR

Q8) a) With neat diagram explain write Cycle. **[6]**

b) Compare salient features of SRAM and DRAM. **[6]**

c) Explain with neat block diagram DMA Controller. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-4283

[Total No. of Pages : 3

[6582]-55

S.E. (Information Technology Engg.)

PROCESSOR ARCHITECTURE

(2019 Pattern) (Semester - IV) (214451)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. N. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write a short note on interrupt structure of PIC 18 microcontroller. **[6]**

b) Design interfacing of Relay and Buzzer to PIC 18F with the help of suitable diagram. Explain its working. **[6]**

c) Write the steps for Executing an interrupt in PIC 18F. **[6]**

OR

Q2) a) Draw an interfacing diagram for 16 × 2 LCD with PIC 18F microcontroller and explain its working. **[8]**

b) Explain any 3 sources of interrupt in PIC18F. **[6]**

c) Differentiate between interrupt and polling. **[4]**

Q3) a) List the steps involved in programming of PIC 18F with respect to PWM mode of CCP module. **[6]**

b) Draw and explain the stepper motor interfacing with PIC 18F. **[6]**

c) Write short note on I2C bus. **[5]**

OR

P.T.O.

Q4) a) Write the steps involved in programming compare mode of CCP1 module in PIC18F. **[6]**

b) How the speed of DC motor is controlled by PWM, explain in brief. **[6]**

c) Distinguish between synchronous and asynchronous serial communication. **[5]**

Q5) a) State the features of RTC. Explain function of following pins of DS 1306 **[7]**

i) SERMODE

ii) SDI

iii) SDO

b) Explain in detail the functions of ADCON1 SFR of PIC 18 microcontroller. **[7]**

c) List out the steps necessary for reading from EEPROM of PIC 18. **[4]**

OR

Q6) a) Explain the interfacing of LM34/LM35 with PIC18FXX for temperature. measurement using on-chip ADC. **[8]**

b) Assuming that R = 5 Ω and Iref = 2 mA for DAC0808, calculate Vout for the following binary inputs: **[6]**

i) 1001100l (99H)

ii) 11001000 (C8H)

iii) 10001000 (88H)

c) Explain in detail the functions of following flags related to onboard ADC of PIC 18 microcontroller. **[4]**

i) GO/DONE

ii) ADON

Q7) a) Draw and explain ARM core dataflow model. **[6]**

b) Describe the ARM bus technology. **[6]**

c) Discuss the different exceptions in ARM processor. **[5]**

OR

Q8) a) What are the main features of ARM7 architecture? How it is different from pure RISC processor?. **[6]**

b) Write significance of special registers R13, R14 and R15 in ARM7. **[6]**

c) What are privileged and non- privileged modes? Write down the processor modes in ARM? **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4284

[Total No. of Pages : 2

[6582]-56
S.E. (Information Technology)
DATABASE MANAGEMENT SYSTEM
(2019 Pattern) (Semester - IV) (214452)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1, or Q.2, .Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumption whenever necessary.***

Q1) a) Explain SQL data types in detail with example. **[6]**

b) Explain with suitable example the concept of view and indexes. **[6]**

c) Write a short note on i) Triggers ii) Stored Procedure. **[6]**

OR

Q2) a) Explain Set Comparison in detail with example. **[6]**

b) What is ODBC? Explain with suitable example. **[6]**

c) Compare Embedded SQL and Dynamic SQL in detail. **[6]**

Q3) a) Explain how to measure query cost in detail. **[6]**

b) What is the purpose of Normalization? **[5]**

c) Explain the difference between 3NF and BCNF. **[6]**

OR

Q4) a) Explain different types of Functional Dependency in detail. **[6]**

b) Explain transformation of relational expression in detail. **[5]**

c) Explain selection and Join operation in detail with example. **[6]**

P.T.O.

Q5) a) Explain database architecture in detail with diagram. **[6]**

b) Explain in detail non recoverable and recoverable schedule. **[6]**

c) Explain concept of checkpoints with its purpose. **[6]**

OR

Q6) a) Explain Deferred and immediate crash recovery method in detail. **[6]**

b) Explain Shadow paging method in detail. **[6]**

c) Explain in detail Multi-version Concurrency Control. **[6]**

Q7) a) Explain 2 Tier and 3 Tier Architecture in detail with example. **[6]**

b) Write short note on: 1. Mobile database 2. Internet databases. **[6]**

c) Explain distributed database architecture in detail. **[5]**

OR

Q8) a) Explain architecture of parallel database in detail. **[6]**

b) Write short note on: 1. SQLite database 2. XML databases. **[6]**

c) Write short notes on NOSQL database. **[5]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-4285

[Total No. of Pages : 2

[6582]-57

S.E. (Information Technology)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - IV) (214453)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What is projection? Explain with diagram, oblique - Cavalier, Cabinet, Orthographic - isometric, diametric, trimetric Parallel projections. **[9]**

b) Use the Cohen Sutherland Line Clipping Algorithm with the help of region codes to clip a line AB with A (50, 30), B (110,70), and PQ with P (30,70), Q (90,30) to clip a line against a window with lower left-hand corner (40,40) and Upper right-hand corner (100,80). Show Graphic Representation of Original and Clipped Line. **[9]**

OR

Q2) a) Explain the basic transformation techniques in 3D Graphics. **[9]**

i) Rotation

ii) Translation

iii) Reflection about XY Plane

b) Let ABCD be the rectangle window with A (150,150), B(150,200), C (200,200) and D (200, 150). Use Cohen Hodgeman polygon clipping algorithm to clip the convex polygon PQR with P (165,240), Q (180,90), R (100, 175) and find the final coordinates of the clipped polygon. **[9]**

Q3) a) Explain in detail with Diagram **[9]**

i) RGB Color Model

ii) CIE Chromaticity Diagram

iii) Color Gamut

b) Define Shading. Compare Constant Intensity, Halftoning, Gourand Shading and Phong Shading algorithm. **[8]**

P.T.O.

OR

Q4) a) What is a segment? Why do we need segments? Explain the complete process of **[9]**

i) Segment Creation,

ii) Segment Deletion and

iii) Segment Renaming,

b) Explain in detail combined diffuse and specular reflections with multiple light sources. **[8]**

Q5) a) Write short note on **[9]**

i) Design of animation sequence

ii) Frame-by-frame Animation techniques

b) Write short note on Hilbert's and Koch Curve along its Topological and Fractal Dimensions. **[9]**

OR

Q6) a) What is interpolation? Explain the process of curves Approximation. **[9]**

b) Explain in detail with diagram Bezier curve generation using midpoint subdivision method. **[9]**

Q7) a) What is the different usage of Virtual Reality? Explain in detail. **[6]**

b) What is Haptics Rendering Pipeline Modeling in Virtual Reality? **[6]**

c) What is kinematic modeling in a Virtual Reality? **[5]**

OR

Q8) a) What is graphics rendering pipeline in a Virtual Reality system. **[6]**

b) Explain gesture interfaces in Virtual Reality. **[6]**

c) Explain 3D position trackers. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-4286

[Total No. of Pages : 2

[6582]-58
S.E. (Information Technology)
SOFTWARE ENGINEERING
(2019 Pattern) (Semester - IV) (214454)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is an architectural style? Discuss different architectural style with suitable example. **[9]**

b) Explain the golden rules of interface design **[9]**

OR

Q2) a) How is interface analysis done? What parameters are considered? **[9]**

b) Explain design evaluation cycle. What design issues to be consider while designing user interface? **[9]**

Q3) a) What are the different ways to estimate a software project? **[8]**

b) What do you meant by Work Breakdown Structure? Explain representations of WBS with suitable examples. List advantages of WBS. **[8]**

OR

Q4) a) What are the typical problems with IT cost estimate? **[7]**

b) What is project scope? Explain scope management statement with example. **[9]**

P.T.O.

Q5) a) What is Project Management Spectrum? Explain the W^5HH Principle. **[9]**

b) What is software testing? Why it is important? Explain Principles of Software Testing **[9]**

OR

Q6) a) What is risk? What are the different sources of risk in IT project? How to handle the risk? **[9]**

b) Explain defect management. Explain various stages of defect management process. **[9]**

Q7) a) What is CASE workbench? Explain types of CASE workbenches. **[9]**

b) Explain software reuse. What are approaches of Reuse-based software engineering? What are benefits of software reuse? **[9]**

OR

Q8) a) What do meant by Software Configuration? Define baseline. What is Software Configuration Objects? **[9]**

b) Explain test-driven development with neat diagram. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE4287

[Total No. of Pages : 2

[6582]-60R
S.E. (Information Technology)
LOGIC DESIGN AND COMPUTER ORGANIZATION
(2019 Pattern) (Semester - III) (214442)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Convert JK Flip Flop to T Flip-Flop. **[6]**

b) What is MOD counter? Design and draw logic diagram of Mod-82 counter using IC7490. **[7]**

c) Explain Shift Register and their types with applications. **[5]**

OR

Q2) a) Design 3-bit Asynchronous Down Counter using JK Flip Flop. **[6]**

b) What is the advantage of MS (Master Slave) Flip-Flop. Explain the working of MS JK Flip Flop in detail. **[6]**

c) What is the difference between asynchronous and synchronous counters? **[6]**

Q3) a) Describe the single bus organization of a CPU. What are some advantages and disadvantages of a single bus organization? **[6]**

b) What are the functions of Input output devices? What are the different types of I/O devices and how are they connected to a computer system? **[5]**

c) Explain the microprogrammed control unit. Write a microprogram of microinstructions for the following instruction ADD (R3) R1. **[6]**

OR

Q4) a) Explain in brief, various functional units of a computer system with a block diagram showing interconnection between them. **[6]**

b) With the help of neat diagram explain the Von Newman architecture. **[5]**

c) What is the function of control unit in a CPU? Compare Hardwired control Unit and Micro-programmed Control Unit. **[6]**

P.T.O.

Q5) a) Explain interrupt w.r.t. its purpose, types. Describe step by step, the interrupt handling procedure of microprocessors. **[7]**

b) Write about Taxonomy of Parallel Processor Architectures Organization. **[6]**

c) Explain SMP organization and its benefits. **[5]**

OR

Q6) a) What is meant by addressing mode? Mention different types of addressing modes? Explain any two addressing modes with suitable examples. **[6]**

b) Explain instruction pipelining? What are different types of pipelining hazards? **[6]**

c) What are the types of MIMD clusters? Discus in detail. **[6]**

Q7) a) Explain the Characteristics of Memory Systems and Memory Hierarchy. **[5]**

b) A set associative cache consists of 64 blocks divided in 4 block sets. The main memory contains 4096 blocks, each 128 words of 16 bit length. **[6]**

i) How many bits are there in main memory address?

ii) How many bits are there in cache memory addres (tag, set and word field)?

c) What are the different types of cache replacement policies? Explain with example. **[6]**

OR

Q8) a) Differentiate between SRAM, DRAM, and ROM based on their characteristics. **[5]**

b) Explain with state diagram - MESI protocol. **[6]**

c) Consider a fully associative cache with 8 lines (0-7). If the memory block requests are in the order 4, 3, 25, 8, 19, 6, 25, 8, 16, 35, 45, 22, 8, 3, 16, 25, 7. If LRU is used then which of the cache line will have memory block 7? Compute the Hit and Miss ratio. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE4288

[Total No. of Pages : 2

[6582]-61

S.E. (Information Technology)

DATA STRUCTURES AND ALGORITHM

(2019 Pattern) (Semester - III) (214443)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain Representation of stack using array, structure and linked list with example. **[6]**

b) Write a short note on doubly ended queue with example. **[6]**

c) Explain sequential organization of queue. With example. **[6]**

OR

Q2) a) Evaluate the following postfix expression AB + C – BA + C $ for A = 1, B = 2, C = 3. **[6]**

b) Convert following infix expression to postfix expression. **[6]**

(a+b)*(c/d)-e

c) Explain operations on stack with example. **[6]**

Q3) a) Explain representation of tree using sequential and linked organization. **[6]**

b) Discuss the merits & demerits of implementing threaded binary tree. **[6]**

c) Explain binary tree traversals with example. **[5]**

OR

Q4) a) Explain conversion of general tree to binary tree with example. **[6]**

b) Explain operations on binary search tree with example. **[6]**

c) Explain treaded binary tree with example. **[5]**

P.T.O.

Q5) a) Explain Representation of graph with example. **[6]**

b) Write short note on prim's algorithm with example. **[6]**

c) Write short note on kruskal's algorithm with example. **[6]**

OR

Q6) a) Write short note on Dijkstra's algorithm with example. **[6]**

b) Write short note on AVL tree with example. **[6]**

c) Write short note on Heap data structure with example. **[6]**

Q7) a) Define hash table and Explain Basic Concepts of hashing. **[6]**

b) Explain Linear Probing with example. **[6]**

c) Explain Quadratic Probing with example. **[5]**

OR

Q8) a) Explain any three operations on file with example. **[6]**

b) Differentiate between index sequential and direct access file. **[6]**

c) Explain sequential file and index sequential file organisation. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE4289

[Total No. of Pages : 2

[6582]-62

S.E. (Information Technology)

OBJECT ORIENTED PROGRAMMING

(2019 Pattern) (Semester - III) (214444)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain constructor overloading with an example. **[6]**

b) Write a program to find the area and perimeter of a circle using a constructor. **[6]**

c) Write a short note on 'Copy Constructor' in JAVA. **[6]**

OR

Q2) a) What are the various types of constructors in JAVA? Explain anyone in detail with example. **[6]**

b) Explain the following terms : **[6]**

i) garbage collection

ii) finalize () method

iii) destructor

c) Design a class 'Complex' with data members for the real and imaginary part. Provide default and Parameterized constructors. Write a program in JAVA to perform the addition of two complex numbers. **[6]**

Q3) a) What is polymorphism? Explain compile time and run time polymorphism. **[6]**

b) What is an interface in Java? How to declare an interface and write a syntax with an example. **[6]**

c) Differentiate between compile time polymorphism and run time polymorphism. **[6]**

OR

Q4) a) Define multiple inheritance. How multiple inheritance is achieved in Java? **[6]**

b) Explain the constructor with a default argument with an example. **[6]**

c) Differentiate between method overriding and method overloading. **[6]**

P.T.O.

Q5) a) Write a Java program to accept the age of a person. If entered negative age throw user-defined exception "Negative age". **[6]**

b) Explain the following terms : **[6]**

i) try

ii) finally

iii) throws

c) Explain the exception handling mechanism in Java with an example. **[5]**

OR

Q6) a) Explain : **[6]**

i) ArrayList Class

ii) LinkedList Class.

b) Explain how user-defined exceptions can be handled. **[6]**

c) Write a program to write a generic function and demonstrate swapping of multiple types of data using the same. **[5]**

Q7) a) Define Stream. Enlist various Stream Classes in Java. Explain anyone in detail. **[6]**

b) Write a short note on : **[6]**

i) Adaptor

ii) Singleton

c) Write a Java program to copy the content of the file "file1.txt" into a new file "file2.txt". **[5]**

OR

Q8) a) What is a design pattern? Enlist the types of design patterns. Explain anyone with an example. **[6]**

b) Implement a program for maintaining a database of employee records using Files. Employee has Emp_id, Emp_name, Emp_salary, Emp_designation. Display the data for a few employees. **[6]**

- Create Database
- Display Database
- Delete Records
- Update Record
- Search Record

c) Explain any three methods of the FileInputStream class with their syntax. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE4290

[Total No. of Pages : 2

[6582]-63
S.E. (Information Technology)
BASICS OF COMPUTER NETWORKS
(2019 Pattern) (Semester-III) (214445)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Draw & Explain the frame format for IEEE 802.3? **[6]**

b) Explain the various controlled access methods. **[6]**

c) Discuss CSMA/CD random access technique. How is collision detection achieved in this technique? **[6]**

OR

Q2) a) Explain the following physical layer implementations in standard Ethernet: **[6]**

i) 10Base5

ii) 10BaseT

iii) 10BaseF

b) Write short notes on: **[6]**

i) IEEE 802.4 (Token Bus)

ii) IEEE 802.5 (Token Ring)

c) Explain FDMA, TDMA and CDMA in detail. **[6]**

Q3) a) Explain different classes of IP addresses and show by calculations how many networks and hosts are possible in each class? **[6]**

b) Calculate the following for a network address 192. 168, 1. 0/27 **[6]**

i) Number of valid subnets

ii) Number of actual hosts per subnet

iii) Network and broadcast address for each subnet

c) Compare between IPv4 and IPv6. **[5]**

OR

P.T.O.

Q4) a) For a given class-C network, design 4 equal subnets having minimum 50 nodes in each sub network. **[6]**

b) Explain NAT & CIDR with neat Diagram. **[6]**

c) Draw and Explain Header diagram of IPv4. **[5]**

Q5) a) What is routing? State different types of routing. Explain two interior gateway routing protocols. **[6]**

b) Compare and contrast the advertisement used by RIP and OSPF Routing protocols. **[6]**

c) Explain Optimally Principle with help of example. **[6]**

OR

Q6) a) What is Autonomous System? What are the Inter Domain Routing Protocols? Explain Any one Inter Domain Routing protocols in details. **[6]**

b) Differentiate between Distance Vector Routing and Link State Routing. **[6]**

c) What is BGP? Explain the operation of BGP with suitable example. **[6]**

Q7) a) Explain duties of transport layer and differentiate between connection oriented and Connection less services. **[6]**

b) Draw & Explain Leaky Bucket and Token Bucket algorithm? **[6]**

c) Explain Three Way Handshake algorithm for TCP connection establishment. **[5]**

OR

Q8) a) What is a socket? Explain the various socket primitives and types of socket with Example. **[6]**

b) Discuss Flow control and Congestion control mechanisms in TCP. **[6]**

c) What is Silly Window Syndrome? Explain at-least two methods to overcome it. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-4291

[Total No. of Pages : 2

[6582]-64
S.E. (Artificial Intelligence & Machine Learning Engineering)
OPERATING SYSTEMS
(2019 Pattern) (Semester - IV) (218552)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Attempt Q.1, or Q.2, Q.3 or Q.4, Q.5 or Q.6,Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Describe in brief the different IPC mechanisms. **[9]**

b) What is deadlock? Explain the necessary and sufficient conditions for the occurrence of a deadlock. **[9]**

OR

Q2) a) Explain the following with example **[9]**

i) Mutual Exclusion

ii) Synchronization

iii) Race condition.

b) What is Critical Section Problem? Explain readers-writers problem. **[9]**

Q3) a) What is page Fault? For the given reference string with 3-page frame available, determine the number of page faults for FIFO and LRU algorithms : **[9]**

3, 5, 3, 7, 2, 1, 5, 4, 6, 7, 4, 1, 2.

b) Explain Demand paging with the help of neat diagram. **[8]**

OR

Q4) a) What is segmentation? How address Translation is performed in segmentation system? **[8]**

b) Explain Buddy System with the help of neat diagram and example. **[9]**

P.T.O.

Q5) a) Describe three methods of record blocking with the help of neat diagrams. **[9]**

b) Explain the different functions of a file management system. **[9]**

OR

Q6) a) Assume a disk with 200 tracks and the disk request queue has random Requests in it as follows : 98,183,37,122,14,124,65,67. **[12]**

Find the no of tracks traversed and average seek length if

i) FCFS

ii) SSTF

iii) SCAN is used and initially head is at track no 53.

b) What is spooling? Explain with suitable diagrams. **[6]**

Q7) a) Explain the data structures required for two PASS Assembler in detail. **[6]**

b) What is Macro? Explain macro call and macro expansion with suitable example. **[6]**

c) Discuss with example what is forward reference problem. **[5]**

OR

Q8) a) What is Loader? What are the basic functions of loaders? **[9]**

b) What is system software? Explain any four system software in brief? **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-4292

[Total No. of Pages : 2

[6582]-65
S.E. (AI & ML)
FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(2019 Pattern) (Semester - IV) (218553)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Discuss various approaches and issues in knowledge representation. Also discuss various problems occur in representing knowledge? **[6]**

b) Expalin the Unification used for reasoning under predicate logic with example. **[6]**

c) Compare between Forward Chaining and Backward Chaining. **[6]**

OR

Q2) a) Explain the algorithm of predicate logic resolution. **[6]**

b) What is reasoning in AI? Explain its types? **[6]**

c) Difference between declarative and procedural knowledge. **[6]**

Q3) a) Explain supervised and unsupervised and reinforcement learning with example. **[8]**

b) Explain the data preprocessing steps in machine learning. **[6]**

c) Distinguish between artificial intelligence and machine learning. **[3]**

OR

Q4) a) Differentiate between positive class and negative class. Explain the training versus testing phase in machine learning. **[4]**

b) Explain different cross validation techniques. **[8]**

c) Discuss different applications of machine learning. **[5]**

P.T.O.

Q5) a) Highlighted differences between supervised, unsupervised and semi-supervised learning in machine learning? Explain with examples. **[9]**

b) Define Principal Component Analysis (PCA) and explain how it reduces the dimensionality of data. **[9]**

OR

Q6) a) Define supervised learning and provide real life examples where it is commonly applied. **[9]**

b) Write a short note on Dimensionality reduction. **[9]**

Q7) a) How the performance of Regression is Assessed? Write any four-performance metrics used for Regression. **[7]**

b) Consider the three-class classification matrix. Calculate accuracy, precision and recall per class. **[10]**

Confusion Matrix		Predicted		
Actual	A	8	10	1
	B	5	60	50
	C	3	30	200

OR

Q8) a) Define following terms : **[8]**

i) Accuracy

ii) Precision

iii) Recall

iv) Error rate

b) What is difference between simple linear and multiple linear regressions? Explain how to assessign performance of Regression. **[9]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-4293

[Total No. of Pages : 3

[6582]-66

S.E.-Artificial Intelligence & Machine Learning

DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - IV) (218554)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume Suitable data if necessary.***

Q1) a) Describe the circumstances in which you would choose to use embedded SQL rather than using SQL alone or using only a general purpose programming language. Compare dynamic and embedded SQL with suitable example. **[8]**

b) Consider following database: **[6]**

Student(rollno,name,address)

Subject(subjectcode,subjectname)

Marks(rollno,subjectcode,marks)

Write following queries in SQL

1) Find average marks of each student along with name of student.
2) Find how many student have failed in subject DBMS.

c) Differentiate between : WHERE and HAVING clauses in SQL. **[4]**

OR

Q2) a) What is the need of embedded SQL? Explain dynamic SQL with example. **[6]**

b) Explain various set operation in SQL with example.. **[6]**

c) What is view? Given the following schema **[6]**

Employee(eno,address,dno,salary)

Department(dno,dname,location,manager)

Using SQL generate a view to display information department wise as dno, total number of employee, total salary, average salary.

Q3) a) Define BCNF? How does it differ from 3NF?why is it consider a stronger form of 3NF? **[7]**

b) Given a relation schema R = (A,B,C,D,E) and function dependency as $A \rightarrow C$, $C \rightarrow D$, $CE \rightarrow A$, $B \rightarrow C$, $DE \rightarrow C$. Relation R is decomposed into r1 = AD, r2 = AB, r3 = BE, r4 = CDE, r5 = AE. Decide this decomposition is lossy or lossless ? Justify **[6]**

c) Write a note on Materialization. **[4]**

OR

Q4) a) Compute the closure of following set F of functional dependencies for relation schema R(A,B,C,D,E) **[6]**

$A \rightarrow BC$, $CD \rightarrow E$, $B \rightarrow D$,$E \rightarrow A$

Also find candidate key.

b) Show that with suitable example: if a relation schema is in BCNF, then it is also in 3NF **[6]**

c) Explain update anomalies with example. **[5]**

Q5) a) Give test for conflict serializability. Check whether following schedule is conflict serializable. **[6]**

T1	T2
Read(A)	
Write(A)	
	Read(A)
	Write(A)
Read(B)	
Write(B)	
	Read(B)
	Write(B)

b) What is meant by transaction? Explain transaction model with state diagram. **[6]**

c) Explain time-stamp based concurrency control. **[6]**

OR

Q6) a) Since every conflict serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability. **[6]**

b) When do deadlock happen, how to recover if deadlock takes place? **[6]**

c) Explain deferred database modification and immediate database modification and their differences in the context of recovery. **[6]**

Q7) a) State which database system architecture you will prefer for following application **[6]**

i) Banking system

ii) Airline management

iii) College admission system

b) Explain speed- up and scale-up .issue with respect to parallelism. **[6]**

c) What are the requirement of mobile databases? List existing mobile databases. **[5]**

OR

Q8) a) What is fragment of a relation? what are the main type of fragmentation? Why is fragmentation a useful context in distributed database design.**[6]**

b) Draw and explain architecture of parallel Databases **[6]**

c) Write a note on XML databases. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-4294

[Total No. of Pages : 2

[6582]-67

S.E. (Artificial Intelligence and Machine Learning)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - IV) (218555)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6,Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the basic transformation techniques in 3D Graphics : **[9]**

i) Rotation
ii) Translation
iii) Reflection about XY Plane

b) Let ABCD be the rectangle window with A (150, 150), B (150, 200), C (200, 200) and D (200, 150). Use Cohen Hodgeman polygon clipping algorithm to clip the convex polygon PQR with P (170,250), Q (180, 100), R (250, 180) and find the final coordinates of the clipped polygon. **[9]**

OR

Q2) a) Let ABCD be the rectangle window with A (20, 20), B (60, 20), C (60, 40) and D (20,40). Find the region code for endpoints and use Cohen Sutherland algorithm to clip the lines P1-P2 with P1 (10, 25) and P2 (70, 35) and Q1-Q2 with Q1 (30, l0) and Q2(50, 70) Show Graphic Representation of Original and Clipped Line. **[9]**

b) What is projection? Explain in detail with diagram parallel and perspective projection. **[9]**

Q3) a) What is a segment? Why do we need segments? Explain the complete process of i) Segment Creation, ii) Segment Deletion and iii) Segment Renaming. **[9]**

b) Explain in detail with Diagram **[8]**

i) RGB Color Model
ii) CMY Color Model
iii) HSV Color Model
iv) Color Gamut

P.T.O.

OR

Q4) a) Compare the following illumination models with diagrams i) Ambient Light, ii) Diffuse Light and iii) Specular reflection **[9]**

b) Define Shading. Explain with help of diagrams Phong Shading algorithm in detail. **[8]**

Q5) a) Explain in detail with diagram Bezier curve generation using midpoint subdivision method. **[9]**

b) Write short note on : **[9]**

i) Fractals and topological dimensions.

ii) Koch Curve

iii) Hilbert Curve

OR

Q6) a) Write Short note on : **[9]**

i) Methods of controlling animation?

ii) Types of animation languages.

b) What is interpolation? Explain in detail with diagram the process of curves Approximation. **[9]**

Q7) a) Explain the behavior modeling in Virtual Reality. **[6]**

b) Explain haptic feedback in Virtual Reality system. **[6]**

c) Differentiate HMD and CAVE in Virtual Reality. **[5]**

OR

Q8) a) Explain the physical modeling in Virtual Reality. **[6]**

b) What is geometric modeling in a Virtual Reality? **[6]**

c) Explain gesture interfaces in Virtual Reality. **[5]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE4295

[Total No. of Pages : 4

[6582]-68

S.E. (Information Technology, AIML)

DISCRETE MATHEMATICS

(2019 Pattern) (Semester - III) (218541)

Time : 2½ Hours] *[Max. Marks : 70*

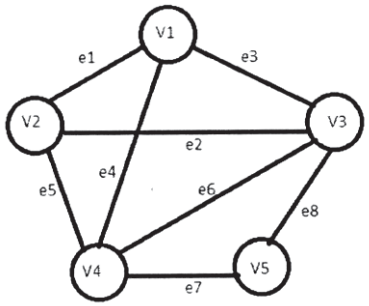
Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***

Q1) a) What is Isomorphism in the graph? Explain the rules for graph to be isomorphic with an example. **[5]**

b) Construct an optimal tree for the weights 5,7,10,15,35,40. Find the weight of the optimal tree. **[6]**

c) Find the fundamental cutset and fundamental circuit for the spanning graph with vertices v4, v2, v1, v3, v5 **[6]**



OR

Q2) a) Explain chromatic numbers with respect to the following graphs **[5]**

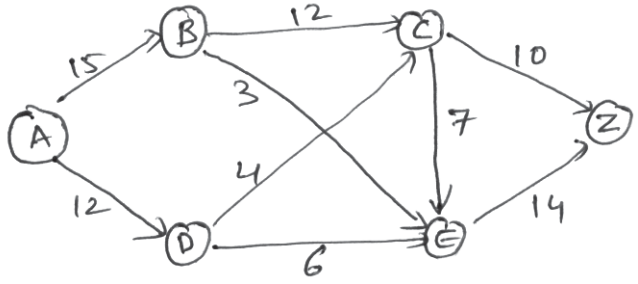
i) Complete Graph

ii) Star Graph

iii) Wheel Graph

P.T.O.

b) Find the maximum flow in the given network **[6]**



c) What number of edges are present in a complete graph with n vertices? Explain with the help of a handshaking lemma. **[6]**

Q3) a) Consider the following relations on {1, 2, 3, 4} : **[6]**

R1 = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 1), (4, 4)},

R2 = {(1, 1), (1, 2), (2, 1)},

R3 = {(1, 1), (1, 2), (1, 4), (2, 1), (2, 2), (3, 3), (4, 1), (4, 4)},

R4 = {(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)},

R5 = {(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 3), (2, 4), (3, 3), (3, 4), (4, 4)},

R6 = {(3, 4)}.

Which of these relations are reflexive?

b) Use Warshall's algorithm to find the transitive closure R* of the following relation R on the set A = {1, 2, 3, 4}, where **[6]**

R = {(1, 2), (1, 3), (1, 4), (2, 1), (2, 3), (3, 4), (3, 2), (4, 2), (4, 3)}

c) Show that if seven numbers from 1 to 12 are chosen then two of them will add up to 13. **[6]**

OR

Q4) a) Consider these relations on the set of integers : **[6]**

R1 = $\{(a, b) \mid a \leq b\}$,

R2 = $\{(a, b) \mid a > b\}$,

R3 = $\{(a, b) \mid a = b$ or $a = -b\}$,

R4 = $\{(a, b) \mid a = b\}$,

R5 = $\{(a, b) \mid a = b + 1\}$,

R6 = $\{(a, b) \mid a + b \leq 3\}$

Which of these relations contain each of the pairs (1, 1), (1, 2), (2, 1), (1, –1), and (2, 2)?

b) Let A = $\{a_1, a_2, a_3\}$ and B = $\{b_1, b_2, b_3, b_4, b_5\}$. Which ordered pairs are in the relation R and R^{-1} represented by the matrix? **[6]**

$$M_R = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \end{bmatrix}$$

c) Show that 7 colors are used to paint 50 bicycles, then at least 8 bicycles of the same color. **[6]**

Q5) a) Determine quotient and remainder for the following : **[6]**

i) 88 / 10

ii) –88 / 10

b) State and explain the Euclidean algorithm to computer GCD of two numbers. **[4]**

c) Let a = 37 and b = 249. Find **[8]**

i) d = gcd(a, b)

ii) Find integers *m* and *n* such that $d = ma + nb$

OR

Q6) a) Find the multiplicative inverse of 40 mod 197 using the Extended Euclidean algorithm. **[6]**

b) Using the primality test theorem determine if the following numbers are prime. Justify your answer : **[4]**

i) 131

ii) 253

c) Using the Chinese Remainder Theorem find the value of X such that :**[8]**

X = 2 mod 3

X = 4 mod 5

X = 3 mod 7

Q7) a) Let R = {0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º} and * = binary operation, so that a*b is overall angular rotation corresponding to successive rotations by a and then by b. Show that (R,*) is a group. **[6]**

b) Consider the (2, 6) encoding function e. e(00) = 10111100, e(10) = 10101010 e(01) =00111010, e(11) = 10101101

Find the minimum distance of e. How many errors will e detect? **[8]**

c) Define Ring with Unity, with an example. **[3]**

OR

Q8) a) Prove that the following table on relation of elements of set G = {0,1,2,3,4,5} multiplication mod 6 is not a group. **[6]**

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	1	2	3	4	5
2	0	2	4	0	2	4
3	0	3	0	3	0	3
4	0	4	2	0	4	2
5	0	5	4	3	2	1

b) S = {1,2,3,6,12,28}, where a*b is defined as GCD (a,b). Determine whether it is an Abelian Group or not. **[8]**

c) Define Commutative Ring, with an example. **[3]**



Total No. of Questions : 8]

SEAT No. :

PE4296

[Total No. of Pages : 4

[6582]-69

S.E. (Computer Engineering) (AI & ML)

DATA STRUCTURES AND ALGORITHMS

(2019 Pattern) (Semester - III) (218542)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat & labelled diagrams if necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Imagine we have two empty stacks of integers, S1 and S2. Draw a picture of each stack after the following operations: **[6]**

i) S1. Push (3);

ii) S1. Push (5);

iii) S1. Push (7);

iv) S1. Push (9);

v) S1. Push (11);

vi) S1. Push (13);

vii) while (! Emptystack (S1))

```
{
        X=S1. Pop ();
        X=S1. Pop ();
        S2. Push (X);
}
```

b) Clearly indicate the content of stack during conversion of given infix expression to prefix. **[6]**

A^B*C-D+E/F/(G+H)

c) Write a C++ pseudocode algorithm for the following operation of simple queue using linked representation. **[6]**

i) enqueue ()

ii) dequeue ()

iii) print_Queue()

OR

P.T.O.

Q2) a) If the values of A, B, C and D are 2, 3, 4 and 5 respectively. Calculate the value of the following prefix expression and clearly indicate the content of stack. (Consider '-' as a minus sign) **[6]**

i) + - * A B C D

ii) - * A + B C D

b) Consider the following circular queue of characters of size 6. "-" denotes an empty queue location. Initial queue configuration is Front = 1, Rear = 3 and having letters as shown below. **[6]**

A. F is added to the queue

B. Two letters are deleted

C. K, L, M are added to the queue

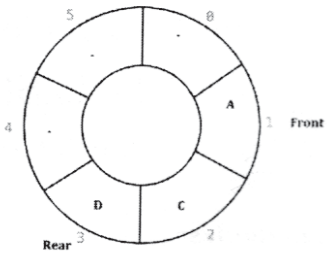
D. Two letters are deleted

E. R is added to the queue

F. Two letters are deleted

G. S is added to the queue

H. Two letters are deleted



Show the queue content of queue with Front and Rear as the above options take place.

c) What is double ended queue? Mention Types of double ended queue. Explain enqueue and dequeue operations of double ended queue. **[6]**

Q3) a) Create a binary tree from given preorder and inorder traversal. Show all intermediate steps. **[6]**

Preorder : G B Q A C K F P D E R H

Inorder : Q B K C F A G P E D H R

b) Write the C++ pseudocode algorithm for creating expression tree from postfix expression. **[6]**

c) Construct an inorder threaded binary search tree for the following set of elements. **[5]**

100, 50, 200, 300, 20, 150, 70, 180, 120, 30

Show all steps.

OR

Q4) a) Write C++ pseudocode algorithm for preorder traversal of threaded binary tree. **[6]**

b) Draw the expression tree for the given postflx expression. Clearly indicate the content of stack. Write the inorder and preorder traversal of the concern tree. **[6]**

A B C * + E * F +

c) Explain the following terms with respect to tree. **[5]**

i) Root

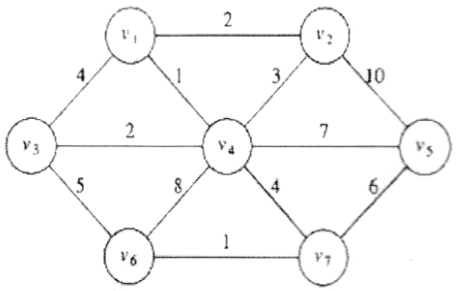
ii) Leaf node

iii) Siblings

iv) Degree of a node

v) Degree of tree

Q5) a) Find the minimum spanning tree using Prim's algorithm for the following graph. **[6]**



b) Obtain an AVL tree by inserting one data element at a time in the following sequence : **[7]**

50, 55, 60, 15, 10, 40, 20, 45, 30, 70, 80.

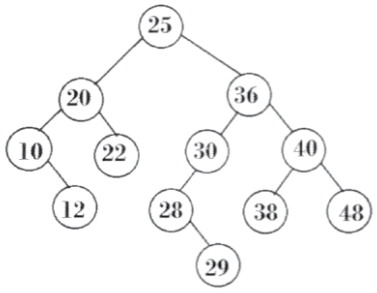
Label the rotations appropriately at each stage

c) Write short note on OBST. **[5]**

OR

Q6) a) Write an application of Topological sorting with suitable example. **[6]**

b) For a given tree, Identify whether it is AVL tree or not? If it is not an AVL tree, convert it into balanced AVL tree . After conversion, insert node 15 in the tree. Delete node 20 from the tree. After insertion and deletion operation, if the tree is imbalanced, make it balanced AVL tree. **[7]**



c) Construct Heap to Sort given values in ascending order using MAXheap sort. 5, 3, 17, 10, 84,19, 22.

(Note : Make a use of Heapify) **[5]**

Q7) a) Differentiate between sequential file and direct access file. **[6]**

b) Write a pseudo code to perform the following operations on Sequential file : **[6]**

i) Insert record

ii) Delete record

c) What are the characteristics of good hash function? List different techniques to resolve collision in hash table and explain any one with suitable example. **[5]**

OR

Q8) a) Explain the Index sequential file organization with advantages and disadvantages. **[6]**

b) Explain Linear probing with and without replacement with suitable example. **[6]**

c) What is File? Differentiate between text file and binary file. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE4297

[Total No. of Pages : 2

[6582]-70

S.E. (Artificial Intelligence and Machine Learning)

COMPUTER NETWORKS

(2019 Pattern) (Semester - III) (218543)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use of Calculator is allowed.***

Q1) a) Demonstrate Cyclic Redundancy Check (CRC) method with suitable example. **[9]**

b) What is frames in data link layer? Describe in detail the fixed size framing and variable size framing? **[9]**

OR

Q2) a) Explain CSMA/CD random access technique in detail. **[9]**

b) Describe any two error detection techniques with suitable example. **[9]**

Q3) a) Describe in detail Enhanced Interior Gateway Routing Protocol. **[9]**

b) What is NAT? Explain PAT in detail with example. **[8]**

OR

Q4) a) What is Dynamic Host Configuration Protocol? Explain in detail. **[9]**

b) Explain following terms **[8]**

i) Distance Vector Routing

ii) Link State Routing

P.T.O.

Q5) a) What is socket? Describe the types of socket with example. **[9]**

b) Compare : Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). **[9]**

OR

Q6) a) Explain UDP with its header format. **[9]**

b) Demonstrate Token Bucket algorithms. **[9]**

Q7) a) Describe Domain Name System (DNS) with suitable examples. **[9]**

b) What is HTTP? Describe Hypertext Transfer Protocol. **[8]**

OR

Q8) a) Demonstrate Post Office Protocol (POP) in detail. **[8]**

b) Write Short Note on **[9]**

i) Client Server Paradigm

ii) IMAP

iii) FTP



Total No. of Questions : 8]

SEAT No. :

PE4298

[Total No. of Pages : 2

[6582]-71

S.E. (Artificial Intelligence & Machine Learning)

OBJECT ORIENTED PROGRAMMING

(2019 Pattern) (Semester - III) (218544)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is Constructor? Explain with example. **[6]**

b) Write a program to calculate an area of circle using parameterized constructor. **[6]**

c) Explain different types of Constructors in OOP. **[6]**

OR

Q2) a) Explain concept of symbolic constant with example. **[6]**

b) Differentiate between Constructor and Destructor. **[6]**

c) Write Pseudo code for Constructor Overloading. **[6]**

Q3) a) Write java program to implement Multiple inheritance. **[5]**

b) Explain Method overriding with example. **[6]**

c) Define Inheritance. What are the types of Inheritance? **[6]**

OR

Q4) a) Write a program for multiplication of two numbers using Method overloading. **[5]**

b) What is abstract class and explain with example? **[6]**

c) What is interface in java? How to declare an interface, write syntax? Can we achieve multiple inheritance by using interface? **[6]**

P.T.O.

Q5) a) What is RunTimeException? Demonstrate with the example, how to handle the Number Format exception? **[6]**

b) Explain try, catch and finally with suitable example. **[6]**

c) What is Collection? Explain set interface. **[6]**

OR

Q6) a) What is checked exception? Demonstrate Arithmatic Exception using throw. **[6]**

b) What is Generics? Write a code of ArrayList using generics. **[6]**

c) Differentiate between ArrayList and LinkedList collection classes. **[6]**

Q7) a) Explain Concept of Stream with its types. **[6]**

b) Explain singleton pattern with example. **[6]**

c) Write the Java program to read a file using FileInputStream class. **[5]**

OR

Q8) a) Explain Iterator Pattern with its merits. **[6]**

b) Write a Program to write a file using FileOutputStream class. **[6]**

c) What are design patterns? Explain 'Adaptor' design pattern in detail. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE4299

[Total No. of Pages : 2

[6582]-72

S.E. (Artificial Intelligence & Machine Learning)

SOFTWARE ENGINEERING

(2019 Pattern) (Semester-III) (218545)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is the different architectural styles for building a software? **[9]**

b) How is interface analysis done? What parameters are considered? **[9]**

OR

Q2) a) What is Architecture Trade-Off Analysis Method used for? **[9]**

b) Explain the golden rules of interface design. **[9]**

Q3) a) What is project scope? Explain scope management statement with example. **[9]**

b) What are the typical problems with IT cost estimate? **[8]**

OR

Q4) a) What is WBS? Explain with an example. Does scope of project affects WBS? **[9]**

b) What are the different ways to estimate a software project? **[8]**

Q5) a) What is defect life cycle? Explain with a neat diagram. **[9]**

b) Explain McCall's Quality Factors with supporting diagram. **[9]**

OR

P.T.O.

Q6) a) Explain software quality dilemma. Why does it occur and how to remove it? **[9]**

b) What is software testing? What is the difference between white box & black box testing? **[9]**

Q7) a) What is risk? What are the differenet sources of risk in IT project? How to handle the risk? **[9]**

b) What are the global challenges in software development? **[8]**

OR

Q8) a) Write short note on following: **[8]**

i) Jira

ii) Kanban

b) What is test driven development? Explain in detail. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-4300

[Total No. of Pages : 2

[6582]-73
S.E. B.Tech. (Biotechnology Engg.)
BIOCHEMISTRY - II
(2019 Pattern) (Semester - IV) (215470)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Answer the following : **[18]**

a) What is Importance of Phosphorylated Intermediates.

b) Draw a diagram showing the key reactions and products of the pentose phosphate pathway.

OR

Q2) Answer the following : **[18]**

a) Write significance of Glycolysis.

b) Write significance of NADPH and glutathione

Q3) Write in detail about : **[17]**

a) Draw and label the reactions of the TCA cycle.

b) Write a short note on the Cori cycle

OR

Q4) Answer the following : **[17]**

a) Analyze the role of nucleoside diphosphate sugars (UDP-glucose) in glycogen and starch synthesis.

b) Explain the role of transferase and α-(l,6)-glucosidase in the glycogen breakdown.

P.T.O.

Q5) Answer the following : **[18]**

a) Explain how Glutamine transport ammonia in the bloodstream.

b) What are the different methods of protein purification? Explain any one in detail.

OR

Q6) Answer the following : **[18]**

a) Explain about digestion and absorption of protein.

b) Write a short note on the toxic effects of ammonia in the body.

Q7) Answer the following : **[17]**

a) Describe the process of beta-oxidation of fatty acids. Include the enzymes involved, the sequence of reactions and the products generated.

b) Depict a flow chart showing processing of dietary lipids in vertebrates.

OR

Q8) Answer the following : **[17]**

a) Discuss the importance of peroxisomal fatty acid oxidation.

b) Discuss the role of fatty acid synthase in synthesis of fatty acids.

Total No. of Questions : 8]

SEAT No. :

PE-4301

[Total No. of Pages : 2

[6582]-74

S.E. (Biotechnology)

CELL BIOLOGY & TISSUE CULTURE

(2019 Pattern) (Semester - IV) (215471)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q.1, or Q. 2, .Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume Suitable data if necessary.***

Q1) a) Discuss the general principle of communications in cell biology. **[6]**

b) How the G-protein couple receptors (GPCR) function? Give its significance. **[6]**

c) Explain in detail about karyokinesis. **[6]**

OR

Q2) a) Explain cell cycle and describe in detail the steps involved in a typical cell cycle. **[6]**

b) Write detail note on morphogen and its functions. **[6]**

c) Write detail about control of cell division and their growth. **[6]**

Q3) a) Write in detail about muscle tissue. **[9]**

b) What is cancer? What are the causes of cancer and how it develops? **[8]**

OR

Q4) a) Explain in detail about nervous tissue. **[9]**

b) What are types of Cancer? Give examples and explain **[8]**

P.T.O.

Q5) a) Explain the disaggregation of tissue with trypsinization and its significance & Draw flowchart with detailed steps. **[8]**

b) Discuss the different types of media used for animal cell culture? **[10]**

OR

Q6) a) What is viable cell count? How it is observed and calculated? State the significance in culture initiations. **[10]**

b) Discuss the concept of contamination and cytotoxicity. **[8]**

Q7) a) What are plant growth hormones? Explain various hormones. **[8]**

b) Describe and explain the various methods used for gene transfer for plant cells. **[9]**

OR

Q8) a) Write a short note on applications of plant tissue culture. **[8]**

b) Describe in detail about protoplast culture in plant tissue culture. **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PE-4302

[Total No. of Pages : 2

[6582]-75
S.E. (Biotechnology)
THERMODYNAMICS
(2019 Pattern) (Semester - IV) (215472)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) A domestic food freezer maintain a temperature of -20ºC. The ambient air is at 40ºC. If the heat leaks into the freezer at continuous rate 1.75KJ/sec, what is the least power necessary to pump the heat out continuously.

Given : $T_L = -20^ºC$

$T_H = 40^ºC$

$Q_S = 1.75KW.$ **[6]**

b) Discuss the principle behind in entropy increases. **[6]**

c) Describe the mathematical statement involved in second law of thermodynamics. **[6]**

OR

Q2) a) Discuss the carnot cycle in detail with neat sketch. **[6]**

b) Define heat engine, PV diagram and explain the equation for heat engine efficiency. **[6]**

c) Write the statement involved in first law of thermodynamics and explain its limitations in detail. **[6]**

P.T.O.

Q3) a) Define phase Equilibria? Explain it along with neat labeled graph. **[9]**

b) What is chemical potential? Derive the expression for fundamental relationship for changes in the free energy of a solution. **[8]**

OR

Q4) a) What is fugacity? Derive the expression of fugacity for ideal gas and mathematical definition of fugacity. **[9]**

b) Explain in detail about ideal gas mixtures with example and neat sketch. **[8]**

Q5) a) Explain in detail about effect of temperature on equilibrium constant and write the applications of equilibrium constant. **[8]**

b) What is the relationship between Kc and Kp in equilibrium constant for reversible reaction and write the importance and applications of chemical equilibrium. **[10]**

OR

Q6) a) What is chemical equilibrium? Explain the various types of chemical equilibrium with examples. **[10]**

b) Write about Duhem's theorem for reacting systems. **[8]**

Q7) a) Discuss in detail about Energy transformations in biological Systems. **[8]**

b) List out the feasibility of individual steps for overall chemical reactions and explain them in detail. **[9]**

OR

Q8) a) Explain Gibb's free energy concept related with biological system along with its applications. **[8]**

b) Explain about energy yielding and energy requiring reactions in biosystems. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4303

[Total No. of Pages : 2

[6582]-76

S.E. B.Tech (Biotechnology)

GENETICS AND MOLECULAR BIOLOGY

(2019 Pattern) (Semester - IV)(215473)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) With neat labelled diagram explain DNA synthesis at the replication fork. **[9]**

b) Give the outline of DNA replication process. **[9]**

OR

Q2) a) Give the functions of following enzymes and proteins in DNA replication. **[9]**

i) DNA Ligase

ii) Helicase

iii) SSBP

b) Describe the importance of mutation in evolution and write a note on types of mutations. **[9]**

Q3) a) Enlist different types of coding RNAs and its function in cell. **[9]**

b) Give the functions of noncoding RNA in cell. **[8]**

OR

Q4) a) With neat labelled diagram explain the structural features of bacterial ribosomes. **[9]**

b) Write short note on heterogenous nuclear RNA (hnRNA). **[8]**

P.T.O.

Q5) a) Outline the phases of initiation, elongation and termination process of transcription in prokaryotes. **[10]**

b) Write short note on regulation of transcription process. **[8]**

OR

Q6) a) Explain concept of Operon. Add note on how the Lac Operon is transcribed when lactose is present. **[10]**

b) Give schematic structure of the transcription bubble during elongation. **[8]**

Q7) a) Write protein biosynthesis process in cell. **[9]**

b) Elaborate the functional role of tRNA in protein synthesis. **[8]**

OR

Q8) a) Describe general features of Genetic Code. **[9]**

b) Write short note on Post-translational modifications. **[8]**



Total No. of Questions : 9]

SEAT No. : ____

PE-4304

[Total No. of Pages : 5

[6582]-77
S.E. (Biotechnology/Chemical/Printing)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III) (207004)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Q.1 is compulsory.***
2) ***Answer Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7 and Q.8 or Q.9.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt the following :

i) The Fourier transform F(λ) of $f(x)=\begin{cases}1, & |x|<a\\ 0, & |x|>a\end{cases}$ is **[2]**

a) $\frac{2\sin\lambda a}{\lambda}$ b) $\frac{e^{-i\lambda a}}{\lambda}$

c) $\frac{e^{i\lambda a}}{\lambda}$ d) $\frac{2\cos\lambda a}{\lambda}$

ii) Second moment μ_2 about mean is **[1]**

a) Mean b) Standard deviation

c) Variance d) Mean deviation

iii) Mean of binomial probability distribution is **[1]**

a) nq b) n^2p

c) npq d) np

iv) For vector functions $\bar{u}(t)$ and $\bar{v}(t), \frac{d}{dt}(\bar{u}\times\bar{v})=$ **[2]**

a) $\bar{v}\times\frac{d\bar{u}}{dt}+\frac{d\bar{v}}{dt}\times\bar{u}$ b) $\frac{d\bar{u}}{dt}+\bar{v}+\bar{u}\times\frac{d\bar{v}}{dt}$

c) $\frac{d\bar{v}}{dt}\times\bar{v}-\bar{u}\times\frac{d\bar{v}}{dt}$ d) $\bar{u}.\frac{d\bar{v}}{dt}+\frac{d\bar{u}}{dt}.\bar{v}$

P.T.O.

v) The general solution of PDE $\frac{\partial u}{\partial t} = \frac{\partial^2 y}{\partial x^2}$ is **[2]**

a) $u\ (x,\ t) = (C_1 \cos mx + C_2 \sin mx)\ e^{-m^2 t}$

b) $u\ (x,\ t) = (C_1 \cos t + C_2 \sin t)\ e^{-m^2 x}$

c) $u\ (x,\ t) = (C_1 \cos mx + C_2 \sin mx)\ e^{-m^2 y}$

d) $u\ (x,\ t) = (C_1 \cos y + C_2 \sin y)\ e^{x}$

vi) In the Fourier integral representation of **[2]**

$$\frac{1}{2\pi}\int_{-\infty}^{\infty}\left(\frac{1+i\lambda}{1+\lambda^2}\right)e^{i\lambda x}d\lambda = \begin{cases}0, x<0\\ e^{-x}, x>0,\end{cases}$$ then F(λ) is

a) $\frac{1+\lambda^2}{1-i\lambda}$ b) $\frac{e^{-i\lambda}}{1-\lambda^2}$

c) $\frac{1-i\lambda}{1+\lambda^2}$ d) $\frac{1+i\lambda}{1+\lambda^2}$

Q2) a) Find the fourier sine transform of the function $f(x) = e^{-x}$ and hence show that $\int_0^{\infty}\frac{x\sin mx}{1+x^2}\,dx = \frac{\pi}{2}.e^{-m}$. **[5]**

b) Find the fourier cosine transform of the following function. **[5]**

$$f(x) = \begin{cases}x, & 0 \le x \le 1\\ 2-x, & 1 \le x \le 2\\ 0, & x > 2\end{cases}$$

c) Solve the following integral equation $\int_0^{\infty} f(x)\cos\lambda x\,dx = \frac{\sin a\lambda}{\lambda}$. **[5]**

OR

Q3) a) Find the fourier transform of the following function **[5]**

$$f(x) = \begin{cases}\sin x, & 0 < x < \pi\\ 0, & x < 0 \text{ or } x > \pi\end{cases}$$

b) Find the fourier sine transform of the following function. **[5]**

$$f(x) = \begin{cases}x, & 0 \le x \le 1\\ 2-x, & 1 \le x \le 2\\ 0, & x > 2\end{cases}$$

c) Solve the following integral equations **[5]**

$$\int_0^{\infty} f(x) \sin \lambda x \, dx = \begin{cases} 1-\lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda \ge 1 \end{cases}$$

Q4) a) The first three moments about value 2 of distribution are 1, 16 and –40. Find mean, standard deviation and β_1 of distribution. **[5]**

b) Find coefficient of correlation from given data. n = 11, $\sum x = -31$, $\sum y = -49$, $\sum x^2 = 1501$ $\sum y^2 = 1865$, $\sum xy = 1540$, **[5]**

c) If 20% of bolts produced by a machine are detective. Determine the probability that out of 4 bolts chosen at random. **[5]**

i) 1 detective ii) at most 2 bolts are detective

OR

Q5) a) If $\sum xi = 30$, $\sum yi = 40$, $\sum xi^2 = 220$, $\sum yi^2 = 340$, $\sum xiyi = 214$ and n = 5 then obtain regression lines for this data. **[5]**

b) Fit Poisson's distribution to following data and calculate theoretical frequencies. **[5]**

x	0	1	2	3	4
y	122	80	15	2	1

c) A fair coin is tossed 600 times. Using normal distribution, find probability of getting number of heads less than 270. **[5]**

[Given : A(2.4495) = 0.4929]

Q6) a) Find the directional derivative of $\phi = x^2y + xyz^2$ at (2,1,1) along the direction normal to the surface $x^2 + y^2 + z^2 = 9$ at (2,1,2). **[5]**

b) Show that $\bar{F} = (6xy + z^3)\,i + (3x^2 - z)\,j + (3xz^2 - y)\,k$ is irrational. Find the scalar ϕ such that $\bar{F} = \nabla\phi$ **[5]**

c) Using Green's theorem, evaluate $\int_c \bar{F}.d\bar{r}$ for the field $\bar{F} = x^2\,i + xy\,j$ over the region R bounded by $y = x^2$ and the line $y = x$. **[5]**

OR

Q7) a) Find the value of m if $\bar{F} = (x + 2y)\, i + (my + 8z)\, j + (5z - 6x)\, k$ is solenoidal. **[5]**

b) Solve any one **[5]**

i) Show that $\nabla^2[\nabla.(r^2\bar{r})] = 30$

ii) Prove that $\bar{b} \times \nabla[\bar{a}.\nabla \log r] = \frac{\bar{b} \times \bar{a}}{r^2} - \frac{2(\bar{a}.\bar{r})(\bar{b} \times \bar{r})}{r^4}$

c) Using Stoke's theorem, evaluate $\oint_c y\, dx + z dy + x dz$ where C being intersection of $x^2 + y^2 + z^2 = a^2$, $x + z = a$. **[5]**

Q8) a) Solve $\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2}$ subject to the conditions **[8]**

i) $y(0, t) = 0, \forall\ t$

ii) $y(l, t) = 0, \forall\ t$

iii) $\left(\frac{dy}{dt}\right)_{t=0} = 0$

iv) $y(x,0) = \frac{3a}{2l}x,\ 0 < x < \frac{2l}{3} = \frac{3a}{l}(l - x);\ \frac{2l}{3} < x < l$

b) An infinitely long plane uniform plate is bounded by two parallel edges in the y-direction and an end at right angles to them. The breadth of the plate is Π. This end is maintained at the constant temperature. Find the steady state temperature $u(x,y)$. **[7]**

OR

Q9) a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ to the condition : **[7]**

i) u is finite for all t

ii) $u\ (0, t) = 0, \forall$ t

iii) $u\ (l, t) = 0\ ; \forall$ t

iv) $u\ (x, 0) = \Pi x - x^2;\ 0 \leq x \leq \pi$

b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition **[8]**

i) $u\ (0, t) = 0, \forall$ t

ii) $u\ (\pi, t) = 0, \forall$ t

iii) $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$

iv) $u\ (x, 0) = 2x,\ 0 < x < \pi$



Total No. of Questions : 8]

SEAT No. :

PE4305

[Total No. of Pages : 2

[6582]-78
S.E. (Biotechnology)
BIOCHEMISTRY - I
(2019 Pattern) (Semester - III) (215461)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Answer the following. **[18]**

a) Which amino acid absorbs ultraviolet light? Depict the structure for same.

b) What are the various techniques to separate proteins? Write a note on any one.

OR

Q2) Explain the classification of amino acids on the basis of their R group **[18]**

Q3) Answer the following. **[17]**

a) Write short note on double helix structure of DNA.

b) Explain in brief the Central Dogma of biology.

OR

Q4) Answer the following. **[17]**

a) Differentiate between nucleotide and nucleoside.

b) Explain the three characteristic components of nucleotides.

Q5) Answer the following. **[18]**

a) Define lipids and write down the functions of lipid.

b) Explain why unsaturated fatty acids, with one or several kinks cannot pack together as tightly as fully saturated fatty acids.

OR

P.T.O.

Q6) Answer the following. **[18]**

a) What is phospholipid? Give the classification of same in detail.

b) Explain lipids movement in membrane.

Q7) Answer the following. **[17]**

a) Give the significance of potassium.

b) Explain the clinical manifestation of any two mineral deficiencies.

OR

Q8) Answer the following. **[17]**

a) What are the functions of iron and enlist the causes which leads to its deficiency?

b) Explain clinical significance of sodium.



Total No. of Questions : 8]

SEAT No. : ____

PE4306

[Total No. of Pages : 2

[6582]-79
S.E. (Biotechnology)
FLUID FLOW & UNIT OPERATIONS
(2019 Pattern) (Semester - III) (215462)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figure to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) What are lift and drag forces related to dynamics of suspended particles? Write the mathematical expression for lift and drag force. **[6]**

b) Discuss the three Newton's laws of motion with neat sketch. **[6]**

c) Give the statement of Stoke's law and derive expression for drag force on sphere. **[6]**

OR

Q2) a) It is observed that as Re particle reaches its critical value, C_D for the sphere drops from 0.5 to a volue of 0.2 due to turbulence. If the driving power remains the same, what will be corresponding percent increase in speed with such change. **[6]**

b) Write note on free and hindered settling in detail. **[6]**

c) Explain in detail about cyclones and hydrocyclones. **[6]**

Q3) a) Derive Kozeny Carmen Equations for laminar flow. **[9]**

b) Describe Burke Plummer equation for turbulent flow. **[8]**

OR

Q4) a) Describe the phonomenon of Computational Fluid Dynamics (CFD) with examples. **[9]**

b) What is fluidization? Give the applications and advantages of fluidization. **[8]**

P.T.O.

Q5) a) What is pumping system? Describe the types of pumps with neat sketch. **[8]**

b) What is Valve? Describe the various types of valves with neat labeled diagram. **[10]**

OR

Q6) a) Write about NPSH (Net Positive Suction Head) in pumping systems. **[10]**

b) What is impeller? Explain the various types of impellers with neat sketch. **[8]**

Q7) a) Calculate the operating speed of a ball mill from the following data. **[8]**

Diameter of the ball mill = 800 mm

Diameter of ball = 60 mm

If

i) Operating speed is 55% less than critical speed

ii) Critical speed is 40% more than operating speed

b) Justify about energy for size reduction and explain Rittinger's law, Bonds law, Kick's law. **[9]**

OR

Q8) a) Write in detail about Gyratory crusher with neat sketch. **[8]**

b) Explain the design, principle and working mechanism involved in Ball Mill with neat labeled diagram. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE4307

[Total No. of Pages : 2

[6582]-80
S.E. (Biotechnology)
HEAT TRANSFER
(2019 Pattern) (Semester - III) (215463)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to the right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Define and explain individual and overall heat transfer coefficient and how it is used? **[10]**

b) Explain with the help of diagram pool boiling curve. **[8]**

OR

Q2) a) By using Rayleigh's method of dimensional analysis derive an expression for natural convection heat transfer. **[9]**

b) What are types of condensation? Which is desirable? **[9]**

Q3) a) Write short note on Stefan Boltzman law with its application. **[9]**

b) Write a short note on shape factor and its significance. **[8]**

OR

Q4) a) Define following terms : **[8]**

i) Absorptivity

ii) Gray Body

iii) Transmitivity

iv) Emissivity

b) Explain in detail Wein's law and derive an expression $\lambda_{max} T = 0.0029$ mk. **[9]**

P.T.O.

Q5) a) What is a concept of log mean temperature difference (LMTD)? Derive an expression for counter current flow using LMTD method. **[9]**

b) Draw a neat sketch and write a short note on Plate and Frame Heat Exchanger. **[9]**

OR

Q6) a) Draw temperature profiles of tube in tube type of co-current and counter current heat exchangers. Which type of flow is considered to be effective? Why? **[9]**

b) Write a short note on Stationary and rotating matrix heat exchanger. **[9]**

Q7) a) Write mass balance equations along an evaporator. **[9]**

b) Give comparison between single effect evaporator and multiple effect evaporators. **[8]**

OR

Q8) a) What is Duhring's plot? Give significance of it. **[9]**

b) Write short notes on Long tube evaporator. **[8]**

x x x

Total No. of Questions : 8]

SEAT No. :

PE4308

[Total No. of Pages : 2

[6582]-81
S.E. (Biotechnology)
MICROBIOLOGY
(2019 Pattern) (Semester-III) (215464)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Assume Suitable data if necessary.***

Q1) a) Define bacterial growth and describe 4 phases of bacterial growth curve? **[9]**

b) Briefly describe principle and applications of Direct Microscopic Count method. **[9]**

OR

Q2) a) Tabulate different biomass determination methods with its applications. **[9]**

b) Definition, principle, process and applications of Batch culture. **[9]**

Q3) a) What is sterilization? Illustrate moist heat sterilization technique with its applications for control of microorganisms. **[9]**

b) Write short note on mode of action of **[8]**

i) Quaternary ammonium compounds

ii) Phenolic compounds

OR

Q4) a) Define antibiotics and give mode of action of antibiotics with examples? **[9]**

b) Tabulate chemical agents of disinfection with its mode of action and examples. **[8]**

P.T.O.

Q5) a) Describe with examples role of microorganisms in food. **[10]**

b) Write short note on: **[8]**

i) Symbiosis

ii) Commensalism

OR

Q6) a) What is indicator microorganism and explain its significance in water microbiology. **[10]**

b) Write short note on: **[8]**

i) Antagonism

ii) Commensalism

Q7) a) Write etiological agent for **[8]**

i) Tuberculosis

ii) Cholera and

iii) Typhoid

Add note on diagnostic test for pathogens.

b) Explain Rabies with respect to Symptoms, treatment, causes, and prevention. **[9]**

OR

Q8) a) Explain Cholera with respect to Symptoms, treatment, causes, and prevention. **[8]**

b) Write short note on: **[9]**

i) Pandemic and

ii) Epidemic

iii) Endemic



Total No. of Questions : 8]

SEAT No. :

PE-4309

[Total No. of Pages : 2

[6582]-82
S.E. (Chemical)
INDUSTRIAL CHEMISTRY - II
(2019 Pattern) (Semester - IV) (209347)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of scientific calculators is allowed.***

Q1) a) Demonstrate different types of volumetric analysis with examples. **[6]**

b) Explain theory of indicators and also explain a difference of 2 PH is required for colour change. **[6]**

c) 50 mL of 0.50M, barium hydroxide are required to fully titrate a 100 mL solution of sulfuric acid. What is the initial concentration of the acid? **[6]**

OR

Q2) a) What is precipitation titration? Explain it using Fajans method. **[6]**

b) Explain the strong acid strong base titration with the help of titration curve and indicators. **[6]**

c) 50 ml of 0.05N Fe^{2+} is titrated agaist 0.1N Ce^{4+} from burette. Calculate potential of indicator electrode which is immersed in reaction mixture, when 24.5 ml of Ce^{4+} is added from burette. **[6]**

Q3) a) What is adsorption isotherm? Deduce the Langmuir adsorption isotherm. **[6]**

b) Explain mechanism of catalysis reaction involving adsorption phenomenon. **[6]**

c) The volume of nitrogen gas at 1 atm and 273K required to cover lg of the silica gel is 0.129 dm^3. Calculate the surface area of the gel if each nitrogen molecule occupies an area of $16.2 \times 10^{20}\ m^2$. **[5]**

OR

P.T.O.

Q4) a) What are the factors affecting the rate and extent of adsorption. **[6]**

b) Give mechanism of metal coordination compound catalysed reaction in Methanol carbonylation. **[6]**

c) Explain photolysis of water molecules using coordination catalysis. **[5]**

Q5) a) Give various conformation of propane with P.E. diagram. **[6]**

b) Give optical activity of compound containing two chiral centres. **[6]**

c) Write the structural formula and the geometrical isomerism of the following compounds **[6]**

i) 2-butene

ii) CHC1=CHC1

iii) 2,3 dichloro 2-butene

OR

Q6) a) Explain various types of conformation in cyclohexane with their order of stability. **[6]**

b) Explain geometrical isomerism in compound with one double bond. **[6]**

c) Explain the terms enantiomers and diastereomers giving examples. **[6]**

Q7) a) What is the equation of first law of thermodynamics under various process **[6]**

b) Explain the spontaneity by using Gibbs free energy. **[6]**

c) A piston filled with 0.04 mol of an ideal gas expands reversibly from 50.0 mL to 375 mL at a constant temperature of 37.0° C. As it does so, it absorbs 208J of heat. The values of w for the process will be. **[5]**

OR

Q8) a) State and explain Kirchhoff's law and its applications. **[6]**

b) Derive the relation between heat of reaction at constant pressure and at constant volume mentioned the three case of it. **[6]**

c) A gas expands isothermally against a constant external pressure of 1 atmosphere from a volume of 10 dm^3 to a volume of 20 dm^3. In this process it absorbs 800 J of thermal energy from its surroundings. Find the ΔU for the process in joule. **[5]**

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Total No. of Questions : 8] **SEAT No. :**

PE4310 **[Total No. of Pages : 2**

[6582]-83

S.E. (Chemical)

HEAT TRANSFER

(2019 Pattern) (Semester - IV) (209348)

Time : 2 ½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What is radiation incident on a Surface? Differentiate between Specular & Diffused reflection? **[8]**

b) Calculate the heat flux emitted due to thermal radiation from a black surface at 5000 ºC. At what wavelength is the manochromatic emissive power maximum & what is the maximum value? **[10]**

OR

Q2) a) Define: **[10]**

i) Kirchhoff's Law
ii) Wien's Displacement Law
iii) Emissive power
iv) Monochromatic emissivity
v) Transmitivity

b) Two very large parallel planes with emissivities 0.8 and 0.7 exchange the heat. Estimate the percent reduction in heat transfer when a polished aluminium radiation shield with emissivity 0.03 is placed between them.**[8]**

Q3) a) State and explain Latent heat, Sensible heat and Saturation temperature.**[7]**

b) Vertical plate of 30×30 cm is exposed to steam at atmospheric pressure. The plate is at 371K. Calculate the mean heat transfer coefficient rate of heat transfer and mass of steam condensed per hour.
Data: Properties of condensate at mean film temperature are
Density = 960 kg/m^3 Dynamic Viscosity = 2.82 × 10^{-4} N s/m^2, Thermal conductivity = 0.68 W/m.k, Latent heat of condensation = 2255kJ/kg.
Saturation temperature of steam = 373K. **[10]**

OR

Q4) a) Differentiate between drop-wise and film-wise condensation? **[8]**

b) What are the different regions or stages of the pool boiling curve, and what processes dominate each stage? **[9]**

P.T.O.

Q5) a) Draw neat sketch of 1-2 shell and tube heat exchanger? Explain? **[10]**

b) Hot oil at a rate of 1.2 kg/s [C_p = 2083 J/(kg.K)] flows through a double pipe heat exchanger. It enters at 633 K and leaves at 573 K. The cold fluid enters at 303 K and leaves at 400 K. If the overall heat transfer coefficient is 500 W/(m^2·k), calculate the heat transfer area for **[8]**

i) Parallel flow and

ii) Countercurrent flow

OR

Q6) a) Explain log mean temperature difference for co-current and counter current flow? **[10]**

b) 20kg/sec of water at 360 ºK entering a heat exchanger is to be cooled to 340 ºK by using cold water at 300 ºK flowing at rate of 25 kg/sec. If the overall heat transfer coefficient is 1500 W/m^2 Calculate heat transfer area required in **[8]**

i) Co-current flow concentric pipe heat exchanger and

ii) Counter current flow concentric pipe heat exchanger

Q7) a) What is evaporation? Define Boiling point elevation and explain Duhring's rule in evaporation. **[7]**

b) Estimate the heat transfer area required to concentrate caustic soda solution from 22% solids to 52% solids in a forced circulation evaporator. The feed is fed at 260 kN/m^2 pressure & the condensate leaves at the corresponding condensation temp. The pressure in the vapour space is maintained at 13 kN/m^2. The product has a BPR of 24 ºC. Also calculate the amount of steam consumed & steam economy **[10]**

Use following additional data.

Overall heat transfer Coefficient= 1500 W/m^2 ºK

Specific heat of feed solution=3390 J/kg ºK

Specific heat of product = 5610 J/kg ºK

OR

Q8) a) Write comparison between forward feed and backward feed arrangements? **[10]**

b) An aqueous sodium chloride solution (10 wt %) is fed into a single effect evaporator at a rate of 10000 kg/hr. It is concentrated to a 20 wt% sodium chloride solution. The rate of consumption of steam in the evaporator is 8000 kg/hr. Calculate Capacity (kg/hr) & Economy of the evaporator. **[7]**

✡ ✡ ✡

Total No. of Questions : 8]

SEAT No. : ____

PE-4311

[Total No. of Pages : 3

[6582]-84
S.E. (Chemical Engineering)
PRINCIPLES OF DESIGN
(2019 Pattern) (Semester - IV) (209349)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Assume suitable data if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket Calculator is allowed.***

Q1) a) State the classification of keys. Explain with neat sketches the common four types of Sunk keys. **[8]**

b) Classify and explain shaft Couplings in brief. Draw a neat diagram of the Sleeve or Muff coupling and explain its design procedure. **[10]**

OR

Q2) a) Determine the diameter of a solid shaft for the following torque transmission duty: **[9]**

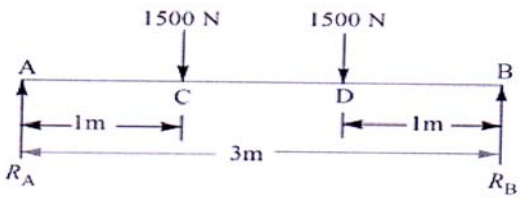
Power transmitted : 55 kW

Rotational speed : 350rpm

Permissible shear stress : 40 MPa

The maximum torque transmitted is 20% higher than the average torque.

b) A shaft made of mild steel is required to transmit 100 kW at 300 rpm. The supported length of the shaft is 3 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Assuming the safe value of shear stress as 60 MPa, determine the diameter of the shaft for the combined torque and bending moments. **[9]**



P.T.O.

Q3) a) A leather belt weighing 2 kg/m is used to drive a cast iron pulley 800 mm in diameter at 300 rpm. If the angle of contact of the belt is 2.61 rad and maximum tension in belt is 4000 N, find power capacity of the belt :**[10]**

i) Considering the centrifugal tension and

ii) Without considering centrifugal tension.

The coefficient of friction of leather on cast iron is 0.35.

b) What are belt drives? Explain with neat figures the different types of belt drives and their configurations. List the applications of belt drives. **[7]**

OR

Q4) a) A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are : σ_t = 120 MPa (permissible tearing stress); τ = 100 MPa (permissible shearing stress); σ_c = 150 MPa (permissible crushing stress). Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear. **[10]**

b) A plate 100 mm wide and 12.5 mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of the weld so that the maximum stress does not exceed 56 MPa. Consider the joint first under static loading and then under fatigue loading. The stress concentration factor for the parallel fillet weld is 2.7. Add 12.5 mm for starting and stopping of the weld run. **[7]**

Q5) a) What are Pressure Vessels? Explain in detail the design procedure (considering longitudinal and circumferential stresses) of cylindrical and spherical pressure vessels subjected to internal pressure. Mention the ASME and IS codes for the design of cylindrical shell of pressure vessels. **[10]**

b) Calculate the thickness of a flanged torispherical head for a vessel having internal diameter 6000 mm, Design pressure of the vessel is 3.4 kg/cm^2. Inside crown radius is 6000 mm and inside knuckle radius is 380 mm. Permissible stress of the head material is 1190 kg/cm^2 and the welded joint efficiency is 100%. **[8]**

OR

Q6) a) Explain in detail the design procedure used for the design of pressure vessel subjected to external pressure. **[8]**

b) A cylindrical pressure vessel with shell diameter of 1.8 m is to be designed to withstand a working pressure of 350 kPa. The vessel is closed with standard elliptical head closures at both ends having the major axis to minor axis ratio as 2:1. The material of construction of the shell and the head closures is same and has a permissible stress of 115 MPa. Calculate the required thickness of the cylindrical shell and the elliptical closures. Weld joint efficiency is 85% and corrosion allowance is 2 mm. **[10]**

Q7) a) List the various types of construction of high pressure vessels and explain in detail the construction of ribbon and wire wound vessels. **[10]**

b) Explain pre-stressing of thick walled pressure vessels. **[7]**

OR

Q8) a) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer radius to inner radius for all the shell is 1.4. The vessel is subjected to internal pressure of 150kg/cm^2. Pressure outside is atmospheric. **[10]**

Estimate:

i) The maximum combined stress at the interface of concentric shells.

ii) Interface pressure resulting from internal pressure and shrinkage stress.

Data : Modules of elasticity = 2×10^6 kg/cm^2, Internal dia. of vessel is 400 mm. Assume the vessel deflection to be $\delta_r = 0.04$.

b) Discuss about the Autofrettage technique for the fabrication of thick-walled pressure vessel. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PE-4312

[Total No. of Pages : 2

[6582]-85
S.E. (Chemical Engineering)
CHEMICAL TECHNOLOGY - I
(2019 Pattern) (Semester - IV) (209350)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket Calculator is allowed.***
5) ***Use of cell phone/ Mobile phone & Smart watch are prohibited in the examination hall.***

Q1) a) Which raw materials are used for manufacturing of urea? **[4]**

b) Explain in brief Ammonia oxidation process of Nitric Acid with reactions involved. **[8]**

c) Explain methods of production for Ammonium Nitrate. **[6]**

OR

Q2) a) Explain in brief manufacturing of Ammonia by pressure catalytic reaction of N_2 & H_2 with a neat process flow diagram. **[9]**

b) Describe in brief stengel process for manufacturing of Ammonium nitrate with a simplified flow chart. **[7]**

c) Explain how Nitric acid id useful in fertilizer industry? **[2]**

Q3) a) Explain in brief about classification of cleansing compounds. **[6]**

b) Draw a neat process flow diagram of a continuous saponification process for manufacturing of fatty acids & Soap. **[6]**

c) Describe manufacturing of bio-degredable detergents. **[5]**

OR

P.T.O.

Q4) a) Distinguish between batch & continuous saponification processes. **[4]**

b) Expalin ziegler catalytic process. **[5]**

c) Describe in brief manufacturing process of dodecyl benzene sulphonate detergent. **[8]**

Q5) a) Explain in brief about modes of polymerization :

i) Condensation polymerization methods. **[3]**

ii) Addition polymerization methods. **[5]**

b) Explain in brief polyvinyl chloride (PVC) with its structure, properties & consumption. **[6]**

c) Describe LDPE (Low Density Polyethylene) **[3]**

OR

Q6) a) Explain in brief polyurethanes. **[5]**

b) Describe in brief uses of thermoplastic resins. **[5]**

c) Draw a neat process flow diagram of manufacturing of phenol-formaldehyde resin. **[7]**

Q7) a) Describe in brief two methods of exploration of crude petroleum. **[6]**

b) Define octane number. **[2]**

c) Define pyrolysis & cracking of hydrocarbons. **[4]**

d) Explain in brief reactions involved in Alkylation process. **[6]**

OR

Q8) a) Explain in brief reactions involved in manufacturing of silicone rubbers with mechanisms. **[6]**

b) Explain in brief difference between plastic polymers & rubbers polymers. **[4]**

c) Draw a neat flow diagram of Butadience styrene (SBR) process. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE4313

[Total No. of Pages : 2

[6582]-86
S.E. (Chemical)
MECHANICAL OPERATIONS
(2019 Pattern) (Semester - IV) (209351)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary***

Q1) a) Write an explanatory note on. **[12]**

i) Cyclone separator

ii) Electrostatic separator

b) Derive an Expression for minimum Fluidization Velocity **[6]**

OR

Q2) Draw a neat sketch of Pressure drop and bed height vs. superficial velocity for a bed of solids and explain in detail conditions of fluidization. **[18]**

Q3) Explain with Neat Sketch. **[17]**

a) Mixing Index

b) Muller Mixer

OR

Q4) a) What are turbines? Explain with a neat sketch different types of turbines.**[8]**

b) Write notes on **[9]**

i) Tumbling Mixer

ii) Ribbon Blender

iii) Sigma Mixer

P.T.O.

Q5) a) Derive the rate of filtration at **[12]**

i) Constant rate

ii) Constant pressure difference

b) Which factor to be considered while selecting Filtration equipment. **[6]**

OR

Q6) a) What is Filter media and Filter aid and gives various requirement of them.**[9]**

b) Explain with a neat sketch Sand filter. **[9]**

Q7) a) Write an explanatory note on pneumatic conveyors. **[9]**

b) Explain Characteristics of Bulk solid material. **[8]**

OR

Q8) a) Explain Advantages and Disadvantage with Application of belt Conveyor.**[8]**

b) Explain with a neat sketch following parts of belt conveyors **[9]**

Belts

Belt idlers

Belt arrangements



Total No. of Questions : 8]

SEAT No. :

PE-4314

[Total No. of Pages : 2

[6582]-87
S.E. Chemical Engineering
INDUSTRIAL CHEMISTRY - I
(2019 Pattern) (Semester - III) (209341)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Discuss the principle and instrumentation of Flame photometer. **[6]**

b) Discuss the instrumentation of Gas chromatography. **[6]**

c) Sate and derive Lambert's and Beer's Law **[6]**

OR

Q2) a) Explain the principle and applications of column chromatographic technique. **[6]**

b) Explain principle and applications of IR spectroscopy. **[6]**

c) Explain the instrumentation of UV-Visible spectroscopy. **[6]**

Q3) a) Describe the Berkeley-Hartley method to measure the osmotic pressure. **[6]**

b) Derive the thermodynamic equation for the depression in freezing point of solution. **[6]**

c) Boiling point of chloroform rises by 0.32 °C when 0.51 gm of solute is dissolved in 35 gm chloroform. If Kb for chloroform is 3.9 and pure chloroform boils at 334K, Calculate molar mass of solute. **[5]**

OR

P.T.O.

Q4) a) Explain Ostwalds-Walker method to measure vapour pressure lowering. **[6]**

b) Derive thermodynamic equation for elevation in Boiling Point. **[6]**

c) Vapour Pressure of water at 20 °C is 17.54mm of Hg and vapour pressure of solution of 0.1 kg of non-volatile solute in 1 kg water at same temperature is 17.3 mm of Mg calculate molar mass of solute. **[5]**

Q5) a) Explain briefly Beckman rearrangement with reaction mechanism. **[6]**

b) Give reaction mechanism for E^1 and E^2 Elimination Reactions. **[6]**

c) Give mechanism of Nitration of benzene. **[6]**

OR

Q6) a) Explain why $-NO_2$ group is deactivating and meta directing. **[6]**

b) Give mechanism for Friedel crafts alkylation reaction. **[6]**

c) Give mechanism for Claisen rearrangement. **[6]**

Q7) a) Explain any two methods of reparation for Pyrrole. **[6]**

b) Explain the classification of dyes on the basis of application. **[6]**

c) Give synthesis of following Alizarin dye **[5]**

OR

Q8) a) Write a note on Diazotization reaction. **[6]**

b) Explain any two methods of reparation for Furan **[6]**

c) Give synthesis of Methyl Orange dye **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4315

[Total No. of Pages : 3

[6582]-88

S.E. (Chemical Engineering)

FLUID MECHANICS

(2019 Pattern) (Semester - III) (209342)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator is allowed.***

Q1) a) Derive Euler's equation of motion. **[6]**

b) Draw a net sketch and explain the working principle of orifice meter derives equation. **[6]**

c) A Pitot static tube placed in the center of a 300mm pipe lines has orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60mm of water take co-efficient of Pitot tube as Cv=0.98. **[6]**

OR

Q2) a) Draw a net sketch and explain the working of Venturimeter derive and equation to calculate flow rate by using Venturimeter. **[6]**

b) Derive the expression for continutity equation in 3-D flow? **[6]**

c) A horizontal venturimeter with inlet and throat diameter 30cm and 15cm respectively is used to measure the flow rate of water the reading of differential monometer connected to the inlet and throat is 20 cm of mercury determining the rate of flow? Take Cd=0.98. **[6]**

Q3) a) Derive the relation between the maximum and average velocities along with their position in the cross section of, circular horizontal pipe. **[6]**

b) Prove that expression for laminar flow of fluid. **[6]**

P.T.O.

c) A fluid of viscocity 0.7 Ns/m^2 and specific gravity 1.3 is flowing through a circular of diameter 100 mm. The maximum shear stress at the pipe wall is given as 196.2 N/m^2. Find **[6]**

i) Pressure gradient

ii) Average velocity

iii) Reynolds no. of the flow

OR

Q4) a) Derive Hagen-Poiseuille Equation, highlighting the assumptions made.**[6]**

b) Derive "Darcy Weisbach" equation to find head loss due to friction? **[6]**

c) A crude oil of viscocity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100mm and of length 10m. Calculate the difference of pressure at two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. **[6]**

Q5) a) Explain Buckingham's π–theorem in detail. **[5]**

b) The pressure difference 'Δp' in a pipe of diameter 'D' and length 'L' due to viscous flow depends on the velocity 'V', viscocity 'μ' and density 'ρ'. Using Buckingham's π–theorem obtain an expression for ΔP. **[6]**

c) Explain the concept of boundary layer? **[6]**

OR

Q6) a) Explain the term dimensional homogeneous equation? With suitable example. **[5]**

b) With suitable example, describe in detail the Rayleigh's Method of dimensional analysis? **[6]**

c) The efficiency 'η' of a fan depends on the density 'ρ' the dynamic viscosity 'μ' of the fluid, the angular velocity 'ω', diameter 'D' of the rotor and the discharge 'Q'. Express 'η' in terms of dimensionless parameter. **[6]**

Q7) a) Explain operating characteristic of centrifugal pump? **[5]**

b) Explain value and its type with application? **[6]**

c) What is high velocity fluidization? Mention the significance of pressure drop in turbulent and fast fluidization. **[6]**

OR

Q8) a) What is fluidization? Write its importance in chemical process industries. **[5]**

b) Explain phenomenon of cavitation's in centrifugal pumps. How it can be prevented? **[6]**

c) What is minimum Fluidization velocity? **[6]**



Total No. of Questions : 8]

SEAT No. :

PE4316

[Total No. of Pages : 2

[6582]-89
S.E. (Chemical)
ENGINEERING MATERIALS
(2019 Pattern) (Semester - III) (209343)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Draw Fe-Fe3C equilibrium diagrams. Explain various reactions involved and different phases observed. **[8]**

b) Write a short note natural rubber and Synthetic rubber. **[8]**

OR

Q2) a) Define Polymerization and Explain addition and condensation polymerization. **[8]**

b) Draw Iron-Iron carbide equilibrium diagram with reaction. **[8]**

Q3) a) Define Corrosion and explain in detail it's any three types. **[9]**

b) Write a short note on factors affecting corrosion. **[9]**

OR

Q4) a) Explain the methods for prevention of corrosion. **[9]**

b) Write a short note on Organic Protective Coatings. **[9]**

P.T.O.

Q5) a) What is Nanotechnology? Explain the application of nanomaterials in Chemical Industry. **[9]**

b) Write a short note on Carbon nanotubes and Bucky balls. **[9]**

OR

Q6) a) Explain in details procedure for synthesis of silver Nano-particles. **[9]**

b) Explain in details the characterization of Nanomaterials. **[9]**

Q7) a) Give the advantages and disadvantages of SEM and TEM. **[9]**

b) Explain principle and working of Atomic Force Microscopy (AFM). **[9]**

OR

Q8) a) Explain principle, construction with diagram and working atomic force microscope. **[9]**

b) Write a short note on X-ray diffraction. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-4317

[Total No. of Pages : 5

[6582]-90
S.E. (Chemical)
PROCESS CALCULATIONS
(2019 Pattern) (Semester - III) (209344)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) 50 kmoles butane and 2000 kmol of air feed to reaction chamber. Assume combustion of butane is 100%. Calculate percentage excess air used and composition of product gases leaving the chamber. **[8]**

b) A fertilizer plant in Sindri (Bihar) manufactures ammonia using water gas and producer gas as raw materials. The composition of the gas are given in table. **[10]**

SN	Component	Analysis, Percentage by volume	
		Water Gas	Producer Gas
1	N_2	2	63
2	H_2	51	5
3	CO	43	25
4	CO_2	4	5
5	Ar	Nil	2
Total		100	100

The gases given in table are mixed in proper proportions to provide a stoichiometric mixture of nitrogen and hydrogen after converting carbon monoxide to carbondioxide using steam.

P.T.O.

Calculate :

i) The kg mol of water gas and producer gas required to obtain 100 kg mol of dry mixed gas.

ii) The analysis of dry mixed gas

iii) The theoretical amount in kg of steam required to convert CO to CO_2 per 100 kg mol of dry mixed gas.

OR

Q2) a) Chlorobenzene is nitrated using a mixture of nitric acid and sulphuric acid. During the pilot plant studies, a charge consisted of 100 kg of chlorobenzene 106.5 kg of 65.5% (by mass) nitric acid and 108 kg of 93.6% (by mass) sulphuric acid. After two hours of operation, the final mixture was analyzed. It was found that the final product contain 2 % unreacted chlorobenzene. Also, the product distribution was found to be 66 % p-nitrochlorobenzene (p-NCB) and 34 % o-nitrochlorobenzene (o-NCB). **[10]**

Calculate :

i) The analysis of charge,

ii) The percentage conversion of chlorobenzene

iii) The composition of the product mixture.

b) In the production of sulphur trioxide, 100 kmol of SO_2 and 100 kmol O_2 are fed to reactor. If the percentage conversion of SO_2 is 80, calculate the composition product stream on mole basis. **[8]**

Q3) a) Methane gas is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol methane using specific heat data given below. **[6]**

Data : $C_p^0 = a + bT + cT^2 + dT^3$, kJ/kmol.K

Gas	**a**	**b×10³**	**c×10⁶**	**d×10⁹**
Methane	19.2494	52.1135	11.973	–11.3173

b) In the production of sulphuric acid from anhydrite, the gypsum is roasted with clay to obtain sulphur dioxide and cement clinker. The reaction proceeds as follows. **[10]**

$3CaSO_{4(s)} + SiO_{2(s)} \rightarrow 3CaO.SiO_{2(s)} + 3SO_{2(g)} + 1.5\ O_{2(g)}$

Calculate the heat of reaction at 25°C.

Data given

Component	**ΔH_f^0 kcal/mol at 25°C.**
$CaSO_{4(s)}$	–173.49
$SiO_{2(s)}$	–393.51
$CaO.SiO_{2(s)}$	–285.83
$SO_{2(g)}$	–70.994
$O_{2(g)}$	0.0

OR

Q4) a) A stream flowing at a rate of 15 kmol/hr. containing 25 % N_2 and 75 % H_2 by mole is heated from 298 K to 473 K. Calculate the heat that must be transfer using Cp data given as follows. **[8]**

Gas	**a**	**b $\times 10^3$**	**c $\times 10^6$**	**d $\times 10^9$**
N_2	29.5909	–5.41	13.1829	–4.968
H_2	28.6105	1.0194	–0.1476	0.769

b) Tin is melted in an open pan using a jacket. The jacket is fed with a vapours of an eutectic mixture of diphenyl-diphenyl oxide at 1.73 Kgf/cm^2. Tin is fed to the pan at 30°C. Calculate the quantity of eutectic mixture of the diphenyl- diphenyl oxide condensed per 100 kg of tin melted at its melting temperature. Assume no subcooling of vapours. **[8]**

Data for Tin: Molecular weight = 118.7, Melting Point = 231.8 °C, Latent heat of fusion = 1720 kcal/kg mol,

Specific heat of solid Tin = 5.05 + 0.0048 T kcal/kg mol.deg K (Tin K)
Latent Heat of diphenyl- diphenyl oxide = 66.5kcal/kg

Q5) a) Define wet bulb temperature, dry bulb temperature, humid volume and humid heat. **[8]**

b) 1000 kg of a 30% (by weight) solution of acetone in water contacted with pure MIBK to extract acetone in a mixer-settler. The operating temperature is 298 K. From the settler the two phases separated are withdrawn separately. Find quantity of MIBK must be feed to reduce the acetone concentration, in the water rich phase to 5 % by weight. Also calculate the percentage of acetone in the original feed solution which remain unextracted. **[10]**

Composition of phases,

Raffinate Phase- 5% Acetone, 92.5 % Water and 2.5% MIBK.

Extract Phase- 10% Acetone, 3 % Water and 87% MIBK.

OR

Q6) It is desired to remove 100 kg of water per hour in a dryer. Air is supplied to the dryer at a temperature of 339 K, at a pressure of 101.3 kPa and a dew point of 277.5 K. If the air leaves the dryer at a temperature of 308 K, a pressure of 100.66 kPa and dew point 297 K, calculate the volume of air at the initial condition that must be supplied per hour. **[18]**

Data : Vapour pressure of water at 277.5 K = 0.8365 kPa

Vapour pressure of water at 297 K = 2.9821 kPa

Q7) a) Crude oil is found to contain 87.1% carbon, 12.5% hydrogen and 0.4% Sulphur (by mass). Its GCV at 298.15 K is measured to be 45071 kJ/kg oil. Calculate its NCV at 298.15 K. **[9]**

Data : Latent heat of water vapour at 298.15 K = 2442.5 kJ/kg.

b) The Orsat analysis of the flue gases from a boiler house chimney gives CO_2 = 11.4%, O_2 = 4.2%, and N_2 = 84.4% (mole %). Assuming that complete combustion has taken place, **[9]**

i) Calculate the percentage excess air and

ii) Find the C: H ratio in the fuel.

OR

Q8) Synthetic natural gas has the following composition : **[18]**

CH_4 = 95%, H_2 = 1.0%, CO_2 = 2% and CO = 2% (by mole).

This gas is used to generate steam at 101.325 kPa.

Find the quantity of steam generated per kg of the gas fired if the boiler has efficiency of 75%.

Data : At 101.325 kPa, H of steam = 2676 kJ/kg.

GCV of CH_4 = 890.65 kJ/mol.

NCV of CH_4 = 802.62 kJ/mol.

ΔH_f^0 CO_2 = – 393.51 kJ/mol.

$\Delta H_f^0 CO$ = – 110.53 kJ/mol.

$\Delta H_f^0 H_2O(1)$ = – 285.83 kJ/mol.

Latent heat of water vapour at 298.15 K = 2442.5 kJ/kg.

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Total No. of Questions : 8]

SEAT No. :

PE4318

[Total No. of Pages : 2

[6582]-91

S.E. (Production Engg.-Sandwich) (Production & Industrial Engineering)
ELECTRICAL AND ELECTRONICS ENGINEERING
(2019 Pattern) (Semester - IV) (203050)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) State applications of IGBT. **[5]**

b) Explain with neat diagram V-I characteristics of DIAC. **[6]**

c) Explain construction of SCR with a neat diagram. **[6]**

OR

Q2) a) What is GTO? State the advantages of GTO. **[5]**

b) Draw and explain output characteristic of IGBT. **[6]**

c) Explain with neat diagram V-I characteristics of SCR. **[6]**

Q3) a) Explain the working of IC 555 as a astable multivibrator. **[5]**

b) With suitable diagram explain OPAMP as a inverting amplifier. **[6]**

c) Explain ADC converter with suitable block diagram. **[6]**

OR

Q4) a) State the applications of IC 555. **[5]**

b) With suitable diagram explain OPAMP as a differential amplifier. **[6]**

c) Explain the adjustable voltage regulation using LM317. **[6]**

P.T.O.

Q5) a) With suitable block diagram explain arrangement of PLC. **[8]**

b) Explain input and output devices with suitable example. **[6]**

c) Which are the various selection criteria for PLC. **[4]**

OR

Q6) a) State the rules for construction of Ladder diagram. **[8]**

b) State advantages and disadvantages of PLC. **[6]**

c) State various features of PLC. **[4]**

Q7) a) Draw interfacing diagram of LED with Arduino board and also write the program to blink the LED. **[8]**

b) Explain the role of embedded system in automation. **[6]**

c) State the features of AT mega328P microcontroller. **[4]**

OR

Q8) a) Compare microprocessor and microcontroller. **[8]**

b) Explain the concept of GIPO in AT mega 328P. **[6]**

c) State any four significant features of Arduino IDE. **[4]**

Total No. of Questions : 8] **SEAT No. :**

PE4319 **[Total No. of Pages : 4**

[6582]-92

S.E. (Production Engineering & Industrial/Production (Sandwich))

THEORY OF MACHINES

(2019 Pattern) (Semester - IV) (211091)

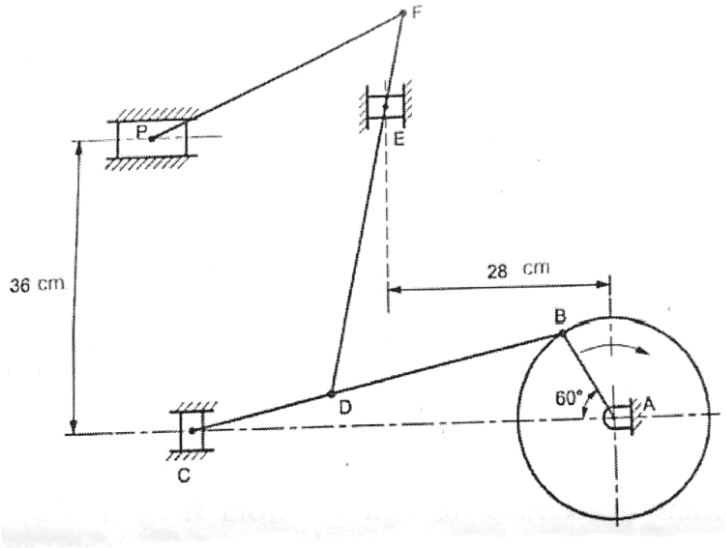
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.***

Q1) a) Explain velocity image principle. Explain method of determining the rubbing velocity at a pin joint. **[6]**

b) In a mechanism shown in figure, the crank AB rotates at 200 rpm. The dimensions of various links are AB=12 cm, BC= 48 cm, CD=18 cm, DE= 36 cm, EF=12 cm and FP = 36 cm. Find velocity of C, P and E. Use relative velocity method. **[12]**



OR

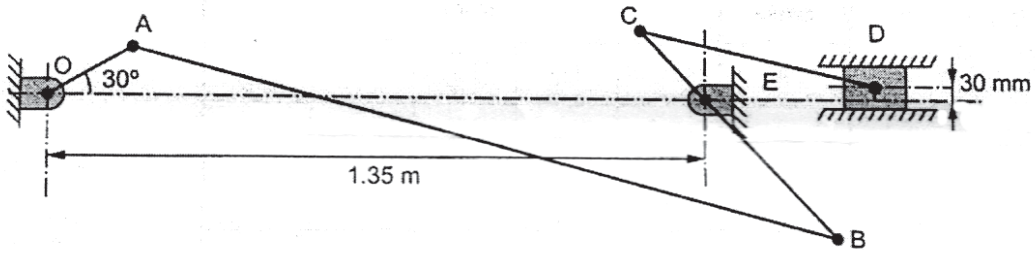
Q2) a) Explain different types of instantaneous centre of rotation. **[6]**

b) A mechanism as shown in fig. has following dimensions:

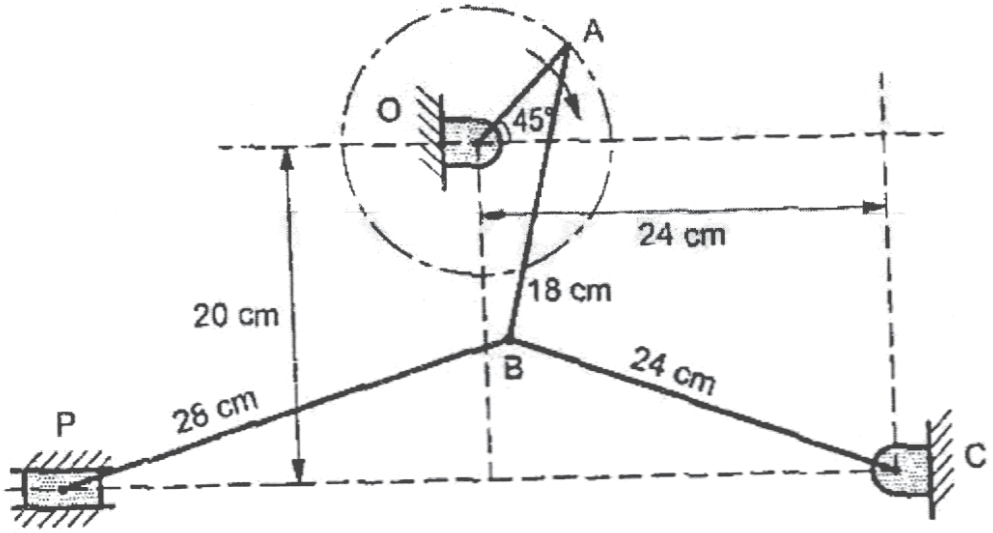
OA= 200 mm, AB = 1.5 m, BC = 600 mm, CD = 500 mm and

P.T.O.

BE = 400 mm. If crank OA rotate uniformly at 400 rpm anticlockwise, find i) velocity of D ii) angular velocity of link BC and CD. Use Instantaneous centre of rotation method. **[12]**



Q3) Toggle mechanism as shown in below given figure, crank OA rotates at a uniform speed of 105 rpm in clockwise direction. Determine velocity and acceleration of slider 'P'. The lengths of various links are: OA = 8 cm, AB = 18 cm, BC = 24 cm, BP = 28 cm. **[17]**



OR

Q4) a) In a slider crank mechanism, the lengths of crank and connecting rod are 90 mm and 360 mm respectively. The crank rotates uniformly at 600 rpm clockwise. When crank has turned through 45° from IDC, find by analytical method **[8]**

i) Velocity and acceleration of piston

ii) Angular velocity and angular acceleration of connecting rod.

b) In a slider crank mechanism, the lengths of crank and connecting rod are 200 mm and 800 mm respectively. The crank is rotating at uniform speed of 480 rpm. Using klein's construction, find

i) Acceleration of slider

ii) Acceleration of middle point of connecting rod

iii) Angular acceleration of connecting rod when the crank has turned through 45° from IDC. **[9]**

Q5) a) Describe the concept of centrifugal tension in a belt drive. How does it vary with the speed of the belt? **[8]**

b) An impregnated belt 10 mm × 250 mm drives a pulley 100 cm in diameter at 340 rpm. The angle of contact on the smaller pulley is 120°. The maximum tension in belt is 2500 N. Belt density is 980 kg/m^3. The coefficient of friction between belt and pulley is 0.35. Determine power transmitting capacity of belt. **[10]**

OR

Q6) a) Explain the reasons why rubber is a commonly used material in belt manufacturing. What are the advantages and limitations of using rubber in belts? **[8]**

b) Explain following with suitable diagram **[10]**

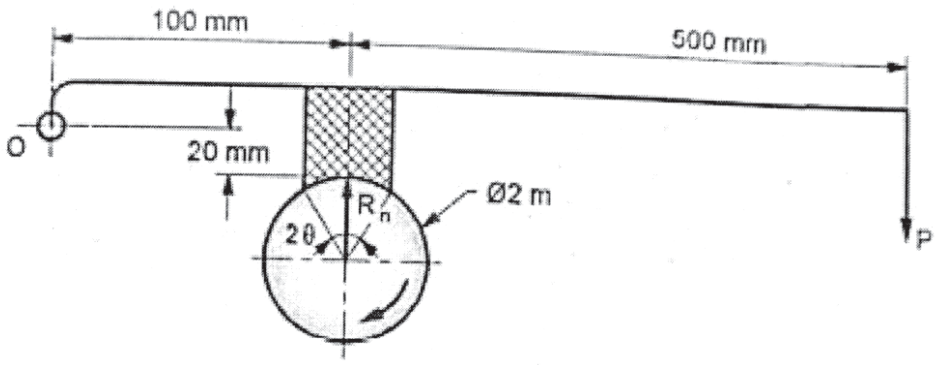
i) Cone pulley drive

ii) Fast and loose pulley drive

Q7) a) Explain differential band brake with sketch. Also derive equation for force applied at lever end. **[8]**

b) A single block brake as shown in figure has a brake drum diameter of 2 m. It required braking torque 500 Nm at 300 rpm clockwise. The coefficient of friction is 0.25. Determine the required force P to be applied at the lever end when **[9]**

i) Angle of contact is 30°
ii) Angle of contact is 90°



OR

Q8) a) What are the general requirements of good brake lining materials? State the materials used for brake lining. **[8]**

b) Explain construction and working of rope brake dynamometer with the help of neat sketch. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE4320

[Total No. of Pages : 3

[6582]-93

S.E. Production (Production Engg. & Industrial Engg.) (Production Sandwich)

DESIGN OF MACHINE ELEMENTS

(2019 Pattern) (Semester - IV) (211092) (Theory)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Derive the torque equation for the square threaded screw to raise the load. **[6]**

b) A power screw having double start square threads of 25mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10kN. The outer and inner diameters of the screw collar are 50mm and 20 mm respectively. The coefficient of the thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8N/mm^2, find: **[8]**

i) The torque required to rotate the screw;

ii) The stress in the screw; and

iii) The number of threads of nut in engagement with screw.

c) Explain concept of overhauling and self-locking screws. **[4]**

OR

Q2) a) Draw a neat labeled sketch of recirculating ball screw mechanism and explain its operation with advantages, disadvantages and applications.**[6]**

b) A vertical two start square threaded screw of a 100 mm mean diameter and 20 mm pitch supports a vertical load of 18kN. The axial thrust on the screw is taken by a collar bearing of 250mm outside diameter and 100 mm inside diameter. Find the force required at the end of a lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20. **[6]**

c) Define power screw and explain with figures the types of power screw threads. **[6]**

P.T.O.

Q3) a) Explain the term used in compression springs; Spring Rate, and Spring Index. **[4]**

b) It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30mm. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81370N/mm^2 respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate:

i) Wire diameter **[8]**

ii) Mean coil diameter

iii) Number of active coils

iv) Total number of coils

v) Free length of the spring, and

vi) Pitch of the coil.

Draw a neat sketch of the spring showing various dimensions.

c) Define helical spring and explain types of springs with applications. **[5]**

OR

Q4) a) A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84kN/mm^2, find the axial load which the spring can carry (W) and the deflection per active turn (δ/n). **[6]**

b) Design a helical compression spring for a maximum load of 1000 N for the deflection of 25 mm using the values of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm^2. Take Wahl's factor, **[6]**

$$K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$$

c) Draw a neat sketch a leaf spring assembly. Mention the different utility components/parts in the assembly. **[5]**

Q5) a) Explain the terms used in grears: **[4]**

i) Pressure Angle, and

ii) Module

b) The following particulars of a single reduction spur gear are given: Gear ratio = 10 : 1; Distance between centres = 660 mm approximatly; Pinion transmits 500 kW at 1800 rpm Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5º; Permissible normal pressure between teeth = 175 N per mm of width. Find; **[8]**

i) The nearest standard module if no interference is to occur

ii) The number of teeth on each wheel

iii) The necessary width of the pinion

iv) The load on the bearings of the wheels due to power transmitted.

c) Explain different causes of gear tooth failure. **[6]**

OR

Q6) a) Derive beam strength equation of gear teeth. **[7]**

b) Write down the design procedure for spur gears. **[8]**

c) Draw a neat sketch showing Gear Nomenclature and Terminology. **[3]**

Q7) a) Explain antifriction bearing and advantages of rolling contact bearings over sliding contact bearings. **[5]**

b) A taper roller bearing has a dynamic load capacity of 30kN. The desired life for 90% of the bearings is 9000 h and the speed is 250 rpm. Calculate the equivalent radial load that the bearing can carry. **[6]**

c) Explain purpose of lubrication and guidelines for selecting lubrication for rolling contact bearings. **[6]**

OR

Q8) a) Write down selection procedure of bearing from manufacturer's catalogue. **[8]**

b) Classify rolling contact bearings. **[3]**

c) A single-row deep groove ball bearing is subjected to radial force of 8 kN and a thrust force of 3 kN. The shaft rotates at 1200 rpm. The expected life L_{10h} of the bearing is 20000 h. The minimum acceptable diameter of the shaft is 75mm. Calculate dynamic load capacity. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PE4321

[Total No. of Pages : 2

[6582]-94
S.E. (Production Engineering And Industrial)
ADVANCED MATERIALS
(2019 Pattern) (Semester - IV) (211093)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat figures whenever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of scientific calculators is allowed.***
6) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) What are the characteristics of polymer materials? **[8]**

b) Which sector uses non-metallic materials? **[8]**

OR

Q2) a) Which are the manufacturing techniques used for processing of rubbers? **[8]**

b) Which are important properties of ceramic materials? **[8]**

Q3) a) What is mean by composites? Which are the attractive features of composites make them suitable for special areas of applications? **[9]**

b) How functionally graded materials are prepared? **[9]**

OR

Q4) a) Which are the two phases present in a composite material? Describe the functions of each phase. **[9]**

b) Why additive manufacturing is attractive for developing functionally graded materials? **[9]**

Q5) a) Explain with sketch any one technique of metal matrix composite processing. **[9]**

b) Explain with sketch squeeze casting process. **[9]**

OR

P.T.O.

Q6) a) Explain with sketch any one technique of polymer matrix composite processing. **[9]**

b) Explain with sketch Rheo casting process. **[9]**

Q7) a) What are the four categories of advanced materials? Give one example of each. **[9]**

b) What are the importances of material standards? Who sets ASTM standards? **[9]**

OR

Q8) a) Where are ASTM standards used? Who uses ASTM standard?. **[9]**

b) What is the difference between ISO and ASTM? **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PE4322

[Total No. of Pages : 2

[6582]-95

S.E. Production (Production Engg. (Sandwich)) / (Production Engg. & Industrial Engg.)

INDUSTRIAL ENGINEERING AND MANAGEMENT

(2019 Pattern) (Semester - IV) (211094)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary***

Q1) a) Describe different Qualities of an entrepreneur. **[8]**

b) Differentiate Between An Entrepreneur and A Manager on following point- Goal Management, Status, Risk, Rewards. **[9]**

OR

Q2) a) Explain Functions of Entrepreneurs. **[8]**

b) Define Break Even Point (BEP). State its assumption and write limitations. **[9]**

Q3) a) Differentiate between job evaluation and merit rating. **[8]**

b) What are various types of methods study symbols? How they are used in Industrial Engineering. **[9]**

OR

Q4) a) What is productivity? Describe the role of work study in improving productivity. **[8]**

b) What do you understand from concept of work content? **[9]**

Q5) a) Explain Primary and Secondary Question in critical examination. **[9]**

b) State the different steps of method study and its objectives. **[9]**

OR

Q6) a) Explain the principle of work place design. Also state the parameters to be considered for work place design. **[9]**

b) Name the various charts used in work study explain any one. **[9]**

P.T.O.

Q7) a) What is difference between work measurement and method study? **[9]**

b) Time study of a-b-c-d-e elements were carried out and reading taken on three cycles continuously. Calculate time taken by each element in each cycle and also calculate standard time for 10% personal and 18% contingency allowance. **[9]**

Element No.	Observed Time in (Min) Cummulative			Performance Rating %
	1	2	3	
a	0.2	3.2	6.3	95
b	0.7	3.9	6.8	90
c	1.3	4.4	7.3	110
d	2.1	5.1	8.2	100
e	2.6	5.6	8.7	105

OR

Q8) a) The elements data for typical job is given below. **[9]**

Element No.	Observed Time in (Min)	Rating%	Frequency	Relaxation Allowance (%)
1	1.5	80	1	10
2	1.8	90	1	12
3	4.5	100	1	10
4	3.6	100	1	10
5	1.6	90	1	12
6	1.2	80	1	12
7	20	80	1/20	12
8	10	90	1/10	12

Calculate Basic time for each element and standard time for the job, if contingeny allowance is 3%

b) What is time study? Explain different steps in it. **[9]**



Total No. of Questions : 9]

SEAT No. :

PE-4323

[Total No. of Pages : 5

[6582]-96

S.E. (Production Engg. & Industrial Engineering) (Production S.W/Robotics & Automation (RA))

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - III) (207007)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.No. 1 is compulsory.***
2) ***Attempt Q.No.2 or Q.No.3, Q.No.4 or Q.No.5, Q.No.6 or Q.No.7, Q.No.8 or Q.No.9.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Choose the correct option of the following.

a) $\nabla\phi$ for $\phi = x^2 + y^2 + z^2$ at (1, 1, 1) is _____ **[2]**

i) $\bar{i} + \bar{j} + \bar{k}$ ii) $2\bar{i} + 2\bar{j} + 2\bar{k}$

iii) $4\bar{i} + 4\bar{j} + 4\bar{k}$ iv) None of these

b) The most general solution of heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ if

(A) u is finite for all t, (B) $u\ (0, t) = 0$ and $u(l, t) = 0$ for all t, (C) $u(x, 0) = f(x)$ for $0 \le x \le l$ is $u(x, t)$ = _____ **[2]**

i) $(C_4 \cos mx + C_5 \sin mx)e^{-m^2 t}$

ii) $C_1 e^{mx} + C_2 e^{-mx}$

iii) $C_1 \cos mx + C_2 \sin mx$

iv) $(C_1 \cos mx + C_2 \sin mx)\ (C_3 \operatorname{cosc} mtx + C_4 \operatorname{sinc} mt)$

c) If $n = 100$ and $P = 0.01$ then by Poisson distribution, $P(r = 0)$ = _____ **[2]**

i) $\frac{1}{e}$ ii) $\frac{2}{e}$

iii) $\frac{3}{e}$ iv) $\frac{4}{e}$

P.T.O.

d) If the first four central moments of a distribution are 0, 2.5, 0.7 and 18.75 then the coefficient of Kurtosis β_2 is _____. **[2]**

i) 0 ii) 1

iii) 2 iv) 3

e) The regression line of x on y is given by _____. **[1]**

i) $(x-\bar{x}) = b_{xy}(y-\bar{y})$ ii) $(y-\bar{y}) = b_{yx}(x-\bar{x})$

iii) $(x-\bar{x}) = b_{yx}(y-\bar{y})$ iv) $(y-\bar{y}) = b_{xy}(x-\bar{x})$

f) If $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ then $\nabla \cdot \bar{r}$ = _____ **[1]**

i) 1 ii) 2

iii) 3 iv) 0

Q2) a) Fit a straight line of the form $y = ax + b$ to the following data, **[5]**

x	100	120	140	160	180	200
y	0.9	1.1	1.2	1.4	1.6	1.7

b) The first four moments of a distribution about 4 are –1.4, 17, –30 and 108. Obtain the first four central moments and coefficient of Skewness and Kurtosis. **[5]**

c) Calculate the coefficient of correlation from the following information, $n = 10$, $\Sigma x = 40$, $\Sigma x^2 = 190$, $\Sigma y^2 = 200$, $\Sigma xy = 150$, $\Sigma y = 40$ **[5]**

OR

Q3) a) Fit a straight line of the form $y = ax + b$ to the following data, **[5]**

x	1	3	4	5	6	8
y	–3	1	3	5	7	11

b) The first four moments of a distribution about the values 5 are 2, 20, 40 & 50. Obtain the first four central moments, mean and coefficient of Skewness and Kurtosis. **[5]**

c) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y = \mu$ and the mean of x and y are 2 and –3 respectively. Find values of λ, μ and correlation coefficient between x and y. **[5]**

Q4) a) A throw is made with two dice. Find the probability that **[5]**

(i) the sum is 7 or less (ii) the sum is a perfect square

b) The mean and variance of a binomial distribution are 6 and 2 respectively. Find $P(r \geq 1)$. **[5]**

c) A life-time of a certain component has a normal distribution with mean of 400 hours and standard deviation of 50 hours. Assuming a normal sample of 1000 components, find the number of components whose life - time lies between 340 to 465 hours.

Whose life-time lies between 340 to 465 hours. **[5]**

[Given : A(Z = 1.2) = 0.3849, A(Z = 1.3) = 0.4032]

OR

Q5) a) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives? **[5]**

b) Number of road accidents on a highway during a month follows a Poisson distribution with mean 5. Find the probability that in a certain month number of accidents on the highway will be **[5]**

i) less than 3

ii) more than 3

c) Demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained. **[5]**

Days	Mon	Tue	Wed	Thur	Fri	Sat
No. of Parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

$\left[\text{Given : } \chi^2_{5,0.05} = 11.07\right]$

Q6) a) Find the direction derivative of the function $\phi = e^{2x-y-z}$ at (1, 1, 1) in the direction of the tangent to the curve $x = e^{-t}$, $y = 2\sin t + 1$ $z = t - \cos t$ at $t = 0$. **[5]**

b) Show that the vector field $\bar{F} = (x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$ is irrotational find the scalar potential ϕ such that $\bar{F} = \nabla\phi$ **[5]**

c) Evaluate $\int \bar{F} \cdot d\bar{r}$ for $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the curve define by $x^2 = 4y$, $3x^3 = 8z$ from $x = 0$ to $x = 2$. **[5]**

OR

Q7) a) Find the direction derivative of $\phi = xy^2 + 2xy + zx$ at the point (2, –1, 1) in the direction $2\bar{i} + \bar{j} + 3\bar{k}$ **[5]**

b) Show that (any one) **[5]**

i) $\nabla^2 \left[r^n \log r\right] = \left[n(n+1)\log r + 2n + 1\right] r^{n-2}$

ii) $\nabla \cdot \left[r \nabla \left(\frac{1}{r^n}\right)\right] = \frac{n(n-2)}{r^{n+1}}$

c) Apply Greens Theorem to evaluate $\int_C \sin y dx + x(1 + \cos y) dy$ where C is the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1, z = 0$. **[5]**

Q8) a) Solve $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ subject to the following conditions : **[8]**

i) $u(0, t) = 0°C$

ii) $u(1, t) = 0°C$

iii) $u(x, 0) = 50°C$ for $0 \leq x \leq 1$, where 1 is the length of the bar

b) A string is stretched and fastened to two points 5 units apart. Motion is started by displacing the string in the form $u = a \sin \frac{\pi x}{5}$ from which it is released at time t = 0. Find the displacement $u(x, t)$ from one end using wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ **[7]**

OR

Q9) a) Solve the equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions : **[8]**

i) $u(0, y) = 0$

ii) $u(\pi, y) = 0$

iii) $u(x, \infty) = 0$ for $0 < x < \pi$

iv) $u(x, 0) = u_0$ for $0 < x < \pi$

b) Using Fourier sine transform, solve the equation

$$\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2} \quad 0 < x < \infty, t > 0$$

Subject to the following conditions

i) $u(0, t) = 0 \quad t > 0$

ii) $u(x,0) = e^{-x} \quad x > 0$

iii) u and $\frac{\partial u}{\partial x} \to 0$ as $x \to \infty$ **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4324

[Total No. of Pages : 2

[6582]-97

S.E. (Production & Industrial/Production Sandwich)

HEAT AND FLUID ENGINEERING

(2019 Pattern) (Semester - III) (211081)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Write Darcay Weisbachs formula and explain its terms for losses of head. **[9]**

b) What are Total Energy Line and Hydraulic Gradient Line? **[9]**

OR

Q2) a) Discuss significance of Buckingham's pie theorem in Fluid Mechanics. **[9]**

b) Explain applications of turbines and pumps. **[9]**

Q3) a) Draw neat sketch and explain working of Babcock and Wilcox boiler. **[9]**

b) A boiler plant supplies 5400 kg of steam/hr. at 750 KN/m^2 and 0.98 dry from feed water at 41.5° C, when using 670 kg of coal/hr. having a calorific value of 31000KJ/kg. Determine. **[8]**

i) The efficiency of the boiler.

ii) The equivalent of evaporator from &at 100° c.

OR

Q4) a) What is proximate and ultimate analysis of fuel. **[9]**

b) How are the boiler mounting useful for safety of boiler. Explain it. **[8]**

P.T.O.

Q5) a) What is mean by wet bulb temperature, dry bulb temperature and pure air. **[9]**

b) What is vapour compression and vapor absorption refrigeration system? Discuss with neat sketches. **[9]**

OR

Q6) a) Explain the severity of environmental effect of refrigeration systems. **[9]**

b) How air conditioning system is useful for metrology laboratories? **[9]**

Q7) a) Explain classification of internal combustion engine in detail. **[9]**

b) An air compressor is required to compress air from a pressure of 1 bar to 10 bar, Calculate the amount of work required per kg of air, when index n =1.2 for compression. Assume initial temperature as 15ºc &R for air is 0.287kj/kg.K **[8]**

OR

Q8) a) Discuss working of single acting reciprocating air compressor. **[9]**

b) The following results refer to a test on a petrol engine. Indicator power - 30Kw, Brake power -26Kw, Engine speed - 1000rpm, Fuel per brake power hr. - 0.35kg, C.V. of fuel used - 43,900 KJ/kg, **[8]**

Calculate,

i) Indicated thermal efficiency

ii) Brake thermal efficiency &

iii) Mechanical efficiency.

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Total No. of Questions : 8]

SEAT No. : ____

PE-4325

[Total No. of Pages : 4

[6582]-98

S.E. (Production/Production & Industrial/Robotics & Automation / Production Sandwich)

STRENGTH OF MATERIAL

(2019 Pattern) (Semester - III) (211082)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***AnswerQ.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Use of scientific calculator is allowed.***
3) ***Figures to the right side indicate full marks.***

Q1) a) Define Bending Stresses in Beam ,Neutral Axis and Section Modouls What are Assumption made in the theory of Simple bending. **[5]**

b) Prove that $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$. Where, *M* is bending moment, I is moment of inertia, σ is stress at any fiber at a distance of *y* from the neutral axis, *E* is Modulus of elasticity, and *R* is radius of curvature. **[6]**

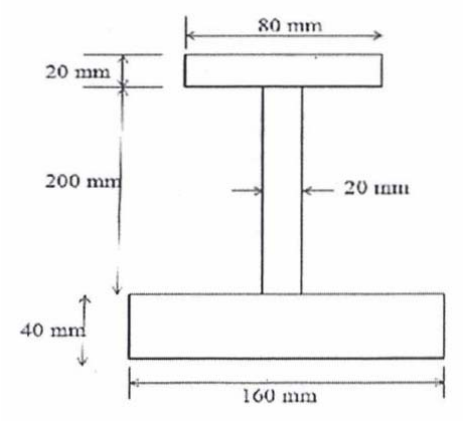
c) Calculate the maximum stress induced in the cast iron pipe of external diameter 40 mm, internal diameter 20 mm and of length 4 m, if it is supported at its ends and carries a point load of 80N at centre. **[7]**

OR

Q2) a) A simply supported wooden beam of span 1.3 m having cross section 150 mm wide by 250 mm deep carries a point load W at the center The permissible stresses are 7 N/mm^2 in bending and 1 N/ mm^2 IN SHEARING Calculate Safe Load W. **[6]**

P.T.O.

b) A cast iron beam is of the I- section as shown in Fig. The beam is simply supported on a Span of 5 meters. If the tensile stress is not to exceed 20 N/mm^2. Find the safe uniformly distributed load which the beam can carry. Also find the maximum compressive stress. **[12]**



Q3) a) Define strain energy, Resilance and proof resilience. Also derive an expression for Strain Energy due to self-weight. **[9]**

b) A solid vertical steel bar of equilateral triangular section of side 20mm is firmly fixed at the top. A rigid collar is attached at the lower end at distance of 600mm from the top. Calculate the strain energy stored in each of the following cases. **[9]**

i) When pull of 10 KN is applied gradually

ii) When a force of 8 KN is suddenly applied

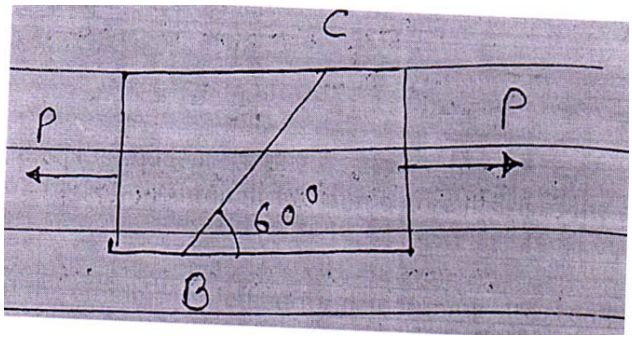
iii) When a weight of 4 KN falls through 120mm before it strikes the collar. Take E = 2 × 10^5 MPa.

OR

Q4) a) Explain in detail the Graphical Method for determining stress on oblique section. **[6]**

b) The principal tensile stresses at a point across two perpendicular planes are 100 MPa and 50 MPa. Find the normal and tangential stresses and the resultant stress and its obliquity on a plane at 20° with the major principal plane. **[8]**

c) A rectangular bar of Crossectional area of 1,1000 mm^2 is subjected to tensile load Path permissible normal and shear stress on obliue plane BC are 7 N/mm^2 and 3.5 N/mm^2 determine the Value of P **[4]**



Q5) a) Derive an expression for Toque Transmitted by hollow circular shaft Torsion. **[5]**

b) A solid steel Shaft has to transmit 75 KW at 200 rpm. Taking allowable shear stress as 70 N/mm^2, find the suitable diameter for the shaft if the maximum torque transmitted at each resolution exceed the mean by 30%. **[8]**

c) Find the maximum shear stress induced in solid circular shaft of diameter 15cm when the shaft transmits 150KW power at 180rpm **[4]**

OR

Q6) a) A solid Circular shaft Transmits 75 Kw power at 200 r.p.m. Calculate the shaft Diameter, if the twist in shaft not exceed 1° in 2 meters length of shaft and shear stress is limited to 50N/mm^2 take C = 1×10^5 N/mm^2. **[5]**

b) A shaft ABC of 500 mm length an 40 mm external diameter is bored for a part of its length AB, to a 20 mm diameter and for the remaining length BC to a 30 mm diameter bore. If the shear stresses s not to exceed 80 N/mm^2 find the maximum power of the shaft can transmit at speed of 200 r.p.m. If the angle of twist in length of 20mm diameter bore is equal to that in the 30 mm diameter bore find the length of the shaft that has been bored to 20 mm and 30 mm diameter. **[8]**

c) Define polar modulus and state the expression for solid Shaft and hollow shaft. **[4]**

Q7) a) What are the assumptions made in Euler's column theory? Explain the end conditions for long Column. **[5]**

b) Calculate the safe compressive load on a hollow cast-iron column (one end is rigidity fixed and other is Hinged) of 15 cm external diameter, 10 cm internal diameter and 10m. length. Use Euler's formula with a factors of safety 5 and E = 95k N/mm^2. **[6]**

c) Expression for crippling load when one end of the column is fixed and other end is free. **[6]**

OR

Q8) a) Determine the crippling load for T* section of dimension 10cm × 10cm × 20 cm and of length 5 m when it is used as strut both of its end are hingned.Take Young's Modulus E = 2.0 105 N/mm^2. **[6]**

b) Explain the Rankine Formula in details along with expression. **[5]**

c) A hollow C.I Column whose outside diameter is 200 mm has thickness of 20 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankins formula using factor of safety 4 .calculate the slenderness ratio and the ratio. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PE4326

[Total No. of Pages : 2

[6582]-99

S.E. (Production/Production Sandwich) (Production Engg. and Industrial Engg.)

MANUFACTURING PROCESSES - I

(2019 Pattern) (Semester - III) (211083)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain following lathe operations by neat sketches : **[8]**

i) Facing

ii) Plane turning

iii) Chamfering

iv) Drilling

b) With the help of neat sketch, explain horizontal column and knee type milling machine. **[10]**

OR

Q2) a) With the help of neat sketch, explain thread cutting operation on lathe machine by using half nut and lead screw. **[9]**

b) With the help of neat sketch, explain vertical column and knee type milling machine. **[9]**

Q3) a) With the help of sketch, explain the construction and working of radial drilling machine. **[9]**

b) With the help of sketch, explain the construction and working of surface grinding machine. **[8]**

OR

Q4) a) With the help of sketch, explain different operations performed on drilling machine. **[8]**

b) With the help of sketch, explain the construction and working of cylindrical grinding machine. **[9]**

P.T.O.

Q5) a) Explain Buffing, Honing and Burnishing processes in short. **[9]**

b) Explain Polishing, Tumbling and Electroplating processes in short. **[9]**

OR

Q6) a) Compare between the Electroplating, Galvanizing and Metal spraying processes. **[9]**

b) Explain Lapping process with neat sketch in detail. **[9]**

Q7) a) Describe various advantages and limitations of additive manufacturing. **[8]**

b) Describe VAT Polymerization process in short. State its merits, demerits and applications. **[9]**

OR

Q8) a) Describe various applications of additive manufacturing. **[8]**

b) Explain material jetting additive manufacturing process in detail. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PE-4327

[Total No. of Pages : 2

[6582]-100

S.E. (Production Sandwich / Production & Industrial / Production)

MATERIALS SCIENCE AND METALLURGY

(2019 Pattern) (Semester - III) (211084)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is Powder Metallurgy? Explain its Advantages, Disadvantages & Applications. **[10]**

b) Explain Mechanical Processes for Powder Manufacturing? **[8]**

OR

Q2) a) Write note on **[10]**

i) Electrical Contact Materials

ii) Self-lubricating Bearings

b) Describe any Two Components Which can be Manufactured by only Powder Metallurgy Technique? **[8]**

Q3) a) Explain Following Terms: **[10]**

i) Annealing ii) Normalizing

iii) Carburizing iv) Hardening

b) What are the step in steel sample preparation for metallurgical analysis?**[8]**

OR

Q4) a) Draw and Explain TTT diagram and what information is obtained from this diagram? **[10]**

b) Discuss Flame hardening and Induction hardening processes in Details?**[8]**

P.T.O.

Q5) a) What are the effects of alloying elements on steel? **[8]**

b) Explain Effects of various parameters on structures and properties of cast irons? **[9]**

OR

Q6) a) Define Cast Iron? Explain clasification of Cast Iron with Applications? **[9]**

b) How would you prevent weld decay in stainless steel? **[8]**

Q7) a) Discuss classification of Non-Ferrous Alloys? **[10]**

b) Describe the characteristics and uses of bearing materials? **[7]**

OR

Q8) a) Differentiate between Brasses & Bronzes with their Compositions & applications? **[10]**

b) Write short note on Aluminium & its alloys? **[7]**



Total No. of Questions : 8]

SEAT No. :

PE4328

[Total No. of Pages : 2

[6582]-101
S.E. (Production/Sandwich)
MANUFACTURING PROCESS - II
(2019 Pattern) (Semester - IV) (211121)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain different types of coordinate systems used in NC/CNC operations. **[10]**

b) Explain the concept of FMS (Flexible Manufacturing System' and its significance in modern manufacturing? **[7]**

OR

Q2) a) For Machining Centre, Explain the following: **[12]**

i) Principles, Working & Advantages

ii) Applications & Parts Programming

b) Explain the following codes: **[5]**

i) G 03

ii) G 63

iii) M 06

iv) M 09

v) M 30

Q3) a) Explain with neat sketch Compression Moulding Process with its Advantages & Applications? **[10]**

b) Describe the process of extruding plastic film, including the equipment involved? **[8]**

OR

Q4) a) Explain in details of Blow Moulding Process with its Advantages & Applications. **[10]**

b) How does vacuum forming work in the thermoforming process, and what are its advantages? **[8]**

P.T.O.

Q5) a) Explain with neat sketch EDM. State the Advantages, Limitations and Applications? **[9]**

b) Explain with neat sketch IBM. State the Advantages, Limitations and Applications. **[8]**

OR

Q6) a) What is the function of electrolyte in ECM? List the common electrolyte used in ECM. **[5]**

b) Explain the Principle with neat sketch of following (Any Two) **[12]**

i) PAM

ii) AJM

iii) USM

Q7) a) Explain the following elements of jig & fixture (Any Two) **[12]**

i) Indexing device

ii) Clamping device

iii) Tool guide

b) Describe factors considered for designing jig & fixture. **[6]**

OR

Q8) a) Explain general guidelines & procedure for design of fixtures. **[13]**

b) Explain fool-proofing for jig & fixture. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PE4329

[Total No. of Pages : 2

[6582]-102

S.E. (Printing Engineering and Graphic Communication)
ELECTRICAL MACHINES AND UTILIZATION
(2019 Pattern) (Semester-IV) (203155)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6 Q.No.7 or Q.No.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain stator resistance starter details. **[9]**

b) Explain how rotating magnetic field is produced in 3 phase induction Motor. **[9]**

OR

Q2) a) Explain star-delta starter in details. **[9]**

b) Explain any two types of starters of 3 phase induction Motor. **[9]**

Q3) a) Explain types of lighting scheme. **[9]**

b) Explain laws of illumination. **[8]**

OR

Q4) a) Write short note on flood lighting design. **[9]**

b) Explain requirement of good lighting scheme. **[8]**

Q5) a) Explain vertical core type induction furnace. **[9]**

b) Explain high frequency eddy-current heating. **[9]**

OR

P.T.O.

Q6) a) Explain any two temperature control methods in furnaces. **[9]**

b) Write short note on Indirect Arc furnace. **[9]**

Q7) a) Explain various types of relays. **[9]**

b) Explain advantages of electric drive **[8]**

OR

Q8) a) Explain selection of motors depending on load characteristics. **[9]**

b) Write short note on Solenoids. **[8]**



Total No. of Questions : 8] **SEAT No. :**

PE4330 **[Total No. of Pages : 2**

[6582]-103
S.E. (Printing)
FINISHING TECHNIQUES
(2019 Pattern) (Semester - IV) (208286)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Draw a sketch of knife and buckle folding and explain working principle of knife and buckle folding machine. **[6]**

b) Draw and label a diagram of knife cutting machine. **[6]**

c) Define cutting and trimming. **[5]**

OR

Q2) a) Compare hand folding and machine folding. **[6]**

b) Write short note on collating marks. **[5]**

c) Why the rollers on folding machines are knurled? **[6]**

Q3) a) Explain in detail hot melt adhesives. **[6]**

b) Distinguish between rexine vs leather as covering material. **[6]**

c) Write short note on securing materials. **[6]**

OR

Q4) a) Explain in detail Application of adhesives in various print finishing processes. **[6]**

b) Describe types of board used in book binding process. **[6]**

c) Write short note on reinforcing materials. **[6]**

Q5) a) Write short note on material flow and inventory management processes. **[6]**

b) How disc ruling machine is more advantages? **[6]**

c) Explain in brief a corner cutting operations and state its purpose. **[5]**

OR

P.T.O.

Q6) a) What are the purposes of edges decoration process? **[6]**

b) Describe in detail a tag Stringing. **[5]**

c) Compare embossing and foil stamping process. **[6]**

Q7) a) Calculate papers for endpapers in double crown size for 5000 books in crown 8vo size with 1% wastage allowances. **[6]**

b) Find out no. of maximum pieces for A5 size book from a board of 30×42"size. **[6]**

c) Calculate cloth rolls of 100 cm wide and 15 meter long for full bound 20000 books in A 5 size having 15mm thickness and 5mm extra squares. **[6]**

OR

Q8) a) Find out no. of 45 Dkg boards in 21×24" size required for A5 cut flush 5000 books. **[6]**

b) Calculate boards of 45 Dkg of 22"×28" for 1000 books in A5 size. **[6]**

c) Calculate cost of papers for endpapers in 2RA0 size with 110 gsm@ Rs. 75 per kg for 10000 books in A5 size. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE4331

[Total No. of Pages : 2

[6582]-104
S.E. (Printing Engineering)
INTRODUCTION TO PACKAGING CONCEPTS
(2019 Pattern) (Semester - IV) (208287)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Describe the packaging is promoting the product in market explain in detail. **[9]**

b) Explain 5 P's of marketing. **[9]**

OR

Q2) a) Describe the retail marketing has extreme importance. **[9]**

b) Explain demographic segmentation in detail with examples. **[9]**

Q3) a) Explain 4 different scenarios of product and package relationship. **[9]**

b) Explain biological effect on product and package. **[8]**

OR

Q4) a) Explain the effect of barrier properties on product. **[8]**

b) Discuss wood characteristics. **[9]**

Q5) a) Discuss specific ISO standards used in packaging industry. **[9]**

b) Describe different physical test required to check quality of package. **[9]**

OR

P.T.O.

Q6) a) Explain quality standard aspects in packaging. **[9]**

b) Explain the general benefits of holding ISO accreditation. **[9]**

Q7) a) Describe the packaging scenario of world and India. **[8]**

b) Explain the growth of food and beverage packaging industry in India. **[9]**

OR

Q8) a) Explain India has become the world's fifth largest packaging industry. **[8]**

b) Explain different packaging laws and regulations. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE4332

[Total No. of Pages : 1

[6582]-105
S.E. (Printing Engineering)
MICROPROCESSOR AND MICRO CONTROLLER TECHNIQUES IN PRINTING
(2019 Pattern) (Semester - IV) (208288)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Describe the features of 8051 and Draw the block diagram of 8051 microcontroller. **[9]**

b) Differentiate between microprocessor and microcontroller. **[9]**

OR

Q2) a) Describe any three categories of 8051 instructions. **[9]**

b) Explain addressing modes of 8051. **[9]**

Q3) a) Write a short program to add two 8-bit numbers in 8051. **[8]**

b) Describe Timers used in 8051. **[9]**

OR

Q4) a) List any five functions of PLC in printing systems. **[8]**

b) Explain block diagram of 8255 in details and its interfacing with 8085. **[9]**

Q5) a) Describe the block diagram of programmable timer IC 8259. **[9]**

b) Explain the CWR, modes of 8253. **[9]**

OR

Q6) Describe all modes of 8255 in detail. **[18]**

Q7) Explain internal architecture of 8259 in detail. **[17]**

OR

Q8) Describe the uses of microprocessor and controller in the field of printing and packaging. **[17]**

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Total No. of Questions : 8]

SEAT No. : ____

PE4333

[Total No. of Pages : 2

[6582]-106
S.E. (Printing Engineering)
PRINT PRODUCTION TECHNIQUES
(2019 Pattern) (Semester - IV) (208289)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Define line photography and halftone photography. Explain diffraction halftone theory with a neat sketch. **[9]**

b) The combination of cyan, magenta and yellow ink is brown and not black. What is the reason behind this? Describe the contaminations present in cyan, magenta and yellow ink with a neat sketch. **[9]**

OR

Q2) a) What is frequency modulated screening? What are the advantages and disadvantages of frequency modulated screening? **[9]**

b) Explain in detail the dot reproduction in computer to plate systems. **[9]**

Q3) a) What is spot colour printing? What are the requirements for spot colour printing? **[9]**

b) What is plate verification and ink verification? What are the factors to be considered during plate and ink verification? **[9]**

OR

Q4) a) What is screen ruling? Describe the screen ruling in digital halftoning process. **[9]**

b) What are the five conditions for viewing a printed sample under light as per ISO standards? **[9]**

P.T.O.

Q5) a) What is optical dot gain and mechanical dot gain? What are the reasons behind optical dot gain and mechanical dot gain? **[9]**

b) What is optical reflection density? Calculate the reflection density from the percentage reflection values. (i) 20% and (ii) 50%. **[8]**

OR

Q6) a) Explain directional and the non - directional mechanical dot gain. **[9]**

b) Describe in brief ink trapping and gray balance. **[8]**

Q7) a) What are the limitations of offset screen printing and digital printing? **[9]**

b) What are the factors which affect lamination? What are the factors which affect nick strength in a carton? **[8]**

OR

Q8) a) What are the factors which affect thermography and embossing? **[9]**

b) With a neat sketch explain the centralized production, distributed production and integrated production. **[8]**



Total No. of Questions : 8]

SEAT No. : [ ]

PE-4334

[Total No. of Pages : 3

[6582]-107
S.E. (Printing Engineering)
THEORY OF PRINTING MACHINE AND MACHINE COMPONENTS
(2019 Pattern) (Semester - III) (202060)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of electronic pocket calculator is allowed.***

Q1) a) What is brake? Write a short note on band brakes. **[8]**

b) What are the various main types of mechanical brakes? Describe internal expanding shoe brake with a neat sketch. **[9]**

OR

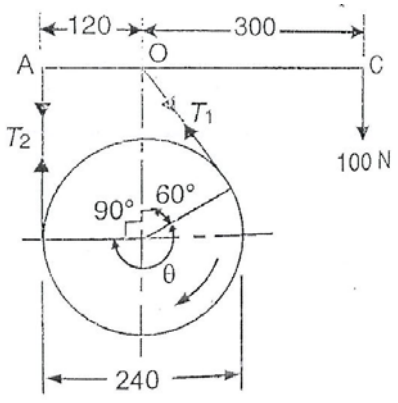
Q2) a) With the help of a neat sketch and equations explain 'self-energizing' and 'self-locking' effect in block or shoe brake. **[8]**

b) The simple band brake, as shown in Fig, is applied to a shaft carrying a flywheel of mass 400 kg. The radius of gyration of the flywheel is 450mm and runs at 300 rpm. If the coefficient of friction is 0.2 and the brake drum diameter is 240 mm, find : **[9]**

i) the torque applied due to a hand load of 100 N,

ii) the number of turns of the wheel before it is brought to rest and

iii) The time of the required to bring it to rest, from the moment of the application of the brake.



P.T.O.

Q3) a) Write the advantages and disadvantages of chain drives over belt and rope drives. **[8]**

b) Explain classification of Chains in detail. **[9]**

OR

Q4) a) Explain the concept of slip and creep in belt drives. **[8]**

b) A compressor, requiring 90 kW is to run at about 250 rpm. The drive is by V-belts from an electric motor running at 750 rpm. The diameter of the pulley on the compressor shaft must not be greater than 1 metre while the centre distance between the pulleys is limited to 1.75 metre. The belt speed should not exceed 1600 m/min.

Determine the number of V-belts required to transmit the power if each belt has a cross-sectional area of 375 mm^2, density 1000 kg/m^3 and an allowable tensile stress of 2.5 MPa. The groove angle of the pulley is 35°, The coefficient of friction between the belt and the pulley is 0.25.

Calculate also the length required of each belt. **[9]**

Q5) a) Explain velocity and Acceleration Image principle. **[10]**

b) Explain with example Klen's construction. **[8]**

OR

Q6) In the toggle mechanism shown in Fig. the slider D is constrained to move on a horizontal path. The crank 0A is rotating in the counter-clockwise direction at a speed 180 rpm increasing at the rate of 50 rad/s^2. The dimensions of the various links are as follows: OA 180 mm; CB =240 mm; AB = 360 mm; and BD = 540 mm For the given configuration, find

a) Velocity of slider D and angular velocity of BD and

b) Acceleration of slider D and angular acceleration of BD.

[18]

Q7) a) Explain Concept of Coriolis component of acceleration. **[9]**

b) Draw acceleration diagram of slider crank mechanism. **[9]**

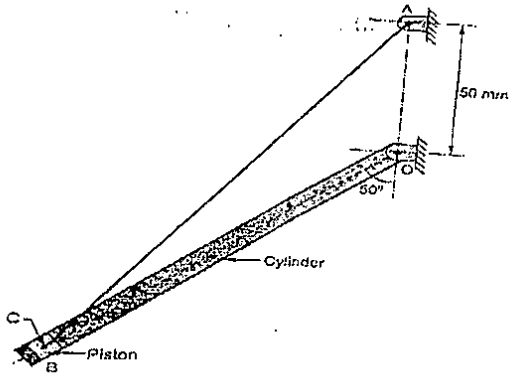
OR

Q8) The kinematic diagram of one of the cylinders of a rotary engine is shown in fig, The crank 0A which is vertical and fixed, is 50 mm long. The length of the connecting rod AB is 125 mm. The line of the stroke OB is inclined at 50° to the vertical. The cylinders are rotating at a uniform speed of 300 rpm in a clockwise direction, about the fixed centre O. Determine :

a) acceleration of the piston inside the cylinder and

b) angular acceleration of the connecting rod

[18]



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Total No. of Questions : 8]

SEAT No. :

PE3773

[Total No. of Pages : 2

[6582]-108R

S.E. (Printing Engineering)

INTRODUCTION TO PRINTING PROCESSES

(2019 Pattern) (Semester-III) (208281)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.No.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume Suitable data, if necessary***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain screen printing process with diagram: **[6]**

b) Explain role of squeegee pressure and angle. **[6]**

c) Write short note on squeegee edge profiles. **[5]**

OR

Q2) a) Explain frame requirements for high-tension printing. **[6]**

b) Describe aluminium frames and their advantages. **[6]**

c) Explain frame deformation problems. **[5]**

Q3) a) Explain mesh count selection for different jobs. **[6]**

b) Explain effect of mesh opening on ink transfer. **[6]**

c) Explain relationship between mesh and resolution **[6]**

OR

Q4) a) Explain role of thread diameter in color thickness. **[6]**

b) Explain fabric area calculation. **[6]**

c) Explain dot gain and loss in screen printing. **[6]**

P.T.O.

Q5) a) Explain importance of uniform tension in stretching. **[6]**

b) Explain mechanical stretching method. **[6]**

c) Explain base coating purpose. **[5]**

OR

Q6) a) Compare pneumatic and mechanical fabric stretching methods. **[6]**

b) Explain four-color separation in screen printing. **[6]**

c) Write short note on artwork registration. **[5]**

Q7) a) Explain workflow of stencil making. **[6]**

b) Explain under exposure problems in printing. **[6]**

c) Explain over exposure problems. **[6]**

OR

Q8) a) Explain screen printing for garment industry. **[6]**

b) Explain graphic overlay printing. **[6]**

c) Explain automotive screen printed products. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-4335

[Total No. of Pages : 2

[6582]-109

S.E. (Printing Engineering)

MATERIAL SCIENCE IN PRINTING & PACKAGING

(2019 Pattern) (Semester - III) (208282)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of electronic pocket calculator is allowed.***

Q1) a) Describe the significance of stiffness, tensile strength and tearing resistance in paper conversion operations. **[6]**

b) Explain how surface texture and porosity influence ink adhesion and print sharpness. **[6]**

c) Explain any 3 important physical properties of paper or factors affecting visual print quality. **[6]**

OR

Q2) a) Illustrate different surface finishing methods such as coating and calendering with examples. **[6]**

b) Discuss the significance of chemical and optical properties of paper for high-quality printing. **[6]**

c) Summarize methods used to test paper gloss and strength. **[6]**

Q3) a) Classify different plastic materials used in packaging and explain their applications LDPE, HDPE, PP, PET. **[9]**

b) State the most important properties of package affecting its shelf life in terms of protection from atmosphere. **[8]**

OR

Q4) a) Evaluate the advantages and limitations of using metal and glass in packaging. **[8]**

b) Explain lamination and metallization techniques for improving packaging barrier properties. **[9]**

P.T.O.

Q5) a) Define pigments, binders and solvents used in printing inks and explain their functions. **[6]**

b) Explain rheological properties of printing inks such as viscosity, tack, and flow, and their effect on printing quality. **[6]**

c) Describe optical properties of inks such as color strength, gloss, and transparency. **[6]**

OR

Q6) a) Classify different types of printing inks used in offset, gravure, flexographic, screen and digital printing. **[6]**

b) Explain how the composition of ink varies according to the printing process. **[6]**

c) Discuss the importance of ink-film thickness and density in maintaining print consistency. **[6]**

Q7) a) Evaluate the importance of sustainability, recyclability and biodegradability in modern packaging materials. **[9]**

b) Write short notes on any two:

i) Starch-based adhesives

ii) Aluminum foil as packaging material.

c) Eco-friendly adhesives. **[8]**

OR

Q8) a) List and describe tests used for ensuring damage free transportation and storage of product after packaging. **[9]**

b) Assess environmental and safety considerations related to adhesives and plastics in the packaging industry. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-4336

[Total No. of Pages : 2

[6582]-110

S.E. (Printing Engineering)

PRINTING DIGITAL ELECTRONICS

(2019 Pattern) (Semester - III) (208283)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn whenever necessary.***

Q1) Perform the following: **[18]**

a) Convert $(39)_{10}$ to binary and find its 1's complement.
b) Find 2's complement of 01101010.
c) Perform binary multiplication 1100×101.
d) Divide 101101÷11.
e) Subtract (18-25) using 2's complement method.
f) Convert 56 and 45 to BCD and add them.
g) Subtract 11101 - 11011
h) Add 10011+11101
i) Multiply 1011 × 1101

OR

Q2) a) Design Full adder and explain its circuit Diagram with truth table. **[9]**

b) Design 1 - bit magnitude comparator using Boolean expressions and K-map **[9]**

Q3) a) Draw & explain JK Flip Flop using NAND gates with truth table & timing Diagram. **[9]**

b) Explain T flip flop with its timing Diagram. **[8]**

OR

Q4) a) Explain 4 bit a synchronous up-down counter with logic Diagram. **[6]**

b) Draw and explain Dflip flop with circuit and timing wave forms. **[6]**

c) Explain serial in parallel out shift register with example. **[5]**

P.T.O.

Q5) a) Explain working of any AIX with neat block Diagram. **[9]**

b) Explain **[9]**

i) Resolution

ii) Sampling Frequency

iii) Quantization noise

iv) Conversion time

OR

Q6) a) Write a note on PLA. **[6]**

b) Explain ROM and its application. **[6]**

c) Describe operation of seven segment Display with truth table. **[6]**

Q7) a) Draw block Diagram of digital computer & explain functions of ALU, memory units. **[8]**

b) Explain any I/O Device along with its working principle. **[9]**

OR

Q8) Discuss two applications each of sequencial and combinational circuits in automatic print inspection and machine control systems. **[17]**



Total No. of Questions : 8]

SEAT No. :

PE4337

[Total No. of Pages : 2

[6582]-111

S.E. (Robotics & Automation)

INDUSTRIAL ENGINEERING AND MANAGEMENT

(2019 Pattern) (Semester - IV) (211508)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of logarithmic table, slide rule is electronic pocket calculator is allowed.***

Q1) a) Explain the factors which motivate entrepreneurship. **[8]**

b) Describe the strategies for business growth. **[9]**

OR

Q2) a) What are the characteristics of successful entrepreneur. **[8]**

b) Describe various funding organizations which support an entrepreneurship. **[9]**

Q3) a) Define Industrial Engineering, What are the applications of industrial engineering? **[9]**

b) The following data is available for a company. The output is Rs. 1,00,000. Calculate Partial productivity considering the input resources and total productivity. **[9]**

Input Resources	Rs.
Labor	20,000
Material	40,000
Capital	25,000
Energy	5,000
Other expenses	7,500

OR

Q4) a) Describe the following tools and techniques of Industrial Engineering. **[9]**

i) Work study

ii) Micro motion study

iii) Value analysis

b) Describe Taylor piece wage system and Merrick piece wage system with suitable illustration. State the advantages and limitations of these systems. **[9]**

P.T.O.

Q5) a) Describe two handed process chart for the activities carried out for assembly of nut and bolt with appropriate symbols. **[9]**

b) Define micro motion study. Describe various therbligs used in micro motion study. **[9]**

OR

Q6) a) Describe flow process chart for the activities carried for the writing a letter by the typist in office with appropriate symbols. **[9]**

b) Describe SIMO chart with suitable illustration and appropriate symbols. **[9]**

Q7) a) Describe various types of rating system used in time study. **[8]**

b) A work sampling study was carried out giving following recorded facts: **[9]**

Total time observed = 6500 min

Number of working observations = 2500

Number of idle observations = 250

Performance rating during observations = 90

Number of parts produced = 400

Allowance = 10%

i) Calculate standard time

ii) Estimate the accuracy at 95% confidence level

OR

Q8) a) Describe the process to carry out work sampling study. State how the standard time is calculated using work sampling study. **[8]**

b) Describe various types of allowances used in time study. **[9]**



Total No. of Questions : 8] **SEAT No. :**

PE4338 **[Total No. of Pages : 2**

[6582]-112
S.E. (Robotics & Automation Engineering)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - IV) (211509)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***All questions are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) State the properties of root locus. **[8]**

b) Find range of K for stability unity feedback system with Characteristics equation, G(S) = K / [S (S+2) (S+4) (S+6)]. Also define what is pole, zero & S-Plane. **[9]**

OR

Q2) a) Explain Routh's array with stability criteria, state advantages and disadvantages of Routh's criteria. **[8]**

b) Sketch root locus of unity feedback system with open loop transfer function G(S) = K / [S (S+l) (S+3) (S+5)] **[9]**

Q3) a) Draw the polar plot for G(S) = 1 + as. **[8]**

b) State Nyquist theorem and explain Nyquist stability criteria. **[9]**

OR

Q4) a) Define phase margin, gain margin. Derive the expression for Resonant frequency and Resonant Peak. **[8]**

b) Draw Bode plot of system with open loop transfer function G(s) = 100 / (S+l) (S +2) (S +5) & comment on its stability. **[9]**

Q5) a) What is sampling? Explain the process of sampling with waveform. **[9]**

b) Explain input and output field devices used in PLC (any 9). **[9]**

OR

Q6) a) Explain the selection criteria used for PLC. **[9]**

b) Explain Digital Control System with Block diagram. Enlist its advantages and disadvantages. **[9]**

P.T.O.

Q7) a) What is phase lag compensation? Enlist effects, advantages, disadvantages of phase lag compensation. **[9]**

b) Explain the Procedure to design of lag compensator using root locus.**[9]**

OR

Q8) a) What is a compensator? Explain Cascade compensation techniques.**[9]**

b) Explain the Procedure to design of lead compensator using root locus.**[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE4339

[Total No. of Pages : 4

[6582]-113
S.E. (Robotics and Automation)
DESIGN OF MACHINE ELEMENTS
(2019 Pattern) (Semester - IV) (211510)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain along with sketch different Types of Screw Threads. **[4]**

b) Derive expression for Torque Required to Raise Load by Square Threaded Screws. **[8]**

c) The nominal diameter of a triple threaded square screw is 50 mm, while the pitch is 8 mm. It is used with a collar having an outer diameter of 100 mm and inner diameter as 65 mm. The coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15. The screw is used to raise a load of 15 kN. Using the uniform wear theory for collar friction calculate: **[6]**

i) Torque required to raise the load;

ii) Torque required to lower the load; and

iii) The force required to raise the load, if applied at a radius of 500 mm

OR

Q2) a) Screw press is to exert a force of 40 kN. The unsupported length of the screw is 400 mm. Nominal diameter of screw is 50 mm. The screw has square threads with pitch equal to10 mm. The material of the screw and nut are medium carbon steel and cast iron respectively. For the steel used take ultimate crushing stress as 320 MPa, yield stress in tension or compression as 200 MPa and that in shear as 120 MPa. Allowable shear stress for cast iron is 20 MPa and allowable bearing pressure between screw and nut is $12N/mm^2$. Young's modulus for steel = $210 kN/mm^2$. Determine the factor of safety of screw against failure. Find the dimensions of the nut. What is the efficiency of the arrangement? Take coefficient of friction between steel and cast iron as 0.13. **[8]**

b) Derive the expression for Efficiency of Self Locking Screws. **[4]**

P.T.O.

c) The cutter of a broaching machine is pulled by square threaded screw of 55 mm external diameter and 10 mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60 mm and 90 mm internal and external diameters respectively. If the coefficient of friction is 0.15 for all contact surfaces on the nut, determine the power required to rotate the operating nut when the cutting speed is 6 m/min. Also find the efficiency of the screw. **[6]**

Q3) a) List out the different Material used in Spring. **[5]**

b) Define the Following Terms: Solid length, Free length, Spring index, Spring rate. **[4]**

c) It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81 370 N/mm^2 respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate: **[8]**

i) wire diameter;

ii) mean coil diameter;

iii) number of active coils

OR

Q4) a) Explain the concept of Surge in Springs. **[4]**

b) A compression coil spring made of an alloy steel is having the following specifications Mean diameter of coil = 50 mm; Wire diameter = 5 mm; Number of active coils = 20. If this spring is subjected to an axial load of 500 N; calculate the maximum shear stress (neglect the curvature effect) to which the spring material is subjected. **[6]**

c) At the bottom of a mine shaft, a group of 10 identical close coiled helical springs are set in parallel to absorb the shock caused by the falling of the cage in case of a failure. The loaded cage weights 75 kN, while the counter weight has a weight of 15 kN. If the loaded cage falls through a height of 50 metres from rest, find the maximum stress induced in each spring if it is made of 50 mm diameter steel rod. The spring index is 6 and the number of active turns in each spring is 20. Modulus of rigidity, G = 80 kN/mm^2. **[7]**

Q5) a) Write a short note classification of Gear. **[4]**

b) Comparison Between Involute and Cycloidal Gears Explain. **[4]**

c) It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4 :1. The pinion as well as the gear is made of plain carbon steel 40C8 (Sut = 600 N/mm^2). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions and suggest suitable surface hardness for the gears. **[10]**

OR

Q6) a) Explain causes of Gear Tooth Failure in detail. **[4]**

b) A reciprocating compressor is to be connected to an electric motor with the help of spur gears. The distance between the shafts is to be 500 mm. The speed of the electric motor is 900 r.p.m. and the speed of the compressor shaft is desired to be 200 r.p.m. The torque, to be transmitted is 5000 N-m. Taking starting torque as 25% more than the normal torque, determine: **[9]**

i) Module and face width of the gears using 20 degrees' stub teeth, and

ii) Number of teeth and pitch circle diameter of each gear.

Assume suitable values of velocity factor and Lewis factor.

c) A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength. **[5]**

Q7) a) Explain in details types of Bearing. **[4]**

b) A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 percent of time, 2 kN for 20 percent of time, I kN for 30 percent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20×106 revolutions at 95 percent reliability, calculate dynamic load rating of the ball bearing. **[7]**

c) Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load. **[6]**

OR

Q8) a) Write a short on Lubrication and Mounting of Bearing. **[5]**

b) A 22KW, 1440 rpm Electric Motor is directly coupled to a shaft of 25 mm diameter, which supported by cylindrical roller bearing. The shaft transmits power to another line shaft through the flat pulley of 300 mm diameter which is placed mid-way between two bearing. The coffiecient of friction between the belt and pulley is 0.3,while angle of lap is 180°. The belt is horizontal, the load factor is 1.5 if expected life is 50,500 hours, select bearing from manufacturing catalogues Bearing No – NU2205 and NU–2305 having basic dynamic Capacity C KN is 15.99 and 31.39 Respectively. **[8]**

c) Write a short note on Selection of Bearing Life. **[4]**

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Total No. of Questions : 8]

SEAT No. : ____

PE4340

[Total No. of Pages : 2

[6582]-114
S.E. (Robotics & Automation)
METROLOGY AND QUALITY ASSURANCE
(2019 Pattern) (Semester - IV) (211511)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat Diagram must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic Table, Slide rule is electronic pocket calculator is allowed.***

Q1) a) Write short notes on Talysurf for surface roughness measurement with systematic diagram. **[8]**

b) Explain Tomlinson surface tester with neat sketch. **[9]**

OR

Q2) a) With neat sketch explain coordinate measuring machine (CMM) **[8]**

b) Sketch & describe gear tooth vernier caliper. **[9]**

Q3) a) Contrast between Quality Control & Quality Assurance. **[9]**

b) Explain $\bar{x}$ -Chart, R-Chart & P-Chart. **[9]**

OR

Q4) a) The following table gives the number of defects in a casting used for making crank case of diesel engine, construct c-chart and comment on casting process. **[9]**

Casting No.	1	2	3	4	5	6	7	8	9	10
No. of defects (c)	15	11	25	10	12	20	15	10	17	13

b) Draw and explain OC curve. **[9]**

P.T.O.

Q5) a) With example explain the concept of Total Quality Management. **[8]**

b) Explain any three quality control tools with neat sketch. **[9]**

OR

Q6) a) With neat sketch explain Juran's Trilogy. **[8]**

b) With neat sketch explain the concept of quality function deployment. **[9]**

Q7) a) Explain function, methodology, and advantages of quality audit. **[9]**

b) State & Explain prerequisites for implementing ISO 9000 quality standards. **[9]**

OR

Q8) a) Explain in detail ISO 9000:2000 series standards. **[9]**

b) Explain the Concept of Quality Management System. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. : [ ]

PE4341

[Total No. of Pages : 3

[6582]-115
S.E. (Robotics & Automation Engineering)
COMPUTER GRAPHICS FOR ROBOTICS
(2019 Pattern) (Semester - IV) (211512)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

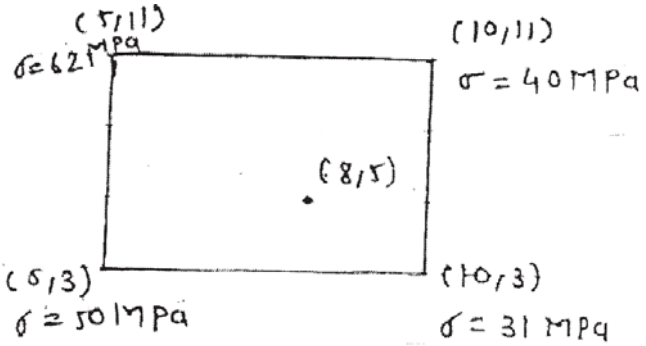
1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Find the value of y at x = 0 given some set of values (–2, 5), (1, 7), (3, 11), (7, 34) by using Lagrange Interpolation Formula. **[9]**

b) Explain the application of Inverse distance weighting method for surface generation. **[8]**

OR

Q2) a) Explain the application of quaternions to obtain the combined roll, pitch and yaw motion of a robot gripper. **[9]**



b) Determine stress at point (8, 5) By using **[8]**

i) IDW method (Inverse distance weighting method)

ii) Shape function

P.T.O.

Q3) a) Explain the applications of B spline and Bezier curves in robot path planning. **[7]**

b) Obtain x, y, and z co - ordinate of point on the quadratic Bazier surface patch at u = 0.6 and v = 0.2 using following control points : **[10]**

$$\begin{bmatrix} (-15\ 0\ 15) & (-15\ 5\ 5) & (-15\ 5\ -15) & (-15\ 0\ -15) \\ (-5\ 5\ 15) & (-5\ 5\ 5) & (-5\ 5\ -15) & (-5\ 5\ -15) \\ (5\ 5\ 15) & (5\ 5\ 5) & (5\ 5\ -5) & (5\ 5\ -15) \\ (15\ 0\ 15) & (15\ 5\ 5) & (15\ 5\ -5) & (15\ 0\ -15) \end{bmatrix}$$

OR

Q4) a) What are B-spling curves? How the geometric continuity is determined for B spline curves? **[7]**

b) Find the midpoint (i.e. point at parameter t = 0.5) of a Hermite cubic spline with two end points as (2, 2) and (7, 6) and corresponding tangent vectors as (1, 5) and (5, 1). **[10]**

Q5) a) A plane contains vectors a = i +3j + 4k and b = 0i + 5j + 2k. A point in the plane is (3, 5, 2). Obtain the equation of plane. **[10]**

b) Write note on: Application of analytic geometry in robotics. **[8]**

OR

Q6) a) Suppose, we have a $\Delta P_1P_2P_3$ and one point is present. To analyse the location of point whether it is inside of Δ, outside of Δ in vertere or at edge for calculation, **[10]**

We will find, $A\Delta(P_1P_2P_i)$, $A\Delta(P_2P_3P_i)$ $A\Delta(P_3P_1P_i)$.

The calculations are in counter clockwise manner

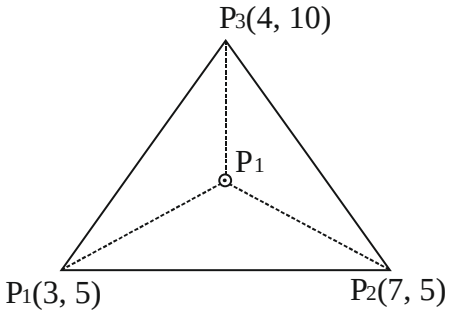
Check the following points

i) (5, 7)

ii) (5, 4)

iii) (6, 5)

iv) (4, 10), for $(P_1 - P_2 - P_i)$, $(P_2 - P_3 - P_i)$, $P_3 - P_1 - P_i)$



b) Write note on : Intersection of a circle with a straight line. **[8]**

Q7) a) Show that the multiplication of basis blades e_{12} and e_{13} is $-e_{23}$. **[9]**

b) Explain the applications of applied geometric algebra for modeling of robotics physics. **[9]**

OR

Q8) a) What do you mean by an other product? What are the properties of outer product? **[9]**

b) Write short note on : Reflection and rotation. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-4342

[Total No. of Pages : 3

[6582]-116

S.E. (Robotics and Automation Engineering)

INDUSTRIAL ELECTRONICS AND ELECTRICAL TECHNOLOGY

(2019 Pattern) (Semester - III) (211501)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2; Q3 or Q4; Q.5 or Q.6; Q.7or Q.8***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assum suitable additional data, if necessary.***
5) ***Use of a non-programmable calculator is allowed.***

Q1) a) Explain the concept of ADC in ATmega 328P-based Arduino board. **[4]**

b) What is the duty cycle in case of Pulse Width Modulation (PWM)? Explain the meaning of following instruction related to PWM. **[6]**

i) analog Write (3, 127)

ii) analogWrite (3, 0)

iii) analogWrite (3, 255)

iv) analogWrite (3, 191)

c) What is the function of LM35? Explain its interfacing with the Arduino board with the help of the interfacing diagram. **[8]**

OR

Q2) a) Draw the interfacing circuit showing the DC motor interface with Arduino. **[4]**

b) Draw and explain the interfacing of the Accelerometer with Arduino ATmega 328P. Write its algorithm. **[6]**

c) Draw the interfacing diagram of LVDT to the Arduino board and explain its algorithm for interfacing. **[8]**

P.T.O.

Q3) a) Write down any two applications of the DC series and the DC shunt motors. **[3]**

b) Derive the expression for the armature torque developed in the DC motor. **[6]**

c) Explain Field Control Method applied to vary the speed of the DC shunt motor along with its diagram. **[8]**

OR

Q4) a) What is the use of the starter in the case of the operation of a DC motor? Draw the diagram of a three-point starter with labelling. **[3]**

b) Explain the working principle of the D.C. generator with diagrammatic representation. **[6]**

c) Draw and explain the characteristics of DC shunt motors, along with their explanation. **[8]**

Q5) a) Distinguish between squirrel cage and slip ring induction motors. **[4]**

b) The power input to 500V, 50 Hz, 6 poles three-phase induction motor running at 975 rpm is 40kW. The stator losses are 1 kW and friction and Windage losses are 2 kW. Calculate Slip, Rotor Copper Loss, and Efficiency of the Motor. **[6]**

c) Derive the generalized equation for torque developed in a three-phase induction motor and draw the torque-slip characteristic curve. **[8]**

OR

Q6) a) Write any four industrial applications of the three-phase induction motor. **[4]**

b) Explain the power stages in the three-phase induction motor along with its formulae and diagram. **[6]**

c) Explain the operation of the autotransformer starter used for three-phase induction motor with the help of a neat schematic. **[8]**

Q7) a) Match the pair suggesting a suitable motor amongst Stepper motor / Linear induction motor / Universal motor/ Servomotor for the following applications. **[3]**

Sr. No.	Type of the Motor	Applications
1.	It is used to start, move and also stop the conveyor belts	Stepper Motor
2.	It is used in table fans, hairdryers and grinders	Linear induction motor
3.	Automatic sliding doors in electric trains.	Universal motor
4.	Used in tape drives, floppy disc drives, printers and electric watches.	Servomotor

b) Describe the constructional details and operation of the capacitor start capacitor run induction motor with the help of diagrams. **[6]**

c) Explain the construction and working principle of the universal motor. Draw its diagram. Give its two applications. **[8]**

OR

Q8) a) Give the point of difference between the AC series and DC series motor. Write any four valid points. **[3]**

b) Explain the construction and working principle of the AC and DC servomotor with the help of a suitable diagram. **[6]**

c) Explain the construction and working of the shaded pole induction motor with the help of suitable diagrams. Mention any two applications. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE-4343

[Total No. of Pages : 2

[6582]-117
S. E. (Robotics and Automation Engineering)
MANUFACTURING TECHNOLOGY
(2019 Pattern) (Semester - III) (211502)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figure to the right indicates full marks.***
3) ***Neat Diagram must be drawn wherever necessary.***
4) ***Electronic pocket calculator is allowed.***

Q1) a) Explain the methods of Tube Drawing. Write the different forces acting in tube drawing operation. Also explain why lubrication in necessary in Tube drawing **[8]**

b) What are the different types of extrusion dies used in industry? Explain with application **[9]**

OR

Q2) a) Explain Analysis of wire drawing operation **[8]**

b) How the forces are acted in drawing operation. Which parameters are responsible for force generation? What impact is observed when material passes through maximum reduction in one pass? **[9]**

Q3) a) Explain the significance of proper electrode selection in shielded metal are welding (SMAW). How does the type of electrode affect the welding outcome? **[9]**

b) Describe the challenges and considerations involved in welding dissimilar metals. Provide solutions or strategies to overcome these challenges. **[8]**

OR

Q4) a) Discuss the importance of selecting the right welding process for a specific material and application. Provide examples to support your explanation.**[9]**

b) Explain the purpose and benefits of using a shielding gas in certain welding processes. **[8]**

P.T.O.

Q5) a) Discuss the working principles of Laser Beam Machining (LBM). How does the focused laser beam facilitate material removal, and what are the advantages and challenges associated with LBM? **[9]**

b) Explain the concept of Electro-Discharge Machining (EDM). What role does electrical discharge play in material removal, and how does the process vary for conductive and non-conductive materials? **[9]**

OR

Q6) a) Examine the concept of Abrasive Water Jet Machining (AWJM). How does the addition of abrasive particles enhance the cutting capabilities of water jets, and what materials are suitable for AWJM? **[9]**

b) Describe the key aspects of Electron Beam Machining (EBM). How does the concentration of high-energy electrons contribute to the material removal process, and what types of materials are suitable for EBM? **[9]**

Q7) a) Describe the impact of Industry 4.0 on robotic applications in manufacturing. How do technologies like the Internet of Things (IoT) and Artificial Intelligence (AI) enhance the capabilities of manufacturing robots, and what is the concept of a "smart factory"? **[9]**

b) Discuss the role of robotic vision systems in manufacturing. How do vision-guided robots contribute to tasks such as pick-and-place, quality control, and inspection, and what are the challenges associated with implementing vision systems? **[9]**

OR

Q8) a) What are the key criteria for selecting suitable tasks or processes for robot applications, and how does this decision impact overall production? **[9]**

b) Examine the challenges and benefits of integrating collaborative robots (cobots) in manufacturing environments. **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-4344

[Total No. of Pages : 2

[6582]-118

S.E. (Robotics & Automation Engineering)

MATERIALS SCIENCE AND ENGINEERING METALLURGY

(2019 Pattern) (Semester - III) (211503)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***

Q1) a) What is powder metallurgy? discuss advantages, disaèivantages and its applications. **[8]**

b) Write a note on : **[10]**

i) Production of sintered structural comports

ii) Self-lubricating bearing

OR

Q2) a) What is conditioning of metal powders? Why it is done. **[8]**

b) Explain term : **[10]**

i) Electric contact materials

ii) Cermets

Q3) a) Draw iron-iron carbide equilibrium diagram and label the temperature composition and phase. **[9]**

b) Define the following : **[9]**

i) Ferrite

ii) Austenite

iii) Cementite

OR

Q4) a) Classify C.I.? And give its application. **[9]**

b) Write a note on :

i) Sensitization of stainless steel **[9]**

ii) Weld decay of stainless steel

P.T.O.

Q5) a) Explain the method of plotting TTT diagram and what information is obtained from this diagram? **[9]**

b) Explain why heat treatment of steel is done? **[8]**

OR

Q6) a) Draw Continuous cooling ransformation diagrams. **[9]**

b) Write short note on Quenching media. **[8]**

Q7) a) Write note on High temperature alloy. **[8]**

b) What you know about Super alloys & Ti Alloys. **[9]**

OR

Q8) a) Explain : **[9]**

i) Biomaterials

ii) Nano-materials

iii) Sports materials

b) Write note on copper and its alloy. **[8]**



Total No. of Questions : 8]

SEAT No. : [ ]

PE4345

[Total No. of Pages : 4

[6582]-119

S.E. (Automobile & Mechanical/Automation & Robotics/ Mechanical Sandwich)

KINEMATICS OF MACHINERY

(2019 Pattern) (Semester - IV) (202047)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain Velocity Image Principle with neat sketch. **[5]**

b) The dimensions of four bar chain mechanism is shown in Fig 1. in which the link AD is fixed and the crank AB rotates at uniform speed of 240 r.p.m. in clockwise direction. When the crank is at 60° with the horizontal find the angular velocity of links BC and CD and also find the angular velocity of point E of the structure BEC. **[13]**

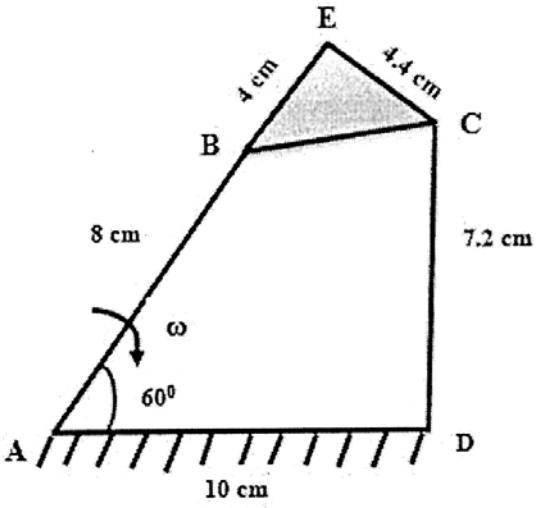


Fig1. Configuration diagram

OR

P.T.O.

Q2) a) Define rubbing velocity at a pin point. Give the formula when ω_1 & ω_2 are in same direction. **[5]**

b) In a four bar chain as shown in fig 2. AB 20 cm, BC = 30 cm, CD = 32 cm and AD = 55 cm. Crank AB rotates at a uniform speed of 200 rpm in anticlockwise direction. When the crank AB has turned 60º, locate all the instantaneous centers and find the angular velocity of link BC. **[13]**

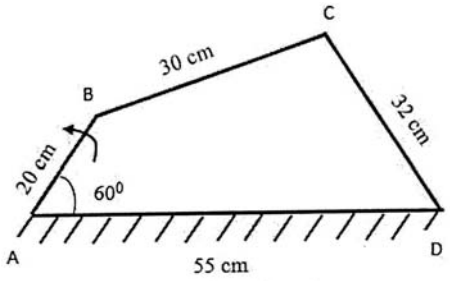


Fig. 2. Configuration Diagram

Q3) a) Explain the terms. **[6]**

i) Precision Positions

ii) Structural Error

b) Determine the Chebychev spacing for the function $y = x^{1.5}$ for the range $0 \leq x \leq 3$ where there precision points are required. For these points, determine θ_2, θ_3 and ϕ_2, ϕ_3 If $\Delta\phi = 90°$, $\Delta\theta = 40°$ **[11]**

OR

Q4) a) Explain the terms. **[6]**

i) Type Synthesis

ii) Number Synthesis

iii) Dimensional Synthesis

b) Design a four bar mechanism with input linkl_2, coupler link l_3 and output linkl_4. Angles θ and ϕ for three successive positions are given in table below. **[11]**

Position	1	2	3
θ	40º	55º	70º
ϕ	50º	60º	75º

If grounded linkl_1 = 30 mm, using Frudenstein's equation find out lengths of other links to satisfy the given positional conditions. Also draw the synthesized mechanism in its first position.

Q5) a) Compare the cycloid and involute gear tooth profile. **[6]**

b) Two 20° involute spur gears having module 6mm mesh externally and are to give a gear ratio of 3. **[12]**

Find:

i) No. of teeth on pinion to avoid interference on it and the corresponding number on the gear

ii) The length of contact and arc of contact

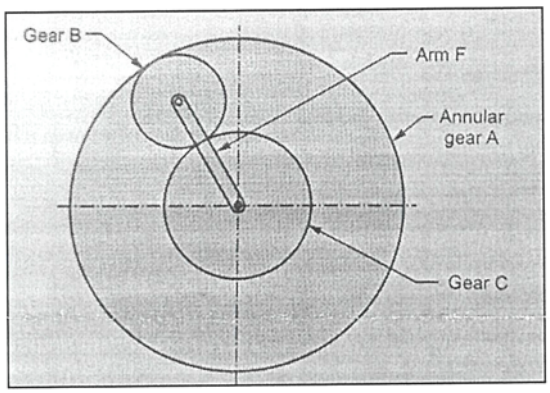
iii) The numbers of pairs of teeth in contact

iv) The maximum velocity of sliding

OR

Q6) a) State and explain terminology for helical gear with neat sketch. **[6]**

b) An epicyclic gear train consist of three gears A, B and C as shown in fig. The number of teeth on annular gear A is 74 and on gear C is 34. The gear B meshes with both gear A and C and it is carried on an arm F which rotates about the centre A at 25 RPM. If the gear A is fixed, Find the speed of gear B and C. **[12]**



Q7) a) Compare different types of automation. **[5]**

b) Using the following data synthesize the cam profile operating a roller follower : **[12]**

- Motion for outstroke = SHM
- Cam rotation during outstroke = 120º
- Maximum lift of follower = 40 mm
- Offset of follower = 10 mm
- Diameter of roller = 14 mm
- Diameter of base circle = 40 mm
- Motion of return stroke = Uniform acceleration retardation
- Cam rotation during return stroke = 80º
- Angle of dwell in highest position of follower 60°.

OR

Q8) a) A cam rotation with uniform acceleration and retardation is required to give the following motion to knife edge follower: **[12]**

- The outstroke of the follower is 20 mm for 120º of cam rotation
- Dwell period for next 60º of cam rotation
- The return stroke during next 90º of cam rotation
- Dwell period for the remaining 90º of cam rotation

The minimum radius of cam is 40 mm. Draw cam profile when the line of stroke of follower is offset 15 mm from the axis of a cam.

b) Explain role of AI in manufacturing industry. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE4346

[Total No. of Pages : 2

[6582]-120
S.E. (Automobile & Mechanical)
APPLIED THERMODYNAMICS
(2019 Pattern) (Semester - IV) (202048)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2 and Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Explain any 3 combustion chambers used in SI Engine with neat sketch. **[9]**

b) List the various components of simple carburetor and explain the working of simple carburetor with neat labelled diagram. **[8]**

OR

Q2) a) Explain any three of the following Solid Injection systems used in CI engines with neat block diagram. **[9]**

i) Individual pump and nozzle system
ii) Unit injector system
iii) Common rail system
iv) Distributor system

b) Difference between Detonation in SI and Knocking in CI Engine. (any eight points) **[8]**

Q3) a) A 4-cylinder, 4-stroke engine 6cm bore and 9cm stroke was tested at constant speed fuel supply was fixed to 0.13 kg/min and plugs of 4-cylinder were successfully short circuited without change of speed;
The power measurement was as follows:
With all cylinder working = 16.25kW, With No. 1st - cylinder cut-off = 11.55kW, With No.2nd – cylinder cut-off = 11.65 (B.P), with No.3rd -cylinder cut-off = 11.70 kW(B.P) With No. 4th-cylinder cut-off =11.50 kW(B.P) **[10]**
Find

i) Indicated power
ii) Mechanical efficiency
iii) Indicated thermal efficiency if C.V. of fuel used is 42000 kJ/kg.

b) Explain briefly: **[8]**

i) Morsettest and
ii) Heat balance sheet

OR

P.T.O.

Q4) a) Explain briefly the Bharat stage norms and also explain the pollution norms adopted in Bharat stage 6 and give the numbers in tabular format for acceptable emission limits. **[9]**

b) Explain with the help of a need diagram exhaust gas recirculation system **[9]**

Q5) a) Write short note on water cooling system for IC engine and explain with neat sketch thermos syphon cooling system. **[9]**

b) Explain with neat sketch wet sump lubrication system. State any six differences between wet sump and dry sump lubrication system. **[8]**

OR

Q6) a) Explain with neat sketch working of battery ignition system? State any six differences between battery and magneto ignition system? **[9]**

b) Explain Bio-Diesel composition, production and its properties? **[8]**

Q7) a) Write the classification of compressors? Define FAD and Volumetric Efficiency? **[8]**

b) A single stage single acting air compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are 30ºC and 1 bar respectively. The bore and stroke of the compressor are 100 mm and 150 mm respectively. The clearance is 3% of the swept volume. Assuming the index of compression and expansion to be n = 1.3.

Find the following:

i) Volumetric efficiency

ii) Power required in mechanical efficiency is 85% and

iii) Speed of the compressor. **[10]**

OR

Q8) a) Short Note on **[8]**

i) Vane Type Compressor

ii) Roots Blower

b) A 2-stage, single acting reciprocating air compressor in 1 bar and 300K air is discharged at 10 bar the law of compression is $PV^{1.3} = C$, rate of discharge is 0.1 kg/sec.

Find:

i) Power required to drive the compressor

ii) Saving in work compared to single stage

iii) Isothermal efficiency for single stage and multistage

take $C_p = 1$ kJ/kg.K, R = 0.287 kJ/kg.K **[10]**

Total No. of Questions : 8]

SEAT No. : ____

PE4347

[Total No. of Pages : 3

[6582]-121
S.E. (Automobile & Mechanical Engineering)
FLUID MECHANICS
(2019 Pattern) (Semester - IV) (202049)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) A fluid flow field is given by $V = x^2yi + y^2zj - (2xyz + yz^2)k$. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the point (2, 1, 3). **[9]**

b) Derive the equation of continuity. Obtain an expression continuity equation for a three dimensional flow. **[8]**

OR

Q2) a) The stream function for a two-dimensional flow is given by $\Psi = 2xy$, Calculate the velocity at the point (2, 3). Find the velocity potential function ϕ. **[9]**

b) Explain the terms : **[8]**

i) Path line
ii) Streak line
iii) Stream line
iv) Stream tube

Q3) a) A pitot-tube is inserted in a pipe of 300 mm diameter. The static pressure in pipe is 100 mm of Mercury (Vacuum). The stagnation pressure at the center of pipe recorded by the pitot tube is 0.981 N/cm^2. Calculate the rate of flow of water through pipe, if the mean velocity of flow is 0.85 times the center velocity. Take $C_v = 0.98$. **[9]**

b) Derive an expression to find theoretical discharge for venturimeter from Bernoulli's theorem. **[9]**

OR

P.T.O.

Q4) a) Two horizontal fixed parallel plates are 20 mm apart. Liquid of specific gravity 0.66 flows between the plates. Velocity at 5 mm from lower plate is 1.2 m/s. Estimate: **[9]**

i) Mean Velocity &

ii) Viscosity of liquid by assuming laminar flow and head loss of 1.6 m per meter length.

b) Prove that the maximum velocity in circular pipe for viscous flow is equal to two times the average velocity of the flow. **[9]**

Q5) a) Derive Darcy-Weisbach equation to find head loss due to friction. **[8]**

b) A Pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500 m. Find the maximum power available at the outlet of the pipe, if the value of $f = 0.006$. **[9]**

OR

Q6) a) Find the displacement thickness and momentum thickness for the velocity distribution in the boundary layer given by,

$\frac{u}{U}+\frac{y}{\delta}$ Where, u is the velocity at a distance y from the plate and $u = U$, at $y = \delta$, where δ is boundary layer thickness. **[8]**

b) A kite of area 0.25 m^2 and 1.2N weight is flying in wind of velocity 20 km/hr. When the string is inclined at angle of 15º to the vertical the tension in the string was found to be 3N. Evaluate the coefficient of lift and drag. Take density of air = 1.15kg/m^3 **[9]**

Q7) a) The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by $T = D^5N^2 \rho\Phi [\mu/(D^2N\rho)]$ prove this by the method of dimensions. **[9]**

b) Explain the following non-dimensional numbers: **[9]**

i) Reynold's number

ii) Froude's number

iii) Mach's number

What are their significances for fluid flow problems?

OR

Q8) a) Water is flowing through a pipe of diameter 30 cm at a velocity of 4m/s. Find the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between the two pipes. The viscosity of water and oil is given as 0.01 poise and 0.25 poise. The sp.gr. of oil = 0.8. **[9]**

b) Prove that the scale ratio for discharge for a distorted model is given as

$$Q_p / Q_m = (L_r)_H \times (L_r) v^{3/2}$$ **[9]**

Where

Q_p = Discharge through Prototype

Q_m = Discharge through model

$(L_r)_H$ = Horizontal scale ratio

$(L_r)_v$ = Vertical scale ratio

* * *

Total No. of Questions : 8] **SEAT No. :**

PE4348 **[Total No. of Pages : 2**

[6582]-122

S.E. (Mechanical/Automobile)

MANUFACTURING PROCESSES

(2019 Pattern) (Semester - IV) (202050)

Time : 2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) A washer with ID 15 mm and OD 30 mm is made from 2 mm thick strip of sheet on a progressive die. Given- ultimate shear strength = 250 N/mm^2 and strip length = 3000mm **[10]**

i) Draw strip layout and calculate percentage utilization for the same

ii) Calculate minimum cutting force and press tonnage Required.

iii) Draw a neat sketch of the progressive die and calculate Punch and Die size for each other

b) Enumerate different sheet metal operations. Explain any four with figures. **[8]**

OR

Q2) a) What is centre of pressure? List down the procedure to calculate centre of pressure. **[10]**

b) Explain with sketch methods of reducing shear force in sheet metal works. **[8]**

Q3) a) What is the difference between welding, soldering and brazing. Explain applications and advantages of each of them. **[9]**

b) Explain the Differentiate between TIG welding and MIG welding with figure. **[9]**

OR

P.T.O.

Q4) a) Explain principle of resistance welding with neat sketch. State its advantages and limitations. Also explain different types of resistance welding processes with figures. **[10]**

b) Explain in detail types of joints used in welding. What are the precaution need to be taken while preparing the edges for welding. **[8]**

Q5) a) Explain with neat sketch Injection molding process. What are its advantages and applications? **[9]**

b) Differentiate thermosetting plastics & thermoplastics in detail. **[8]**

OR

Q6) a) Explain in brief compression and Transfer molding process. **[9]**

b) Explain with figures different thermoforming processes. **[8]**

Q7) a) What is composite material? What are the properties of Composite material? **[9]**

b) With neat sketch Explain Hand lay up and spray lay up CM process. **[8]**

OR

Q8) a) Explain resin transfer molding composite manufacturing process. **[9]**

b) Explain with diagram Vacuum Impregnation Process. **[8]**



Total No. of Questions : 9]

SEAT No. : ____

PE4349

[Total No. of Pages : 5

[6582]-123
S.E. (Automobile & Mechanical/ Mechatronics/ Automation & Robotics/Mechanical S.W.)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III/IV) (207002)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Question No.1 is compulsory.***
2) ***Solve Q.2 or Q.3, Q4 or Q.5, Q.6 or Q.7, Q.8 or Q.9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Choose the correct option.

a) The coefficient of Kurtosis β_2 is given by **[1]**

i) $\frac{\mu_4}{\mu_3}$ ii) $\frac{\mu_4}{\mu_2^2}$

iii) $\frac{\mu_3}{\mu_2^2}$ iv) $\frac{\mu_3^2}{\mu_2^3}$

b) From the given information $\Sigma x = 235$, $\Sigma x^2 = 6750$, $n = 10$ then standard deviation of x is **[2]**

i) 11.08 ii) 13.08

iii) 8.08 iv) 7.6

c) If x follows the binomial distribution with parameter n and $p = ½$ and $p(x = 5) = p(x = 4)$, then $p(x = 2)$ is **[2]**

i) $^7C_2\left(\frac{1}{2}\right)^7$ ii) $^{11}C_2\left(\frac{1}{2}\right)^{11}$

iii) $^{10}C_2\left(\frac{1}{2}\right)^{10}$ iv) $^9C_2\left(\frac{1}{2}\right)^9$

P.T.O.

d) A unit vector normal to the surface $x^2 + y^2 + z^2 = 9$ at (1, 2, 1) is ____ **[2]**

i) $\frac{1}{\sqrt{6}}\left(\bar{i} + 2\bar{j} + \bar{k}\right)$ ii) $\frac{1}{\sqrt{3}}\left(2\bar{i} + 4\bar{j} + 4\bar{k}\right)$

iii) $\bar{i} + 2\bar{j} + 2\bar{k}$ iv) $2\bar{i} + 2\bar{j} - \bar{k}$

e) The most general solution of the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ representing metal plate having length x and breadth $y \to \infty$ is **[2]**

i) $\left(c_1 \cos mx + c_2 \sin mx\right)\left(c_3 e^{my} + c_4 e^{-my}\right)$

ii) $\left(c_1 e^{-my} + c_2 e^{my}\right)$

iii) $\left(c_1 e^{mx} + c_2 e^{-mx}\right)\left(c_3 \cos my + c_4 \sin my\right)$

iv) $\left(c_1 e^{-mx} + c_2 e^{mx}\right)$

f) The value of $\nabla\left(\frac{1}{r}\right) =$ _____ **[1]**

i) $-\frac{\bar{r}}{r^2}$ ii) $\frac{\bar{r}}{r}$

iii) $-\frac{\bar{r}}{r^3}$ iv) 0

Q2) a) The first four moments about the value 3.5 are 0.058064, 0.451612, 0.082259 and 0.5 calculate the first four central moments. **[5]**

b) Compute correlation coefficient for the following data **[5]**

x	152	158	169	182	160	166	182
y	198	178	167	152	180	170	162

c) Fit a straight line for the following data of the form $y = ax + b$ **[5]**

x	5	4	3	2	1
y	1	2	3	4	5

OR

Q3) a) If $\Sigma f = 27$, $\Sigma fx = 91$, $\Sigma fx^2 = 359$, $\Sigma fx^3 = 1567$, $\Sigma fx^4 = 7343$. **[5]**

Find first four moments about origin.

b) Find the regression line of y on x from the data **[5]**

x	65	63	67	64	68	62	70	66	68	67
y	68	66	68	65	69	66	68	65	71	67

c) For the tabulated values of x and y fit a straight line of the form $y = mx+c$. **[5]**

x	1.0	3.0	5.0	7.0	9.0
y	1.5	2.8	4.0	4.7	6.0

Q4) a) A box containing 6 red balls, 4 white balls and 5 blue balls. Three balls are drawn successively from the box. Find the probability that they are drawn in the order red, white and blue if each ball is not replaced. **[5]**

b) A random variable X B(n = 6, P). Find P if 9P(R = 4) = 4P(R = 2). **[5]**

c) In a certain city 4,000 tube lights are installed. If the lamps have average life of 1,500 burning hours. Assuming normal distribution **[5]**

i) How many lamps will fail in first 1,400 hours?

ii) How many lamps will last beyond 1,600 hours?

Given A = 0.3413 for Z =1.

OR

Q5) a) A coin thrown 4 times successively. X denotes the number of heads. Find the expectation of X. **[5]**

b) A manufacturer of electronic goods has 4% of his product defective. He sells the articles in packet of 300 and guarantees 90% good quality. Determine the probability that a particular pocket will violate the guarantee. **[5]**

c) A set of five similar coins in tossed 210 times and the result is **[5]**

No of heads	0	1	2	3	4	5
Frequency	2	5	20	60	100	23

Test the hypothesis that the data follow a binomial distribution. [Given $\chi^2_{5,0.05}$ = 11.070]

OR

Q6) a) The position vector of a particle at time t is $\bar{r} = \cos(t-1)\bar{i} + \sin h\,(t-1)\bar{j} + mt^3\bar{k}$. Find the condition imposed on m by requiring that at time t =1, the acceleration is normal to the position vector. **[5]**

b) Show that $\bar{F} = (ye^{xy}\cos z)\bar{i} + (xe^{xy}\cos z)\bar{j} - e^{xy}\sin z\bar{k}$ is irrotational. Find scalar potential function & such that $\bar{F} = \nabla\phi$. **[5]**

c) Evaluate $\int_c \bar{F}\cdot d\bar{r}$ where $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the straight line (0, 0, 0) and (2, 1, 3). **[5]**

Q7) a) Find the directional derivative of $\varphi = e^{2x}\cos yz$ at (0, 0, 0) in the direction of tangent to the curve $x = a\sin t$, $y = a$ cost, $z =$ at at $t = \pi/2$. **[5]**

b) Solve any one : **[5]**

i) Show that $\nabla\left(\frac{\bar{a}\cdot\bar{r}}{r^n}\right) = \frac{\bar{a}}{r^n} - \frac{n(\bar{a}\cdot\bar{r})}{r^{n+2}}\bar{r}$

ii) Show that $\bar{b}\times\nabla\left[\bar{a}\cdot\nabla\log r\right] = \frac{\bar{b}\times\bar{a}}{r^2} - \frac{2(\bar{a}\cdot\bar{r})}{r^4}(\bar{b}\times\bar{r})$

c) Evaluate $\iint_s \nabla\times\bar{F}\cdot d\bar{s}$ where $\bar{F} = y\bar{i} + z\bar{j} + x\bar{k}$ where s is surface of the paraboloid. $z = 1 - x^2 - y^2$, $z \geq 0$. **[5]**

Q8) a) Solve $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$ subject to **[8]**

i) $u(o, t) = 0, \ \forall t$

ii) $u(l, t) = 0, \ \forall t$

iii) $u(x, t)$ is bounded

iv) $u(x, o) = \frac{uox}{l}$, for $o \leq x \leq l$.

b) A string is stretched and fastened to two points l a part, motion is streatched by displaying the string in the form $u = a\sin\left(\frac{\pi x}{l}\right)$ from rest it is released at time $t = 0$. Find the displacement $u(x, t)$ from one end. **[7]**

OR

Q9) a) An infinitely long plane uniform plate is bounded by two parallel edges in the y - direction and an end at right angles to them. The breadth of the plate is π. This end is maintained at temperature u_0 (constant) at all points and other edges at zero temperature. Find the steady - state temperature $u(x, y)$. **[8]**

b) Use fourier sine transform to solve **[7]**

$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, subject to

i) $u(0, t) = 0, \quad t > 0$

ii) $u(x, 0) = 1, \quad 0 < x < 1$

$= 0 \quad x > 0$

iii) $u(x, t)$ is bounded.

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. : [ ]

PE-4350

[Total No. of Pages : 4

[6582]-124

S.E. (Automobile & Mechanical / Automation & Robotics / Mechanical Sandwich)

SOLID MECHANICS

(2019 Pattern) (Semester - III) (202041)

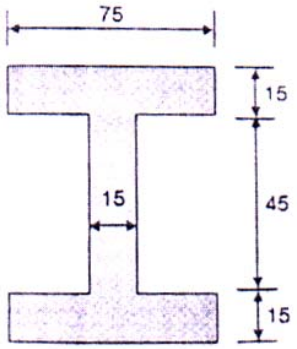
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.***
2) ***Figures to the right indicate full marks.***
3) ***Use Graph paper for Graphical solution.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) A beam of cross-section 100 mm × 200 mm is simply supported at both ends. It carries two concentrated loads of 100 KN each acting at 2m distance from each support. Span of beam is 7m. determine the maximum bending stress induced in the beam. **[9]**

b) Abeam of cross-section shown in Fig. is bent about a horizontal axis. If the bending moment is 8KN-m, determine the total force acting on the top flange. **[9]**

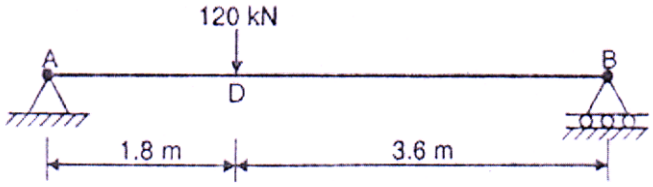


OR

P.T.O.

Q2) a) A symmetrical H-section with height 120 mm, width 120 mm and thickness 20 mm is used as a simply supported beam and carries UDL of 60 KN/m over a span of 3 m. Determine shear stress at neutral axis if inertia about neutral axis is 5.75×10^6 mm^4. **[9]**

b) The horizontal beam as shown in fig. is hinged at a point 'A' and supported on roller at point 'B'. It carries a vertical load of 120 KN at point 'D'. Determine deflection at point 'D' by taking E = 200 GPa and I = 160×10^6 mm^4. **[9]**



Q3) a) A hollow shaft with diameter ratio 3/5 is required to transmit 450 kW at 120 rpm with a uniform twisting moment. The shearing stress in the shaft must not exceed 60 N/mm^2 and the twist in a length of 2.5 m must not excced 1°. Calculate the external diameter of the shaft satisfying these conditions.Take the modulus of rigidity is 8×10^4 N/mm^2. **[9]**

b) A 4 m length of a tube has a buckling load of 2 kN when used as a column hinged at both ends. Calculate buckling load for 4.5 m length of the same tube when used as column if **[8]**

i) Both ends are fixed

ii) One end fixed and other is hinged

iii) One end is fixed and the other free

OR

Q4) a) A composite shaft consist of copper rod of 20 mm diameter enclosed in a steel tube of 60 mm external diameter and 20 mm thick. The shaft is required to transmit to torque of 1200 Nm. Determine the shear stresses developed in the copper and steel if both the shaft have equal length and welded to a plate at each end so that their twists are equal take modulus of rigidity for steel as twice that copper. **[9]**

b) Calculate the critical load for a strut which is made up of a bar circular in section, 1.2 m long and which is hinged at one end and fixed at the other end. The same bar when freely supported at its ends gives the central deflection of 3 mm, when a load of 100 N is placed at its centre. Also find the safe load taking factor of safety is 3. **[8]**

Q5) a) At a point in a strained material, the principal tensile stresses across two perpendicular planes are 80 N/mm^2 and 40 N/mm^2. Determine normal stress, shear stress and resultant stress on a plane inclined at 20° with major principal plane. Determine also the obliquity. Use Mohr's circle method. **[9]**

b) A solid circular shaft is subjected to a bending moment of 45 kNm and a torque of 15 kNm. Design the diameter of the shaft according to : **[9]**

i) Maximum principal stress theory

ii) Maximum shear stress theory

iii) Maximum strain energy theory

Take $\mu = 0.25$, Stress at elastic limit = 200 MPa and factor of safety is 2.

OR

Q6) a) A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile stress of 60 N/mm^2 on a plane at right angles, together with shear stresses of 70 N/mm^2 on the faces. Find the following terms : **[9]**

i) The magnitude of principal stresses

ii) The magnitude of greatest shear stress

iii) The location of principle plane

iv) The location of plane containing maximum shear stress

b) An axial pull of 25 kN along with a shear force of 20 kN is applied to a circular bar of 20 mm diameter. The elastic limit of the bar material is 250 MPa and Poisson's ratio, $\mu = 0.3$. Determine the factor of safety against failure based on : **[9]**

i) Maximum shear stress theory

ii) Maximum strain energy therory

iii) Maximum principal strain energy theory

iv) Maximum shear strain energy theory

Q7) a) A masonry pillar 8 m high is 1.5 m × 2.5 m in section, a horizontal wind pressure of 1.4 kN/m^2 acts on the 2.5 m × 8 m face. Find the maximum and minimum stress intensities induced on the base section. The weight of masonry is 22.5 kN/m^3. **[9]**

b) A hollow rectangular section is having external size 600 mm × 550 mm and internal size 500 mm × 450 mm. It carries a vertical load of 110 kN at the outer edge of the column on X-axis.Calculate maximum and minimum intensities of stress in the section. Assume 600 mm side horizontal. **[8]**

OR

Q8) a) The bar has a diameter of 40 mm. If it is subjected to the two forece components at its end as shown in Figure 3. Determine the state at point A and B and show the results on a different volume element located at this point. **[9]**

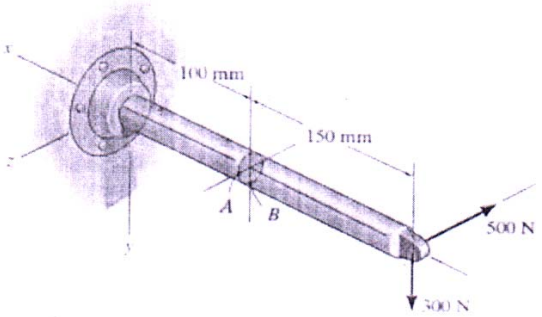


Figure 3

b) Determine the stress resultant at four corners of column subjected to eccentric load of 500 kN, as shown in Figure. 4. **[8]**

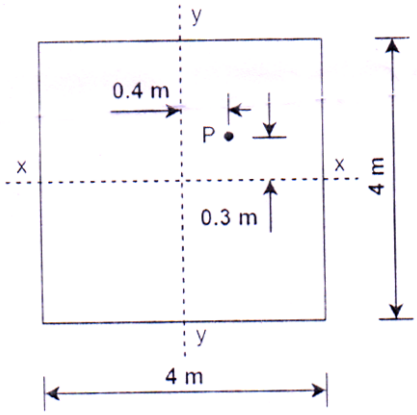


Figure. 4

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Total No. of Questions : 8]

SEAT No. :

PE-4351

[Total No. of Pages : 2

[6582]-125

S.E. (Automobile & Machanical/Automation & Robotics/ Mechanical Sandwhich)

SOLID MODELING & DRAFTING

(2019 Pattern) (Semester - III) (202042)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q.5 or Q.6, Q.7or Q.8***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be draw, wherever necessary.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Explain Constructive Solid Geometry in detail with advantages and disadvantages. **[9]**

b) What is Geometry & Topology? Also differentiate between Sweep & Loft? **[8]**

OR

Q2) a) Explain the concept of Parametric Solid Modeling with its advantages and disadvantages? **[9]**

b) What do you mean by assembly modeling? Also differentiate between bottom up assembly and top down assembly. **[8]**

Q3) a) Given a triangle with corner coordinates (0, 0), (1, 0) and (1, 1). Rotate the triangle 90 degree anticlockwise direction and find out the new coordinates. **[9]**

b) Compare between translation, scaling, rotation. **[9]**

OR

Q4) a) Explain with neat sketches the any two types of coordinate system? **[8]**

b) What is Geometric Projection? Explain any two types of projections in details. **[10]**

P.T.O.

Q5) a) Explain CAD conversion with its advantages and disadvantages? **[8]**

b) Explain CAD Kernels in details with its different types. **[9]**

OR

Q6) a) Explain Computer Aided Engineering with its benefits and applications. **[8]**

b) What is Additive Manufacturing? Explain the 3D printing with principal of working, advantages and disadvantages? **[9]**

Q7) a) Explain in detail Model Based Definitions (MBD). How the MBD approach is different from the traditional approach? **[9]**

b) What is CAD customization? Explain Need for CAD Customization. **[9]**

OR

Q8) a) Write a short note on any two of the following. **[10]**

i) Application Programming Interface (API)

ii) Coding/Scripting for customization.

iii) CAD API and macros.

b) Explain CAD Automation with types and suitable examples? **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-4352

[Total No. of Pages : 3

[6582]-126

S.E. (Mechanical /Automobile & Mechanical) (Mechanical S.W.)

ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - III) (202043)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) State and prove clausius Inequality? **[6]**

b) 5kg of ICE at -5^0C is exposed to atmosphere which is at 30^0C. The ice melts and then comes into thermal equilibrium with the surrounding determine entropy increase of the universe. **[6]**

c) Prove that entropy is the property of the system. **[5]**

OR

Q2) a) Explain **[6]**

i) Entropy

ii) Effectiveness

iii) Second law efficiency.

b) Different between unavailable and available energy. **[6]**

c) 30 kg of copper block, C_p=0.386 kJ/kgk at 95^0C is dropped in 30 liters of water at 24^0C. Assume perfect heat transfer and no heat lost to the surroundings. Find the final equilibrium temperature reached for water and copper block and entropy generation. **[5]**

Q3) a) Write short notes on following terms. **[6]**

i) Critical Point

ii) Enthalpy of Steam

iii) Triple Point

P.T.O.

b) Determine superheated entropy, enthalpy and specific volume for a steam at 20 bar and 250^0C using steam table. **[6]**

c) Draw and explain P-V Diagram for water. **[6]**

OR

Q4) a) Explain Separating and throttling calorimeter. **[6]**

b) Difference between Rankin cycle and Carnot cycle. **[6]**

c) Explain Carnot vapour power cycle with the help of T-S diagram. **[6]**

Q5) a) Write down the advantages and disadvantages of gaseous fuel. **[6]**

b) Explain Boys Gas Calorimeter with a schematic diagram. **[6]**

c) A Carnot vapour power cycle operaters between 20kpa and 800kpa steam pressures. Calculate net work per cycle and cycle efficiency. **[5]**

OR

Q6) a) Explain ORSAT Flue gas analysis. **[6]**

b) A Bomb calorimeter water used to determine the calorific value of a coal sample and the following reading where recorded **[6]**

Mass of coal sample = 1.01gm

Mass of water = 2.5kg

Water equivalent of apparatus = 744gm

Temperature of rise water = 2.59^0C

Temperature correction of cooling = $+0.016^0$c

Determine the calorific value of sample in kJ/kg

Take c_p for water 4.186kj/kg k.

c) Explain Equivalence ratio, Calorific value - HCV & LCV. **[5]**

Q7) a) Define Boiler and Classify The Boilers. **[6]**

b) How much air per kg of coal is burnt in a boiler having chimney height of 32.3m to create a drought of 19mm of water column when the temperature of the flue gases leaving chimney is 370^0C and temperature of boiler house is 29.5^0C. Also calculate the drought produced in terms of hot gas column. **[6]**

c) Explain the procedure to draw the heat balance sheet for a boiler plant.**[6]**

Q8) a) Explain Superheater and Economizer. **[6]**

b) A boiler evaporates 3.6 kg of water per kg of coal is saturated steam at 10 bar. The temperature of feed water is 32^0c. find the euivalent evaporation. From and at 100^0C as well as the factor of Evaporator. **[6]**

c) Explain functions and locations of different boiler mountings. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE-5939

[Total No. of Pages : 2

[6582]-127

S.E. (Automobile & Mechanical Engineering/Mechanical Sandwich Engineering/ Automation & Robotics Engineering)

ENGINEERING MATERIALS AND METALLURGY

(2019 Pattern) (Semester - III) (202044)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q.5 or Q.6, Q.7or Q.8***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be draw, wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.***

Q1) a) What is Equilibrium diagram? Explain its significance / importance. Draw equilibrium diagram for binary alloy. **[8]**

b) What is solid solution? Explain all the types in detail. **[9]**

OR

Q2) a) What do you mean by kinetics of phase transformation? Explain the term - 'Nucleation and Crystal growth' in detail. **[8]**

b) Draw iron and iron carbide equilibrium diagram and show the following points: critical temperatures, phases and reactions. **[9]**

Q3) a) Explain with neat sketch the austenite to bainite transformation. Compare lower bainite and upper bainite with respect to following points: temperature range, appearance, hardness and diagram. **[9]**

b) Explain the process of generation of isothermal transformation diagram? Draw TTT Diagram for Austenite to Martensite Transformation. **[9]**

OR

Q4) a) What is Annealing Process? State all types of Annealing Process? How does it carry out for Hypo and Hypereutectoid alloys? **[9]**

P.T.O.

b) Define hardening process. Show following heat treatments on TTT diagram. **[9]**

i) Conventional hardening.

ii) Interrupted quench hardening

iii) Martempering

iv) Ausforming

Q5) a) Define Steel. Classify the steel on the basis of : **[8]**

i) Amount of carbon.

ii) Amount of alloying elements.

iii) De-oxidation.

b) What are stainless steels? Explain its types in detail. **[9]**

OR

Q6) a) Differentiate between Steel & Cast iron. State & explain the types of cast iron. **[8]**

b) Differentiate between White & Grey Cast Iron. **[9]**

Q7) a) Classify the Copper Alloys. State & explain in detail the types of α brass. **[9]**

b) What are the general properties and uses of Nickel. Enlist the Nickel Alloys. Write properties, composition and applications of any two Nickel Alloys. **[9]**

OR

Q8) a) Enlist the Bearing Materials. Write properties, composition and applications of any two Bearing Materials. **[9]**

b) Explain in detail the process of Age Hardening. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PE-4353

[Total No. of Pages : 3

[6582]-128

S.E. (Automobile&Mechanical/Mechanical Sandwich) ELECTRICAL AND ELECTRONICS ENGINEERING (2019 Pattern) (Semester - III) (203156)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Draw the characteristics curves of a DC shunt motor and explain the same briefly. **[6]**

b) A 200 V, 4 pole lap wound DC shunt motor has 800 conductors on its armature. The resistance of armature winding is 0.5 Ω and that of shunt field winding is 200 Ω. The motor takes current of 21 A and flux per pole is 30 mWb. Find the speed and gross torque developed in motor. **[6]**

c) What is braking in a motor? Explain regenerative braking of DC shunt motor with the help of neat diagrams. **[6]**

OR

Q2) a) Derive the expression for armature torque developed in a DC motor.**[6]**

b) A 230V DC shunt motor runs at 800 rpm and takes armature current of 50A. Find the resistance to be added to the field circuit to increase speed to 1000 rpm at an armature current of 80A. Assume flux proportional to field current. Given that :

Armature resistance = 0.15 Ω and field winding resistance = 250Ω.**[6]**

c) Enlist the parameters on which speed of a DC motor depends. Explain the field control method used for controlling speed of a DC shunt motor. **[6]**

P.T.O.

Q3) a) Describe in brief the frequency control method for the speed control of a three phase induction motor with the help of block diagram. **[6]**

b) A 6 pole, 50 Hz, three phase induction motor has a rotor impedance of (0.025 + j0.1) Ω at standstill. Determine (i) synchronous speed (ii) the speed and the corresponding slip at which maximum torque occurs (iii) the additional resistance per phase that must be connected in series with the rotor to obtain maximum torque at starting (iv) the value of slip at which maximum torque occurs and corresponding speed if an external resistance of 0.025 Ω is connected in series with the rotor. **[6]**

c) Draw the power flow diagram of a three phase induction motor. **[5]**

OR

Q4) a) Derive the generalised torque equation of a three phase induction motor and hence obtain the condition for maximum torque. **[6]**

b) A 415 V, 4 pole, 50 Hz three phase induction motor is running at a speed of 1440 rpm at full load produces an output of 53.66 kW. If the stator losses are 1.5 kW and friction and windage losses are 2.5 kW, determine (i) gross mechanical power developed by the rotor (ii) power input to the rotor (iii) rotor copper loss per phase (iv) power input to the motor (v) % motor efficiency **[6]**

c) Draw a neat sketch and explain the operation of a star-delta type starter used for starting a three phase induction motor. **[5]**

Q5) a) State and explain the subsystems of an Hybrid Electric Vehicle (HEV) with the help of suitable diagram **[6]**

b) Elaborate the impact of usage of EV on power grid **[6]**

c) Differentiate between a Conventional Vehicle and an Electric Vehicle with the help of six significant points **[6]**

OR

Q6) a) Explain the configuration and subsystems of a series-Parallel Hybrid EV with the help of suitable diagram. **[6]**

b) Explain Vehicle to Grid (V2G) Technology with the help of suitable diagram. **[6]**

c) Differentiate between Plug-in EV and Hybrid EV. **[6]**

Q7) a) Specify the following about NMC battery :

Voltage, specific energy, C-rate, cycle life, thermal runaway and applications. **[6]**

b) Explain characteristics and speed control of BLDC motor. **[6]**

c) Elaborate the factors used in selecting a battery for an EV. **[5]**

OR

Q8) a) Differentiate between a battery and a fuel cell. **[6]**

b) Explain the operation of a three phase induction motor drive for an EV with the help of a block diagram. **[6]**

c) State advantages and disadvantages of LFP Battery. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE4354

[Total No. of Pages : 3

[6582]-129
S.E. (Mechanical-Sandwich)
FLUID MECHANICS AND MACHINERY
(2019 Pattern) (Semester - IV) (202062)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or Q.6, Q. No. 7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of a calculator is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Derive an expression for maximum power transmitted through the pipe. **[8]**

b) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow. **[9]**

OR

Q2) a) Assuming the viscous force F exerted by a fluid on sphere of diameter D depends on viscosity (μ), mass density (ρ) and velocity of sphere (v). Obtain expression for the viscous force. **[8]**

b) Explain the concept of equivalent pipe and derive Dupit's Equation. **[9]**

Q3) a) Explain the term unit speed, unit discharge and unit power And derive the expression for the same. **[9]**

b) A 7.5 cm diameter jet having velocity of 12 m/s impinges on a smooth plate at an angle of 60° to the normal to the plate. What will be the force when **[9]**

i) The plate is stationary and

ii) When the plate is moving in the direction at jet at 6 m/s. Determine the work done per second on the plate in each cases.

OR

P.T.O.

Q4) a) State the difference between impulse and reaction turbine. **[9]**

b) A pelton wheel has 2.5m of diameter operates under a following conditions

Net Head = 300 m

Speed = 300 rpm

Jet deflection angle = 165°

Cv = 0.98, Jet Diameter = 0.2 m

Relative velocity at outlet = 0.95 times relative velocity at inlet.

Mechanical efficiency = 95%

Calculate the power delivered by the runner, speed ratio, Hydraulic Efficiency, Overall efficiency and. Draw velocity triangle. **[9]**

Q5) a) What is specific speed of turbine? State its significance and derive an expression for the same. **[9]**

b) A reaction turbine works at 450 rpm under head of 120 m, diameter at inlet is 120 cm and flow area is 0.4m^2. Angles made by absolute and relative **[9]**

velocity are 20° and 60° respectively at inlet. Determine

i) volume flow rate

ii) Power developed

iii) Hydraulic efficiency

Assume whirl velocity at outlet is zero.

OR

Q6) a) Compare Francis and kaplan Turbine. **[9]**

b) A Kaplan Turbine working under head of 20m develops 11772 kW shaft power. **[9]**

Outer diameter = 3.5 m

Hub diameter = 1.75 m

Guide blade angle at extreme edge of runner is 35°

Hydraulic efficiency = 87%

Overall efficiency = 84%

Determine:

i) Vane angle at extreme edge.

ii) Speed of turbine

iii) Specific speed.

Q7) a) Derive the expression for rise in pressure in the impeller of a centrifugal pump **[8]**

b) A centrifugal pump having outer diameter equal to two times inner diameter and running at 1200 rpm works against a total head of 75 m. The velocity of flow through the impeller is constant and equal of 3m/s. The vanes are set back at width at an angle 30º at outlet. If the outer diameter of the impeller is 600 mm and width at outlet is 50 mm, determine; **[9]**

i) Vane angle at inlet

ii) Work done per second by impeller

iii) Manometric efficiency

OR

Q8) a) Explain multistaging in a centrifugal pump and explain the methods used for multistaging. **[8]**

b) A centrifugal pump running at 800 rpm is working against a head of 20.2m. The external diameter of impeller is 480 mm and its width is 60 mm. If the vane angle at exit is 40º and manometeric efficiency is 70% find, **[9]**

i) Flow velocity at outlet

ii) Absolute velocity of water leaving the vane

iii) Angle made by the absolute velocity at outlet with direction of motion at the outlet

iv) Discharge

v) Specific speed

Total No. of Questions : 8]

SEAT No. : ____

PE4355

[Total No. of Pages : 2

[6582]-130
S.E. (Mechanical-Sandwich)
MANUFACTURING ENGINEERING
(2019 Pattern) (Semester - IV) (202063)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary and mention it clearly.***

Q1) a) Discuss DCEP and DCEN in case of ARC welding. **[5]**

b) Explain SAW (Submerged Arc Welding) process with neat sketch. **[5]**

c) Distinguish between arc and gas welding process from the point of view of : Heat concentration, temperature, ease of operation and running cost.**[7]**

OR

Q2) a) What are functions of coatings on a FCAW electrode? **[5]**

b) What is the equation for heat generation in resistance welding? Explain the process parameters in resistance welding process. **[5]**

c) Briefly describe the oxyacetylene welding equipment with neat sketch.**[7]**

Q3) a) What are the elements of metal cutting? Explain with neat figure. **[5]**

b) What are the functions of cutting fluids? **[5]**

c) The tool life of high speed steel (HSS) tool and carbide tool have the same tool life of 60 minutes at a cutting speed of 75m/min. The exponent of tool life in Taylor's equation "n" is 0.15 for HSS, while it is 0.2 for carbide tool. Compare tool life for the two tools at a speed of 90m/min. **[8]**

OR

P.T.O.

Q4) a) Explain the relation between tool life and cutting speed? What other parameters will effect on tool life? **[5]**

b) Find the time required for machining a work-piece of 50 mm diameter, 350 mm length, turn all over in 4 passes. Approach length is 2 mm, Over-travel is 3 mm, the feed = 0.5 mm/rev and cutting speed is 50m/min.**[5]**

c) Explain in detail different types of tool wear. What are the effects of excessive tool wear? **[8]**

Q5) a) A hole of 30 mm diameter and 80 mm depth is to be drilled. The suggested feed is 1.3 mm/rev and cutting speed is 62m/min. Assuming tool approach and tool over travel of 6mm, calculate: **[5]**

i) Spindle RPM and

ii) Cutting time

b) Explain different operations performed on drilling machine. **[5]**

c) Draw a neat sketch of up milling and down milling operation. Compare based on following points: **[7]**

i) Cutting force required

ii) Surface finish

iii) Ease of fixture design,

iv) Reach of cutting fluid

OR

Q6) a) Write a note on horizontal milling machine. **[5]**

b) Suggest a suitable milling operation for making a hexagonal bolt head and explain it. **[5]**

c) Index for 51 divisions by compound indexing using following Brown and Sharpe Plate. **[7]**

Plate 1 - 15, 16, 17, 18, 19, 20, holes

Plate 2 - 21, 23, 27, 29, 31, 33 holes

plate 3 - 37, 39, 41, 43, 47, 49 holes

Q7) a) Discuss the factors affecting on selection of grinding wheel. **[5]**

b) Sketch and explain horizontal spindle surface grinding machine. **[5]**

c) Draw a neat sketch of a pull type of broach. Explain the significance of each part. **[8]**

OR

Q8) a) Explain the Standard Marking System of a grinding wheels. **[5]**

b) Explain the terms ‘truing’ and ‘dressing’ in grinding wheels. **[5]**

c) Discuss the following terms in brief: **[8]**

i) Lapping,

ii) Honing

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Total No. of Questions : 8] **SEAT No. :**

PE4356 **[Total No. of Pages : 3**

[6582]-131

S.E. (Mechanical-Sandwich)

THERMAL ENGINEERING

(2019 Pattern) (Semester - IV) (202061)

Time : 2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables, slide rule, Steam table, Psychrometric Chart. And electronic pocket calculator is allowed.***
4) ***Figures to right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define the following terms **[8]**

i) Dry Blub Temperature

ii) Wet Bulb Temperature

iii) Wet Blub depression

iv) Relative humidity

b) Explain on the Psychrometric Chart following Processes **[9]**

i) Sensible Cooling

ii) Sensible Heating

iii) Cooling & Dehumidification

iv) Cooling & Humidification

OR

Q2) a) Atmospheric air with dry bulb temperature of 28 °C and Wet bulb temperature of 17 °C is cooled to 15 °C without changing its moisture content. Find **[8]**

i) Original relative humidity

ii) Final relative humidity.

iii) Final wet bulb temperature.

b) How the air conditioning systems are classified and explain the Split air conditioning system with neat sketch. **[9]**

P.T.O.

Q3) a) Explain Briefly Otto Cycle with the help of P-V & T-S diagram, and derive an expression for ideal efficiency of Otto cycle. **[8]**

b) Compare Air standard cycle, fuel cycle and actual cycle for petrol engine **[9]**

OR

Q4) a) Explain Closed Cycle Gas Turbine with reheating and derive expression for thermal efficiency **[8]**

b) Calculate the ideal air-standard cycle efficiency of a petrol engine operating on Otto cycle. The cylinder bore is 50 mm, a stroke is of 75 mm and the clearance volume is of 21.3 cm^3. **[9]**

Q5) a) Explain with neat sketch battery ignition system. **[8]**

b) Explain the Supercharging &Turbocharging with neat sketch, also give advantages of Turbocharging over supercharging. **[9]**

OR

Q6) a) Explain the air-cooling system and what are its advantages and disadvantages? **[8]**

b) What is necessity of lubrication system and what are different types Lubrication systems and explain any one? **[9]**

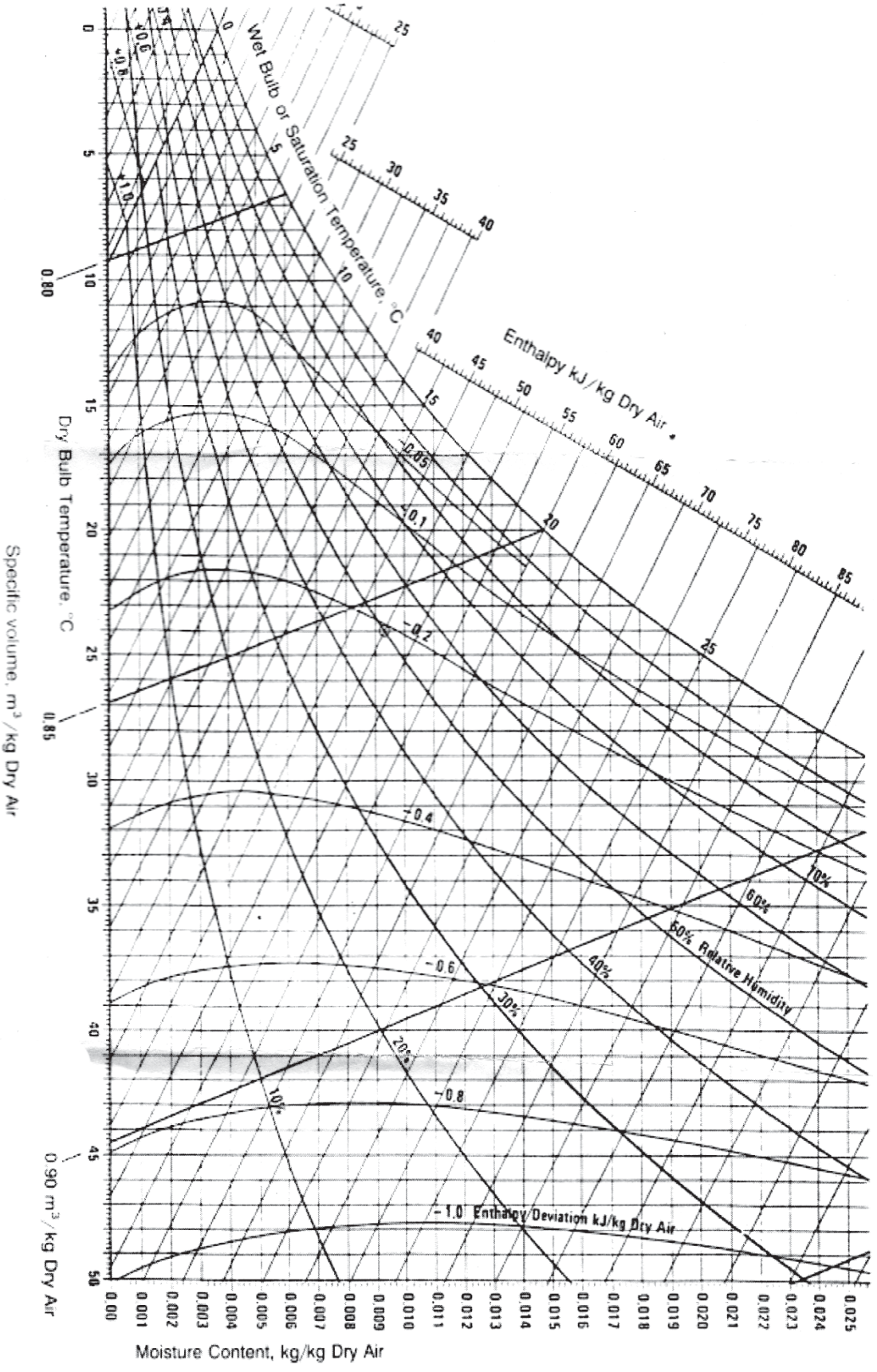
Q7) a) Explain stages of combustion in SI engine with P-θ diagram **[9]**

b) Explain Normal combustion and abnormal combustion Phenomena in S I engine **[10]**

OR

Q8) a) What are the different methods of emission control in SI engine? **[9]**

b) An IC engine uses 6 kg of fuel having calorific value 44000 KJ/kg in one hour. The IP developed is 18 KW. The Temperature of 11.5 kg of cooling water was found to rise through 25 ºC per minute. The temperature of 4.2 kg of exhaust gas with specific heat 1 KJ/kg K was found to rise through 220 °C. Draw the heat balance sheet for the engine. **[10]**


Wet Bulb or Saturation Temperature, °C
Enthalpy kJ/kg Dry Air
Dry Bulb Temperature, °C
Specific volume, m³/kg Dry Air
0.80
0.85
0.90 m³/kg Dry Air
-0.05
-0.1
-0.2
-0.4
-0.6
-0.8
-1.0 Enthalpy Deviation kJ/kg Dry Air
10%
20%
30%
40%
50% Relative Humidity
60%
Moisture Content, kg/kg Dry Air

✡ ✡ ✡

Total No. of Questions : 8]

SEAT No. :

PE4357

[Total No. of Pages : 2

[6582]-132
S.E. (Automation and Robotics)
PRINCIPLES OF ROBOTICS
(2019 Pattern) (Semester - IV) (202524)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw an adaptable gripper and describe its practical use. **[4]**

b) Based on its control perspective, categorize the robot gripper. Draw and describe the operation of a mechanical robot gripper. **[6]**

c) Explain characteristics of Grippers. **[8]**

OR

Q2) a) Explain the design consideration for selection of gripper. **[4]**

b) Sketch and explain magnetic gripper with its industrial application. **[6]**

c) Derive an expression for velocity of End effectors of a Cartesian configuration. **[8]**

Q3) a) What kinds of sensors are there? Classify them out. Sketch a torque sensor in work and describe its usage. **[4]**

b) What are safety sensors? Discuss the use of light curtain in industrial robots. **[6]**

c) Distinguish between tactile and no-tactile sensors. Sketch and explain the working of an acoustic sensor. **[7]**

OR

Q4) a) Explain sensor selection and design consideration for robotic application. **[4]**

b) Discuss response, accuracy and sensitivity in relation to robot sensors. Explain the working of proximity and range sensors. **[6]**

c) Differentiate between incremental and absolute encoders. Draw an illustration of an optical encoder, describe how it operates, and list its uses. **[7]**

P.T.O.

Q5) a) Discuss the properties of translation and rotation operators. **[4]**

b) A point P (6,4,1) is attached to a robot frame and subjected to following transformation. Find the coordinate of point relative to reference frame. **[6]**

i) Rotation of 60º about *Z*-axis.

ii) Followed by rotation of 60º about *Y*-axis.

iii) Followed by translation of [2, –3, 7].

c) Explain the steps involved in DH parameters for 2 DOF Robot. **[8]**

OR

Q6) a) What are homogeneous transformations of coordinates? Write the homogeneous transformation matrix for translation in 3D space. **[4]**

b) A point P (7, 4, 1) is attached to a robot frame and subjected to following transformation. Find the coordinate of point relative to reference frame. **[6]**

i) Rotation of 60º about *Z*-axis.

ii) Followed by rotation of 70º about *Y*-axis.

iii) Followed by translation of [4, –3, 5].

c) Explain the steps involved in DH parameters for 2 RP Robot. **[8]**

Q7) a) Write note on robot welding application. **[4]**

b) What is robot software and explain common software elements of a robot. **[6]**

c) Write a program to write below letters by Robot using VAL Language. **[7]**

A R

OR

Q8) a) Sketch and explain with suitable example "A Robot program as a path in space". **[4]**

b) Write short notes on: **[6]**

i) Robot cell design

ii) Robots in non-manufacturing applications.

c) Write a program to assemble nut and bolt by Robot using VAL Language. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PE4358

[Total No. of Pages : 2

[6582]-133
S.E. (Automation and Robotics)
FLUID AND THERMAL ENGINEERING
(2019 Pattern) (Semester - IV) (202523)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer four questions from the following.***
2) ***Draw neat labeled diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of nonprogrammable electronic calculator is permitted.***
4) ***Assume suitable data, if necessary.***

Q1) a) Two tanks A and B have a 70m difference in water levels and are connected by a pipe 0.25 m diameter and 6 km long with 0.002 friction coefficient. The pipe is tapped at its mid-point to leak out 0.04m^3/s flow rate. Minor losses are ignored. Determine the discharge leaving tank A? Find the discharge entering tank B. **[9]**

b) Explain the concept of siphon and its working with neat sketch. Give any two application of siphon. **[9]**

OR

Q2) a) What are major and minor losses? Derive an expression for the Darcy-Weisbach equation. **[9]**

b) A siphon of diameter 0.1 m connects two reservoirs having a difference in elevation of 15m. The length of the siphon is 400 m and summit is 2m above the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 200m. Determine the discharge through the siphon and also pressure at the summit. Consider minor loss due to entry and exit. Take coefficient of friction f = 0.005. **[9]**

Q3) a) Explain with sketch working of following control valve **[8]**

i) Butterfly valve

ii) Globe valve

b) What is a hydraulic actuator? Discuss the construction and working of the Actuator with a sketch. **[9]**

OR

P.T.O.

Q4) a) Discuss the any two desired characteristics of control valves. With the help of neat diagram, explain the working of the ball valve. **[8]**

b) Write a note on **[9]**

i) Electric actuator
ii) Solenoid actuator, and
iii) Digital actuator

Q5) a) A single-cylinder, single-acting reciprocating air compressor has a cylinder of 25cm diameter with stroke length of 50 cm and a linear piston speed of 100 rpm. It takes in air at 100 kN/m^2 and delivers at 1000kN/m^2, Determine the indicated power of the compressor. Assume the law of compression to be $pv^{1.25}$ = Constant. The temperature of the air at the inlet is 288K. Neglect clearance effect. **[9]**

b) Draw a P-V diagram for a two-stage compressor with perfect intercooling. Derive an expression for ideal intercooler pressure (P_2). **[8]**

OR

Q6) a) A single stage, single acting reciprocating compressor has air entering at 1 bar, 20ºC and compression is polytrophic compression with index 1.2 up to delivery pressure of 10 bar. The compressor run at speed of 250 rpm and has L/D ratio of 1.5. The compressor has mechanical efficiency of 90%. Determine the isothermal efficiency and cylinder dimensions. Also find out the rating of drive required to run the compressor which admits $1m^3$ of air per minute. **[9]**

b) Explain with a neat sketch the working of the centrifugal compressor. Give any two application. **[8]**

Q7) a) A plane brick wall is 25cm thick if faced with 15cm thick concrete layer. If the temperature of the exposed brick face is 70ºC and that of the concrete is 25ºC, Find out the heat lost per hour through a wall of 15m×10m. Also, determine the interface temperature. Thermal conductivity of brick and concrete are 0.7W/mK and 0.95 W/mK resp.**[9]**

b) Write short note on **[9]**

i) Thermal Insulation
ii) Heat pipe
iii) Electric cooling

OR

Q8) a) Derive general three-dimensional heat conduction equation in Cartesian coordinates. Also, deduce the equation in simplified forms. **[9]**

b) A furnace wall is made up of three layers of thicknesses 250mm, 100mm, and 150mm with thermal conductivity of 1.65 W/mºC, kW/mºC and 9.2W/mºC, respectively. The inside layer of the wall is exposed to gases at 1250 ºC with a convective coefficient of $25W/m^2$ ºC and the inside surface is at 1100 ºC, the outside surface is exposed to air at 25ºC with a convection coefficient of $12W/m^2$ ºC. Determine **[9]**

i) The unknown thermal conductivity k
ii) The overall heat transfer coefficient
iii) All surface temperatures

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Total No. of Questions : 8]

SEAT No. :

PE-4359

[Total No. of Pages : 3

[6582]-134

S.E. (Automation & Robotics Engineering)

ELECTRICAL TECHNOLOGY

(2019 Pattern) (Semester - III) (202521)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q1 or Q2; Q3 or Q4; Q5 or Q6; Q7 or 08.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Sketch a typical torque-slip characteristic of a three-phase induction motor. Explain its nature. What is the effect of increasing the rotor resistance on this characteristic? **[6]**

b) Distinguish between squirrel cage and slip ring induction motors. **[6]**

c) Explain the working principle, construction and working of a linear induction motor. **[6]**

OR

Q2) a) Write any two applications each in case of following motors. **[6]**

i) Linear induction motor

ii) Slip ring induction motor

iii) Capacitor spilt phase motor

b) Draw and explain the equivalent circuit of a three-phase induction motor. **[6]**

c) Draw a neat schematic of a star- delta starter for three phase induction motor and explain its operation. **[6]**

P.T.O.

Q3) a) What is a brushless alternator? Explain its working principle. **[6]**

b) Derive an expression for induced emf of an alternator. **[6]**

c) Discuss the factors deciding the size of a motor for an industrial application. **[5]**

OR

Q4) a) What are synchronous machines? Describe construction of a synchronous machine with the help of suitable diagrams. **[6]**

b) State any two applications for each of the following machines: **[6]**

i) Stepper Motor

ii) Servo Motor

iii) Universal Motor

c) What is a duty cycle in case of electric motors? State the types of duty cycles for electric motors. **[5]**

Q5) a) Draw the typical layout of power systems structure involving generation and utilisation of electrical power. **[6]**

b) Compare the DC and AC systems for transmission and distribution. **[6]**

c) Classify the types of HVDC links. Discuss the applications of each of these links. **[6]**

OR

Q6) a) Draw the line diagram of the typical HVDC transmission system and explain it detail. **[6]**

b) Explain the necessity of EHV transmission lines as an essential part of the grid. **[6]**

c) Briefly discuss the advantages and operational problems of HVDC transmission system. **[6]**

Q7) a) Derive the transfer function of an armature controlled dc servomotor with usual notations. **[6]**

b) Using the block diagram reduction technique, determine the transfer function C(s)/R(s) for the system shown in Fig. 1 **[6]**

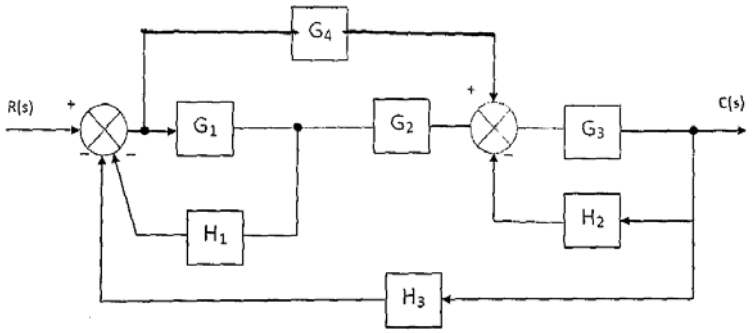


Fig.1

c) An electrical system is represented using R, L and C as shown in the Fig.2. Write the equations that describes the behaviour of this system in time domain and hence determine $E_0(s)/E_m(s)$. **[5]**

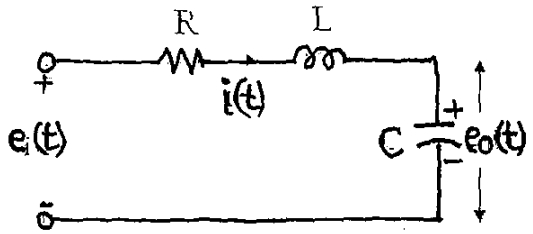


Fig.2

OR

Q8) a) Distinguish between open loop and closed loop control system with any six significant points. **[6]**

b) Using Mason's gain formula, determine the transfer function C(s)/R(s) for the signal flow graph shown in the following Fig.3. **[6]**

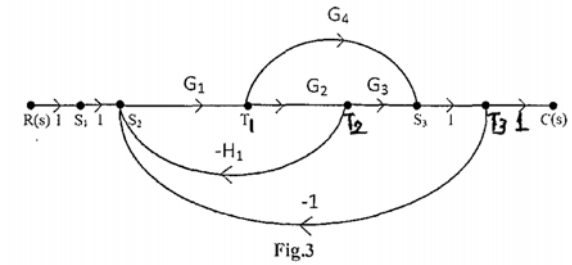


Fig.3

c) Elaborate the use of a potentiometer as a component of a control system. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4360

[Total No. of Pages : 3

[6582]-135
S.E. (Automation & Robotics Engineering)
INDUSTRIAL ELECTRONICS
(2019 Pattern) (Semester - III) (202522)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) State and explain the types of programming languages used in PLC. **[6]**

b) State the types of timers. Explain on delay timer operation with diagram. **[6]**

c) Draw a ladder diagram for stepper motor control. **[6]**

OR

Q2) a) Explain the rules for constructing the ladder diagram of PLC. **[6]**

b) Explain the types of counters with their timing diagram. **[6]**

c) Draw the ladder diagram for traffic light controller for following

Switch I1 is used to start and I2 is used to stop the cycle. There will be three lamps red, yellow and green lamps as output. **[6]**

Q3) a) Explain MODBUS Protocol used in PLC. **[6]**

b) State the need of HMI in Industrial Automation. **[6]**

c) What are the functions of HMI. **[5]**

OR

Q4) a) Explain the types of HMI? **[6]**

b) List out the Communication Protocols used in PLC. Explain any two. **[6]**

c) Discuss about RS 485 Serial Communication. **[5]**

P.T.O.

Q5) a) Explain the types of models in Batch Process. **[6]**

b) Develop PLC Programming Batch Process ladder logic program according to logic given below, **[6]**

i) Ingredient A is sent to the tank first by energizing solenoid 1. The flow meter gives one pulse for every gallon of flow. Solenoid Valve will be open until 200 gal has poured in.

ii) After ingredient A is in the tank, 200 gal of ingredient B should be added. The process of adding follows the same procedure as ingredient A.

iii) Once step 2 is done, the mixer motor starts and runs for 10s.

iv) After mixing is complete, solenoid 3 should open, let the mixed batch goes to the finished tank.

v) When the tank is empty, the low-level sensor turns ON to open solenoid 3 to close and restarts the process again.

c) Define recipe as per ANSI/ISA S88 standard. Explain its types. **[6]**

OR

Q6) a) What is Extrusion? Explain in detail types of extrusion? **[6]**

b) Develop ladder logic program for Multiple Pumps Control according to the logic given below : **[6]**

i) The start/stop push button is provided for control of the two input pump motors P1 and P2.

ii) The Start/Stop pushbutton station is operated to control pump P1.

iii) When the tank is full drain pump motor P3 is started automatically and runs until the low-level sensor is actuated.

iv) After 3 fillings of the tank by pump P1 control automatically shifts to pump P2.

v) The operation of the start/stop pushbutton now controls pump P2.

vi) After 3 fillings of the tank by pump P2, the sequence is repeated.

c) Explain in brief (i) Batch Process (ii) Discrete Control. **[6]**

Q7) a) Compare CMOS and TTL logic family. **[6]**

b) Define the following terms : **[6]**

i) Power Dissipation

ii) Propagation delay

iii) Noise Margin

c) Explain with a neat diagram CMOS NOR gate. **[5]**

OR

Q8) a) Explain the concept of Tristate logic. **[6]**

b) What is logic family? Give comparisons between TTL, ECL and CMOS logic families. **[6]**

c) Explain with a neat diagram CMOS inverter. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PE4361

[Total No. of Pages : 4

[6582]-136
S.E. (Mechatronics Engineering)
KINEMATICS OF MACHINERY
(2019 Pattern) (Semester - IV) (217547)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Use of drawing instruments,electronic pocket calculators are allowed.***
4) ***Figure to the right indicates full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) In the mechanism shown in Fig.1, the slider C is moving to the right with a velocity of 1 m/s and an acceleration of 2.5 m/s^2.The dimensions of various links are AB = 3 m inclined at 45° with the vertical and BC = 1.5 m inclined at 45° with horizontal. Determine:

i) The magnitude of vertical and horizontal component of the acceleration of the point B, and

ii) The angular acceleration of the links AB and BC. **[10]**

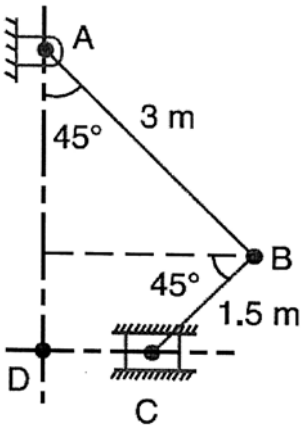


Fig.1

b) Explain the Concept of Acceleration Image Principal **[4]**

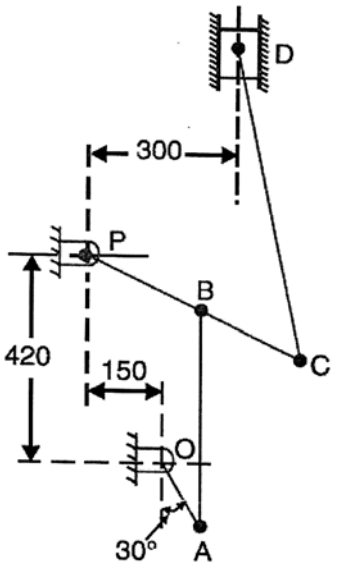
c) Explain the Concept rubbing velocity at a pinpoint. **[4]**

OR

P.T.O.

Q2) a) Find out the acceleration of the slider D and the angular acceleration of link CD for the engine mechanism shown in Fig.2. The crank OA rotates uniformly at 180 r.p.m. in clockwise direction. The various lengths are: OA = 150 mm ;

AB = 450 mm; PB = 240 mm ; BC = 210 mm ; CD = 660 mm. **[10]**



All dimensions in mm.

Fig.2

b) Locate all the instantaneous centers of the slider crank mechanism as shown in Fig.3 The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, **[8]**

Find :

i) Velocity of the slider A, and

ii) Angular velocity of the connecting rod AB.

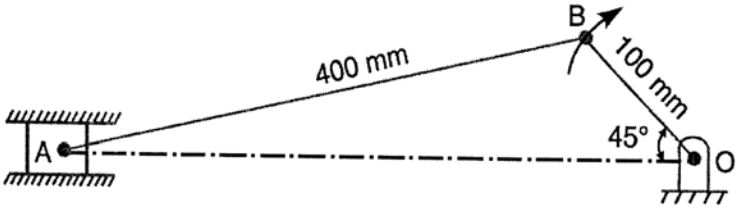


Fig.3

Q3) a) Synthesize a four bar mechanism by the method of Inversion.

Assume the following data: **[10]**

i) Length between fixed points 80 mm and input link length is 25mm.

ii) Initial position of input link 60 degree 2-Position of input link from the initial position 30°and 60°.

iii) 2-Position of the output link from the initial position 20° and 40°.

b) Explain the terms Motion Generation. **[3]**

c) Explain Precision positions related to synthesis of Mechanisms. **[4]**

OR

Q4) a) Using frudenstine's equation design a four bar mechanism to generate the function $Y = x^{1.4}$ for an interval in X : from 1 to 4. The input link is to start from 30° and is to have a range of 90°, the output link is to start from 90°, and is to have a range of 90°, Use three point chebyshev spacing. Take the length of fixed link as 50 mm. **[10]**

b) Derive the Frudenstine's equation of four bar Mechanism. **[7]**

Q5) a) Draw neat labeled diagram of gear tooth Terminology. **[7]**

b) A pair of gears, having 40 and 20 teeth respectively, are rotating in mesh, the speed of the smaller being 2000 r.p.m. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are 20° involute form, addendum length is 5 mm and the module is 5 mm. Also find the angle through which the pinion turns while any pairs of teeth are in contact. **[10]**

OR

Q6) a) Define the following terms related to gears : **[8]**

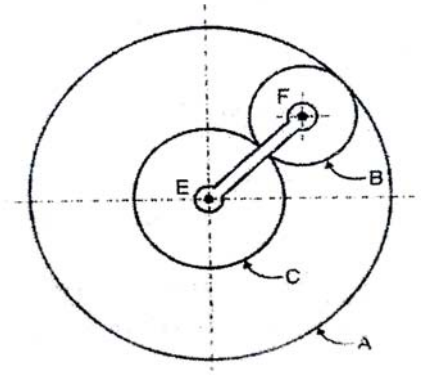
i) Backlash in gears

ii) Working depth of gear tooth

iii) Formative number of teeth for Helical gear

iv) Helix angle

b) An epicyclic gear consists of three gears A, B, and C as shown in Fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C. **[9]**



Q7) a) A cam is to give the following motion to a knife-edged follower : **[12]**

i) Outstroke during 60° of cam rotation;
ii) Dwell for the next 30° of cam rotation;
iii) Return stroke during next 60° of cam rotation, and
iv) Dwell for the remaining 210° of cam rotation.

The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm.

The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

b) What is Industrial Automation? And explain its types. **[6]**

OR

Q8) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below: **[18]**

a) To raise the valve through 50 mm during 120º rotation of the cam;
b) To keep the valve fully raised through next 30°;
c) To lower the valve during next 60°; and
d) To keep the valve closed during rest of the revolution i.e. 150º;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of the stroke is offset 15 mm from the axis of the cam shaft. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m. Draw the displacement, the velocity and the acceleration diagrams for one complete revolution of the cam.



Total No. of Questions : 8]

SEAT No. :

PE4362

[Total No. of Pages : 3

[6582]-137
S.E. (Mechatronics Engineering)
FLUID MECHANICS & MACHINERY
(2019 Pattern) (Semester - IV) (217548)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Derive an expression of velocity & shear stress distribution for laminar fluid flow passing through parallel plates. **[7]**

b) Explain Displacement thickness, Momentum thickness and Energy thickness with mathematical expression. **[6]**

c) A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300 mm at the rate of 300 liters per sec. Find the head lost due to friction for a length of 50 m of the pipe. **[5]**

OR

Q2) a) Derive an expression for Darcy-Weisbach equation. **[6]**

b) A fluid of viscosity 0.7 Ns/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 100mm. The maximum shear stress at the pipe wall is given as 196.2 N/m^2. Find the **[5]**

i) Pressure gradient

ii) Reynold number of the flow

iii) Average velocity

c) Derive an expression of velocity & shear stress distribution for laminar fluid flow passing through parallel plates. **[7]**

P.T.O.

Q3) a) State and explain Buckingham's Pi theorem. **[3]**

b) Write a short note on following **[8]**

i) Reynold's model law

ii) Froude model law

iii) Euler model law

iv) Weber model law

c) Determine the dimensions of the quantities given below. **[6]**

i) Volume

ii) Area

iii) Force

iv) Torque

v) Work done

vi) Discharge

OR

Q4) a) Determine the dimensions of the quantities given below. **[3]**

i) Density

ii) Kinematic viscosity

iii) Dynamic viscosity

b) The pressure difference ΔP in a pipe of diameter D and length l, due to viscous flow depends upon the velocity V, viscosity μ, density ρ. Using Buckingham's π - theorem, obtain an expression for ΔP. **[7]**

c) Write a short note on Dimensionless number and their significance (give any four) **[7]**

Q5) a) Explain construction and working principle of Pelton turbine with application. **[7]**

b) Explain the working principle of kaplan turbine with neat sketch. **[7]**

c) Differentiate impulse and reaction turbine. **[4]**

OR

Q6) a) Explain construction and working principle of Francis turbine with application. Draw velocity diagram for Francis turbine. **[9]**

b) Explain the classification of Turbine based on hydraulic action, direction of flow and specific speed in detail. **[9]**

Q7) a) Draw Velocity diagram for centrifugal pump. **[5]**

b) What is a centrifugal pump? Write the classification of centrifugal pumps. **[6]**

c) Explain in detail classification of hydraulic pump. **[6]**

OR

Q8) a) The internal and external diameter of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are 20 and 30 respectively. The water enters the impeller radially and velocity of flow is constant. Determine the flow velocity and work done by the impeller per unit weight of water. **[9]**

b) Explain the working principle of reciprocating pump. Also classify different types of the reciprocating pump. **[8]**

* * *

Total No. of Questions : 8]

SEAT No. :

PE4363

[Total No. of Pages : 2

[6582]-138
S.E. (Mechatronics Engineering)
ELECTRICAL MACHINES AND DRIVE
(2019 Pattern) (Semester - IV) (217549)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable calculator is permitted.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain construction and working of synchronous motor with neat diagram. **[9]**

b) A 3-phase 10 KVA, 400V, 50Hz star-connected alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5 ohm and synchronous reactance is 10 ohm, find the torque angle and voltage regulation. **[8]**

OR

Q2) a) In a 50 KVA, star-connected, 440V, 3-phase, 50Hz alternator, the effective armature resistance is 0.25 ohm per phase. The synchronous reactance is 3.2 ohm per phase the leakage reactance is 0.5 ohm per phase. Determine at rated load and unity power factor: **[9]**

i) internal emf

ii) no load emf

iii) percentage voltage regulation at full load

iv) value of synchronous reactance which replaces armature reaction.

b) With a neat phasor diagram explain effect of armature reaction in synchronous machine. **[8]**

P.T.O.

Q3) a) With the help of neat sketch explain the block diagram of Electrical Drives. Also state the advantages of the same. **[9]**

b) A drive has following parameters: **[8]**

$J = 10$ kg-m^2, $T = 100\text{-}0.1N$, N-m, Passive load torque $T_1 = 0.05N$, N-m, where N is the speed in rpm.

Initially the drive is operating in steady-state. Now it is reversed. For this motor characteristics is changed to $T = -100\text{-}0.1N$, N-m. Calculate time of reversal.

OR

Q4) a) Write a short note on Load Equalisation. **[9]**

b) Explain the different selection criteria's of Electrical Drive. **[8]**

Q5) a) A 220V, 970 rpm, 100A dc separately excited motor has armature resistance of 0.05 ohm. It is braked by plugging from initial speed of 100 rpm Calculate. **[9]**

i) Resistance to be placed in armature circuit to limit braking current to twice the full load value.

ii) Braking torque

iii) Torque when speed fallen to zero

b) Derive the expression for Transient Analysis of Separately Excited Motor with Armature Control. **[9]**

OR

Q6) a) Explain the operation of Ward-Leonard Drive with the help of suitable diagram. Also state the applications of the same. **[9]**

b) Explain the operation of 3-phase rectifier control of separately excited dc motor. **[9]**

Q7) a) Differentiate between a PMAC motor and a BLDC motor. **[9]**

b) Explain in details static scherbius in details. **[9]**

OR

Q8) a) Explain closed loop control of CSI Drive. State the advantage of the same. **[9]**

b) State whether a single phase induction motor is self-starting. Explain in brief any two method of braking a single phase induction motor. **[9]**

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Total No. of Questions : 8] **SEAT No. :**

PE4364 **[Total No. of Pages : 2**

[6582]-139

S.E. (Mechatronics Engineering)

SENSORS AND ACTUATORS

(2019 Pattern) (Semester - IV) (217550)

Time : 2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Use of Non-Programmable Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Enlist the different types of pressure transducers. Explain any one in detail. **[9]**

b) With neat diagram explain the ultrasonic flow meter. **[8]**

OR

Q2) a) Write a short note on magnetic flow meters. **[8]**

b) Explain in brief the chemical sensors. **[9]**

Q3) a) Explain the construction and working principle of DC motor. **[9]**

b) Explain the concept of heat dissipation in DC motor. **[9]**

OR

Q4) a) Explain the construction and working of stepper motor. **[9]**

b) Write a short note on characteristics of a Stepper motor with neat diagram. **[9]**

P.T.O.

Q5) a) Explain with neat diagram the working of hydraulic system. **[9]**

b) Enlist the different types of pumps in hydraulic system. Explain any one. **[8]**

OR

Q6) a) Explain with neat diagram the working of pneumatic system. **[9]**

b) Write a short note on control valves. **[8]**

Q7) a) Enlist the criteria for selection of actuator based on frequency response. **[9]**

b) Give the selection of actuator based on bandwidth. **[9]**

OR

Q8) a) With neat diagram explain the control system for temperature measurement. **[9]**

b) Write a short note on torque/ speed characteristics of stepper moter. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE4365

[Total No. of Pages : 2

[6582]-140

S.E. (Mechatronics Engineering)

APPLICATIONS OF INTEGRATED CIRCUITS

(2019 Pattern) (Semester - IV) (217551)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain the working of Inverting Comparator. **[6]**

b) Draw and explain sample and hold circuit using op-amp. **[6]**

c) Draw and explain Triangular wave Generator using OP-Amp. **[6]**

OR

Q2) a) Draw and Explain Zero cross detector and Window Detector with necessary waveform. **[6]**

b) Draw and Explain Square wave Generator using OP-Amp. **[6]**

c) Explain with neat circuit diagram working of Inverting and Non-Inverting Schmitt Trigger. **[6]**

Q3) a) Explain the operation of Dual Slope ADC. **[5]**

b) Explain with Diagram binary weighted resistor type of DAC. **[5]**

c) Write a short note on Performance parameter of ADC. **[8]**

OR

Q4) a) With the help of neat Diagram, Explain in details the Flash ADC. **[5]**

b) Draw ADC using DAC. **[5]**

c) Draw the circuit diagram of R/2R Ladder type DAC. **[8]**

P.T.O.

Q5) a) Explain the working of functional block diagram of IC 555 Timer. **[5]**

b) Write a short note on Basic operation of Power Amplifier LM 380. **[5]**

c) Draw circuit diagram of multiplier 534. **[7]**

OR

Q6) a) What is Voltage controlled Oscillator 566 and write its applications. **[5]**

b) Draw circuit diagram of waveform generator XR 2206. **[5]**

c) Calculate the change in the output frequency if the supply voltage is varied between 9v to 11v. Assume Vcc = 12v, R t = 6.8 KΩ, Ct = 75 pf, RT = 15 KΩ and R2 = 100 KΩ. **[7]**

Q7) a) What is the function of Voltage Regulator and functional diagram of 723 regulator? **[10]**

b) Write a short note on IC LM 317. **[7]**

OR

Q8) a) Design the voltage regulator for the following specification **[10]**

V0 = 18±3 volts and IL = 50Ma

b) Write a short note on **[7]**

i) Current limiting Feature

ii) Current fold back protection



Total No. of Questions : 8]

SEAT No. : ____

PE-4366

[Total No. of Pages : 2

[6582]-141
S.E. (Mechatronics Engineering)
DIGITAL ELECTRONICS
(2019 Pattern) (Semester - III) (217543)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Draw and explain SR flipflop using NAND gates with Timing diagram. **[9]**

b) Explain with neat diagram working of serial-in serial-out 4-bit shift register. Draw necessary timing diagram **[9]**

OR

Q2) a) Design MOD-5 synchronous counter using JK-Flip-Flops. **[9]**

b) Design a sequence generator to generate a pulse train 110011 using D-Flip-Flop **[9]**

Q3) a) What is ASM chart? Design ASM chart for 4-bit gray code sequence With up-down conditions. **[8]**

b) Draw the ASM chart for the following State Machine. A 2-bit up-counter is to be designed with enable signal 'X'. If X=0, then counter changes the state as 00-01-10-11-00. If X=1 the counter remains in the same state. Design the circuit using JK-FF & suitable MUX **[9]**

OR

Q4) a) Draw block diagram of PLA device & explain. **[8]**

b) Design BCD to Excess -3 code converter using PAL **[9]**

Q5) a) Explain with the help of circuit diagram 2-input TTL NAND gate with Totem pole output driver. Write advantages of Totem-Pole output. **[9]**

b) Draw and explain the circuit diagram of CMOS inverter. Give advantages & disadvantages of CMOS. **[9]**

OR

Q6) a) Draw three input standard TTL NAND gate circuit & explain its operation. Give disadvantages of Totem-Pole output **[9]**

b) Draw and explain the circuit diagram of CMOS inverter. What are advantages of CMOS devices over TTL devices? Explain in short. **[9]**

Q7) a) Explain architecture of 8086 with diagram. **[8]**

b) Draw & explain the basic building blocks of an ideal microprocessor-based system with the help of neat diagram with its characteristics. **[9]**

OR

Q8) a) Explain flag register with diagram **[8]**

b) Write short note on ALU. Give the applications of Microprocessor. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4367

[Total No. of Pages : 4

[6582]-142
S.E. (Mechatronics Engg.)
ANALYSIS OF MECHANICAL STRUCTURE
(2019 Pattern) (Semester - III) (217544)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.No.1 or Q.No.2,Q.No.3 or Q.No.4,Q.No.5 or Q.No.6,Q.No.7 or Q.No.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figure to the right indicates full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) A rolled steel joist of I-section has the dimensions as shown in fig. 1. The beam of I section carries a U.D.L of 40 KN/m run on span of 10m. Calculate the maximum stress produced due to bending. Also draw the bending stress distribution across the depth of section. **[8]**

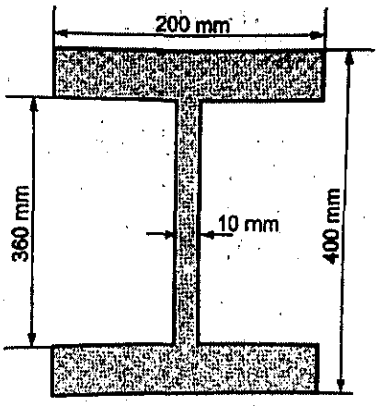


Fig.1

b) A beam of length 6 m is simply supported at its ends and carries two point loads of 48 KN and 40 KN at a distance of lm and 3m respectively from the left support Find 1. Deflection under each load 2.Maximum deflection 3.The point at which maximum deflection occurs. (Take $E = 2 \times 10^5$ N/mm^2 and $I = 85 \times 10^6$ mm^4.) **[10]**

OR

P.T.O.

Q2) a) A timber beam of rectangular section is simply supported over a span of 5 m and carries a uniformly distributed load of 3 KN/m over the entire span.lf the maximum shear stress is 7 MPa. If b = $\frac{2}{3}$ d, find the value of b and d. **[8]**

b) A beam is 10 m long and is simply supported at its ends.lt carries concentrated loads of 100 KN and 60 KN at distances of 2 m and 5 m respectively from the left end as shown in fig.2 Calculate the deflection under each load. Take E =200 GPa and I =18×10^{8}mm^{4}. Use Maycaulay's method. **[10]**

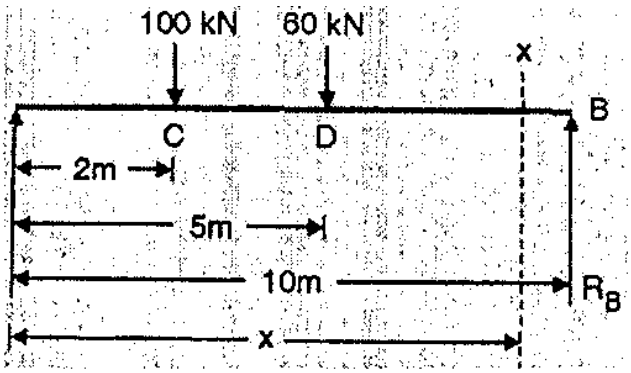


Fig.2

Q3) a) A circular solid shaft transmits 300 KW at 250 r.p.m. A permissible shear stress is 30 N/mm^2 and allowable twist 1° in a length of 2 meters. Determine diameter of shaft. Take G = 1×10^5 N/mm^2 **[9]**

b) Derive the expression for the critical load for a column pinned at both its ends. **[8]**

OR

Q4) a) State torsional formula and explain the terms involved in it. What assumptions are made in theory of pure torsion? **[8]**

b) An alloy tube 25 mm internal diameter and 40 mm external diameter, when subjected to axial tensile force of 60 KN undergoes an extension of 3.84 mm over its 3 m length. What is its safe axial load resisting capacity as column, when one end is fixed and other end is hinged? Factor of safety be taken as 4. **[9]**

Q5) a) At a point in a strained material,the values of normal stress across two right angles to each other are 80 MPa and 32 MPa,both tensile and there is a shear stress of 32 MPa as shown in fig.3. Determine i) Principal stress ii) Location of principal stress iii) Maximum shear stress iv)Location of plane of maximum shear plane. **[9]**

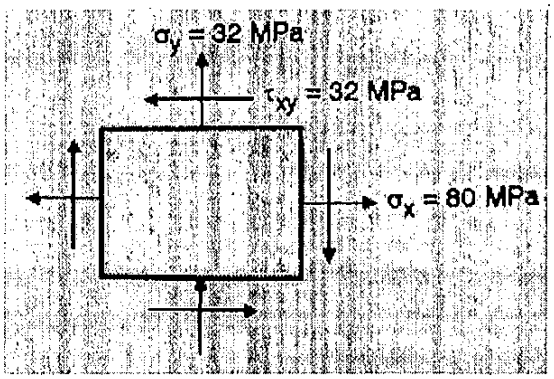


Fig.3

b) Explain in detail Maximum Principal stress theory. **[8]**

OR

Q6) a) A point in a strained material is subjected to stress as shown in fig.4.Using Mohr's circle method (Using only graphical method). Determine **[9]**

i) Direction and magnitude of major and minor principal stress.

ii) Magnitude of greatest shear stress

iii) The normal and tangential stresses across the oblique plane AM as shown in fig.4. Draw Mohr's circle only on graph paper with a suitable scale factor.

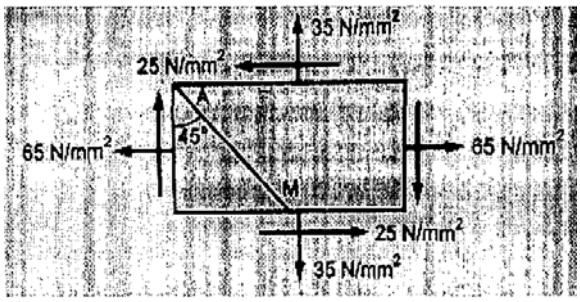


Fig 4

b) Explain in detail Maximum shear stress theory. **[8]**

Q7) a) A rectangular column of 240 mm × 150 mm is subjected to a vertical load of 10 KN placed at an eccentricity of 60 mm in a plane bisecting 150 mm side as shown in fig. 5. Determine the maximum and minimum intensities in the section. **[10]**

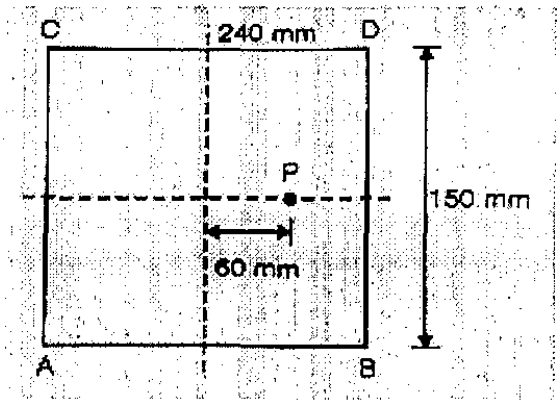


Fig 5

b) Explain combined Direct and Bending Stress with: i) Definition ii) Applications, iii) Symbol, iv) Formula. v) S. I. Unit, vi) Diagrammatic representation. **[8]**

OR

Q8) a) Determine the stress resultant at four corners of column subjected to eccentric load of P = 600 KN, shown in fig.6 Also draw the stress distribution diagrams **[10]**

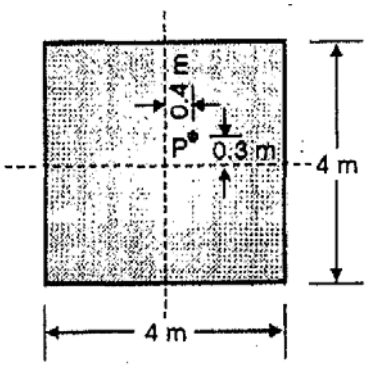


Fig.6

b) Explain core of section. Hence obtain core of section for hollow rectangular column of external and internal size 'B×D' and 'b×d' respectively. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4368

[Total No. of Pages : 2

[6582]-143
S.E. (Mechatronics Engineering)
ENGINEERING MATERIAL
(2019 Pattern) (Semester - III) (217541)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw self-explanatory cooling curves for binary eutectic. Calculate the degree of freedom (F) for all regions. **[6]**

b) What is nucleation? Explain the types of nucleation mechanisms with the help of a diagram. **[7]**

c) State the Hume Rothery rule of Solid Solubility. **[5]**

OR

Q2) a) Draw an Iron Carbon diagram showing all details, like Temperature, Composition, Phases, Critical lines, and reactions. **[10]**

b) Define the following terms: **[4]**

i) Alloy

ii) Phase

iii) System

iv) Variable

c) Draw the equilibrium diagram for Antimony and Bismuth. **[4]**

Q3) a) Explain the terms: Hardenability, Tempering and sub zero treatment. **[6]**

b) Write the process and purpose of Quenching and Annealing. **[6]**

c) Classify surface hardening process and explain in detail. **[5]**

OR

P.T.O.

Q4) a) Explain the following: **[5]**

Normalizing

Martempering

b) Write the process and mechanism for carburizing & carbonitriding. **[6]**

c) Differentiate between TTT diagram and CCT diagram and Draw and explain the critical cooling transformation diagram. **[6]**

Q5) a) Enlist the properties and advantages of gray cast iron **[6]**

b) Write the classification of steels based on carbon content in detail. **[6]**

c) Discuss the comparison of steel and cast iron based on composition, properties, and application **[6]**

OR

Q6) a) Write the classification of steel in detail with its subcategories. **[6]**

b) Write short notes on: **[6]**

- Malleable cast iron
- Alloy cast iron

c) Write any five difference between ferrous and nonferrous metals with examples **[6]**

Q7) a) State bronze and explain in brief the types of bronze with suitable examples. **[6]**

b) Discuss any three nickel alloys with composition and application. **[6]**

c) Write the properties of copper and explain its applications. **[5]**

OR

Q8) a) Classify the copper-based alloys based on the percentage of Cu and Zinc. **[5]**

b) Enlist the differences between brass and bronze in tabular form. **[6]**

c) Give typical composition, important properties, and application of Red Brass, Muntz metal & Free-cutting brass. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PE-4369

[Total No. of Pages : 2

[6582]-144

S.E. (Mechatronics Engineering)

HEAT AND MASS TRANSFER

(2019 Pattern) (Semester - III) (217542)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2; Q3 or Q4; Q5 or Q6; Q7 or 08.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figure to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain PV and TS diagram for the following cycles : **[8]**

i) Diesel cycle

ii) Dual cycle

b) Explain four stroke SI engine with neat sketch. **[9]**

OR

Q2) a) State the following engine nomenclature with neat sketch : **[8]**

i) Cylinder Bore

ii) TDC

iii) BDC

iv) Compression ratio

b) Explain the Otto cycle with a neat diagram. Derive an expression for its efficiency. **[9]**

P.T.O.

Q3) a) State Fourier's law of heat conduction. Derive an expression for rate of heat transfer through the composite wall. **[8]**

b) Explain the various modes of heat transfer with suitable real life examples. **[9]**

OR

Q4) a) Explain critical radius of insulation and its significance. **[9]**

b) Define and give significance for following terms : **[8]**

i) Thermal conductivity

ii) Thermal diffusivity

Q5) a) Explain significance of any three dimensionless numbers used in various modes of heat transfer for thermal analysis. **[6]**

b) Differentiate natural convection and forced convection. **[6]**

c) Explain Laminar flow heat transfer in circular pipe with neat sketch. **[6]**

OR

Q6) a) State and explain with mathematical expressions of the following laws in radiation heat transfer : **[6]**

i) Kirchhoff's law

ii) Stefan's Boltzmann's law

b) Explain Plank's law and Lambert's cosine law of heat transfer in radiation. **[6]**

c) Write a short note on Shape factor. **[6]**

Q7) a) Explain Effectiveness-NTU method of heat exchanger. **[6]**

b) Write difference between film condensation and drop wise condensation with examples. **[6]**

c) Give detail classification of heat exchangers. **[6]**

OR

Q8) a) Explain the six regimes of the pool boiling curve with the help of a neat diagram. **[6]**

b) Differentiate counter flow and parallel flow heat exchanger. **[6]**

c) Derive an expression for LMTD for counter flow heat exchanger with neat sketch. **[6]**

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Total No. of Questions : 16]

SEAT No. : ____

PE4370

[Total No. of Pages : 3

[6582]-145
S.E. (Instrumentation)
CONTROL SYSTEMS
(2019 Pattern) (Semester - IV) (206268)

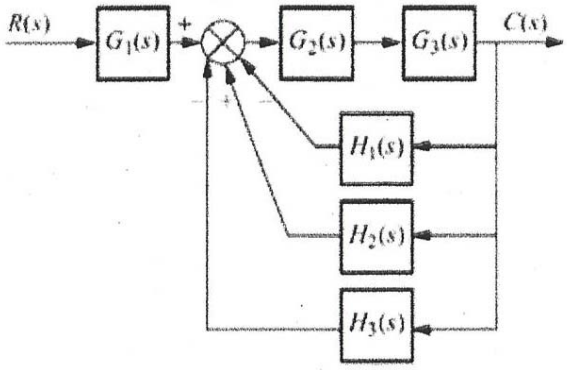
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer all questions***
2) ***Figures to the right indicate full marks.***

Q1) State & explain Mason's Gain Formula. **[8]**

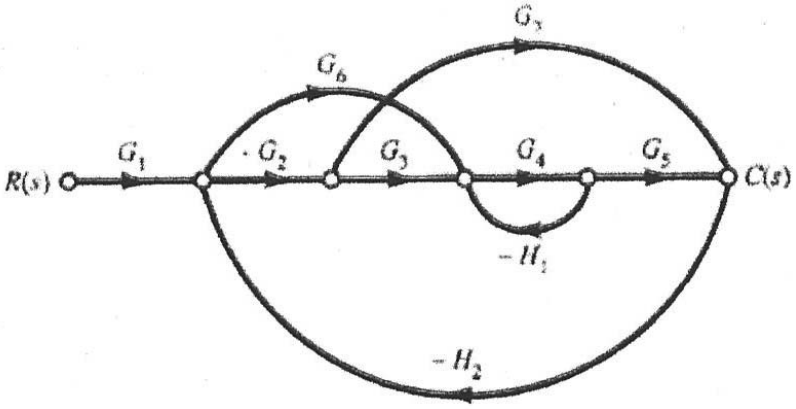
Q2) Solve the following examples by using Block Diagram Reduction Technique: **[10]**



OR

Q3) Elaborate the rules to solve Block diagram reduction technique. **[8]**

Q4) Solve by Signal Flow Graph Method. **[10]**



P.T.O.

Q5) Explain First order, second order systems and their response. **[9]**

Q6) A Second order system with damping ratio 0.8 and natural undamped frequency 4 rad/sec. 1 Write the system transfer function. 2 If the system is subjected to a unit-step input, obtain the steady state error e_{ss}, peak time tp, maximum overshoot Mp, and settling time ts. **[9]**

OR

Q7) Drive static error constants - kp, kv, ka. **[9]**

Q8) Consider the system shown below, where $\zeta = 0.75$ and $\omega n = 5$ rad/sec. Obtain the maximum overshoot Mp, e_{ss}, w_d when the system is subjected to a unit-step input. **[9]**

Q9) Solve following example by time domain analysis & comment on stability also find the value of K : **[10]**

$G(S) = K/S\ (S+2)(S+4)$ with $\xi = 0.707$.

Q10) List out steps to solve Routh's Criteria for stability analysis. **[6]**

OR

Q11) Solve following examples by Routh's Criteria & comment on stability. **[10]**

a) $G(S) = 7S^3 + 5S^2 + 2S + 8$

b) $G(S) = S^4 + 3S^3 + 3S + 9$

Q12) Write steps to solve by time domain analysis. **[6]**

Q13) Solve following examples by Bode plot method. Determine Gain Crossover Frequency, Phase Crossover Frequency. Gain Margin, Phase Margin. Also comment on stability. **[12]**

$G(S)H(S) = 4/S(1+0.5S)(1+0.08S)$

Q14) What is Bode Plot? Write the steps to solve Bode Plot. **[6]**

OR

Q15) Solve following examples by Bode plot method. Determine Gain Crossover Frequency, Phase Crossover Frequncy, Gain Margin, Phase Margin. Also comment on stability. **[12]**

$G(S)H(S) = 50/(S+1)(S+2)$

Q16) What is Polar Plot? Explain its need for stability of system. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE4371

[Total No. of Pages : 2

[6582]-146
S.E. (Instrumentation and Control)
DIGITAL ELECTRONICS
(2019 Pattern) (Semester - IV) (206269)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Design and describe a BCD adder circuit with neat diagram. **[9]**

b) What is magnitude comparator? Design & explain the 1-bit magnitude comparator circuit. **[9]**

OR

Q2) a) Elaborate with the help of logic diagram and function table an 8:1 multiplexer. **[9]**

b) Describe with neat circuit diagram and truth table the operation of full subtractor. **[9]**

Q3) a) Elaborate the J-K flip flop with logic gate circuit and excitation table. **[9]**

b) Convert and examine the SR flip flop to D flip flop. **[9]**

OR

Q4) a) Describe different types of memory. **[9]**

b) Differentiate between the combinational circuits and sequential circuits. **[9]**

Q5) a) Describe the 3-bit asynchronous up counter with the help of state diagram, truth table and timing diagram. **[8]**

b) Design and elaborate the MOD-10 counter circuit using IC490. **[9]**

OR

P.T.O.

Q6) a) What is Sequence generator? Elaborate with the help of suitable example. **[8]**

b) Describe the internal circuit diagram of IC7495 Universal Shift register. **[9]**

Q7) a) What is Programmable Logic Devices (PLD)? Elaborate different types of PLDs. **[8]**

b) Elaborate the characteristics of Logic Families in details. **[9]**

OR

Q8) a) Describe the Transistor-Transistor Logic (TTL) with neat circuit diagram. **[8]**

b) Implement and discuss the following Boolean functions using PAL. **[9]**

$A = XY + X\overline{Z}$ and $B = X\overline{Y} + Y\overline{Z}$

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Total No. of Questions : 8] **SEAT No. :**

PE4372 **[Total No. of Pages : 3**

[6582]-147

S.E. (Instrumentation & Control Engineering)

PROCESS LOOP ELEMENTS

(2019 Pattern) (Semester - IV) (206270)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator is allowed.***

Q1) a) Explain the following terms related to various control actions. **[10]**

i) Proportional Band

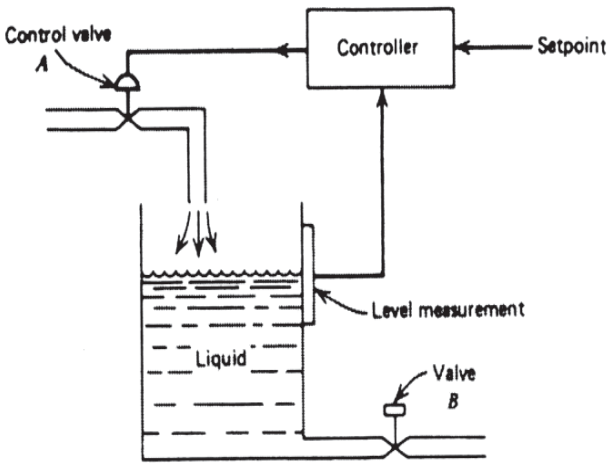
ii) Rate gain

iii) Rate action

iv) Offset

v) Dead Zone

b) Consider the proportional-mode level-control system of below figure. Valve A is linear, with a flow scale factor of $10m^3/h$ per percent controller output. The controller output is nominally 50% with a constant of K_p = 10%. A load change occurs when flow through valve B changes from 500 m^3/h to 550 m^3/h. Calculate the new controller output and offset Error. **[7]**



OR

P.T.O.

Q2) a) Explain PI Controller. Draw the responses of PI controller for Unit step change in error. **[10]**

b) Explain Single speed and Multi speed floating control mode. **[7]**

Q3) a) What is mean by tuning of controller? Explain Ultimate cycle method (Ziegler and Nichols) for tuning of controller. **[10]**

b) Draw and explain the block diagram of Digital controller. **[8]**

OR

Q4) a) Write and explain the equations for position and velocity algorithm for digital controller. **[10]**

b) Explain Z-N close loop tuning method. In this method, the critical gain was found to be 4.2 and the critical period was 2.21 min. Find the standard three mode controller settings of PID controller. **[8]**

Q5) a) Draw and explain Cavitation and Flashing. Draw pressure profile diagram. Also list techniques to reduce it. **[10]**

b) Discuss the construction and working of gate valves. Discuss its application. **[8]**

OR

Q6) a) Define valve coefficient (Cv). State its significance. Also Find the proper valve size in inches for a pumping a liquid flow rate of 800gal/min with a maximum pressure difference of 65 psi. The liquid specific gravity is 1.5 use following data. **[10]**

Cv	0.3	3	14	35	55	108	174	400	725
Valve size in inches	0.25	0.5	1	1.5	2	3	4	6	8

b) What are fail-safe actions in the control valve? Discuss in detail. **[8]**

Q7) a) Discuss the function of the following accessories: **[10]**

i) Solenoid Valves

ii) Volume Boosters

iii) Limit Switches

iv) Air lock

v) Hand wheel

b) Describe the construction and operation of piston-cylinder actuators used in control valves. **[7]**

OR

Q8) a) What is the need of actuator? explain the following actuators with neat diagrams. **[10]**

i) Pneumatic actuator

ii) Hydraulic actuator

iii) Electrical actuator

b) What are the various types of positioners? Discuss one in detail. **[7]**



Total No. of Questions : 8] **SEAT No. :**

PE4373 **[Total No. of Pages : 3**

[6582]-148

S.E. (Instrumentation & Control)

SIGNALS AND SYSTEMS

(2019 Pattern) (Semester - IV) (206271)

Time : 2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to the right candidates indicate full marks.***
4) ***Use of logarithmic tables slide rule, mollier Charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Let x(t) be a periodic signals with fundamentals period T and Fourier series coefficients Cn. Derive the Fourier series coefficients of following signals in term of Cn. **[10]**

i) $x_e(t)$

ii) $\frac{d^2x(t)}{dt^2}$

b) If x1 and x2(t) are both periodic with T and the Fourier series coefficients of x1(t) and x2(t) are Cn and Dn respectively. Then prove that **[8]**

$$FS\left[x_1(t) * x_2(t)\right] = Tc_n d_n$$

OR

Q2) a) For the continuous time periodic signal **[10]**

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}t\right) + 4\sin\left(\frac{5\pi}{3}t\right)$$

Determine the fundamental frequency $\Omega 0$ and the Fourier series coefficients Cn such that

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\Omega_0 t}$$

b) Derive the relation between trigonometric Fourier series and exponential Fourier series. **[8]**

P.T.O.

Q3) a) State and prove Frequency shifting property of Fourier Transform. **[9]**

b) Determine the Fourier transform of the following signals. **[8]**

i) $x(t) = te^{-at}u(t)$

ii) $x(t) = t\cos 2t$

OR

Q4) a) State and prove time shifting property of Fourier Transform. **[9]**

b) Find inverse Fourier transform of **[8]**

$$X(j\Omega) = \frac{j\Omega}{(3+j\Omega)^2}$$

Q5) a) Find the Laplace transform and ROC of the following signals. **[9]**

i) $x(t) = -e^{-at}u(-t)$

ii) $x(t) = e^{-at}u(t) + e^{-bt}u(-t)$

b) State and prove the time scaling property of Laplace transform. **[9]**

OR

Q6) a) Find the inverse Laplace transform of **[9]**

i) $X(s) = \frac{2s+1}{(s+1)(s^2+2s+2)}$

ii) $X(s) = \frac{s}{s^2+5s+6}$

b) State and prove the time differentiation property of Laplace transform. **[9]**

Q7) a) There is a container full of colored bottles, red, blue, green and orange. Some of the bottles are picked out and displaced. Submit did this 1000 times and got the following results: **[9]**

No. of blue bottles picked out: 300

No. of red bottles: 200

No. of green bottles: 450

No. of orange bottles: 50

i) What is the probability that Submit will pick a green bottle?

ii) If there are 100 bottles in the container, how many of them are likely to be green?

b) A box contains three coins: two regular coins and one fake two-headed coin (P(H)=1 p(H)= 1), **[8]**

i) You pick a coin at random and toss it. What is the probability that it lands heads up?

ii) You pick a coin at random and toss it, and get heads. What is the probability that it is the two-headed coin?

OR

Q8) a) Two dice are rolled, find the probability that the sum is: **[9]**

equal to 1

equal to 4

less than 13

b) If You toss a fair coin three times:

What is the probability of three heads, HHH?

What is the probability that you observe exactly one heads?

Given that you have observed *at least* one heads, what is the probability that you observe at least two heads? **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE4374

[Total No. of Pages : 2

[6582]-149
S.E. (Instrumentation & Control)
DATA STRUCTURES
(2019 Pattern) (Semester - IV) (206272)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary***

Q1) a) How are lists different from strings when both are sequences? **[9]**

b) Develop a program to reverses an array of integers. **[9]**

OR

Q2) a) Write a program to display the fibonacci sequence up to n-th term. **[9]**

b) Write a python program to find maximum element of each row in a matrix. **[9]**

Q3) a) Explain the multidimensional array, array storage and index computation. **[9]**

b) Comment on the following Set methods with an example. **[8]**

i) intersection( )
ii) union( )
iii) issubset( )
iv) difference( )

OR

Q4) a) Explain the Set ADT & its operations in python programming. **[9]**

b) Comment on the following Map methods with an example. **[8]**

i) length ( )
ii) contains (key)
iii) add (key, value)
iv) remove (key)

P.T.O.

Q5) a) Explain the steps involved insertion, iteration and deletion in a singly and doubly linked list. **[9]**

b) Write a program to implement the linked list operations. **[9]**

OR

Q6) a) Explain functions for **[9]**

i) Adding new item

ii) Removing item

iii) To check item is in Bag

b) Explain how nodes can be remove in tail reference using example. **[9]**

Q7) a) Elaborate Postfix evaluation algorithm stepwise. **[9]**

b) How the Queue ADT is implemented using python list. **[8]**

OR

Q8) a) Describe the implementation of queue using circular array. **[9]**

b) Explain the enqueue and dequeue operations of queue. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-4375

[Total No. of Pages : 2

[6582]-150
S.E. (Instrumentation and Control)
SENSORS & TRANSDUCERS
(2019 Pattern) (Semester - III) (206261)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define and give one unit each of : **[8]**

i) Absolute pressure.

ii) Gauge pressure.

iii) Differential pressure.

iv) Vacuum pressure.

b) Discuss capacitive (Delta Cell) pressure transducers in detail with a neat sketch? **[5]**

c) Explain the working of bourdon tube with neat diagram? **[5]**

OR

Q2) a) List different type of elastic transducers for pressure measurements? Explain the working of any one of them in detail? **[8]**

b) Draw and explain the construction and working of Inverted Bell-Type Manometer? **[5]**

c) Explain working principle of McLeod gauge with neat diagram? **[5]**

Q3) a) Explain in detail RTD with respect to its: **[8]**

i) Principle

ii) Three wire construction.

iii) Sensitivity.

iv) Materials used for construction

b) Write a short note on Total Radiation Pyrometers? **[5]**

P.T.O.

c) A platinum resistance thermometer has a resistance of 100Ω at 0°C and 139.5Ω at 100°C. When used to measure the temperature inside an oven, it shows a resistance of 287.4Ω what is the temperature in the oven? **[5]**

OR

Q4) a) Explain the working principle of thermocouple and the necessity of cold junction compensation for temperature measurement? **[8]**

b) Explain IC LM35 sensor available for temperature measurement with IC pin diagram? **[5]**

c) A platinum resistance thermometer has a resistance of 140.5Ω and 100Ω at 100°C and 0°C respectively. If its resistance becomes 305.3Ω when it is in contact with a hot gas, determine the temperature of the gas? **[5]**

Q5) a) List different types of Head type flow meters. And explain the working of venturi tube with neat sketch for flow measurement? State the formula? **[7]**

b) Explain the working principle of vortex shedding flowmeter with a neat diagram? **[5]**

c) Derive the Bernoulli's equation for incompressible flow? **[5]**

OR

Q6) a) List different types of Head type flow meters. And explain Orifice plate in detail for measurement of flow? State the mathematical equation? **[7]**

b) Explain the working principle of mass flow meter with a neat diagram? **[5]**

c) Explain the basic principle of turbine flow meter? Draw the diagram? **[5]**

Q7) a) Explain hydrometer for density measurement with neat sketch? List out its two applications? **[7]**

b) Define viscosity? Explain any one technique of viscosity measurement? **[5]**

c) Explain with neat diagram solid level detectors for level measurement? **[5]**

OR

Q8) a) Explain air bubbler method for water level measurement with neat sketch? List out any two advantages of this method? **[7]**

b) Define absolute Humidity and Relative Humidity? Explain any one sensor for humidity measurement? **[5]**

c) Draw and explain pH measurement system in detail? **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4376

[Total No. of Pages : 2

[6582]-151

S.E.- (Instrumentation and Control)

LINEAR INTEGRATED CIRCUITS

(2019 Pattern) (Semester - III) (206262)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Draw and derive expression for Instrumentation amplifier with three Op-amps. **[9]**

b) Discuss with neat circuit diagram the current booster circuit using Op-amp. **[9]**

OR

Q2) a) Discuss the limitation of basic integrator circuit. Draw neat diagram of practical integrator and derive the output voltage equation with input-output waveforms. **[9]**

b) Explain with neat diagram Isolation amplifiers with its applications. **[9]**

Q3) a) What is called rectifiers? Discuss with suitable circuit diagram precision half wave rectifier. Draw proper input-output wave forms. **[9]**

b) State Barkhausen criteria for sustain oscillation. Explain with neat sketch RC phase shift oscillator in details. **[8]**

OR

Q4) a) What is called precision rectifiers? Explain Precision full-wave rectifier with neat circuit diagram using OP-AMP **[9]**

b) Explain Schmitt trigger with neat circuit diagram, waveforms, UTP, LTP and hysteresis plot. **[8]**

P.T.O.

Q5) a) Explain V to F using IC LM331 with neat circuit diagram. **[9]**

b) Explain VCO with neat block diagram using IC LM566. **[9]**

OR

Q6) a) Design Monostable multivibrator using IC LM555 for the pulse width of 3.2ms. **[9]**

b) Explain Analog Multiplexer/Demultiplexer using IC CD 4051. **[9]**

Q7) a) Design and draw first order Butterworth non-inverting low-pass filter for the cut- off frequency of 850 Hz. Assume suitable data with neat circuit diagrams **[9]**

b) Design and discuss fixed voltage regulators using IC 78xx and 79xx. **[8]**

OR

Q8) a) Design High voltage regulator (HVR) using IC LM723 neat circuit diagram for 11 .5V regulated output. Assume suitable data. **[9]**

b) What is "Q" factor of filter? Draw detailed ideal and practical output responses for all types of filters. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4377

[Total No. of Pages : 2

[6582]-152

S.E. (Instrumentation and Control)

ELECTRICAL MEASUREMENT & INSTRUMENTATION

(2019 Pattern) (Semester - III) (206263)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figure to the right candidates indicate full marks.***
4) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if nessacary.***

Q1) a) State the significance vertical and horizontal plates used in a CRO. **[9]**

b) If the vertical amplifier of an oscilloscope has a bandwidth of 25MHZ.What is the fastest rise time that an input may have to be displayed without distortion. **[9]**

OR

Q2) a) Elaborate with neat sketch measurement of phase using CRO. **[8]**

b) Describe the measurement of AC voltage using CRO. **[6]**

c) State the significance of electronics switch used in dual trace oscilloscope. **[4]**

Q3) a) Derive the equations for general AC bridge at balanced condition. **[9]**

b) Calculate the current through the galvanometer in wheatstone bridge **[8]**

R1 = 2 .5kΩ

R2 = 3kΩ

R1= 7 .0kΩ

R4 = 25kΩ

The operating voltage is 8V

OR

P.T.O.

Q4) a) Derive the general bridge balance equations of Hays bridge. **[9]**

b) Calculate the equivalent parallel resistance and capacitance that causes a Wien's bridge to null with the following component values. **[8]**

R1 = 2.9kΩ

Cl = 4.5 μF

R2 = 25kΩ

R4 = 110kΩ

The operating frequency is 2.2 kHz

Q5) a) For R-2R DAC, Rf = R = 1000 ohms. If the reference voltage is 10 volts, calculate the analog output voltage for digital input (011100011)2. **[9]**

b) Draw the block diagram of digital thermometer and explain function of each block. **[9]**

OR

Q6) a) Select appropriate digital instruments for the measurement of current, Voltage and Resistance and justify the selection with example. **[9]**

b) Select appropriate digital instruments for the measurement of current and justify the selection with example. **[9]**

Q7) a) State the significance of X-Y recorder with neat sketch. **[9]**

b) Elaborate different marking mechanism used in recorder. **[8]**

OR

Q8) a) State the significance of LVDT recorder with neat sketch. **[9]**

b) Elaborate with neat sketch Potentiometric type recorder. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE-4378

[Total No. of Pages : 2

[6582]-153
S.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2019 Pattern) (Semester - III) (206264)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answers Q1 or Q2; Q3 or Q4; Q5 or Q6; Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write down the Comparison of Pneumatic, Hydraulic & Electrical systems. **[6]**

b) Explain any one type of Pneumatic relay (Bleed & Non bleed, Reverse & Direct). **[6]**

c) What is meant by Pneumatic Circuits? List out the Standard Symbols used for developing pneumatic circuits. **[6]**

OR

Q2) a) Explain in brief the Single acting & Double acting cylinder with neat diagram. **[6]**

b) Differentiate between: Cushion, Double rod, Tandem, Multiple position, and Rotary. **[6]**

c) Explain any one: pressure reducing valve and time delay valve. **[6]**

Q3) a) What is meant by Hydraulic Circuits? List out Standard Symbols used for developing hydraulic circuits. **[6]**

b) Explain in brief any one circuit of: Meter in, Meter out. **[6]**

c) Define Hydraulic pumps and explain any one in detail. **[5]**

OR

P.T.O.

Q4) a) Define Hydraulic supply, explain in brief. **[6]**

b) What is meant by Sequencing of cylinder? Illustrate with proper example. **[6]**

c) Explain in brief the Hydraulic valves. **[5]**

Q5) a) Write down Construction, working, characteristics, specifications and applications of SCR, UJT. **[6]**

b) Write down Construction, working, characteristics, specifications and applications of MOSFET. **[6]**

c) What is meant by Triggering and Commutation of SCR, Illustrate the same. **[6]**

OR

Q6) a) Write down Construction, working, characteristics, specifications and applications of TRIAC, DIAC. **[6]**

b) Write down Construction, working, characteristics, specifications and applications of IGBT. **[6]**

c) Give the comparison for SCR, UJT, TRIAC, DIAC. **[6]**

Q7) a) Explain with Construction, working & applications of: Synchros (Transmitter and Receiver). **[6]**

b) What is the use of Alarm annunciator? Explain with a proper diagram. **[6]**

c) Give the definition for designing for intrinsic Safety. **[5]**

OR

Q8) a) Explain in brief the square root extractor. **[6]**

b) What are Circuit Breaker and Fuses? Explain. **[6]**

c) Write down in brief Introduction to HaZOP. **[5]**



Total No. of Questions : 9]

SEAT No. : ____

PE-4379

[Total No. of Pages : 5

[6582]-154

S.E. (Instrumentation)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - III) (207008)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1, Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculators is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) Write the correct option :

a) The z-transform of $\left(\frac{1}{5}\right)^k . k \geq 0$ is **[2]**

i) $\frac{5z}{5z-1}$ ii) $\frac{5z}{z-1}$

iii) $\frac{z}{z-5}$ iv) $\frac{1}{z-5}$

b) If covariance between *x* and *y* is 10 & variance of *x* is 16, variance of y is 9 then the coefficient of correlation is **[2]**

i) 0.527 ii) 0.633

iii) 0.833 iv) 0.745

c) The value of $\nabla(r^2)$ is equal to **[2]**

i) $\overline{r}$ ii) 0

iii) 1 iv) $2\overline{r}$

P.T.O.

d) Value of the integral $\oint_C \frac{z^2+1}{z-1}\,dz$ where C is $|z| = 2$ by using Cauchy integral formula is given by **[2]**

i) πi ii) $4\pi i$

iii) 0 iv) $2\pi i$

e) In a Poisson distribution $n = 100$, $p = 0.01$ $p(r = 0)$ is equal to **[1]**

i) $\frac{1}{e}$ ii) $\frac{2}{e}$

iii) $\frac{3}{e}$ iv) $\frac{4}{e}$

f) The residue of e^z/z at its pole is **[1]**

i) e ii) 0

iii) 1 iv) $1/e$

Q2) a) Solve any one : **[5]**

i) Find z-transform of $f(k) = \cos\frac{\pi}{2}k;\ k \geq 0$

ii) Find inverse z-transform of $f(z) = \frac{1}{(z+2)(z+5)}, |z| > 2$

b) Solve $f(k+1) + \frac{1}{2}f(k) = \left(\frac{1}{2}\right)^k$, $f(0) = 0;\ k \geq 0$. **[5]**

c) Find the Fourier cosine transform of $f(x) = \begin{cases} 0, & x < 0 \\ \pi e^{-x}, & x > 0 \end{cases}$. **[5]**

OR

Q3) a) Solve any one : **[5]**

i) Find z-transform of $f(k) = k2^k$, $k > 0$.

ii) Find inverse z-transform of $f(z) = \left(\frac{1}{z-5} - \frac{1}{z-4}\right); 4 < |z| < 5$.

b) Find the fourier cosine transform of $f(x) = e^{-2x} - e^{-3x}, x > 0$. **[5]**

c) Solve the integral equation $\int_0^\infty f(x)\cos\lambda x \; dx = \begin{cases} 1-\lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda \ge 1 \end{cases}$. **[5]**

Q4) a) Calculate first four moments about mean for the following distribution **[5]**

x	5	8	12	16	22
f	11	16	6	8	10

b) Calculate the coefficient of correlation for the following data **[5]**

$n = 10$, $\Sigma x = 147$, $\Sigma y = 170$, $\Sigma x^2 = 2291$, $\Sigma y^2 = 3056$, $\Sigma xy = 2638$

c) From a standard deck of 52 cards, 2 cards are drawn randomly. Find the probability that both cards are face cards. If the cards are replaced. **[5]**

OR

Q5) a) Determine the arithmatic mean and standard deviation for the following data : **[5]**

x	2	4	6	8	9
f	5	3	2	4	3

b) The average number of spelling mistakes in a A4 size page of a book is 1.7 assuming the distribution of number of spelling mistakes follows Poisson distribution find the probability that a particular page of the book has at most 1 spelling mistake. **[5]**

c) The temperature of coffee sold at a coffee shop follows normal distribution with mean 150°C & standard deviation of 5°. What is the probability that the coffee temperature will be between 146° to 156°. **[5]**

($z(-0.8) = 0.2119$, $z(1.2) = 0.8849$)

Q6) a) Find the directional derivative of $\phi = 2x^2 + 3y^2 + z^2$ at (2, 1, 3) in the direction of the vector $\bar{i} - 2\bar{k}$. **[5]**

b) Show that $\bar{f} = (6xy + z^3)\bar{i} + (3x^2 - z)\bar{j} + (3xz^2 - y)\bar{k}$ is irrotational. Find scalar ϕ such that $\bar{f} = \nabla\phi$. **[5]**

c) If $\bar{f} = \cos y\bar{i} - (x\sin y)\bar{j}$ and C is the curve $y^2 = 1 - x^2$ in the xy plane from (1, 0) to (0, 1), Evaluate $\int_C \bar{f} \cdot d\bar{r}$. **[5]**

OR

Q7) a) Find the directional derivative of $\phi = e^{2x}\cos yz$ at (0, 0, 0) in the direction of tangent to the curve $x = a\sin t$; $y = a\cos t$; z = at; at $t = \frac{\pi}{4}$. **[5]**

b) Show that (any one) : **[5]**

i) $\nabla^2 f(r) = f''(r) + \frac{z}{r} f'(r)$

ii) $\nabla\left(\frac{\bar{a}\cdot\bar{r}}{r^n}\right) = \frac{\bar{a}}{r^n} - \frac{n(\bar{a}\cdot\bar{r})\bar{r}}{r^{n+z}}$

c) Evaluate by Green's theorem $\oint_C (\cos x.\sin y - xy)dx + (\sin x.\cos y)dy$, where C is the circle $x^2 + y^2 = 1$ **[5]**

Q8) a) If $v = 4xy(x^2 - y^2)$ is harmonic find its harmonic conjugate and hence determine $f(z) = u + iv$ interms of z. **[5]**

b) Use Cauchy's integral formula to evaluate $\oint_C \frac{2z^2 + z + 5}{(z - 3/2)^2} dz$ where C is the circle $|z| = 2$ **[5]**

c) Find the bilinear transformation which maps the points 0, 1, 2 from z-plane onto the points $1, \frac{1}{2}, \frac{1}{3}$ on the w-plane. **[5]**

OR

Q9) a) If $u = e^x \cos y$, find its harmonic conjugate v such that $f(z) = u + iv$ is analytic function. Express $f(z)$ interms of z. **[5]**

b) Use Cauchy' - Residue theorem to evaluate $\oint_C \frac{z^2 + 2z \,/\, dz}{(z-1)^2(z+2)}$ where C is the contour $|z - 2| = 3$. **[5]**

c) Find the map of straight line $y = x$ under the transformation $w = \frac{z-1}{z+1}$. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE4380

[Total No. of Pages : 2

[6582]-155
S.E. (Computer Science and Engineering) (Data Science)
MATHEMATICAL FOUNDATION FOR DATA SCIENCE - II
(2019 Pattern) (Semester - IV) (210652)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write the difference between Simple Linear Regression & Multiple Linear Regression. **[6]**

b) For $y = 50x + 4$, using the following datasets of Score of students & their studied hours, find residuals and plot a residual plot. Comment on the plot for model fit. **[6]**

Hours Studied	2	4	5	6	7	8	10
Score	52	58	64	68	78	90	98

c) Give the applications of linear regression in data science with examples. **[6]**

OR

Q2) a) Explain any three Variable selection techniques in statistics. **[6]**

b) Compute the regression lines for the following data. **[6]**

x	6	2	10	4	8
y	9	11	5	8	7

c) Fit a parabola $y = ax^2 + bx + c$ for the following data in multiple linear regression. **[6]**

x	–3	–2	–1	0	1	2	3
y	12	14	1	2	7	15	30

Q3) a) Explain the components of a time series. How do trends, seasonality, cyclic variations, and irregular variations impact time series forecasting? **[6]**

b) Give a brief note on ARIMA model. **[6]**

c) Differentiate between stationary and non - stationary time series. Why is stationarity important in time series modeling? **[5]**

OR

P.T.O.

Q4) a) Explain applications of time series in data science with the help of an example. **[6]**

b) For the following sales data for the last 6 months, forecast/evaluate the sales of the month July by using ARIMA (1, 1, 1). **[6]**

Month	Jan	Feb	March	April	May	June
Sales	120	135	150	160	175	190

c) Explain with an example, stationarity & autocorrelation in time series. **[5]**

Q5) a) Explain the types of machine learning with examples. **[6]**

b) Differentiate between Classification & regression problems in the context of supervised learning. **[6]**

c) What is the K-Nearest Neighbors (KNN) algorithm? Describe its algorithmic steps with an illustration. **[6]**

OR

Q6) a) Design a machine learning workflow using a classification problem. Highlight each stage and the decisions involved. **[6]**

b) Explain the Bias Variance Tradeoff in Machine Learning with a suitable example. **[6]**

c) Explain the applications of Machine Learning in data science. **[6]**

Q7) a) Explain the types of optimization in machine learning & data science. **[6]**

b) By using the Gradient Descent method, find the first five iterations for $f(x) = x^2 + 4x + 4$ for dataset (0,5) and learning rate is 0.1. **[6]**

c) Explain Constrained Optimization techniques. **[5]**

OR

Q8) a) Explain any five Meta-Heuristic Optimization Algorithms with an example. **[6]**

b) Find the minimum value of $f(x, y) = x^2 + y^2$ subject to the condition $x + y = 1$ by using method of Lagrange's Multipliers. **[6]**

c) Write Applications of Optimization Techniques in Data Science. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE4381

[Total No. of Pages : 2

[6582]-156

S.E. (Computer Science and Engineering) (Data Science)

OPERATING SYSTEMS

(2019 Pattern) (Semester - IV) (210653)

Time : 2 ½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the brief explanation of following : **[9]**

i) The Ostrich Algorithm

ii) Deadlock Avoidance

b) Explain producer Consumer problem and readers/writers problem. **[8]**

OR

Q2) a) Explain the four necessary conditions for Deadlock. **[8]**

b) Explain Semaphores, Mutex, Monitors. **[9]**

Q3) a) For the given reference string

5, 0, 1, 0, 2, 3, 0, 2, 4, 3, 3, 2, 0, 2, 1, 2, 7, 0, 1, 1, 0

Count the number of page faults and page hit that occur with 3 frames using FIFO and OPTIMAL page replacement methods. **[10]**

b) Write a short note on Paging with proper Diagram. **[8]**

OR

Q4) a) Give the difference between **[10]**

i) Paging and Segmentation

ii) Fixed Partitioning and Dynamic Partitioning

b) Write a short note on **[8]**

i) Demand paging

ii) Trashing

iii) Buddy System

iv) Optimal Page replacement

P.T.O.

Q5) a) What is file system? Explain in details File system and File structure. **[9]**

b) Explain in brief different I/O buffering techniques. **[9]**

OR

Q6) a) Explain file attributes and operations on file in detail. **[9]**

b) Write a short note with respect to disk scheduling policies (Any Two) **[9]**

i) FIFO

ii) SCAN

iii) STTF

Q7) a) Write note on: **[9]**

i) Buffer overflow

ii) Intrusion Detection Systems (IDS)

b) Define and explain in details:Threats, Intruders, Attacks and Asset **[8]**

OR

Q8) a) Difference between Malware, Virus, Worm and Bot with suitable example. **[8]**

b) Describe various types of Intruders and the techniques they use for unauthorized access? Also explain concept of Authentication in details with real time example. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE4382

[Total No. of Pages : 2

[6582]-157

S.E. (Computer Science and Engineering) (Data Science)
DATA STORYTELLING AND VISUALIZATION
(2019 Pattern) (Semester - IV) (210654)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or 2, Q.3 or 4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of scientific calculator is permitted.***

Q1) a) Explain the importance of data pre-processing in creating effective data visualizations. **[6]**

b) Identify and explain the five big categories of data visualization. **[6]**

c) Explain the principles of visual perception and the role of color as a preattentive attribute in data visualization. **[6]**

OR

Q2) a) How can practicing good ethics improve the impact of data visualizations? Provide examples. **[6]**

b) Differentiate between cognitive and perceptual design in data visualization, with examples. **[6]**

c) Elaborate the PowerBl and Tableau as tools for data visualization, mentioning their strengths in detail. **[6]**

Q3) a) Explain the Gestalt Principle of Proximity and its importance in creating accessible visualizations. **[6]**

b) How can static visualizations and interactive visualizations be used effectively? Compare with examples. **[6]**

c) List and explain different types of foundational and advanced visualizations tools. **[5]**

OR

Q4) a) Write a note on:

i) Circle charts

ii) Jittering

iii) Histograms **[6]**

b) Discuss the differences between Exploratory Analysis and Explanatory Analysis in the context of data visualization. **[6]**

c) Describe the process of bringing different visual elements together into a cohesive dashboard. What factors must be considered? **[5]**

P.T.O.

Q5) a) Explain the importance of geospatial visualization and describe the tools used for mapping data. **[6]**

b) What are temporal visualization techniques, and how are they applied in time series analysis? **[6]**

c) Describe the role of animation and dynamic visualizations in enhancing data storytelling. **[6]**

OR

Q6) a) Discuss network and graph visualization techniques and how they help in understanding relationships and connections. **[6]**

b) Discuss the methods and importance of text and sentiment visualization, including tools like word clouds and sentiment analysis. **[6]**

c) What are the key principles in designing interactive dashboards, and how do user experience and usability considerations influence their development? **[6]**

Q7) a) Discuss how data storytelling is applied differently across industries such as healthcare, finance, and ecommerce. **[6]**

b) Explain the challenges and opportunities faced in applying data visualization in different industries. **[6]**

c) How can virtual reality, augmented reality, AI, and machine learning enhance data visualization experiences? **[5]**

OR

Q8) a) What are some key innovations and trends currently shaping the field of data visualization? **[6]**

b) How is predictive analytics and forecasting influencing the future of data storytelling and visualization? **[6]**

c) Discuss ethical considerations in data storytelling, focusing on avoiding bias and ensuring transparency. **[5]**

Total No. of Questions : 8] **SEAT No. :**

PE4383 **[Total No. of Pages : 2**

[6582]-158

S.E. (Computer Science & Engineering) (Data Science)

DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - IV) (210655)

Time : 2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain 2NF and 3NF and BCNF with example. **[9]**

b) What is anomaly in relational model? Explain how normalization can be used to reduce the anomalies? **[9]**

OR

Q2) a) What are relational integrity constraints? Explain with example Domain constraints, Referential Integrity and enterprise Constraints. **[9]**

b) Elaborate the significance of codd's rule. Explain 12 rules proposed by codd's. **[9]**

Q3) a) Explain the concept of conflict serializability with suitable example. Since every conflict-serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability? **[8]**

b) What is the Need of Concurrency Control? Explain two phase locking protocol for concurrency control. **[9]**

OR

Q4) a) Differentiate between Centralized and Client-Server Architectures. **[8]**

b) What is distributed Databases? Explain data replication in Distributed Data Storage. **[9]**

Q5) a) Compare JSON and XML with example. **[8]**

b) Write short note on **[9]**

i) SQLite

ii) Mobile Database

iii) Cloud Database

OR

P.T.O.

Q6) a) Explain Map Reduce with example. **[9]**

b) Differentiate between SQL and NoSQL Databases. **[8]**

Q7) a) What is Data Warehouse? Explain architecture of Data Warehouse. **[9]**

b) Explain Knowledge Discovery Process in detail. **[9]**

OR

Q8) a) Write a short note on complex data types: **[9]**

i) Semi-structured data

ii) Features of semi-structured data models

b) What is object relational database system. Explain Table inheritance with example. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE4384

[Total No. of Pages : 2

[6582]-159

S.E. (Computer Science and Engineering) (Data Science)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - IV) (210656)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary***

Q1) a) Explain Perspective projections with an example. **[6]**

b) Derive 3D transformation matrix for rotation about a principal axis. **[5]**

c) What are the types of Projection and write briefly on any kind of projection. **[6]**

OR

Q2) a) What is transformation, and write a transformation matrix for: **[6]**

i) 2-D reflection with respect to the line Y = X.

ii) 3-D rotation about Y-axis.

b) Differentiate between Orthographic Projection and Isometric Projection. **[5]**

c) Perform 45º rotation of a triangle A(0, 0), B(1, 1) and C(5, 2). Find transformed coordinates after rotation. **[6]**

i) About origin

ii) About P(–1, 1)

Q3) a) Explain ambient light and diffuse reflection with examples. **[6]**

b) Explain Halftone shading in detail. **[5]**

c) Write a short note on: **[6]**

i) CMY color model

ii) Properties of light

OR

P.T.O.

Q4) a) Write a short note on Warnock's Algorithm. **[6]**

b) Compare Gauraud shading and Phong shading. **[5]**

c) What is Backface? Explain Backface Detection and removal. **[6]**

Q5) a) Explain the Bezier curve. List its properties. **[4]**

b) Write a short note on the motion specification method based on. **[7]**

i) Geometric and kinematics information.

ii) Animation languages.

c) What are fractals? Explain the Triadic Koch in detail. **[7]**

OR

Q6) a) Define Morphing and write the applications of Morphing. **[4]**

b) Explain Hilbert's curve with an example. **[7]**

c) Explain the blending function for the B-spline curve. **[7]**

Q7) a) Explain gesture interfaces in virtual Reality. **[4]**

b) Explain haptic feedback in a Virtual Reality system. **[7]**

c) Discuss NVIDIA as a gaming platform in detail. **[7]**

OR

Q8) a) Explain 3D position trackers. **[4]**

b) What are the different usage of Virtual Reality? Explain in detail. **[7]**

c) What are navigation and manipulation interfaces in a virtual reality system? Explain in detail. **[7]**



Total No. of Questions : 8]

SEAT No. :

PE-4385

[Total No. of Pages : 3

[6582]-160

S.E. (Computer Science and Engineering (Data Science))

MATHEMATICAL FOUNDATION FOR DATA SCIENCE - I

(2019 Pattern) (Semester - III) (210641)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Probability of man aged 60 years will live for 70 years is 1/10. Find probability of 5 men selected at random 2 will live for 70 years. Also Find mean, standard deviation & variance of Binomial probability distribution. **[6]**

b) Two dies are thrown simultaneously and the sum of the numbers obtained is found to be 7. What is the probability that the number 3 has appeared at least once? **[6]**

c) What are the applications of Probability Theory in data science? **[6]**

OR

Q2) a) What is the Probability? Explain their types. **[6]**

b) A throw is made with two dice. Find probability of getting a score of **[6]**

i) 10 points

ii) At least 10 points

iii) At most 10 points

c) Consider a biased coin where the probability of getting heads (Success) is p=0.3. **[6]**

i) Find the mean of X

ii) Find the variance of X

P.T.O.

Q3) a) i) Define Point Estimation.

ii) Calculate the mean for the following data set

{0,2,9,10,12,15,18,21,24,36,43,59,68,72,81,99} **[6]**

b) A random sample size 20 from normal population gives a sample mean of 42 a sample standard deviation is 6. Test the hypothesis that the populations mean is 44. (T_{tab} = 2.093). **[6]**

c) Define : **[5]**

i) Point Estimation ii) Interval Estimation

iii) Confidence Level iv) Margin of Error

v) Hypothesis testing

OR

Q4) a) What is Parametric and Non-Parametric Test? What are the types of Parametric and Non-parametric tests. **[6]**

b) i) Define the methods of Point Estimation.

ii) Calculate the sample variance for the data set

{5,8,10,12,15} **[6]**

c) What are the steps of Hypothesis Testing? Explain Types of Hypothesis Testing. **[5]**

Q5) a) Using Newton Raphson's Method find the real root of the equation $x^3 - 2x - 5 = 0$ correct up to 3 decimal places. **[6]**

b) Evaluate the following integral using **[6]**

i) Trapezoidal rule

ii) Simpson's Rule or Simpson's $\frac{1}{3}$ rule

iii) Simpson's $\frac{3}{8}$ Rule

$I = \int_0^2 (2x^2 - 1)\, dx$ *with* 4 interval

c) Find a real root of equation $x^3 - 2x - 5 = 0$ correct up to three decimal places using Secant method. **[6]**

OR

Q6) a) Use Euler's method to solve the equation $\frac{dy}{dx} = 1 + xy$ subject to the conditions at $x = 0$, $y = 1$ and tabulate y for $x = 0$ (0.l) 0.5. **[6]**

b) Solve the following system of equation by matrix inversion method **[6]**

$x + y + z = 6$

$3x + 3y + 4z = 20$

$2x + y + 3z = 13$

c) Find a real root of $x^3 - x = 1$ by using Bisection method up to 3 decimals **[6]**

Q7) a) What is Set? Explain their types with example. **[6]**

b) From a group of 7 men and 6 women, five persons are to be selected to form a committee. So that at least 3 men are there on the committee. In how many ways can it be done? **[6]**

c) In a class of 40 students, 15 like to play cricket and football and 20 like to play cricket. How many people like to play football only but not cricket? **[5]**

OR

Q8) a) Prove the following statement **[6]**

i) $[(A \rightarrow B) \wedge A] \rightarrow B$ is a tautology

ii) $(A \vee B) \wedge [(\sim A) \wedge (\sim B)]$ *is a contradiction*

b) What is Cardinality of Set explain with example. **[6]**

c) Explain the principle of Inclusion and Exclusion. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-4386

[Total No. of Pages : 3

[6582]-161

S.E. (Computer Science & Engineering (Data Science))

DATA STRUCTURES AND ALGORITHMS

(2019 Pattern) (Semester - III) (210642)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Write rules to convert given infix expression to postfix expression using stack. Convert expression (A* B – (C + D * E) ^ (F * G / H)) stepwise using above rules. Where ^ is - exponential operator. **[7]**

b) Draw and explain implementation of Linear Queue using Singly Linked List. Explain Add, Remove, Queue Full and Queue Empty operations. **[7]**

c) Explain the application of stacks in evaluating prefix expressions. **[4]**

OR

Q2) a) Write rules to convert given infix expression to postfix expression using stack. Convert expression (P * Q – (L + M * N) ^ (X* Y / Z)) stepwise using above rules. **[7]**

b) What is Doubly Ended Queue? Draw Diagram with labelling four basic operations at appropriate places. Which two data structures are combined in it and how? **[7]**

c) What is the difference between a stack and a queue? Provide examples of each. **[4]**

Q3) a) Write an algorithm to delete a node from Threaded binary Search Tree. **[7]**

b) The following numbers are inserted into an empty binary search tree in the given order : G, C, B, A , D, E, F, I, H. Construct tree step by step. Represent the constructed tree using static memory allocation.**[7]**

P.T.O.

c) Explain the properties of a binary tree. How can a general tree be converted into a binary tree? **[4]**

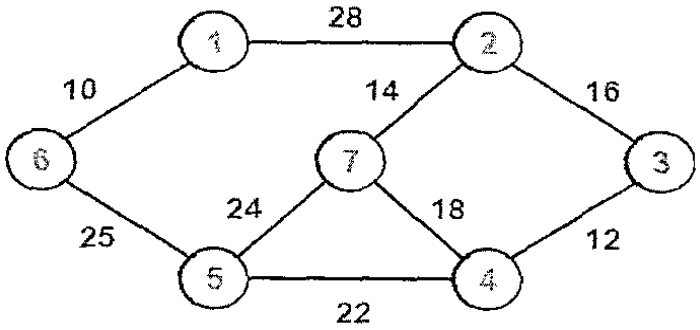
OR

Q4) a) Discuss the concept of a threaded binary search tree (TBST). Explain the process of threading and the insertion and deletion of nodes in an inorder threaded binary search tree. **[7]**

b) Construct threaded binary tree step by step if the preorder traversal is G, B, D, C, A, K, Q, P, R & in-order traversal is B, A, C, D, G, K, P, Q, R. Delete G and redraw a tree. **[7]**

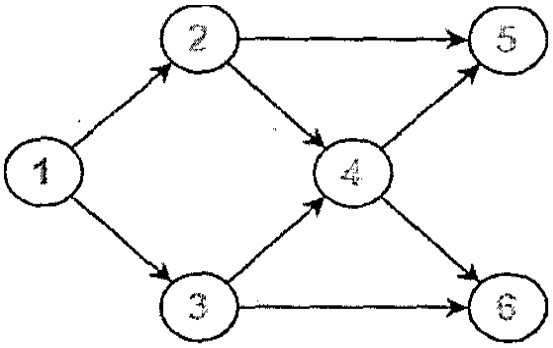
c) Write an algorithm to delete a node from Threaded binary Search Tree. **[4]**

Q5) a) Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm staring from vertex 6. **[7]**



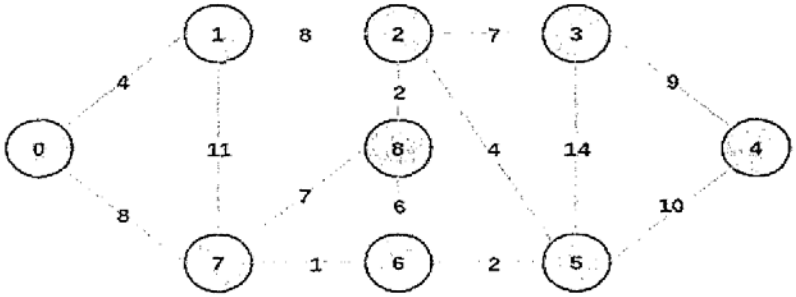
b) Write Kruskal's algorithm for minimum spanning trees and explain with example. **[6]**

c) What is topological sorting? Find topological sorting of given graph. **[4]**



OR

Q6) a) Using Prim's Algorithm, find the cost of minimum spanning tree (MST) of the given graph starting from vertex 'a'. **[7]**



b) Write an algorithm for breadth first traversal of a graph with example. **[6]**

c) Define the following terms : **[4]**

i) Complete Graph

ii) Connected Graph with example

Q7) a) For the given set of values: 76,40,48,5,55 Construct a hash table with size 7 and resolve collision using quadratic probing. **[7]**

b) Explain Index Sequential file and discuss their advantages and disadvantages **[6]**

c) What is hash function? What are characteristics of good hash function? **[4]**

OR

Q8) a) Insert the following data in the hash table of size 10 using linear probing with chaining by applying with replacement: 11, 33, 20, 88, 79, 98, 68, 44, 66, 24. Calculate average number of comparisons required to search given data from hash table. **[7]**

b) Explain Sequential file organization and discuss their advantages and disadvantages. **[6]**

c) What is hashing? Explain different methods of hash function calculation. **[4]**

Total No. of Questions : 8]

SEAT No. : ____

PE-4387

[Total No. of Pages : 2

[6582]-162
S.E. Computer Science and Engineering (Data Science)
OBJECT ORIENTED PROGRAMMING
(2019 Pattern) (Semester - III) (210643)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is operator overloading? Write C++ program to overload + operator for addition of two complex numbers **[6]**

b) Differentiate between compile time and runtime polymorphism? **[6]**

c) What is virtual function? Illustrate with example significance of virtual function **[6]**

OR

Q2) a) What is data conversion and type casting? Illustrate with example implicit and explicit data conversions. **[6]**

b) What is abstract base class? Write C++ program to create student as abstract base class with pure virtual function show_qualification() and derive Engineering and medical classes to display it. **[6]**

c) Explain function overloading with suitable example **[6]**

Q3) a) Explain various ways to create and open a file with example? **[6]**

b) What is file pointer? Explain any two File pointer manipulators with suitable example. **[6]**

c) Write C++ program to copy data from one file into other file? **[5]**

OR

P.T.O.

Q4) a) What is File and stream? Illustrate any four file opening modes with proper syntax? **[6]**

b) What are command line arguments? Write a program to explain the same? **[6]**

c) Write C++ program to write and read employee data in file using class objects? **[5]**

Q5) a) What is Exception Handling? Write C++ program to handle divide by zero exception handling? **[6]**

b) Explain significance of multiple catch statement with suitable example? **[6]**

c) What is class template? Write C++ program to create class template with multiple arguments? **[6]**

OR

Q6) a) How to create userdefined exceptions? Explain with example. **[6]**

b) Why templates are useful in programming? Write C++ program to display integer and float array using function template? **[6]**

c) Illustrate with example typename and export keyword? **[6]**

Q7) a) What is container? Elaborate containers in STL with suitable diagram. **[6]**

b) What is algorithm? Explain min-max algorithms with example? **[6]**

c) Write C++ program to implement operation on stack container adapter? **[5]**

OR

Q8) a) Explain basic searching and sorting algorithms of STL? **[6]**

b) Why iterators are used in STL? Explain types of iterators? **[6]**

c) Write C++ program to implement map container? **[5]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-4388

[Total No. of Pages : 2

[6582]-163
S.E. (Computer Science and Engineering (Data Science))
SOFTWARE ENGINEERING AND PROJECT MANAGEMENT
(2019 Pattern) (Semester - III) (210645)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the different software project estimation techniques and compare their effectiveness. **[7]**

b) What is the COCOMO II model, and how is it used in software project estimation? **[7]**

c) What is a use-case-based estimation approach? Outline its main components. **[4]**

OR

Q2) a) Illustrate decomposition techniques in software sizing with suitable examples. **[7]**

b) Explain how to prepare a requirement traceability matrix (RTM) and its significance in software project management. **[7]**

c) Describe LOC-based estimation and its advantages and disadvantages. **[4]**

Q3) a) What is modularity in software design, and why is it important? **[5]**

b) Briefly describe the taxonomy of architectural styles and their relevance in software design. **[5]**

c) Describe component-level design in web applications. How are content design and functional design addressed at the component level? **[7]**

OR

P.T.O.

Q4) a) Explain the concept of abstraction in software design. Provide an example. **[5]**

b) What is refactoring, and why is it used in software design? **[5]**

c) What is software architecture? Why is architecture important in software design, and what are some common architectural styles? **[7]**

Q5) a) Define software risks and explain why they are critical in software project management. **[5]**

b) What is Software Configuration Management (SCM), and why is it important? **[5]**

c) Explain the RMMM plan in risk management. Describe its components and purpose. **[7]**

OR

Q6) a) Explain the process of risk projection in software projects. **[5]**

b) Briefly describe the CF Engine and Puppet configuration tools in SCM. **[5]**

c) Discuss risk identification and refinement in software projects. How do they contribute to effective risk management? **[7]**

Q7) a) Explain the strategic approach to software testing. Why is it important to have a strategic plan in software testing? **[7]**

b) What are validation testing and validation-test criteria? Why are they important in the software testing process? **[7]**

c) Define unit testing and describe its purpose in the software testing process. **[4]**

OR

Q8) a) Describe the different test strategies for conventional software and object-oriented software. How do these strategies differ? **[7]**

b) Explain configuration review in software testing and its importance in maintaining software quality. **[7]**

c) Describe the testing strategy for Web applications (WebApps). **[4]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-4389

[Total No. of Pages : 2

[6582]-164
S.E. (Computer Science and Engineering) (Data Science)
DIGITAL ELECTRONICS AND LOGIC DESIGN
(2019 Pattern) (Semester - III) (210644)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is the function of preset and clear inputs in flip-flop. **[6]**

b) Write short note on Ring counter. **[6]**

c) Distinguish between combinational and sequential switching circuits also write examples of both. **[6]**

OR

Q2) a) What is an ASM Chart? Name the elements of an ASM chart and define each of them. **[6]**

b) Explain the working of the master slave JK flip-flop. **[6]**

c) Convert Following Flip flops : **[6]**

i) SR to D

ii) JK to T

Q3) a) What is FPGA? Explain its basic Architecture. **[6]**

b) What is the difference between PAL and PLA. **[6]**

c) Implement following Boolean function using PLA **[5]**

F1(A, B, C) = ∑m(l, 5, 7) F2(A, B, C) = ∑m(5, 6, 7)

OR

Q4) a) Explain Basic architecture of CPLD. **[6]**

b) Draw an ASM chart and state table of a 2 bit up-down counter having a mode control input. **[6]**

c) Draw a block diagram of the PLA device and explain. **[5]**

P.T.O.

Q5) a) Explain with a neat diagram CMOS NAND Gate. **[6]**

b) Explain the wired logic output of TTL with neat diagram. **[6]**

c) Compare CMOS and TTL logic family. **[6]**

OR

Q6) a) With the help of a neat diagram, explain the working of two - input TTL NAND gate. **[6]**

b) Draw and explain CMOS invertor. **[6]**

c) Define the following terms and mention the standard values for TTL logic Family. **[6]**

i) Fan-out

ii) Power Dissipation

iii) Propagation Delay

Q7) a) With the help of a block diagram explain the fundamental units of a microprocessor. **[6]**

b) What are the different types of buses used in Microprocessor? **[6]**

c) Explain in brief basic arithmetic operations using ALU IC 74181. **[5]**

OR

Q8) a) What is Microprocessor? List different applications of Microprocessor. **[6]**

b) Write a short note on ALU IC 74181. **[6]**

c) Explain the Memory organization of the microprocessor. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-4390

[Total No. of Pages : 2

[6582]-165

S.E. (Electronics Engineering) (VLSI Design & Technology)

FPGA BASED SYSTEM DESIGN USING VERILOG

(2019 Pattern) (Semester - III) (204206)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Explain logical operators of verilog in detail. **[6]**

b) What are the different lexical convention used in verilog? **[6]**

c) Write a short note on system tasks. **[5]**

OR

Q2) a) With the help of example explain if else conditional statement. **[6]**

b) Explain procedural blocks of verilog in detail. **[6]**

c) Explain different data types of verilog. **[5]**

Q3) a) Write verilog program for 4:1 mux using behavioural modelling. **[6]**

b) Write verilog program for 2:4 decoder using data - flow modelling. **[6]**

c) Write verilog program for 4-bit ripple carry full adder using structural modelling. **[6]**

OR

Q4) a) Using case statement write verilog code for SR flip - flop. **[6]**

b) Write a verilog code for binary up-down counter. **[6]**

c) Write a verilog code for 2:1 mux using structural modelling. **[6]**

P.T.O.

Q5) a) Write short notes on : **[6]**

i) State table

ii) State diagram

b) Differentiate between mealy machine & moore machine. **[6]**

c) Design sequence detector for given sequence of 110 using moore model. **[6]**

OR

Q6) a) Write a short note on : **[6]**

i) State assignment

ii) State Reduction

b) Draw a state diagram using mealy ckt from given state table. **[6]**

PS	Next State		Output	
	x = 0	x = 1	x = 0	x = 1
P	P	Q	0	0
Q	P	R	0	0
R	S	Q	0	0
S	P	Q	0	1

c) Design a 1-bit serial adder using mealy model. **[6]**

Q7) a) Explain dynamic architechture of FPGA. **[5]**

b) Design LCD Interface with FPGA. **[6]**

c) Explain the interfacing of RTC using FPGA. **[6]**

OR

Q8) a) What do you mean by reconfigurable systems. Explain the terms with respect to FPGA. **[5]**

b) Design keyboard interface with FPGA. **[6]**

c) Draw & explain VGA Interfacing with FPGA. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PE5080

[Total No. of Pages : 2

[6582]-166

S.E. (E & C Engineering) (Advance Communication Technology)
DIGITAL COMMUNICATION ENGINEERING
(2019 Pattern) (Semester-IV) (204204)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer any one Question out of Q.1 or 2, Q.3 or 4, Q.5 or Q.6 and Q.7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the performance of MSK with suitable block schematic and detail waveforms. **[9]**

b) Compare M-ary PSK and M-ary QAM. **[8]**

OR

Q2) a) With the help neat block diagram explain OFDM transmitter and receiver system. **[9]**

b) Draw and explain block diagram of generation and reception of M-ary FSK with waveforms. **[8]**

Q3) a) What is PN sequence? Explain properties of PN sequence with 3-stage shift register. **[9]**

b) List the advantages and disadvantages of CDMA. **[8]**

OR

Q4) a) Write a short note on: **[8]**

i) DSSS

ii) FHSS

b) Explain in detail DSSS-BPSK transmitter and receiver along with waveforms. **[9]**

P.T.O.

Q5) a) Explain the concept of Matched Filter and its applications. **[9]**

b) Write a short notes on: **[9]**

i) Baseband receiver

ii) MAP

iii) LRT

OR

Q6) a) Explain the concept of Matched filter with block diagram and concept of correlation receiver. **[9]**

b) Explain in detailed geometric representation so signals. Explain with the help of BPSK and QPSK. **[9]**

Q7) a) Explain in detailed Passband Transmission Model and its signal space representation. **[9]**

b) Write short notes on **[9]**

i) Minimum shift keying

ii) Gaussian MSK

iii) DPSK

OR

Q8) a) Explain the concept of coherent QPSK and derive its error probability. **[9]**

b) Write short notes on **[9]**

i) OFDM

ii) DEPSK

iii) BFSK



Total No. of Questions : 8]

SEAT No. :

PE-4391

[Total No. of Pages : 2

[6582]-167

S.E. (E & C Engineeering) (Advanced Communication Technology)

PRINCIPLES OF COMMUNICATION ENGINEERING

(2019 Pattern) (Semester - III) (204202)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Describe balanced slope detector with circuit diagram and characteristics for demodulation of FM signal. **[6]**

b) With neat block diagram describe relationship between phase modulation and frequency modulation. **[6]**

c) Describe FM generation by Armstrong's indirect method with neat block diagram. **[6]**

OR

Q2) a) Define modulation index, maximum deviation and Bandwidth of FM signal. Sketch FM waveform for sinusoidal input signal. **[5]**

b) Compare Narrow band FM and Wide band FM. **[5]**

c) Calculate the carrier swing, carrier, frequency, frequency deviation, and modulation index for an FM signal which reaches a maximum frequency of 99.057 MHz and a minimum frequency of 99.023 MHz. The frequency of the modulating signal is 7 KHz. **[8]**

Q3) a) Describe generation of flat top samples with circuit diagram and waveform. **[6]**

b) Discuss generation of Pulse Amplitude modulation with block diagram and waveform. **[5]**

c) Distinguish between PPM, PWM & PPM. **[6]**

OR

P.T.O.

Q4) a) State Sampling theorem in time domain. Draw the spectrum showing aliasing and guard band. **[5]**

b) With neat circuit diagram and waveform explain generation of pulse position modulation signal. **[6]**

c) Explain distortion that occurs in process of sampling and how it can be reduced? **[6]**

Q5) a) Draw & explain Delta modulation waveform with slope overload & granular noise. **[6]**

b) Compare Adaptive delta modulation with Differntial Pulse code modulation. **[6]**

c) With a neat block diagram explain PCM transmitter. **[6]**

OR

Q6) a) Describe working principles of Differential Pulse code modulation with neat block diagram of DPCM transmitter. **[6]**

b) Draw neat diagram for Adaptive Delta modulation transmitter and receiver and explain reason to use Adaptive delta modulation. **[6]**

c) State types of quantization & explain uniform quantization in detail with characteristics. **[6]**

Q7) a) Describe Eye pattern-Graphical display of Intersymbol Interference with diagram. **[5]**

b) Describe concept of digital multiplexer and demultiplexer with diagram. **[6]**

c) Explain working principle of scrambling & unscrambling with example. **[6]**

OR

Q8) a) Draw AT & T hierarchy multiplexing system & explain it in detail. **[6]**

b) State different synchronization techniques and explain any one in detail with neat circuit diagram. **[6]**

c) Draw the lines codes - Unipolar RZ, Polar NRZ, AMI & Split phase Manchester for the bit stream 101100110101. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE4392

[Total No. of Pages : 2

[6582]-168
S.E. (Computer Science)
MICROPROCESSOR & MICROCONTROLLER
(2019 Pattern) (Semester - IV) (210554)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Differentiate and explain GDTR, LDTR, and IDTR. **[6]**

b) With the help of necessary diagram, explain the complete address translation process in 80386. **[6]**

c) Draw and explain General Selector Format. **[6]**

OR

Q2) a) Explain the use of following instructions in detail. **[6]**

i) SGDT

ii) LIDT

iii) SLDT

b) Explain the page translation process in 80386. **[6]**

c) Demonstrate General Descriptor Format available in various descriptor tables. **[6]**

Q3) a) Draw & Explain the Task state segment of 80386. **[6]**

b) List and explain various Privilege Instructions. **[6]**

c) Explore five aspects of protection applied in segmentation. **[5]**

OR

Q4) a) Explain the following terminologies: **[6]**

i) CPL

ii) DPL

iii) RPL

b) Elaborate on the concept of combining segment protection and page level protection in 80386. **[6]**

c) What is call gate? Explain how it is used in calling functions with higher privilege levels? **[5]**

P.T.O.

Q5) a) Define Task Switching and explain the steps involved in task switching operation? **[6]**

b) Explain the following exception conditions with an example: Faults, Traps, and Aborts. **[6]**

c) Explain the TSS descriptor of 80386 with a neat diagram. **[6]**

OR

Q6) a) List and explain various features of virtual 8086 Mode. **[6]**

b) With the necessary diagram, explain entering and leaving the virtual mode of 80386. **[6]**

c) Explain the structure of a V86 Task in detail. How is protection provided within the V86 task? **[6]**

Q7) a) With the help of neat diagram explain the process of handling interrupts in protected mode. **[6]**

b) Differentiate the Interrupt gate and Trap gate descriptor. **[6]**

c) Explain various features of the 8051 Microcontroller. **[5]**

OR

Q8) a) Explain the following exceptions in brief. **[6]**

i) Divide Error

ii) Overflow

iii) Invalid op code

b) With the help of neat diagram explain the architecture of typical Microcontroller. **[6]**

c) Differentiate between Microprocessor and Microcontroller. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE4393

[Total No. of Pages : 2

[6582]-169
S.E. (Computer Science)
DESIGN THINKING
(2019 Pattern) (Semester - IV) (210555)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain Walt Disney method for idea generation. **[6]**

b) What are the different techniques for effective idea generation? **[6]**

c) Write a short note on **[6]**

i) The Dreamer

ii) The Critic

OR

Q2) a) Write a short note on six thinking hats. **[6]**

b) Explain the principles of creativity. **[6]**

c) What is idea generation? Explain different stages of idea generation. **[6]**

Q3) a) Explain visualization and presentation in prototyping. **[6]**

b) What is quick and dirty prototyping? Explain. **[6]**

c) Explain Lean startup method for prototype development. **[5]**

OR

Q4) a) Explain models and prototypes with examples. **[6]**

b) Explain creative storyboard ideas and mock-ups. **[6]**

c) Write a short note on prototype phase. **[5]**

P.T.O.

Q5) a) What is prototype testing? Explain different types of prototype testing. **[6]**

b) What are the different categories in the Kano model? Explain. **[6]**

c) What is desirability testing? Explain. **[6]**

OR

Q6) a) What is split testing? Explain. **[6]**

b) Write a short note on ergonomic testing. **[6]**

c) Explain the terms : **[6]**

i) Interviews

ii) Surveys

Q7) a) What are the different project management software? **[6]**

b) What is the new social contract? Explain in detail. **[6]**

c) What are the different success factors for implementation of ideas? Explain. **[5]**

OR

Q8) a) What are the benefits of strong design and innovation strategy? Explain. **[6]**

b) How corporations integrate design thinking? Explain. **[6]**

c) Write a short note on design activism. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4394

[Total No. of Pages : 2

[6582]-170
S.E. (Computer Science)
COMPUTER GRAPHICS FOR DATA VISUALIZATION
(2019 Pattern) (Semester - III) (210244)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain 2D rotation with respect to any arbitrary point with suitable example **[6]**

b) What are the types of Projection and write in brief about any one type of projection. **[6]**

c) Given a circle C with radius 5 and center coordinates (1, 4). Apply the translation with distance 5 towards X axis and 1 towards Y axis. Obtain the new coordinates of C without changing its radius. **[6]**

OR

Q2) a) Derive 3D transformation matrix for rotation about a principal axis. **[6]**

b) Write transformation matrix for **[6]**

i) 2-D Rotation clockwise direction

ii) 2-D Scaling

iii) 2-D translation

iv) 2-D reflection about X-axis.

c) Explain what is perspective projection in details **[6]**

Q3) a) Compare Gauraud shading and phong shading. **[6]**

b) Compare RGB and HSV color model **[6]**

c) Explain Back-face Removal algorithm **[5]**

OR

P.T.O.

Q4) a) Explain Painter's algorithm. **[6]**

b) What is Shading & Explain Halftone shading **[6]**

c) Explain Warnock algorithm in details **[5]**

Q5) a) Explain the concept of Fractals also explain any two applications of Fractals **[6]**

b) What is Spline curve & explain B-Spine curve **[6]**

c) Write a short note on interpolation and approximation. **[6]**

OR

Q6) a) Explain the Bezier curve. List its properties. **[6]**

b) Draw and explain Hilbert's curve with an example **[6]**

c) Differentiate between interpolation and approximation. **[6]**

Q7) a) Explain deletion of segment with suitable example. **[6]**

b) Draw block diagram of NVIDIA workstation and explain it in brief. **[6]**

c) Compare 2D and 3D visualization. **[5]**

OR

Q8) a) What is computer animation? Write basic guideline of animation technology. **[6]**

b) Discuss the various Motion specification methods. **[6]**

c) Write the names of 3D visualization tools. Explain use of any one tool in detail. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE-4395

[Total No. of Pages : 2

[6582]-171

S. E. (Computer Science Engineering)

DIGITAL ELECTRONICS AND VLSI

(2019 Pattern) (Semester - III) (210245)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Assume suitable data if necessary.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Design full adder by using half adder. **[6]**

b) Differentiate between Demultiplexer and Decoder. **[5]**

c) Design BCD to excess three code converters. **[6]**

OR

Q2) a) Implement following function using 16:1 Mux. $F = \sum m(0,2,3,6,8,9,12,14)$. **[6]**

b) Design 4:1 MUX using 2:1 MUX. **[5]**

c) Differentiate between combinational and sequential circuits. **[6]**

Q3) a) Convert D flipflop to T flipflop. **[6]**

b) Draw and explain the behavior of M-S JK flipflop. **[6]**

c) Explain with neat diagram 3-bit universal Shift register. **[6]**

OR

Q4) a) Convert J-K flipflop to S-R flipflop. **[6]**

b) Draw the logical diagram of 4-bit bidirectional shift register. Explain Shift left and shift right operation. **[6]**

c) Design 2-bit synchronous up counter using J-k flipflop. **[6]**

P.T.O.

Q5) a) What are the different Modelling styles of architecture in VHDL? Explain any one with example. **[6]**

b) Differentiate between signal and variable. **[5]**

c) Write VHDL code for full subtractor. **[6]**

OR

Q6) a) Explain with example: delays in VHDL. **[6]**

b) What are datatypes in VHDL? Explain in Detail **[6]**

c**)** Write VHDL code for Full Adder. **[5]**

Q7) a) Differentiate Between CPLD and FPGA. **[6]**

b) Draw FSM state diagram for 11001 Mealy sequence detector & write VHDL Code for it. **[6]**

c) Write VHDL code for any 3 logic gate. **[6]**

OR

Q8) a) What is mean by configuration of PLD? What are the methods of configuration? **[6]**

b) With neat schematic explain the architectural building blocks of FPGA.**[6]**

c) Write VHDL code for 4:1 MUX **[6]**

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