Total No. of Questions : 8]

SEAT No. : ____

PC2777

[Total No. of Pages : 2

[6352]-1
S.E. (Civil)
GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester - IV) (201008)

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) ***Assume suitable data, if necessary and mention it clearly.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Explain in detail Effect of compaction on properties of soil. **[6]**

b) What is Geostatic stresses? Enlist various approaches to compute stresses due to different loading patterns of soil. **[6]**

c) What is Isobar? Explain its Significance. A line load of 200 kN/m is acting on the ground surface along a vertically downward direction. Determine the vertical stress at P which is 3.6 m deep and 2 m away horizontally. **[5]**

OR

Q2) a) What is Compaction? How is it different from consolidation? Explain how compacting efforts affects compaction? **[6]**

b) The following observations were noted during proctor compaction test with a soil :

Water content(%)	8.6	11.0	12.5	14.5	16.0	18.0	19.5
Bulk density(kg/m^3)	1800	1900	1960	2045	2100	2050	2010

Specific gravity of soil grains is 2.7. Find out MDD and OMC for the soil. Plot the zero air void curve and 80% saturation curve also. **[6]**

c) Explain in detail comparison between Boussinesq's and Westergaard's Equation. **[5]**

Q3) a) Explain the principle of Vane shear test. What are the advantages of this test? What are the limitations? **[6]**

b) A cohesive soil has an angle of shearing resistance of 20° and cohesion of 45 KN/m^2. If a specimen of this soil is subjected to a triaxial compression test, find the value of lateral pressure in the cell for failure to occur at a total axial stress of 350 KN/m^2. **[6]**

c) State and explain modes of application of Shear Force in shear strength determination. **[5]**

OR

P.T.O.

Q4) a) Enlist different drainage conditions in triaxial test also explain characteristic features of Triaxial Compression Test. **[6]**

b) Explain the principle of Direct shear test. What are the advantages & limitations of the test? Explain phenomenon of Thixotropy in soil. **[6]**

c) An in-situ: vane shear test was conducted in a clay at the bottom of bore hole, A torque of 153 N-m was required to shear the soil. What was the undrained strength of clay? The vane was 100mm diameter and 150mm long. **[5]**

Q5) a) Explain Earth Pressure with respect to wall movement with sketches. **[6]**

b) Explain step by step Rehbann's graphical for determination of earth pressure of retaining wall. **[6]**

c) For a retaining wall system, the following data was available: Height of wall – 7 m, properties of backfill – γ_d = 18 kn/m^3,ϕ = 35° , Angle of internal friction – δ = 25°, back of the retaining wall is inclined at 20° to the vertical, backfill is sloping at 1 :10. Determine the magnitude of active earth pressure by Culmann's method. **[6]**

OR

Q6) a) Derive the relation for lateral pressure due to submerged cohesionless backfill with neat sketch. **[6]**

b) In a cohesionless soil deposit having unit weight of 25 kN/m^3 and ϕ =32°. Determine active and passive lateral pressure intensities at depth of 5 m.**[6]**

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

Q7) a) What is slope stability and how are the different types of factor of safety determined? **[6]**

b) Write short note on Taylor's Stability Number for stability analysis of finite slope. **[6]**

c) What is the critical height of vertical excavation that can be made without any lateral support in a cohesive soil having the following properties γ = 18 kN/m^3, c =10 kN/m^2, ϕ = 32°. **[6]**

OR

Q8) a) Analyze the stability of soil using friction circle method with neat sketch.**[6]**

b) Write short notes on causes and remedial measures of landslides. **[6]**

c) Determine the factor of safety for cohesive soil with vertical cut 7 m high, if stability number is known to be 0.2, slope material having cohesion = 25 kN/m^2, γ = 20 kN/m^3. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2778

[Total No. of Pages : 3

[6352]-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 or Q.5 or Q.6, Q.7 & Q.8.***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to 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 examination hall.***

Q1) a) Explain principle of stadia tacheometry and methods for determination of constants. **[5]**

b) A Tacheometer was set up at Station at C and the following readings were obtained on a staff vertically held. Determine RL of point D and distance CD when Constants are 100 & 0.15. RL of BM = 750.50 m **[7]**

Inst Station	Staff Station	Vertical Angle	Hair Reading
C	BM	–5°20’	1.500,1.800,2.450
C	D	+8°12’	0.750,1.500,2.250

c) State characteristics of contours. **[6]**

OR

Q2) a) Define Contour Tnterval, Horizontal Equivalent and state uses of contour maps. **[5]**

b) The following observations were made using a tacheometer fitted with an anallatic lens, Staff held vertically and multiplying constant being 100. Determine RL of point B and distance Between A & B. RL of BM = 255.75 m **[7]**

Inst Station	HI	Staff Station	Vertical Angle	Hair Reading
P	1.255	BM	–4°20’	1.325,1.825,2.325
P	1.255	A	+6°30’	0.850,1.600,2.350
B	1.450	A	–7°24’	1.715,2.315,2.915

c) Enlist different indirect methods of contouring. Explain any one method with detailed sketch. **[6]**

P.T.O.

Q3) a) Draw a neat sketch of Simple Circular curve and Properties of Simple Circular Curves. **[5]**

b) Two straight roads intersect at a chainage of 150.5m. The angle of deflection being 30°. Taking radius of l00 m, calculate necessary data for setting curve by Methods of Offsets from Long Chords. **[7]**

c) Write a note on necessity and types of transition curves. **[5]**

OR

Q4) a) What is transition curve, state the applications of transition curve? **[5]**

b) Two straights AB and BC meet at chainage of 1250 m. A right-handed simple circular curve of 250 m radius joins them. The Intersection angle between two straights is 150°. Tabulate the necessary data to layout the curve by Rankine's method of deflection angle. Take Peg Interval as 20 m and Least Count 20". **[7]**

c) Explain Horizontal Curves and Types of Horizontal Curve. **[5]**

Q5) a) Explain Segments and advantages of Space Based Positioning System. **[6]**

b) Explain necessity of horizontal and vertical controls in construction activity. **[5]**

c) Write a note on Construction Survey. **[6]**

OR

Q6) a) State Different names of satellites and Explain any One in details. **[6]**

b) Write a short note on survey for drainage line work. **[6]**

c) Write a short note on Shore Line Survey. **[5]**

Q7) a) What do you mean by triangulation and trilateration in geodetic survey? **[6]**

b) Define Sounding and state any one method of sounding with sketch. **[6]**

c) Differentiate between Map and aerial photograph. **[6]**

OR

Q8) a) State the working principle and applications of total station. **[6]**

b) Differentiate between Plane and Geodetic Survey. **[6]**

c) Explain sounding methods and sounding equipment of hydrographic survey. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2779

[Total No. of Pages :4

[6352]-3

S.E. (Civil)

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.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 allowed.***
5) ***If necessary, assume suitable data and indicate clearly.***

Q1) a) Write short note on: **[6]**

i) Shrinkage of concrete.

ii) Creep of Concrete.

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

c) Explain the relationship between compressive strength and tensile strength 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

OR

P.T.O.

Q4) A) Using Indian Standard recommended guidelines, design a concrete mix for 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/m^3 and 450 kg/m^3 respectively

b) Test data for materials
   i) Specific gravity of cement: 3.15
   ii) Specific gravity of:
      1) Coarse aggregate - 2.74
      2) Fine aggregates - 2.74
   iii) Water absorption:
      1) Coarse aggregates - 0.5 %
      2) Fine aggregates - 1.00 %
   iv) Free surface moisture:
      1) Coarse aggregates - Nil (absorbed moisture also nil)
      2) Fine aggregates - Nil
   v) Sieve analysis
      1) 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				

2) Fine aggregate: Conforming to grading zone I

3) 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 different zone 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	360	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 factors 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 and preventive 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. : ____

PC2780

[6352]-4

[Total No. of Pages :3

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, 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 electronic pocket calculator is allowed.***

Q1) a) Analyze the beam shown in figure 1 by Slope Deflection Method. Draw BMD. **[12]**

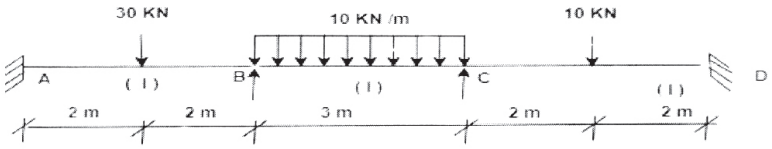

Figure 1

b) Analyze the beam shown in figure 2 by Slope Deflection Method. **[5]**

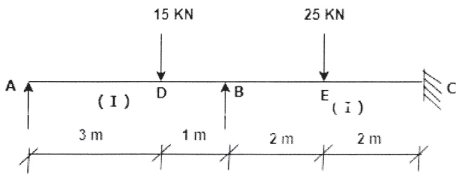

Figure 2

OR

Q2) Analyze the frame shown in figure 3 by Slope Deflection Method. Draw BMD. **[17]**

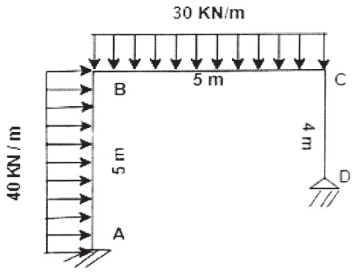

Figure 3

P.T.O.

Q3) a) Analyze the beam shown in figure 4 by Moment Distribution Method. Draw BMD. **[10]**

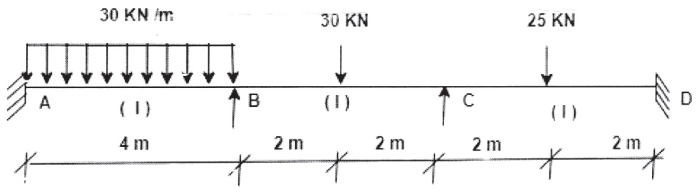

Figure 4

b) Analyze the beam shown in figure 5 by Moment Distribution Method.**[8]**

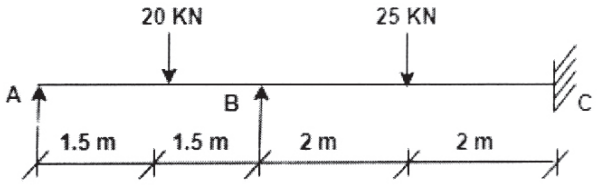

Figure 5

OR

Q4) Analyze the frame shown in figure 6 by Moment Distribution Method. Draw BMD. **[18]**

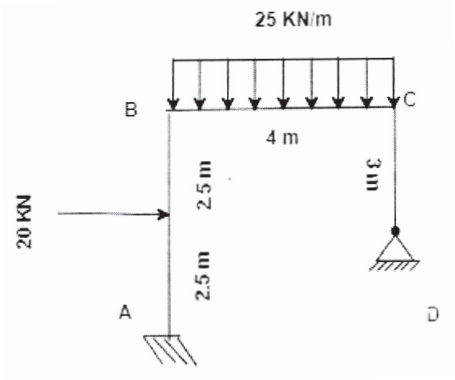

Figure 6

Q5) a) Analyze the beam shown in figure 7 by Stiffness Matrix Method. **[12]**

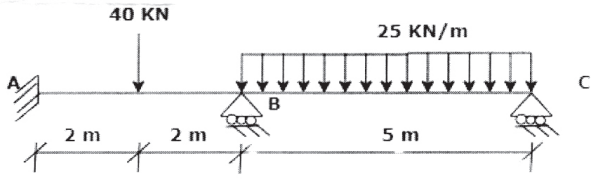

Figure 7

b) Differentiate between stiffness matrix and displacement matrix. **[5]**

OR

Q6) Analyze the frame shown in figure 8 by Stiffness Matrix Method. **[17]**

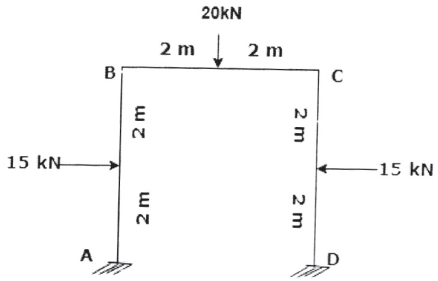

Figure 8

Q7) a) Explain different collapse mechanisms in plastic analysis. **[5]**

b) Determine plastic moment for the beam as shown in figure 9. **[13]**

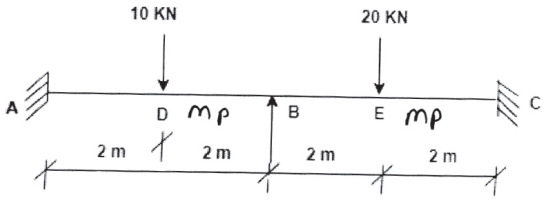

Figure 9

OR

Q8) a) Determine shape factor of I - Section Shown in figure 10. **[12]**

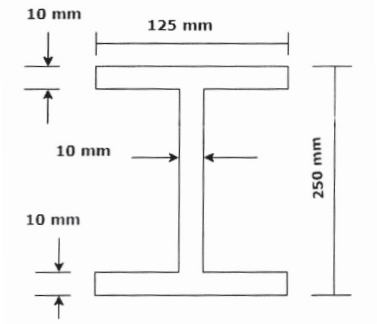

Figure 10

b) Define plastic hinge, load factor and shape factor. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC2781

[Total No. of Pages : 2

[6352]-5
S.E. (Civil Engineering)
PROJECT MANAGEMENT
(2019 Pattern) (Semester - IV) (201012)

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) ***Use of calculator is allowed in the examination.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain the procedure of procurement of primary materials. **[5]**

b) Describe ABC Analysis and state its advantages in construction industry. **[5]**

c) The annual demand of a construction item by a firm is 6400 units. The unit cost is Rs. 6 and inventory carrying cost per unit per annum is 25% of the average inventory cost. If the cost of procurement is Rs. 75, determine (a) economic order quantity. **[7]**

OR

Q2) a) Describe implementation of safety programs in a construction project. **[5]**

b) Write short note on Personal Protective Equipment **[5]**

c) Explain Economic ordering quantity. **[7]**

Q3) a) Differentiate between resource levelling and resource smoothening. **[5]**

b) What do you mean by Project Monitoring. Explain any one method of project monitoring. **[5]**

c) What is updating of network. Also state its advantages. **[8]**

OR

Q4) a) What do you mean by network crashing? Explain with suitable example. **[5]**

b) Explain Earned value analysis and its advantages. **[5]**

c) Enlist various project management software used in construction sector. Discuss advantages of these softwares. **[8]**

P.T.O.

Q5) a) Explain importance of project economics in construction industry. **[5]**

b) Discuss in brief the following: **[5]**

i) Equilibrium Price

ii) Equilibrium amount

c) Define capital. Discuss in brief working capital. **[7]**

OR

Q6) a) Explain in detail Elasticity of demand. **[5]**

b) State and explain the various sources of project finance. **[5]**

c) Explain in detail Time value of money. **[7]**

Q7) a) List different types of project appraisal. Explain any one in detail. **[6]**

b) A construction company has the resources to implement one of the two projects that have been offered to it. Using NPV suggest the company should accept. The expected returns are about 12% per annum. **[6]**

Particulars	Project A	Project B
Initial Investment (Rs.)	4,00,000	3,50,000
Annual Income (Rs.) Year 1	1,50,000	1,00,000
Annual Income Year 2	2,00,000	3,00,000
Annual Income Year 3	80,000	50,000
Annual Income Year 4	1,00,000	90,000
Annual Income Year 5	20,000	60,000

c) Write short note on IRR method. **[6]**

OR

Q8) a) Explain discounted and Non Discounted cash flow techniques for project selection. **[6]**

b) Discuss the role of project management consultant in pre tender and post tender stage. **[6]**

c) Write a note on NPV and IRR. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2782

[Total No. of Pages : 4

[6352]-6
S.E. (Civil)
BUILDING TECHNOLOGY AND ARCHITECTURAL PLANNING
(2019 Pattern) (Semester - III) (201001)

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 figures must be drawn wherever necessary.***
4) ***Assume suitable data if required.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Enlist different types of floor finishes and their suitability. **[6]**

b) What are the functional requirements of good roofing materials? Draw the sketch of king post roof truss. **[6]**

c) Explain Battened & Ledged Doors with sketch. **[5]**

OR

Q2) a) Explain the procedure of Fixing door and window in detail. **[6]**

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

c) Write a note on Protective Coatings with plastering and finishing. **[5]**

Q3) a) Write a short note on rating system for green building. **[4]**

b) Draw the sketch of stair. **[8]**

i) Curved Stair

ii) Spiral stair

iii) Dog legged stair

iv) Bifurcated stair

c) Design a dog legged staircase along with a sketch for an office building in a room measuring 5.8m ×2.8m clear. Vertical distance between the floors is 3.6m and width of flight is to be 1.25m. **[6]**

OR

P.T.O.

Q4) a) What are the salient features of Green building? **[5]**

b) A line plan of a residential building is shown in following figure. Draw detailed floor plan with 1:50 or suitable scale. Use the following data: **[13]**

i) All external wall thickness 230mm

ii) All partition wall 150mm

iii) RCC Frame structure

iv) Column Size 0.23m × 0.5m

v) Floor to floor height - 3m

vi) Plinth Height - 0.6m

vii) Toilet for M. Bed - 1.2× 2.1m

viii) All dimensions are in meters

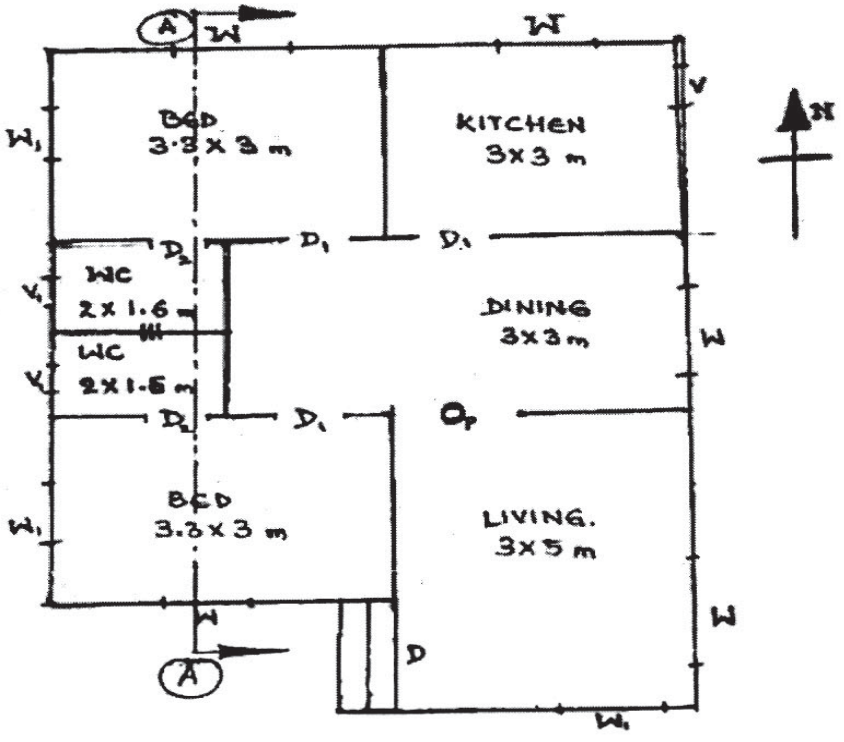

Fig. 1

Q5) a) It is proposed to construct a PWD Executive Engineer's office with the following data: **[13]**

i) Entrance and waiting-60m^2

ii) Administrative office-100m^2

iii) Sanitary block-20m^2

iv) Executive engineer's office (with attached toilet of suitable size) -35m^2

v) PA to executive engineer (with attached toilet of suitable size) -20m^2

vi) Drawing, printing and Xeroxing- 12m^2

vii) Records and stationary room-30m^2

viii) All passages -2m wide.

Draw to a scale of 1:50 or suitable.

b) What are the salient features of Hospital building? **[5]**

OR

Q6) a) Draw a line plan of a post-office using the following data: **[12]**

i) Entrance and moving space: 30m^2 with seating arrangement

ii) Public dealing counters 6 in no. with 0.5m width

iii) Post-master's room: 15m^2

iv) Working area for other staff:30m^2

v) Post separation room: 30m^2

vi) Safe custody area for cash 10m^2

vii) Cash transaction room: 12m^2

viii) Speed post-delivery section: 12m^2

Water room and Toilet (separate for male and female): 7.5m^2

b) What are the salient features of vegetable market building. **[6]**

Q7) a) Explain the Concept of TDR. **[5]**

b) Write a note on Develolpment plan and its importance. **[6]**

c) Write a short note on 7/12 abstract, it's importance and meaning of every term in it. **[6]**

OR

Q8) a) Explain the types of ventilation and its necessity in a residential building? **[6]**

b) Explain Two pipe plumbing system along with sketch. **[6]**

c) Write a note on planning for good acoustics and also causes of reverberation and echoes. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2783

[Total No. of Pages :3

[6352]-7

S.E. (Civil)

MECHANICS OF STRUCTURE

(2019 Pattern) (Semester- III) (201002)

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) ***If necessary, assume suitable data and indicate clearly.***
4) ***Use of electronic pocket calculator is allowed.***

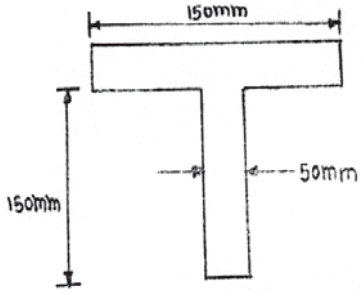
Q1) a) A T-section with flange 200mm×50mm and web 200mm×50 mm is subjected to a vertical shear force of 200 kN. Calculate shear stress at the junction of the flange and web and shear stress at the junction of the flange and web and shear stress at the neutral axis. Sketch the shear stress diagram. **[9]**

b) A symmetric I section is 150 wide and 200 deep. The flange thickness and web thickness is 10 mm. This section is used for cantilever beam having span of 3 m and subjected to uniformly distributed load. Find the maximum u.d.l. that can be supported if E=200 GPa and maximum allowable stress is 180 MPa. **[9]**

OR

Q2) a) A T section 100mm×130mm×20mm is subjected to a shear force of 100kN. Draw the shear stress distribution and find the maximum shear stress. **[9]**

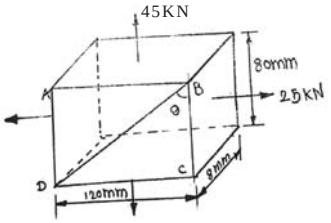
b) Two Wooden Planks 150mm×50mm each are connected to form a T section of a beam. A moment of 6.4kN-m is applied around the horizontal neutral axis. Find the bending stresses at both the extreme fibers of cross-section (Fig.1) **[9]**



P.T.O

Q3) a) A bar of steel is 80mm in diameter and 550mm long. A tensile load of 100kN is found to stretch the bar by 0.25 mm. The same bar when subjected to a torque of 1.4kN.m is found to twist through 3º. Find the value of four elastic constant. **[9]**

b) A block 120mm×80 mm ×8mm thick is subjected to uniformly distributed stress field as shown in Fig.2 Compute the normal stress and shear stress development along the plane BD. Also find out the maximum shear stress and corresponding plane. **[8]**



OR

Q4) a) A metal bar 15mm diameter subjected to pull of 40kN elongated by 0.5 mm over a gauge length of 500 mm. In a torsion test on the same material, maximum shear stress of 45 MPa was measured on a bar of 50 mm diameter and angle of twist over a length of 300 mm was measured 0.4º. Determine Poisson's ratio for the material . **[9]**

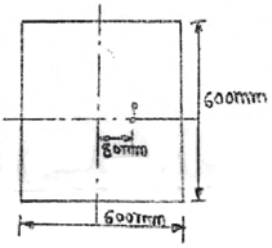
b) The principal tensile stresses at a point are 100 N/mm^2 and 60 N/mm^2. Find normal tangential and resultant stress on a plane at 30º with major principal plane. What is angle of obliquity? Show by sketch how normal stress and tangential stress act. **[8]**

Q5) a) A 4m length of a tube has a buckling load of 2kN 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

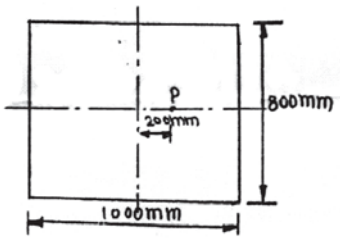
b) A short masonry pillar 600 mm×600 mm in section. The pillar carries an eccentric load of 1000kN acting at an eccentricity of 80 mm from the longitudinal axis as shown in Fig. Find the maximum and minimum stresses on the section. **[9]**



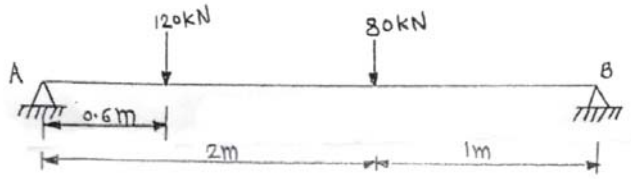
OR

Q6) a) A steel rod 5 m long and of 40 mm diameter is used as a column with one end fixed and other end free. Determine the crippling load by Euler's formula. Take E=200 GPa. **[8]**

b) A column support load of 400 kN is shown in Fig. Find the stresses at the correct of the column at its base. **[9]**



Q7) a) A simply supported beam of 3 m span carries two point load of 120kN at a distance 0.6m and 2m form the left support. If for the beam $I=16\times10^8$ mm^4 and $E=2\times10^5$ N/mm^2, calculate the deflection under loads using Macaulay's Method. **[9]**



b) A rectangular beam 80mm wide and 100mm is 4.5m long and subjected to two point loads 20kN and 15kN at 2m and 3.5m from left supports. Determine strain energy stored in the beam. Take E=200 GPa. **[9]**

OR

Q8) a) A beam of uniform section, 10m long is simply supported at the ends. It carries point loads of 150kN and 65kN at distance of 2.5m and 5.5m respectively from the left end. **[9]**

Calculate:

i) Deflection under each load

ii) Maximum Deflection

Take E=200 kN/m^2 and $I=118\times10^{-4}$ m^4

b) A simply supported beam 4m span with EI constant throughout is subjected to a point load of 24kN at 3 m from left hand support. Find the strain energy of the beam is bending. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC4814

[Total No. of Pages : 3

[6352]-8R

S.E. (Civil Engineering)

FLUID MECHANICS

(2019 Pattern) (Semester-III) (201003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer any four questions from 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) ***Use of logarithmic table, slide rule and electronic pocket calculator are allowed.***
5) ***Assume suitable data if necessary, stating it clearly.***

Q1) a) Derive the dimensionless numbers: **[5]**

i) Reynold number

ii) Froude number and what are the field application of each.

b) What is a repeating variable and what are the criteria for selecting repeating variable? Explain Buckingham π theorem method of dimensional analysis. **[6]**

c) The resisting force for a ship is found to depend on its length L, velocity V, acceleration due to gravity g, and fluid density ρ, dynamic viscosity μ. Develop a dimensionless relation for the resisting force. Use Bukingham's π method. **[6]**

OR

Q2) a) Derive expression for: **[6]**

i) Displacement thickness

ii) Energy thickness

b) A flat plate 10cm wide and 30cm long is placed in oil of relative density 0.85 and kinematic viscosity 0.6 stoke which is flowing with a velocity of 4.5m/s. Find the friction drag on the flat plate, shear stress and thickness of boundary layer at the trailing edge of plate. **[6]**

c) How does the pressure gradient along flow direction effect boundary layer separation. Explain any one method of controlling boundary layer separation. **[5]**

P.T.O.

Q3) a) Explain the Reynold Experiment for classification of fluid flow and classify the flow based on Reynold number. Also explain significance of lower and upper Reynold number. **[6]**

b) A fluid of specific gravity 1.05 flows through a pipe of diameter 120mm. The viscosity of oil is 12 poise and the velocity of flow along centre line of pipe is 3.2 m/s. Find: **[6]**

i) Pressure gradient in flow direction.

ii) Shear stress at the pipe wall.

iii) Reynold's number.

c) What are the characteristics of turbulent flow in pipes? Explain hydrodynamically smooth and rough boundaries. **[5]**

OR

Q4) a) A horizontal compound pipe in series has 4 pipes. Pipe 1 is 5cm in diameter and 5m long, pipe 2 is 7.5cm in diameter and 7m long, pipe 3 is 10cm in diameter and 10 m long, pipe 4 is 7.5 cm in diameter and 3m long. The changes in pipe diameter is sudden. Draw the hydraulic gradient line(HGL) and total energy line for this compound pipe. Explain why total energy line always fall in the direction of flow, whereas the hydraulic gradient line may fall or rise. **[6]**

b) What is major loss and minor loss in flow through pipe and why these losses occur in flow through pipes. Enlist all major and minor loss with relevant equations? **[5]**

c) A pipe in series connects two reservoir and is having length of 150m and 200m. The diameter of the two pipes is 15 cm and 20cms respectively. If the difference in head between water surfaces in reservoir is 6m and friction factors are 0.02 and 0.015 respectively, find the rate of flow through the pipe. **[6]**

Q5) a) In what ways is the flow in open channel is different from the flow through pipe? What are the different types of flow that occur in an open channel flow. **[6]**

b) Derive the Chezy' s equation for velocity of flow in an open channel. **[6]**

c) A discharge of $15m^3/s$ is to be carried at an average velocity of 1.85m/s. Calculate the dimensions for most efficient, Rectangular channel. **[6]**

OR

Q6) a) How does the specific energy of flow in an open channel differ from total energy of flow in open channel? Derive the equation for critical depth for Rectangular channel. **[6]**

b) Explain with neat sketch specific force diagram. **[6]**

c) A rectangular channel is 3.5m in wide carries a discharge of 2.8 m^3/s with a depth of flow of 0.90m, if Manning N = 0.015 determine. **[6]**

i) Specific energy

ii) Channel bed slope

iii) Critical depth

iv) Nature of flow

Q7) a) State the assumptions made in the derivation of the dynamic equation for gradually varied flow and derive dynamic equation for GVF. **[6]**

b) Classify various types of channel bed slope. **[4]**

c) A wide rectangular channel carries a discharge of 7.5 $m^3/s/m$ width of channel. The slope of channel is 1 in 2000 and Manning's N=0.020. At a section in the channel the depth of flow is 4.5m, find the length of flow profile so developed between this depth and depth within 10% of normal depth. Take 2 steps, sketch the flow profile so developed. **[8]**

OR

Q8) a) Distinguish between: **[6]**

i) Streamlined body and bluff body

ii) Skin friction drag and form drag

b) Explain flow around a cylinder and development of Karman vortex street. **[6]**

c) Tests were conducted on a flat plate 1.25m long and 0.80m wide in a wind tunnel. The wind speed was maintained at 25km/hr. The coefficient of lift and drag are 0.50 and 0.15 respectively. Find: **[6]**

i) Lift force

ii) Drag force

iii) Resultant force

iv) Direction of resultant force and

v) Power required to overcome resistance due to flow of wind. Take density of air as 1.2 kg/m^3.

Total No. of Questions : 9]

SEAT No. : ____

PC2785

[Total No. of Pages : 5

[6352]-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) ***Non-programmable electronic pocket calculator is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***
6) ***Neat diagrams must be drawn wherever necessary.***

Q1) Write the correct option for the following multiple choice questions :

a) Given $b_{xy} = 0.85$, $b_{yx} = 0.89$ and $\sigma_x = 6$ then the values of $r(x,y)$ and σ_y are **[2]**

i) $r = 0.87$, $\sigma_y = 6.14$

ii) $r = -0.87$, $\sigma_y = 0.61$

iii) $r = 0.75$, $\sigma_y = 6.14$

iv) $r = 0.89$, $\sigma_y = 4.64$

b) The divergence of a vector field $\bar{F} = 3xz\bar{i} + 2xy\bar{j} - yz^2\bar{k}$ at a point (1, 1, 1) is **[2]**

i) 4

ii) 6

iii) 5

iv) 3

P.T.O.

c) If $\overline{F} = y^2\overline{i} + z^2\overline{j} + x^2\overline{k}$, then by using divergence theorem, $\iint_S \overline{F}.d\overline{s} =$

(where S is closed surface bounded by volume V) **[2]**

i) 3

ii) 0

iii) 2

iv) 5

d) The finite and bounded general solution of heat equation $\frac{\partial u}{\partial t} = 5\frac{\partial^2 u}{\partial x^2}$ is **[2]**

i) $u(x,t) = (c_1 \cos mx + c_2 \sin mx)(c_3 \cos 5mt + c_4 \sin 5mt)$

ii) $u(x,t) = (c_1 \cos mx + c_2 \sin mx)e^{-25mt}$

iii) $u(x,t) = (c_1 \cos mx + c_2 \sin mx)e^{-5mt}$

iv) $u(x,t) = (c_1 e^{-mt} + c_2 e^{-mx})(c_3 \cos mx + c_4 \sin mn)$

e) If x is a poisson random variable with mean value 3 then standard deviation of poisson distribution is **[1]**

i) 1

ii) $\sqrt{2}$

iii) $\sqrt{3}$

iv) 3

f) $\nabla \times \overline{r} =$ **[1]**

i) 0

ii) 1

iii) 2

iv) 3

Q2) a) First four moments of the distribution are 1, 4, 10 and 46. Compute the first four central moments. Also find β_1 and β_2. **[5]**

b) Find the Co-efficient of correlation for the following data. **[5]**

x	152	158	169	182	160	166	182
y	198	178	167	152	180	170	162

c) With the usual notations, find the probability of the binomial distribution (p) if 9 P(X = 4) = P(X = 2) where X be the random variable. **[5]**

OR

Q3) a) If $\overline{x} = 8.2, \overline{y} = 12.4, \sigma_x = 6.2\ \sigma_y = 20, r(x, y) = 0.9$ then find the line of regression y on x. Also kind the value of y for $x = 10$. **[5]**

b) If the random variable X follows the poisson distribution such that P(X = 1) = 2P (X = 2), **[5]**

find the

i) mean of distribution

ii) P(X = 3)

c) From the past experience the labor contractor knows that per hour wages of skilled labor on an average is Rs. 100 with standard deviation Rs. 2. What percentage of labors will have wages between Rs. 98 and Rs. 102, assuming that the wages are normally distributed . **[5]**

(Given : $\phi(1) = \phi(-1) = 0.3413$)

Q4) a) Find the angle between velocity and acceleration vectors to the curve $x = 2\sin(3t), y = 2\cos(3t), z = 8t$ at $t = 0$. **[5]**

b) Find the directional derivative of the function $\phi(x, y, z) = 4\ e^{2x-y-z}$ at (1, 1, 1) in the direction tangent to the curve $x = e^{-t}$ cos$t$ $y = 2\sin t + 1$, $z = t - \cos t$ at $t = 0$. **[5]**

c) Show that vector field **[5]**

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

is irrotational. Find scalar potential ϕ such that $\overline{F} = \nabla\phi$.

OR

Q5) a) Find the angle between surfaces $x^2 - y^2 + 2z^2 = 3$ and $x^2 + y^2 + z^2 = 16$ at (1, 2, 2). **[5]**

b) Determine $f(r)$, such that $\bar{F} = f(r).\bar{r}$ is solenoidal. **[5]**

c) Attempt any one. **[5]**

i) Prove that : $\nabla^2\left(\frac{1}{r^2}\right) = \frac{2}{r^4}$

ii) Prove that : $\nabla^2(\phi\psi) = \phi\nabla^2\psi + 2\nabla\phi\nabla\psi + \psi\nabla^2\phi$

Q6) a) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ for $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the curve $x = 2t^2, y = t, z = 4t^2 - t$ from $t = 0$, $t = 1$. **[5]**

b) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot d\bar{s}$ where $\bar{F} = 3y\bar{i} - xz\bar{j} + yz^2\bar{k}$ and S is the surface of the paraboloid $x^2 + y^2 = 2z$ bounded by the plans $z = 2$. **[5]**

c) Evaluate $\iint_S \bar{F} \cdot d\bar{s}$ by using. Gauss-divergence theorem, where $\bar{F} = (4x + 3yz^2)\bar{i} - (x^2z^2 + y)\bar{j} + (y^3 + 2z)\bar{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = 9$. **[5]**

OR

Q7) a) Using Green's theorem, evaluate $\int_C \bar{F} \cdot d\bar{r}$, wher $\bar{F} = (\sin y)\bar{i} + x(1 + \cos y)\bar{j}$ and C is the boundary of an ellipse $\frac{x^2}{4} + \frac{y^2}{g} = 1; z = 0$. **[5]**

b) Using Stoke's theorem, evaluate $\int_C \bar{F} \cdot d\bar{r}$, where $\bar{F} = yz\bar{i} + zx\bar{j} + xy\bar{k}$ and S is the upper part of the sphere $x^2 + y^2 + z^2 = 1$ above XOY plane. **[5]**

c) Evaluate $\iint_S (x^3\bar{i} + y^3\bar{j} + z^3\bar{k}) \cdot d\bar{s}$ where S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$. **[5]**

Q8) a) Solve one dimensional heat flow equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ subject to the conditions. **[7]**

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

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

iii) $u(x,0)=\pi x-x^2, 0<x<\pi$

b) Solve wave equation $\frac{\partial^2 y}{\partial t^2}=c^2\frac{\partial^2 y}{\partial x^2}$ subject to conditions **[8]**

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

ii) $y(\mathrm{L},t)=0$

iii) $\left.\frac{\partial y}{\partial t}\right|_{t=0}=0$

iv) $y(x,0)=y_0; 0<x<\mathrm{L}$

where y_0 is constant

OR

Q9) a) Solve Laplace equation $\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}=0$ subject to conditions : **[7]**

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

ii) $v(1,y)=0$

iii) $v(x,\infty)=0, 0<x<1$

iv) $v(x,0)=10,\ 0<x<1$

b) Solve wave equation $\frac{\partial^2 y}{\partial t^2}=c^2\frac{\partial^2 y}{\partial x^2}$ subject to conditions **[8]**

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

ii) $y(\pi,t)=0$

iii) $\left.\frac{\partial y}{\partial t}\right|_{t=0}=0$

iv) $y(x,0)=2\sin x,\ 0<x<\pi$

Total No. of Questions : 8]

SEAT No. :

PC2786

[Total No. of Pages : 3

[6352]-10

S.E. (Civil)

ENGINEERING GEOLOGY

(2019 Pattern) (Semester - III) (207009)

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

Instructions to the candidates:

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

Q1) a) Explain parts of fold with neat sketch. Add a note on anticline and syncline. **[6]**

b) Explain with sketch angular unconformity and non-conformity. **[6]**

c) Perpendicular distance between any two successive strike line is 3.0 cm, scale of the map is 1cm = 100m and contour interval is 30m. Calculate amount of dip (True Dip). **[5]**

OR

Q2) a) What is fault ? Describe normal and reverse fault with neat sketch. **[6]**

b) Describe various types of igneous intrusions. **[6]**

c) Perpendicular distance between any two successive strike line is 5.5 cm, scale of the map is 1cm = 100m and contour interval is 50m. Calculate amount of dip (True Dip) **[5]**

Q3) a) Explain applications of remote sensing in civil engineering. **[6]**

b) Explain how GIS is an important tool for civil engineers. **[6]**

P.T.O.

c) Calculate RQD and Core recovery from following table. **[6]**

Run in m	Piece No.	Length in cm	Nature of fracture
3-6m	1	12	J
	2	10	J
	3	14	M
	4	55	M
	5	50	M
	6	13	J
6-9m	07	50	M
	08	60	M
	09	90	M
	10	08	M

OR

Q4) a) Discuss in detail core drilling method of subsurface geological exploration with its significance. **[6]**

b) What is remote sensing? Explain its importance in civil engineering field. **[6]**

c) Calculate RQD and Core recovery from following table. **[6]**

Run in m	Piece No.	Length in cm	Nature of fracture
0-3 m	1	15	J
	2	13	J
	3	60	M
	4	55	M
	5	50	M
	6	13	J
	7	50	J
	8	10	J
	9	10	J
3-6 m	10	60	M
	11	80	M
	12	09	M
	13	10	M

Q5) a) Discuss on favorable geological conditions for reservoir area of dam. **[6]**

b) Explain geological investigations required to select site for tunneling. **[6]**

c) What are the geological requirements for the foundation of dam? **[5]**

OR

Q6) a) Discuss on stability of tunnels through limb and axial region of folds. **[6]**

b) Explain the suitable and unsuitable dipping strata conditions at dam site. **[6]**

c) Discuss on tunnel excavated through faulted area. **[5]**

Q7) a) Define landslide? Describe preventive measures against landslides. **[6]**

b) Explain various types of aquifers. **[6]**

c) Describe suitability of basalt, granite and limestone as a building stone. **[6]**

OR

Q8) a) What is earthquake? Explain causes of earthquake. **[6]**

b) What is groundwater? Describe methods of artificial recharge of groundwater. **[6]**

c) Describe requirements of good building stone. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PC2787

[Total No. of Pages : 3

[6352]-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 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) Define string efficiency. Derive the expression for string efficiency of a suspension insulator consisting of three discs. **[6]**

b) An overhead transmission line conductor having a parabolic configuration. weighs 1.925 kg per metre of length. The area of X-section of the conductor is 2.2 cm^2 and the ultimate strength is 8000 kg/cm^2 .The supports are 600 m apart having 15 m difference of levels. Calculate the sag from the taller of the two supports which must be allowed so that the factor of safety shall be 5. Assume that ice load is 1 kg per metre run and there is no wind pressure.

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

i) Pin type insulator

ii) Suspension type insulator

OR

Q2) a) An insulator string consists of three units, each having a safe working voltage of 15 kV. 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. **[6]**

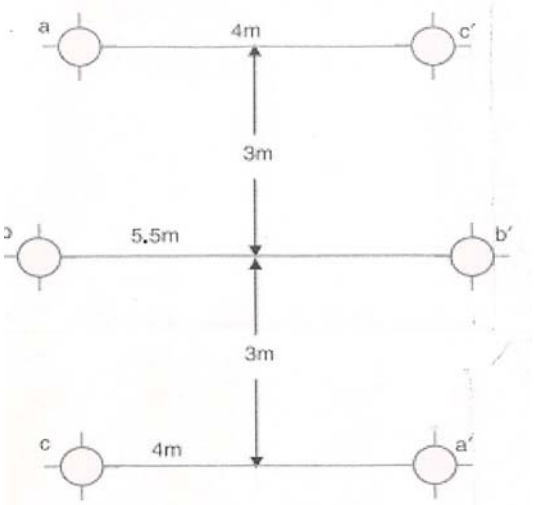
b) Derive an expression for sag in case of overhead transmission line when the supports are at unequal level. **[6]**

c) Explain various methods of improving string efficiency. **[6]**

P.T.O.

Q3) a) Derive an expression for inductance of three phase transmission line with symmetrical spacing. Draw a neat diagram. **[5]**

b) Find the inductance per phase per km of double circuit 3-phase line shown in Fig. The conductors are transposed and are of radius 0.75 cm each. The phase sequence is ABC. **[7]**



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

i) Skin effect.

ii) Proximity effect.

OR

Q4) a) Explain the concept of GMD and GMR for inductance calculation. **[5]**

b) Derive the expression for inductance of single phase two wire line. **[7]**

c) The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2 m, 2.5 m and 4.5 m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24 cm. **[5]**

Q5) a) 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. **[5]**

b) A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate the charging current per phase assuming complete transposition. **[7]**

c) Derive the expression for capacitance to neutral of a three-phase line with equilateral spacing. Draw a neat diagram. **[5]**

OR

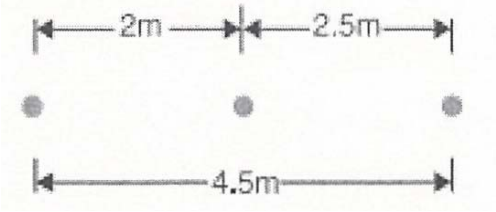
Q6) a) What do you understand by electric potential? Derive an expression for Electric potential at conductor in a group of charged conductors. **[5]**

b) 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 100 km, calculate. **[7]**

i) capacitance per phase

ii) charging current per phase

Assuming complete transposition of the line.



c) Derive the expression for capacitance of three phase overhead line considering unsymmetrical spacing. **[5]**

Q7) a) Derive an expression for ABCD constants of short transmission line. **[6]**

b) 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 6 Ω respectively. Determine : **[6]**

i) sending end voltage

ii) percentage regulation

iii) transmission efficiency.

c) Write a short note on Ferranti effect. **[6]**

OR

Q8) a) 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. **[6]**

b) Find the following for a single circuit transmission line delivering a load of 50 M VA at 110 kV and p.f. 0.8 lagging: **[6]**

i) Sending end voltage

ii) Sending end current

iii) Sending end power

iv) efficiency of transmission.

c) Given A = D = 0.98 $\angle 3°$; B = 110 $\angle 75°$ohm; C = 0.0005 $\angle$ 80°siemen. State and explain the classification of transmission line. **[6]**

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. : ____

PC2788

[Total No. of Pages : 2

[6352]-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) ***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 a non-programmable calculator is allowed.***

Q1) a) Draw & Label a neat diagram showing constructional details of DC machine. Explain each parts. **[9]**

b) A 500V,4 poles, wave connected DC shunt motor has 1200 armature conductors and useful flux/pole is 20 mWb. The armature and field winding resistance are 0.5ohm & 250ohm respectively. The Iron & Friction losses are 900W. At full load motor draw 20A. Calculate.

i) Armature Torque
ii) Shaft torque
iii) Lost torque **[9]**

OR

Q2) a) Explain Demagnetizing & Cross magnetizing effect of armature reaction on DC machine. **[9]**

b) Derive Torque equation of DC motor with usual notation. Write Voltage and Current equation of DC shunt motor. **[9]**

Q3) a) Draw and explain all three characteristics of DC shunt motors. **[9]**

b) A 500V, 6pole DC shunt motor have armature & field winding resistance of 0.5ohm and 250ohm respectively. It draws a full load current of 20A from supply. If the rotational losses are 900W, calculate efficiency of motor. **[8]**

OR

Q4) a) Draw and explain all three characteristics of DC series motors. **[9]**

b) What is necessity of starter for DC motor? Draw and explain Three point starter **[8]**

P.T.O.

Q5) a) Compare squirrel cage rotor & wound rotor three phase induction motor **[6]**

b) A 3 phase, 50Hz, 4pole induction motor had slip of 4%. Calculate

i) Synchronous speed

ii) Frequency of rotor emf: If the rotor has a resistance of 1 ohm & standstill reactance of 4ohm calculate the rotor power factor.

iii) Speed of motor

iv) Power factor at standstill. **[8]**

c) Explain effect of slip on rotor frequency and rotor current. **[4]**

OR

Q6) a) Derive the torque of three phase induction motor and obtain the condition for maximum torque. **[6]**

b) Three phase, 50Hz, 6pole induction motor develop a shaft torque of 150Nm at full load slip of 4%. The rotating losses are 300W & that of stator losses are 1.5KW Calculate.

i) Rotor copper loss

ii) Rotor gross output.

iii) Efficiency at full load. **[8]**

c) Draw and explain the torque-slip characteristics of three phase induction motor. **[4]**

Q7) a) Draw and explain approximate and exact equivalent circuit of an induction motor along with required equation. **[9]**

b) Enlist the various types of starters for three phase induction motor. Explain Star- Delta starter along with merits and demerits. **[8]**

OR

Q8) a) Explain V/f method of speed control of three phase induction motor.**[8]**

b) With neat connection diagram explain No load & Blocked rotor test on three phase induction motor. **[9]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. :

PC2789

[Total No. of Pages : 4

[6352]-13

S.E. (Electrical Engineering)

NETWORK ANALYSIS

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

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) The switch is closed at t=0 for the network shown in Fig. No.1 Find i(t), $\frac{di(t)}{dt}$ at t=0+, if the capacitor is initially uncharged. **[6]**

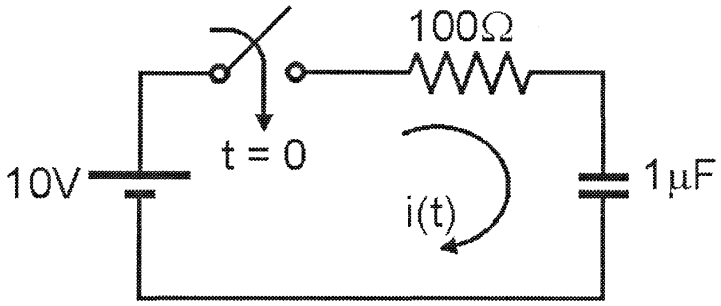


Fig. No.1

b) i) State behaviour of R, L and C based on initial condition. **[6]**

ii) State behaviour of R, L and C based on Steady state condition.

iii) State the formula for current flowing through inductor and current flowing through capacitor.

P.T.O.

c) A coil which has a Inductance of 40mH and a resistance of 2 Ω is connected to form an LR series circuit. If they are connected to a 20V DC supply. Find: **[6]**

i) Value of induced emf across inductor after 10 ms.

ii) Value of current flowing through inductor after 5 ms.

$$i(t)=\frac{V}{R}\left(1-e^{-\frac{1}{\tau}}\right)$$

iii) Time constant of the LR series.

OR

Q2) a) A series R-L-C circuit shown in fig. No.2, find current $i(t)$ using conventional method. The switch is closed at $t = 0$. **[10]**

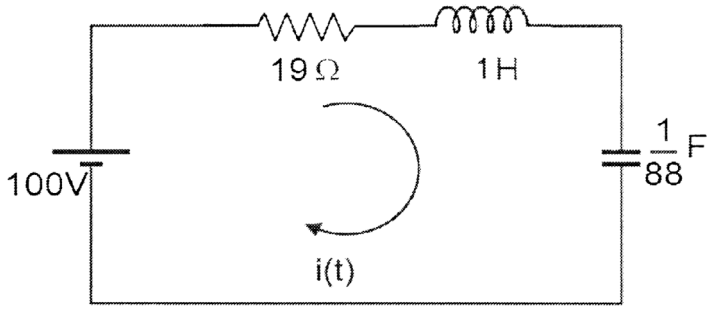


Fig. No.2

b) Explain time constant in case of series R-C and series R-L circuit. **[8]**

Q3) a) Using Laplace Transform solve differential equation. **[6]**

$$\frac{d^2i(t)}{dt^2}+3\frac{di(t)}{dt}-28i(t)=0 \text{ with } I(0^-)=0 \text{ and } I'(0^-)=1$$

b) State any six properties of Laplace Transform. **[6]**

c) Find Laplace Transform of the following: **[6]**

i) $e^{-3t}.t^2$

ii) $t.e^{-3t}$ and

iii) $\cosh\frac{3}{2}t$

OR

Q4) a) A series RC circuit in Fig No.3, the switch is closed at t=0. Find the expression for $V_c(t)$ using Laplace Transform method. **[6]**

$$\left[V_c(s) = \frac{1}{sC} I(s) \right]$$

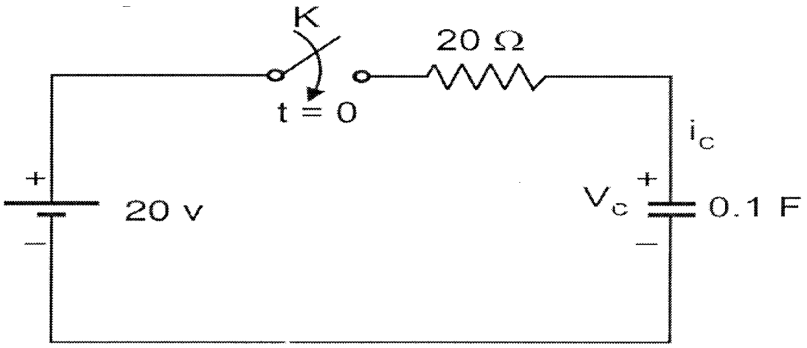


Fig. No.3

b) Find Laplace Transform of the waveform given in Fig No.4. **[6]**

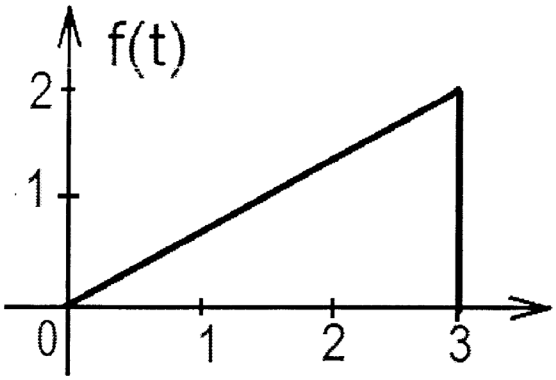


Fig. No.4

c) Explain Initial Value Theorem and Final Value Theorem. **[6]**

Q5) a) Design a prototype low pass filter sections if design impedance R_0= 500 Ω and cut-off frequency f_c = 2000 Hz. **[9]**

b) Express Y-parameters in terms of Z-parameters. **[8]**

OR

Q6) a) Find the Y- parameters of the network shown in Fig. No.5 **[9]**

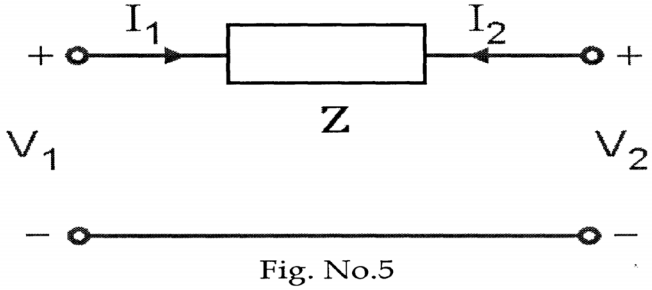


Fig. No.5

b) Define the following terms: **[8]**

i) Band pass filter
ii) Band stop filter
iii) Low pass filter
iv) High pass filter

Q7) a) Draw pole-zero plot of the driving point impedance of the network shown in Fig. No.6. **[9]**

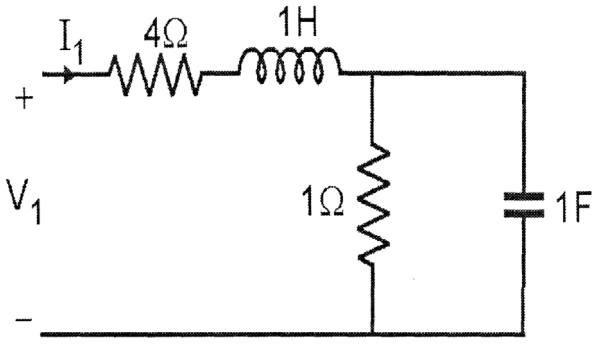


Fig. No.6

b) Define the following terms: **[8]**

i) Driving point Impedance
ii) Driving Point Admittance
iii) Transfer impedance function
iv) Transfer admittance function

OR

Q8) a) Draw pole-zero plot of the driving point impedance of the network shown in Fig. No.7. **[9]**

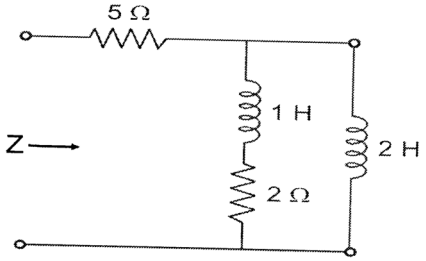


Fig. No.7

b) Write short note on following terms: **[8]**

i) Poles of system function
ii) Zeros of system function

Total No. of Questions : 8]

SEAT No. :

PC2790

[Total No. of Pages : 4

[6352]-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) ***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 interpolation? Enlist the methods used when data is equally and unequally spaced. **[4]**

b) Use Newton's forward interpolation formula and evaluate $y = e^{-2x}$ for $x = 0.1$ using the following table. **[7]**

x	0.0	0.2	0.4	0.6	0.8
$y=e^{-2x}$	1.0	0.67032	0.44932	0.30119	0.20189

Also, comment on why Newton's forward interpolation formula is used to evaluate the above equation.

c) Apply Bessel's formula to obtain $y(25)$. **[7]**

Given that: $y(20) = 2854$, $y(24) = 3162$, $y(28) = 3544$, $y(32) = 3992$

OR

Q2) a) What is the difference between equally spaced data and unequally spaced data in the case of interpolation? Explain with one example each. **[4]**

b) Given the following data, find $f(x)$ as a polynomial using Newton's divided difference interpolation formula. **[7]**

x	0	2	3	4	7	9
$f(x)$	4	26	58	112	466	922

P.T.O.

c) The values of the temperature coefficient of resistance i.e., (α) at the different temperatures have been given in the following table. Determine the value of the temperature coefficient of resistance when the temperature in degrees Celsius is 22°C using Newton's backward interpolation formula.

Temp. in degrees Celsius	0	5	10	15	20	25
α	0.00427	0.00418	0.00409	0.00393	0.00378	0.00364

Also, comment on why Newton's backward interpolation formula is used to solve this problem. **[7]**

Q3) a) Derive formula for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = x_n$ using Newton's backward difference interpolation formula. **[4]**

b) Calculate $I = \int_0^{\pi} (1 - x\sin x)\,dx$ using trapezoidal rule by taking step size as $h = \frac{\pi}{6}$ **[6]**

c) Evaluate the following double integral using Simpson's 1/3rd rule with both the step sizes equal to 0.25 i.e., $h = k = 0.25$. **[7]**

$$I = \int_0^{0.5}\int_0^{0.5} \frac{\cos(x+y)}{1+xy}\,dxdy$$

OR

Q4) a) Draw the graphical representation showing the area under the approximate curve for the trapezoidal rule, Simpson's 1/3rd rule and hence write the formula of trapezoidal rule and Simpson's 1/3rd rule. **[4]**

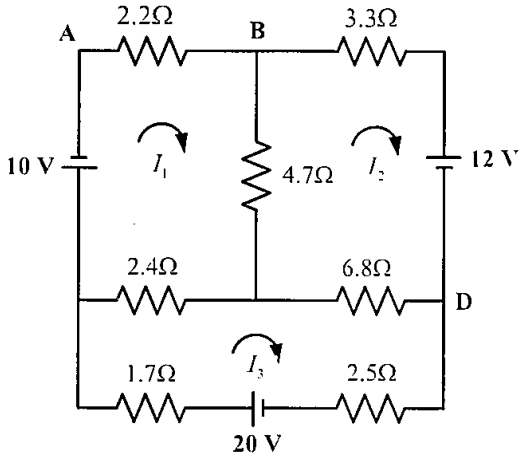
b) Find the first and second derivatives of the function tabulated below at the point $x = 1.5$. **[6]**

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.0	13.625	24.5	38.875	59.0

c) Evaluate the double integral $I = \int_1^5\int_1^5 \frac{dxdy}{\sqrt{(x^2+y^2)}}$ using the trapezoidal rule with two sub-intervals i.e., $h = k = 2$. **[7]**

Q5) a) What is the difference between the direct and iterative methods used to solve the linear simultaneous equation? Enlist the methods. **[4]**

b) Using the loop current analysis to the following circuit, the three equations with loop currents I_1, I_2, I_3 are as shown below. **[7]**



$$9.3I_1 - 4.7I_2 - 2.4I_3 = -10$$
$$-4.7I_1 + 14.8I_2 - 6.8I_3 = -12$$
$$-2.4I_1 - 6.8I_2 + 13.4I_3 = 20$$

Find the value of currents I_1, I_2, I_3 by using Gauss Elimination method.

c) Solve the following system of linear simultaneous equation using Gauss-Jacobi method with the initial approximation as $x^{(0)} = y^{(0)} = z^{(0)} = 0$. Solve 3 iterations only. **[7]**

$$x - 4y - z = 6$$
$$6x + y + z = 20$$
$$x - y + 5z = 7$$

OR

Q6) a) How Gauss-Seidel method differs from the Gauss-Jacobi method? Explain. Which method is faster among these two? **[4]**

b) The mesh currents in terms of I_1, I_2, I_3 for the circuit is as shown below. **[7]**

$$75I_1 - 45I_2 - 30I_3 = 21$$
$$-45I_1 + 54I_2 = 27$$
$$-30I_1 + 48I_3 = -27$$

Use Gauss-Seidel method to find the values of currents I_1, I_2, I_3. Consider the initial approximation of the currents as $I_1^{(0)}$, $I_2^{(0)}$, $I_3^{(0)} = 0$. Solve only 3 iterations.

c) Find the A^{-1} using Gauss Jordan inversion method. **[7]**

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 1 & 4 & 9 \end{bmatrix}$$

Q7) a) Enlist the methods used to solve ordinary differential equation (ODE). State which method is better: Taylor's method or R-K method? Why? **[4]**

b) Use the Taylor's series method to evaluate the $y(1.2)$ and $y(1.4)$ by taking the first three terms of the Taylor's series expansion. **[6]**

$$\frac{dy}{dx} = x + 2y$$

The initial value is $y(1) = 1$

c) Solve the following equation using R-K method of fourth order for $x = 0.1$. **[7]**

$$\frac{dy}{dx} = \frac{y^2 - 3x}{y^2 + x}$$

Given that $y = 1$ when $x = 0$.

OR

Q8) a) Explain Euler's method for the solution of ordinary differential equation (ODE). **[4]**

b) Use Euler's modified method to obtain $y(0.2)$ **[6]**

$$\frac{dy}{dx} = x + y$$

Given that $y = 1$when $x = 0$. Correct the answer up to three decimal places.

c) Solve the following second order ODE using R-K fourth order method. **[7]**

$$y'' = xy'^2 + 2y^2$$

Given that $y(0) = 1$; $y'(0) = 0$

Find $y(0.2)$ and $y'(0.2)$.

Total No. of Questions : 8]

SEAT No. : ____

PC2791

[Total No. of Pages : 2

[6352]-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 Q6, Q.7 or Q.8.***
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) Explain TMOD register. **[4]**

b) Write a program in C to toggle all bits of Port P1 with some delay. Use a suitable 'for' loop for delay generation. **[6]**

c) Write a program in C language to generate a square waveform of frequency 10 Hz at pin P1.4 of 8051. Use Timer 0 in mode 1. Assume crystal frequency as 11.0592 MHz. **[8]**

OR

Q2) a) State and explain various data types used in embedded C programming. **[4]**

b) Explain in detail steps to program timer 0 of 8051 in mode 1. **[6]**

c) Write a program in C to toggle the lower 4 bits of Port 1 with a delay of 50 msec.Use Timer l in mode 1 to generate the delay. Assume crystal frequency = 11.0592 MHz. **[8]**

Q3) a) Describe in short IE register. **[3]**

b) A switch is connected to INT0 pin and a LED is connected to pin P 1.5. Write a program in C to light up the LED when the switch is made ON. (The LED will glow when the pin is made HIGH). **[6]**

c) Describe the features of ADC 0809 and show the interfacing of ADC 0809 with 8051. **[8]**

OR

P.T.O.

Q4) a) State the sources of interrupts in 8051 along with the corresponding interrupt vector table addresses. **[3]**

b) Explain the steps to be taken for programming ADC 0809 using C language. **[6]**

c) Write a program in C to do the following. **[8]**

Turn ON all LEDs connected to Port P1 when INT0 interrupt occurs. Turn OFF all LEDs connected to Port P1 when INT1 linterrupt occurs.

Q5) a) Explain following terms with respect to Serial communication- **[4]**

i) RS232

ii) UART

b) What are AT Commands? Explain any four AT commands used in GSM. stating its syntax and use. **[6]**

c) Write a program in C to transfer the letter 'S' serially with a baud rate of 9600. Use Mode 1 of serial communication. Crystal frequency =11.0592 MHz. **[8]**

OR

Q6) a) Write the steps to receive data serially in 8051. **[4]**

b) Explain in detail SCON Register. **[6]**

c) What is GSM? With a neat diagram. explain interfacing of GSM module (SIM 800 / 900) with 8051 microcontroller. **[8]**

Q7) a) Explain with neat diagram. switch and LED interfacing with 8051. **[3]**

b) With the help of a neat block diagram, explain AC voltage measurement using 8051 microcontroller. **[6]**

c) A stepper motor is connected to lower 4 bits of Port 2 of 8051. Write a program in C to rotate the motor continuously in clockwise direction. **[8]**

OR

Q8) a) Explain with neat diagram, relay interfacing with 8051. **[3]**

b) A switch is connected to pin P1.0 and two LEDs are connected to pins P1.1 and P1.2 in common cathode mode. Write a program in C to glow both the LEDs when switch is made ON. **[6]**

c) With thc help of a neat diagram, explain interfacing of stepper motor with 8051 along with suitable driver circuit/IC. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2792

[Total No. of Pages : 3

[6352]-16
S.E. (Electrical Engineering)
POWER GENERATION TECHNOLOGIES
(2019 Pattern) (Semester - III) (203141)

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 additional data, if required.***
5) ***Use of Non-programmable calculator is allowed.***

Q1) a) Write a short note on Small, mini and micro hydro power plant. **[4]**

b) Differentiate between Kaplan and Pelton wheel turbine. **[6]**

c) The average rate of inflow during 12 months for a river are as under. **[7]**

Month	Discharge in m^3/s	Month	Discharge in m^3/s
January	200	July	1600
February	400	August	1200
March	600	September	2000
April	2400	October	1200
May	1200	November	800
June	1800	December	400

Draw the hydrograph. Determine the average inflow and the power that can be developed at an effective head of 90M. Assume overall generation efficiency to be 80%

OR

Q2) a) Describe the advantages of hydroelectric power plant. **[4]**

b) Explain the function of the following component in HPP. **[6]**

i) Dam

ii) Penstock

c) Draw layout of hydroelectric power plant and explain functions of different components. **[7]**

P.T.O.

Q3) a) Compare vertical axis and horizontal axis wind turbine. **[4]**

b) Describe the types of wind turbine electrical generators and explain any one. **[6]**

c) With neat diagram explain different components and their function in horizontal axis wind turbine. **[8]**

OR

Q4) a) Explain pitch control techniques used in wind turbine to extract maximum power. **[4]**

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

c) Derive the relation of power in wind and explain impact of tower height on power generation in wind energy system. **[8]**

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

b) Explain flat type solar collector and its application. **[6]**

c) With the help of diagram explain the working principle of solar thermal power. **[7]**

OR

Q6) a) Explain the following terms in solar power system. **[4]**

i) Concentration ratio

ii) Cloudy index

b) Discuss the working of a parabola collector with neat sketch. **[6]**

c) Explain the working of PV cell and simplest Equivalent Circuit for a Photovoltaic cell. **[7]**

Q7) a) Write a short note on Geothermal energy. **[4]**

b) Describe the fuel cell. How they are used for energy storage requirement? **[6]**

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

i) Geothermal energy

ii) Ocean energy

OR

Q8) a) What is a grid connected renewable system, explain with neat sketch. **[4]**

b) Explain the process of municipal solid waste to energy conversion. **[6]**

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

i) Biomass energy

ii) Fuel cell energy

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Total No. of Questions : 8]

SEAT No. : ____

PC2793

[Total No. of Pages :2

[6352]-17

S.E. (Electrical Engineering)

MATERIAL SCIENCE

(2019 Pattern) (Semester- III) (203142)

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.***
5) ***Use on non-programmable calculator is allowed.***

Q1) a) Explain the properties of ceramic material. **[4]**

b) Classify insulating materials and hence write properties and application of any two materials from Class F type. **[6]**

c) Explain properties of insulating materials which are used in Cables and transformers. **[8]**

OR

Q2) a) State the requirement of material used for rotating machines. **[4]**

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

i) Sulphur Hexa Fluoride

ii) Transformer oil

c) Explain the properties & applications of solid insulating material. **[8]**

Q3) a) State the properties of Magnetic material used for transformer core. **[3]**

b) Differentiate Soft Magnetic Materials and Hard Magnetic Materials. **[6]**

c) Explain the terms diamagnetism, Para magnetism, ferromagnetism and Anti-ferromagnetism with the reference to magnetic dipoles of the atom. **[8]**

OR

Q4) a) Draw and explain magnetization curve for a ferromagnetic material. **[3]**

b) What is Curie temperature? Explain Ferro-magnetic behaviour below critical temperature. **[6]**

c) Define: **[8]**

i) Permeability

ii) Magnetic susceptibility

iii) Magnetic Moment

iv) Magnetization

Q5) a) State properties of electrical solders materials. **[4]**

b) Write down properties and application of Copper and its alloys. **[6]**

c) What do you mean by an alloy, hence write property of Nichrome and constant. **[8]**

OR

Q6) a) State the properties & applications of Electrical Carbon material. **[4]**

b) Describe properties and applications of Tungsten & Kanthal. **[6]**

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

i) Thermocouple

ii) Thermal Bimetal

Q7) a) State application of BN nano tubes. **[3]**

b) Describe with neat diagram-Nano wires. **[6]**

c) Explain Nano materials used in Batteries and Photovoltaic Cells. **[8]**

OR

Q8) a) State application of carbon nano tubes. **[3]**

b) Describe with neat diagrams-Carbon clusters. **[6]**

c) Describe single electron transist or with neat diagram. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC2794

[Total No. of Pages : 2

[6352]-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 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 additional data, if necessary.***
5) ***Use of non-pro programmable calculator is allowed.***

Q1) a) Explain CPLD. **[6]**

b) Compare Between SRAM & DRAM. **[6]**

c) What is semiconductor memory? Enlist advantages of it. **[6]**

OR

Q2) a) Compare ROM & PROM. **[6]**

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

c) Explain PAL. **[6]**

Q3) a) With neat pin diagram explain function of each pin of IC 741 **[5]**

b) Explain with Neat diagram of peak detector. **[6]**

c) Explain generation of Triangular waveform using Op-Amp. Draw input & output waveforms. **[7]**

OR

Q4) a) Explain with neat diagram and output waveforms, Op-Amp as a Comparator. **[5]**

b) Explain Instrumentation amplifier with Circuit Diagram. **[6]**

c) Explain generation of Square waveform using Op-Amp. Draw input & output wavefroms **[7]**

P.T.O.

Q5) a) With neat diagram explain working of IC 555 as a Mono stable Multivibrator. **[5]**

b) Explain Sequence generator. **[5]**

c) Explain High pass filter using op-amp with its frequency response. **[7]**

OR

Q6) a) Explain the function of IC 78xx as adjustable voltage regulator. **[5]**

b) What is voltage regulator? Write any two applications of voltage regulator. **[5]**

c) With neat diagram explain working of IC 555 as a Astable Multivibrator. **[7]**

Q7) a) Explain working of single phase half wave rectifier with R load. **[5]**

b) Compare single phase& three phase rectifier. **[5]**

c) With the help of circuit diagram and relevant waveforms, explain the operation of a 3-phase bridge rectifier with resistive load. **[7]**

OR

Q8) a) Define **[4]**

i) Form factor

ii) TUF

b) Explain working of single phase half wave rectifier with RL load. **[6]**

c) Explain the working o single-phase full wave centre tapped rectifier with pure resistive load. **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PC2795

[Total No. of Pages : 3

[6352]-19

S.E. (Electrical)

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

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

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) Describe the constructional details of an Electrodynamometer type wattmeter. **[6]**

b) Derive the torque equation for an Electrodynamometer type wattmeter. Comment on the shape of scale if spring control is used. **[6]**

c) When the power of 3 phase balanced star connected load is measured by single wattmeter with current coil in Y phase and pressure coil between Y phase and neutral, it shows 6 kW. The load current is 30 A at 400 V. What will be the reading of wattmeter if connections of current coil remain unchanged and pressure coil is connected between R and B phases. **[6]**

OR

Q2) a) With neat diagram, and necessary phasor diagram, explain one wattmeter method for measurement of reactive power. **[6]**

b) In two wattmeter method, what will be the readings of two wattmeter's, if power factor of the circuit is. **[6]**

i) Unity
ii) 0.5 lagging
iii) Zero

Write necessary equations to justify your answer.

c) 3 phase, 415 V 50 Hz AC systems supplying a balanced load. Two wattmeters are used to measure total power in the circuit reads 10 kW and 3 kW respectively. **[6]**

Calculate

i) Total active power

ii) Total reactive power

iii) Power Factor

P.T.O.

Q3) a) Derive the torque equation of single-phase induction type energy meter. **[6]**

b) A single-phase energy meter makes 625 revolutions per kWh. It makes 45 revolutions in 55 seconds at 4.6 kW load. Calculate percentage error, hence state whether meter is running slow or fast. **[5]**

c) Draw a block diagram of electronic energy meter and explain function of each block. **[6]**

OR

Q4) a) Draw neat diagram of single phase induction type energy meter, label all the parts. **[5]**

b) A 230 V, single phase energy meter has constant load of 5A passing through it for 5 hours at unity power factor. If the meter makes 2990 impulses during this period calculate **[6]**

i) Energy supplied

ii) meter constant

iii) Energy consumed when meter makes 2500 impulses

c) Explain necessity of calibration of energy meter and how electronic energy meter is calibrated. **[6]**

Q5) a) Define transducer and explain various requirements of transducers. **[6]**

b) With neat diagram, explain McLeod gauge for measurement of low pressure. **[6]**

c) In an experiment to measure various electrical quantities using CRO, volts/div knob is set at 10 V/div and times/div knob is set to 5mS/div. Waveform shows total vertical occupancy of 4.5 cm and horizontal occupancy of 5 cm. If the same signal is applied across 2.5Ω resistance, Calculate **[6]**

i) Peak to peak voltage

ii) Maximum voltage

iii) RMS voltage

iv) Current

v) Time period

vi) Frequency

OR

Q6) a) Explain how voltage, current and frequency can be measured using CRO. **[6]**

b) Explain capacitive pressure transducers. **[6]**

c) State importance of pressure measurement hence gives detailed classification of pressure. **[6]**

Q7) a) Explain construction and working of **[8]**

i) Foil strain gauge

ii) Semi conductor strain gauge

b) With neat diagram, explain Ultrasonic method for level measurement. **[6]**

c) State the applications of LVDT. **[3]**

OR

Q8) a) With neat diagram, explain any two electrical methods for level measurement. **[8]**

b) Explain construction and working of LVDT with neat diagram. **[6]**

c) Define strain and what are the types of strain gauge? **[3]**

ⓘⓘⓘⓘ

Total No. of Questions : 9]

SEAT No. : ____

PC2796

[Total No. of Pages : 4

[6352]-20

S.E. (Electrical)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - II) (207006)

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

Instructions to the candidates:

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

Q1) Write the correct option :

a) Z transform of $f(k)=\left(\frac{1}{2}\right)^k \quad k \geq 0$ is **[2]**

i) $\frac{z}{z-2}$ ii) $\frac{2z}{2z-1}$

iii) $\frac{2z}{z-2}$ iv) $\frac{1}{z-2}$

b) The second and fourth moment of distribution about mean are 16 and 43.2 respectively then the coefficient of kurtosis β_2 is equal to **[2]**

i) 0.1687 ii) 2.262

iii) 0.3703 iv) 0.5617

c) The value of $\Delta(r^2)$ is equal to **[2]**

i) $\overline{r}$ ii) 0

iii) $2\overline{r}$ iv) 1

P.T.O.

d) If $f(z) = u + iv$ is an analytic function where $u = x^2 - y^2$ then its harmonic conjugate v is given by **[2]**

i) $x^2 + y^2$ ii) $2xyi$

iii) $y^3 + c$ iv) $2xy$

e) Mean of Binomial distribution is **[1]**

i) $n(1 - p)$ ii) $n^2 p$

iii) np iv) $np(1-p)$

f) The poles of $f(z) = \dfrac{z^2 + 2z}{z^2 + 1}$ are **[1]**

i) $z = \pm 1$ ii) $z = \pm i$

iii) $z = 1, 1$ iv) $-1, -1$

Q2) a) Find the fourier cosine transform of the function $f(x) = e^{-2x} - e^{-3x}$ $(x > 0)$. **[5]**

b) Solve any one. **[5]**

i) Find z transform of $f(k) = e^{-3k} \cos 4k$

ii) Find inverse z - transform of $f(z) = \left(\dfrac{1}{z-3} - \dfrac{1}{z-2}\right)$; $2 < |z| < 3$.

c) Solve the equation $f(k + 2) - 5f(k + 1)\ 6f(k) = 36$, $f(0) = f(1) = 0$. **[5]**

OR

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

i) Find z transform of $f(k) = \sin(3k + 2)$, $k \geq 0$

ii) Find Inverse z-transform of $f(z) = \left(\dfrac{1}{z-5} - \dfrac{1}{z-4}\right)$, $4 < |z| < 5$.

b) Find Fourier sine transform of $f(x) = e^{-ax}$; $a > 0$. **[5]**

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

$$\int_0^\infty f(x) \sin \lambda x \, dx = \begin{cases} 2 - \lambda & ; \quad 0 \leq \lambda \leq 2 \\ 0 & ; \quad \lambda > 2 \end{cases}$$

Q4) a) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. Obtain the first four central moments, β_1 and β_2. **[5]**

b) Find the correlation coefficient between the number of hours studied (X) and marks obtained out of 100(Y) in Mathematics of five students as given in the following data. **[5]**

X	50	65	60	35	40
Y	70	85	65	50	55

c) 20% bolts produced by a machine are defective. Determine the probability that out of 5 bolts chosen at random, at the most one is defective. **[5]**

OR

Q5) a) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y = \mu$ and the means of x and y are 2 and –3 respectively, find the values of λ, μ and the correlation coefficient between x and y. **[5]**

b) On an average, there are two typing mistakes on a page of a book. Using poisson distribution, find the probability that a randomly selected page from the book has at the most one typing mistake. **[5]**

c) The lifetime of an article has a normal distribution with mean 400 hours and standard deviation 50 hours. Assuming normal distribution, find the expected number of articles out of 2000 whose lifetime lies between 335 hours and 465 hours. **[5]**

[Given : Z = 1.3, A = 0.4032]

Q6) a) If the directional derivative at $\phi = axy + byz + czx$ at (1, 1, 1) has maximum magnitude 4 in a direction parallel to x-axis, find the value of a,b,c. **[5]**

b) Show that $\bar{F} = \left(2xz^3 + 6y\right)\bar{i} + \left(6x - 2yz\right)\bar{j} + \left(3x^2z^2 - y^2\right)\bar{k}$ is irrotational. Find scalar potential ϕ such that $\bar{F} = \nabla\phi$. **[5]**

c) If $\bar{F} = \left(2xy + 3z^2\right)\bar{i} + \left(x^2 + 4yz\right)\bar{j} + \left(2y^2 + 6xz\right)\bar{k}$, evaluate $\int_c \bar{F}.d\bar{r}$ where c is the curve $x = t$, $y = t^2$, $z = t^3$ joining (0, 0, 0) and (1, 1, 1). **[5]**

OR

Q7) a) Find the directional derivative of $\phi = xy^2 + yz^3$ at (1, –1, 1) along the vector $\bar{i} + 2\bar{j} + 2\bar{k}$. **[5]**

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

i) $$\nabla\left(\frac{\bar{a}\cdot\bar{r}}{r^n}\right) = \frac{\bar{a}}{r^n} - \frac{n(\bar{a}\cdot\bar{r})\bar{r}}{r^{n+2}}$$

ii) $$\nabla\times\left(\frac{\bar{a}\times\bar{r}}{r^3}\right) = \frac{-\bar{a}}{r^3} + \frac{3(\bar{a}\cdot\bar{r})}{r^5}\bar{r}$$

c) Using Green's theorem evaluate $\oint_c \left(x^2\bar{i} + xy\,\bar{j}\right)\cdot d\bar{r}$

where c is the boundary of region enclosed by $y = x^2$ and line $y = x$. **[5]**

Q8) a) If $f(z) = u + iv$ is analytic, find $f(z)$ in terms of z if given, $u = x^2 + y^2$. **[5]**

b) Using cauchy's integral formula, evaluate $\oint_c \frac{z^2+2}{(z-1)^2}dz$, where c is the circle $|z| = 2$. **[5]**

c) Find the bilinear transformation which maps the points –i, 0, 2 + i of the z - plane on to the points 0, –2i, 4 of the w-plane. **[5]**

OR

Q9) a) If $f(z) = u + iv$ is an analytic function, find $f(z)$ in terms of z if, $u–v = (x–y)(x^2 + 4xy + y^2)$. **[5]**

b) Evaluate $\oint_c \cot z\,dz$, where 'c' is the circle $|z| = 4$ using cauchy's residue theorem. **[5]**

c) Show that under the transformation $w = z + \frac{4}{z}$ the circle $|z| = 2$ is mapped onto the straight line. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC2797

[Total No. of Pages : 4

[6352]-21

S.E. (Electronics/E & TC/Electronics & Computer Engg.)

SIGNALS & SYSTEMS

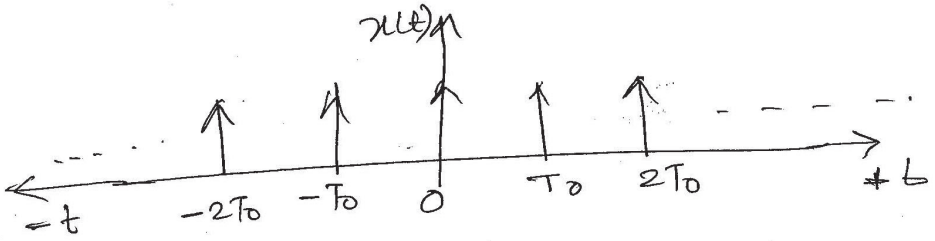
(2019 Pattern) (Semester-IV) (204191)

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) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Find out the exponential Fourier series for impulse train shown in following figure. **[8]**

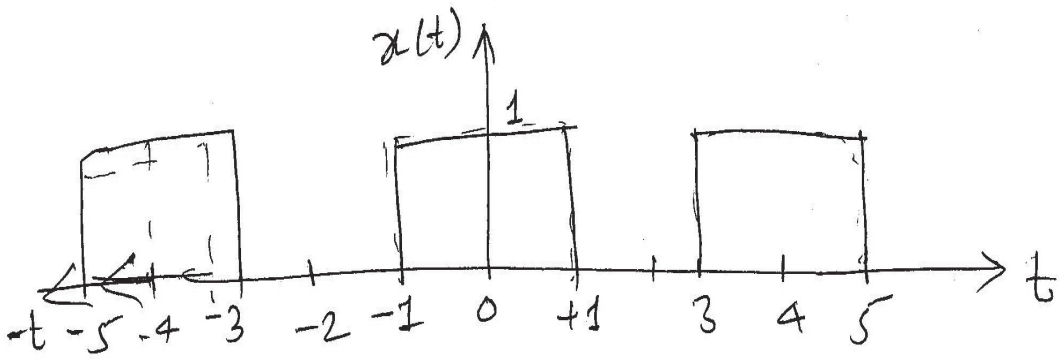


b) Explain Gibb's phenomenon and how to reduce the effect. **[6]**

c) Provide mathematical expression of trignometric and exponential Fourier series. And, give the relation between their coefficients. **[4]**

OR

Q2) a) Find the Trignometric Fourier series for a given signal $x(t)$ **[8]**



P.T.O.

b) State the mathematical expression and physical significance of following CT Fourier series properties. **[6]**

i) Linearity

ii) Modulation

iii) Time shifting

c) State the Dirichlet conditions for the existence of Fourier series. **[4]**

Q3) a) Determine the Fourier Transform of $x(t)=e^{-t}.\ u(t)$. Also, plot magnitude and phase spectrum. **[8]**

b) Find the Fourier Transform of unit step signal. **[6]**

c) State and explain following properties of Fourier Transform. **[3]**

i) Linearity

ii) Time scaling

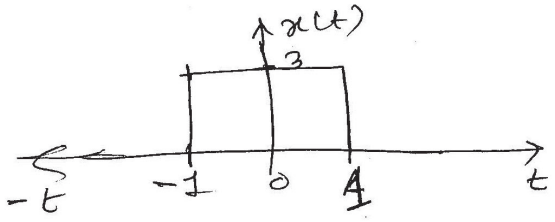
OR

Q4) a) Using the CT Fourier Transform properties, find the Fourier transform of **[8]**

i) $\dfrac{d}{dt}\, e^{-at}u(t)$

ii) 6 sinc $(0.5t)$

b) Find the Fourier Transform of signal given below. **[6]**

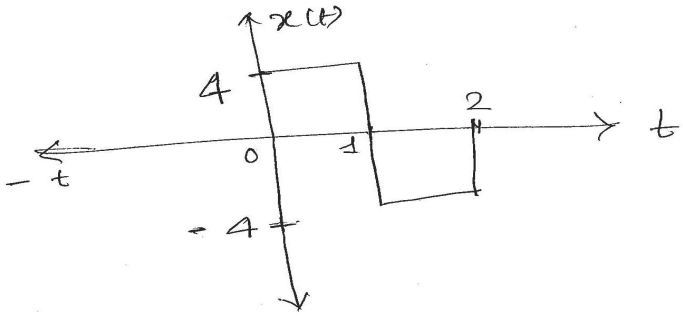


c) Does Fourier Transform exist for the signal **[3]**

$x(t) = e^{2t} \cdot u(t)$

Justify your answer.

Q5) a) Determine the Laplace transform of given signal. Also, sketch ROC. **[8]**



b) Determine the impulse response of the system described by the equation. **[6]**

$$5\frac{d}{dt}y(t)+10y(t)=3x(t)$$

c) State the conditions for stability of a system. Check whether the given **[4]**

$h(t) = e^{-10t}.\ u(t)$ is stable or unstable.

OR

Q6) a) Find inverse laplace transform of **[8]**

$$X(s)=\frac{s+2}{s(s-3)(s+4)}$$

b) Determine the initial value and final value of given **[6]**

$$X(s)=\frac{s+3}{s^2+2s+2}$$

c) Determine the laplace transform of $x(t) = u(t) * u(t-3)$ **[4]**

Q7) a) CDF of a random variable is **[9]**

$$F_X(x)=\begin{cases}0 & x<0\\ \frac{2x}{5} & 0\le x\le 2\\ k & x>2\end{cases}$$

Find:

i) k value

ii) $P(1\le x\le 2)$

iii) $P(x>2)$

b) State the properties of CDF and PDF. **[8]**

OR

Q8) a) PDF of a random variable is given **[9]**

$$f_X(x) = \begin{cases} kx & -1 \le x \le 2 \\ 0 & \text{otherwise} \end{cases}$$

Find:

i) k,

ii) CDF

iii) $P(0 < x \le 1)$

iv) $P(x > 1)$

b) PDF of Random variable is given as **[8]**

$$F_X(x) = \begin{cases} \dfrac{1}{2\pi} & 0 \le x \le 2\pi \\ 0 & \text{otherwise} \end{cases}$$

Find:

i) Mean

ii) Mean square value

iii) Variance

iv) Standard deviation

Total No. of Questions : 8]

SEAT No. : ____

PC2798

[Total No. of Pages : 3

[6352]-22
S.E. (E & TC)
CONTROL SYSTEMS
(2019 Pattern) (Semester - IV) (204192)

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) Investigate the stability of the system using Routh Hurwitz criterion **[8]**

$$G(S) = \frac{100}{S^4 + 6S^3 + 30S^2 + 60S + 100}$$

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 natural oscillation

OR

Q2) a) The unity feedback system has open loop transfer function $G(S) = \frac{k}{s(s+2)(s+5)(s+10)}$. Determine the range of 'k' for the system stability, value of 'k' and frequency of oscillation at marginal stability. **[8]**

b) A unity feedback transfer function has forward path gain $G(S) = \frac{k}{s(s+2)}$

Plot a root locus. **[10]**

P.T.O.

Q3) a) If $G(S)H(S) = \frac{24}{S(S+2)(S+12)}$, Construct the Bode plot and Calculate gain Crossover frequency, Phase Crossover frequency. **[9]**

b) Draw the Polar plot for given transfer function. $G(S) = \frac{10}{S+2}$ **[8]**

OR

Q4) a) For 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) Define and explain **[8]**

i) Bandwidth

ii) Gain margin

iii) Phase margin

iv) Gain cross-over frequency

v) Phase cross over frequency

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]**

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

OR

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

b) Determine the State transition matrix of state equation **[9]**

$$x(t) = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Q7) a) What do you mean by On-Off control? Explain with suitable example. **[9]**

b) Write comparison of P,I and D control action. **[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. **[9]**

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

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Total No. of Questions : 8]

SEAT No. : ____

PC2799

[6352]-23

[Total No. of Pages :2

S.E. (Electronics /E & TC) /(Electronics and Computer)
PRINCIPLES OF COMMUNICATION SYSTEMS
(2019 Pattern) (Semester- IV) (204193)

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*) Differentiate Between NBFM and WBFM . **[6]**

b) Draw and explain the block diagram of super heterodyne FM receiver. **[6]**

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

$V = 10\sin [10^8 t + 3 \sin 10^4 t]$ calculate

i) Carrier and modulating frequency

ii) Modulation index and frequency deviation

iii) Power dissipated by FM wave in 100Ω resistor

OR

Q2) a) Explain with suitable diagram importance of pre-emphasis and de-emphasis. **[6]**

b) What are methods of FM generation? Explain any one in detail. **[6]**

c) An angle modulated signal is described by the equation **[6]**

$V = 10\cos (2\pi * Fc * t + 4\sin 2\pi * Fm * t)$

Fc = 10MHz, Fm = 1,000Hz

i) Determine Modulation index and transmitted signal bandwidth.

ii) If Fm is doubled, Determine Modulation index and transmitted signal bandwidth.

Q3) a) Explain types of sampling with waveform. **[6]**

b) Explain with block diagram and waveforms generation of PAM. **[6]**

c) Find the Nyquist rate and Nyquist interval for the following signal **[5]**

$X(t) = 3\cos (200\pi t) + 5\sin (6000\ \pi t) + 10\cos (1200\ \pi t)$

OR

Q4) a) Compare PAM, PWM and PPM **[6]**

b) What is aliasing and Draw a spectrum showing aliasing and guard band. **[6]**

c) Explain Principles of time division multiplexing? Why synchronization is needed in TDM system. **[5]**

P.T.O.

Q5) a) Draw and explain Block diagram of DM Transmitter. **[6]**

b) What are different types of Quantization? Explain any one method of quantization with neat diagram. **[6]**

c) What is necessity of companding? Explain A law companding in detail. **[6]**

OR

Q6) a) Draw and explain Block diagram of Adaptive delta modulation. **[6]**

b) Compare PCM,DM and ADM. **[6]**

c) Explain need of digital communication. **[6]**

Q7) a) Draw the following data formats for bit stream 10110100101 **[5]**

i) Unipolar RZ

ii) Unipolar NRZ

iii) polar RZ

iv) PoIar NRZ

v) split phase Manchester

b) What is equalizer? Explain Adaptive Equalizer. **[6]**

c) What is inter symbol Interference (ISI)?Explain methods to eliminate it.

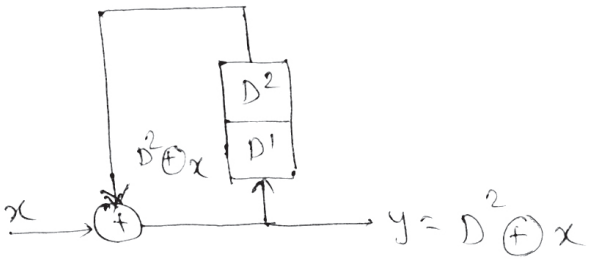
[6]

OR

Q8) a) Draw and explain CCIT hierarchy multiplexing system. **[6]**

b) Explain need of synchronizer in digital multiplexing. Explain frame synchronization. **[6]**

c) The data strearm [1 1 1 1 1] is given to scrambler shown below. Determine the output sequence of scrambler. Assume initial contents of register to be zero. **[5]**



Total No. of Questions : 8]

SEAT No. :

PC2800

[Total No. of Pages : 2

[6352]-24

S.E. (Electronics / E & TC/ Electronics & Computer)

OBJECT ORIENTED PROGRAMMING

(2019 Pattern) (Semester - IV) (204194)

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) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain Friend function with example. **[6]**

b) Which operators cannot be overloaded? Write steps to add two complex numbers using + operator overloading. **[6]**

c) Write down program to overload unary operators. **[6]**

OR

Q2) a) What are the rules for overloading operators? **[6]**

b) Explain the operator overloading. Also, explain different steps for overloading operator. **[6]**

c) Explain the concept of Bianary operator overloading with example. **[6]**

Q3) a) What does inheritance mean in C++? Explain different forms of Inheritance. **[6]**

b) Explain the pure virtual function. State the rules for virtual function. **[6]**

c) Discuss the role of access specifiers in inheritance and show their visibility when they are inherited as public, private and protected. **[5]**

OR

Q4) a) Explain virtual base class and virtual function with example. **[6]**

b) What is the ambiguity that arises in multiple inheritance? How it can be overcome? Explain with example. **[6]**

c) Explain Containment and Inheritance along with examples. **[5]**

P.T.O.

Q5) a) What is stream? Explain types of streams available in C++. **[6]**

b) Write a program to swap two integer, two character and two float values using function template. **[6]**

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

OR

Q6) a) Write a program to illustrate class template using multiple parameters. **[6]**

b) Explain the following terms. **[6]**

i) Throwing mechanism

ii) Catching mechanism

iii) Multiple catch statements

c) Explain name space with example. **[6]**

Q7) a) Explain the classes for file stream operations. **[6]**

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

c) Explain error handling during file operations. **[5]**

OR

Q8) a) Explain opening a file with constructor function and opening a file with open () function. **[6]**

b) Explain following functions for manipulation of file pointers. **[6]**

i) seekg()

ii) seekp()

iii) tellg()

c) Write a program using the open ( ), eof ( ) andgetline ( ) functions to open and read file contents line by line. **[5]**

■■■■

Total No. of Questions : 9]

SEAT No. : ____

PC2801

[6352]-25

[Total No. of Pages :4

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

ENGINEERING MATHEMATICS - III

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

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

Instructions to the candidates:

1) ***Q1 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 indicate 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.

a) The second forward difference $\Delta^2 f(x)$ for $f(x) = x^2$, $h = 2$ is given by **[2]**

i) 6 ii) 12

iii) 4 iv) 8

b) $\nabla(r^2 \log r)$ is equals to **[2]**

i) $r\bar{r}(2\log r + 1)$ ii) $\bar{r}(2\log r + 1)$

iii) $r(2\log r - 1)$ iv) $r\log r(r+1)$

c) The residue of $f(z) = \cot z$ at $z = 0$ is **[2]**

i) 1 ii) 2

iii) π iv) 0

d) The value of $\int_C \bar{F}_0 d\bar{r}$, for $\bar{F} = x\bar{i} + y\bar{j} + z\bar{k}$ along the path $n = t$, $y = t^2$, $z = t^3$ from $t = 0$ to $t = 1$ is **[2]**

i) $\frac{2}{3}$ ii) $\frac{3}{2}$

iii) $\frac{5}{3}$ iv) $\frac{4}{3}$

P.T.O.

e) In Runge-Kutta method of fourth order, the value of K_2 is **[1]**

i) $\frac{h}{2} f(x_0, y_0)$ ii) $hf(x_0, y_0)$

iii) $hf(x_0 + \frac{h}{2}, y_0 + \frac{K_1}{2})$ iv) $f(x_0, y_0)$

f) The poles of $\frac{z^2+1}{(z+1)(z^2-9)}$ are **[1]**

i) –1, –3, 3 ii) 1, 3, 4

iii) –1, 3, 3 iv) 1, 2, 3

Q2) a) Find cubic polynomial by Newton's forward difference formula. Hence find $f(4)$. **[5]**

x	0	1	2	3
$f(x)$	1	2	1	10

b) Use Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to evaluate $\int_0^{\frac{\pi}{2}} \left(\frac{\sin x}{x}\right) dx$ by dividing the interval into 4 equal parts. **[5]**

c) Using Euler's modified method, find the value of y at $x = 0.05$ given that $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$ (2 iterations only). **[5]**

OR

Q3) a) The velocity distribution of fluid near a flat surface is given below **[5]**

x	0.1	0.3	0.6	0.8
v	0.72	1.81	2.73	3.47

Where x is distance from surface (mm). v is velocity (mm/sec). Use Lagrange's interpolation formula to find v at $x = 0.4$.

b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ taking $h = \frac{1}{6}$ by using Simpson's $\frac{3}{8}^{th}$ rule compare with actual value. **[5]**

c) Use fourth order Runge-Kutta formula to find the value of y when $x = 1$

Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ and $y(0) = 1$ take $h = 1$. **[5]**

Q4) a) Find the directional derivative of $f(x, y, z) = x^2y + xyz + z^3$ at (1, 2, –1) along normal to the surface $x^2y^3 = 4xy + y^2z$ at the point (1, 2, 0). **[5]**

b) Show that the vector field $\bar{F} = (y^2 \cos x + z^2)i + (2y \sin x)\, j + (2xz)k$ is conservative and find scalar field ϕ. Such that $\bar{F} = \nabla\phi$. **[5]**

c) Show that $\nabla^2\left[\nabla.\left(\frac{\bar{r}}{r^2}\right)\right] = \frac{2}{r^4}$. **[5]**

OR

Q5) a) Find the values of a, b, c so that the directional derivative of $\phi = axy^2 + byz + cz^2x^2$ at (2, 1, 1) has a maximum magnitude 12 in the direction parallel to x - axis. **[5]**

b) If $\bar{F}_1 = yzi + zxj + xyk$, $\bar{F}_2 = (\bar{a}.\bar{r})\bar{a}$ then show that $\bar{F}_1 \times \bar{F}_2$ is solenoidal. **[5]**

c) For scalar functions ϕ and ψ show that **[5]**

$$\nabla.(\phi\nabla\psi - \psi\nabla\phi) = \phi\nabla^2\psi - \psi\nabla^2\phi$$

Q6) a) Find the work done in moving a particle in a force field $\bar{F} = 3xy\bar{i} - 5z\,\bar{j} + 10x\bar{k}$ along the curve $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from $t = 1$ to $t = 2$. **[5]**

b) Using Gauss-Divergence theorem, evaluate $\iint_s \bar{F}.\hat{n}\, ds$ where $\bar{F} = x^3\bar{i} + y^3\bar{j} + z^3\bar{k}$ and s is the surface of the sphere $x^2 + y^2 + z^2 = a^2$. **[5]**

c) By using Stoke's thoerem, evaluate $\iint_s (\nabla \times \bar{F}).\hat{n}\, ds$ for $\bar{F} = y\bar{i} + z\,\bar{j} + x\bar{k}$ where s is the surface of the parabolide $z = 1 - x^2 - y^2$, $z \geq 0$. **[5]**

OR

Q7) a) A vector field is given by $\bar{F} = \cos y\bar{i} + x(1-\sin y)\bar{j}$. By using Green's theorem, evaluate $\int_c \bar{F}.d\bar{r}$ where *c* is the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$, $z = 0$. **[5]**

b) Show that $\iiint_v \frac{dv}{r^2} = \iint_s \frac{\bar{r}.\hat{n}}{r^2} ds$. **[5]**

c) By using Stoke's theorem, evaluate $\int_c \bar{F}.d\bar{r}$ where $\bar{F} = \sin z\bar{i} + \cos x\bar{j} + \sin y\bar{k}$ and '*c*' is the boundary of rectangle $0 \le x \le \pi$, $0 \le y \le 1$ & $z = 3$. **[5]**

Q8) a) If $v = 3x^2y - y^3$, then find it's harmonic conjugate *u*. **[5]**

b) Evaluate $\oint_c \frac{z^2+1}{z-2} dz$, where c is the circle $|z - 2| = 1$, by using Cauchy's Integral formula. **[5]**

c) Find the bilinear transformation which maps the points $z = 1, i, 2i$ on the points $w = -2i, 0, 1$ respectively. **[5]**

OR

Q9) a) If $u = x^4 - 6x^2y^2 + y^4$ then find *v* such that $f(z) = u + iv$ is analytic & determine $f(z)$ in terms of *z*. **[5]**

b) Evaluate $\oint_c \frac{\sin(\pi z^2) + 2z}{(z-2)} dz$, where *c* is the circle $|z| = 4$, by Residue theorem. **[5]**

c) Find the map of the straight line $y = x$ under the transformation $w = \frac{z-1}{z+1}$. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC2802

[6352]-26

[Total No. of Pages :3

S.E. (Electronics/E & TC)/ (Electronics Engg. (VLSI Design and Technology))/ (Electronics & Communication-Advanced Communication Technolgoy)

ELECTRONIC CIRCUITS

(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 indicates full marks.***
3) ***Draw a neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define voltage regulator, line regulation and load regulation in case of voltage regulator. **[6]**

b) Calculate min and max range of variable resistance R_2 for an adjustable voltage regulator using LM 317 to get output voltage of +5 V to +24 V, assume R_1=240 Ω, I_{adj}=100 uA. **[6]**

c) Compare Linear and switch mode power supply. **[6]**

OR

Q2) a) Draw and explain the Block diagram of DC Voltage regulated Power Supply. **[6]**

b) Determine the range over which voltage range can vary in LM317 voltage regulator if the values of R_1 is 240Ω and R_2 taken as 4.7 KΩ potentiometer. Assume I_{adj}=100uA. Draw the typical connection diagram. **[6]**

c) Explain the concept of Low Drop Out (LDO) in detail. **[6]**

Q3) a) Draw the block diagram of OPAMP and explain each block in detail. **[6]**

b) Explain the following op-amp parameters: **[6]**

i) Input offset voltage
ii) Input Bias current
iii) Slew Rate.

c) Compare Ideal and Practical Parameters of an OP–AMP. **[5]**

OR

P.T.O

Q4) a) Explain the following parameters of Op-Amp **[6]**

i) Slew rate

ii) CMRR

iii) Gain bandwidth product

b) Explain from the block diagram the Output stage of Op Amp. **[5]**

c) Draw and explain an Inverting summing amplifier with three inputs with expression for its output voltage. **[6]**

Q5) a) Draw and explain working of Inverting Symmetrical Schmitt trigger circuit using op-amp., also give the equation for triggering points. **[6]**

b) Draw and write the output equation of. **[6]**

i) Voltage follower

ii) Non-Inverting amplifier

c) Draw and explain Practical integrator circuit with equation of output voltage. What are the limitations of an ideal integrator? **[6]**

OR

Q6) a) Draw a circuit diagram of three op-amp instrumentation amplifiers and write its output equation. **[6]**

b) Draw and explain Practical differentiator circuit with equation of output Voltage. Draw the frequency response of the differentiator . **[6]**

c) Draw and explain the triangular wave generator using an op-amp with waveforms. **[6]**

Q7) a) Define the following terms w.r.t PLL: **[6]**

i) Free running Frequency

ii) Lock range

iii) Capture range

b) Draw the block schematic of PLL and explain each block in detail. **[5]**

c) With the neat circuit diagram explain Current to Voltage Converter. **[6]**

OR

Q8) a) With the neat circuit diagram explain Voltage to Current Converter. **[6]**

b) Write short notes on Frequency Multiplier using PLL. **[6]**

c) Compare the various methods of A/D Conversion. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC2803

[Total No. of Pages : 3

[6352]-27

S.E. (Electronic/ E&Tc) (Electronics & Computer/VLSI Design & Technology/Electronics & Communication/Advanced Communication Technology)

DIGITAL CIRCUITS (OOP)

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

Time : 2 ½Hours] *[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.7or Q.No.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicates full marks.*

Q1) a) Explain the working of a half-adder? Draw its logic diagram. **[7]**

b) Implement the full subtractor using a 1:8 demultiplexer. **[5]**

c) Implement the following function using multiplexer **[5]**

$f(A,B,C) = \Sigma m(0,2,4,6)$

OR

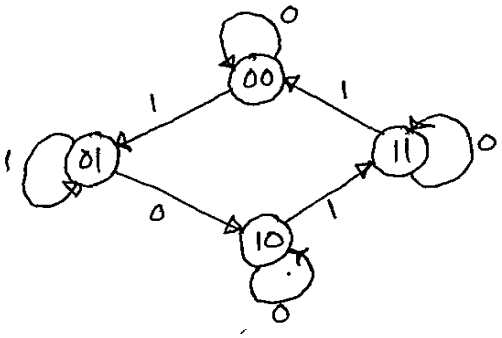
Q2) a) Draw the logic diagram of full-adder and its truth table. **[7]**

b) Implement a full-adder using Demultiplexer. **[5]**

c) Implement the given logic function using a 4:1 multiplexer **[5]**

$f(A,B,C) = \Sigma m(0,2,4,6)$

Q3) a) For the state diagram shown in figure, obtain the state table and design the circuit using minimum number of J-K flip-flops. **[8]**



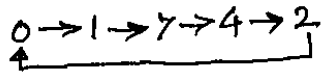
P.T.O.

b) Explain the function of a shift register. Give its application. **[5]**

c) Explain with truth table the working of clocked RS flip-flop. **[5]**

OR

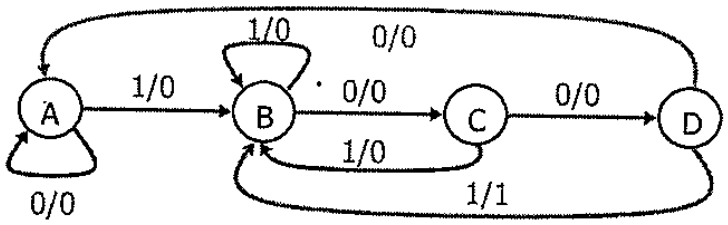
Q4) a) Design a sequence generator using T FFs. **[8]**



b) Explain the types of shift register. **[5]**

c) Explain with diagram the working of D type Flip-flop. Give its truth table. **[5]**

Q5) a) Design the clocked sequential circuit for the state diagram using JR flip flop. **[9]**



b) Draw ASM chart for a 2 bit up- down counter having mode control input M. **[8]**

M= 1 Up counter.

M= 0 Down center.

OR

Q6) a) Design a sequential circuit using Mealy machine for detecting the sequence....1001..... Use JK Flip-flop. **[9]**

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

i) State Diagram

ii) ASM chart

Q7) a) Explain the classification of memories based on their principle of operation. **[8]**

b) Write a short note on concept of PLA and PAL. **[10]**

OR

Q8) a) Explain with circuit diagram the dynamic MOS memory. **[8]**

b) A combinational circuit defined by the function **[10]**

$F_1(A,B,C) = \sum (3,5,6,7)$ and

$F_2(A, B, C) = \sum (0,2,4,7)$

Implement the circuit with PLA having 3 inputs, 3 product terms and 2 outputs.

Total No. of Questions : 8]

SEAT No. : ____

PC2804

[Total No. of Pages : 3

[6352]-28

S.E. (Electronics/Electronics & Telecommunication)

ELECTRICAL CIRCUITS

(2019 Pattern) (Semester - III) (204183)

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) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Write a note on pole zeros of network functions and stability. **[6]**

b) Find h-parameters for the network shown in Fig. 1. **[6]**

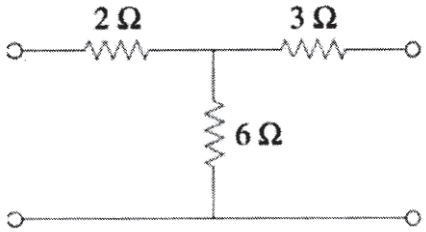


Fig. 1

c) When do we say that, an electric network is symmetrical? What are the conditions for an electrical network to be symmetrical in terms of **[6]**

i) Y parameters

ii) Z parameters

OR

Q2) a) What is network function? Give various types of network functions for two port network. **[6]**

b) Find Y-parameters for the network shown in Fig. 2 **[6]**

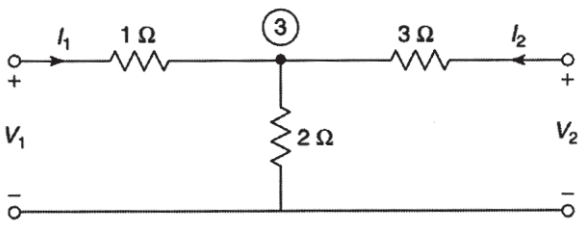


Fig. 2

P.T.O.

c) Determine the z parameters for the circuit shown in Fig. 3 **[6]**

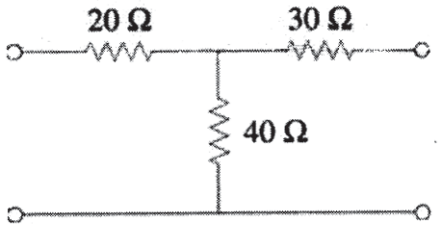


Fig. 3

Q3) a) What do you understand by the term back e.m.f.? **[5]**

b) A shunt generator has 4 pole with lap wound armature having 24 slots with 10 conductors/slot. If the flux/pole is 0.04 Wb and the speed is 1500 rpm, calculate the emf generated in the armature. What would be generated e.m.f. if the winding is wave connected? **[6]**

c) What are the losses that occur in DC machines (generator/motor). **[6]**

OR

Q4) a) What are the various types of DC motors? Draw circuit diagram of them and mention their application. **[5]**

b) A 250V, 4 pole, wave wound DC series motor has 782 conductors on its armature. It has armature and series field resistance of 0.75 ohm. The motor takes a current of 40 A. Estimate its speed and gross torque developed if it has a flux per pole of 25mWb. **[6]**

c) Draw a neat sketch of a DC generator. State the functions of each part. **[6]**

Q5) a) Define slip and synchronous speed of 3 phase induction motor. A 3-phase induction motor is wound for 8 poles and is supplied from 50 Hz source. **[6]**

Calculate

i) Synchronous speed.

ii) Slip of the motor when speed is 720 rpm.

b) Explain various power stages in three phase induction motor. **[6]**

c) List the different losses that occur in an induction motor. Also mention the factors on which these losses depend. **[6]**

OR

Q6) a) Explain the difference between squirrel cage induction motor and slip ring induction motor. **[6]**

b) The power input to a 3 phase induction motor is 60kW. The stator losses total 1kW. Find the mechanical power developed and the rotor copper loss per phase if the motor is running with a slip of 3%. **[6]**

c) What are the advantages of using three phase system over single phase system? **[6]**

Q7) a) Compare Variable Reluctance and Permanent Magnet stepper motors. **[5]**

b) Enlist the advantages and disadvantages of BLDC motor. **[6]**

c) Explain the operation of stepper motor with full stepping sequence. **[6]**

OR

Q8) a) Compare Brushless DC motor with conventional DC motor. **[5]**

b) What is the need of electric vehicle? Also give the advantages and disadvantage of electric vehicle. **[6]**

c) What are stepper motors? How does it work? **[6]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC2805

[6352]-29

[Total No. of Pages : 3

S.E. (Electronics/Electronics & Telecommunication)

DATA STRUCTURES

(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, 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) 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]**

OR

Q2) 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]**

Q3) 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]**

OR

P.T.O.

Q4) 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]**

Q5) 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: **[6]**

i) Array

ii) Linked List

OR

Q6) 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

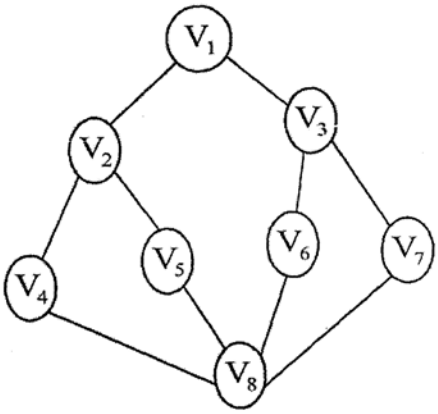
iii) Depth of tree

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.

Q7) a) Draw adjacency list and adjacency matrix for the following graph: **[6]**

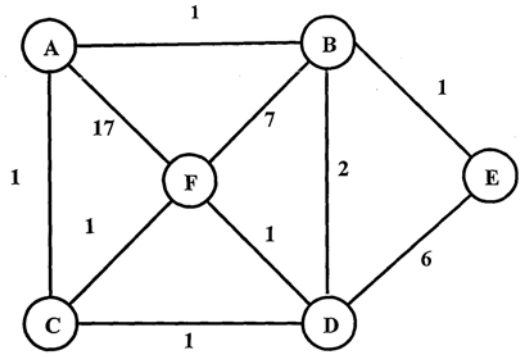


b) What is MST? Explain with suitable example Kruskal's Algorithm to find out MST. **[6]**

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 6 vertices

Total No. of Questions : 8]

SEAT No. :

PC2806

[Total No. of Pages : 2

[6352]-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) ***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) Explain about Stack Class in C++ with suitable example. **[8]**

b) Write in short about following programming languages. **[10]**

i) Procedure Oriented Programming.

ii) Object Oriented Programming.

OR

Q2) a) Explain in detail about. **[8]**

i) Libraries of modules.

ii) Generic modules.

b) Explain in detail about language features for Programming in the large for C++ language. **[10]**

Q3) a) Explain about following decision statements in java. **[8]**

i) if statement

ii) else if statement

b) Explain in detail about different Java features. **[9]**

OR

Q4) a) Explain about Java and internet. **[8]**

b) Explain about **[9]**

i) Primitive data types in Java.

ii) Non-Primitive data types in Java.

P.T.O.

Q5) a) Explain use of this keyword in Java with suitable example. **[8]**

b) Explain Concept of interface in Java with suitable example **[10]**

OR

Q6) a) Explain the use of. **[8]**

i) Static

ii) Final Keyword in Java

b) Explain Concept of inheritance in Java with suitable example for any one type. **[10]**

Q7) a) Explain in detail about Printwriter class in Java with suitable example.**[8]**

b) Explain use of following keywords in Java. **[9]**

i) throw

ii) throws

iii) finally

OR

Q8) a) Explain about reading console input in Java with example for Buffered Reader class. **[8]**

b) Explain the life cycle of applet with block diagram. **[9]**

■■■■

Total No. of Questions : 8]

SEAT No. :

PC2807

[Total No. of Pages : 3

[6352]-31
S.E. (Electronics & 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 indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) What are the different purpose of Operating system? Explain different Goals of Operating System. What are the different functions of Operating System. **[9]**

b) Explain pre-emptive & non preemptive scheduling Compare between preemptive & non preemptive scheduling. **[8]**

OR

Q2) a) Describe real time operating systems? Explain with suitable examples any four types of real time operating systems. **[9]**

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. **[8]**

Process	Arrival time	Burst time
P_1	02	06
P_2	05	02
P_3	01	08
P_4	00	03
P_5	04	04

P.T.O.

Q3) a) Explain Interprocess communication (IPC). Explain the any three approaches for Inter-Process Communication. **[9]**

b) Consider the following snapshot of a system with five processes P_0, P_1, P_2, P_3 and P_4 and three resources A, B and C. Find out the safe sequence for the execution of the following processes using banker's algorithm. **[9]**

	Allocation			Max			Available		
Process	A	B	C	A	B	C	A	B	C
P_0	1	1	2	4	3	3	2	1	0
P_1	2	1	2	3	2	2			
P_2	4	0	1	9	0	2			
P_3	0	2	0	7	5	3			
P_4	1	1	2	1	1	2			

OR

Q4) a) What is Mutual Exclusion? Explain any three mutual exclusion techniques in details. **[9]**

b) Describe the concept Semaphore. What is meant by Binary semaphores and counting semaphores. **[9]**

Q5) a) Calculate the number of page faults and page hits for the page replacement policies FIFO for the given reference string 2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2 with 3 frames. **[9]**

b) Explain fixed partitioning and dynamic partitioning. State the their advantages and disadvantages. **[8]**

OR

Q6) a) Explain page replacement in operating systems? What is meant by page fault? List the page replacement algorithm and explain LRU in details. **[9]**

b) Describe Fragmentation in OS. Explain internal Fragmentation. Difference between Internal Fragmentation and External Fragmentation **[8]**

Q7) a) Explain three different Categories of I/O devices. Difference between Programmed I/O and Interrupt Driven I/O. **[9]**

b) Explain the concept I/O buffering? What is meant by double I/O buffering and state its advantages and disadvantages. **[9]**

OR

Q8) a) 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 count) in cylinders using FCFS scheduling. **[9]**

b) What is operating system? List and explain operating system design issues. **[9]**

❋ ❋ ❋

Total No. of Questions : 8]

SEAT No. : ____

PC2808

[Total No. of Pages :2

[6352]-32

S.E. (Electronics & Computer Engg.)

ELECTRONICS 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.***

Q1) a) Draw practical voltage regulator using LM317 & justify each components. **[5]**

b) Explain the basic principle of switching regulator with block diagram. **[6]**

c) Explain low dropout regulator with neat diagram in detail **[6]**

OR

Q2) a) Compare linear regulator & SMPS. **[5]**

b) Explain how current boosting is achived in three terminal voltage regulator. **[6]**

c) Draw and explain the block diagram of an adjustable three terminal regulator and justify function of each block. **[6]**

Q3) a) Draw block diagram of Op-Amp and Explain in detail. **[6]**

b) Define & Explain- **[6]**

i) P$RR

ii) CMRR

iii) Slew Rote

c) Draw the circuit diagram of dual input balance out differential amplifier & explain. **[6]**

OR

P.T.O

Q4) a) Explain current mirror circuit with neat diagram. **[6]**

b) Draw the circuit diagram of level shifter and explain its necessity. **[6]**

c) Define & Explain **[6]**

i) I/P offset current

ii) Gain Bandwidth product

iii) I/P bias current

Q5) a) Draw & Explain schmitt trigger with characteristics. **[6]**

b) Compare inverting & non inverting Amplifies. **[6]**

c) Draw the circuit diagram of differential amplifier & derive an expression for output voltage. **[6]**

OR

Q6) a) Draw the circuit diagram of square wave generator and explain with suitable diagram. **[6]**

b) Draw the circuit diagram of an integrator and derive the expression for output voltage. **[6]**

c) Draw the circuit diagram of instrumentation amplifier and derive the expression for output voltage. **[6]**

Q7) a) What is the operating principle of PLL & Explain its one application. **[5]**

b) Explain the operation of successive approximation type ADC with neat block diagram. **[6]**

c) Define **[6]**

i) Free running frequency

ii) Capture Range

iii) Lock Range or PLL.

OR

Q8) a) What is the operating principle of DAC? Explain its one type. **[5]**

b) Calculate the output frequency F_o, lock range ΔF_L and capture range ΔF_c of PLL IC565 if external resistor R_1=12KΩ external capacitor connected to pin no.9 C_1=0.01 μF, Filter capacitor C_2 at pin no. 7=10μf. **[6]**

c) Draw the block diagram of PLL & Explain in detail. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC2809

[Total No. of Pages : 3

[6352]-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, Q7 or Q8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Use of non-programmable scientific calculator is allowed.***

Q1) a) What is stack data structure? Write a C structure for a stack of integer implemented using array. Explain stack operations. **[6]**

b) Write an algorithm for evaluating a postfix expression using stack. **[6]**

c) Evaluate following postfix expression with the help of stack. **[5]**

i) 623 + – 382 / + * 2 $ 3 +

ii) 231 * + 9 –

OR

Q2) a) Write the following C functions when the stack is implemented using array of integers. **[6]**

i) is empty

ii) is full

iii) Push

iv) Pop

b) Compare stacks and queues. **[6]**

c) What is queue? Explain basic operations on queue. State queue empty and full conditions when queue is implemented using array. **[5]**

Q3) a) Compare SLL with DLL? **[6]**

b) Write a C declaration for a structure of - **[6]**

i) Singly Linked List

ii) Doubly Linked List

c) Differentiate between static and dynamic memory allocation. Name and explain in brief dynamic memory allocation functions. **[6]**

OR

P.T.O.

Q4) a) Compare array and linked list. Declare in 'C' a node structure for doubly linked list. **[6]**

b) Write a function in C to delete a node in SLL. **[6]**

c) Represent the following polynomials using linked list. **[6]**

i) $25x^5 + 15x^4 + 5x^3 + 2x^2 + 100$

ii) $16x^8 + 9x^4 + 5x^2 + 2x$

Q5) a) Define the following terms with respect to tree data structure with suitable example. **[6]**

i) Degree of a node

ii) Height of a node

iii) Height of tree

b) Construct a binary search tree for the following set of elements. **[6]**

50, 25, 85, 45, 15, 95, 75

Traverse the resulting binary search tree in post-order manner.

c) What is threaded binary search tree. Explain with suitable example. **[5]**

OR

Q6) a) From the given traversal construct the binary tree. **[6]**

Inorder : D B F E A G C L J H K

Postorder : D F E B G L J K H C A

b) Explain with suitable example how binary tree can be represented using **[6]**

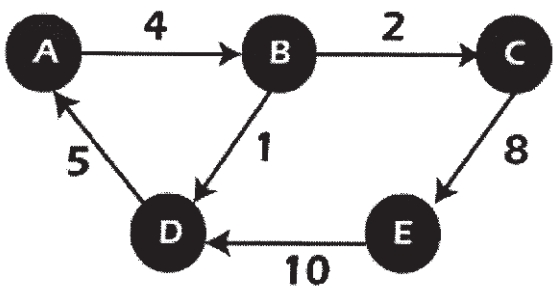
i) Array

ii) Linked List

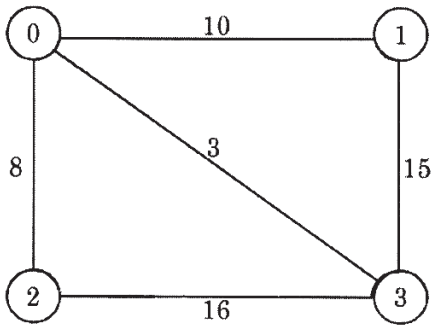
c) Construct a threaded binary search tree for the following data. **[5]**

100, 50, 200, 300, 20, 150, 70, 180, 120, 30

Q7) a) What do you mean by adjacency matrix and adjacency list. Give the adjacency matrix and adjacency list of the following graph. **[6]**



b) Construct a minimum spanning tree for the following graph using Kruskal's Algorithm. **[6]**

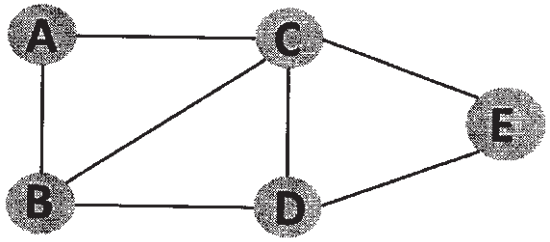


c) Explain Dijkstra's shortest path algorithm with suitable example. **[6]**

OR

Q8) a) Write an algorithm for depth first search technique. **[6]**

b) Perform depth first search algorithm on the following graph. **[6]**



c) Define graph data structure. Explain following graph terms with illustrations/diagrams. **[6]**

i) Complete graph

ii) Connected graph

iii) Subgraph

Total No. of Questions : 8]

SEAT No. :

PC2810

[Total No. of Pages : 2

[6352]-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 Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Compare memory mapped I/O with I/O mapped I/O. **[5]**

b) What is need of DMA? How it works? **[6]**

c) What are the evolutionary steps of I/O channel? Explain types of I/O channel? **[6]**

OR

Q2) a) Explain data transfer modes in DMA. **[5]**

b) What is the use of DMA? Explain cycle stealing in DMA? **[6]**

c) Differentiate between programmed I/O and interrupt driven I/O. **[6]**

Q3) a) What is displacement addressing? Explain its types with calculation of effective address. **[5]**

b) Explain different addressing modes with example. Discuss drawback of relative addressing mode. **[6]**

c) Explain following addressing modes of 8086 with suitable examples **[6]**

i) Index Addressing

ii) Register Indirect

iii) Relative Addressing

OR

Q4) a) What is machine instruction? Explain types of instruction. **[5]**

b) List the features of 8086 microprocessors. **[6]**

c) Draw and explain the functional block diagram of 8086. **[6]**

P.T.O.

Q5) a) Explain hardware organization and execution of 4 stage instruction 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) What are the advantages of pipelining? Define latency and throughput of pipeline. **[5]**

b) What is register organization? What are different types of registers? Explain in detail. **[6]**

c) Explain the use of the following registers of 8086 CPU: **[7]**

i) General purpose registers

ii) Segment Register

iii) Flag Register

Q7) a) Write control sequence for execution of the instruction Add (R3), R1. **[5]**

b) What are the different design methods for Hardwired control units? Explain any one. **[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 the following microinstruction sequencing techniques: **[7]**

i) Single Address Fields

ii) Variable Address Fields

Total No. of Questions : 9]

SEAT No. :

PC2811

[Total No. of Pages : 5

[6352]-35

S.E. (Computer Engineering)/(Computer Science & Design Engg.)/ (I.T.)/(AI & ML)

ENGINEERING MATHEMATICS-III

(2019 Pattern) (Semester-IV) (207003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.No.1 is compulsory.***
2) ***Attempt Q.2 or Q.3, Q.4 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 indicates full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Choose the correct option of the following.

a) 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

b) The probability distribution of x is **[2]**

x	1	2	3	4
P(x)	1/2	1/4	1/8	1/8

The mathematical expectation E(x) is ____

i) 11/8 ii) 13/8

iii) 15/8 iv) 9/8

c) A root of the equation $x^3 - 4x - 9 = 0$ using bisection method lies between____ **[2]**

i) 0 and 1 ii) 1 and 2

iii) 2 and 3 iv) 3 and 4

P.T.O.

d) If Lagrange's polynomial passes through **[2]**

x	0	2
y	–3	1

then $\int_0^2 y\,dx$ is equal to_____

i) –1 ii) –2

iii) 1 iv) 2

e) If $\bar{x}$ is arithmetic mean, N=Σf and the data is presented in the form of frequency distribution then the standard deviation σ is given by ___ **[1]**

i) $\frac{1}{N}\Sigma f\left(x-\bar{x}\right)^2$ ii) $\sqrt{\frac{1}{N}\Sigma f\left(x-\bar{x}\right)^2}$

iii) $\frac{\Sigma fx}{N}$ iv) $\frac{1}{N}\Sigma f\,|x-\bar{x}|$

f) Given equation is $\frac{dy}{dx}=f\left(x,y\right)$ with initial condition $x=x_o,\ \ y=y_o$ and h is step size. Euler's formula to calculate y_1 at $x=x_o+h$ is given by _____ **[1]**

i) $y_1=y_0+hf\left(x_0,y_0\right)$ ii) $y_1=y_0+hf\left(x_1,y_1\right)$

iii) $y_1=y_0+hf\left(x_0,y_1\right)$ iv) $y_1=hf\left(x_0,y_0\right)$

Q2) a) The first four moments of a distribution about the value 5 are 2,20,40 and 50. 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 of the type $y = ax + b$ to the data using method of least squares. **[5]**

x	0	1	2	3	4	5	6	7
y	–5	–3	–1	1	3	5	7	9

OR

Q3) a) Calculate the coefficient of correlation from the information $n=10$, $\Sigma x=40$, $\Sigma x^2=190$, $\Sigma y^2=200$, $\Sigma xy=150$, $\Sigma y=40$ **[5]**

b) Fit a curve $y=ax^b$ for the data **[5]**

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

c) The two regression equations of the variables x and y are **[5]**

$x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$

Find mean of x and mean of y and coefficient of correlation.

Q4) a) A mathematics problem is given to the three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? **[5]**

b) The mean and variance of a binomial distribution are 6 and 2 respectively. Find P ($r \geq 1$) **[5]**

c) A fair coin is tossed 64 times. Using normal distribution with mean 32 and standard deviation 4, find the probability of getting. **[5]**

i) Number of heads between 28 to 40

ii) Number of heads less than 28.

[Given: A(1) = 0.3413, A(2) = 0.4772]

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) Let 10% of the rivets produced by a machine are defective. Using Poisson distribution find the probability that out of 5 rivets chosen at random, at least two will be defective. **[5]**

c) A nationalized bank utilizes four teller windows to render fast service to the customers. On a particular day, 800 customers were observed. They were given service at the different windows as follows: **[5]**

Window number	1	2	3	4
No. of customers observed	150	250	170	230

Test whether the customers are uniformly distributed over the windows.

(Given : $\chi^2_{3,0.05} = 7.815$)

Q6) a) Use secant method to find a root of the equation $f(x) = x^3 - 5x - 7 = 0$ correct to three decimal places. **[5]**

b) Obtain a root of the equation $3x - \cos x - 1 = 0$ (measured in radians), correct to four decimal places, using Newton-Raphson method. **[5]**

c) Solve by Gauss-Seidel method, the following system of equations. **[5]**

$$10x_1 + x_2 + x_3 = 12$$
$$2x_1 + 10x_2 + x_3 = 13$$
$$2x_1 + 2x_2 + 10x_3 = 14$$

OR

Q7) a) Solve the following system by Gauss elimination method. **[5]**

$$x_1 + 4x_2 - x_3 = -5$$
$$x_1 + x_2 - 6x_3 = -12$$
$$3x_1 - x_2 - x_3 = 4$$

b) Solve the following system of equations by Jacobi-iteration method: **[5]**

$$20x_1 + x_2 - 2x_3 = 17$$
$$3x_1 + 20x_2 - x_3 = -18$$
$$2x_1 - 3x_2 + 20x_3 = 25$$

c) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position at the end of fifth iteration. **[5]**

Q8) a) Find value of y for $x = 0.5$ using Newton's forward difference formula for following data. **[5]**

x	0	1	2	3	4
y	1	5	25	100	250

b) Use Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to find the value of $\int_1^2 \frac{1}{x}\,dx$. Take h = 0.25 correct solution upto fourth decimal place. **[5]**

c) Use Euler's method to solve the equation $\frac{dy}{dx} = x^2 + y$ with y(0)=1 and tabulate the solution for $x = 0$ to $x = 0.3$ take $h = 0.1$. **[5]**

OR

Q9) a) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = x^2 + y^2$, y(1)=1.5 in the interval (1, 1.1) with h=0.1 and correct upto four decimal places. **[5]**

b) Given $\frac{dy}{dx} = x^2 + y,\ y(0) = 1$, determine $y(0.02)$ by using modified Euler's method correct upto forth decimal places. Take h=0.02 (Two iterations only) **[5]**

c) Find the value of $f(4.5)$ using Newton's backward difference formula correct upto 4 decimal places for following data. **[5]**

x	1	2	3	4	5
$y=f(x)$	14	30	62	116	198

Total No. of Questions : 8]

SEAT No. : ____

PC2812

[Total No. of Pages : 3

[6352]-36

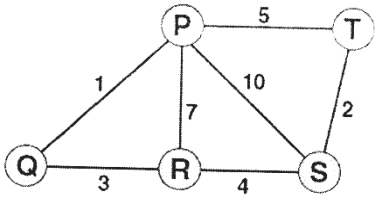
S.E. (Computer Engineering)/(AI&DS)
DATA STRUCTURES & ALGORITHMS
(2019 Pattern) (Semester - IV) (210252)

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

Instructions to the candidates:

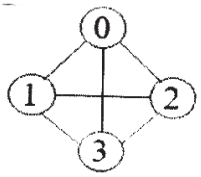
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Assume suitable data, if necessary.***
3) ***Draw neat labelled diagram wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Using Kruskal's algorithm, construct minimum spanning tree for the following graph. **[6]**



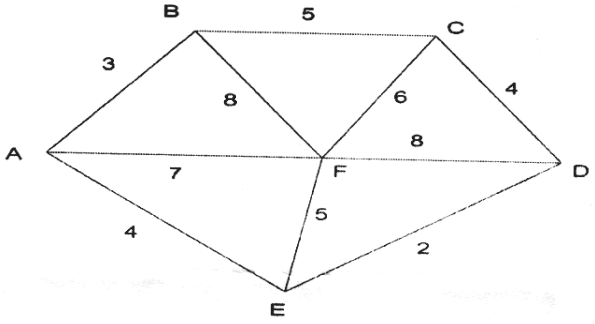
b) Write an algorithm for traversing Graphs BFS and DFS. **[6]**

c) Write in brief about adjacency multilist. Build adjacency multilist for the following graph. **[6]**



OR

Q2) a) Find the minimum spanning tree using Prim's method for the graph given below with A as the root. **[6]**



P.T.O.

b) What does Floyd Warshall Algorithm compute? Which approach is used by it for computation? Write pseudo C/C++ code for the same. **[6]**

c) Define the following terms: **[6]**

i) Complete Graph

ii) Connected Graph

iii) Subgraph

Q3) a) Construct the AVL tree by inserting numbers from 11 to 18. **[6]**

b) Explain following terms with respect to height balance tree: **[6]**

LL, LR, RR.

c) Elaborate the concept of Splay Tree and K Dimension Tree. **[6]**

OR

Q4) a) What is OBST? How dynamic programming is used in OBST to reduce time complexity? What are the advantages of OBST? **[6]**

b) What is symbol table? Describe static tree table and dynamic tree table with example. **[6]**

c) Elaborate the concept of AA tree and Red Black tree. **[6]**

Q5) a) What is B+ tree? Construct B+ tree of order 3 for the following data: **[6]**

F, S, Q. K, C, L, H, T, V, W, M, R

b) Elaborate the concept of Trie Tree, Construct a Trie Tree for the following data: Big, Bigger, Bill, Good, Gosh, Goodbye. **[6]**

c) Explain primary and secondary indexing techniques. **[5]**

OR

Q6) a) Construct a B tree of order 4 by inserting the following numbers **[6]**

10, 34, 78, 45, 123, 341, 234, 167, 159, 52, 83

b) Write a brief remark about indexing techniques and multiway trees. **[6]**

c) Write steps for insertion of a node in B+ Tree. Give example. **[5]**

Q7) a) Explain Sequential file and random flie organization. **[6]**

b) What is a File? Write with an example different file opening modes in C++. **[6]**

c) Describe inverted files. **[5]**

OR

Q8) a) What is cellular partitions? What are its advantages? **[6]**

b) Clarify about the following: **[6]**

i) Coral Ring;

ii) Benefits and Drawbacks of Linked Organization

c) Explain any two types of indices. **[5]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC2813

[6352]-37

[Total No. of Pages :2

S.E. (Computer Engineering) (AI & DS)
SOFTWARE ENGINEERING
(2019 Pattern) (Semester- IV) (210253)

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) Describe various activities during software project planning? **[8]**

b) What are different decomposition techniques? Explain any two in detail. **[10]**

OR

Q2) a) What is project scheduling? Explain different tasks of project scheduling. **[8]**

b) Discuss various types of COnstructive COst MOdel mode. Explain COCOMO II model for project estimation with suitable example. **[10]**

Q3) a) Discuss the differences between object oriented and function oriented design. **[8]**

b) Why Architecture is Important? List the different architectural styles. Explain any two in detail. **[9]**

OR

Q4) a) What is modularity? Explain important properties of modular system. **[9]**

b) Write short note on Modelling Component level design. **[8]**

Q5) a) Define Risk? Explain in detail different types of software risks. **[9]**

b) Discuss any two of the following. **[9]**

i) Risk Refinement

ii) Risk Mitigation

iii) Risk Management

OR

P.T.O.

Q6) a) Discuss Configuration Management for any suitable software system. **[6]**

b) Write short note on any two of the following. **[12]**

i) Change control mechanism in SCM

ii) SCM Process

iii) RMMM Plan

Q7) a) Define testing. Explain different types of functional testing techniques with suitable example. **[8]**

b) Discuss any two of the following. **[9]**

i) User Acceptance Testing

ii) Difference between Verification and validation Testing

iii) Software Testing Life Cycle

OR

Q8) a) Explain Defect Life Cycle with different statuses in detail. **[8]**

b) List types of Black Box Testing. Explain any three in detail with suitable example. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC2814

[Total No. of Pages : 2

[6352]-38
S.E. (Computer)
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) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Differentiate and explain GDTR, LDTR, and IDTR. **[6]**

b) Explain the Segment Translation Process with a neat diagram of 80386. **[6]**

c) Explain the role of TLB in the Address Translation process. **[6]**

OR

Q2) a) Demonstrate General Descriptor Format available in various descriptor tables. **[6]**

b) With the necessary diagram, explain the page translation process in 80386. **[6]**

c) Explain the use of following instructions in detail: **[6]**

i) LGDT

ii) SIDT

iii) LLDT

Q3) a) Explore five aspects of protection applied in segmentation. **[6]**

b) List and explain various Privilege Instructions. **[6]**

c) Explore the need for a protection mechanism in 80386. **[5]**

OR

P.T.O.

Q4) a) Explain how control transfer instructions are executed using the call gate in the system? **[6]**

b) Explain different levels of protection. Describe the rules of protection check? **[6]**

c) Elaborate on the concept of combining segment protection and page level protection in 80386. **[5]**

Q5) a) Explore memory management in the Virtual 8086 Mode. **[6]**

b) Explain the TSS descriptor and its role in multitasking. **[6]**

c) Explore the role of Task Register in multitasking and the instructions used to modify and read Task Register. **[6]**

OR

Q6) a) Draw and explain the Task State Segment of 80386. **[6]**

b) With the necessary diagram, explain entering and leaving the virtual mode of 80386. **[6]**

c) Define Task Switching and explain the steps involved in task switching operation? **[6]**

Q7) a) Explain Faults, Traps, and Aborts conditions with an example. **[6]**

b) Explore various descriptors present in IDT of 80386. **[6]**

c) List and elaborate on different applications of microcontrollers. **[5]**

OR

Q8) a) Explain the following exceptions in brief. **[6]**

i) Divide Error

ii) Invalid Opcode

iii) Overflow

b) How interrupts are handled in protection mode. Explain with the help of neat diagram. **[6]**

c) List and elaborate features of Microprocessor and Microcontroller. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC2815

[Total No. of Pages : 3

[6352]-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) ***Answer four 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) ***Assume suitable data if necessary.***

Q1) a) Explain following features of Java in detail. **[6]**

i) Platform Independence

ii) Object – Oriented

iii) Dynamic Programming

b) Explain one dimensional and multi - dimensional array used in Java with suitable examples. **[6]**

c) Define constructor. Explain different types of Constructors used in Java with example. **[6]**

OR

Q2) a) 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]**

b) Explain in brief below keywords with example in Java. **[6]**

i) final

ii) finalize()

iii) references

c) Explain Command line argument Concept for Java language. **[6]**

P.T.O.

Q3) a) Define Inheritance and list the advantages. Explain the types of Inheritance in Java with suitable Java code. **[9]**

b) Explain following concepts with example. **[8]**

i) abstract classes

ii) Method Overloading

iii) Package

iv) Interface

OR

Q4) a) Describe Exception. Write any two examples of exception. Explain keywords try, catch, throw, throws and finally related to exception handling. **[9]**

b) Elaborate the significance of keyword "Super" in Java. Demonstrate with suitable example. **[8]**

Q5) a) Differentiate Multiprocessing and Multi-threading. Explain life cycle of Thread model in Java. **[9]**

b) List the features of JavaScript. Write short note angular JS. List its advantages and disadvantages. **[9]**

OR

Q6) a) Explain methods in Java thread with example. **[9]**

i) getPriority()

ii) setPriority()

iii) notifyAll()

b) List and elaborate features of React JS, Angular JS, Vue JS. **[9]**

Q7) a) Describe Functional Programming. Enlist its features. Also list the commonly used functional programming languages. **[6]**

b) Write sequences of CAR's and CDR's that will pick the atom of the following s- **[6]**

expression:

i) (Monday Tuesday Wednesday Thursday)

ii) ((Monday Tuesday) (Wednesday Thursday))

iii) (((Monday) (Tuesday) (Wednesday) (Thursday)))

c) Explain the concept of "List" in Prolog. Explain basic operations on lists. **[5]**

OR

Q8) a) Explain the following functions with suitable examples. **[6]**

i) CAR ()

ii) CDR ()

iii) cons ()

b) Explain the following number predicates using suitable example. **[6]**

i) NUMBERP

ii) ZEROP

iii) PLUSP

iv) EVENP

v) ODDP

vi) MEMBERP

c) Describe Logical Programming. Explain the phrases "Facts", "Rules" with examples. **[5]**

❋ ❋ ❋

Total No. of Questions : 8]

SEAT No. : ____

PC2816

[6352]-40

[Total No. of Pages :4

S.E. (Computer Engineering /Artificial Intelligence & Data Science/ Computer Science & Design Engg./Computer Science)

DISCRETE MATHEMATICS

(2019 Pattern) (Semester- III) (210241)

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) Suppose repetitions are not possible. **[6]**

i) How many three digitnumbers can be formed by using the digits 2, 3, 4,5,7,9?

ii) How many of these numbers are less than 400? How many are even?

b) Find eighth term in the expansion of $(x+y)^{13}$ **[6]**

c) 12 persons are made to sit around a table. Find the number of ways they can sit such that 2 specific persons are not together. **[6]**

OR

Q2) a) A student has to answer 10 out of 13 questions in an exam: **[6]**

i) How many choices have he, if he must answer the first or second question but not both?

ii) How many choices have he, if he must answer exactly three out of first five questions?

b) Suppose that repetitions are not permitted. In how many ways 4 digitnumbers can be formed from the digits 1, 2, 3, 5, 7, 8? How many such numbers are less than 4000? **[6]**

c) Find the number of ways of arranging the letters of the word TENNESSEE all at a time? Find if the first two letters must be E? **[6]**

P.T.O.

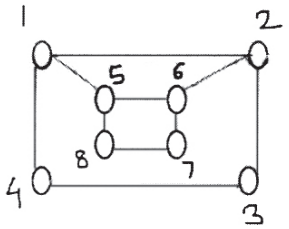
Q3) a) Explain the following: **[6]**

i) Bipartite graph

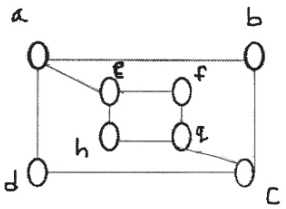
ii) Planar graph

iii) Eulerian graph

b) Whether the following pairs of graphs are isomorphic or not? **[5]**



G_1



G_2

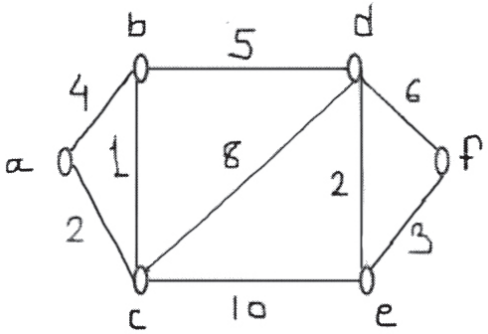
c) Explain the following in brief with example: **[6]**

i) Adjacency matrix

ii) Incidency matrix

OR

Q4) a) Use Dijkstra's algorithm to find the shortest path from vertex a to f **[6]**



b) Explain the following : **[6]**

i) Spanning tree

ii) Colouring of graph

iii) Bipartite graph

c) Prove that, If G is connected planar graph with N vertices, E edges and R regions then N – E + R = 2 **[5]**

Q5) a) Define the following terms with example: **[6]**

i) Binary tree

ii) Ordered tree

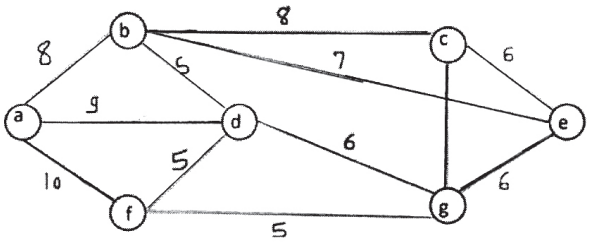
iii) Eccentricity of vertex

b) Suppose data items A, B, C, D, E, F, G occur in the following frequencies respectively 8, 22, 9, 11, 13, 10, 15. Construct Huffman code for the data. **[6]**

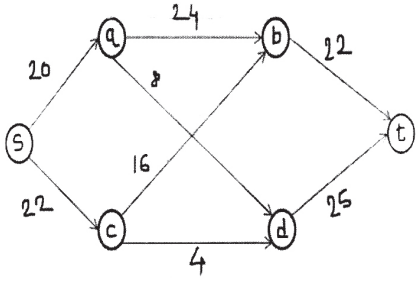
c) Create a binary search tree generated by inserting integer in order 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24. **[6]**

OR

Q6) a) Use Prims algorithm to construct a minimal spanning tree starting at vertex *a*. **[6]**



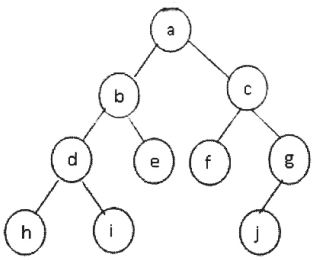
b) Determine the maximum flow in the transport network given below. Determine the corresponding min cut. **[6]**



c) Explain the following: **[6]**

i) Regular m-ary tree with example.

ii) Find the preorder, postorder and inorder of the following binarytree



Q7) a) Explain the following terms giving suitable example: **[6]**

i) Monoid

ii) Group

iii) Cyclic group

b) Let (Q,*) is an algebraic system. * is a binary operation on Q defined as $a * b = a + b$ - for every $a, b \in Q$. Determine whether (Q,*) is group?**[6]**

c) Show that, $S = \{a + b\sqrt{2}; a, b \in Z\}$ for the operations + and * is an integral domain. **[5]**

OR

Q8) a) Explain the following terms giving suitable example: **[6]**

i) Homomorphism of groups

ii) Integral domain

iii) Abelian group

b) Let Z_n denotes the set of integers {0, 1, 2, ... $n - 1$}. Let * be a binary operation on Z such that , $a * b$ = the remainder of ab divided by n **[6]**

i) Construct the table for $n = 4$

ii) Show that (Zn, *) is semigroup for any n.

c) What is Hamming distance? Find minimum distance generated by paritymatrix H = 110 011 101 100010001

How many errors can it be detect or correct? **[5]**

Total No. of Questions : 8]

SEAT No. :

PC2817

[6352]-41

[Total No. of Pages :3

S.E. (Computer Engineering/Artificial Intelligence & Data Science)

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) Explain with example the following terms related to sorting methods: **[6]**

i) Stability

ii) Number of Passes/Iterations

iii) Sort order

b) Sort given array by using quick sort method **[6]**

25, 23, 18, 19, 21, 17, 28, 20, 16 14. Show step by step execution.

c) Write the algorithm to search an element in array A using binary search technique. Write the complexity of the algorithm for best case worst case and average case. **[6]**

OR

Q2) a) Compare linear search, binary search and sentinel search methods by considering its performance measures. **[6]**

b) Sort given array by using shell sort method **[6]**

50, 23, 18, 9, 01, 70, 21,20, 6,40,03. Show step by step execution.

c) Write pseudocode for Selection sort method. Is this sort stable or unstable? **[6]**

P.T.O

Q3) a) What are advantages of making doubly linked list making circular? Write pseudo code for following function using Doubly Circular Linked List of integer number **[9]**

i) Perform addition of odd numbers in Doubly linked list and insert at start

ii) Delete all even numbers from list

b) Write and explain node structure of Generalized linked list. Represent given Generalized linked list graphically.

(A, B, C, (D, (E, (F), I)), J) **[8]**

OR

Q4) a) Write node structure for polynomial implementation using circular linked list. Write pseudocode to perform addition of two polynomials using circular linked list. Write complexity of it. **[8]**

b) Write and explain node structure of generalized linked list for representing multiple variable polynomials. Represent given polynomial graphically using Generalized linked list. **[9]**

$7x^5 y^2 z^3+13x^3 y^4+30x^9z^8$

Q5) a) What is the necessity of expression conversion? Write pseudocode to convert given infix expression to prefix using stack. **[10]**

b) Explain with example four different types of recursion. **[8]**

OR

Q6) a) Convert given infix expression into postfix expression using stack. Show step by step conversion and evaluation. Evaluate postfix expression using given values. **[10]**

Infix Expression: (A+B^C^D*F/H)

Values for A=4, B=2, C=3, D=2, F=2, H=8

^-exponential operator

b) What is backtracking algorithmic strategy? Explain the use of stack in backtracking strategy with any one application. **[8]**

Q7) a) What are the advantages of Circular Queue over normal queue? Write insert and delete functions for Circular Queue using static memory allocation. **[9]**

b) Explain the Queue implementation using Singly Linked List. Draw diagram with three elements in queue, showing front and rear. scheduling problem using Queue. Write pseudocode for insert and delete operations of above Queue. **[8]**

OR

Q8) a) Explain with example primitive operations of Double ended Queue. **[8]**

b) What are the types of priority queue? Explain any one type of priority queue in detail with example. Mention the time complexity for insert and delete operations on it. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC2818

[Total No. of Pages : 2

[6352]-42

S.E. (Computer Engineering) (Computer Science & Design Engg.) (Artificial Intelligence & Data Science Engg.)

OBJECT ORIENTED PROGRAMMING

(2019 Pattern) (Semester-III) (210243)

Time : 2 ½Hours] *[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 Diagram***
3) ***Assume Suitable Data if Necessary***

Q1) a) Explain what is type conversions? Define implicit type casting and explicit type casting with example. **[5]**

b) Explain Virtual destructor with the help of a program. **[6]**

c) Write a C++ program to overload binary operator '+' to add two complex numbers using member function and friend function. **[6]**

OR

Q2) a) Explain Polymorphism and Types of Polymorphism. **[5]**

b) How do you declare and define a pure virtual function in C++?

Explain with help of a program. **[6]**

c) Explain need of operator overloading. Write C++ program to demonstrate use of unary operator overloading. **[6]**

Q3) a) Explain overloading the extraction (>>) and insertion (<<)operators with the help of a program. **[5]**

b) What are File Pointers? Explain seekg() and tellg() functions with syntax **[6]**

c) Write a program that emulates the DOS COPY command. That is, it should copy the contents of a text file (such as any .CPP file) to another file. Invoke the program with two command-line arguments-the source file and the destination file-like this; C>ocopy srcfile.cpp destfile.cpp In the program, check that the user has typed the correct number of command-line arguments, and that the files specified can be opened. **[7]**

OR

P.T.O.

Q4) a) List and Explain different Mode bits used in open() function, while opening a file. (Any five) **[5]**

b) Define a class Book that has three attributes viz bookname, author and price. Write a C++ Program that writes an object to a file and reads an object from a file. **[6]**

c) What do you mean by File Handling? Explain following functions with syntax and an example. **[7]**

i) open()

ii) read()

iii) write()

Q5) a) Explain fundamentals of exception in C++ with suitable example. **[5]**

b) Discuss class template with suitable example in C++. **[6]**

c) Write a program in C++ to demonstrate Divide by Zero exception. **[6]**

OR

Q6) a) Write a program to demonstrate user defined exception in C++. **[5]**

b) What is template in C++? Dicuss template with multitype parameter in C++. **[6]**

c) Write a program to demonstrate overloading function template in C++. **[6]**

Q7) a) Write a program to demonstrate a map in C++. **[5]**

b) Enlist various containers in STL. Explain any one with the help of a program. **[6]**

c) What is STL? Enlist and explain various components of STL. **[7]**

OR

Q8) a) What is an iterator? What are the various types of iterators? **[5]**

b) What is Map? Enlist and explain various functions of map. **[6]**

c) What is a vector? Write a C++ program to explain various functions of vector. **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PC2819

[Total No. of Pages : 2

[6352]-43

S.E. (Computer Engg.)/(Computer Science & Design Engg.)/(AI & DS)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - III) (210244)

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) Illustrate three types of Orthographic projections with suitable diagram. **[6]**

b) Represent the matrices used for following 3D transformations - Translation, Scaling, Shearing. **[6]**

c) Why homogeneous coordinates are used in 2D transformations. Illustrate 2D rotation about an arbitrary point with diagram. **[5]**

OR

Q2) a) Given a triangle with coordinates P (0, 0), Q (1, 0) and R(1, 1). Apply shear parameter 3 along Y axis and find out the new coordinates of the object. Draw the diagram. **[6]**

b) Illustrate three types of perspective projections with neat diagrams. **[6]**

c) In 3-D transformations, illustrate 3D object rotation about an arbitrary axis. **[5]**

Q3) a) Define the following terms with example: **[6]**

i) RGB Colour Model

ii) Diffuse reflection

iii) Specular reflection

b) Compare Halftone shading, Gauraud shading & Phong shading. **[6]**

c) Illustrate "Area Subdivision Warnock algorithm" with suitable example. **[5]**

OR

P.T.O.

Q4) a) Compare RGB, HSV & CMY colour models. **[6]**

b) Illustrate the Z-buffer algorithm in detail with diagram. **[6]**

c) How is back face detection and removal possible? Illustrate using algorithm. **[5]**

Q5) a) List various methods for drawing curved lines. Write short note on Bezier curve. **[6]**

b) Define fractal and give any two examples of fractal. **[7]**

c) Compare Bezier and B-spline curves. **[5]**

OR

Q6) a) State the properties of Bezier curve. Derive blending function of Bezier curve. **[6]**

b) How is Koch curve generated recursively? Elaborate the fractal dimension used in Koch curve. **[7]**

c) In curve drawing, define the terms control points, order of continuity, blending function for cubic polynomial. **[5]**

Q7) a) State the applications of Computer Graphics in Gaming Industry, what is morphing. **[6]**

b) State twelve animation principles that are applied while creation of sequences in Animation. **[6]**

c) Illustrate how segments in the display file are created, renamed, and deleted. **[6]**

OR

Q8) a) Explain renaming of a segment with suitable example. **[7]**

b) Write any three important features of NVIDIA gaming platform. **[4]**

c) Write a short note on motion specification methods based on: **[7]**

i) Geometric and kinematics information.

ii) Specification methods based on physical information.

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Total No. of Questions : 8]

SEAT No. :

PC2820

[Total No. of Pages : 2

[6352]-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) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Design sequence generator using counter for sequence 1001001. **[6]**

b) Difference between sequential and combinational circuit. **[6]**

c) Explain the working of Ring counter. **[6]**

OR

Q2) a) What is MOD counter? Design MOD-6 counter using 7490. **[6]**

b) Design 2 bit synchronous up counter using MS-JK flip flop. Draw the circuit diagram. **[6]**

c) Explain in details the working of 3 bit bidirectional shift register. **[6]**

Q3) a) Draw the block diagram of PLA device and explain. **[6]**

b) Draw an ASM chart for 2 bit Up counter using mode control line **[6]**
When M = 1 : Up counting and
When M = 0 : remains in same state

c) A combinational Circuit is defined by the following function : **[5]**
F1(A,B,C) = Σ m (0,1,2,4)
F2 (A,B,C) = Σ m (1,3,5,6)
Implement this circuit with PLA.

OR

Q4) a) Design PLA for following function : **[6]**
F1 = A'B'C'+A'B'C+A'BC+ABC
F2 = A'B'C+A'BC'+AB'C+ABC'

b) What is an ASM chart? Name the elements of an ASM chart and define each of them. **[6]**

c) Implement 4 : 1 multiplexer using suitable PAL. **[5]**

P.T.O.

Q5) a) Compare TTL and CMOS families and also draw CMOS-open drain output. **[6]**

b) Draw 2 i/p standard TTL NAND gate with Totem pole. Explain operation of transistor. (ON/OFF) with suitable input conditions and truth table. **[6]**

c) Explain the Tristate logic and Tristate TTL inverter. **[6]**

OR

Q6) a) Explain TTL open collector. **[6]**

b) Define the following terms and mention the standard values for TTL logic Family : **[6]**

i) Noise Margin

ii) Fan Out

iii) Power Dissipation

c) Draw and explain the circuit diagram of CMOS Inverter. **[6]**

Q7) a) Explain the Memory organization of the microprocessor. **[6]**

b) Draw and explain 4-bit Multiplier circuit using ALU and shift registers. **[6]**

c) Explain the basic arithmetic operations can be performed by using IC 74181. **[5]**

OR

Q8) a) What is Microprocessor? Explain the system bus in brief. **[6]**

b) Draw and explain the block diagram of Microprocessor with its Functional units. **[6]**

c) What are various functional units of microprocessors? Explain ALU in brief. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC2821

[Total No. of Pages : 4

[6352]-45

S.E. (Artificial Intelligence & Data Science)

STATISTICS

(2019 Pattern) (Semester - IV) (217528)

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) ***Make suitable assumption whenever necessary.***

Q1) a) Explain the following terms : **[8]**

i) Skewness & Kurtosis

ii) Regression

b) A collar manufacturer is considering the production of a new style collar to attract young men. The following statistics of neck circumference are available based on the measurement of a typical group of students. Calculate mean and standard deviation. **[10]**

	12.5	13	13.5	14	14.5	15	15.5	16
Frequency	4	19	30	63	66	29	18	1

OR

Q2) a) The following marks have been obtained by a class of students in 2 papers of mathematics. **[9]**

Paper I	45	55	56	58	60	65	68	70	75	80	85
Paper II	56	50	48	60	62	64	65	70	74	82	90

Calculate the coefficient of correlation for the above data.

b) Determine the equations of regression lines for the following data. Also find the values of **[9]**

i) y for $x = 4.5$

ii) x when $y = 13$

X	2	3	5	7	9	10	12	15
Y	2	5	8	10	12	14	15	16

P.T.O.

Q3) a) 10% of bolts produced by a machine are defective. Determine the probability that out of 10 bolts chosen at a random. **[5]**

i) 2 will be defective

ii) at most 2 will be defective

b) A dice is thrown 10 times. If getting an odd number is a success, What is the probability of **[6]**

i) 8 success

ii) at least 6 success

c) For a normal distribution When mean = 2, standard deviation $\sigma = 4$, find the probabilities of the following intervals. **[6]**

i) $4.43 \leq x \leq 7.29$

ii) $-0.43 \leq x \leq 5.39$

[Given : A (z = 0.61) = 0.2291, A(z = 1.32) = 0.4066, A (z = 0.85) = 0.3023]

OR

Q4) a) A random variable X has the following probability distribution : **[5]**

i) Find k

ii) Evaluate P (X < 6)

iii) P(X > = 6)

iv) P(0 < X < 5)

X	0	1	2	3	4	5	6	7
P(X)	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

b) Fit a Poisson 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) The lifetime of an article has a normal distribution with mean 400 hours and standard deviation 50 hours. Find the expected number of articles out of 2000 whose lifetime lies between 335 hours to 465 hours. **[6]**

(Given : A (z = 1.3) = 0.4032)

Q5) a) In a Batch of 500 articles, produced by a machine, 16 articles are found defective. After overhauling the machine, it is found that 3 articles are defective in a batch of 100. Has the machine improved? **[6]**

(Given $Z_{\alpha} = 1.96$)

b) The Table below gives the number of customers visit the certain company on various days of week

Days	Sun	Mon	Tue	Wed	Thurs	Fri	Sat
Number of Customers	6	4	9	7	8	10	12

Test at 5% of level of significance whether customer visits are uniformly distributed over the days. **[6]**

[Given $\chi^2_{6,0.05} = 15.592$]

c) Two random samples gave the following results. Test whether the samples came from the same normal population at 5% level of significance. **[6]**

Sample	Size	Sample mean	Sum of squares of deviations from them mean
1	10	15	90
2	12	14	108

Given : F(0.05, (9, 11)) = 2.9

OR

Q6) a) A survey of 320 families with 5 children each revealed the following distribution : **[9]**

No. of boys	0	1	2	3	4	5
No. of family	12	40	88	110	56	14

Use chi-square test to test the hypothesis that data follows a binomial distribution (chi-square = 11.07 at 5% level of significance)

b) A random sample of 10 boys had the following I.Q.'s : 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100. Given : $t(0.05,9) = 2.262$. **[9]**

Q7) a) Let P be the probability that a coin will fall head in a single toss in order to test $H_0 : P = \frac{1}{2}$ against $P = \frac{3}{4}$. The coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probability of type I error and power of the test. **[8]**

b) What do you mean by Non Parametric Test? State its advantages & disadvantages. **[9]**

OR

Q8) a) Write short note on : **[8]**

i) Population and sample

ii) Type I and Type II error

iii) Critical Region

iv) Power of test

b) State and prove Neyman-Pearson lemma for testing a simple hypothesis against a simple alternative hypothesis. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC2822

[Total No. of Pages : 2

[6352]-46

S.E. (Artificial Intelligence & Data Science)

INTERNET OF THINGS

(2019 Pattern) (Semester - IV) (217529)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Questions 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) List and explain fundamental components of IoT system. **[8]**

b) Write a short note on IoT communication. Explain different types of IoT communication with example. **[10]**

OR

Q2) a) Explain Next Generation Kiosks & smart vending machines in detail? **[8]**

b) Explain : Automation, asset management, telemetry, transportation and telematics. **[10]**

Q3) a) Explain any four IoT network protocols? **[8]**

b) Draw and Explain WSN architecture? **[9]**

OR

Q4) a) Explain any four IoT network devices. **[8]**

b) Explain with the help of a neat diagram cellular Machine to Machine application network? **[9]**

P.T.O.

Q5) a) What are the applications of IoT tagging and tracking? **[8]**

b) Explain IoT SIM card technology. What are the features of IoT SIM card technology? **[10]**

OR

Q6) a) Write a short note on IOT Security & IOT Communication. **[8]**

b) Define what IoT sensors. List different types of sensor and explain any two of them. **[10]**

Q7) a) What are IoT design ethics, explain? **[8]**

b) How does Vehicle-to-Vehicle (V2V) communication enhance safety and efficiency in the IoT ecosystem? **[9]**

OR

Q8) a) Elaborate on how you will use IoT for remote healthcare. **[8]**

b) Explain in detail business model and business innovation in the IoT. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC2823

[Total No. of Pages : 2

[6352]-47
S.E. (Artificial Intelligence and Data Science)
MANAGEMENT INFORMATION SYSTEM
(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) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Elaborate the major capabilities of database management systems (DBMS) and explain how database is related with information system? **[8]**

b) Explain how the internet and Internet technology work and how do they support communication and e-business? **[9]**

OR

Q2) a) Elaborate upon few strategies adopted by businesses to manage the statement as "Every business organization needs to secure their information systems." **[8]**

b) How BI Plays important role in MIS. **[9]**

Q3) a) What is Design Making. How it helps in MIS. Explain the stages of decision making. **[8]**

b) Write short notes on: **[9]**

i) Business Intelligence in MIS

ii) Database and Information Management

iii) Differentiate between the traditional market and digital market.

OR

P.T.O.

Q4) a) What are the business benefits of using intelligent techniques for knowledge management? **[8]**

b) Describe Unique Features of E-Commerce Technology with suitable examples? **[9]**

Q5) a) What is an OLTP? Explain in detail? **[9]**

b) What is an Enterprise Management System? What are the essential components of EMS? **[9]**

OR

Q6) a) How knowledge management Systems enable business organizations to implement efficient information systems and undertake critical business decisions, Discuss in detail? **[9]**

b) Define Data Mining. Explain how data mining is useful in decision support? **[9]**

Q7) a) What is AI? How AI is used in business today? **[9]**

b) How does a decision support system (DSS) help business manager in taking effective business decisions? Explain the components of a DSS? **[9]**

OR

Q8) a) Explain the value of expert systems highlighting its benefits and challenges in global business systems.? **[9]**

b) The data analyst does in order to perform detective analysis on large volume business datasets elaborate it with example.? **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2824

[6352]-48

[Total No. of Pages : 2

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) ***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 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

i) Internal fragmentation

ii) External fragmentation **[6]**

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]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2825

[Total No. of Pages : 3

[6352]-49

S.E. (Computer Science & Design)

DATA STRUCTURES & FILES

(2019 Pattern) (Semester - IV) (218253)

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

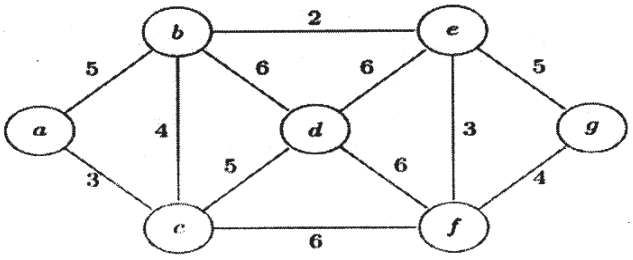
Instructions to the candidates:

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 labelled diagrams if necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Write an algorithm for depth first traversal (DFS) and breadth first traversal (BFS) of a graph. **[8]**

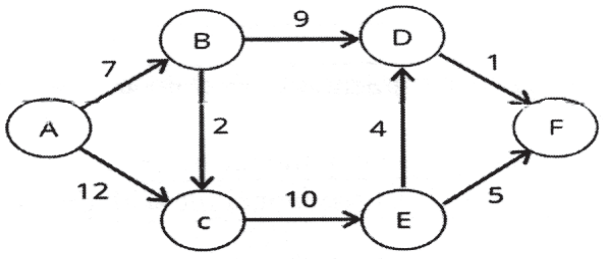
b) Draw any directed graph with minimum 6 nodes and represent graph using adjacency matrix, adjacency list and adjacency multi list. **[6]**

c) Construct the minimum spanning free (MST) for the given graph using Kruskal's Algorithm. **[4]**



OR

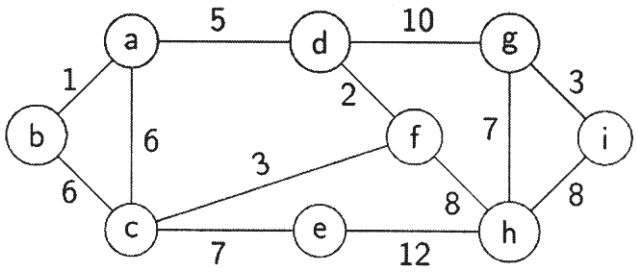
Q2) a) Apply Dijkstra's Algorithm for the graph given below, and find the shortest path from node A to all other vertices. **[8]**



b) What is topological ordering in a directed acyclic graph (DAG), and why is it important? Explain with example. **[6]**

P.T.O.

c) Apply the Prim's algorithm on below graph to construct Minimum Spanning Tree. Starting vertex is 'b'. **[4]**



Q3) a) Construct AVL tree for insertion of following data: **[7]**

20,11,5,32,40,2,4,27,23,28,50

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

i) Splay Tree

ii) K - dimensional tree

c) Define Red Black tree with example. List its properties. **[4]**

OR

Q4) a) What is OBST? List binary search tree with 3 words (w1, w2, w3) = (do, if, stop) words occurs with probabilities (P1, P2, p3) = (0.4,0.5,0.1) find expected access time in each case. **[7]**

b) Explain static and dynamic tree tables with suitable example. **[6]**

c) Explain with example K-dimensional tree. **[4]**

Q5) a) Construct a B+- Tree of order 3 by inserting numbers from 71 to 83.**[9]**

b) Explain following primary index, Secondary index, Sparse index and Dense index with example. **[8]**

OR

Q6) a) Construct a B Tree of order 5 with the following data: **[9]**

30,20,35,95,15,60,55,25,5,65,70,10,40,50,80,45

b) Explain with example trie tree. Give advantage and applications of trie tree. **[8]**

Q7) a) What is linked organization? Explain inverted file and coral rings with respect to linked organization. **[6]**

b) Explain modes of opening the file in C++. **[6]**

c) Compare and contrast sequential file with direct access file. **[6]**

OR

Q8) a) Explain multilist files with the help of suitable example. **[6]**

b) What is Sequential and index sequential file organization? State its advantages and disadvantages. **[6]**

c) Explain inverted file & cellular partitions. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC2826

[6352]-50

[Total No. of Pages :2

S.E. (Computer Science & Design Engineering)

OPERATING SYSTEM

(2019 Pattern) (Semester- IV) (218254)

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.***

Q1) a) Describe in detail requirements of mutual exclusion and principal of concurrency. **[6]**

b) Explain Producer and Consumer problem in detail. **[6]**

c) What is inter process commnication? Explain shared Memory. **[5]**

OR

Q2) a) Explain in detail reader writer problem in detail. **[6]**

b) What is deadlock? Explain how to handle deadlock. **[6]**

c) Explain mutual exclusion and requirement for mutual exclusion. **[5]**

Q3) a) What is fixed partitioning? Explain it in detail. **[6]**

b) Write a short note on Buddy System with its advantages and disadvantages. **[6]**

c) What is the Difference between Paging and Segmentation? **[6]**

OR

Q4) a) Explain concept of relocation. Explain it with example. **[6]**

b) What is the memory management? Explain it in detail. **[6]**

c) Write a short note on paging. **[6]**

Q5) a) Explain disk scheduling policies in detail. **[6]**

b) Explain directory structure in detail. **[6]**

c) Explain free space management in detail? **[5]**

OR

P.T.O.

Q6) a) Compare and explain LIFO FIFO & STTP. **[6]**

b) What is I/O buffering in detail. **[6]**

c) Explain FIFO,LIFO,STTF in detail? **[5]**

Q7) a) Explain process scheduling in detail. **[6]**

b) What is booting, explain it in detail? **[6]**

c) Explain Linux utility program in detail. **[6]**

OR

Q8) a) Write difference between Process and Thread Linux. **[6]**

b) Explain process management system calls in detail. **[6]**

c) What is shell? **[6]**

Total No. of Questions : 8]

SEAT No. :

PC2827

[Total No. of Pages : 2

[6352]-51

S.E. (Computer Science and Design)
COMPUTER NETWORKS
(2019 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) ***Draw neat and clean diagram.***
3) ***Assume suitable data, if necessary.***

Q1) a) List and explain functions of Network Layer. **[5]**

b) What is fragmentation? What are different strategies for fragmentation? **[6]**

c) Explain link state routing algorithm with example. **[6]**

OR

Q2) a) Explain routing protocols RIP, BGP. **[5]**

b) What is difference between classful and classless IP addressing? Which addressing is currently used in the internet? **[6]**

c) Find the sub-network address and the host id for the following. **[6]**

IP Address	Mask
120.14.22.16	255.255.128.0
140.11.36.22	255.255.255.0
141.181.14.16	255.255.224.0

Q3) a) Explain TCP state transition diagram? **[7]**

b) Explain UDP Header? Below is an Hexadecimal dump of an UDP datagram captured. **[7]**

06 32 00 0D 00 1C E2 17

i) What is source port number?

ii) What is destination port number?

iii) What is the length of the data?

iv) Is packet directed froma client to server or vice versa?

v) What is the client process?

c) What is traffic shaping? How is it used in congestion control? **[4]**

OR

P.T.O.

Q4) a) What causes silly window syndrome? How is avoided? Explain. **[7]**

b) Differentiate between TCP and UDP protocol. **[7]**

c) What is socket? Which are various socket primitives used in client server communication? **[4]**

Q5) a) Explain the function of Email system. **[4]**

b) Write short notes on TELNET and Webmail. **[6]**

c) What is DHCP? Explain DHCP working with client state diagram. **[8]**

OR

Q6) a) Explain FTP in details. **[4]**

b) Differentiate between POP & IMAP protocol. **[6]**

c) What is the difference between persistent & non persistent HTTP? Explain HTTP request and reply message format. **[8]**

Q7) a) Explain key principles of security? **[4]**

b) Explain Types of Network Attacks. **[6]**

c) Compare Symmetric Key and Asymmetric key encryption techniques. **[7]**

OR

Q8) a) Explain SSL in detail. **[4]**

b) Discuss the working of IPSec? What are the different security services offered by IPSec? **[6]**

c) List and explain various elements of Information Security. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PC2828

[Total No. of Pages : 2

[6352]-52
S.E. (Computer Science and Design)
DESIGN THINKING
(2019 Pattern) (Semester - IV) (218256)

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 required.***

Q1) a) Explain the terms value and inclusion. **[5]**

b) What is called idea generation? How do you determine the feasibility of ideas? **[6]**

c) What is brainstorming? What are different variants of brainstorming? **[6]**

OR

Q2) a) What is Ockham's razor principle? Also explain basic design direction. **[5]**

b) What is refinement? When do designers think in images and signs? Explain with example. **[6]**

c) Explain the following terms: **[6]**

i) appropriation

ii) Humour

iii) Personification

Q3) a) Why Visualization techniques are useful for design Thinking. Elaborate on any three visualization techniques. **[7]**

b) What are the principles and benefits of lean startup method? **[7]**

c) Write short notes on quick and dirty prototype. **[4]**

OR

P.T.O.

Q4) a) What is story boarding? Why is story boarding essential? Give an example of storyboarding. **[7]**

b) What is a prototype phase of a design thinking process? Give example. **[7]**

c) What is a mock up in design thinking? Give example. **[4]**

Q5) a) What are the principles of usability testing? **[4]**

b) Explain kano model of Testing. **[6]**

c) What is prototype testing? What are the characteristics of prototype testing? **[8]**

OR

Q6) a) Explain with suitable example desirability testing. **[4]**

b) What are the steps of testing a prototype? **[6]**

c) What is a user test? Is user testing really needed? What is a best time to conduct user testing? **[8]**

Q7) a) What is an innovation strategy and how do you create one? **[4]**

b) How to introduce design thinking into your organization? **[6]**

c) What is the importance of design activism? Explain types of activism. **[7]**

OR

Q8) a) How do you create an innovation portfolio? **[4]**

b) What are the innovation challenges in design thinking? **[6]**

c) Differentiate among idea, invention and innovation. **[7]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2829

[6352]-53

[Total No. of Pages :2

S.E. (Computer Science and Design)

DATA STRUCTURES AND ALGORITHMS

(2019 Pattern) (Semester- III) (218242)

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

Instructions to the candidates:

1) ***Solve Q.1 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) Explain quick sort and sort the given list using quick sort: 40,9,1,50,90,72,18,20. **[6]**

b) Explain Binary search and Index Sequential search with example. **[6]**

c) Explain radix sort and bucket sort with example. **[6]**

OR

Q2) a) Explain heap sort and sort the given list using heap sort: 8, 3, 5, 7, 22,9,1. **[6]**

b) Explain Fibonacci search with pseudocode. **[6]**

c) Compare bubble sort and selection sort and also mention their time complexities. **[6]**

Q3) a) Explain Generaslised Linked List with example. **[6]**

b) Write pseudo code for function using singly linked list of student (name and mobile number stored in every node) add and delete the record. **[6]**

c) Give difference between static and dynamic memory. **[5]**

OR

Q4) a) Write and explain circular linked list and doubly linked list. **[6]**

b) Write pseudo code to perform merging of two linked list. **[6]**

c) Give difference between linked list and array. **[5]**

P.T.O.

Q5) a) Explain recursion and types of recursion with example. **[6]**

b) Write pseudo code to convert postfix to infix expression with example **[6]**

c) Explain multiple stack with example **[6]**

OR

Q6) a) Explain Backtracking algorithm with example. **[6]**

b) Explain push and pop example in stack with example. **[6]**

c) Write algorithm for evaluation of postfix expression **[6]**

Q7) a) Compare stack and queue. **[6]**

b) Explain Multi queue with example. **[6]**

c) Explain concept of dequeue with example. **[5]**

OR

Q8) a) Explain concept of circular queue with example. **[6]**

b) Explain the insertion and deletion of element in queue implemented using array **[6]**

c) What are priority queue and explain its types. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC2830

[Total No. of Pages : 2

[6352]-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) ***Attempt 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) Design and implement 2 bit synchronous up counter using JK flip flop. **[6]**

b) Differentiate Synchronous and Asynchronous counter. **[6]**

c) Write short note on Sequential and combinational circuit. **[4]**

d) Draw internal structure of IC 7490. **[2]**

OR

Q2) a) Design JK flip flop using SR flip flop. **[6]**

b) Construct MOD 99 ripple counter using 7490 IC. **[5]**

c) State and explain different types of Shift register. **[4]**

d) What is the difference between latch and flip flop? **[3]**

Q3) a) With a neat diagram of computer architecture explain the components involved in modern computer architecture. **[6]**

b) Explain the pipelining process in VLIW processors. **[5]**

c) Write short note on Von Neumann architecture. **[3]**

d) Define Micro-operation. Specify how internal hardware organization of a digital computer is best defined? **[3]**

OR

Q4) a) Draw and explain instruction cycle state diagram. **[6]**

b) What is Bus? Draw the single bus structure. **[5]**

c) What are the five classic components of a computer? **[4]**

d) Show the representation of registers in block diagram form. **[2]**

P.T.O.

Q5) a) State and Explain types of operands Addressing modes. **[6]**

b) Explain Features of multicore Intel core i7. **[5]**

c) What is the use of PC register? **[4]**

d) What are the two state elements needed to store and access an instruction? **[3]**

OR

Q6) a) State characteristics of RISC & CISC. **[6]**

b) Define Interrupt, explain its types. **[5]**

c) Explain advantages of Multicore. **[4]**

d) Write the instruction format for the jump instruction. **[3]**

Q7) a) Draw and explain the structure of memory hierarchy. **[6]**

b) State and explain Characteristics of Memory Systems. **[5]**

c) Differentiate SRAM from DRAM. **[4]**

d) What are the various memory technologies? **[2]**

OR

Q8) a) Explain how read and write operations are carried out in cache memory? **[6]**

b) Explain different mapping functions of Cache memory. **[5]**

c) What are the steps to be taken in an instruction cache miss? **[4]**

d) Write short note on cache memory. **[2]**

Total No. of Questions : 8]

SEAT No. :

PC2831

[Total No. of Pages : 2

[6352]-55

S.E. (Information Technology)

PROCESSOR ARCHITECTURE

(2019 Pattern) (Semester - IV) (214451)

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 PIR (Peripheral Interrupt Request Register) IPR (Peripheral Interrupt Priority Register). **[8]**

b) Draw and explain the interfacing of relay and buzzer with PIC 18 FXXX microcontroller. **[7]**

c) Explain function of 3 important pins of LCD. **[3]**

OR

Q2) a) Discuss the steps in executing interrupts in PIC 18 microcontroller. **[7]**

b) Draw an interfacing diagram for 4×4 matrix keyboard with PIC18F microcontroller and explain it. **[8]**

c) What are peripheral interrupts, IVT and ISR? **[3]**

Q3) a) State the applications of CCP module in PIC. **[6]**

b) Write short note on SPI protocol. **[5]**

c) Explain the DC motor interfacing with PIC18F microcontroller with suitable diagram. **[6]**

OR

Q4) a) Explain the stepper motor interfacing with PIC18FXX microcontroller with suitable diagram. **[6]**

b) List the steps involved in programming PIC microcontroller in compare mode. **[6]**

c) Write short note on PWM module of PIC 18 F microcontroller. **[5]**

P.T.O.

Q5) a) Explain RTC DS1306 interfacing with PIC18FXX microcontroller. **[6]**

b) Write short note I2C bus. **[6]**

c) Draw and explain the interfacing diagram of DAC0808 with PIC 18FXX microcontroller. **[6]**

OR

Q6) a) Explain interfacing of LM35 temperature sensor with PIC 18FXX microcontroller. **[6]**

b) With suitable diagram, explain on - chip ADC of PIC 18. **[6]**

c) State the features of RTC. **[6]**

Q7) a) State differences between the ARM7, ARM9 and ARM11 processors. **[6]**

b) Describe the major Design Rules of RISC philosophy. List the features of RISC Processor accepted by ARM processor. **[5]**

c) Why ARM processors are suitable in embedded system applications? **[6]**

OR

Q8) a) What are privileged and non-privileged modes? Write down the processor modes in ARM. **[6]**

b) Explain bits in CPSR of ARM7 in detail along with diagram. What is the use of SPSR. **[6]**

c) Compare PIC microcontroller and ARM core processor. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2832

[6352]-56

[Total No. of Pages :2

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 different DDL and DML commands with example. **[6]**

b) What is view in SQL? Explain with example. **[6]**

c) What is stored procedure? Explain stored procedure with suitable example. **[6]**

OR

Q2) a) Write a short note on **[6]**

i) Embedded SQL

ii) Dynamic SQL

b) List out different aggregate function? Explain with example. Consider a relational database Supplier(sid, sname, city) Parts(pid, pname, color, weight) Catalog(sid, pid, quantity) **[6]**

c) Write SQL queries for the following: **[6]**

i) Find the names of parts whose color is ‘red’.

ii) Find the names of all parts whose weight is less than 25kg.

iii) Sort the suppliers by ascending order of city.

iv) Find the average weight of all parts.

v) Display part details of green color part with its quantity.

Q3) a) Explain insertion, deletion, and modifications anomalies with proper example. **[6]**

b) State and Explain Armstrong’s axioms and its properties. **[6]**

c) Define query processing. What are the steps involved in query processing? **[5]**

OR

P.T.O.

Q4) a) Explain with example Materialized evaluation and pipelining. **[5]**

b) State the need of normalization? Explain 1NF, 2NF and 3NF with example **[7]**

c) What is closure of functional Dependency? Given functional dependencies for the relation R = (A, B, C, D, E, F), Find closure of FD set by applying Armstrong's Axioms. $A \rightarrow B$, $A \rightarrow C$, $CD \rightarrow E$, $CD \rightarrow F$, $B \rightarrow E$ **[5]**

Q5) a) What is transaction? Explain ACID properties of transaction. **[6]**

b) What is deadlock? Explain how deadlock detection and prevention is done. **[6]**

c) Write short note on: Two phase locking protocol **[6]**

OR

Q6) a) What is Serializable schedule? Explain with suitable example the types of Serializable schedules. **[6]**

b) What is concurrency control? Explain time stamp based concurrency control. **[6]**

c) Write short note on: Shadow paging **[6]**

Q7) a) Explain: Parallel database and distributed database architecture **[6]**

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

i) NOSQL database

ii) Internet Database

c) What are advantages and disadvantages of centralized database? **[5]**

OR

Q8) a) Explain Client server architecture in detail. **[6]**

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

i) Cloud database

ii) SQLlite Database

c) Discuss design issues of distributed database architecture. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC2833

[Total No. of Pages : 2

[6352]-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 indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Let ABCD be the rectangle window with A (-20,-20), B (40,-20), C (40,30) and D (-20,30). Find the region code for endpoints and use Cohen Sutherland algorithm to clip the lines P1-P2 with P1 (-30,20) and P2 (60,-10). and Q1-Q2 with Q1 (-10, -30) and Q2 (20, 60). Show Graphic Representation of Original and Clipped Line. **[9]**

b) What is projection? Explain with diagram, Perspective Projection with vanishing points as 1 point, 2 point and 3 point. **[9]**

OR

Q2) a) Explain the Concept of Window, Viewport, and Viewing transformations. Find the normalization transformation window to viewport, with window, lower left corner at (3, 3) and upper right corner at (6, 8) onto a viewport, for entire normalized device screen. **[9]**

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 (110,180), Q(240, 160), R (170,110) and find the final coordinates of the clipped polygon.**[9]**

Q3) 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 Closing

b) Explain in detail with diagram **[8]**

i) Ambient Light,
ii) Diffuse Light, and
iii) Specular reflection

OR

P.T.O.

Q4) a) Explain in detail with Diagram **[9]**

i) HSV Color Model

ii) YCbCr Color Model

iii) CIE Chromaticity Diagram

b) Define Shading. Explain with help of diagrams Phong Shading algorithm in detail. **[8]**

Q5) a) Explain in detail with diagram how midpoint subdivision method can be used for Bezier-Curve Generation. **[9]**

b) What is curve interpolation? As far as splines are concerned what do Bezier and B-splines curves indicate? **[9]**

OR

Q6) a) Write short note on **[9]**

i) Methods of controlling animation.

ii) Various types of animation languages.

b) Why cubic Bezier curves are chosen? What are the properties of Bezier Curves. Explain any Bezier curve generation method. **[9]**

Q7) a) Explain the behavioral modeling in Virtual Reality. **[6]**

b) What are sound displays in Virtual Reality? **[6]**

c) What is navigation and manipulation interfaces in virtual reality system? **[5]**

OR

Q8) a) Explain the Graphics Rendering Pipeline. **[6]**

b) Explain the applications of Virtual Reality systems. **[6]**

c) Explain Kinematic modeling in Virtual Reality. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC2834

[Total No. of Pages : 2

[6352]-58
S.E. (Information Technology)
SOFTWARE ENGINEERING
(2019 Pattern) (Semester - IV) (214454)

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 must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if required.***

Q1) a) Explain the characteristics of a good design. Explain Software Quality Guidelines and Attributes of Software design. **[9]**

b) Define a software component. Explain an Object-Oriented View of components with suitable example. **[9]**

OR

Q2) a) Explain the refinement and refactoring in software design. Compare refinement with abstraction. **[9]**

b) What is an archetype? How do systems interoperate with one another? **[9]**

Q3) a) What do you meant by project initiation? Explain steps in project initiation in details. **[9]**

b) What are the typical problems with I.T. cost estimates? **[8]**

OR

Q4) a) What are the categories of stakeholders? What are characteristics of effect project manager? **[9]**

b) What is meant by Work Breakdown Structure? Explain representations of WBS with suitable examples. **[8]**

P.T.O.

Q5) a) Compare Software Quality Assurance, Software Quality Control and Software Testing. **[9]**

b) Explain following quality factors with their key attributes:- **[9]**

i) Portability

ii) maintainability

iii) Reusability

OR

Q6) a) How to define software quality? Explain McCall's Quality Factors with suitable diagram. **[9]**

b) What are different metrics are available for software quality control? How they control quality of software? **[9]**

Q7) a) Explain CASE workbench. Explain types of CASE workbenches. **[9]**

b) What is Kanban? What are benefits of Kanban? **[8]**

OR

Q8) a) What are the different global software development challenges? **[9]**

b) What are changes in software development? How to handle these changes. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2835

[6352]-59

[Total No. of Pages :4

S.E. (Information Technology)

DISCRETE MATHEMATICS

(2019 Pattern) (Semester- III) (214441)

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

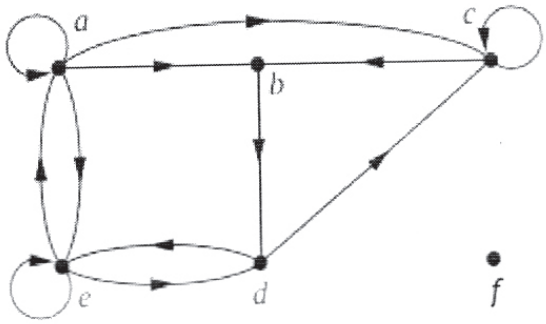
Instructions to the candidates:

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 a planar graph? Draw planar embedding of K4 and K3,2. **[6]**

b) For the following set of weights construct an optimal binary prefix tree. Find the weight of the optimal tree 2, 3, 5, 7, 9, 13. **[6]**

c) Find the in-degree and out-degree of each vertex in the graph G with directed edges shown in Figure. Show that the sum of In-degree and Out-degree is the same in the graph. **[6]**



G

OR

Q2) a) Define the following terms **[6]**

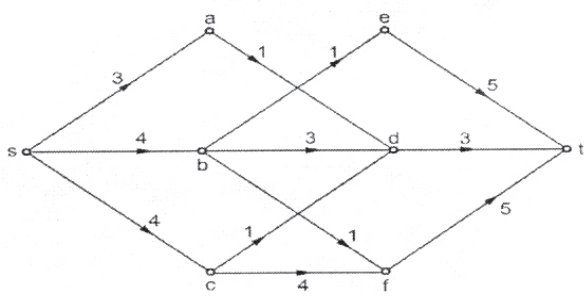
i) Bipartite Graph

ii) Hamiltonian Path

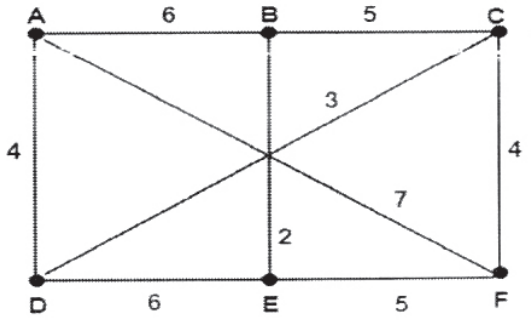
iii) Eulerian Circuit

P.T.O.

b) Use the labeling procedure to find a maximum flow in the transport network. Shown in the following fig. **[6]**



c) Determine the minimum spanning tree of the weighted graph shown in fig using Kruskal's Algorithm: **[6]**

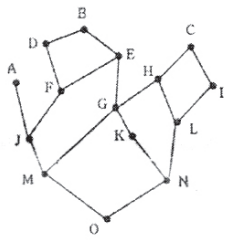


Q3) a) Solve the following recurrence relation. **[6]**

$x_n = 6x_{n-1} - 9x_{n-2}$ where $x_0 = 0$ and $x_1 = 3$

b) Given $f(x) = 2x + 3$ and $g(x) = 3x - 2$. Find $f(4)$, $g(5)$, $gof(x)$ and $fog(x)$. **[6]**

c) Give answers of the following questions w.r.t. Given POSET? **[5]**



What is the upper bound of B?

What is the minimal element?

How many maximal elements are there?

What is the upper bound of M and N?

OR

Q4) a) Define POSET. Draw Hasse Diagram for relation R defined over set **[6]**

A={1, 2, 3, 4, 6, 8, 12} R = {(*x*,*y*) | *x* divides *y*}

b) What is an equivalence relation? Explain with an example. **[6]**

c) Find the minimum number of students in a class such that four of them are born in the same month? (Use PigeonHole Principle) **[5]**

Q5) a) Using Binary Expansion method solve the following (Show stepwise answer) 7 ^ 50 mod 13. **[6]**

b) Find the Euler's totient function of the following numbers **[6]**

i) 77

ii) 75

iii) 50

c) Using Chinese Remainder Theorem, find the value of P using following data **[6]**

$P \equiv 3 \pmod 7$

$P \equiv 6 \pmod{11}$

OR

Q6) a) Find the multiplicative inverse of 13 mod 31 using Extended Euclidean Algorithm. **[6]**

b) Compute GCD of the following numbers using Euclidean Algorithm **[6]**

i) GCD (1250,900)

ii) GCD (456, 165)

c) Explain Fermat's Little Theorem. Find 3^31 mod 7 using Fermat's Little Theorem **[6]**

Q7) a) Let P be the set of all matrices of the form [[*x x*],[*x x*]] where *x* is a non-zero rational number. * is the matrix multiplication defined over P. Show that it is a group. **[6]**

b) Explain Integral Domain with an example. **[6]**

c) Let S={1, 2, 3, 6, 12}, where a*b is defined as LCM (a,b) over set S. Determine whether it is a semigroup, group, or Abelian Group or neither. **[5]**

OR

Q8) a) Prove that Z={1, 5, 7, 11} is an Abelian group under multiplication mod 12. **[6]**

b) Let I be the set of all positive integers. For each of the following determine * is a commutative operation or not: **[6]**

i) a * b = max (a, b)

ii) a * b = (a + b)/2

iii) a * b = a.b (Multiplication)

iv) a * b = power (a,b)

v) a * b = 2a/b

vi) a * b = 2a + b

c) Find the minimum distance of an encoding function **[5]**

e:$B^2 \rightarrow B^5$ given as: e(0, 0) = 00000, e(0, 0) = 10011, e(0, 0) = 01110, (0, 0) = 11111.

Total No. of Questions : 8]

SEAT No. :

PC2836

[Total No. of Pages :2

[6352]-60

S.E. (I.T.)

LOGIC DESIGN & 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, and 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-FF into T-FF. **[6]**

b) Compare combinational circuits and sequential circuits with example? **[6]**

c) Design MOD-96 using Asynchronous Decade Counter IC 7490 **[6]**

OR

Q2) a) Explain D-FF with Logic diagram, Symbol & Truth Table. **[6]**

b) Design 3-bit Asynchronous up Counter using JK-FF **[6]**

c) State the types of shift register with application of each. **[6]**

Q3) a) Explain components of CPU with Block Diagram? **[6]**

b) Write required micro operations and control signals for instruction ADD (R3) R1? **[6]**

c) Compare horizontal and vertical microinstruction format **[5]**

OR

Q4) a) Explain various types of Registers? State the function of Control and status Registers. **[6]**

b) Write in brief about multiple bus organization with suitable diagram? **[6]**

c) Compare Hardwired control unit with Micro Programmed control Unit? **[5]**

Q5) a) Differentiate between UMA and NUMA? **[6]**

b) What is meant by interrupt? Mention steps of interrupt handling procedure of microprocessor? **[6]**

c) What is mean by Multi-core architecture? Discuss its advantages? **[6]**

OR

Q6) a) What is mean by Addressing modes? Explain any two addressing modes with suitable example? **[6]**

b) Write a short note explaining instruction pipelining, its advantages and disadvantages? **[6]**

c) Describe Flynn's taxonomy for parallel computing? **[6]**

Q7) a) Write a short note on memory hierarchy? Write any four the characteristics of memory system **[8]**

b) Briefly describe different cache mapping techniques? **[9]**

OR

Q8) a) Explain DMA operation with help of suitable diagram? Compare Programmed I/O and Interrupt Driven I/O. **[8]**

b) What is mean by Cache Coherence? Explain cache coherence prolem in single processor systems? **[9]**

Total No. of Questions : 8]

SEAT No. :

PC2837

[Total No. of Pages : 3

[6352]-61

S.E. (Information Technology)

DATA STRUCTURES AND ALGORITHMS

(2019 Pattern) (Semester-III) (214443)

Time : 2 ½Hours] *[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.***

Q1) a) Convert following Infix Expression to Postfix and evaluate using stack (A/B-C+D*E) **[6]**

A=30 B=2 C=5 D=10 E=6

b) Explain queue ENQUEUE and DEQUEUE operations with example. **[6]**

c) Explain Any One application of Queue with figure. **[6]**

OR

Q2) a) Convert following Infix Expression to Postfix and evaluate using stack

M * N+(P–Q) + R **[6]**

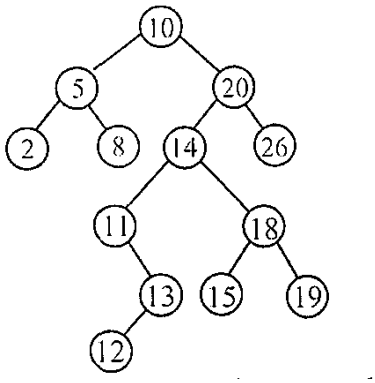
M=2 N=5 P=3 Q=6 R=1

b) Draw and explain circular and circular double queue with advantages and disadvantages. **[6]**

c) Explain ‘Dqueue’ data structure with figure. **[6]**

P.T.O.

Q3) a) **[6]**



In a given BST state the output of Inorder, preorder, postorder, level wise traversals. Also draw mirror image.

b) Explain recursive algorithm to display height of Binary Tree. **[6]**

c) Construct BST from below data **[5]**

Inorder - 17,32,44,48,50,62,78,88

Postorder - 32,17,48,62,50,88,78,44

OR

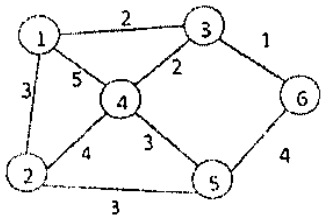
Q4) a) Construct the expression tree from the following prefix expression using stack. **[6]**

/, *, -, 4, 7, 9, 3

b) State and explain algorithm to display binary tree level wise. Give example. **[6]**

c) Draw and explain how TBT is efficient than BT. **[5]**

Q5) a) **[6]**



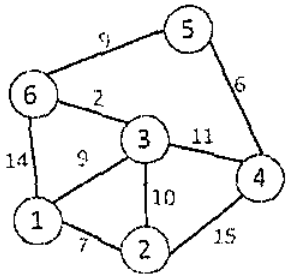
If '1' is the resource, explain step by step minimum spanning tree by 'Prims' algorithm.

b) Explain with example by which methods Graph is represented? **[6]**

c) Explain the heap sort technique with the help of example. **[6]**

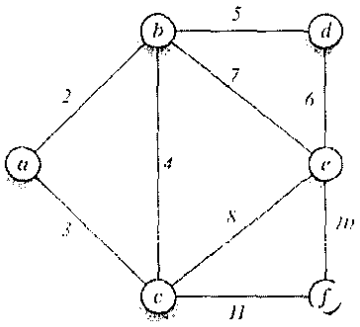
OR

Q6) a) **[6]**



If '1' is the source, find the shortest path from source to all vertices, using Dijkstra's algorithm. Show answer step by step.

b) **[6]**



Show the output of DFT using stack. Use 'A' as a starting node.

c) Explain with example OBST. **[6]**

Q7) a) Create the hash table using Linear Probing **[6]**

Table size : 15

Data : 30, 61, 46, 77, 33, 93, 105, 70, 1

Hash function: data% table size

b) Explain with example characteristics of good hash function. **[6]**

c) Compare sequential file and direct access file with example. **[5]**

OR

Q8) a) Explain chaining with replacement with proper example. **[6]**

b) Compare sequential, Index sequential and direct access files. **[6]**

c) State and Explain an algorithm to merge 2 sequential files into 3rd sequential file. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC2838

[Total No. of Pages : 2

[6352]-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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is a Constructor? State characteristics of the Constructor. **[6]**

b) Differentiate between Constructor and Method. **[6]**

c) Write Pseudo code for Constructor Overloading. **[6]**

OR

Q2) a) Explain different types of Constructors in OOP. **[6]**

b) Differentiate between Constructor and Destructor. **[6]**

c) Explain Automatic Garbage Collection in Java using the Finalize Method. **[6]**

Q3) a) Write a Java program to implement multilevel inheritance. **[5]**

b) Explain types of polymorphism with examples. **[6]**

c) What is an interface in Java? How to declare an interface, and write syntax? Can we achieve multiple inheritance by using an interface? **[6]**

OR

Q4) a) Differentiate between method overriding and method overloading. **[5]**

b) Define Inheritance. What are the types of Inheritance? **[6]**

c) How parameterized constructors get executed in multilevel inheritance? Explain with an example. **[6]**

P.T.O.

Q5) a) What is an exception? Demonstrate with the example, how to handle the ArrayIndex out of Bound exception? **[6]**

b) Write the Java program to demonstrate at least 3 methods of ArrayList collection class. **[6]**

c) What is Generic? Write the syntax for the Generic Method and explain the use of the Generic Method. **[6]**

OR

Q6) a) What is a checked exception? Show with the example, how to throw and handle the Arithmetic Exception manually. **[6]**

b) Explain the use of throw, throws, and finally with the help of example. **[6]**

c) Differentiate between ArrayList and LinkedList collection classes. **[6]**

Q7) a) Explain Various Types of Streams. **[6]**

b) Explain the singleton pattern with an example. **[6]**

c) Write the syntactically correct Java program to copy the content of one file to another. **[5]**

OR

Q8) a) Explain the Iterator Pattern with its merits. **[6]**

b) What are the advantages of design patterns? Explain the 'Adaptor' design pattern in detail. **[6]**

c) Differentiate between sequential files and random-access files. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2839

[Total No. of Pages : 2

[6352]-63

S.E. (IT)

BASICS OF COMPUTER NETWORK

(2019 Pattern) (Semester - III) (214445)

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) Compare TDMA & FDMA with neat Diagram. **[6]**

b) Explain the following physical layer implementations in standard Ethernet: **[6]**

i) 10 Base5

ii) 10 BaseT

iii) 10 BaseF

c) Explain the various controlled access methods. **[6]**

OR

Q2) a) Discuss Fast Ethernet and Gigabit Ethernet. **[6]**

b) Discuss CSMA/CD random access technique. How is collision detection achieved in this technique? **[6]**

c) Draw & Explain each Field of MAC frame format of IEEE 802.3. **[6]**

Q3) a) Compare between IPv4 and IPv6. **[6]**

b) What do you mean by Classful addressing? Explain classes with ranges with examples. **[6]**

c) Draw and Explain IPv6 header format. **[5]**

OR

Q4) a) Draw and Explain IPv4 header format. **[6]**

b) What is NAT? Explain operation of NAT with suitable example. **[6]**

c) What is fragmentation? Explain how it is supported in IPv4 and IPv6. **[5]**

P.T.O.

Q5) a) Explain the difference between Interdomain and Intradomain routing protocol with example. **[6]**

b) What is BGP protocol? Explain the operation of BGP protocol with suitable example. **[6]**

c) Explain the Concept of Subnetting and Supernetting. **[6]**

OR

Q6) a) Differentiate between Distance Vector Routing and Link State Routing. **[6]**

b) Explain EIGRP protocol. Compare with OSPF. **[6]**

c) Explain Optimality Principle in Unicast routing. **[6]**

Q7) a) Differentiate between connection oriented and Connection less services with an example. **[6]**

b) Explain all the fields of TCP header. **[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) Explain different timers used in TCP. **[6]**

c) What is Congestion control? Explain leaky bucket and token bucket algorithm. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC2840

[Total No. of Pages : 2

[6352]-64

S.E. (Artificial Intelligence and Machine Learning)

OPERATING SYSTEMS

(2019 Pattern) (Semester - IV) (218552)

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 Deadlock? Describe the Deadlock prevention strategies with the help of example. **[8]**

b) What is semaphore and Mutex? Explain with the help of pseudocode, how semaphore is used to solve the Producer Consumer Problem. **[9]**

OR

Q2) a) What is the reader-writer's problem? Explain the solution for readers-writers problem with writers having priority. **[8]**

b) What is interprocess communication between processes using pipes? Explain the advantages and disadvantages. **[9]**

Q3) a) Explain the role of Translation Lookaside Buffer (TLB) in virtual memory and describe it with the help of diagram. **[9]**

b) What is memory partitioning? Explain the different types of partitioning in memory management. **[9]**

OR

Q4) 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) What is thrashing in virtual memory? Describe the different causes of thrashing and techniques to handle the thrashing. **[9]**

P.T.O.

Q5) a) What are the three methods of file access? Explain in detail. **[9]**

b) What is File? Explain different mapping strategies for file records into blocks. **[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. Initially head is at track no 53. **[9]**

Find the no of tracks traversed and average seek length if

i) FCFS

ii) SSTF

iii) SCAN is used.

b) Describe various techniques of I/O buffering in detail. **[9]**

Q7) a) Write an algorithm for Pass-I of two pass Assembler. **[6]**

b) What are Assembler Directives? Explain any two assembler directives with an example. **[6]**

c) What is Compiler? Explain any two phases of the compiler with suitable example. **[5]**

OR

Q8) a) Explain with example imperative statement, and declarative statement of assembly language programming? **[6]**

b) Explain phases structure of complier in brief. **[6]**

c) What is forward reference? Discuss with the example. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2841

[Total No. of Pages :3

[6352]-65

S.E. (A.I. & M.L.)

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(2019 Pattern) (Semester- IV) (218553)

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) ***Assume Suitable data if necessary.***

Q1) a) What is knowledge-based agent? Explain various levels of describing knowledge based agent in AI? **[6]**

b) What is First - Order Logic (FOL)? Specify the syntax of basic elements of FOL? **[6]**

c) Explain Frame Representation with its merits and demerits. **[6]**

OR

Q2) a) Explain universal quantifier and Existential quantifier used in FOL with suitable example. **[6]**

b) What is reasoning in AI? Explain its types. **[6]**

c) Difference between predicate and propositional logic. **[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 **[6]**

i) Positive and Negative Class.

ii) Training dataset and Testing dataset.

b) Explain different types of machine learning. **[6]**

c) Discuss with examples any two useful applications of machine learning. **[5]**

P.T.O.

Q5) a) What are the fundamental differences between supervised, unsupervised, and semi- supervised learning in machine learning? Explain with examples. **[9]**

b) Write a short note on Dimensionality reduction. **[9]**

OR

Q6) a) Explain supervised and unsupervised learning with Real life applications. **[9]**

b) Explain Principal Component Analysis with appropriate example. **[9]**

Q7) a) Define the following terms **[9]**

i) Binary Classifiers and Multi-Class Classification

ii) Multi-Class Classification -One-Vs-Rest

iii) Multi-Class Classification -One-Vs-One

b) Fast learner: - + class **[8]**

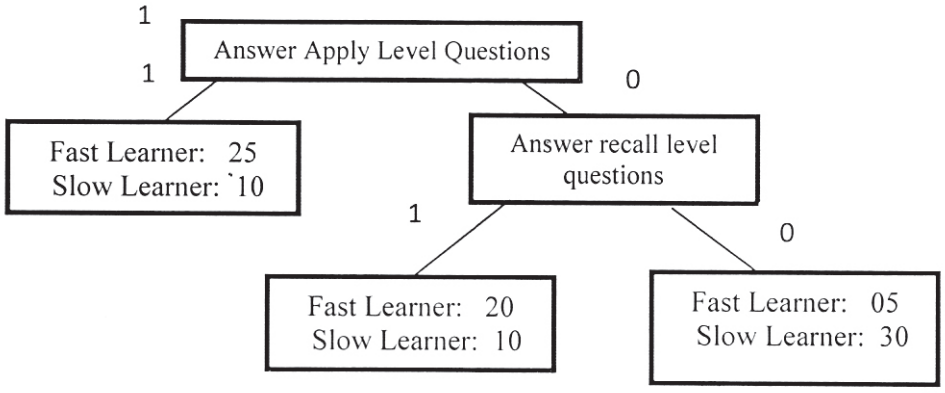
Find

i) Confusion Matrix.

ii) Find Recall.

iii) Precision

iv) Accuracy



OR

Q8) a) How the performance of Regression is assessed? Write any four - performance metrics used for Regression. **[10]**

b) Consider the three-class classification matrix. Calculate accuracy, precision and recall per class **[7]**

Confusion Matrix		Predicted		
Actual	A	8	10	1
	B	5	60	50
	C	3	30	200

Total No. of Questions : 8]

SEAT No. :

PC2842

[Total No. of Pages : 2

[6352]-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 indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain DDL and DML in detail with example. **[9]**

b) Explain Nested queries in detail with example. **[9]**

OR

Q2) a) Explain updating views in detail with example. **[9]**

b) Explain stored procedure in detail with example. **[9]**

Q3) a) Explain selection and join operation in detail. **[9]**

b) Explain Functional dependency in detail with example **[8]**

OR

Q4) a) Explain evalution of expression in detail. **[9]**

b) Explain measures of query cost in detail. **[8]**

Q5) a) Explain Serializability in detail. **[9]**

b) Explain the concept of shadow paging in detail. **[9]**

OR

P.T.O.

Q6) a) Explain Deferred and Immediate crash recovery method in detail. **[9]**

b) Explain Multi-version Concurrency Control in detail. **[9]**

Q7) a) Explain architecture of distributed database in detail. **[9]**

b) Explain SQLite database in detail. **[8]**

OR

Q8) a) Explain Internet database in detail. **[9]**

b) Explain Key elements of Parallel Database Processing in detail. **[8]**

■■■■

Total No. of Questions : 8]

SEAT No. :

PC2843

[Total No. of Pages : 2

[6352]-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) ***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 3D reflection about XY, YZ and XZ plane. **[9]**

b) Use the Cohen Sutherland Line Clipping Algorithm with the help of region codes to clip a line AB with A (30 ,50), B (110,70) and PQ with P (50, 30) , Q (90,90) 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) 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 (100, 175), Q (170, 250) , R (250, 165) and find the final coordinates of the clipped polygon. **[9]**

b) What is projection? Explain with diagram, Perspective Projection with vanishing points as 1 point, 2 point and 3 point. **[9]**

Q3) a) Explain in detail with Diagram. **[9]**

i) RGB Color Model

ii) HSV Color Model

iii) CIE Chromaticity Diagram

b) Define Shading. Explain with help of diagrams Gourand Shading algorithm in detail. **[8]**

OR

P.T.O.

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 Closing.

b) Explain in detail combined diffuse and specular reflections with multiple light sources. **[8]**

Q5) a) What are the steps in design in animation sequence? Describe about each step briefly. **[9]**

b) What is curve interpolation? As far as splines are concerned what do Bezier and B-splines curves indicate? **[9]**

OR

Q6) a) Explain how Koch curves are generated. Also calculate the fractal dimension of Koch curve. **[9]**

b) Explain in detail with diagram how midpoint subdivision method can be used for Bezier-Curve Generation. **[9]**

Q7) a) Explain the behavioral modeling in Virtual Reality. **[6]**

b) What are sound displays in Virtual Reality? **[6]**

c) Explain Kinematic modeling in Virtual Reality. **[5]**

OR

Q8) a) Explain the Graphics Rendering Pipeline. **[6]**

b) Explain the applications of Virtual Reality Systems. **[6]**

c) What is navigation and manipulation interfaces in virtual reality System? **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC-2845

[Total No. of Pages : 4

[6352]-69

S.E. (A.I&M.L)

DATA STRUCTURES & ALGORITHMS

(2019 Pattern) (Semester - III) (218542)

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

Instructions to the candidates :

1) ***Attempt question Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Draw neat & labelled diagrams if necessary.***
3) ***Assume suitable data if necessary.***
4) ***Figures to the right side indicate frill marks.***

Q1) a) Convert following Infix Expression to Postfix and evaluate using stack **[6]**

(A/B–C+D*E)

A = 30 B = 2 C = 5 D = 10 E = 6

b) What is queue? How they are represented in memory? Write a pseudocode to implement insert & delete operation in a linear queue using array. **[6]**

c) What is priority queue? How insertion & deletion operation is performed? Explain with example. **[6]**

OR

Q2) a) Convert following expression into postfix form. (Show all intermediate steps) **[6]**

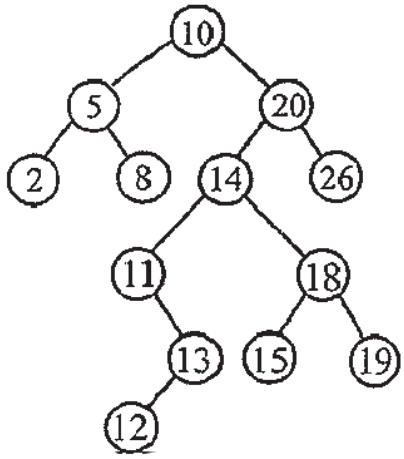
((A + B) - C * (D / E)) + F

b) Explain the concept of linear queue and circular queue.Give the advantages of circular queue over linear queue. Write C/C++ code to implement enqueue & degueue operation on circular queue. **[6]**

c) What is linked stack? Write a C/C++ code to implement insertion & deletion operation on it. **[6]**

P.T.O.

Q3) a) In a given BST write the output of inorder, preorder, postorder, level wise traversals. Also draw mirror image. **[6]**



b) Discuss algorithm for recursive and non recursive inorder traversal. **[6]**

c) Construct BST from below data **[6]**

lnorder - 17, 32, 44, 48, 50, 62, 78, 88

Postorder - 32, 17, 48, 62, 50, 88, 78, 44

OR

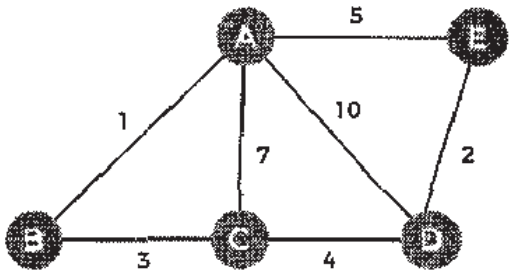
Q4) a) Construct the expression tree from the following prefix expression using stack. **[6]**

/, * , – , 4, 7, 9, 3

b) State and explain algorithm to display binary tree level wise with the help of sample tree. **[6]**

c) Draw and explain how Threaded Binary Tree is efficient than Binary tree. **[6]**

Q5) a) In the following graph, consider 'A' is the source. Apply Kruskal's algorithm to get minimum spanning tree. **[6]**



b) Find the Optimal Binary Search Tree for the : **[6]**
Identifier set {al, a2, a3} = {do, if, while} Where n = 3 and Probabilities of successful search as {pl, p2, p3) = {0.5, 0.1, 0.05) and Probability of unsuccessful search as {q0, q1, q2, q3) = {0.15, 0.1, 0.05, 0.05)

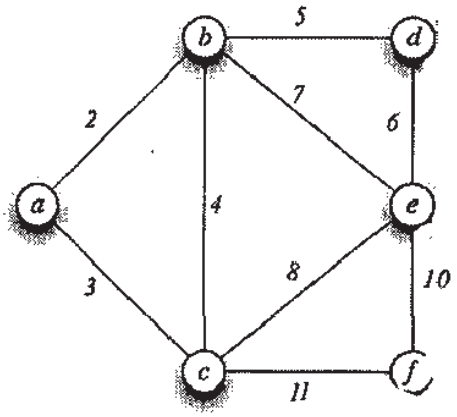
c) Explain the heap data structure &it's types with the help of sample heap tree. **[5]**

OR

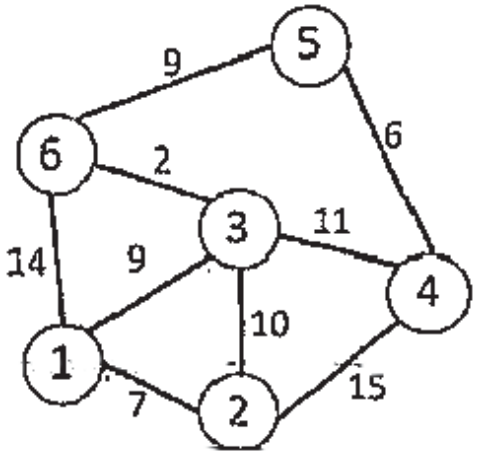
Q6) a) Construct AVLtree for following set of keys :

A, Z, B, Y, C, X, D, E, V, F, M, R. Show the balance factor of all the nodes & name the' type of rotation used. **[6]**

b) Show the output of Breadth First Search using stack. Use 'd' as a starting node **[6]**



c) If '5' is the source, find the shortest path from source to all vertices, using Dijkstra's algorithm. Show answer step by step. **[5]**



Q7) a) Create the hash table using Linear Probing. **[6]**

Table size : 15

Data : 30, 61, 46, 77, 33, 93, 105, 70, 1

Hash function: data% table size

b) Explain with example characteristics of good hash function. **[6]**

c) Discuss an algorithm to delete a record from the sequential file. **[5]**

OR

Q8) a) Discuss chaining with replacement technique to handle collision. Mention suitable example. **[6]**

b) Compare sequential, Index sequential and direct access file organization. **[6]**

c) Give an algorithm to merge two sequential files into third new sequential file. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC2846

[Total No. of Pages : 2

[6352]-70

S.E. (Artificial Intelligence and Machine Learning Engg.)

COMPUTER NETWORKS

(2019 Pattern) (Semester-III) (218543)

Time : 2 ½Hours] *[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 diagram 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) What is error correction and error detection? Demonstrate following Error detection methods with suitable example: **[9]**

i) Parity Checks

ii) Hamming code

b) What is frames in data link layer? Describe in detail the fixed size framing and variable size framing? **[9]**

OR

Q2) a) Demonstrate Error Detection by One's Compliment Checksum with suitable example. **[9]**

b) Explain CSMA/CA random access technique in detail with suitable diagram/flowchart, Explain how collision is avoided in CSMA/CA. **[9]**

Q3) a) How does routing work? Describe in detail OSPF and EIGRP. **[9]**

b) Explain following terms: **[8]**

i) NAT

ii) Static routing and Dynamic routing

OR

P.T.O.

Q4) a) Explain following terms **[9]**

i) Distance Vector Routing

ii) Link State Routing

iii) Path Vector Routing

b) Explain ARP protocol with diagram. **[8]**

Q5) a) What is socket? Enlist all socket primitives & explain any three. **[9]**

b) Explain the three-way handshake algorithm for TCP connection establishment. Compare and contrast between TCP and UDP. **[9]**

OR

Q6) a) Explain TCP with its header format. **[9]**

b) What do you mean by flow control in transport layer? List the different methods of achieve it. Explain any one method in detail. **[9]**

Q7) a) What is the purpose of DNS? How does recursive resolution differ from iterative resolution? Explain with suitable diagram. **[9]**

b) What is MIME? What is the purpose of MIME? Explain MIME header in detail. **[8]**

OR

Q8) a) Describe the functions of the two FTP connections. List difference between FTP & TFTP. **[8]**

b) Write Short Note on **[9]**

i) HTTP

ii) SMTP

iii) POP

Total No. of Questions : 8]

SEAT No. :

PC-2847

[Total No. of Pages : 2

[6352]-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 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) What is Destructors? Explain finalize function. **[6]**

b) Write a program to calculate an area of any polygon 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 program to implement hierarchical 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 addition of two numbers using Method overloading. **[5]**

b) What is abstract class? Explain with example. **[6]**

c) What is interface? How to declare an interface, write syntax? Can we achieve multiple inheritance by using interface? **[6]**

P.T.O.

Q5) a) What is Run Time Exception? 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 Array List using generics. **[6]**

c) Differentiate between Array List and Linked List collection classes. **[6]**

Q7) a Explain Concept of Stream with its types. **[6]**

b) Explain singleton pattern with example. **[6]**

c) Write the program to read a file using FileInput Stream class. **[5]**

OR

Q8) a) Explain Iterator Pattern with its merits. **[6]**

b) Write a program to write a file using File Output Stream class. **[6]**

c) What are design patterns? Explain 'Adapter' design pattern in detail. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC2848

[6352]-72

[Total No. of Pages : 2

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 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 Design? Explain any four design concepts. **[9]**

b) What is User Interface? Explain how to make the interface consistent. **[9]**

OR

Q2) a) What is architecture? Explain any two architectural styles with suitable diagrammatical representation. **[9]**

b) Write and Explain the Interface design steps with diagrammatical representation. **[9]**

Q3) a) Explain the project life cycle with appropriate diagrammatical representation. **[9]**

b) Write short note on : **[8]**

i) PERT

ii) Work Breakdown Structure

OR

Q4) a) List the different project estimation techniques. Explain with example how size oriented metrics are used for project estimation. **[9]**

b) Explain 4 Ps in project management. **[8]**

P.T.O.

Q5) a) What is software quality? Explain McCall's Quality factors. **[9]**

b) What is defect? Explain defect management life cycle. **[9]**

OR

Q6) a) Explain software quality dilemma in your own words. **[9]**

b) What is objective of Testing? Differentiate between testing & debugging. **[9]**

Q7) a) What is Baseline? List and explain different software configuration items. **[9]**

b) Write short note on : **[8]**

i) Risk Management

ii) Collaborative development

OR

Q8) a) What is SCM? Write and explain the features of SCM Repository. **[9]**

b) Write short note on : **[8]**

i) CASE Tools

ii) Test driven development

Total No. of Questions : 8]

SEAT No. : ____

PC2849

[Total No. of Pages : 2

[6352]-73
S.E. (Biotechnology)
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.***

Q1) Answer the following. **[18]**

a) Draw the diagram showing oxidative Pentose Phosphate Pathway?

b) Analyze the energy investment and energy payoff of glycolysis.

OR

Q2) Answer the following. **[18]**

a) Describe the significance of pentose phosphate pathway.

b) Differentiate between the preparatory phase and the payoff phase of glycolysis.

Q3) Write in detail about. **[17]**

a) Analyze the role of glycogen phosphorylase and glycogen debranching enzyme in glycogen breakdown.

b) Draw and label a diagram illustrating the steps of the Cori cycle.

OR

Q4) Answer the following. **[17]**

a) Draw a diagram illustrating the synthesis of glycogen.

b) Explain with the labeled diagram how ETC cycle occurs in mitochondria.

P.T.O.

Q5) Answer the following. **[18]**

a) Discuss the role of solubility difference in protein purification. How can techniques like salting out and precipitation be utilized for protein separation?

b) Explain metabolic fates of amino group.

OR

Q6) Answer the following. **[18]**

a) Discuss the significance of the urea cycle in nitrogen metabolism.

b) Write in detail about size exclusion chromatography.

Q7) Answer the following. **[17]**

a) Explain the process of lipid digestion in the human digestive system. Include the roles of lipases, bile salts, and micelles in the digestion and absorption of lipids.

b) How do odd-chain fatty acids differ in their metabolism compared to even-chain fatty acids?

OR

Q8) Answer the following. **[17]**

a) Explain the four basic steps of oxidation of saturated fatty acids.

b) What are the sources of NADPH for fatty acid synthesis?

Total No. of Questions : 8]

SEAT No. :

PC2850

[Total No. of Pages : 2

[6352]-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) Differentiate between mitosis and meiosis. **[6]**

b) Explain the term programmed cell death apoptosis. **[6]**

c) Explain How the G-Protein couple receptors (GPCR) functions? Give its significance. **[6]**

OR

Q2) a) Write functions and significance of Apoptosis. **[6]**

b) Explain in detail about Karyokinesis, Cytokinesis. **[6]**

c) Discuss the different types of signal transduction pathways in the human body? Give examples. **[6]**

Q3) a) What are embryonic stem cells? How are they important in regenerative medicines. **[9]**

b) Write a detail note on muscle tissue. **[8]**

OR

Q4) a) Discuss the difference between embryonic stem cells and hematopoietic stem cells. **[9]**

b) What is blood? Explain blood as the connective tissue. **[8]**

P.T.O.

Q5) a) Describe the process of cell passaging and cell separation. **[8]**

b) Explain the difference between Adherent cell culture and suspension cell culture. **[10]**

OR

Q6) a) Explain How to establish mammalian cell line. Describe in detail and draw it flowchart starting from explant culture. **[10]**

b) Explain the term in detail about contamination and cytotoxicity. **[8]**

Q7) a) Write in detail about callus culture, With the help of neat diagram. Describe the steps involved. **[8]**

b) Enlist types of plant culture and explain any two with neat sketch. **[9]**

OR

Q8) a) Discuss in detail about the transgenic plants. **[8]**

b) What is micropropagation? Give significance with respect to regeneration of endangered plants. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC2851

[Total No. of Pages :2

[6352]-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 indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) A refrigerator working on reversed carnot cycle requires 0.7 KW Per KW of cooling to maintain a temperature of –20°C, determine the following: **[6]**

i) COP of refrigerator

ii) Temperature at which heat is rejected

iii) Amount of heat rejected to the surroundings per KW of cooling (Q_1).

Given : W = 0.7 KW

Q_2 = 1 KW

T_2 = –20°C

b) Discuss about heat pump along with its applications and neat sketch. **[6]**

c) What is carnot cycle/engine? Explain the various steps involved in carnot cycle. **[6]**

OR

Q2) a) What are heat engines? Describe its working and types of heat engines. **[6]**

b) What is second law of thermodynamics? Discuss the various statements involved in second law of thermodynamics. **[6]**

c) What is entropy? Describe the relationship of entropy with heat, temperature and process. **[6]**

Q3) a) Discuss in detail about phase Equilibria with neat labeled graph. **[9]**

b) What is fugacity? Discuss the concept of fugacity for infinite reversible changes occurring in system under isothermal conditions and mathematical definition of fugacity. **[8]**

OR

P.T.O.

Q4) a) What is ideal solution? Derive the equation for Raoult's law and discuss the properties and characteristics of ideal solution. **[9]**

b) What is chemical potential? Write about partial molar properties of solution and derive the expression for the partial molar property. **[8]**

Q5) a) Explain about Duhem's theorem for reacting systems. **[8]**

b) What is chemical reaction equilibrium? Discuss the factors affecting chemical equilibrium. **[10]**

OR

Q6) a) Explain in detail about effect of temperature on equilibrium constant and write the applications of equilibrium constant. **[10]**

b) What is equilibrium constant? Derive the formula for equilibrium constant. **[8]**

Q7) a) Write in detail about Energy transformations in biological systems with examples. **[8]**

b) Write note on Thermodynamics of biochemical changes. **[9]**

OR

Q8) a) Discuss how feasibility of chemical reactions can be explained based on change in entropy, enthalpy and Gibbs energy. **[8]**

b) Discuss the laws of thermodynamics in biosystems with examples and applications. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC2852

[Total No. of Pages :2

[6352]-76

S.E. (Biotechnology)

GENETICS AND MOLECULAR BIOLOGY

(2019 Pattern) (Semester- IV) (215473)

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) a) Explain the process of DNA synthesis at the replication fork. **[9]**

b) Write short note on Telomere replication process. **[9]**

OR

Q2) a) Explain the phases in DNA replication process. **[9]**

b) Describe the mechanism of DNA polymerase in DNA replication. **[9]**

Q3) a) What is RNA splicing? Explain alternative splicing mechanism. **[9]**

b) Give structure and functions of mRNA. **[8]**

OR

Q4) a) With neat labelled diagram explain the structural features of tRNA. **[9]**

b) Write a short note on Introns and Exons. **[8]**

Q5) a) Describe in detail the process of Transcription cycle in bacteria. **[10]**

b) Write a short note on General Transcription Factors. **[8]**

OR

P.T.O.

Q6) a) Give the functional role of RNA polymerase in transcription process. **[10]**

b) Describe the concept of Lac Operon. **[8]**

Q7) a) Write the translation mechanism in prokaryotes. **[9]**

b) Write short note on post translational modification of proteins. **[8]**

OR

Q8) a) Define genetic code. Write general properties of genetic code. **[9]**

b) Write a note on components of ribosomes with their role in translation process. **[8]**

Total No. of Questions : 9]

SEAT No. : ____

PC-2853

[Total No. of Pages : 5

[6352]-77
S.E. (B.Tech Biotechnology / Printing /Chemical Production/ Production S.W)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III) (207004) (Theroy)

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 right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) The fourier Transform of $f(x)=\begin{cases}1; x>0\\0; x<0\end{cases}$ is **[2]**

i) $i\lambda$ ii) $\frac{1}{i\lambda}$

iii) $\frac{1}{\lambda}$ iv) λ

b) The standard deviation and arithmetic mean of the distribution are 4.8989 and 17 resp. coefficient of variation is **[2]**

i) 26.12 ii) 28.82

iii) 21.82 iv) 25.82

c) if $\phi = x^2 - y^2 - z^2$ then $\nabla\phi$ at point (1, 2, 3) is **[2]**

i) $2i-4j-12\hat{k}$ ii) $2i-4j+12\hat{k}$

iii) $2i+4j+12\hat{k}$ iv) $\hat{i}+\hat{j}$

P.T.O.

d) The general solution of PDE $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ is **[2]**

i) $u(x,t) = (c_1 \cos mx + c_2 \sin mx) e^{-c^2 m^2 t}$

ii) $u(x,t) = (c_1 \cos t + c_2 \sin t) e^{-c^2 m^2 x}$

iii) $u(x,y) = (c_1 \cos mx + c_2 \sin mx) e^{-c^2 m^2 y}$

iv) $u(x,y) = (c_1 \cos y + c_2 \sin y) e^{-c^2 x}$

e) Coefficient of correlation always lies between **[1]**

i) $-1 \le r \le 1$ ii) $0 \le r \le 1$

iii) $-2 \le r \le 2$ iv) $-1 \le r \le 0$

f) The coefficient of Kurtosis β_2 is **[1]**

i) $\frac{\mu_3}{\mu_2}$ ii) $\frac{\mu_3^2}{\mu_2^3}$

iii) $\frac{\mu_2}{\mu_3}$ iv) $\frac{\mu_4}{\mu_2^2}$

Q2) a) Find the fourier integral representation of the function $f(n) = \begin{cases} 4 - x^2, & |x| \le 2 \\ 0, & |x| > 2 \end{cases}$ **[5]**

b) By considering fourier cosine transform of e^{-x}, prove that

$$\int_0^\infty \frac{\cos \lambda x}{1+\lambda^2} d\lambda = \frac{\pi}{2} e^{-x}, n > 0$$ **[5]**

c) Solve the following integral equation, $\int_0^\infty f(n) \sin \lambda x \, dx = e^{-2\lambda}, \lambda > 0$ **[5]**

OR

Q3) a) Find the fourier integral representation for the function $f(n) = \begin{cases} k, & |x| \le 1 \\ 0, & |x| \ge 1 \end{cases}$ **[5]**

b) Find the fourier sine transform of $f(n) = e^{-ax}$, $a > 0$ **[5]**

c) Solve the following integral equation, $\int_0^\infty f(n) \sin \lambda n \, d\lambda = \begin{cases} 2 - \lambda, & 0 \le \lambda \le 2 \\ 0, & \lambda > 2 \end{cases}$ **[5]**

Q4) a) The firot four moments about the working mean 30.2 of a distribution are 0.255, 6.222, 30.211 and 400.25 calculate the first four moments about the mean. Also β_1, β_2. **[5]**

b) Follwing are the values of import of raw material and export of finished product in suitable units.

Export	10	11	14	14	20	22	16	12	15	13
Import	12	14	15	16	21	26	21	15	16	14

Calculate the coefficient of correlation between the import values and export values. **[5]**

c) On an average 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]**

p = probability of defective articles = $\frac{2}{10} = \frac{1}{5}$

q = probability of non-defective items = $\frac{4}{5}$

OR

Q5) a) Calculate the correlation coefficient for the following weights (inkg) of husband (x) and wife (y). **[5]**

x	65	66	67	67	68	69	70	72
y	55	58	72	55	66	71	70	50

b) In certain examination test 2000 students appeared in subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks. suppose that the marks are distributed normally & (A = 0.4772). **[5]**

c) A manufacturer of cotter pins knows that 2% of his product is defective. If he sells cotterpins in boxes of 100 pins and guarantees that not more than 5 pins will de defective in a box. Find probability that a box will fail to meet guarantee. **[5]**

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

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

i) $\nabla^2\left[\nabla.\left(\frac{\bar{r}}{r^2}\right)\right] = \frac{2}{r^4}$

ii) $\nabla^2 f(r) = f^{11}(r) + \frac{2}{r} f^1(r)$

c) Using divergence theorem to evaluate surface integral $\iint_s \bar{F}.\hat{n}\ ds$ where $\bar{F} = (\sin x)\bar{i} + (2-\cos x)y\,\bar{j}$ and S is total surface are a bounded by $x = 0$, $x = 3$, $y = 0$, $y = 2$ and $z = 0$, $z = 1$. **[5]**

Q7) a) Find angle between tangents to curve $x = t^2 + 1$, $y = t^2 - 1$, $z = t$ at $t = 1$ and $t = 2$. **[5]**

b) Show that $\bar{F} = (2xz^3 + 6y)\bar{i} + (6x - 2yz)\bar{j} + (3x^2z^2 - y^2)\bar{k}$ is irrotational. Find scalar function ϕ such that $\bar{F} = \nabla\phi$ **[5]**

c) If $\bar{F} = (2xy + 3z^2)\bar{i} + (x^2 + 4yz)\bar{j} + (2y + 6xz)\bar{k}$ evaluate $\int_c \bar{F}.d\bar{r}$ where 'C' is curve joining points (0,0,0) and (1,1,1). **[5]**

Q8) a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions **[8]**

i) u is finite for all t

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

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

iv) $u(x,0) = \pi x - x^2; o \le x \le \pi$

b) Sovle the wave equation $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition. **[7]**

i) $u(0,t) = 0\ \forall\, t$

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

iii) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$

iv) $u(x,0) = 2x, 0 < x < \Pi$

Q9) a) An infinitely long plate is bounded by two paralles 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 temprature 40°c at all points and other edges at zero temprature. Find the steady state temprature. **[7]**

b) Solve $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ subject to the conditions. **[8]**

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

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

iii) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$

iv) $y(x,0) = x, a < x < l$

Total No. of Questions : 8]

SEAT No. :

PC-2854

[Total No. of Pages : 2

[6352]-78
S.E. (Biotechnology)
BIOCHEMISTRY - I
(2019 Pattern) (Semester - III) (215461)

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 indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) Answer the following **[18]**

a) Write a short note on affinity chromatography with suitable diagram and example

b) Explain in detail why amino acids can act as acids and bases

OR

Q2) Answer the following **[18]**

a) Write a note on size exclusion chromatography and ion exchange chromatography

b) What is a peptide bond? Give the reaction for peptide formation

Q3) Answer the following **[17]**

a) Explain the formation of phosphodiester bonds with a suitable example

b) Illustrate the functions of nucleotides.

OR

Q4) Answer the following **[17]**

a) Differentiate between purines and pyrimidine

b) Depict a general structure of nucleotide

P.T.O.

Q5) Answer the following **[18]**

a) Explain the nomenclature of fatty acids by any one method with one suitable example

b) Define glycolipid. Explain it with suitable structure. Enlist the functions of same

OR

Q6) Answer the following **[18]**

a) Explain the properties of lipid bilayer?

b) What are the types of membrane proteins? explain them in detail

Q7) Answer the following **[17]**

a) State the function and deficiency of vitamin K.

b) What are clinical manifestations of Calcium deficiency

OR

Q8) Answer the following **[17]**

a) Write a note on Vitamin E, its sources, functions and toxicity

b) What are the sources and functions of vitamin C

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PC-2855

[Total No. of Pages : 2

[6352]-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) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain about Centrifugal settling including its Advantages and disadvantages. **[6]**

b) Determine the rate at which an air bubble of 0.5 mm diameter will rise in liquid having density 1400 kg/m^3 and dynamic viscosity 0.5 kg/ms. Assume that the rise of the bubble is within stoke's range Neglate density of air and Justify the assumption of stoke's range. **[6]**

c) Illustrate the design and operation of cyclones and hydrocyclones included in centrifugal settling. **[6]**

OR

Q2) a) Write note on Lift and drag forces, drag coefficients. **[6]**

b) Describe Newton's Laws of motion with neat labeled diagram. **[6]**

c) Explain the gravity sedimentation process and Write about sorting classifiers that uses sink and float method and differential settling method. **[6]**

Q3) a) Derive Ergun equation that expresses the friction factor in packed bed column detail. **[9]**

b) Explain the term Computational Fluid Dynamics (CFD). **[8]**

P.T.O.

OR

Q4) a) Explain the design and operational procedure involved in packed bed reactors with neat sketch. **[9]**

b) What is filtration? Derive the Darcy equation for flow of fluid through uniform constant filter bed. **[8]**

Q5) a) What is the function of impellers in mixed systems? Describe the various types of impellers with neat labeled diagram. **[8]**

b) Explain the types of centrifugal pumps for fluid flowing with neat sketch. **[10]**

OR

Q6) a) Discuss about the various types of positive displacement pumps for fluid flowing. **[10]**

b) Write about NPSH (Net Positive Suction Head) in pumping systems. **[8]**

Q7) a) Write note on particle technology which includes size and shape and derive the expression for irregular shape particle. **[8]**

b) What is screen effectiveness? derive the expression about how screen effectiveness is calculated by applying simple material balance over a screen. **[9]**

OR

Q8) a) What is Rittingers law, Kicks Law? Derive the expression included in energy for size reduction. **[8]**

b) Calculate the operating speed of a ball mill from the following data. **[9]**

Diameter of the ball mill = 800 mm

Diameter of ball = 60 mm

If(a) Operating speed is 55 % less than critical speed

(b) Critical speed is 40 % more than operating speed.

Total No. of Questions : 8]

SEAT No. :

PC-2856

[Total No. of Pages : 2

[6352]-80

S.Y. B.Tech. (Biotechnolgy)

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) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Give dimensionless numbers in case of natural and forced convection. **[10]**

b) Define and explain individual and overall heat transfer coefficient and how it is used? **[8]**

OR

Q2) a) What is convection? Describe types of convection using one example each. **[9]**

b) Draw and explain in detail pool boiling curve with significance of each point in the pool boiling. How is it used in design of equipments? **[9]**

Q3) a) What is Reynold's analogy and j-factor analogy? Give importance of these transfer analogies and their application. **[9]**

b) What is monochromatic emissive power? Write a short note on Plank's distribution law. **[8]**

OR

Q4) a) Write Short note on Plank's Displacement law. **[8]**

b) Write a short note on shape factor. **[9]**

P.T.O.

Q5) a) What is NTU effectiveness method? When is it used? Explain in detail Capacity, NTU and effectiveness. **[9]**

b) Draw a neat sketch and write a short note on double pipe heat exchanger. **[9]**

OR

Q6) a) What is the concept of log mean temperature difference (LMTD)? Derive an expression for co-current flow heat exchanger using LMTD method. **[9]**

b) What is fouling? Give reasons for fouling and expression for fouling factor. How it affects the performance of heat exchanger? **[9]**

Q7) a) What is evaporation?Give detailed classification of evaporators. **[9]**

b) Discuss the terms : **[8]**

i) Evaporator Capacity

ii) Evaporator Economy with its significance,

OR

Q8) a) write a short note on closed / open pan evaporator? State advantages, disadvantages and applications. **[9]**

b) Give comparison between single effect evaporator and multiple effect evaporators. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PC2857

[Total No. of Pages : 2

[6352]-81

S.E. (Biotechnology)

MICROBIOLOGY

(2019 Pattern) (Semester - III) (215464)

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 right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) What is lag and log phase of bacterial growth curve? How to calculate exponential bacterial growth? **[9]**

b) Describe principle, applications, advantages of Standard Plate Count method for enumeration of bacteria. **[9]**

OR

Q2) a) Illustrate Continuous culture method and its applications. **[9]**

b) Write short note on turbidometry. **[9]**

Q3) a) Explain the principle of moist heat sterilization methods with applications. **[9]**

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

i) Concept of MIC and MBC

ii) Drug Resistance

OR

Q4) a) Describe mode of action of Quaternary ammonium compounds for control of microorganisms. **[9]**

b) Define pasteurization. Describe methodology used in pasteurization of food with examples. **[8]**

P.T.O.

Q5) a) Describe interactions of microorganisms in environment with examples. **[10]**

b) Write short notes on role of microorganisms in **[8]**

i) Air

ii) Milk

OR

Q6) a) Explain importance of microorganisms in water and waste water treatment. **[10]**

b) Write note on the soil microbiology. **[8]**

Q7) a) Illustrate Typhoid with respect to causative agent, symptoms, pathogenesis, treatments. **[8]**

b) What is Epidemiology? Why is it important? **[9]**

OR

Q8) a) Describe Influenza with its etiological agent, symptoms, treatments and preventive measures. **[8]**

b) Give preventive measures for **[9]**

i) Tuberculosis

ii) Candidiasis

iii) Cholera

Total No. of Questions : 8]

SEAT No. :

PC-2858

[Total No. of Pages : 3

[6352]-82
S.E. (Chemical Engineering)
INDUSTRIAL CHEMISTRY - II
(2019 Pattern) (Semester - IV) (209347)

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 Primary standard substance and give conditions to be primary substance. **[6]**

b) Define precipitation titration and Describe Fajan's Method for precipitation titration. **[6]**

c) If 250 ml of 0.25 N NaOH solution diluted up to 1000 ml calculate normality of diluted solution. **[6]**

OR

Q2) a) Define complexometric titration, explain the complexometric titration with the help of EDTA method. **[6]**

b) Explain theory of indicators and also explain a difference of 2 pH is required for colour change. **[6]**

c) Calculate Normality of solution if 30 gm of NaCl added in 2500 ml of water. **[6]**

P.T.O.

Q3) a) What is adsorption isotherm? Describe Freundlich Adsorption Isotherm. **[6]**

b) Discuss in details the adsorption mechanism involve in the catalysis reaction. **[6]**

c) Describe the Wacker process of metal coordination compound catalysed reaction. **[5]**

OR

Q4) a) Describe the postulates of BET theory of adsorption and give its equation. **[6]**

b) What is zeolites? Describe the structure and applications of it. **[6]**

c) Explain the process of photolysis of water. **[5]**

Q5) a) Describe various conformations of butane with energy profile diagram. **[6]**

b) Write a note on E & Z isomers with suitable examples of it. **[6]**

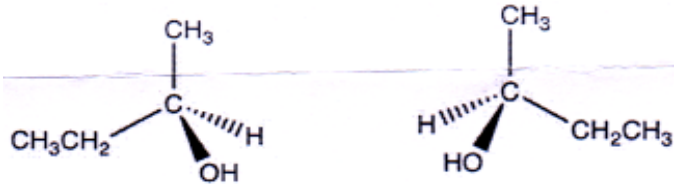
c) Explain the phenomenon of optical isomerism in detail. **[6]**

OR

Q6) a) Explain the terms Enantiomers, Diastereomers with suitable examples. **[6]**

b) Define geometrical isomers and identify E and Z isomers for the following molecules. **[6]**

c) Define Optical isomers and assign R and S configurations for the following molecules. **[6]**



Q7) a) Define enthalpy change and derive equation of enthalpy change. **[6]**

b) Explain the different conditions for spontaneity by using Gibbs free energy. **[6]**

c) Calculate the work performed on system containing 1 mole of substance. The initial and final volumes are 5 litter and 16 litter respectively at temperature of 26°C. **[5]**

OR

Q8) a) Explain the first law of thermodynamics and derive equation for work done in reversible isothermal process. **[6]**

b) State and explain Kirchhoff's law and give its applications. **[6]**

c) Find the change in internal energy of system if 500 Cal of heat is given to the system & system dose 25 Cal of work. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2859

[Total No. of Pages : 2

[6352] - 83
S.E. (Chemical)
Heat Transfer
(2019 Pattern) (Semester-IV) (209348)

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, jf necessary.***

Q1) a) What are the different laws of Radiation? Explain Stefan Boltzman Law? **[8]**

b) Calculate the heat flux emitted due to thermal radiation from a black surface at 5000°C. At what wavelength is the monochromatic emissive power maximum & what is the maximum value? **[10]**

OR

Q2) a) What is Black Body, Explain concept of artificial black body? **[8]**

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 aluminum radiation shield with emissivity 0.03 is placed between them.**[10]**

Q3) a) Explain Pool Boiling Curve in details? **[8]**

b) What is Condensation? Explain classification of Condensation process? **[9]**

OR

P.T.O.

Q4) a) Write a note on Heat transfer to boiling liquids? **[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}Ns/m^2,

Thermal conductivity = 0. .68 W/m.K, Latent heat of condensation=2255kJ/.kg. Saturation temperature of steam=3 73K. **[10]**

Q5) a) What is Heat exchanger? Explain the detail classification of Heat Exchanger? **[10]**

b) A shell & tube heat exchanger is to be provided with tubes of 31mm outer diameter & 27mm inner diameter, 4m long. It is required for heating water from 295° K to 318°K with the help of condensing steam at 393°K on the outside of tubes. Determine the number of tubes required if water flow rate is 10kg/sec. Heat transfer coefficient on steam side & water side are 6000W/m^2 °K & 850 W/m^2 °K respectively. Neglect all other resistances. **[8]**

OR

Q6) a) Explain in detail about Shell and tube heat exchanger? **[10]**

b) What is Fouling factor? Explain? **[8]**

Q7) a) Explain the different factors affecting the evaporation operation. **[7]**

b) A solution containing10% solids is to be concentrated to a level of 50% solids. Steam is availalile at a pressure of 0.20 MPa (saturation temperature of 393K). Feed rate to the evaporator is 30000 kg/hr. The evaporator is working at reduced pressure such that boiling point is 323K. The overall heat transfer coefficient 2.9 kW/(m^2K). Estimate the steam economy and heat transfer surface for feed introduced at 293K

Data Specific heat of feed = 3:98 kJ/(kg-K)

Latent heat of condensation of steam at 0.20 MPa = 2202 kJ/kg

Latent heat of vaporization of water at 323 K=2383 kJ/kg. **[10]**

OR

Q8) a) What is evaporation? Explain multiple effect evaporators? **[10]**

b) An aqueous sodium chloride solution 10 wt% is fed into a single effect evaporator at a rate of 10,000 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 evaporator capacity (Kg/hr) and economy? **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2860

[Total No. of Pages : 3

[6352]-84
S.E. (Chemical Engineering)
PRINCIPLES OF DESIGN
(2019 Pattern) (Semester - IV) (209349) (Paper - I)

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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) a) Explain in detail the design procedure for a Flange Coupling with neat sketch and important design equations. **[10]**

b) Explain Torsion Equation with all its terms and assumptions. Mention how shaft diameter is determined using the Torsion equation for a given power and speed of rotation (rpm) service. **[8]**

OR

Q2) a) Design the rectangular sunk key for a shaft of 40 mm diameter. The shearing and crushing stresses for the key material are 32 MPa and 60 MPa respectively. Especially determine the length of the key to withstand the shearing and crushing stresses. **[8]**

b) A hollow shaft is required to transmit 600 kW at 110 rpm the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 metres not to exceed 1.4 degrees. Find the external diameter of the shaft considering : **[10]**

i) the shear strength of the shaft and

ii) the stiffness of the shaft

The internal diameter to the external diameter ratio of the hollow shaft is 3/8. Take modulus of rigidity as 84 GPa. -

P.T.O.

Q3) a) Explain the types of welded joints with neat cross-sectional figures. **[7]**

b) Design a rubber belt to drive a dynamo generating 20 kW at 2250 r.p.m. and fitted with a pulley 200 mm diameter. Assume dynamo efficiency to be 85% (actual power transmitted is 85% of theoretical power). **[10]**

Allowable stress for belt = 2.1 MPa

Density of rubber = 1000 kg / m^3

Angle of contact for dynamo pulley = 165° (2.88 rad.)

Coefficient of friction between belt and pulley = 0.3

Belt thickness = 10 mm

OR

Q4) a) Mention the phenomenon of Slip and Creep in belt drives with equations. State the disadvantages of these phenomenon. **[7]**

b) Explain the types of riveted joint with figures and mention the three types of riveted joint failures with expressions. **[10]**

Q5) a) A cylindrical shell of a vessel has an inside diameter 2 m and is subjected to an internal pressure of 5 kg/cm^2. Calculate the required thickness and the corresponding deflection. Allowable tensile stress of the material is 1020 kg/cm^2 and modulus of elasticity of material E = 2.09 × 106 kg/cm^2. **[8]**

b) A pressure vessel with cylindrical shell of diameter 1.4 m is to be designed to withstand a working pressure of 400 kPa. The vessel is closed with standard torispherical head closures at both ends with crown radius of 1 m and knuckle radius of 8 mm. The material of construction of the shell and the head closures is same and has a permissible stress of 100 MPa. Calculate the required thickness of the cylindrical shell and the torispherical closures. Weld joint efficiency is 85% and corrosion allowance is 2 mm. **[10]**

OR

Q6) a) Explain the types of standard heads or closures for cylindrical pressure vessels with neat figures and design equations. **[12]**

b) Determine the thickness of a spherical pressure vessel of diameter 10 rn for storage of ammonia at a pressure of 10 bar. The permissible stress of the material of construction is 1000 kg/cm^2. Take corrosion allowance of 2mm and the weld joint efficiency of 90%. **[6]**

Q7) a) A vessel is to be designed to withstand internal pressure of 150 MN/m^2. An internal diameter of 300 mm is specified and steel having a yield point of 450 MN/m^2 has been selected. Calculate the wall thickness according to the Lame's equation for ductile material and Birnie's equation based on the maximum strain theory of failure. Consider a factor of safety of 1.5 and the Poisson's ratio of 0.3 for the steel material. **[12]**

b) Mention the important differences between Thin-walled Pressure Vessels and Thick-walled High Pressure Vessels. **[5]**

OR

Q8) a) Discuss the design procedure of high pressure vessels according to various theories of failure in detail. **[10]**

b) A high pressure vessel is to be designed to withstand internal pressure of 175 MN/m^2. The internal diameter of the vessel is 250 mm and the permissible stress of the material of construction is 400 MN/m^2. Determine the vessel wall thickness according to the Birnie's equation. Consider the Poisson's ratio of 0.25 for the material. **[7]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PC2861

[Total No. of Pages :2

[6352]-85

S.E. (Chemical)

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) State end uses for Ammonia worldwide. **[4]**

b) Explain in brief two major engineering problems of Montecatini intermediate pressure process. **[6]**

c) Explain stamicarbon urea stripping process with a simplified flow chart. **[8]**

OR

Q2) a) Describe in brief market and sales for urea in India and in manufacture of industrial chemicals. **[6]**

b) Describe in brief consumption & end uses of Ammonium Nitrate. **[5]**

c) Draw a neat process flow diagram of Montecatini intermediate pressure process for manufacturing of Nitric Acid. **[7]**

Q3) a) Explain in brief about surfactants. **[5]**

b) Describe in brief manufacturing of soaps by continuous hydrolysis & saponification process with a neat flow diagram. **[10]**

c) What is the use of bio-degradable detergent? **[2]**

OR

Q4) a) Explain in brief methods for production of Detergents and unit operations & unit processes involved. **[8]**

b) Explain in brief Alkyl-Aryl sulfonates with chemical reactions. **[6]**

c) Explain batch saponification process. **[3]**

P.T.O.

Q5) a) Differentiate between thermosetting & thermoplastic resins. **[6]**

b) Draw a process flow diagram for production of polyvinyl resin. **[6]**

c) Describe polyurethanes. **[5]**

OR

Q6) a) Describe in brief low pressure Ziegler process with a neat flow diagram. **[10]**

b) Draw a neat process flow diagram of manufacturing of vinyl polymer by emulsion polymerization. **[7]**

Q7) a) Describe in brief unit operations and unit processes involved in refinery processes of crude oil. **[8]**

b) Describe high pressure Pt catalyst reforming process. **[5]**

c) Explain moving bed type catalytic cracking process. **[5]**

OR

Q8) a) Explain in brief production of olefin by polymerization process using phosphoric acid on solid carrier as catalyst. Draw a neat process flow diagram. **[10]**

b) Draw a neat flow diagram of Butadiene - Styrene (SBR) rubber process. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-2862

[Total No. of Pages :2

[6352]-86

S.E. (Chemical)

MACHANICAL OPERATIONS

(2019 Pattern) (Semester - IV) (209351)

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) ***Figures to the right side indicate full marks.***

Q1) Derive the equation for minimum fluidization velocity and describe the equation for case of very small particles. **[18]**

OR

Q2) a) Explain Fluidized - bed Catalytic cracking. **[9]**

b) Derive the relationship for equal setting velocities. **[9]**

Q3) a) Write notes on **[9]**

i) Helical blade mixer

ii) Twin blade conical mixer

iii) Banbury Mixer

b) What are different flow pattern in mixing and how are they obtained. **[8]**

OR

Q4) Explain and derive the necessary equations for **[17]**

a) Mixing Index

b) degree of mixing

P.T.O.

Q5) Explain with a neat sketch Principle, construction and working **[18]**

a) Semi-continuous centrifuge

b) Batch underdriven centrifuge

OR

Q6) a) Comparisons of Pressure Filter and Vacuum filter. **[9]**

b) Derive the following for filtration at constant pressure difference. **[9]**

$$\frac{t - t_1}{V - V_1} = \frac{r\mu\upsilon}{2A^2\,(-\Delta p)}(V - V_1 + \frac{r\mu\upsilon V_1}{A^2(-\Delta P)}$$

Q7) a) What are chain and fight conveyors? Explain any two types of chain conveyors. **[9]**

b) Write an explanatory note on Auger Conveyors. **[8]**

OR

Q8) a) Explain with neat sketch pneumatic type of conveyors. **[8]**

b) Explain with a neat sketch **[9]**

i) Belt Conveyors

ii) Different Belt drive arrangement

Total No. of Questions : 8]

SEAT No. :

PC-2863

[Total No. of Pages : 2

[6352]-87

S.E. (Chemical Engineering)

INDUSTRIAL CHEMISTRY - I

(2019 Pattern) (Semester - III) (209341)

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) What is lambert's Law? Describe instrumentation of UV-Visible Spectroscopy. **[6]**

b) Explain in detail the principle, technique and applications of GC. **[6]**

c) What is HPLC? State its features due to which it is used commonly. **[6]**

OR

Q2) a) What are the different electronic transitions possible in molecule on absorption of UV radiation. **[6]**

b) Define Chromatography and give different Application for TLC. **[6]**

c) What is gas chromatography? Give operation of gas chromatography. **[6]**

Q3) a) Derive equation for determination of molar mass of solute by depression in freezing point. **[6]**

b) Define osmotic pressure and give it's applications. **[6]**

c) An aqueous solution of glucose has an osmotic pressure of 4.25 atm at a temperature of 298 K. How many moles of glucose were dissolved per litter of solution? Given: R = 0.0821 Lit.atm.degree^{-1}Mol^{-1}. **[5]**

OR

P.T.O.

Q4) a) Derive thermodynamic equation of depression in freezing point of solution. **[6]**

b) Slate and explain Henry's law & give its applications. **[6]**

c) 1.5 gm of sulphur in 50 gm naphthalene (M.P. = 80.1°C) had freezing point of 0.64 °C. Latent heat of fusion of naphthalene is 19.4 KJ/Mole. Find the molar mass of sulphur molecule. **[5]**

Q5) a) Give mechanism of Sulphonation of benzene. **[6]**

b) Write a note on Saytzeff and Hofmann products in the elimination reaction. **[6]**

c) Write a note on Hofmann Rearrangement. **[6]**

OR

Q6) a) Discuss mechanism of SN^1 and SN^2 reactions of Alkyl halides. **[6]**

b) Explain why - NO_2 Group is deactivating and m-directing. **[6]**

c) Give mechanism of Reformatsky rearrangement. **[6]**

Q7) a) Discuss synthesis and chemical properties of Furan. **[6]**

b) Define dyes and describe steps involved in the synthesis of methyl orange. **[6]**

c) Give steps involved in the synthesis of Crystal Violet. **[5]**

OR

Q8) a) Give Applications for heterocyclic Compounds. **[6]**

b) Define dyes and give steps involved in the synthesis of Methyl Phenolphthalein. **[6]**

c) Describe steps involved in the synthesis of Alizarin. **[5]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. : ____

PC-2864

[Total No. of Pages : 3

[6352]-88
S.E. (Chemical)
FLUID MECHANICS
(2019 Pattern) (Semester - III) (209342)

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

Instructions to the candidates :

1) ***Neat diagram must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Use of calculator is allowed.***

Q1) a) Derive the expression for continuity equation in one dimensional flow? **[6]**

b) What is Orifice meter? Derive an expression for the discharge through a Orifice meter. **[6]**

c) An oil of Specific gravity 0.8 is flowing through a venture meter having inlet diameter 20 cm and throat diameter 10 cm. The oil mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venture meter. Take C_d=0.98. **[6]**

OR

Q2) a) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it? **[6]**

b) State Bernoulli's theorem. Mention the assumption made. How it is modified while applying in practice? List out its engineering application. **[6]**

c) The water is flowing through a tapper pipe of length 100m having diameters 600mm at the upper end and 300mm at the lower end, at the rate of 50 liters/sec.The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19. 62N/cm^2. **[6]**

P.T.O.

Q3) a) Derive "Darcy Weisbach" equation to find head loss due to friction? **[6]**

b) Derive Hagen-Poiseuille Equation, highlighting the assumptions made.**[6]**

c) A crude oil of viscosity 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]**

OR

Q4) a) Derive the relation between the maximum and average velocities along with their position in the cross section of, circular horizontal pipe. **[6]**

b) Derive an expression for loss of head due to sudden enlargement. **[6]**

c) A fluid of viscosity 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 a) Pressure gradient b) Average velocity c) Reynolds no. of the flow. **[6]**

Q5) 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]**

OR

Q6) a) What do you mean by separation of boundary layer? What is the effect of pressure gradient on boundary layer separation? **[5]**

b) State Buckingham's π-theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis? **[6]**

c) The pressure difference 'Δp' in a pipe of diameter 'D' and length 'L' due to viscous flow depends on the velocity 'V' ,viscosity 'μ' and density 'ρ'. Using Buckingham's π-theorem obtain an expression for ΔP. **[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) Why do different control valves have different characteristics? **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-2865

[Total No. of Pages : 2

[6352]-89
S.E. (Chemical)
ENGINEERING MATERIALS
(2019 Pattern) (Semester - III) (209343)

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) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw Iron-Iron carbide equilibrium diagram and explain different reaction involved. **[10]**

b) Explain various phases observed in Iron-Iron carbide equilibrium diagram. **[6]**

OR

Q2) a) Define polymers. Write down the classification of polymers with example. **[10]**

b) Write note on Addition and Condensation polymerization. **[6]**

Q3) a) Define corrosion. Write down its types. **[10]**

b) Write down the various methods used for prevention of corrosion. **[6]**

OR

Q4) a) Explain the various factors affecting corrosion. **[8]**

b) Explain rate method for control of corrosion. **[8]**

P.T.O.

Q5) a) Define Nanotechnology and write down its classification in detail. **[9]**

b) Expiain Sol-Gei method, for synthesis of nanomaterials. **[9]**

OR

Q6) a) Explain Chemical Vapor deposition method for synthesis of nanomaterials. **[9]**

b) Write down various applications of Nanomaterials in Chemical industries. **[9]**

Q7) Explain principle and working of Scanning Electron Microscope (SEM). **[18]**

OR

Q8) Explain principle and working of Scanning Tunneling Microscopy (STM). **[18]**

Total No. of Questions : 8]

SEAT No. :

PC-2866

[Total No. of Pages : 3

[6352]-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 diagrams 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) A coke is known to contain 90% carbon and 10% non-combustible ash (by weight) : (i) find the moles of oxygen theoretically required to burn 100 kg of coke completely? (ii) If 50 percent excess air is supplied, calculate the analysis of Gases at the end of combustion. **[8]**

b) Ethylene Oxide is produce from oxidation of ethylene. 100 kmol of ethylene feed to reactor. The product stream contains 80 kmol ethylene oxide and. 10 kmol of CO_2. Calculate percentage conversion of ethylene and percentage yield of ethylene oxide. **[8]**

OR

Q2) a) Gaseous benzene reacts with hydrogen in the presence of Ni catalyst as per the reaction:

C_6H_6 (g) + $3H_2$ (g) $\rightarrow$ C_6H_{12} (g)

30% excess hydrogen is used above that required by the above reaction. Conversion is 50% and yield is 90%. Calculate the requirement of the benzene and hydrogen gas for 100 moles of cyclohexane produced. **[8]**

b) A gas analyzing CO_2 = 5.5 %, CO = 25 %, H_2 = 14 %, CH_4 = 0.5 % and N_2 = 55 % (by volume) is burnt in furnace with air which is 10 % excess over that required to burn CO, H_2, CH_4 completely. Give the analysis of the product gas mixture, assuming all reactions proceed to completion.**[8]**

P.T.O.

Q3) a) A stream of carbon dioxide flowing at a rate of 100 kmol/min is heated from 298 K to 383 K. Calculate the heat that must be transferred using C_p data : **[10]**

$C_p^0 = a + bT + cT^2 + dT^3$, kJ/kmol.K

Gas	a	$b \times 10^3$	$c \times 10^6$	$d \times 10^9$
CO_2	21.3655	64.2841	–41.0506	9.7999

b) Calculate the heat of formation of ethane gas at 298.15 K from its elements using Hess's law : **[8]**

Data :

Heat of formation of CO_2 (g) = – 393.51 kJ/mol

Heat of formation of H_2O (1) = - 285.83 kJ/mol

Heat of combustion of ethane gas at 298.15 K = -1560.69 kJ/mol

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. **[10]**

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) Calculate the heat of reaction at 298.15 K of the following reaction: **[8]**

C_6H_6 (g) $\rightarrow$ C_2H_4 (g) + H_2 (g)

Data

Component	**ΔH_c^0 kJ/mol**
C_2H_6 (g)	–1560.69
C_2H_2 (g)	–1411.2
H_2 (g)	–285.83

Q5) a) Define wet bulb temperature, dry bulb temperature, humid volume and humid heat. **[8]**

b) SO_2 is absorbed in water using a packed column operated at constant T and P. The gases entering the tower contain 14.8% SO_2 by volume. Water is distributed from the top of the column at the rate of 16.5 l/s. The volume of the gas handled at 101.325 kPa at 303 K is 1425 m^3/hr. The gases leaving the tower contain by volume. Find the % SO_2 in the outlet water (by weight). **[10]**

OR

Q6) An absorption tower, packed with Telleratte packings, is used to absorb carbon dioxide in an aqueous monoethanol amine solution (MEA). The volumetric flow rate of incoming dry gas mixture is 1000 m^3/h at 318 K and 101.3 kPa a. The CO_2 content of the gas is 10.4 mole%, while the outgoing gas mixture contains 4.5 mole% CO_2. A 3.2 M monoethanol amine solution is introduced at the top of the tower at the rate of 0.625 L/s. Dissolved CO_2 concentration of the entering solution is 0.166 kmol/kmol of MEA. Find the concentration of dissolved CO_2 in the solution leaving the tower.

Data: Specific volume of the gas at 318 K and 101.3 kPa a, V = 26.107 m^3/ kmol. **[18]**

Q7) a) Explain the following : **[6]**

i) Classification of fuels

ii) Calorific values of fuels

b) Fuel gas has the following composition : CO = 27%, CO_2 = 4%, O_2 = 0.5% and N_2 = 68.5% by volume. Find the net theoretical oxygen required. Find the analysis of flue gas if the fuel gas is burned with 80% excess air than the net requirement. **[6]**

c) Define adiabatic flame temperature, HCV and NCV. Is the actual adiabatic flame temperature different than that calculated theoretically? **[6]**

OR

Q8) Calculate the gross and net heating values of the natural gas at 298.15 K which has the following molar composition : **[18]**

CH_4 = 74.4%, C_2H_6 = 8.4%, C_3H_8 = 7.4%, iso-C_4H_{10} = 1.7%, n-C_4H_{10} = 2.0%, iso-C_5H_{12} = 0.5%, n-C_5H_{12} = 0.4%, CO_2 = 0.9% and N_2 = 4.3%.

Data :

Component	GCV kJ/mol	NCV kJ/mol
CH_4	890.65	802.62
C_2H_6	1560.69	1428.64
C_3H_8	2219.17	2043.11
iso-C_4H_{10}	2868.20	2648.12
n-C_4H_{10}	2877.40	2657.32
iso-C_5H_{12}	3528.83	3264.73
n-C_5H_{12}	3535.77	3271.67

Specific volume of the natural gas at 298.15 K and 101.3 kPa = 24.465 m^3/kmol.

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2867

[Total No. of Pages : 3

[6352] - 91

S.E. (Production & Industrial Engineering/Production S.W)

ELECTRICAL AND ELECTRONICS ENGINEERING

(2019 Pattern) (Semester - IV) (203050)

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 any two applications for each of the following: **[4]**

i) SCR

ii) MOSFET

b) Differentiate between DIAC and TRIAC on the basis of the following:**[6]**

i) Symbol of representation

ii) Construction features

iii) V-I characteristics

c) Explain the constructional details of IGBT and draw the following curves of IGBT: **[8]**

i) Transfer Characteristics

ii) Output Characteristics

OR

P.T.O.

Q2) a) State advantages and disadvantages of GTO. **[4]**

b) State the methods to turn on SCR and explain any one of them in details. **[6]**

c) Explain the constructional details of MOSFET and draw the following curves of MOSFET: **[8]**

i) Transfer Characteristics

ii) Output Characteristics

Q3) a) List the non-linear applications of an operational amplifier (OPAMP). **[3]**

b) What is a Voltage Controlled Oscillator (VCO)? Write the applications of 566 VCO. **[6]**

c) Draw and explain the functional diagram of IC 555. **[8]**

OR

Q4) a) State the features of an IC555 timer. **[3]**

b) Explain any two applications of an IC voltage regulator. **[6]**

c) Draw the block diagram of a typical D to A Converter (DAC). Write the advantages and disadvantages of R-2R ladder DAC. **[8]**

Q5) a) What is a Programmable Logic Controller (PLC)? Write its any four applications. **[4]**

b) Distinguish between a PLC and a conventional control mechanism. **[6]**

c) What is ladder programming in PLC? Draw and explain the typical ladder diagram for a home lighting system with the help of suitable assumptions. **[8]**

OR

Q6) a) Write merits and demerits of a PLC based system. **[4]**

b) Discuss the role of a PLC in modern day automation. **[6]**

c) Draw the structure of a Programmable Logic Controller (PLC) with the help of schematic and elaborate the function of modules in it. **[8]**

Q7) a) What is an embedded system? State any two applications of it. **[3]**

b) Write any six important features of ATmega328P microcontroller. **[6]**

c) What is a data acquisition system? Draw the block diagram showing a typical data acquisition system and explain the function of each block. **[8]**

OR

Q8) a) Write the structure of an Arduino Program. **[3]**

b) Differentiate between a microprocessor and a microcontroller; mentioning any six points. **[6]**

c) Explain the following functions used in programming of ATmega 328P based Arduino Board. **[8]**

i) pinMode()

ii) digitalWrite()

iii) digitalRead()

iv) delay()

Total No. of Questions : 8]

SEAT No. : [ ]

PC-2868

[Total No. of Pages : 4

[6352]-92

S.E. (Production & Industrial Engineering/Production S.W)

THEORY OF MACHINES

(2019 Pattern) (Semester - IV) (211091)

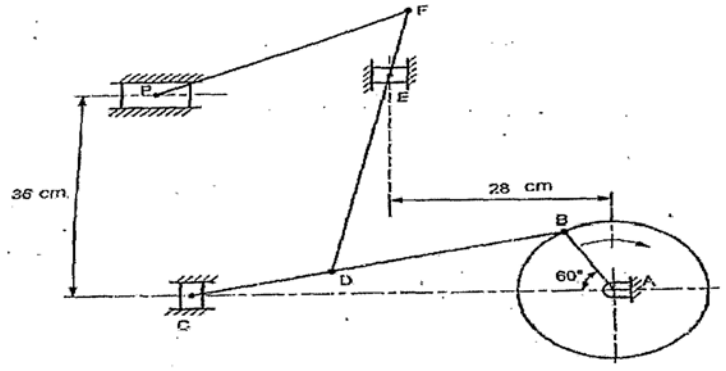
Time : 2½ Hours] ***[Max. Marks : 70***

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 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= 36cm, EF=12 cm and FP = 36 cm. Find velocity of C,P and E. Use relative velocity method. **[12]**

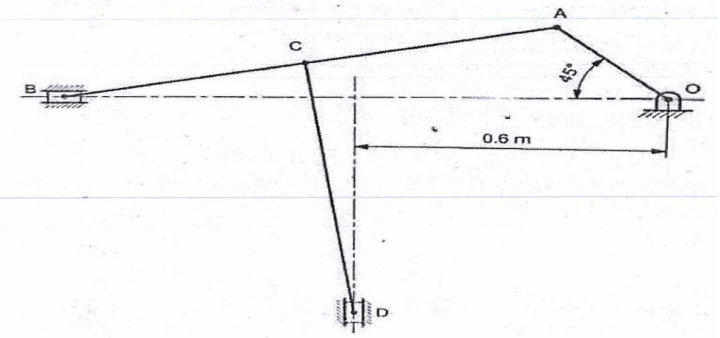


OR

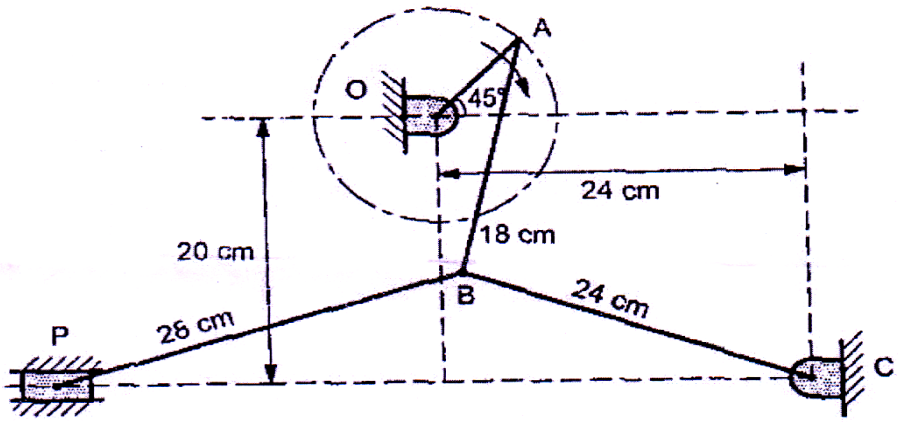
P.T.O.

Q2) a) Explain the properties of instantaneous centre of rotation. **[6]**

b) Crank OA of a compound slider crank mechanism as shown in figure rotate at 60 rpm clockwise and gives motion to sliding blocks B and D. The dimensions of various links are OA = 300 mm, AB = 1000 mm, AC = BC and CD = 800 mm. Determine i) Angular velocity of link AB and CD ii) Velocity of block B and D. 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=28cm **[17]**



OR

Q4) a) The lengths of crank and connecting rod of a vertical reciprocating engine are 300 mm and 1.5 m respectively. The crank is rotating at 200 rpm clockwise. Find analytically i) velocity and acceleration of piston ii) angular acceleration of connecting rod when crank has turn through 40° from top dead centre and piston is moving downwards. **[8]**

b) In a reciprocating engine, crank length is 100 cm and connecting rod is 350 mm. Angular velocity of crank is 60 rad/sec. Crank is at 30° from IDC. Using Klein's construction method determine: i) velocity and acceleration of piston ii) Angular velocity and angular acceleration of connecting rod. **[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 x 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) What is slip in a belt drive, and how does it impact the efficiency of power transmission? Discuss the factors that contribute to slip. **[8]**

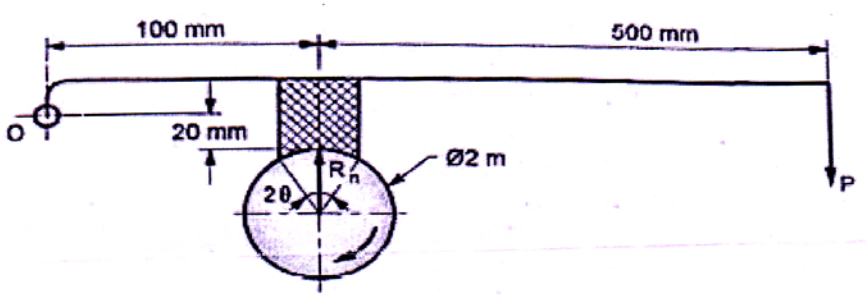
b) Discuss the key properties required in materials used for making belts. How do these properties contribute to the effectiveness of the belt drive system? **[10]**

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) Explain in detail the self energize and self-locking brake? **[8]**

b) Explain construction and working of Epicyclic-Train Dynamometer with the help of neat sketch. **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PC-2869

[Total No. of Pages : 3

[6352]-93

S.E. (Production / Production & Industrial Engg.) (Sandwich)

DESIGN OF MACHINE ELEMENTS

(2019 Pattern) (Semester - IV) (211092)

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

Instructions to the candidates :

1) ***Assume suitable data, if necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable electronic pocket calculator is allowed.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Student will solve/write the Answers to any four questions in single answer book only (Note: Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8).***

Q1) a) Derive the torque equation for the square threaded screw to lower the load. **[6]**

b) A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of the screw collar are 50 mm 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 5.8 N/mm^2, find: (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. **[8]**

c) Explain importance of Helix angle on efficiency. **[4]**

OR

Q2) a) Explain types of stresses are induced in the power screw. **[6]**

b) A double start screw is used to raise load of 5 kN, the horizontal diameter is 60 mm and pitch is 9 mm. The threads are of ACME type ($2\theta = 29°$) and coefficient of friction is 0.15. Neglect collar friction, Calculate: (i) Torque required to raise the load, (ii) Torque required to lower the load, (iii) Efficiency of screw and (iv) Torsional shear stress in the screw. **[8]**

c) Define power screw and explain with figures the types of power screw threads. **[4]**

P.T.O.

Q3) a) Explain the terms 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 1force 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 81370 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,

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 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN / 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 gears: (i) Pressure Angle and (ii) Module. **[4]**

b) A pair of straight teeth spur gears is to transmit 20 kW when the pinion rotates at 300 r.p.m. The velocity ratio is 1: 3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. Determine: (i) Module; (ii) Face width; and (iii) Pitch circle diameters of both the pinion and the gear from the standpoint of strength only, taking into consideration the effect of the dynamic loading. The tooth form factory can be taken as **[8]**

$$y = 0.154 - \frac{0.912}{No.of\ teeth}$$

And velocity factor C_v as $C_V = \frac{3}{3+v}$, where v is expressed in m/s.

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 30 kN. 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 75 mm. Calculate dynamic load capacity. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC-2870

[Total No. of Pages : 2

[6352]-94
S.E. (Production & Industrial Engineering)
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. 7or Q.8***
2) ***Assume Suitable data if necessary***
3) ***Figures to the right indicate full marks***
4) ***Draw neat figures whenever necessary***
5) ***Use of scientific calculators is allowed.***
6) ***Use of cell phone is prohibited in the examination hall***

Q1) a) Which are the important properties desired from electrical materials? **[6]**

b) Which are the key properties of nanomaterials? **[6]**

c) How are polymers classified on the basis of their structure? **[6]**

OR

Q2) a) Which are the common magnetic materials? **[6]**

b) What are the limitations of nanomaterials? **[6]**

c) What is vulcanization? **[6]**

Q3) a) Where are semiconductors used? **[6]**

b) Give one example each of zero-, one- and two-dimensional nanomaterials? **[6]**

c) What do you mean by Engineering plastics? Give examples. **[5]**

OR

Q4) a) How are magnetic materials classified based on relative permeability? **[6]**

b) What do you mean by carbon nanotubes? **[6]**

c) What is a biodegradable polymer? Give examples. **[5]**

P.T.O.

Q5) a) What do you mean by calandering of elastomers? **[9]**

b) Write note on: Mixing mechanisms of rubber/ elastomers. **[8]**

OR

Q6) a) Which are the manufacturing techniques used for processing of rubbers? **[9]**

b) Write note on: Extrusion of Rubber or elastomer. **[8]**

Q7) a) What do you understand by "Ceramics"? Distinguish between "Traditional" and "Advanced" ceramics. **[9]**

b) Explain with sketch slip casting for Ceramic processing. **[9]**

OR

Q8) a) Which are the different types of Ceramic? Where are advanced ceramics used? **[9]**

b) How is processing of ceramics different than for metals? Explain with sketch tape casting for ceramics. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-2871

[Total No. of Pages : 2

[6352]-95

S.E. (Producation 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) ***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) Discuss various factors to select any business location. **[6]**

b) What is break even analysis? Explains it. **[6]**

c) How to achieve business growth? State various stages. **[5]**

OR

Q2) a) Discuss skills for becoming good entherprener. **[6]**

b) Which are the various sources of finance? Classify those sources. **[6]**

c) Describe process IPR. Why it is essential. **[5]**

Q3) a) Elaborate on various merit evaluation techniques. **[6]**

b) Explain concept of wages in detail. **[6]**

c) Write a short note on productivity improvement. **[6]**

OR

Q4) a) Discuss role of industrial engineer in manufacturing industry. **[6]**

b) State procedure for work measurement in manufacturing industry. **[6]**

c) How to calculate productivity. State its process. **[6]**

P.T.O.

Q5) a) Why study of motion economy is essential? **[6]**

b) How to use Multiple Activity Chart? Explain it with suitable example. **[6]**

c) Write a short note on MOST. **[5]**

OR

Q6) a) Why Chronocylegraph is required. How to use it. **[6]**

b) Brief on "5W and 1H" **[6]**

c) State assembly procedure for nut-bolt using any of method study. **[5]**

Q7) a) Elaborate two handed chart in detail. **[6]**

b) How to analyze performance rating. **[6]**

c) State procedure for PMTS. **[6]**

OR

Q8) a) Explain concept of work sampling. **[6]**

b) Classify various types of allowances. **[6]**

c) Write a short note on WFS. **[6]**

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Total No. of Questions : 9]

SEAT No. :

PC-2872

[Total No. of Pages : 5

[6352]-96

S.E. (Production & Industrial Engineering/ (Production/Production S.W/R.A) 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) **Write the correct option for the following multiple choice questions :**

a) If $\phi = x^2 + y^2 + z^2$ then $\nabla\phi$ at (1, 4, –1) is **[2]**

i) $\bar{i} + 16\bar{j} + \bar{k}$ ii) $2\bar{i} + 8\bar{j} - 2\bar{k}$

iii) $2\bar{i} + 8\bar{j} + 2\bar{k}$ iv) $\frac{\bar{i}}{3} + \frac{64}{3}\bar{j} - \frac{\bar{k}}{3}$

b) To solve one - dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ with conditions $u(0, t) = 0$, $u(l, t) = 0$, $u(x, 0) = f(x)$ and $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$ for $0 \le x \le l$, the most general solution $u(x, t)$ is **[2]**

i) $(C_1 \cos mx + C_2 \sin mx)\ (C_3 \operatorname{cosc} mt + C_4 \operatorname{sinc} mt)$

ii) $(C_1 \cos mx + C_2 \sin mx)\ e^{-m^2c^2t}$

iii) $(C_1 \cos mx + C_2 \sin mx)\ (C_3 t + C_4)$

iv) $(C_1 e^{mx} + C_2 e^{-mx})\ (C_3 \cos mt + C_4 \sin mt)$

P.T.O.

c) If the two regression coefficient are $\frac{-8}{15}$ and $\frac{-5}{6}$ then the correlation coefficient is **[2]**

i) 0.5 ii) –1.5

iii) –0.667 iv) 0.667

d) X is normally distributed. The mean of X is 15 and standard deviation 3. Given that for Z = 1, A = 0.3413, $p(X \geq 12)$ is given by **[2]**

i) 0.6587 ii) 0.8413

iii) 0.9413 iv) 0.7083

e) Range of coefficient of correlation *r* is **[1]**

i) $-\infty < \frac{1}{r} < \infty$ ii) $-\infty < r < \infty$

iii) $-1 \leq r \leq 1$ iv) $0 \leq r \leq 1$

f) $\nabla f(r)$ is equal to **[1]**

i) $\frac{f'(r)}{r}\bar{r}$ ii) $\frac{r}{f(r)}\bar{r}$

iii) $f'(r)\bar{r}$ iv) $\frac{f(r)}{r}\bar{r}$

Q2) a) Fit a straight line of the form $y = ax + b$ to the following data by the least square method. **[5]**

x	0	6	8	10	14	16	18	20
y	3	12	15	18	24	27	30	33

b) The first four moments of a distribution about the value 4 of the variables are –1.5, 17, –30 & 108. Find the moments about mean, B_1 & B_2. **[5]**

c) Find the regression equation of *y* on *x* for a birariate data with following details $n = 25, \sum_{i=1}^{n} x_i = 75, \sum_{i=1}^{n} y_i = 100, \sum_{i=1}^{n} x_i^2 = 250, \sum_{i=1}^{n} y_i^2 = 500, \sum_{i=1}^{n} x_i y_i = 325$ **[5]**

OR

Q3) 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 the values 5 are 2, 20, 40, 50. Obtain the first four central moments, coefficient of skewness & 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]**

Q4) a) Two cards are drawn from a well shuffled pack of 52 playing cards. Find the probability that they are both Jacks if **[5]**

i) the first card drawn is replaced

ii) the first card drawn is not replaced.

b) The mean and variance of a binomial distribution are 4 and 2 respectively. Find $P(r \leq 2)$. **[5]**

c) A fair coin is tossed 64 times. Using normal distribution with mean 32 and standard deviation 4, find the probability of getting **[5]**

i) number of heads between 28 to 40

ii) number of heads less than 28

[Given : A(z = 1) = 0.3413, A(Z = 2) = 0.4772]

OR

Q5) a) A series of 5 one-day matches is to be played between India and Srilanka. Assuming that the probability of India's win in each match as 0.6 and the result of all 5 matches is independent, find the probability that India wins the series. **[5]**

b) The number of breakdowns of a computer in a week follows Poisson distribution with Z = np = 0.2. what is the probability that the computer will operate **[5]**

i) with no breakdown

ii) at most one breakdown

c) A bank utilizes 4 teller windows to render fast service to the customers. On a particular day, 800 customers were observed. They were given service at the different windows as follows : **[5]**

Window Number	1	2	3	4
No. of customers	150	250	170	230

Test whether the customers are uniformly distributed over the windows.

[Given : $\chi^2_{3,0.05} = 7.815$]

Q6) a) Find the direction derivative of $\phi = xy^2 + yz^3$ at (1, –1, 1) along the direction normal to the surface $x^2 + y^2 + z^2 = 9$ at (1, 2, 2) **[5]**

b) If the vector field

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

is irrotational. Find a, b, c and determin ϕ such that $\bar{F} = \nabla\phi$ **[5]**

c) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ for $\bar{F} = (2y + 3)\bar{i} + xz\bar{j} + (yz - x)\bar{k}$ along the $x = 2t^2, y = t,$ $z = t^3$ from $t = 0$ to $t = 1$ **[5]**

OR

Q7) a) Find the Direction derivative of $\phi = e^{2x}\cos yz$ at (0, 0, 0) in the direction tangent to the curve $x = a\sin t, y = a\cos t, z =$ at at $t = \pi/4$. **[5]**

b) Show that [any one] **[5]**

i) $$\nabla^2\left(\frac{1}{r}\log r\right) = -1/r^3$$

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

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

Q8) a) Solve $\frac{\partial u}{\partial t} = C^2\frac{\partial^2 u}{\partial x^2}$ if **[8]**

i) u is finite for all t

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

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

iv) $u(x, 0) = u_0$ for $0 \le x \le l$, where l is the length of the bar.

b) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y(x,0) = y_0 \frac{\sin \pi x}{l}$. If it is released from rest from this position, find the displacement y at any distance x from one end and at any time t. **[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) $u(x, \infty) = 0$

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

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

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

b) Using Fourier sine transform, solve the equation

$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ $0 < x < \infty$, $t > 0$

Subject to the following conditions : **[7]**

i) $u(0, t) = 0$ $t > 0$

ii) $u(x,0) = \begin{cases} 1, & 0 < x < 1 \\ 0, & x > 1 \end{cases}$

iii) $u(x, t)$ is bounded

Total No. of Questions : 8]

SEAT No. : ____

PC-2873

[Total No. of Pages : 2

[6352]-97

S.E. (P.E&I.E/Production S.W)

HEAT AND FLUID ENGINEERING

(2019 Pattern) (Semester - III) (211081)

Time : 2½ Hour] ***[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 are different types of energy losses of fluid? And explain equation's related to it. **[9]**

b) Find the head lost due to friction in a pipe of diameter 300mm and length of 50m through which water is flowing at a velocity of 3m/s. using Darcay formula (Take kinematic viscosity of water = 0.01 stroke) **[8]**

OR

Q2) a) Discuss working of reciprocating pump. **[9]**

b) An oil of specific gravity 0.7 is flowing a pipe of diameter 300mm at the rate of 500 liters/second. Find the head lost due to friction and power required to maintain the flow for a length of 1000 m. Take kinematic viscosity of water = 0.29 strokes. **[8]**

Q3) a) Explain with sketch Cochran boiler. **[9]**

b) What do you understand from proximate and ultimate analysis of fuel? **[9]**

OR

Q4) a) What is necessity of boiler mounting and boiler accessories? **[9]**

b) Explain boiler performance, boiler efficiency, equivalent of evaporation and energy balance sheet of boiler. **[9]**

P.T.O.

Q5) a) Discuss application of conduction, convention and radiation in manufacturing. **[9]**

b) Explain with sketch vapour compression refrigeration system. **[8]**

OR

Q6) a) Discuss unit and industrial air conditioning systems. **[9]**

b) Explain the followings terms related to refrigeration. **[8]**

i) Capacity of refrigeration

ii) Coefficient of performance of a refrigerator.

Q7) a) What is single stage and multistage compression? **[9]**

b) The following results refer to a test on a petrol engine. **[9]**

Indicated power = 30kw, Brake power = 26kw, Engine speed = 1000rpm, Fuel per brake power hr. = 0.35kg, Calorific Value of fuel used = 43,900kJ/kg.

Calculate;

i) Indicated thermal efficiency.

ii) Brake thermal efficiency &

iii) Mechanical efficiency.

OR

Q8) a) Explain any one systems for internal combustion engine. **[9]**

b) A single stage, single acting air compressor delivers air af 5 bars. The suction temperature is 20°c & suction pressure is 1 bar. Volume of air entering the compressor is $3m^3$/minute, Index of compression is 1.2, Calculate isothermal efficiency &power required to drive the compressor. Neglect clearance volume. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-2874

[Total No. of Pages : 3

[6352]-98
S.E. (P.E &I.E./Production S.W/RA)
STRENGTH OF MATHEMATICS
(2019 Pattern) (Semester - III) (211082)

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) Derive relation between Maximum shear stress and average shear stress for Rectangular cross-sectional Beam **[8]**

b) A rectangular beam 100 mm wide and 250 mm deep is subjected to a maximum shear force of 50 kN. Determine: Average shear stress, Maximum sheart stress and shear stress at a distance of 25 mm above the neutral axis. **[9]**

OR

Q2) a) Derive relation between Maximum shear stress and average shear stress for circular cross-sectional Beam. **[8]**

b) A circular cantilever beam of spam 4Meter is subjected to a point load of 2KN at free end. If the cross section of beam is 50 mm wide and 75 mm deep. Determine maximum bending stress in beam. **[9]**

Q3) a) A metal block of 100 mm^2 cross sectional area carries an axial tensile load of 10 kN. For a plane inclined at 30° with the direction of applied load, calculate: (a) Normal stress (b) Shear stress (c) Maximum shear stress, (d) Angle of Obliquity. **[7]**

b) Define-principal stress, Principal plane and Angle of Obliquity. **[6]**

c) A circular rod of 60KN is gradually applied to a circular bar of 40 mm diameter and 5Meter long. Given $E=2\times10^5$ mm^2 Determine Stress in rod, Elongation of rod and Strain Energy absorbed by rod. **[5]**

P.T.O.

OR

Q4) a) At a point in a crank shaft the stresses on two mutually perpendicular planes are 30 MP a (tensile) and 15 MP a (tensile). The shear stres across the se planes is 10 MPa. Find the normal and shear stress on a plane making an angle 30° with the plane of first stress. Find also magnitude and direction of resultant stress on the plane. **[7]**

b) Define- Resilience, Proof Resilience and Modulus of Resilience. **[6]**

c) A bar 50 mm diameter, 2Mater long is fixed at upper end provided with collar at lower end. A weight of 450 N ids dropped on a collar from height 250 mm. Given $E=2\times10^5$ mm^2. Find instantaneous strees and strain energy stored in bar. **[5]**

Q5) a) A cylindrical steel pressure vassel 400 mm in diameter with a wall thicness of 20 mm, is subjected to an internal pressure of 4.5 MN/m^2. (a) Calculate the tangential and longitudinal stresses in the steel. (b) To what value may the internal pressure be increased if the strees in the steel is limited to 120 MN/ m^2 . **[6]**

b) Define - Hoop or Circumferential Stress, Longitudinal Stress, Radial pressure. [6]

c) Design a solid circular shaft to transmit a power of 200KW running at 130 rpm taking maximum allowable shear stress 120N/mm^2 with permissible angle of twist 1.5° over a length of 4 meter with G =80×10^3 Mpa. **[6]**

OR

Q6) a) Derive a equation for circular shaft subjected to torsion. **[6]**

$$\frac{\tau}{R}=\frac{T}{J}=\frac{G\theta}{L}$$

Where J = Polar moment of inertia τ = Shear stress induced due to torsion T. G = Modulus of rigidity θ = Angular deflection of shaft R,L = Shaft radius & length respectively

b) A hollow steel rod 200 mm long is to be used as torsional spring. The ratio of inside to outside diameter is 1 : 2 . The required stiffness of this spring is 100 N.m/ degree. Determine the outside diameter of the rod. Value of G is 8×10^4 N/ mm^2. **[6]**

c) A thick cylinder is subjected to an internal pressure of 60 MPa. If the hoop stress on the outer surface is 150 MPa, find the hoop stress on the internal surface. **[6]**

Q7) a) Explain procedure for finding deflection in beam by Macaulay's method. **[7]**

b) A beam 6 m long, simply supported at its ends, is carrying a point load of 50 KN at its centre. The moment of inertia of the beam is 78×10^6 mm^4. If E for the material of the beam = 2.1×10^5 /mm^2. Calculalate deflection at the centre of the beam and slope at the supports. **[5]**

c) Write assumptions of Euler's Theory for columm design. **[5]**

OR

Q8) a) Determine the crippling load for a column having diameter 50mm and length 3000 mm, E= 2.1×10^5 N/mm^2 and Moment of inertia (I) = 30.68×10^4 N/mm^4 when used with following conditions- i) One end of column is fixed and other rend is free, ii) Both ends of column are fixed. **[7]**

b) Derive a relation for slope and deflection for a simply supported beam with central point load. **[10]**

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Total No. of Questions : 8]

SEAT No. :

PC-2875

[Total No. of Pages : 2

[6352]-99

S.E. (Production Sandwich/production Engg, & 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 parts of a lathe by neat sketches: **[8]**

i. Lathe Bed

ii. Carriage

iii. Headstook

iv. Tailstock

b) What is indexing? State different indexing methods? Explain compound indexing in detail. **[10]**

OR

Q2) a) List out various taper turning methods on lathe machine. Explain Tail Stock set over method with neat sketch in detail. **[10]**

b) State various operations performed on milling machine. Differentiate between up milling and down milling. **[8]**

Q3) a) With the help of sketch, explain the construction and working of radial drilling machine. **[10]**

b) Explain the standard marking system used for grinding wheels. **[7]**

P.T.O.

OR

Q4) a) Sketch and describe various operations which can be performed on drilling machine. **[8]**

b) Explain with neat sketch centreless grinding machine. **[9]**

Q5) a) Compare the Honing and Lapping processes with respect to **[6]**

i. Principle of working

ii. Types of abrasive

iii. Area of applications

iv. Surface finish

b) Explain Buffing, Polishing and Tumbling processes in short, stating its applications. **[11]**

OR

Q6) a) Compare between the Electroplating, Galvanizing and Metal spraying processes. **[8]**

b) Explain Hot dipping and Burnishing processes in detailed. **[9]**

Q7) a) What is additive manufacturing? What are its merits and demerits? **[7]**

b) Describe VAT Polymerization process in short. State its merits, demerits and applications. **[11]**

OR

Q8) a) Describe Material Extrusion process in short. State its merits, demerits, and applications. **[9]**

b) Explain Powder Bed Fusion process in short. State its merits, demerits, and applications. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-2876

[Total No. of Pages : 2

[6352] - 100

S. E. (Production Sandwich) (Production Engg. & Industrial Engg.)

Materials Science and Metallurgy

(2019 Pattern) (Semester-III)

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 suitaable data if necessary.***

Q1) a) Write note on

i) Diamond Impregnated Cutting Tools **[10]**

ii) Self-lubricating Bearings

b) Explain Mechanical Processes for Powder Manufacturing? **[8]**

OR

Q2) a) What is Powder Metallurgy? Compare its Advantages & Disadvantages over conventional process. **[10]**

b) Describe any Two Components Which can be Manufactured by only Powder Metallurgy Technique? **[8]**

Q3) a) Draw and Explain TTT diagram and what information is obtained from. this diagram? **[10]**

b) Explain Annealing & Normalising Heat treatment processes in Details?**[8]**

OR

P.T.O.

Q4) a) Explain Following Terms: **[10]**

a) Annealing b) Normalizing

c) Carburizing d) Hardening

b) List the classifications of steels and their applications? **[8]**

Q5) a) Explain Effects of various parameters on structures and properties of cast irons? **[9]**

b) What are the effects of alloying elements on steel? **[8]**

OR

Q6) a) Define Cast Iron? Explain classification of Cast Iron with Applications? **[9]**

b) Examine the impact of heat treatment on tool steels? **[8]**

Q7) a) Differentiate between Brasses & Bronzes with their Compositions & applications? **[10]**

b) Write Short Note on Precipitation hardening alloys? **[7]**

OR

Q8) a) Discuss classification of Non-Ferrous Alloys? **[10]**

b) Describe the characteristics and uses of bearing materials? **[7]**

Total No. of Questions : 8]

SEAT No. :

PC-2877

[Total No. of Pages : 2

[6352]-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 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) ***Assume suitable data if necessary.***

Q1) a) For Machining Centre, Explain the following : **[10]**

i) Principles, Working & Advantages

ii) Applications & Parts Programming

b) Explain the concept of FMS (Flexible Manufacturing System) and its significance in modern manufacturing? **[7]**

OR

Q2) a) Explain different types of coordinate systems used in NC/CNC operations. **[12]**

b) Explain the following codes : **[5]**

i) G 03

ii) G 63

iii) M 06

iv) M 09

v) M30

Q3) a) Explain in details of Blow Moulding Process with its Advantages & Applications? **[10]**

b) Explain the Extrusion Process for thermoplastic Material? **[8]**

OR

Q4) a) Explain with neat sketch Compression Moulding Process with its Advantages & Applications? **[10]**

b) What is Pressure Forming in Thermoforming, and how does it affect the final product? **[8]**

P.T.O.

Q5) a) Explain the Principle with neat sketch of following (Any Two) **[10]**

i) PAM

ii) AJM

iii) IBM

b) Explain with neat sketch USM. State the Advantages, Limitations and Applications? **[7]**

OR

Q6) a) What is the function of electrolyte in ECM? List the common electrolyte used in ECM. **[7]**

b) Explain with neat sketch EDM. State the Advantages, Limitations and Applications? **[10]**

Q7) a) What are some general guidelines and procedures followed in the design of jigs and fixtures? **[13]**

b) Describe factors considered for designing jig & fixture? **[5]**

OR

Q8) a) Describe the various types of jigs and fixtures used in manufacturing processes? **[13]**

b) Explain fool-proofing for jig & fixture? **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-2878

[Total No. of Pages : 2

[6352]-102
S.E. (Printing Engineering)
ELECTRICAL MACHINES AND UTILIZATION
(2019 Pattern) (Semester - IV) (203155)

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) Torque -Slip Characteristics of 3 phase Induction Motor in details. **[9]**

b) Explain any two types of Starters used for 3 phase Induction Motor. **[9]**

OR

Q2) a) Explain any two types of Speed Control methods of 3 phase Induction Motor. **[9]**

b) A 12-pole, 3-phase induction motor has rotor resistance per phase = 1Ω, and stand-still reactance per phase = 3Ω. At stand still rotor induced EMF is 100 volts between the slip rings. Calculate the rotor current per phase and rotor power factor when (a) slip-rings are short-circuited (b) when resistance of 3 Ω/phase is inserted in the rotor circuit. **[9]**

Q3) a) Explain nine requirements of Good Lighting Scheme. **[9]**

b) The front of a building 50 m × 16 m is illuminated by sixteen 1000-W lamps arranged so that uniform illumination on the surface is obtained. Assuming a luminous efficiency of 17.4 lumens/watt and a coefficient of utilization of 0.4, determine the illumination on the surface. **[8]**

P.T.O.

OR

Q4) a) Explain the types of Lighting Scheme with diagrams. **[9]**

b) A badminton hall to be provided with a lighting installation. The hall is 30 m × 20 m × 10 m (high). The mounting height is 5 m and the required level of illumination is 150 /m/m^2. Using metal filament lamps, estimate the size and number of single lamp luminaries and also draw their spacing layout. Assume : Utilization coefficient = 0.6, Maintenance factor = 0.75, Space/height ratio = 1, Lumens/watt for 300 W lamp = 13 lumens/watt for 500 W lamp = 16. **[8]**

Q5) a) Explain in details principal of Induction Heating and Vertical Core Type Induction Furnace. **[9]**

b) Explain in details of Arc Heating with types. **[9]**

OR

Q6) a) Explain in details Temperature Control Methods of Furnaces. **[9]**

b) Explain in details Core Less type Induction Furnace. **[9]**

Q7) a) Enumerate the selection of motors depending on load characteristics. **[9]**

b) Explain in details Type of Switches used in Printing Industry. **[8]**

OR

Q8) a) State the difference between Individual & Group Drive. **[9]**

b) Explain in details various types of Relays and Electric Encoders used Printing Industries. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2879

[Total No. of Pages : 2

[6352]-103
S.E. (Printing)
FINISHING TECHNIQUES
(2019 Pattern) (Semester - IV) (208286)

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 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 machineö. **[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% **[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 100cm wide and 15 meter long for full bound 20000 books in A5 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 45Dkg 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. : ____

PC-2880

[Total No. of Pages : 2

[6352]-104

S.E. (Printing Engg.)

INTRODUCTION TO PACKAGING CONCEPTS

(2019 Pattern) (Semester - IV) (208287)

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) Explain 5 P's of marketing. **[9]**

b) How packaging industry is used as marketing tool. **[9]**

OR

Q2) a) What role does product packaging design play in your marketing strategy. **[9]**

b) Explain market considerations for package design. **[9]**

Q3) a) Explain 4 different scenarios of product and package relationship. **[9]**

b) Explain product's physical characteristics. **[8]**

OR

Q4) a) Explain the concept of center of gravity with diagram and symbol. **[8]**

b) How chemical characteristics of a product effect package. **[9]**

P.T.O.

Q5) a) Write down the checklist of the items to be considered for quality control. **[9]**

b) Explain quality standard aspects in packaging. **[9]**

OR

Q6) a) What is the need of quality control in packaging? **[9]**

b) Which ISO standards are important in packaging industry? **[9]**

Q7) a) Explain packaging perception v/s reality. **[8]**

b) What are environment considerations for packaging industry. **[9]**

OR

Q8) a) Explain different packaging laws and regulations. **[8]**

b) What are the further requirements for packaging industry to be considered? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-2881

[Total No. of Pages : 2

[6352]-105
S.E. (Printing Engineering)
MICROPROCESSOR & MICROCONTROLLER TECHNIQUES IN PRINTING
(2019 Pattern) (Semester - IV) (208288)

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.***

Q1) a) State the main features of the 8051 microcontroller. **[6]**

b) Differentiate between the microprocessor and Microcontroller. **[6]**

c) Describe the functions of the two timers (Timer 0 and Timer 1) in the 8051 microcontroller. **[6]**

OR

Q2) a) Explain Functions of all Pins of 8051. **[12]**

b) Explain the memory organization of 8051 microcontroller. **[6]**

Q3) a) Demonstrate how different addressing modes in the 8051 microcontroller are used in programming. **[8]**

b) Explain any three stack related and Data transfer instructions from 8051 instruction set. **[9]**

OR

Q4) a) Explain Special Function registers. **[9]**

b) Describe the following instructions with examples **[8]**

i)	MOV R0, #0AH,	ii)	MOV 30H, 40H
iii)	MOV P1, A,	iv)	MOV A, @R0
v)	MOV R7, @R0	vi)	DJNZ R0, radd
vii)	DEC R0	viii)	ADD A, 31H

P.T.O.

Q5) a) Explain the internal architecture of IC8253 **[8]**

b) Describe the Block diagram of 8255 **[10]**

OR

Q6) Describe the block diagram of programmable timer IC 8259. **[18]**

Q7) a) Describe the programmable logic controller with block diagram. **[10]**

b) Discuss contemporary microprocessors in terms of their advancements over earlier models. **[7]**

OR

Q8) Explain how microcontrollers can be utilized in the printing industry, focusing on specific applications and benefits. **[17]**

Total No. of Questions : 8]

SEAT No. :

PC-2882

[Total No. of Pages : 2

[6352]-106
S.E. (Printing)
PRINT PRODUCTION TECHNIQUES
(2019 Pattern) (Semester - IV) (208289)

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) What are Screening methods. Explain the objective behind Screening. **[10]**

b) What are the advantages and disadvantages of screening methods. **[8]**

OR

Q2) a) What is Color Separations. Explain its objectives. **[10]**

b) What is N-Color Separations and where it is used. **[8]**

Q3) a) What is Screening Frequency? What are Screen Angles. **[10]**

b) Explain Plate marks verification in details. **[7]**

OR

Q4) a) What is Plate linearization curve and its requirement in prepress. **[10]**

b) Explain importance of Print Sequence. **[7]**

Q5) Explain two types of Dot gain and its causes. Also explain acceptable dot gain for various printing processes. **[18]**

P.T.O.

OR

Q6) Calculate Hue Error and grayness for following readings. **[18]**

Cyan	Magenta	Yellow
D1 = 0.10	D1 = 0.67	D1 = 1.17
D2 = 0.86	D2 = 1.22	D2 = 0.56
D3 = 1.16	D3 = 0.07	D3 = 0.11

Q7) a) Explain Relation between Customer - Printer - Designer. **[9]**

b) Explain limitations of Printing Process and finishing on Design. **[8]**

OR

Q8) Explain various parameters of Post Press Consideration. **[17]**

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Total No. of Questions : 8]

SEAT No. :

PC-2883

[Total No. of Pages : 4

[6352]-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) Write short note on band brake with neat sketch. **[5]**

b) Define brakes and give its types. **[5]**

c) A single block brake has a brake drum diameter of 2 m and angle of contact is 30°. It takes 500 Nm torque at 300 rpm clockwise. [Take u = 0.25]. Determine required force P when drum rotating clockwise. **[7]**

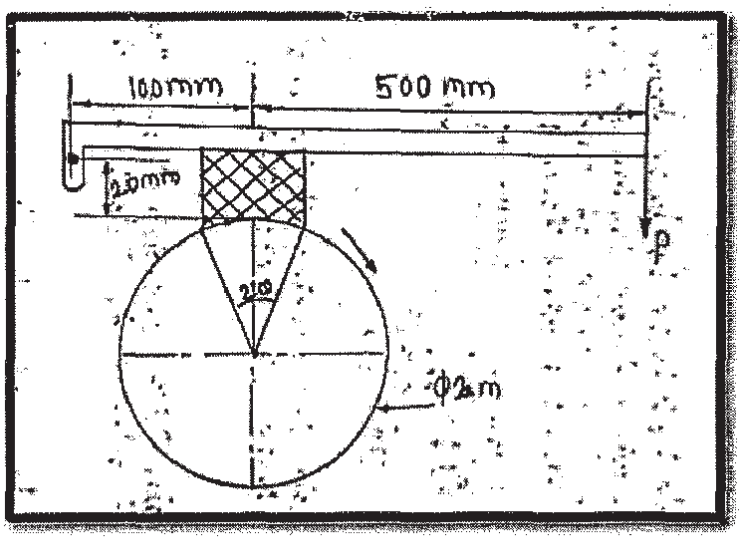


Fig. 1(c)

OR

P.T.O.

Q2) a) Explain the working of internal expanding shoe brake with neat sketch. **[5]**

b) Explain "Self-energizing" and "Self- locking" effect related to block (shoe) brakes. **[7]**

c) A bicycle and rider of mass 105 kg are travelling at a speed of 12 km/hr on a level road. The rider applies brake to the rear wheel which is 800 mm diameter. How Far bicycle will travel before it comes to rest? Pressure applied 80 N and u = 0.06. Also find number of revolutions. **[7]**

Q3) a) What is belt drive? Give its types. **[5]**

b) Derive an equation for length of open belt drive. **[5]**

c) Find the length of belt necessary to drive a pulley of 80 cm diameter running parallel at a distance of 12 m from the driving pulley of diameter 480 cm for **[7]**

i) Open belt

ii) Cross belt

OR

Q4) a) State and explain Creep of belt. **[5]**

b) Explain with neat sketch flat belt drive. **[5]**

c) Two pulleys 450mm diameter and 200mm diameter are on parallel shaft 1.95 m apart and are connected by a cross-belt. Find the length of belt. **[7]**

Q5) Find velocity and acceleration of piston. When crank rotates at non-uniform speed of 200 rpm and angular acceleration of 100rad/s^2. The length of connecting rod is 450mm and crank is 150mm long. Which rotates 45° from i.d.c. **[18]**

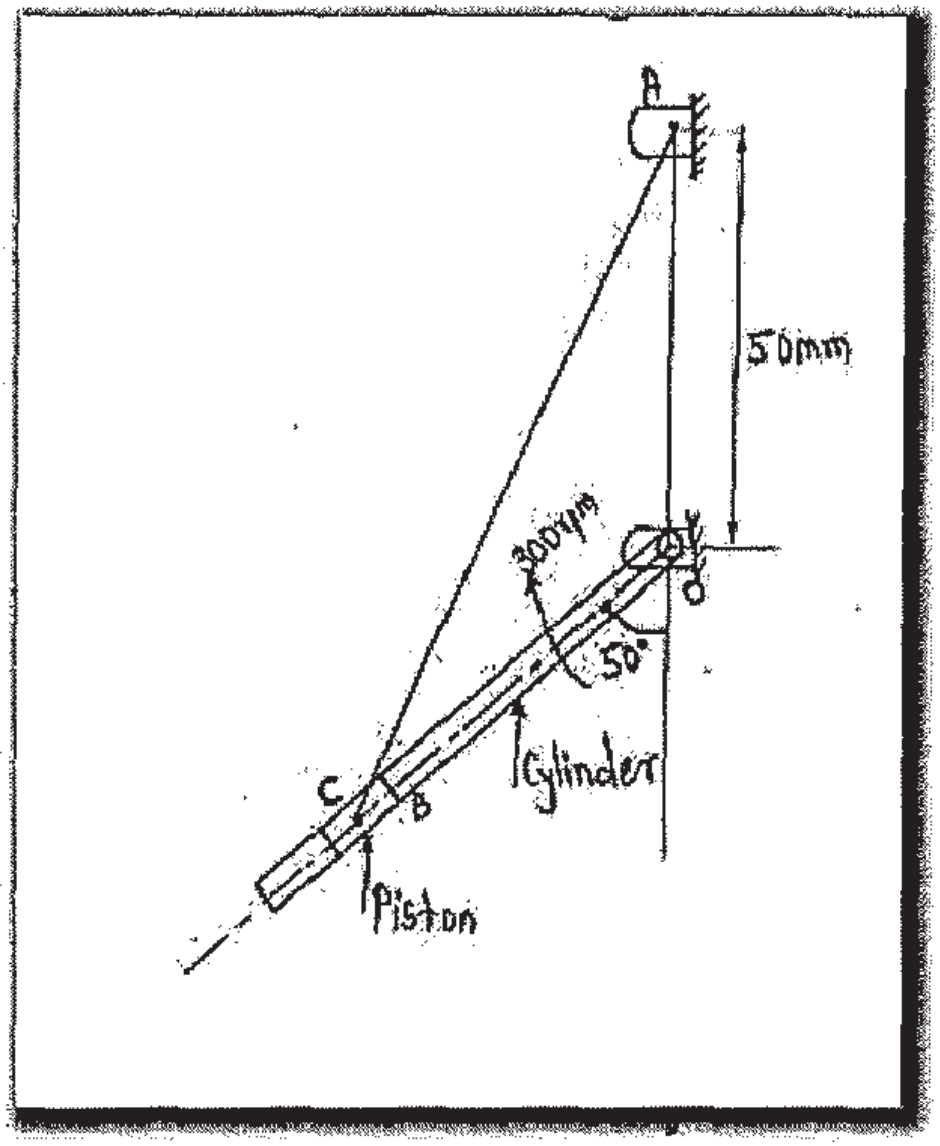
OR

Q6) The kinematics diagram of one of the cylinders of a rotary engine is shown in figure. The crank OA which is vertical and fixed is 50 mm long. The length of the connecting rod is 125 mm. the line of the stroke OB is inclined at 50° to the vertical. The cylinder is rotating at a uniform speed of 300 rpm in a clockwise direction, about the fixed centre 0. **[18]**

Determine :

a) Acceleration of the piston inside the cylinder.

b) Angular acceleration of the connecting rod.

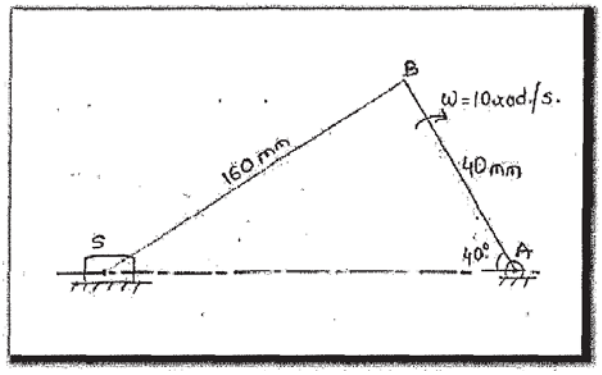


Q7) Find **[18]**

a) The Velocity and Acceleration of piston

b) The Angular velocity of connecting rod.

for following mechanism. Using klein's construction method.



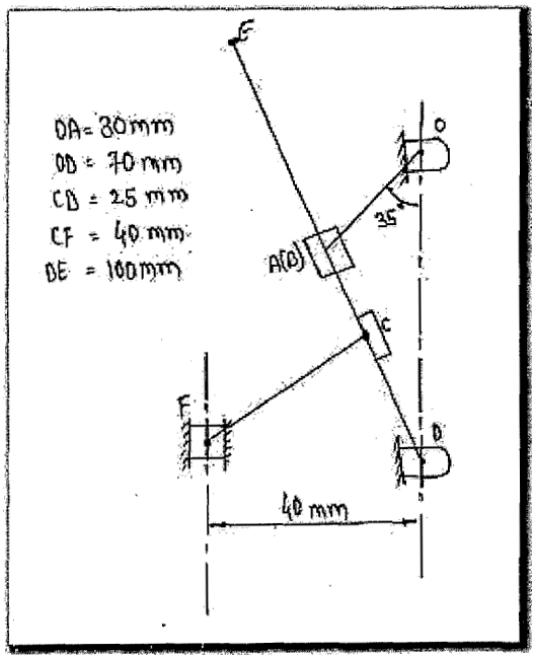
OR

Q8) Figure shows a mechanism in which crank OA is rotating anticlockwise at 10 rad/s. DE is an oscillating lever pivoted at D and it passes through cylinder pivoted to crank OA at point A. The coupler CF drives slider F as shown. For the instant shown. **[18]**

Find

a) Angular acceleration of lever DE.

b) Acceleration of slider F.



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Total No. of Questions : 8]

SEAT No. :

PC-2884

[Total No. of Pages : 2

[6352]-108
S.E. (Printing)
INTRODUCTION TO PRINTING PROCESSES
(2019 Pattern) (Semester - III) (208281)

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

Instructions to the candidates :

1) ***Attempt Qno.1 or Qno.2, Q.no3 or Q.no4, Q.no5 or Q.no6, Q.no7 or Q.no8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) List down the material required for screen printing and explain the purpose of each material. **[6]**

b) Write Short. note on Squeeze. **[6]**

c) Write short note on Screen frames. **[5]**

OR

Q2) a) Explain the squeeze types and its purpose in screen printing. **[6]**

b) Explain in brief Important Elements Affecting the screen printing process. **[5]**

c) Explain in brief the squeeze selection criteria for screen printing applications. **[6]**

Q3) a) Differentiate between a nylon mesh with stainless steel mesh. **[6]**

b) Write Short note on Ink film thickness. **[6]**

c) Write short note on mesh opening. **[6]**

P.T.O.

OR

Q4) a) List down the fabric stretching methods and explain in brief the fabric . streching methods. **[6]**

b) Explain in brief the mesh selection criteria for screen printing applcations. **[6]**

c) Write short note on mesh count. **[6]**

Q5) a) Write short note on mechanical fabric stretching. **[6]**

b) Explain in brief the steps required in preparation for screen stretching process. **[6]**

c) Write short note on Screen Angle. **[5]**

OR

Q6) a) Explain in brief four color separation method for screen printing process. **[6]**

b) Write short note on Fabric Stretching. **[5]**

c) Compare pneumatic and mechanical fabric stretching methods. **[6]**

Q7) a) Write short note on screen stencil making process. **[6]**

b) Write short note on exposure time. **[6]**

c) Compare under and over exposure and optimum exposure for screen stencil making process. **[6]**

OR

Q8) a) Write Short note an direct screen stencil making process. **[6]**

b) Write Short note on Indirect screen stencil making process. **[6]**

c) Write Short note on direct/indirect screen stencil making process. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-2885

[Total No. of Pages : 2

[6352]-109
S.E. (Printing Engineering)
MATERIAL SCIENCE IN PRINTING AND PACKING
(2019 Pattern) (Semester - III) (208282)

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

Instructions to the candidates :

1) ***Solve 01 or 02, Q3or 04, 05 or Q6, Q7 or Q8***
2) ***Black 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) "Paper acquires its properties while manufacturing": Justify this sentence with the properties below: **[18]**

a) Bulk

b) Tensile Strength

c) Two sidedeness

d) pH

e) Opacity

f) Caliper

OR

Q2) Solve the following: **[18]**

a) If paper shopkeeper tells you that weight of 23*36" paper is 30 kgs., what grammage paper ream are you buying?

b) Calculate no. of reams required for a job which is 4 up in 23*36" size. No. of printed pages of the job are 168 nos. No. of copies required is 500.

P.T.O.

Q3) Describe thermoset and thermoplastic polymers on the basis of: **[17]**

a) Properties

b) Types

c) Applications

OR

Q4) Explain following types of polymers with properties, types and applications. **[17]**

a) Polyethylene

b) Polypropylene

c) Polyvinyl chloride

d) polystyrene

Q5) Explain glass as a packaging material with respect to its properties, advantages, limitations and applications in detail. **[18]**

OR

Q6) Answer the following: **[18]**

a) Which metal is primarily used as packaging material and why

b) Compare and contrast between textile and plastic bags

Q7) Explain following test methods, usage with suitable principle of working Diagram: **[17]**

a) Cobb Test

b) Tensile strength

c) Bursting Strength

OR

Q8) With neat diagram, explain various methods of testing grain direction and cross direction of paper. **[17]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2886

[Total No. of Pages : 2

[6352]-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 01 or 02, Q3or 04, 05 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) Perform Following: **[18]**

a) 110011-100011

b) 101 × 10

c) Solve (12-5) using 2's complement method.

d) Add 101101 + 110111

e) Multiply 101 and 1101

f) l's complement of 00110101

g) Convert 42 and 22 in BCD and add them in BCD form

h) 2's complement of 1010

i) Convert $[26]_{10}$ in binary form.

OR

Q2) Explain the functions and design of arithmetic and logical unit in detail. **[18]**

P.T.O.

Q3) a) Describe Synchronous counters and its applications. **[6]**

b) Differentiate combinational and sequential circuits. **[6]**

c) Draw the circuit for Mod 4 counter using JK flip flop. **[5]**

OR

Q4) a) Describe RS flip flop along with timing diagram. **[6]**

b) Explain SRAM and DRAM memories. **[6]**

c) Depict serial in serial out shift register in detail. **[5]**

Q5) a) What is shift register? Depict any type of shift register in detail. **[6]**

b) Explain. The Working of. Rs flip flop. **[6]**

c) Differentiate asynchronous and synchronous counter. **[6]**

OR

Q6) a) Describe any ADC or DAC type in detail. **[9]**

b) Explain any two ROM and RAM memories. **[9]**

Q7) a) Differentiate serial port and parallel port. **[8]**

b) Describe the working of Mouse and Joystick. **[9]**

OR

Q8) Elucidate any 2 Input devices in detailed. **[17]**

Total No. of Questions : 8]

SEAT No. :

PC-2887

[Total No. of Pages : 3

[6352] - 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 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) ***Assume Suitable data if necessary.***
5) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***

Q1) a) What are the factors impacting on entrepreneurship. **[8]**

b) Describe various funding organizations which support an entrepreneurship. **[9]**

OR

Q2) a) Explain the factors which motivate entrepreneurship. **[8]**

b) Describe the elements of entrepreneurial ecosystem. **[9]**

Q3) a) Define Industrial Engineering. Describe various tools and techniques of Industrial Engineering. **[9]**

b) The following data is available for a company. The output is Rs.20, 00,000. Calculate Partial productivity considering the input resources and total productivity. **[9]**

Input Resources	Rs.
Labor	4,00,000
Material	8,00,000
Capital	5,00,000
Energy	1,00,000
Other expenses	1,50,000

P.T.O.

OR

Q4) a) Define Job evaluation and Job specification. What are the different methods of Job evaluation? **[9]**

b) Describe Taylor Piece Wage System and Merrick Piece Wage System with suitable illustration. State the advantages and limitations of these systems. **[9]**

Q5) a) Describe Two Handed process chart for the activities carried out for changing the refill of pen with appropriate symbols. **[9]**

b) Define Method study. Describe various steps of method study. **[9]**

OR

Q6) a) Describe String diagram and Flow diagram. **[9]**

b) Describe Flow process chart with suitable illustration and appropriate symbols. **[9]**

Q7) a) Define Time study. Describe various steps of time study. **[8]**

b) The following data is collected from work sampling study. Determine
i) Normal time **[9]**

ii) Standard time (Assuming 15% Allowance)

Duration of the study (Hrs)	192
Total number of units produced during study	640
Total number of observations	3000
Number of observations of productive work	2400
Number of observations of machine controlled work	1600
Averge performance rating	90
Total allowances (%)	15

OR

Q8) a) Describe the process to carry out work sampling study. **[8]**

b) Following data relate to a work sampling study of long cycle non- repetitive operation. **[9]**

i) Total time of study =10 days

ii) Total number of observations = 1200

iii) Observation of production activity = 900

iv) Manually controlled elements = 300

v) Machine controlled element = 300

vi) Total unit produced = 400 pieces

vii) Rating index = 110%

viii) Observation of unavoidable delays = 100

Calculate the standard time assuming that the study was made for 5 hours per day and the industry is running for single of 8 hours per day

Total No. of Questions : 8]

SEAT No. :

PC-2888

[Total No. of Pages : 2

[6352] - 112
S.E. (Robotics & Automation)
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, jf 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 openloop transfer function G(S) = K / [S (S+1) (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+1) (S + 2) (S +5) & comment on its stability. **[9]**

P.T.O.

Q5) a) Explain the selection criteria used for PLC **[9]**

b) Explain Digital Control System with Block diagram. Enlist its advantages and disadvantages. **[9]**

OR

Q6) 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]**

Q7) a) What is a componsator? Explain cascade compensation techniques. **[9]**

b) Explain the Procedure to design of lead compensator using root locus. **[9]**

OR

Q8) 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]**

Total No. of Questions : 8]

SEAT No. :

PC-2889

[Total No. of Pages : 3

[6352]-113
S.E. (Robotics and Automation Engineering)
DESIGN OF MACHINE ELEMENT
(2019 Pattern) (Semester - IV) (211510)

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 side indicates full marks.***
3) ***Use of scientific calculator is allowed.***

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) An electric motor driven power screw moves a nut in a horizontal plane against a force of 75 kN at a speed of 300 mm/min. The screw has a single square thread of 6 mm pitch on a major diameter of 40 mm. The coefficient of friction at screw threads is 0.1. Estimate power of the motor. **[6]**

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 50mm. The screw has square threads with pitch equal to 10 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 12 N/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) Derrive the expression for Efficiency of Self Locking Screws **[4]**

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]**

P.T.O.

Q3) a) List Out the Different Material Used in Spring. **[5]**

b) Define the Following Terms 1. Solid length. Free length. Spring index. Spring rate. **[4]**

c) Helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm^2, find the axial load which the spring can carry and the deflection per active turn. **[8]**

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 weighs 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 50mm 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) A pair of straight teeth spur gears is to transmit 20 kW when the pinion rotates at 300 r.p.m. The velocity ratio is 1 : 3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. Determine: i. Module; ii. Face width; and iii, Pitch circle diameters of both the pinion and the gear from the standpoint of strength only, taking into consideration the effect of the dynamic loading. The tooth form factory can be taken as Y = 0.154- 0.912/No of Teeth and Velocity factor C_v = 3/3+v. **[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: 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. **[9]**

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 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20 × 106 revolutions at 95 per cent 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 coffiecnt 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 no on Selection of Bearing Life. **[4]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2890

[Total No. of Pages : 2

[6352]-114
S.E. (Robotics and 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) ***Figure to the right indicates 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 with neat sketch Floating Carriage Micrometer. **[9]**

OR

Q2) a) Derive an expression for measuring of effective diameter using Two Wire Method. **[8]**

b) Explain the Base Tangent Method & Derive an expression for the value of base tangent length. **[9]**

Q3) a) Draw & Explain OC curve. **[9]**

b) Explain following SQC tools **[9]**

i) Xchart ii) Rchart

iii) P chart

OR

Q4) a) Differentiate between Random (Chance) Causes & Assignable (Special) Causes. **[9]**

b) Explain : **[9]**

i) Producer's Risk

ii) Consumer's Risk

iii) AQL

P.T.O.

Q5) a) Explain Deming's approach of Quality. **[8]**

b) Explain any three quality control tools with neat sketch. **[9]**

OR

Q6) a) With neat sketch explain Juran's Trilogy. **[8]**

b) Explain any three new quality control tools with neat sketch. **[9]**

Q7) a) Explain the Concept of ISO 14000. **[9]**

b) State & Explain prerequisites for implementing ISO 9000 quality standards. **[9]**

OR

Q8) a) Explain history & evolution of ISO 9000 series. **[9]**

b) Explain function, methodology and advantages of quality audit. **[9]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2891

[Total No. of Pages : 3

[6352]-115
S.E. (Robotics and Automation Engineering)
COMPUTER GRAPHICS FOR ROBOTICS
(2019 Pattern) (Semester - IV) (211512)

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

Instructions to the candidates :

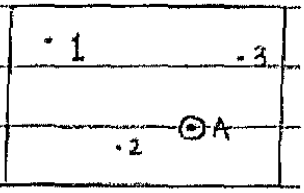
1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full metrics.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Derive an expression for interpolating Thnction of a Hermite Cubic interpolation. **[8]**

b) For the following data, use inverse distance weighting method to interpolate at **[9]**

point A ≡ (2,1)

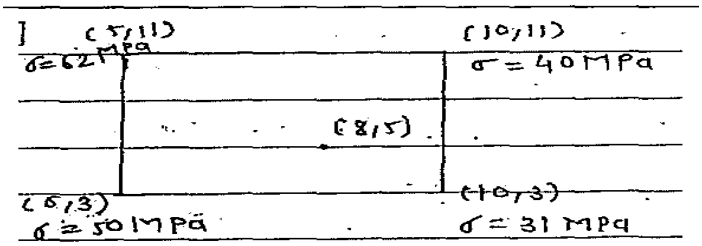
x	y	z
0	1	52
1	3	46
2	2	102
4	2	78



OR

Q2) a) Write note on: Interpolating quaternions **[8]**

b) Deteimine stress at point (8,5) **[9]**



By using

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]**

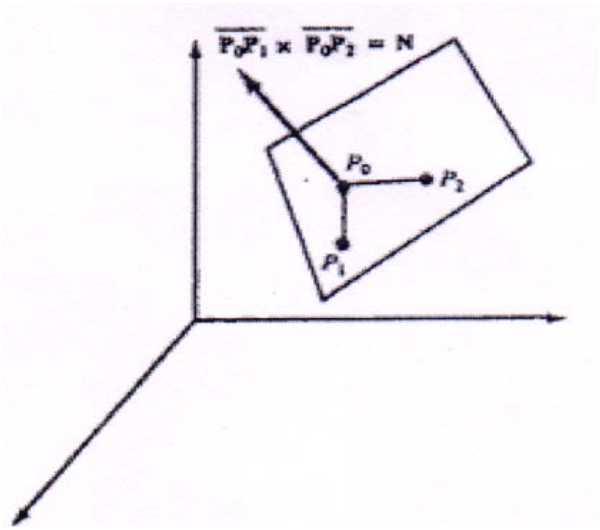
b) Obtain *x-y* co-ordinates of a point on Bezier curve at parameter value t = 0.3 considering control points as (1, 4), (3, 6), (4,2) and (5, 10).**[10]**

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) Find the equation of the plane determined by the three points p0(l,5,-7),pl(2,6,1) and p2(0,1,2) see in fig given below **[10]**



b) Write note on: Application of analytic geometry in robotics. **[8]**

OR

Q6) a) A triangle has vertices $P_1(2, 3)$, $P_2(5, 5)$, $P_3(4, 7)$. Determine whether point $P(3, 5)$ lies inside the triangle, outside triangle or on the edge. If it is on the edge then mention that edge. **[10]**

b) Write note on: Intersection of a circle with a straight line. **[8]**

Q7) a) Prove the formula V_1, V_2 = $|V_1||V_2|$ cos (θ), where V_1 and V_2 are two vectros and θ is the smaller angle between V_1 and V_2 (when the vectors are placed tail to tail). **[9]**

b) Explain the applications of applied geometric algebra for modeling of robotics physics. **[9]**

OR

Q8) a) What do you mean by an outer product? What are the properties of outer product? **[9]**

b) Write short note on: Reflection and rotation. **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PC-2892

[Total No. of Pages : 2

[6352]-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 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 additional data, if necessary.***
5) ***Use of a non-programmable calculator is allowed.***

Q1) a) Draw the schematic showing the interfacing of an AT mega-based Arduino board to a DC motor with L293D. **[4]**

b) Explain the concept of Pulse Width Modulation (PWM). **[6]**

c) Draw a neat schematic showing the interfacing of temperature sensor LM 35 with ATmega 328P-based Arduino board. The output of LM 35 is connected to analog pin A4 of the Arduino board. Write the algorithm for the same. **[8]**

- What is the operating temperature range of LM 35?
- How many pins are available for the LM 35 sensor?
- What is the output voltage of LM 35 per degree Celsius temperature'?

OR

Q2) a) Explain the concept of ADC in ATmega 328P-based Arduino board. **[4]**

b) Draw a neat diagram showing the interfacing of the strain gauge with an ATmega 328P-based Arduino board. Given that the output voltage from the strain gauge after signal conditioning is connected to analog pin A0 of the Arduino board. Write algorithmic steps to display strain on the serial monitor. **[6]**

c) Draw and explain the interfacing of the Accelerometer with Arduino ATmega 328P. Write its algorithm. **[8]**

P.T.O.

Q3) a) Draw and explain the Speed-armature current characteristics and torque-armature current characteristics of the DC shunt motor. **[3]**

b) State and explain the working principle of the DC generator along with a diagram. **[6]**

c) Draw the schematic of the three-point starter used for the DC shunt motor. Indicate the following components of the three-point starter and write their functions during operation: (i) No volt coil; (ii) Overload release. **[8]**

OR

Q4) a) Write any four industrial applications of the DC series and DC shunt motor. **[3]**

b) What are the different types of DC motors? Define back emf of DC motor? Write the emf equation of the DC generator. **[6]**

c) Derive the expression for the torque of the DC machine. **[8]**

Q5) a) Distinguish between squirrel cage and slip ring induction motors. Write any four valid points. **[4]**

b) Explain constructional details of three-phase IM with its appropriate diagram. **[6]**

c) Explain the operation of star - delta starter used for three phase induction motor with the help of a neat schematic diagram. **[8]**

OR

Q6) a) Write any four industrial applications of the induction motor. **[4]**

b) The useful torque of the three-phase, 50Hz, an 8-pole induction motor is 190 NM. The frequency of the rotor is 1.5 Hz. Calculate the rotor copper loss if the mechanical losses are 700 watts. **[6]**

c) Derive the expression for the torque developed in a three-phase induction motor under running conditions. **[8]**

Q7) a) What is a linear induction motor? Draw its diagram. **[3]**

b) Explain the construction and working of the shaded pole induction motor with the help of a suitable diagram. **[6]**

c) Describe the construction and working of Brushless DC (BLDC) motor with the help of a suitable diagram and state any two applications of it. **[8]**

OR

Q8) a) Differentiate AC and DC motors, Write any four valid points. **[3]**

b) Explain the construction and working of the split phase induction motor with the help of a suitable diagram. **[6]**

c) Describe the construction and working of the Universal motor with the help of suitable diagrams and state its two applications. **[8]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2893

[Total No. of Pages : 2

[6352]-117
S.E. (Robotics and Automation)
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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain working principle of wire drawing process with its advantages and limitations. **[9]**

b) Compare direct extrusion process with indirect extrusion process. **[8]**

OR

Q2) a) Discuss various methods to draw tube. How to prevent defects in tube drawing. **[9]**

b) Define extrusion ratio and discuss its significance in the process. **[8]**

Q3) a) List and explain fundamental principles involved in arc welding process. Also state its advantages and limitations. **[9]**

b) Explain ultrasonic welding process in detail. **[8]**

OR

Q4) a) Compare TIG Welding process to MIG Welding process. **[9]**

b) Write various welding defects. How prevention of welding defects? are important? **[8]**

P.T.O.

Q5) a) Explain with a neat sketch process of EDM. **[9]**

b) Compare conventional machining process to non-conventional machining process. Also write advantages and limitations of both processes. **[9]**

OR

Q6) a) Discuss abrasive machining process in detail. **[9]**

b) Explain working principle of ECM. **[9]**

Q7) Write a short note on:

a) Application of robot in spot welding process. **[6]**

b) Assembly of parts using robot. **[6]**

c) Application of robot in hazardous work environment for human. **[6]**

OR

Q8) Write a short note on:

a) Application of robotics in press working operation. **[6]**

b) Utilization of robotics in casting process. **[6]**

c) Limitations of robotics in manufacturing industry. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2894

[Total No. of Pages : 2

[6352] - 118
S.E. (Robotics & Automation)
Materials Science and Engineering Metallurgy
(2019 Pattern) (Semester-III) (211503)

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) What is powder metallurgy? Discuss advantages, disadvantages and its applications. **[8]**

b) Explain term: **[10]**

i) Electric contact materials.

ii) Cermets

OR

Q2) a) What is conditioning of metal powders? Why it is done. **[8]**

b) Write a note on: **[10]**

i) Cemented carbides

ii) Diamond impregnated Cutting Tools

Q3) a) Draw iron-iron carbide. equilibrium diagram and label the temperature, composition and phase. **[10]**

b) Write a note on Tool steel. **[8]**

OR

P.T.O.

Q4) a) Classify C.I.? And give its application. **[9]**

b) Explain the following : **[9]**

i) Peritectic transformation

ii) Eutectic transformation

iii) Eutectoid transformation

Q5) a) Write short note on Quenching media **[8]**

b) Explain terms : **[9]**

i) Quenching

ii) Annealing

iii) Normalizing

OR

Q6) a) Explain why heat treatment of steel is done? **[8]**

b) Explain the method of plotting TTT diagram and what information is obtained from this diagram? **[9]**

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. : ____

PC-2895

[Total No. of Pages :4

[6352]-119

S.E. (Mechanical Sandwich / Automobile & Mechanical Engg. / Automaton & Rototics Engg.)

KINEMATICS OF MACHINERY

(2019 Pattern) (Semester - IV) (202047)

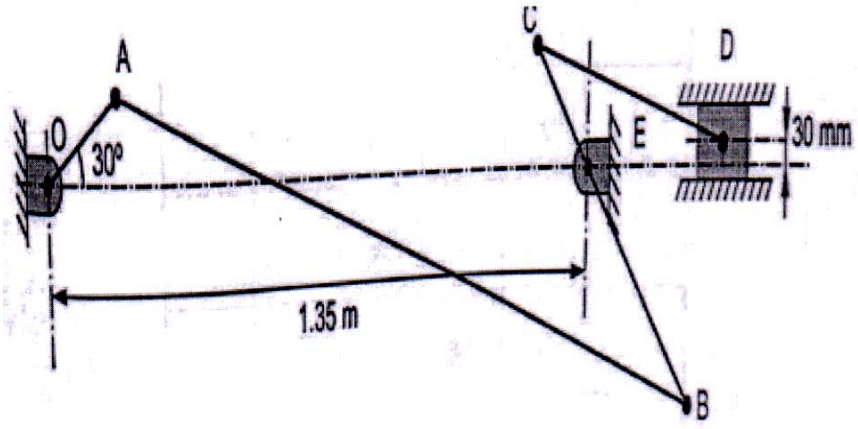
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Attempt question Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagram 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 with neat sketch different type of ICR **[5]**

b) A mechanism as shown in figure has the following dimensions: OA = 200 mm, AB = 1500 mm, BC = 600 mm, CD = 500 mm and BE = 400 mm . Locate all the possible ICR by inspection, if crank OA rotates uniformaly at 400 rpm clockwise, find i) velocity of B,C and D ii) angular velocities of link AB, BC, CD. **[13]**

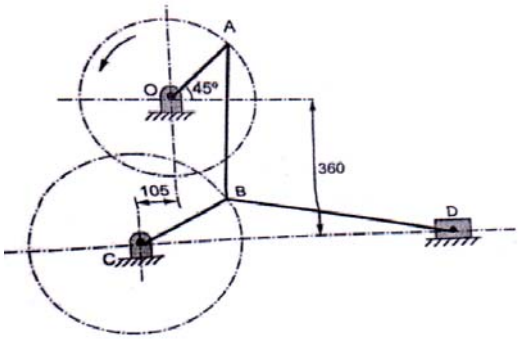


OR

P.T.O.

Q2) a) Explain Velocity Image Principle with neat sketch. **[5]**

b) In the mechanism shown, the slider D is constrained to move on a horizontal path. The crank OA is rotating at 180 rpm counter clockwise increasing at a rate of 50 rad/s^2. The dimensions of links are OA = 180 mm, CB = 240 mm, AB = 360 mm, BD = 540 mm, For the given configuration find A) velocity of slider D, B) Angular velocity of links AB, CB and BD, C) Angular acceleration of BD. **[13]**



Q3) a) Explain the following terms : **[6]**

i) Type synthesis, ii) Number synthesis , (iii) Dimensional synthesis.

b) Find $\theta_1,\theta_2,\theta_3,\phi_1,\phi_2,\phi_3$ of a four bar mechanism to generate the function $y = 5\sin(x)$ and x varies from 0º to 90º. Angle of the driving link from 30º to 150º Angle of the driven link from 60º to 120º. Use three precision positions from Chebychev spacing. **[11]**

OR

Q4) a) Explain with neat sketches three position synthesis of four bar mechanism by inversion method. **[6]**

b) Design a four - bar mechanism with input link *l*2,, coupler link *l*3, and output link *l*4. Angles θ and Φ for three successive positions are given below: **[11]**

If the grounded link ***l***1=30 mm unit, using Freudenstein's equation, find out lengths of other links to satisfy the given positional conditions. Also draw the synthesized mechanism in its first position.

Position	1	2	3
θ	40°	55°	70°
Φ	50°	60°	75°

Q5) a) Explain following terms used in gear tooth terminology : (i) Module (ii) Gear ratio (iii) Addendum (iv) Circular Pitch (v) Pressure angle (vi) Backlash **[6]**

b) Two mating gears have 20 and 40 involute teeth of module 10 mm and 20° pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio.**[12]**

OR

Q6) a) Explain following terms with reference to Helical gear : (i) Helix angle (ii) Transverse circular pitch (iii) Transverse module **[6]**

b) As shown in fig. Of reverted epicyclic gear train, in which arm F carries two wheels A and D and a compound wheel B-C. The wheel A meshes with wheel B and the wheel D meshes with wheel C. The number of teeth on wheel A,D and C are 80, 48 and 72 respectively. If arm rotates 200 rpm and wheel A is fixed, find the speed and directions of wheel D.**[12]**

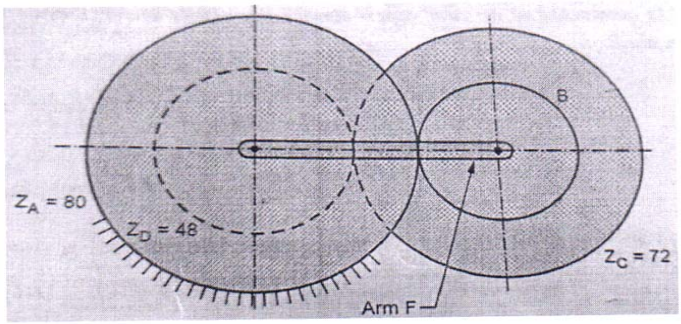


Fig. Reverted Epicyclic Gear Train

Q7) a) Explain concept of artificial intelligence in automation. **[5]**

b) A cam operates a roller inline reciprocating follower while rotating at 150 rpm. The further specifications are : Minimum radius of the cam = 25 mm, Lift of follower =30 mm, Diameter of roller = 15mm Angle of lift = 120° (Nature of lift is S.H.M), Next dwell angle =30°, Angle of return = 150° (Nature of return is uniform acceleration and retardation) and remaining dwell is 60°. Draw the cam profile. **[12]**

OR

Q8) a) What are the various types of automations? Explain them. **[5]**

b) The following data relates to Knife Edge follower. **[12]**

The followers to move outward through a distance of 40 mm during - 60°

The follower to dwell for next - 30°

The follower to return to its initial position during - 60°

The followers to dwell for remaining 210° of cam rotaion.

The cam is rotaing clockwise at a uniform speed of 500 rpm. The minimum radius of the cam is 50 mm and displacement of the followers is to take place with uniform velocity for both outstroke and return stroke. Draw the camp profile.

Total No. of Questions : 8]

SEAT No. :

PC-2896

[Total No. of Pages : 3

[6352]-120

S.E. (Automobile & Mechanical)

APPLIED THERMODYNAMICS

(2019 Pattern) (Semester - IV) (202048)

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

Instructions to the candidates:

1) ***Attempt 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) ***Make suitable assumption wherever necessary.***
5) ***Scientific Calculator is allowed.***

Q1) a) Explain different stages of combustion in CI engine. **[9]**

b) Write short note on phenomenon of detonation SI engines. **[8]**

OR

Q2) a) Explain with neat sketch Bosch Fuel Pump. **[9]**

b) Write short note on combustion chamber used in SI engines. **[8]**

Q3) a) A single cylender, 4 - stroke engine gave the following results while running on full load,

Area of indicator card = 300mm^2, Length of diagram = 40 mm
Spring constant = 1 bar/mm Speed of the engine = 400 rpm
Load on the brake = 370 N Spring balance reading = 50N
Diameter of brake drum = 1.2 m Fuel consumption = 2.8 Kg/hr
Calorific value of fuel = 41800 KJ /Kg Diameter of Cylinder = 160 mm
Stroke of piston = 200 mm,
Calculate,

i) Indicated mean effective pressure
ii) Brake power and brake mean effective pressure.
iii) Brake specific fule consumption
vi) Brake thermal efficiency
v) Indicated thermal efficiency. **[10]**

b) Define IP, BP and FP. Explain Willan's Line Method to find Friction Power. **[8]**

OR

P.T.O.

Q4) a) The following data were recorded in a test one hour duration on a single cylinder oil engine working on 4-stroke cycle,

Bore = 300 mm Stroke = 450 mm

Fuel used = 8.8Kg Calorific value of fuel = 41800KJ/Kg

Average speed = 200 rpm Mean effective pressure = 5.8 bar

Brake friction load = 1860N Quantity of coolling water = 650Kg

Temperature rise = 22°C Diameter of brake wheel = 1.22 m

Calculate,

i) Mechanical efficiency

ii) Brake thermal efficiency

iii) Draw Heat Balance Sheet. **[10]**

b) Write short note on Indian and European Driving Cycle. **[8]**

Q5) a) Explain with neat sketch Splash type lubrication system. **[8]**

b) Explain Transistorized Coil Ignition (TCI) system and state its advantages and disadvantages. **[9]**

OR

Q6) a) Explain with neat sketch thermostat type water cooling system. **[8]**

b) State the need of alternative fuel in IC engines. Write short note on alternative fuel used in SI and CI engines. **[9]**

Q7) a) A two stage air compressor with perfect inter - cooling takes in air at 1 bar and 27°C . The law of compression in both the stages is PV 1.3 = constant. The compressed air is delivered at 9 bars from the HP cylinder to an air receiver.

Calculate per Kg of air,

i) Minimum work of compression

ii) Heat rejected in intercooler

iii) Work required for single stage compression to the same deliver pressure. **[10]**

b) What is multi - stage compression? Justify it save power required for compression as compared to single stage compression. **[8]**

OR

Q8) a) A single stage reciprocating air compressor has a swept volume of 2000

cm^3, runs at 800 rpm and takes in air 1.013 bar and 15°C. It operates on a pressure ratio of 8, with a clearance of 5% of the swept volume. Assume polytrophic compression and expansion with n = 1.25.

Calculate,

i) Volumetric efficiency

ii) Indicated power

iii) Isothermal efficiency

iv) Actual power needed to drive the compressor, if the mechanical efficiency is 85%**.** **[10]**

b) Give the classification of compressor? State the applications of compressed air . **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2897

[Total No. of Pages : 3

[6352]-121

S.E. (Automobile & Mechanical Engg.)

FLUID MECHANICS

(2019 Pattern) (Semester - IV) (202049)

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

Instructions to the candidates:

1) ***Attempt 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) Define stream function and velocity potential function. **[4]**

b) Derive an expression for continuity equation in three dimensions. **[6]**

c) Given that $u = x - 4y$ and $v = -y - 4x$, determine the stream function and potential function for the flow. **[7]**

OR

Q2) a) Explain path line and stream line. **[4]**

b) Discuss various types of flow with example. **[6]**

c) The stream function for a two-dimensional flow is given by $\psi = A(x^2 - y^2)$. Determine the velocity and velocity potential. **[7]**

Q3) a) Differentiate between the Venturi meter and the Orifice meter. **[4]**

b) Derive an expression for the discharge for a steady laminar flow through circular pipe. **[6]**

c) A 150 mm × 75 mm venturi meter is provided in a vertical pipe carrying water flowing in horizontal direction. The throat is 250mm above inlet of venturi meter. The discharge of venturi meter is 40lit/s and coefficient of discharge is 0.96. Calculate i) Static pressure difference between inlet and throat ii) Difference in levels of mercury in U tube manometer. **[8]**

P.T.O.

OR

Q4) a) Draw neat labelled sketch of shear stress and velocity distribution diagram across a section of the pipe. **[4]**

b) Prove that for steady laminar flow through pipe, the velocity distribution across the section is parabolic and the average velocity is half the maximum velocity. **[6]**

c) A vertical pipeline 10cm diameter at the top tapers uniformly to 20cm at bottom. The length of pipe is 2m. If the discharge through the pipeline is 30lit/s, find the difference in pressure. Neglect the friction. **[8]**

Q5) a) Define the lift force and drag force of an object immersed in a fluid. **[4]**

b) Explain the boundary layer separation and discuss the methods to avoid boundary layer separation. **[6]**

c) What is meant by boundary layer thickness, displacement thickness, momentum thickness and energy thickness? **[8]**

OR

Q6) a) Explain the following term with their graphical representation : **[4]**

i) Hydraulic Grade Line.

ii) Total Energy Line.

b) Derive Darcy-Weishbach equation for calculating loss of head due to friction in pipe. **[6]**

c) A flat plate of area $3.25m^2$ moves at 10m/s in a stationary air. The coefficient of lift and drag are 0.8 and 0.12 respectively. Compute i) lift force ii) drag force iii) resultant force. Density of air is $1.23kg/m^3$. **[8]**

Q7) a) Explain Froude's Model Law. **[4]**

b) Define : **[4]**

i) Reynold's Number,

ii) Froude's number

c) Using Buckingham π theorem prove that the discharge over weir is given by : **[9]**

$$Q = VL^2\left[\frac{gL}{V}, \frac{H}{L}\right]$$

OR

Q8) a) Explain Reynolds's Model Law. **[4]**

b) Define : **[4]**

i) Euler's Number

ii) Mach number

c) The pressure rise ΔP generated by a pump is a function of the impeller diameter D, the rotational speed N, the fluid density ρ, viscosity μ'. And the rate of discharge Q, show that $\Delta p = \rho N^2 D^2 \phi \left[\frac{Q}{ND^3}, \frac{\rho ND^2}{\mu} \right]$ Using Buckingham π theorem **[9]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC-2898

[Total No. of Pages : 2

[6352]-122

S.E. (Mechanical & Automobile)

MANUFACTURING PROCESSES

(2019 Pattern) (Semester - IV) (202050)

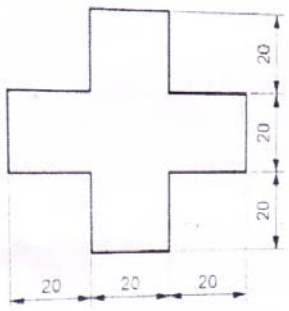
Time : 2½ Hours] ***[Max. Marks : 70***

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 compound die with neat sketch. **[8]**

b) Design a strip layout for manufacturing a MS component as shown in figure. The thickness of the component is 1.2 mm. Ultimate shear stress is 250N/mm^2. Also find percentage utilization, center of pressure and press capacity. **[10]**



OR

Q2) a) Explain bending terminology with the help of suitable sketch. **[8]**

b) Washer with 10 mm internal hole and 25 mm outside diameter is to be made from a strip of 2 mm thickness. Considering elastic recovery of the material, find a) Clearance b) Blanking die opening size c) Blanking punch size d) Piercing punch size e) Piercing die opening size. Assume clearance to be 5% of the stock thickness. **[10]**

P.T.O.

Q3) a) Explain the functions of fluxes in FCAW electrode. **[5]**

b) State any three welding defects with their causes and remedies. **[6]**

c) Explain the principle of Spot Welding process in brief. How 'Heat Balance'to be obtained in resistance welding? Expalin. **[6]**

OR

Q4) a) Demonstrate the different types of flames used in oxyacetylene welding. Give application of each flame. **[6]**

b) Distinguish between welding and brazing Which process gives the strongest joints and why? **[5]**

c) Discuss submerged arc welding (SAW) with neat sketch. **[6]**

Q5) a) Describe injection molding with neat sketch. **[6]**

b) Explain Transfer molding process in plastics with neat sketch. **[6]**

c) Explain Compression molding process in plastics with neat sketch. **[6]**

OR

Q6) a) Explain with neat sketch pressure thermoforming. State its advantages and disadvantages. **[6]**

b) Why is the cycle time for the injection molding of thermosetting polymers significantly longer than that for thermoplastics? Give typical applications of thermosetting polymers and thermoplastics. **[6]**

c) What are the different types of extruders used in plastic extrusion process? Expain. **[6]**

Q7) a) Explain fiber reinforced composites and particle reinforced composites. **[6]**

b) Classify composite materials in detail and give applications of each. **[5]**

c) Explain spray lay up process in composites. **[6]**

OR

Q8) a) Write short note on ceramic matrix composites. **[6]**

b) State advantages limitation and application of composites. **[5]**

c) What are the typical products that are made by filament winding process? Explain the process in detail. **[6]**

⌘⌘⌘

Total No. of Questions : 9]

SEAT No. : ____

PC-2899

[Total No. of Pages : 5

[6352]-123

S.E. (Automobile & Mechanical / Mechanical - (SW) / Automation & Robotics)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - IV) (207002)

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

Instructions to the candidates :

1) ***Question No.1 is compulsory.***
2) ***Solve 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) ***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 correct option of the following :

a) If $\phi = x + y + z, \bar{a} = \bar{i} + \bar{j} + \bar{k}$ then $\nabla\phi \cdot \hat{a} = ...$ **[2]**

i) $\frac{3}{2}$ ii) $\sqrt{3}$

iii) 0 iv) $\frac{-5}{2}$

b) The most general solution of partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ representing metel plate having length x and breadth $y \to \infty$ is **[2]**

i) $(c_1 \cos mx + c_2 \sin mx)\,(c_3 e^{my} + c_4 e^{-my})$

ii) $c_1 e^{mn} + c_2 e^{-mx}$

iii) $c_1 e^{my} + c_2 e^{-my}$

iv) $(c_1 \cosh mx + c_2 \sinh mx)(c_3 \cos my + c_4 \sin my)$

P.T.O.

c) A throw is made with two dice. The probability of getting a score of 10 point is _____. **[2]**

i) $\frac{1}{12}$ ii) $\frac{1}{6}$

iii) $\frac{1}{5}$ iv) $\frac{2}{3}$

d) The first four central moments are 0, 14.75, 39.75 & 142.3125 the value of β_1 is **[2]**

i) 0.4926 ii) 0.50

iii) 1.4926 iv) 2.888

e) The coefficient of correlation is given by **[1]**

i) $\gamma = \frac{\text{cov}(x,y)}{\sigma_x}$ ii) $\gamma = \frac{\text{cov}(x,y)}{\sigma_y}$

iii) $\frac{\text{cov}(x,y)}{\sigma_x^2 \sigma y^2}$ iv) $\gamma = \frac{\text{cov}(x,y)}{\sigma_x \sigma_y}$

f) The value of $\nabla \cdot \overline{r} = \ldots$ **[1]**

i) 0 ii) $\frac{1}{r}\overline{r}$

iii) 3 iv) 1

Q2) a) Fit a straight line of the form $y = ax + b$ to the following data **[5]**

x	0	6	8	10	14	16	18	20
y	3	12	15	18	24	27	30	33

b) The first four moments of distribution about the value 30 are 0.255, 6.222, 30.211 and 400.25. Calculate first four moments about the mean, also find β_1 and β_2. **[5]**

c) Find coefficient of correlation of following data **[5]**

x	10	14	18	22	26	30
y	18	12	24	6	30	36

OR

Q3) a) Fit a straight line $y = ax + b$ to the following data **[5]**

x	1	3	4	5	6	8
y	–3	1	3	5	7	11

b) First four moments of distribution about the value 4 are –1.5, 17, –30 and 108. Find first four moments about mean, β_1 and β_2. **[5]**

c) Obtain regression line of following data **[5]**

x	1	2	3	4	5
y	2	5	3	8	7

Q4) a) The probability of a mon hitting a target is $\frac{1}{3}$. If he fires 5 times, what is the probability of his hitting the target atleast twice? **[5]**

b) A manufactures knows that, the condensers he makes contains on average 1% defectives. He packs them in a boxes of 100. What is the probability that a box picked at random will contain 4 or more faulty condensers? **[5]**

c) In a normal distribution, 31% of the items are under 45 & 8% are over 64. Find the mean & standard deviation of the distribution. **[5]**
(Given for $z = 0.496$, $A = 0.19$, $z = 1.405$, $A = 0.42$)

OR

Q5) a) There are 3 envelopes containing rupees 100, 400 & 700 respectively. A player selects on envelope & keep with him, what he gets. Find the expected gain of the player. **[5]**

b) Number of road accidents on a highway during a month follows poission distribution with mean 5. Find the probability that in a certain month no. of road accidents on a highway will be : **[5]**

i) Less than 3

ii) More than 3

c) A nationalized bank utilizes 4 teller windows to render fast service to customers. On a particular day 800 customers were observed. They were given service at different windows as follows : **[5]**

Window number	Expected no. of Customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows (Given $X^2_{3,0.05} = 7.815$).

Q6) a) A curve is given by $x = t^2 + 1, y = 4t + 3, z = 3t^2 - 5t$ find angle between the tangents at $t = 0, t = 1$. **[5]**

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

c) Evaluate $\int_c \bar{F} \cdot d\bar{r}$ where $\bar{F} = x^2\bar{i} + 2xy\bar{j} + z\bar{k}$ where c is straight line joining (1, 0, 2) to (3, 1, 1). **[5]**

OR

Q7) a) Find directional derivative of $\varphi = 4xz^3 - 3x^2y^2z$ at (1, –1, 1) along tangent to the curve $x = e^t \cos t, y = e^t \sin t, z = e^t$ at $t = 0$. **[5]**

b) Solve any one : **[5]**

i) Show that $\nabla^4 r^4 = 120$

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

c) Evaluate by using Stoke's theorem.

$\iint_S \nabla \times \bar{F} \cdot \hat{n}\, ds$ where $\bar{F} = y\bar{i} + z\bar{j} + x\bar{k}$ over the surface $x^2 + y^2 = 1 - z$, $z > 0$. **[5]**

Q8) a) The temperature at any point of the insulated metel rod of one meter length ($l = 1$) is governed by the differential equation **[8]**

$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, find the temperature $u(x, t)$ subject to the following conditions.

i) $u(0, t) = 0°C, \quad \forall\, t$

ii) $u(l, t) = 0°C, \quad \forall\, t$

iii) $u(x, 0) = 40°C$

b) A tightly stretched string with fined end points $x = 0$ and $x = l$ is infinitely in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement y at any distance x from one end at any time t. **[7]**

OR

Q9) a) A rectangular plate with insulated surfaces is 10 cm wide and so long compaired to its width that it may be considered infinite in length without introducing appreciable error. If the temperature along short edge $y = 0$ is given by $u(x,0) = 100\sin\left(\frac{\pi x}{100}\right), 0 \le x \le 10.$ While two long edges $x = 0$ and $x = l$ as well as the other short edges are kept at 0ºC. Find the steady state temperature $u(x, y)$. **[8]**

b) Using Fourier sine transform solve the partial differential equation $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}, 0 < x < \infty, t > 0$, subjected to **[7]**

i) $u(0, t) = 0, t > 0,$

ii) $u(x, 0) = e^{-x}, x > 0$

iii) u and $\frac{\partial u}{\partial x} \to 0$ as $x \to \infty$

▽▽▽▽

Total No. of Questions : 8]

SEAT No. : [ ]

PC-2900

[Total No. of Pages : 4

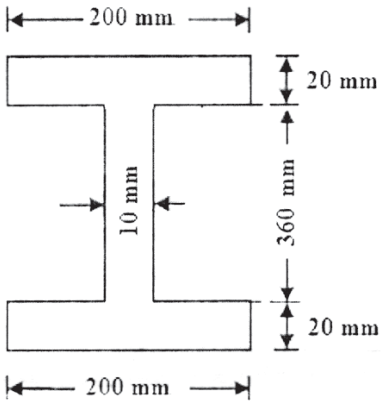
[6352]-124
S.E. (Automobile & Mechanical / Mechanical S.W/ Automation & Robotics)
SOLID MECHANICS
(2019 Pattern) (Semester - III) (202041)

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

Instructions to the candidates :

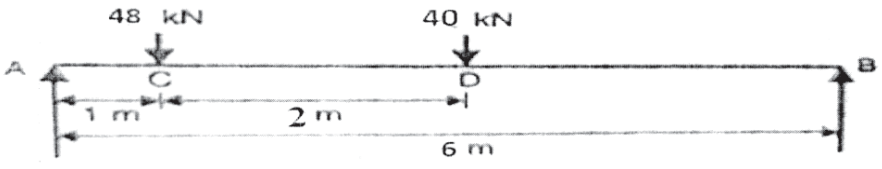
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) A simply supported beam is 10 m long carries udl of 40 kN/m over entire span. The cross section of beam is I as shown in fig. 1. Calculate the maximum stress produced due to bending. Also draw bending stress distribution diagram across depth. **[9]**



Q1 (a) Fig.1

b) A simply supported beam of 6 m length is loaded as shown. Find deflection under each load. Take E = 200GPa. And I = 85 × 10^6 mm^4. **[9]**



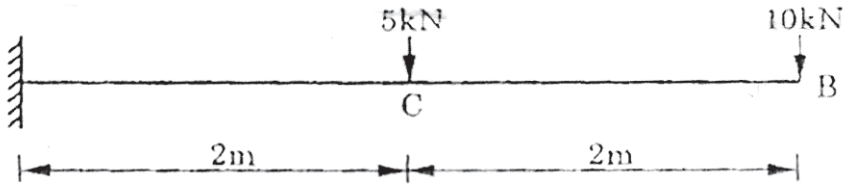
Q1 (b) Fig.2

OR

P.T.O.

Q2) a) The T shaped cross section of beam has 200 mm wide X 50 mm thick flange and overall depth of section is 250 mm. The web is 50 mm thick. Section is subjected to vertical shear force of 100kN. Calculate the shear stress at the neutral axis and at the junction of flange and the web. Also draw the stress distribution diagram. Moment of inertia about the horizontal neutral axis is 1.134×10^8 mm^4. **[9]**

b) A horizontal cantilever of uniform cross section of length 4 meter carries two point loads as shown. Find the maximum deflection due to loading.**[9]**



Q2 (a) Fig.3

Q3) a) A solid steel shaft 6m long is subjected to a torque of 10kNm. Shows maximum twist of 3^0 over whole length. Find diameter of shaft and maximum shear stress developed. Take G = 83GPa. **[9]**

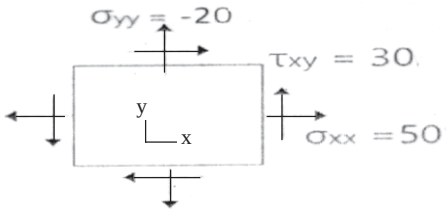
b) A cylindrical tube having internal diameter 70 mm and external diameter 80 mm is subjected to an axial tensile load of 90kN undergoes an extension of 3 mm over its 8 m length. What is the safe axial load resisting capacity of Column when cylindrical tube is fixed at one end and free at other end. Determine safe load on column taking FOS as 3. **[8]**

OR

Q4) a) A shaft of hollow circular section has outer diameter 120mm, inner diameter 100mm. Permissible shear stress is 95MPa. Angle of twist is not to exceed 3.6 degree in a length of 3m. Maximum torque is 30% excess of mean torque. Speed of shaft is 2 Hz. Determine maximum power transmitted by shaft. Take G = 80 CPa. **[9]**

b) Calculate Safe compressive load on hollow cast iron column with both end pinned. The column having 150mm external diameter and 100mm internal diameter with 10m length. Take $E = 95 \times 10^3$ N/mm^2 and FOS = 5. **[8]**

Q5) a) A strained material is subjected to stresses σx = 50 N/mm^2 Tensile, σy = 20 N/mm^2 (Compressive) and τxy = 30 N/mm^2. Determine the intensity of normal tangential and resultant stress and angle of obliquity on a plane inclined at 30^o to the plane carrying 50 N/mm^2 stress as shown in Fig.4. Also find Principal stresses and its orientation. Use analytical method.**[12]**

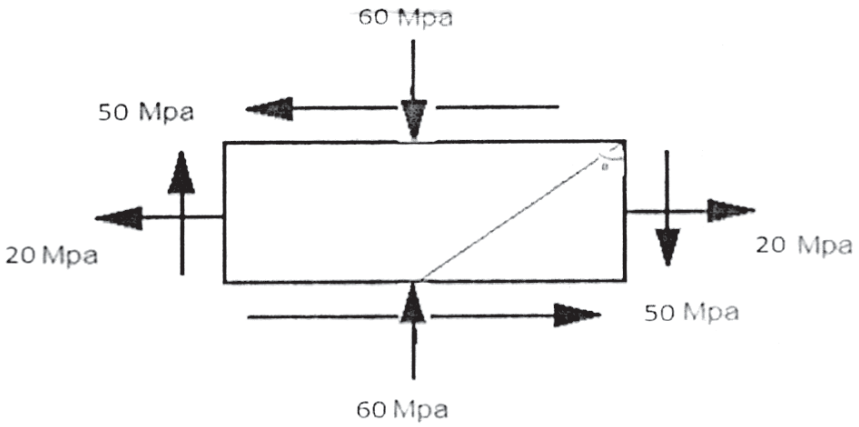


Q5 (a) Fig.4

b) At a certain position of circular structure of diameter d is subjected to shear force of 10 kN together with an axial tensile load of 20 kN. If the allowable working stress is 70 MPa. Estimate the magnitude of 'd' required according to the maximum principal stress theory. **[6]**

OR

Q6) a) The planes are stressed as shown in fig.5, determine the principal stresses and its orientation. Determine normal and tangential stresses on oblique plane inclined at 30^o with the plane of 60 MPa. Also determine the maximum shear stress and plane on which it acts using Mohr's Circle method.**[12]**



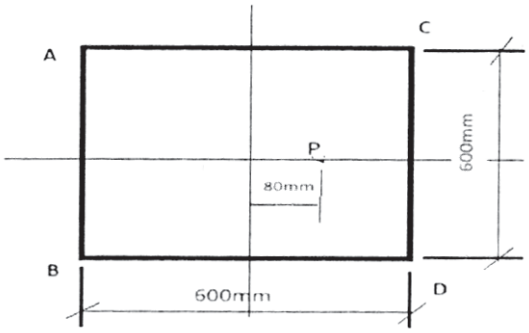
Q.6(a) Fig.5

b) A machine element is subjected to the stress σx = 60 MPa, σy = 45 MPa, τ_{xy} = 30 MPa. Find the factor of safety if it is made of steel having yield stress as 353 MPa. Using the following theories. **[6]**

i) Maximum shear stress theory

ii) Maximum normal stress theory

Q7) a) A short masonry pillar 600 mm × 600 mm in section. The pillar carries an eccentric load of 1000kN at 80 mm as shown. Find maximum and minimum stresses on the section. **[9]**

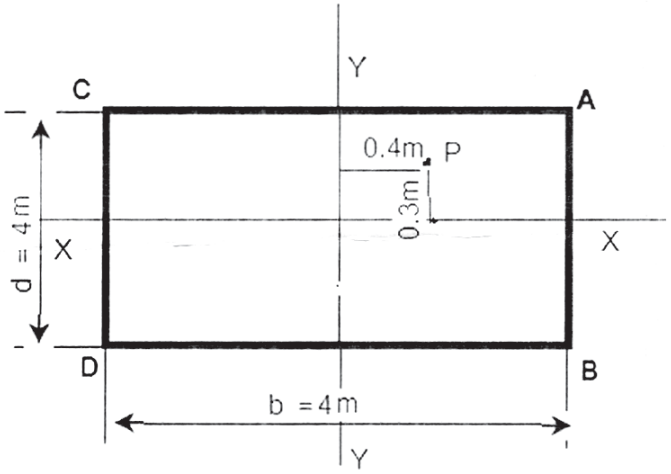


Q.7(a) Fig.6

b) A sohd shaft of diameter 80 mm is subjected to twisting moment of 8 MN-mm and bending moment of 5 MN-mm at a point. Determine i) Principal stresses and ii) Position of plane on which it acts. **[8]**

OR

Q8) a) Determine the resultant stress at four corners of column subjected eccentric load of P = 600 kN as shown in Fig. 7. **[9]**



Q.8(a) Fig.7

b) A solid circular shaft is subjected to a bending moment of 2.3 kNm and twisting moment of 3.45 kNm. Find the diameter of the shaft if the allowable tensile and shear stresses for shaft material are limited to 703 MN/m^2 and 421.8 MN/m^2 respectively. **[8]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2901

[Total No. of Pages : 2

[6352]-125
S.E. (Automobile & Mechanical/Automation & Robotics/Mechanical S.W)
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, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain Boundary Representation with its advantages and disadvantages? **[8]**

b) Explain the concept of Half Space in solid modeling with its types and suitable example? **[9]**

OR

Q2) a) Explain the concept of feature based 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 square with coordinate with coordinates points A (0,3), B (3,3), C (3,0) and D (0,0). Apply the translation with distance 1 towards X axis and 1 with towards Y axis. Obtain the new coordinates of the square.**[9]**

b) What is reflection? Explain various reflection matrix used in transformation. **[9]**

OR

Q4) a) Write a short note with neat sketch : **[8]**

i) Mapping of Coordinate System

ii) Screen Coordinate System

b) What is Geometric Projection? Explain any two types of projections in details. **[10]**

P.T.O.

Q5) a) Explain CAD Kernels in details with its different types. **[9]**

b) Explain Direct Data Translators with neat sketch. **[8]**

OR

Q6) a) Write a short note with its advantages : **[9]**

i) Computer Aided Engineering

ii) Finite Element Analysis

iii) Computational Fluid Dynamics

b) Explain the concept of CAD Geometry Clean-up with suitable example? **[8]**

Q7) a) Explain the concept of Product and Manufacturing Information in details with neat sketch? **[9]**

b) What is CAD customization? Explain Need for CAD Customization. **[9]**

OR

Q8) a) Write a short note on the following. **[10]**

i) Application Programming Interface (API)

ii) Coding/Scripting for customization.

b) Explain CAD Automation with process working and advantages. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-2902

[Total No. of Pages : 3

[6352]-126
S.E. (Mechanical Sandwich Engineering/Automobile & Mechanical)
ENGINEERING THERMODYNAMICS
(2019 Pattern) (Semester - III) (202043)

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) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Use of steam table is allowed.***

Q1) a) Define : **[4]**

i) Dead State

ii) Exergy

b) A system at a temperature of 400 K receives 150 KJ/s of heat from a source at a temperature of 1200 K. Atmospheric Temperature is 300 K. In case the temperatures of both, the system and source are assumed to be constant during the heat transfer process, find the net change in entropy, available energy of the heat source and the system and the decrease in available energy. Represent the process on T-S diagram. **[8]**

c) State and prove the Principle of Increase of Entropy. **[5]**

OR

Q2) a) State and prove Clausius Inequality. **[5]**

b) A heat engine receives 600 kJ of heat from a high temperature reservoir at a temperature of 1000K during a cycle: It converts 150 kJ of this heat into net work and rejects the remaining 450 kJ heat to a low temperature sink at 300 K temperature. Determine if this heat engine violates the second law of Thermodynamics on the basis of i) Clausius Inequality ii) Carnot Theorem. **[8]**

c) Define : **[4]**

i) Available Energy

ii) Unavailable Energy

P.T.O.

Q3) a) Explain combined separating & throttling steam calorimeter with the help of neat diagram. **[7]**

b) Find the specific volume, enthalpy and internal energy of wet steam at 18 bar pressure, having dryness fraction 0.85using steam tables. **[7]**

c) Explain Rankine vapour power cycle with the help of T-S diagram. **[4]**

OR

Q4) a) A throttling calorimeter is used to measure dryness fraction of the steam in the steam mains which has steam flowing at a pressure of 8 bar. The steam after passing through the calorimeter is at 1 bar pressure and 115 deg centigrade temperatures. Calculate the dryness fraction of the steam in the mains. Take specific heat of superheated steam as 2.1 kJ/kg K.**[7]**

b) Explain the following terms : **[4]**

i) Critical point

ii) Triple point

iii) Enthalpy of different types of steam

c) A closed vessel of 0.6 m^3 capacity contains dry steam at 360 kPa pressure. The vessel is cooled till pressure drops to 200 kPa. Find out i) mass of steam in the vessel ii) Final Dryness fraction of steam. **[7]**

Q5) a) Distinguish between Proximate Analysis & Ultimate Analysis of a fuel.**[4]**

b) Determine the Air-Fuel ratio and the theoretical mass of air required for complete combustion of a fuel containing 85% of Carbon, 8 % of Hydrogen, 3% of Oxygen, 1% of Sulphur and remaining ash by mass. If 40 % of excess air is used, what volume of air at 27deg centigrade and 1.05 bar pressure, does this represent per kg of fuel? **[8]**

c) Explain Boy's Gas Calorimeter with a neat schematic diagram. **[5]**

OR

Q6) a) Define : **[4]**

i) Stoichiometric Air

ii) Stoichiometric Mixture

b) Coal with following mass analysis is burnt with 100% excess air. C = 74%, H_2 = 4.3 %, S = 2.7%, N2 = 1.5%, H_2O = 5.5%, O_2 = 5%, Ash = 7%. Find the moles of gaseous product if 100 kg of fuel are burnt. **[8]**

c) Write a note on 'Orsat Apparatus' used for volumetric analysis of Dry Exhaust Gases. **[5]**

Q7) a) Distinguish between Fire tube & Water tube Boilers. **[4]**

b) A water tube boiler produces 6000 kg/hour of steam at a pressure of 10.5 bar and consumes coal at a rate of 10.83 kg/min. The steam produced has a temperature of 250°C. The Calorific value of fuel is 30500 kJ/kg. The water initially enters into the economizer and has temperature of 49 °C at the economizer outlet. Determine i) Boiler Efficiency ii) Equivalent Evaporation. **[8]**

c) Define 'Boiler Accessories' and enlist different accessories of a boiler. With the help of neat sketch, explain Green's Economizer. **[6]**

OR

Q8) a) Define steam generator. Write down classification of boiler. **[4]**

b) The following results obtained from boiler trial: **[8]**

i) Feed water per hour = 700 kg at 27°C

ii) Steam pressure = 8 bar of dryness 0.97

iii) Coal consumption = 100 kg/hr

iv) C.V. of coal = 25000kJ/kg

v) Unburnt coal collected = 7.5 kg/hr

vi) Flue gas formed per kg of fuel = 17.3 kg at 327°C (Cp of flue gas = 1.025 kJ/kg K)

vii) Room temperature = 16°C

Draw heat balance sheet kJ/min basis & Boiler Efficiency.

c) With the help of neat sketches, explain : **[6]**

i) Fusible Plug

ii) Blow off cock

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2903

[Total No. of Pages : 2

[6352]-127
S.E. (Automobile & Mechanical Engineering/Mechanical Sandwich Engineering/Automation & Robotics Engg)
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, 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 Logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data necessary.***

Q1) a) State and explain the Hume Rothery's Rule of Solid Solubility. **[8]**

The atomic radius of Al and Si are 0.143 nm and 0.117 nm respectively. Do they satisfy Hume Rothery's first rule for complete solid solubility? Justify your answer.

b) Define the terms — System, Phase, Variable, Component & Alloy. Also explain the significance of Equilibrium diagram. **[9]**

OR

Q2) a) Draw iron and iron carbide equilibrium diagram and show the following points: critical temperatures, phases and reactions. **[8]**

b) State and explain Gibb's Phase Rule. Apply the same rule for following cooling curves. **[9]**

i. Cooling curve for Pure metal

ii. Cooling Curves for Binary Solid Solution Alloy

Q3) a) Explain with neat sketch the austenite to pearlite transformation and draw microstructures for: **[9]**

i. hypoeutectoid steel

ii. 100% Pearlite

iii. Hypereutectoid steel

b) Explain with neat sketch the austenite to bainite transformation. **[9]**

Compare lower bainite and upper bainite with respect to following points: temperature range, appearance, hardness and diagram.

P.T.O.

OR

Q4) a) Define Tempering process. State its objectives. Show the variation in hardness, toughness and internal stresses with low, medium and high temperature tempering. **[9]**

b) State objectives of heat treatment processes. Show following heat treatments on TTT diagram. **[9]**

i. Conventional annealing
ii. Isothermal annealing
iii. Austempering
iv. Martempering

Q5) a) Explain in detail the classification of Steel. **[8]**

b) Define Alloy Steels. Explain in detail the classification of alloy steels? Explain the effect of increasing concentrations of alloying elements like Si, Mn, and Ni on eutectoid temperature. **[9]**

OR

Q6) a) What are cast irons? How they are different than steel? List any five types of cast irons. Write properties, composition and applications of white cast iron. **[8]**

b) Explain the manufacturing process of a Malleable Cast Iron with the help of a Time — Temperature plot. State an four applications of Malleable Cast Iron. **[9]**

Q7) a) What are the general properties and uses of copper. Enlist the α brasses. Write properties, composition and application of any two α brasses. **[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) What are the general properties and applications of cobalt? Explain its alloys in detail. **[9]**

b) Where the bearing materials are used? What are its requirements? List any four non-ferrous bearing materials. Write properties, composition and applications of any two Bearing Materials. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2904

[Total No. of Pages : 2

[6352]-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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of non-programmable calculator is allowed.***

Q1) a) Write the voltage equation in case of the following: **[4]**

i) DC shunt generator

ii) DC shunt motor

b) Obtain the expression for the torque developed in the armature of a DC motor. **[6]**

c) A 230 V, DC shunt motor draws a current of 8 A at no load from the supply while driven at 1200 rpm. Find the speed of the motor on certain load while drawing a current of 38 A from supply. Assume the flux as constant. Given that the armature resistance is 0.25 Ω and the shunt field resistance is 115 Ω. **[8]**

OR

Q2) a) Derive the EMF equation of a DC machine from first principles. **[4]**

b) What is an electrical braking in a motor? Explain the regenerative braking in a DC shunt motor with the help of circuit diagram. **[6]**

c) A 230 V, 4 pole lap wound DC shunt motor has 900 armature conductors. The resistance of armature conductor is 0.75 Ω and that of shunt field winding resistance is 210 Ω. The motor takes a current of 20 A and flux per pole is 50 mWb. Find the speed and the gross torque developed by the motor. **[8]**

Q3) a) Define the term 'slip' in a three phase induction motor. Can a three phase induction motor run at synchronous speed? Justify your answer. **[3]**

b) Derive the generalized equation for the torque developed in a three phase induction motor in steps. **[6]**

P.T.O.

c) The power input to a three phase induction motor is 40 kW. The stator losses are 1kW and the friction and windage losses are 2 kW. If the motor operates at the slip of 4%, find: **[8]**

i) Mechanical power developed
ii) Rotor copper loss per phase
iii) Efficiency of the motor

OR

Q4) a) Suggest a suitable type of a three phase induction motor for the following applications: **[3]**

i) Cranes ii) Electric traction
iii) Flour mill

b) Explain V/F control method for controlling the speed of a three phase induction motor. **[6]**

c) Explain the necessity of a starter in a three phase induction motor. Hence draw the schematic of the DOL starter and explain its operation. **[8]**

Q5) a) Define an Electric Vehicle (EV). Draw the block diagram of structure of anEV. **[4]**

b) Explain the concept of Vehicle to Grid (V2G) technology with the help of schematic. **[6]**

c) i) Explain in brief the challenges faced by EV technology in the present context. **[8]**

ii) Differentiate between Hybrid EV and Fuel Cell EV.

OR

Q6) a) What is an Hybrid EV (HEV)? State the merits offered by such a vehicle. **[4]**

b) Explain the impact of usage of EV on power grid operations. **[6]**

c) List the configurations of an HEV. Hence explain any two configurations with the help of block diagram. **[8]**

Q7) a) State the factors used in the selection of a battery for an EV. **[3]**

b) State the advantages and disadvantages of LMO battery. **[6]**

c) Draw and explain the block diagram of a Battery Management System (BMS) incorporated in an EV. **[8]**

OR

Q8) a) What is a supercapacitor? State its limitations while used in an EV. **[3]**

b) Explain the working of a hydrogen fuel cell with the help of diagram and state the advantages offered by it. **[6]**

c) State the factors used for selecting an electric motor in an EV and explain the working of a BLDC hub motor drive. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-2905

[Total No. of Pages : 3

[6352]-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) ***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 logarithmic tables, slide rule, and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Derive Darcy-Weisbach formula for calculating loss of head due to friction in pipe. **[8]**

b) Explain Pipes in series and concept of Equivalent Pipe with fig and formula. **[8]**

OR

Q2) a) A 0.2 m diameter pipe carries liquid in laminar regime. A pitot tube placed in the flow at a radial distance of 20 mm from the axis of the pipe indicates velocity of 0.5m/s. Calculate: **[8]**

i) The maximum velocity
ii) The mean velocity, and
iii) The discharge in the pipe

b) Determine the dimensions of the quantities given below in MLT form. **[8]**

i) Viscosity
ii) Surface tension
iii) Power
iv) Force

Q3) a) A jet of water of diameter 40mm moving with a velocity of 30 m/s strikes normally to a flat plate moving at 10m/s Determine **[10]**

i) The force exerted by the jet on the plate,
ii) Power of the jet,
iii) Efficiency of the jet and
iv) Max efficiency

P.T.O.

b) Prove that the condition for maximum efficiency (V=2u) for a jet of water strikes at centre of series of curved vane also finds an expression for maximum efficiency. **[8]**

OR

Q4) a) Double Jet Pelton Wheel has a specific speed of 14 and is required to deliver 1000 kW. The turbine is supplied through pipeline from a reservoir whose level is 400 m above the nozzles. Allowing 5% for frictional loss in the pipe. **[10]**

Calculate:

i) Speed in RPM

ii) Diameter of jets.

iii) Mean Diameter of Bucket circle.

iv) Number of buckets

Take Cv = 0.98, speed ratio = 0.46 and overall efficiency = 85%, the specific speed is based on power output per jet.

b) Explain the functions of following: **[8]**

i) Casing of Pelton wheel

ii) Notch of bucket

iii) Governing mechanism

Q5) a) A Kaplan turbine operates at a discharge of 77 m^3/s. The runner diameter and hub diameter are 4.2 m and 1.5 m respectively. Taking the speed ratio of 2.1. Determine.

i) The net head,

ii) The power developed and

iii) The specific speed.

Assume the mechanical and hydraulic efficiency of 88% and 92% respectively and no whirl at outlet. **[8]**

b) Explain unit quantities in reaction turbine. **[6]**

c) Draw Velocity Triangles of Francis Turbine. **[4]**

OR

Q6) a) Design a Francis turbine runner with the following data.

Net Head = 68 m; Speed = 750RPM Power output = 330 kW; Hydraulic efficiency = 94 %; Overall Efficiency = 85%; Flow ratio = 0.15: Ratio of breadth to diameter = 0.1; Inner diameter of the runner is half of outer diameter of the runner. 6% of circumferential area of the runner is occupied by the thickness of the vanes. Assume velocity of flow remains constant and flow is radial at exit. **[8]**

b) Explain the working principle of turbine which is suitable for low head. **[6]**

c) Explain the following for hydraulic turbine. **[4]**

i) Hydraulic Efficiency

ii) Mechanical Efficiency

Q7) a) Derive the expression for rise in pressure in the impeller of a centrifugal pump. **[6]**

b) Find the rise in pressure in the impeller of a centrifugal pump through which water is flowing at the rate 15 litre/s. The internal and external diameters of the impeller are 20 cm and 40 cm respectively. Widths of impeller at inlet and outlet are 1 .6 cm and 0.8 cm .The pump is running at 1200 r.p.m. The water enters the impeller radially at inlet and impeller vane angle at outlet is 30°. Neglect losses through the impeller. **[7]**

c) What is Priming? Explain methods of priming in pump. **[5]**

OR

Q8) a) Derive the expression for minimum starting speed of a centrifugal pump. **[7]**

b) The diameter of an impeller of a centrifugal pump at inlet and outlet are 300 mm and 600 mm respectively. The velocity of flow at outlet is 2.5 m/s and vanes are set back at an angle of 45° at outlet. Determine the minimum starting speed of the pump if the manometric efficiency is 75%. **[6]**

c) Explain cavitation and NPSH in pump. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2906

[Total No. of Pages : 2

[6352]-130

S.E. (Mechanical-Sandwich)

MANUFACTURING ENGINEERING

(2019 Pattern) (Semester - IV) (202063)

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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary and mention it clearly.***

Q1) a) Differentiate TIG and MIG systems of arc welding. Draw sketch of each. **[8]**

b) How would you analyze and differentiate the distinct characteristics of various oxy-acetylene gas welding flames with neat sketches incorporating factors such as temperature and fuel-to-oxygen ratios? **[9]**

OR

Q2) a) Illustrate with neat sketch the following terms used in welding : **[8]**

i) Base metal ii) Bead iii) Crater iv) Fillet weld v) Root vi) Tack weld vii) Toe of weld viii) Weld face

b) Explain the principle underlying the resistance welding process. Explain Spot, Seam and Projection welding in detail. **[9]**

Q3) a) State Taylors' Tool life equation.

The following equation for tool life is given for a turning operation $vT^{0.13}f^{0.77}d^{0.37}$ = C, A 60 min tool life was obtained while cutting at v = 30 m/min, f = 0.30 mm/rev and d = 2.5 mm. Calculate the change in tool life if the cutting speed, feed and depth of cut are increased by 25 % individually and together. **[9]**

b) With a neat sketch draw a single point cutting tool geometry. Also explain the signature of single point cutting tool **8-14-6-6-20-15-4**. **[9]**

P.T.O.

OR

Q4) a) Differentiate between orthogonal; cutting and oblique cutting. Discuss the process parameter in metal cutting. **[9]**

b) i) Demonstrate the various types of chips formed during metal cutting.

ii) Determine the cutting speed in machining a work-piece of 200 mm diameter rotating at a speed of 100 rpm. Also calculate machining time if the work-piece length is 400 mm and feed is 0.45 mm/rev **[9]**

Q5) a) Differentiate between Mutli-spindle and gang drilling machine. **[5]**

b) Construct a Radial Drilling Machine with neat sketch. **[5]**

c) Index for 69 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

OR

Q6) a) Calculate the time required to produce 10 holes on a MS plate of 40 mm thickness using i) Radial drilling machine and ii) Multi-spindle drilling machine with the following data : **[5]**

(i) Drill diameter = 25 mm, (ii) cutting speed = 25m/min, (iii) Feed = 0.1 mm/rev., (iv) Overrun and approach = 0.3 × drill diameter

b) Explain thread tapping process with neat sketch. **[5]**

c) Explain following Milling operations with suitable sketch : **[7]**

i) Straddle Milling

ii) Gang Milling

Q7) a) Differentiate between rough grinding and precision grinding. **[5]**

b) Explain the Principle of centreless grinding with neat sketch. **[5]**

c) Explain Lapping and Honing processes with neat sketch. **[8]**

OR

Q8) a) Explain dressing of a grinding wheel. **[5]**

b) What is mean by the terms Grit, Grade and structure of a Grinding Wheel? **[5]**

c) Draw a neat sketch of broach and enlist the functions of its parts. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2907

[Total No. of Pages : 3

[6352]-140

S.E. (Mechanical Sandwich)

THERMAL ENGINEERING

(2019 Pattern) (Semester - IV) (202061)

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) ***Use of logarithmic tables, slide rule, steam table, Psychrometric chart. And electronic pocket calculator is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Define the following terms **[8]**
- i) Dew point Temperature
- ii) Degree of Saturation
- iii) Dew point depression
- iv) Relative humidity

b) How the air conditioning systems are classified and explain the summer air conditioning system with neat sketch. **[9]**

OR

Q2) a) Explain the processes on the Psychrometric Chart **[8]**
- i) Sensible Cooling
- ii) Sensible Heating
- iii) Dehumidification
- iv) Humidification

b) Atmospheric air with dry bulb temperature of 30ºC and wet bulb temperature of 17ºC is closed to 15ºC without changing its moisture content. Find 1) Original relative humidity 2) Final relative humidity 3) Final wet bulb temperature. **[9]**

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. **[10]**

b) Explain closed cycle gas turbine with neat sketch and show the cycle P-V & T-S Diagram. **[8]**

P.T.O.

OR

Q4) a) Explain with figure difference between Air standard cycle, fuel cycle and actual cycle for petrol engine. **[9]**

b) An air standard diesel cycle has a compression ratio of 14. The pressure at the beginning of the compression stroke is 1 bar and the temperature is 300 K. The maximum cycle temperature is 2500K. Determine the cut - off ratio and the thermal efficiency. **[9]**

Q5) a) Explain the Turbocharging with neat sketch, also give advantages of Turbocharging. **[8]**

b) Explain types of Governing systems in IC Engines. **[9]**

OR

Q6) a) What is necessity of cooling the engine, what is effect of undercooling and overheating of an engine. **[8]**

b) What are the different types wet sump lubrication system and explain any one of them. **[9]**

Q7) a) What are Sources of Pollutants from SI engine, Explain in details? **[9]**

b) Explain Normal combustion and abnormal combustion Phenomena in SI engine. **[9]**

OR

Q8) a) Explain stages of combustion in CI engine with P-θ diagram. **[9]**

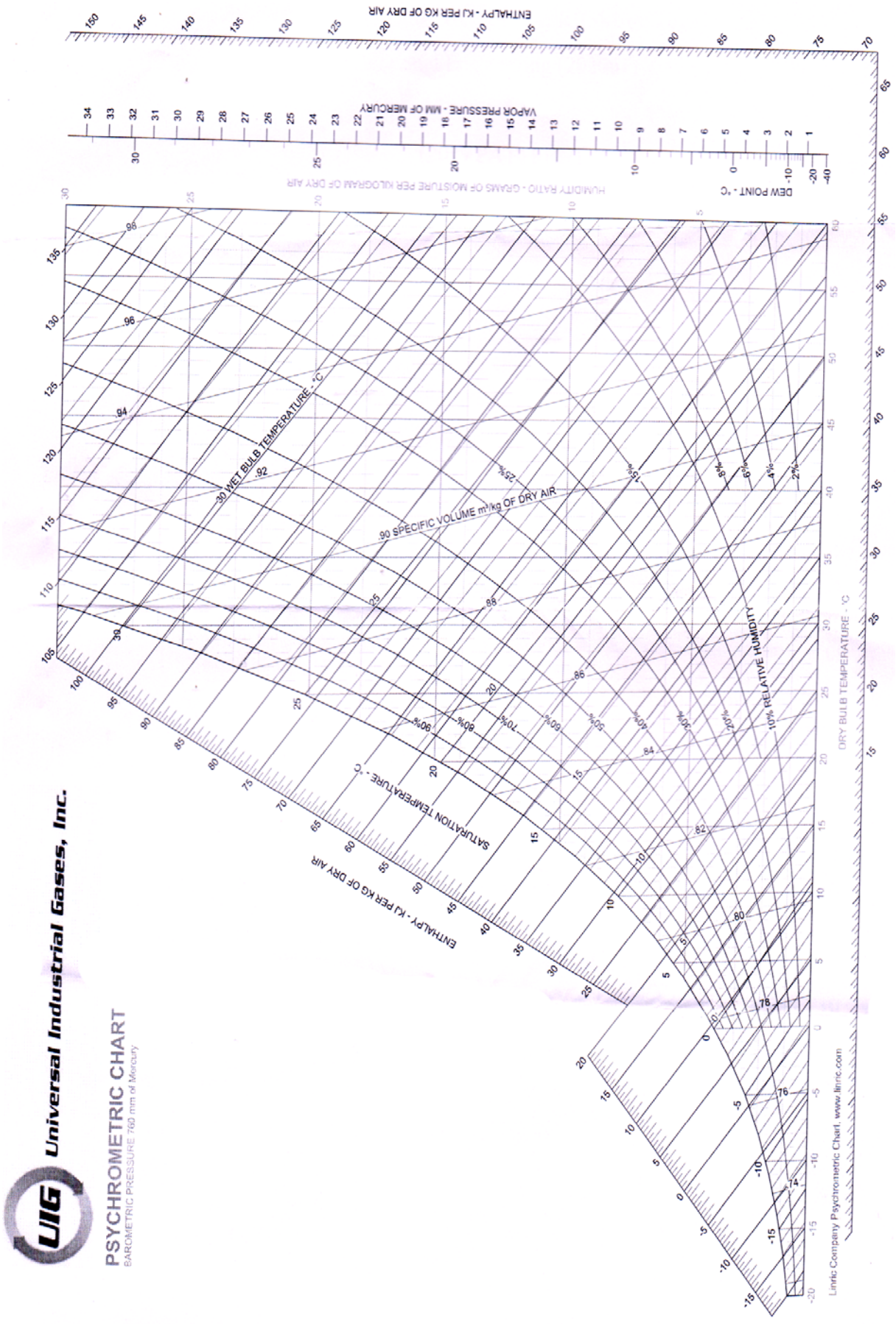
b) In a test of a single - cylinder, four -stroke **[9]**

Diesel engine, the following data were recorded.
Indicated mean effective pressure = 755 kPa
cylinder diameter =10 cm
piston stroke = 15 cm
Engine speed = 480rpm
brake wheel diameter = 62.5 cm
net load on the brake wheel = 170 N
Calculate

i) indicated power,

ii) brake power, and

iii) the mechanical efficiency of the engine.


Universal Industrial Gases, Inc.
PSYCHROMETRIC CHART
BAROMETRIC PRESSURE 760 mm of Mercury
ENTHALPY - KJ PER KG OF DRY AIR
VAPOR PRESSURE - MM OF MERCURY
DEW POINT - °C
HUMIDITY RATIO - GRAMS OF MOISTURE PER KILOGRAM OF DRY AIR
WET BULB TEMPERATURE - °C
SPECIFIC VOLUME m³/kg OF DRY AIR
SATURATION TEMPERATURE - °C
% RELATIVE HUMIDITY
DRY BULB TEMPERATURE - °C
Linric Company Psychrometric Chart. www.linric.com

Total No. of Questions : 8]

SEAT No. :

PC-2908

[Total No. of Pages : 3

[6352]-141

S.E. (Automatin and Robotics)

PRINCIPLES OF ROBOTICS

(2019 Pattern) (Semester - IV) (202524)

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 side indicate full marks.***
4) ***Use of non programmable electronic calculator is permitted.***
5) ***Assume Suitable/Standard data necessary.***

Q1) a) Classify the robot gripper from the view point of its control. Sketch and explain a mechanical gripper used for robots. **[5]**

b) Sketch and explain adaptive gripper with its industrial application. **[5]**

c) Distinguish between two-point and three-point centering of robot gripper. Explain any two types of grippers used for robots? **[8]**

OR

Q2) a) Write the design considerations for robot end-effectors in industrial use. **[5]**

b) Sketch and explain magnetic gripper with its industrial application. **[5]**

c) Illustrate which type of gripper is suitable for following application and justify. **[8]**

i) Industrial Spray Painting

ii) Pick & Place

P.T.O.

Q3) a) Discuss response, accuracy and sensitivity in relation to robot sensors. **[4]**

b) Explain sensor selection and design consideration for robotic application. **[6]**

c) Distinguish between Sensor and transducer? Explain role of a transducer in a control system. **[7]**

OR

Q4) a) What is meant by LVDT. State its applications. **[4]**

b) Sketch and explain the working of optical encoder and specify its application. **[6]**

c) What are safety sensors? Discuss the use of light curtain in industrial robots. **[7]**

Q5) a) A point P (8, 4 and 1) is attached to a robo frame and subjected to following transformation. Find the coordinate of point relative to reference frame. **[10]**

i) Rotation of 60° about Z-axis.

ii) Followed by rotation of 60° about Y-axis.

iii) Followed by translation of [4, –3, 7].

b) Discuss the various inputs to an inverse kinematics of 2 DOF robots. **[8]**

OR

Q6) a) Figure shown in 6.a is a planar 2 DOF robotic arm. Perform the inverse kinematic analysis and find out the joint angles? **[10]**

Given data :

L_1 = 10 cm, L_2 = 8 cm, X = 13 cm, Y = 18 cm, ϕ = 75°

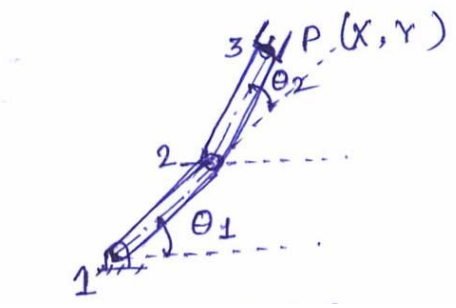


Fig. 6a

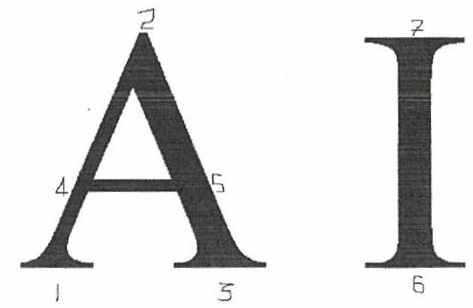
b) Discuss the major parameters of DH convention for robot manipulator. **[8]**

Q7) a) Discuss the relative merits and demerits of different textual robot languages. Explain the different program instructions. **[10]**

b) Distinguish On-line and off-line programming. **[7]**

OR

Q8) a) Write a program to write below letters by Robot using VAL Language. **[10]**



b) Discuss robot application for welding and machine loading. **[7]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-2909

[Total No. of Pages : 3

[6352]-142

S.E. (Automation & 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 side indicate full marks.***
4) ***Use of nonprogrammable electronic calculator is permitted.***
5) ***Assume Suitable/Standard data if necessary.***

Q1) a) A 2000 m long pipeline is used for transmission of power. 150 kW power is to be transmitted through the pipe in which water having a pressure of 3000 kN/m^2 at inlet is flowing. If the pressure drop over the length of pipe is 900 kN/m^2 and f = 0.006. Find Diameter of the pipe and Efficiency of transmission. **[9]**

b) Explain the concept of siphon and its working with neat sketch. **[9]**

OR

Q2) a) Explain with sketch minor loss in following cases and write minor loss equation. **[9]**

i) Loss during entry in pipe

ii) Loss due to contraction of pipe

iii) Loss due to fittings in pipe

b) A siphon of diameter 0.1 m connects two reservoirs having a difference in elevation of 15 m. The length of the siphon is 400 m and summit is 2 m above the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 200 m. 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]**

P.T.O.

Q3) a) Explain with sketch working of following control valve : **[8]**

i) Ball valve

ii) Globe valve

b) Explain the working of pneumatic actuator with neat diagram, Also mention two application. **[9]**

OR

Q4) a) Write any four desired characteristics of Control Valve. **[8]**

b) Write a short note on : **[9]**

i) Electric actuator

ii) Solenoid actuator and

iii) Digital actuator

Q5) a) A single stage, single acting reciprocating compressor has air entering at 1 bar, 20°C 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 applications. **[8]**

OR

Q6) a) A single stage reciprocating air compressor takes in 7.5 m^3/rnin of air at 1 bar and 28°C and delivers it at 5 bar. The clearance is 4% of the stroke. The expansion and compression are polytropic, n = 1.2, Calculate: **[9]**

i) The temperature of delivered air

ii) Volumetric efficiency

iii) Power of the compressor.

b) Explain with a P-V diagram the working of two stage compressor with intercooler. Also give any two benefits of multistage with intercooling in compressor. **[8]**

Q7) a) Derive general three-dimensional heat conduction equation in Cartesian coordinates in simplified forms. **[9]**

b) A plane brick wall is 30 cm thick if faced with 20 cm thick concrete layer. If the temperature of the exposed brick face is 70°C and that of the concrete is 25°C, Find out the heat lost per hour through a wall of 15m X 10m. Also, determine the interface temperature. Thermal conductivity of brick and concrete are 0.7 W/mK and 0.95 W/mK respectively. **[9]**

OR

Q8) a) Define the falling law and write its governing equations : **[9]**

- Fourier law of conduction
- Newton's law of cooling
- Stefan Boltzmann law

b) A furnace wall of composite nature is made up of with 120 mm of fire clay with k = 0.20 (1 + 0.0008 t) W/m °C and 600mm of red brick (k = 0.8 W/m °C). The inside brick surface temperature is 1250 °C and outside air temperature is 40 °C. Determine the temperature at layer interface and the heat loss for 1 m^2 of furnace wall. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-2910

[Total No. of Pages : 3

[6352]-143
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 data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Explain Bit type instructions- XIC, XIO, OTE, OTL, OTU, OSR. **[6]**

b) Explain the ON Delay Timer and OFF Delay Timer with timing diagram. **[6]**

c) Draw a ladder diagram for stepper motor control. **[6]**

OR

Q2) a) Explain ladder logic programming with symbols of PLC. **[6]**

b) List types of counters available in PLC. Explain any one. **[6]**

c) Draw a ladder diagram for following function table **[6]**

Inputs; I1,I2 Outputs: Q1, Q2, Q3

I1	I2	Q1	Q2	Q3
0	0	0	0	0
0	1	0	0	1
1	0	0	1	0
1	1	1	0	0

Q3) a) Discuss about RS485 Serial Communication. **[6]**

b) Explain with neat diagram hierarchical level in Industrial Communication Networks, **[6]**

c) State the advantages of HMI **[5]**

OR

Q4) a) Explain the types of HMI? **[6]**

b) Discuss about ControlNet Protocol **[6]**

c) Explain the function of HMI **[5]**

P.T.O.

Q5) a) What is Extrusion? Explain in detail types of extrusion? **[6]**

b) Develop PLC Programming Batch Process ladder logic program according to logic given below, **[6]**

i) When the start button is pushed, the process starts. On SV1 and SV2 if the level is low.

ii) Off SV1 and SV2, when the level is high. And on motor for 30 seconds to mix the ingredient A and ingredient B.

iii) Off Motor and on SV3 after 30 seconds

iv) Off SV3 when the level is low. This is the end of one batch. Again on SV1 and SV2.

v) The cycle continues till, stop push button is pressed.

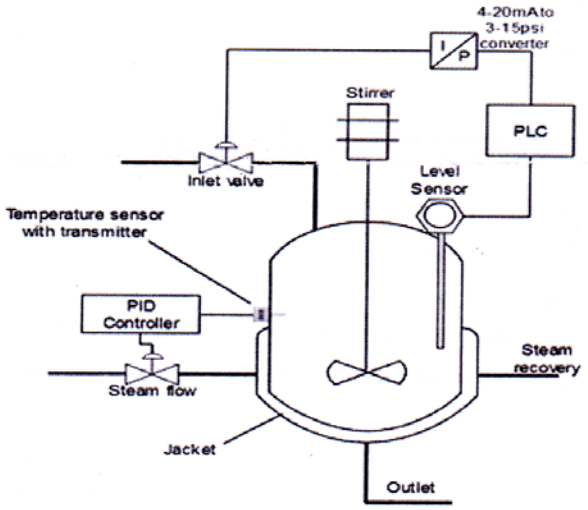
vi) When stop/reset button is pushed, the process resets/stops. But when SV3 is on, stop button action should not affect the process.

c) Define recipe as per ANSI/ISA S88 standard. Explain its types. **[6]**

OR

Q6) a) What is Batch? Explain the control equipment of used for Batch control.**[6]**

b) Develop ladder logic program to control Continuous Stirred Tank Reactor in PLC. **[6]**



c) What are the types of models in Batch Process? Explain any two **[6]**

Q7) a) What is logic family? Give comparisons between TTL, ECL and CMOS logic families. **[6]**

b) Define the following terms : **[6]**

i) Power Dissipation

ii) Propagation delay

iii) Noise Margin

c) Explain with a neat diagram CMOS inverter. **[5]**

OR

Q8) a) Compare CMOS and TTL logic family. **[6]**

b) Explain the concept of Tristate logic. **[6]**

c) Explain with a neat diagram CMOS NOR gate. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-2911

[Total No. of Pages : 4

[6352]-144

S.E. (Mechatronics Engineering)

KINEMATICS OF MACHINERY

(2019 Pattern) (Semester - IV) (217547)

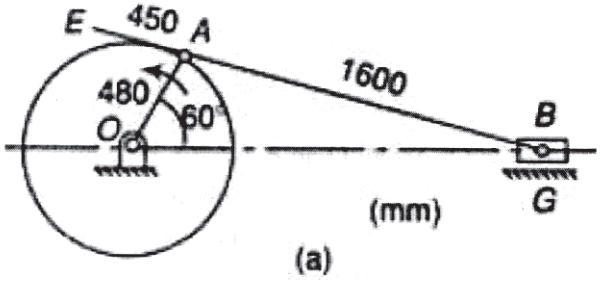
Time : 2½ Hours] ***[Max. Marks : 70***

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) ***Use of drawing instruments, electronic pocket calculators is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain the method of determining the rubbing velocity at a pin joint. **[6]**

b) For the configuration of a slider crank mechanism shown in fig. link OA rotates at 20 rad/s counter clockwise, calculate : i) Acceleration at slider at B ii) Acceleration of the point E. iii) Angular acceleration of the link AB. **[12]**



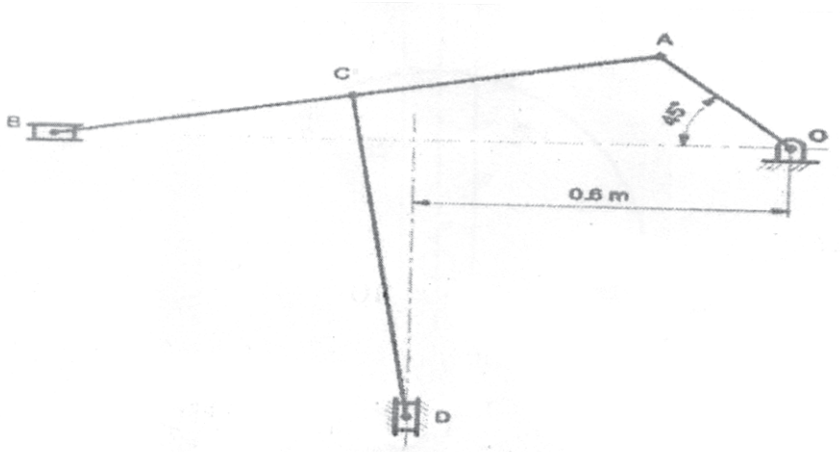
(a)

OR

Q2) a) Discuss various types of Instantaneous Centre with the help of example.**[6]**

P.T.O.

b) The length of various links of mechanism as shown in figure are OA = 0.3 m, AB = 1 m, CD = 0.8 m, AC = CB. The horizontal distance from point O and axis of vertical slider is 0.6 m. Determine for the given configuration. i) Velocity of slider B ii) Velocity of slider D iii) Angular velocity of CD iv) Angular velocity of AB If OA rotates at 60 rpm clockwise use instantaneous centre method. **[12]**



Q3) a) Explain the following terms : **[6]**

i) Type Synthesis

ii) Number Synthesis

iii) Dimensional Synthesis

b) Determine the chebyshev spacing for function $y = x^{1.5}$ for the range $0 < X < 3$ where three precision points are required. For these position points, determine the value of θ_2, θ_3 and ϕ_2, ϕ_3 when $\Delta\theta = 40°$ and $\Delta\phi = 90°$. **[11]**

OR

Q4) a) Explain the following terms : **[6]**

i) Function Generation

ii) Path Generation

iii) Motion Generation [Body Guidance]

b) Synthesize a four bar mechanism for three successive positions given in the table below : **[11]**

Positions	1	2	3
θ	30	90	180
ϕ	40	115	175

Consider L1 = Grounded Link, L2 = Input Link, L3 = Coupler Link, L4 = Output Link, θ = input link angle, ϕ = output link angle, if the grounded link of length 100 mm is horizontal and input link is of 20 mm length, synthesize the mechanism using precision positions of the input link and precision position of output link. Ground the pivot of the input link on left hand side and ground the pivot of output link on right hand side. Input and output links are rotating in opposite directions. Use the method of inversion Draw the mechanism in its first precision position.

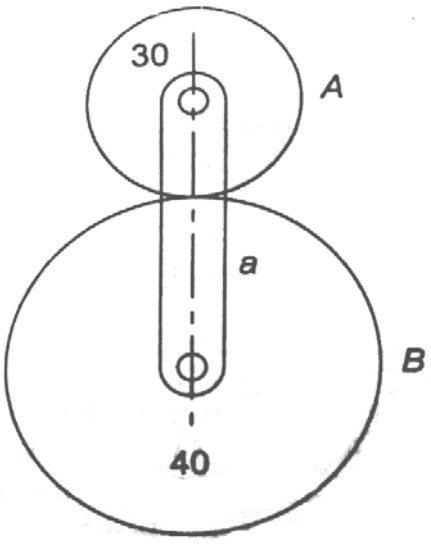
Q5) a) Derive the expression for a minimum number of teeth on gear wheel required to avoid interference with neat sketch. **[8]**

b) Two involute gears in mesh have 20° pressure angle. The gear ratio is 3 and the number of teeth on the pinion is 24. The teeth have a module of 6 mm. The pitch line velocity is 1.5 m/s and the addendum equal to one module. Determine the angle of action of the pinion and maximum velocity of sliding. **[9]**

OR

Q6) a) Define 'gear train' and explain the various types of gear trains. **[7]**

b) An epicyclic gear train consists of an arm and two gears A and B having 30 and 40 teeth respectively. The arm rotates about the centre of the gear A at a speed of 80 rpm counter clockwise. Determine the speed of the gear B if i) the gear A is fixed and ii) the gear A revolves at 240 rpm clockwise instead of being fixed. **[10]**



Q7) a) Define automation. Why automation is important for any industry? **[6]**

b) A cam rotating at a uniform speed is required to give the knife edged follower motions defined as follows: **[12]**

i) Follower to move outwards through a distance of 30 mm during 90° of cam rotation with uniform velocity.

ii) Follower to dwell for the next 60° of cam rotation.

iii) Follower to return to its original position during 90° of cam rotation with uniform velocity.

iv) Follower to dwell for the remaining period. The minimum radius of the cam is 50 mm.

Draw the cam profile for the following cases :

I) When the follower translates along the axis of the cam.

II) When the follower is offset by 20 mm from the axis of the cam shaft.

OR

Q8) a) Write note on Artificial intelligence in automation. **[5]**

b) 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 as described below. **[13]**

i) To raise the valve through 50mm during 120° rotation of the cam;

ii) To keep the valve fully raised through next 30°;

iii) To lower the valve during next 60°; and

iv) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft.

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2912

[Total No. of Pages : 3

[6352] - 145
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, jf necessary.***

Q1) a) Prove that, in case of steady laminar flow through a circular pipe average velocity is half of the maximum velocity. **[6]**

b) Explain Displacement thickness, Momentum thickness and Energy thickness with mathematical expression. **[6]**

c) A fluid of viscosity 0.7 Ns/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 196.2 N/m^2. Find the 1) Pressure gradient 2) Reynold number of the flow 3) Average velocity. **[6]**

OR

Q2) a) Derive an expression for Darcy-Weisbach equation **[6]**

b) A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300 mm at the rate of 300 litres per sec. Find the head lost due to friction for a length of 50 m of the pipe. **[5]**

c) Derive an expression of velocity & shear stress distribution for laminar fluid flow passing through parallel plates. **[7]**

P.T.O.

Q3) a) Write a short note on following **[8]**

i) Reynold's model law

ii) Froude model law

iii) Euler model law

iv) Weber model law

b) State and explain Buckingham's Pi theorem. What are the steps involved in selection of repeating variables? **[5]**

c) Determine the dimensions of the quantities given below **[4]**

1) Density

2) Kinematic viscosity

3) Dynamic viscosity

4) Discharge

OR

Q4) a) Write a short note on following **[5]**

a) Reynold's number

b) Euler Number

c) Mach Number

d) Weber Number

e) Froude's Number

b) The efficiency η of a fan depends on density ρ, dynamics viscosity μ, of the fluid, angular velocity ω, diameter D of the rotor and discharge Q. Express η in terms of dimensionless parameters. **[6]**

c) Write a short note on Dimensionless number and their significance (give any four) **[6]**

Q5) a) Explain the following for hydraulic turbine **[3]**

i) Gross Head

ii) Net Head

b) Explain the classification of Turbine based on hydraulic action, direction of flow and specific speed in detail. **[8]**

c) A Kaplan turbine develops 24647.6 kW power at an average head of 39 meters. Assuming speed ratio of 2, flow ratio of 0.6, diameter of boss is equal to 0.35 times the diameter of runner and overall efficiency of 90 %. Calculate diameter, speed and specific speed of runner. **[7]**

OR

Q6) a) Explain construction and working principle of Francis turbine with application. **[7]**

b) Explain construction and working principle of Pelton turbine with application. **[7]**

c) Differentiate impulse and reaction turbine. **[4]**

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 centritugal 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. :

PC-2913

[Total No. of Pages : 2

[6352]-146
S.E. (MECHATRONICS ENGINEERING)
Electrical Machines and Drives
(2019 Pattern) (Semester - IV) (217549)

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

Instructions to the candidates :

1) ***Attempt Q.1 or 2, 3 or 4, 5 or 6, 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.***
5) ***Use of non-programmable calculator is permitted.***

Q1) a) Explain construction of synchronous motor with neat diagram. **[6]**

b) With a neat phasor diagram explain effect of armature reaction in synchronous machine. **[6]**

c) A star connected, 3 phase, 200 kVA, 13.5 kV, 50 Hz synchronous generator has full load armature resistance drop and synchronous reactance drop of 11.12 V and 171.1 V respectively. Calculate : **[6]**

i) full load current

ii) phase and line value of induced emf at 0.8 lagging power factor

OR

Q2) a) Explain open circuit and short circuit test to determine synchronous reactance. **[6]**

b) Explain the development of the circuit model of a synchronous machine in steps. **[6]**

c) A 1000 kVA, 3300 V, 50 Hz, 3 phase, star connected synchronous generator has armature resistance of 0.25 ohm per phase. A field current of 30 A produces a short circuit current of 250 A and an open circuit voltage of 1100 V line to line. Calculate : **[6]**

i) synchronous impedance and synchronous reactance

ii) full load current

iii) phase value of emf generated at full load, 0.8 pf lagging

P.T.O.

Q3) a) What is an electrical drive? State and explain any four major advantages of an electrical drive. **[6]**

b) List the selection factors of electrical drives. Explain any one selection factor of electrical drives in detail. **[6]**

c) Elaborate the steady state stability of an electrical drive. **[5]**

OR

Q4) a) List and explain the components of an electrical drive system with the help of suitable diagram. **[6]**

b) What are Load Torque components? Classify Load Torque. **[6]**

c) Explain the Motor-Load dynamics in the context of electrical drives with the help suitable mathematical equations. **[5]**

Q5) a) Discuss the transient analysis of a DC motor drive. **[6]**

b) Explain the operation of a single phase fully controlled rectifier fed DC motor. **[6]**

c) Describe the closed loop speed control of a DC motor with the help of block diagram. **[6]**

OR

Q6) a) Explain the operation of Ward-Leonard Drive with the help of suitable diagram. **[6]**

b) What is multi-quadrant operation of a motor? Explain the multi-quadrant operation of a DC motor with the help of appropriate diagrams. **[6]**

c) Explain any two methods of controlling the speed of a DC shunt motor. **[6]**

Q7) a) Differentiate between a PMAC motor and a BLDC motor. **[6]**

b) Explain the rotor resistance control of a three phase induction motor with the help of suitable diagram. **[6]**

c) What is a stepper motor drive? Write its merits and demerits. **[5]**

OR

Q8) a) Explain the principle of V/f control in a three phase induction motor. **[6]**

b) Draw the generalized diagram of closed loop control of induction motor drives and explain the process of speed control. **[6]**

c) State whether a single phase induction motor is self-starting. Explain in brief any one method of braking a single phase induction motor. **[5]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-2914

[Total No. of Pages : 2

[6352]-147
S.E. (Mechatronics)
SENSORS AND ACTUATORS
(2019 Pattern) (Semester - IV) (217550)

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) ***Figures to the right side indicate full marks.***

Q1) a) Explain Basic Principle of working of Magnetic Flow meter? **[6]**

b) What are elastic pressure transducers? What are their applications? **[6]**

c) What is various types of Chemical Sensors? What are their applications? **[6]**

OR

Q2) a) Explain working of Ultrasonic Flow measurement? Explain with real time applications? **[6]**

b) Explain Working Principle of High Pressure measurement? Explain any one technique. **[6]**

c) Explain working principle of Optical Light Sensors? What are its applications? **[6]**

Q3) a) What is modeling of DC motor? How heat dissipation in DC motor can be managed? **[6]**

b) Write a short note on Characteristics features of Stepper Motor? **[5]**

c) Explain different types of Linear Actuators? What is Voice Coil Actuators? **[6]**

P.T.O.

OR

Q4) a) What are Linear Actuators? Explain working of solenoid? **[6]**

b) What are characteristics of Induction motors? **[5]**

c) Explain working Principle of Stepper Motor? Explain What is step angle? **[6]**

Q5) a) Write a Short note on Pneumatic Actuator Systems? What are the advantages of Pneumatic Actuator? **[6]**

b) What are Pumps and Compressor used in Hydraulic and Pneumatic Systems? **[6]**

c) Draw symbols of pumps, compressor, filter, control valves, pressure regulation, relief valves, and accumulator in Pneumatic Systems? **[6]**

OR

Q6) a) Draw relevant symbols of pumps, filter, control valves, pressure regulation, relief valves, accumulator in Hydraulic Systems? **[6]**

b) Write a Short note on Hydraulic Actuator Systems? What are the Limitations of Hydraulic Actuator? **[6]**

c) What are Electro active Polymers? What are their specific applications? **[6]**

Q7) a) Explain following terms (i) Actuator Range (ii) Actuator Bandwidth. **[6]**

b) What are power and energy consideration during actuator selection? **[6]**

c) Write a short note on tradeoffs between force / displacement. **[5]**

OR

Q8) a) What are industrial considerations during actuator selection? **[6]**

b) Write a short note on tradeoffs between torque/ speed. **[6]**

c) Write a short note on control system and electronics for Industrial need. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2915

[Total No. of Pages : 2

[6352]-148
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 indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain the working of Non-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 11 v. Assume Vcc = 12 v, 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 V0 = 18 $\pm$ 3 volts and IL = 50 Ma. **[10]**

b) Write a short note on **[7]**

i) Current limiting Feature

ii) Current fold back protection

Total No. of Questions : 8]

SEAT No. :

PC-2916

[Total No. of Pages : 2

[6352]-149

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 Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 orQ.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) Explain four stroke SI engine with neat sketch. **[8]**

b) Draw and explain PV and TS diagram for the following cycles : **[9]**

i) Diesel cycle

ii) Dual cycle

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]**

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

P.T.O.

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 trapsfer 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]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. : ____

PC-2917

[Total No. of Pages : 2

[6352]-150

S.E. (Mechatronics Engineering)

DIGITAL ELECTRONICS

(2019 Pattern) (Semester - III) (217543)

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

Instructions to the candidates:

1) ***Attempt 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.***

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? Give its applications & advantages? **[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) Implement full adder circuit using suitable PLA. **[8]**

b) Design BCD to Excess -3 code converter using PAL. **[9]**

P.T.O.

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 working of 2-input CMOS NOR gate. Give characteristicsof CMOS. **[9]**

Q7) a) Explain the System Bus, Data Bus, Address Bus, Control Bus. **[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) Describe semi-conductor memory organization & operation. **[8]**

b) Write short note on ALU. Give the applications of Microprocessor. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC-2918

[Total No. of Pages : 4

[6352]-151
S.E. (Mechatronics Engineering)
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) ***Figures to the right indicate 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 10 m. Calculate the maximum stress produced due to bending. Also draw the bending stress distribution across the depth of section. **[8]**

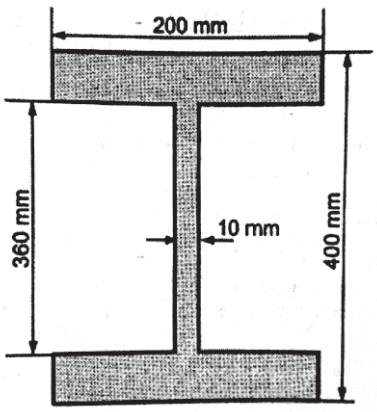


Fig.1

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 1m and 3m respectively from the left support Find i) Deflection under each load ii) Maximum deflection iii) 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. If 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. It 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]**

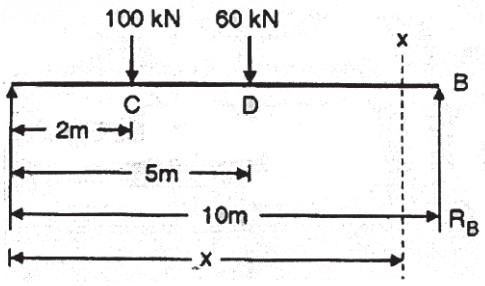


Fig.2

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]**

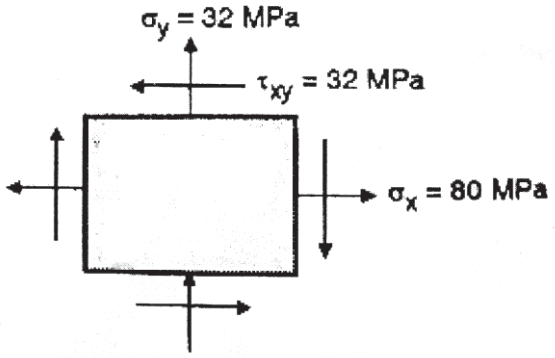


Fig.3

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

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.

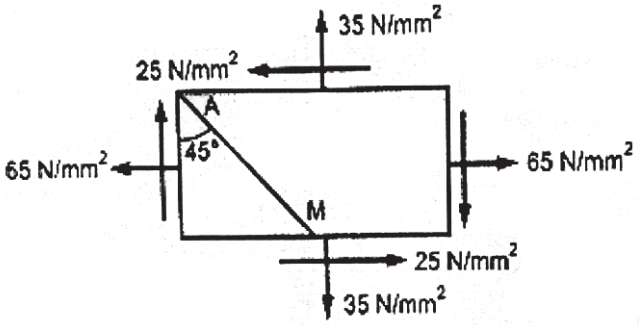


Fig 4

[9]

b) Explain in detail Maximum shear stress theory. **[8]**

Q7) a) A rectangular column of 240mm × 150mm 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]**

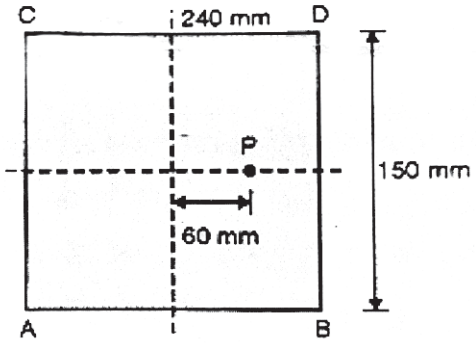


Fig 5

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]**

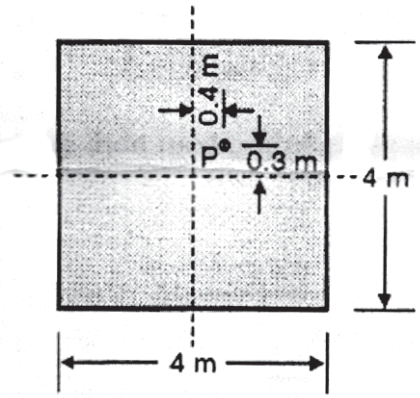


Fig.6

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. : ____

PC-2919

[Total No. of Pages : 2

[6352]-152
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) What is nucleation? Explain the types of nucleation mechanisms with the help of a diagram? **[7]**

b) Explain all four types of cooling curves in detail. **[6]**

c) State Hume Rothery's rule of Solid Solubility. **[5]**

OR

Q2) a) Draw an Iron-iron carbide equilibrium diagram and show all the details. **[10]**

b) Explain the following terms: **[4]**

i. Austenite

ii. Pearlite

c) Draw the equilibrium diagram for Antimony and Bismuth. **[4]**

Q3) a) Explain the following: **[5]**

i. Quenching

ii. Austempering

b) Distinguish between isothermal annealing and spheroidise annealing. **[6]**

c) Draw the TTTdiagrarn in the heat treatment process and explain its importance. **[6]**

OR

Q4) a) Distinguish between stress relief annealing and process annealing. **[6]**

b) Explain the terms: Martempering, Austempering and sub zero treatment. **[5]**

c) Differentiate between TTT diagram and CCT diagram and Draw and explain the critical cooling transformation diagram. **[6]**

P.T.O.

Q5) a) Enlist the properties and advantages of white cast iron. **[6]**

b) Write the classification of steels based on deoxidation in detail. **[6]**

c) Write any five difference between ferrous and nonferrous metals with examples. **[6]**

OR

Q6) a) Write the classification of steels based on application in detail. **[6]**

b) Write short notes on: **[6]**

- Malleable cast iron
- Alloy cast iron

c) Explain the classification of Alloying elements of steel concerning the relation with carbon. **[6]**

Q7) a) Draw a phase diagram of brass showing all phases. **[6]**

b) Explain brass and its types with suitable examples. **[5]**

c) Write the typical composition, important properties, and application of Cartridge brass, Admiralty brass, & Statuary brass. **[6]**

OR

Q8) a) Discuss any three aluminium alloys with composition and application. **[6]**

b) State bronze and explain in brief the types of bronze with suitable examples. **[6]**

c) Write the properties of copper and explain its applications. **[5]**

Total No. of Questions : 9]

SEAT No. :

PC-2920

[Total No. of Pages :5

[6352]-153
S.E. (Mechatronics/Automobile & Mechanical)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III) (207002)

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

Instructions to the candidates :

1) ***Q.No. 1 is compulsory.***
2) ***Solve Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) Choose the correct option.

i) Coefficient of skewness β_1 is given by **[1]**

a) $\frac{\mu_4}{\mu_2^2}$ b) $\frac{\mu_4}{\mu_2}$

c) $\frac{\mu_3^2}{\mu_2^3}$ d) $\frac{\mu_2^3}{\mu_3^2}$

ii) The vector field $\overline{V}$ is called as irrotational if. **[1]**

a) $\nabla \times \overline{V} = 0$ b) $\nabla . \overline{V} = 0$

c) $\nabla^2 V = 0$ d) $\int \nabla . \overline{V}\, dv = 0$

iii) If two regression coefficents bxy & byx are given by 0.27 and 03 then coefficent or correlation r is given by. **[2]**

a) 0.81 b) 0.9

c) 8.1 d) –0.9

P.T.O.

iv) If randum variable has Poisson's Distribution such that P (1) = P(2) then p (4) is **[2]**

a) 0.2 b) 0.71
c) 0.09 d) 0.01

v) If $\phi = x^2 + y^2 + z^2 - 9$ the vector normal to Surface ϕ = c at (1,2,3) is, **[2]**

a) i + 2j +3k b) 2i +4j +6k

c) 2i +2j + 2k d) $\frac{1}{9}$ (i + j + k)

vi) Most general solution of wave eq^n $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ is given by **[2]**

a) $(C_1 \cos m\, x + C_2 \sin m\, x)\,(C_3 \cos cmt + C_4 \sin cmt)$

b) $(C_1 \cos m\, x + C_2 \sin mx)\, e^{-c^2 m^2 t}$

c) $(C_1 \cos m\, x + C_2 \sin mx)\,(C_3 e^{mt} + C_4 \bar{e}^{\,mt})$

d) $(C_1 e^{mx} + C_2 \bar{e}^{\,mx})\,(C_3 \cos cmt + C_4 \sin cmt)$

Q2) a) The first four moments of a distribution about the value 3.5 are 0.0581, 0.4516, 0.0823 and 0.5. Find first four central moments. **[5]**

b) Fit a straight line of the form y = an + b to the following data : **[5]**

x	1	2	3	4	5
y	3	2	1	6	8

c) Calculate the coefficient of correlation for the following data : **[5]**

x	10	14	19	26	30	34	39
y	12	16	18	26	29	35	38

OR

Q3) a) The first four moment of the distribution about working mean 24 are 1.33, 129.08, 450.46 and 37693.83. Calculate the first four central moments. **[5]**

b) Fit a straight line $y = ax + b$ to the following data. **[5]**

x	1	2	3	4	5
y	5	3	1	2	4

c) Obtain the regression line of y on x for the following data: **[5]**

x	2	3	5	7	9	10
y	2	5	8	10	12	14

Q4) a) A card is drawn from a well - shuffled pack of playing cards. What is the probability that it is either a spade or an ace? **[5]**

b) During war, 1 ship out of 9 was sunk on an average is making a certain voyaga. What is the probability that

i) Exactly 3 ships arive safely out of 6.

ii) At least 1 out 6 ships arrive safely. **[5]**

c) In a certain examination test. 1000 students appeared in a subject of mathematics. Average marks obtained were 50% with standard deviation 5%. How many student do you expect to obtain. **[5]**

i) More than 60% of marks.

ii) Between 40% and 60% marks.

(Given z = 2, A = 0.4772)

OR

Q5) a) A can hit a target 4 times in 5 shots; B can hit 3 times in 4 shots; C can hit 2 times in 3 shots. What is the probability that at least two shots hit? **[5]**

b) Number of road accidents on a highway during a month follows poisson's distribution with mean 5. Find the probability that number of accidents on the highway will be

i) Less than 3

ii) Exactly 3 **[5]**

c) A die is thrown 264 times with the following results

Number appeared on die	1	2	3	4	5	6
Frequency	40	32	28	58	54	60

Show that the die is biased. (Given $\chi^2_{tab} = 11.07$) **[5]**

Q6) a) Find the directional derivative of $\phi = xyz$ at (0, 1, 2) a long the direction of vecter $2\bar{i}+3\bar{j}+4\bar{k}$. **[5]**

b) Show that $\bar{F}=(y+\sin z)\bar{i}+x\bar{j}+x\cos z\,\bar{k}$ is irrotational vector field. Find scalar potential ϕ such that $\bar{F}=\nabla\phi$. **[5]**

c) Evaluate the line integral of $\bar{F}=(x^2-y^2)\bar{i}+2xy\,\bar{j}$ along the curve $x = y^2$ from the point (0,0) to (1,1) in $x-y-$ plane. **[5]**

OR

Q7) a) In what direction from the point (2,1,–1) is the directional derivative of $\phi = x^2 y z^3$ maximum? What is it's magnitude? **[5]**

b) Show that (ANY ONE).

i) $\nabla^2(r^n\log r)=(n(n-1)\log r+2n+1)r^{n-2}$

ii) $\nabla^2\left[\nabla\cdot\frac{\bar{r}}{r^2}\right]=\frac{2}{r^4}$ **[5]**

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

Q8) a) Solve the wave equation $\frac{\partial^2 u}{\partial t^2}=C^2\frac{\partial^2 u}{\partial x^2}$ subject to the Following initial and boundary conditions

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

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

iii) $\frac{\partial u}{\partial t} = 0$ when $t = 0$

iv) $u(x,0) = x$, $0 < x < \pi$ **[8]**

b) Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ with boundary and initial conditions

i) $u(x, 0) = 3\sin n\pi x$, $0 < x < 1$

ii) $u(0, t) = 0$ For all $t > 0$

iii) $u(1, t) = 0$ For all $t > 0$ **[7]**

OR

Q9) a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ subject to the Following initial and boundary conditions **[8]**

i) $\mu(\pi, y) = 0$ For all values of y

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

iii) $\mu(x, 00) = 0$ in $0 < x < \pi$

iv) $\mu(x, 0) = u_0$ in $0 < x < \pi$

b) Use Fourier transform to solve the boundary value problem $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}$, $-\infty<x<\infty$, t > o **[7]**

i) subject to $u.\frac{\partial u}{\partial x}\to o \; as \; x\to\pm\infty$

ii) u $(x, 0) = F(x)$

Total No. of Questions : 8]

SEAT No. : ____

PC-4418

[Total No. of Pages : 2

[6352]-154
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 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 with example: i) Probability ii) Independent Events iii) Dependent Events **[6]**

b) A throw is made with two dice. Find probability of getting a score of i) 10 points ii) At least 10 points iii) At most 10 points. **[6]**

c) Assuming that the diameter of 1000 plugs taken from machine form a normal distribution with mean 0.7515cm and standard deviation 0.0020cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004 cm? (Given : for $z = 2.25$, $A = 0.4878$, for $z = 1.75$, $A = 0.4599$) **[6]**

OR

Q2) a) State the following: i) Law of Large Number ii) Central Limit Theorem. **[6]**

b) 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]**

c) What are the applications of Probability Theory in data science? **[6]**

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) What is Parametric and Non-Parametric Test? What are the types of Parametric and Non-parametric tests. **[6]**

c) What are the applications of Statistical Inference in data science? **[5]**

OR

P.T.O.

Q4) a) Among 64 offspring's of a cross between pigs 34 were red, 10 were black & 20 were white which are in ratio 9:3:4. Are the data consistent with the model at 5% level? (*Chi - square tabulated Value* = 5.991) **[6]**

b) Define : i) Interval Estimation ii) Confidence Level iii) Margin of Error.**[6]**

c) What are the steps of Hypothesis Testing? Explain Types of Hypothesis Testing. **[5]**

Q5) 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 $x = 0$ (0.1) 0.5. **[6]**

b) Define Interpolation & Extrapolation? And explain their applications in data science **[6]**

c) Find a real root of $x^3 - x = 1$ by using Bisection method up to 3 decimals.**[6]**

OR

Q6) a) Explain the root finding methods which are frequently used in data science applications. **[6]**

b) Evaluate the following integral using i) Trapezoidal rule & ii) Simpson's $\frac{1}{3}$ rule $I = \int_0^2 (2x^2 - 1)\,dx$ *with 4 interval.* **[6]**

c) What are the applications of numerical methods in data science? **[6]**

Q7) a) What is Set? Explain its types & set operations with example. **[6]**

b) Find the coefficient of x^9 in the expansion $(2 - x)^{19}$. **[6]**

c) What are the applications of graph theory in data science? **[5]**

OR

Q8) a) Prove the following statement **[6]**

$[(A \rightarrow B) \wedge A] \rightarrow B$ is a tautology

$(A \vee B) \wedge [(\sim A) \wedge (\sim B)]$ is a contridiction

b) What is Function? Explain their types with example. **[6]**

c) What are the applications of discrete mathematics in data science? **[5]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-4419

[Total No. of Pages : 4

[6352]-155

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. 7or 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) Identify the expression and convert it into the remaining two forms :

AB + C * DE – FG + + $ Note $ = Exponent operator **[6]**

b) What is Queue? Explain insertion and deletion operations in Queue with a suitable diagram. **[6]**

c) Compare stacks and queues. **[6]**

OR

Q2) a) Explain the concept of the linear and circular queue with an example. **[6]**

b) Construct a function PUSH and POP in 'C' for a stack using an array. **[6]**

c) Give the postfix and prefix expression for (a+b*c)/(x+y/z). **[6]**

Q3) a) Explain a 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

P.T.O.

b) From the given traversal construct the binary tree. **[6]**

Inorder : D B F E A G C L J H K

Postorder : D F E B G L J K H C A

c) Construct the binary search tree (BST) from the following elements. **[5]**

10, 60, 40, 28, 14, 50, 6.

OR

Q4) a) Write a recursive 'C' function for inorder and preorder traversal of Binary Search Tree. **[6]**

b) Explain with suitable example how binary tree can be represented using : **[6]**

i) Array

ii) Linked List

c) Define the following terms with respect to Trees : **[5]**

i) Root

ii) Subtree

iii) Level of node

iv) Depth of Tree

v) Siblings

Q5) a) Represent the following graph using the adjacency matrix and adjacency list **[6]**

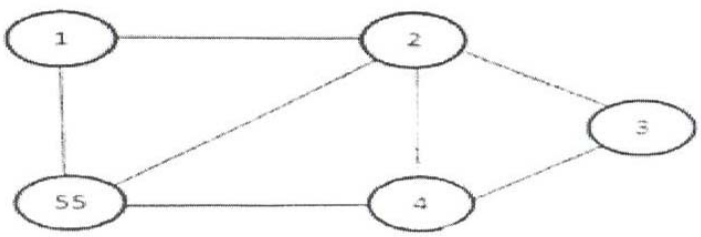
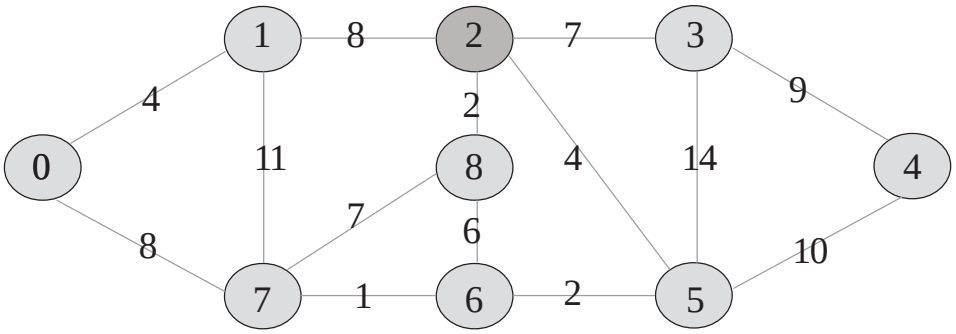


Fig. 1

b) Explain with suitable example, DFS and BFS traversal of a graph. **[6]**

c) Find out Minimum Spanning Tree of the following graph (figure 3) using Kruskal's algorithm. **[6]**



OR

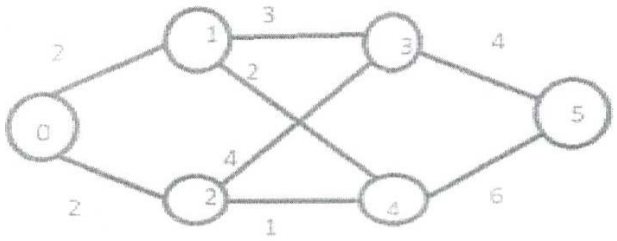
Q6) a) Define with an examples : **[6]**

i) Undirected Graph

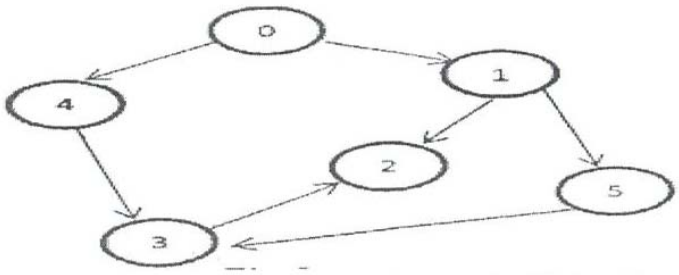
ii) Directed Graph

iii) Weighted Graph

b) Find minimum spanning tree for the following graph using Prim's algorithm. **[6]**



c) Find the indegree and outdegree of the following graph. **[6]**



Q7) a) What is a collision in Hashing? What are different Collision Resolution Strategies? Explain any one with example. **[6]**

b) Show the result of inserting the following keys into a hash table of size 7 using linear probing and the hash function

h(k) = k%7:l9, 27, 36, 10, 64. **[6]**

c) What is a file? List different modes of file. Explain any four functions related to File handling? Explain concept of inverted files. **[5]**

OR

Q8) a) Insert the keys 49, 63, 56, 52, 48 into a hash table of size 11 using quadratic probing and h(k)=k% 11. Show the resulting hash table. Assume i^2 is the probing sequence. **[6]**

b) Define sequential file organization. Give it's advantages and disadvantages. **[6]**

c) Explain indexed sequential file organization. Compare it with a direct access file. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC-4420

[Total No. of Pages : 3

[6352]-156
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 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) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Explain pitfalls of Operator Overloading. Write down program to overload unary operators. (Any two operators). **[6]**

b) Explain data conversion in C++. Write down the program for conversion of Class Type to Primitive Type. **[5]**

c) How virtual functions and virtual destructor are implemented in C++? Explain with help of a program. **[6]**

OR

Q2) a) Explain the polymorphism features of OOP. How different types of polymorphism achieved in C++. Explain it along with example. **[6]**

b) Explain implicit and explicit type casting with help of a program. **[5]**

c) Explain abstract class concept along with example. **[6]**

Q3) a) Explain the data hierarchy of stream classes in C++ with suitable diagram and an example. **[5]**

b) Explain command line arguments in C++. Write a C++ program that takes two integer values as command line agruments, calculates their sum,and displays the result. Also discuss how the argc and argv parameters are used in the program. **[7]**

c) Explain the functions used for the file pointer manipulation in C++. Write a C++ program that demonstrates the use of these functions by reading data from a specific position in a file and writing data at another position. **[6]**

OR

P.T.O.

Q4) a) Explain the error handling in file I/O. **[5]**

b) Explain stream classes and their use? Provide the hierarchy of stream classes in C++. **[7]**

c) Explain the role of a file pointer in C++. Write a C++ program that opens a text file, reads its content using a file pointer, and displays the content on the console. **[6]**

Q5) a) Explain the syntax and structure of class templates in C++, How do class templates enable code reusability? Write a C++ program that defines class template using multiple parameters. **[6]**

b) Explain the concept of re-throwing exceptions in C++. Write a C++ program that demonstrates the re-throwing of an exception from a catch block,and explain how the exception is handled in subsequent catch blocks. **[6]**

c) How templates in C++ contribute to generic programming? Write a C++ program for function template that calculates the maximum of two values which can be of any data type. **[5]**

OR

Q6) a) Explain how the exception handling mechanism works in inheritance context. Write a C++ program that demonstrates how an exception thrown by a derived class object can be caught by a catch block for the base class. **[6]**

b) Explain the main components of exception handling in C++. Write a C++ program that demonstrates the use of mutliple catch blocks to handle different types of exceptions. **[6]**

c) How to create and use user-defined exceptions in C++. Write a C++ program where we define a custom exception class to handle invalid input (e.g. a negative number) and demonstrate how to throw and catch this exception. **[5]**

Q7) a) What is the Standard Template Library (STL) in C++? Explain its significance and major components. **[5]**

b) Explain the role of algorithms in the Standard Template Library (STL). Write a C++ program that demonstrates the use of the sort () algorithm to sort a list of integers in ascending order. **[5]**

c) Explain the difference between sequence containers and associative containers in C++. Write a C++ program that demonstrates the use of vector (sequence container) and map (associative container). **[8]**

OR

Q8) a) What are iterators in C++ STL? Explain the different types of iterators in C++? **[5]**

b) Explain any 5 functions of the vector class in C++. Illustrate their usage with a C++ program. **[5]**

c) Explain sequence containers and its main types in C++, Write a C++ program that creates a vector of integers, add elements to it, display elements of the vector using an iterator,remove an element from the end of the vector, resize the vector using the resize () finction and display the resized vector. **[8]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. : ____

PC-4971

[Total No. of Pages : 2

[6352]-157R
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) Distinguish between combinational and sequential switching circuits also write examples of both. **[6]**

b) Convert following flip flops **[6]**

i) SR to JK

ii) JK to D

c) Draw and explain 4-bit asynchronous up-counter using JK flip flop. Also draw the necessary timing diagram. **[6]**

OR

Q2) a) What is MOD counter? Design MOD 7 counter using IC 7490. **[6]**

b) With neat diagrams explain the working of the following types of shift Registers **[6]**

i) Serial-in, serial-out

ii) Parallel-in, serial-out

c) What do you mean by excitation table of flip flop? Write the excitation table of **[6]**

i) SR flip flop

ii) J-K flip flop

Q3) a) Draw an ASM chart and state table of a 2 bit up-down counter having a mode control input. **[6]**

M = 1 Up counting M = 0 down counting

b) What is an ASM Chart? Name the elements of an ASM chart and define each of them. **[6]**

P.T.O.

c) Implement following Boolean function using PAL **[5]**

F1 = Σm (0, 2, 4, 6, 8, 12)

F2 = Σm (2, 3, 8, 9, 12, 13)

F3 = Σm (1, 3, 4, 6, 9, 11, 12, 14, 15)

OR

Q4) a) Draw a block diagram of the PLA device and explain. **[6]**

b) Implement BCD to Gray code converter using PAL. **[6]**

c) What is the difference between PAL and PLA? **[5]**

Q5) a) What is the advantage of open collector output? Justify your answer with suitable circuit. **[6]**

b) Compare TTL and CMOS logic family. **[6]**

c) What is logic family? Give the classification of logic family and also write important characteristics of CMOS. **[6]**

OR

Q6) a) Draw and explain the circuit diagram of CMOS inverter. **[6]**

b) Define the following terms and mention the standard values for TTL logic Family **[6]**

i) Fan-out

ii) Power Dissipation

iii) Propagation Delay

c) With the help of a neat diagram. Explain the working of two-input TTL NAND gate. **[6]**

Q7) a) What is system bus? Draw microprocessor bus structure and explain in brief. **[6]**

b) Write a short note on following with respect to microprocessor. **[6]**

i) Address Bus

ii) Data Bus

iii) Control Bus

c) Explain the Memory organization of the microprocessor. **[5]**

OR

Q8) a) What is Microprocessor? List different applications of Microprocessor. **[6]**

b) Write a short note on ALU IC 74181. **[6]**

c) With the help of a block diagram explain the fundamental units of a Microprocessor. **[5]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC4422 **[6352]-158** [Total No. of Pages : 2

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 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 project scheduling? What are the basic principles of project scheduling? **[9]**

b) What is need of Project estimation? What are the steps while estimation of software? **[9]**

OR

Q2) a) Explain COCOMO Model for project estimation with suitable example. **[9]**

b) How LOC and FP used during project Estimation? Explain both Estimation techniques with suitable example. **[9]**

Q3) a) Explain any four design concepts with appropriate example. **[9]**

b) What is design pattern? How patterns can be used in design? **[9]**

OR

Q4) a) Explain the Data-flow architecture and Layered Architecture in detail. **[9]**

b) Explain the golden rules for User Interface Design. **[9]**

Q5) a) What is SCM? Write short note on SCM Elements. **[8]**

b) What is RMMM? Write short note on it? **[9]**

OR

P.T.O.

Q6) a) What is Risk? Explain the reactive and proactive risk strategies with appropriate examples. **[8]**

b) Write note on **[9]**

i) Risk Identification

ii) Risk Refinement

iii) Risk Mitigation

Q7) a) Write Note on **[8]**

i) Integration Testing

ii) Unit Testing

b) Explain phases in Verification and Validation model with suitable diagram. **[9]**

OR

Q8) a) Discuss the following with suitable diagram: **[10]**

i) Compare Conventional Software Testing and Object-Oriented Software testing.

ii) Compare Black box and white box testing.

b) Explain the software testing life cycle in detail. **[7]**

■■■■

Total No. of Questions : 8]

SEAT No. :

PC-4423

[Total No. of Pages : 2

[6352]-162
S.E. (Electronics) (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) What are the lexical conventions in verilog? Explain in details. **[5]**

b) What are verilog modelling styles? Explain any one them using suitable example. **[6]**

c) Explain the operators used in verilog language. **[6]**

OR

Q2) a) Differentiate between task & function. **[5]**

b) Explain 'case .....' statement in verilog. Write syntax with example. **[6]**

c) What is gate level modeling? Explain with example. **[6]**

Q3) a) Write a D flip - flop verilog code using any one modeling. **[6]**

b) Write a full adder verilog code uisng half adder code. **[6]**

c) Write a verilog code for 4 bit up-down counter. **[6]**

OR

Q4) a) Write a 4 : 1 mux verilog code using two 2 : 1 mux. **[6]**

b) Write a synchronous Jk flip flop verilog code. **[6]**

c) Write a 4 bit serial shift register verilog code. **[6]**

Q5) a) Differentiate between Mealy machine and moore machine. **[6]**

b) Write short notes on following : **[6]**

i) State table

ii) State diagram

iii) State assignment

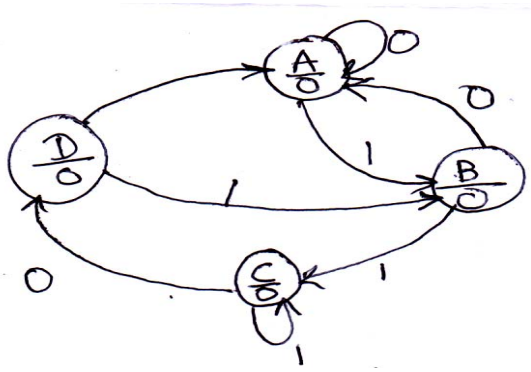
c) Design a sequence detector for given sequence of '110' with D flip flop using Mealy machine. **[6]**

P.T.O.

OR

Q6) a) Draw and explain Mealy machine with example. **[6]**

b) **[6]**



i) State the type of FSM (Finite State Machine) of above state diagram.

ii) Write state table of it.

iii) Write state assignment.

c) Design a single bit serial adder with suitable FSM. **[6]**

Q7) a) What do you mean by reconfigurable systems? Explain the terms with respect to FPGA. **[5]**

b) Explain the interfacing of RTC using FPGA. **[6]**

c) Draw and explain VGA interfacing with FPGA. **[6]**

OR

Q8) a) Design LCD interface with FPGA. **[6]**

b) Design keyboard interface with FPGA. **[6]**

c) Write short notes on Dynamic architecture using FPGA. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC4845

[Total No. of Pages : 2

[6352]-164

S.E. (E & C Engineering) (Advance Communication Technology)
PRINCIPLES OF COMMUNICATION ENGINEERING
(2019 Pattern) (Semester - III) (204202)

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) Derive mathematical presentation of FM (Frequency Modulation). **[6]**

b) Compare AM, FM and PM. **[6]**

c) State the types of FM Generation & with neat diagram explain any one method. **[5]**

OR

Q2) a) Sketch PM waveform for sinusoidal input signal. Enlist advantages & disadvantages of phase modulation. **[4]**

b) State the types of FM detector & with neat diagram explain FM detection using PLL. **[5]**

c) A frequency modulated signal is represented by voltage equation $e_{fm}=10 \sin [6 \times 10^8 t + 5 \sin 1250 t]$, calculate **[8]**

i) Carrier frequency f_c

ii) Modulating frequency (FM)

iii) Maximum deviation (δ)

iv) What power will this FM wave dissipates in 20 ohm resistor?

Q3) a) Describe with the help of neat sketches of wave forms methods of generation of PWM. **[6]**

b Illustrate the classification of multiplexing & with suitable diagram explain time division multiplexing. **[5]**

c) Distinguish between PPM, PWM & PPM. **[6]**

OR

P.T.O.

Q4) a) Draw & explain spectrum showing aliasing effect & Guard band. **[6]**

b) State Sampling theorem in time domain and explain in detail the sampling process with suitable diagram. **[6]**

c) Consider the signal {3cos(200πt) +(5sin 6000 πt) + 10 cos l200πt} what is Nyquist rate for this signal? **[5]**

Q5) a) Draw & explain Delta modulation waveform with slope overload & granular noise. **[6]**

b) Compare A-law & u-law compander. **[6]**

c) With a neat block diagram explain PCM transmitter. **[6]**

OR

Q6) a) Describe Adaptive Delta modulation with neat diagram. **[6]**

b Draw block diagram of Digital communication system & explain function of each block. **[6]**

c) State types of quantization & explain uniform quantization in detail with characteristics. **[6]**

Q7) a) Define synchronization & with block diagram explain bit synchronization. **[6]**

b) Explain the properties of line codes. **[6]**

c) Explain working principle of scrambling & unscrambling with example. **[6]**

OR

Q8) a) Draw AT&T hierarchy multiplexing system & explain it in detail. **[5]**

b) What is Inter Symbol Interference (ISI). Explain methods to eliminate to it. **[5]**

c) Draw the line codes - Unipolar RZ, Polar NRZ, AMI & Split phase Manchester for the bit stream 101110101. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC4846

[Total No. of Pages : 2

[6352]-166

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, 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) Differentiate between Parallel Projection and Perspective Projection. **[6]**

b) Explain the concept of transformation write transformation matrix for: **[6]**

i) 2-D rotation about an arbitrary point

ii) 3-D rotation about Y-axis

c) A 3D triangle with points (0, 0, 0), (1, 1, 2) and (1, 1, 3). Apply shear parameter 2 on X axis, 2 on Y axis and 3 on Z axis and find out the new coordinates of the object. **[6]**

OR

Q2) a) Describe the concept of 3D Reflection in Computer Graphics in detail with respect to XY plan, YZ plan and XZ plan. **[6]**

b) Explain 2D Transformation matrix for Rotation and Shearing in detail. **[6]**

c) A 3D triangle with coordinate points A(3, 4, 1), B(6, 4, 2), C(5, 6, 3). Apply the reflection on the XY plane and find out the new coordinates of the object. **[6]**

Q3) a) Explain Painters Algorithm in detail with suitable example. **[6]**

b) Compare Gauraud shading and phong shading. **[6]**

c) Describe HSV and CMY color Model in detail. **[5]**

OR

Q4) a) What is Specular Reflection and describe Specular reflections with multiple light sources. **[6]**

b) Compare and contrast between point source and diffuse illumination. **[6]**

c) Explain Back face detection and removal in detail. **[5]**

P.T.O.

Q5) a) Explain B-Spline curve with suitable example. **[6]**

b) What are fractals? Explain Triadic Koch in detail. **[6]**

c) Describe Hilbert curve in detail. **[6]**

OR

Q6) a) Explain Blending function for B-spline curve. **[6]**

b) Derive the concept of Interpolation and Approximation. **[6]**

c) Explain Bezier curve with suitable example. **[6]**

Q7) a) Explain the term Segment Deleting with example in detail. **[6]**

b) Distinguish between 2D and 3D visualization. **[6]**

c) What is Animation also Explain the Concept of computer based animation. **[5]**

OR

Q8) a) Explain any two motion specification methods. **[6]**

b) Describe the following terms with examples: **[6]**

i) Segment Closing

ii) Segment Renaming

c) Define Morphing and Write Applications of Morphing. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC4847

[6352]-167

[Total No. of Pages :2

S.E. (Computer Science)

DIGITAL ELECTRONICS AND VLSI DESIGN

(2019 Pattern) (Semester- III) (210245)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q. 2, Q.3 or Q4, Q.5 or Q.6 and Q.7 or Q.8***
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 using 4:1 MUX. **[6]**

b) Design two-bit comparator using gates. **[5]**

c) Differentiate between Demultiplexer and Decoder. **[6]**

OR

Q2) a) Design BCD to excess three code converters. **[6]**

b) How you will implement full adder using half adder? Explain Circuit Diagram. **[5]**

c) Differentiate between combinational and sequential circuits. **[6]**

Q3) a) Design S-R flipflop using J-K 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 D flipflop to T flipflop. **[6]**

b) Draw the logical diagram of 4-bit bidirectional shift register. Explain Shift left and shift right operation. **[6]**

c) Draw and explain ring counter using D flipflop. **[6]**

P.T.O.

Q5) a) What are the different Modelling styles of architecture in VHDL. Explain with example. **[6]**

b) Differentiate between signal and variable. **[5]**

c) Write VHDL code for Half Adder. **[6]**

OR

Q6) a) Explain with example: delays in VHDL. **[6]**

b) Define the terms. **[6]**

i) Identifier

ii) Entity

iii) Data Objects

c) Write VHDL code for Full subtractor. **[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 Full adder. **[6]**

OR

Q8) a) Write VHDL code for 4-bit shift register for SISO operation. **[6]**

b) With neat schematic explain the architectural building blocks of FPGA. **[6]**

c) Write VHDL code for 4:1 MUX. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-2921

[Total No. of Pages : 3

[6352]-168

S.E. (Instrumentation & Control Engineering)

CONTROL SYSTEMS

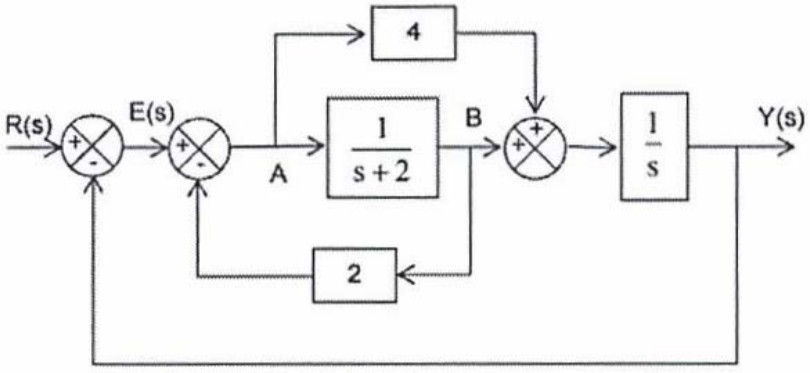
(2019 Pattern) (Semester - IV) (206268)

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.***
5) ***Use of non-programmable calculators/Log table is allowed.***

Q1) a) Apply the block diagram reduction rules to reduce the following system into canonical form and determine its transfer function $\frac{Y(s)}{R(s)}$. **[10]**

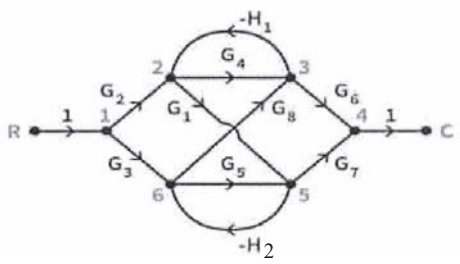


b) List out the Block diagram reduction rules. **[8]**

OR

P.T.O.

Q2) a) Apply Mason's Rule to calculate the transfer function of the system represented by following Signal Flow Graph **[10]**



b) Differentiate between block diagram reduction and signal flow graph techniques. **[8]**

Q3) a) A servo system for position control has the closed loop transfer function $\frac{6}{s^2+2s+6}$. Find the natural frequency, damping ratio and percentage overshoot. **[8]**

b) For a unity feedback system whose open-loop transfer function is $G(s)=\frac{10}{(1+0.1s)(1+2s)}$ find the position, velocity and acceleration error constants. **[9]**

OR

Q4) a) Find all the time domain specifications for a unity feedback control system whose open-loop transfer function is given by $G(s)=\frac{25}{s(s+6)}$. **[8]**

b) A servo mechanism is represented by the equation $\frac{d^2y}{dt^2}+4.8\frac{dy}{dt}=144E$ where E = C – 0.5y the actuating signals. Find the value of the damping ratio, damped and undamped frequency of oscillations also draw the block diagram of the system described above. **[9]**

Q5) Plot the root locus pattern of a unity feedback system whose forward path transfer function is $G(s)=\frac{K}{(s+3)(s+4)}$. **[17]**

OR

Q6) Using Routh-Hurwitz criterion determine the relation between K and T so that unity feedback control system whose open-loop transfer function given below is stable $G(s)=\frac{K}{s[s(s+10)+T]}$. **[17]**

Q7) a) Sketch the Magnitude and Phase plot and determine the gain cross-over and phase cross over frequencies $G(s)=\frac{50}{(s+1)(s+2)}$. **[10]**

b) Define the following : **[8]**

i) Gain Margin

ii) Phase Margin

iii) Gain Cross Over frequency

iv) Phase Cross Over frequency

OR

Q8) a) Sketch the bode plot and determine the gain cross-over and phase cross over frequencies $G(s)=\frac{100}{s(s+3)(s+6)}$. **[10]**

b) Sketch the polar plot for $G(s)=\frac{1}{s(x+5)}$. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-2922

[Total No. of Pages : 2

[6352]-169
S.E. (Instrumentation & 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) Describe function of full subtractor circuit with its truth table, K-map simplification and logic diagram. **[8]**

b) Design 1: 16 demultiplexer using 1: 4 demultiplexers. **[6]**

c) Realize the following function using demultiplexer F = Σm (l, 2, 5, 6, 7, 11, 14) **[4]**

OR

Q2) a) Design Full Adder using K-map and Truth Table. **[8]**

b) Draw Block diagram of 4:1 Multiplexer and write its truth table. **[6]**

c) Give the function of the following terminals of IC 7447. **[4]**

i) LT
ii) RBI
iii) BI
iv) RBO

Q3) a) Draw symbol and write the truth table and Excitation table of JK flip flop. **[8]**

b) Convert JK Flipflop to D flipflop by using K map. **[5]**

c) Write a short note on Memory devices used in Digital Electronics. **[4]**

OR

Q4) a) Draw symbol and write the truth table and Excitation table of D flip flop. **[8]**

b) Describe the working of Master-Slave JK Flip-Flop with Truth Table and Logic diagram. **[5]**

c) What is race around condition and how it can be eliminated. **[4]**

P.T.O.

Q5) a) Describe the operation of 3 bit synchronous up counter with Truth Table and Logic diagram. **[8]**

b) Describe the operation of 4 bit SISO shift register with the help of block diagram. **[6]**

c) Define modulus of a counter? Write down the number of flip flops required for mod-5 counter? **[4]**

OR

Q6) a) Design 3-bit asynchronous counter with Truth Table and Logic diagram. **[8]**

b) Design 4-bit ring counter and draw output waveform. **[6]**

c) Describe the operation of 4- bit universal shift register with the help of block diagram. **[4]**

Q7) a) Draw the block diagram and Explain Programmable Logic Array. **[9]**

b) Describe the operation of TTL logic circuit working as NAND gate. **[8]**

OR

Q8) a) Design digital clock by using counter ICs. **[9]**

b) Compare TTL and CMOS logic families on the basis of following: **[8]**

i) Propogation delay

ii) Power dissipation

iii) Fan-out

iv) Basic gate

Total No. of Questions : 8]

SEAT No. : ____

PC-2923

[Total No. of Pages : 2

[6352]-170
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 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 calculator is allowed.***

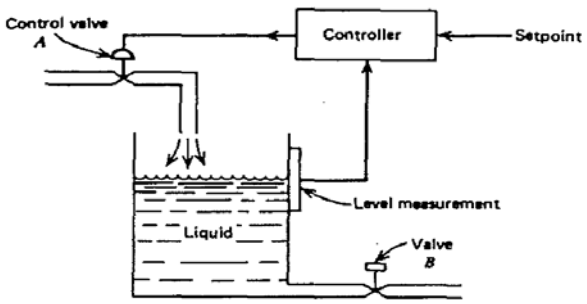
Q1) a) Explain On-Off controller in detail. Explain neutral zone in On-Off controller. **[9]**

b) An integral controller is used for speed control with a set point of 12 rpm within a range of 10 to 15 rpm. The controller output is 22% initially. The constant K_1 = -0.15% controller output per second per percentage error. If the speed jumps to 13.5 rpm, calculate the controller output after 2 s for a constant error. **[8]**

OR

Q2) a) Write output equation for PID controller. Also write advantages of PID controller over another controllers. **[9]**

b) Consider the proportional-mode level-control system of above figure. Valve A is linear, with a flow scale factor of 10 m^3/h per percent controller output. The controller output is nominally 50% with a constant of K_p = 10% per %. A load change occurs when flow through valve B changes from 500 m^3/h to 600 m^3/h. Calculate the new controller output and offset Error. **[8]**



P.T.O.

Q3) a) What is mean by tunning of controller. Explain in brief process reaction curve method for tuning controller. **[10]**

b) Draw the face plate of Digital controller and list the facilities provided on face plate. **[8]**

OR

Q4) a) Explain tuning of controller. Explain 1/4 Amplitude decay ration for tuning of controller. **[10]**

b) Explain criteria for Z-N close loop tuning method. (Ultimate gain and ultimate period) **[8]**

Q5) a) Why sizing is necessary in control valve? State equations used in Cv calculation for gas, vapor and liquid service in control valve. **[10]**

b) Explain the construction and application of single-seated globe valves.**[8]**

OR

Q6) a) Discuss control valve selection criteria for different industrial applications in detail. Also explain High temperature service valves. **[10]**

b) Discuss the construction and working of Butterfly valve. Discuss its application. **[8]**

Q7) a) What is the function of actuators in control valves? What are the various types of actuators? **[10]**

b) Discuss the function of the following accessories : **[7]**

a) Solenoid valves

b) Limit switches

OR

Q8) a) What is the function of positioner in control valves? What are the various types of positioners? Discuss one in detail. **[10]**

b) Discuss the function of the following accessories : **[7]**

a) Air lock

b) Hand wheel

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Total No. of Questions : 8]

SEAT No. :

PC-2924

[Total No. of Pages : 3

[6352]-171

S.E. (Instrumentation)

SIGNALS AND SYSTEMS

(2019 Pattern) (Semester - IV) (206271)

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

Instructions to the candidates :

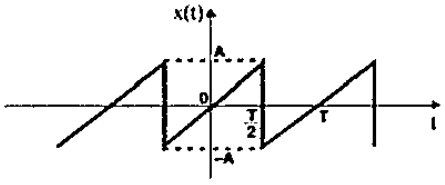
1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks***
4) ***Use of Logarithmic tables, electronic Pocket calculator and steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Find the Fourier series coefficients for the following signal $x(t) = 1 + \cos(2\ \pi t)$. **[10]**

b) Derive Fourier series coefficient for even symmetric signal. **[7]**

OR

Q2) a) Determine the exponential form of Fourier series of the waveform as shown in fig. **[9]**



b) State and prove Linear and Time shifting Properties of Fourier series. **[8]**

Q3) a) State and prove following properties of Fourier transform. **[8]**

i) Time scaling

ii) Frequency Shifting property

P.T.O.

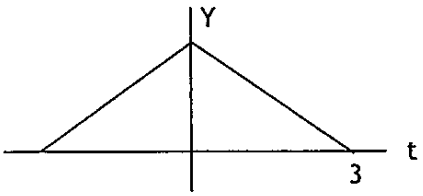
b) State equation of Fourier transform. Find Fourier transform of **[10]**

i) $x(t) = e^{at} \cos(\Omega_0 t)\, u(t)$

ii) $x(t) = A\, e^{at}$ for all t

OR

Q4) a) Determine Fourier Transform of following signal **[10]**

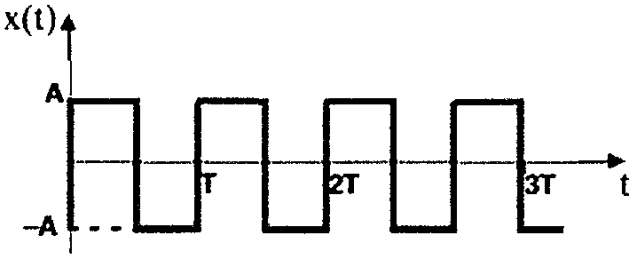


b) Find Fourier transform of **[8]**

i) $x(t) = t \sin(\Omega_0 t)$

ii) $x(t) = tu(t)$

Q5) a) Find the Laplace transform of following wave. **[9]**



b) Find inverse Laplace transform **[8]**

i) $X(s) = \dfrac{(s+1)}{(s+5)(s+6)}$

ii) $X(s) = \dfrac{10(s+1)}{(s^2+4s+8)}$

OR

Q6) a) State and prove any two properties of Laplace Transform **[8]**

b) Find Laplace transform of following : **[10]**

i) Convolution sum of $x_1 = \cos(2t)\ u(t)$, $x_2 = e^{-5t}\ u(t)$

ii) $x(t) = 4 \sin(100t)u(t)$

Q7) a) Explain following terms with example **[9]**

i) Experiment,

ii) Sample space,

iii) Event

b) i) Find the constant c such that

$$f(x) = \begin{cases} cx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$

is a density function,

ii) Compute P(1 < X < 2).

[8]

OR

Q8) a) Define Random Variables? Explain Discrete random variable with example along with discrete probability distribution. **[8]**

b) Find the probability that a single toss of a die will result **[9]**

i) In a number less than 4 if no information is given

ii) In a number less than 4 if toss result in an odd number

iii) In a number grater that 3.

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Total No. of Questions : 8]

SEAT No. :

PC-2925

[Total No. of Pages : 2

[6352]-172

S.E. (Instrumentation & Control)

DATA STRUCTURES

(2019 Pattern) (Semester - IV) (206272)

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) Elaborate the functions used to perform the below mentioned operations on list: **[9]**

i) Number of elements in the list
ii) Remove object from a list
iii) All elements of second list in first list
iv) Print a selection of the list
v) Find minimum value in list
vi) Find maximum value in list

b) Write a Python program that will create a 2-dimensional array and print it. Also illustrate the delete element and update element operation. **[9]**

OR

Q2) a) Develop a program to reverses an array of integers. **[9]**

b) Explain in detail about python lists. **[9]**

Q3) a) Explain the multidimensional array, array storage and index computation. **[9]**

b) Apply the Bubble sort method to sort the below array in ascending order.[8, 32, 10, 2, 99, 68, 40, 5, 16, 23] **[8]**

OR

P.T.O.

Q4) a) Comment on the following Map methods with an example. **[9]**

i) length()
ii) contains (key)
iii) add (key, value)
iv) remove (key)
v) value Of (key)
vi) iterator ()

b) Explain the Set ADT & its operations in python programming. **[8]**

Q5) a) How to build a linked list using a Tail Reference? Write steps to append nodes and remove nodes using a tail reference and current node respectively. **[9]**

b) Explain the following code for sorting of linked list. **[8]**

```
def Sorted Search (head, target) :
curNode = head
while curNode is not None and curNode. data < target:
if curNode. data == target:
return True
else:
curNode = node.next
return False
```

OR

Q6) a) Explain functions for i) Adding new item, ii) Removing item iii) To check item is in Bag. **[9]**

b) Write a note on BAG abstract data type. Give example of BAG ADT. **[8]**

Q7) a) How the Queue ADT is implemented using a Python list. **[9]**

b) Elaborate Postfix evaluation algorithm stepwise. **[9]**

OR

Q8) a) With suitable example describe the conversion of infix expression to postfix expression. **[9]**

b) Describe the implementation of queue using circular array. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-2926

[Total No. of Pages : 2

[6352]-173
S.E. (Instrumentation & Control)
SENSORS AND TRANSDUCERS
(2019 Pattern) (Semester - III) (206261)

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 indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Compare and contrast Bourdon tube transducers / instrument with Delta cell (DPT) pressure measurement transducers/ instrument? Draw diagrams for both. **[8]**

b) Explore the functioning of a dead weight tester in calibrating pressure instruments? Draw diagram and explain principle of operation? **[9]**

OR

Q2) a) Discuss the mechanics of elastic pressure sensors and how they convert pressure to mechanical movement? Explain With suitable diagrams? **[8]**

b) Explain the working principle of Well and Bell type manometers and their role in pressure measurement? **[9]**

Q3) a) Define term temperature? Give their different scales? How these scales are related to each other? **[8]**

b) Discuss situations where thermistors are preferred over other temperature sensors? Draw diagrams of various thermistor available? Which materials are used for construction of thermistors? **[9]**

OR

Q4) a) What are the fundamental principles/laws behind the operation of a thermocouple, and how does it convert temperature into an electrical voltage? Give formula for output voltage? **[8]**

b) How does the LM35 temperature sensor work, and what are its key characteristics that make it suitable for measuring temperature in electronic applications? Draw pin diagram of it? **[9]**

P.T.O.

Q5) a) What are the common methods used for measuring fluid flow in industrial processes, and how do fattors like fiow velocity and fluid properties influence the choice of a particular flow measurement technique? Draw appropriate diagrams and mathematical equations to support your answer? **[9]**

b) What are the principles behind the operation of orifice plates, Venturi tubes, and Pitot tubes in fluid flow measurement? How do these devices differ in terms of design, applications, and accuracy? Explain with suitable diagrams and equations? **[9]**

OR

Q6) a) How does a turbine flow meter work, and what are the key advantages and limitations of using this type of flow meter in industrial applications? What is the formula for measurement of flow? **[9]**

b) What are the different types of anemometers available for various applications? How do external factors like fluid composition and environmental conditions impact the accuracy of anemometer-based flow measurements? Draw circuit diagram and state the formula to support your answer? **[9]**

Q7) a) Compare and contrast the principles behind radar and ultrasonic level sensors for measuring the level of liquids in tanks. What are the specific advantages and limitations of each technology? Draw diagrams for both methods? **[9]**

b) Explore the concept of buoyancy-based density measurement. How can a buoyancy force sensor be employed to determine the density of a liquid? Explain with suitable diagram? **[9]**

OR

8) a) Describe the significance of viscosity in fluid dynamics and industrial processes. How do rotational viscometers work, and what types of fluids are they suitable for measuring? Draw diagram? **[9]**

b) Explain the working principle of a hydrostatic level sensor and how it is utilized for measuring liquid levels. What factors can affect the accuracy of this type of level measurement? Draw suitable figure of it? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-2927

[Total No. of Pages : 2

[6352]-174
S.E. (Instrumentation and Control)
LINEAR INTEGRATED CIRCUITS
(2019 Pattern) (Semester - III) (206262)

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) Draw and derive an expression for Inverting a summing amplifier with three inputs. **[9]**

b) Discuss with a neat circuit diagram the ideal differentiator and practical differentiator circuit using opamp. **[9]**

OR

Q2) a) Draw a neat diagram of the voltage to current converter and derive the output voltage equation. **[9]**

b) Explain the Instrumentation amplifier and its applications with a neat diagram. **[9]**

Q3) a) What is a rectifier? Discuss with suitable circuit diagram precision full-wave rectifier. Draw proper input-output waveforms. **[9]**

b) State Barkhausen criteria for sustain oscillation. Design with neat sketch wien-bridge oscillator for frequency of 2.2 KHz. **[8]**

OR

Q4) a) What is called precision rectifiers? Explain the Precision half-wave rectifier with a neat circuit diagram using OP-AMP. **[9]**

b) Explain the basic comparator and its input-output waveforms with a neat circuit diagram. **[8]**

P.T.O.

Q5) a) Design an astable multivibrator using timer 555 to generate 12 KHz frequency at 70% duty cycle. **[9]**

b) Explain the voltage-controlled oscillator with a neat block diagram using IC LM566. **[9]**

OR

Q6) a) Explain PLL using IC LM565 with a neat block diagram with lock range capture range. **[9]**

b) Explain the Bi-stable multivibrator using IC LM 555. **[9]**

Q7) a) Draw and explain second-order Butterworth high-pass filter with frequency response. **[9]**

b) Design and discuss fixed voltage regulators using IC 78xx and 79xx for 12V supply. **[8]**

OR

Q8) a) Explain linear voltage regulator using IC LM723 with neat circuit diagram. **[9]**

b) What is "Q" factor and the Ripple factor of the filter? Draw detailed ideal and practical output responses for all types of filters. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-2928

[Total No. of Pages : 2

[6352]-175
S.E. (Instrumentation & 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 diagrams 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 stem table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) An electronically deflected CRT has a final anode voltage of 1500V and parallel deflecting plate 4.5 cm long and 5mm apart. If the screen is 45 cm from the center of depleting plate find **[9]**

i) Beam speed

ii) Depletion sensitivity of the tube

iii) Depletion factor of the tube

b) A Voltmeter reads 215.5 V. The error taken from an error curve is 5.3%, Find the true value of the voltage. **[9]**

OR

Q2) a) Elaborate with neat sketch measurement of AC & DC Voltage using CRO. **[9]**

b) Prove that when a shunt connected instrument is connected to a circuit, the measured voltage is given by, $E_L = \dfrac{E0}{1 + \dfrac{Z_0}{Z_L}}$

Where $E0$ = voltage at no load (without the instrument connected)

Z_0 = output impedance of circuit

Z_L = input impedance of voltage measuring device.

Discuss the methods of reducing the loading error in the above case. **[9]**

P.T.O.

Q3) a) A basic D'Arsonval movement with full scale reading of 10 milli-ammpere and an internal resistance of 40 ohm is available. It is converted in to 0-5V, 0-10V, 0-15V and 0-20V, Design multirange voltmeter using individual multiplier. Calculate the value of individual multiplier **[9]**

b) Design series type ohm meter for the measurement of unknown resistance. **[8]**

OR

Q4) a) How creep error is compensated in induction type single phase energy meter suggest suggest suitable method and brief your answer with proper justification. **[9]**

b) The full scale deflection current of a meter is 1 mA and its Internal resistance is 80 Ω. If this meter is to have full-scale deflection when 100 V is measured. What should be the value of series resistance? **[8]**

Q5) a) For R-2R DAC, Rf = R = 1100 ohms. If the reference voltage is 10 volts, calculate the analog output voltage for digital input (11011100)2. **[9]**

b) Draw the block diagram of digital Phase meter and explain function of each block. **[9]**

OR

Q6) a) Draw general block diagram of digital thermometer. **[9]**

b) Draw general block diagram of digital ultrasonic distance meter. **[9]**

Q7) a) Describe the galvanometric type recorder with neat sketch. **[9]**

b) Elaborate different marking mechanism used in recorder. **[8]**

OR

Q8) a) Describe the XY recorder with neat diagram. **[9]**

b) Elaborate with neat sketch X-t Type recorder. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-2929

[Total No. of Pages : 2

[6352]-176
S.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2019 Pattern) (Semester - III) (206264)

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) Differentiate between the Pneumatic and Hydraulic systems with applications. **[6]**

b) Explain the Bleed & Non bleed type Pneumatic relay with application. **[6]**

c) What is the purpose of using special cylinders in Pneumatic systems? Explain anyone. **[6]**

OR

Q2) a) What is meant by direction-controlled valves? Illustrate with proper example of the same. **[6]**

b) Differentiate the Single acting & Double acting cylinder with neat diagram and its applications. **[6]**

c) Define the pressure relieving valve with appropriate diagram and its application. **[6]**

Q3) a) Explain the sequencing of cylinders and Direction control in hydraulic circuits. **[6]**

b) Draw the Standard Symbols for developing hydraulic circuits. **[6]**

c) Define Hydraulic components and Hydraulic valves, list them with neat diagram. **[5]**

OR

Q4) a) Explain the reciprocating hydraulic circuit with appropriate diagram. **[6]**

b) How speed is controlled in any hydraulic circuits, Elaborate the same. **[6]**

c) Explain in brief any one circuit of: Meter in, Meter out. **[5]**

P.T.O.

Q5) a) Write down the working, characteristics and specifications of SCR. **[6]**
b) Write down the working, characteristics and specifications of TRIAC. **[6]**
c) Write down the working, characteristics and specifications of IGBT. **[6]**

OR

Q6) a) Write down the working, characteristics and specifications of DIAC. **[6]**
b) Write down the working, characteristics and specifications of MOSFET. **[6]**
c) Give the definition of SCR, also explain the commutation of SCR. **[6]**

Q7) a) Draw a proper ladder diagram for Alarm annunciator with application. **[6]**
b) List down the NEC standards any six for Hazardous Area & Material classification. **[6]**
c) Define the Purging systems in terms of safety measures. **[5]**

OR

Q8) a) Explain the sealing and immersion in safety measures. **[6]**
b) Illustrate the definition of Intrinsic Safety also designing. **[6]**
c) Classify' what is HAZOP in details. **[5]**

Total No. of Questions : 9]

SEAT No. : ____

PC-2930

[Total No. of Pages : 4

[6352]-177

S.E. (Instrumentation)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - III) (207008)

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

Instructions to the candidates :

1) ***Question No. 1 is compulsory.***
2) ***Attempt Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Use of electronic pocket calculators are allowed.***
5) ***Figure to the right indicates full marks.***
6) ***Assume suitable data if necessary.***

Q1) **Choose the correct option :**

i) z transform of sequence $f(k)$ is defined as **[1]**

a) $\sum_{-\infty}^{\infty} f(k)z^{-k}$ b) $\sum_{-\infty}^{\infty} f(k)z^{k}$

c) $\sum_{-\infty}^{\infty} f(k)|z|^{k}$ d) $\sum_{0}^{\infty} f(k)z^{k}$

ii) If $f(x) = \cos\pi k$, $k \geq 0$ then $z[\cos\pi k]$ is given by **[2]**

a) $\frac{z(z-1)}{z^2+1}, |z|>1$ b) $\frac{z-1}{z+1}, |z|>1$

c) $\frac{z(z+1)}{(z-1)^2}, |z|>1$ d) $\frac{z}{z+1}, |z|>1$

iii) If arithmetic mean and coefficient of variation of a set of data are 10 and 5 respectively, then the standard deviation is _____. **[1]**

a) 15 b) 10

c) 5 d) 0.5

P.T.O.

iv) Events A and B have probabilities 0.25 and 0.5 respectively. The probability that both occur is 0.14. The probability that neither occurs is _____. **[2]**

a) 0.11 b) 0.25

c) 0.39 d) 0.61

v) If $\phi = x + y + z$ and $\bar{a} = \bar{i} + \bar{j} + \bar{k}$, then $\nabla\phi \cdot \hat{a}$ is equal to _____. **[2]**

a) $\frac{3}{2}$ b) $\sqrt{3}$

c) 0 d) $-\frac{5}{2}$

vi) If $f(z) = u + iv$ be an analytic function where $u = x^2 - y^2$, $v = 2xy$ then $f(z)$ in terms of z is, **[2]**

a) $z^2 + 2iz$ b) z^2

c) $z^2 - 2iz$ d) $-z^2$

Q2) a) Establish the following representation

$$e^{-x} - e^{-2x} = \frac{6}{\pi}\int_0^{\infty} \frac{\lambda \sin \lambda x}{(\lambda^2+1)(\lambda^2+4)} d\lambda, \quad x > 0$$ **[5]**

b) Attempt any one : **[4]**

i) Find z-transform of $f(k) = \begin{cases} -\left(-\frac{1}{3}\right)^k & , k < 0 \\ \left(-\frac{1}{4}\right)^k & , k \geq 0 \end{cases}$

ii) Find inverse z-transform of $f(z) = \frac{3z^2 + 2z}{z^2 - 3z + 2}, 1 < |z| < 2$.

c) Find $f(k)$; given that $f(k+2) - 4f(k) = 0$, $f(0) = 0$; $f(1) = 2$. **[6]**

OR

Q3) a) Attempt any one : **[5]**

i) Find z-transform of $f(k)=\frac{\sin ak}{k} : k>0$

ii) Find inverse z-transform of $f(z)=\frac{1}{(z-3)(z-2)} \quad 2<|z|<3$

b) Find fourier cosine transform of $f(x) = 2e^{-5x} + 5e^{-2x}$ **[5]**

c) Solve the following integral equation $\int_0^\infty f(x)\cos\lambda x\,dx = e^{-\lambda}, \lambda>0$. **[5]**

Q4) a) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. Obtain the first four central moments, β_1 and β_2. **[5]**

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

x	3	4	6	8	10
y	2	4	5	7	8

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

OR

Q5) a) Obtain the line of regression of y on x for the following data. **[5]**

x	1	3	4	5	6
y	1	2	3	5	7

b) The number of industrial injuries per week in a particular factory follows a Poisson distribution with mean 0.5. Find the probability that during a week, there will be at the most one injury. **[5]**

c) The height of students in a class follows a normal distribution with mean 190 cm and variance 80 $(cm)^2$. Among the 1,000 students from the school, how many are expected to have height above 200 cm? **[5]**
[Given : z = 1.118, A = 0.3686]

Q6) a) Find the directional derivative of $\phi = x^2y^2 + xy^2 - z^2$ at (3, 1, 1) in the direction of $2\bar{i} + \bar{j} - \bar{k}$. **[5]**

b) Consider the vector field $\bar{F}$,
$\bar{F}(x+2y+az)\bar{i} + (bx-3y-z)\bar{j} + (4x+cy+2z)\bar{k}$. If $\bar{F}$ is irrotational, then find the values of a, b, c. **[5]**

c) Evaluate $\int_C \bar{F}\cdot d\bar{r}$, where $\bar{F} = x^2\bar{i} + y^3\bar{j}$ and C is the arc of a parabola $y = x^2$ in the xy plane from (0, 0) to (1, 1). **[5]**

OR

Q7) a) If the directional derivative of $\phi = ax^2y + by^2z + cz^2x$ at point (1, 1, 1) has maximum magnitude 15 in the direction parallel to the vector $2\bar{i} + 2\bar{j} + \bar{k}$. Then find values of *a*, *b*, *c*. **[5]**

b) Show that (any one) : **[5]**

i) $\nabla^2(r^n) = n(n + 1)r^{n-2}$

ii) $\nabla^2(f(r)) = f''(r) + \frac{2}{r} f'(r)$.

c) Apply Green's theorem to evaluate $\int_C [[2x^2 - y^2]dx + [x^2 + y^2]dy]$, where C is the boundary of area enclosed by X-axis & upper half of circle $x^2 + y^2 = a^2$. **[5]**

Q8) a) If $f(z) = u + iv$ is an analytic function of *z*, prove that, $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|\mathrm{Re}(z)|^2 = z|f'(z)|^2$. **[5]**

b) Evaluate using Residue theorem, $\oint_C \frac{4z^2 + 2}{[z^2 - 1]^2} dz$, where C is contour $|z - 1| = ½$. **[5]**

c) Find the bilinear transformation which maps the points $z = -i, 0, 2 + i$ onto the points $w = 0, -2i, 4$. **[5]**

OR

Q9) a) If $v = 3x^2y - y^3$, find the function *u* such that $f(z) = u + iv$ is analytic. Find $f(z)$ interms of *z*. **[5]**

b) Use Residue theorem to evaluate, $\oint_C \frac{e^z \ dz}{(z+1)^2(z+2)^2}$, where C is the contour $|z + 1| = ½$. **[5]**

c) Show that the transformation $w = \frac{z - b}{z + b}$ maps the right half of the z-plane ($x > 0$) into the unit circle $|w| < 1$ (b is positive real number) **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC-2931

[Total No. of Pages : 3

[6352]-178
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 Q8.***
2) ***Figures to the right indicatae full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***
4) ***Use of non-programmable calculator is allowed.***

Q1) a) Differentiate between a squirrel cage induction motor and a slip ring induction motor with any six significant points. **[6]**

b) Draw and explain the torque-speed characteristics of a three phase induction motor. **[6]**

c) Show that the three phase ac supply produces a rotating magnetic field in case of a three phase induction motor. **[6]**

OR

Q2) a) Discuss the effect of addition of a rotor resistance on the torque-slip characteristics of a three phase induction motor with the help of a relevant diagram. State the condition under which it is possible to achieve the maximum torque at start. **[6]**

b) A 6 pole, 50 Hz. three phase induction motor is running on Full load with 4% slip Calculate **[6]**

i) the synchronous speed

ii) the rotor speed

iii) frequency of rotor current at standstill and at full load

iv) the speed of the motor if it runs with 3% slip

v) what is the maximum achievable theoretical speed of this motor?

c) Explain with suitable justification why the single phase induction motors are not self-starting. **[6]**

P.T.O.

Q3) a) Explain the constructional features of a three phase synchronous motor. Why the synchronous motors are not self-starting? **[6]**

b) Explain the construction and working principle of universal motor and state its any two applications. **[6]**

c) Discuss in brief the working of a stepper motor. **[5]**

OR

Q4) a) Explain any one method of starting a three phase synchronous motor. **[6]**

b) Write a short note on servomotor with reference to its types, working principle and applications. **[6]**

c) Discuss the working principle of a brushless alternator. **[5]**

Q5) a) Draw and explain the single line diagram of a layout of a typical power system from generation to load showing various voltage levels. **[6]**

b) Differentiate between EHVAC and HVDC transmission systems. **[6]**

c) State and explain the major components used in power system transmission and distribution. **[6]**

OR

Q6) a) Write a short note on EHVAC transmission. **[6]**

b) State any three advantages and limitations of HVDC transmission system. **[6]**

c) Draw and explain the single line diagram of a typical distribution substation supplying power to residential consumers. **[6]**

Q7) a) An electrical system is represented using R, L and C as shown in the Fig. 1 Write the equations that describes the behaviour of this system in time domain and hence determine $E_o(s)/E_m(s)$. **[6]**

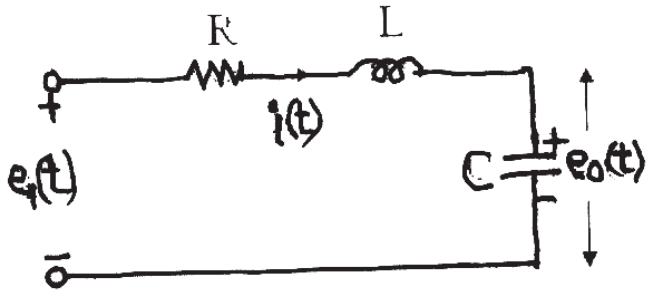

Fig. 1

b) Using the block diagram reduction technique, determine the transfer function C(s)/R(s) shown in Fig. 2. **[6]**

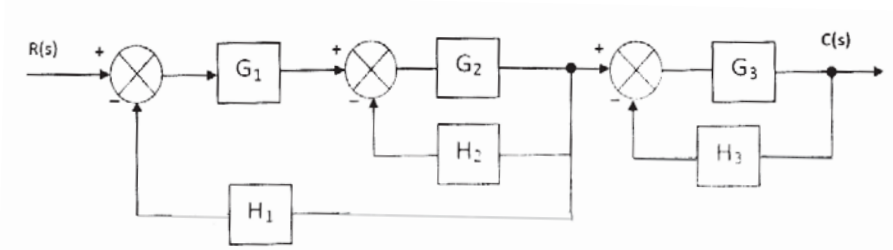

Fig. 2

c) Distinguish between open loop and closed loop control systems with significant points. **[5]**

OR

Q8) a) Represent the mechanical system shown in Fig. 3 by node representation method and hence write the node equations. **[6]**

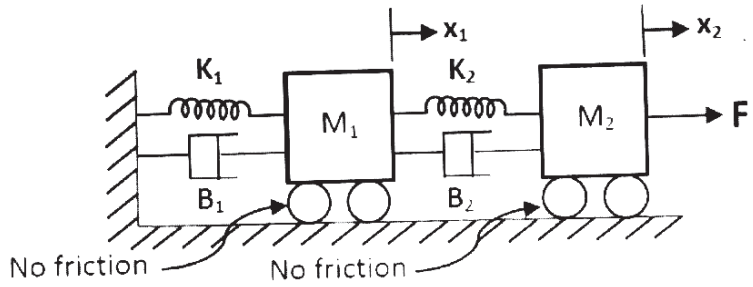

Fig. 3

b) Draw the signal flow graph for the block diagram shown in Fig.2 and hence obtain the transfer function C(s)/R(s) by using Mason's gain formula. **[6]**

c) State whether the following systems are open loop or closed loop control systems. **[5]**

i) Voltage stabilizers
ii) Automatic washing machine
iii) Solar tracking system
iv) Speed control mechanism used in water turbines at the hydroelectric stations
v) Traffic light system

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