

[6403]-1

T.E. (Civil Engineering)

HYDROLOGY AND WATER RESOURCES ENGINEERING
(2019 Pattern) (Semester - V) (301001)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers Q.No 1 or Q.No 2, Q.No 3 or Q.No 4, Q.No 5 or Q.No 6, Q.No 7 or Q.No 8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) State the various methods to estimate the magnitude of peak flood. Explain any two methods in detail. [2+7]
- b) Estimate the maximum flood flow for the following catchments by using an appropriate empirical formula; [9]
- Consider Dickens constant 6.0 and Ryves Coefficient 6.8.
- i) $A_1 = 40.5 \text{ km}^2$, (for Western Ghat area, Maharashtra).
 - ii) $A_2 = 40.5 \text{ km}^2$, (in Gangetic plain).
 - iii) $A_3 = 40.5 \text{ km}^2$, (in the Cauvery delta, Tamil Nadu).

OR

- Q2)** a) State and explain Q-GIS software application in hydrology (watershed delineation). [8]
- b) What is hydrologic flood routing? Explain Muskingum method in detail. [3+7]

- Q3)** a) Explain in brief various investigations required for reservoir planning. [7]
- b) State the significance of mass curve. Explain the step by step procedure for fixation of reservoir capacity using annual inflow and outflow. [2+8]

OR

- Q4)** a) Explain with neat sketch the significance of reservoir sedimentation and trap efficiency. [5+5]
- b) What are the different losses which take place from the reservoir. Explain the measures to control this losses. [3+4]

P.T.O.

Q5) a) Derive the formula to calculate discharge of a well in a confined aquifer and unconfined aquifer. **[10]**

b) Write the preventive and curative measures of water logging. Explain tile drain method and also state the formula for spacing of tile drains. **[3+5]**

OR

Q6) a) A 30 cm well completely penetrates an unconfined aquifer of saturated depth 40m. After a long period of pumping at steady rate of 1500 lpm, the drawdown in two observation wells 25 and 75m from the pumping well were found to be 3.5 and 2 m respectively. **[5+5]**

i) Determine the transmissivity of the aquifer.

ii) What is the drawdown at pumping well?

b) What is Participatory Irrigation Management (PIM)? What is co-operative water distribution systems. **[4+4]**

Q7) a) Write the advantages and disadvantages of PDN over conventional canal distribution network. **[10]**

b) Differentiate between surface irrigation and subsurface irrigation and explain sprinkler irrigation in detail. **[7]**

OR

Q8) a) State various methods of canal revenue collection and explain any two in detail. **[10]**

b) What is micro irrigation and what are its advantages compared other methods of irrigation. **[3+4]**

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Total No. of Questions : 8]

SEAT No. :

PD4209

[Total No. of Pages : 2

[6403]-2

T.E. (Civil Engineering)

WATER SUPPLY ENGINEERING

(2019 Pattern) (Semester - V) (301002)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Explain in detail: Rapid Mixer and flocculator. **[6]**
b) A clariflocculator is to be designed for a flow of 60 MLD. Assuming, inlet velocity 1.2 m/s, and detention time in flocculator and clarifier as 30 and 120 mins, respectively, surface overflow rate in clarifier as $40 \text{ m}^3/\text{m}^2/\text{d}$, G in flocculator 40 s^{-1} , and depth of flocculator basin as 2.5 m, determine diameter of inlet pipe, flocculator and clarifier. **[6]**
c) Discuss in detail filtration process in Rapid Sand Gravity filter with neat sketch. **[4+2=6]**

OR

- Q2) a)** Explain in detail diffused double layer theory of coagulation with neat sketch. **[4+2=6]**
b) A filter unit is of size $5\text{m} \times 10 \text{ m}$. After filtering $9000 \text{ m}^3/\text{day}$ in 24 hr period, the filter is back washed for 30 minutes at the rate of $10 \text{ lit}/\text{m}^2/\text{sec}$ for 10 minutes. Compute the average filtration rate, quantity and percentage of treated water used in washing and the rate of wash water flow in each trough. The unit has 4 collecting troughs. **[6]**
c) Discuss in detail coagulation by natural coagulant *Moringa oleifera* stating its advantages and disadvantages over Alum. **[6]**

- Q3) a)** Explain in detail following water softening processes: **[6]**
i) Lime soda process
ii) Zeolite process
b) What is Super Chlorination? Find the dose of chlorine and chlorine demand for water quantity of $50,000 \text{ m}^3/\text{day}$. Chlorine used is 20 kg per day and residual chlorine after 10 minutes of contact time is 0.2 mg/lit. **[6]**
c) What do you mean by disinfection? Discuss the factors affecting efficiency of disinfection. Enlist 4 disinfectants used in water treatment plant. **[1+2+2=5]**

OR

P.T.O.

- Q4) a)** Explain in detail: various methods of desalination of water with neat sketch. [6]
 b) Explain in detail: Break Point chlorination with neat sketch. [4+2=6]
 c) Write with a neat sketch: a detailed note on Ion exchange. [2+3=5]

- Q5) a)** Write in detail: Methods and Components of domestic rain water harvesting with a suitable sketch. [8]
 b) Designed demand of town is 4 MLD. It is pumped into an elevated service reservoir at a uniform rate from 5am to 9am and 5pm to 9pm. The variation in demand of water is given below. [10]

Period	5 am to 9 am	9 am to 5 pm	5 pm to 9 pm	9 pm to 12 am	12 am to 5 am
Demand	40%	15%	30%	10%	05%

Determine the balancing Capacity of the reservoir.

OR

- Q6) a)** Explain in detail: Requirements of good water distribution system. [6]
 b) Calculate storage capacity and dimensions of the tank to store rain water for the given data: [6]
 Terrace area=300 m², average annual rainfall =720 mm
 Runoff coefficient= 0.8, Assume L/B= 2, D=2m
 c) List down various leakage detection systems. Write a detailed note on any one leakage detection system. [2+4=6]

- Q7) a)** Explain in detail with neat sketch: Packaged WTP for swimming pools. [2+4=6]
 b) Write a note on: [6]
 i) Air valve,
 ii) Sluice valves
 c) Explain with neat sketch two pipe system. [5]

OR

- Q8) a)** Explain following initiatives taken by Government in water infrastructure. [3+3=6]
 i) Amrut mission
 ii) Jal Jeevan mission
 b) Explain in detail requirement of water meters and state their types.[3+2=5]
 c) Write a note on: [6]
 i) Drain valve,
 ii) Vent pipe



Total No. of Questions : 8]

SEAT No. :

PD-4210

[Total No. of Pages : 3

[6403]-3
T.E. (Civil)
DESIGN OF STEEL STRUCTURES
(2019 Pattern) (Semester - V) (301003)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and Q. 7 or Q. 8.*
- 2) *Neat sketches must be drawn wherever necessary*
- 3) *Figures to the right indicate full marks*
- 4) *Take $f_y = 250$ and $f_e = 410$ grade of steel*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400$ N/mm².*
- 6) *Assume suitable data, if necessary*
- 7) *Use of electronic pocket calculator, IS: 800-2007 and steel table are allowed*
- 8) *Use of cell phone is prohibited in the examination hall.*

Q1) a) Define beam-Column with suitable sketches. **[3]**

- b) A column section ISHB 350 @66.12 kg/m carries a factored axial compressive load of 1645 kN and factored B.M. of 90 kN-m. Design a moment resisting base plate. Assume concrete pedestal of M20 grade.**[14]**

OR

Q2) a) Differentiate between slab base and gusseted base. **[3]**

- b) A column having effective length of 3.5 m is subjected to factored axial load of 450 kN and factored moment of 50 kNm. Design the column section. Check for section strength only. **[14]**

Q3) a) Explain in brief web buckling and web crippling with suitable sketches. **[4]**

- b) A simply supported steel joist of 4 m effective span carries a working uniformly distributed load 40 kN/m on entire span and a point load of 50 kN at mid span. The section is laterally supported throughout the span. Design an appropriate section. Apply usual checks for strength along with check for deflection. **[14]**

OR

P.T.O.

- Q4) a)** Explain modes of failure of beam with suitable sketches [4]
- b)** Design a suitable I section for simply supported beam of span 5 m carrying a dead load of 20 kN/m and imposed load of 40 kN/m. The beam is laterally unsupported throughout the span. [14]

Q5) Design a gantry girder supporting an electronically operated crane to the following data : [17]

- a) Capacity of crane = 120 kN
- b) Span between crane rails = 20 m
- c) Self-weight crane girder = 100 kN
- d) Weight of crab, electric motor, Hook etc. = 15 kN
- e) Minimum hook approach = 1.2 m
- f) Wheelbase = 2 m
- g) Span of Gantry 5.5 m

OR

Q6) Determine panel point dead load, imposed load and wind load for the truss as show in Figure 1. Assume design wind pressure as 1200 N/m², use A.C. Sheet and the C/C spacing of truss is 6 m. Assume self-weight of purlin as 120 N/m. [17]

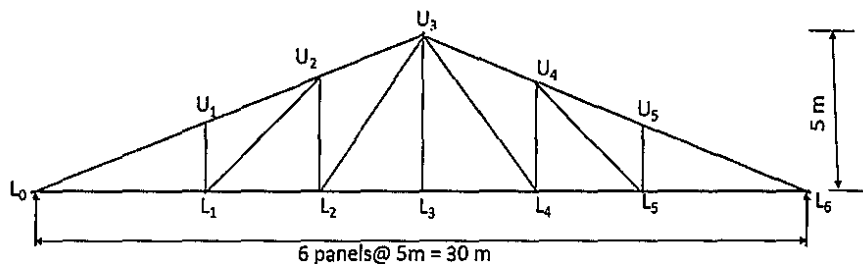


Fig. 1

- Q7) a)** Explain in brief IS provisions for length and spacing of intermittent weld. [4]
- b)** A simply supported welded plate girder of an effective span of 20 m subjected to factored uniformly distributed load 43 kN/m throughout the span including self weight. Assume compression flange laterally supported throughout the span. Design cross section of the plate girder. [14]

OR

- Q8)** a) Explain in brief flange curtailment of plate girder. **[4]**
- b) A Simply supported welded plate girder is designed for the span of 24 m. It is subjected to a shear force of 2300 kN and bending moment of 20700 kNm. A section used for plate girder to carry above load is as given below -
- Flanges - 780mm wide and 50 mm thick
- Web - 16 mm thick and 2600 mm deep
- Design intermittent welded connection between flange and web. Also design end bearing stiffener. **[14]**



Total No. of Questions : 8]

SEAT No. :

PD4211

[Total No. of Pages : 3

[6403]-4

T.E. (Civil)

**ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT
(2019 Pattern) (Semester - V) (301004)**

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 of non programmable scientific calculator is allowed.

- Q1) a)** What is Financial Management? Explain “Why construction financial management is different?” **[6]**
- b) What are the roles and responsibilities of construction finance manager? **[6]**
- c) Write down the definition of contract and explain: **[5]**
- i) Percentage rate contract
 - ii) Item rate contract

OR

- Q2) a)** The following were the expenses on a contract which commenced on 1st January, 2020. **[8]**
- i) Materials purchased = Rs. 4,40,000
 - ii) Direct wages = Rs. 1,28,000
 - iii) Plant issued = Rs. 40,000
 - iv) Overhead = Rs. 17,200
 - v) Material in hand = Rs. 20,000.

The contract price was Rs. 12,00,000 against which the cash received on account of contract was Rs. 6,00,000. The plant has gone 20% depreciation. Prepare the contract account.

- b) Explain the importance of Financial management in construction. **[4]**
- c) What is Contract? Explain why it is prepared? **[5]**

P.T.O.

- Q3) a)** Explain in brief the essential elements of budget. **[4]**
b) What is 'Rule of 72'? Write down its formula. **[5]**
 If Mr. 'A' has invested Rs. 20,00,000 at a 8% rate of interest, in how many number of years the invested amount gets doubled?
c) Calculate the Internal Rate of Return (IRR) on the investment in the following cash flow: **[8]**

Year	0	1	2	3	4	5
Cash inflow	-1,00,000	+20,000	+30,000	+20,000	+40,000	+40,000

Consider 10% discount rate for first calculation.

OR

- Q4) a)** From the following details relating to two projects A and B, suggest which one is to be accepted using Net Present Value (NPV) method? **[6]**

Particular	Project A	Project B
Estimated Cost (Rs.)	1,10,000	1,10,000
Cash flow in year 1 (Rs.)	31,000	71,000
Cash flow in year 2 (Rs.)	40,000	40,000
Cash flow in year 3 (Rs.)	50,000	40,000
Cash flow in year 4 (Rs.)	70,000	20,000

The company expects a return of 10%

- b)** Write down a detailed note on "Project Expenditure Budget". **[5]**
c) A concrete mixer was purchased at Rs. 9,00,000. Assuming Scrap Value to be Rs. 6,50,000 after 10 years. Calculate the depreciation at the end of 5 years by **[6]**
 i) Straight Line Method
 ii) Constant Percentage Method
- Q5) a)** Write down the significance of working capital in construction company. Enlist any 6 factors considered for determination of working capital. **[6]**
b) Considering 10% contingencies, calculate the working capital from the following data; **[6]**

Particulars	Amount (Rs.)	Particulars	Amount(Rs.)
Bank Balance	2,55,000	Account Payable	2,80,000
Term loan from Bank	2,95,000	Stock of finished goods	1,20,000
Payable unclaimed dividend	55,000	Account receivable	3,00,000
Commission receivable	62,000	Staff PF	80000

- c)** What is classification problem in inventory management? How to solve this problem? Explain any one method. **[6]**

OR

- Q6) a)** Write a note on following: [6]
- Types of working capital
 - Components and financing resources of working capital
- b)** The yearly requirement of cement by a construction firm is 250 bags. The cost of one bag of cement is Rs. 375 and ordering cost per order is Rs. 100. Assume annual carrying cost for inventory of 20% of average inventory management. Calculate EOQ and number of orders in one year. If the lead time is 5 days calculate order point. [6]
- c)** Explain Safety stock, stating its importance and various cost involved. [6]
- Q7) a)** What is direct tax? Explain any two types of direct tax in India. [6]
- b)** Calculate the property tax for the apartment which used only for residential purpose, from following location data: [6]
- No of floors –14 (Floor factor -1.10)
 - Base value – Rs. 370/Sqft
 - User category factor – 0.5
 - Nature and type of structure – RCC (factor-1)
 - Age of building – 18 years (Age factor – 0.85)
 - Carpet area – 550 Sq ft
 - Location – Thane
 - Tax rate – 0.775%
- c)** Explain any 6 functions of Reserve Bank of India (RBI). [6]
- OR
- Q8) a)** What are objectives the of Tax planning? Explain in brief Corporate tax planning. [6]
- b)** Write down the roles and functions of following financial regulatory bodies: [6]
- ICRA (Information and Credit Rating Agency)
 - SEBI (Security and Exchange Board of India)
- c)** Calculate the payable property tax to be paid on property located in Chennai from following data; [6]
- Plinth area= 400sq. ft.
 Monthly rent notified = Rs. 6 per sq. ft.
 Tax rate = 30%
 Library cess = 15%
 Consider 10% rebate on age of building.

Total No. of Questions : 8]

SEAT No. :

PD-4212

[Total No. of Pages : 2

[6403]-5

T.E. (Civil)

**ADVANCE FLUID MECHANICS AND HYDRAULIC MACHINES
(2019 Pattern) (Semester - V) (301005A) (Elective - I)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the methods to reduce water hammer effect. [6]
b) What is surge tank? Explain different types of surge tanks. [6]
c) A fluid flow through an orifice of an area 0.4 m^2 with an actual discharge of 400 lps, determine the coefficient of discharge if the theoretical velocity of flow is 2.0 m/s . [6]

OR

- Q2)** a) Prove that for gradual closure of valve rise of pressure $h = LV/gt$ [6]
b) Explain one complete cycle of water hammer phenomenon. [6]
c) A tank having constant cross-sectional area and sharp edged orifice at the bottom took 100 seconds to empty upper third part. How long it will take to empty the middle third part. [6]

- Q3)** a) Derive an expression for force exerted by jet on flat moving plate held incline to the jet. [6]
b) A jet of water 8 cm in diameter having velocity 24 m/s strikes normally on flat plate. If the plate is moving with the velocity of 5 m/s determine the force on the plate. [6]
c) Derive an expression for force exerted by jet on stationary plate held perpendicular to the jet. [6]

OR

- Q4)** a) Derive impulse momentum equation [6]
b) Derive an expression for force exerted by jet on symmetrical moving curved vane at the center. [6]
c) A jet of water 6 cm in diameter having velocity 15 m/s strikes normally on flat plate. If the plate is stationary determine the force on the plate. [6]

P.T.O.

- Q5) a)** Explain various types of turbines. [6]
b) Explain functions of various components of hydroelectric power plant. [6]
c) Explain various components of Francis turbine. [6]

OR

- Q6) a)** Calculate diameter of jet and mean diameter of pelton wheel turbine working under following conditions. [6]
i) Power 12000kw
ii) Net head available 800 m
iii) Speed 500 rpm
iv) Cv for jet 0.98
v) Speed ratio 0.46
vi) Overall efficiency 90%
- b) Describe various types of draft tubes [6]
c) What is cavitation in turbine and what are measures to reduce it. [6]

- Q7) a)** With neat sketch explain functions of each components of centrifugal pump. [6]
b) Describe multistage pump with impeller in series and parallel. [6]
c) Explain various types of efficiencies of pump. [4]

OR

- Q8) a)** Explain various types of centrifugal pumps. [6]
b) Describe various characteristic curves of pump. [6]
c) Explain measures to reduce cavitation in centrifugal pump. [4]



Total No. of Questions : 8]

SEAT No. :

PD-4213

[Total No. of Pages : 2

[6403]-6

T.E. (Civil Engineering)

RESEARCH METHODOLOGY AND IPR (Elective - I)

(2019 Pattern) (Semester-V) (301005 B)

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 and Q.7 or Q.8.*
- 2) Neat diagram must be drawn wherever necessary.*
- 3) Figures to the right bracket indicate full marks.*
- 4) Assume suitable data, if necessary and clearly state.*

Q1) a) What are the advantages of primary and secondary data? **[9]**

- b) “Processing of data implies editing, coding, classification and tabulation”. Describe in brief these four operations pointing out the significance of each in context of research study. **[8]**

OR

Q2) a) Enumerate the different methods of collecting data. Which one is the most suitable for conducting survey’ regarding traffic density of national highway? Explain its merits and demerits. **[9]**

- b) Write a short notes on the following : **[8]**

- i) Histogram
- ii) Bar Chart
- iii) Pie Chart
- iv) Curve Fitting

P.T.O.

- Q3)** a) Write a brief note on the ‘task of interpretation’ in the context of research methodology. [9]
b) Describe, in brief, the layout of a research report, covering all relevant points. [9]

OR

- Q4)** a) “Interpretation is a fundamental component of research process”, Explain. Why so? [9]
b) What are the different forms in which a research work may be reported. Describe. [9]

- Q5)** a) Why does intellectual property need to be promoted and protected? [8]
b) List out the subject matter protected by intellectual property rights under the World Intellectual Property Organization(WIPO). [9]

OR

- Q6)** a) What are the legislations covering IPRs in India? [8]
b) What is TRIPS Agreement? Outline the main three features of the TRIPS Agreement. [9]

- Q7)** a) What is a patent? Explain the elements of patentability? [9]
b) Write a short notes of following: [9]
i) Trade mark
ii) Term of copyright
iii) Geographical Indication.

OR

- Q8)** a) Discuss the grounds on which the registration of a patent can be refused? [9]
b) How has a software patent been defined? Briefly discuss some of the important issues concerning software patenting. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4214

[Total No. of Pages : 2

[6403]-7
T.E. (Civil)
CONSTRUCTION MANAGEMENT
(2019 Pattern) (Semester - V) (301005 C) (Elective - I)

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,orQ.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 Building and other Construction Workers act 1996? [6]
b) What are the Significance of Project Balance Sheet and its Use? [6]
c) Explain Profit loss account statement. [6]

OR

- Q2)** a) Explain needs and importance of Labour laws in the Field of Civil Engineering. [6]
b) Write Note on Working Capital. [6]
c) Explain minimum wages of ACT 1948. [6]

- Q3)** a) Write short Note on Risk Control in Construction. [6]
b) How Mathematical model will be useful in Risk Management. [6]
c) State the application of Value Engineering. [6]

OR

- Q4)** a) Write Short note on Break even analysis and Sensitivity analysis. [6]
b) Explain energy cost escalation and its impact on infrastructure project.[6]
c) Explain principle of risk Management. [6]

P.T.O.

- Q5)** a) Explain supply Chain Management in Construction. [6]
b) Explain in detail Role of ERP in material management. [6]
c) Write short note on material resource information systems. [5]

OR

- Q6)** a) Write note on break even analysis. [6]
b) Explain inventory control methods. [6]
c) Role of material management in construction Industry. [5]

- Q7)** a) Explain the importance of Human Resource Management in Construction Industry. [6]
b) Explain nature and scope of human resource management. [6]
c) Discuss in detail importance of Genetic Algorithm tool in construction industry. [5]

OR

- Q8)** a) Explain Human Resource development process. [6]
b) Write note on human resources information systems. [6]
c) Explain Fuzzy Logic and its application in Civil engineering. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4215

[Total No. of Pages :2

[6403]-8

T.E. (Civil)

**Elective - I : ADVANCED CONCRETE TECHNOLOGY
(301005D) (2019 Pattern) (Semester - V)**

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.*

- Q1)** a) What are chemical admixtures? What are their functions? [9]
b) How are chemical admixtures classified? Explain their functions. [9]

OR

- Q2)** a) Explain the differences between plasticizer and superplasticizer. [9]
b) Compare the functions of retarders and accelerators. [9]

OR

- Q3)** a) What do you understand by the balling effect? How does it affect the properties of concrete? [8]
b) How are glass fibers classified? List their applications. [9]

- Q4)** a) Explain the role of synthetic fibers in improving the early-age properties of concrete. [8]
b) What are Polypropylene fibers? List their applications. [9]

- Q5)** a) Explain what you understand by the durability of concrete. [9]
b) Explain the plastic and autogenous shrinkage of concrete. [9]

P.T.O.

OR

- Q6)** a) With a neat diagram, explain fiber bridging in concrete. [9]
b) Explain, with a neat diagram, the diffusion process in concrete. [9]

- Q7)** a) List any five applications of ultrasonic pulse velocity method. [8]
b) With a neat diagram, explain the principle of ultrasonic pulse velocity method. [9]

OR

- Q8)** a) How is corrosion measured in concrete? [8]
b) Explain why concrete cores are extracted from structures? [9]



[6403]-9

T.E. (Civil Engg.)

MATRIX METHODS OF STRUCTURAL ANALYSIS
(2019 Pattern) (Semester - V) (301005E) (Elective - I)

Time : 2½ Hours]

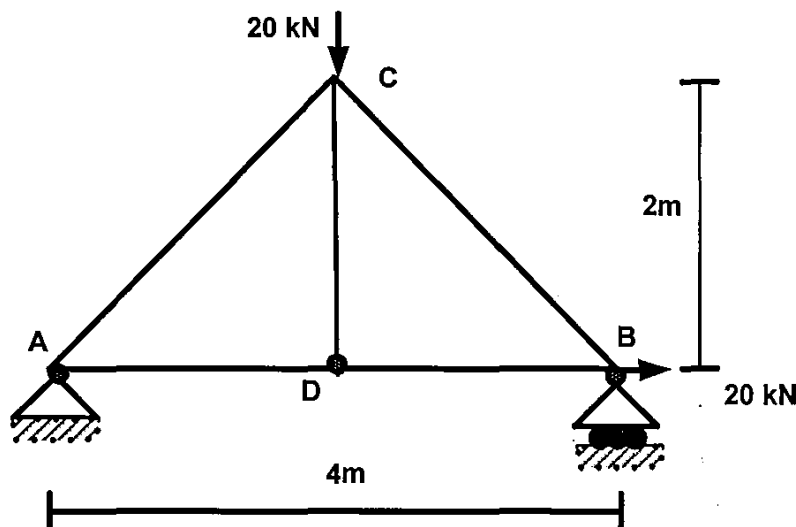
[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, 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 non-programmable electronic calculator is allowed.
- 5) Assume suitable data, if necessary.
- 6) Assessment will be based on complete solution and not on final answer.

- Q1) a)** Using stiffness member approach, determine overall stiffness matrix for the given truss. Take $AB = 4\text{m}$. $DC=2\text{m}$ Area of all members, $A = 400\text{ mm}^2$ and take $E = 200\text{ GPa}$. What will be the size of the force vector and displacement matrix? What will be the size of reduced stiffness matrix?

[14]



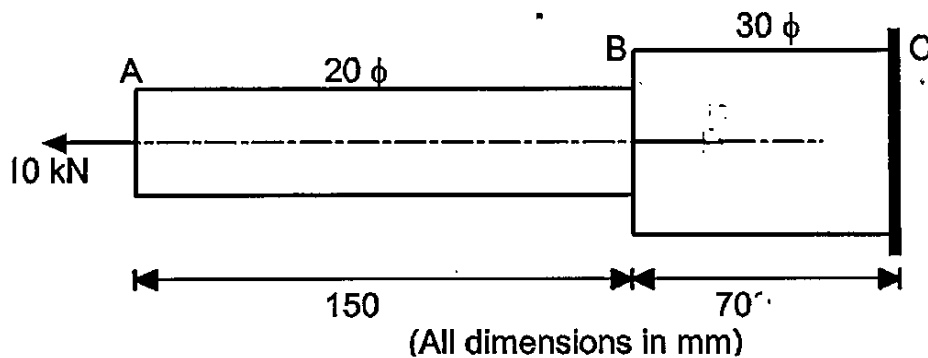
- b)** Derive the member stiffness matrix for a bar element subjected to axial forces.

[4]

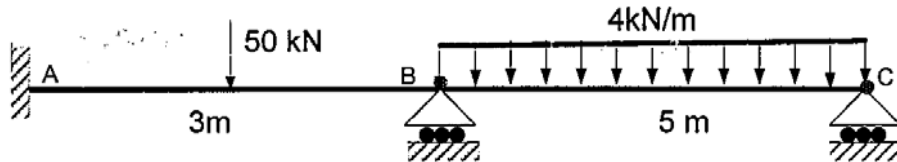
P.T.O.

OR

- Q2) a) Derive the stiffness matrix for truss element. [6]
- b) For the given bar fixed at C with varying diameter, subjected to axial force of 10 kN at A, determine the displacements at A and B. Also find the corresponding strains and stresses. Take $E = 200\text{GPa}$. Length of AB and BC is 150 mm and 70 mm respectively. Diameter of the bar AB and BC is respectively 20 mm and 30 mm. [12]



- Q3) Using stiffness method, analyze the two span continuous beam. Point load is centrally placed. Draw shear force and bending moment diagram. [17]



OR

- Q4) a) Derive the stiffness matrix for plane frame member. [8]
- b) A cantilever beam of length 4 m is subjected to a uniformly distributed load of 20 kN/m. Determine the slope and deflection at free end and draw the shear force and bending moment diagram using stiffness member approach. [9]
- Q5) a) State the necessity of transformation matrix. For a grid member, derive the transformation matrix. [9]
- b) Derive the stiffness matrix for grid member. [8]

OR

Q6) A uniformly distributed load of 10 kN/m act on two perpendicular member AB and BC of a grid. The members are fixed at A and C and B is a rigid joint connecting both the members. Length of both members is 4 m . Considering EI and GJ as constant, using structure approach, analyse the grid and find the vertical displacement at C. **[17]**

Q7) a) Drawing neat sketches for the unit displacements, derive the stiffness matrix for a space frame member. **[9]**

b) Derive the stiffness matrix for space truss element for local axis. Drawing neat sketches for direction cosines, write the global stiffness matrix for space truss element. **[9]**

OR

Q8) a) Write flowchart for solution of beam problem. **[9]**

b) Write flowchart for solution of space truss problem. **[9]**



[6403]-10

T.E. (Civil)

ADVANCED MECHANICS OF STRUCTURES
(2019 Pattern) (Semester - V) (301005f) (Elective - I)

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 sketches must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of electronic pocket calculator is allowed.

- Q1) a)** A simply Supported beam of span 12 m loaded as shown in fig1. Find the shear force & bending moment at a section 6 m from left end, Draw ILD for support reactions, shear force & Bending Moment. **[9]**

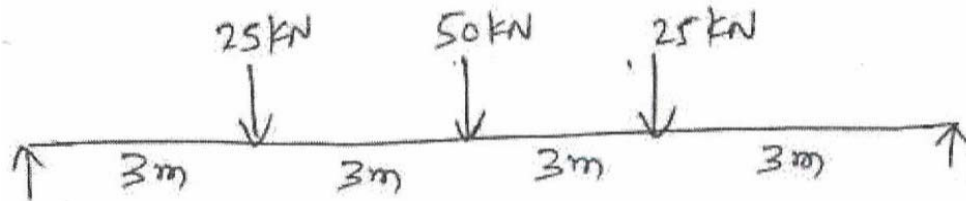


fig.1

- b)** Draw the influence line diagrams for forces in the member U_2L_3 , U_2U_3 and L_2L_3 of the through type bridge truss as shown in fig.2 **[8]**

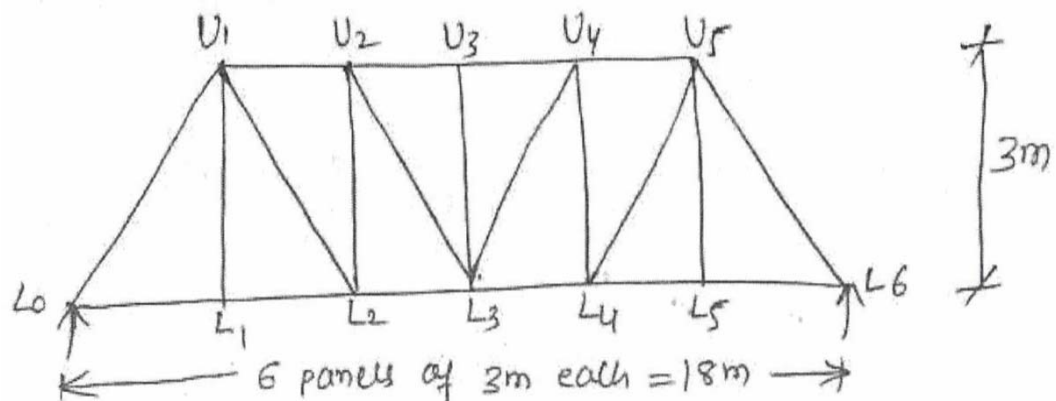


fig.2

P.T.O.

OR

- Q2) a)** A simply Supported beam of span 10m loaded as shown in fig.3. Find the Support Reactions, shear force at point D & bending moment at Point F. Draw ILD for support reactions, shear force & Bending Moment. [9]

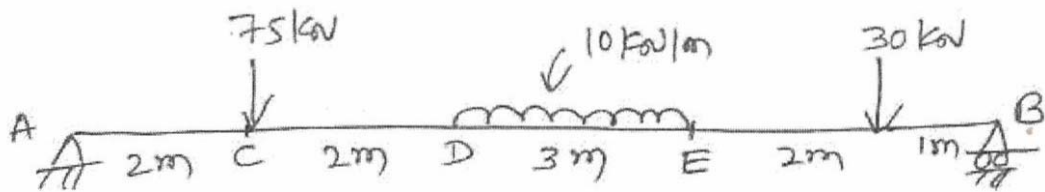


fig. 3

- b)** Draw the influence line diagrams for forces in the member U_2U_3 , U_2L_2 and L_2L_3 of the truss as shown in fig. 4. [8]

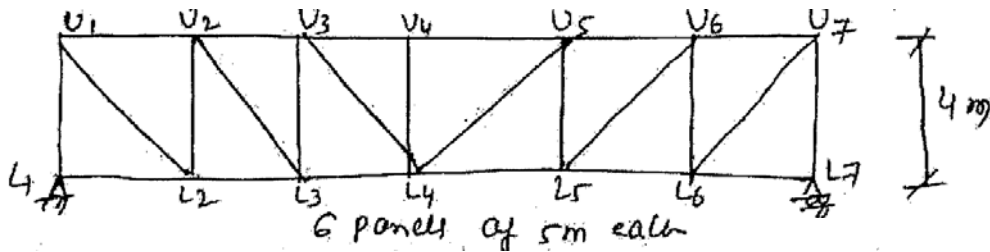


fig.4

- Q3) a)** A simply supported beam of 15m span is carrying a rolling UDL of intensity 40 kN/m with length larger than the span. Determine [12]
- Maximum Reactions
 - Maximum negative & positive shear force & Maximum Bending Moment at a section 8m from left support
 - Absolute Maximum Bending Moment anywhere in the span.
- b)** An uniformly distributed load of span 8m having intensity has 15 kN/m moving on simply supported beam of span 6m. Draw influence line diagram for shear force and bending moment at distance 2.5m from left support. [6]

OR

- Q4) a)** A simply supported beam of 10 m span is carrying a rolling UDL of 4m length with intensity of 25 kN/m moving from left to right. Determine [12]
- Maximum Reactions
 - Maximum negative & positive shear force & Maximum Bending Moment at a section 4m from left support
 - Absolute Maximum Bending Moment anywhere in the span.

- b) Two wheel loads 75 kN & 150 kN spaced at 2m move on a girder of 10m long. Find the maximum positive and negative shear force at a section 3m from left end. Any wheel load can lead the other. [6]

Q5) Derive an expression for semi-circular beam simply supported on three supported equally spaced support. [17]

OR

Q6) Derive an expression for circular beam loaded with uniformly and supported on symmetrically placed column. [17]

Q7) a) A three hinged parabolic arch of 20m span & carries rise of 5m carries a point load of 25 kN at 6m from the left hand hinge. Find reactions at support, Maximum Positive & Negative Bending Moment and draw BMD. [12]

- b) Derive the expression for horizontal thrust when entire span of two hinged parabolic arch is loaded with UDL of intensity 'w' kN/m. [6]

OR

Q8) a) A parabolic arch is hinged at the springing, which are at the same level. The span is 48m with a central rise of 6m. It carries a point load of 150 kN at the crown. If $I = 10 \text{ Sec } \theta$, Calculate the normal thrust, radial shear and bending moment at the left and quarter span. [12]

- b) A symmetrical 3 hinged parabolic arch as shown in fig.5 has a span of 20m. It carries UDL of intensity 15 kN/m over the entire span & two point loads of 40 kN each at 2m & 5m from left support. Compute the reactions, Horizontal Thrust & Normal Thrust at a section 4m from left end take central rise as 4m. [6]

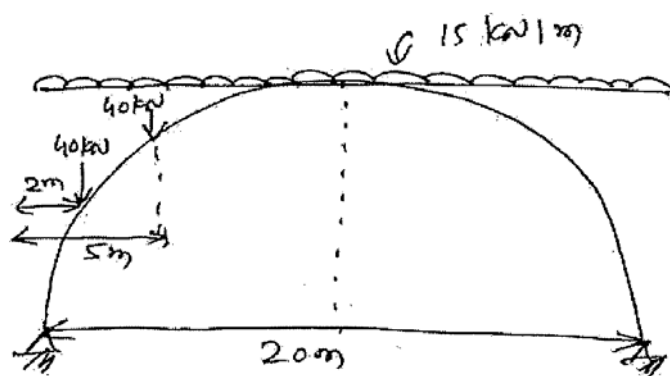


fig.5



Total No. of Questions : 8]

SEAT No. :

PD4217

[Total No. of Pages : 3

[6403]-11

T.E. (Civil)

WASTE WATER ENGINEERING
(2019 Pattern) (Semester - VI) (301012)

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 scientific calculators is allowed.

Q1) a) Explain with neat sketch the principle and working process of activated sludge process. **[2+3]**

b) Explain the term Aeration period (H.R.T), Hydraulic retention time (HRT), BOD Loading Rate (VLR) and F/M ratio in detail. **[5]**

c) Design of conventional activated sludge treatment plant for an average operating data is as follows: **[8]**

Wastewater flow=34000m³/d

Volume of aeration tank=10600m³

Influent BOD=250 mg/l

Effluent BOD=20mg/l

Mixed liquor suspended solids = 2500mg/l

Effluent suspended solids =30mg/l

Waste sludge suspended solids 9700mg/l

Quantity of waste sludge=220m³/d

Based on the information above determine,

- i) Aeration period(hrs)
- ii) Food to microorganism ratio (F/M ratio)
- iii) Percentage efficiency of BOD removal
- iv) Sludge age (days).

OR

P.T.O.

Q2) a) Explain difference between suspended growth and attached growth process. [5]

b) Define sludge bulking. Explain the control measures for the sludge bulking. [5]

c) An average operating data for conventional activated sludge treatment plant is as follows: [8]

Sewage flow = 35000 m³/day

Volume of aeration tank = 12000 m³

Influent BOD = 250 mg/lit

Effluent BOD = 20 mg/lit

Mixed liquor suspended solids 2800 mg/lit

Effluent suspended solids = 30 mg/lit

Waste sludge suspended solids = 9700 mg/lit

Quantity of waste sludge = 220 m³/d

Determine:

i) Aeration period

ii) Food to microorganism's ratio

iii) Percentage of efficiency of BOD removal

iv) Sludge age.

Q3) a) Explain with neat sketch the construction and working of oxidation pond. [5]

b) Explain the aerated lagoon with respect to its working principle and applications. [5]

c) Design an oxidation pond for a colony of 3500 population. The sewage flow is 120lit/person/day. BOD₅ is 300mg/l. Assume necessary required data. [7]

OR

- Q4)** a) Explain the construction and working of trickling filter with neat sketch. [5]
b) What is phytoremediation and root zone technology. [3]
c) Determine the size of a high rate trickling filter for the following data: [9]
Sewage flow 5 MLD
Recirculation ratio = 1.5
BOD of sewage = 200 mg/l
BOD removed in primary sedimentation tank = 30%
Final effluent BOD = 20 mg/l
Depth of filter = 2 m.

- Q5)** a) Explain with neat sketch the construction and working of septic tank. [8]
b) Compare the aerobic and anaerobic treatment of waste water. [5]
c) Difference between secondary treatment and tertiary treatment of wastewater. [5]

OR

- Q6)** a) Explain working of Sequential batch reactor (SBR) and Moving bed bio reactor (MBBR) in detail. [6]
b) Design a septic tank for 330 Users. Water allowance is 130 liters per head per day. Also design a suitable soil absorption system if the percolation rate is 3 min/cm and depth of ground water table below GL is 1.5 m. [8]
c) Write short notes on tertiary treatment of waste water. [4]

- Q7)** a) Explain the construction and working process of anaerobic digestion tank. [5]
b) Write a note on sludge thickener. [5]
c) Explain any two methods employed for the sludge disposal along with advantages and disadvantages. [7]

OR

- Q8)** a) Write a short note on grey water recycling. [5]
b) Discuss the waste water reuse opportunities in municipal industrial and agricultural sectors. [7]
c) Write a short notes on sludge drying beds. [5]



Total No. of Questions : 8]

SEAT No. :

PD4218

[Total No. of Pages : 6

[6403]-12

T.E. (Civil)

**DESIGN OF RC STRUCTURES
(2019 Pattern) (Semester - VI) (301013)**

Time : 3 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) IS 456-2000 and non programmable calculator are allowed in the examination.
- 4) Neat diagrams must be drawn wherever necessary
- 5) Mere reproduction from IS Code as answer, will not be given full credit.
- 6) If necessary, assume suitable data and indicate clearly.

Q1) a) Design an intermediate flight of a dog legged staircase of a residential building as shown in Figure 1 with the following data: **[13]**

- i) Floor to floor height= 3.15m
 - ii) Tread = 250mm;
 - iii) Width of supporting beams = 230mm
 - iv) Live load = 4.0 kN/m²; Floor finish= 0.75 kN/m²
 - v) Material = M25, Fe 500, Use LSM
 - vi) Draw details of reinforcement of only one flight.
- b) What is Redistribution of moments and what are advantages of it? **[5]**

OR

Q2) Design a simply supported reinforced concrete floor beam B10 as shown in Figure 1 with following data: **[18]**

- i) Center to center Span of beam = 3.73 m
- ii) Width of supporting columns = 300mm
- iii) Beam width = 230 mm
- iv) The beam supports slab of thickness 120mm on both side of beam
- v) For slab-Live load = 2kN/m²; Floor finish = 1.0 kN/m²
- vi) The wall on this beam is 120 mm thick and 2.7 m high.
- vii) Material- M25, Fe 500.

Show details of reinforcement along with zoning of shear reinforcement.
UseLSM

P.T.O.

Q3) Design a continuous floor beam B11-B12-B13 as shown in Figure 1 using IS code coefficients. Thickness of the all floor slab is 130 mm, live load and floor finish load on all slabs are 2.5 kN/m^2 and 1.5 kN/m^2 , respectively. The wall on this beam is 230 mm thick and 2.6 m high. Use M 30 and Fe 500 steel. Design longitudinal reinforcement for all the spans and support for flexure. Design shear reinforcement only for beam B12. Draw neat sketch showing details of main and shear reinforcement. Use LSM. [17]

OR

Q4) Design a continuous floor beam B17-B23 (A-B-C) as shown in Figure 1 using moment redistribution method. Thickness of the all floor slab is 130 mm, live load and floor finish load on all slabs are 3.0 kN/m^2 and 1.5 kN/m^2 , respectively. The wall on this beam is 120 mm thick and 2.7 m high. Calculate design moment for span AB and support B after 22 % redistribution of moments. Design span BC and support B for flexure only. Draw the reinforcement details. Material- Concrete of grade M30, Fe 500 reinforcement. [17]

Q5) a) Design a uni-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 900 kN, working moment of 80 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. [13]

b) Explain the role of longitudinal and transverse reinforcement of column. [4]

OR

Q6) Design a bi-axial short column by limit state method to carry Ultimate load of 1200 kN. Ultimate moment of 100 kN-m about major axis bisecting the depth of column and 20 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Use M25 grade of concrete and Fe 500 grade of steel. Show details of reinforcement in plan and sectional elevation. [17]

Q7) Design rectangular isolated pad footing for an ultimate working axial load of 1500 kN. The column size is $300 \times 450 \text{ mm}$. SBC of soil is 250 kN/m^2 . Use M30 grade of concrete and Fe 500 grade of steel. Show detailed design calculations and reinforcement details in plan and sectional elevation. [18]

OR

Q8) Design a slab type rectangular combined footing for two columns A and B subjected to working axial load 1000 kN and 1050 kN, respectively. Center to center to distance between two columns is 2.8m. Size of both the columns is $400 \times 400 \text{ mm}$. Safe bearing capacity of soil is 180 kN/m^2 . Use M30 concrete and Fe500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. [18]

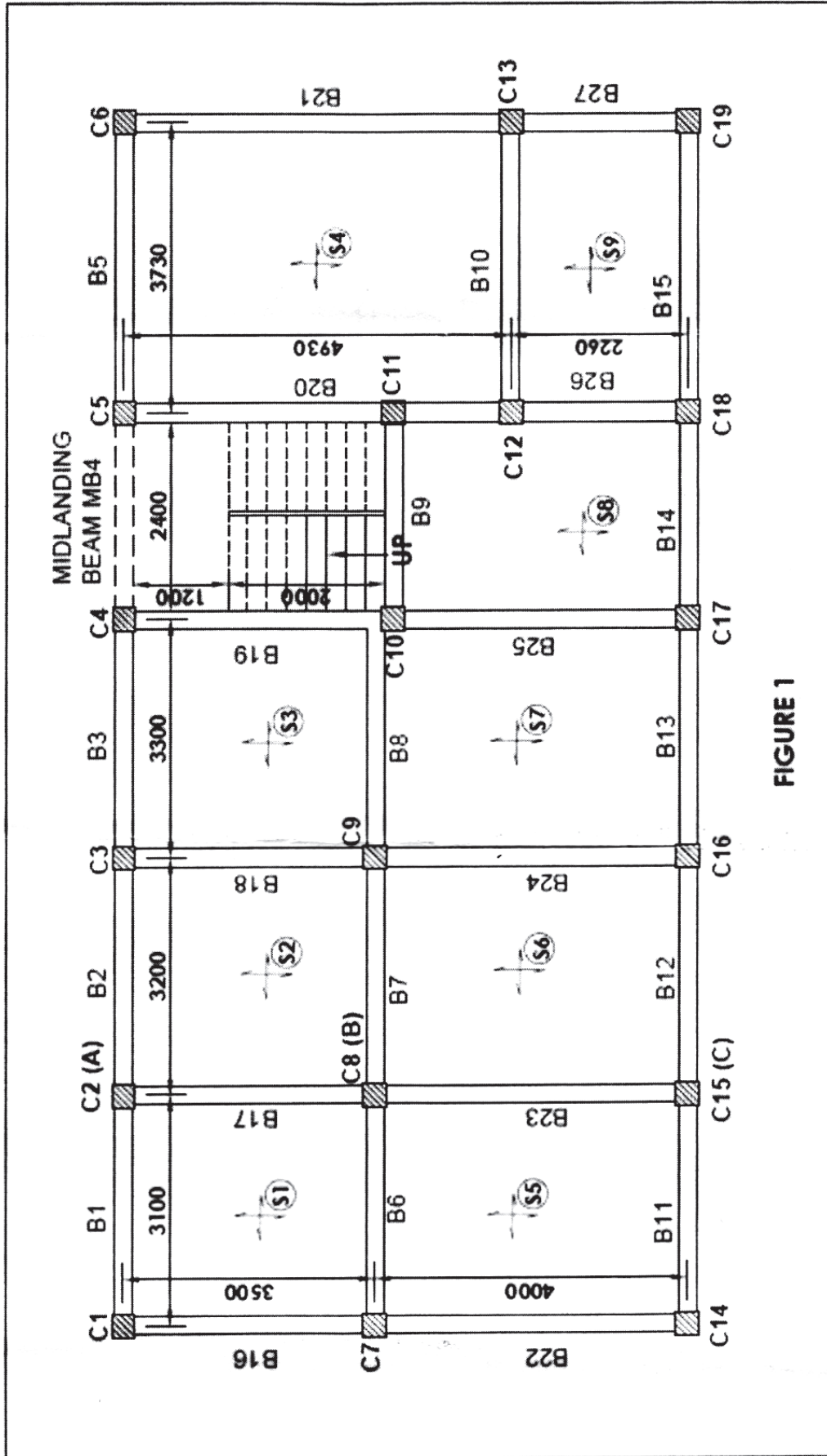


FIGURE 1

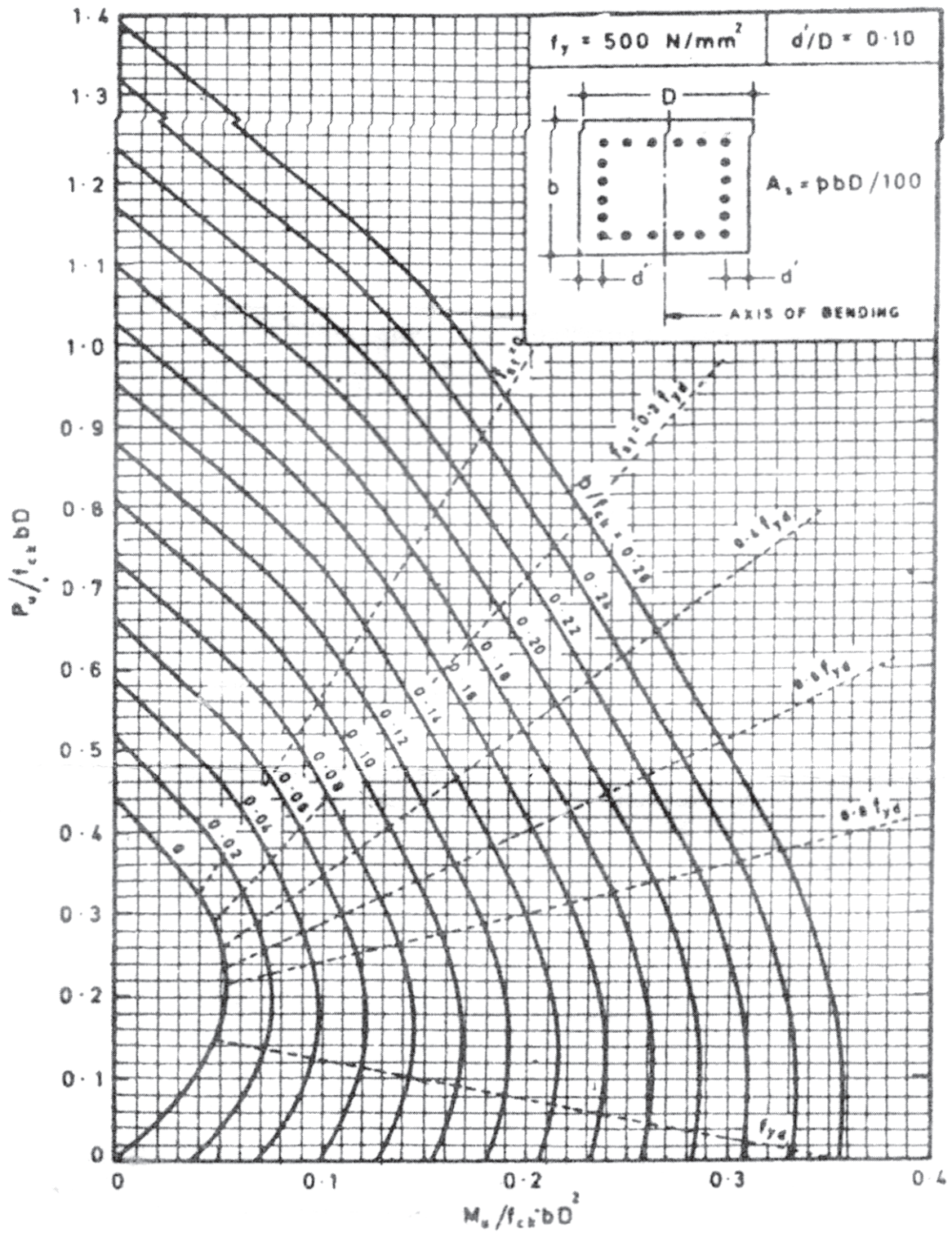


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

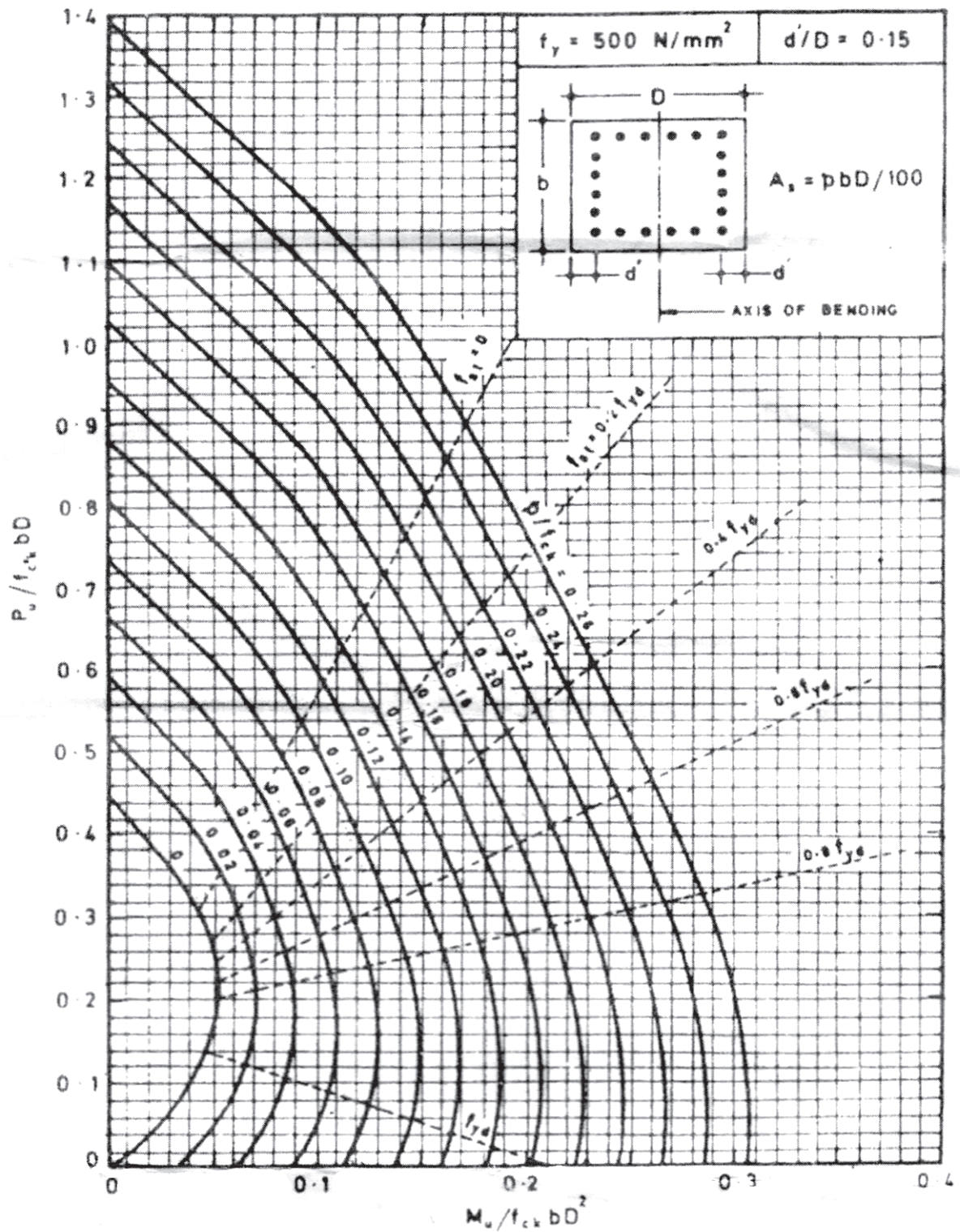


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

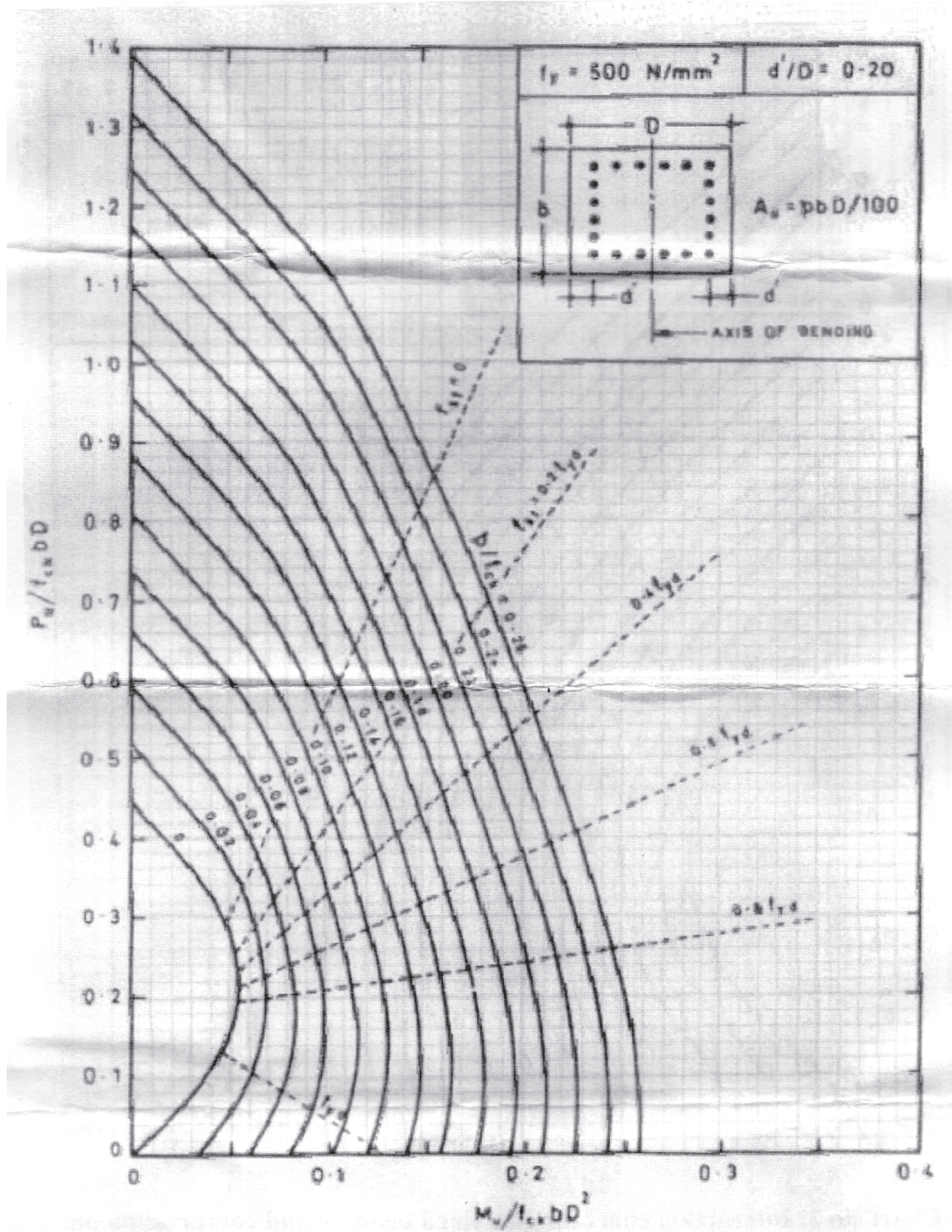


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides



Total No. of Questions : 8]

SEAT No. :

PD4219

[Total No. of Pages : 2

[6403]-13

T.E. (Civil)

**REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM
(2019 Pattern) (Semester - VI) (301014)**

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 electronic pocket calculator is allowed in the examination.*
- 5) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) What are the three segments of GPS? Describe them briefly. [6]
b) Compare different GNSS Systems throughout the world. [6]
c) Write a note on types of GPS tracking. [5]

OR

- Q2)** a) Write Advantages of GPS. [6]
b) Define IRNSS and illustrate its structure. [6]
c) Write a short note on following: [5]
i) GLONASS system
ii) Galileo system

- Q3)** a) Explain in detail spectral signature curve with neat sketch. [6]
b) Define Triangular Irregular Network Model (TIN) and its applications. [6]
c) Explain in detail the concept of post processing and pre Processing. [6]

OR

- Q4)** a) Write down the importance of image enhancement in image processing. [6]
b) Write a note on digital image and analog image. [6]
c) Differentiate between supervised and unsupervised image classification. [6]

P.T.O.

- Q5)** a) Write a note on fundamentals of Cartography and map creation in GIS. [6]
- b) Discuss the difference between drafting software's and GIS. [6]
- c) Define Geographic Information System (GIS). What are the various sources from which data can be derived to be used for GIS? [5]

OR

- Q6)** a) Write in detail about various components of GIS. [6]
- b) Discuss the spatial and non-spatial data with example. [6]
- c) Illustrate the advantages of data storage in GIS. [5]

- Q7)** a) Discuss differences between raster and vector data formats. [6]
- b) Illustrate the different projection systems and explain any one in detail. [6]
- c) What is Georeferencing of GIS data? And explain its importance in the field of GIS. [6]

OR

- Q8)** a) Enumerate different Attribute Data models and explain any one of them. [6]
- b) Explain the application of GIS in Urban Planning. [6]
- c) Write down the procedure for conversion of raster data to vector data. [6]



Total No. of Questions : 8]

SEAT No. :

PD4220

[6403]-14

[Total No. of Pages : 2

T.E. (Civil Engineering)

ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS

(2019 Pattern) (Semester - VI) (301015A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams should be drawn wherever necessary.*

- Q1)** a) Describe various Seismic zones of India. [6]
b) Explain suitability of DTB as construction material. [6]
c) What is landslide? Explain the causes and control measures of landslide. [6]

OR

- Q2)** a) Discuss on compact basalt as a construction material. [6]
b) Describe influence of geological factors upon urban development and planning. [6]
c) Will dam building activity cause a major earthquake? Explain. [6]

- Q3)** a) Describe various mechanical properties of rocks. [6]
b) Calculate RQD recovery and Core recovery from following table. [6]

Run in m	Piece No.	Length in cm	Nature of fracture
0-3m	1	9	J
	2	15	J
	3	88	M
	4	66	M
	5	10	M
	6	13	J
	7	7	J
	8	6	J
	9	8	J
3-6m	10	09	M
	11	83	M
	12	78	M
	13	11	M

P.T.O.

- c) Calculate apparent resistivity values at different depth zones. [6]

Sr. No.	R	a	apparent resistivity
1	1.78	1	?
2	1.62	2	?
3	1.57	3	?
4	1.42	4	?
5	1.10	5	?
6	1.33	10	?

OR

- Q4)** a) Explain Electrical Resistivity method of Geophysical Exploration. [6]
 b) What is Rock Quality Designation (RQD)? Explain How to calculate Core recovery and RQD? [6]
 c) Explain in detail Bieniawski's Geomechanical classification. [6]

- Q5)** a) Write any one case history of tail channel erosion in Deccan Trap area. [6]
 b) Discuss various suitable and unsuitable conditions for dam construction on dipping strata. [6]
 c) How economy has been achieved by proper geological interpretation? Discuss any one case study. [5]

OR

- Q6)** a) What type of treatment is to be given to fracture occurring at a Dam site? [6]
 b) Discuss the strength and water tightness characters of DTB from foundation point of view. [6]
 c) Discuss reasons of success and/or failure of percolation tanks on various basalts. [5]

- Q7)** a) Explain standup time of rock during tunneling. [6]
 b) Explain in detail engineering geological investigations for bridge foundation. [6]
 c) Is the columnar basalt suitable/unsuitable for tunnel excavation? Give reasons. [5]

OR

- Q8)** a) Describe geological conditions responsible for roof collapsing of tunnel. [6]
 b) Explain in brief safe bearing capacity during bridge construction. [6]
 c) Explain favorable and unfavorable conditions for tunneling. [5]



Total No. of Questions : 8]

SEAT No. :

PD4221

[Total No. of Pages : 3

[6403]-15

T.E. (Civil)

SOFT COMPUTING TECHNIQUES

(2019 Pattern) (Semester - VI) (301015 B) (Elective - II)

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 Overfitting of ANN and their effects. What is normalization and denormalization of data. **[9]**

- b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6,4,11], First layer weights (input to hidden): [0.4 -0.5 0.6; -0.3 0.8 -0.7], First layer bias: [3; -3.7], Second layer weights (hidden layer to output layer): [0.35 0.55], second layer bias: [2]. Use sigmoidal transfer function between the first layer and hidden layer and hyperbolic tangent function between the hidden layer and output layer. **[9]**

OR

Q2) a) For feed forward back propagation neural network, how to fix number of Input neurons, Output neurons, Hidden layers, hidden neurons? Discuss data preprocessing. **[9]**

- b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6,6,8], First layer weights (input to hidden): [0.4 -0.5 0.6; -0.3 0.8 -0.7], First layer bias: [3; -3.7], Second layer weights (hidden layer to output layer): [0.35 0.55], Second layer bias: [2]. Use sigmoidal transfer function between the first layer and hidden layer and hyperbolic tangent function between the hidden layer and output layer. **[9]**

P.T.O.

- Q3)** a) Distinguish between Radial basis function networks and Generalized regression neural networks. Give suitable example for each. [8]
- b) Discuss working of self-organized feature maps with a suitable example.[9]

OR

- Q4)** a) Distinguish between Recurrent networks and Radial basis function networks with suitable example for each. [8]
- b) The power developed by a water turbine (P) depends upon the rotational speed N, Operating head (H), Gravitational acceleration (g), diameter (D) and breadth (B) of the runner, density (ρ) and viscosity (μ) of water. Design a 3 layered neural network using the above parameters and give the following details: [9]
- i) Input and output parameters
 - ii) Architecture with figure
 - iii) Size of weight and Bias matrix
 - iv) Activation function/s between the layers.
 - v) Performance function/s

- Q5)** a) Discuss the Genetic operators in Genetic Algorithm in detail. [9]
- b) What is a kernel in SVM? Why do we use kernels in SVM? Discuss any one kernel in detail. [9]

OR

- Q6)** a) Discuss in detail an application of Genetic Algorithm in Civil Engineering.[9]
- b) Discuss the basic principle of Support Vector Regression. What do you mean by generalization error in terms of the SVM? [9]

- Q7)** a) Discuss the working of Model Tree and Random Forest Regression.[8]
- b) The power developed by a water turbine (P) depends upon the rotational speed N, Operating head(H), Gravitational acceleration(g), diameter (D) and breath (B) of the runner, density (ρ) and viscosity (μ) of water. Design a Model using Random Forest using the above parameters and give the following details: [9]
- i) Input and output parameters
 - ii) No. of trees
 - iii) Data division
 - iv) Out of bag estimates
 - v) Performance function/s

OR

- Q8)** a) Discuss working of Model Tree with M5 Algorithm. Explain Feature importance in a Random Forest. [8]
- b) The power developed by a water turbine (P) depends upon the rotational speed N, operating head (H), Gravitational acceleration(g), diameter(D) and breath(B) of the runner. density (ρ) and viscosity (μ) of water. Design a Model using Model Tree using the above parameters and give the following details: [9]
- i) Input and output parameters
 - ii) No. of rules
 - iii) Splitting criteria
 - iv) Standardization of data
 - v) Performance function/s



Total No. of Questions : 8]

SEAT No. :

PD4222

[Total No. of Pages : 3

[6403]-16

T.E. (Civil Engineering)

ADVANCED SURVEYING

(2019 Pattern) (Semester - VI) (301015 C) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat figures wherever necessary.*
- 4) Assume suitable data if necessary.*

Q1) a) Define the terms: celestial sphere, hour angle, zenith and nadir. **[6]**

b) State the various methods of locating soundings and explain briefly **[6]**

i) Location by two angles from boat

ii) Location by one angle from shore and other from boat

c) Explain the analytical method of determining the position of boat in hydrographic surveying. **[6]**

OR

Q2) a) Define spherical triangle and explain its properties. **[6]**

b) Define mean sea level. Explain the importance of mean sea level in surveying. **[4]**

c) The following observations were made on three points A, B and C from a boat at O with the help of sextant. Station B and O being on same side of AC. Calculate the distances of the boat from the three stations. The angles AOB and BOC were found to be $30^{\circ}25'$ and $45^{\circ}25'$ respectively. The angle ABC measured $130^{\circ}10'$. AB= 4000m, BC=4995 m. **[8]**

P.T.O.

- Q3)** a) Define relief displacement. Derive an expression for the same. [5]
- b) Define : [4]
- i) Air base distance,
 - ii) Parallax,
 - iii) Flying height,
 - iv) Scale
- c) The scale of aerial photograph is 1: 10000, effective at an average elevation of terrain of 500 m. The size of aerial photograph is 230mm × 230mm. Focal length of camera lens is 20 cm. Speed of aircraft is 180 kmph, longitudinal overlap is 60% and side overlap is 30%. Determine the number of photographs required to cover an area of 30 km × 22.5 km. Also determine exposure interval and flying height. [8]

OR

- Q4)** a) Define ground control points, explain their role in Photogrammetry. [6]
- b) Write a short note on drone mapping. [4]
- c) A pair of photograph is taken with a camera having focal length 15 cm. The scale of photography is 1 : 10000 and photo base is 5.65 cm. The measured parallax of a vertical control point having an elevation 140 m is 87.28 mm. Compute the elevation of another point P whose measured parallax is 84.18 mm. [7]

- Q5)** a) Explain the components of ideal remote sensing system. [6]
- b) Explain Remote sensing applications in disaster management with suitable example. [6]
- c) What is GIS? Explain the components of GIS. [6]

OR

Q6) a) Explain with neat sketch of working principle of total station. What are the sources of errors in total station? [6]

b) Differentiate between LIDAR and GPR. [6]

c) Write a note on raster and vector model in GIS. [6]

Q7) a) Explain the segments of GPS. [6]

b) What are the GPS errors sources? Explain in detail. [6]

c) State and explain the applications of GPS in watershed management analysis. [5]

OR

Q8) a) Explain the working principle of GPS. What are the differences between hand held GPS and differential GPS. [9]

b) Explain differential GPS survey. [8]



Total No. of Questions : 8]

SEAT No. :

PD4223

[6403]-17

[Total No. of Pages : 2

T.E. (Civil Engineering)

ADVANCED GEOTECHNICAL ENGINEERING

(2019 Pattern) (Semester - VI) (301015 D) (Elective - II) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) 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) What are the advantages and disadvantages of a triaxial compression test? Briefly explain how you conduct the test and compute the shear parameters for the soil from the test data. [6]
- b) State and explain the factors affecting angle of shearing resistance. [6]
- c) A simple dry sand is subjected to a triaxial test. The angle of internal friction is 37 degrees. If the minor principal stress is 200 kN/m², at what value of major principal stress will the soil fail? [6]

OR

- Q2)** a) Explain the shear characteristics of sand and normally loaded clays. [6]
- b) What is the effect of pore pressure in strength of soils? [6]
- c) A triaxial compression test on a cohesive sample cylindrical in shape yields the following effective stresses: [6]

Major principal stress = 8 MN/m²

Minor principal stress = 2 MN/m²

Angle of inclination of rupture plane is 60° to the horizontal. Present the above data, by means of Mohr's circle of stress diagram. Find the cohesion and angle of internal friction.

- Q3)** a) What is stress path? State the factors influencing the stress path. [6]
- b) Draw and explain the stress path (t - s, s') for stress changes near retaining wall. [6]

P.T.O.

- c) Drained triaxial compression test results are given below. Plot the stress path in $\sigma_a - \sigma_r$. [5]

σ_1 (kPa)	σ_3 (kPa)	u (kPa)
400	400	200
500		
600		
665		
690		

OR

- Q4)** a) Write a note on behavior of saturated sand under drained and undrained conditions. [6]
 b) Explain in detail determination of shear strength of soil from UU Test with a neat sketch. [6]
 c) State and explain the variants of cambridge plot. [5]

- Q5)** a) Explain different factors affecting soil stabilization. [9]
 b) Write note on mechanism of bituminous stabilisation. [9]

OR

- Q6)** a) Explain Lime stabilization of soil. [9]
 b) What is soil stabilization? What are the objectives and factors affecting soil stabilization? [9]

- Q7)** a) Write short note on: Permeation grouting and jet grouting. [9]
 b) Write a short note on In-situ ground improvement by inserting reinforcement elements. [8]

OR

- Q8)** a) Explain In-situ ground improvement by explosion sand drains. [9]
 b) Explain Deep mixing method of ground improvement. [8]



Total No. of Questions : 8]

SEAT No. :

PD4224

[Total No. of Pages : 2

[6403]-18

T.E. (Civil)

ARCHITECTURE AND TOWN PLANNING

(2019 Pattern) (Semester - VI) (301015 E) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q No. 1 or 2, Q.No.3 or 4, Q.No.5 or 6. Q.No.7 or 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Does the objectives of planning really change or enhance the scenario of the area. Explain with appropriate example. **[9]**

b) Write a detailed note on Neighbourhood planning. **[9]**

OR

Q2) a) Explain legislative mechanism for preparation of development Plan by MRTP act 1966. **[9]**

b) Mention the steps involved while preparing DP. What are the expected outcomes of DP? **[9]**

Q3) a) Explain various types of civic surveys carried out for Development plan proposal with its significance. **[9]**

b) Explain the Functioning of CIDCO (City and Industrial Development Corporation) of Maharashtra. **[8]**

OR

Q4) a) Explain the working of MIDC planning agency and draw their organization structure. **[8]**

b) What is traffic management? Why ITS is important to support the same? **[9]**

P.T.O.

Q5) a) Explain the salient features Land acquisition rehabilitation and resettlement Act 2013. [9]

b) Write a note on AMRUT Guidelines with a mention of case study. [9]

OR

Q6) a) Describe the importance of MAHARERA (Maharashtra Real Estate Regulatory) and benefits in real estate world. [9]

b) Write a note on URDPFI Guidelines. Explain mention details. [9]

Q7) a) Write a detailed note on Special townships: SEZ and CRZ. [9]

b) Write a short note on GIS and its application in Town Planning. [8]

OR

Q8) a) Write about the importance of Coastal Regulation Zone Act in relation with India. [9]

b) Explain need and strategies in rural planning. [8]



Total No. of Questions : 8]

SEAT No. :

PD4225

[Total No. of Pages : 2

[6403]-19

T.E. (Civil Engg.)

SOLID WASTE MANAGEMENT

(2019 Pattern) (Semester - VI) (301015 F) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat figures wherever necessary.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of scientific calculator is allowed.*

- Q1)** a) State the factors considered during evaluation of on-site processing equipments of solid waste. [6]
- b) Explain with sketch the Bangalore Method of Vermicomposting. [6]
- c) State the terms related to Solid waste management. [6]
- i) Prevention
 - ii) Minimisation
 - iii) Recycling
 - iv) Reuse

OR

- Q2)** a) State different methods of collection of Solid waste and explain any one with sketch. [6]
- b) List the factors affecting composting process of solid waste. [6]
- c) Write a note on material recovery facility. [6]

- Q3)** a) What are the stages of Anaerobic digestion. [6]
- b) Write the environmental impacts of waste to energy system. [6]
- c) What are the different types of incinerators? Explain any one. [5]

OR

P.T.O.

- Q4)** a) Describe the incineration technologies and air emissions and its control in detail. Explain the following: [6]
i) Pyrolysis
ii) Refuse-derived fuel
b) How does energy recovery relate to renewable energy. [5]
c) Write advantages and disadvantages of Plasma Gasification. [6]
- Q5)** a) Explain trench method of landfilling and state the factors to be considered for site selection. [6]
b) Write principles of Bioreactor landfill. [6]
c) Draw and explain with neat labeled sketch of single liner system of leachate control. [6]

OR

- Q6)** a) Write short notes on legal aspects of solid waste disposal. [6]
b) Describe the factors which affect production of leachate and landfill gas in the landfill? [6]
c) State any two advantages and disadvantages of Landfill method of solid waste disposal. [6]
- Q7)** a) Write objectives and major provision in construction and demolition (C&D) waste management rules - 2016. [6]
b) Suggest various management technologies for biomedical waste. [6]
c) Suggest various management technologies for slaughter waste. [5]

OR

- Q8)** a) Explain any one case study of material recovered from e-waste. [6]
b) Write objectives and major provision in plastic waste management rules - 2016. [6]
c) Explain EPA - identification of hazardous and toxic waste. Write down the characteristics of hazardous waste. [5]



Total No. of Questions : 8]

SEAT No. :

PD4226

[Total No. of Pages : 3

[6403]-20
T.E. (Chemical)
MASS - TRANSFER - I
(2019 Pattern) (Semester - V) (309341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Choice of Solvent for Gas Absorption. **[8]**

- b) A packed tower is designed to recover 98% CO₂ from a gas mixture containing 10% CO₂ & 90% air using water. The equilibrium relation is given as $Y = 14X$. Where $Y = \text{KgCO}_2/\text{Kg dry air}$ & $X = \text{Kg CO}_2/\text{kg water}$. The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if (HTU) OG = 1m. **[9]**

OR

Q2) a) What is Absorption and Stripping factor? Explain minimum L/G ratio?**[8]**

- b) 5,000 kg/hr of a SO₂ - air mixture containing 5% by volume SO₂ is to be scrubbed with 2,00,000 kg/hr. of water in a packed tower. The exit concentration of SO₂ is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relationship is given by $Y = 30X$ Where, $Y = \text{Mole SO}_2/\text{Mole air}$ & $X = \text{Mole SO}_2/\text{Mole water}$. If the packed height of the tower is 420 cm, estimate the height of transfer unit (HTU)? **[9]**

P.T.O.

Q3) a) Write a short note on Adiabatic Saturation temperature in Humidification operation. [8]

b) The air in a room is at 26.7°C & a pressure of 101.325KPa & contains water vapor with a partial pressure 2.76 KPa . [9]

Calculate

- i) Absolute Humidity
- ii) Molal Humidity
- iii) Saturation Humidity
- iv) Percentage Humidity
- v) Percentage Relative humidity
- vi) Relative humidity
- vii) Humid Heat
- viii) Humid Volume

Data : Vapour pressure of water at 26.7°C is 3.5 KPa .

OR

Q4) a) Explain HTU, NTU concept in connection with cooling tower. [8]

b) A gas (B) - Benzene (A) mixture is saturated at 1 std.atm 50°C . Calculate the absolute humidity if B is [9]

- i) Nitrogen
- ii) Carbon dioxide and
- iii) Oxygen (Data: $P_A = 0.362\text{ std. atm.}$)

Q5) a) What are the various equipment's used for gas-liquid contact? With neat sketch explain Venturi Scrubber. [9]

b) Explain the different types of Column in detail with figures. [9]

OR

- Q6) a)** Explain mechanically agitated vessels with different types of impellers. **[9]**
- b)** What is Tray efficiency? Explain types of Tray efficiencies. **[9]**

- Q7) a)** How to plot the Rate of drying curve? **[8]**
- b)** A porous dry solid was dried under constant drying conditions in a batch dryer. It took 6hrs. to reduce the moisture from 50% to 10%. All the moisture content on dry basis. How long will it take to dry a sample of the above solid to dry from 66% to 6% under the same drying conditions? **[10]**

OR

- Q8) a)** Explain time required for Drying. Derive the equation to calculate total time for Drying? **[8]**
- b)** A batch of solid for which the following table of data applies is to be dried from 25% to 6% (wet basis) moisture under conditions identical to those for which the data were tabulated. The initial weight of the wet solid is 200 kg & the drying surface is 1 m²/8 kg dry weight. Determine the time for drying. **[10]**

X	0.30	0.25	0.2	0.18	0.16	0.14	0.12	0.10	0.08	0.06	0.04
Kgmoisture/ Kg dry solid											
R	0.3	0.3	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.025
Kgmoisture/ hr.m ²											

* * *

Total No. of Questions : 8]

SEAT No. :

PD4227

[Total No. of Pages : 2

[6403]-21

T.E. (Chemical)

CHEMICAL TECHNOLOGY - II

(2019 Pattern) (Semester - V) (309342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume suitable data if necessary.*
- 3) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*

- Q1)** a) Describe the process of manufacturing of Portland cement. Write the metal oxides composition necessary in the Portland cement. [9]
- b) Describe carbonization of coal and the effect of temperature on the products obtained? [9]

OR

- Q2)** a) Explain production of coke by coke oven co-product method. Give its major engineering problems. [9]
- b) Explain construction and working of Blast furnace. [9]

- Q3)** a) Explain the preparation of paint with a typical formulation, mention the function of each ingredient. [9]
- b) Discuss production of producer gas with its major engineering problems. [8]

OR

- Q4)** a) Explain steps in paint manufacturing and factors affecting the viscosity of paints. [9]
- b) Give the classification of dyes based on various parameters. [8]

- Q5)** a) Explain manufacturing of penicillin with major engineering problems.[9]
- b) Discuss different types of agrochemicals with their applications. [9]

OR

P.T.O.

- Q6)** a) Describe in detail about plant growth regulators and yield stimulators. **[9]**
b) Enlist Antibiotics with their properties and applications. **[9]**

- Q7)** a) Describe production of styrene with its engineering problems. **[9]**
b) With a suitable diagram, explain the production of phenol by cumene peroxidation-hydrolysis route. **[8]**

OR

- Q8)** a) Explain production of cumene by propylene alkylation of benzene. **[9]**
b) Explain the manufacturing of Formaldehyde. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4228

[Total No. of Pages : 3

[6403]-22

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2019 Pattern) (Semester - V) (309343)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3or Q4, Q5 or Q6, Q7or 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) Fit a second order polynomial to the data in the table below : [9]

x	1	2	3	4
y	6	11	18	27

b) Fit a straight line to the x and y values in the following set of data : [8]

x	1	2	3	4	5	6	7
y	0.5	2.5	2	4	3.5	6	5.5

OR

Q2) a) Fit a Straight line to the following set of data : [8]

x	1	2	3	4	5
y	3	4	5	6	8

b) Given the table of data, obtain a regression plane to fit the data : [9]

x1	1	2	3	4
x2	0	1	2	3
y	12	18	24	30

P.T.O.

Q3) a) Solve the equation by using Taylor series method $y' = x^2 + y^2$ for $x = 0.25$ and $x = 0.5$ given $y(0) = 1$. **[9]**

b) Use the classical RK forth order method to estimate $y(0.4)$ when $y'(x) = x^2 + y^2$ with $y(0) = 0$ Assume $h = 0.2$. **[9]**

OR

Q4) a) Given the equation $dy/dx = 3x^2 + 1$ with $y(1) = 2$. Estimate $y(2)$ by Euler's method using **[9]**

i) $h = 0.5$ and

ii) $h = 0.25$

b) Find by Taylor's series method, the values of y at $x = 0.1$ and $x = 0.2$ to five places of decimals from $dy/dx = x^2y - 1$, $y(0) = 1$ **[9]**

Q5) Solve numerically the wave equation **[17]**

$$f_{tt}(x, t) = 4f_{xx}(x, t) \quad 0 \leq x \leq 5$$

with the boundary conditions

$$f(0, t) = 0 \text{ and } f(5, t) = 0$$

and initial values $f(x, 0) = f(x) = x(5 - x)$

$$f_1(x, 0) = g(x) = 0 \quad \text{Consider } h = 1.$$

OR

Q6) a) Consider a steel plate of size $15 \text{ cm} \times 15 \text{ cm}$. If two of the sides are held at 100°C and the other two sides are held at 0°C , what are the steady state temperature at interior points assuming a grid size of $5 \text{ cm} \times 5 \text{ cm}$. **[10]**

b) Solve the Poisson equation $g(x, y) = 2x^2y^2$ over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h = 1$. **[7]**

Q7) Maximize $Z = x_1 + 3x_2$

Subject to $x_1 + 2x_2 \leq 10$

$$0 \leq x_1 \leq 5,$$

$$0 \leq x_2 \leq 4$$

[18]

OR

Q8) a) What are the six steps of optimization? Enlist and Explain.

[8]

b) What is Simplex method? Explain the method in detail.

[10]



Total No. of Questions : 8]

SEAT No. :

PD4229

[Total No. of Pages : 3

[6403]-23

T.E. (Chemical Engineering)

CHEMICAL ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - V) (309344)

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

- Q1) a) As benzene and toluene are the members of same chemical family, they are expected to form ideal liquid solutions. Calculate the data needed to construct a t-x-y diagram for this system at a pressure of 1 bar (750 mm Hg). Constant in the Antoine equation are given for the equation:[12]
 $\log P^{\text{sat}} = A - B / T + C$, with P^{sat} in mm Hg and T in °C. The parameters are

Compound	A	B	C
Benzene	6.90565	1211.033	220.790
Toluene	6.95334	1343.943	219.377

- b) Explain Raoult's law and Henry's law.

[6]

OR

- Q2) Assuming Raoult's law to be valid, prepare a P-x-y diagram for a temp of 363.15 K and T-x-y diagram for a pressure of 90 kPa for benzene. [18]

a) and ethyl benzene

b) system

The Antoine equation and parameters are given below:

$$\ln P^{\text{sat}}/\text{KPa} = A - \frac{B}{T + C} \quad (T \text{ in K})$$

Component	A	B	C
Benzene	13.8594	2773.78	-53.08
Ethyl benzene	14.0045	3279.47	-59.95

- Q3) a) How Gibbs-Duhem equation are helpful in testing the consistency of VLE data? [7]

b) Explain liquid-liquid equilibria and derive the equations for finding LLE data. [10]

OR

P.T.O.

Q4) Derive the following expression for solid – liquid equilibrium. [17]

$$\psi_i = \exp \int_{T_m}^T \frac{H_i^l - H_i^s}{RT^2} dt \text{ where } \psi_i = \frac{f_i^s}{f_i^l}$$

H_i^l and H_i^s are the molar enthalpies for the species i in the liquid and solid phases. T_m is the melting temperature of pure species i .

Q5) a) Comment on the feasibility of a chemical reaction. [4]

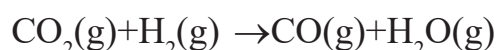
b) The equilibrium constant at 420 K for the vapour phase hydration of ethylene to ethanol according to the reaction $C_2H_4 + H_2O \rightarrow C_2H_5OH$ is 6.8×10^{-2} and standard heat of reaction at 298K is -45.95×10^3 J. The specific heat data are as follows. [14]

Component	α	β	γ
Ethylene	11.886	120.12×10^{-3}	-----
Water	30.475	9.652×10^{-3}	1.189×10^{-6}
Ethanol	29.358	166.9×10^{-3}	-50.09×10^{-6}

Formulate general relationship for estimating the equilibrium constant and standard free energy change as functions of temperature.

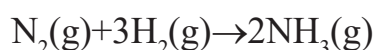
OR

Q6) a) A system initially containing 3 mol CO_2 , 5 mol H_2 & 1 mol H_2O undergoes the following reactions. [9]



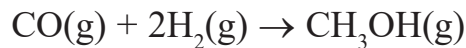
Derive expression for the mole fractions of the reacting species as function of reaction co-ordinates for the two reactions.

b) Calculate the equilibrium constants at 673K and 1 bar for the reaction [9]



Assuming that the heat of reaction remains constant in the temperature range involved. Take the standard heat of formation and standard free energy of formation of ammonia at 298 K to be $-46,110$ J/mol and $-16,450$ J/mol respectively.

Q7) a) Methanol can be produced according to the reaction. **[9]**



Estimate the degree of conversion of CO(g) into methanol at 500K and 5 bar if

- i) an equimolar mixture of CO and H₂ is fed to a reactor
 - ii) a stoichiometric mixture of CO and H₂ is fed
 - iii) CO and H₂ in the ratio 1:4 enter the reactor.
- b) Explain various methods used for evaluation of equilibrium constant. **[8]**

OR

Q8) a) For gas phase reactions explain the relation of equilibrium constant with composition. **[4]**

- b) A stoichiometric mixture of N₂ (g) and H₂ (g) at 100 bar and 800K enter a catalytic reactor for the synthesis of ammonia. Assuming that the gas phase is ideal, estimate the degree of conversion and the equilibrium composition. At 800 K, $K_a = 1.122 \times 10^{-5}$ **[8]**
- c) Explain multireaction equilibria. **[5]**



Total No. of Questions : 8]

SEAT No. :

PD4230

[Total No. of Pages : 2

[6403]-24

T.E. (Chemical)

CHEMICAL INDUSTRY MANAGEMENT

(2019 Pattern) (Semester - V) (Elective - I) (309345A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain various functions of purchase manager. **[8]**

b) Discuss the process of industrial purchasing using quotation and comparative statement. **[10]**

OR

Q2) a) Explain in Inventory Control and importance of Economic Order Quantity (EOQ). **[10]**

b) Write a note on Principles of good lending. **[8]**

Q3) a) Describe why Market research is important. **[8]**

b) What is sales promotion? Explain sales promotion techniques. **[9]**

OR

Q4) a) Explain in any two pricing strategies in detail with suitable example. **[9]**

b) Explain the role of advertising in marketing along with it's advantages. **[8]**

P.T.O.

Q5) a) Write a explanatory note on International trade. **[10]**

b) Write a explanatory note on Patent and patent rights. **[8]**

OR

Q6) a) Explain the concept of Monopolies and Restrictive Trade Practices (MRTP) Act. **[10]**

b) Explain Importance of Quality Management. **[8]**

Q7) a) Write a note on Patent Act, 1970. **[9]**

b) Explain the classification of types of contracts. **[8]**

OR

Q8) a) Explain FERA in detail. **[9]**

b) Define work measurement. Explain the objectives and procedures of work measurement. **[8]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4231

[Total No. of Pages : 2

[6403]-25

T.E. (Chemical)

FOOD TECHNOLOGY

(2019 Pattern) (Semester - V) (309345B) (Elective - I) (Theory)

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 diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) Write short notes on preservation of fruits and vegetables by [16]

- a) Fermentation.
- b) Drying.

OR

Q2) a) Explain glass containers seaming technology for canning of fruits and vegetables. [8]

- b) Discuss about natural and ventilated low temperature storage methods of fruit and vegetable. [8]

Q3) a) Discuss about various unit operations involved in food engineering processing of food grains. [9]

- b) Explain theory of size reduction equipment's and effect of size reduction on foods. [9]

OR

Q4) Write Short Notes on [18]

- a) Evaporation extrusion theory and equipment's.
- b) Hot air dehydration theory and equipment's.

P.T.O.

Q5) Write short notes on food packaging techniques in: **[18]**

- a) Bags and carton.
- b) Pouches and wrappers.

OR

Q6) Describe following. **[18]**

- a) Principle in the development of protective packaging.
- b) Explain flexible packaging materials and their properties.

Q7) a) Explain quality assessment of food materials in cereals and dairy products. **[9]**

- b) Explain concept of Codex Alimentarius and HACCP in food quality assurance. **[9]**

OR

Q8) a) Explain food adulteration and food safety, basis, trends and composition of India's foreign trade. **[9]**

- b) Describe Objectives, importance, and functions of quality control of food. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4232

[Total No. of Pages : 2

[6403]-26

T.E. (Chemical)

POLYMER ENGINEERING

(2019 Pattern) (Semester - V) (309345C) (Elective - I)

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) Explain in detail the different methods of determination of molecular weight.[17]

OR

Q2) a) Write a detailed note on Poly Dispersity Index with detail. [8]

b) Explain the need of identifying the correct weight on the properties of polymers. [9]

Q3) With a proper example, explain in detail the kinetics of free radical polymerization. [18]

OR

Q4) a) Explain the need of the Chain transfer agent during polymerization. Explain with the help of example. [9]

b) Write a note on Copolymers in detail. [9]

P.T.O.

Q5) Explain the need of the fillers, fire retardants and antioxidants during the polymer processing. Give the various examples and the need of them. **[17]**

OR

Q6) Explain the different moulding methods of polymers. **[17]**

Q7) With a neat and labelled diagram and reactions, explain the production of Nylon in detail. **[18]**

OR

Q8) With a neat and labelled diagram and reactions, explain the production of Vinyl Esters in detail. **[18]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4233

[Total No. of Pages : 2

[6403]-27

T.E. (Chemical)

DOWNSTREAM PROCESSING

(2019 Pattern) (Semester - V) (309345D) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain Cryogenic distillation for refinery in detail. **[8]**

b) Explain petrochemical flue gases with example. **[8]**

OR

Q2) a) Write down the Cavitation process with neat diagram. **[8]**

b) Write short note on Natural gases with example. **[8]**

Q3) a) Explain Azeotropic distillation and draw residue curve maps. **[9]**

b) Explain extractive distillation and draw residue curve maps. **[9]**

OR

Q4) a) Explain pressure swing distillation in detail. **[9]**

b) Discuss in detail Column sequences. **[9]**

P.T.O.

Q5) a) Explain the adsorption process and write down the energy conservation in adsorption. **[9]**

b) Write note on hydrogel process. **[9]**

OR

Q6) a) Write note on New trends for energy conservation. **[9]**

b) What are the separation synthesis algorithms? **[9]**

Q7) Explain the Separations process synthesis for nonazeotropic mixtures and non ideal liquid mixtures. **[18]**

OR

Q8) Explain Ion exchange process in detail with diagram. **[18]**

x x x

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4234

[6403]-28

T.E. (Chemical)

CHEMICAL REACTION ENGINEERING - I

(2019 Pattern) (Semester - VI) (309348)

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 whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Define recycle ratio. With help of neat diagram explain recycle reactor operation. [6]

b) Homogeneous liquid phase reaction takes place in mixed flow reactor with 70% conversion. The original reactor is replaced by another mixed flow reactor having volume of 5 times that of original reactor, all else remain unchanged. Obtain the conversion in the new reactor. [6]

c) Write a comparative account of mixed flow versus plug flow reactors. [6]

OR

Q2) a) Explain the terms space time and holding time in details with their utility. [6]

b) Derive the performance equation for Plug Flow Reactor. With help of graphical representation discuss the constant density system PFR. [12]

Q3) a) Derive the relationship for C_{Rf} in terms of Ψ for CSTR in case of parallel reactions. [5]

b) Explain the terms used to characterize parallel reactions. [12]

OR

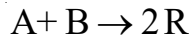
Q4) In PFR, reactant A produces product R and S by parallel reaction, rate of formation of R = $0.4 C_A^2$ and rate of formation of S = $2 C_A$. A feed with $C_{A0} = 40 \text{ mol/m}^3$ enters the reactor and mixture of A, R and S leaves the reactor. Find C_R , C_S and τ for 90% conversion in PFR. [17]

P.T.O.

- Q5)** a) Milk is pasteurized if it is heated to 63°C for 30 min, but if it is heated to 74°C it only needs 15 s for the same result. Find the activation energy of this sterilization process. [6]
- b) Explain effect of temperature on heat of reaction. [12]

OR

- Q6)** Calculate the heat of reaction at 500 °C for following reaction: [18]



Heat capacities of reacting species may be expressed as

$$C_p = a + bT + cT^2$$

Component	a	$b \times 10^2$	$c \times 10^5$
A	-0.45	7.65	-2.73
B	-1.67	5.35	-8.13
R	2.17	1.08	-0.32

The heat of reaction at standard state (25°C) of the reaction is -50,000 J.

- Q7)** a) With help of neat diagram explain the nonideality in continuously stirred tank reactor (CSTR). [8]
- b) Explain the concept of Residence Time Distribution in detail and their applicability. [9]

OR

- Q8)** A sample of the tracer was injected as pulse to a reactor and the effluent concentration was measured as function of time, resulting in data represented below:

t (min)	0	1	2	4	6	8	10	13
C (g/m ³)	0	1	5	10	6	3	1.2	0

- a) Draw figures showing $C(t)$ and $E(t)$ as functions of time. [10]
- b) Determine the fraction of material leaving the reactor having spent 9.5 minutes of less in the reactor. [3]
- c) Determine fraction of material leaving the reactor that has spent between 3 to 9 minutes in the reactor. [4]



Total No. of Questions : 8]

SEAT No. :

PD4235

[Total No. of Pages : 3

[6403]-29

T.E. (Chemical Engg.)

MASS TRANSFER - II

(2019 Pattern) (Semester - VI) (309349)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, 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)** Solution of Nicotine in water containing 1% nicotine is to be extracted with kerosene as a solvent at 293K. Water and kerosene are practically immiscible (Essentially insoluble). [6]

Assume the equilibrium relationship to be $Y = 0.9 X$

Where $Y = \text{kg of nicotine / kg of kerosene}$

$X = \text{kg of nicotine / kg of water}$

Determine % extraction of nicotine if 100 kg of the feed solution is extracted with 150 kg of solvent.

- b) Define the selectivity, Distribution coefficient and plait point and give their significance in solvent Extraction. [6]
- c) Differentiate between the Solvent Extraction and Distillation for separation of liquid mixtures. [6]

OR

- Q2) a)** Explain Binodal Solubility Curve with triangular diagram in solvent Extraction. [6]
- b) Explain the selection criteria of solvent used for Liquid-Liquid Extraction. [6]
 - c) Discuss on the minimum solvent requirement for counter-current solvent extraction in case of immiscible solvents [6]

P.T.O.

- Q3)** a) Discuss on the graphical representation of equilibrium characteristics of Leaching operation for constant underflow and no solid in overflow with diagram and proper notations. [6]
- b) Explain the constant and variable underflow in leaching operation. [4]
- c) Describe the construction and mechanism of Bollman / Basket Extractor for leaching operation with neat sketch. [7]

OR

- Q4)** a) Write the material balance for the continuous crosscurrent leaching assuming variable underflow and no insolubles in the overflow. [7]
- b) Which are the applications of leaching? Explain the factors affecting the rate of leaching. [10]

- Q5)** a) Discuss on the principle, equilibria and rate of ion Exchange process in details. [8]
- b) A solution of washed raw cane sugar is colored by the presence of small amounts of impurities. The solution is to be decolorized by treatment with an adsorptive carbon in a contact filtration plant. The original solution has a color concentration of 9.6 measured on an arbitrary scale and it is desired to reduce color of 0.96. Calculate the necessary dosage of the fresh carbon per 2000 kg solution for a single stage process. The data for an equilibrium isotherm is as follows: [10]

Kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium colour	9.6	8.6	6.3	4.3	1.7	0.7

OR

- Q6)** a) Explain the concentration profile in fixed bed adsorber. [4]
- b) Describe the adsorption Isotherms in adsorption operation. [8]
- c) Discuss on the Breakthrough curve in adsorption in details with neat sketch. [6]

- Q7)** a) Enlist the methods of supersaturation in crystallization and explain Mier's theory of supersaturation for crystallization. [7]
- b) Define the terms in membrane processes; [4]
- i) Rejection
 - ii) Permeability
 - iii) Membrane fouling
 - iv) Cake Resistance
- c) Explain the construction and working of Swenson Walker Crystallizer with diagram. [6]

OR

- Q8)** a) Explain membrane fouling. [3]
- b) Define the terms in membrane processes; [4]
- i) Rejection
 - ii) Permeability
 - iii) Membrane fouling
 - iv) Cake Resistance
- c) Crystallizer is charged with 7500 kg of an aqueous solution at 377K. Anhydrous sodium sulphate is 29.6% by weight in the feed. The solution is cooled in the cooling stage, and 5% of water is lost by evaporation. As a result, crystals of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystallize out. Calculate the yield of the crystals and the quantity of mother liquor is found to contain 18.3% by weight anhydrous Na_2SO_4 . Molecular weight of $\text{Na}_2\text{SO}_4 = 142$. [10]



Total No. of Questions : 8]

SEAT No. :

PD4236

[Total No. of Pages : 2

[6403]-30

T.E. (Chemical)

TRANSPORT PHENOMENA

(2019 Pattern) (Semester - VI) (309350)

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 the expression of molar flux and concentration profile for heterogeneous instantaneous chemical reaction. [12]

- b) The solute HCl is diffusing through a thin film of water 2.0 mm. The concentration of HCl at point 1 is 12.0 wt% (density = 1061 kg/m³), and at point 2 is 6.0 wt% (density = 1030 kg/m³).

Diffusivity of HCl in water is 2.5×10^{-9} m²/s. Calculate the flux of HCl in kg-mole/m².s [6]

OR

Q2) a) Derive the expression of molar flux, concentration profile and average concentration for diffusion with homogeneous chemical reaction. [12]

- b) State the boundary conditions to solve mass transfer problems. [6]

Q3) a) Use Navier-Stokes equation of motion to determine velocity distribution for laminar flow of Newtonian fluid through vertical pipe. [12]

- b) Explain different types of derivatives used in deriving equation of change. [5]

OR

Q4) a) Derive Newton's second law of motion and extend it to derive Euler's equation of motion. [12]

- b) Explain macroscopic energy balance equation. [5]

P.T.O.

Q5) a) An incompressible fluid flows turbulently in a circular tube of cross sectional area S_1 which empties into a large tube of cross sectional area S_2 . Use macroscopic balances and derive expression for pressure rise and friction loss due to sudden expansion. [12]

b) Derive the expression of fanning friction factor for flow of fluid in a tube. [6]

OR

Q6) a) Derive Blake Kozeny equation for laminar flow of fluid through packed bed. [12]

b) What pressure gradient is required to cause N, N-diethylamine to flow in a horizontal smooth tube of inside diameter 3 cm at a rate of 1.1 lit/sec. Density of diethylamine is 935 kg/m^3 and viscosity is 1.95 cp. Assume factor of 'f' = 0.0063. [6]

Q7) a) Derive the correlation for binary mass transfer coefficient in two phase at low mass transfer rates. [9]

b) Explain transfer coefficients at high transfer rates by film theory. [8]

OR

Q8) a) Explain in detail about Reynold's, Prandtl's and Chilton-colburn J-factor Analogy. [9]

b) A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215cm/sec through dry, still air at 1 atm pressure. Estimate instantaneous rate of evaporation from the drop if drop surface is at 21°C and air at 60°C . Vapor pressure of water at 21°C is 0.0247atm. Assume pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3} \text{ mol s}^{-1} \text{ cm}^{-2}$. [8]



Total No. of Questions : 8]

SEAT No. :

PD4237

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[6403]-31

T.E. (Chemical)

ENERGY CONSERVATION IN CHEMICAL PROCESS INDUSTRIES

(2019 Pattern) (Semester - VI) (309351A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Which are different new technologies and conservation methods for industrial uses? **[10]**

b) Explain importance's of forecasting in Supply Chain Management. **[7]**

OR

Q2) a) Which are different Energy Conservation Methods used in Chemical Industries? **[10]**

b) What are the primary motivations driving the implementation of energy conservation measures, and how do these motivations differ across various sectors such as residential, commercial, and industrial? **[7]**

Q3) a) What are different Human aspect of energy conservation in process industry? **[10]**

b) Which are different types of Energy Organization? Explain anyone in details. **[7]**

OR

P.T.O.

Q4) a) How we can Planning the programme for successfully energy management? [10]

b) Explain setting goal of Energy conservation in chemical Industries? [7]

Q5) Make Energy Conservation Checklist in Motor and Transformation. How we can save energy in boilers to improve efficiency? [18]

OR

Q6) How can household energy consumption be effectively minimized through efficient housekeeping practices, considering factors such as appliance usage, lighting, temperature control, and overall maintenance? [18]

Q7) Make detail study report for dairy industry, sugar industry for effective utilization of energy? [18]

OR

Q8) What are the key strategies for waste minimization, and how can waste be effectively classified to optimize recycling, reuse, composting, and disposal practices? [18]



Total No. of Questions : 8]

SEAT No. :

PD4238

[Total No. of Pages : 2

[6403]-32

T.E. (Chemical)

PROCESS INSTRUMENTATION AND CONTROL

(2019 Pattern) (Semester - VI) (309351B) (Elective - II)

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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) Assume suitable data, if necessary.*

Q1) a) Explain LVDT as pressure measuring device with diagram, construction, working. [8]

b) Enumerate the desirable characteristics of manometric liquids. [8]

OR

Q2) a) Explain classification of Pressure measuring instruments. [8]

b) Explain with diagram, construction, working of diaphragms. [8]

Q3) a) Explain with diagram, construction and working of Rotameter with its industrial application. [10]

b) Explain classification of level measuring instruments. [8]

OR

Q4) Write Short Notes on : [18]

a) Ultrasonic level method.

b) Air purge method

P.T.O.

Q5) a) Explain principle with diagram, construction, working of mass Spectroscopy. [8]

b) Write short notes on : [10]

i) Liquid chromatography

ii) HPLC

OR

Q6) Describe with neat diagram the following techniques of composition analysis. [18]

a) Ultraviolet Absorption Spectroscopy

b) Gas chromatography

Q7) a) Explain with diagram different control actions. [9]

b) Describe the characteristics of step response of second order under damped system. [9]

OR

Q8) a) With the help of block diagram explain working of feedback control system. [9]

b) Describe the types of ideal forcing function. [9]



Total No. of Questions : 8]

SEAT No. :

PD4239

[Total No. of Pages : 2

[6403]-33

T.E. (Chemical)

CORROSION ENGINEERING

(2019 Pattern) (Semester - VI) (309351C) (Elective - II)

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

- Q1)** a) Explain in Detail about Galvanic corrosion. [5]
- b) Explain in Detail about pitting corrosion. [5]
- c) Discuss Remedial Measure for fretting corrosion and intergranular Corrosion. [8]

OR

- Q2)** a) What is uniform attack, Explain in Detail? [5]
- b) Explain in Detail about pitting corrosion and dezincification. [8]
- c) What is stress corrosion cracking? Explain in Detail. [5]
- Q3)** a) Explain the Concept in Detail about High temperature oxidation. [6]
- b) Write a short note on : [8]
- i) Mechanisms of Oxidation
 - ii) Corrosion of iron and steel
- c) What is Corrosion? [3]

OR

P.T.O.

- Q4)** a) Explain the Testing and Evaluation procedure used in Corrosion. [7]
b) Explain in Detail about the Effect of temperature and composition on Media. [8]
c) Define Pilling Bedworth ratio. [2]

- Q5)** a) Explain in Detail about Modification technique for material. also suggest required heat treatment to avoid corrosion. Justify your answer with proper example. [12]
b) What is Non Metallic Lining Explain in Detail? [5]

OR

- Q6)** a) With proper example justify the role of alloying to prevent corrosion.[7]
b) Explain in Detail about : [10]
i) cathodic protection
ii) Anodic protection

- Q7)** a) Define and Explain in Brief about Erosion and Cavitation. [6]
b) What is High temperature oxidation? Explain with Example. [6]
c) Write a short note on surface treatment coatings. [6]

OR

- Q8)** a) Explain the Method to Prevent Galvanic Corrosion. [6]
b) Explain Prevention techniques for different types of Corrosion. [12]



Total No. of Questions : 8]

SEAT No. :

PD4240

[Total No. of Pages : 2

[6403]-34

T.E. (Chemical)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
(2019 Pattern) (Semester - VI) (309351D) (Elective - II)

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.*

Q1) a) Define the following terms : **[5]**

i) Bias

ii) Threshold

b) List down at least five advantages of using ANN models. **[5]**

c) Explain Goal Trees employed in Problem Decomposition. **[8]**

OR

Q2) a) Schematically represent different components of expert system, including brief notes of each components. **[10]**

b) Explain the six-stage development of expert systems. **[8]**

Q3) a) What is deductive retrieval? **[7]**

b) Explain Plan Space Planning. **[5]**

c) Explain Goal Stack Planning. **[5]**

OR

Q4) a) Explain Rule based expert systems. **[7]**

b) Explain STRIPS employed in planning. **[10]**

P.T.O.

- Q5)** a) What is deductive retrieval? [8]
- b) Write down applications of expert system in chemical and bio-chemical engineering. [10]

OR

- Q6)** a) Explain the six-stage development of expert systems. [10]
- b) What is formal logic in Artificial Intelligence and ways of its applications? [8]

- Q7)** a) What are factors that can cause ANN modelling difficulties? [8]
- b) Write down four tools of expert system. [5]
- c) What is smoothing or regularization? [4]

OR

- Q8)** a) What is AI oriented languages and architectures? [10]
- b) What is second order logic in Artificial Intelligence? [7]



Total No. of Questions : 8]

SEAT No. :

PD4241

[Total No. of Pages : 2

[6403]-35

**T.E. (Computer Engineering) (A.I.D.S)
DATABASE MANAGEMENT SYSTEM
(2019 Pattern) (Semester - V) (310241)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is the impact of insert, update and delete anomaly on overall design of database? How normalization is used to remove these anomalies? **[8]**
- b) Elaborate the significance of CODD's rule. Explain 12 rules proposed by CODD's. **[9]**

OR

- Q2)** a) What are the desirable properties of decomposition? Explain it with example. **[8]**
- b) Explain partial, full and transitive dependency with examples. **[9]**
- Q3)** a) How to ensure the atomicity using Recovery Methods? Explain the log based recovery method in detail. **[9]**
- b) When do deadlocks happen, how to prevent them, and how to recover if deadlock takes place? **[9]**

OR

P.T.O.

- Q4)** a) What is conflict serializability? How to check schedule is conflict serializable schedule? Explain with one example. [9]
- b) Explain two phase locking protocol. Consider the following two transactions. [9]
- T1 : read (A);
read (B);
if A = 0 then B := B + 1;
Write (B).
- T2 : read (B);
read (A);
if B = 0 then A := A + 1; Write (A).
- Add lock and unlock instructions to transactions T1 and T2, so that they observe the two phase locking protocol. Can the execution of these transactions result in a deadlock?

- Q5)** a) Explain the CAP theorem referred during the development of any distributed application. [8]
- b) Explain the NOSQL database types with examples and write down the real time applications. [9]

OR

- Q6)** a) Explain Structured, Semi-structured and Unstructured data types with examples. [9]
- b) List the different NOSQL data models. Explain following NOSQL database types with examples. [8]
- i) Column-oriented
- ii) Document-oriented

- Q7)** a) What is the significance of XML databases? Explain with example the use of XML databases. [9]
- b) What is Deductive Database. Explain its features and state its advantages over traditional database. [9]

OR

- Q8)** a) Write a short note on complex data types: [9]
- i) Semi-structured data
- ii) Features of semi-structured data models
- b) Explain how encoding and decoding of JSON object is done in JAVA with example. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4242

[Total No. of Pages : 2

[6403]-36

T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2019 Pattern) (Semester - V) (310242)

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) Give Context Free Grammars for the following languages and show the derivation for given string. **[12]**

- i) $L = \{ w \in \{a,b\}^* \mid w \text{ is string of starting with 'a' and ending with 'b' } \}$
show the derivation for “ababab”
- ii) $L = a^n b^{2n}$ where $n \geq 1$. Show the derivation for “aabbbb”
- iii) $RE = (0+1)^*$ Show the derivation for “0110”

b) Reduce the following grammar to Greibach Normal form. **[6]**

$S \rightarrow AA \mid 0$
 $A \rightarrow SS \mid 1$

OR

Q2) a) Convert the following grammar to CNF. **[8]**

$S \rightarrow aSa \mid bSb \mid A \mid \epsilon$
 $A \rightarrow a \mid b \mid \epsilon$

b) In the grammar, convert the given production rule into GNF form. If any production rule in the grammar is not in GNF form, convert it. **[10]**

$S \rightarrow XB \mid AA$
 $A \rightarrow a \mid SA$
 $B \rightarrow b$
 $X \rightarrow a$

Q3) a) i) Construct PDA for the given CFG, and test whether 010^4 is acceptable by this PDA. **[10]**

$S \rightarrow 0BB$
 $B \rightarrow 0S \mid 1S \mid 0$

ii) Construct PDA for the given CFG, and test whether ‘aaabb’ is acceptable by this PDA.

$S \rightarrow aSb$
 $S \rightarrow a \mid b \mid \epsilon$

b) Construct PDA to accept $L = \{ a^n b^n \mid n \geq 1 \}$ through empty stack. **[4]**

c) Convert the given PDA to CFG $S \rightarrow 0S1 \mid 00 \mid 11$ **[4]**

OR

P.T.O.

- Q4)** a) Construct Pushdown automata for $L = \{0^n 1^m 2^{(n+m)} \mid m, n \geq 0\}$ [6]
 b) NPDA for accepting the language $L = \{a^{2m} b^{3m} \mid m \geq 1\}$ [6]
 c) NPDA for accepting the language $L = \{a^i b^j c^k d^l \mid i=j=k \text{ or } j=1, i \geq 1, l \geq 1\}$ [6]

- Q5)** a) Write short notes on with suitable diagrams. [12]
 i) Reducibility
 ii) Multi-tape Turing Machine
 iii) Multi-head Turing Machine
 iv) Two-way infinite Tape Turing Machine:
 v) Multi-tape Multi-head Turing Machine
 b) Construct a TM for subtraction of two unary numbers $f(a-b) = c$ where a is always greater than b . Explain the logic of building this Turing machine. [5]

OR

- Q6)** a) Draw a Turing Machine to increment a binary number by 1 and demonstrate with any example. [6]
 b) Obtain a Turing Machine to accept the language containing strings of a 's and b 's that do not end with abb . [7]
 c) Construct a TM for the language $L = \{0^n 1^n 2^n\}$ where $n \geq 1$ [4]

- Q7)** a) What Minimum spanning tree problem? Prove that finding MST by using Kruskal's algorithm is in class P. [5]
 b) What is post correspondence problem? Why is post correspondence problem undecidable? Explain PCP with following instance of the set of the strings A and B. [12]

	A	B
1.	1	111
2.	10111	10
3.	10	0

OR

- Q8)** a) Define and Compare Class P and Class NP Problem with suitable diagram. [8]
 b) State and explain with suitable example. [9]
 i) Decidable Problem
 ii) Undecidable Problem
 iii) Church-Turing Thesis



Total No. of Questions : 8]

SEAT No. :

PD-4243

[Total No. of Pages : 2

[6403]-37

T.E. (Computer Engineering)

SYSTEMS PROGRAMMING AND OPERATING SYSTEM

(2019 Pattern) (Semester - V) (310243)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain “General loading scheme (using suitable diagram)” with advantages and disadvantages? **[9]**

b) What is the need of DLL? Differentiate between Dynamic and static linking? **[9]**

OR

Q2) a) List and explain different loader schemes in detail. **[9]**

b) What are the different types of Loaders? Explain compile and Go loader in detail. **[9]**

Q3) a) List different types of Operating Systems? Describe any two of them. **[9]**

b) Differentiate Preemptive and non-preemptive scheduling. Explain one example of each. **[8]**

OR

Q4) a) What is time quantum and its significance in Round robin scheduling. **[9]**

b) Explain multithreaded mode and Process Control block in detail. **[8]**

P.T.O.

- Q5) a)** Write a short note on following with example? **[9]**
i) Semaphore
ii) Monitor
iii) Mutex
b) What is Deadlock? Explain deadlock avoidance algorithm with suitable example. **[9]**

OR

- Q6) a)** Explain hardware approach for Mutual Exclusion with its advantages and disadvantages. **[9]**
b) What is semaphore? Write a solution to Reader Writer problem using Semaphore with Readers have priority. **[9]**

- Q7) a)** Given a memory partitions of 100 K, 500 K, 200 K, 300 K and 600 K (in order), how would each of the first fit, best fit and worst fit algo. Place processes of size 212 K, 417 K, 112 K, 426 K (in order)? Which also makes the most efficient use of memory. **[9]**
b) Compare Paging and Segmentation with the help of an example. **[8]**

OR

- Q8) a)** Consider page sequences 2, 3, 2, 1, 5, 4, 5, 3, 2, 2, 2, 5, 2 and discuss working of following page replacement policies. Also count page faults. (Use no. of frames = 3) **[8]**
i) FIFO
ii) LRU
b) What is TLB? Explain the paging system with the use of TLB? What are the advantages of TLB? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4244

[Total No. of Pages : 2

[6403]-38

T.E. (Computer Engineering)
COMPUTER NETWORKS AND SECURITY
(2019 Pattern) (Semester - V) (310244)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Give short note on [6]

- i) ICMP
- ii) IGMP

b) Explain Link state routing. [6]

c) 192.168.5.51 / 27 for given address find out the. [6]

- i) Subnet mask?
- ii) What is first ip address for given series?
- iii) What is last ip address for given series?

OR

Q2) a) Give short note on [6]

- i) ARP
- ii) RARP

b) Explain Distance vector routing. [6]

c) Differentiate between Circuit Switching, Message Switching and Packet Switching. [6]

Q3) a) Draw and explain UDP header format. [6]

b) What is Socket? 'What are different types of socket? Explain socket functions used in connection oriented services with diagram. [6]

c) Explain SCTP protocol in detail. [6]

OR

Q4) a) Draw and explain TCP header format. [6]

b) List and explain transport layer services. [6]

c) e2 a7 00 0D 00 20 74 9e 0e ff 00 00 00 01 00 00 00 using this UDP hexadecimal dump find out in decimal numbers [6]

- i) Source port no.,
- ii) Destination port no.,
- iii) Total length of user datagram

P.T.O.

- Q5)** a) What is SNMP? Explain SNMP working. [9]
b) What is HTTP? Explain HTTP request and reply messages. [8]

OR

- Q6)** a) What is DNS? Explain DNS working. [9]
b) Write short notes on FTP and TELNET. [8]

- Q7)** a) Differentiate between Symmetric and Asymmetric Key Cryptography. [6]
b) Explain SSL in detail. [6]
c) Give short note on Firewalls. [5]

OR

- Q8)** a) Draw and explain ITU-T X.800 Security Architecture for OSI. [6]
b) Give short note on HTTPS. [6]
c) Give short note on IDS. [5]



Total No. of Questions : 8]

SEAT No. :

PD4245

[6403]-39

[Total No. of Pages : 2

T.E. (Computer Engineering)

INTERNET OF THINGS AND EMBEDDED SYSTEMS

(2019 Pattern) (Semester - V) (310245(A)) (Elective - I)

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 diagram must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) Evaluate the importance of each step in the IoT design methodology.[6]
- b) Demonstrate SCADA pillar of IoT with Suitable IoT System. [6]
- c) Illustrate connectivity technologies used in IoT with proper example.[6]

OR

- Q2)** a) Discuss the suitability of different communication models for specific IoT applications. [6]
- b) Demonstrate the use of RFID with the help of suitable IoT Application.[6]
- c) Provide a case study of a home automation system using IoT communication models. [6]
- Q3)** a) Critically evaluate the role of wireless sensor network (WSN) protocols in enabling efficient communication among sensor nodes in IoT deployments. [6]
- b) Classify the different Topology of IEEE 802.15.4 and explain with suitable diagram. [6]
- c) Analyze the Modbus protocol and its usage in industrial IoT applications.[5]

OR

P.T.O.

- Q4)** a) Analyze the role of RFID protocols in supply chain management and inventory tracking. [6]
- b) Illustrate the various IoT applications developed using IP based protocols.[6]
- c) Critically evaluate the advantages and limitations of Zigbee technology in home automation systems. [5]

- Q5)** a) Design a Django-based RESTful API for an IoT system. [8]
- b) Design a cloud storage model for a fleet management system. Discuss the data synchronization, real-time data processing, and backup strategies to ensure seamless access to vehicle telemetry and operational data from multiple locations. [10]

OR

- Q6)** a) Demonstrate Amazon Cloud platform usage for IoT applications. [8]
- b) Apply the concept of cloud computing to design the Weather forecasting system with proper explanation. [10]
- Q7)** a) Predict the possible security challenges in designing secure IoT applications. [8]
- b) Illustrate the challenges in securing IoT applications. [9]

OR

- Q8)** a) Examine how threat model is useful in securing IoT applications. [8]
- b) Design a security model for an IoT ecosystem, encompassing all the necessary components, protocols and mechanisms to ensure end-to-end security. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4246

[Total No. of Pages : 2

[6403]-40

T.E. (Computer) (AIDS)

HUMAN COMPUTER INTERFACE

(2019 Pattern) (Semester - V) (310245 B) (Elective - I) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Make suitable assumption whenever necessary.*

- Q1)** a) What is GUI? Elaborate Graphical user Interface in Details. [6]
b) What is mean by interaction styles? Explain any two interaction styles.[6]
c) Discuss software life cycle used in HCI system using appropriate example.[6]

OR

- Q2)** a) Explain Principles for UI/UX Design in details. Also give some application name. [6]
b) What is design Rationals? Explain Usability Engineering with suitable example. [6]
c) List down Norman's Seven rules. [6]

- Q3)** a) Discuss the GOMS Models with example. [6]
b) Elaborate the objective measures of Usability, formative and summative evaluation. [6]
c) Explain Cognitive walkthrough in detail. [5]

OR

- Q4)** a) Elaborate evaluation framework using following points : [6]
i) Paradigms and techniques.
ii) DECIDE : a framework to guide evaluation.
b) Discuss the concept of designing in diversity. [6]
c) Write short note on Heuristic evaluation and Usability testing in laboratory. [5]

P.T.O.

- Q5)** a) Explain vision based hand gesture recognition system using HCI Paradigms. [6]
- b) Discuss about handling missing data. What are the roles of Machine learning in HCI. [6]
- c) Describe following paradigms used for interaction in HCI [6]
- i) Time sharing
 - ii) Programming toolkit
 - iii) Agent based Interfaces

OR

- Q6)** a) Explain with example pattern recognition in HCI. [6]
- b) What do you mean by Ubiquitous Computing? What is its application? Explain with suitable example. [6]
- c) Compare Data Integrity versus Data immunity. [6]
- Q7)** a) What is significance of “navigation and toolbar” in HCI? Explain with example. [6]
- b) Write short note on : [6]
- i) Mini tablet format app.
 - ii) Searching, Sorting and Filtering.
- c) Describe anatomy of mobile app. [5]

OR

- Q8)** a) What is used of “Multi-touch gestures”? Explain various multi texture gesture used in Mobile devices. [6]
- b) Write short note on based on various devices : [6]
- i) Designing for kiosks
 - ii) Designing for audible interfaces
- c) Describe the “Inter-app integration”. [5]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4247

[Total No. of Pages : 2

[6403]-41

T.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - V) (310245(C)) (Elective - I)

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

- Q1)** a) What is clocks synchronization? Explain any one clocks synchronization algorithm. **[6]**
- b) What is mutual exclusion? How mutual exclusion is achieved in centralized algorithm? **[6]**
- c) Write short note on: Election Algorithms. **[6]**

OR

- Q2)** a) What is Gossip-Based Overlay Construction? How it is achieved? **[6]**
- b) Explain in brief, Logical Positioning of nodes in GPS system. **[6]**
- c) Explain in short, the following algorithms: **[6]**
- i) Bully Algorithm
 - ii) Token-Ring Algorithm

- Q3)** a) What is Distributed File System? Explain any one distributed file system. **[6]**
- b) Why Naming is essential in DFS? Describe Structured Naming in DFS. **[6]**
- c) Explain in short, File service architecture of Distributed File System. **[5]**

OR

- Q4)** a) Explain the need and requirements of distributed file system. **[6]**
- b) Explain the following Naming in DFS. **[6]**
- i) Flat Naming
 - ii) Attributed Based Naming
- c) Explain in short: Network file system of DFS. **[5]**

P.T.O.

- Q5)** a) What is Replication? What are the reasons for data replication? [6]
b) What is Replica Management? Explain how to manage the replicated data?[6]
c) Explain with suitable example, Replication in the web. [6]

OR

- Q6)** a) Compare Data- Centric v/s Client-Centric Consistency models. [6]
b) Define Replication. Explain Replication as a Scaling Technique. [6]
c) Write a short note on: Monotonic Reads and Writes of Consistency models. [6]

- Q7)** a) What is Failure Masking? Explain Failure Masking by Redundancy. [6]
b) What do you mean by Process Resilience? Explain Resilience by Process Groups. [6]
c) What is RPC? Explain RPC semantics in the presence of failure. [5]

OR

- Q8)** a) What is Recovery Oriented Computing? Explain. [6]
b) Elaborate Reliable Point-to-Point Client Server Communication. [6]
c) Define the terms: Message Logging and Checkpoint in recovery technique.[5]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4248

[Total No. of Pages : 2

[6403]-42

T.E. (Computer)

SOFTWARE PROJECT MANAGEMENT

(2019 Pattern) (Semester - V) (310245(D)) (Elective - I)

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

- Q1)** a) What do you mean by activity table? Explain activity table of forward pass. **[6]**
- b) How many activity relationships are used in software project management? Explain any two relationships in detail. **[6]**
- c) What is critical path? List the limitations of critical path. **[6]**

OR

- Q2)** a) Explain formulating a network model in detail with the neat diagram. **[6]**
- b) Differentiate between forward and backward pass techniques. **[6]**
- c) Write short note on: **[6]**
- i) Activity float
 - ii) Shortening the project duration

- Q3)** a) Explain in detail change control process with neat diagram. **[6]**
- b) What are the different methods used in visualizing project progress explain in detail? **[6]**
- c) Write short notes on cost monitoring. **[5]**

OR

- Q4)** a) List and explain different types of project status reports. **[6]**
- b) Write short note on Earned Value Analysis. **[6]**
- c) Explain the term contract management. List the various typical terms of a contract. **[5]**

P.T.O.

- Q5)** a) What is Agile Project? Explain the stages of Agile Project. [6]
b) Explain Scrum methodology with different stakeholders. [6]
c) What is Product backlog? Explain it with neat diagram. [6]

OR

- Q6)** a) Explain the term Scheduling and Tracking in agile projects. [6]
b) What is Agile methodology? List the advantages of Agile methodology. [6]
c) Explain the importance of estimation in agile project management. [6]

- Q7)** a) With neat sketch explain Virtual Teams. Explain challenges in working with virtual team. [6]
b) List and explain all the stages of team development. [6]
c) Write short note on Communication Plan. [5]

OR

- Q8)** a) With neat diagram explain Z theory features. [6]
b) State and explain the basic steps involved in a typical selection procedure. [6]
c) What is Decision Making? Explain its types. [5]

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Total No. of Questions : 8]

SEAT No. :

PD-5303

[Total No. of Pages : 2

[6403]-43

T.E. (Computer Engineering)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semester - VI) (310251)

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.
- 5) Use of Scientific calculator is allowed.

Q1) a) What is Model Building elaborate this phase of data analytics with the help of a suitable example? **[8]**

b) List out different stakeholders of an analytics project. What do they usually expect at the conclusion (key outputs) of a project? **[9]**

OR

Q2) a) Explain Descriptive, Diagnostic, Predictive analytics. **[8]**

b) List and explain the various activities involved in identifying potential data resources as a part of discovery phase in Data Analytics Life Cycle? **[9]**

Q3) a) What is association rule mining? Describe the working of the Apriori algorithm with an example. **[9]**

b) Explain how decision trees are constructed using information gain and entropy. Illustrate with a small example. **[9]**

OR

Q4) a) Explain Naïve Bayes' classifier and its applications. **[9]**

b) Consider a dataset with binary classes and two features: "Loan Amount" and "Default History." Show how logistic regression could be applied for loan default prediction. **[9]**

P.T.O.

Q5) a) Explain the holdout method. Differentiate training set, validation set, and test set. **[8]**

b) Given the confusion matrix below. Calculate Accuracy, Precision, Recall and F1-score. **[9]**

	Predicted Yes	Predicted No
Actual Yes	70	30
Actual No	20	80

OR

Q6) a) Explain the following Text Analysis steps with suitable example **[8]**

i) Part-of-speech (POS) tagging

ii) Lemmatization

b) Use K-Means Clustering for the following points and determine the centroids after one iteration. Assume initial centroids as A(1,1), B(5,7). Points: (1,2), (2,1), (3,5), (6,8), (7,6), (5,5) **[9]**

Q7) a) Explain Hadoop Architecture with a neat diagram. Highlight the roles of NameNode and DataNode. **[9]**

b) Compare Tableau, Power BI, and Matplotlib for data visualization. Discuss scenarios where each tool is best suited. **[9]**

OR

Q8) a) What is Data Visualization? Describe the challenges of data visualization. **[9]**

b) Write short notes on the following : **[9]**

i) Map Reduce

ii) HDFS

iii) Hive



Total No. of Questions : 8]

SEAT No. :

PD4249

[Total No. of Pages : 2

[6403]-44

T.E. (Computer Engg.)

WEB TECHNOLOGY

(2019 Pattern) (Semester - VI) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or 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) Compare doGet and doPost methods in Servlet. **[8]**

b) What is Servlet? Explain the life cycle of sevlet. Illustrate with example.**[9]**

OR

Q2) a) What is session? List the session tracking techniques. How cookies are used to track a session. **[9]**

b) Distinguish between external and internal DTDs. **[8]**

Q3) a) List and elaborate any five JSP implicit objects with example. **[8]**

b) Explain the Struct architecture with neat diagram and also explain the benefits of Strut. **[9]**

OR

Q4) a) Write a JSP program to demonstrate use of page directive, Scriplet, Expression and Comment. **[9]**

b) Identify and justify the benefits of Web Services. **[8]**

Q5) a) Explain different types of arrays in PHP with example. **[9]**

b) How does this function work in PHP? Explain with example. **[9]**

OR

P.T.O.

Q6) a) Write php code to connect MYSQL database to display records from the table. [9]

b) Draw and explain.Net framework. [9]

Q7) a) Explain types of Arrays in Ruby? Explain the array operation in Ruby. [9]

b) What are the positive aspects of Rails, explain with example. [9]

OR

Q8) a) What is a module? Explain the difference between classes and modules? [9]

b) What is EJB? Draw and explain main components of EJB architecture. [9]



Total No. of Questions : 8]

SEAT No. :

PD4250

[Total No. of Pages : 2

[6403]-45

T.E. (Computer Engineering)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester - VI) (310253)

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) Explain Alpha-Beta tree search and cut off procedure with example. [9]
b) Explain in details the concept of backtracking and constraint propagation to solve n-queens problem. [8]

OR

- Q2)** a) What is constraint satisfaction problem? Explain with example. [5]
b) Compare and contrast the stochastics games and partial observable games. [4]
c) How AI technique is used to solve tic-tac-toe problem. [8]

- Q3)** a) Explain Wumpus world environment with PEAS description. [9]
b) What is knowledge representation in propositional logic? Compare and contrast PL and FOL. [8]

OR

- Q4)** a) Explain different inference rules in FOL with suitable example. [9]
b) What is an agent? Explain knowledge based agent with architecture diagram, also state the significance of inference engine. [8]

- Q5)** a) Illustrate with an example the use of the unification algorithm to prove the concept of resolution. [9]
b) Define and explain the forward changing with example, analyze the differences between forward and backward changing. [9]

OR

P.T.O.

Q6) a) Describe Ontological Engineering w. r t. Categories, Objects and Model. [9]

b) Define First order Logic, Explain FOL inference for following classifiers. [9]

i) Universal Generalization

ii) Universal Instantiation

iii) Extential Instantiation

iv) Extential Introduction

Q7) a) Explain the algorithm for classical planning with an example. [6]

b) Analyze various planning approaches in AI. [6]

c) Explain the Hierarchical planning with relevant example. [6]

OR

Q8) a) Explain with example how planning is different than problem solving. [6]

b) Explain types of planning in details. [6]

c) Explain AI components and AI Architecture. [6]



Total No. of Questions : 8]

SEAT No. :

PD4251

[Total No. of Pages : 2

[6403]-46

T.E. (Computer Engineering)

INFORMATION SECURITY

(2019 Pattern) (Semester - VI) (310254 (A)) (Elective - II)

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) *A Neat diagram must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Figures to the right indicate full marks.*

- Q1)** a) Differentiate between Asymmetric key cryptography and symmetric key cryptography? [8]
- b) What are the different types of attacks possible on RSA? Explain in brief? [8]
- c) Explain Chinese reminder Theorem? [6]

OR

- Q2)** a) Explain ECC for the finite field with points $y^2 = x^3 + ax + b$? [8]
- b) Perform encryption and decryption using RSA algorithm for the following: [8]
- $P = 3; q = 11; d = 7; M = 5$
- c) Explain El-Gemmal Algorithm in detail? [6]

- Q3)** a) What services are provided by IPSec? What is the difference between transport mode and tunnel mode in IPSec? [8]
- b) Explain the MD5 algorithm in brief? [8]

OR

P.T.O.

- Q4)** a) What is Message Digest? Compare MD-5 with SHA-I? [8]
b) Explain the contents of X.509 format of certificate with diagram? [8]

- Q5)** a) Write a short note on : [8]
i) Honeypot
ii) Distributed DOS attack
b) What are the capabilities and limitations of Firewall? [8]

OR

- Q6)** a) What are Intrusion Prevention policies? Explain in brief? [8]
b) Discuss operating system security in detail? [8]

- Q7)** a) Write short note on : [8]
i) Cyber Terrorism
ii) Social Engineering
b) Write short note on : [8]
i) Keyloggers and Spywares
ii) Password Cracking

OR

- Q8)** a) Write short note on Amendments of IT ACT in India? [8]
b) Write short notes on keyloggers and spyware? Also explain the severity of the incident? [8]



Total No. of Questions : 8]

SEAT No. :

PD4252

[Total No. of Pages : 2

[6403]-47

T.E. (Computer Engineering)

AUGMENTED & VIRTUAL REALITY

(2019 Pattern) (Semester - VI) (310254 (B)) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain how vision is used in a VR Experience. Justify the use of depth cues in a VR Experience. **[9]**

b) Discuss the use of aural representation in Virtual Reality. **[9]**

OR

Q2) a) Explain the features of aural representation in Virtual Reality. **[9]**

b) Discuss the use of haptic representation in Virtual Reality. **[9]**

Q3) a) Explain different methods of manipulating a virtual world. **[8]**

b) List out and explain any four properties of manipulation in a virtual world. **[9]**

OR

Q4) a) What is immersion? Justify the importance of physical and mental immersion in a Virtual Reality system. **[8]**

b) Explain different types of virtual world physics. **[9]**

P.T.O.

- Q5)** a) Explain different categories of sensors used in Augmented Reality. [9]
b) Write short note on : [9]
i) Visual Depth Cues in AR
ii) Auditory Depth Cues in AR
iii) Spatial Multiplexing
iv) Temporal Multiplexing

OR

- Q6)** a) How does augmented reality work? Explain in detail. [9]
b) What are major hardware components for augmented reality systems? [9]
- Q7)** a) List and explain the functional components of the software that is involved directly in Augmented Reality applications. [9]
b) What is Mobile Augmented Reality? Write down different advantages and disadvantages of Mobile Augmented Reality. [8]

OR

- Q8)** a) Explain the following terms related to interaction in virtual world. [9]
i) Manipulation
ii) Communication
iii) Navigation
b) Discuss the following terms related to Software Involved Directly in the Augmented Reality Application. [8]
i) Environmental acquisition (sensors)
ii) Sensor integration
iii) Application engine
iv) Rendering software (visual, audio, etc.)



Total No. of Questions : 8]

SEAT No. :

PD4253

[Total No. of Pages : 2

[6403]-48

T.E. (Artificial Intelligence and Data Science) (Computer Engg.)

CLOUD COMPUTING

(2019 Pattern) (Semester - VI) (310254 C) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define virtualization. Discuss the types of virtualizations. [6]
- b) Draw & Explain VMware architecture in detail. [6]
- c) Distinguish between virtualization in Grid and virtualization in Cloud. [6]

OR

- Q2)** a) Explain the role of virtualization in cloud computing. [6]
- b) Discuss how distributed computing technologies underpin the architecture of cloud services, focusing on the role of load balancing and fault tolerance? [6]
- c) Draw & Explain the anatomy of cloud infrastructure. [6]
- Q3)** a) List and explain the services offered by AWS. [6]
- b) Explain the AWS Elastic load Balancer and its types with its advantages. [6]
- c) Draw and Explain Architecture of Amazon Dynamo. [5]

OR

P.T.O.

- Q4)** a) Explain steps to configure server for EC2. [6]
b) Describe the storage Services offered by Amazon. [6]
c) Write a note on Services offered by Microsoft. [5]

- Q5)** a) Identify and explain Security issues in Cloud Computing. [6]
b) Discuss Secure Cloud Software Requirements in detail. [6]
c) List and explain Security Authorization Challenges in the Cloud. [6]

OR

- Q6)** a) Explain the Secure Cloud Software Testing. [6]
b) Discuss Challenges, Advantages and Disadvantages of Data Security in Cloud. [6]
c) Explain Cloud Digital persona and Data security. [6]

- Q7)** a) Difference between Distributed Cloud Computing Vs Edge Computing. [6]
b) Describe DevOps Architecture in Cloud Computing. [6]
c) Explain the Comet Cloud Architecture with diagram. [5]

OR

- Q8)** a) Explain Containers and Dockers in details. [6]
b) Describe Jungle Computing in detail. [6]
c) Draw & explain working of Kubernetes architecture. [5]



Total No. of Questions : 8]

SEAT No. :

PD4254

[Total No. of Pages : 2

[6403]-49

T.E. (Computer Engineering) (A.I.D.S.)

SOFTWARE MODELING AND ARCHITECTURE

(2019 Pattern) (Semester - VI) (310254 (D)) (Elective - II)

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 marks.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) What are the major components of interaction overview diagrams? [6]
- b) What is the types of a state machine diagram? Explain its types in detail.[6]
- a) Explain Fork and Join concept inActivity diagram with a suitable example. [6]

OR

- Q2)** a) What is Interaction diagram in software modelling? What is the purpose Interaction diagram? How to draw the interaction diagram? [8]
- b) Explain the significance of timing diagram in software modelling. How do you create timing diagram? [6]
- c) What is the types of a state machine diagram? Explain its types in detail.[4]
- Q3)** a) Explain the real time software architecture with a suitable example. [6]
- b) Explain the importance of Object oriented software architecture and its applicability in software development? [6]
- c) Explain the strategies for scaling agile process. [6]

OR

P.T.O.

- Q4)** a) What is the software architecture? What are the three different views of an architecture? [8]
- b) Explain the following quality attribute consider during software architecture with suitable example [10]
- i) Portability
 - ii) Scalability
 - iii) Performance
 - iv) Modifiability
 - v) Availability

- Q5)** a) What is layered architecture? Explain Layered architecture for Software Design with suitable example [6]
- b) What is Object oriented software architecture ?what are the advantages and disadvantages of Object oriented software architecture [6]
- c) Explain the broker pattern for design of service oriented architecture.[5]

OR

- Q6)** a) Define the importance of architecture structure and views. [6]
- b) Explain the importance of Object oriented software architecture and its applicability in software development. [6]
- c) Explain the broker pattern for design of service oriented architecture.[5]

- Q7)** a) What is the Design pattern? What is the purpose of design patterns? What are the different types of design patterns? What is purpose of each type of design pattern? [9]
- b) What are the different creational patterns? Explain any three creational pattern in short. [8]

OR

- Q8)** a) What are the different approaches of design patterns in software architecture? [6]
- b) What are the different structural pattern? Explain any three creational pattern in short. [6]
- c) What is the role of behavioral patterns for interaction and responsibility of objects? [5]



Total No. of Questions : 8]

SEAT No. :

PD4255

[Total No. of Pages : 2

[6403]-50

T.E. (Artificial Intelligence and Data Science)

COMPUTER NETWORKS

(2019 Pattern) (Semester - V) (317521)

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 Static Routing and Dynamic Routing. [6]
b) Draw and explain the IPv4 header? [6]
c) Write a Short Note on ICMP with header format? [6]

OR

- Q2)** a) State the difference between circuit switching and packet switching. [6]
b) Describe link state routing algorithm with example? [6]
c) Explain Routing Information Protocol with suitable diagram. [6]

- Q3)** a) Draw TCP header and explain TCP connection 3-way handshake. [7]
b) Explain the role of the bind(), listen(). and accept() functions in socket programming. Provide code examples for each. [6]
c) Give differences between TCP and UDP protocol. [4]

OR

- Q4)** a) Explain Stream Control Transmission Protocol (SCTP). What are its advantages over TCP and UDP, and where is it commonly used? [7]
b) Discuss the issues related to wireless network congestion and how they can be addressed in the context of TCP and UDP. [6]
c) Describe the Quality of Service (QoS) and congestion control mechanisms. [4]

P.T.O.

- Q5)** a) Discuss the Simple Network Management Protocol (SNMP) and its role in network management and monitoring. [6]
b) Explain HTTP request and reply message format with example? [6]
c) Differentiate between POP3 and IMAP protocols? [6]

OR

- Q6)** a) Describe DHCP and its need. Explain header format in detail? [6]
b) Differentiated between Persistent and Non-persistent HTTP? [6]
c) Explain FTP in detail and any four commands of FTP? [6]

- Q7)** a) Write a short note on CSMA/CD? [6]
b) Describe the concept of Pure and slotted Aloha? [6]
c) Explain IEEE 802.3 Standards and Frame Format. [5]

OR

- Q8)** a) Discuss Binary Exponential Back-off algorithm. [6]
b) Explain the concept of Fast ethernet and gigabit ethernet? [6]
c) Write Short note on IEEE 802.15 and IEEE 802.16. [5]



Total No. of Questions : 8]

SEAT No. :

PD-5278

[Total No. of Pages : 2

[6403]-51
T.E. (AI&DS)
WEB TECHNOLOGY
(2019 Pattern) (Semester - V) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the XML, DTD, XSL with suitable examples. **[6]**
b) Explain Session Management in Servlet. **[6]**
c) What is AJAX. Explain with suitable example. **[6]**

OR

- Q2)** a) Differentiate between Generic servlet and HTTP Servlet. Write code snippet for Generic Servlet to display Hello World. **[6]**
b) Write servlet code to fetch data from MySQL database. **[6]**
c) What are DTDs? Explain internal DTD with example? **[6]**

- Q3)** a) Write a note on SOAP and WSDL. **[9]**
b) Explain the architecture of struts. **[8]**

OR

- Q4)** a) Create a JSP page to search a student details from database by studentid. (Assume suitable table structure). **[9]**
b) Write advantages of JSP over Servlets? Also explain life cycle of a JSP. **[8]**

P.T.O.

- Q5) a)** Write the PHP code for fetching the data from a database to a webpage?[6]
- b) Explain all possible types of scope of variable in PHP. [6]
- c) What is .NET Framework? Explain Architecture. [6]

OR

- Q6) a)** Write a note on WAP and WML. [6]
- b) Write a program in PHP to calculate Square Root of a number? [6]
- c) What is Node.js? What are the features of Node.js [6]

- Q7) a)** What is EJB. Explain Types of Enterprise Java Bean. [9]
- b) How code blocks are used in Ruby? Explain with appropriate code snippet. [8]

OR

- Q8) a)** Explain array in Ruby with example. [9]
- b) Explain classes and objects in Ruby with appropriate examples. [8]



Total No. of Questions : 8]

SEAT No. :

PD4256

[Total No. of Pages : 2

[6403]-52

T.E. (Artificial Intelligence & Data Science)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - V) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain Min-Max search procedure with an example. [9]
b) Explain alpha beta pruning with example. [9]

OR

- Q2)** a) Explain how constraint propagation is carried out in CSP. [9]
b) Explain and represent N-Queen problem as CSP. [9]

- Q3)** a) Write the algorithm for deciding entailment in propositional logic. [9]
b) Explain property inheritance algorithm with example. [8]

OR

- Q4)** a) Consider the following sentences. [9]

- John likes all kinds of food
- Apples are food
- Chicken is food
- Anything anyone eats and isn't killed by is food
- Bill eats peanuts and is still alive
- Sue eats everything bill eats

- i) Translate these sentences into formulas in predicate logic
 - ii) Prove that John likes peanuts using backward chaining
 - iii) Convert the formulas of a part into clause form
 - iv) Prove that john likes peanuts using resolution
- b) Discuss and define following words in the context of AI. [8]
- i) Intelligence
 - ii) Knowledge
 - iii) Information
 - iv) Logical Reasoning

P.T.O.

- Q5) a)** Explain Non Monotonic reasoning and discuss Various logic associated with it. **[9]**
b) Explain unification algorithm used for reasoning under predicate logic with an example. **[9]**

OR

- Q6) a)** Convert following sentences into FOL representation. **[9]**
i) Every student who takes English passes it.
ii) John likes books and music.
iii) All elephants are gray in color.
iv) Not all students take both History and Biology.
v) Sue eats everything Bill eats.
vi) If the car belongs to John then it is green.
vii) Anything any one eats and isn't kill by food
viii) Only one student failed in History.
ix) Some students take English in summer 2020.
b) What are fuzzy membership function explain with example. **[9]**

- Q7) a)** Write short note on circumscription. **[5]**
b) Discuss theory of beliefs. **[6]**
c) What do you mean by ontology of situation calculus? **[6]**

OR

- Q8) a)** Write short note on AI architecture. **[5]**
b) Discuss and Analyze various planning approaches. **[6]**
c) Explain terms time and schedule from perspective of temporal planning. **[6]**



Total No. of Questions : 8]

SEAT No. :

PD4257

[6403]-53

[Total No. of Pages : 2

T.E. (AI & DS/Information Technology)

DESIGN THINKING

(2019 Pattern) (Semester - V) (Elective - I) (314445(C))

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)** IDEATION USING SCAMPER: Explain. **[8]**
- b) How 2×2 Matrix helps in ideate phase? Which other tools support working with 2×2 Matrix? **[9]**

OR

- Q2) a)** Explain 6-3-5 Method for Ideation. **[6]**
- b) What is Analogous Inspiration? When to use Analogous Inspiration? How to use Analogous Inspiration for Ideation. **[6]**
- c) What is User Experience Journey? **[5]**

- Q3) a)** What are Paper prototypes? What is a WYSIWYG? For what purpose that is used? **[9]**
- b) Why is prototyping important? In Design Thinking how we use a prototype? **[9]**

OR

- Q4) a)** What is the difference between a wireframe and prototype? **[6]**
- b) What are the advantages and disadvantages of using a prototype in design thinking? **[6]**
- c) What is Critical Experience Prototype (CEP) & Critical Function Prototype (CFP)? **[6]**

P.T.O.

- Q5) a)** What is meant by creating a pitch with reference to reflect phase, explain.**[8]**
- b) Discuss how the Structured Usability Testing is carried out to test prototypes? **[9]**

OR

- Q6) a)** What is A/B testing? How it is carried out in test phase? **[8]**
- b) What is the purpose of the Evolve Phase? Explain Concept Synthesis in detail. **[9]**

- Q7) a)** Discuss How Design thinking used in redesigning the Customer Contact Center at Toyota. **[9]**
- b) How The Good Kitchen helped Improving the nutrition of the elderly, explain in detail. **[9]**

OR

- Q8) a)** Discuss UberEATS design using design thinking tools. **[9]**
- b) Explain IBM Design Thinking: A Framework To Help Teams Continuously Understand and Deliver. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PD4258

[Total No. of Pages : 2

[6403]-54

T.E. (AI & DS)

EMBEDDED SYSTEMS AND SECURITY

(2019 Pattern) (Semester - V) (317522(A))

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) Explain the role of pre-processors in embedded C programming. Discuss the commonly used pre-processor directives and their significance in firmware development. **[9]**

b) Differentiate between simulators and emulators in the context of embedded system development. Discuss their roles, benefits, and limitations. Provide examples of popular simulators and emulators used in the industry. **[9]**

OR

Q2) a) Describe the programming concepts and steps for implementing UART communication using embedded C on an ARM 7 microcontroller. Discuss the key registers and operations involved. **[9]**

b) Explain the concept of bootloaders in embedded systems. Discuss the purpose and functionality of a bootloader, and describe the key steps involved in its implementation. **[9]**

Q3) a) Explain the mechanisms for task communication in an RTOS, focusing on the concepts of mailboxes and semaphores. Discuss their role in facilitating inter-task communication and synchronization. **[9]**

b) Describe the basic functions of a Real-Time Kernel in an RTOS. Discuss how the kernel manages tasks, interrupts, and resources in real-time systems. **[9]**

OR

P.T.O.

- Q4) a)** Explain the concept of a Real-Time Operating System. Discuss the fundamental characteristics and requirements of an RTOS in the context of embedded systems. **[9]**
- b)** Differentiate between preemptive scheduling and cooperative scheduling. Describe scheduling algorithms Round Robin, Priority-based, and Rate Monotonic scheduling. **[9]**

- Q5) a)** Explain the concept of the root file system in embedded Linux. Discuss its purpose, contents, and different types of root file systems. **[8]**
- b)** Explain the concept of a cross-compilation toolchain in the context of embedded Linux development. Discuss its purpose, components, and the process of setting up and using a cross-compilation toolchain. **[9]**

OR

- Q6) a)** Explain in detail the characteristics and purpose of tool utilities commonly used in embedded Linux systems, such as Minicom, Busybox, Redboot, and Libc. Explain how these utilities contribute to the overall functionality and efficiency of the system. **[9]**
- b)** Discuss the types of device drivers commonly found in embedded Linux systems. Differentiate between device drivers, and provide examples of devices that are typically managed by each type. **[8]**

- Q7) a)** Enlist the common network attacks that target embedded systems. Explain the impact of attacks such as denial-of-service (DoS), man-in-the-middle (MitM), and packet sniffing on the security and functionality of embedded systems. **[9]**
- b)** Explain the concept of eavesdropping in embedded systems. Discuss how attackers can intercept and analyze communication channels to gain unauthorized access to sensitive information or compromise system security. **[8]**

OR

- Q8) a)** Explain the cold boot attack in embedded systems. Discuss how attackers can exploit the data remanence property of volatile memory to retrieve sensitive information even after a device is powered off. **[9]**
- b)** Discuss the effects of denial-of-service (DoS) attacks on embedded systems. Explain how these attacks can disrupt the availability and functionality of a device or system, leading to service outages and potential financial losses. **[8]**

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x

x

Total No. of Questions : 8]

SEAT No. :

PD4259

[6403]-55

[Total No. of Pages : 2

T.E. (Artificial Intelligence and Data Science)

PATTERN RECOGNITION

(2019 Pattern) (Semester - V) (317522(B)) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the Chomsky Normal form with suitable example. **[6]**
b) Explain the fundamental elements of formal grammars. **[6]**
c) Describe Blocks Word Description String Generation as Pattern Description. **[6]**

OR

- Q2)** a) Describe the Grammar Based Approach and its Application in detail. **[6]**
b) Explain the concept of Augmented Transition Networks (ATN) in the context of parsing. **[6]**
c) Give an Abstract view of parsing problem. **[6]**

- Q3)** a) Compare Top down Parsing and Bottom up Parsing. **[6]**
b) Describe Clique finding algorithm with suitable example. **[6]**
c) Analyze different application of Relational Graph to Pattern Recognition. **[5]**

OR

- Q4)** a) Describe Canonical definite finite state grammar (CDFSG) with suitable example. **[6]**
b) Differentiate between Homomorphism and Isomorphism. **[6]**
c) Draw and Explain Grammatical Interface Model and its objectives. **[5]**

P.T.O.

- Q5)** a) Describe with neat diagram Artificial Neuron Activation and output characteristics. [6]
- b) Explain Neural Pattern Associates and Matrix Approaches. [6]
- c) Explain CAM & other Neural Memory Structure. [6]

OR

- Q6)** a) What are the different reasons to adopt a Neural Computational Architecture? [6]
- b) Describe Neural Networks as a Black Box Approach. [6]
- c) Explain Neural Network Structures for Pattern Recognition Applications. [6]

- Q7)** a) Write a short note on: [6]
- i) The Delta Rule
- ii) Generalized Delta Rule.
- b) How to train the feed forward network using Generalized delta Rule? Explain. [6]
- c) Describe how the character classification is done with pattern Associator? [5]

OR

- Q8)** a) Draw & Explain Summary of the Back Propagation learning Procedure. [6]
- b) Explain the structure of a Multiple Layer Feed Forward Network. [6]
- c) Explain Unsupervised Learning in NeurPR. [5]

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Total No. of Questions : 8]

SEAT No. :

PD4260

[Total No. of Pages : 2

[6403]-56

T.E. (Artificial Intelligence and Data Science)

DATA SCIENCE

(2019 Pattern) (Semester - VI) (317529)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain phases of data analytic life cycle in detail. Draw a suitable diagram. **[9]**
- b) What is model building elaborate this phase of Data analytics with the help of suitable example. **[8]**

OR

- Q2)** a) Write a short note on : **[9]**
- i) ETL
 - ii) Common tools for model building
 - iii) Model selection for Data analytics
- b) List and explain the various activities involved in identifying potential data resources as a part of discovery phase in Data analytics life cycle. **[8]**

- Q3)** a) Write short note on the following : **[9]**
- i) Removing duplicates from data set.
 - ii) Data transformation
 - iii) FP Growth
- b) What are association rules? Explain Apriori Algorithm in brief. **[8]**

OR

P.T.O.

- Q4)** a) Explain Predictive, Descriptive and Prescriptive analytics with example.[9]
 b) What is Classification? Explain Decision Tree Classification with example.[8]

- Q5)** a) Write short note on the following : [9]
 i) Confusion matrix.
 ii) AUC-ROC Curves.
 iii) Elbow plot.
 b) Explain the following Text Analysis steps with suitable example : [9]
 i) Part-of-speech(POS)tagging
 ii) Lemmatization

OR

- Q6)** a) What is clustering? With suitable example explain the steps involved in Hierarchical Clustering. [9]
 b) What is confusion matrix? Given the confusion matrix, Calculate Accuracy, Precision, Recall, Error rate with description on diabetic risk[9]

	Predicted Classes		
Actual Classes	Classes	Diabetic Risk- Yes	Diabetic Risk- No
	Diabetic Risk- Yes	90	210
	Diabetic Risk- No	140	9560

- Q7)** a) List the challenges of Big Data Visualization. Explain the types of visualization with example. [9]
 b) Explain in detail the Hadoop Ecosystem with suitable diagram and different components. [9]

OR

- Q8)** a) Write a short note on the following : [9]
 i) Map reduce.
 ii) Pig
 iii) Hive
 b) With suitable example draw histogram and boxplot. Also explain its uses.[9]



Total No. of Questions : 8]

SEAT No. :

PD4261

[Total No. of Pages : 2

[6403]-57

T.E. (AI & DS)

CYBER SECURITY

(2019 Pattern) (Semester - VI) (317530)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

- Q1)** a) Write short note on X.509. [5]
- b) What is Digital Signature Standard? Explain the DSS approach. [6]
- c) Perform encryption and decryption using RSA algorithm for $p = 11$, $q = 3$, $e = 3$ and $M = 7$. [6]

OR

- Q2)** a) Identify and explain the various methods of authentication. [5]
- b) Explain the operations of Kerberos. [6]
- c) In a Diffie-Hellman Key Exchange, Alice and Bob have chosen prime value $q = 17$ and primitive root $= 5$. If Alice's secret key is 4 and Bob's secret key is 6, what is the secret key they exchanged? [6]

- Q3)** a) What is VPN? Explain types of VPN. [6]
- b) Explain IPsec also state the advantages of IPsec. [6]
- c) Distinguish between PGP and S/MIME. [6]

OR

- Q4)** a) Explain ISAKMP protocol of IPsec. [6]
- b) Explore Secure Socket Layer Handshake protocol in detail. [6]
- c) Distinguish between IDS and IPS. [6]

P.T.O.

- Q5)** a) List and explain types of intrusion detection system (IDS) [6]
b) Enlist the various types of firewall. [5]
c) Explain : [6]
i) Dictionary Attack
ii) Social Engineering attack
iii) Brute Force attack

OR

- Q6)** a) What is Attribute-Based Access Control (ABAC) [5]
b) What is trusted system? Explain in brief. [6]
c) Differentiate packet filtering router and stateful Inspection firewall. [6]
- Q7)** a) List types of VoIP hacking and Explore any 3? Describe a few counter Measures to prevent remote connectivity and VoIP hacking. [8]
b) Who are cyber criminals? What are types of cybercrimes? [6]
c) Explain Personally Identifiable Information PII. [4]

OR

- Q8)** a) What is cyberstalking? Compare between cyberstalking and physical stalking. [8]
b) Explain the terms : [6]
i) Virus
ii) Phishing
iii) Spoofing
iv) Mobile hacking
v) Internet Pharming
vi) Cyber Forensic
c) Compare Security and Privacy. [4]



Total No. of Questions : 8]

SEAT No. :

PD4262

[Total No. of Pages : 2

[6403]-58

T.E. (Artificial Intelligence and Data Science)

ARTIFICIAL NEURAL NETWORK

(2019 Pattern) (Semester - VI) (317531)

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 the Boltzmann machine and Boltzmann learning law. What are the limitations of the Boltzmann learning? [9]

b) Explain the concept of associative learning and associative memory in artificial neural networks. How is it related to pattern recognition? [8]

OR

Q2) a) Write a short note on : [9]

- i) Pattern Classification
- ii) Pattern mapping Task

b) What is simulated Annealing? Write and explain Simulated Annealing Algorithm. [8]

Q3) a) Enlist and explain components of Competitive learning Network. [9]

b) Describe the architecture of a Self-Organizing Map (SOM). Discuss the Competition, Cooperation, and synaptic adaptation process. [9]

OR

Q4) a) What is Vector Quantization. Explain linear vector quantization training algorithm. [9]

b) State and explain Properties of feature map in detail. Enlist Applications SOM. [9]

P.T.O.

- Q5)** a) Draw and explain the architectures of Convolutional Neural Network. [9]
b) Write a short note on following CNN Model: [9]
i) LeNet-5
ii) AlexNet

OR

- Q6)** a) Explain the concept of Bias and Variance. Discuss the different combination of Bias and Variance. [9]
b) Explain any four Deep Learning Framework in detail. [9]
- Q7)** a) Explain the architecture of NET talk model. Discuss the application of to convert English text to speech. [9]
b) Discuss the application of ANN in pattern classification and recognition of Olympic game symbols. [8]

OR

- Q8)** a) Describe the Neocognitron model and its significance in the recognition of handwritten characters. [9]
b) Explain texture classification and segmentation in ANN. [8]



Total No. of Questions : 8]

SEAT No. :

PD4263

[Total No. of Pages : 2

[6403]-59

T.E. (Artificial Intelligence & Data Science)

ROBOTICS & AUTOMATION

(2019 Pattern) (Semester - VI) (317532 (A)) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Qu 1 or Qu 2, Qu 3 or Qu 4, Qu 5 or Qu 6 and Qu. 7 or Qu. 8.*
- 2) *Figures to the right side indicates full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of scientific calculator allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain Euler Langrange's equation of motion. **[9]**

b) Explain D-H matrix and its significance in robot kinematics. **[9]**

OR

Q2) a) A planer RR manipulator has first link of 1000 mm length and second link of 750 mm, state whether the manipulator can reach points P, Q and R separately where P is (750, 750), Q is (1500, 1700) and R is at (150, 1700). **[9]**

b) Explain Newton-Euler Equation of motion. **[9]**

Q3) a) What is end effector. Which devices can be used as End Effector. **[8]**

b) Classify grippers with, suitable examples. **[9]**

OR

Q4) a) A part weighing 8 kg is to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the fingers and the part surface is 0.25, Assume appropriate 'g' factor for the gripper. Compute required gripper force. **[10]**

b) Differentiate between hydraulic, pneumatic and electric actuators. **[7]**

P.T.O.

- Q5)** a) Explain how sensors can be integrated with Robot System with suitable example. [8]
- b) Define ARTIFICIAL INTELLIGENCE in Robotics. Speculate role of AI techniques in Robotic Applications. [9]

OR

- Q6)** a) Explain Open loop and Closed loop systems. [8]
- b) Explain architecture of Microcontroller in embedded system. [9]
- Q7)** a) Explain different languages/methods used for robotic programming. Explain RAIL programming. [6]
- b) Write short note on Robotic applications in medical field. [6]
- c) Explain powered lead through robot programming. [6]

OR

- Q8)** a) Explain “WAIT”, “DELAY”, “SIGNAL” and “DEPART”. [6]
- b) Explain Robot Control Sequencing in robot programming. [6]
- c) Explain VAL system & programming. [6]



Total No. of Questions : 8]

SEAT No. :

PD4264

[Total No. of Pages : 3

[6403]-60

T.E. (Artificial Intelligence & Data Science)

NATURAL LANGUAGE PROCESSING

(2019 Pattern) (Semester - VI) (317532 (B)) (Elective - II)

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 assumptions whenever necessary.*

Q1) a) Consider the following CNF rules. Create a Parse tree for the sentence “The flight includes a meal” using CKY parsing algorithm. **[9]**

$S \rightarrow NP VP$

$NP \rightarrow Det N$

$VP \rightarrow V NP$

$V \rightarrow \text{includes}$

$Det \rightarrow \text{the}$

$Det \rightarrow \text{a}$

$N \rightarrow \text{meal}$

$N \rightarrow \text{flight}$

b) Explain why CFG is used to represent natural language in parsing. Differentiate between top-down and bottom-up parsing. **[9]**

OR

P.T.O.

Q2) a) Consider following grammar rules. [9]

$S \rightarrow NP VP$

$S \rightarrow VP$

$NP \rightarrow DET N$

$NP \rightarrow N$

$VP \rightarrow V$

$VP \rightarrow V NP$

$Det \rightarrow \text{this} \mid \text{that} \mid \text{a} \mid \text{the}$

$Noun \rightarrow \text{book} \mid \text{flight} \mid \text{John} \mid \text{ball} \mid \text{meal}$

$Verb \rightarrow \text{book} \mid \text{include} \mid \text{read}$

Generate the Top-Down and Bottom-up Parse Trees for the sentence. "Book that flight". Is the Top-Down parsing approach better than Bottom up approach? Justify your answer.

b) What is Constituency Parsing? Explain CCG parsing with an example.[9]

Q3) a) What do you mean by Semantic and Thematic Roles? List out any 4 thematic roles with definitions and examples. [9]

b) Write short note on : [8]

i) WordNet

ii) FrameNet

OR

Q4) a) What is the significance of Word Sense Disambiguation in NLP? Explain any one Word Sense Disambiguation method. [8]

b) Explain the Scherer typology of affective states. What are the two families of theories of emotion? [9]

- Q5) a)** Why is Machine Translation needed? Explain various problems of machine translation. [9]
- b) Explain in detail Rule based Machine Translation, Knowledge based Machine Translation and Statistical Machine Translation. [9]

OR

- Q6) a)** Draw a neat diagram of Encoder-decoder architecture. Explain the working of Neural Machine Translation. [9]
- b) Explain the stages of a Direct Machine Translation System with example. [9]

- Q7) a)** Write short notes on : [9]
- i) Named Entity Recognition
 - ii) Question Answer System
 - iii) Chatbot using Dialogflow
- b) Draw the architecture of an ad hoc Information Retrieval system. Explain the working of vector space model of information retrieval. [8]

OR

- Q8) a)** Describe the following approaches used in information retrieval. [9]
- i) Term weighting and document scoring
 - ii) Stop word Elimination
 - iii) Inverted Index
- b) Explain the stages and working of Question Answering System. [8]



Total No. of Questions : 8]

SEAT No. :

PD4265

[Total No. of Pages : 2

[6403]-61

T.E. (Electrical)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2019 Pattern) (Semester - V) (303141)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is IPR? Explain patent structure in detail. **[8]**

b) Describe the need and scope of Human Resources Management **[9]**

OR

Q2) a) Write a short note on recruitment and selection process. **[8]**

b) Explain details of provisional and complete specifications of patent. **[9]**

Q3) a) What is six sigma? Explain requirements of different belts. **[10]**

b) Write a short note on ISO 14001 : 2004. **[8]**

OR

Q4) a) Which are the components of quality management system? Explain ISO 9001 : 2012. **[10]**

b) How Kaizen works? Write merits and demerits. **[8]**

P.T.O.

- Q5)** a) What is cost? Which are the different types of costs. [8]
b) Explain in detail market survey and market research. [9]

OR

- Q6)** a) What is online marketing? Enlist its benefits. [8]
b) Explain the Taxation system in India. [9]

- Q7)** a) What is group dynamics? Which are the different stages? [10]
b) What is Herzberg's Two factor Theory. Explain Hygiene and motivational factors in detail. [8]

OR

- Q8)** a) What is process theory? Explain Taylor's Motivational Theory in detail. [10]
b) Write a short note on Government policies and incentives for Entrepreneurship. [8]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4266

[Total No. of Pages : 3

[6403]-62

T.E. (Electrical)

POWER ELECTRONICS

(2019 Pattern) (Semester - V) (303142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Describe working of single phase semi converter with RL load. Draw waveforms of load voltage, load current. [6]
- b) A single phase fully controlled converter is supplied from 230V, 50Hz source. The load consists of $R = 10\Omega$ and a large inductance so as to render the load current constant. For a firing delay of 45° determine : [6]
- i) Average output voltage
 - ii) Average output current.
- c) Describe working of circulating current type single phase dual converter with waveforms. [6]

OR

- Q2)** a) Compare- single phase Fully controlled converter and single phase semi converter on following points. [6]
- i) Output voltage waveform for R load
 - ii) Output voltage waveform for RL load
 - iii) Average output voltage for R & RL load
- b) Draw and explain single phase fully controlled converter feeding R-L load with output voltage and current waveform. [6]
- c) A single phase half controlled bridge converter feeds a load comprising of a resistance of 10 ohm and a large inductance to provide a constant and ripple free current. Calculate the average value of output voltage and current. Firing angle is 45° and input ac voltage is 120V, 50Hz. [6]

P.T.O.

- Q3)** a) Draw output voltage waveform for three phase fully controlled converter with R load for $\alpha = 60^\circ$. [5]
- b) A three phase fully controlled converter is fed from 3 phase, 400V, 50Hz source and is connected to a resistive load of 10 ohm per phase. Calculate the average value of load voltage and current for a firing angle of 30° . [5]
- c) Describe working of three phase Semi converter with output waveforms for firing angle of 60° with RL load [8]

OR

- Q4)** a) Explain single phase ac regulator feeding RL load. Draw output voltage waveform. [5]
- b) Derive expression for RMS output voltage (V_{rms}) and current (I_{rms}) of single phase ac voltage regulator feeding R load. [5]
- c) Draw neat diagram of two stage AC voltage regulator and explain its working for R load. [8]
- Q5)** a) State different voltage control techniques used in single phase inverter. Elaborate any one method in detail. [5]
- b) Explain Sinusoidal Pulse width modulation with necessary waveforms. [5]
- c) For single pulse width modulation with quasi square wave show that output voltage can be expressed as $V_0 = \sum_{n=1,3,5,\dots}^{\infty} \frac{4V_s}{n\pi} \sin \frac{n\pi}{2} \sin n\omega t$. Where V_s is source voltage and pulse width is $2d$. [7]

OR

- Q6)** a) Compare VSI and CSI [5]
- b) With neat circuit diagram and waveforms, explain operation of single phase current source inverter. [5]
- c) Explain working of single phase full bridge voltage source inverter. Draw all waveforms. [7]

- Q7)** a) Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. [10]
- b) Draw a neat diagram and explain cascaded multilevel converter. [7]

OR

- Q8)** a) Explain working of three phase six step voltage source inverter in 120° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. [10]
- b) List different harmonic elimination techniques used in inverter. Explain any two methods in detail. [7]



Total No. of Questions : 8]

SEAT No. :

PD-4267

[Total No. of Pages : 3

[6403]-63

T.E.

ELECTRICAL ENGINEERING

Electrical Machines - II

(2019 Pattern) (Semester-V) (303143)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Draw V curve of synchronous motor. Show under excitation, over excitation and critical excitation regions in it. **[4]**
- b) Explain the following terms related to loading of 3 phase synchronous motor **[6]**
- i) load angle or torque angle
 - ii) Internal angle
 - iii) power factor angle. Show these angles by drawing relevant phasor diagram at lagging power factor.
- c) Explain with relevant phasor diagrams the operation of synchronous motor at constant load and variable excitation condition. **[8]**

OR

- Q2)** a) Draw constructional details of 3 phase synchronous motor and label it. **[4]**

P.T.O.

- b) Compare three phase synchronous motor with three phase induction motor. (any six points). [6]
- c) A 3 phase 36.775 kW , 410 V 50 Hz star connected synchronous motor has full load efficiency of 85 % . The synchronous impedance of the motor is $0.2 + j 2$ ohms per phase. If the excitation of the motor is adjusted to give a leading pf of 0.85. [8]

Calculate

- i) full load induced emf and
- ii) mechanical power developed.

- Q3)**
- a) State different methods of speed control of three phase induction motor. [3]
 - b) Explain with neat block diagram Cascade control method to control speed of three phase induction motor. [6]
 - c) Describe with suitable diagram working of permanent magnet D C motor. State its advantages and applications. [8]

OR

- Q4)**
- a) What is energy efficient Induction Motor? State its any two features. [3]
 - b) Explain with suitable diagram construction and working of Permanent Magnet Stepper motor. [6]
 - c) Explain operation of three phase induction motor as an induction generator. State its advantages and applications. [8]

- Q5)**
- a) Draw and explain phasor diagram of Non compensated A C series motor. [4]
 - b) With suitable diagram , explain Conductively compensated A C series motor. [6]
 - c) Discuss the modifications necessary in design and construction of D C series motor so that it can work satisfactorily on A C supply as a universal motor. [8]

OR

- Q6)** a) What are the drawbacks of a DC series motor when it is operated on AC supply? [4]
- b) What do you mean by universal motor? Draw its torque vs speed characteristics on A C and DC operation. State applications of universal motor. [6]
- c) A 350 watts single phase 50 Hz 220 V universal motor runs at 2000 rpm and takes a current of 1 Amp when supplied from 220 V DC Supply . If the motor is connected to 220 Volts A C Supply, it takes 1 Amp current. Calculate the speed torque and power factor when operated on A C supply. Assume resistance of motor (R_m) = 20 ohms and inductance of motor (L_m) = 0.4 H. [8]

- Q7)** a) Draw phasor diagram of single phase capacitor start induction motor. [3]
- b) With neat diagram explain working of Permanent capacitor induction motor. State any two applications of this motor. [6]
- c) A 220 V single phase induction motor gave following test results-
Blocked rotor test: 120 V 9.6 A 460W
No load test :220 V 4.6 A 125 W
The stator winding resistance is 1.5 ohm. During the blocked rotor test the starting winding is open. Determine the equivalent circuit parameters. Also find the core friction and windage losses. [8]

OR

- Q8)** a) Draw Torque Vs Speed characteristics of single phase induction motor on the basis of double revolving field theory. What is net torque at starting? [3]
- b) With suitable diagram explain blocked rotor test performed on single phase capacitor start induction motor. Draw its equivalent circuit under blocked rotor conditions. [6]
- c) A 230 V 1 kW 4 pole 50 Hz single phase induction motor has the following parameters: $R_1 = 2.2$ ohm, $X_1 = 3$ ohm, $R'_2 = 3.8$ ohm, $X'_2 = 2.1$ ohm, the total magnetizing reactance $X_m = 86$ ohm. Calculate - Current, power factor, input power, and efficiency at slip $s = 0.06$. [8]



Total No. of Questions : 8]

SEAT No. :

PD4268

[Total No. of Pages : 2

[6403]-64

T.E. (Electrical Engineering)

**ELECTRICAL INSTALLATION, DESIGN AND CONDITION
BASED MAINTENANCE**

(2019 Pattern) (Semester - V) (303144)

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) List and explain the various advance tools and techniques of condition monitoring. **[6]**

b) Explain motor current signature analysis (MCSA) with suitable diagrams. **[8]**

c) State and explain various failure modes in a transformer. **[4]**

OR

Q2) a) What is maintenance? State its importance and its advantages. **[4]**

b) Explain following Terms: **[6]**

i) Role of thermography in electric field

ii) State the basic causes of insulation degradation

c) Explain Dissolved Gas Analysis. **[8]**

Q3) a) Write short notes on Guidelines for inviting tenders. **[3]**

b) Write short notes on the following: **[6]**

i) Schedule of rates

ii) Labour rates

c) What are the qualities of good estimator? **[8]**

OR

Q4) a) Write short notes on Price catalogue. **[3]**

b) What are the essentials of estimating and costing? **[6]**

c) State the general factors to be considered in estimation of LT lines. **[8]**

P.T.O.

- Q5)** a) Write short note on Minimum permissible size of the conductor. [4]
b) How to determine size of conductor for lines. [6]
c) Explain various residential wiring methods. [8]

OR

- Q6)** a) Write down all rules for residential wiring work. [4]
b) Write short notes on the following: [6]
i) Current carrying capacity
ii) Voltage drop
c) Explain the procedure of installation of underground LT service line. [8]

- Q7)** a) List the different methods for earth testing. Explain any one method in detail with suitable diagram. [9]
b) Explain IE Act and Statutory Regulations for Electrical Safety. [8]

OR

- Q8)** a) Enumerate the danger arising out of faulty equipment with appropriate examples. [9]
b) Classify different hazardous areas and its effect on human body. [8]



Total No. of Questions : 8]

SEAT No. :

PD4269

[Total No. of Pages : 3

[6403]-65

T.E. (Electrical)

ADVANCED MICROCONTROLLER AND EMBEDDED SYSTEM

(2019 Pattern) (Semester - V) (303145A) (Elective - I)

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) List out timers used for CCP module in PIC18F458. Also explain CCP registers used in detail. **[8]**

b) Write embedded C program to generate PWM of 5KHz with 40% duty cycle and Prescaler N=4. **[9]**

OR

Q2) a) Draw CCP1CON and list the steps involved in programming PIC18F458 microcontroller in PWM mode. **[8]**

b) How DC motor speed control is achieved using PWM mode of CCP module of PIC18F458. **[9]**

Q3) a) Write a short note on interrupt structure of PIC18F458 microcontroller. **[9]**

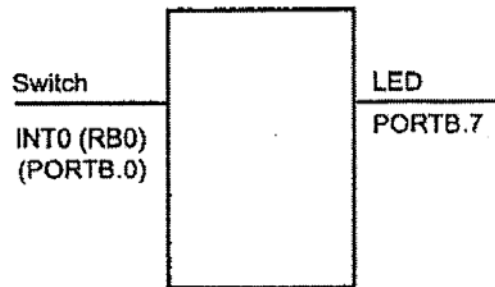
b) Assuming crystal frequency = 10MHz, write a program in C language to generate square wave form with a frequency of 25kHz on PORTB.4. Use timer 0 in 8bit mode without a prescaler. **[9]**

OR

P.T.O.

Q4) a) Enlist Interrupt registers in PIC18F458. Explain any two. **[9]**

b) Write a C Program for PIC18 toggle the LED connected to pin7 of the PORT B every time INT0 is activated by a switch connected at INT0(RB0). Assume XTAL=10MHz. **[9]**



Q5) a) Explain in detail the function of following flags related to on board ADE of PIC microcontroller: **[8]**

i) ADIF

ii) Go/Done

iii) ADFM

iv) ADON

b) With the help of interfacing diagram and flow chart, explain how PIC microcontroller can be used to measure temperature using LM35 sensor. **[9]**

OR

Q6) a) Explain features of on-board ADC of PIC18F458. Also explain in detail the functions of ADIF and ADFM bits. **[8]**

b) Draw a neat diagram and flow chart, explain AC voltage measurement using PIC microcontroller. **[9]**

Q7) a) Write a C program for the PIC18 to transfer the message “A” serially at 9600 baud, 8-bit data, 1 stop bit. Do this continuously. Assume XTAL=10MHz. **[9]**

b) List the steps for programming PIC18 to receive the data serially. **[9]**

OR

Q8) a) Compare serial and parallel data transfer. Also list the registers associated with transmission and reception modes of USART. **[9]**

b) Explain the SPBRG register uses. Also find the value to be loaded in SPBRG register to have baud rate of 4800 and Fosc=10MHz. Assume asynchronous mode and low baud rate. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4270

[Total No. of Pages : 3

[6403]-66

T.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - V) (303145B) (Elective-I)

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 side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) State and prove the following properties of DTFT **[8]**

i) Time shifting

ii) Convolution

b) Using the definition determine the DTFT of the following sequences. If it does not exist say why: **[9]**

i) $\left(\frac{1}{3}\right)^n u(n)$

ii) $(3)^n u(n)$

iii) $(3)^{-n} u(n)$

OR

Q2) a) Explain the frequency response of first order system. **[8]**

b) Find the discrete-time Fourier transform of the following sequence and draw magnitude and phase plot. **[9]**

$$x(n) = \left(\frac{1}{2}\right)^n u(n)$$

P.T.O.

Q3) a) Define DFT and its existence. Also give the relation between Z transform and DFT. [8]

b) Find the DFT of the sequence $x(n) = \{-1, 2, -1, 2\}$. [9]

OR

Q4) a) Draw the structure of DIT-FFT algorithm for $N=8$. [8]

b) Find circular convolution of following two sequences. From circular convolution obtain linear convolution. [9]

$$x_1(n) = \{1, 2\} \text{ and } x_2(n) = \{-1, -1, -1\}$$

Q5) a) Compare FIR and IIR filters. [6]

b) For the analog transfer function $H(s) = \frac{2}{(s+2)(s+1)}$. Determine $H(z)$ using impulse invariance method. Assume $T=1$ sec. [6]

c) Explain realization of IIR digital filters using cascade structure. [6]

OR

Q6) a) Obtain direct form-I realization for the system described by the difference equation. [6]

$$y(n) = \frac{1}{2}y(n-1) - \frac{1}{3}y(n-2) + x(n) + \frac{1}{4}x(n-1)$$

b) Explain mapping of s-domain to z-domain using Bilinear Transformation. [6]

c) Compare analog and digital filters. [6]

Q7) a) Design an ideal low pass filter with frequency response **[12]**

$$H_d(e^{j\omega}) = 1 \text{ for } \frac{-\pi}{2} \leq \omega \leq \frac{\pi}{2}$$

$$H_d(e^{j\omega}) = 0 \text{ otherwise}$$

Find the values of $h(n)$ for $N=7$

b) Explain any one method used to measure voltage using DSP. **[6]**

OR

Q8) a) Obtain direct form realization of system function. **[6]**

$$H(z) = 1 + z^{-1} + 6z^{-3} + 3z^{-5}$$

b) With diagram explain application of DSP in protective relaying. **[6]**

c) Write short note on “Application of DSP for measurement of power system frequency”. **[6]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4271

[Total No. of Pages : 3

[6403]-68

T.E. (Electrical)

POWER SYSTEM - II

(2019 Pattern) (Semester - VI) (303148)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Use of calculator is allowed.
- 3) Assume suitable data if necessary.

- Q1)** a) Show that in transformer the per unit impedance of referred to primary and secondary is same. [8]
- b) Determine the missing elements of the following Ybus matrix. [8]

$$Y_{BUS} = \begin{vmatrix} -j20 & j5 & j10 & ? \\ ? & -j25 & ? & ? \\ ? & j20 & ? & j10 \\ ? & ? & ? & ? \end{vmatrix}$$

OR

- Q2)** a) i) The transmission line impedance is $0.1 + j0.2$ Ohm/km. If the length of line is 150km, what is the per unit impedance of the line on the base of 200MVA, 10kV?
- ii) The impedance of a 200MVA, 10kV/200kV transformer referred to primary is $(2 + j4)$ Ohm. What is the per unit impedance of the transformer referred to secondary?
- iii) The per unit base on primary side of the transformer is 100MVA, 10kV. The rating of the transformer is 150MVA, 11kV/220kV. What is the base MVA and kV to be taken on secondary side of the transformer?
- iv) A 100MVA, 11 kV alternator has reactance 10% on its own rating. What is the percentage reactance of alternator on 50MVA, 22kV base? [8]
- b) Derive the generalize power flow equations for “n” bus power system. [8]

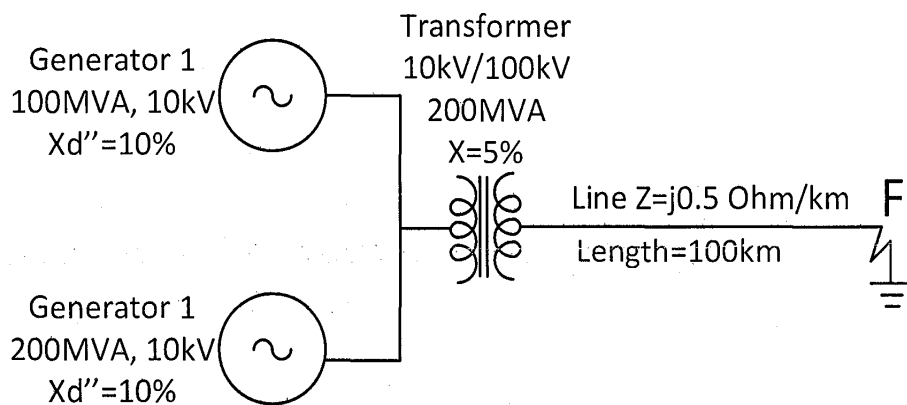
P.T.O.

Q3) Let all phases of an alternator is short circuited at its terminal: [18]

- Draw the waveform of fault current showing sub transient, transient and steady state period. [3]
- From above diagram comment on time period sub transient, transient and steady state period. [3]
- Draw the reactance diagram and write its formula for sub transient, transient and steady state period. [3]
- If the damper winding reactance is $j0.1$ pu, field winding reactance is $j0.2$ pu, armature reactance is $j0.3$ pu and leakage reactance is $j0.5$ pu. Calculate sub-transient, transient and steady state reactance. [3]
- Justify that the fault current under sub transient period is more than transient and steady state period. [3]

OR

- Q4)**
- Show that when an alternator (or RL circuit) is shorted at its terminal derive the formula for maximum possible fault current to be supplied by the alternator? [8]
 - Determine the fault current and fault MVA when the three phase fault is occurred at point F in following: [10]



- Draw per unit impedance diagram with generator 1 rating as a base. [3]
- Find the per unit impedance upto fault point. [2]
- Fault current in kA. [3]
- Fault current supplied by each generator in kA. [2]

- Q5) a)** Derive the equation of fault current in case of LLG fault. [9]
b) In a three phase circuit the phase voltages and currents are given as [9]

$$V_a = 100\angle 0^\circ \text{ V}, V_b = 100\angle -110^\circ \text{ V}, V_c = 100\angle 110^\circ \text{ V}$$

$$I_a = 10\angle -30^\circ \text{ A}, I_b = 10\angle -140^\circ \text{ A}, I_c = 11\angle 80^\circ \text{ A}$$

Calculate :

- Symmetrical component voltages of phase a
- Symmetrical component currents of phase a
- Complex power using symmetrical components

OR

- Q6) a)** Draw the zero sequence impedance diagram for following connections of transformer [9]

- Delta-Star
- Star-Star secondary neutral with solid ground
- Delta-delta

- b)** A double line to ground fault is occurred at a star connected 100MVA, 11kV alternator terminal. The sequence impedance of the alternator are $x_1 = j0.2 \text{ pu}$, $x_2 = j0.1 \text{ pu}$ and $x_0 = j0.05 \text{ pu}$. Calculate. [9]

- Fault current in kA if neutral is solidly grounded. [4]
- Fault current in kA if neutral is grounded with $j0.2$ reactance. [5]

- Q7) a)** Draw the single line diagram of a HVDC system showing all components with proper labels. Explain the working of any three components used in HVDC transmission. [9]

- b)** Write a short note on Monopolar and Bipolar HVDC transmission line. [9]

OR

- Q8)** Write short note on any three of the following in details : [18]

- Constant Current control in HVDC
- Constant Extinction Angle Control in HVDC
- Multi terminal HVDC
- HVDC line in Maharashtra



Total No. of Questions : 8]

SEAT No. :

PD4272

[Total No. of Pages : 3

[6403]-69

T.E. (Electrical)

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

(2019 Pattern) (Semester - VI) (303149)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explain the procedure to estimate the no load current of a three phase transformer. [6]
- b) Explain the mechanical forces developed under short circuit condition in a transformer. [6]
- c) A 600 KVA, 6600/400 V, 50Hz, three phase core type transformer has: Width of LV winding = 3 cm , Width of HV winding = 3 cm , width of duct between LV and HV = 2 cm, height of HV and LV windings = 40cm, length of mean turns = 1.5 m, HV winding turns = 220, $\mu_0 = 4\pi \times 10^{-7}$ H/m. Estimate the leakage reactance of the transformer referred to the HV side. [6]

OR

- Q2)** a) Explain the procedure for the calculation of core losses in the three phase transformer. [6]
- b) Draw the generalized flow chart of computer aided design of a transformer [6]
- c) A 6600 V, 60 Hz, single phase transformer has a core of sheet steel. The net cross sectional area is $22.6 \times 10^{-3} \text{ m}^2$. The mean length is 2.23m. There are four lap joints and each joint takes one fourth times as much reactive mmf as it is required per meter of core. Flux density is 1.1 Wb/m². Find the number of turns on the 6600 V winding and the no load current. Assume the amplitude factor as 1.52, mmf/m = 232 A /m, specific loss = 1.76 W/ kg and density = 7.5×10^3 Kg/m³. [6]

P.T.O.

- Q3) a)** Find the main dimensions of a three phase, 10 KW, 400 V, 50 Hz, 4 pole squirrel cage induction motor. Assume the following data : efficiency = 0.85 power factor = 0.86, specific magnetic loading = 0.4 wb/m², specific electric loading = 20,000 A/m , winding factor = 0.955 and rotor peripheral speed = 20 m/sec. [10]
- b) Explain the constructional features of a three phase induction motor. [7]

OR

- Q4) a)** Determine the main dimensions of a 250 H.P three phase, 50 Hz, 400 V, 1410 rpm ,4 pole, slip ring Induction motor. Assume the following data: efficiency = 0.9, power factor = 0.9, specific magnetic loading = 0.5 wb/m², specific electric loading = 30,000 A/m , winding factor = 0.955, ratio of core length to core pitch = 1.2. The motor is delta connected. [10]
- b) Derive the output equation of a three phase induction motor and also state the significance of the terms involved. [7]

- Q5) a)** Derive the expression for end ring current in induction motor. [10]
- b) Discuss the various constraints in the selection of suitable combination of stator and rotor slots. [8]

OR

- Q6) a)** A 11 KW, three phase, 6 pole, 220 V, star connected induction motor has 54 stator slots , each having 9 conductors . Calculate the values of bar and end ring current and also the bar and end ring sections if the number of rotor bars is 64, efficiency = 0.86, power factor = 0.85 , rotor mmf = 85% of stator mmf, current density = 5 A/mm². [10]
- b) Discuss the various factors which affect the choice of length of air gap for a three phase induction motor. Why generally the air gap should be as small as possible. [8]

- Q7)** a) With the help of neat sketches explain the different types of leakage fluxes in an induction motor. (any two) [5]
- b) A 75 KW, 3300 V, 50 Hz, 8 pole, three phase, star connected induction motor has magnetizing current which is equal to 35% of full load current. Calculate the value of stator turn per phase if the mmf required for flux density at 60° from pole axis 500 A, winding factor = 0.95, efficiency = 0.94, power factor = 0.86. [5]
- c) Explain the procedure to find out MMF required for air gap, stator teeth, stator core of an induction motor. [7]

OR

- Q8)** a) Draw the generalized flow chart of computer aided design of three phase induction motor. [5]
- b) State and explain the various losses that occur in a three phase induction motor. [5]
- c) Explain the procedure to calculate the magnetizing current of an induction motor. [7]



[6403]-70

T.E. (Electrical Engineering)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - VI) (303150) (Term-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7 or Q8.
- 2) Use of electronic calculator is permitted.
- 3) Assume suitable data, if necessary.

Q1) a) Explain any four rules for construction of root locus. [8]

b) Sketch root locus for given OLTF $G(s)H(s) = \frac{K}{s(s+4)(s^2+2s+2)}$.
 Determine marginal value of K and comment on stability. [10]

OR

Q2) a) Explain Routh's Hurwitz criterion for stability. Explain special cases of Routh's criterion. [8]

b) Using Routh's Hurwitz Criterion for stability determine range of values of K for the system to be stable. Determine frequency of sustained

oscillations from that $G(s) = \frac{K}{s(s+4)(s^2+s+1)}$, $H(s) = 1$. [10]

Q3) a) Explain correlation between frequency domain and time domain. [7]

b) Sketch Polar plot for the system given. Also determine GM and PM

$G(s) = \frac{50}{s(s+3)(s+6)}$. [10]

OR

Q4) a) Explain Nyquist stability criterion, general nyquist contour for system with pole at origin. [7]

b) Sketch the nyquist plot, for given system and comment on stability

$G(s) = \frac{10}{s(s+2)(s+3)}$. [10]

P.T.O.

Q5) a) Sketch bode diagram showing GM, PM for i) stable system ii) unstable system iii) marginally stable system. [6]

b) Draw bode plot for a unity feedback system with $G(s)$ given as. Also find

GM, PM and comment on stability of system $G(s) = \frac{160}{(s+2)(s+20)}$. [12]

OR

Q6) a) Explain terms gain cross over frequency, phase cross over frequency, gain margin and phase margin in Bode plot. [6]

b) Draw bode plot for a unity feedback system with $G(s)$ given as. Also find

GM, PM and comment on stability of system $G(s) = \frac{20(s+5)}{s(s+10)}$. [12]

Q7) a) Derive transfer function of armature controlled DC servo motor. [8]

b) Using Ziegler Nicholas method design a PID controller for a system with

unity feedback and $G(s) = \frac{1}{s(s+2)(s+5)}$. [9]

OR

Q8) a) Derive transfer function of Lead network, its pole zero plot and key features. [8]

b) Explain P, PI, PID controller with reference to their expression, block diagram, advantages and shortcomings. [9]



Total No. of Questions : 8]

SEAT No. :

PD4274

[Total No. of Pages : 2

[6403]-71

T.E. (Electrical)

CYBERNETICS ENGINEERING

(2019 Pattern) (Semester - VI) (303151C) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer any one question from each pair of questions: 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) Explain the terms transfer function, poles, zero and pole-zero plot. [6]
- b) How optimal control is different from adaptive control? [6]
- c) What do you mean by multivariable control system? Give example. [6]

OR

- Q2)** a) Draw the block diagram of adaptive control system and explain. [6]
- b) Compare linear and nonlinear control system. [6]
- c) Explain the different types of nonlinearities in the nonlinear system. [6]

- Q3)** a) Explain the components of the electrical system used in mathematical modeling. [6]
- b) How the linearization of the nonlinear system is carried out? [6]
- c) What is the significance of the differential equations of the physical system? [5]

OR

P.T.O.

- Q4)** a) Explain the use of software tools in mathematical modeling. [6]
b) How to get the solution of ordinary differential equation using ODE solver? [6]
c) Obtain the representation of separately excited DC motor using linear ordinary differential equations. [5]

- Q5)** a) Write short note on computer architecture. [8]
b) Explain system components for embedded and industrial applications.[10]

OR

- Q6)** a) What are various analog and digital interface? [8]
b) How data communication is carried out in the industrial environment?[10]

- Q7)** a) Define optimization. List out at least five applications of optimization.[7]
b) Explain particle swarm optimization method using example. [10]

OR

- Q8)** a) Write statement of an optimization problem. [7]
b) Explain Genetic Algorithm using example. [10]

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Total No. of Questions : 8]

SEAT No. :

PD4275

[Total No. of Pages : 2

[6403]-72

T.E. (Electrical)

**IOT AND ITS APPLICATIONS IN ELECTRICAL ENGINEERING
(2019 Pattern) (Semester - VI) (303151A) (Elective - II)**

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) 2 LEDs - LED1 and LED2, are connected to digital pin No. 2 and 6 of Arduino UNO respectively. Write a program to blink these LEDs continuously, with a delay of 2 sec. While blinking, LED1 will glow with 80% brightness and LED2 should glow with 30% brightness. **[10]**

b) What is a serial monitor in Arduino IDE? Explain any 4 functions in detail with respect to serial monitor. **[8]**

OR

Q2) a) Write a program in Python to accept lower and upper limit of a range of numbers from user and print all the odd numbers in that range. **[10]**

b) Write a short note on Arduino Integrated Development Environment (IDE). **[8]**

Q3) a) Write a program to read data from LM 35 temperature sensor and display it on serial monitor every 30 seconds, using Arduino IDE. Sensor is connected to D2 pin of NodeMCU. **[9]**

b) Write a short note on sound sensors. **[8]**

OR

P.T.O.

Q4) a) Draw in detail an interfacing diagram of a dc motor through L293D with nodeMCU and explain in brief the working. **[9]**

b) What is an IR sensor ? Explain its working principle and various types. **[8]**

Q5) a) State and explain salient features of Zigbee communication technology. **[9]**

b) Discuss 6LoWPAN communication technology, on the basis of features, advantages, security and interoperability. **[8]**

OR

Q6) a) Describe salient features of Bluetooth communication technology. **[9]**

b) Compare Wi-Fi, BLE and Zigbee communication technology. **[8]**

Q7) a) With a suitable block diagram, explain one IoT application of Home Automation. **[10]**

b) State and explain the steps in reading the sensor data and sending it to cloud platform. **[8]**

OR

Q8) a) Write a simple html code to create a web page and display the heading “IoT Applications” and two buttons - START and STOP. The background colour of the webpage should be light green and display should be centrally aligned. **[10]**

b) What is meant by Data Visualization ? Explain in short, any 4 techniques of data visualization. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PD4276

[Total No. of Pages : 2

[6403]-73

T.E. (Electrical)

ELECTRIC MOBILITY

(2019 Pattern) (Semester - VI) (303151B) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Draw block diagram of Battery Management System and explain it. **[8]**

b) Explain Constant current charging algorithm used in battery charging. **[9]**

OR

Q2) a) Explain functions of battery management system. **[8]**

b) Explain Coulomb Counting method used in SOC estimation. **[9]**

Q3) a) Draw block diagram for vehicle speed control system and explain it. **[10]**

b) Draw schematic diagram of series HEV drive train and explain its working. **[8]**

OR

Q4) a) Draw Control Architecture of HEV and all electronic control systems. **[10]**

b) Draw schematic diagram of parallel HEV drive train and explain its working. **[8]**

P.T.O.

- Q5) a)** Draw charger Architecture and explain it. **[8]**
- b) Explain Advantages of PMSM drives for HEV. **[9]**

OR

- Q6) a)** Explain sizing of motors and charging levels-01,02 and 03. **[8]**
- b) Write short note on battery swapping. **[9]**

- Q7) a)** Draw and explain block diagram of interactive operation between EVs and Power grid. **[10]**
- b) Draw block diagram of Home control and vehicle control in V2H and explain it. **[8]**

OR

- Q8) a)** Draw Flowchart for EV Charging Infrastructure and explain it. **[10]**
- b) Explain V2G concept and state advantages of V2G. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PD4277

[Total No. of Pages : 2

[6403]-74

T.E. (Electrical)

ENERGY MANAGEMENT

(2019 Pattern) (Semester - VI) (303151 D) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Why Demand side management is essential? Discuss the advantages of Demand Side Management? [9]
- b) Discuss avenues under supply side management. [9]

OR

- Q2)** a) What are the benefits of load curve manipulations? Explain with suitable examples load curve manipulation tools? [9]
- b) How renewable energy sources help in demand management? Discuss with suitable examples. [9]

- Q3)** a) Elaborate steps in detailed energy Audit. How data analytics is useful in Energy Audit? [9]
- b) In a company on production shop data for man hours and corresponding productivity in units is collected. Obtain a simple straight line fit for all data points by using least square method. [8]

Man hours	3.6	4.8	7.2	6.9	10.7	6.1	7.9	9.5	5.4
Productivity (in units)	9.3	10.2	11.5	12	18.6	13.2	10.8	22.7	12.7

OR

- Q4)** a) What is Executive summary? Explain in detail. Give some bench marking energy performances commonly used in industries. [9]
- b) What is Sankey diagram? Discuss with suitable examples. How these are useful in audit? [8]

P.T.O.

- Q5) a)** During energy audit it is recommended to replace 200 HP induction motor with energy efficient motor for energy saving. On the basis on following data calculate payback period for replacement of old motor with energy efficient motor. Take cost of electricity is Rs 7/kWh. The demand charges Rs. 450/kVA per month. [9]

Description	Old motor	Energy Efficiency Motors
Rating of machine	200 HP	200 HP
Operating hours per annum	6800	6500
Efficiency near full load	89%	94%
Power factor near full load	0.85 lag	0.92 lag
Capital cost	--	Rs. 750000/-
Scrap value	Rs. 150000/-	--

- b) Discuss energy audit case study for sugar industry. [9]

OR

- Q6) a)** Calculate net present value for an investment of Rs. 650000 for retrofit. The energy savings realised for five years are Rs. 100000, Rs. 125000, Rs. 150000, Rs. 200000 and Rs. 250000/- With discounting factor is 10% judge the economic feasibility of the project. [9]

- b) Explain with suitable example break even analysis. How it is different from others? [9]

- Q7) a)** Enumerate energy conservation options in refrigeration and air conditioning systems. [9]

- b) Energy saving opportunities in boiler and auxiliaries. [8]

OR

- Q8) a)** Discuss Energy Conservation options in Textile industry. [9]

- b) Explain the method for adequacy assessment for illumination system. What inferences can be drawn after assessment? [8]



Total No. of Questions : 8]

SEAT No. :

PD4278

[Total No. of Pages : 2

[6403]-75

T.E. (Electronics)

POWER AND INDUSTRIAL ELECTRONICS

(2019 Pattern) (Semester - V) (304201) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain Power factor improvement techniques for controlled rectifiers. **[9]**
b) Explain Single Phase PWM Rectifier using IGBT. **[9]**

OR

- Q2)** a) Give an Overview of applications of Controlled rectifies in DC drives. **[9]**
b) Draw and explain three phase full converter for R Load. **[9]**
- Q3)** a) Explain Working principle of step down chopper for R-L load with waveforms. Derive the expression for average output voltage. **[9]**
b) A type-A chopper has input dc voltage of 200V and a load of $R = 10$ Ohm in series with $L = 80\text{mH}$. If load current varies linearly between 12A and 16A, find the time ratio $T_{\text{on}}/T_{\text{off}}$ for this chopper. **[8]**

OR

- Q4)** a) Explain fly-back converter (SMPS) with circuit diagram and its appropriate waveforms. **[9]**
b) A step-up chopper has input voltage of 220V and output voltage of 660V. If the non-conducting time of thyristor chopper is 100 Micro seconds, compute the pulse-width of output voltage. In case the pulse-width is halved for constant frequency operation, find the new output voltage. **[8]**

P.T.O.

- Q5) a)** Explain performance parameters of Voltage Source Inverters. **[9]**
- b) Write a short note on PWM inverter. **[9]**

OR

- Q6) a)** Draw and explain Three phase Inverter for RL Load, 180 degree conduction mode. **[9]**
- b) Explain Single phase full bridge inverter for R-L loads with waveforms in details. **[9]**

- Q7) a)** Draw and explain online UPS with neat diagram. **[9]**
- b) Draw and explain battery charger. **[8]**

OR

- Q8) a)** Explain application of power electronics in induction heating. **[9]**
- b) Explain performance parameters of battery. **[8]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4279

[Total No. of Pages : 2

[6403]-76

T.E. (Electronics)

ELECTROMAGNETIC WAVES AND PROPAGATION THEORY
(2019 Pattern) (Semester - V) (304202)

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, and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of smith chart and calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) State Maxwell's equations in point form for free space. [6]
b) For a lossy dielectric, $\sigma = 5 \text{ S/m}$ and $\epsilon_r = 1$, the electric field intensity is $\vec{E} = 100 \sin(10^{10} t) \text{ V/m}$. Find J_C , J_D and frequency at which both have equal values. [6]
c) Explain Displacement current and displacement current density. [6]

OR

- Q2)** a) State Maxwell's equations in point/integral form for time varying field. [6]
b) Write Maxwell's equations for static fields in point integral form. [6]
c) Find amplitude of displacement density in free space within a large power distribution transformer where, $\vec{H} = 10^6 \cos(377 t + 1.2566 \cdot 10^{-6} z) \hat{a}_y \text{ A/m}$ [6]

- Q3)** a) Derive wave equations for free space. [6]
b) An electric field in free space is given by $E_y = e^{j(2\pi \times 10^9 t - \beta x)} \mu \text{V/m}$. [8]
i) Find the direction of propagation
ii) Phase Velocity
iii) Phase constant
iv) Propagation constant
c) Calculate skin depth at 60Hz and 6Hz. [4]

OR

P.T.O.

- Q4)** a) Derive wave equations for losses dielectric medium. [8]
 b) Derive expression of intrinsic impedance and depth of penetration in good conductor. [8]
 c) Find the velocity of a plane wave in a lossless medium having $\epsilon_r = 5$ and $\mu_r = 1$. [2]

- Q5)** a) What is transmission line. Explain types of transmission line and its applications. [10]
 b) Explain primary parameters associated with transmission line. [7]

OR

- Q6)** a) What is characteristics impedance. Explain in detail. [4]
 b) For transmission line terminated to Z_o , prove that $Z_o = \sqrt{Z_{oc} Z_{sc}}$. [6]
 c) Calculate characteristic impedance Z_o for given line parameters $R = 10.4K\Omega$, $G = 0.8 \times 10^{-6} \Omega^{-1}/Km$, $L = 0.00367H/Km$, $C = 0.0085\mu/Km$. [7]

- Q7)** a) What is waveguide? Explain its types and applications. [6]
 b) Write advantages and disadvantages of Waveguide. [4]
 c) Explain structure of rectangular waveguide. Explain cut-off frequency, cut-off wavelength and Guide wavelength in waveguide. [7]

OR

- Q8)** a) Compare TE and TM modes of waveguides. [4]
 b) Explain types of cavity resonators with diagrams : Regulated, unregulated and co-axial cavity resonators. [7]
 c) An air filled circular waveguide with $a = 2.5cm$ is excited in domain mode at 12GHz. Calculate f_c , λ_g and Z_{TE} . [6]



Total No. of Questions : 8]

SEAT No. :

PD-4280

[Total No. of Pages : 2

[6403]-77

T.E. (Electronics / Electronics & Telecommunication Engineering)

DATA BASE MANAGEMENT

(2019 Pattern) (Semester - V) (304183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat Diagram must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Figure to the right indicates full marks.*

- Q1) a)** Explain the use of constraints in SQL. List and explain any three constraints with example. [7]
- b) What are different types of joins in SQL? Explain any one with suitable example. [6]
- c) Explain with example any two STRING functions used in SQL. [5]

OR

- Q2) a)** What are some common clauses used with SELECT query in SQL? Explain any two with example. [7]
- b) What is Cursor? Explain Implicit and Explicit cursor in PL/SQL with suitable example. [6]
- c) Explain the use of TRUNCATE, DELETE and DROP statements in SQL? Explain any one with example. [5]

- Q3) a)** Explain briefly different states of transaction with a neat state transition diagram. [6]
- b) Define transaction. State and explain in brief the ACID properties of a transaction? [5]
- c) When deadlock occurs? How to prevent them? How to recover if dead lock occurs. [6]

P.T.O.

OR

- Q4)** a) Explain the term i) Conflict Serializability ii) View Serializability [6]
b) What is Concurrent execution of transaction? Explain any two concurrency problems occurs during Concurrent execution of transaction with examples? [5]
c) Explain Commit and Rollback operations of Transactions. [6]

- Q5)** a) What are performance parameters for parallel database? [6]
b) Explain virtualization on Multicore processors with neat schematic diagram. [6]
c) What is Parallelism? Explain Inter query parallelism. [6]

OR

- Q6)** a) List the parallel database architectures and explain any one architecture. [6]
b) Explain Oracle Database Architecture. [6]
c) Explain client server architecture with suitable example. [5]

- Q7)** a) Explain Homogeneous and Heterogeneous Distributed Databases. [6]
b) Explain Fragmentation and Replication in Distributed data storage. [6]
c) What is distributed transaction? Explain failure modes of distributed transaction. [6]

- Q8)** a) What is necessity of distributed database management system? What are the Factors Encouraging DDBMS. [6]
b) Explain two phase commit protocol in distributed database. [6]
c) Draw and explain client-server architecture for DDBMS. [6]



Total No. of Questions : 8]

SEAT No. :

PD4281

[Total No. of Pages : 2

[6403]-78

T.E. (Electronics Engineering)
MICROCONTROLLERS AND APPLICATIONS
(2019 Pattern) (Semester - V) (304204)

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) Draw interfacing of Buzzer with 8051 microcontroller also write an embedded C program to turn on and off the Buzzer. **[6]**
- b) Explain the TCON (timer control) register of timer of 8051 microcontroller in detail. **[6]**
- c) Draw interfacing diagram of DAC 0808 with 8051 microcontroller, write an embedded C program to generate following waveform. **[8]**
- i) Triangular waveform
 - ii) Sine waveform
 - iii) Square waveform

OR

- Q2)** a) Draw interfacing of relay with 8051 microcontroller also write an embedded C program to turn on and off the relay with same delay. **[6]**
- b) List features of timer in 8051 microcontroller. Explain mode 1 of timer in 8051 microcontroller with neat diagram. **[6]**
- c) Draw interfacing diagram of Temperature sensor (LM35) with 8051 microcontroller using ADC 0808/0809. Write an Embedded C program for the same. **[8]**

- Q3)** a) Explain different register of PIC18 microcontroller. **[8]**
- i) Working register
 - ii) Bank Select Register
 - iii) File Select Registers (FSRs)
- b) Define addressing modes. Explain various addressing modes of PIC18FXXX microcontroller with example. **[8]**

OR

P.T.O.

- Q4) a)** Draw and explain the block diagram of Timer 1 of PIC18Fxx microcontroller in 16-bit mode. Also write the steps to program it in 16 bit mode. **[8]**
- b)** Explain the following instructions of PIC18FXX microcontroller. **[8]**
- i) RRCF
 - ii) MOVWF
 - iii) SWAPF
 - iv) SUBLW

- Q5) a)** Explain Capture, Compare and PWM mode operation of PIC18F458. **[8]**
- b)** Draw LCD interfacing diagram to PIC18FXXX and write embedded C program to display message “WELCOME” on second/first line. **[8]**

OR

- Q6) a)** Interface internal ADC of PIC18Fxx microcontroller and write an Embedded C program to convert analog to digital signal. **[8]**
- b)** Draw interfacing of 4×4 matrix keyboard with PIC18fxx and write algorithm to detect key pressed. **[8]**

- Q7) a)** Draw and explain frequency counter using 8051 microcontroller. Also write algorithm for the same. **[9]**
- b)** Draw and explain water level monitoring and control using PIC18FXXX microcontroller. Also write algorithm for the same. **[9]**

OR

- Q8) a)** Draw and explain digital multimeter using 8051 microcontroller. Also write algorithm for the same. **[9]**
- b)** Draw and explain block diagram of data acquisition system for temperature measurement using any one microcontroller. Also write algorithm for the same. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4282

[Total No. of Pages : 2

[6403]-79

T.E. (Electronics) (E & TC Engineering)

FUNDAMENTALS OF JAVA PROGRAMMING

(2019 Pattern) (Semester - V) (304185 (c)) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Describe different types of inheritance in Java. Explain syntax of hierarchical inheritance. **[9]**

b) What is abstract class in Java? How it is used in Java program? Explain with suitable example. **[9]**

OR

Q2) a) Write a Java program to create a player class. Use the concept of inheritance and create cricket player and Hockey player classes from the player class. **[9]**

b) Explain difference between method overloading and method overriding. Also provide example of each. **[9]**

Q3) a) What are the ways to access a package from another package? Explain with suitable programming example. **[9]**

b) What is an interface in Java? Compare interface and class in Java. **[8]**

OR

Q4) a) Explain the need of an interface in Java. With suitable example, explain how to create and use an interface. **[9]**

b) What is a package? With the help of suitable example, explain how to create a package. **[8]**

P.T.O.

- Q5) a)** What is life - cycle of an applet? Explain with suitable diagram. **[9]**
- b)** With suitable programming examples, explain the terms try, catch and finally. **[9]**

OR

- Q6) a)** What is an exception in Java? Why exceptions occur in a Java program? Explain with suitable example. **[9]**
- b)** Explain the concept of single threaded and multithreaded program in Java. Also explain the difference between multiprocessing and multithreading. **[9]**

- Q7) a)** Explain the use of File class in Java. What are the different methods in Java File class? **[9]**
- b)** Write a Java program using AWT to create one button and add it on the Frame object inside the main () method. **[8]**

OR

- Q8) a)** Explain the hierarchy of AWT package in Java. **[9]**
- b)** What are byte stream and character stream in Java? Explain. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4283

[Total No. of Pages : 2

[6403]-80

T.E. (Electronics Engineering)

COMPUTER NETWORKS

(2019 Pattern) (Semester - V) (304205) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt all the Questions out of Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) What is significance of data link layer? Explain the design issues of data link layer. **[10]**

b) What are various types of error detection methods? **[8]**

OR

Q2) a) Explain in detail about broadcast and multi-casting routings. **[10]**

b) Compare simple and transparent bridges. **[8]**

Q3) a) What is format of IPv4 header? Describe significance of each field. **[9]**

b) Explain distance vector routing algorithm with an example. **[8]**

OR

Q4) a) Classify the static and dynamic routing algorithms? Explain the basic concept of flooding. **[9]**

b) Illustrate the shortest path routing algorithm with suitable example? **[8]**

Q5) a) What is DNS? What resource records are associated with it? Explain. **[10]**

b) Write about electronic mail in detail. **[8]**

OR

Q6) a) What are the five basic functions supported in e- mail systems? Explain. **[10]**

b) How name servers are managed in DNS? **[8]**

P.T.O.

- Q7)** a) Explain how network security can be achieved? [9]
b) What are the different classes of UTP? Explain. [8]

OR

- Q8)** a) Explain in detail about the real time transport protocol. [9]
b) What are the reasons for congestion? what are the problems with congestion? [8]



[6403]-81

T.E. (Electronic)

DATA COMMUNICATION

(2019 Pattern) (Semester - V) (304205) (Elective - 1)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Questions 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.

Q1) a) Obtain the code words for the (6,3) LBC which has the generator Matrix of [8]

$$\begin{matrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{matrix}$$

If code word $C=101110$ is Transmitted and received code word is $r = 001110$ obtain the correct code word.

- b)** Define the following with examples : [8]
- i) Code rate
 - ii) Hamming Distance
 - iii) Hamming Weight
 - iv) Code Vector

OR

Q2) a) The parity check bits of a (7, 4) block code are generated by [8]

$$C_5 = d_1 + d_2 + d_3$$

$$C_6 = d_1 + d_2 + d_3$$

$$C_7 = d_2 + d_3 + d_4$$

Where d_1, d_2, d_3 and d_4 are the message digits.

Find the generator matrix and parity check matrix for this code.

Find the minimum weight of this code.

Find error detecting capability of this code

- b)** Explain in detail Go back N and stop and wait ARQ system. [8]

P.T.O.

Q3) a) Define entropy. Show that the entropy is maximum when binary message has 50% probability of occurrences. **[9]**

b) Apply Huffman Coding procedure to find coding efficiency for the following symbols, **[9]**

$$S_1 = 1/3, S_2 = 1/27, S_3 = 1/3, S_4 = 1/9, S_5 = 1/9, S_6 = 1/27, S_7 = 1/27$$

OR

Q4) a) Apply Shannon Fano encoding scheme for given message ensemble, **[9]**

$$[X] = [x_1 \ x_2 \ x_3 \ x_4 \ x_5 \ x_6 \ x_7 \ x_8]$$

$$[P] = [1/4 \ 1/8 \ 1/16 \ 1/16 \ 1/4 \ 1/16 \ 1/8 \ 1/16]$$

b) Define with examples Information rate, entropy, mutual information, channel capacity. **[9]**

Q5) a) Explain QPSK with its Transmitter and Receiver. **[9]**

b) Explain ASK in detail with the help of transmitter and receiver block diagram and waveforms. **[9]**

OR

Q6) a) Explain FSK in detail with the help of transmitter and receiver block diagram. **[9]**

b) Explain M-ary PSK in detail with the help of transmitter and receiver block diagram with signal space and spectrum. **[9]**

Q7) a) With neat block schematic explain the FHSS transmitter and receiver. **[9]**

b) Compare FDMA, TDMA and CDMA. **[9]**

OR

Q8) a) Consider a Fast hop –SS system with binary FSK, 2 hops/symbol and a PN sequence with binary message 010010010000. The message is transmitted using following PN sequence {010, 110, 101, 100, 000, 101, 011, 001, 001, 111, 011.....} plot the output frequency for input message. **[9]**

b) Explain properties of PN sequence. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4285

[Total No. of Pages : 2

[6403]-82
T.E. (Electronics)
INSTRUMENTATION SYSTEMS
(2019 Pattern) (Semester - V) (304205) (Elective-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

Q1) a) Explain with neat sketch working principle of the following flow measurement techniques- **[8]**

- i) Pitot static tube
 - ii) Electromagnetic flow meter
- b) Explain working principle of capacitance probe type of level measurement technique. **[9]**

OR

Q2) a) Explain with neat sketch working principle of the following flow measurement techniques **[8]**

- i) Ultrasonic flow meter
 - ii) Hot wire anemometer
- b) Explain working principle of ultrasonic level measurement technique. **[9]**

P.T.O.

- Q3)** a) Explain working principle of following proximity sensors- [8]
- i) Inductive proximity sensors
 - ii) Capacitive proximity sensors
- b) Explain weight measurement technique using load cell and strain gauges. Draw a neat signal conditioning circuit for the strain gauge elements for weight measurement. [9]

OR

- Q4)** a) Explain the process of charge transfer in Charge Coupled Devices (CCD). [8]
- b) Explain with neat sketch working principle of incremental optical encoder. State its applications. [9]
- Q5)** a) Explain working principle of PZT actuators. State its applications. [9]
- b) Explain magneto-transistor and Magneto-Resistive Elements (MRE). [9]

OR

- Q6)** a) Write a short note on surface micromachining for MEMS devices. [9]
- b) Explain with neat sketch bulk micro-machined absolute pressure sensor. [9]
- Q7)** a) Explain pneumatic lift system using a poppet valves and pneumatic cylinder. [6]
- b) Explain any one type of electrical actuator. [6]
- c) Explain with neat graph control valve characteristics. [6]

OR

- Q8)** a) Explain transistorized driver circuit for electromechanical relay. [6]
- b) Explain control of double acting cylinder using an appropriate directional control valve. [6]
- c) Explain how actuators are classified. Explain any one type of actuators. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4286

[Total No. of Pages :2

[6403]-83

T.E. (Electronics)

MACHINE LEARNING

(304205) (2019 Pattern) (Semester - V) Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a) Explain in brief the Bayesian network for learning and inference. [9]
b) Explain forward and backward chaining in artificial intelligence. [8]

OR

- Q2) a) Explain various steps of Knowledge engineering process. [8]
b) Compare prepositional and first order logic. [9]

- Q3) a) Detail the Semantic analysis phase of Natural language Processing (NLP) and explain the challenges. [9]
b) What is ambiguity. Explain the different types of ambiguities in NLP with examples. [8]

OR

- Q4) a) Which are the probabilistic language models? List various probabilistic language modes. Explain any one in detail. [10]
b) What are the important elements of semantic analysis in NLP. [7]

- Q5) a) What is reinforcement Learning? What is meant by passive and active reinforcement learning explain with one example. [10]
b) In which scenarios are the active and passive RL techniques applicable. Compare and contrast between reinforcement learning and supervised learning. [8]

OR

P.T.O.

- Q6)** a) Explain the decision tree algorithm with suitable example. [9]
- b) Write short note on: [9]
- i) Inductive learning
 - ii) Information Gain
 - iii) Gini Index

Q7) What is fuzzy logic? Explain fuzzy semantics in artificial intelligence. What are pros and cons of fuzzy logic, the advantages and the disadvantages of FLC? [18]

OR

Q8) What do you understand by PWM controller? Explain Fuzzy Logic Implementation for Induction Motor Control. [18]



Total No. of Questions : 8]

SEAT No. :

PD4287

[Total No. of Pages : 2

[6403]-84

T.E. (Electronics)

FUNDAMENTALS OF HDL

(2019 Pattern) (Semester - VI) (304212)

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.

Q1) a) Explain the following data type in verilog : **[7]**

- i) Net
- ii) Parameters
- iii) Registers

b) Explain structure of verilog module with an example. **[7]**

c) What is verilog HDL? What are the major capabilities of verilog HDL? **[6]**

OR

Q2) a) With example write the syntax of always block. **[7]**

b) Explore modelling style in verilog. **[7]**

c) Explain in detail operators in verilog. **[6]**

Q3) a) Distinguish between interconnections among functional blocks in a CPLD and Programmable logic blocks in an FPGA. **[8]**

b) Explain the following terms related to CPLD : **[8]**

- i) Functional Blocks/PAL Blocks
- ii) I/O Blocks

OR

Q4) a) Explain salient features of Xilinx Xc 9500 family. **[8]**

b) Describe in brief types of FPGA technologies. **[8]**

P.T.O.

- Q5)** a) Write verilog code for 4 : 1 multiplexer using : [8]
- i) Data flow modeling
 - ii) Behavioral modelling
- b) Draw logic symbol with excitation table and write HDL code for 3 bit binary counter in any modeling style. [6]
- c) Compose verilog code for D Flip Flop. [4]

OR

- Q6)** a) Draw the logic block of 8 : 1 mwc. Write its truth table. Draw the schematic symbol of 8 : 1 mwc write VHDL code of 8 : 1 mwc by using concurrent statement “Case”. [8]
- b) Explain loop statements with two examples. [6]
- c) Compose verilog code for full adder. [4]

- Q7)** a) Write HDL description of a half adder using procedure and task. [8]
- b) What are the difference between procedure and task. [8]

OR

- Q8)** a) Explain task syntax with example. [8]
- b) Explain difference between task and function. [8]



Total No. of Questions : 8]

SEAT No. :

PD4288

[Total No. of Pages : 2

[6403]-85

T.E. (Electronics Engineering)

EMBEDDED PROCESSORS & APPLICATIONS

(2019 Pattern) (Semester - VI) (304213)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data if necessary.

- Q1)** a) Interface buzzer using relay with LPC 2148. Write an embedded C program to turn ON and OFF the buzzer with suitable delay. [6]
- b) Explain the functions of control signals of LCD display. [6]
- c) Explain the functions of Match register, Compare Register, capture register and Timer Match Control Register in timer of LPC 2148. [8]

OR

- Q2)** a) Interface LED's to P0.0 to P0.7 port pins of LPC2148. Write an embedded C program to blink LED's along with flowchart. [6]
- b) What is PLL? Explain the steps in PLL programming in LPC 2148. [6]
- c) Explain the functions of PLL registers of LPC 2148. [8]
- i) PLLCON
 - ii) PLLCFG
 - iii) PLLSTA
 - iv) PLLFEED

- Q3)** a) Draw architecture of UART0 of LPC 2148 and explain the functions of each block in brief Give the difference between UART0 and UART1. [8]
- b) Interface GSM module with LPC2148. Explain any four AT commands. Write an algorithm and draw flow chart for sending the message through GSM module. [8]

OR

P.T.O.

- Q4)** a) Explain ADCR (A/D Control Register), ADDR (A/D Data Register), ADGDR (A/D Global data register) and ADGSR (A/D Global start register) of ADC LPC 2148. [8]
- b) Write embedded C program and draw flow chart to generate triangular and square wave using on chip DAC LPC 2148. [8]

- Q5)** a) List the features of CORTEX M3 Processor. Explain operating modes of the ARM Cortex-M3 processor. [8]
- b) State the features and applications of ARM Cortex A, Cortex R, Cortex M Series processors. Give difference between ARM Cortex R and Cortex M Series. [8]

OR

- Q6)** a) Draw interfacing of CORTEX based controllers using CMSIS standard. Draw and explain the structure of CMSIS standard. [8]
- b) Compare ARM classical series and ARM Cortex series. State advantages of ARM Cortex series for embedded system design. [8]

- Q7)** a) What is IoT? State the importance of IoT. State the benefits of using IoT. [6]
- b) Explain case study of Waste Management for Smart City using IoT with detailed diagram. [6]
- c) Explain case study of Smart energy meter using IoT with detailed diagram. [6]

OR

- Q8)** a) Draw and explain Health Care Monitoring System using IoT. [6]
- b) What is embedded system? Explain the characteristics of embedded system. [6]
- c) Define Sensors and Actuators with suitable examples. Compare Sensors and Actuators. [6]



Total No. of Questions : 8]

SEAT No. :

PD4289

[Total No. of Pages : 2

[6403]-86

T.E. (Electronics)

INDUSTRIAL MANAGEMENT

(2019 Pattern) (Semester -VI) (304214) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) a) Discuss in details - The ISO - Quality Management System Standard.[9]

b) Elaborate Quality Management Assistance Tools. [9]

OR

Q2) a) Illustrate types of quality - quality of design, conformance and performance, phases of quality management. [9]

b) Elaborate Six sigma Quality Management Standards. [9]

Q3) a) What is Social Responsibility of Business? Explain in details. [9]

b) What are the different changing concepts of Business and Objectives of Business? [8]

OR

Q4) a) What is Business ethics? Explain the benefits of Business ethics. [9]

b) What is Social audit of business? Explain its importance. [8]

Q5) a) Write a short note on Services sector. [9]

b) Differentiate between Private sector and Cooperative Sector in details.[9]

OR

P.T.O.

- Q6)** a) Differentiate between Sole Proprietorship and Partnership firms in details. [9]
- b) Illustrate Joint stock companies - their features, relative merits, demerits & suitability. [9]

- Q7)** a) What is an Entrepreneur? Classify the types of entrepreneur according to different categories? [9]
- b) Describe the identification of business opportunities in details. [8]

OR

- Q8)** a) What is mean by business proposal? How to write business proposal, explain it step by step? [9]
- b) With respective source of finance for business explain below agencies, [8]
- i) Source of finance from government agencies
- ii) Source of finance from non-government agencies



Total No. of Questions : 8]

SEAT No. :

PD4290

[Total No. of Pages : 2

[6403]-87

T.E. (E&TC/Electronics)

ADVANCED JAVA PROGRAMMING

(2019 Pattern) (Semester - VI) (304195C) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve question Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Figures to the right indicate full Marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Explain about Sets, Sequence, and Map. **[9]**

- b) Develop a GUI which accepts the information regarding the marks of all subjects of a student in the examination. **[9]**

OR

Q2) a) What are AWT component? Explain some AWT component. **[9]**

- b) Write a program which stores the list of strings in an ArrayList and then displays the contents of the list. **[9]**

Q3) a) What is Prepared Statement? Write a Java Program to insert Student Name and Branch Name into Student table using Prepared Statement. **[8]**

- b) Write a program to insert and retrieve the data from the database using JDBC. **[9]**

OR

Q4) a) Explain the execution of SQL commands while handling the database. **[8]**

- b) What is a JDBC? Explain types of JDBC Driver. **[9]**

P.T.O.

- Q5) a)** Write a short note on: **[9]**
- i) RMI Registry.
 - ii) Naming and Directory Services
- b) Develop an RMI application which accepts a string or a number and checks that string or number is palindrome or not. **[9]**

OR

- Q6) a)** Explain the various methods of registering and gaining access to the remote object? **[9]**
- b) What is RMI? Explain with neat diagram the RMI Architecture. **[9]**
- Q7) a)** What is servlet? Explain with neat diagram Life cycle of a Servlet. **[8]**
- b) Explain InetAddress Class and factory method. Write a Java program to find the IP address of your machine. **[9]**

OR

- Q8) a)** Write a short note on : **[8]**
- i) java.net package
 - ii) Cookies
- b) Write a program to create a simple calculator application using servlet. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PD4291

[Total No. of Pages : 2

[6403]-88

T.E. (Electronics Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - VI) (304215(B)) (Elective - II)

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) *Assume suitable data, if necessary.*

Q1) a) An analog filter has transfer function $H(s) = \frac{1}{s+1}$ Using bilinear transformation, determine transfer function of digital filter $H(z)$. Write the difference equation of the digital filter. **[6]**

b) Write comparison between Butterworth, Chebyshev, and Elliptic filters. **[12]**

OR

Q2) a) Compare IIR and FIR methods for digital filter design. **[10]**

b) List various windows used in FIR filter design. Write mathematical expression and draw the frequency response of Rectangular, hamming and Blackman window. **[8]**

Q3) a) What is a finite length problem? Describe effects of it. **[6]**

b) Obtain direct form I and II realisation of a system described by. **[12]**

$$Y(n) = 2b \cos(\omega_0) y(n-1) - b^2 y(n-2) + x(n) + 0.5x(n-1)$$

OR

P.T.O.

Q4) a) Draw parallel realization of **[10]**

$$H(z) = (1 + 2Z^{-1} + Z^{-2}) / (1 - 0.75Z^{-1} + 0.125Z^{-2})$$

b) Compare between Butterworth polynomial and Chebyshev polynomial. **[8]**

Q5) a) Draw a block diagram of decimator. Explain the working of a decimator with the help of waveforms. Explain the role of antialiasing filter. **[8]**

b) Draw block diagram of interpolator with interpolation factor 2 followed by decimator with factor 3. Draw waveforms for input and output waveforms assuming an arbitrary data at input. **[10]**

OR

Q6) a) List applications of Multirate DSP. Explain any one application in detail with appropriate block diagram and waveform. **[8]**

b) What do you understand by Multirate DSP? What is need for multirate DSP? Explain types of multirate DSP based on sampling rate. What are the challenges in multirate DSP? **[10]**

Q7) a) Draw neat block diagram and explain general architecture of DSP. **[8]**

b) Explain the architecture of DSP processor TMS320C54XX series. Draw a generalized block diagram. Mention the key features of the series. **[8]**

OR

Q8) a) What is the need for separate architecture of DSP? Elaborate the need with proper explanation. **[8]**

b) List various applications of DSP in biomedical engineering. Explain any one application in detail by drawing a neat block diagram and appropriate waveforms. **[8]**

x

x

x

Total No. of Questions : 8]

SEAT No. :

PD-5304

[Total No. of Pages : 2

[6403]-89

T.E. (Electronics Engineering)

E MOBILITY

(2019 Pattern) (Semester - VI) (304215) (Elective - II)

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) Use of logarithmic tables slide rule, Electronic pocket Calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1)** a) Explain the working principle of a hydraulic energy storage system. What are its advantages in grid-scale energy storage? What are the key factors affecting their efficiency and deployment? [9]
- b) Describe the principle of operation of a flywheel energy storage system. What are its main components? What are its advantages and limitations in grid and transportation applications? [8]

OR

- Q2)** a) Describe the construction and working principle of a lead-acid battery. What are its advantages, limitations, and applications? [9]
- b) Describe the construction and working principle of a metal-air battery. What are its advantages, limitations & applications? [8]
- Q3)** a) Describe the principle of inductive (wireless) charging for electric vehicles. How is power transferred without direct contact? [9]
- b) Compare conductive and inductive charging methods for EVs. Explain the function and benefits of using a soft-switching power converter in inductive EV charging systems. [8]

OR

P.T.O.

Q4) a) Explain the charge equalization in EV battery packs? Explain its significance and describe methods used to maintain uniform charge distribution among battery cells. **[9]**

b) Draw and explain a basic conductive charger circuit used for charging EV batteries. Highlight its components and their functions. **[8]**

Q5) a) Describe the Tesla charging connector system. How does it differ from other standards, and what are the implications of Tesla opening its standard to other EVs? **[9]**

b) Define a “move-and-charge zone.” How does it work, and what are its potential benefits for urban EV users? **[9]**

OR

Q6) a) Describe the different types of EV charging connectors. How are they categorized based on charging type (AC/DC) and region? **[9]**

b) Explain the North American EV plug standards for both AC and DC charging. Give examples of connectors used and their technical specifications. **[9]**

Q7) a) What is IEEE 802.15.4, and how does it support communication in Advanced Metering Infrastructure (AMI)? Discuss its features, topology, and limitations. **[9]**

b) What is Power Line Carrier Communication? Discuss its operation, benefits, and challenges in implementing AMI over existing power lines. **[9]**

OR

Q8) a) Discuss the use of IEEE 802.11 standards (Wi-Fi) in AMI systems. What are the advantages and limitations compared to other wireless protocols? **[9]**

b) Explain the 6LoWPAN protocol. How does it enable IPv6 communication over low-power wireless networks in AMI systems? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4292

[Total No. of Pages : 2

[6403]-90

T.E. (Electronics Engg.)

FIBER OPTIC COMMUNICATION

(2019 Pattern) (Semester - VI) (Elective - II) (304215)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve question Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Figures to the right side indicate full Marks.
- 3) Assume the suitable data, if necessary.

- Q1)** a) Explain the various factors responsible for optical signal attenuation and dispersion while propagating through optical fiber. [8]
- b) A continuous 12 km long optical fiber link has a loss of 1.5 dB/km. [10]
- i) What is the minimum optical power level that must be launched into the fiber to maintain as optical power level of 0.3 μ W at the receiving end.
 - ii) What is the required input power if the fiber has a loss of 2.5 dB/km

OR

- Q2)** a) Compare and contrast single mode step index fiber, multi mode step index fiber and multimode graded index fiber. Also sketch the index profile for each of the above fiber. [8]
- b) Determine the maximum bit rate for RZ and NRZ encoding for the following pulse-spreading constants and cable lengths : [10]
- i) $\Delta t = 10$ ns/mm, $L = 100$ m
 - ii) $\Delta t = 20$ ns/m, $L = 1000$ m
 - iii) $\Delta t = 2000$ ns/km, $L = 2$ km

- Q3)** a) With a schematic diagram explain the working of optical receiver. [9]
- b) With the schematic representation and energy band diagram explain the working of a PIN photodiode. [8]

OR

P.T.O.

- Q4) a)** Describe the working principle of LASER along with condition for light amplification. Explain the process of absorption, Spontaneous emission and Stimulated emission with respect to LASER. [9]
- b)** The radiative and non radiative recombination life times of minority carriers in the active region of a double heterojunction LED are 60 nsec and 90 nsec respectively. Determine the total carrier recombination life time and optical power generated internally if the peak emission wavelength is 870 nm and the drive current is 40 mA. [8]

- Q5) a)** With a neat diagram, describe the working of an Erbium doped fibre amplifier. [9]
- b)** Describe 2×2 fiber coupler and its various losses. Explain the operational principle and implementation of WDM. [9]

OR

- Q6) a)** Write short notes on the following : [9]
- Optical LAN
 - Optical amplifiers.
- b)** Write a short note on subcarrier multiplexing [9]

- Q7) a)** With the help of block diagram, explain link power Budget for an optical power loss model of a point to point link [9]
- b)** An optical fiber system is to be designed to operate over an 8 km length without repeaters. The rise time of chosen components are : [8]
- Source (LED) : 8ns
 Fiber: Intermodal : 5ns/km
 (Pulse broadening) Intra modal : 1ns/km
 Detector (P-I-N photodiode) : 6ns
- From system rise time consideration, estimate the maximum bit rate that may be achieved on the link when using an NRZ format. Estimate the maximum bit rate that may be achieved on the link when using an NRZ format and RZ format.

OR

- Q8) a)** In order to design a simplex point-to-point fiber optic link, what are all the choices available with regard, to the components and their associated characteristics? Discuss. [9]
- b)** Write short notes on : [8]
- Optical power budget
 - Rise time budget



Total No. of Questions : 8]

SEAT No. :

PD-4293

[Total No. of Pages : 2

[6403]-91
T.E. (Electronics)
PLC & Automation
(2019 Pattern) (Semester - VI) (304215) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Develop a ladder diagram for NAND and NOR gates. **[6]**
- b) Develop a ladder diagram for a motor START - STOP system. **[6]**
- c) List various brands of PLCs and their programming features. **[6]**

OR

- Q2) a)** Explain a programmed Timer function in PLC application w.r.t **[6]**
- i) Simple Timer ii) Accumulated Timer
- b) Construct a boolean equation that implement considering the variables the following event in Oven System. **[6]**
- i) FAN will be turned on when the HEATER is ON or when the temperature is above the limit & door is closed.
- ii) The light is turned ON if light switch is ON or if door is opened.
- c) Design ladder logic for a system controlling a liquid level for a set value using timer and comparison instructions. **[6]**

P.T.O.

Q3) a) How will you protect PLC from Electrical noise, voltage variation & surge? Explain with diagram [9]

b) Write short note on program Editing & commissioning of PLC. [8]

OR

Q4) a) Extend your view on trouble shooting of a PLC system for [9]

i) Leaky inputs & outputs

ii) Circuit protection & wiring

b) How will you Trouble shoot processor module Input & output malfunctions. [8]

Q5) a) Explain ON-OFF control system in detail with diagram. [9]

b) Explain motion control system in detail. [9]

OR

Q6) a) Explain SCADA system in detail. [9]

b) Explain with diagram RTU & MTU [9]

Q7) a) Explain in detail types of communication interface. [8]

b) Explain with diagram working of control net. [9]

OR

Q8) a) Explain with diagram working of device net. [8]

b) Explain three - axis robot control using PLC [9]



Total No. of Questions : 8]

SEAT No. :

PD4294

[Total No. of Pages : 2

[6403]-92
T.E. (E & TC)
DIGITAL COMMUNICATION
(2019 Pattern) (Semester - V) (304181)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers any one question out of Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1) a)** Explain the working of minimum shift keying (MSK), modulator and demodulator with the help of block diagram and waveform. **[8]**
- b)** What is Inter Symbol Interference (ISI)? Explain Causes of ISI. **[9]**

OR

- Q2) a)** Compare M-ary PSK and M-ary QAM. **[8]**
- b)** What is OFDM? Draw and Explain block diagram of generation and reception of the OFDM. **[9]**
- Q3) a)** What is PN sequence? Explain properties of PN sequence. **[9]**
- b)** The bit duration in DS SS BPSK communication system is 4 ms and chipping rate is 1 Mbps. Considering average error probability of $P_e = 10^{-5}$ for detecting the message signal, calculate the processing gain and Jamming margin Assume $Q(4.25) = 10^{-5}$ **[9]**

OR

- Q4) a)** Write a short note on following. **[9]**
- i) Slow FHSS
 - ii) Fast FHSS
- b)** Explain DSSS BPSK System in detail. **[9]**

P.T.O.

- Q5) a)** What is Entropy and Mutual Information, and What are a properties of Entropy and Mutual Information. **[8]**
- b) A discrete source transmits messages x_1 and x_2 with probability $\frac{3}{4}$ and $\frac{1}{4}$. The source connected to the binary symmetrical Channel with $p(y_1/x_1) = 2/3$. Calculate all entropies and mutual information. **[9]**

OR

- Q6) a)** Compare Shannon-Fano and Huffman coding techniques **[8]**
- b) Apply Huffman coding for the following message ensemble.
 $X = [x_1 \ x_2 \ x_3 \ x_4 \ x_5 \ x_6 \ x_7]$
 $P = [0.45 \ 0.15 \ 0.1 \ 0.1 \ 0.08 \ 0.08 \ 0.04]$ and find coding efficiency. **[9]**

- Q7) a)** For a systematic linear block code, (7,4) the parity matrix is given by $[110;011;111;101]$ **[9]**
- i) Construct Generator Matrix
- ii) Find code vectors for messages 1100, 0011
- iii) If the received code vector $R = 01111101$, find corrected codeword.
- b) Define and Explain following terms **[9]**
- i) Hamming distance
- ii) Hamming weight
- iii) Code rate
- iv) Constraint length
- v) Generator polynomial

OR

- Q8) a)** Draw the encoder and syndrome calculator for the generator polynomial $g(x) = 1 + x^2 + x^3$ and obtain the syndrome for the received codeword 1 0 0 1 0 11 **[9]**
- b) Explain Properties of Linear Block code and Cyclic Code with example. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4295

[Total No. of Pages : 2

[6403]-93

T.E. (E & TC Engineering)

ELECTROMAGNETIC FIELD THEORY

(2019 Pattern) (Semester - V) (304182)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Derive the boundary conditions of the normal and tangential components of electric field at the inter face of two media with different dielectrics.

[6]

b) Derive boundary conditions for dielectric material.

[6]

c) A region $y \geq 0$ consists of a dielectric medium and the region $y < 0$ is a conductor. For surface charge of 4nC/m^2 on the conductor and $\epsilon_r1 = 3$ (for dielectric medium). Find E' and D' at the points :

[6]

i) $M(4, -2, 1)$

ii) $N(-3, 1, 4)$

OR

Q2) a) Two extensive homogeneous isotropic dielectrics meet on plane $z = 0$, for $z \geq 0$, $\epsilon_r1 = 4$ and $z \leq 0$, $\epsilon_r2 = 3$. A uniform electric field $E' = 5ax' - 2ay' + 3az'$ kV/m exists for $z \geq 0$. Find :

[10]

i) $E2'$ for $z \leq 0$

ii) Angles $E1$ and $E2$ make with interface

iii) The energy densities in J/m^3 in both dielectrics.

b) Derive an expression for capacitance of a spherical capacitor.

[8]

Q3) a) State and Explain Displacement Current Density and Displacement Current. Explain Physical Significance of displacement current.

[8]

b) Calculate displacement current through parallel plate air filled capacitor having plates if area 10cm^2 separated by a distance 2 mm connected to 300 V, 1 MHz source

[8]

OR

P.T.O.

- Q4) a)** State and Explain Faraday's Law and Lenz's Law [8]
b) Write Maxwell equation for free space in point form and integral form. [8]

- Q5) a)** Derive the wave equation (Helmoltz Equation) for free space in terms of electric field. [8]
b) Derive the parameters of propagation constant, phase constant, intrinsic impedance, and velocity for free space medium. [10]

OR

- Q6) a)** Explain the terms Depth of penetration and Loss tangent in detail. [8]
b) Explain the Incidence, reflection and transmission parameters for normal incidence with suitable diagram and derive the terms Transmission coefficient and Reflection coefficient. [10]

- Q7) a)** Explain different distortions of transmission lines? What is mean by distortion less line and explain the condition of distortion less lines? [8]
b) Derive the equations for primary constants (R, L, G, C) if known the secondary constant (γ , Z_0). [10]

OR

- Q8) a)** Explain the following terms in detail with respect to open, short and matched terminations of transmission Lines. [8]
i) Reflection Coefficient
ii) Return Loss
iii) VSWR
b) A lossless 100Ω transmission line is terminated in an impedance $50 + j60\Omega$. Using smith chart calculate : [10]
i) VSWR
ii) Reflection coefficient
iii) Impedance of 0.35λ from the load.



Total No. of Questions : 8]

SEAT No. :

PD4296

[Total No. of Pages : 2

[6403]-94
T.E. (E&TC)
MICROCONTROLLERS
(2019 Pattern) (Semester - V) (304184)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw and explain the block schematic of PIC18F4550 MCU unit. [6]
b) Explain functions of ALU in PIC18F4550 with example. [6]
c) Explain the criteria for choosing PIC18F184550 Microcontroller. [6]

OR

- Q2)** a) State features of PIC18F4550. [6]
b) Explain PSW of PIC18F4550. [6]
c) Draw and explain the data memory organization of PIC18F4550. [6]

- Q3)** a) Draw and explain the Timer 0, 8bit operation of PIC18F4550 compare the Timer 0,1, and 2. [9]
b) Write a program for 2.5 KHz and 50 % duty cycle PWM generation with N=4. fosc=10MHz. [8]

OR

- Q4)** a) Write program to generate delay of 10 ms using timer1, 16 bit and no prescaler. [9]
b) Explain in details capture mode of PIC18F4550. [8]

- Q5)** a) Explain step wise procedure and design methodology of PIC18F4550 test board. [6]
b) Draw an interfacing diagram of LCD with PIC18F4550 and explain function of RS and EN. [6]
c) Draw port structure of PIC18F4550 with SFRs used in programming. [6]

OR

P.T.O.

- Q6)** a) Draw an interfacing diagram of LEDs connected to port B of PIC 18F4550 and write an embedded C program for BCD counter.[6]
b) Draw an interfacing diagram of 4×4 matrix keyboard and explain the concept of key detection. [6]
c) Draw an interfacing diagram of Home protection system with LED, Key, Motion Sensor, LCD, buzzer and relay connected to various port lines.[6]
- Q7)** a) State features of SPI bus and compare RS232 and RS 485. [9]
b) State features of EEPROM, draw an interfacing diagram with PIC18F4550. [8]

OR

- Q8)** a) State features of RTC, draw an interfacing diagram with PIC18F4550. Write initialization program. [9]
b) Draw and explain block diagram of UART receiver. [8]



Total No. of Questions : 8]

SEAT No. :

PD4297

[6403]-95

[Total No. of Pages : 2

T.E. (Electronics & Telecommunication Engineering)
COMPUTER NETWORKS
(2019 Pattern) (Semester - V) (Elective - I) (304185(D))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the various performance parameters of network Layer. [6]
b) Explain the services provided by Network Layer. [6]
c) Compare datagram switching and virtual circuit switching. [6]

OR

- Q2)** a) Explain error reporting messages, informational messages, neighbor discovery messages and group membership messages related to ICMPv6. [6]
b) Explain network id and host id. [6]
c) What is difference between classless addressing and classfull addressing related to IPv4 addresses? [6]

- Q3)** a) Explain unicast routing and multicast routing protocol. [9]
b) What is routing? Explain the distance vector routing algorithm. [8]

OR

- Q4)** a) What is routing? Explain the link state routing algorithm. [9]
b) Explain inter-domain and intra-domain routing. [8]

P.T.O.

- Q5)** a) Explain TCP services and its features with relevant diagram. [9]
b) Explain various transport layer quality of services parameters. [8]

OR

- Q6)** a) Explain TCP connection establishment using three way handshaking.[9]
b) Explain UDP protocol and its features with relevant diagram. [8]

- Q7)** a) Explain the DNS in detail. [6]
b) Explain FTP protocol. [6]
c) Explain simple mail transfer protocol. [6]

OR

- Q8)** a) Explain internet message access protocol. [6]
b) Explain how DNS server works. [6]
c) Explain dynamic host configuration protocol. [6]

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Total No. of Questions : 8]

SEAT No. :

PD4298

[Total No. of Pages : 2

[6403]-96

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - V) (304185(A)) (Elective - I)

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) Your answers will be valued as a whole.
- 5) Use logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

Q1) a) $x(n) = \{1, 2, 1, 2\}$ & $h(n) = \{1, -1, 2, 1\}$. Compute circular convolution using DFT-IDFT method. [6]

b) Compute 4-points DFT of the sequence given by $x(n) = (-1)^n$ using DIT FFT algorithms. [4]

c) Compute the 8-point DFT of the sequence $x(n) = \left\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0\right\}$ using Radix-2 DIF algorithm. Follow exactly the corresponding signal flow graph and keep track of all the intermediate quantities by putting them on the diagrams. [8]

OR

Q2) a) Bring out the difference between DFT and FT with suitable examples. [6]

b) Draw a flow graph of DIF of 8 point DFT computation. [6]

c) Determine sequence $x(n)$ from its DFT; $X(k) = \{4, 1 - j, -2, 1 + j\}$. [6]

Q3) a) The system function of the analog filter is given as,

$H_a(s) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$. Obtain the system function of the IIR digital filter by using impulse invariance method. [10]

b) Explain the impulse invariance method of IIR filter design. What is the drawback? [8]

OR

P.T.O.

Q4) a) The system function of the analog filter is given as,
$$H_a(s) = \frac{s + 0.1}{(s + 0.1)^2 + 16}$$
 Obtain the system function of the digital filter

using bilinear Transformation method which is resonant at $\omega_r = \frac{\pi}{2}$. [10]

- b) What is warping effect? What is the effect on magnitude and phase response. [4]
- c) Compare the impulse invariance and bilinear transformation methods. [4]

Q5) a) What are the advantages and disadvantages of FIR filter? [8]

- b) What is Gibb's phenomenon? Explain the need of window function in design of FIR filter. [9]

OR

Q6) a) Compare FIR and IIR filters. [6]

- b) Explain the designing of FIR filters using windows. [4]

- c) Realize the following system function in Cascade form.

$$H(z) = 1 + \frac{3}{4}z^{-1} + \frac{17}{8}z^{-2} + \frac{3}{4}z^{-3} + z^{-4} \text{ in Direct Form.} \quad [7]$$

Q7) a) How the DSP is useful in speech processing? Explain any application of speech processing using DSP. [8]

- b) Explain real time application of DSP in medical field with example. [9]

OR

Q8) a) Write a short note on application of DSP for ECG signal analysis. [9]

- b) What is Spectrogram? What are their types? Explain its significance and application. [8]



Total No. of Questions : 8]

SEAT No. :

PD4299

[6403]-97

[Total No. of Pages : 2

T.E. (E & TC Engineering)

ELECTRONICS MEASUREMENTS

(2019 Pattern) (Semester - V) (304185-B) (Elective - I)

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 the suitable data wherever necessary.*

- Q1)** a) Explain the operation of Audio generator with block diagram. [8]
b) Draw block diagram of random noise generator & explain with wave forms. [9]

OR

- Q2)** a) Explain : [8]
i) Rise time
ii) Fall time
iii) Overshoot
iv) Pulse repetition rate
b) Explain Sweep frequency generator with the help of block diagram. [9]

- Q3)** a) Explain DSO with neat diagram. List its applications. [9]
b) Explain 2-modulation with diagram. [9]

OR

- Q4)** a) Explain power oscilloscope with neat diagram & list its application. [9]
b) Write a note on : [9]
i) Delay Sweep CRO
ii) Sampling CRO

P.T.O.

Q5) a) With help of diagram, explain LEO display. List its applications. [8]

b) Explain universal counter with diagram. List its application. [9]

OR

Q6) a) Write note on EIA and TIA. [8]

b) Why recorders are essentials? With neat diagram explain x-y plotter. [9]

Q7) a) What are different automatic test equipments? Explain one with diagram. [9]

b) Explain vector analyser with diagram. List its applications. [9]

OR

Q8) a) What is EMI/EMC testing? Why it is necessary. Explain EMI/EMC. [9]

b) Write a note on : [9]

i) Spectrum analyzer

ii) Industrial revolution & impact on industrial automation



Total No. of Questions : 8]

SEAT No. :

PD4300

[Total No. of Pages : 4

[6403]-98

T.E. (E & TC)

CELLULAR NETWORK

(2019 Pattern) (Semester - VI) (304192)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer questions from 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) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Compare 1G to 5G on following parameters only? **[5]**

- i) Data Bandwidth
 - ii) Technology used
 - iii) Multiplexing Technique used
 - iv) Switching technique used
 - v) Core network used
- b) Draw GSM system architecture along with different interfaces used and function of each interface? **[6]**
- c) Draw and explain following terms - **[6]**
- i) Co-channel Interference
 - ii) Adjacent channel Interference

OR

Q2) a) Write following characteristics parameters of GSM standard : **[6]**

- i) Uplink frequency band
- ii) Down link frequency band
- iii) Bandwidth per channel
- iv) Number of possible simultaneous calls
- v) Modulation used
- vi) Access method used

P.T.O.

- b) In the context of optimizing cellular network performance, consider a scenario where a network consists of 20 clusters, each containing 5 cells, each cell equipped with 15 channels for communication. Determine number of channels per cluster and calculate the total channel capacity for entire network. [5]
- c) Consider frequency reuse factor $N = 7$, for a system that requires S/I ratio of 18 dB, calculate worst case of signal to Noise ratio, Also justify whether $N = 7$ is an acceptable limit for cochannel interference? [6]

- Q3)**
- a) Write a short note on Teletraffic system model. [5]
 - b) In a wireless signal propagation with cell radius $d = 10$ km, height of Transmission antenna of 40 m, height of receiving antenna = 2 m Temperature $T = 293^\circ\text{K}$, Noise figure of 5 dB, Bandwidth = 30 kHz, gain of receiving antenna = 10 dB, cable losses are 3 dB, gain of transmitting antenna is 10 dB, Margin = 10 dB and $\text{SNR}_{\text{req}} = 30$ dB. Calculate the transmit power required through link budget analysis with consideration of level of interference equal to noise power. Assume carrier frequency of 6 GHz and $a(\text{hre}) = 1.04$ dB for large city. [8]
 - c) Describe state transition diagram for the system with N channels. [5]

OR

- Q4)**
- a) Calculate load offered to network by 20 subscribers with total duration of calls are 3600 seconds, If observation period of 20 minutes. [5]
 - b) Write a short note on - [8]
 - i) Blocking probability
 - ii) Loss call system assumptions

- c) Define the following - [5]
- i) Traffic Intensity
 - ii) Peak Busy Hour
 - iii) Grade of Service
 - iv) Erlang
 - v) Relation between Erlang - CCS-CS-CM

- Q5)** a) Draw and explain : General Packet Radio Service used in 2.5G Technology. [6]
- b) Draw and explain Architecture of LTE System? [6]
- c) Compare LTE and LTE-A on following parameters : [6]
- i) Peak data rate
 - ii) Modulation used
 - iii) Peak spectrum efficiency
 - iv) Network architecture
 - v) Access Technology
 - vi) Channel Bandwidth

OR

- Q6)** a) Draw & explain 3G-UMTS Architecture? [6]
- b) Draw and explain LTE-A Radio Protocol Architecture. [6]
- c) Draw and explain open wireless architecture of 5G network. [6]

Q7) a) Define QoS? Explain in brief following parameters : **[9]**

i) Throughput

ii) Latency

iii) Jitter

iv) Packet loss

v) Reliability

vi) Availability

b) Write short note on - **[8]**

i) Application layer

ii) Network Layer

iii) MAC Layer

iv) Physical Layer

OR

Q8) a) Draw and explain how to do performance evaluation of the system. **[5]**

b) Define QoE? Explain in brief following parameters. **[9]**

i) Peak signal to Noise ratio

ii) Structural similarity

iii) Video quality metric

iv) Mean opinion score

c) Short note on Layered Analysis. **[3]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4301

[6403]-99

T.E. (E & TC)

PROJECT MANAGEMENT

(2019 Pattern) (Semester - VI) (304193)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, 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) Write a note on Change Management. **[5]**

b) Explain the principles involved in conflict management. **[6]**

c) Enlist various organisational structures? Explain any one of them in detail. **[6]**

OR

Q2) a) Write a note on team management. What is its significance. **[5]**

b) What is the need of diversity management and explain it in detail. **[6]**

c) State various leadership styles and explain any two in brief. **[6]**

Q3) a) Explain the Project Evaluation and Review Technique. **[6]**

b) Write a note on project budget. **[6]**

c) Explain the following with respect to Network diagram : ES, LS, critical path, float, total float and slack. **[6]**

OR

P.T.O.

- Q4)** a) Explain the critical path method. [6]
 b) Explain the resource allocation in project management. [6]
 c) A project has the following time schedule. [6]

Activity	Time in Week	Activity	Time in Week
(1-2)	4	(5-7)	8
(1-3)	1	(6-8)	1
(2-4)	1	(7-8)	2
(3-4)	1	(8-9)	1
(3-5)	6	(8-10)	8
(4-9)	5	(9-10)	7
(5-6)	4		

Construct the network diagram and compute :

- ES, EF and LS, LF for each event
- Float for each activity
- Critical path and its duration

- Q5)** a) Write a note on project management tool : JERA. [6]
 b) Explain the process of risk management. [6]
 c) What is significance of conducting feasibility studies in finance management. [6]

OR

- Q6)** a) Write a note on project management tool : TRELLO. [6]
 b) Explain the process of project financial management. [6]
 c) Write a note on Risk analysis. [6]

- Q7)** a) Write short note on : [5]
 i) Trade marks
 ii) Licensing
 b) Identify the characteristics of successful entrepreneurs. [6]
 c) Describe product development process. [6]

OR

- Q8)** a) Write short note on : [5]
 i) Copyright
 ii) Trade secret
 b) Define the factors impacting emergence of entrepreneurship. [6]
 c) Describe in detail about entrepreneurship process. [6]



Total No. of Questions : 8]

SEAT No. :

PD4302

[Total No. of Pages : 2

[6403]-100

T.E. (E & TC Engineering)

POWER DEVICES & CIRCUITS

(2019 Pattern) (Semester - VI) (304194)

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 and waveforms must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of nonprogrammable calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1)** a) Draw a three phase inverter for balanced star R load? Explain its operation of 120° mode with gate signals & output waveforms. [12]
- b) Compare 120° mode with 180° mode in three phase bridge inverter. [5]

OR

- Q2)** a) Explain working of single phase full bridge inverter for R load with input & output waveforms. Derive an expression for rms o/p voltage. [8]
- b) Compare freewheeling diode with feedback diode. [5]
- c) What is mean by harmonics in inverters? Explain how harmonics can be reduced. [4]

- Q3)** a) Draw circuit diagram of step up chopper and derive an expression for its output voltage. [8]
- b) Explain various control strategies in DC chopper. [4]
- c) Compare step up & step down choppers. [6]

OR

- Q4)** a) Explain with neat diagram the operation of 4 quadrant chopper with dc motor as a load. [9]
- b) Input to the step up chopper is 200V. The output required is 600 V. If the conducting time of thyristor is 200 μ sec. Calculate: [9]
- i) Chopping Frequency
 - ii) If the pulse width is halved for constant frequency operation, find new output voltage.

P.T.O.

- Q5)** a) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. [8]
- b) Explain the role of heat sink? Draw its thermal equivalent circuit. [5]
- c) What are various EMC standards? Explain any two. [4]

OR

- Q6)** a) What is the need of resonant converter? Explain ZVS resonant converter with circuit & waveforms. [8]
- b) What are different over voltage protection techniques in power electronics? Explain any one in detail. [5]
- c) Compare resonant converters: ZVS with ZCS. [4]

- Q7)** a) Explain various performance parameters of batteries in battery operated power systems. [6]
- b) Explain with suitable circuit diagram working of a LED driver. [6]
- c) Explain working of electronic ballast with block schematic. [6]

OR

- Q8)** a) Draw & explain single phase full wave ac voltage controller for resistive load with o/p voltage waveforms. [6]
- b) Explain with neat diagram variable voltage type three phase induction motor drive. [6]
- c) Explain operation of Off-line UPS with block schematic. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4303

[Total No. of Pages : 2

[6403]-101

T.E. (E &TC)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester - VI) (Elective- II) (304195-A)

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) Your answers will be valued as a whole.
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

- Q1) a)** Explain Image segmentation using. **[6]**
- i) Region growing.
 - ii) Region Splitting.
- b)** With the help of suitable masks, explain the following. **[6]**
- i) Point detection.
 - ii) Line detection.
- c)** Explain the following edge-detecting operators in detail. **[6]**
- i) Prewitt operator
 - ii) Sobel operator

OR

- Q2) a)** What is edge detection? Compare the performance of first-order & second order derivative w.r.t. image. **[6]**
- b)** Explain the Laplacian edge detector. Explain Why the LoG mask is preferred over the Laplacian edge detector. **[6]**
- c)** What is Image thresholding? Explain Local, global, and adaptive thresholding. **[6]**

P.T.O.

- Q3)** a) What is data redundancy? Explain the redundancies used in image compression. [5]
b) What is the need of image compression? Explain an image compression model. [6]
c) Draw and explain JPEG base line encoder. Comment on block size used in JPEG. [6]

OR

- Q4)** a) What is lossy compression technique? Explain the DCT-based compression technique. [6]
b) Explain the need for fidelity criteria in Image compression. Write any two fidelity measures. [5]
c) Explain the concept of motion estimation with the help of any one algorithm in detail. [6]

- Q5)** a) Explain estimating the degradation function for image restoration. [6]
b) Compare in detail image enhancement and image restoration. [6]
c) Explain image restoration process with help of block diagram. [6]

OR

- Q6)** a) State noise models, Explain any one in detail. [6]
b) Explain how the Wiener filter is used in image restoration. [6]
c) Explain any three Geometric transforms in image restoration. [6]

- Q7)** a) What is a pattern in images? Explain the different pattern classes in object recognition. [6]
b) What are the methods of object recognition? Explain the recognition based on decision-theoretic methods. [6]
c) Explain in detail deep learning using CNN. [5]

OR

- Q8)** a) Explain any one algorithm of content-based image retrieval. [6]
b) Write a short note on the following structural methods. [6]
i) Matching shape numbers.
ii) String matching.
c) Explain any one application of image processing as object recognition in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4304

[Total No. of Pages : 2

[6403]-102

T.E. (E &TC)

EMBEDDED PROCESSORS

(2019 Pattern) (Semester - VI) (Elective- II) (304195)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q1 OR Q2, Q3 OR Q4, Q5 OR Q6, Q7 OR Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1) a)** Draw an Interfacing diagram of GSM-UART module with LPC2148 and write an initialization program to send a message. **[9]**
- b)** State features of ADC in LPC2 148, draw an interfacing diagram to display the sensed temp on LCD with initialization program. **[9]**

OR

- Q2) a)** Explain UART module of LPC2148. Write an embedded C program to transmit character 'A' to PC. **[9]**
- b)** Draw an interfacing of DHT 11 with LPC2148. Write algorithm to display temperature and humidity. **[9]**

OR

- Q3) a)** Compare Cortex processors over ARM7 for embedded system design. Enlist the features and applications of Cortex processors. **[9]**
- b)** Draw and explain the memory map of Cortex M Processor **[8]**
- Q4) a)** State various Features of STM32F4xxx, Comment on Peripheral Clock **[9]**
- b)** Explain the programmer model-Register in Cortex M Processor. **[8]**

P.T.O.

- Q5) a)** Explain timer structure of STM32F4XX. Which are the SFRs associated with timers? Write Embedded C program to generate delay of 5 msec.[9]
- b)** Draw an interfacing diagram to interface LDR & MQ3 sensor with STM32F4xx microcontroller and write algorithm to display the light & the Gas percentage parameter on LCD. [9]

OR

- Q6) a)** What are the features of GPIO of STM32F4XX? Write a note on different types of GPIO registers available in STM32F4xx. [9]
- b)** Write a program to generate 100 ms time delay using timer. Assume external clock frequency of 16 MHz. [9]
- Q7) a)** State features of CAN Bus with CAN Bus frame. [9]
- b)** Draw an interfacing diagram of STM32F4xx with accelerometer MPU 6050 with flowchart to display the parameters. [8]

OR

- Q8) a)** Write detailed note on PWM. With interfacing diagram, show speed and direction of DC Motor can be changed using PWM in STM32F407XX. [9]
- b)** State features of ultrasonic sensor-HC-SRO4, Draw an interfacing diagram. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4305

[Total No. of Pages : 2

[6403]-103

T.E. (E &TC)

NETWORKS SECURITY

(2019 Pattern) (Semester - VI) (Elective- II) (304195)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Discuss the block cipher modes of operation and stream cipher mode of operation. [9]
b) Explain the subkey generation in the Blowfish algorithm. [8]

OR

- Q2)** a) What is an Initialization Vector (IV)? What is its significance? [4]
b) Which basic steps are performed in one round of operation in DES? Explain in detail. [8]
c) Discuss the difference between differential and linear cryptanalysis. [5]

- Q3)** a) Elaborate the working of hash based Message Authentication codes (HMAC). [6]
b) Discuss X.509 Authentication services [7]
c) Write a short note on: Digital signatures [4]

OR

- Q4)** a) What are biometric authentication techniques? Explain its importance in today's digital world. [6]
b) How the Authentication Applications such as Kerberos work? Explain in detail. [7]
c) Write a short note on: Knapsack algorithm. [4]

P.T.O.

- Q5) a)** Explain in detail PGP Pretty Good Privacy concept and services provided by PGP. **[6]**
- b)** Explain in brief S/MIME protocol. **[6]**
- c)** Describe in brief IP security applications, IP Security architecture. **[6]**

OR

- Q6) a)** Describe Key management use in email security. **[6]**
- b)** How confidentiality is obtained using Encapsulating, Security payload **[6]**
- c)** Describe in brief security associations. **[6]**

- Q7) a)** Discuss how secure socket layer and transport layer security can be obtained. **[6]**
- b)** Which are the key participants in SET? **[6]**
- c)** Discuss the web security considerations. **[6]**

OR

- Q8) a)** Elaborate different types of firewalls. What are limitations of firewalls? **[6]**
- b)** What are the types of intruders and what are intrusion techniques? **[6]**
- c)** What is need of SSL? Explain all Phases of SSL handshake protocol in detail. **[6]**



Total No. of Questions : 8]

SEAT No. :

PD-4306

[Total No. of Pages : 2

[6403]-104

T.E. (E &TC)

SENSORS IN AUTOMATION

(2019 Pattern) (Semester - VI) (Elective- II) (304195-B)

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)** With the help of neat diagram explain operation of Hall effect sensor with one application **[6]**
- b) Explain Fiber optic sensor with Bragg grating **[6]**
- c) Explain with neat diagram Orifice and Venturi **[5]**

OR

- Q2) a)** Explain the flow meter sensor with one application. **[7]**
- b) Explain Piezoelectric transducer with neat diagram **[4]**
- c) Explain the Strain gauge sensor with one application **[6]**

- Q3) a)** Explain working principle of potentiometric displacement sensors with diagram Write its applications. **[9]**
- b) Explain working principle of Strain Gauge with suitable diagram, what are different types of Strain gauge sensing elements **[9]**

OR

- Q4) a)** What is LVDT, explain working of LVDT with suitable diagram, Write application of LVDT. **[9]**
- b) What are Optical encoders? Explain its working principle with diagram and write its applications **[9]**

P.T.O.

- Q5) a)** Define and explain the term [8]
i) Biosensors Resonant mirror and
ii) Light addressable Potentio-Metric.
b) Use of Plasmon resonance in environmental studies [5]
c) Explain in details working of LDR [4]

OR

- Q6) a)** Explain in detail about MQ-3 Alcohol Detector and Gas Sensor Module MQ 135 Air Quality. [8]
b) What do you mean by Ph Measurement [5]
c) Distinguish between Photo diode and Photo Transistor [4]

- Q7) a)** What is a data acquisition system? What are different types of data acquisition systems? Explain any one DAS system [7]
b) Explain the IOT based Greenhouse system with the help of block diagram. [5]
c) Explain Interface in details using block diagram. [4]
d) Explain various application of IOT [2]

OR

- Q8) a)** Describe the different components of IOT with the help of Block diagram. [6]
b) With the help of block diagram explain the IOT Functional blocks [6]
c) Explain Multichannel DAS System [4]
d) State application of DAS. [2]



[6403]-105

**T.E (Electronics & Computer Engineering)
DATABASE MANAGEMENT SYSTEMS
(2019 Pattern) (Semester - V) (310341)**

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 indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Explain concept of trigger in PL/SQL. Explain with syntax how to create trigger. Explain the different types of trigger. **[6]**
- b) Explain COMMIT, ROLLBACK and SAVEPOINT commands of TCL in SQL. **[6]**
- c) Explain the following set operations with suitable example. **[8]**
- i) UNION
 - ii) UNION ALL
 - iii) INTERSECT
 - iv) MINUS

OR

- Q2)** a) Consider the following schema. **[6]**
student (fname, sname, PRN, age, percentage_marks,)
Write SQL queries for following requirements.
- i) Retrieve all records from the student table.
 - ii) Retrieve fname, PRN and percentage_marks from the student table.
 - iii) Retrieve the fname and PRN of students whose percentage_marks is less than 40.
 - iv) Delete all records from the student table who have obtained percentage_marks less than 40.
- b) Explain any six string functions in SQL with examples. **[6]**
- c) Explain PL/SQL stored function with syntax. Compare PL/SQL stored procedure and stored function. **[8]**

P.T.O.

- Q3) a)** Explain concept of transaction in DBMS in detail. Explain ACID properties of a transaction in DBMS. [8]
- b) Explain the need of concurrency control in DBMS. Explain the two phase lock protocol for concurrency control. [8]

OR

- Q4) a)** Check whether the given non-serial schedule is conflict serializable or not. If serializable, find conflict equivalent schedule. [8]

T1	T2	T3	T4
			R(A)
	R(A)		
		R(A)	
W(B)			
	W(A)		
		R(B)	
	W(B)		

- b) Explain the following schedule in transaction. [8]
- Recoverable Schedule
 - Non-Recoverable Schedule
- Q5) a)** What are advantages of parallel database? Explain Shared memory, Shared disk and Shared nothing parallel database architecture. [8]
- b) Explain parallel query optimizations in parallel databases. Explain performance parameters for parallel databases. [8]

OR

- Q6) a)** Explain distributed database management system with the help of diagram. With the help of diagram explain homogeneous distributed databases and heterogeneous distributed databases. [8]
- b) What is concurrency control in distributed databases? What are the potential problems of concurrency control in distributed databases? What is need of concurrency control method is DDBMS. [8]

- Q7)** a) Define structured, unstructured, and semi-structured data and compare structured, unstructured, and semi-structured data. [9]
- b) What is NoSQL database? Explain key features of NoSQL database. Differentiate between SQL and NoSQL databases. [9]

OR

- Q8)** a) What are indexes in MongoDB? Explain creating indexes, finding indexes and dropping indexes by using suitable examples. [9]
- b) What is MongoDB replication? What are the key features of replication? Why MongoDB replication necessary? Differentiate between replication and sharding in MongoDB. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4308

[Total No. of Pages : 2

[6403]-106

T.E. (Electronics and Computer Engineering)

ADVANCED JAVA PROGRAMMING

(2019 Pattern) (Semester - V) (310342)

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 wherever necessary.

- Q1)** a) Explain the difference between an applet and a standalone application. Describe the purpose of the init() method in an applet. [6]
- b) Explain in detail about the complete life cycle of an applet. [6]
- c) Write a Java Applet program to handle mouse events implementing the MouseListener interface. [5]

OR

- Q2)** a) Explain in detail about different attributes of HTML APPLET tag. [6]
- b) Explain the following Swing components in detail: [6]
- i) JLabel
 - ii) Scroll Panes
- c) Compose a Java program to create a simple 'Hello World' applet and also write output. [5]

- Q3)** a) Define an event in Java and illustrate the Event Delegation Model in Java. [6]
- b) Explain Adapter classes and inner classes in detail. [6]
- c) Compose a Java program to handle keyboard events implementing the KeyListener interface. [5]

OR

- Q4)** a) Describe the following: [6]
- i) Event Sources and
 - ii) Event Listeners
- b) Explain any four types of containers in Java AWT. [6]
- c) Compose a program to create a Panel in Frame Window indicating the size of panel and frame. [5]

P.T.O.

- Q5)** a) Explain any two layout management classes with examples of each. [6]
b) Explain list and set interface used in Collection framework with suitable example? [6]
c) Compose a Java program to create a JMenu and add it to a JMenuBar inside a JFrame? [6]

OR

- Q6)** a) Compare Java AWT and Java Swing. [6]
b) Describe the following: [6]
i) Model-View-Controller terminology
ii) JMenuBar.
c) Write a Java program using swings components to create a login page. On clicking the JButton a dialog box should appear saying login successful. [6]

- Q7)** a) Explain the any three types of JDBC drivers with the suitable diagram.[6]
b) Explain the process of database connection in JDBC. [6]
c) Compose a Java program to insert data and retrieve in MySQL database using JDBC? [6]

OR

- Q8)** a) Explain in detail about prepared statement & callable statement? [6]
b) Define JDBC. Using JDBC, explain in detail about the steps to connect to the database in Java. [6]
c) Explain in detail about ResultSet Interface. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4309

[Total No. of Pages : 2

[6403]-107

T.E. (Electronics & Computer Engineering)

DATA COMMUNICATION

(310343) (2019 Pattern) (Semester - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain ASK Transmitter and Receiver with waveform. [5]
- b) Explain QPSK Transmitter in detail with the help of block diagram. [6]
- c) Draw and explain BPSK modulator and demodulator with its waveforms. [6]

OR

- Q2)** a) Explain QPSK Receiver in detail with the help of block diagram. [5]
- b) Explain M-ary PSK in detail with the help of Transmitter and Receiver. [6]
- c) Compare between FSK and PSK [6]
- Q3)** a) Compare between CDMA and FDMA. [5]
- b) Explain CDMA technology in details. [6]
- c) Explain FDMA in details. Also State its Advantages & Disadvantages [6]

OR

P.T.O.

- Q4)** a) What is PN Sequence in CDMA? Explain. [5]
 b) Explain TDMA technology in details. Also state its advantages and disadvantages. [6]
 c) What are the Advantages & Disadvantages of Code Division Multiple Access? [6]
- Q5)** a) Prove the following statement, If receiver know the message being transmitted, the amount of information carried is “Zero”. [5]
 b) Explain the following terms, 1) Measure of Information
 2) Unit of Information 3) Information Rate [6]
 c) In binary sequence ‘0’ occur with probability of $\frac{1}{4}$ and ‘1’ occur with probability of $\frac{2}{3}$ then calculate amount of information conveyed by each binit. [7]

OR

- Q6)** a) Explain Huffman coding algorithm. Also state its advantages. [5]
 b) Let us consider a binary source with source alphabet $s = \{S_1, S_2\}$ with probabilities $P = \{1/256, 255/256\}$ find entropy. [6]
 c) Define entropy. Derive the expression for entropy. [7]
- Q7)** a) Define and explain single bit error and burst error. Also state disadvantages of error control coding. [5]
 b) Define the following related to error control coding. 1) code word
 2) code rate 3) code efficiency 4) hamming distance
 5) Minimum distance [6]
 c) What is meant by error detection? Explain check sum error detection method. [7]

OR

- Q8)** a) Define error control coding. Explain need of error control coding. [5]
 b) What is meant by error detection? Explain parity checking error detection method. [6]
 c) Find the checksum of following message 10001001, 11100010, 001001001, 10000100 [7]



Total No. of Questions : 8]

SEAT No. :

PD4310

[Total No. of Pages : 2

[6403]-108

T.E. (Electronics & Computer Engineering)
MICROCONTROLLER AND APPLICATIONS
(2019 Pattern) (Semester - V) (310344)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the term opto-isolators. What are advantages of opto-isolators. Draw interfacing diagram of opto –isolator with 8051 microcontroller. **[6]**
- b) Interface relay with 8051 microcontroller. Write an Embedded C program for the same. **[6]**
- c) A switch is connected to pin P2.7 of 8051 microcontroller. Draw interfacing diagram and write an Embedded C program to monitor the status of SW and perform the following: **[8]**
- i) If SW=0, the stepper motor moves clockwise.
 - ii) If SW=1, the stepper motor moves counterclockwise.

OR

- Q2)** a) Interface buzzer with 8051 microcontroller. Write an Embedded C program for the same. **[6]**
- b) Draw interfacing diagram and write a C program for the 8051 microcontroller to transfer the letter “A” serially at 4800 baud continuously. Use 8 bit data and 1 stop bit. **[6]**
- c) Draw interfacing diagram of DAC to 8051 microcontroller and write an Embedded C program to generate triangular waveform. Also draw flowchart. **[8]**

- Q3)** a) List out the features of MSP430. Draw and explain the architecture of MSP430 microcontroller. **[8]**

- b) Explain in brief System clocks of MSP430 microcontroller. **[8]**

OR

- Q4)** a) Draw and explain in brief on chip peripherals of MSP430 microcontroller. **[8]**

- b) Explain in detail any four addressing modes of MSP430 microcontroller. **[8]**

P.T.O.

- Q5) a)** Write an Embedded C program for blinking of LED with and without switch using MSP430. Also draw its interfacing diagram. **[8]**
- b)** Draw and explain the block diagram of Watchdog Timer of MSP430. Also explain watchdog timer control register (WDTCTL). **[8]**

OR

- Q6) a)** Draw interfacing diagram of IR sensor with MSP430 microcontroller. Also write the Embedded C program for the same along with its flowchart. **[8]**
- b)** Draw and explain block diagram of Timer A of MSP430 along with its modes of operation. **[8]**

- Q7) a)** Design water level monitoring and control system using 8051 microcontroller and write the algorithm for the same. **[9]**
- b)** Design environment Monitoring System using MSP430 microcontroller. Also draw the flowchart for same. **[9]**

OR

- Q8) a)** Design soil Monitoring System for agriculture using MSP430 microcontroller. **[9]**
- b)** Explain with neat block diagram DAS using 8051 microcontroller. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4311

[6403]-109

[Total No. of Pages : 2

T.E. (Electronics and Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - V) (Elective - I) (310345A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Elaborate the Key design issues for distributed file systems. **[6]**
b) Define Peer to Peer systems. What are the characteristics of peer to peer system? **[6]**
c) Discuss in detail the design and implementation of name services and Domain Name services. **[8]**

OR

- Q2)** a) Discuss on file sharing semantics with necessary examples. **[6]**
b) Give the differences between Overlay networks and IP routing. **[6]**
c) What is meant by distributed file system? What are the two basic file system used in distributed system? Explain both the file system in detail. **[8]**

- Q3)** a) What are the different ways to control concurrency in distributed transactions? Explain with examples. **[8]**
b) Explain the Chandy and Lamports snapshot algorithm for determining the global states of distributed systems. **[8]**

OR

- Q4)** a) What is atomic transaction and atomic commit protocol? Explain the two-phase commit protocol. **[8]**
b) What is clock skew and clock drift? What is clocks drift rate? Explain International Atomic Time and Coordinated Universal Time? **[8]**

P.T.O.

- Q5) a)** Explain Process Migration with suitable example? How process migration is done in heterogeneous systems? **[8]**
- b)** With the help of neat diagram explain Global Scheduler Architecture. Explain the desirable features of Global Scheduling Algorithm. **[8]**

OR

- Q6) a)** What are Thread models? What is Dispatcher worker model? What is Team Model? **[8]**
- b)** What is load balancing? What is the goal of load balancing algorithms? What are the rules of load balancing operation? What is static load balancing? **[8]**
- Q7) a)** What is Coda distributed file system? State the features of Coda distributed file system. **[6]**
- b)** What do you mean by Google file system? How does the Google file system work? State the features of Google file system. **[6]**
- c)** With the help of neat diagram explain Network File System (NFS) of distributed file system. **[6]**

OR

- Q8) a)** Explain characteristics of Distributed File System. **[6]**
- b)** What is need of Distributed File System? Explain challenges associated with distributed file system. **[6]**
- c)** Explain design constraints/issues of Google File System. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PD4312

[6403]-110

[Total No. of Pages : 2

T.E. (Electronics & Computer Engineering)

BLOCKCHAIN TECHNOLOGY

(2019 Pattern) (Semester - V) (310345B) (Elective - I)

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 Hash in cryptography? Explain Hash function. [6]
b) What is hashing in blockchain? Write any four characteristics of hashing.[6]
c) What is secure Hash algorithm? Explain application of hash algorithm.[6]

OR

- Q2)** a) What is Hash function? Explain in detail. Also, explain the features of Hash functions. [6]
b) What is solidity programming in ethereum? Write the other programming languages used for ethereum. [6]
c) What is blockchain? What are Cryptographic Primitives? Erite types of cryptographic primitives. [6]

- Q3)** a) What is ethereum? Draw and explain ethereum architecture. [6]
b) What is ethereum virtual machine? Explain its working. [6]
c) What is consensus in blockchain? Explain three types of consensus in blockchain. [6]

OR

- Q4)** a) What is ethereum client? Explain its architecture. [6]
b) Explain Secure Hash Algorithm Version 1 in detail. [6]
c) What is distributed hash table? Write the steps to create distribution table. [6]

P.T.O.

- Q5)** a) Explain bitcoin transaction format in detail. [6]
b) Explain Merkel tree concept in Bitcoin building block. How it works?[6]
c) What is Bitcoin wallet? Explain facilities provided by Bitcoin wallets. [6]

OR

- Q6)** a) Explain the structure of bitcoin payment system. [6]
b) Explain the working of Bitcoin Transactions. [6]
c) What is bitcoin client? How it offers security in Bitcoin Transactions? [6]

- Q7)** a) What is the role of blockchain in cloud computing? Explain advantages of integrating blockchain into cloud computing. [5]
b) Explain in detail, how Blockchain and Artificial Intelligence integration is changing the business process. [6]
c) Describe any five limitations of implementation of blockchain technology with IoT. [5]

OR

- Q8)** a) Explain, how the future Internet of Things (IoT) depends on Blockchain technology? [5]
b) Explain: Blockchain with machine learning tools. [6]
c) Explain benefits of implementation of Blockchain technology with Robotics Process Automation. [5]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4313

[6403]-111

[Total No. of Pages : 2

T.E. (Electronics and Computer Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - V) (310345C) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Properties of FIR filters. **[8]**

b) Explain design of IIR filter using Impulse Invariance method. What are the disadvantages of Impulse invariance Method. **[9]**

OR

Q2) a) What is Bilinear transformation? Explain the properties of Bilinear Transformation. **[8]**

b) Convert an analog filter with system function $H(s)$ into digital IIR filter using impulse - invariance method. $H(s) = 10 / S^2 + 7S + 10$ **[9]**

Q3) a) Draw the direct form - I and II structures for the following systems. **[9]**

i) $3y(n) - 2y(n-1) + y(n-2) = 4x(n) - 3x(n-1) + 2x(n-2)$

ii) $y(n) = 0.5 [x(n) + x(n-1)]$

b) Compare IIR and FIR filters on Memory requirement, Stability, Phase response, Processing time, Mathematical equation. **[9]**

OR

Q4) a) Explain Finite Word length effect in IIR filters. **[9]**

b) Obtain the system function $H(z)$ for $h(n) = \{4, 2, -2, -3\}$ and draw a direct form FIR filter structure. **[9]**

P.T.O.

- Q5)** a) What is the role of anti-aliasing filter and anti-imaging filter in decimator and interpolator? [9]
- b) What do you mean by decimation? Give the input- output relationship for the decimation process. [9]

OR

- Q6)** a) Explain the sampling theorem and prove with mathematical equation. [9]
- b) What is principle of interpolation? Derive the expression for interpolated signal at the output. [9]
- Q7)** a) Explain any one application of Speech signal processing. [8]
- b) With the help of block diagram explain the basic elements of DSP system.[9]

OR

- Q8)** a) Explain the features of a digital signal processing. [8]
- b) Explain the architecture of TMS320C54XX digital signal processing. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4314

[6403]-112

[Total No. of Pages : 2

T.E. (Electronics and Computer Engineering)

SENSORS AND APPLICATIONS

(2019 Pattern) (Semester - V) (Elective - I) (310345D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of non-programmable scientific calculator is allowed.*

Q1) a) Explain with neat sketch working principle of the following flow measurement techniques **[8]**

- i) Pitot static tube
- ii) Electromagnetic flow meter

b) Explain working principle of capacitance probe type of level measurement technique. **[9]**

OR

Q2) a) Explain with neat sketch working principle of the following flow measurement techniques **[8]**

- i) Ultrasonic flow meter
- ii) Hot wire anemometer

b) Explain working principle of ultrasonic level measurement technique. **[9]**

Q3) a) Explain working principle of following proximity sensors- **[8]**

- i) Inductive proximity sensors
- ii) Capacitive proximity sensors

b) Explain weight measurement technique using load cell and strain gauges. Draw a neat signal conditioning circuit for the strain gauge elements for weight measurement. **[9]**

OR

P.T.O.

- Q4)** a) Explain the process of charge transfer in charge coupled devices (CCD).**[8]**
b) Explain with neat sketch working principle of incremental optical encoder. State its applications. **[9]**

- Q5)** a) Explain working principle of PZT actuators. State its applications. **[9]**
b) Explain magneto-transistor and magneto-resistive elements (MRE). **[9]**

OR

- Q6)** a) Write a short note on surface micromachining for MEMS devices. **[9]**
b) Explain with neat sketch bulk micro-machined absolute pressure sensor.**[9]**

- Q7)** a) Explain pneumatic lift system using a poppet valves and pneumatic cylinder. **[6]**
b) Explain any one type of electrical actuator. **[6]**
c) Explain with neat graph control valve characteristics. **[6]**

OR

- Q8)** a) Explain transistorized driver circuit for electromechanical relay. **[6]**
b) Explain control of double acting cylinder using an appropriate directional control valve. **[6]**
c) Explain how actuators are classified. Explain any one type of actuators.**[6]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4315

[Total No. of Pages : 2

[6403]-113

T.E. (Electronics and Computer Engineering)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

(2019 Pattern) (Semester - VI) (310352)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain Decomposition techniques. **[8]**

b) How do you calculate FP and how it is used in estimation of software projects? **[6]**

c) What are the basic principles of project scheduling? **[4]**

OR

Q2) a) Compare Lines of code(LOC) and Function Point(FP) based estimation of software. **[8]**

b) What is the need of project estimation? **[6]**

c) Explain a time line chart with suitable example. **[4]**

Q3) a) What are the software design quality attributes and quality guidelines? **[7]**

b) Explain content design and functional design at component level. **[6]**

c) What do you mean by the term cohesion and coupling in the context of software design? How are these concepts useful in arriving at a good design of a system? **[4]**

OR

P.T.O.

- Q4)** a) What do you mean by software architecture? Why is architecture important? [7]
b) What do you understand by refactoring? Give the importance of refactoring in improving the quality of software. [6]
c) Explain data centered architecture. [4]

- Q5)** a) What are the layers of the SCM process? Explain each in detail. [8]
b) Prepare RMMM plan for the late delivery of software product to customer. [6]
c) Write a short note on: Risk table. [4]

OR

- Q6)** a) Write a short note on : [8]
i) Version Control ii) Change control process
b) What is risk identification? What are the different categories of risks? [6]
c) What is a software SCM repository? [4]

- Q7)** a) What is software testing? Explain the software testing strategies for software development. [7]
b) Discuss the following in detail [6]
i) Alpha and Beta testing
ii) White box and black box testing
c) Compare verification and validation. [4]

OR

- Q8)** a) Explain defect life cycle. [7]
b) What is the test plan? Write down a test plan for Mobile App testing. [6]
c) Write a short note on: Tools for automated testing and features. [4]



Total No. of Questions : 8]

SEAT No. :

PD4316

[Total No. of Pages : 2

[6403]-114

**T.E. (Electronics and Computer Engineering)
COMPUTER NETWORKS AND SECURITY
(2019 Pattern) (Semester - VI) (310353)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is framing? Explain in details starting and ending flags with bit stuffing framing method. **[9]**

b) What is flow control? Explain the flow control in DLL. **[8]**

OR

Q2) a) Explain frame format of PPP. Draw & explain flow diagram for PPP connection. **[9]**

b) Draw and explain ARQ error correction technique. What is the error probability on the return path? **[8]**

Q3) a) i) Find the error, if any, in the following IPv4 addresses. **[6]**

1) 111.56.045.78

2) 221.34.7.8.20

3) 75.45.301.14

ii) Find the class of each address.

1) 252.5.15.111

2) 11000001 10000011 00011011 11111111

3) 14.23.120.8

b) Identify & Explain the network software designing issues for the layer. **[6]**

c) Explain the function of ARP packet? Draw and explain ARP packet format in details. **[6]**

OR

P.T.O.

- Q4)** a) Explain DHCP protocol with message format. State its advantages. [6]
b) Draw & explain TCP Header in details. [6]
c) Write short note on : [6]
i) Shortest path routing
ii) Flooding

- Q5)** a) Draw and explain TELNET protocol in details. [6]
b) Explain BOOTP with its message format. [6]
c) What is E-mail. List out the basic function of E-mail and explain it. [6]

OR

- Q6)** a) What are the different Main components of Internet mail system? Explain SMTP Protocol in short. [6]
b) What is the Socket? Explain socket address and socket structure. [6]
c) Explain DNS working. Write note on Name server in details. [6]

- Q7)** a) With neat diagram explain Hash function in details. [9]
b) Write note on : [8]
i) Network Monitoring
ii) Network Simulator

OR

- Q8)** a) What is mean Cryptography? Compare between Symmetric Key & Asymmetric Cryptography Algorithm. [9]
b) List the different types of security attack? Explain each in details. [8]



Total No. of Questions : 8]

SEAT No. :

PD4317

[Total No. of Pages : 2

[6403]-115

T.E. (Electronics & Computer Engineering)
EMBEDDED PROCESSORS AND APPLICATIONS
(2019 Pattern) (Semester - VI) (310354)

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) Draw the architecture of UART1 of LPC2148 and explain the function of each block in detail. [6]
- b) Draw interfacing GPS module to LPC2148. Write algorithm and draw flowchart. [6]
- c) Draw interfacing diagram of on chip ADC to LPC2148. List features of ADC of LPC2148. Write an embedded C program for ADC without interrupt. [8]

OR

- Q2)** a) Draw interfacing of 12C EEPROM with LPC2148. Also write algorithm and draw flowchart for reading and writing data in EEPROM. [6]
- b) Write an embedded C program for generation of triangular waveform using on chip DAC of LPC2148 along with its interfacing diagram. [6]
- c) Draw and explain interfacing of GSM module with LPC2148, Write algorithm and draw flowchart for sending the message through GSM module. [8]

- Q3)** a) Draw and explain the block diagram of Cortex M3 processor. Also elaborate the features of same. [8]
- b) Write features and applications of the following Cortex series processors and compare them: [8]
- i) Cortex A Series
 - ii) Cortex M Series

OR

- Q4)** a) Explain in detail programmer model of ARM Cortex M3 processor. [8]
- b) Compare ARM7 and ARM Cortex -M3 series. Also list out advantages of ARM Cortex -M3 for embedded application. [8]

P.T.O.

Q5) a) Elaborate MQ3 sensor in detail with pin diagram and applications. Draw and explain interfacing diagram of MQ3 sensor to STM32F4xx series. [8]

b) Explain with example following GPIO registers of STM32F4xx series.

i) GPIOx_MODER [8]

ii) GPIOx_IDR

iii) GPIOx_ODR

iv) GPIOx_BSSR

OR

Q6) a) Enlist ARM Cortex-M4 processor features. Draw and explain block diagram of ARM Cortex-M4 processor. [8]

b) Draw interfacing of seven segment display to STM32F4xx series. Write a program to display 0 to 9 count on seven segment. [8]

Q7) a) What is meant by Embedded System? Draw and explain the block diagram of Embedded System. [9]

b) Explain in detail case study of Waste management for Smart City using IoT along with block diagram. [9]

OR

Q8) a) What is meant by Internet of Things? Draw and explain the architecture of Internet of Things. [9]

b) Along with block diagram explain health monitoring system using IoT. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4318

[Total No. of Pages : 2

[6403]-116

TE (Electronics & Computer Engineering)

SOFTWARE MODELING AND DESIGN

(2019 Pattern) (Semester - VI) (Elective - II) (310355A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain Activity Diagram with suitable example. [6]

b) Draw State Diagram for ATM machine. [6]

c) Explain Collaboration Diagram and its components. [8]

OR

Q2) a) Difference between activity diagram and sequence diagram. [6]

b) Explain Iteration Expression, Parallel Execution, Guard Expression in Collaboration Diagram. [6]

c) Draw sequence diagram Flight reservation system. [8]

Q3) a) Explain Designing Well Defined Class Visibility, Attribute Refinement.[8]

b) Explain Method Design Using UML Activity Diagram. [8]

OR

Q4) a) Explain Designing the Access Layer Classes. [8]

b) Explain Component and Deployment Design using Component and Deployment Diagram. [8]

P.T.O.

Q5) a) Describe Low coupling, High Cohesion. **[8]**

b) Describe Polymorphism, Pure fabrication. **[8]**

OR

Q6) a) Describe Singleton and Factory. **[8]**

b) Explain Structural Pattern in brief. **[8]**

Q7) a) Explain Anatomy of Software Architecture. **[9]**

b) Explain Designing Service-Oriented Architectures. **[9]**

OR

Q8) a) Explain Designing Client/Server Software Architecture. **[9]**

b) Explain Product Line Architecture design. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4319

[Total No. of Pages : 2

[6403]-117

TE (Electronics and Computer Engineering)

ADVANCED DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - VI) (Elective- II) (310355-B)

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.

- Q1)** a) What is XML? Explain key features of XML. What are the applications of XML? [6]
- b) What is a NoSQL database? Explain the advantages and disadvantages of NoSQL databases? [6]
- c) What is a key-value database in NoSQL? Explain it in brief. What are the advantages and disadvantages of key-value NoSQL databases? [8]

OR

- Q2)** a) What is a JSON database? Explain features of JSON. [6]
- b) Describe any three NoSQL database development tools in detail. [6]
- c) What is Apache Cassandra? Explain the key features of Apache Cassandra? Explain advantages and disadvantages of Apache Cassandra. [8]

- Q3)** a) Explain in brief characteristics and limitations of data warehouse. [8]
- b) With the help of diagram explain Star Schema used data warehouse. Compare Star and Snowflake Schema used data warehouse. [8]

OR

- Q4)** a) With the help of diagram explain Multidimensional OLAP (MOLAP) Architecture. State its advantages and disadvantages. [8]
- b) What is a decision support system (DSS)? Explain different components of decision support system. What are the benefits of a decision support system? [8]

P.T.O.

- Q5) a)** Draw and explain architecture of data mining system. **[8]**
b) Explain different challenges in implementation of data mining in detail. Explain the applications of data mining. **[8]**

OR

- Q6) a)** What is data mining? Why is Data Mining Important? Write the advantages and disadvantages of data mining. **[8]**
b) With the help of diagram explain Knowledge Discovery in Databases (KDD) seven step processes. **[8]**

- Q7) a)** Explain multimedia databases in detail with respect to characteristics and challenges. **[6]**
b) Explain the components of geographic information systems. Explain the functions of GIS. **[6]**
c) Write advantages and disadvantages of genome data management **[6]**

OR

- Q8) a)** What is genomic data? What information is found in genomic data? What are the challenges in genomic data management? **[6]**
b) What is multimedia database? What are the challenges of multimedia databases? What are the applications of multimedia database? **[6]**
c) Compare Spatial and Temporal databases. **[6]**



Total No. of Questions : 8]

SEAT No. :

PD-4320

[Total No. of Pages : 2

[6403]-118

T.E. (Electronics and Computer Engineering)

POWER ELECTRONICS

(2019 Pattern) (Semester - VI) (Elective - II) (310355C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** With the help of neat circuit diagram and relevant waveforms explain the two quadrant operation of single phase fully controlled bridge converter. Drive the expression of average output voltage and output current. **[9]**
- b)** Explain difference between SCR based conventional rectifiers and IGBT base rectifiers. **[8]**

OR

- Q2) a)** Describe working of single phase semi converter with R load. Draw waveforms of load voltage, load current for $\alpha = 60^\circ$. **[8]**
- b)** Explain working of three phase Semi controlled converter with R Load and firing angle of 30 degrees. Draw output voltage waveforms. **[9]**

- Q3) a)** Explain first quadrant chopper. How these choppers can be used to obtain two quadrant choppers and Explain any one quadrant chopper. **[9]**
- b)** Explain working of AC Voltage regulator with RL Load. Draw output voltage waveforms. Derive expression for output voltage. **[9]**

OR

- Q4) a)** Explain Class E chopper with circuit diagram and waveforms. **[9]**
- b)** Explain working of SMPs with block diagram. Explain flyback converter with circuit diagram and waveform. **[9]**

P.T.O.

- Q5) a)** Explain working of single phase full bridge voltage source inverter. Draw all waveforms. State its advantages. **[9]**
- b)** Compare current source inverter and voltage source inverter. **[8]**

OR

- Q6) a)** Explain working of three phase inverter with 180 degree conduction mode with neat diagram, switching sequence of switches and output voltage waveforms. **[10]**
- b)** Explain Performance parameter of inverter. **[7]**

- Q7) a)** With the help of respective block diagrams, explain the difference between online and offline UPS. **[9]**
- b)** Explain the principle of induction heating and state its application. Also give advantages and disadvantages. **[9]**

OR

- Q8) a)** Explain block diagram of Electric vehicle. State each block also explain advantages and disadvantages. **[9]**
- b)** Draw and explain online and offline UPS with neat diagram. Write their specification. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4321

[Total No. of Pages : 2

[6403]-119

T.E. (Electronics and Computer Engineering)

PLC AND AUTOMATION

(2019 Pattern) (Semester - VI) (Elective- II) (310355-D)

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; No.7 or Q.No.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain On Delay timer and Off Delay timer. **[8]**

b) Draw a ladder diagram for a two-motor system having the following conditions: **[10]**

The start Push button starts Motor 1; 10 seconds later Motor 2 will start.
The stop Push button stops Motor 1; 15 seconds later Motor 2 stops

OR

Q2) a) Explain any four arithmetic functions used in PLC programming **[8]**

b) Draw a ladder diagram for following statement: **[10]**

Motor 1 (M1) starts as soon as start switch is ON; after 10 Seconds M1 goes off and Motor 2 (M2) starts. After 5 seconds M2 goes OFF and M3 starts. After 10 Seconds M3 goes off, M1 Starts and the cycle is repeated. When stop switch is ON, all Motors are stop.

Q3) a) Explain test, check and assembly in connection with PLC installation. **[9]**

b) Explain electrical noise, leaky inputs and outputs **[9]**

OR

Q4) a) Explain need of program editing during commissioning. **[9]**

b) Explain need of grounding and various circuit protections used during installation **[9]**

P.T.O.

- Q5) a)** Explain Proportional, Derivative and Integral control in detail. **[9]**
b) Explain functions of RTU and MTU in SCADA. **[8]**

OR

- Q6) a)** Explain HMI and it's interfacing with PLC. **[9]**
b) Explain block diagram of SCADA **[8]**

- Q7) a)** Explain types of communication interfaces in detail. **[8]**
b) Write short note on **[9]**
i) DeviceNet
ii) MODBUS
iii) CAN

OR

- Q8) a)** What are advantages of standard industrial network? **[8]**
b) Write short note on **[9]**
i) Fieldbus
ii) EtherNet/IP Protocol
iii) ControlNet



Total No. of Questions : 8]

SEAT No. :

PD4322

[Total No. of Pages : 2

[6403]-120

T.E (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - V) (314441)

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) Construct CFG for the language L which consists of strings over $\{0,1\}^*$ with at least one occurrence of “000”. [4]
- b) Explain any three closure properties of Context Free language. [6]
- c) Convert the following grammar to CNF. [8]

$S \rightarrow PQP$

$P \rightarrow QP | \epsilon$

$Q \rightarrow 1Q | \epsilon$

OR

- Q2)** a) Consider the following grammar [8]
- $S \rightarrow aAS | a$
- $A \rightarrow SbA | SS | ba$
- Derive the string “aabbaa” using
- i) Leftmost derivation
 - ii) Rightmost derivation
 - iii) Parse tree
- b) Convert the following LLRG to RLRG. [6]
- $S \rightarrow B1 | A0 | C0$
- $A \rightarrow C0 | A1 | B1 | 0$
- $B \rightarrow B1 | 1$
- $C \rightarrow A0$
- c) Explain Chomsky Hierarchy of grammar. [4]

P.T.O.

- Q3)** a) Construct PDA for the following CFG. [6]
 $S \rightarrow 0SX \mid 1SY \mid \epsilon$ $X \rightarrow 1$ $Y \rightarrow 0$
 b) Write formal definitions of [4]
 i) Deterministic PDA
 ii) Non-deterministic PDA
 c) Define post machine. Design PM to check well formedness of parentheses. [7]

OR

- Q4)** a) Compare finite automata and push down automata. [4]
 b) Design a PDA for the language $L = \{a^n b^m c^n \mid m, n \geq 1\}$ [6]
 c) Define Push down Automata. Explain different types of PDA. Explain any two applications of PDA. [7]

- Q5)** a) Explain the power of Turing machine over Finite Automata. [4]
 b) Design a Turing machine to accept language $L = \{0^n 1^n \mid n \geq 1\}$. Explain with diagram and transition table. [8]
 c) Explain Halting Problem of Turing Machine. [6]

OR

- Q6)** a) Write a note on variants of Turing machine. [8]
 b) Explain solvable problems and unsolvable problems. [4]
 c) Construct a Turing machine for 1's complement of a binary number. [6]

- Q7)** a) Show that for two recursive languages L_1 and L_2 , each of the following are recursive. [9]

i) $L_1 \cup L_2$

ii) $L_1 \cap L_2$

- b) Write a note on Node-Cover Problem. [8]

OR

- Q8)** a) What do you mean by polynomial time reduction? Explain with a suitable example. [8]

- b) Define P-class problems and NP- class problems. Explain them with suitable examples. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4323

[Total No. of Pages : 2

[6403]-121

T.E. (Information Technology)

OPERATING SYSTEMS

(2019 Pattern) (Semester - V) (314442)

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 wherever necessary.

- Q1)** a) Explain the Reader writer problem with the readers having priority and give a solution using semaphore and mutex. [8]
- b) Explain various strategies to deal with deadlocks. [9]

OR

- Q2)** a) State the Producer-Consumer problem and give a solution using semaphore and mutex. [7]
- b) Define and discuss : [10]
- i) Mutex
 - ii) Race condition
 - iii) Critical section
 - iv) Semaphore
 - v) Deadlock

- Q3)** a) For the reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 3, 6. Calculate the number of page faults with 3 frames using FIFO,LRU,and optimal page replacement methods. [9]
- b) Differentiate : [9]
- i) Logical and physical address
 - ii) Page table and segment table
 - iii) Static and dynamic partitioning

OR

- Q4)** a) Explain demand paging. Why do we need demand paging? [6]
- b) Explain thrashing with an example. How can it be handled? [6]
- c) Discuss the Internal and External Fragmentation with example. [6]

P.T.O.

Q5) a) Assume a disk with 400 tracks, and the disk request has random requests as follows: 53, 59, 42, 21, 310, 350, 380, 184. Find the no. of tracks traversed and average seek length if [9]

i) FIFO

ii) SSTF

iii) CLOOK is used, and initially head is at track no.100.

b) Why I/O buffering is necessary? State and explain different I/O buffering techniques. [8]

OR

Q6) a) Why free space management is required. Explain various Free space management techniques (at least 4) [9]

b) Explain different file organization techniques with their advantages and disadvantages. [8]

Q7) a) Categorize the overall compilation process in the form of various phases using suitable diagrams. Explain each phase in detail. [9]

b) Explain the data structures required for a two-pass assembler with their usage in detail. [9]

OR

Q8) a) Define System Software. How is it different from application software? List and explain important components of system software. [9]

b) Explain the following : [9]

i) Compile and Go Loader

ii) Direct linking loader



Total No. of Questions : 8]

SEAT No. :

PD-4324

[Total No. of Pages : 2

[6403]-122
T.E. (I.T)
MACHINE LEARNING
(2019 Pattern) (Semester - V) (314443)

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) Define Regression and explain types of regression with proper examples. [6]
- b) Explain Generalization Issues with Overfitting, Underfitting and Bias, Variance. [5]
- c) Explain Least-Square Method for finding values of the regression coefficients [6]

OR

- Q2)** a) Explain Simple Linear Regression with Gradient Descent Algorithm. [6]
- b) Explain Multivariate Regression with model representation. [5]
- c) Write short note on Vapnik-Chervonenkis dimension. [6]
- Q3)** a) What is Decision Tree? Explain Concepts and Terminologies. [8]
- b) Explain Bayes Rule & Naive Bayes Classifier. [4]
- c) Define Gini Index, Information gain and Entropy. [6]

OR

- Q4)** a) Explain feature tree & comment on best split algorithm. [12]
- b) Explain Conditional Probability, Joint Probability and Probability Density Function. [6]

P.T.O.

- Q5) a)** Apply Apriori algorithm for following set of transactions and find all the association rules with min support = 1 and min confidence = 60%. **[12]**

Transaction ID	Transactions
1	1,3,4
2	2,3,5
3	1,2,3,5
4	2,5

- b) Define and explain various Distance Metrics. **[6]**

OR

- Q6) a)** Suppose the task is to cluster points into three clusters using K-means clustering algorithm, where the points are A 1(2, 10), A2(2, 5), A3(8, 4), B 1(5, 8), B2(7, 5), B3(6, 4), C 1(1, 2), C2(4, 9). Find the members of these 3 clusters after 2 iterations. **[10]**

- b) What is distance metric? Explain any three distance measures. **[8]**

- Q7) a)** Explain different Activation Functions and it's types. **[6]**

- b) Explain Multi-layer Perceptron with example. **[6]**

- c) Write a note on Loss function- Mean Square Error. **[5]**

OR

- Q8) a)** Explain Perceptron with it's Learning Aigorithm. **[6]**

- b) Write a note on ANN. **[6]**

- c) Elaborate Deep Learning in detail. **[5]**



Total No. of Questions : 8]

SEAT No. :

PD4325

[Total No. of Pages : 2

[6403]-123

**T.E. (Information Technology)
HUMAN COMPUTER INTERACTION
(2019 Pattern) (Semester - V) (314444)**

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 circuit diagrams should must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1) a)** Categorize user profiles for any mobile phone-based money transfer application. (Hint:- Google pay/ PhonePe/ BHIM, etc.) **[7]**
- b) Goals are accomplished by methods consisting of operators which are identified by selection rules. illustrate this for following goals. **[10]**
- i) To delete a sentence in a graphical text editor
 - ii) To close window in a graphical text editor

OR

- Q2) a)** Create a GOMS description of the task of photocopying a paper from a journal. Discuss the issue of closure in terms of your GOMS description? **[7]**
- b) Consider designing a user interface for “on-line movie ticket booking” or “hospital admission system”. Perform a detailed task analysis. Identify task domain object & actions. Relate task domain & actions with interface objects & actions. **[10]**

- Q3) a)** A scenario is not only an idealized but also a detailed description of a specific instance of HCI. Scenarios specify how users carry out their tasks in a specified context. Write scenarios for booking an airline ticket from any online application. **[9]**

Note: Generate scenarios to cover a wide range of situations. Include problem situations that will test the system concept.

- b) Draw and explain Software design process from HCI perspective. **[9]**

OR

P.T.O.

- Q4) a)** Specify an example for low-fidelity, medium-fidelity, and High-fidelity prototype for any “Exam registration portal”. **[9]**
- b)** Consider any “Online grocery ordering system”, draw Model -View-Controller (MVC) framework. Mention the necessary technology solutions available for each of MVC. **[9]**

- Q5) a)** Explain DECIDE framework with necessary diagram and an example of the same. **[9]**
- b)** Explain user interface management system (UIMS) with its architecture? **[9]**

OR

- Q6) a)** What is Usability testing? How will you perform Usability testing on an interactive interface which deals into “Hotel booking” **[9]**
- b)** Write a short note on- **[9]**
- i) Heuristic Evaluation
 - ii) Cognitive walk through

- Q7) a)** Explain the following along with real life examples of both. **[10]**
- i) Augmented Reality
 - ii) Virtual Reality
- b)** Discuss in the detail the Challenges faced by designer while designing interfaces for. **[7]**
- i) Smart TV
 - ii) Smart wrist bands

OR

- Q8) a)** Draw and explain Design thinking in detail for any suitable application. **[10]**
- b)** In today’s world finding things on web has become very easy. Discuss how multimodal interaction has enriched the experience. Discussion on Input and output through speech, audio, image is expected with relevance to website / products. **[7]**



T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHM

(2019 Pattern) (Semester - V) (314445A) (Elective - I)

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) Find out min no. coins to make change of given amount using given coins : Coins {1, 5, 6, 9} [9]

W=10

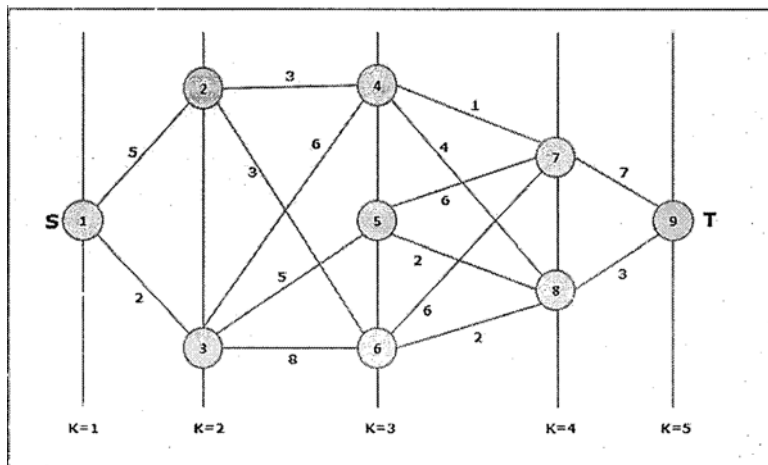
- b) Differentiate between dynamic programming method and divide and conquer method along with principle of optimality. [9]

OR

Q2) a) Find the optimal solution for the 0/1 knapsack problem making use of dynamic programming approach. [9]

Consider- weight [] = {1, 2, 3}, profit [] = {10, 15, 40}, Capacity = 6

- b) Find minimum path cost between vertex s and t for following multistage graph using dynamic programming. [9]



Q3) a) How backtracking strategy is useful to solve the graph coloring problem, explain with the help of algorithm and example. [9]

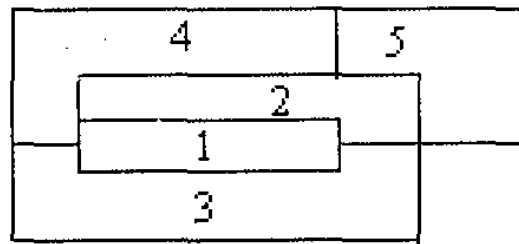
b) Explain the 0/1 knapsack problem. Provide solution to following problem instance using backtracking. [8]

$$N=5, M=12, P1-P5 = (10,15,6,8,4), W1-W5 = (4,6,3,4,2)$$

OR

Q4) a) Solve the 4-queen Problem. Draw the state space tree for the same. [9]

b) Construct planar graph for following map. Explain how to find m - coloring of this planar graph by using m - coloring Backtracking algorithm. [8]



Q5) a) What is Traveling Salesman Problem? Find the solution of the following traveling salesman problem using LCBB method. [9]

$$\text{Cost Matrix : } \begin{bmatrix} \infty & 4 & 2 \\ 3 & \infty & 4 \\ 1 & 8 & \infty \end{bmatrix}$$

b) Describe the branch and bound algorithm strategy for solving the 0/1 knapsack problem. Where Profit: {10, 10, 12, 18} and Weight: {2, 4, 6, 9} with $m = 15$. [9]

OR

Q6) a) Discuss the control abstraction of LCBB Branch and Bound with a suitable example. [9]

b) Describe branch and bound strategy and its types with example. [9]

Q7) a) What are steps to prove NP-completeness of a problem? Prove that vertex cover problem is NP-complete. [9]

b) What do you mean by NP Hard and NP Complete problems? Give an Example. [8]

OR

Q8) a) Explain P Class and NP Class. [9]

b) Write a non-deterministic algorithm for searching key elements and explain that function. [8]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4327

[6403]-125

[Total No. of Pages : 2

T.E. (Information Technology)

ADVANCED DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - V) (314445(B)) (Elective - I)

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 different type of NOSQL databases with examples. Compare RDBMS with NOSQL databases. **[9]**

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

- i) MapReduce and Hive
- ii) MongoDB.

OR

Q2) a) Explain the CAP theorem in the context of systems like Apache Cassandra and differentiate between Apache Cassandra and MongoDB. **[9]**

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

- i) XML
- ii) JSON

Q3) a) Explain key components of data warehouse architecture; also explain the role of data marts in a data warehousing architecture. **[9]**

b) What is OLAP? Explain ROLAP, MOLAP, and HOLAP with examples. **[9]**

OR

Q4) a) Apply the concepts of data warehousing to design a simplified data warehouse schema for a retail company. Include relevant dimensions and facts. **[9]**

b) Explain the advantages and disadvantages of using a star schema versus a snowflake schema in a data warehouse design. **[9]**

P.T.O.

Q5) a) Explain Data Mining Architecture in details, also explain different examples or applications where data mining is widely used to gain insights and make decisions. **[9]**

b) Illustrate Predictive algorithms and Descriptive algorithms in detail with examples. **[8]**

OR

Q6) a) Describe the Knowledge Discovery in Databases (KDD) process with the help of seven steps involved in KDD. **[9]**

b) Explain data mining techniques, such as classification, and clustering in details. **[8]**

Q7) a) What is a deductive database, and justify how it differs from a traditional relational database with example. **[9]**

b) Provide a brief overview of: **[9]**

i) Mobile databases

ii) Multimedia databases

iii) Geographical Information Systems

OR

Q8) a) What is an active database? Justify the role of triggers in it. Elaborate with an example of real-world scenarios where active databases and triggers are beneficial. **[9]**

b) Provide a brief overview of: **[9]**

i) Temporal Databases

ii) Spatial Databases

iii) Genome Data Management

x x x

Total No. of Questions : 8]

SEAT No. :

PD4328

[6403]-126

[Total No. of Pages : 2

T.E. (Information Technology)

INTERNET OF THINGS

(2019 Pattern) (Semester - V) (Elective - I) (314445D)

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 in Brief IEEE 802.15.4 protocol. **[8]**

b) Explain Sensor deployment & Node discovery in detail. **[9]**

OR

Q2) a) Explain Application Layer Protocols MQTT and AMQP in short. **[8]**

b) Discuss Wireless Media Access Issues in Internet of Things. **[9]**

Q3) a) Explain Arduino. What are the different features of Arduino? Discuss digital, analog, and power pins of it. **[9]**

b) Draw and explain interfacing of robotic arm using raspberry pi with python program. **[9]**

OR

Q4) a) Draw and explain the interfacing of the DHT11 sensor with Node McU to upload data on cloud with the program. **[9]**

b) Draw and explain interfacing of Bluetooth speaker using raspberry pi with python program. **[9]**

P.T.O.

Q5) a) What is cloud storage? Explain Cloud Storage models (SaaS, PaaS, IaaS) in details. **[8]**

b) Explain the RESTful web API with its designing and development using Django Framework. **[9]**

OR

Q6) a) Write short notes on **[8]**

i) ThingSpeak

ii) Ubidots

b) Explain Challenges for Secure IOT, Threat Modelling in details. **[9]**

Q7) a) Explain how you will design a smart water management system for agriculture using IOT. **[9]**

b) Elaborate on how you will use IOT for remote health care. **[9]**

OR

Q8) a) Explain how you will design an energy management system in a commercial building using IOT. **[9]**

b) Explain how you will design a smart shipment management system using IOT. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4329

[Total No. of Pages : 2

[6403]-127

T.E. (Information Technology)
COMPUTER NETWORKS & SECURITY
(2019 Pattern) (Semester - VI) (314451)

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.

- Q1)** a) Explain DSR in details with route discovery & route maintenance. [9]
b) Comment on Adhoc Network MAC layer with Design issues, Design Goal. [9]

OR

- Q2)** a) Briefly explain classification of routing protocol for Adhoc Wireless Network. [6]
b) Explain with diagram layered Architecture of Sensor Network. [6]
c) Write a short note on MACAW. [6]

OR

- Q3)** a) What is stream cipher? Explain the encryption process using stream cipher with suitable example. [8]
b) What is Cipher Feedback Mode (CFM)? Explain the process of CFM with suitable example. [9]
- Q4)** a) What is substitution cipher? Explain the mono alphabetic cipher and poly alphabetic cipher. [5]
b) Define Network Attack. Explain with suitable example what do you mean by active attack & passive attacks. [6]
c) Describe the following network security threats : [6]
i) Unauthorized access
ii) Distributed denial of service
iii) Man in the middle

P.T.O.

- Q5)** a) Explain private key management. [9]
b) Explain advanced encryption standard with diagram. [9]

OR

- Q6)** a) Explain following term : [9]
i) Hash function
ii) Digital signature
iii) Digital certificate
b) Explain PKIX Model. [9]

- Q7)** a) Define crime and cybercrime? State cybercrimes classification. [8]
b) Define the term cyber security & explain layers of security. [9]

OR

- Q8)** a) Explain the concept of software attack & hardware attacks with example. [8]
b) Write short notes on : [9]
i) Malware
ii) Phishing
iii) Cyber threat



Total No. of Questions : 8]

SEAT No. :

PD4330

[Total No. of Pages : 2

[6403]-128

T.E. (Information Technology)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semester - VI) (314452)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

- Q1)** a) Explain GFS as solution for Big data Processing Challenges. [6]
- b) Write short note on HIVE and HBASE. [8]
- c) Explain any 3 Hadoop shell commands. [3]

OR

- Q2)** a) Explain HDFS with a neat diagram. [6]
- b) Write the 4 types of NoSQL databases. [8]
- c) State and explain CAP Theorem. [3]

- Q3)** a) Explain the 4 types of big data analytics along with the analytical purpose. [8]
- b) Explain the different modes of data transformation in big data. [9]

OR

- Q4)** a) Explain the tasks in Data integration and Data Transformation phase. [8]
- b) Explain the three ways of Data Normalization used in data analytics. [9]

P.T.O.

- Q5)** a) Explain different Data Visualization Techniques. [8]
b) What are five purposes of using charts and state which type of charts used for each purpose? [10]

OR

- Q6)** a) Explain how data Visualization is beneficial for Business Analytics and Intelligence. [8]
b) Write note on any three of the following DV tools. [10]
i) Tableau
ii) Infogram
iii) Fusion Charts

- Q7)** a) Explain what is Social Media Data Analytics and state the advantages of SMA. [9]
b) Explain the data analysis life cycle in big data with example. [9]

OR

- Q8)** a) What is Mobile analytics? Explain its importance with suitable example. [9]
b) Explain Text mining architecture with suitable example. [9]



Total No. of Questions : 8]

SEAT No. :

PD4331

[Total No. of Pages : 2

[6403]-129

T.E. (IT)

WEB APPLICATION DEVELOPMENT

(2019 Pattern) (Semester - VI) (314453)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*
- 4) Neat diagram must be drawn wherever necessary.*

- Q1)** a) Explain how to create component and use it in angular application. [6]
b) Compare functional component with class component. [6]
c) Explain any 2 Hooks in ReactJS with example. [6]

OR

- Q2)** a) What is TypeScript? Write typescript program which will find maximum and minimum number from array. [6]
b) Explain any 2 types of Directive in Angular with example. [6]
c) Explain Angular - Architecture in detail. [6]

- Q3)** a) Compare NoSQL with SQL. [5]
b) Write a code using ExpressJS to illustrate the concept of routes. [6]
c) Explain the concept of Event Loop with suitable diagram. [6]

OR

- Q4)** a) What is API? Explain REST HTTP API's in detail. [5]
b) Write code to create collection, display and search data in MongoDB using NodeJS. [6]
c) Explain File system module NodeJS. Write program to perform append and delete operation on file. [6]

P.T.O.

- Q5)** a) List and Explain any 3 widgets in jQuery Mobile. [6]
b) Explain concept of 'role' in jQuery mobile? List and explain any 4 role. [6]
c) What is navigation? Write code to navigate from one page to another in jQuery Mobile. [6]

OR

- Q6)** a) Compare jQuery with jQuery Mobile. [6]
b) Write jQuery Mobile code to hide button once it is clicked. [6]
c) What is content? Write code to create content in JQuery Mobile page. [6]

- Q7)** a) Explain working of Elastic Load Balancer in detail. [6]
b) What is VPC? Explain advantages of VPC. [5]
c) What is PuTTY? How to connect EC2 instance with PuTTY? [6]

OR

- Q8)** a) What are different AWS Storage types? [6]
b) What is cloud computing? Enlist benefits of cloud computing. [5]
c) What is elastic beanstalk and how it works? [6]



Total No. of Questions : 8]

SEAT No. :

PD-4332

[Total No. of Pages : 2

[6403]-130

T.E. (Information Technology)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - VI) (Elective- II) (314454-A)

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 Representation in Artificial Intelligence? What are types of knowledge representation? **[9]**

b) Explain with an example Forward reasoning? Explain **[9]**

OR

Q2) a) What is Conceptual Dependency? Explain it's use with an example. **[9]**

b) What is Dempster-Shafer theory? Give an example of its application scenario. **[9]**

Q3) a) What is Unification? Discuss conditions for unification to apply. **[8]**

b) What is NLP? Explain phases of NLP. **[9]**

OR

Q4) a) What is Conversational Postulates? Mention few examples. **[9]**

b) What do you mean by Pragmatic? Why it is important in NLP? Discuss. **[8]**

P.T.O.

- Q5)** a) Alpha-Beta Pruning technique? What Alpha and Beta parameters in Alpha-Beta cutoff algorithm? State the condition for Alpha-Beta Pruning. [9]
b) Elaborate Components of A Planning System and mention the phases.[9]

OR

- Q6)** a) Explain Nonlinear Planning Using Constraint Posting. [9]
b) Elaborate Hierarchical Planning planning system in AI. [9]

- Q7)** a) “Deep learning is subset of ML and hence AI”. Comment on this. [9]
b) Write a short note on “Boltzmann Machines” [8]

OR

- Q8)** a) What is TensorFlow? Discuss. [9]
b) Explain Architecture of Deep Network [8]



Total No. of Questions : 8]

SEAT No. :

PD-4333

[Total No. of Pages : 2

[6403]-131

T.E. (Information Technology)

CYBER SECURITY

(2019 Pattern) (Semester - VI) (Elective - II) (314454B)

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 cyber forensics? Explain cyber forensics investigation process. **[9]**
- b) What is malware? List and explain types of malwares. How to perform malware analysis? **[9]**

OR

- Q2) a)** What do you mean by digital evidence? Explain different types of digital evidence. **[9]**
- b) Explain Anti-forensics practices in details **[9]**
- Q3) a)** What is Digital Forensics? Explain branches of Digital forensics. **[9]**
- b) Differentiate between Cyber Forensics and Digital Forensics. **[8]**

OR

- Q4) a)** What is meant by digital evidence? Which properties of digital evidence are important in Digital Forensics? Explain in detail. **[9]**
- b) List and explain principles of Forensics Audio and Video Analysis. **[8]**

P.T.O.

- Q5) a)** What is Social Engineering? Explain the role of social engineering in cyber security. **[9]**
- b)** Explain social engineering conceptual evolution. **[9]**

OR

- Q6) a)** Explain categorization theories and comparative analysis for Social Engineering. **[9]**
- b)** What do mean by insider attack? How to prevent insider attack? **[9]**

- Q7) a)** What is meant by Cyber Law? Explain Cyber Law with suitable example. **[9]**
- b)** Write a short note on E-Commerce and E-Governance. **[8]**

OR

- Q8) a)** Explain ITA 2000 with its positive aspects and weak areas. **[9]**
- b)** What do mean by Cyber offences? List different offences under IT Act 2000. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4334

[Total No. of Pages : 2

[6403]-132

T.E. (Information Technology Engineering)

CLOUD COMPUTING

(2019 Pattern) (Semester - VI) (Elective- II) (314454C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Draw and explain architecture of Google AppEngine. **[6]**
- b) Differentiate between Azure SQL and SQL Database. **[6]**
- c) What is AWS compute service? Elaborate on each category of compute services. **[6]**

OR

- Q2) a)** Explain features of Azure SQL database. **[6]**
- b) Write short note on: **[6]**
- i) Ajax
 - ii) JSON
- c) Explain application life cycle of Google AppEngine. **[6]**

- Q3) a)** Draw & explain General Architecture of Google File System (DFS)? **[6]**
- b) Discuss the terms: BigTable, HBase and Dynamo Cloud data stores in cloud computing? **[6]**
- c) What are the General Security Advantages of Cloud-Based Solutions?[5]

OR

P.T.O.

- Q4)** a) Draw & explain General Architecture Hadoop Distributed File System (HDFS)? [6]
b) Differentiate between BigTable and HBase of cloud computing. [6]
c) What is meant by Disaster Recovery? Discuss Threats in Disaster Recovery? [5]

- Q5)** a) Explain cloudlet. Differentiate between cloud & cloudlet. [6]
b) Write a short note on RFID [6]
c) Write a short note on ZigBee Technology. [6]

OR

- Q6)** a) Explain in detail the Cyber-Physical System. [6]
b) Explain Benefits & Graph Properties of Social Network. [6]
c) Explain Social Networking site Facebook. [6]

- Q7)** a) Draw the Docker architecture and explain the components. [6]
b) Discuss in brief: Comet Cloud? [6]
c) What's the difference between cloudlets and clouds? [5]

OR

- Q8)** a) Draw the kubernetes architecture and explain the components. [6]
b) Differentiate between multimedia Vs Mobile Cloud? [6]
c) Write a different application of fabric and paints? [5]



Total No. of Questions : 8]

SEAT No. :

PD-4335

[Total No. of Pages : 2

[6403]-133

T.E. (Information Technology Engineering)

SOFTWARE MODELING AND DESIGN

(2019 Pattern) (Semester - VI) (Elective- II) (314454-D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) The use case 'Login' accepts user-id and password from the user. The system validates them and displays a message "Log in successful". Draw a sequence diagram for this **[8]**

b) A simple digits watch has a display and two buttons, button 'A' and 'B' to set it. The watch has two modes of display, 'display time' mode and 'set time' mode. In the display time mode, the watch displays the hours and minutes separated by a flashing colon. The set time mode has two sub modes, set hours and set minutes. The 'A' button sets modes. Each time it is pressed, the mode advances in a sequence: display time, set hours and set minutes. Within the sub modes, the B button advances the hours or minutes once each time it is pressed. Buttons must be released before they can generate another event. Prepare a state diagram of the watch. **[9]**

OR

Q2) a) Draw the notations of synchronous asynchronous, return, create object and destroy object messages in the context of sequence diagram. **[8]**

b) In the context of a state diagram, what are concurrent sub states? Elaborate with an example. **[5]**

c) In the context of sequence diagram, what is an entity and a controller class? **[4]**

P.T.O.

- Q3)** a) With the help of UML, how can we package the classes involved within a system scenario. [6]
b) Describe the challenges involved in object-relational mapping. [6]
c) What are the benefits of the Access Layer Class? List the access layer tasks. [6]

OR

- Q4)** a) What is OCL? Explain its applications. [6]
b) Describe the steps involved in the process of designing view layer. [6]
c) Draw a detailed Deployment diagram for Library management system scenario. [6]

Q5) Write short note on following with diagram: [18]

- a) Singleton design pattern
- b) State design pattern
- c) Adapter design pattern

OR

- Q6)** a) Explain the terms: Low coupling, High Cohesion, polymorphism, pure fabrication, indirection [9]
b) What is GRASP? Explain Low Coupling and high Cohesion in detail. [9]

- Q7)** a) Explain the entities involved in documenting a software architectural pattern. [8]
b) What are the features for building distributed systems, explain in brief. [9]

OR

- Q8)** a) List and explain multiple views of a software architecture. [9]
b) Write a short note on: designing client-server software architectures. [8]



Total No. of Questions : 8]

SEAT No. :

PD4336

[Total No. of Pages : 2

[6403]-134

T.E. (Instrumentation and Control Engineering)

EMBEDDED SYSTEMS

(2019 Pattern) (Semester - V) (306261)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Compare following instructions with an example. **[8]**

- i) LCALL and ACALL
- ii) PUSH and POP

b) Elaborate Steps in Assembly Language Programming. **[9]**

OR

Q2) a) Explain in detail following instructions of 8051 μ C. **[8]**

- i) MOVX A, @ DPTR
- ii) MUL AB

b) Assume that RAM locations 40 - 44H have the following values. Develop a program to find the sum of the values. At the end of the program, register A should contain the low byte and R7 the high byte. **[9]**

40 = (7D), 41 = (EB), 42 = (C5), 43 = (5B), 44 = (30).

Q3) a) Develop and explain an interfacing diagram of 4×4 matrix keyboard with 89C51. **[9]**

b) Develop an interfacing diagram of 3-digit multiplex 7-segment LED display with 8051 μ C. Explain in brief. **[9]**

OR

P.T.O.

- Q4)** a) Discuss interfacing scheme of temperature sensor RTD Pt-100 with 89C51 μ C. [9]
b) Draw and explain interfacing scheme of ADC0808 with 89C51 μ C. [9]

Q5) Draw block diagram of washing machine control using 89C51 μ C. And explain the operation.

- a) Block diagram [9]
b) Explanation [9]

OR

Q6) Design on/off temperature control system using 89C51 μ C. Discuss the design based on following points.

- a) Block diagram and sensor selection [9]
b) Circuit diagram [9]

- Q7)** a) Elaborate applications of embedded system. [8]
b) Discuss Types of Operating Systems. [9]

OR

- Q8)** a) Compare ASIC and PLD. [8]
b) Discuss quality attributes of embedded system. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4337

[Total No. of Pages : 2

[6403]-135

T.E. (Instrumentation & Control Engg.)

INDUSTRIAL AUTOMATION - I

(2019 Pattern) (Semester - V) (306262)

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 wherever necessary.

Q1) a) Develop ladder logic for the following : [9]

- Process :
- i) Measure a level in the tank
 - ii) Open valve V_a to fill the tank level 45%
 - iii) Open valve V_b & close valve V_a when level 70%
 - iv) Turn on heater & stirrer for 20 seconds when level is 70%
 - v) The open valve V_c till level goes to 10%

b) Describe the following : [8]

- i) PID module
- ii) PID functions

OR

Q2) a) Explain the example of analog output application with neat diagram. [8]

b) Write short note on : [9]

- i) Comparison instruction
- ii) Arithmetic instruction
- iii) Logical instruction

Q3) a) Illustrate bit pattern in register, shift register & sequencer instruction. [9]

b) How analog inputs are handled in PLC? What are instruction's used to handle analog I/O's. [9]

OR

Q4) a) Explain SQO instruction of AB PLC with suitable example. [9]

b) Describe the analog signal processing & multi-bit data processing. [9]

P.T.O.

- Q5)** a) Describe PLC interfacing to Hydraulic & Pneumatic circuits. [8]
b) Define SCADA system with its component's. [9]

OR

- Q6)** a) List out the advantages & disadvantages of drives. [8]
b) Explain the different types of SCADA system. [9]

- Q7)** a) Write short note on : [9]
i) Need of SCADA
ii) Benefits of SCADA
iii) Alarm management
b) Explain internet based SCADA system with its diagram. [9]

OR

- Q8)** a) Describe the procedure to interface VFD to PLC. [9]
b) Define motion control & explain any one application of motion control. [9]



[6403]-136

T.E (Instrumentation and Control)
MODERN CONTROL THEORY
(2019 Pattern) (Semester - V) (306263)

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) Use of non-programmable calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Check whether following system is controllable and Observable. **[10]**

$$\dot{x} = \begin{bmatrix} -1 & -2 & -1 \\ 0 & -1 & 1 \\ 1 & 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} u \quad \& \quad y = \begin{bmatrix} 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

b) Select proper lyapunov function and determine stability for system; **[8]**

$$\dot{x} = \begin{bmatrix} 0 & 2 \\ -2 & -1 \end{bmatrix} x$$

OR

Q2) a) Check whether following system is controllable and Observable? **[10]**

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 1 & 1 \end{bmatrix} u \quad \& \quad y = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

b) Determine stability of system defined by $\dot{x} = \begin{bmatrix} 0 & 1 \\ 3 & -2 \end{bmatrix} x$ **[8]**

Using Lyapunov direct method of stability analysis. Assume symmetric positive definite matrix Q is identity matrix.

P.T.O.

Q3) A regulator system has the plant $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -8 & -14 & -7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$ and

$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ Design a state-feedback controller which will place the closed-loop poles at $s = -5, s = -6, s = -7$. **[17]**

OR

Q4) A regulator system has the plant $\dot{x} = \begin{bmatrix} -4 & 1 & 0 \\ -3 & 0 & 1 \\ -1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$ $y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

Design a full order state observer, the observer-error poles are required to be located at $s = -3, s = -4, s = -5$. **[17]**

Q5) a) Draw basic block diagram of discrete time control system. Explain one application of DTCS in detail. **[10]**

b) State and discuss sampling process also illustrate the term 'aliasing'. **[7]**

OR

Q6) a) Elaborate the ADC and DAC Operation with block diagram. **[10]**

b) What do you mean Zero Order Hold? State the importance of ZOH. **[7]**

Q7) a) Using Jury's stability criterion, check whether the system with characteristic equation is $F(z) = z^5 + 2.6z^4 - 0.56z^3 - 2.05z^2 + 0.0775z + 0.35 = 0$ is stable or not. **[10]**

b) Consider following difference equation. **[8]**

$$y(k+2) - \frac{3}{2}y(k+1) + \frac{1}{2}y(k) = r(k+1) + \frac{1}{2}r(k) \text{ and } y(k) = 0; k < 0,$$

$$\begin{aligned} r(k) &= 0; k = 0 \\ r(k) &= 1; k > 0 \end{aligned} \quad \text{Find } y(k)$$

OR

- Q8) a)** Consider following discrete time closed loop control system; find the range of K for stability of system when sampling Time $T = 1$ sec. **[10]**

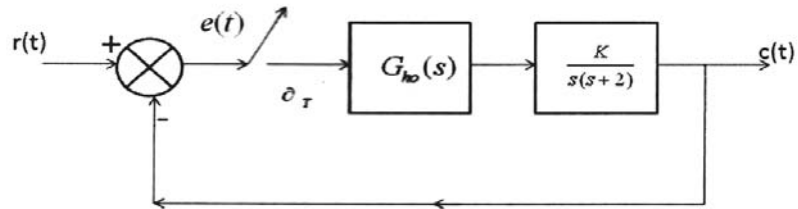


Figure. Closed Loop Control System

- b)** Obtain Pulse Transfer function of system shown in figure below. **[8]**

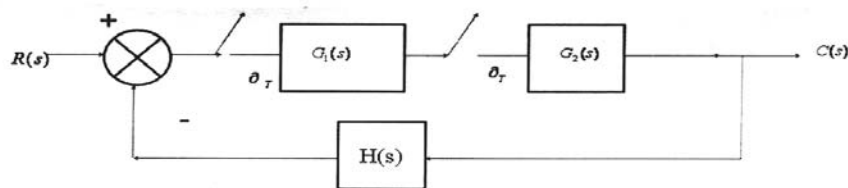


Figure. Closed Loop Control System

* * *

Total No. of Questions : 8]

SEAT No. :

PD4339

[Total No. of Pages : 2

[6403]-137

T.E. (Instrumentation and Control Engineering)

OPERATING SYSTEMS

(2019 Pattern) (Semester - V) (306264)

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 circuit diagrams should be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1) a)** What is paging? With neat diagram explain paging hardware. **[8]**
- b) What is page fault and page replacement? Describe the steps in handling a page fault with suitable figure. **[9]**

OR

- Q2) a)** Describe memory protection and memory sharing. **[8]**
- b) Explain FIFO page replacement algorithm with suitable example. Also explain briefly Belady's anomaly. **[9]**

- Q3) a)** What is deadlock? Describe 4 conditions if hold simultaneously can cause deadlock. **[9]**
- b) Describe deadlock prevention and deadlock avoidance. **[9]**

OR

- Q4) a)** With neat figures explain resource allocation graph. **[9]**
- b) Describe the role of safety algorithm and resource-request algorithm used in the Banker's algorithm for deadlock avoidance. **[9]**

- Q5) a)** What is file? Explain file attributes and file operations. **[8]**
- b) Explain single level and two-level directory. **[9]**

OR

P.T.O.

- Q6)** a) What is the need of free space management? Explain linked list approach. [8]
b) Explain with suitable figure linked allocation. [9]

- Q7)** a) Explain access matrix implementation options. [9]
b) Explain different categories of viruses. [9]

OR

- Q8)** a) Enlist different methods to implement access matrix. Explain any two of them. [9]
b) Describe program threats. [9]



Total No. of Questions : 8]

SEAT No. :

PD4340

[6403]-138

[Total No. of Pages : 2

T.E. (Instrumentation and Control Engineering)

MECHATRONICS & ROBOTICS

(2019 Pattern) (Semester - V) (306265A) (Elective - I)

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) Explain the Recognition of the Need and Conceptual Design for a Mechatronics System? **[6]**

b) List the Sensor and Actuator Selection criteria and explain the Drivers for Actuators? **[6]**

c) Explain life cycle and life cycle optimization? **[6]**

OR

Q2) a) What is Prototyping Hardware-in-the-loop Simulation? Explain? **[6]**

b) Explain in brief the Deployment of Embedded Software with an example? **[6]**

c) Explain conceptual design and functional specification? **[6]**

Q3) a) Define the term Robotics and explain its concept? List out the Sensors in Robotics (any one)? **[6]**

b) List out the important characteristics of a robot with an example? **[6]**

c) Give the history of Robot in brief? **[6]**

OR

Q4) a) What are the different types of Micro-controllers and Motors used in Robotics? Explain with appropriate example? **[6]**

b) Illustrate the Scope of Robotics & what are the Safety Measurement in Robotics? Explain? **[6]**

c) Write a note on scope of robotics, advantages and disadvantages of it? **[6]**

P.T.O.

- Q5)** a) Differentiate between Direct and Inverse kinematics? Also define these terms? [6]
- b) Illustrate the concept of Artificial Intelligence in Robots in details? [6]
- c) Write a short note on classes and data structure? [5]

OR

- Q6)** a) What are the roles of End effectors and Actuators in kinematics? Explain?[6]
- b) Define the degree of Freedom? Explain different types of Grippers? Draw diagrams of it? [6]
- c) Enlist different types of grippers, tools as an end effectors? [5]
- Q7)** a) Explain the Line following Robot algorithm and program in detail? [12]
- b) Give the design for development of Robotic arm with appropriate example. [5]

OR

- Q8)** a) Explain the Remote-controlled car programming in detail? [12]
- b) What are the selection components for designing of Robotics arm? Explain with example. [5]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4341

[6403]-139

[Total No. of Pages : 2

T.E. (Instrumentation and Control Engineering)

DATA SCIENCE

(2019 Pattern) (Semester - V) (306265B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Distinguish Data Visualization using Matplotlib Vs Seaborn. **[9]**

b) Explain with applications the concepts of **[9]**

i) append and merge

ii) loc and iloc

iii) concatenation of data

OR

Q2) a) Explain the mathematical operations that Numpy may perform on arrays.**[9]**

b) Describe the customizations of plots and graphic representations used in data science. **[9]**

Q3) a) Analyze the concept of 'Outlier' and discuss the various Outlier detection algorithms. **[8]**

b) Discuss on the analysis of univariate, bivariate data. **[9]**

OR

Q4) a) With examples, explain categorical and numerical data. **[9]**

b) Examine the various statistical methods for accounting for missing values in a dataset. **[8]**

P.T.O.

- Q5)** a) Demonstrate the concept of ‘One Hot Encoding’ with example. [9]
b) Distinguish between One Hot Encoding and Label Encoding with advantages and applications. [9]

OR

- Q6)** a) Discuss on the concept of data scaling. Discuss about Min-max scaling and mean scaling in detail. [9]
b) Describe the feature selection and how it can affect ML modeling. [9]
- Q7)** a) Explain the ‘live’ and ‘extract’ connections between Tableau and database in detail. [8]
b) Discuss the different types of Charts in Tableau. [9]

OR

- Q8)** a) Differentiate between traditional BI and Tableau. [9]
b) Explain the different data types and databases in Tableau. [8]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4342

[6403]-141

[Total No. of Pages : 2

T.E. (Instrumentation and Control)
BIOMEDICAL INSTRUMENTATION
(2019 Pattern) (Semester - V) (306265D) (Elective - I)

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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Define Blood Flow. State the Types of Blood Flow Meters. Draw and Discuss the working principle of Electromagnetic Blood flow meter with neat diagram. **[10]**
- b) Define Blood Pressure. Compare Direct and Indirect Blood Pressure Measurement. **[7]**

OR

- Q2)** a) State the working principle of Microphone used in the measurements of Heart Sounds. Draw and Discuss the working principle of Phonocardiography with neat diagram. **[10]**
- b) Describe the Working Principle of Cardiac Output with neat diagram. **[7]**
- Q3)** a) State the function of Cranium Nerves. With the help of neat diagram, explain the working of Neuron and its function. **[10]**
- b) Explain the Biofeedback with the help of neat diagram. **[8]**

OR

- Q4)** a) Define myoelectric voltages. Explain the working principle of Electromyography (EMG) with the help of neat diagram. **[10]**
- b) With the help of neat diagram, Elaborate the various parts of brain, and its functions. **[8]**

P.T.O.

Q5) a) Elaborate the role of Bone conduction system in the mechanism of hearing. Explain the working of Audiometer system Bekesy with the help of neat diagram. **[10]**

b) Describe the Visual Acuity (Errors in Vision) and its remedy. **[7]**

OR

Q6) a) State the role of rods and cones in the mechanism of hearing Describe the mechanism of Hearing Aids System with the help of neat diagram.**[10]**

b) With the help of neat diagram, Explain the Anatomy of Eye. **[7]**

Q7) a) With the help of neat diagram, explain the Regulation of breathing process. Explain the working of Air Flow measurements with the help of neat diagram. **[10]**

b) With the help of neat diagram, Explain the working of Oxygen Gas Analyzer. **[8]**

OR

Q8) a) State the function of Oxygenator. With the help of neat diagram, Explain the working of Bubble Type Oxygenators with the help of neat diagram.**[10]**

b) With the help of neat diagram, Explain the working of Ventilators. **[8]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4343

[Total No. of Pages : 2

[6403]-142

T.E. (Instrumentation & Control)

INTERNET OF THINGS

(2019 Pattern) (Semester-VI) (306268)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Logarithmic tables, electronic Pocket calculator and steam table is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Explain roll of platform in IoT. **[8]**

b) Discuss deployment options of IoT platforms. **[9]**

OR

Q2) a) What are different types of platform? Discuss each in brief. **[9]**

b) It is required to interface a sensor having measuring displacement from 0 mm to 10000mm having output range is 0 to 5V. Draw a interfacing diagram write a program to read the data and display it on serial port. Consider any suitable IoT compatible board. **[8]**

Q3) a) Explain architecture of cloud. **[9]**

b) What is Identity portrayal? Explain federal and global identity management. **[9]**

OR

Q4) a) What is infrastructure as a service? Explain with suitable example. **[9]**

b) Explain hybrid and device centric identity management with suitable example? **[9]**

P.T.O.

- Q5)** a) Discuss network and transport layer challenges from security view point.[8]
- b) Discuss security framework in IoT. [9]

OR

- Q6)** a) Explain authorization mechanism in IoT. [8]
- b) Explain IoT routing attacks. [9]

- Q7)** a) Explain application of IoT in smart grid. [9]
- b) Elaborate application of IoT in automobiles. [9]

OR

- Q8)** a) Discuss how IoT help to improve healthcare services with suitable example. [9]
- b) What is role of IoT in building SMART cities? Explain with suitable example. [9]



Total No. of Questions : 8]

SEAT No. :

PD4344

[Total No. of Pages : 2

[6403]-143

**T.E. (Instrumentation and Control)
INDUSTRIAL AUTOMATION - II
(2019 Pattern) (Semester - VI) (306269)**

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) Which protocols are used in Distributed Control Systems. [7]
b) Differential between HART and Fieldbus protocols. [10]

OR

- Q2)** a) Explain HART protocol benefits. How HART Communication is established in the DCS [9]
b) How Control net protocol used in DCS [8]

- Q3)** a) What is role of operator station in DCS Automation. How history is managed in the DCS. [9]
b) Explain Integration and Optimization of DCS. [9]

OR

- Q4)** a) Explain Trends Display and Data archiving in DCS. [9]
b) What are the benefits of implementing advanced alarming and event management in a DCS? [9]

- Q5)** a) Enlist Programming Languages (IEC 61131-3) used in DCS. [7]
b) Explain use of SFC language for DCS with suitable Example. [10]

OR

- Q6)** a) Explain use of advanced control functions in DCS. [9]
b) Discuss on Programming Algorithms for Modules [8]

P.T.O.

- Q7)** a) How IoT is used in Distributed Control Systems. [8]
b) How can DCS support condition monitoring in a plant? [10]

OR

- Q8)** a) Explain use of DCS in oil and gas plants? [10]
b) With the help of schematic diagram describe use of DCS in paper and pulp industry. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4345

[Total No. of Pages : 2

[6403]-144

T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - VI) (306270)

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 should be drawn wherever necessary.*
- 3) *Use of Non- programmable Calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) Find DTFS for the following **[8]**

$$x(n) = \cos\left(\frac{\pi}{3}n\right)$$

b) Enlist the different properties of DTFS. Prove any two properties. **[9]**

OR

Q2) a) Compare DTFS and DTFT. **[6]**

b) A discrete time system is described given by a difference equation **[11]**

$$y(n) - 5y(n - 1) = x(n) + 4x(n - 1)$$

where $x(n)$ is the input and $y(n)$ is the output. Determine the magnitude and phase response.

Q3) a) Explain how the inverse DFT can be obtained by means of FFT algorithm. **[8]**

b) Find the DFT of the given sequence using Decimation in Frequency (DIF) FFT algorithm. **[10]**

$$x(n) = \{1, 2, 1, 2\}$$

OR

P.T.O.

- Q4) a)** Perform the circular convolution of the following sequences [8]

$$x(n) = \{1, 1, 1, 0\}$$

$$h(n) = \{2, 1, 1, 2\}$$

- b) Find the DFT of the following using Decimation in Time (DIT) FFT algorithm [10]

$$x(n) = \{2, 1, 2, 1\}$$

- Q5) a)** Apply bilinear transformation to the following to find $H(z)$, [9]

$$H(s) = \frac{1}{(s+6)(s+7)}$$

with $T = 1$ sec.

- b) Explain bilinear transformation method for designing the digital filters. [8]

OR

- Q6)** Design a Butterworth digital low pass filter with following specification, [17]

$$0.9 \leq |H(e^{j\omega})| \leq 1; \text{ for } 0 \leq \omega \leq 0.4\pi$$

$$|H(e^{j\omega})| \leq 0.3; \text{ for } 0.8\pi \leq \omega \leq \pi$$

using impulse invariance method. Assume $T = 1$ sec.

- Q7) a)** Design a linear-phase FIR Low Pass Filter with the following desired frequency response. [12]

$$H_d(e^{j\omega}) = 1; -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4}$$

$$H_d(e^{j\omega}) = 0; \frac{\pi}{4} \leq \omega \leq \pi$$

Using Triangular window with $N = 7$.

- b) Compare FIR and IIR filters [6]

OR

- Q8) a)** Give the advantages and disadvantages of windowing method. [6]

- b) Design a low pass FIR filter using rectangular window by taking $N = 9$, magnitude=1 and cut-off frequency $\omega_c = 0.2\pi$ rad/sample. [12]



Total No. of Questions : 8]

SEAT No. :

PD-4346

[Total No. of Pages : 2

[6403]-145

T.E. (Instrumentation & Control)

BUILDING AUTOMATION

(2019 Pattern) (Semester - VI) (Elective- II) (306271-A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to right indicate full marks.*
- 4) Assume suitable data, if necessary.*

Q1) a) What are the components of an AHU? Explain with neat labelled diagram of AHU **[10]**

b) Compare AHUs based on 100% outdoor air and mixed air type. **[8]**

OR

Q2) a) How does an Air Handling Unit work? **[10]**

b) Describe Run Around Coil and Thermal wheel in AHU **[8]**

Q3) a) Distinguished Water-Cooled Chiller vs Air Cooled Chiller in HVAC System **[10]**

b) Describe concept of heat pump with respect to geothermal energy. **[7]**

OR

Q4) a) What are the main components of a water tube boiler? What is the working principle of a water tube boiler? What is the difference between a water tube and fire tube boiler? **[10]**

b) Explain the Vapor-compression Cycle — Refrigeration Cycle **[7]**

P.T.O.

- Q5) a)** Explain FAS loops and classifications **[8]**
b) Explain the conventional (non-addressable) and addressable Types of Fire Alarm Systems. **[10]**

OR

- Q6) a)** Describe is SLC? **[8]**
b) Explain Different Types of Fire Alarm Cables **[10]**

- Q7) a)** What is Video Analytics? Why Use Video Analytics? **[7]**
b) What are the types of CCTV camera? **[10]**

OR

- Q8) a)** What is the difference between a Video Server, an NVR and a DVR?[7]
b) What is an Access control System? Describe its benefits. **[10]**



Total No. of Questions : 8]

SEAT No. :

PD-4347

[Total No. of Pages : 2

[6403]-146

T.E. (Instrumentation & Control Engg)

MACHINE LEARNING

(2019 Pattern) (Semester - VI) (Elective- II) (306271-B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** What is KNN and how does it classify instances based on similarity measures? **[10]**
- b) Explain the role of conditional probability and Bayes' theorem in Naïve Bayes classification. **[8]**

OR

- Q2) a)** Describe the significance of the sigmoid function in logistic regression and its role in transforming inputs into probabilities. **[10]**
- b) What is logistic regression and how does it model the probability of a binary outcome? **[8]**

- Q3) a)** Define Support vector machine. Explain the significance of support vectors in determining the decision boundary of an SVM classifier. **[9]**
- b) Define a hyperplane and its significance in SVM-based classification. **[8]**

OR

- Q4) a)** Distinguish between hard margin and soft margin SVM approaches, highlighting their respective characteristics. **[9]**
- b) Define non-linear separable data and explain how SVMs address such datasets. **[8]**

P.T.O.

- Q5) a)** Explain the concept of tree split criteria in Decision Trees and its role in determining the branching of the tree. **[10]**
- b)** Define overfitting and underfitting in machine learning models, including Decision Trees and discuss techniques to mitigate them, such as regularization. **[8]**

OR

- Q6) a)** Define Random Forest and explain how it combines the concept of ensemble learning with Decision Trees. Write the advantages of using Random Forest over individual Decision Trees. **[10]**
- b)** Explain the process of pruning in Decision Trees and its importance in preventing overfitting. **[8]**

- Q7) a)** Define K-Means Clustering, Discuss the steps involved in the K-Means Clustering algorithm. **[9]**
- b)** Describe model evaluation techniques for hierarchical clustering, including dendrogram visualization and cluster validation indices like the silhouette score. **[8]**

OR

- Q8) a)** Explain the Silhouette Method and its purpose in evaluating the quality of clustering results. **[9]**
- b)** Discuss the advantages and limitations of both K-means and hierarchical clustering algorithms in different scenarios and datasets. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4348

[Total No. of Pages : 2

[6403]-147

T.E. (Instrumentation & Control)

ELECTRICAL DRIVES

(2019 Pattern) (Semester - VI) (Elective - II) (306271C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Give the types of DC motor. Describe a DC Shunt motor. **[9]**

b) Describe a DC permanent-magnet motor. **[9]**

OR

Q2) a) Distinguish between Time Ratio Control and Current Limit Control strategies in dc chopper. **[9]**

b) What is Universal Motor? Explain the operation of Universal Motor. List two differences between Universal Motor and DC series Motor. **[9]**

Q3) a) Explain the Speed Control of Induction Motors. **[8]**

b) Explain the Variable Frequency Control of Induction Motor Drive along with its features. **[9]**

OR

Q4) a) What are the different methods of speed control of IM? Explain the pole changing method and supply frequency changing method of speed control of induction motors. **[8]**

b) What is an Inverter? How an Inverter is Classified in main categories? Explain briefly about two types of single phase inverters. What is the difference between single phase inverter and three phase inverter? **[9]**

P.T.O.

- Q5) a)** Explain the electrical drives for Electric Traction and Refrigeration and Air Conditioning. **[9]**
- b)** What is Electric Drive? Discuss the types of Electric Drives and parameters on which it depends. **[9]**

OR

- Q6) a)** Discuss electrical drives for Pumps and Air Compressor. **[9]**
- b)** Elaborate on Machine Tool Drives as a Applications of Electric Drives. **[9]**

- Q7) a)** Explain electrical drives for Lathes, Milling and Grinding Machines. **[8]**
- b)** Discuss the Non-isolated converters and isolated converters types of DC/DC converters. **[9]**

OR

- Q8) a)** Describe a DC/DC converter in electric vehicle? **[8]**
- b)** Explain the Function of an Inverter? Enlist Limitations of DC-to-AC Converters (Inverters). **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4349

[Total No. of Pages : 2

[6403]-148

T.E. (Instrumentation and Control)

ANALYTICAL INSTRUMENTATION

(2019 Pattern) (Semester - VI) (306271D) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Give the classification of Liquid Chromatography? Draw a suitable block of any one of them and explain its working? Give its applications? **[8]**
- b) Draw the schematic diagram of Gas Chromatography and explain function of each part? Draw and explain the importance of sample injection system in it? **[9]**

OR

- Q2) a)** What are the different types of Recorders used in Gas Chromatography. Explain any one type of recorder working and construction. **[8]**
- b) Draw a block diagram of High Pressure Liquid Chromatography(HPLC) and explain its working principle? How a sample is injected in it? Draw and Explain? **[9]**
- Q3) a)** Enlist various Pollution Monitoring Instruments . Explain the working of any one Pollution Monitoring Instrument using block diagram? **[9]**
- b) Enlist methods used for oxygen analysis? Draw Zirconium oxide based oxygen analyzer and describe operation of it? State the formula for the voltage generated across the cell? **[9]**

OR

P.T.O.

- Q4) a)** Draw the equipment used for the Turbidity analysis? Explain the working of the instrument? Give the details about ppm and NTU units used for turbidity? **[9]**
- b)** Draw and explain how NO_x is monitored or analyzed. **[9]**

- Q5) a)** What you mean by Reverse Osmosis? Draw a block diagram of typical RO water filter? Explain in brief different parts and working of them?**[9]**
- b)** Explain the working of quadrupole Mass Spectrometer? Draw appropriate diagram? Give at least one application of it? **[9]**

OR

- Q6) a)** Define and explain the process of Micro filtration and ultra-filtration? What are their application, state one each? **[9]**
- b)** Draw a schematic diagram of Magnetic Deflection Mass Spectrometer and Explain its working? State mathematically that the radius of the orbit is a function of the mass-to- charge ratio (m/e) of the particles? **[9]**

- Q7) a)** Draw a neat sketch and explain in detail Geiger-Muller tube (GM tube).**[8]**
- b)** Describe how radiation interacts with matter? Define Photoelectric and Compton effect related to this interaction? **[9]**

OR

- Q8) a)** What is mean by Scintillation? Which materials exhibits this property? Draw the schematic diagram of scintillation counter and explain how it detects nuclear radiation'? **[8]**
- b)** Enlist the Radioactive Instruments. Elaborate in detail Industrial applications of radiation measurement. **[9]**

x x x

[6403]-149

T.E. (Automobile)

NUMERICAL & OPTIMIZATION METHODS
(2019 Pattern) (Semester - V) (316481)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Use Taylor's series method solve equation $\frac{dy}{dx} = x^2 + y^2$. Given initial conditions are $x = 0, y = 1$. Estimate $y(0.5)$ take $h = 0.25$. [8]
- b)** Use Runge-Kutta method of fourth order to obtain the numerical solution of $\frac{dy}{dx} = \sqrt{x^2 + y}$, Find y at $x = 0.4$ given $y(0) = 1$, take $h = 0.2$. [9]

OR

- Q2) a)** Solve the Laplace's equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh shown below: [8]

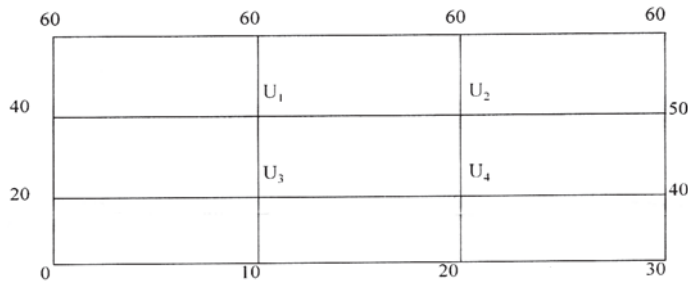


Fig.1

- b)** Solve for $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ the following explicit finite scheme, given by, [9]
- i) $u = \sin(\pi x)$ for $t = 0$, where $0 \leq x \leq 1$,
 - ii) $u = 0$ for $x = 0$ and $x = 1$ for $t = 0$ to 0.06 , and
 - iii) Increment in t is $k = 0.02$ and in x is $h = 0.2$
- Calculate values of u for $t = 0$ to 0.06 at $x = 0$ to 1 .

P.T.O.

Q3) a) Evaluate $\int_0^3 2x - x^2 \cdot dx$, taking 6 intervals by using Trapezoidal rule. [9]

b) Evaluate $\int_0^1 \frac{\sin x}{2 + 3 \sin x} dx$ using Simpson's (3/8)th rule. Take 6 strips. [9]

OR

Q4) a) Evaluate $I = \int_0^1 \int_0^1 e^{x+y} \cdot dx \cdot dy$ using trapezoidal rule. Take $h = k = 0.5$ [9]

b) Find double integral of $f(x, y) = x^2 + y^2 + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Applying Simpson's 1/3rd rule. [9]

Q5) a) Find the initial basic feasible solution for the Transportation problem by Vogel's approximation method. [8]

S \ D	D1	D2	D3	D4	Supply
S1	11	13	17	14	250
S2	16	18	14	10	300
S3	21	24	13	10	400
Demand	200	225	275	250	950

Fig. 2

b) Maximize $Z = 1600x + 1500y$. Constraints are, [9]
 $5x + 4y \leq 500$
 $15x + 16y \leq 1800$
 $x \geq 0, y \geq 0$
 Use simplex method to calculate x, y and maximize profit Z .

OR

Q6) a) Determine the maximum value of root of equation $0.51x - \sin x$ by Newton's method. Take initial guess as 2 and do 4 iterations. [5]

b) Define Optimization. Explain the types of optimization and write its Engineering Application. [3]

c) Minimize $f(x) = 4x^3 + x^2 - 7x + 14$ within the interval (0, 1) using Golden-section search method. [9]

Q7) a) Explain Genetic algorithm. Write its advantages, disadvantages and applications. [9]

b) Explain Simulated annealing with its advantages, disadvantages and applications. [9]

OR

Q8) a) Explain Particle swarm optimization in detail. [9]

b) Explain Ant Colony optimization also write its advantages, disadvantages and applications. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4351

[Total No. of Pages : 3

[6403]-150

T.E. (Automobile Engineering)

HEAT TRANSFER

(2019 Pattern) (Semester - V) (316482)

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, electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Explain the following non dimensional Numbers. **[8]**

- i) Nu
- ii) Pr
- iii) Re
- iv) Pe

- b) When 0.6 kg of water per minute is passed through a tube of 2 cm diameter, it is found to be heated from 20°C to 60°C. the heating is achieved by condensing steam on the surface of the tube and subsequently the surface temperature of the tube is maintained at 90°C. Determine the length of the tube required for fully developed flow.(Use Data book for correlation)

[9]

OR

Q2) Write short notes on :

- a) Thermal & Hydrodynamic Boundary Layer **[6]**
- b) Temperature response **[6]**
- c) Bulk mean temperature and mean film temperature **[5]**

Q3) a) Explain the following with diagram :Film wise and drop wise condensation in detail with diagrams. **[8]**

- b) A vertical pipe 80 mm diameter and 2 m height is maintained at a constant temperature of 120°C. the pipe is surrounded by still atmospheric air at 30°C. Find heat loss by natural convection. **[10]**

Use correlation $Nu = 0.10(GrPr)^{0.333}$.

OR

P.T.O.

Q4) a) Plot and explain Boiling curve for saturated water at atmospheric pressure. [8]

b) A horizontal cylinder of 0.4m dia. at a surface temperature of 40°C is placed in air at 80°C. Compare the heat gain by the cylindrical surface with that of a vertical plate of height $\frac{\pi \times 0.4m}{2}$ under the same conditions.

Use correlation for Cylinder $Nu = 0.53(Gr Pr)^{1/4}$

And for plate $Nu = 0.59(Gr Pr)^{1/4}$. [10]

Q5) a) i) Explain the concept of overall Heat transfer coefficient used for heat exchange. [4]

ii) How fouling factor affects the performance of heat exchanger. Explain with illustration. [4]

b) A counter flow heat exchanger is employed to cool 0.55 kg/s ($C_p = 2.45$ kJ/kg°C) of oil from 115°C to 40°C by the use of water. The inlet and outlet temperature of cooling water are 15°C and 75°C respectively. The overall heat transfer coefficient is expected to be 1450 W/m²°C.

Using NTU method, calculate the following: [9]

i) The mass flow rate of water.

ii) The effectiveness of heat exchanger.

iii) The surface area required

OR

Q6) a) Explain the concept of LMTD and derive the expression for counter flow heat exchanger [8]

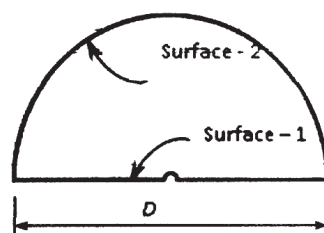
b) In a counter flow double pipe heat exchanger, water is heated from 25°C to 65°C by oil with specific heat of 1.45 kJ/kg K and mass flow rate of 0.9 kg/s. The oil is cooled from 230°C to 160°C. If overall Heat transfer coefficient is 420 W/m² °C. calculate following: [9]

i) The rate of heat transfer

ii) The mass flow rate of water, and

iii) The surface area of heat exchanger

Q7) a) The flat floor of a hemispherical furnace is at 800 K and has emissivity of 0.5. The corresponding values for the hemispherical roof are 1200 K and 0.25. Determine the net heat transfer from roof to floor. Take $\sigma = 5.67 \times 10^{-8}$ [9]



- b) Define :
- i) Monochromatic emissive power and total emissive power
 - ii) What is shape factor obtain the expression for it
 - iii) Explain what do you mean by absorptivity, reflectivity and transmissivity.

[3×3]

OR

Q8) a) Two large parallel planes with emissivities of 0.3 and 0.5 are maintained at temperatures of 527°C and 127°C respectively. A radiation shield having emissivities of 0.05 on both sides is placed between them. Calculate [9]

- i) Heat transfer rate between them without shield
- ii) Heat transfer rate between them with shield

b) Explain the following : [3×3]

- i) Weins Displacement law
- ii) Kirchhoff's law
- iii) Radiation resistances



Total No. of Questions : 8]

SEAT No. :

PD4352

[Total No. of Pages : 2

[6403]-151

T.E. (Automobile Engineering)

DESIGN OF MACHINE COMPONENTS

(2019 Pattern) (Semester - V) (316483)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers four question from the following.*
- 2) *Assume suitable data, if necessary.*

- Q1)** a) Brief about the different forms of threads. **[8]**
b) The lead screw of a lathe has single start ISO trapezoidal threads of 30 mm diameter and 6 mm pitch. It drives a tool carriage and exerts an axial load of 1.5 KN on a collar of 30 mm inside diameter and 50mm outside diameter. If the lead screw rotates 40rpm, find the power required to drive the screw and efficiency. Take the coefficient of friction for power screw as 0.14 and for collar as 0.09. **[10]**

OR

- Q2)** a) Narrate the types of fastenings. **[6]**
b) A double riveted lap joint is made between 15mm thick plates. If the ultimate stresses are 400 Mpa in tension, 620 Mpa in crushing and 330 Mpa in shear. Take the factor of safety 4. Design the joint. **[12]**
- Q3)** a) A connecting rod is subjected to a reversed axial loading 180KN. Determine the required diameter of rod using factor of safety 2. Take ultimate stress = 363 Mpa, yield shear stress = 216 Mpa, yield stress = 470Mpa, fatigue stress concentration factor = 1, correction factor = 0.7, surface finish factor = 1, size factor = 0.89. **[10]**
b) The brasses of an automobile engine connecting rod have worn so as to allow play which gives shock loading equivalent to a weight 6000N falling through a height 0.2 mm. The connecting rod is 250 mm long and has a cross-sectional area 300mm². Determine the maximum stress induced in connecting rod, resilience in tension or compression. Take E = 2,00,000Mpa. **[7]**

OR

P.T.O.

Q4) a) A steel rod is subjected to torsional load varying from -110N-m to 440N-m and axial load varying from 4500N to 13500N. Assume factor of safety as 8. Take ultimate stress = 550Mpa, yield shear stress = 235Mpa, yield stress = 470Mpa, fatigue stress concentration factor = 1, load factor=0.7 for axial and 1 for torsion, surface finish factor = 0.89, size factor = 1. Calculate the diameter of rod. **[10]**

b) Explain about Modified Goodman diagram. **[7]**

Q5) a) Brief about the classification of gears. **[6]**

b) Design a pair of helical gears are to transmit 15KW at 10,000rpm of the pinion with PCD 80mm. The transmission ratio is 3:1. Assume $\alpha = 20^\circ$ FDI, $\beta = 45^\circ$, $\sigma_d = 193.2$ Mpa, BHN = 250 for pinion and gear. Check only tangential tooth load. $Y = \pi(0.154 - 0.912/Z_e)$, $C_v = 5.55/5.55 + V^{0.5}$ **[12]**

OR

Q6) a) Design spur gear set to transmit 20 KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2$ Mpa, BHN = 250 for pinion and $\sigma_d = 47.1$ Mpa, BHN = 200 for gear. Check only tangential tooth load. Form factor $Y = \pi(0.154 - 0.912/Z)$, $C_v = 3.05/3.05 + V$. **[12]**

b) Derive Lewis equation for beam strength. **[6]**

Q7) a) Differentiate involute and cycloidal teeth profile. **[5]**

b) Two shafts are right angles to each other are connected by 20° full depth involute teeth bevel gears. The velocity ratio is 3:1. The pinion transmits 37.5 KW at 750 rpm. Assume number of teeth on pinion is 20. Design the gear set. Take $\sigma_d = 233.4$ Mpa, BHN = 200 for pinion and $\sigma_d = 172.6$ Mpa, BHN = 150 for gear. Form factor $Y = \pi (0.154 - 0.912/Z_e)$, $C_v = 6.1/6.1 + V$ **[12]**

OR

Q8) a) What are the advantages and disadvantages of worm gear drive? **[5]**

b) A worm gear drive is to connect two shafts to transmit 10 KW. The transmission ratio is 20:1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take $\sigma_d = 207$ Mpa, for worm and $\sigma_d = 82.4$ Mpa, for worm wheel. Form factor $Y = \pi (0.154 - 0.912/Z)$. **[12]**

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Total No. of Questions : 8]

SEAT No. :

PD-5287

[Total No. of Pages : 2

[6403]-152R

T.E. (Automobile Engineering)

AUTOMOBILE ELECTRICAL AND ELECTRONICS

(2019 Pattern) (Semester - V) (316484)

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.

- Q1)** a) Explain the electronic ignition system with a sketch. [6]
b) Describe the construction and working of oil pressure gauge and fuel gauge. [6]
c) What are the different types of spark plugs? Explain any one. [6]

OR

- Q2)** a) Describe the working of battery coil ignition system in detail. [8]
b) Explain working of Fuel gauge. [10]

- Q3)** a) Explain with neat sketch the starter motor characteristics. [5]
b) Enlist the different types of battery ratings. [5]
c) Explain the working of Wind shield wiper with neat sketch. [7]

OR

- Q4)** a) What are different types of sensors? Explain any one. [5]
b) Explain with neat sketch Solenoid Actuators. [5]
c) Write short note on cold and warm start system. [7]

P.T.O.

- Q5)** a) What are the different types of actuators? Explain any one. [5]
b) Explain with neat sketch MAP Sensor. [5]
c) Write down the difference between Group and sequential injection system. [7]

OR

- Q6)** a) Explain CRDI system with neat sketch. [5]
b) Write short note on Adaptive Cruise control. [5]
c) Compare PFI and TBI system. [7]

- Q7)** a) Write down the difference between cold start and warm start system. [6]
b) Write short note on Vehicle tracking system. [6]
c) Explain Radar warning system with layout. [6]

OR

- Q8)** a) Explain ABS System with layout. [6]
b) Explain Global Positioning Systems (GPS). [6]
c) What is Adaptive Cruise Control? Explain in brief. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4354

[Total No. of Pages :2

[6403]-153

T.E. (Automation & Robotic/Automobil/Mechanical Engg.)
ADVANCED FORMING AND JOINING PROCESSES
(302045 A) (2019 Pattern) (Semester - V) (Theory) (Elactive - I)

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) Explain the following points in relation to HAZ. [9]

- i) Definition
- ii) Causes
- iii) Effects
- iv) Reduction of HAZ formation

b) What is Weld ability? Elaborate the various factors affecting weld ability.[8]

OR

Q2) a) What are the various criteria's for the characterization of the weld. Explain them in detail. [9]

b) What are the factors affecting weld thermal cycles. [8]

Q3) a) Explain with neat sketch construction & working of Ultrasonic Welding.[9]

b) Discuss various steps to be followed during adhesive bonding. [9]

OR

Q4) a) Explain with the sketch basic principles of friction stir welding. [9]

b) Explain with the sketch how explosive welding is carried out. [9]

P.T.O.

- Q5)** a) Explain the process of underwater welding. [8]
b) Explain working of Laser beam welding with neat sketch. [9]

OR

- Q6)** a) Explain the process of Electron Beam welding along with its applications [8]
b) Write a short note on Robotic Welding. [9]

- Q7)** a) What is sustainable manufacturing and what are the drivers for sustainable Manufacturing practices. [9]
b) Explain the basic stages of conducting a Life Cycle Assessment. [9]

OR

- Q8)** a) List and Explain about the major factors that influence sustainability.[9]
b) Explain the five core elements of ISO 14000. [9]



Total No. of Questions : 8]

SEAT No. :

PD4355

[6403]-154

[Total No. of Pages : 2

T.E. (Mechanical Engineering)/(Automobile Engineering)

MACHINING SCIENCE & TECHNOLOGY

(2019 Pattern) (Semester - V) (Elective - I) (302045B)

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 wherever necessary.*

Q1) a) Describe with neat sketch any one special application of cylindrical grinder. Mention the application. **[9]**

b) Write any four constant factors and any four variable factors for selection of grinding wheel in machining process. **[8]**

OR

Q2) a) Explain Glazing , Dressing and Truing of Grinding wheels with neat sketches. **[9]**

b) Draw sketch of any lapping process. What are its control parameters? Write its two industrial applications. **[8]**

Q3) a) Write any six advantages of use of jig and fixture. **[6]**

b) Explain with neat sketch principle of setting elements in milling operation. **[6]**

c) Draw a sketch of Turnover Jig. **[6]**

OR

Q4) a) Write any six principles of clamping. **[6]**

b) Give any six location guidelines for fixture. **[6]**

c) Explain with neat sketch 3-2-1 principle of location. **[6]**

P.T.O.

- Q5) a)** Explain material evaluation in process planning. **[9]**
- b)** Explain with flow chart steps in process selection. **[8]**

OR

- Q6) a)** List and explain the set of documents required for Process Planning. **[9]**
- b)** Explain the process parameters that need to be calculated for each operation during process planning. Why this is important? **[8]**
- Q7) a)** “Milling Cutter requires Radius Compensation”, support the statement. **[6]**
- b)** Explain Canned cycle of programming? Write the advantage of writing part program with canned cycle. **[6]**
- c)** Write and explain any six preparatory functions codes. (G Codes) **[6]**

OR

- Q8) a)** Explain with neat diagram clockwise and anticlockwise Circular interpolation in CNC part program. **[6]**
- b)** Explain Steps in developing CNC part program. **[6]**
- c)** Write and explain any six miscellaneous functions codes. (M Codes) **[6]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4356

[Total No. of Pages : 2

[6403]-155

T.E. (Automobile)

AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING

(2019 Pattern) (Semester - VI) (316485)

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 Psychrometric chart is allowed.*

- Q1)** a) Compare and contrast the operation of a defrost and a demist air distribution mode in a vehicle's HVAC system. When would you use each mode, and why? [6]
- b) Explain Factors Affecting Human Comfort (any 3). [6]
- c) Explain strategies a driver can employ to improve the efficiency and speed of cool-down within the vehicle cabin. [6]

OR

- Q2)** a) How does the fan speed influence airflow and impact vehicle cabin temperature control? [6]
- b) Explain different types of Air Filters. [6]
- c) Explain in brief Cool-down Performance. [6]

- Q3)** a) Explain the concept of moist air as a working substance in psychrometric processes. [7]
- b) In a cooling application, moist air enters a refrigeration coil at the rate of 100 kg of dry air per minute at 35° C and 50% RH. The apparatus dew point of coil is 5° C and by-pass factor is 0.15. Determine the outlet state of moist air and cooling capacity of coil in TR. [10]

OR

P.T.O.

- Q4)** a) Explain Psychrometric Processes in short and draw process on psychrometric chart outline (any 3). [7]
 b) 800 m³/min of recirculated air at 22°C DBT and 10°C dew point temperature is to be mixed with 300 m³/min of fresh air at 30°C DBT and 50% RH. Determine the enthalpy, specific volume, humidity ratio and dew point temperature of the mixture. [10]

Q5) An air-conditioned hall is to be maintained at 27°C dry bulb temperature and 21°C wet bulb temperature. It has a sensible heat load of 46.5 kW and latent heat load of 17.5 kW. The air supplied from outside atmosphere at 38°C dry bulb temperature and 27°C wet bulb temperature is 25 m³/min, directly into the room through ventilation and infiltration. Outside air to be conditioned is passed through the cooling coil whose apparatus dew point is 15°C. The quantity of recirculated air from the hall is 60%. This quantity is mixed with the conditioned air after the cooling coil.

Determine :

- condition of air after the coil and before the recirculated air mixes with it;
- condition of air entering the hall, e, after mixing with recirculated air
- mass of fresh air entering the cooler;
- by-pass factor of the cooling coil, and
- refrigerating load on the cooling coil.

[18]

OR

- Q6)** a) Explain Outside & inside design consideration for AC System. [6]
 b) Explain the difference between winter air conditioning & summer air conditioning. [6]
 c) Write a short note on sensors and actuators. [6]

- Q7)** a) Discuss common methods for leak detection in an A/C system. [6]
 b) Discuss two important safety precautions to consider when handling refrigerants. [6]
 c) Explain refrigerant recycle and charging. [5]

OR

- Q8)** a) Explain the importance of temperature measurements in diagnosing air conditioning system issues. [6]
 b) Explain Automotive AC system flushing. [6]
 c) Write short note on Compressor servicing. [5]



Total No. of Questions : 8]

SEAT No. :

PD4357

[Total No. of Pages : 2

[6403]-156

T.E. (Automobile Engineering)

AUTOMOTIVE CHASSIS AND TRANSMISSION

(2019 Pattern) (Semester - VI) (316486)

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 the neat sketches wherever required.

Q1) a) Explain the basic requirements of wheels. **[8]**

b) Describe the construction of Pressed Steel Disc wheel with neat sketch. **[10]**

OR

Q2) a) Narrate self energizing brake with neat sketch. **[10]**

b) Explain the following : **[8]**

- i) Brake fade
- ii) Stopping distance
- iii) Brake balance
- iv) Brake torque

Q3) a) Describe the construction and working of Multiplate clutch with neat sketch. **[10]**

b) Brief the functions and requirements of clutch. **[7]**

OR

Q4) a) Explain in brief the working of sliding mesh gearbox with neat sketch. **[10]**

b) What are the resistances the vehicle has to face? Explain. **[7]**

Q5) a) List out the types of Axle & Explain Semi-Floating axle. **[10]**

b) Explain Hotchkiss Drive with neat sketch. **[8]**

OR

P.T.O.

Q6) a) What is the need of differential in vehicle? Explain about differential locking. [10]

b) Explain Non slip differential and differential lubrication. [8]

Q7) a) Explain the construction and working of fluid flywheel with sketch. [10]

b) Explain the construction & working of Wilson epicyclic gear train. [7]

OR

Q8) a) Narrate semi- automatic transmission with features. [10]

b) Explain the advantages and disadvantages of CVT. [7]



Total No. of Questions : 8]

SEAT No. :

PD-4358

[Total No. of Pages : 4

[6403]-157

T.E. (Automobile Engg.)

DESIGN OF ENGINE COMPONENTS

(2019 Pattern) (Semester - VI) (316487)

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) Explain the valve assembly of an IC. Engine. **[6]**

b) Write the step by step procedure for the design of push rod in valve mechanism. **[6]**

c) Design an exhaust valve for a horizontal diesel engine using the following data: **[6]**

Cylinder bore= 150 mm, length of stroke = 275 mm, Engine speed = 500 rpm, Maximum gas pressure = 3.5 Mpa, seat angle = 45°.

Calculate

- (i) diameter of the valve port,
- (ii) diameter of the valve head,
- (iii) diameter of the valve stem,

Consider, allowable mean velocity of gas as 50 m/s, k value for steel valve 0.42 and allowable bending stress of valve material as 50 N/mm²

OR

P.T.O.

Q2) a) Explain the working of the lubrication system in a single cylinder engine. [8]

b) Find the reaction at the fulcrum pin of rocker arm of an exhaust valve of a four stroke engine using the following data : [10]

Effective length of each arm = 180 mm, Angle between two arms = 135° , Diameter of valve head = 75 mm, Lift of valve = 25 mm, mass of valve = 0.5 kg, Engine Speed = 600 rpm, Back pressure when exhaust valve opens = 0.4 Mpa, maximum suction pressure = 0.02 Mpa below atmosphere. The valve opens 33° before the outer dead centre and closes 1° after the inner dead centre. The motion of the valve is SHM without dwell in the fully opened condition. Assume suitable data and state the assumption you make.

Q3) a) What is the functional difference between flywheel and governor? [4]

b) Explain the torque analysis of the flywheel. [5]

c) The turning moment diagram for a petrol engine is drawn on the following scales: Turning moment (1 mm = 5 N-m), Crank angle (1 mm = 1°). The turning moment diagram repeats itself at every half revolution of the engine and the area above and below the mean turning moment line, taken in order are 295, 685, 40, 340, 960, 270 mm². Determine the mass of 300 mm diameter flywheel rim, when the coefficient of fluctuation of speed is 0.3 % and the engine runs at 1800 rpm. [8]

OR

Q4) a) Explain the design of the solid disk flywheel. [7]

b) A single cylinder, single acting, four stroke oil engine develops 20 kW at 300 r.p.m. The work done by the gases during the expansion stroke is 2.3 times the work done on the gases during the compression and the work done during the suction and exhaust strokes is negligible. The speed is to be maintained within $\pm 1\%$. Determine the mass moment of inertia of the flywheel. Assume compression and expansion strokes are triangular in turning moment diagram, Also, neglect the suction and exhaust strokes. [10]

Q5) a) Explain in brief hydrostatic bearing with a neat diagram. [5]

b) Enlist the various parameters required to select suitable values for journal bearing design. [5]

- c) The following data is given for a 360° hydrodynamic bearing : [7]
 radial load = 10 kN,
 journal speed = 1440 rpm,
 unit bearing pressure = 1000 kPa,
 clearance ratio (r/c) = 800,
 viscosity of lubricant = 30 mPa s
 (l/d) ratio=1,
 Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate the dimensions of bearing and coefficient of friction.

$\left(\frac{l}{d}\right)$	ϵ	$\left(\frac{h_0}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)_f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{\max}}\right)$
∞	0	1.0	∞	(70.92)	∞	π	0	—
	0.1	0.9	0.240	69.10	4.80	3.03	0	0.826
	0.2	0.8	0.123	67.26	2.57	2.83	0	0.814
	0.4	0.6	0.0626	61.94	1.52	2.26	0	0.764
	0.6	0.4	0.0389	54.31	1.20	1.56	0	0.667
	0.8	0.2	0.021	42.22	0.961	0.760	0	0.495
	0.9	0.1	0.0115	31.62	0.756	0.411	0	0.358
	0.97	0.03	—	—	—	—	0	0
	1.0	0	0	0	0	0	1.0	0
	0	1.0	∞	(85)	∞	π	0	—
1	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0

OR

- Q6)** a) Enlist the different types of Rolling-contact Bearings. [5]
 b) Explain the selection of bearing life in roller bearing. [5]
 c) Write a short note on Static and dynamic load carrying capacities of roller bearing. [7]
- Q7)** a) Write a short note on Selection of engine type on the basis of Stroke and Bore. [6]
 b) Write a short note on Cylinder arrangement in IC Engine. [6]
 c) Write a short note on considerations of combustion chamber. [6]

OR

- Q8)** a) Write a short note on Oscilloscope engine analyzers and Distributor dwell-angle. [6]
- b) Write a short note on Exhaust gas CO and HC analyzer. [6]
- c) Write a short note on Mechanical fuel pump testing. [6]



Total No. of Questions : 8]

SEAT No. :

PD4360

[Total No. of Pages : 2

[6403]-159

T. E. (Automobile Engineering)

AUTOMOTIVE MATERIALS

(2019 Pattern) (Semester - VI) (316488B) (Elective - II)

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.*

Q1) a) Describe the Spray up process. **[9]**

b) Explain the Reinforcement of fibres in composites. **[8]**

OR

Q2) a) Compare Pultrusion with Compression moulding. **[9]**

b) Explain the Resin transfer moulding. **[8]**

Q3) a) Discuss the sequences of application of paint on automotive body. **[9]**

b) Explain the properties and composition of glass. **[9]**

OR

Q4) a) Describe the use of nanoparticles in paints to make them self- cleaning. **[9]**

b) Explain the various approaches in tempering of glass for shatter resistance. **[9]**

P.T.O.

- Q5) a)** Explain the Electro- or magneto-rheological engine mounts. **[9]**
- b) Explain the powder metallurgy process for making disc brake pads. **[8]**

OR

- Q6) a)** Describe the use of ceramics as fuel injectors in automotive engines. **[9]**
- b) Discuss the use of ER fluids in dampers in automobiles. **[8]**

- Q7) a)** Describe the materials developments by Land Rover. **[9]**
- b) Explain the criteria for selection of materials for different systems in automobiles. **[9]**

OR

- Q8) a)** Discuss the Ashby charts. **[9]**
- b) Explain the developments in materials by Honda. **[9]**

x x x

[6403]-160

T.E. (Mechanical & Mechanical S/w)
NUMERICAL AND STATISTICAL METHODS
(2019 Pattern) (Semester - V) (302041)

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) Use of scientific Calculator is allowed
- 5) Assume suitable data, if necessary.

Q1) a) Find the area under the curve on x-axis. The curve passes through the following points (1.0, 2.0), (1.50, 2.40), (2.0, 2.70), (2.50, 2.80), (3.0, 3.0), (3.50, 2.60), (4.0, 2.10). Use Simpson's 1/3rd Rule. **[6]**

b) Use the trapezoidal rule with n = 6 to estimate: **[6]**

$$\int_1^5 \sqrt{1+x^2} dx$$

c) Draw flowchart for Simpson 1/3 method to solve integration of any function. **[6]**

OR

Q2) a) Evaluate $I = \int_0^1 \int_0^1 e^{x+y} dx dy$ for 4 strips in x and y using Trapezoidal rule. **[8]**

b) Find Solution of an equation $1/(x+\sin x)$ using Simpson's 3/8 rule $x_1 = 1$ and $x_2 = 2$; Step value (h) = 0.25 **[5]**

c) Draw flowchart of Trapezoidal Method to evaluate Integration of a function. **[5]**

Q3) a) Find the polynomial passing through points (0.1), (1,3), (2,7), (3, 25), (4, 61), (5, 12) using Newton's interpolation formula and hence find y at $x = 1.5$. **[8]**

b) Fit a power equation $y = ax^b$ to the following data set. **[10]**

x	2.5	3.5	5	6	7.5	10	12.5	15
y	7	5.5	3.9	3.6	3.1	2.8	2.6	2.4

OR

P.T.O.

- Q4) a)** The velocity distribution of a fluid near a flat surface is given below. [10]

x	0.1	0.3	0.5	0.7	0.9
v	0.72	1.81	2.73	3.47	3.98

x is the distance from the surface (cm) and v is the velocity (cm/sec). Using Lagrange's interpolation method obtain the velocity at $x = 0.4$ and also find distance x when velocity will be 2 cm/sec.

- b) Find the least square polynomial approximation of quadratic curve to the data. [8]

x	-3	-2	-1	0	1	2	3
y	12	4	1	2	7	15	30

- Q5) a)** Calculate the first four moments of the following distribution about the mean. Also evaluate β_1 and β_2 . Identify type of curve. [8]

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

- b) The following are scores of two batsmen A and B in a series of innings:[8]

A	12	115	6	73	7	19	119	36	84	29
B	47	12	16	42	4	51	37	48	13	0

Who is the better scorer and who is more consistent? Justify your answer.

OR

- Q6) a)** Compute Karl Pearson's coefficient of correlation for the following heights in inches of fathers (x) and their sons (y): [9]

X	65	68	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

- b) Illustrate the following statistical diagrams with real life example [8]
- Scattered diagram
 - Histogram
 - Pie chart

- Q7) a)** Supposing that out of 12 test matches played between India and Pakistan during last 3 years, 6 are won by India, 4 are won by Pakistan and 2 have ended in a draw. If they agree to play a test series consisting of three matches, find the probability that India wins the test series on the basis of past performance. [8]

- b) In a distribution of 'NSM' marks exactly normal, 10% of students are under 40 and 5% are over 80. Find the mean and standard deviation of the distribution. [$A_1 = 0.4$, $Z_1 = 1.29$, $A_2 = 0.45$, $Z_2 = 1.65$] [9]

OR

- Q8) a)** 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: **[9]**

Window Number	Expected Number of customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows.
($\chi^2_{3,0.05} = 7.815$)

- b)** A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times and C can hit the target 3 out of 4 times. Find the probability of **[8]**
- i) at least two hit the target
 - ii) At most two hit the target
 - iii) No one hitting the target

* * *

Total No. of Questions : 8]

SEAT No. :

PD4362

[Total No. of Pages : 3

[6403]-161

T.E. (Mechanical/Mechanical Sandwich)

HEAT & MASS TRANSFER

(2019 Pattern) (Semester - V) (302042)

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 wherever necessary.

- Q1)** a) With neat figure explain pool boiling curve with different regions. Explain critical heat flux with its significance. [9]
- b) Explain the following Non dimensional numbers with their significance. [9]
- i) Reynold Number
 - ii) Prandtl Number
 - iii) Nusselt Number

OR

- Q2)** a) A cylinder body of 300 mm diameter and 1.6 m height is maintained at a constant temperature of 36.5. The surrounding temperature is 13.5°C. Find out the amount of heat to be generated by the body per hour if $\rho = 1.025 \text{ kg/m}^3$, $C_p = 0.96 \text{ kJ/kg}^\circ\text{C}$; $\nu = 15.06 \times 10^{-6} \text{ m}^2/\text{s}$; $k = 0.0892 \text{ kJ/m-h-}^\circ\text{C}$ and $\beta = 1/298 \text{ K}^{-1}$ Assume $Nu = 0.12 (\text{Gr. Pr})^{1/3}$ (the symbols have their usual meanings.) [9]
- b) In a straight tube of 60 mm diameter, water is flowing at a velocity of 12 m/s. The tube surface temperature is maintained at 70°C and the flowing water is heated from the inlet temperature 15°C to an outlet temperature of 45°C. Taking the physical properties of water at its mean bulk temperature, calculate the following: [9]
- i) The heat transfer coefficient from the tube surface to the water.
 - ii) The heat transferred, and
 - iii) The length of the tube.

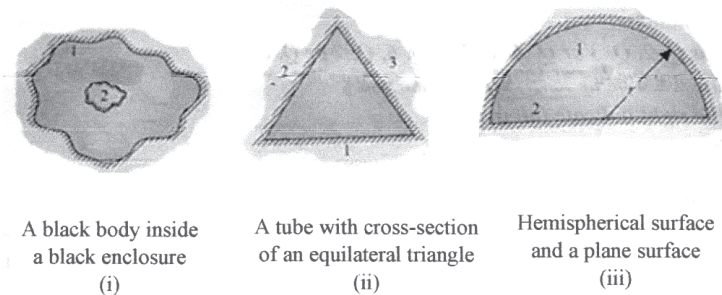
The thermo-physical properties of water at 30°C as: $\rho = 995.7 \text{ kg/m}^3$, $C_p = 4.174 \text{ kJ/kgK}$, $k = 61.718 \times 10^{-2} \text{ W/m}^\circ\text{C}$, $\nu = 0.805 \times 10^{-6} \text{ m}^2/\text{s}$ $Pr = 5.42$
Use the correlation $Nu = 0.023 Re^{0.8} Pr^{0.333}$.

P.T.O.

- Q3) a)** Explain the following : [8]
- Black Body
 - Solid angle
 - Emissivity
 - Gray Body
- b)** Explain the following with mathematical equations. [9]
- Stefan's Boltzmann's law
 - Kirchoff's law

OR

- Q4) a)** Calculate the shape factors for the configurations shown in the figure. [9]



- b)** Calculate the net radiant heat exchange per m^2 area for two large parallel plates at temperatures of 427°C and 27°C respectively. $\epsilon_{(\text{hot plate})} = 0.9$ and $\epsilon_{(\text{cold plate})} = 0.6$. If a polished aluminium shield is placed between them, find the percentage reduction in the heat transfer, $\epsilon_{(\text{shield})} = 0.4$. [8]

- Q5) a)** State and explain Fick's law for mass diffusion. [7]
- b)** Define : [10]
- Mass Fraction
 - Molar Fraction
 - Mass Concentration
 - Molar Concentration
 - Mass Diffusion Flux

OR

- Q6) a)** Oxygen at 25°C and pressure of 2 bar is flowing through rubber of inside diameter 25mm and wall thickness 2.5mm. the diffusion of oxygen in rubber is $0.21 \times 10^{-2} \text{ m}^2/\text{s}$ and solubility of O_2 in rubber is $3.12 \times 10^{-3} \text{ k mol/m}^3 \text{ bar}$. Find the loss of O_2 diffusion per meter length of pipe. (Assume partial pressure of O_2 to be zero) [9]
- b)** Hydrogen stored in a vessel diffuses through the steel wall of 20 mm thickness. The molar concentration at the inner surface is 2 kg mol/m^3 . At the other surface it is zero. Assuming plane wall condition and $D_{AB} = 0.26 \times 10^{-12} \text{ m}^2/\text{s}$ (a into b), determine the mass of hydrogen diffused per 1 m^2 . [8]

- Q7)** a) Define Heat Exchanger? Classify Heat Exchanger. [6]
- b) Draw labelled temp profiles (with suitable temp values) of the following types of heat exchanger. [8]
- i) Parallel flow heat Exchanger
 - ii) Counter flow heat exchanger
 - iii) Condenser
 - iv) Evaporator
- c) Define following terms : [4]
- i) Fouling factor
 - ii) Effectiveness

OR

- Q8)** a) In a counter-flow double pipe heat exchanger; water is heated from 25°C to 65 by oil with a specific heat of 1.45 kJ/kg K and mass flow rate of 0.9 kg/s. The oil is cooled 230° C to 160° C. If the overall heat transfer coefficient is 420 W/m²C, calculate the following : [9]
- i) The rate of heat transfer,
 - ii) The mass flow rate of water, and
 - iii) The surface area of the heat exchanger.
- b) In a parallel flow double-pipe heat exchanger water flows through the inner pipe and is heated from 20°C to 70°C. Oil flowing through the annulus is cooled from 200°C to 100°C. It is desired to cool the oil to a lower exit temperature by increasing the length of the heat exchanger. Determine the minimum temperature to which the oil may be cooled. [9]



[6403]-162

T.E (Mechanical/Mechanical-S/w)
DESIGN OF MACHINE ELEMENTS
(2019 Pattern) (Semester - V) (302043)

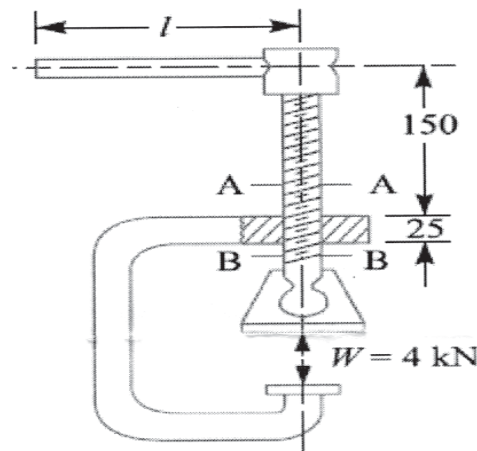
Time : 2½ Hours]

[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 from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume suitable/standard data, if necessary.

- Q1)** a) Define power screw and state its applications and advantages. [4]
 b) Prove that efficiency of self-locking square threads is less than 50%. [5]
 c) A C-clamp, as shown in Figure, has trapezoidal threads of 12 mm outside diameter and 2 mm pitch. The coefficient of friction for screw threads is 0.12 and for the collar is 0.25. The mean radius of the collar is 6 mm. If the force exerted by the operator at the end of the handle is 80 N, find: [8]
- i) The length of handle
 - ii) The maximum shear stress in the body of the screw and where does this exist; and
 - iii) The bearing pressure on the threads.



OR

P.T.O.

Q2) a) Derive the expression for the torque required to overcome collar friction. **[4]**

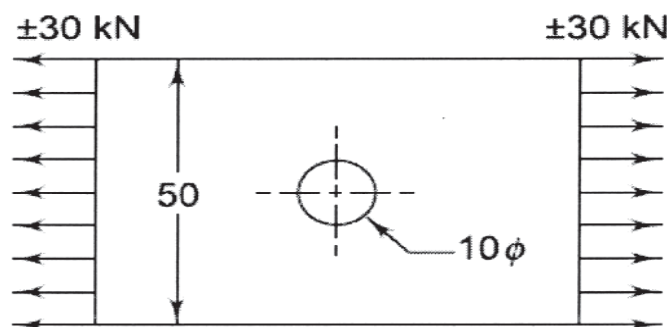
b) Explain self-locking and over-hauling property of screw. Prove the condition for screw to be self-locking. **[5]**

c) A vertical two start square threaded screw of a 100mm mean diameter and 20 mm pitch supports a vertical load of 18kN. The axial thrust on the screw is taken by a collar bearing of 250 mm outside diameter and 100mm inside diameter. Find the force required at the end of a lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20. **[8]**

Q3) a) Define and explain Notch Sensitivity. **[4]**

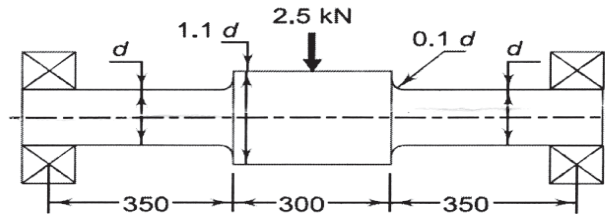
b) What is modifying factor to account for stress concentration? **[5]**

c) A plate made of steel 20C8 ($S_{ut} = 440\text{N/mm}^2$) in hot rolled and normalized condition is shown in Figure. It is subjected to a completely reversed axial load of 30kN. The notch sensitivity factor q can be taken as 0.8, surface finish factor 0.89, Theoretical stress concentration factor 2.51 and the expected reliability is 90% the size factor is 0.85. The factor of safety is 2. Determine the plate thickness for infinite life. **[8]**

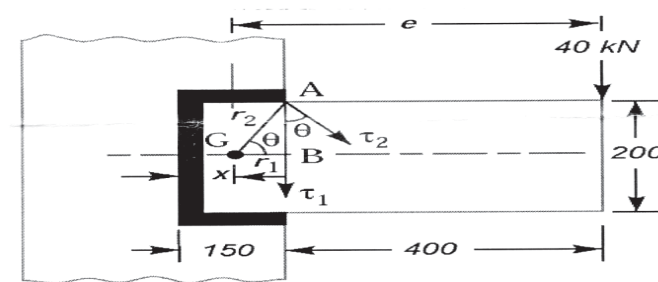


OR

- Q4) a)** A non-rotating shaft supporting a load of 2.5 kN is shown in Fig. The shaft is made of brittle material, with an ultimate tensile strength of 300 N/mm^2 . The factor of safety is 3, $K_t = 1.16$. Determine the dimensions of the shaft. **[4]**

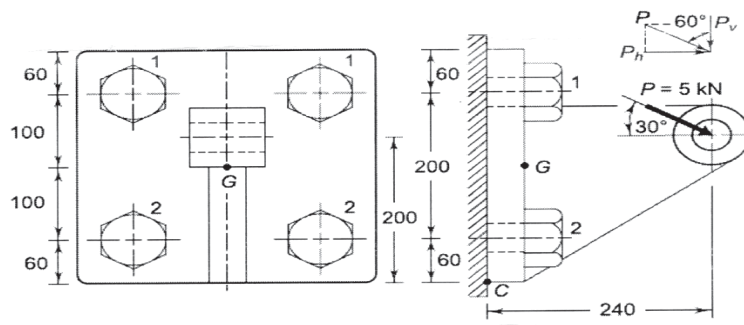


- b) With neat Sketch, write a short note on Fatigue Failure. **[5]**
- c) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250 N/mm^2 . The bar is made of steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$). Calculate the life of the bar for a reliability of 90%. Take $K_b = 0.85$, $K_a = 0.44$, $K_c = 0.897$. **[8]**
- Q5) a)** List the materials used for **[4]**
- Lightly loaded small bolts, nuts and studs.
 - High strength bolts
 - Corrosion resistance threaded fasteners.
- b) Derive equations for strength of **[6]**
- Single transverse fillet weld
 - Double parallel fillet weld.
- c) A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load 40kN, as shown in Figure. Determine the Maximum shear stress if size of weld is 11.62mm. **[8]**



OR

- Q6)** a) Write a note on: Bolts of uniform strength. [4]
 b) Explain the procedure for the design of bolts for eccentrically loaded bolted joints in shear. [6]
 c) A bracket, subjected to a force of 5 kN inclined at an angle of 60° with the vertical, is shown in Fig. The bracket is fastened by means of four identical bolts to the structure. The bolts are made of plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 5 based on maximum shear stress. Assume maximum shear stress theory and determine the size of the bolts. [8]



- Q7)** a) Explain the different types of stress induced in helical spring. [4]
 b) What is surging of springs? What remedial measures you will suggest to avoid the surging? [6]
 c) A helical spring is made from a wire of 6mm diameter and has outside diameter of 75mm. 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

- Q8)** a) Explain the following terms for helical spring. [4]
 i) Active and inactive coils
 ii) Spring index
 b) Explain with the neat sketch, nipping of leaf spring. [6]
 c) Design a close coiled helical compression spring for a service load ranging from 2250N to 2750N. The axial deflection of the spring for the load range is 6mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, $G = 84 \text{ kN/mm}^2$. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. [8]

* * *

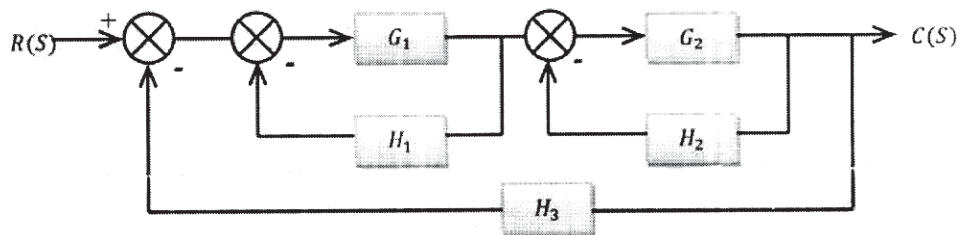
Time : 2½ Hours]

[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 wherever necessary.
- 5) Use of electronic pocket calculator is allowed.

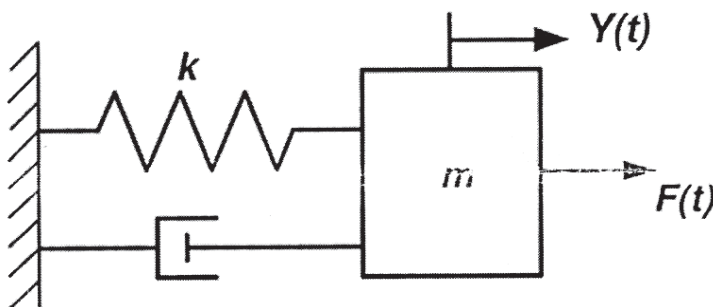
Q1) a) Find overall transfer function for following block diagram representation using block diagram reduction technique. [10]



b) With the block diagram, explain working of closed loop control system with its advantages. [7]

OR

Q2) a) For the system shown in fig. Assume $m = \text{mass} = 1 \text{ kg}$, $k = \text{stiffness} = 2 \text{ N/m}$, and $d = \text{damping} = 0.5 \text{ Ns/m}$. Also, F - Force input in N and Y = Displacement output in m. For this system. [10]



- i) Derive transfer function $Y(s)/F(s)$
 - ii) Identify the location of poles and zeros
 - iii) Comment on stability of the system
- b) Using suitable block diagram, Explain working of an automatic washing machine. [7]

Q3) a) For the transfer function $G(s) = \frac{200}{s^2 + 2s + 200}$ [10]

Find Peak Time, Rise Time, Delay Time, Settling Time

b) With suitable diagram, explain transient response specifications for second order system. [8]

OR

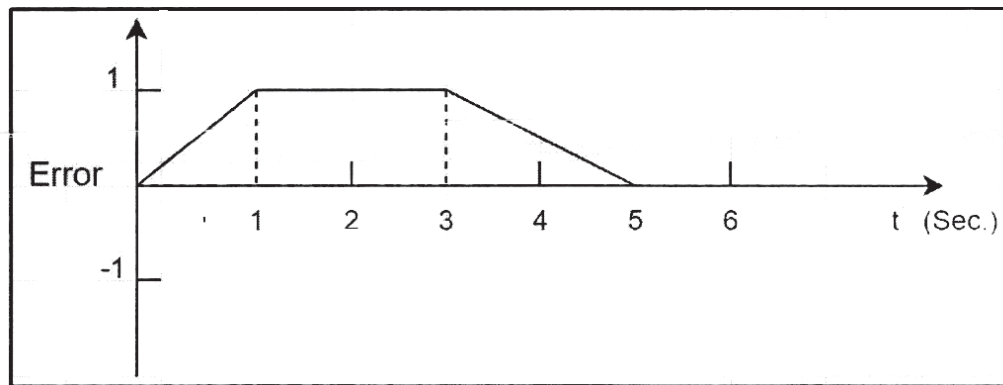
Q4) a) The Transfer Function of a system is $\frac{C(s)}{R(s)} = \frac{1}{(s+3+7j)(s+3-7j)}$ [10]

Draw the pole zero plot and find following for unit step input

- i) Damping Ratio
- ii) Damped Natural Frequency
- iii) Settling Time
- iv) Peak Time

b) Write a short note on bode plots. [8]

Q5) a) Fig. shows an error time graph. sketch PD Controller Output w.r.t. time $K_p=5$, $K_d=0.5$ %/sec. and $P(0)=30$ %. [10]



b) Draw a suitable diagram and derive equation of PID (Proportional, Integral and Derivative) controller output in parallel form. [7]

OR

Q6) a) The equation of error is $e=0.5t+0.03t^2$. With $K_p=5$, $K_d=0.5$ and $P(0)=50$ %. Sketch the graph of the controller output Vs time for Proportional Derivative Controller (Parallel Form) from $t=0$ to $t=2$ sec. [10]

b) Distinguish between proportional and derivative controller. [7]

Q7) a) Develop ladder diagram to meet following objectives **[10]**

Given 2 push to ON buttons(PB 1, PB2) Red and green lamps,

- i) When PB1 is pushed, RED lamp should be ON and it will continue to be ON till PB2 is pushed.
 - ii) When PB2 is pushed GREEN lamp should be ON and it will continue to be ON till PB1 is pushed.
 - iii) If PB1 and PB2 both are pushed simultaneously both light should be OFF
- b) Using suitable block diagram, explain the components of PLC (Programmable Logic Controllers) **[8]**

OR

Q8) a) Given four normally open switches (P1, P2 ,S1 & S2) ,with DC motor (M) write a PLC Program to satisfy' following objectives. **[10]**

- i) When P1 (Start Button) is pushed the Cycle Shall Start. The Cycle Shall continue to remain ON until P2 (Stop Button) is pushed.
 - ii) When S1 is pushed and S2 is not pushed then Motor is ON clockwise direction.
 - iii) When S2 is pushed and S1 is not pushed then Motor is ON in counter clockwise direction.
 - iv) When P2 is pushed the program stops.
- b) Write a short note on following in context with PLC. **[8]**
- i) Counters
 - ii) Timers



Total No. of Questions : 8]

SEAT No. :

PD4365

[6403]-164

[Total No. of Pages : 2

T.E (Automobile/Mechanical)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(2019 Pattern) (Semester - VI) (302049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Compare bagging and boosting ensemble techniques. Does the Random forest tree algorithm fall into any of these categories? Justify. [6]
- b) How can you evaluate the performance of an SVR model, and what are the typical regression metrics used for evaluation? [5]
- c) State down the pros and cons of logistic regression. [6]

OR

- Q2)** a) How do classification algorithms help in material selection? [6]
- b) Explain cost function in linear and logistic regression. [5]
- c) The commonly used steps in Naive Bayes classification. [6]

- Q3)** a) How can missing values in a dataset be handled during data pre-processing? [6]
- b) Explain interpretation of confusion matrix. What is four key metrics of confusion matrix? [6]
- c) What is the trade-off between overfitting and underfitting in hyperparameter tuning? [6]

OR

P.T.O.

- Q4)** a) What is feature scaling, and why is it necessary in data pre-processing?[6]
b) When should data dimensionality reduction techniques be applied? [6]
c) What are the different cross validation techniques? Explain Leave-p-out cross-validation cross validation? [6]

- Q5)** a) What are some specific applications of deep learning in the field of mechanical engineering? [7]
b) Difference between Positive vs Negative Reinforced Learning. [6]
c) What is Q-learning in reinforcement learning, and how does it work?[5]

OR

- Q6)** a) In reinforcement learning, what are three main categories of algorithms based on their approach to solving problems? [7]
b) What are the components of a Markov Decision Process? [6]
c) What are the several advantages and disadvantages of Artificial Neural Networks (ANNs) compared to other conventional algorithms. [5]

- Q7)** a) In What few ways AIML can be used in process optimization? [6]
b) How does over-tuning or under-tuning affect control systems? [5]
c) How AI and machine learning can be applied to traffic control using image-based classification? [6]

OR

- Q8)** a) What is the different Techniques for Dynamic System Order Reduction?[6]
b) Write any 3 key ways in which machine learning and AI are used in health management. [5]
c) What is the future of Human machine Interaction with emerging technologies like virtual reality and brain-computer interfaces? [6]



[6403]-165

T.E. (Mechanical Engg.)

COMPUTER AIDED ENGINEERING

(2019 Pattern) (Semester - VI) (302050)

Time : 2½ Hours]

[Max. Marks : 70

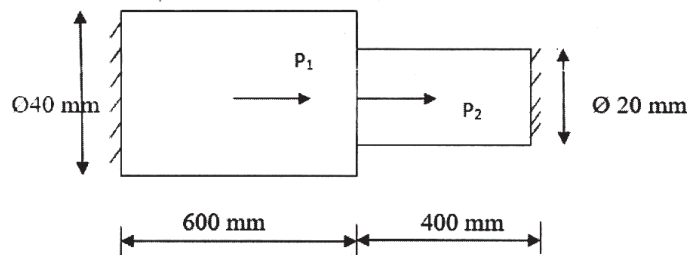
Instructions to the candidates:

- 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) Figure shows the stepped bar subjected to load P_1 (at center) and P_2 using 1-D element. [8]

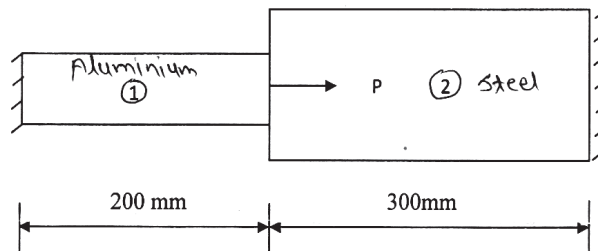
$E = 200 \text{ GPa}$, $P_1 = 50 \text{ KN}$, $P_2 = 20 \text{ KN}$. Find

- i) Nodal displacement
- ii) Stresses in each element



b) An axial load $P = 400 \times 10^3 \text{ N}$ is applied at 20°C to the rod as shown in figure. The temperature is then raised to 50°C . [9]

- i) Assemble the K and F matrices.
- ii) Determine the nodal displacement and element stresses

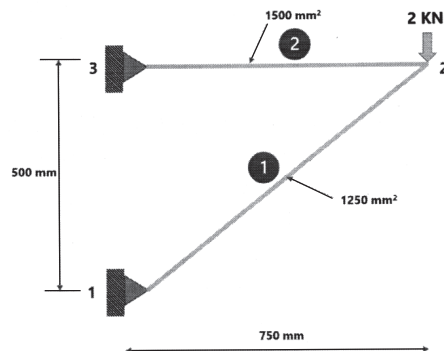


① Aluminium	② Steel
$E_1 = 70 \times 10^9 \text{ N/m}^2$	$E_2 = 200 \times 10^9 \text{ N/m}^2$
$A_1 = 900 \text{ mm}^2$	$A_2 = 1200 \text{ mm}^2$
$\alpha_1 = 23 \times 10^{-6} \text{ per } ^\circ\text{C}$	$\alpha_2 = 11.7 \times 10^{-6} \text{ per } ^\circ\text{C}$

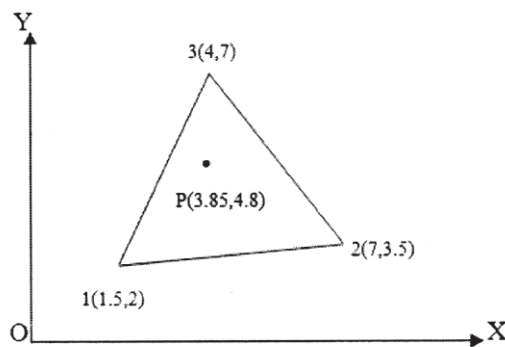
OR

P.T.O.

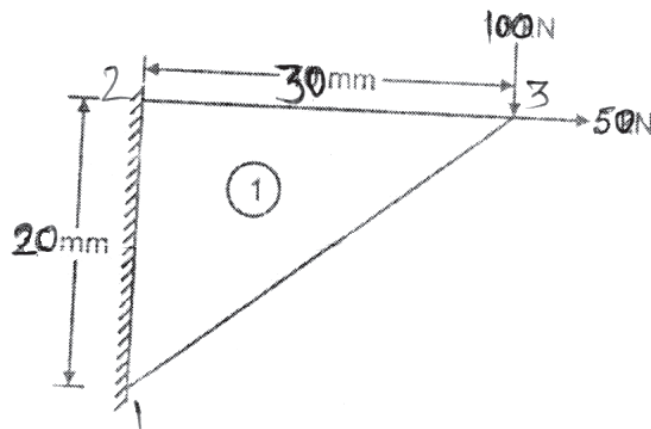
- Q2) a)** Derive element stiffness matrix for two and three noded (linear) bar element connected in series. [7]
- b)** Determine the nodal displacements, stresses in each element and reaction at support in the following truss elements. $E = 85 \text{ GPa}$. [10]



- Q3) a)** A constant strain triangular element is defined by three nodes 1(1.5,2), 2(7, 3.5) and 3(4, 7). Evaluate the shape functions N_1 , N_2 and N_3 at the interior point $P(3.85, 4.8)$. Also determine the Jacobian of the transformation J . [7]

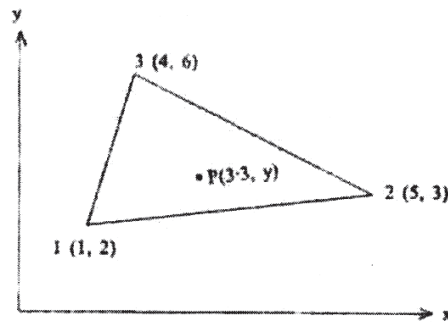


- b)** In a plane stress condition of a CST element shown in figure. Determine element stiffness matrix and nodal displacement. [10]
- Thickness = 10mm and Poisson's ratio = 0.3, $E = 70 \times 10^3 \text{ N/mm}^2$.

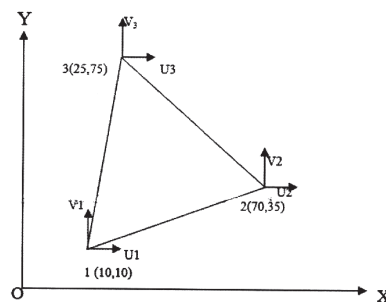


OR

- Q4) a)** The nodal coordinate of triangular element are shown in the figure. At the interior point 'P' the x-coordinate is 3.3. $N_1 = 0.3$. Determine N_2 , N_3 and the y-coordinate of point P. [7]



- b) The triangular metallic plate ($E = 200 \times 10^3 \text{ N/mm}^2$, $\nu = 0.25$) of thickness 10mm is used to machine assembly. The coordinates of three vertices of the plate are shown in figure. The deflections observed at three nodes are :
- | | |
|------------------------|------------------------|
| $U_1 = 0.01\text{mm}$ | $V_1 = -0.04\text{mm}$ |
| $U_2 = 0.03\text{mm}$ | $V_2 = 0.02\text{mm}$ |
| $U_3 = -0.02\text{mm}$ | $V_3 = 0.05\text{mm}$ |
- Assuming the plate as CST element, determine the strains and stresses. [10]



- Q5) a)** Give comparison of Linear and Nonlinear Analysis CAE Problems with respect to its characteristics features - load-displacement relation, stress-strain relation, scalability, stress-strain measures, superposition, reversibility, solution scheme, computational time, and user interaction with software. [6]
- b) What are the different kinds of geometric non-linearities in CAE Project? Explain with figures. [6]
- c) Write a general procedure for Non-linear static analysis project. [6]

OR

- Q6) a)** Explain difference between static analysis and dynamic analysis. [6]
- b) Explain free and forced vibration. [6]
- c) What is natural frequency? How many natural frequencies are there for any projects? Why it is necessary to evaluate? [6]

- Q7)** a) What is Computational Fluid Dynamics (CFD)? Explain the three dimension of fluid dynamics. [6]
- b) Discuss the concept of FEA for structural dynamics and acoustics used in NVH analysis. [6]
- c) Enlist the CAE software used for different application of CAE. Write at least 10 software with their applications. [6]

OR

- Q8)** a) What is durability, reliability and fatigue? Explain S-N Curve with low cycle, high cycle and infinite fatigue life. [6]
- b) Write the comparison of Explicit and Implicit method for following criteria: [6]
- i) Common software
 - ii) Stability
 - iii) Computational speed/cost
 - iv) Maximum size of computational problem
 - v) Numerical scheme
 - vi) Handling nonlinearity
 - vii) Filtering of frequencies
- c) How to validate and check accuracy of the CAE results and how to view and interpret the CAE results? Explain with computation accuracy and correlation with actual testing. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4367

[Total No. of Pages : 3

[6403]-166

T.E. (Mechanical)

**DESIGN OF TRANSMISSION SYSTEMS
(2019 Pattern) (Semester - VI) (302051)**

Time : 3 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 should be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data wherever necessary.

Q1) a) A single row deep-groove ball bearing is subjected to the following work cycle : **[10]**

Sr No.	Fraction of Cycle	Radial Load Fr(kN)	Axial Load Fa(kN)	Radial Factor X	Thrust Factor Y	Race Rotation
1	1/10	1.5	0.25	1.0	0	Inner
2	1/5	1.0	0.75	0.56	2.0	Outer
3	3/5	5.0	1.1	0.56	2.0	Inner
4	Remaining	1.0	-	1.0	0	Outer

If the desired rating life of the bearing is 15000 hours, select bearing from the following data.

Bearing No.	6011	6211	6311	6411
Dynamic Capacity C (kN)	28.1	43.6	71.5	99.5

What is the average speed of the bearing?

b) Explain the designation of rolling contact bearings and rating life of bearings. **[7]**

OR

P.T.O.

- Q2) a)** Explain the design variables and performance variables of hydrodynamic journal bearings. **[9]**
- b) State the assumptions made in deriving Reynold's equation. Write Reynold's equation for 2-D flow and explain each term in it. **[8]**

- Q3) a)** With the help of neat sketch, explain the working of single plate clutch, state its advantages, limitations and applications. **[10]**
- b) What are the two theories applied to friction plates? Why clutches are usually designed on the basis of uniform wear? **[7]**

OR

- Q4) a)** Find the effort applied at the end of the lever for Differential band brake. What is the condition of self-locking in differential band brake? Why should it be avoided in speed-control brakes? **[9]**
- b) Draw a figure for internal expanding shoe brake and write the assumptions on which its analysis depends? **[8]**

- Q5) a)** Draw the structure diagram for the following structural formulas and identify the optimum structural formula out of them. Draw the gearing diagram for the optimum structural formula. **[10]**
- (i) 2(1) 3(2) (ii) 2(3) 3(1) (iii) 3(2) 2(1) (iv) 3(1) 2(3).
- b) Explain the following terms with reference to machine tool gear box.
i) Range ratio ii) Number of transmission groups or stages iii) Transmission range. iv) Significance of geometric progression ratio. **[8]**

OR

- Q6) a)** A six speed gear box is to be connected to a motor. The spindle speed ranges between 150 rpm to 1000 rpm. The gear box is driven by 5 kW, 1000 rpm electric motor. **[10]**
- i) Draw the structure and speed diagram for the arrangement;
- ii) Draw the gearing diagram.
- b) Explain in detail Geometric Progression and Harmonic Progression laws for stepped regulation of speeds in multi-speed gear boxes. **[8]**

- Q7)** a) What is hybrid Vehicle? What are the advantages and disadvantages of Hybrid Vehicles? **[10]**
- b) Explain the components of HEV? **[8]**

OR

- Q8)** a) Explain Power Split Device with neat sketch? **[10]**
- b) Explain how the performance analysis carried in Series HEV and parallel HEV? **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4368

[Total No. of Pages : 2

[6403]-167

T.E. Mechanical Engg.

COMPOSITE MATERIALS

(2019 Pattern) (Semester - VI) (302052-A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Solve 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) Explain metal matrix composites along with its important characteristics. **[9]**

b) Explain classification of metal matrix composites. Elaborate any one. **[9]**

OR

Q2) a) What is meant by In-situ fabrication of metal matrix composites? Also state its advantages and disadvantages. **[9]**

b) What are major discontinuities at interfaces in MMCs? Explain each in short. **[9]**

Q3) a) A thermoplastic matrix contains 30 wt.% glass fibers. If the density of the matrix $P_m = 1.2 \text{ g/cm}^3$ while that of glass fiber $q_f = 2.8 \text{ g/cm}^3$, what is the density of the composites? Assume that no voids are present. **[8]**

b) Write a note on 1. Large particle composites, 2. Fatigue and long-term strength **[9]**

OR

P.T.O.

Q4) a) Write a note on flexural testing of composites and explain how flexural strength is predicted? **[8]**

b) A simply supported composite beam of span 5m is subjected to the downward point load of 20KN at 2m from the left end. The cross-section area of beam is 200 mm x 300 mm deep. Calculate maximum bending stress developed in cross- section. **[9]**

Q5) a) How tensile test is conducted on material? What is output of tensile test? **[8]**

b) What are testing techniques for double cantilever beams? Explain in brief. **[9]**

OR

Q6) a) What is thermographic testing of composites? Explain any practical application. **[9]**

b) What are ASTM and ISO standards for composite materials? **[8]**

Q7) a) List down various composite materials used for aerospace industry. What are advantages of these materials over conventional materials? **[9]**

b) What are application of composite materials for transportation industry? **[9]**

OR

Q8) a) What do you mean of composite materials in protective equipment explain in brief with brief explanation. **[9]**

b) Enumerate and discuss the uses of composite in the energy industry. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4369

[Total No. of Pages : 2

[6403]-168
T.E. (Mechanical)
SURFACE ENGINEERING
(2019 Pattern) (Semester - VI) (302052B) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve 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 side indicate full marks.*

- Q1)** a) Describe carburizing process with an example. **[6]**
- b) Discuss any two techniques of case depth measurement with suitable sketches. **[6]**
- c) Explain Laser Hardening with neat and labeled diagram. **[6]**

OR

- Q2)** a) Define diffusion? State implication of Fick's law of diffusion. **[6]**
- b) Explain Induction hardening with neat and labelled set up diagram. **[6]**
- c) Comment on Nitrocarburising with suitable diagram. **[6]**
- Q3)** a) Comment on carbon nitride thin film coatings for wear resistance. **[6]**
- b) Describe ion beam surface treatment with neat sketch. **[6]**
- c) Explain electroless coating. **[5]**

OR

P.T.O.

- Q4)** a) Describe sol-gel coating technology with neat sketch. [6]
b) Explain laser surface alloying. [5]
c) Explain method of dielectric coatings of Si-C alloy films. [6]
- Q5)** a) What is the necessity of coating? State an example of metal, inorganic and organic coating. [6]
b) Write short note on hot dipping and cladding. [6]
c) Explain the method of chemical conversion for the process of inorganic coatings. [6]

OR

- Q6)** a) Discuss vapor deposition technique for metal coatings. [6]
b) Write short note on coatings for aerospace and aircrafts. [6]
c) Explain the steps of surface preparation for organic coatings. [6]
- Q7)** a) Describe with neat diagram atomic force microscopy. [6]
b) What is residual stress? Describe a method of residual stress measurement. [6]
c) Write short note on surface roughness measurement. [5]

OR

- Q8)** a) List coating defects. Discuss corrective measures to be taken to minimize any three coatings defects. [6]
b) Describe with neat diagram scanning probe microscopy. [6]
c) Write short note on any two methods of coating thickness measurement. [5]



T.E. (Mechanical S/W)

FUNDAMENTALS OF COMPUTER-AIDED ENGINEERING
(2019 Pattern) (Semester - V) (302061)

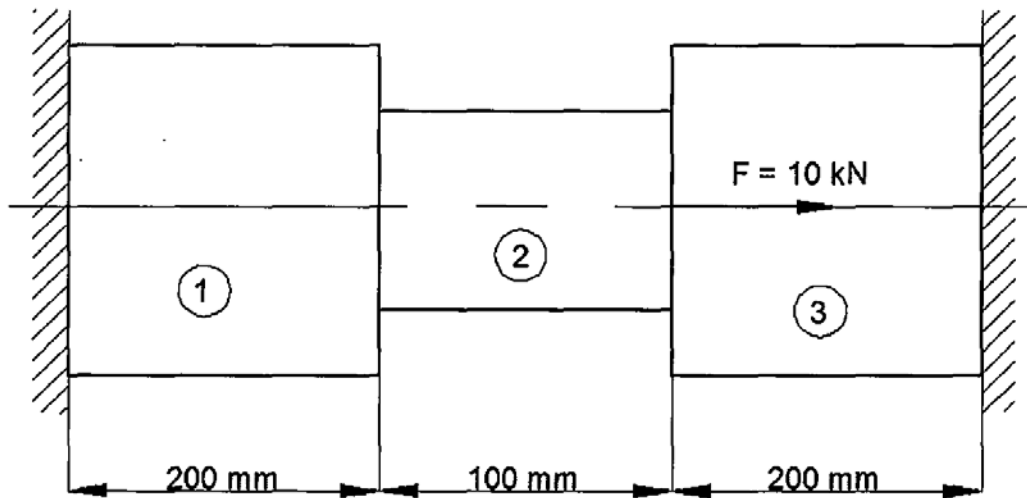
Time : 2½ Hours]

[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 figures wherever necessary.
- 4) Assume suitable data if required.
- 5) Use of a non-programmable scientific calculator is allowed.

- Q1) a) An axial stepped bar, shown in Fig.1 is subjected to an axial load of 10kN. If the material of the bar is uniform and has a modulus of elasticity as 200 GPa, determine the nodal displacements, element stresses, and support using finite element analysis. The area for each element is: $A_1=A_3 = 200 \text{ mm}^2$ and $A_2 = 100 \text{ mm}^2$. [12]



- b) Explain temperature effect in 1-dimensional element. Deduce the equation for thermal stress in two-node beam element. [5]

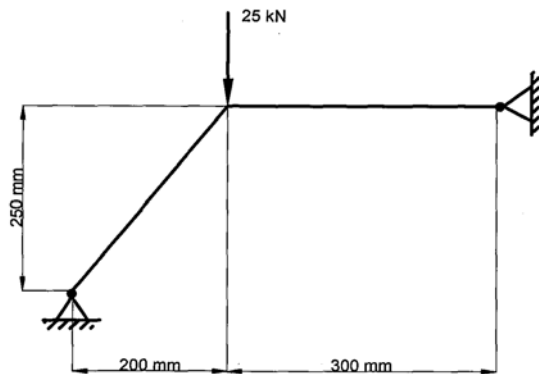
OR

P.T.O.

Q2) a) The arrangement of the truss element is shown in the below figure. Using the finite element method, determine: **[12]**

- i) Nodal displacements
- ii) Stress in each element
- iii) Reaction force at the support.

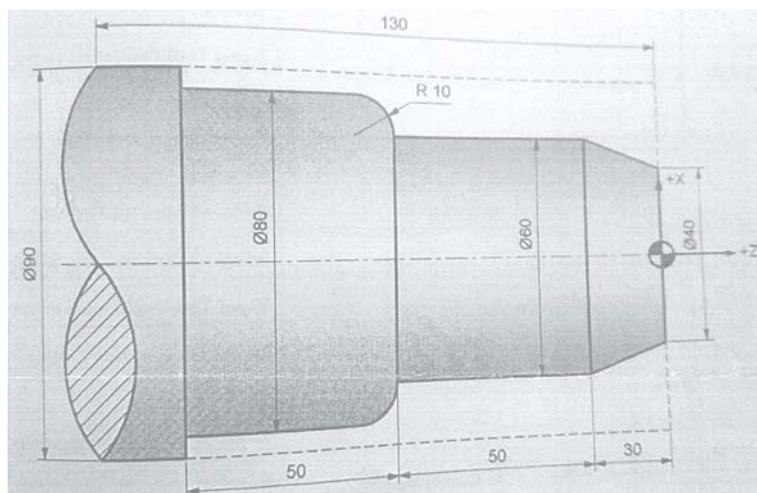
Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $A = 200 \text{ mm}^2$.



b) Explain Rayleigh Ritz approximate numerical method. **[5]**

Q3) a) Develop a part program using G and M codes to turn MS job of size $\phi 80 \times 120 \text{ mm}$ length as shown below. Assume cutting speed as 30 m/min and feed as 0.25 mm/rev . **[12]**

The final shape of the workpiece is $\phi 90 \times 130 \text{ mm}$.

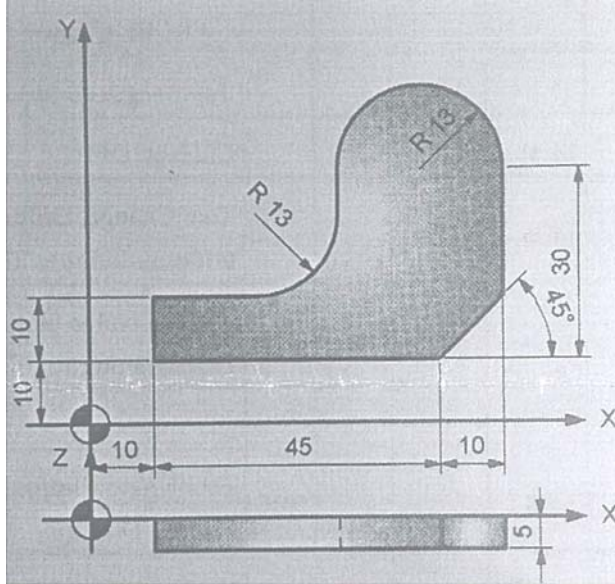


b) Explain the classification of CNC machines according to control loop feedback system. **[5]**

OR

- Q4) a)** Write a NC program using G and M code , to cut a slot for the component shown in below figure using an endmill of 6mm diameter. Consider the below data for machining parameters. **[12]**

HSS end mill cutter : cutting speed = 25 m/min; no. of teeth on cutter = 3,
feed = 0.1mm/tooth



- b) Explain zero points and reference points for vertical milling machines with a suitable sketch. **[5]**

- Q5) a)** Explain the basic anatomy of the robot with a suitable sketch. **[7]**

- b) List various actuators used for the robot. Explain the stepper motor in detail. **[7]**

- c) Explain various types of servo-controlled robots in detail. **[4]**

OR

- Q6) a)** Explain different types of automation. **[7]**

- b) Explain in detail various types of Flexible Manufacturing Systems (FMS) based on the flexibility of the system. **[7]**

- c) Explain computer-aided process planning with its advantages. **[4]**

- Q7)** a) How the CAE results are validated and checked for accuracy? Explain in brief. [7]
- b) Describe the three dimensions of fluid dynamics. [7]
- c) Explain the Stress life (S-N) approach for durability analysis. [4]

OR

- Q8)** a) What are the common mistakes made by CAE Engineers? [7]
- b) Explain the implicit integration scheme for crash analysis. [7]
- c) Write a short note on CAE Reports [4]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4371

[6403]-170

[Total No. of Pages : 2

T.E. (Mechanical - Sandwich)

PROCESS PLANNING & TOOL SELECTION (Self-Study - I)

(2019 Pattern) (Semester - VI) (302066)

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) What are reasons for work-piece variations? [5]
- b) What are the rules for locating long cylinder and short cylinder? Explain with neat diagram. [6]
- c) How do you classify basic Process Operations? [6]

OR

- Q2)** a) Distinguished between supporting operations and auxiliary operation. [5]
- b) For a cube of 50 cm size, sketch six locators needed for equilibrium, and Explain why the locators are generally arranged in 3-2-1 pattern. [6]
- c) What are the rules for combating tool forces and holding forces? [6]

- Q3)** a) Distinguish between General Purpose Machine (GPM) and Special Purpose Machine (SPM). [6]
- b) What are various factors affecting the machine selection? Explain. [6]
- c) Suggest a typical situation when following tool/work holding devices are to be used: [6]
- | | |
|-----------------------|-------------------|
| i) Floating holder, | ii) Steady rests, |
| iii) Sleeves, | iv) Sockets, |
| v) Adjustable support | vi) Mandrels |

OR

P.T.O.

Q4) a) Suggest a typical situation when following tool/work holding devices are to be used: [6]

i) Pipe center,	ii) Follower rests,
iii) Expansion mandrels,	iv) Four jaw chuck,
v) Adjustable supports	vi) Universal indexing head
- b) What are the design considerations of jigs and fixtures? [6]
- c) Explain briefly the relation between process selection and machine Selection. [6]

Q5) a) What is a 'make or buy' decision? Explain with flow chart. [5]

- b) What costs are associated with manufacturing? [6]
- c) How do you calculate total machining cost for conventional machines? [6]

OR

Q6) a) What is variable and fixed costs involved in producing a product? [5]

- b) Write a note on 'Economics of Process Planning'. [6]
- c) Which factors to be considered in manufacturing cost estimation? [6]

Q7) a) Explain the meaning of following process symbols used while making process pictures sheets: [6]



- b) What information is provided on process picture sheet? [6]
- c) What are the benefits of computer aided process planning (CAPP) [6]

OR

Q8) a) Discuss various steps involved in manual process planning. [6]

- b) What information is provided on operation route sheet? [6]
- c) Explain the Automatic Time Standard System (ATS) in CAPP. [6]



Total No. of Questions : 8]

SEAT No. :

PD4372

[Total No. of Pages : 2

[6403]-171

T.E. (Mechanical Sandwich)

**ADVANCED MATERIALS & MANUFACTURING (Self-Study - II)
(2019 Pattern) (Semester - VI) (302067)**

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) *Use of electronic pocket calculator is allowed.*
- 4) *Figure to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Classify the metal matrix composites each with suitable examples and properties. **[10]**

b) Briefly explain spray process of MMC.(Construction & Working). State the advantages & limitations. **[8]**

OR

Q2) a) Explain the process of stir casting of MMC. State it's applications, advantages & limitations. **[9]**

b) Explain the purpose of reinforcement and specify the characteristics along with suitable examples. Elaborate Rule of mixtures in regards with composites. **[9]**

Q3) a) Elaborate with the applications, advantages and limitations laser beam forming process. **[9]**

b) State the different metals used in metal spinning operations. Explain the process in detail along with its applications. **[8]**

OR

Q4) a) State the specifications of high speed extrusion process and explain the process in detail. **[9]**

b) Explain the process of isostatic pressing. Discriminate between hot and cold isostatic pressing. **[8]**

P.T.O.

Q5) a) Write a short note on welding automation in aerospace, nuclear and transport vehicle area with examples. **[10]**

b) Differentiate between electron beam and laser beam welding. **[8]**

OR

Q6) a) Briefly explain the principle and working of Plasma arc welding process. State its advantages and limitations. **[10]**

b) With neat sketch explain working of atomic hydrogen welding process, advantages and limitations. **[8]**

Q7) a) Briefly explain the principle and working of ultrasonic machining process. State its advantages and limitations. **[9]**

b) Explain the construction and working of Electrochemical machining process. **[8]**

OR

Q8) a) Differentiate between non conventional and conventional machining processes. State advantages of non conventional over conventional machining processes. **[9]**

b) Write a short note on micro-machining. **[8]**



[6403]-172

T.E. (Automation and Robotics)

DESIGN OF ROBOT ELEMENTS

(2019 Pattern) (Semester - V) (302521)

Time : 2½ Hours]

[Max. Marks : 70

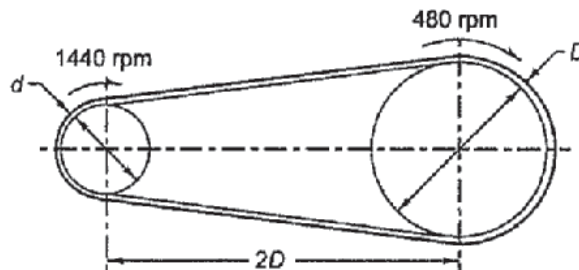
Instructions to the candidates :

- 1) Draw neat labeled diagrams wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Use of non programmable electronic calculator is permitted.
- 4) Assume Suitable/Standard data if necessary.

- Q1) a)** The layout of a leather belt drive transmitting 15 kW of power is shown in Figure. The centre distance between the pulleys is twice the diameter of the bigger pulley. The belt should operate at a velocity of 20 m/s approximately and the stresses in the belt should not exceed 2.25 N/mm². The density of leather is 0.95 g/cc and the coefficient of friction is 0.35. The thickness of the belt is 5 mm. [11]

Calculate :

- i) the diameter of pulleys;
- ii) the length and width of the belt; and
- iii) the belt tensions.



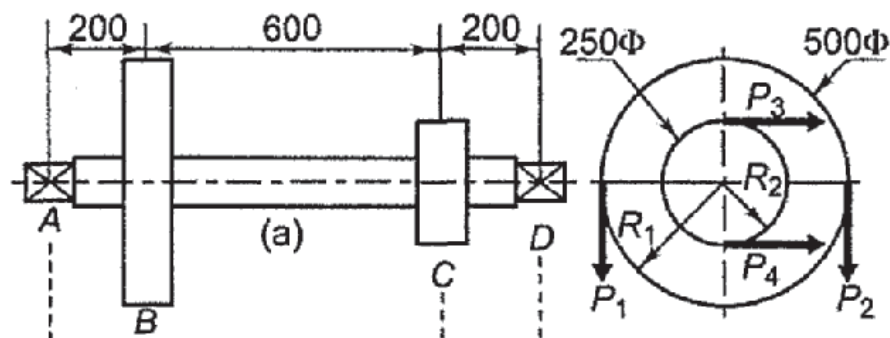
- b) Derive equations for center distance, length of belt for open belt drive. [7]

OR

P.T.O.

Q2) a) Explain significance of equivalent bending moment and equivalent twisting moment. [5]

b) The layout of a transmission shaft carrying two pulleys B and C and supported on bearings A and D is shown in Figure. Power is supplied to the shaft by means of a vertical belt on the pulley B, which is then transmitted to the pulley C carrying a horizontal belt. The maximum tension in the belt on the pulley B is 2.5 kN. The angle of wrap for both the pulleys is 180° and the coefficient of friction is 0.24. The shaft is made of plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 3. Determine the shaft diameter on strength basis. [13]



Q3) a) Write a note on using tools as end effectors. [9]

b) Write basic design process of gripper. [8]

OR

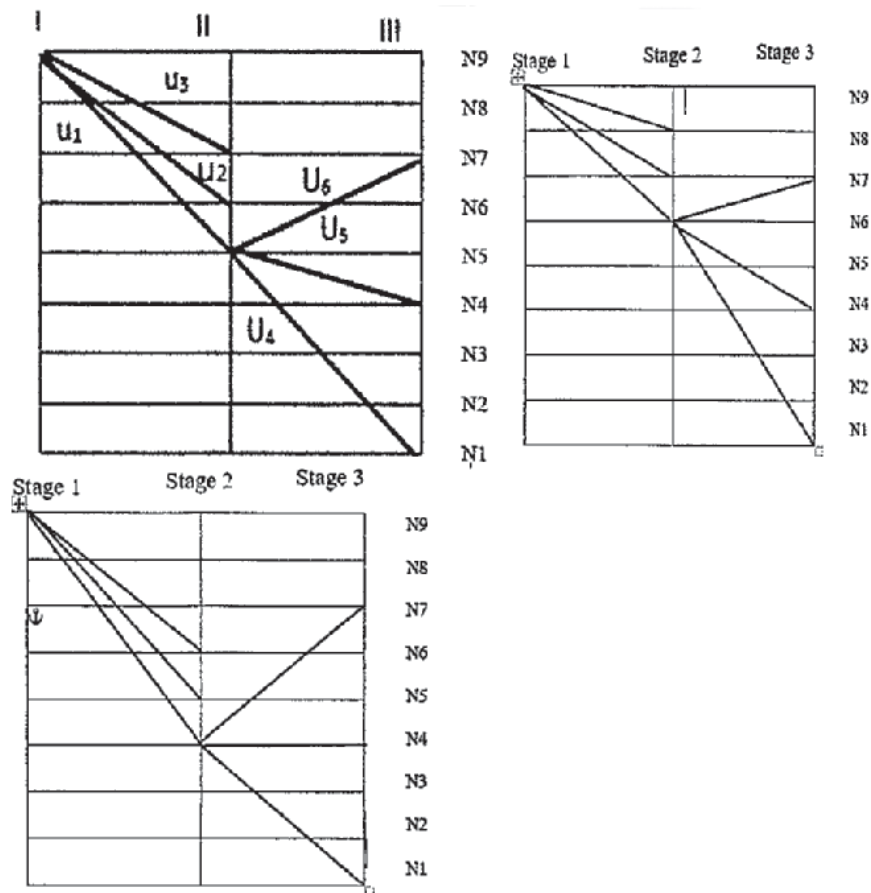
Q4) a) Explain in detail with examples and diagrams elements required for the physical support of the end effector. [9]

b) What do you mean by payload in the design of robots. Explain payload force analysis with neat diagram and mathematical equations. [8]

Q5) Design a nine-speed gear box having $N_{\min} = 100 \text{ rpm}$ and $N_{\max} = 630 \text{ rpm}$. Assume motor speed 1400 rpm. The design should include structural diagram, ray diagram, speed chart, gearing diagram and number of teeth of the gear. [18]

OR

- Q6) a)** A 3×3 Gear box is transmitting a power of 10 kW. Choose the best ray diagram based on minimum summation of shaft diameters made of same material with permissible shear stress of 36 N/mm^2 . Use GP ratio of 1.26 and Lowest speed $N_1 = 100 \text{ RPM}$ [10]



- b) Write a note on general recommendation for developing the gearing diagram. Explain with suitable example. [8]

- Q7) a)** A ball bearing is operating on a work cycle consisting of three parts-a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10000 h. Calculate the dynamic load carrying capacity of the bearing. [7]
- b) Explain load life relationship in rolling contact bearing. [3]
- c) A taper roller bearing has a dynamic load capacity of 26 kN. The desired life for 90% of the bearings is 8000 h and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry. [7]

OR

- Q8) a)** Derive Petroff's Equation for sliding contact bearing. **[7]**
- b)** The following data is given for a 360° hydrodynamic bearing: radial load = 3.2 kN journal speed = 1490 rpm journal diameter = 50 mm bearing length = 50 mm radial clearance = 0.05 mm viscosity of lubricant = 25 cP Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, **[10]**
- Calculate
- i) coefficient of friction;
 - ii) power lost in friction;
 - iii) minimum oil film thickness;
 - iv) flow requirement in litres/min; and
 - v) temperature rise.



Total No. of Questions : 8]

SEAT No. :

PD4374

[Total No. of Pages : 2

[6403]-173

T.E. (Automation and Robotics)
ROBOT KINEMATICS AND DYNAMICS
(2019 Pattern) (Semester - V) (302522)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 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 if necessary.*

Q1) a) Derive the equation for three link robot considering inverse kinematics with geometrical method. **[9]**

b) Explain the concept of tool configuration of five axis articulated robot in details. **[9]**

OR

Q2) a) Explain the inverse kinematics of four axis SCARA robot. **[9]**

b) Derive the equation for two link robot considering inverse kinematics with geometrical method. **[9]**

Q3) a) What is path generation? Differentiate between path and trajectory. **[9]**

b) Explain the pick and place operations. **[8]**

OR

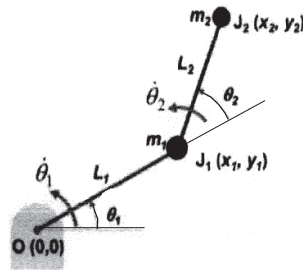
Q4) a) Explain the Joint Space Work Envelope. **[9]**

b) Evaluate the concept of work envelop of four axis articulated robot. **[8]**

P.T.O.

- Q5) a)** Find the equation of motion for following configuration by using lagrangian formulation method. [9]

A planar 2R serial manipulator



- b) Explain the concept of “Gravity” in manipulator dynamics. [9]

OR

- Q6) a)** Write the equations for manipulator Link inertia tensor? Explain in details. [9]

- b) Explain the dynamic model of a three axis SCARA robot. [9]

- Q7) a)** Explain the hardware architecture system in details. [9]

- b) Explain the concept of Computational Speeds. [8]

OR

- Q8) a)** What are the Hardware for Joint Controllers. Explain with block Diagrams. [9]

- b) What are the different types of sensors used in robot control systems? Explain in details. [8]



[6403]-174

T.E. (Automation and Rototics)
COMPUTER AIDED ENGINEERING AND
MANUFACTURING
(2019 Pattern) (Semester - V) (302523)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer two 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 if necessary.

Q1) a) Explain constant strain triangle and write an equation of stiffness matrix. [6]

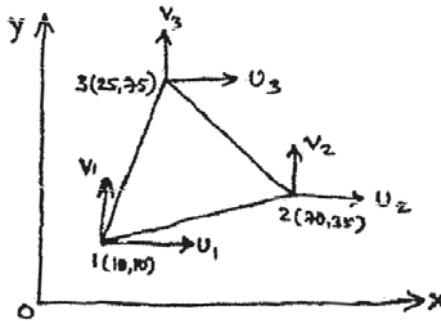
- b) The triangular metallic plate ($E = 210 \times 10^3 \text{ N/mm}^2$, $\mu = 0.25$) of thickness 10mm is used in machine assembly. The coordinates of three vertices of the plate are shown in figure. The deflections observed at three nodes are: [12]

$$U_1 = 0.01 \text{ mm}, V_1 = -0.04 \text{ mm}$$

$$U_2 = 0.03 \text{ mm}, V_2 = 0.02 \text{ mm}$$

$$U_3 = -0.02 \text{ mm}, V_3 = 0.05 \text{ mm}.$$

Assuming the plate as CST element, determine the strains and stresses.



OR

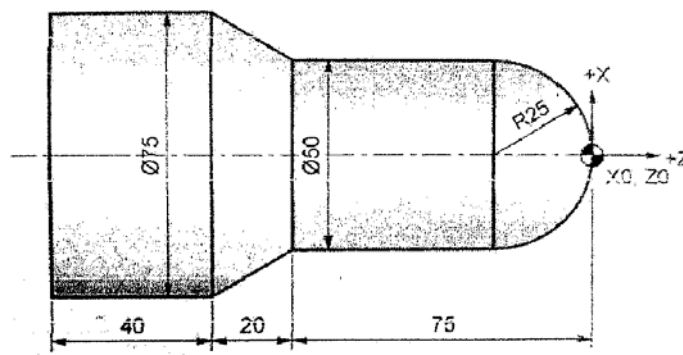
P.T.O.

Q2) a) A CST element is defined by nodes at I(24, 30), J (60, 20) and K (90, 50) while the stresses at these nodes are 90, 120 and 160 MPa respectively. Determine the stress at point P (60, 30). [9]

b) A constant strain triangular element is defined, by three nodes 1 (1.5, 2), 2 (7, 3.5). and 3 (4, 7). Evaluate the shape functions N_1 , N_2 and N_3 at the interior point 'P' (3.85, 4.8). Also determine the Jacobian of the transformation, J. [9]

Q3) a) Explain different CNC machine control systems. [5]

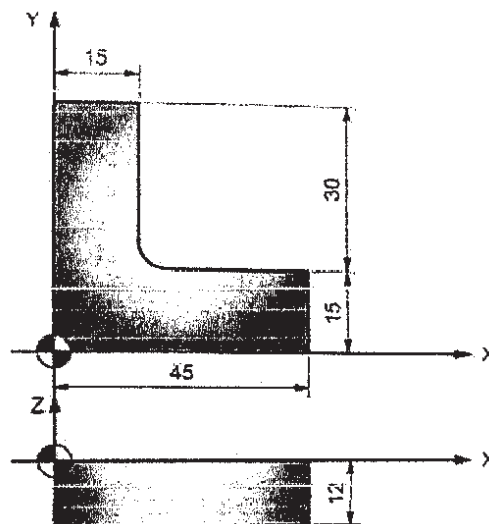
b) Write a CNC part program to turn a mild steel bar of size and shape, as shown in fig. Use canned cycle for both rough turning and finish cut. Take feed rate of 0.5 mm/rev and spindle speed of 200 r.p.m. [15]



OR

Q4) a) Explain the cutter radius compensation with suitable G Code. [5]

b) Write a NC part program, using G and M code, to cut a slot for the component, shown in fig., by using an end mill of 10mm diameter. Assume suitable data for machining parameters. [12]



- Q5) a)** List and explain the five core principles of lean manufacturing. **[9]**
b) How do “Kanban” and “Poka-Yoke” help in lean manufacturing? **[9]**

OR

- Q6) a)** What is cellular manufacturing, and how does it differ from traditional manufacturing methods? **[9]**
b) Name three commonly used tools or techniques in Six Sigma, and explain their purposes. **[9]**

- Q7) a)** What are the factors influencing process selection and write down the process selection parameters. **[9]**
b) Describe the methods used for cost estimation in manufacturing. **[8]**

OR

- Q8) a)** Describe the role of process planning in ensuring efficient and cost-effective production. **[9]**
b) Outline the general procedure for conducting a cost estimation in manufacturing. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4376

[Total No. of Pages : 2

[6403]-175

T.E. (Automation & Robotics)

SIGNAL PROCESSING AND CONDITIONING

(2019 Pattern) (Semester - V) (302524)

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) Assume Suitable/Standard data if necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of non programmable electronic calculator is permitted.*

- Q1) a)** Draw a suitable block diagram and explain the working of a DAQ system with its components. **[8]**
- b)** A 4-bit SAR type ADC has reference voltage of 16 volts. If the ADC is supplied with an analog input of 11.2 volts, determine the equivalent digital output with the help of neat circuit diagram. Also draw a graph of output waveform. **[9]**

OR

- Q2) a)** With the help of neat diagrams explain interfacing of any one Sensor to Data Acquisition system. **[8]**
- b)** Explain signal communication and the types of data transmission. **[9]**

- Q3) a)** Draw and explain Ladder Logic programming for any three logic gates. **[9]**
- b)** Write at least 9 aspects to be considered while selection of a PLC. **[9]**

OR

- Q4) a)** Draw and explain Architecture of PLC. **[9]**
- b)** Draw and explain a PLC ladder diagram for control of two pneumatic pistons. **[9]**

P.T.O.

Q5) a) Sketch pole-zero plot of the system. **[8]**

$$G(S) = \frac{S+1}{S^2(S^2+5S+6)}$$

b) Write a short note on Bode Plot, Gain margin and Phase margin with the help of neat diagram. **[9]**

OR

Q6) a) Using Sutable diagram explain Unit step response analysis via transient response specifications. **[8]**

b) A unit step response test conducted on a second order system yielded peak overshoot $M_p = 0.12$ and peak time $t_p = 0.2s$. Obtain the corresponding frequency response indices (M_r , ω_r , ω_b) for the system. **[9]**

Q7) a) Explain Manual tuning of PID control with variation in different values of control parameters and plot the respective graphs. **[9]**

b) Explain Proportional (P), Integral (I) and Derivative (D) control actions. **[9]**

OR

Q8) a) Draw and explain PD and PID control systems in parallel form. **[9]**

b) Explain Linear Quadratic Control (LQR) with equations. Also draw a block diagram for robot application using LQR Controller. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4377

[Total No. of Pages : 2

[6403]-176

T.E. (Automation and Robotics)

OPTIMIZATION TECHNIQUES

(2019 Pattern) (Semester - V) (302525B) (Elective - I)

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) Use of electronic calculator is allowed.
- 4) Assume suitable data if necessary.

Q1) a) State the classification of Integer Programming Problems. [5]

b) Solve the following Integer LP problem using Gomory's Cutting Plane method. [12]

$$\text{Max } Z = x_1 + x_2$$

$$\text{Subject To: } 3x_1 + 2x_2 \leq 5$$

$$x_2 \leq 2$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$

OR

Q2) a) What do you mean by Simulation? Explain Monte- Carlo Simulation. [5]

b) Solve the following using Branch and Bound Method: [12]

$$\text{Max } Z = x_1 + 4x_2$$

$$\text{Subject To: } 2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0, \text{ all integers.}$$

Q3) a) What do you mean by Multi objective decision making methods? [6]

b) Explain the concept of Genetic Algorithm with suitable examples? [6]

c) Explain the concept of Ant colony Optimization? [6]

OR

P.T.O.

- Q4)** a) State applications of Particle Swarm Optimization? [6]
b) What is the principle of simulated annealing? [6]
c) What is the concept of Goal programming? [6]

- Q5)** a) What is the concept of Analytical Hierarchy Process (AHP) with steps?[6]
b) Short note on Weighted Product Method (WPM). [5]
c) Explain brief about PROMETHEE? [6]

OR

- Q6)** a) Explain Multiple Criteria Decision Making (MCDM)? List out its method. [6]
b) Which is the highest accuracy method in MCDM? Why? [6]
c) Write brief note on TOPSIS. [5]

- Q7)** Write a short note on: [18]
a) Artificial Neural Network
b) Ant Colony Optimization
c) Fuzzy based Optimization

OR

- Q8)** a) Write down application of Modern Optimization Techniques. [6]
b) Explain the training or learning process in ANN with diagram. [6]
c) What are the uses and disadvantages of Genetic Algorithm? [6]



Total No. of Questions : 8]

SEAT No. :

PD-4378

[Total No. of Pages :2

[6403]-177

T.E. (Automation & Robotics)

SENSORS AND VISION SYSTEMS IN ROBOTS

(302527) (2019 Pattern) (Semester - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) Draw the structure of human eye and explain any eight parts of eye. [8]
b) Draw and Explain components of a general-purpose image processing system. [9]

OR

- Q2)** a) Draw and Explain working of the K-Means algorithm. [8]
b) Explain basic relationship between pixels-camera computer interfaces.[9]

- Q3)** a) Explain Gray Level Transformation and its types with Transformation Curves. [9]
b) Sketch Laplacian kernels used for image sharpening using second order derivative equations. [9]

OR

- Q4)** a) Explain smoothing (low pass) spatial filter and its two types of kernels.[9]
b) Explain Mechanics of Linear Spatial filtering with neat diagram of kernel. [9]

- Q5)** a) Explain Region segmentation using K-means Clustering and its algorithm. [8]
b) Explain the basics of Intensity Thresholding using intensity Histogram.[9]

OR

P.T.O.

- Q6)** a) Explain Edge Linking using Hough Transform. [8]
b) Explain Topological Descriptor using suitable examples. [9]

- Q7)** a) Explain Open CV image processing library. [9]
b) Explain image processing using MATLAB programming. [9]

OR

- Q8)** a) Write Installation and testing of ROS camera Drivers. [9]
b) Explain ROS to Open CV- The CV bridge Package. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4379

[Total No. of Pages : 2

[6403]-178

T.E. (Automation and Robotics)

ARTIFICIAL INTELLIGENCE IN ROBOTS

(2019 Pattern) (Semester-VI) (302528)

Time : 2½ Hours]

[Max. Marks : 70

Instruction to the candidates :

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Figures to the right indicate full marks.

- Q1)** a) What is Feature? What is feature engineering. [7]
b) What is feature selection and why is it important in machine learning?[8]
c) What role does dimensionality reduction play in feature extraction? [5]

OR

- Q2)** a) What are the main types of feature selection techniques? [7]
b) What do you mean by entropy and information gain? Calculate Entropy for the following examples: (a) [14+,0–] , (b) [9+,5–], (c) [7+,7–]. [8]
c) Explain the difference between feature extraction and feature selection? [5]

- Q3)** a) What is supervised learning, and how does it differ from unsupervised learning? [7]
b) What is unsupervised learning, and what are some common applications? [8]

OR

- Q4)** a) Find linear regression equation for the following two sets of data: [7]

x	2	4	6	8
y	3	7	5	10

P.T.O.

- b) State the algorithms used in unsupervised learning? Explain any one in detail. [8]

Q5) a) What is reinforcement learning? Explain the concept of an ‘agent’ and an ‘environment’ in the context of reinforcement learning? [7]

- b) What is deep learning? Explain elements of Deep Learning? [8]

OR

Q6) a) What are some common applications of reinforcement learning in fields such as robotics, gaming, and finance? [7]

- b) What is the concept of “back propagation” in deep learning, and how is it used to train neural networks? [8]

Q7) a) What are the key steps involved in the development of a machine learning model? [7]

- b) Explain scope of ML for Materials Inspection. [8]

- c) Explain 2×2 confusion matrix and explain its terminology. [5]

OR

Q8) a) Explain different performance evaluators used for interpretation/assessment of classification model. [7]

- b) Explain fault diagnosis (of any suitable machine element) using ML. [8]

- c) What is human-machine interaction? How does human-machine interaction work? [5]



Total No. of Questions : 8]

SEAT No. :

PD-4380

[Total No. of Pages : 2

[6403]-179

T.E. (Automation and Robotics Engg.)

MODELLING AND SIMULATION

(2019 Pattern) (Semester - VI) (302529)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Explain pseudo random numbers with examples. **[8]**
- b) Explain timing and relationship of validation, verification and establishing credibility. **[9]**

OR

- Q2) a)** Use the linear congruential method to generate a sequence of random numbers with $X_0 = 27$, $a = 17$, $c = 43$ and $m = 100$. Here, the integer values generated will all be between zero and 99 because of the value of the modulus. These random integers should appear to be uniformly distributed the integers zero to 99. Random numbers between zero and 1 can be generated by $R_i = X_i / m$, $i = 1, 2, \dots$ **[9]**
- b) Define following terms : **[8]**
- i) Verification
 - ii) Validation
 - iii) Credibility
 - iv) Accreditation

P.T.O.

- Q3) a)** Explain terminating simulation with any two examples in detail. [9]
b) Explain inverse transform technique for uniform and Weibull distribution with detailed procedure. [9]

OR

- Q4) a)** What are the different techniques for generating random variates? Explain any one of them. [9]
b) Explain inverse transform technique for exponential distribution with detailed procedure. [9]

- Q5) a)** What are the different performance measures used in manufacturing systems. [8]
b) Explain conveyor system with its input parameters that should be considered when designing and implementing them. [9]

OR

- Q6) a)** Define the following terms with respect to manufacturing system: [9]
i) Downtime
ii) Rework
iii) Reentrancy
b) Explain simulation of Job shop with Material Handling System. [8]

- Q7) a)** Explain the classification of simulation software with example. [6]
b) Explain the features needed in programming the discrete-event type simulation model. [6]
c) State advantages and disadvantages of object oriented simulation approach. [6]

OR

- Q8) a)** Compare simulation software with the programming languages. [6]
b) Define simulation software and list out its key features. Also mention few popular simulation software used in different domains. [6]
c) What is general purpose software package? Explain any one example of it. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4381

[Total No. of Pages : 3

[6403]-180

T.E. (Automation & Robotics)

MACHINING SCIENCE & TECHNOLOGY

(2019 Pattern) (Semester - VI) (302530A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve 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 side indicate full marks.**
- 4) Assume Suitable data if necessary.**

Q1) a) Explain in details effect of process parameters on tool life. [9]

- b) A tool life 80 minutes is obtained at a speed of 30 m/min and 8 minutes in 60 m/min. [9]**

Determine the following:

- i) Tool life Equation**
- ii) Cutting speed for 4 minutes of tool life.**

OR

Q2) a) What are the modes of tool wear? Write a short note on crater wear and flank wear. [9]

- b) A tool life 70 minutes is obtained at a speed of 15 m/min and 7 minutes in 50 m/min. Determine the following:**

- i) Tool life Equation.**
- ii) Calculate percentage of increase of tool life when cutting speed reduced by 50%. [9]**

P.T.O.

Q3) a) What is milling tool dynamometer, explain its construction and working with neat sketch. Write its applications. **[9]**

b) What is the need of measurement of cutting forces? **[8]**

OR

Q4) a) What is lathe tool dynamometer, explain its construction and working with neat sketch. Write its applications. **[8]**

b) Write a classification of cutting force dynamometers. Explain any two of them. **[9]**

Q5) a) What are the elements of total production cost? Explain in details. **[9]**

b) Suppose a turning operation is to be performed with HSS tooling on mild steel, with Taylor tool life parameters $n=0.125$, $C=70$ m/min. Work part length = 500mm and diameter = 100 mm. Feed = 0.25 mm/rev. Handling time per piece = 5.0 min, and tool change time = 2.0 min. Cost of machine and operator = 30 rupees /hr, and tooling cost = 3 rupees per cutting edge. Find: (a) cutting speed for maximum production rate, and (b) cutting speed for minimum cost (c) the hourly production rate and cost per piece for the two cutting speeds computed. **[9]**

OR

Q6) a) Derive equation for optimum cutting speed and tool life for minimum cost. **[9]**

b) A high-speed steel tool is used to turn a steel work part that is 300mm long and 80mm in diameter. The parameters in the Taylor equation are: $n = 0.13$ and $C = 75$ (m/min) for a feed of 0.4 mm/rev. The operator and machine tool rate = 30 rupees/hr. and the tooling cost per cutting edge = 4 rupees. It takes 2 min to load and unload the work part and 3.5 min to change tools. Determine (a) cutting speed for maximum production rate, (b) cutting speed for minimum cost, (c) tool life of cutting in (a) and (b), (d) cycle time and cost per unit of product in (a). **[9]**

Q7) a) Describe in detail Ultrasonic Machining (USM) with working principle, diagram, construction, working, and application. Write a short note on Modern Machining Techniques. **[9]**

b) Describe in detail Electrical Discharge Machining (EDM) with working principle, diagram, construction, working, and application. **[8]**

OR

Q8) a) Differentiate between conventional and non-conventional machining process. **[9]**

b) Describe in detail Laser Beam Machining (LBM) with working principle, diagram, construction, working, and application. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4382

[Total No. of Pages : 2

[6403]-181

T.E. (Automation & Robotics)

Maintenance and Safety Engineering

(2019 Pattern) (Semester - VI) (302530-B) (Elective II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve 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 side indicate full marks.
- 4) Assume Suitable data if necessary

Q1) a) Explain corrective maintenance in detail and state its limitations. **[9]**

b) Write a short note on following parameter in CBMS: **[9]**

- i) Temperature monitoring
- ii) Leakage monitoring

OR

Q2) a) Explain preventive maintenance and state its advantages and limitations. **[9]**

b) Write a short note on following parameter in CBMS:

- i) Vibration monitoring
- ii) Crack monitoring **[9]**

Q3) a) Explain various methods of scheduling of work. **[8]**

b) Write a short note on: **[9]**

- i) Short term planning
- ii) Long term planning

OR

P.T.O.

- Q4)** a) Explain factors involved in effective planning of maintenance work. [8]
b) Write a short note on: [9]
i) Major repair
ii) Modernization

- Q5)** a) Explain Hazard and Operability (HAZOP) Study and state its objectives.[9]
b) Discuss various types and categories of accidents. [9]

OR

- Q6)** a) Explain Job Safety Analysis (JAS) study and steps involved in JAS process. [9]
b) Discuss various accident prevention tools and techniques. [9]

- Q7)** a) Why process design is important from safety point of view? Explain.[9]
b) Write a short note on: [8]
i) Passive safety measures
ii) Active safety measures

OR

- Q8)** a) Explain alarm and hazard defense plans in detail. [9]
b) Write a short note on: [8]
i) Personal safety
ii) Personal protective equipment



Total No. of Questions : 8]

SEAT No. :

PD-4383

[Total No. of Pages : 2

[6403]-182

T.E. (Biotechnology)

ANALYTICAL TECHNIQUES

(2019 Pattern) (Semester - V) (315461)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What is the basic principle of gel electrophoresis? On what basis DNA bands are separated in Gel electrophoresis? **[12]**

b) Write a short note on SDS and its role in SDS-PAGE. **[6]**

OR

Q2) What are the component parts of the SDS-PAGE system? Which crosslinkers are used in the process to form a gel of acrylamide and bisacrylamide? What is the role of pH in the entire process of SDS-PAGE? Explain the process with the help of case examples. **[18]**

Q3) a) Explain the significance of Stoke's law in particle removal in sedimentation with applications of the process for bioproducts. **[10]**

b) Explain the gravitational sedimentation of particles in a liquid. **[7]**

OR

Q4) What is the working principle of centrifugation? How the process is important for the separation of biomolecules and explain the working of any two industrial centrifuges in detail. **[17]**

P.T.O.

Q5) What is the electromagnetic spectrum? Also, explain the relation between wavelength and frequency. Write in short about the different regions of the Electromagnetic spectrum. **[18]**

OR

Q6) a) What are the two radiation sources? What are the factors affecting the absorbance of light? **[9]**

b) What is the principle of UV-Visible spectroscopy? What are the applications of UV-Visible spectroscopy? **[9]**

Q7) a) What is Nuclear Magnetic Resonance Spectroscopy? Explain its principle. **[10]**

b) What are the different methods of ionization used in Mass Spectrometry? Explain any two. **[7]**

OR

Q8) Describe the instrumentation used in IR spectroscopy with the help of a diagram. Explain its applications in the field of biotechnology and biopharmaceuticals. **[17]**



Total No. of Questions : 8]

SEAT No. :

PD4384

[Total No. of Pages : 3

[6403]-183

T.E. (Biotechnology)

MATERIAL BALANCES AND STOICHIOMETRY
(2019 Pattern) (Semester - V) (315462)

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) Chlorinated diphenyl (Diphenyl A-30) is heated from 313K (40°C) to 553K (280°C) at the rate of 4000kg/hr in an indirectly fired heater. In this particular temperature range the heat capacity of the fluid is given by the equation.

$$C_p = 0.7511 + 1.465 \times 10^{-3}T \text{ kJ/(kg.k) where } T \text{ is in K}$$

Also, the heat capacity data of Diphenyl A-30 at 313 K and 553K are 1.1807 and 1.5198kJ/(Kg.K) respectively. Calculate the heat to be supplied to the fluid in the heater using the heat capacity equation. Also, calculate the % error involved using the mean heat capacity data for the heat change calculations. [12]

b) Define : [6]

- i) Latent heat and sensible heat
- ii) Latent heat of condensation
- iii) Latent heat of Vaporization

OR

Q2) a) State and explain the forms of energy associated with the process. [3]

b) Define the following terms : [3]

- i) Heat capacity
- ii) Specific heat
- iii) Enthalpy

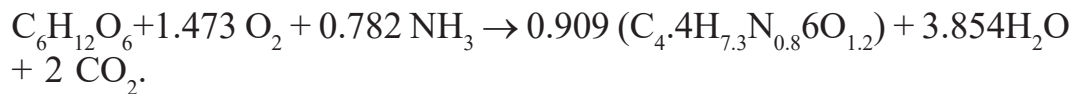
c) A stream flowing at a rate of 15000 mol/h containing 25 mole % N₂ and 75 mole % H₂ is to be heated from 298 K (25°C) to 473 (200°C). Calculate the heat that must be transferred using C_p⁰ data given below : [12]

$$C_p^0 = a + bT + cT^2 + dT^3, \text{ kJ/(kmol.k)}$$

Gas	a	b×10 ³	C×10 ⁶	d×10 ⁹
N ₂	29.5909	-5.41	13.1829	-4.968
H ₂	28.6105	1.0194	-0.1476	0.769

P.T.O.

- Q3) a)** A certain organism has shown that cells can convert substrate glucose to biomass. Calculate the yield Y_{x/O_2} (g dw cell/g O_2) and $Y_{x/s}$ (g dw cell/g substrate) for the following biological reaction. [10]



(Glucose)

(Biomass)

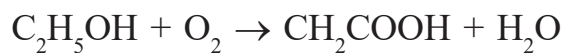
- b)** In the synthesis of ammonia, fresh feed containing 24.7% nitrogen and 1% inerts is mixed with recycle feed. Mixed feed entering into reactor resulted in 25% conversion of ammonia. [7]

Calculate :

- The recycle ratio
- The purge ratio

OR

- Q4) a)** Acetobacter aceti bacteria convert ethanol to acetic acid under aerobic condition using the reaction : [8]



What is the maximum amount of C_2H_5OH required?

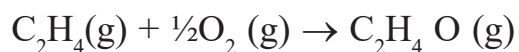
- b)** A feed containing 60 mole % A, 30 mole % B and 10 mole % inerts enters a reactor. 80% of original A reacts according to the following reaction : [9]



Find the composition of product stream on mole basis.

- Q5) a)** Calculate the change in enthalpy between reactants and products if both are at 298K(25°C) and if 5 mol of ethylene oxide is produced as per the following : [10]

reaction :



Data :

Component	ΔH_f^0 kJ/mol at 298.15 K (25°C)
$C_2H_6(g)$	52.50
$C_2H_4O(g)$	-52.63

- b)** If the standard heat of formation for $H_2O(l)$ is -285.835 KJ/g mol and heat of evaporation is + 44.012 KJ/g mol at 298.15K (25°C) and 1 atm, what is the standard heat of formation of $H_2O(g)$? [7]

OR

- Q6)** a) Discuss in details about effect of temperature on heat of reaction. [5]
 b) Calculate the heat of formation of phenol crystals at 298.15 K (25°C) from its elements using the following data : [8]
 Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ KJ/mol}$
 Standard heat of formation of $\text{H}_2\text{O}(\text{l}) = -285.83 \text{ KJ/mol}$
 Standard heat of combustion of phenol crystals at 298.15K = -3053.25 KJ/mol
 c) Define the following terms : [4]
 i) Hess's law of constant heat summation
 ii) Thermochemistry
- Q7)** a) Define the following terms : [8]
 i) Gross calorific value
 ii) Calorific value of fuels
 iii) Ultimate analysis of fuel
 iv) Excess air requirement
 b) Crude oil is found to contain 87% carbon, 12.5% hydrogen and 0.5% sulphur (by weight). Calculate the net calorific value of the crude oil at 298 K (25°C). Data : Gross calorific value of crude oil at 298K (25°C) is 45071KJ/kg oil Latent heat of water vapour at 298K(250C) = 2442.5KJ/kg. [10]

OR

- Q8)** a) Fuel oil having the following ultimate analysis is desired to be fired in a boiler. Carbon - 85%, hydrogen-9%, sulphur-3%, oxygen-2% and nitrogen-1%. Assume negligible steam requirement for atomization of fuel oil. Gross calorific value of the fuel oil is measured to be 43, 540kJ/kg at 298.15k. Calculate : [8]
 i) Net Calorific value of the fuel
 ii) Theoretical air requirement in kg/kg fuel oil
 b) The gross calorific value of gaseous n-propanol at 298K (250C) is 2067.44 kJ/mol. Find its net calorific value using the latent heat of water vapour at 298K (250C). [6]
 c) Discuss about the classification of coal. [4]



Total No. of Questions : 8]

SEAT No. :

PD-4385

[Total No. of Pages : 2

[6403]-184
Third Year of B. Tech.
BIOTECHNOLOGY
Genetic Engineering
(2019 course) (Semester - V) (315463)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 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 side indicate full marks.*

Q1) Write a note on

- a) Colony PCR [9]
- b) Blue White Selection [9]

OR

Q2) a) Selection done based on nutrient deficiency - write a note. [9]

b) What are cDNA libraries? What is their significance? [9]

Q3) a) What is competency in bacteria? How is it important? [9]

b) Cloning in gram positive bacteria - Discuss with respect to its significance, problems and solutions. [8]

OR

Q4) a) A gene encoding for a novel protein needs to be expressed in *E.coli* strain DH5 α . Develop rDNA process for this objective and explain how do you select positive recombinants? How is this different in *Saccharomyces cerevisiae*? [10]

b) What are broad host range plasmids? What is their significance? What is copy number? [7]

P.T.O.

- Q5)** a) Infer on agrobacterium tumefaciens mediated gene transfer in plants. [9]
b) Discuss the gene transfer methods using gene gun method. Add a note on their applications. [9]

OR

Q6) Write a short note on:

- a) Electroporation [9]
b) Liposome mediated gene transfer [9]

- Q7)** a) What is Bt cotton? How is it produced and what are the steps in its production? [9]
b) Write a note on Gene Therapy. [8]

OR

- Q8)** a) How is recombinant DNA technology used for developing of biotic stress resistant plants? Explain with an example. [8]
b) Write notes on: [9]
i) Challenges in Gene Therapy
ii) Microbial Biotechnology for clearing oil spills



Total No. of Questions : 8]

SEAT No. :

PD-4386

[Total No. of Pages : 2

[6403]-185
T.E. (Biotechnology)
Introduction to Immunology
(315464) (2019 Pattern) (Semester - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Give comparative account of different classes of immunoglobulins with respect to structure and functions. **[12]**
- b) Give definition and example of a hapten. **[6]**

OR

- Q2)** a) Discuss what is the IR produced in following cases **[12]**
- i) Egg ovalbumin injected in rabbit
 - ii) Egg ovalbumin boiled and consumed by human
 - iii) Egg ovalbumin given to hen by injection
 - iv) DNP attached to egg ovalbumin and injected in animals
- b) With the help of labeled diagram represent the structure of antibody IgG **[6]**
- Q3)** a) Write short notes on - i) MHC, ii) Graft rejection **[12]**
- b) What is phagocytosis **[5]**

OR

P.T.O.

- Q4) a)** Discuss GVHR [15]
- b) Human red blood cells are not nucleated. Do they express any MHC molecules? [2]

- Q5) a)** With the help of a diagram discuss the sensitization and Degranulation of mast cells upon cross linking of IgE by Allergen. [9]
- b) What is autoimmunity? Discuss Rheumatoid Arthritis and SLE. [9]

OR

- Q6)** Write short notes on (ANY THREE) : [18]
- a) atopic allergy, b) Mast cells, c) IgE, d) DTH

- Q7) a)** Write short notes on (ANY Three): [15]
- i) Passive agglutination,
ii) RIA
iii) FACS,
iv) immunofluorescence

- b) Write full form of ELISA [2]

OR

- Q8) a)** Write in detail on types of ELISA tests and their applications. [12]
- b) With the help of labeled diagram depict primary and secondary IR [5]



Total No. of Questions : 8]

SEAT No. :

PD-4387

[Total No. of Pages : 2

[6403]-186

T.Y. (Biotechnology)

ENZYME TECHNOLOGY

(315465 A) (2019 Pattern) (Semester - V) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Figures to the right indicate full marks.

Q1) Describe the function of following coenzymes with one suitable example. **[18]**

- 1) Lipoic acid
- 2) PLP

OR

Q2) Explain with suitable example reaction catalyzed by enzyme with following coenzyme. **[18]**

- 1) Biotin
- 2) Thiamine diphosphate

Q3) What is enzyme inhibition? Describe the Michaelis-Menten equation in case of competitive inhibition. **[17]**

OR

Q4) What is significance of enzyme inhibition studies? Describe irreversible inhibition. Moreover explain Michaelis-Menten equation in case of non-competitive inhibition **[17]**

P.T.O.

Q5) Answer the following :

[18]

- 1) Enlist various organic/inorganic matrices used for enzyme immobilization.
- 2) Differentiate between immobilized and free enzyme.

OR

Q6) What are the different methods of enzyme immobilization? Explain any two with its advantages & disadvantages. **[18]**

Q7) Explain in detail application of one enzyme in development of biosensor. **[17]**

OR

Q8) Illustrate in detail application of any one immobilized enzyme in chemical industry. **[17]**



Total No. of Questions : 8]

SEAT No. :

PD-4388

[Total No. of Pages : 2

[6403]-188

Third Year B.Tech. (Biotechnology)

AGRICULTURAL BIOTECHNOLOGY

(315465 C) (2019 Pattern) (Semester - V) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.

2) Figures to the right indicate full marks.

Q1) a) Give the general features of tissue culture media composition, and discuss the roles of various growth regulators. **[9]**

b) Write short notes on: **[9]**

i) Totipotency, ii) Surface sterilization, iii) Callus culture

OR

Q2) a) Discuss the various aspects of shoot regeneration from cultured plant cells and tissues. **[9]**

b) Describe the various events during somatic embryogenesis. **[9]**

Q3) a) Describe Restriction Fragment Length Polymorphism (RFLP) techniques with its principle and applications. **[9]**

b) Differentiate between structural and functional genomics. **[8]**

OR

Q4) a) Describe in brief importance of QTL in crop improvement. **[9]**

b) Write short note on- **[8]**

i) RAPD and 2) Single nucleotide polymorphism (SNP)

P.T.O.

- Q5)** a) Describe Nif genes and its role in Nitrogen fixation. [10]
b) Write short notes on [8]
1) Biopesticides 2) Fungal bio-fertilizers

OR

- Q6)** a) Give significance of BGA in sustainable agriculture. [10]
b) Write short notes on [8]
1) Biostimulants 2) Antioxidants 3) PGRs

- Q7)** a) What is the purpose of Cartagena protocol on biosafety? [8]
b) What is the risk assessment of GMOs? [9]

OR

- Q8)** a) Describe the functional role of Genetic Engineering Appraisal Committee (GEAC) [8]
b) Write short notes on : [9]
1) Environment Protection Act (EPA) 1986, and
2) Ethical issues in biotechnology



Total No. of Questions : 8]

SEAT No. :

PD-4389

[Total No. of Pages : 2

[6403]-189

T.Y. (Biotechnology Engineering)

FERMENTATION TECHNOLOGY

(315471) (2019 Pattern) (Semester - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

Q1) Describe the production process of Baker's Yeast.

[18]

OR

Q2) What is the role of Vitamin B12 in the human body? Explain the production process of Vitamin B12 in detail.

[18]

OR

Q3) Explain the following two methods of immobilization:

[17]

- a) Entrapment
- b) Cross-linking

OR

Q4) Explain with the case study immobilization of enzymes and production of fructose and glucose.

[17]

P.T.O.

Q5) Write short notes on the following modes of operations of the Fermentation process: **[18]**

- a) Batch process
- b) Fed-batch process

OR

Q6) Explain the continuous mode of operation of the Fermentation process and explain the concepts of 'Chemostat' and 'Turbidostat'. **[6 × 3 = 18]**

Q7) Explain the process of 'Scale-Up' for the sterilization process. **[17]**

OR

Q8) How fermentation economy is important? How to calculate the yield and purity of the product? Find the relation between both concepts. **[17]**



Total No. of Questions : 8]

SEAT No. :

PD-4390

[Total No. of Pages : 2

[6403]-190

T.Y. (Biotechnology Engineering)
MASS TRANSFER
(2019 Pattern) (Semester - VI) (315472)

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,orQ.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) Write a short Note on:

- i) Oslo crystallizer
- ii) Vacuum crystallizer

[9]

b) Explain Mier's Supersaturation theory.

[9]

OR

Q2) a) Write mass balance equation for batch crystallizer.

[9]

- b) A crystallizer is charged with 7500 kg of an aqueous solution at 377K 29.6% by weight of which is anhydrous sodium sulphate. The solution is cooled. During the cooling operation, 5% of the initial water is lost by evaporation. As a result, crystals of $\text{Na}_2\text{SO}_4 \cdot 10 \text{H}_2\text{O}$ crystallize out. If the mother liquor is found to contain 18.3% by weight anhydrous Na_2SO_4 , Calculate the yield of crystals and quantity of mother liquor.

At. Wt.: Na=23, S=32, O=16,H=1

[9]

Q3) a) Explain concept of distillation. Define terms based on your understanding more volatile and less volatile components. Why terms differential distillation and fractionation are used?

[9]

b) What are types of efficiencies? How overall plate efficiency is calculated?

[8]

OR

P.T.O.

- Q4) a)** Define terms : [8]
i) Equilibrium
ii) Bubble point
iii) Relative Volatility
iv) Raoult's Law
- b)** Write Short note on: [9]
i) Molecular Distillation
ii) Steam Distillation

- Q5) a)** Explain in detail types of condensers and reboilers? [9]
b) If we consider $y = \alpha x / 1 + (\alpha - 1) x$ in terms of relative volatility, then derive Rayleigh equation in terms of relative volatility. [9]

OR

- Q6) a)** Write material balance over distillation column and derive an expression of operating line in rectifying section. [9]
b) Write short notes on: [9]
i) Bubble cap Tray
ii) Sieve tray

- Q7) a)** Explain in detail concept of $L_{\min}$ for absorption column. [9]
b) Discuss with a neat diagram channeling misdistribution phenomena of liquid flow. [8]

OR

- Q8) a)** What is absorption? Explain it with neat diagram and give two examples. [9]
b) Explain concept of HETP by correlating it with distillation column. [8]



[6403]-191**T.E. B.Tech. (Biotechnology)****BIOSEPARATION ENGINEERING****(2019 Pattern) (Semester - VI) (315473)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates :**

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

- Q1) a)** Explain in detail different types of adsorption isotherms with their applications. **[9]**
- b) How adsorption occurs in fixed beds? Explain it with adsorption breakthrough curve. Highlight bed exhaustion portion in breakthrough curve and write its significance. **[9]**

OR

- Q2) a)** The breakthrough time for $C/C_0 = 0.005$ was determined to be 4.5 hr for a lab scale adsorption column of total length of 20 cm. If a larger scale adsorbent column were to have a breakthrough time of 12 hr what should be the total length of the column for the following lab scale data. The C/C_0 values at breakthrough time and beyond are as follows : **[12]**

Time (hr)	C/C_0
4.5	0.005
5.0	0.20
5.5	0.50
6.0	0.80
6.5	0.995

- b) Write a short note on Pressure swing adsorption with one case study. **[6]**

P.T.O.

- Q3) a)** Explain the terms and write significance : **[9]**
i) Retention Time
ii) Resolution
iii) Capacity factor
b) What is the purpose of using mass spectrometry in combination with GC and LC? Explain it with one case study on GC-MS and LC-MS. **[8]**

OR

- Q4) a)** Draw a schematic diagram of the chromatographic set-up and describe the functions of the main components involved in gas chromatography. **[8]**
b) Calculate the retention volumes, capacity factors and relative retention of two solutes giving peak 1 and 2 with retention times of 3.5 and 5 minutes respectively on an adsorption column at a flow rate of 2.2 ml/min. The t_0 value is 1.5 min. **[9]**

- Q5) a)** Classify and explain membrane separation processes with 1-2 examples. **[9]**
b) Write a short note on factors affecting the performance of membranes? How are they minimized? **[9]**

OR

- Q6) a)** Enlist the materials used for membrane fabrication. Give detailed classification of membranes based on types. **[9]**
b) Write short note on : **[9]**
i) Dialysis
ii) Reverse Osmosis

- Q7) a)** What is isoelectric point? How isoelectric precipitation is performed? Explain with one example. **[9]**
b) What is supercritical extraction? Explain the phenomenon with suitable examples. How is it different from solid-liquid extraction? **[8]**

OR

- Q8) a)** What is the principle of adductive crystallization? When is it applied? Give 1-2 examples. **[9]**
b) What are the types of columns present in gas chromatography? **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4392

[Total No. of Pages : 2

[6403]-193

T.E. B.Tech. (Biotechnology)

FOOD BIOTECHNOLOGY

(2019 Pattern) (Semester - VI) (315474B) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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 side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) Answer the following :

[18]

- a) How is pasteurization time calculated? Explain the terms- D value, F value, Z value.
- b) Define thermal death kinetics and its significance in food safety.

OR

Q2) Answer the following :

[18]

- a) Define HTST (High-Temperature Short Time) sterilization and its purpose
- b) Explain the concept of pasteurization and its importance in food safety.

Q3) Answer the following :

[17]

- a) Explain the bioprocess optimization strategies employed for enhancing the production of functional compounds.
- b) Discuss the significance of microbial biotechnology in food ingredient production.

OR

P.T.O.

Q4) Answer the following : **[17]**

- a) Explain how solid state fermentation is used for production of functional food ingredients.
- b) Evaluate the advantages and challenges of utilizing microbial technologies for food ingredient production.

Q5) Answer the following : **[18]**

- a) Define enzymes and their significance in food processing.
- b) Outline the role of enzymes in cereal processing, including starch degradation and modification.

OR

Q6) Answer the following : **[18]**

- a) Evaluate the opportunities in enzyme production for various food applications.
- b) Highlight the benefits of enzyme applications in improving product quality.

Q7) Answer the following : **[17]**

- a) Explain the principles of physical, chemical, and biological waste disposal methods.
- b) Explain in short about chemical treatment techniques - flocculation, and oxidation.

OR

Q8) Answer the following : **[17]**

- a) Describe the characteristics of liquid wastes produced by the food industry.
- b) How is food waste classified? Explain in brief.



Total No. of Questions : 8]

SEAT No. :

PD-4393

[Total No. of Pages : 3

[6403]-195

T.E. (Printing Engineering)

PRINT STATISTICS

(2019 Pattern) (Semester-V) (308281)

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) Explain the following

[17]

- a) Measures of Accuracy or Centering
- b) Measures of Precision or Spread
- c) Normal Distribution

OR

Q2) From the given data, arrange the data, prepare frequency distribution table and draw the Histogram only and comment on the same.

[17]

0.912	0.910	0.904	0.905	0.910	0.911
0.914	0.912	0.910	0.913	0.908	0.914
0.907	0.909	0.913	0.912	0.909	0.913
0.902	0.906	0.909	0.907	0.906	0.908
0.915	0.909	0.910	0.911	0.912	0.909
0.910	0.909	0.908	0.910	0.909	0.907

P.T.O.

Q3) Prepare X bar R chart from the given data on graph paper

[18]

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurement	933	911	889	882	903	890	892	908	895	916
Values	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note: Round off all the values as per standard rule Shewhart's Constants:

$A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.114$

OR

Q4) Make two Pareto Charts for the data given in the following table, one for the number of defectives and one for dollar loss. In each case, include a cumulative percentage graph as well.

[18]

Department	Defectives	Dollar Loss
A	15	170
B	130	60
C	70	850
D	160	550
E	55	2100
F	30	900

Q5) Explain in detail with suitable examples, data dispersion, its measurable characteristics, standard distribution and its ± 3 zones with suitable diagram. And also explain how standard deviation is more important than range. **[17]**

OR

Q6) From the following data, draw appropriate diagrams and also comment on the same (any two) **[17]**

- 1) Target 22 mm, Tolerance ± 2 mm, process mean 23 mm, LCL 20 mm, UCL 26 mm
- 2) Target 530, process μ 532, standard deviation 8, LSL 505, USL 560
- 3) Design specification 5.5, $s = 1.5$, μ 6, specification width 8

Q7) Explain in detail problem solving process (DMAIC) with suitable examples. **[18]**

OR

Q8) Explain the various quality control tools. **[18]**



Total No. of Questions : 8]

SEAT No. :

PD4394

[Total No. of Pages : 2

[6403]-196

T.E. (Printing Technology)

Offset Printing Techniques

(2019 Pattern) (Semester - V) (308282)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*
- 4) Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain the working of transfer drums in the sheet fed offset. [6]
- b) Explain the drive mechanism in web offset. [6]
- c) Define suction belts sheet guiding. Draw neat diagram. [6]

OR

- Q2)** a) Explain dancer roller function in web offset infeed. [5]
- b) Describe splice preparation in the web offset machine. [5]
- c) Explain functions of clamp truck transport and any one type of automatic splicers. [8]

- Q3)** a) Describe the ink transfer principle in offset inking system. [9]
- b) Explain the modern dampening systems. - any 2 [8]

OR

- Q4)** a) Difference between conventional and hybrid UV Offset inking unit. [8]
- b) Explain the significance of IPA and IPA substitutes use in fountain solution. [9]

P.T.O.

Q5) Write a short note on :

- a) Dryer [6]
- b) Chiller [6]
- c) IR Dryer [5]

OR

Q6) a) Explain the role of remoisturizing unit used on heat set presses. What is ink cracking in heat set. [9]

b) Explain the working principle of UV Dryer with diagram. [8]

Q7) a) Explain the web fluttering in dryer in heatset press. [9]

b) Define different types of chill rollers. [9]

OR

Q8) Write a note on :

- a) Web preheaters [6]
- b) Anti-static Devices [6]
- c) Temperature-controlled oscillators [6]



Total No. of Questions : 8]

SEAT No. :

PD-4395

[Total No. of Pages : 3

[6403]-197

T.E. (Printing)

COLOR SCIENCE AND MEASUREMENT

(2019 Pattern) (Semester - V) (308283)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the L *a *b color system. [6]
b) Define saturation and explain out of 2 same samples, which attribute will have show higher degree of difference. [6]
c) Describe the CIE 1931 Yxy System. [5]

OR

- Q2)** a) Describe the Munsell Color model system [6]
b) Explain which attributes can be derived from tri-stimulus values and how? [5]
c) Explain with neat diagram LCH. [6]

- Q3)** a) State different parts of a Spectrophotometer. Distinguish between a colorimeter and spectrophotometer. [12]
b) Justify effect of light source on the color of an object. [6]

OR

- Q4)** a) Draw a neat diagram of spectrum of the sample which the spectrophotometer considers during computing CIE metrics. [6]
b) Density is not a CIE -type color metric and therefore densitometry is only indirectly used in color management Justify. [8]

P.T.O.

- Q5) a)** Delta E is the measured change of color from one color sample to another. Explain it using Delta Eab equation. **[6]**
- b) State disadvantages of evaluating color visually. **[6]**
- c) State importance of instrument to measure color difference. **[5]**

OR

- Q6) a)** Solve following using delta Eab equation between Sample 1 & 2 And Sample 3 & 4 **[6]**

Sample 1

$L_1^* 56.2$

$a_1^* -32.5$

$b_1^* 4.9$

&

Sample 2

$L_2^* 56.0$

$a_2^* -45.7$

$b_2^* 5.7$

Sample 3

$L_3^* 60.3$

$a_3^* 33.0$

$b_3^* 64.3$

&

Sample 4

$L_4^* 41.0$

$a_4^* 33.2$

$b_4^* 25.5$

- b) Draw a neat diagram of L^*C^*h that shows a color difference in hue chroma. **[5]**
- c) Compare any 2 color difference equations. State their differences. **[6]**

- Q7)** a) Why do automobiles face the problem of metamerism. [6]
b) How can it be solved? [6]
c) Explain difference between colorant and dye. [6]

OR

- Q8)** a) Explain the term Colour Index™ Generic Name (CIGN). Give any 3 examples, how pigments are described using this term. [6]
b) What is metamerism. Explain it's significance in color management.[12]



Total No. of Questions : 8]

SEAT No. :

PD-4396

[Total No. of Pages : 2

[6403]-198
T.E. (Printing)
Ink Technology
(2019 course) (Semester - V) (308284)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary*

- Q1)** a) Write review on Behavior of Inks on machines. [6]
b) Categories Newtonian and non-Newtonian liquids. [6]
c) Write review on Rheology. [6]

OR

- Q2)** a) Factors which affects the rheological behavior of printing inks. [6]
b) Write review on Thixotrophy. [6]
c) Write review on Viscometer. [6]

- Q3)** a) Identify the factors which affects ink drying. [5]
b) Compare evaporation and absorption drying. [6]
c) Compare UV and EB curing. [6]

OR

P.T.O.

- Q4)** a) Write review EB ink drying. [5]
b) Write review on setting of ink. [6]
c) Compare Micro wave and radio frequency drying. [6]
- Q5)** a) What is the purpose of ink dispersing agents in ink formulation? [6]
b) What is the purpose of Breakdown of the Pigment Particles. [6]
c) Explain in brief the factors to be considered while formulating printing inks. [6]

OR

- Q6)** a) Classify the ink manufacturing process and different methods for pigment dispersal. [6]
b) compare the ink ingredients for ink manufacturing for various printing process inks. [6]
c) Compare mixing and milling process of ink manufacturing. [6]
- Q7)** a) Write review on analysis of Ink component. [5]
b) Explain in brief health, hazards, safety and environmental effect of ink ingredients on human health. [6]
c) Explain in brief the ink proofing. [6]

OR

- Q8)** a) Explain in brief the purpose to check the glass of ink. [5]
b) Explain in brief the solid contents of ink and the purpose of solid contents in ink. Explain the method to calculate the % of solid content. [6]
c) Write review on VOC. [6]



Total No. of Questions : 8]

SEAT No. :

PD-5298

[Total No. of Pages : 2

[6403]-199

T.E. (Printing)

Elective-I: CYBER SECURITY

(2019 Pattern) (308286A) (Semester-V)

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 not allowed.

- Q1) a) Explain in detail about Logic Bombs and working of logic bombs? [6]
b) Describe virus and How Virus can damage the corporate world? [12]

OR

- Q2) a) Define the terms - Malware, Trojan and Ransomware. [6]
b) How to avoid getting breached with a virus attack. [6]
c) Explain how an android device was hacked using the Metasploit framework? [6]

- Q3) a) Explain hacking phases and Name a few tools used for each of these phases. [10]
b) Describe Steganography and its advantages and disadvantages of Steganography. [7]

OR

- Q4) a) What security measures can be taken by an individual to stay safe from android hacking? [8]
b) Do hackers need physical access to a computer in order to infect it with malware? If not, explain the other options available to them. [9]

P.T.O.

- Q5) a)** Define Social Engineering. How can you identify such attacks? **[10]**
b) Describe SEToolkit? How can you use this tool to simulate a phishing attack? **[8]**

OR

- Q6) a)** How is “The Harvester” tool used for reconnaissance? Explain the modus operandi of a social engineering attack. **[8]**
b) How can you detect and prevent falling prey to phishing, vishing and smishing Attacks? **[10]**

- Q7) a)** Explain the historical background, Object, Extent, Scope and Commencement of the Information Technology Act. **[10]**
b) What is stalking? What are the legal actions which can be taken against stalking as per the IT Act in India? **[7]**

OR

- Q8) a)** Define and discuss various IT Act clauses related to cyber crimes. **[12]**
b) Explain the liability aspect of the Internet Service Provider as per the Information Technology Act 2000. **[5]**



Total No. of Questions : 8]

SEAT No. :

PD-4397

[Total No. of Pages : 2

[6403]-200

T.E. (Printing Technology)

WOOD, GLASS AND METAL BASED PACKAGING

(2019 Pattern) (Semester - V) (308286 B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain Glass containers advantages and disadvantages with applications. **[9]**

b) Write down Benefits of Glass Packaging with facts. **[9]**

OR

Q2) a) Explain evaluation studies on glass containers and advantages of glass containers. **[9]**

b) Explain composition of glass containers. **[9]**

Q3) a) Explain procedure of Annealing Test with applications. **[9]**

b) Explain procedure of thermal shock test with applications. **[8]**

OR

Q4) a) Explain the cause of glass to spoil with advantages and disadvantages. **[8]**

b) Explain USP test with applications. **[9]**

Q5) a) Explain characteristics of black plate with diagram. **[9]**

b) Explain about packaging and marking of metal containers. **[9]**

OR

Q6) a) Write down applications of aluminium foil. **[9]**

b) Write down advantages and disadvantages of Metal Based Packaging. **[9]**

P.T.O.

- Q7)** a) Explain about oil Drums. [8]
b) Explain GI drums. [9]
- OR
- Q8)** a) Write down type of closures. [8]
b) Explain recent developments of closures and drums. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4398

[Total No. of Pages : 2

[6403]-202

T.E. (Printing Engineering)

FLEXO PRINTING TECHNIQUES

(2019 Pattern) (Semester - VI) (308289)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) How to prepare a conventional photopolymer plate for flexo press. [9]
b) Discuss Environmental concerns in flexo industry. [4]
c) Explain UV light source used in plate making process. [4]

OR

- Q2)** a) Discuss Standardization of Conventional Flexo Plate. [9]
b) Why we use developing solution and explain different type of washout solution. [4]
c) Explain Term : Post Exposure and Light Finishing. [4]

- Q3)** a) How to printability effects by varying dots. [6]
b) Explain the working principle of Argon laser with neat and clean diagram. [6]
c) Define laser Ablation technique. [6]

OR

- Q4)** a) Explain Digital Workflow in detail. [8]
b) Explain the working principle of He-Ne laser with neat and clean diagram. [10]

- Q5)** a) Explain wide web press in detail with diagram. [9]
b) Explain UVdryer in detail with diagram. [4]
c) Explain flexography process with diagram. [4]

P.T.O.

OR

- Q6)** a) Explain narrow web press in detail with diagram. [9]
b) Explain EB dryer in detail with diagram. [4]
c) Discuss on flexography product and application. [4]

- Q7)** a) Explain different method of anilox engraving. [6]
b) Discuss anilox volume carrying capacity and cell count. [6]
c) Explain different method of Anilox cleaning. [6]

OR

- Q8)** a) Describe the anilox maintenance and storage. [6]
b) Explain different ink metering system used in flexography. [6]
c) Explain Doctor Blade in flexography with diagram. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4399

[Total No. of Pages : 2

[6403]-203
T.E. (Printing)
ColorManagement
(308290) (2019 Pattern) (Semester - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1or Q2, Q3 or Q4, Q5 or Q6, Q7or 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) Describe the Three Cs of Monitor Profiling. **[10]**

b) Explain white point in monitor calibration. **[7]**

OR

Q2) a) Write a short note on the following CRT, LCD and LED technologies. **[11]**

b) Brightness setting primarily affects the shadows. Explain with help of graph. **[6]**

Q3) a) Explain the process of GCR and UCR and its significance in color management of Printers. **[11]**

b) What does calibration process include in inkjet printing. **[6]**

OR

Q4) a) Describe any 2 printer test charts in terms of patches, measurement and profiling. **[11]**

b) Compare visual and random charts used in printer charts. **[6]**

P.T.O.

- Q5) a)** Explain the importance of spot color with regards to brand identity. **[6]**
- b) A device link ICC profile allows, an RGB to CMYK or a CMYK to CMYK color transformation. Explain this process. **[12]**

OR

- Q6) a)** Explain the advantages of Pantone Matching Systems. **[6]**
- b) Explain need of DeviceLink profile. State advantages and disadvantages if DeviceLink profile. **[12]**
- Q7) a)** Describe the concept of evaluation of color visually. State the viewing conditions required. **[12]**
- b) Explain grey balance. **[6]**

OR

- Q8) a)** State the effect of surrounding lighting conditions on visual evaluation of color. **[6]**
- b) Why do we need a viewing standard. Explain the importance of ISO 3664: 2009 **[12]**



[6403]-204
T.E. (Printing Engg.)
DESIGN OF EXPERIMENTS
(2019 Pattern) (Semester - VI) (308291)

*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 an electronic pocket calculator is allowed.

Q1) Test the hypothesis by the Chi-square method for printability and gender.
 Consider P Table $\alpha_{0.05} = 5.99$ **[18]**

Observed Values			
Gender	Left Image	Center Image	Right Image
Male	6	7	9
Female	3	8	10

OR

Q2) Test the hypothesis by the T-test method for the following two sets of values:

Set 1 : 7, 6, 5, 7, 8, 8, 6, 5 and Set 2 : 4, 2, 3, 5, 1, 4, 3, 5? (t-Table $\alpha_{0.05} = 1.7613$) **[18]**

Q3) Prepare ANOVA for dot gain from side-to-side of a Cyan printed sheet.
 $\alpha = 0.05$ **[17]**

Dot Gain		
Left	Center	Right
16	16	15
15	16	15
14	16	15
15	17	13
13	15	13

OR

P.T.O.

- Q4)** Prepare a 2-Way ANOVA Table and identify whether Sales Managers Daghe, Raghe, and Waghe with or without Training have an impact on the Unit Sales. ($\alpha = 0.05$) [17]

Training			Not Training		
Manger Daghe	Manager Raghe	Manager Waghe	Manager Daghe	Manager Raghe	Manager Waghe
13	11	11	8	7	8
14	13	14	8	8	7
12	11	13	7	6	8
13	11	14	7	7	7
12	13	13	7	6	6

- Q5)** Bebe, Lele, and Nene listed the following factors affecting gravure printability. Deduce fractional factorial design from a full factorial for the following factors. [18]

Factors	Low	High
Ink Viscosity (sec.)	15	17
Press Speed (m/min.)	250	350
Impression Pressure (kg/cm ²)	2	2.5
Hardness (Shore A)	60	80
Doctor Blade Angle (°)	30	60
Cell Angle (°)	1	2

OR

- Q6)** Flexo print quality factors were listed by Kore, Pore, and Sakore. Generate a full factorial and fractional factorial design for the following factors. [18]

Factors	Low	High
Plate Line Screen (LPI)	120	133
Speed (m/min.)	200	300
Anilox Cell Angle (°)	30	60
Anilox Screen (LPI)	600	700
Dot Compensation (%)	30	40
Lamp intensity (%)	80	90

Q7) Calculate the Process Capability and Process Performance for Density on a Press. Data is collected on an hourly basis. USL: 1.55 and LSL: 1.2, $d_2 = 1.128$ [17]

Sample No.	8.00	9.00	10.00	11.00	12.00	1.00
1	1.4	1.46	1.5	1.45	1.48	1.25
2	1.25	1.32	1.35	1.35	1.55	1.3

OR

Q8) Explain in detail QC tools. [17]



Total No. of Questions : 8]

SEAT No. :

PD-4401

[Total No. of Pages : 2

[6403]-205

T.E. (Printing Engg.)

**MAINTENANCE MANAGEMENT OF PRINTING MACHINES
(Elective - II) (2019 Pattern) (Semester - VI) (308293 - A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7or 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) Prepare a Monthly Preventive Maintenance check sheet for Offset Printing Press? [6]
- b) What are the Characteristics of Preventive Maintenance? [6]
- c) Important Steps for Establishing a Corrective Maintenance Program. [5]

OR

- Q2)** a) Write a Brief Note on Corrective Maintenance for Offset Compressor. [6]
- b) What are the Elements of Corrective Maintenance? [6]
- c) What are the Types Lubricants. [5]
- Q3)** a) What is Condition Based Monitoring. [6]
- b) Explain in detail about Air Leakage testing for Offset Press. [6]
- c) How Condition Based Monitoring helps to build data mine. [6]

OR

P.T.O.

- Q4)** a) How Vibration Tester & Ultrasonic Digital Cameras are used in Condition Based Monitoring? [6]
- b) Describe in Detail the Predictive Maintenance with respect to Diesel Generator used for Offset Printing Press. [6]
- c) Explain any 3 Instruments used for Different Condition Monitoring. [6]
- Q5)** a) What is OEE, Explain with respect to Quality. [6]
- b) How Need for Effectiveness Maintenance Important. [6]
- c) What are the Key Performance Indicators for Gravure Maintenance. [5]

OR

- Q6)** a) What are the Safety Measures taken during Maintenance. [6]
- b) What is significance of 5s in Maintenance Management. [6]
- c) What is MTTR and MTBF [5]
- Q7)** a) Describe the Replacement or Repair Decision Making Policy with respect to LCC Model Technique. [6]
- b) What is Kaizen. Explain with suitable example for Offset Printing Machine. [6]
- c) Explain 7 Elements of Repair/Replacement Model. [6]

OR

- Q8)** a) What is TPM. Explain with respect to Single color Offset Press. [6]
- b) What are the Pillars of TPM. Explain with suitable example. [6]
- c) What is Critical Spares. [6]



Total No. of Questions : 8]

SEAT No. :

PD4402

[6403]-206

[Total No. of Pages : 2

T.E. (Printing Engineering)

**BASIC COMMUNICATION SYSTEMS AND ELECTRONIC
INSTRUMENTATION**

(2019 Pattern) (Semester - VI) (308293B) (Elective -II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the RFID fundamental components and working principles behind RFID technology. **[9]**

b) Differentiate Between RFID and Barcode. **[9]**

OR

Q2) a) Explain the Wi-Fi Communication system with modulation techniques used in it. **[9]**

b) Explain the DSSS and FHSS techniques used in communication system. **[9]**

Q3) Describe static and Dynamic characteristics of the measurement system. **[17]**

OR

Q4) a) Explain the selection criteria for the sensors and transducers. **[9]**

b) Describe the optics based sensors used in printing industry. **[8]**

P.T.O.

Q5) Mention the applications of thermal sensors used in printing industry. **[18]**

OR

Q6) a) Explain the working principle of LVDT. **[9]**

b) Describe the errors and elimination methods of errors while performing any measurements. **[9]**

Q7) Describe the working and characteristics of capacitive sensors. **[17]**

OR

Q8) Describe in detail any pressure sensor used in printing industry. **[17]**

x x x

[6403]-208**T.E. (Production)****ENGINEERING METROLOGY & INSTRUMENTATION
(2019 Pattern) (Semester - V) (311081A)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates :**

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

- Q1) a)** Explain in detail ISO 9001-2000 & ISO 9000-1998 Series standards. **[8]**
- b)** A manufacturer uses injection moulding machine to produce a plastic insulation barrier. He inspects 110 barriers daily, picked up randomly from the production and determines the number of rejects by visual inspection the results of daily inspection of 110 barriers for 10 days are given below. **[10]**

Day	1	2	3	4	5	6	7	8	9	10
No. of rejects	6	8	9	11	12	7	9	11	12	10

Construct a suitable chart to analyse the quality of production. Name the chart and state whether the process is in control?

OR

- Q2) a)** What is sampling inspection? Explain in detail double sampling inspection. **[8]**
- b)** A subgroup of 4 items is taken from the manufactured items. After 22 subgroups the values of $\bar{x}$ and R were found to be $\sum \bar{x} = 275$ and $\sum R = 6.5$. The specification limits for the part are 21.5 ± 0.25 . Assuming the process is in control, what conclusion would you draw about the ability of the process to produce the items within the specified limits? Take $A_2 = 0.729$, $D_3 = 0$, $D_4 = 2.283$, $d_2 = 2.059$ for subgroup size of 4. **[10]**

P.T.O.

- Q3)** a) Write short note on Quality of Service and value of Quality. [8]
b) What is Q.F.D.? Explain house of quality. [10]
OR
- Q4)** a) Write short notes on Kaizen and six sigma. [10]
b) What are the principles of TQM? [8]
- Q5)** a) Explain in short sensor-Transducer stages in generalized measuring system. [7]
b) What are the types of Active and Passive transducers? [10]
OR
- Q6)** a) Explain in detail the following features of measuring instrument
i) Hysteresis ii) Precision [10]
b) Explain in short active and passive sensors with example. [7]
- Q7)** a) Explain with neat sketch LVDT type of transducer for force measurement. [8]
b) What are strain gauges? Explain in detail bonded type of strain gauge. [9]
OR
- Q8)** a) Define Force. Explain in detail Direct and Indirect methods of force measurement. [8]
b) Explain in detail laws of thermocouple. [9]



Total No. of Questions : 8]

SEAT No. :

PD4404

[Total No. of Pages : 2

[6403]-209

T.E. (Production)

MATERIAL FORMING TECHNOLOGY

(2019 Pattern) (Semester - V) (311082A)

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, and 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) The following is the data related to wire drawing operation, **[10]**

Initial diameter = 1.55 mm; Final diameter = 1.40 mm;

Radius of drum (bull block) = 125 mm

Yield strength of material, $\sigma_0 = 250$ MPa

Die angle = 16° ; Coefficient of friction, $\mu = 0.15$;

Speed of bull block = 200 rpm

Calculate :

- i) Drawing stress
 - ii) Drawing load
 - iii) Drawing speed
 - iv) Motor power required
- b) Elaborate the importance of lubrication in drawing process. What are the defects and their remedies in drawing process. **[8]**

OR

Q2) a) What is importance of tube drawing? Explain the various tube drawing processes with neat sketch. **[12]**

- b) With neat sketch describe the different zone of wire drawing die. What are the materials used in wire drawing dies? **[6]**

Q3) a) List various types of rolling mills and explain planetary rolling mill and four high rolling mill with application, advantages and limitation. **[10]**

- b) Explain roll bending and its effects on rolling operation. Suggest remedies to prevent roll bending. **[8]**

OR

P.T.O.

Q4) Write short note on any three of the following with sketch. [18]

- a) Two high rolling mill
- b) Roll flattening.
- c) Rolling defect
- d) Angle of bite, forward slip and backward slip

Q5) Write short note (any Three) [17]

- a) Impact extrusion
- b) Tube extrusion
- c) Defect in extrusion
- d) Hydrostatic extrusion process.
- e) Lubrication in extrusion

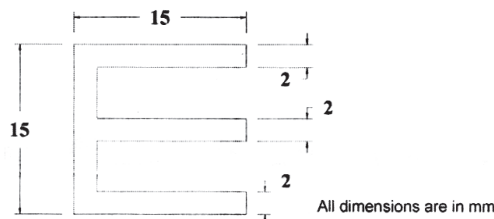
OR

Q6) a) What are different factors which affect extrusion pressure? Explain the variation of extrusion pressure with ram travel in direct and indirect extrusion. [8]

b) An Aluminum billet of 150mm diameter and 1m long is extruded to the final shape shown in fig. Calculate:

- i) Extrusion Ratio
- ii) CCD
- iii) Shear (Shape) Factor
- iv) Work done

The flow stress of Aluminum is 70N/mm^2 and coefficient of friction between billet and container is 0.15. [9]



Q7) Write short note on. [17]

- a) Electro hydraulic forming.
- b) Electromagnetic forming
- c) Flow forming.

OR

Q8) a) Explain different types of Explosive Forming Process with neat sketch. What are the factors that affect the process? [12]

b) Explain metal spinning with neat sketch. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD-4405

[6403]-210

T.E.

PRODUCTION ENGINEERING

Machining Science and Technology

(2019 Pattern) (Semester-V) (311083 (A))

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 side indicate full marks.
- 4) Use of Calcuator is allowed.
- 5) Assume Suitable data if necessary

- Q1)** a) Discuss direct tool failure criterias in metal cutting. [9]
b) How cutting fluids are classified? State functions of cutting fluids in metal cutting. [9]

OR

- Q2)** a) Discuss sources of heat generation in metal cutting with suitable sketches. [9]
b) The useful tool life of a HSS tool machining mild steel at 30 m/min is 3 hours. Calculate the tool life when the tool operates at 25 m/min. $n=0.125$. [9]

- Q3)** a) Explain wear by plastic shear and diffusion wear mechanisms with suitable sketches. [9]
b) Explain effect of cutting parameters on tool life. [8]

OR

- Q4)** a) What are the types of tool damages? Describe any two type of tool damage with suitable sketch. [9]
b) For a metal machining, the following information is available: [8]
Tool change time, =16 min. Tool re-grind time,=6 min.
Machine running cost, = Rs. 12 per hour, Tool depreciation per re grind,=80 paise, $n=0.25$, $C=150$. Calculate the optimum cutting speed.

P.T.O.

- Q5) a)** How inserts are different from single point HSS tools? [9]
b) Explain design procedure of single point cutting tool for rectangular shank with suitable sketches. [9]

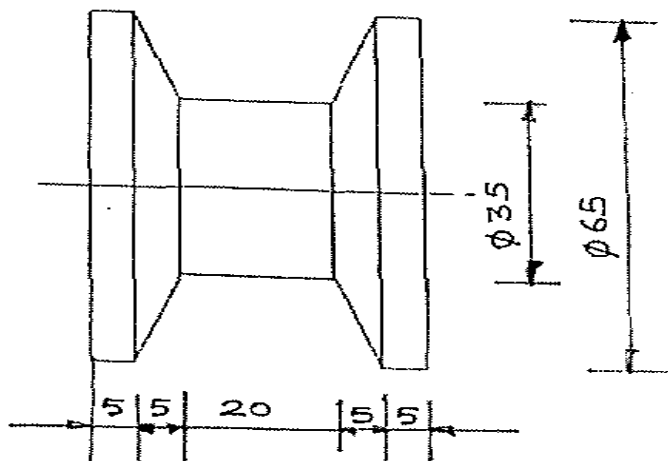
OR

- Q6) a)** What are the shapes of inserts? Draw any two shapes and comment on strength, power requirement and vibration tendency. [9]
b) Design a single point cutting tool to turn a M S bar with a linear cutting speed of 32m/min on a lathe equipped with a 16 KW motor. Safe stress for tool material is 265 MPa and efficiency of machine tool is 82%. [9]

- Q7) a)** State various guidelines to be used in design of broach. [9]
b) Discuss in detail with suitable sketches the procedure to be followed in designing a flat form tool by graphical method [8]

OR

- Q8) a)** Discuss in detail with suitable sketches the procedure to be followed in designing a circular form tool by graphical method [8]
b) Design flat form tool for a given job by graphical method when, Rake angle = 25° , Relief angle = 30° , Raw material - Aluminum [9]



Total No. of Questions : 8]

SEAT No. :

PD-4406

[Total No. of Pages : 3

[6403]-211

T.E. (Production Engineering)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester - V) (311084(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of logarithmic tables, slide rules, Moilier charts, electronic pocket calculator and steam table is allowed.

Q1) a) Explain following terms related to cam with suitable sketch : [8]

- i) Prime circle
- ii) Pitch curve
- iii) Base circle
- iv) Pitch point

b) A cam rotating clockwise at a uniform speed of 100 r.p.m. is required to give motion to knife-edge follower as below : [10]

- i) Follower to move outwards through 25 mm during 120° of cam rotation,
- ii) Follower to dwell for the next 60° of cam rotation,
- iii) Follower to return to its starting position during next 90° of cam rotation, and
- iv) Follower to dwell for the rest of the cam rotation.

The minimum radius of the cam is 50 mm and the line of stroke of the follower passes through the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward and return strokes, Draw the cam profile.

OR

P.T.O.

Q2) a) What is punching press? Describe with neat sketch the operation of flywheel in punching press. [8]

b) A Punching press is required to punch 40 mm diameter holes in a plate of 15 mm thickness at a rate of 30 holes per minute. It requires 6 Nm of energy per mm² of sheared area. If the punching takes 1/10 of a second and the rpm of flywheel varies from 1.60 to 140, determine the mass of the flywheel having radius of gyration of 1 meter. [10]

Q3) a) What is the stress concentration? What are the various causes of stress concentration? [7]

b) A transmission shaft made of cold drawn steel having ultimate tensile strength of 630 N/mm² and tensile yield strength 360 N/mm² is subjected to a fluctuating torque which varies from 600 Nm clockwise to 100 Nm anticlockwise. The surface finish factor and size factor are 0.8 and 0.85 respectively. The reliability factors is 0.897. If the factor of safety is 2, determine diameter of shaft. Use distortion energy theory of failure. [10]

OR

Q4) a) Explain various factors influencing the fatigue strength of the component. [7]

b) A cantilever beam of circular cross section, made of alloy steel with ultimate tensile strength of 1500 N/mm², is fixed at one end and subjected to a completely reversed force of 1000 N at free ends. The force is perpendicular to beam axis. The distance between free and fixed end of beam is 400 mm. The theoretical stress concentration factor and notch sensitivity are 1.33 and 0.85 respectively. The surface finish factor and size factor are 0.79 and 0.85 respectively. The temperature factor and reliability factor are 0.975 and 0.868 respectively. The desired life of beam is 50000 cycles. If the required factor of safety is 1.5, determine diameter of beam. [10]

Q5) a) Give comparison between normal distribution and standard distribution curves. [7]

b) A shaft and hole assembly of nominal diameter 30 mm have the following dimension. Shaft diameter = $30_{-0.15}^{+0.1}$ mm Hole diameter = $30_{+0.0}^{+0.1}$ mm Assuming shaft and hole diameters are normally distributed, determine the percentage of assemblies having clearance less than 0.14 mm. The areas below standard normal distribution curve from zero to z are as follows : [10]

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Areas	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713

OR

Q6) a) Explain 'design tolerance' and 'natural tolerance' and explain the difference between them. **[7]**

b) The mean tensile strength and the standard deviation of 250 nuts are 310 N/mm² and 35 N/mm² respectively. Determine : **[10]**

- i) The number of nuts expected to have a strength less than 270 N/mm²
- ii) The number of nuts expected to have a strength between 270 N/mm² and 360 N/mm².

The areas below standard normal distribution curve from $Z = 0$ to Z are as follows.

Z	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Areas	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

Q7) a) What is design for safety? Explain the general principles to be followed while designing the product for safety. **[8]**

b) Explain the concept of design for assembly and design for manufacture. **[10]**

OR

Q8) a) What is adequate design and optimum design? Explain with suitable examples. **[6]**

b) A tensile bar of length 500 mm is subjected to constant tensile force of 3000 N. If the factor of safety is 2, design the bar diameter using Johnson's method, with a objective of minimizing the material weight using optimum material from the list given below. **[12]**

Material	Mass density kg/m ³	Material cost per unit mass, Rs/kg	Yield strength N/mm ²
Steel	7800	28	400
Aluminum alloy	2800	132	150
Titanium alloy	4500	2200	800



[6403]-212

T.E. (Production Engineering)
FINITE ELEMENT ANALYSIS
(2019 Pattern) (Semester - V) (311085(A)-I)

Time : 2½ Hours]

[Max. Marks : 70]

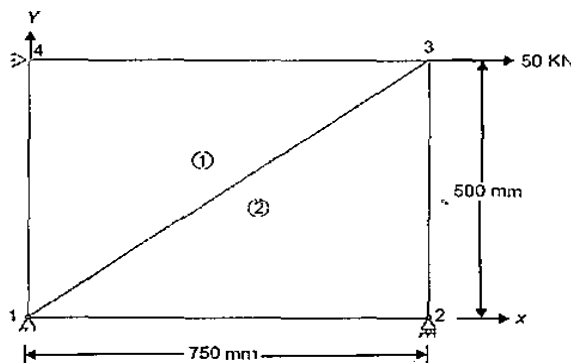
Instructions to the candidates:

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

- Q1) a)** Determine the stresses and strains for the 2D CST element using any approach. [8]
- b)** A triangular membrane element of thickness $t = 0.1$ cm, with the (x, y) coordinates of nodes indicated beside the node numbers, is shown in Fig. Take $E = 217$ GPa and $\mu = 0.25$, determine the following : [9]
- i) Shape functions of the element, $N_i(x, y)$, $N_j(x, y)$, and $N_k(x, y)$.
 - ii) Matrix $[B]$ that relates the strains to the nodal displacements.
 - iii) Elasticity matrix $[D]$.
 - iv) Element stiffness matrix.

OR

- Q2) a)** Illustrate with examples the plane stress, plane strain, and axisymmetric problems. [9]
- b)** Determine the nodal displacements and element stresses in the propped beam shown in Fig. Idealize the beam into two CST elements as shown in the figure. Assume plane stress condition. [8]
- Take $\mu = 0.25$, $E = 2 \times 10^5$ N/mm², Thickness = 15 mm.



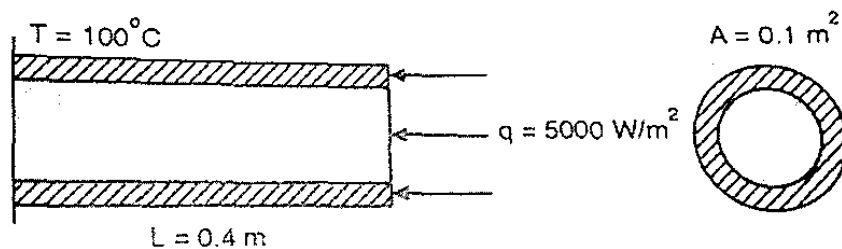
P.T.O.

- Q3) a)** Determine the structural stresses and strains for 1D bar element using a direct and energy approach? Also, apply a direct approach to determine the thermal stresses and strains for the 1D bar element. [9]
- b)** Outline the procedure to determine the stresses and strains for the truss element? [8]

OR

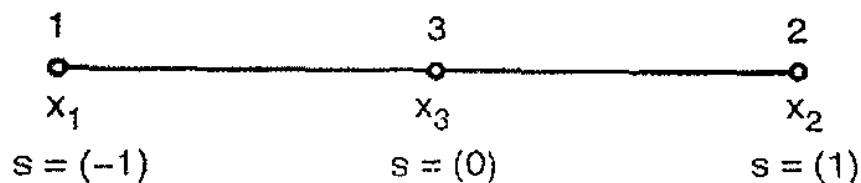
- Q4) a)** Derive the element stiffness matrix formulation for 1D steady state heat conduction problems. [9]
- b)** Write short notes on boundary conditions that prevail in 1D steady state heat conduction. [8]

- Q5) a)** Write notes on steps involved in processing step, to solve 1D heat transfer problem using FE Problem [8]
- b)** The fin shown in fig. is insulated on the perimeter. The left end has a constant temperature of 100°C . A positive heat flux of $q=6000 \text{ W/m}^2$ acts on the right end. Let $K_{xx}= 5 \text{ W/m}^\circ\text{C}$ and cross sectional area $A = 0.1 \text{ m}^2$. Determine Global matrix [10]



OR

- Q6) a)** For the three-noded iso-parametric bar element shown, show that the Jacobean determinate is $|J|=L/2$. Also determine the shape function N_1 , N_2 and N_3 and the strain displacement matrix $[B]$. Assume displacement field as $u=a_1+a_2s+a_3s^2$. [10]



- b)** Define Warp angle and skewness. Explain their significance in FEM. [8]

Q7) a) A three stepped rod of dia 80mm, 110mm with length 1100mm and 200mm is fixed at one end. Let density=0.00073kg/cub.metre, $E=250 \times 100000\text{N/sq.mm}$, calculate Global Matrix and the eigen values considering for free vibration problem? **[10]**

b) Give the various approaches used in fatigue analysis, **[8]**

OR

Q8) a) A three stepped rod of dia 60mm, 100mm with length 100mm and 300mm is fixed at one end. Let density = 0.00073kg/cub.metre, $E=250 \times 100000\text{N/sq.mm}$, calculate Global Matrix and the eigen values considering for free vibration problem? **[10]**

b) Distinguish between the static and dynamic analysis. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4408

[Total No. of Pages : 2

[6403]-213

T.E. (Production Engineering)

ADVANCES IN MANUFACTURING PROCESSES

(2019 Pattern) (Semester-V) 311085(A)-II (Elective-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) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.
- 4) Use of Non-programmable scientific calculator is allowed.
- 5) Figures to the right indicate full marks.

- Q1)** a) Explain with neat sketch the principle of working, advantages and applications of vacuum-mold casting. [6]
- b) Describe the differences between expendable and permanent molds. [6]
- c) Explain with neat sketch the principle of working, advantages and applications of continuous casting. [6]

OR

- Q2)** a) Outline of production steps in a typical sand-casting operation. [6]
- b) Explain why squeeze casting produces parts with better mechanical properties, dimensional accuracy and surface finish than do expendable-mold processes. [6]
- c) Explain with neat sketch the principle of working, advantages and applications of evaporative-pattern casting. [6]
- Q3)** a) A single full penetration weld pass is made on steel using the following parameters $E = 20 \text{ V}$, $I = 200 \text{ A}$, $v = 5 \text{ mm/s}$, $T_o = 25^\circ\text{C}$, $T_m = 1510^\circ\text{C}$, $\rho_c = 0.0044 \text{ J/mm}^3\text{C}$, $t = 5\text{mm}$, $f_1 = 0.9$, $H_{\text{net}} = 720\text{J/mm}$. Calculate the peak temperatures at distances of 1.5 and 3.0 mm from the weld fusion boundary. [9]
- b) Determine the expression for cooling rate at the weld centerline by considering relative plate thickness factor. [8]

P.T.O.

OR

- Q4)** a) With neat sketches discuss the defects in the welds their causes and remedies. [8]
- b) Explain in brief the significance and uses of estimation of peak temperature during welding? Write the expression for estimation of peak temperature during welding. [9]
- Q5)** a) Explain with neat sketch the effect of duty cycle on percentage decrease in surface roughness. [8]
- b) Explain the constituents of magnetorheological fluids. Explain with cause-and-effect diagram of process parameters of magnetorheological abrasive flow finishing process. [9]

OR

- Q6)** a) Explain with neat sketch the principle of working, equipment, mechanism of material removal, process parameters, performance characterization, applications of magnetic abrasive finishing process. [8]
- b) Explain with neat sketch the principle of working, equipment, mechanism of material removal, process parameters, performance characterization, applications of magnetorheological abrasive flow finishing process. [9]
- Q7)** a) Write short note on thread grinding, thread rolling and thread milling. [9]
- b) Explain continuous horizontal broaching machine with neat sketch. [6]
- c) Sketch the tool shape of broach and write briefly about its elements. [3]

OR

- Q8)** a) What are the different methods of thread manufacturing? Explain any one with a neat sketch. [6]
- b) Explain various types of broaching machines with neat sketches. [6]
- c) List the various gear grinding methods. Explain in brief the gear grinding process with neat sketch. [6]



Total No. of Questions : 8]

SEAT No. :

PD4409

[Total No. of Pages : 2

[6403]-214

T.E. (Production Engineering)

MECHATRONICS

(2019 Pattern) (Semester - V) (311085A-III) (Elective - I)

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, and Q.7 or Q.8.
- 2) Figures to the right indicate full marks.

- Q1)** a) What are the seven basic designs of logic gates? [6]
b) State the six types of Boolean laws. [6]
c) What are the advantages and disadvantages of the binary system? [6]

OR

- Q2)** a) Describe Dual Slope A/D Converter. [6]
b) Describe working of Digital to analog convertor. [6]
c) A 5-bit D/A converter produces $V_{OUT} = 0.2$ V for a digital input of 0001. Find the value of V_{out} for an input of 11111. [6]

- Q3)** a) Explain in brief control system parameters in process control. [6]
b) What are Dead Time Responses in Laplace form? [6]
c) Write note on Laplace transform. [6]

OR

- Q4)** a) Explain Lag Responses in Laplace Form. [6]
b) Which are the types of Second-Order Response in Laplace transform? [6]
c) Describe Process Dynamics Laplace. [6]

- Q5)** a) Explain Derivative Controllers. [6]
b) What is Proportional and Integral Controller? [6]
c) Explain Closed-loop control system with PD Controller. [5]

OR

P.T.O.

- Q6)** a) Describe Proportional plus Integral plus Derivative Controller (PID Controller). [6]
b) State general guidelines for designing a PID Controller. [6]
c) Which are the advantages and disadvantages of Proportional Controller? [5]

- Q7)** a) Describe programmable logic controller with sample ladder logic program. [6]
b) Describe five basic programming models of PLC. [6]
c) Explain an SFC program for tank level control using PLC. [5]

OR

- Q8)** a) Explain the Ladder language of PLC programming. [6]
b) State ladder relay instructions of PLC programming. [6]
c) Explain Timer Instructions with example in PLC. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4410

[Total No. of Pages : 2

[6403]-215

T.E. (Production Engg.)

SUPPLY CHAIN MANAGEMENT

(Elective - I) (311085A-IV) (2019 Pattern) (Semester - V)

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 supply chain management (SCM) and why is it important?[10]
b) What are the drivers of supply chain performance? [6]

OR

- Q2) a) Explain the impact of responsiveness and efficiency on each of the major drivers of supply chain performance? [10]
b) What are the objectives of a supply chain? [6]

- Q3) a) Explain how to manage supply chain cycle inventory. [10]
b) Why are RFID tags used in warehouse? [8]

OR

- Q4) a) Explain the different models of inventory used by warehouses to effectively stock the goods. [10]
b) Why are RFID tags used in warehouse? [8]

- Q5) a) Define supply chain management. What are the differences/similarities between logistics and supply chain management? [12]
b) How can supply chain cost be reduced? [6]

OR

P.T.O.

- Q6)** a) What is demand planning in supply chain management? [6]
b) What is the impact of a mismatch in supply and demand? [12]

- Q7)** a) What are the current trends in supply chain management? [12]
b) How do you manage risk in supply chain? [6]

OR

- Q8)** a) What are the major categories of supply chain risk? [12]
b) What are the common food supply chain issues? [6]



[6403]-216

T.E. (Production Engineering)

PRODUCTION TOOLING

(2019 Pattern) (Semester - VI) (311088(A))

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 side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) To design a drawing die for a component as shown in figure no. 1, calculate following values for a sheet of thickness 4.5 mm and yield strength 410 MPa. **[12]**

- i) Blank size,
- ii) Percentage reduction,
- iii) Number of draws required,
- iv) Cup diameter and height in each draw,
- v) Die and punch dimensions in each draw,
- vi) Press capacity required in each draw

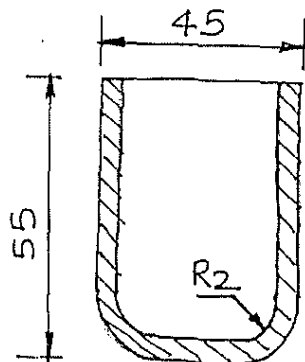


Figure No.1

All dimensions in mm.

P.T.O.

- b) Calculate developed length of the part as shown in figure no. 2 [6]

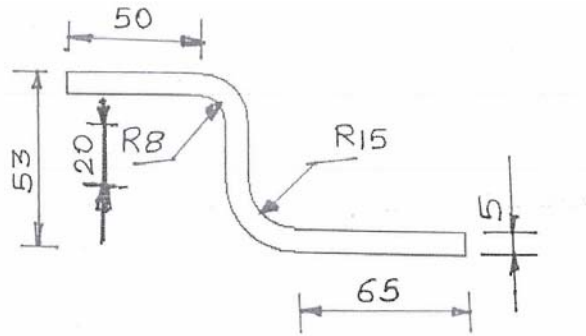


Figure No.2 All dimensions in mm

OR

- Q2) a) Explain use of Area Method in calculation of blank size with suitable sketch. [9]
b) Why is an ironing operation required in deep drawing? Explain concept of ironing operation with suitable sketches. [9]

- Q3) a) How inserts are useful in forging die. Explain types of die inserts used in forging with suitable sketches. [9]
b) Explain use of flash and gutter in forging die design with suitable sketches. [8]

OR

- Q4) a) Discuss various guidelines to be used for designing ribs, webs and drafts in forging die design with suitable sketches. [9]
b) Explain various guidelines to be used in selection of parting line in forging die design. [8]

- Q5) a) Which metals and alloys are used for submerged plunger type hot chamber die casting machines? Explain working of submerged plunger type hot chamber die casting machine with suitable sketches. [9]
b) Why lubrication is required in die casting? State various rules of die lubrication. [9]

OR

- Q6) a) Explain working of air- injection type die casting machine with suitable sketch. [9]
b) Discuss die casting defects with causes and remedies. [9]

- Q7)** a) Discuss types of sprue pullers with suitable sketches. [9]
b) Explain types of runners used in plastic molding with suitable sketches. [8]

OR

- Q8)** a) Determine number of cavities for a mould by rated capacity method for a given data. Material = Acrylic, Rated clamping capacity = 850 kN, Cavity pressure = 63 MPa, Projected area of moulding including runners & sprue = 2850 mm². [9]
b) Explain with the help of neat sketches disc gate, fan gate and spoke gate. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4412

[Total No. of Pages : 2

[6403]-217

T.E. (Production Engineering)

PRODUCTION & OPERATIONS MANAGEMENT

(2019 Pattern) (Semester - VI) (311089 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Figures to the right indicate full marks.*
- 2) *Neat Diagrams must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Use of logarithmic table, slide rule is electronic pocket calculator is allowed.*
- 4) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

Q1) a) Explain various factors determining PPC. **[9]**

b) Describe in detail Production Planning Principles. **[8]**

OR

Q2) a) Write a short note on: role of PPC in different production systems. **[9]**

b) Describe in detail Production Planning Principles. **[8]**

Q3) a) Explain principles of material handling. **[9]**

b) Write down the types of methods of evaluating location decision and Describe any one of them. **[8]**

OR

Q4) a) Describe objectives of Material Handling. **[9]**

b) Explain the factors Influencing Facility Location. **[8]**

Q5) a) What is selective inventory control? Explain HML and VED analysis in brief. **[9]**

b) An automobile factory manufacturer manufactures Engine within the factory. The particulars of this engine are given below. **[9]**

Demand rate = 16,000 units/year

Production rate = 38000 units/year

set-up cost = Rs. 550/set-up

carrying cost = Rs. 17 /unit/ year

Find EBQ, Total cost and Cycle time.

OR

- Q6)** a) What is EOQ? Derive an expression for the Economic Order Quantity when the stock replenishment is instantaneous (give assumptions). [9]
b) XYZ Industries needs 18,000 units/year of a bought out component which will be used in its main product. The ordering cost is Rs. 135 per order and the carrying cost per unit per year is 20% of the purchase price per unit which is Rs.75. [9]
Find
i) Economic order quantity.
ii) Number of orders per year.
iii) Time between successive orders.

- Q7)** a) What is block chain technology? How it can be used in Supply Chain Management? [9]
b) What are the stages in drawing Line of Balance? [9]

OR

- Q8)** a) What are the benefits of Asset Tracking? [9]
b) What are the wastes considered in Lean Manufacturing? [9]



Total No. of Questions : 8]

SEAT No. :

PD4413

[Total No. of Pages : 1

[6403]-218

T.E. (Production Engineering)

PROCESS ENGINEERING AND RESOURCE PLANNING

(2019 Pattern) (Semester - VI) (311090(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is mean by Geometric Control? **[8]**

b) Explain the causes of work piece Variation? **[9]**

OR

Q2) a) Explain in details Equilibrium theories? **[8]**

b) List the variables influencing work piece Control. **[9]**

Q3) a) List the types of tooling? And which factors are to be considered while selecting the tooling? **[9]**

b) What you know about operation rout sheet design. **[8]**

OR

Q4) a) What are factors to be considered while selecting the Machine or equipment? **[9]**

b) Explain the importance of process picture sheet. **[8]**

Q5) a) What are the factors affecting process selection. **[9]**

b) Explain role of capacity planning in industry. **[9]**

OR

Q6) a) Explain in brief-measuring capacity, Dimensions of capacity. **[9]**

b) What do you mean by OEE? **[9]**

Q7) a) Explain the CAPP (Computer Aided Process Planning). **[9]**

b) What are the recent trends in CAPP? **[9]**

OR

Q8) a) Explain Knowledge based process planning. **[9]**

b) What are advantages of CAPP over manual process planning? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4414

[6403]-219

[Total No. of Pages : 2

T.E. (Production Engineering)

PRODUCT DESIGN AND DEVELOPMENT

(2019 Pattern) (Semester - VI) (311091-(A)-I) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Write various stages of product life cycle. **[9]**

b) Elaborate functions of marketing department in product development. **[8]**

OR

Q2) a) Why product planning is essential. Explore various planning stages. **[9]**

b) Brief on stage gate system of product development. **[8]**

Q3) a) How to gather information of customers. Explain it related to product of an automobile industry. **[9]**

b) Explain benchmarking in general. How to implement it? **[8]**

OR

Q4) a) Discuss house of quality in brief. **[9]**

b) What is Kano model. How it is useful? **[8]**

P.T.O.

Q5) a) Discuss DFM guidelines. How these are important in manufacturing industry? **[9]**

b) Why to do estimation of manufacturing cost? Explain it. **[9]**

OR

Q6) a) Explain DFM guidelines for closed die forging. **[9]**

b) Discuss design for sheet metal forming in detail. Write advantages and limitations. **[9]**

Q7) a) Elaborate various opportunities available for PLM. **[9]**

b) Explore PLM strategies for different conditions. **[9]**

OR

Q8) a) Discuss case study of PLM related to auto industry. **[9]**

b) Write a short note on Product data management. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4415

[Total No. of Pages : 2

[6403]-220

T.E. (Production)

NANO MANUFACTURING

(2019 Pattern) (Semester - VI) (311091A-II) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What are the different energy sources used in nonconventional machining processes? **[10]**

b) Which non-conventional machining process has highest material removal rate? **[6]**

OR

Q2) a) What is the reason for using unconventional or advanced machining? **[10]**

b) What are the needs of unconventional manufacturing process? **[6]**

Q3) a) What are the different types of nano finishing process? **[10]**

b) Why finishing is necessary on metal surface? **[8]**

OR

Q4) a) What is the purpose of nano finishing process? **[10]**

b) What is the need for nano finishing process? **[8]**

P.T.O.

Q5) a) What are the difference between bottom-up fabrication and top-down fabrication? **[12]**

b) What are the approaches used in nano fabrication. **[6]**

OR

Q6) a) What are the two fundamental approaches to nanomanufacturing? **[6]**

b) What are the key issues in the synthesis of nanomaterials? **[12]**

Q7) a) Which device can be used for nano measurement? **[12]**

b) What is the role of size in nanomaterials? **[6]**

OR

Q8) a) What are the different methods of measurement of nano materials? **[12]**

b) What is importance of Nanometrology? **[6]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4416

[6403]-221

[Total No. of Pages : 2

T.E. (Production)

STATISTICS AND NUMERICAL METHODS

(2019 Pattern) (Semester - VI) (311091A-III) (Elective - II)

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 mean truncation error, absolute error and round off error? [9]

b) If $u = 4x^2y^3/z^4$ and errors in x, y, z be 0.00, compute the relative maximum error in u , when $x = y = z = 1$ [9]

OR

Q2) a) Discss root of equation and explain algebraic and transcendental equations. [9]

b) Find the root of equation $x^3 - 20x + 20 = 0$, by Newton Raphson method. Take initial guess as 1, up to accuracy 0.001. [9]

Q3) a) Explain various methods of least square criteria? Discuss in detail. [9]

b) Following is the data given for the values of x & y . fit a second-degree polynomial of type $ax^2 + bx + c$, where a, b, c are constants. [8]

x	-3	-2	-1	0	1	2	3
y	12	4	1	2	7	15	30

OR

P.T.O.

Q4) a) What do you understand from is power equation? And explain how it is fitted? [9]

b) In some determinations of the values v of CO_2 dissolved in a given volume of water at different temp θ , the following pairs were obtained.[8]

θ	0	5	10	15
v	1.80	1.45	1.18	1.00

Obtain by method of least square, a relation of the form $v = b + a\theta$ which best fits to these observations. Also find the value CO_2 dissolved in volume of water at temp. 25°C .

Q5) a) The following are co-ordinates of a set of point. Find x at $y = 2$. [9]

x	0	1	2	3
y	0	1	7	25

b) Use Simpson's 3/8 rule to evaluate $\int_0^{\pi/2} \sqrt{\sin x + \cos x} dx = \int_0^{\pi/2} (\sin x + \cos x)^{1/2} dx$. (Consider only one strip i.e.3 sub strips). [9]

OR

Q6) a) $\int_0^1 \frac{\sin x}{2 + 3\sin x} \cdot dx$ Find the integration using Simpson's 3/8 rule (6 strips).[9]

b) A set of values x and $f(x)$ are given below. Using Lagrange's interpolation formula, find $f(g)$ when $x_g = 9$ [9]

x	5	7	11	13	17
$Y = f(x)$	150	392	1452	2866	5202

Q7) a) Explain manufacturing optimization? Discuss with case study. [9]

b) What is Genetic Algorithm (GA) with any one case study. [8]

OR

Q8) a) What is Lagrange multipliers and Steepest descent method? [9]

b) Explain classical and multiple optimization? Discuss in detail. [8]

x x x

Total No. of Questions : 8]

SEAT No. :

PD-4417

[Total No. of Pages : 4

[6403]-222

T.E. (Production Engineering)

FINANCIAL MANAGEMENT AND COSTING

(2019 Pattern) (Semester - VI) (311091(A)-IV) (Elective - II)

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 side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) How are funds from operations calculated? **[6]**
b) A company issues ₹ 10,00,000; 10% debentures at a discount of 5%. The cost of floatation amounts to ₹ 30,000. The debentures are redeemable after 5 years. Calculate before tax and after tax cost of debt assuming a tax rate of 50%. **[6]**
c) Explain the current assets holding period method of estimating working capital. **[5]**

OR

- Q2)** a) What should be the mix of short and long-term sources in financing current assets? **[9]**
b) Hi-tech Ltd. plans to sell 30,000 units next year. The expected cost of goods sold is as follows :

	₹ (Per Unit)
Raw material	100
Manufacturing expenses	30
Selling, administration and financial expenses	20
Selling price	200

The duration at various stages of the operating cycle is expected to be as follows:

Raw material stage	2 months
Work-in-progress stage	1 month
Finished stage	1/2 month
Debtors stage	1 month

P.T.O.

Assuming the monthly sales level of 2,500 units, estimate the gross working capital requirement. Desired cash balance is 5% of the gross working capital requirement, and working progress in 25% complete with respect to manufacturing expenses. [6]

- c) Is there a difference between the project's and the firm's cost of capital? Explain. [5]

Q3) a) Explain the different elements of total costs. [6]

- b) From the following particulars, prepare the Stores Ledger Account showing how the value of the issues would be recorded under FIFO methods. [6]

01.12.2003 Opening Stock 1,000 Units at ₹ 26 each

05.12.2003 Purchased 500 Units at ₹ 24.50 each

07.12.2003 Issued 750 Units

10.12.2003 Purchased 1,500 Units at ₹ 24 each

12.12.2003 Issued 1,100 Units

15.12.2003 Purchased 1,000 Units at ₹ 25 each

17.12.2003 Issued 500 Units

18.12.2003 Issued 300 Units

25.12.2003 Purchased 1,500 Units at ₹ 26 each

29.12.2003 Issued 1,500 Units

- c) Ramesh Ltd. has three production departments A, B and C and six service departments. The following figures are extracted from the records of the company: [5]

Production Departments		Service Departments	
A	₹ 16,000	Stores	₹ 2,000
B	₹ 10,000	Timekeeping	₹ 3,000
C	₹ 12,000	Maintenance	₹ 1,000
	₹ 38,000	Power	₹ 2,000
		Welfare	₹ 1,000
		Supervision	₹ 2,000
		Total	₹ 49,000

The other information available in respect of the production departments

Particulars	Production Departments		
	A	B	C
No. of Employees	40	30	20
No. of Stores Requisition	30	20	10
Horse Power of Machines	500	500	600
Machine Hours	2500	1500	1000

You are required to apportion the costs of various service departments to production departments.

OR

- Q4) a)** Discuss the various methods of pricing materials issues to production. [6]
- b) Calculate the earnings of workers A and B under Straight Piece Rate System and Taylor's Differential Piece Rate System from the following particulars : [6]
- Standard time allowed 50 units per hour.
Normal time rate per hour ₹ 100.
Differentials to be applied.
80% of Piece rate below standard.
120% of Piece rate at or above standard.
In a day of 8 hours A produced 300 units and B produced 450 units.
- c) Following information is made available from the costing records of a factory : [5]
- i) The original cost of the machine : ₹ 1,00,000
Estimated life : 10 years
Residual Value : ₹ 5,000
Factory operates for 48 hours per week : 52 weeks in a year.
Allow 15% towards machine maintenance down time. 5% (of productive time assuming unproductive) may be allowed as setting up time.
 - ii) Electricity used by the machine is 10 units per hour at a cost of 50 paise per unit.
 - iii) Repair and maintenance cost is ₹ 500 per month.
 - iv) Two operators attend the machine during operations along with two other machines. Their total wages including fringe benefits, amounting to ₹ 5,000 per month is paid.
 - v) Other overheads attributable to the machine are ₹ 10,431 per year. Using above data, calculate machine hour rate.

- Q5) a)** Define Standard Costing. What do you understand by Standard Cost and Standard Costing? [6]
b) Discuss the preliminary steps for determination of Standard Cost. [6]
c) Calculate Material Cost Variance from the following information : [6]

Standard Price of material per kg = ₹ 4

Standard Usage of materials = 800 kgs

Actual Usage of materials = 920 kgs

Actual Price of materials per kg = ₹ 3

Actual Cost of materials ₹ 2,760

Standard cost of material for actual production ₹ 3,200

OR

- Q6) a)** What are the differences between Standard Costing and Estimated Costing? [6]
b) Explain the different types of Material Cost Variance. [6]
c) From the following particulars, calculate Labour Variance : [6]

Standard hours = 200

Standard rate for actual production = ₹ 1 per hour

Actual hour = 190

Actual Rate = ₹ 1.25 per hour

- Q7) a)** What do you understand by Marginal Costing? Define Marginal Costing. Briefly explain the features of marginal costing. [6]
b) What are the merits and demerits of process costing? [6]
c) From the following information, calculate the amount of profit using marginal cost technique : [6]

Fixed cost ₹ 3,00,000

Variable cost per unit ₹ 5

Selling price per unit ₹ 10

Output level 1,00,000 units

OR

- Q8) a)** What are the differences between Absorption costing and Marginal costing? [6]
b) Explain the stages in applying ABC in manufacturing company. [6]
c) A batch of 1,000 units was produced in a process at a cost of ₹ 1,850. The normal process loss of 10% of production. It is ascertained that the actual process loss was of 150 units. The scrap is normally sold to a contractor at ₹ 0.50 per unit. You are required to prepare (1) Process Account and (2) Abnormal Loss Account. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4418

[Total No. of Pages : 2

[6403]-223

T.E. (Production Sandwich)

MANUFACTURING TECHNOLOGY (Self Study)

(2019 Pattern) (Semester - V) (311122 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** What is meant by predictive maintenance? Explain in detail. **[9]**
b) What do you understand the term reliability? **[8]**

OR

- Q2) a)** Write a short notes on wear debris analysis. **[9]**
b) Differentiate between Preventive Maintenance and Breakdown Maintenance. **[8]**

- Q3) a)** What is Concurrent Engineering? What is the main goal of concurrent engineering? What are some challenges in implementing concurrent engineering? **[9]**
b) What are standard 14 points for quality transformation given by Dr. W. Edward Deming? **[8]**

OR

- Q4) a)** How does a poka yoke improve quality? How does poka-yoke reduce waste? **[9]**
b) What are the 5 stages of PDCA process? **[8]**

- Q5) a)** What happens when there is demand, but no supply? Explain with example. **[9]**
b) Differentiate between MRP-I and MRP-II. **[9]**

OR

- Q6)** a) Explain Material Resource Planning with example? How can the use of MRP contribute to productivity? [9]
b) What do you understand by Diminishing Marginal Utility? Explain it with example. [9]

- Q7)** a) What is the importance of Estimating Weights and volume of materials? Do we consider volume and weight of scrap while minimizing manufacturing time? Justify your answer. [9]
b) Explain objectives and functions of Material Management. [9]

OR

- Q8)** a) What do you mean by Depreciation? List out and explain different Methods of depreciation. [9]
b) Write a short note on Time Value of Money. [9]



[6403]-224

T.E. (Production Sandwich Engineering)
KINEMATICS AND DESIGN OF MACHINES
(2019 Pattern) (Semester - VI) (311084(A))

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) *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 and pocket calculator is allowed.*

Q1) a) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below :

1. To raise the valve through 50mm during 120° rotation of the cam;
2. To keep the valve fully raised through next 30°;
3. To lower the valve during next 60°; and
4. To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when the line of the stroke is offset 15 mm from the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m.

Draw the displacement, the velocity and the acceleration diagrams for one complete revolution of the cam. **[12]**

b) What is punching press? Describe with neat sketch the operation of flywheel in punching press. **[6]**

OR

Q2) a) Sketch different types of cams and follower and name it. **[6]**

b) A punching press is required to punch 40 mm diameter holes in a plate of 15 mm thickness at the rate of 30 holes per minute. It requires 6 N-m of energy per mm² of sheared area. If the punching takes 1/10 of a second and the r.p.m. of the flywheel varies from 160 to 140, determine the mass of the flywheel having radius of gyration of 1 metre. **[12]**

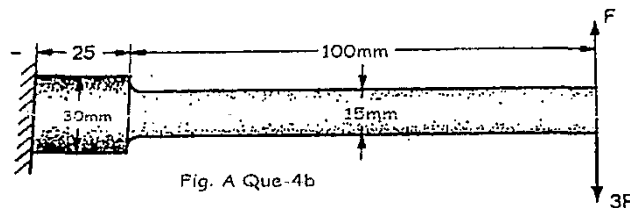
Q3) a) What is stress concentration? What are the various causes of stress concentration? Discuss the various methods of reducing the effect of stress concentration. [8]

b) A steel bar of 50 mm diameter is subjected to a completely reversed bending stress 250 N/mm^2 . The ultimate tensile strength of steel is 600 N/mm^2 . The surface finish factor and size factor are 0.43 and 0.85 respectively. The reliability factor is 0.897. Assuming there is no stress concentration, determine the life of the bar. [9]

OR

Q4) a) Explain the laboratory method of determining endurance limit of ferrous material with neat sketch. [8]

b) A cantilever beam made of cold drawn steel 35C8 ($S_{ut} = 550 \text{ N/mm}^2$ and $S_{yt} = 320 \text{ N/mm}^2$), shown in Fig. A, is subjected to a load which varies from $-F$ to $3F$. The surface finish factor and size factor are 0.89 and 0.85 respectively. The theoretical stress concentration factor and notch sensitivity at the fillet are 1.42 and 0.9 respectively. If the factor of safety is 2, determine the maximum value of F , which the cantilever beam can withstand for infinite life. [9]



Q5) a) Differentiate between 'Normal Distribution Curve' & 'Standard Normal Distribution Curve' in engineering statistical analysis. [6]

b) A batch of 100 helical compression springs are tested for the deflection under the axial load. The results are tabulated as follows; [12]

Deflection of springs in	Number of springs
14-16	03
16-18	10
18-20	50
20-22	31
22-24	06

If the permissible deflection for the springs is between 18 mm and 23 mm, determine the % of the springs likely to be rejected

Z	0.8	0.9	1.0	1.1	2.2	2.3	2.4	2.5
Area	0.2881	0.3159	0.3413	0.3643	0.4861	0.4893	0.4918	0.4938

[Use linear interpolation for values in between.]

OR

- Q6) a)** Explain the difference between 'Design Tolerance and Natural Tolerance'. How would the designer select the tolerance for the minimum rejection of the components? [6]
- b)** The recommended class of fit for the journal and the bearing of a hydrodynamic bearing is $20 H_7-e_8$. The diameters of the journal and bearing are normally distributed. From the considerations of hydrodynamic action and bearing stability, the maximum and minimum clearances are limited to 0.08 and 0.05mm respectively. Determine the percentage of rejected assemblies. [12]

The tolerances in micron are as follows:

Diameter, mm	H_7		e_8	
	es	ei	es	ei
20	+21	0	- 40	- 73

[Use linear interpolation for values in between.]

Z	1.8	1.9	2.0	2.1	2.0	2.1	2.2	2.3
Area	0.4641	0.4713	0.4772	0.4821	0.4772	0.4821	0.4861	0.4893
Z	2.4	2.5	2.6	2.7				
Area	0.4918	0.4938	0.4953	0.4965				

- Q7) a)** What is design for manufacture (DFM)? Explain the general principles to be followed while designing the parts for manufacture. [9]
- b)** Explain the following terms: i) Desirable effect ii) Undesirable effect iii) Primary design equation iv) Geometrical parameter [8]

OR

- Q8) a)** Define adequate design & optimum design. [3]
- b)** A tensile bar of length 200 mm is subjected to the constant tensile force of 5000 N. If the factor of safety is 3, design the bar with the objective of minimizing the material cost, out of the following materials: [14]

Material	Mass density ρ kg/m ³	Material cost per unit Mass c, Rs/kg	Yield strength S _{yt} , N/mm ²
Steel	7800	14	400
Aluminium Alloy	2800	66	150
Titanium Alloy	4500	1100	800
Magnesium Alloy	1800	75	100



Total No. of Questions : 8]

SEAT No. :

PD-4420

[Total No. of Pages : 2

[6403]-225

T.E. (Production Sandwich Engineering)
MATERIAL FORMING AND MOULD DESIGN
(2019 Pattern) (Semester - VI) (311124 A)

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.

Q1) a) Show that for rolling process **[9]**

$$(\Delta h)_{\max} = \mu^2 R$$

Where, h = draft in rolling

μ = coefficient of friction

R = Roll radius

b) Explain following in case of rolling: - **[8]**

i) Angle of bite	ii) Neutral Plane
iii) Backward slip	iv) Forward slip

OR

Q2) a) Explain Electromagnetic / Magnetic pulse forming in detail with neat sketch. Also explain its process variables. **[9]**

b) Write a short note on following in case of rolling: - **[8]**

i) Roll Flattening	ii) Roll camber

Q3) a) Explain various elements of gating system with neat sketch. **[8]**

b) Explain following in case of Die casting **[10]**

i) Core & Cavity	ii) Draft
iii) Parting line shape & location	iv) Die wear
v) Die lubricants	

OR

Q4) a) Calculate size of cylindrical riser (height & diameter equal) necessary to feed a steel slab casting $25 \times 25 \times 5$ cm with side riser, casting poured horizontally into mould. For steel take constant $a = 0.10$, $b = 0.03$ & $c = 1.0$. **[8]**

b) Explain following with neat sketch **[10]**

i) Hot chamber die casting	ii) Cold chamber die casting

P.T.O.

- Q5) a)** Define forgability and explain various forgability tests. [8]
b) Explain various forging design factors in detail. [9]

OR

- Q6) a)** Explain procedure to derive edging impression with suitable illustration. [6]
b) Explain following for forging (any two) [6]
i) Flash & Flash gutter ii) Rotary swaging
iii) Press Forging
c) Explain how die block dimensions are determined in forging die design. [5]

- Q7) a)** Explain with neat sketch various ancillary items used in injection mould. [8]
b) For injection moulding explain following (any two) [8]
i) Sprue puller
ii) Cooling systems and heat transfer consideration.
iii) Ejector plate assembly return system
c) Define core & cavity in case of injection moulding. [2]

OR

- Q8) a)** Write a short note on runner layout & runner balancing. [6]
b) Calculate gate dimensions for rectangular gate used in moulding polythene blocks having length 150 mm, width 130 mm, height 50 mm & thickness 1.3 mm. take density of material as 0.9 gm/cm^3 also find runner dimensions. Assume length of gate as 0.5 mm, length of runner as 50 mm. take material constant (n) as 0.6. [6]
c) Explain importance of positioning of gate in injection moulding with suitable sketch. [6]



Total No. of Questions : 8]

SEAT No. :

PD4421

[Total No. of Pages : 2

[6403]-226

T.E. (Production S/W Engineering)
METROLOGY AND QUALITY CONTROL
(2019 Pattern) (Semester - VI) (311125A)

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 Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

- Q1)** a) Discuss elements of machine vision. [9]
b) Classify types of probes with neat sketches. [8]

OR

- Q2)** a) Enlist applications of CMM. Explain any three applications in detail. [9]
b) Write short notes on the following. (any two) [8]
i) Straightness measuring method
ii) AC Interferometer
iii) Concept of error

- Q3)** a) Why flatness measurement is essential? Explain various methods of measuring flatness. [9]
b) Draw square thread profile, also show its terminology. [8]

OR

- Q4)** a) Explain how the alignment of lathe bed may be checked by using various instruments. [9]
b) Enlist different methods to measure pitch of the gear. Explain any one in detail. [8]

- Q5)** a) Mention few methods for power measurement. [9]
b) Draw neat diagram of Venturimeter. Explain its construction and working. [9]

OR

P.T.O.

- Q6)** a) Discuss various methods for measurement of temperature. [9]
b) Differentiate between readability and reliability with desired example. [9]

- Q7)** a) Describe various capability variables. [9]
b) Elaborate p and np charts in detail. [9]

OR

- Q8)** a) Explain briefly frequency distribution methods. [9]
b) Define Quality. List and explain the Five quality characteristics with examples. [9]



Total No. of Questions : 8]

SEAT No. :

PD4422

[6403]-227

[Total No. of Pages : 2

T. E. (Production Sandwich)

ADVANCED MATERIALS

(2019 Pattern) (Semester - VI) (311126A-I) (Elective -II)

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) *Figure to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What are the various Moulding Methods used in the production of advanced materials? **[8]**

b) What is the purpose and significance of conducting a macromechanical analysis of a lamina? **[9]**

OR

Q2) a) What is the significance of hand layup in the manufacturing of advanced materials? **[9]**

b) What is the role of the laminate-laminate code in the macromechanical analysis of laminates? **[8]**

Q3) a) Explain the classifications of Functionally Graded Materials with its Applications? **[8]**

b) How does the shape memory effect work in Shape Memory Alloys? Give examples of applications where Shape Memory Alloys are commonly used? **[9]**

OR

Q4) a) What are different systems used in the preparation of Functionally Graded Materials? Explain some notable properties. **[8]**

b) Can you give examples of applications where Shape Memory Alloys are Commonly used? **[9]**

P.T.O.

Q5) a) Explain Nano materials with their significance in various fields? State the Advantages, Disadvantages and Applications? **[9]**

b) Highlight important bio metallic alloys, such as Ni-Ti alloy and Co-Cr-Mo alloys with their properties and Applications? **[9]**

OR

Q6) a) What are the unique properties exhibited by materials at the nano scale? State their advantages and disadvantages? **[9]**

b) How does bio-functionality play a role in the design and development of biomaterials? **[9]**

Q7) a) What are the strengthening mechanisms employed in Iron base super alloys? State their properties and Applications? **[9]**

b) What are the important metallurgical aspects of Aluminum alloys with their properties and Applications? **[9]**

OR

Q8) a) What are the significant properties of Titanium alloys? State their important metallurgical aspects and Applications? **[9]**

b) Explain the composition of Nickel base super alloys and their role in enhancing properties and State their Applications? **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4423

[6403]-228

[Total No. of Pages : 4

T.E. Production (Sandwich)
COSTING AND COST CONTROL
(2019 Pattern) (Semester - VI) (311126A-II) (Elective - II)

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 electronic pocket Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1) a)** What are the steps to calculate machine hour rate? Write advantages and disadvantages of calculating machine hour rate. **[9]**
- b) Following information is made available from the costing records of a factory: **[9]**
- i) The original cost of the machine: Rs.1,00,000
Estimated life: 10 years
Residual Value: Rs. 5,000
Factory operates for 48 hours per week: 52 weeks in a year
Allow 15% towards machine maintenance down time.
5% (of productive time assuming unproductive) may be allowed as setting up time.
 - ii) Electricity used by the machine is 10 units per hour at a cost of 50 paise per unit.
 - iii) Repair and maintenance cost is Rs. 500 per month.
 - iv) Two operators attend the machine during operations along with two other machines. Their total wages including fringe benefits, amounting to Rs. 5,000 per month is paid.
 - v) Other overheads attributable to the machine are Rs. 10,431 per year. Using above data, calculate machine hour rate.

OR

P.T.O.

Q2) a) In a factory where machine hour rates are used for recovering overhead expenses, state what information would be necessary to compute these rates? **[9]**

b) The following particulars relate to a processing machine treating a typical material. You are required to calculate the machine hour rate. **[9]**

The cost of the machine Rs. 10,000

Estimated life 10 years

Scrap value Rs. 1,000

Working time (50 weeks of 44 hrs. each) 2,200 hrs. Machine maintenance per annum 200 hrs.

Setting up time estimated @ 5% of total productive time

Electricity is 16 units per hour @ 10 paise per unit.

Chemicals required weekly Rs. 20 Maintenance cost per year Rs. 1,200

Two attendants control the operations of the machine together with 6 other machines, their combined weekly wages are Rs. 140. Departmental overhead allocated to this machine per annum Rs. 2,000.

Q3) a) What are overheads? How should overheads be classified? To what extent will you include overhead charges in your valuation of (i) work-in-progress, and (ii) finished goods? **[8]**

b) The following information has been gathered for a company doing jobbing work only for 2013: **[9]**

	Rs.
Materials Consumed	4,00,000
Direct Labour	3,00,000
Factory Overheads	2,40,000
Office and Administrative Expenses	94,000
Sales	12,40,800

The company has to quote for a job to be undertaken in February, 2014. It is estimated that the job will require materials costing Rs. 30,000 and direct wages for it will be Rs. 45,000. What should be the quotation?

OR

Q4) a) State the main sources from which overhead expenses are collected in the Cost Accounts. **[8]**

b) XYZ Ltd. uses a historical cost system and absorbed overheads on the basis of predetermined rate. The following data are available for the year ended 31st March, 2015. **[9]**

Manufacturing Overheads	Rs.
Amount Actually spent	1,90,000
Amount absorbed	1,70,000
Cost of Goods sold	3,36,000
Stock of finished goods	96,000
Work-in-progress	48,0000

Calculate using the Supplementary rate methods of disposal of under-absorbed overheads.

Q5) a) What are the benefits of activity based costing? **[8]**

b) The under given data is supplied by Fair deal travel services, From the following information calculate fare for passenger Km. **[9]**

The cost of the Bus Rs. 4,50,000

Insurance charges 3 % p.a.

Annual tax Rs. 4,500

Garage rent Rs. 500 p.m.

Annual repairs Rs. 4,800

Expected life of the bus 5 yrs

Value of scrap at the end of 5 years Rs. 30,000

Route distance 20 km long

Driver's salary Rs. 550 p.m.

Conductor's Salary Rs. 500p.m.

Commission to Driver & conductor (shared equally) 10 % of the takings

Stationary Rs. 250 p.m.

Manager-cum-accountant's Salary Rs. 1,750 p.m.

Diesel and Oil (for 100 kms) 125

The bus will make 3 rounds trips for carrying on the average 40 passenger's in each trip. Assume 15 % profit on takings. The bus will work on the average 25 days in a month.

OR

Q6) a) What is Activity Based Costing? Why is it needed? [8]

b) 20 Hp unit is required to drive a pump for watering an agricultural farm. Two plans A and B for supplying are under consideration: [9]

	A	B
Purchase and installation	Rs. 10,000	Rs. 4,000
Life in years	4	4
Salvage value	1,000	-
Interest on capital	10%	10%
Maintenance per year	Rs. 3,000	-
Maintenance per hour	-	0.50
Operating wages per hour	Rs. 0.20	Rs. 0.60
Power per hour	Rs. 1.00	-
Fuel and oil per hour	-	2.00

Assuming that 3 million litres of water is to be pumped in a year and that the pump will pump 1,000 litres in an hour, find out the cost per 1,000 litres of water under both the plans and find out the number of hours for which the operating costs of both the machines will be even.

Q7) Write Short note on : [18]

- a) Budget and budgetary control
- b) Zero Base Budgeting

OR

Q8) Write Short note on : [18]

- a) Standard cost
- b) Variance analysis

x

x

x

Total No. of Questions : 8]

SEAT No. :

PD4424

[6403]-229

[Total No. of Pages : 2

T.E. (Production Sandwich)

ADVANCED JOINING TECHNOLOGY

(2019 Pattern) (Semester - VI) (311126 (A)-III) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain diffusion bonding process stating its advantages, disadvantages and applications of the process. **[10]**
- b) Explain Brazing and soldering process stating its advantages, disadvantages and applications. **[8]**

OR

- Q2)** a) Explain Ultrasonic Welding stating its advantages, disadvantages, and applications of the process. **[9]**
- b) What is cold welding? State its advantages, disadvantages, and applications of the process. **[9]**

OR

- Q4)** a) Explain Laser Beam Welding stating its advantages, disadvantages and applications of the process. **[8]**
- b) Write short notes on: **[9]**
- i) Welding automation in aerospace
 - ii) Robotic Welding.
 - iii) Under Water welding

P.T.O.

- Q5) a)** Describe various types of joints used in welding with sketch in short. **[9]**
b) Describe in short, the Magnetic Particle Testing of weldments. **[9]**

OR

- Q6) a)** Write short notes on: **[9]**
i) Radio graphs of weldments
ii) Life assessment of weldments
iii) Tensile bend test of weldments
b) Describe in short, the liquid penetration test of weldments. **[9]**

- Q7) a)** Write Short notes on : **[8]**
i) Weld thermal cycles and their effects
ii) Concept of HAZ
b) What do you understand by weldability? Explain how weldability is assessed in short. **[9]**

OR

- Q8) a)** Explain the following weld defects, their causes and remedies. **[9]**
i) Lack of penetration
ii) Cracks
iii) Lack of fusion
b) What are different weldability test? Describe any one in short. **[8]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4425

[6403]-230

[Total No. of Pages : 2

T.E. (Production Sandwich)

WORLD CLASS MANUFACTURING

(2019 Pattern) (Semester - VI) (311126 (A)-IV) (Elective - II)

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 is meant by cellular manufacturing? Explain in detail, single-linkage clustering algorithm used for cell formation. **[9]**

a) State and explain benefits and applications of Group Technology. **[8]**

OR

Q2) a) State and explain Group Technology. Its methods of Codification & Classification of Systems. **[9]**

b) What is Production Flow Analysis? List the steps involved in carrying out PFA. **[8]**

Q3) a) Distinguish between preventive maintenance and breakdown maintenance. **[9]**

b) What is Overall Equipment Effectiveness (OEE)? State and explain it with example. **[8]**

OR

Q4) a) What is Resource Levelling? State and explain its importance with suitable example. **[9]**

b) State and explain Japanese Lean Principles. Explain any one concept with appropriate example. **[8]**

P.T.O.

Q5) a) What is Theory of Constraints? What are the Steps of Theory of Constraints? **[9]**

b) What are 5S techniques? Explain with suitable example. **[9]**

OR

Q6) a) What is throughput accounting in Theory of Constraints? What are the limitations of throughput accounting? How do you calculate throughput in accounting? **[9]**

b) What is Visual Management? What do you mean by visual control and why is it important? **[9]**

Q7) a) What are the components of Industry 4.0? Explain globalization and Emerging issues with suitable example. **[9]**

b) What do you mean by Lean Logistics? What is the benefit of lean processes in the logistics operation? **[9]**

OR

Q8) a) What is Lean Thinking? How it can be applied to logistics? **[9]**

b) What are Cyber-Physical Systems? Write down benefits of Cyber Physical Systems. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD-4426

[Total No. of Pages : 3

[6403]-231

T.E. (Production Sandwich)

STATISTICS AND NUMERICAL OPTIMIZATION METHODS

(2019 Pattern) (Semester - VI) (311088A)

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 side indicate full marks.
- 4) Assume Suitable data if necessary.
- 5) Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.

Q1) a) Show that $f(x) = x^3 + 4x^2 - 10 = 0$ has a root in $[1, 2]$ and use the Bisection method to find the approximation root. [9]

b) Find a root of an equation $f(x) = e^x - x$ using Newton Raphson method. With $X_0 = 0$ for five interactive steps. [8]

OR

Q2) a) Solve following equation using gauss elimination method : [8]

$$4y + 2z = 1$$

$$2x + 3y + 5z = 0$$

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

b) Solve following equation using gauss Seidal method upto three approximations [9]

$$5x_1 - 2x_2 + 3x_n = -1$$

$$-3x_1 + 9x_2 + x_n = 2$$

$$2x_1 - x_2 - 7x_n = 3$$

P.T.O.

- Q3) a)** Fit a simple linear regression equation $Y = a + bx$ applying the method of least squares. [8]

X	8	3	2	10	11	3	6	5	6	8
Y	4	12	1	12	9	4	9	6	1	14

- b) The following are co-ordinates of a set of points. Find x at $y = 2$ using Lagrange formula. [9]

x	0	1	2	3
y	0	1	7	25

OR

- Q4) a)** State the order of the polynomial which might be suitable for the following Function. Calculate $f(1895)$ using Newton Forward Difference Method. [9]

x	1891	1901	1911	1921	1931
y	46	66	81	93	101

- b) By the method of least squares find the straight line to the data given below [8]

x	5	10	15	20	25
y	16	19	23	26	30

- Q5) a)** State the order of the polynomial which might be suitable for the following function. Calculate $f(3)$ using Newton Backward Difference Method. [9]

x	2012	2014	2016	2018
f(x)	10392	9863	8247	7698

- b) Find the value of $f(x)$ by Using Newton Divided Difference Method formula from the following data [9]

x	-4	-1	0	2	5
y	1245	33	5	9	1335

OR

Q6) a) Evaluate $f(x) = \frac{300x}{1+e^x}$ by using Trapezoidal Method by taking 3 divisions, from $x = 0$ to $x = 10$. [9]

b) Use Simpsons 1/3rd rule to evaluate e^{-x^2} . [9]

Q7) a) Describe in brief classical optimization Multipliers. [9]

b) Explain the multiple optimization in manufacturing. [9]

OR

Q8) a) Write in brief implantation of Genetic Algorithm with suitable example. [9]

b) Brief on: Generalized reduced gradient Method. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4427

[Total No. of Pages : 4

[6403]-232
T.E. (Mechatronics)
MACHINE DESIGN
(2019 Pattern) (Semester - V) (317541)

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 right indicate full Marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) A square threaded screw having 50 mm nominal diameter and 10 mm pitch is used for lifting a load of 20 kN through distance of 170 mm. Find the work done in lifting the load and the efficiency of the screw, when :

- i) the load rotates with the screw; and
- ii) the load rests on the loose head which does not rotate with the screw.

The external and internal diameters of the bearing surface of the loose head are 60mm and 10mm respectively, while the coefficient of friction for the bearing surface is 0.08. **[10]**

- b) Derive the formula for torque required to raised the load by a square threaded power screw. **[4]**
- c) What is self-locking property of threads and where it is necessary? **[4]**

OR

Q2) a) 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 screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm², find: 1. the torque required to rotate the screw; 2. the stress in the screw; and 3. the number of threads of nut in engagement with screw. **[10]**

P.T.O.

- b) Why are the square threads preferable to V threads for power transmission? [4]
- c) Explain the differential screw with a neat sketch. [4]

Q3) a) A rotating bar, made of steel 45C8 ($S_{ut} = 630$ MPa) is subjected to a completely reversed bending stress. The corrected endurance limit of the bar is 315 MPa. If the expected life of bar is 90000 Cycles, calculate its fatigue strength. Draw the SN curve and indicate all parameters. [10]

b) Write short note on : [8]

- Stress Concentration
- Endurance strength
- Notch Sensitivity
- Surface Finish Factor

OR

Q4) a) A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700 MPa. Determine the diameter of bar using safety factors of 3.5 related to ultimate tensile strength and 4 related to endurance limit and a stress concentration factor of 1.65 for fatigue load. Use Goodman straight line as basis for design. [10]

b) List and explain the factors affecting the endurance strength. [4]

c) What are the causes of stress concentration? [4]

Q5) a) An angle is welded to a steel plate as shown in Figure 1. The angle is subjected to an axial load of 50 kN and the permissible shear strength of the weld is 75 MPa. Determine the weld lengths L_2 and L_1 . [8]



Figure 1

- b) What do you understand by the single start and double start threads?[5]
- c) Define the following terms : (i) Major diameter, (ii) Minor diameter, (iii) Pitch, and (iv) Lead. [4]

OR

- Q6) a)** A steel bracket is fixed to the vertical support by three bolts of size M20, two at the top and one at the bottom, as shown in fig.2. If the permissible tensile stress for the bolt is 60 N/mm^2 , determine the maximum load that can be supported by bracket at 350 mm from the vertical support. [9]

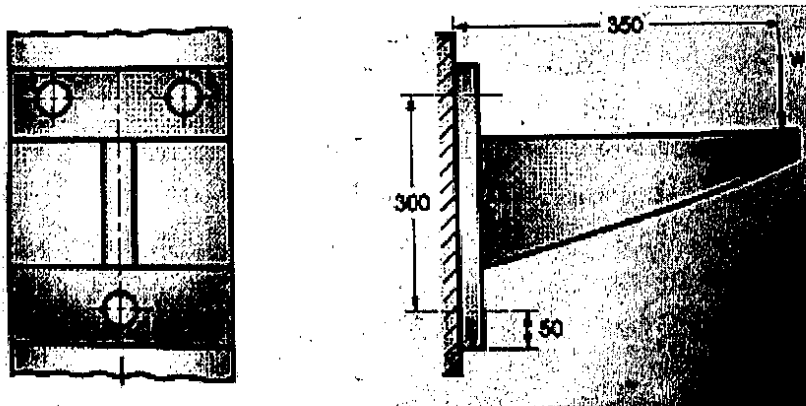


Fig.2

- b) Explain Turn Buckle, also state two applications of it. [4]
- c) State advantages and limitations of welded Joints. [4]
- Q7) a)** It is required to design a helical compression spring of circular wire, subjected to an axial load, which varies from 2.5 kN. to 3.5 kN. For this range of load the deflection of spring should be limited to 5 mm. The spring index is 5 and the spring has square and ground ends. For spring wire material, $S_{ut} = 1050 \text{ MPa}$ and $G = 81370 \text{ MPa}$. If permissible shear stress for the spring wire is $0.5 S_{ut}$, calculate : [8]
- the wire diameter and mean coil diameter
 - the required spring rate
 - the number of active coils and total number of coils
 - the solid length of spring
 - the free length of spring
- b) Explain different types of stresses induced in the helical spring [5]

- c) Write short notes on : [4]
- i) Free Length
 - ii) Spring index
 - iii) Spring rate
 - iv) Stress factor

OR

- Q8) a)** Design a closed-coil helical compression spring with the following data:[8]
- Service load range = 2250 N to 2750 N
- Axial deflection of spring for load range = 6 mm
- Spring index = 5
- Permissible shear stress for spring = 420 MPa
- Modulus of rigidity for spring material = 84 kN/mm²
- Neglect the effect of stress concentration.
- b) Explain one method of avoiding the tendency of a compression spring to buckle. [5]
- c) Explain leaf spring with neat sketch. [4]



Total No. of Questions : 8]

SEAT No. :

PD4428

[Total No. of Pages : 2

[6403]-233

**T.E. (Mechatronics Engineering)
MANUFACTURING PROCESSES
(2019 Pattern) (Semester - V) (317542)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4 or Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of drawing instrumentns, electronic pocket calculators are allowed.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What are the various type of chips? Explain with a neat sketch. [9]
b) Define Machining & differentiate between orthogonal & oblique cutting. [8]

OR

- Q2)** a) Describe the tool geometry of a single point cutting tool with a neat sketch. [9]
b) Classify the Milling Machine. Compare Shaping and Planing Machine. [8]

- Q3)** a) What are the type of brazed joint? Compare Soldering and Brazing processes. [9]
b) Short note on : [8]
i) Soldering method
ii) Brazing method

OR

- Q4)** a) Draw neat sketch of Oxy Acetylene gas welding and explain important points regarding oxy Acetylene welding. [9]
b) Write short note on: [8]
i) Forge welding
ii) Ultrasonic welding

P.T.O.

- Q5)** a) Explain with neat sketch electrical discharge machining (EDM). [6]
b) Explain with neat sketch laser beam machining. [6]
c) Write short note on Fundamental of Rapid prototyping. [6]

OR

- Q6)** a) Classify the unconventional machining processes. [6]
b) Explain with neat sketch Electron Beam Machining (EBM) [6]
c) Explain photolithography and layer processes used in IC fabrication. [6]

- Q7)** a) Explain silicon processing with neat sketch. (circuit) [6]
b) Explain PCB assembly with neat sketch. [6]
c) State the procedure for PCB fabrication. [6]

OR

- Q8)** a) Explain IC packaging. [6]
b) Write short notes on Stereo lithography. [6]
c) What do you mean by PCB structure. What are the types and materials required? [6]



Total No. of Questions : 8]

SEAT No. :

PD-4429

[Total No. of Pages : 2

[6403]-234

T.E. (Mechatronics Engineering)

CONTROL SYSTEM

(2019 Pattern) (Semester - V) (317543)

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 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)** Comment on the stability of a system using Routh's stability criteria whose characteristic equation is : $s^4 + 2s^3 + 4s^2 + 6s + 8 = 0$. How many poles of systems lie in right half of S Plane. **[6]**
- b) Define stable, unstable, marginally stable systems. **[6]**
- c) State and explain Routh Hurwitz stability criterion. **[6]**

OR

- Q2) a)** Explain the significance of auxiliary equation. **[6]**
- b) Describe the various rules to sketch the root locus. **[6]**
- c) Investigate the stability of a system having closed loop characteristic equation : $Q(s) = s^3 + 7s^2 + 10s + K = 0$ and find K_{mar} and ω_{mar} . **[6]**

- Q3) a)** Explain Nyquist stability criterion. **[8]**
- b) For the system with closed loop transfer function $G(s) = \frac{25}{s^2 + 6s + 25}$, determine resonant peak, resonant frequency, damping factor and natural frequency. **[4]**
- c) Note on : correlation between time domain and frequency domain for second order system. **[6]**

P.T.O.

OR

- Q4) a)** What are the limitations for frequency domain approach. [4]
- b) For the system with closed loop transfer function $G(s) = \frac{100}{s^2 + 10s + 100}$, determine resonant peak, resonant frequency, damping factor and undamped natural frequency. [6]
- c) Define the terms : [8]
- i) Bandwidth
 - ii) gain Margin
 - iii) Phase cross over frequency
 - iv) Phase margin

- Q5) a)** Discuss the nature of bode plot of : [8]
- i) Pole at origin
 - ii) Simple pole
 - iii) Simple zero
 - iv) Quadratic pole
- b) Explain steps to sketch Bode plot. [10]

OR

- Q6) a)** What are asymptotic Bode plot? How correction can be applied to accurate Bode plot? [6]
- b) Explain the procedure to obtain gain margin and phase margin from the Bode plot. [6]
- c) State the advantages of Bode plot. [6]

- Q7) a)** Using Ziegler Nicholas method design a PID controller for the system with unity feedback and $G(s) = \frac{1}{s(s+1)(s+5)}$. [6]
- b) Explain concept of industrial automation. [5]
- c) What is a PID controller? Explain in detail. [5]

- Q8) a)** Note on ON/OFF controller. [5]
- b) What is derivative control mode. State its characteristics. [6]
- c) What is integral control mode? State its characteristics. [5]



Total No. of Questions : 8]

SEAT No. :

PD4430

[Total No. of Pages : 2

[6403]-235

**T.E. (Mechatronics Engineering)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - V) (317544)**

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 non-programmable calculator is allowed.
- 4) Assume suitable data if necessary.

Q1) a) Find DTFS for the following. [8]

$$x(n) = \cos\left(\frac{\pi}{3}n\right)$$

b) Enlist the different properties of DTFS. Prove any two properties. [9]

OR

Q2) a) Compare DTFS and DTFT. [7]

b) Find the DTFT of the sequence, $x(n) = \{1, 1, 1, 1\}$. [10]

Q3) a) Explain how the inverse DFT can be obtained by means of FFT algorithm. [8]

b) Find the DFT of the given sequence using Decimation in Time (DIT) FFT algorithm [10]

$$x(n) = \{1, 2, 1, 2\}$$

OR

Q4) a) Perform the circular convolution of the following sequences, [8]

$$x(n) = \{1, 1, 1, 0\}$$

$$h(n) = \{2, 1, 1, 2\}$$

b) Compare DTFT and DFT. [6]

c) State and explain the properties of Discrete Fourier Transform. [4]

P.T.O.

Q5) a) Apply bilinear transformation to the following to find $H(z)$, [9]

$$H(s) = \frac{1}{(s+6)(s+7)} \text{ with } T = 1 \text{ sec.}$$

b) Explain bilinear transformation method for designing the digital filters. [8]

OR

Q6) Design a Butterworth digital low pass filter with following specification, [17]

$$0.9 \leq |H(e^{j\omega})| \leq 1; \text{ for } 0 \leq \omega \leq 0.4\pi$$

$$|H(e^{j\omega})| \leq 0.3; \text{ for } 0.8\pi \leq \omega \leq \pi$$

using impulse invariance method. Assume $T = 1$ sec.

Q7) a) Design a linear-phase FIR Low Pass Filter with the following desired frequency response. [12]

$$H_d(e^{j\omega}) = 1; -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4}$$

$$H_d(e^{j\omega}) = 0; \frac{\pi}{4} \leq \omega \leq \pi$$

Using Triangular window with $N = 7$.

b) Compare FIR and IIR filters. [6]

OR

Q8) a) Give the advantages and disadvantages of windowing method. [6]

b) Design a low pass FIR filter using rectangular window by taking $N = 9$, magnitude=1 and cut-off frequency $\omega_c = 0.2\pi$ rad/sample. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4431

[Total No. of Pages : 2

[6403]-236

T.E. (Mechatronics Engineering)

Microcontrollers

(317545) (2019 Pattern) (Semester - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Write Significance of GATE pin in 8051 [6]
- b) Write a detailed note on Time delay programming in C. [6]
- c) Explain with the help of diagrams the structure of TCON and TMOD Register. [6]

OR

- Q2)** a) Write in short about 8051 Programming in C and Data types using inC Programming of 8051. [6]
- b) Explain various timer modes for 8051. [6]
- c) Explain the modes of operation of the timer /counter 8051 [6]
- Q3)** a) Write a note on Programming of External hardware interrupts in C. [5]
- b) Draw an interfacing diagram of ADC 0809 with 8051 [5]
- c) Write an 8051 C program to switch “ON” OR “OFF” A LED connected on P1.3 Complement the LED whenever the switch is connected on P 3.2 is pressed. [7]

OR

P.T.O.

- Q4)** a) Write a detailed note on the interrupt structure and priorities of the 8051 microcontroller. [5]
- b) Explain different types of SFR's associated with Interrupt. [5]
- c) Write an Assembly program to switch "ON" OR "OFF" A LED connected on P 1.3 when external interrupt INTO is activated. [7]
- Q5)** a) Write a note on serial communication in 8051. [5]
- b) Discuss the modes of operation of the serial port of the 8051 microcontroller [5]
- c) Describe the SCON and SBUF - SFR's in 8051. The serial port is full duplex, which means that it can transmit and receive simultaneously. [7]

OR

- Q6)** a) Explain interfacing diagram for measurement of electrical measurement with the help of 8051 [5]
- b) Write short notes on: SCON Register of 8051. [5]
- c) Write a note on Measurement of Voltage and current with the help of 8051. [7]
- Q7)** a) Draw and explain the interfacing diagram of Stepper Motor with 8051 microcontroller. [10]
- b) Draw and explain the interfacing diagram of Single key with 8051 microcontroller. [8]

OR

- Q8)** a) Draw and explain the interfacing diagram of the LCD with the 8051 microcontroller. [10]
- b) Draw and explain the interfacing diagram of LED with 8051 microcontroller. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4432

[Total No. of Pages : 2

[6403]-237

**T.Y. (Mechatronics Engineering)
INDUSTRIAL AUTOMATION
(317547) (2019 Pattern) (Semester - VI)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figures to the right side indicate full marks.
- 5) Assume suitable data if necessary.

Q1) a) Draw a ladder diagram for following math operations: **[8]**

- i) ADD ii) SUB

b) Draw a ladder diagram for MUL, DIV and SQR math operations. **[9]**

OR

Q2) a) Draw a ladder diagram for following comparison operations: **[8]**

- i) less than ii) greater than

b) Draw a ladder diagram for following comparison operations: **[9]**

- i) Equal ii) Not equal to iii) Greater than or equal to

Q3) a) Explain analog signal processing for analog input signal with example. **[8]**

b) Explain analog output application for Analog in/ Analog or BCD Out with neat sketch. **[9]**

P.T.O.

OR

- Q4)** a) Explain multi-bit data processing with suitable diagram. [8]
- b) What is PID tuning and state various tuning methods for it. Explain loop control PID function with inputs and outputs. [9]
- Q5)** a) Explain working of HMI with suitable example. [6]
- b) Draw a block diagram for motion control and state its different elements. [6]
- c) State the need of drives [6]

OR

- Q6)** a) Compare PLC and SCADA on any six points. [6]
- b) State the need of HMI with its advantages. [6]
- c) Explain Variable Frequency Drive (VFD) in detail. [6]
- Q7)** a) Explain SCADA system with its benefits. [6]
- b) Explain Internet based SCADA system and also list down its advantages. [6]
- c) Write a short note on: Master Terminal Units (MTU). [6]

OR

- Q8)** a) State different SCADA packages and compare among each other's. [6]
- b) Differentiate between PLCs and RTUs. [6]
- c) State the applications of SCADA and explain any one application related to our day today life. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4433

[Total No. of Pages : 2

[6403]-238

**T.E. (Mechatronics Engineering)
ELECTRO-MECHANICAL SYSTEMS
(317548) (2019 Pattern) (Semester - VI)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 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 drawing instruments, electronic pocket calculators are allowed.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explanation neat sketch the any two types of Pressure Intensifiers. [6]
b) Explanation of Meter in and Meter out circuits. [6]
c) Explain the accumulators. State its types. Explain any one. [6]

OR

- Q2)** a) Difference between Meter in and Meter out circuits. [6]
b) Explain with neat sketches spring loaded and gas charged accumulators. Explain their advantages and disadvantages. [6]
c) Explain the Intensifiers and write its applications. [6]
- Q3)** a) Sketch and explain the general layout of Pneumatic Systems. [6]
b) Explain construction and working of pneumatic (air) filter and lubricator. [6]
c) What is an air compressor? Explain its classification. [5]

OR

P.T.O.

- Q4)** a) Write a short note on: [6]
1) Directional control valves. 2) Non-return valves
- b) What are the advantages and disadvantages of Pneumatic Systems. [5]
- c) Compare Hydraulic & Pneumatic systems. [6]
- Q5)** a) Draw Pneumatic circuits using quick exhaust valve. [6]
- b) Draw the Circuit for - Speed Control explanation. [6]
- c) Draw the Circuit for - Operating SAC using 3/2 DCV, explanation. [6]

OR

- Q6)** a) Draw the Circuit for - Operating DAC using 4/2 DCV, explanation. [6]
- b) Draw the Circuit for - Operating Two SAC in Sequence, explanation.[6]
- c) Draw the Circuit for - Operating SAC and DAC in Sequence, explanation. [6]
- Q7)** a) Explain Electro - Pneumatic systems. [5]
- b) What is ladder logic diagram in PLC. Explain its functions. [6]
- c) Explain Electro-hydraulic system. [6]

OR

- Q8)** a) Explain the use of PLC for industrial process control. [6]
- b) Explain hydro- pneumatic system. [6]
- c) Explain the function of Relays in electro pneumatic systems. [5]



[6403]-239

T.E. (Mechatronics Engineering)
FINITE ELEMENT ANALYSIS
(2019 Pattern) (Semester - VI) (317549)

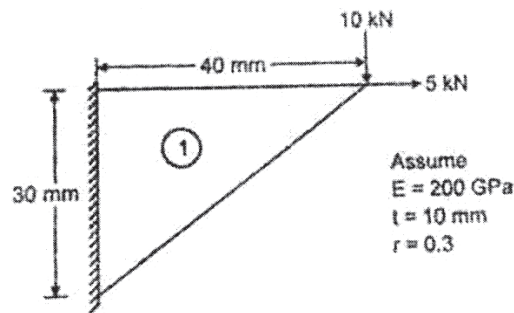
Time : 2½ Hours]

[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.

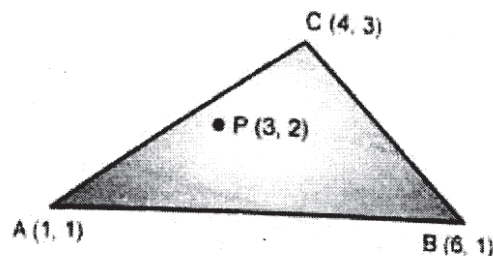
- Q1) a)** In a plane stress condition of a CST element shown in figure. Determine element stiffnessmatrix and nodal displacement. [10]



- b) How to verify and validate results in FEA post-processing? [8]

OR

- Q2) a)** For a point P located inside triangle, as shown in figure find shape functions for triangular element. [10]



- b) Explain the tricks for post processing in computer aided Engineering. [8]

P.T.O.

- Q3) a)** Evaluate the following integrals using 2-point or 3-point Gaussian quadrature method. Also compare with the exact solution. [10]

$$\int_5^{10} (1 + x + x^2) dx$$

- b) Differentiate between p-refinement and h-refinement. [7]

OR

- Q4) a)** Derive the elements of Jacobian Matrix of transformation in three noded triangular element(CST). [10]

- b) Explain the terms isoparametric, subparametric and superparametric elements. [7]

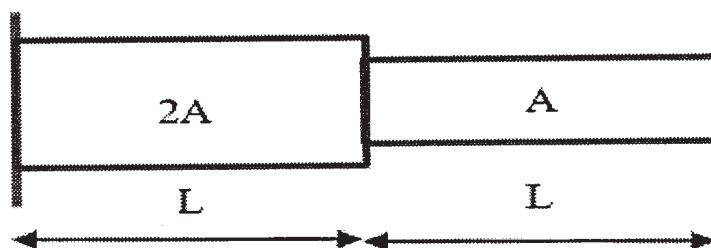
- Q5) a)** A brick wall has a thickness of 0.6m and thermal conductivity of 0.8 W/m°K. The inner surface of wall is at 28°C and outer surface is exposed to cold air at -10°C. The heat transfer coefficient at outer surface is 40 W/m². Using two elements for finite element formulation, determine the steady state temperature distribution within the wall and heat flux through the wall. [10]

- b) Explain steps involved in the processing to solve for 1D heat transfer problem using Finite Element Problem. [7]

OR

- Q6) a)** A metallic fin with thermal conductivity W/m°K, 1 cm radius and 5 cm long extends from a plate having temperature as 140°C. Determine the temperature distribution along the fin, if heat is transferred to ambient air at 20°C with heat transfer coefficient of 5 W/m² K. Take two elements along the fin. [17]

- Q7) a)** Find the natural frequencies of longitudinal vibrations of the same stepped shaft of areas A and 2A and of equal lengths (L), when it is constrained at one end, as shown in fig. [10]



- b) Enlist and explain different types of Dynamic Analysis. [8]

OR

- Q8)** a) Estimate the natural frequencies of axial vibrations of bar shown in fig. using consistent mass matrices. The bar is having uniform cross-section as $A=50 \times 10^{-6} \text{m}^2$. Length of bar = 1.5m, modulus of elasticity = $2 \times 10^{11} \text{N/m}^2$ and density = 7800 kg/m^3 . Model the bar using two elements. **[10]**



- b) Differentiate between Lumped mass system and Consistent mass system. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4435

[Total No. of Pages : 2

[6403]-240

T.E. (Mechatronics Engg)

Embedded System Design

(2019 Pattern) (Semester - VI) (317550)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Solve 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 indicates full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary*

- Q1)** a) Write a program in embedded C to generate a square wave of 1Hz to blink LED for PIC18FXX. **[6]**
- b) Explain compare mode of operation of PIC18FXX in details with proper neat diagram. **[6]**
- c) Design a DC Motor control using PWM of CCP mode in PIC18FXX. **[6]**

OR

- Q2)** a) Draw and Explain the capture mode of the CCP module in PIC18FXX. **[9]**
- b) Draw an interfacing diagram and write an algorithm for DC Motor speed control using PIC18XXX. **[9]**
- Q3)** a) Explain Interrupt Structure of PIC18FXX. **[5]**
- b) Explain external hardware interrupts in PIC18FXX. **[5]**
- c) Explain in detail the steps in executing an interrupt for PIC18FXX. **[8]**

OR

P.T.O.

- Q4)** a) Write a short note on sources of interrupts in PIC18FXX. [5]
- b) Explain PORTB Change on interrupt of PIC18FXX. [5]
- c) Write a program using Timer 0 and Timer 1 interrupts to generate square wave on PINS RB1 and RB7 ,while data is been transferred from PORT C to PORT D. Draw a neat interfacing diagram of PIC18FXX. [8]

- Q5)** a) Design a PIC 18 based data acquisition system for Temperature Measurement using LM 35. [5]
- b) Draw and Explain interfacing of ADC for analog input 0 to 5v with PIC. [5]
- c) Draw a neat interfacing diagram of 16×2 LCD with PIC18FXX to display “SPPU” on first line and “UNIVERSITY” on second line, write an embedded C Program. [7]

OR

- Q6)** a) Draw and explain the interfacing of LCD to port D and port E of PIC18FXX microcontroller. [5]
- b) Draw and explain an interfacing of Temperature sensors to PIC using Serial ADC. [5]
- c) Design a PIC18 based data Acquisition system for Temperature measurement using LM35. Write the corresponding embedded C program to display the temperature on LCD. [7]

- Q7)** a) Explain RS-232 and RS -485 communication protocol in detail. [8]
- b) Draw and explain MSSP structure of PIC18FXX. [9]

OR

- Q8)** a) Explain the SPI mode of MSSP structure used for serial communication with a proper neat diagram. [10]
- b) Explain in detail MODBUS with its types and physical media. [7]



Total No. of Questions : 8]

SEAT No. :

PD-4436

[Total No. of Pages : 2

[6403]-241

T.E. (Mechatronics Engineering)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(2019 Pattern) (Semester - VI) (317551)

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) Explain application of classification & regression in Mechanical Engineering. **[8]**

b)

Weekend	Weather	Parents	Money	Decision
W1	Sunny	Yes	Rich	Cinema
W2	Sunny	No	Rich	Tennis
W3	Windy	Yes	Rich	Cinema
W4	Rainy	Yes	Poor	Cinema
W5	Rainy	No	Rich	Stay in
W6	Rainy	Yes	Poor	Cinema
W7	Windy	No	Poor	Cinema
W8	Windy	No	Rich	Shopping
W9	Windy	Yes	Rich	Cinema
W10	Sunny	No	Rich	Tennis

Calculate gini Index of above data & Construct a decision tree. **[9]**

OR

Q2) a) Explain Naive Bayes Classifier Algorithm. **[9]**

b) Explain K-Means Algorithm. **[8]**

P.T.O.

- Q3)** a) Enlist steps involved in development of classification models. [9]
b) Explain with neat sketch 5-fold cross-validation mode. [9]

OR

- Q4)** a) How should you split up a dataset into test and training sets? [6]
b) Explain hyper parameter tuning for simple decision tree. [6]
c) Differentiate between clustering and classification. [6]

- Q5)** a) State key constituents of reinforcement learning. [5]
b) Explain Q-Learning. [6]
c) Explain working of deep Learning with an example. [6]

OR

- Q6)** a) Explain elements of reinforcement learning. [6]
b) Explain value-based, policy-based, and model-based reinforcement learning. [6]
c) Explain Artificial Neural Network (ANN). [5]

- Q7)** a) How does human-machine interaction work? [6]
b) Explain an intelligent approach for classification of Nuts, Bolts, Washers and Locating Pins? [6]
c) Explain fault diagnosis (of any suitable machine element) using ML. [6]

OR

- Q8)** a) Explain scope of ML for Materials Science. [6]
b) What opportunities and challenges arise from human-machine interaction? [6]
c) Make a list of maintenance and explain in brief. Discuss the scope of AIML. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4437

[Total No. of Pages : 2

[6403]-242

T.E. (Robotics & Automation Engineering)

EMBEDDED SYSTEM IN ROBOTICS

(2019 Pattern) (Semester - V) (311501(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q. 6, Q.7 or Q.8.*
- 2) *Assume suitable data, if necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is serial communication? Explain 12C in detail. **[9]**

b) What is wireless sensor network? Explain anatomy of sensing nodes. **[9]**

OR

Q2) a) Write a short note on : **[9]**

i) Bluetooth

ii) CAN

b) Explain Zig-Bee in detail. State its advantages, disadvantages and applications. **[9]**

Q3) a) Write a short note on : **[9]**

i) Interfacing of ADC

ii) Sensor interfacing

b) Explain the terms : **[9]**

i) Constants

ii) Data types

iii) Variables

iv) Function

OR

P.T.O.

Q4) a) What is switch? Explain interfacing of switch with any embedded C controller. [9]

b) Explain SFR in detail. [9]

Q5) a) Explain Architecture of Kernel in detail. [8]

b) Explain memory management of RTOS in detail. [9]

OR

Q6) a) Explain the terms : [8]

i) ISR

ii) Semaphores

iii) Task scheduler

iv) Message queues

v) Pipes

vi) IPC

vii) Context switching

viii) RTOS

b) Consider 2 tasks one is in foreground T1 and another one is in background TB. The completion time for the background task TB is 3000 ms and the processing time required for TB is 1500 ms. Compute the required processing time for T1 when p1 is 100 ms. [9]

Q7) a) Write any 5 commands of Linux with description. [8]

b) Write short note on : [9]

i) Block device driver

ii) Network device driver

OR

Q8) a) Explain linux architecture in detail. [8]

b) Write short note on : [9]

i) Linux kernel module

ii) The Role of Device Driver



[6403]-243

T.E. (Robotics & Automation)
HYDRAULICS & PNEUMATICS
(2019 Pattern) (Semester - V) (311502(A))

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.
- 5) Use of calculator is allowed.

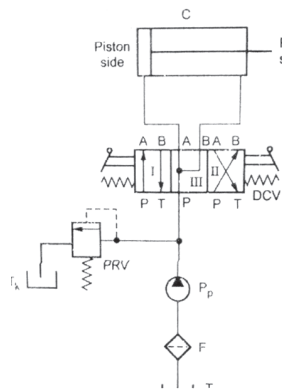
- Q1)** a) Draw a simple sketch and ISO symbol of a pressure relief valve and explain its working. State its importance in hydraulic systems. [8]
 b) Draw ISO symbols for the following Hydraulic and Pneumatic Components : [9]

- i) 4×2 pneumatically pilot operated spring offset DCV
- ii) Spring loaded accumulator
- iii) Quick Exhaust Valve

OR

- Q2)** a) What is the purpose of providing pilot operated check valve in hydraulic circuit. Explain in short locked cylinder circuit using pilot check valves. [8]
 b) Draw ISO symbols for the following Hydraulic and Pneumatic Components : [9]
- i) F-R-L unit detailed symbol
 - ii) 5/2, Solenoid operated, Spring Return DCV
 - iii) 4/3, Float Centre, Lever Operated, detent control DCV

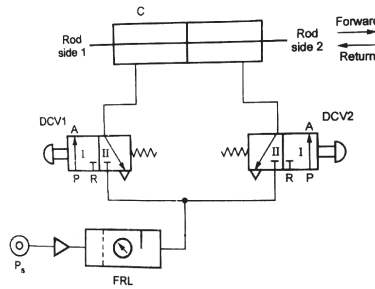
- Q3)** a) Explain with neat sketch, meter-in speed control methods in hydraulics system and also mention 3 differences between meter-in & meter-out circuit. [9]
 b) Label the components and analyze the circuits : [9]



OR

P.T.O.

Q4) a) Analyze the circuits : [9]



b) Draw and explain fail-safe circuit. [9]

Q5) a) Explain with neat sketch typical compressed air generation and distribution system. [9]

b) What is the purpose of providing pressure Regulator in pneumatic circuits? Explain with the help of neat sketch construction and working of anyone type of pressure regulator. [9]

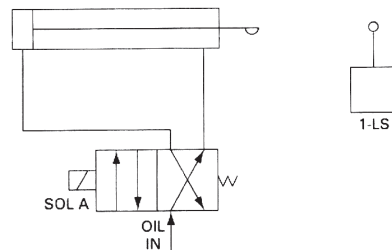
OR

Q6) Draw circuit for : [9]

- Pneumatic motor actuation circuit.
 - Pneumatic circuit equivalent to AND gate.
- Draw and explain throttle-out circuit used in pneumatics. [9]

Q7) a) Explain in short : [8]

- How does a limit switch differ from a push-button switch?
 - What is an electrical relay? How does it works.
- b) Explain the complete operation of the system shown in fig. [9]



OR

Q8) Explain in short : [8]

- What is the difference between a normally open switch and a normally closed switch.
 - What is a programmable logic controller?
- Explain an Electro-hydraulic servo system with neat sketch. [9]



[6403]-244

T.E. (Robotics and Automation)
ROBOT KINEMATICS AND DYNAMICS
(2019 Pattern) (Semester - V) (311503 A)

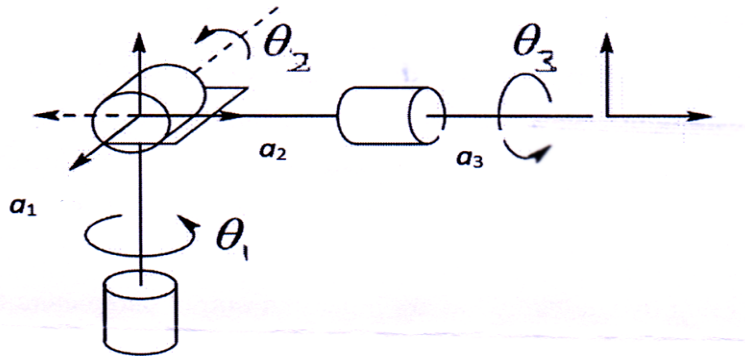
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

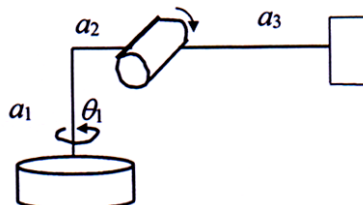
- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Use of Calculator is allowed.
- 4) Assume Suitable data if necessary.

- Q1) a)** Explain the following terms related to genetic algorithm: (a) Crossover probability (b) Mutation probability [8]
- b)** For the robot shown in Figure, use inverse kinematics to obtain the joint parameters θ_1 , θ_2 and θ_3 to bring the robot end effector to the position (-25.8, -30.75, -7.34). Consider $a_1 = 50$ cm, $a_2 = 40$ cm, $a_3 = 30$ cm. [10]



OR

- Q2) a)** What is inverse kinematics problem? Explain various approaches to solve inverse kinematics problem. [8]
- b)** For the robot shown in Figure, use inverse kinematics to obtain the joint parameters θ_1 and θ_2 to bring robot end effector to position (39.5, 22.8, 55.7). Consider $a_1 = 30$ cm, $a_2 = 15$ cm and $a_3 = 40$ cm. [10]

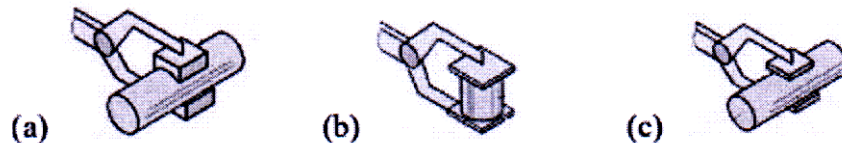


P.T.O.

- Q3) a)** Write short note on: (1) Vacuum Grippers (2) Mechanical grippers. [8]
b) A vacuum gripper is to be designed to hold a plate having weight 200 N with 2 suction cups each having diameter 100 mm. Determine the negative pressure required to lift the plate. [6]
c) Write short note on: Magnetic grippers. [4]

OR

- Q4) a)** Following gripper mechanisms are used to hold the objects. Determine the degrees of freedom of the objects. [6]



- b)** A magnet with 1,500 turns and a cross-sectional area of 0.4 m^2 is operated with 12 amperes of current, 0.8 meters from a piece of metal. Determine the electromagnetic force. [6]
c) What are different types of gripper's based on method of actuation? [6]
- Q5) a)** A planner robot has both prismatic joints. The masses of the link 1 and link 1 are 1.2 Kg and 1 Kg respectively. Linear positions of the joints are given by equations: $q_1 = -0.2t^3 + 3t^2 + 5$ and $q_2 = -0.1t^3 + 5t^2 + 4$. Determine the joint force acting on each link at $t = 3 \text{ sec}$. [9]
b) What is inverse robot dynamics? What are input and output parameters for inverse dynamics of articulated robot? [8]

OR

- Q6) a)** Following data operates for a 2 DOF planer robot : [12]
 • Length of link 1=0.3 m
 • Length of link 2=0.2m
 • Angular position of link 1 = 40°
 • Angular position of link 1 = 35°
 Determine the Jacobian of link 1 and link 2.
b) Explain Lagrangian formulation for manipulator dynamics. [5]
- Q7) a)** Explain clearly the terms 'static balancing' and 'dynamic balancing'. State the necessary conditions to achieve them. [7]
b) Write a short note on primary balancing and secondary balancing. [10]

OR

- Q8) a)** Write notes on: (a) Free vibration (b) Damped vibration. **[8]**
- b)** A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4440

[Total No. of Pages : 2

[6403]-245

T.E. (Robotics & Automation Engineering)

SENSOR TECHNOLOGY

(2019 Pattern) (Semester - V) (311504A)

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 and Q.7 or Q.8.
- 2) Assume suitable data, if necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) Explain the following terms: **[8]**

- i) Thermocouple Sensors
- ii) Gas Thermometers

b) Define Temperature and Explain following terms **[9]**

- i) Thermal Energy
- ii) Absolute and Relative Temperature

OR

Q2) a) Explain the following terms: **[8]**

- i) Resistance versus Temperature Approximations
- ii) Semiconductor Resistance versus Temperature

b) Define Thermistor and Thermocouple and explain three characteristics of each. **[9]**

Q3) a) With neat sketch, explain the working of Piezoelectric Accelerometer. **[8]**

b) What are the types of Level sensors explain any two with suitable diagram also state the advantages and application of both. **[9]**

OR

Q4) a) Explain **[8]**

- i) Shock and Vibration Sensors
- ii) Variable-Reluctance Sensors

b) Draw the circuit diagram and explain the operation of LVDT also state the advantages and application of the same. **[9]**

P.T.O.

- Q5)** a) With the help of neat diagram explain Quartz Sensors also state the advantages and application of the same. [9]
b) Explain working of load cell with suitable diagram also state the advantages and application of the same. [9]

OR

- Q6)** a) Explain Standards Strain Gage Sensors also state the advantages and application of the same. [9]
b) Compare Metal type and Semiconductor type Strain Gauge. [9]

- Q7)** a) Explain in detail [9]
i) Phototransistor
ii) Photo sensors
b) Explain in detail Position and Motion Sensors with their different types.[9]

OR

- Q8)** a) Write a short note on Nanotechnology-Enabled Sensors also state the advantages and application of the same. [9]
b) Explain the Thermal Detectors with their different types. [9]



Total No. of Questions : 8]

SEAT No. :

PD4441

[Total No. of Pages : 2

[6403]-246

T.E. (Robotics and Automation)

STATISTICS AND NUMERICAL METHODS

(2019 Pattern) (Semester - V) (311505(A)-I) (Elective - I)

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 indicates full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic table, slide rule or electronic pocket calculator is allowed.

Q1) a) Perform five iterations of the bisection method to obtain the smallest positive root of the equation $f(x) = \cos x - x e^x = 0$. [9]

b) Perform Four iterations of Newton Raphson method to obtain the approximate value of $f(x) = x^3 - 17 = 0$. [8]

OR

Q2) a) Solve following equation using gauss elimination method [8]

$$10X_1 - X_2 + 2X_3 = 4$$

$$X_1 + 10X_2 - X_3 = 3$$

$$2X_1 + 3X_2 + 20X_3 = 7$$

b) Solve following equation using gauss Seidal method upto three approximations [9]

$$20X + Y - 2Z = 17$$

$$3X + 20Y - Z = -18$$

$$2X - 3Y + 20Z = 25$$

Q3) a) Fit a straight line using least square method to the following data [8]

x	6	7	7	8	8	8	9	9	10
y	5	5	4	5	4	3	4	3	3

b) Evaluate $f(3)$ by Using Lagrange's Interpolation formula from the following data [9]

x	0	1	2	5
f(x)	2	3	12	147

OR

P.T.O.

- Q4) a)** State the order of the polynomial which might be suitable for the following Function. Calculate $f(45)$ using Newton Forward Difference Method. **[9]**

x	40	50	60	70	80
y	31	73	124	159	190

- b) Using a method of least square fit the curve $y = ae^{bx}$ to the following data **[8]**

x	0	1	2	3
y	1.05	2.10	3.85	8.30

- Q5) a)** Find the value of y at $x = 9$ by Using Newton Divided Difference Method formula from the following data **[9]**

x	5	7	11	13	17
y	150	392	1452	2366	5202

- b) Evaluate $\int_0^{0.6} e^{x-2}$ by using Trapezoidal Method and Simpson's $1/3^{\text{rd}}$ rule corresponding to seven intervals. **[9]**

OR

- Q6) a)** Using Newton Backward Difference Method formula, Construct an interpolating Polynomial of degree 3 for the data: **[9]**

$$f(-0.75) = -0.0718125,$$

$$f(-0.5) = -0.02475$$

$$f(-0.25) = 0.3349375$$

$$f(0) = 1.10100$$

Hence find $f(-1/3)$

- b) Use Simpsons $1/3^{\text{rd}}$ rule and Trapezoidal Method to evaluate

$$\int_0^1 \left(\frac{x^2}{1+x^3} \right) dx \text{ corresponding to Four intervals.} \quad \mathbf{[9]}$$

- Q7) a)** Describe in brief Method of Lagrange multipliers. **[9]**

- b) Explain the Generalized reduced gradient Method. **[9]**

OR

- Q8) a)** Write in brief steepest descent method suitable example. **[9]**

- b) Brief on: genetic algorithm and simulated annealing. **[9]**



[6403]-247

T.E. (Robotics and Automation)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - V) (Elective - I) (311505(A)-II)

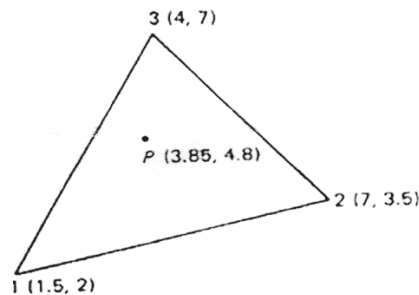
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

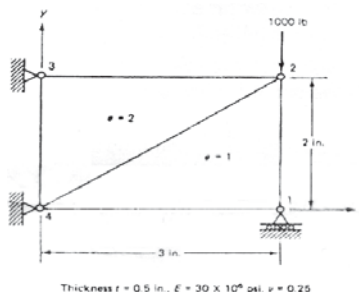
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Use of scientific calculator is allowed.
- 3) Figures to the right indicate full marks.

- Q1) a)** Discuss the properties of shape functions used in finite element analysis. Explain how primary and secondary variables are related to shape functions in the context of displacement and stress distribution? **[9]**
- b)** Determine the stiffness matrix for the straight-sided triangular element of thickness $t = 1$ mm, as shown. Use $E = 70$ GPa, $\nu = 0.3$ and assume a plane stress condition. **[9]**



OR

- Q2) a)** Consider a thin plate having thickness $t = 0.5$ in. being modeled using two CST elements, as shown. Assuming plane stress condition, **[9]**
- i) determine the displacements of nodes 1 and 2, and
 - ii) estimate the stresses in both elements



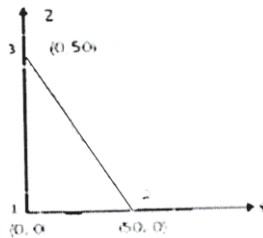
- b)** Explain the significance of Pascal's triangle in relation to shape functions. How does it assist in developing higher-order shape functions for finite element formulations? **[9]**

P.T.O.

- Q3) a)** Describe the finite element formulation for an axi-symmetric problem using triangular elements. Include an explanation of how the stiffness matrix and load vector are derived for such problems? [9]
- b) Explain the concept of axi-symmetric problems in finite element analysis. Explain how these problems differ from 2D and 3D problems and provide examples of typical engineering applications? [8]

OR

- Q4) a)** For axisymmetric element shown in figure, determine the strain-displacement matrix. Let $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates shown in figure are in millimeters. [9]



- b) Explain the four-node quadrilateral element used in finite element modeling. Describe its properties and explain how it differs from triangular elements in terms of formulation and application? [8]
- Q5) a)** Derive the general form of the heat transfer equation for convection at a solid surface. How do fluid properties like velocity, viscosity, and thermal conductivity influence the convective heat transfer rate? [9]
- b) Explain the concept of thermal conductivity and its role in 1D heat conduction problems. How does the heat flux vary with changes in material properties, temperature gradient, and geometry? [8]

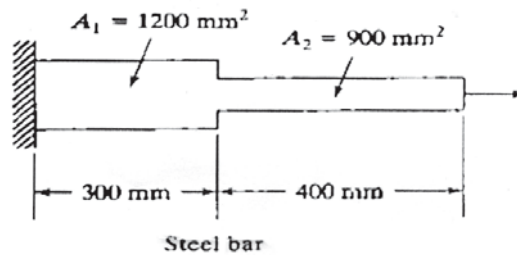
OR

- Q6) a)** A composite slab consists of 3 materials of different conductivities i.e. 22 W/m K, 32 W/m K, 52 W/m K of thickness 0.31 m, 0.14 m and 0.14 m, respectively. The outer surface is 220 C and the inner surface is exposed to the convective heat transfer coefficient of 28 W/m² K, 8000 C. Determine the temperature distribution within the wall? [9]
- b) Explain the process of heat transfer by convection. [8]

- Q7) a)** Estimate the temperature distribution in a fin whose cross section is $15\text{mm} \times 15\text{mm}$ and 500mm long. Take Thermal conductivity as 50W/m-k and convective heat transfer coefficient as $75\text{ W/m}^2\text{-k}$ at 25°C . The base temperature is assumed to be constant and its value may be taken as 900°C . And also calculate the heat transfer rate? [9]
- b) Discuss in detail about 2D heat conduction in Composite slabs using FEA. [9]

OR

- Q8) a)** Determine natural frequencies for a Steel bar as shown in figure. [9]



- b) Explain the importance of natural frequencies and mode shapes in structural design. How do engineers use these concepts to avoid resonance and ensure the stability of structures under dynamic loading conditions? [9]



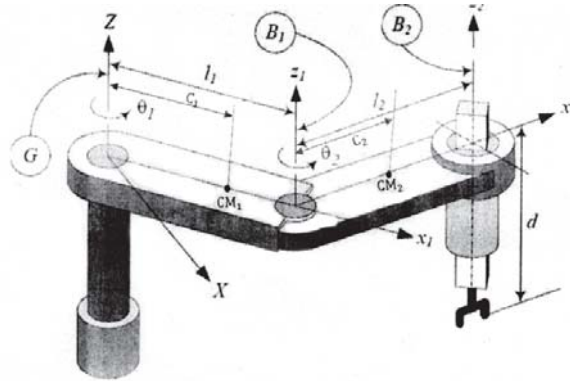
Time : 2½ Hours]

[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 indicates full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic table, slide rule and electronic pocket calculator is allowed.

Q1) a) Consider a SCARA used for Pick and Place operation as shown in the figure below: [9]



Considering along the Z, and Z₁ axes there has consolidated motion along (X, Y) and (X₂, Y₂) the given system. The force matrix by using Newton- Euler Equation with respect to G, B₁ and B₂ frame is given as:

$${}^0F_0 = m_1 \begin{bmatrix} a_{1x} \\ a_{1y} \\ a_3 \end{bmatrix} + m_2 \begin{bmatrix} a_{2x} \\ a_{2y} \\ a_3 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ (m_1 + m_2 + m_3 + m_0)g \end{bmatrix}$$

$${}^0F_1 = m_2 \begin{bmatrix} a_{2x} \\ a_{2y} \\ a_3 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ (m_2 + m_3 + m_0)g \end{bmatrix}$$

$${}^0F_2 = (m_3 + m_0) a_3 \hat{k} + \begin{bmatrix} 0 \\ 0 \\ (m_3 + m_0)g \end{bmatrix}$$

Where, m_1, m_2 are masses of (link)₁ and (link)₂ while, m_3 is mass of gripper while m_0 is mass of payload. The centre of mass CM₁ and CM₂ is located at geometric centres of the link. Table: 1 gives the values of maximum angular movements by the links possible, the lengths of links and the mass of the link.

Table:1 Parameter of the links

Length of links (meters)		Maximum angular movements (Deg.)		Mass (kg)	
l_1	2	θ_1	40	m_1	10
l_2	1	θ_2	140	m_2	5
d	2.5	—	—	m_3	3
—	—	—	—	m_0	?

Determine:

- The accelerations a_{1x}, a_{1y}, a_{2x} and a_{2y} .
- The payload capacity of the system neglecting the kinematics of gripper, if the kinematic condition of operation of the links is shown in Table:2 and the acceleration of the gripper along Z_2 as 1m/sec.²

Table:2 kinematics of the links

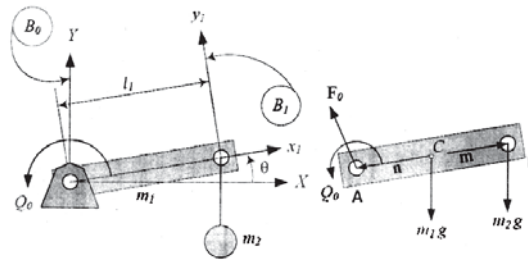
Angular Velocity (rad./sec)		Angular acceleration (rad./sec ²)		Forces at the joints (N)	
$\dot{\theta}_1$	1	$\ddot{\theta}_1$	0.5	${}^0F_0$	(6.76,13.12,-210.63)
$\dot{\theta}_2$	2.4	$\ddot{\theta}_2$	1	${}^0F_1$	(4.55, 8, -122.53)
—	—	—	—	${}^0F_2$	(0,0,86.48)

- Differentiate between an Articulated Robot and Cartesian Robot. [8]

OR

- Q2) a) A turning uniform beam with a payload at the tip of mass m_2 . Figure below illustrates the FBD of the beam. The mass center of the beam is at ${}^1r_1$ [8]

$$\begin{aligned}
 {}^1r_1 &= \frac{m_1}{m_1 + m_2} \begin{bmatrix} l/2 \\ 0 \\ 0 \end{bmatrix} + \frac{m_2}{m_1 + m_2} \begin{bmatrix} l \\ 0 \\ 0 \end{bmatrix} \\
 &= \begin{bmatrix} \frac{m_1 + 2m_2}{2(m_1 + m_2)} l \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} r_x \\ 0 \\ 0 \end{bmatrix}
 \end{aligned}$$



An expression of Force Matrix using Newton-Euler Equation is given by:

$${}^0F_0 =$$

$$\begin{bmatrix} F_x \\ F_y \\ F_z \end{bmatrix} = \begin{bmatrix} -(m_1 + m_2)r_x (\ddot{\theta} \sin \theta - \dot{\theta}^2 \cos \theta) \\ (m_1 + m_2)r_x (\ddot{\theta} \cos \theta + \dot{\theta}^2 \sin \theta) + (m_2 + m_1)g \\ 0 \end{bmatrix}$$

Determine maximum payload capacity(m_2) of beam, if the maximum turning angle of the beam is 80° with constant angular acceleration is 0.1 rad/sec.^2 and angular velocity as 1 rad/sec. resulting in force exertion at joint A at x-axis 5 N and y-axis 66.52 N. The mass of the beam is 4 kg while the length of the beam is 1 meter.

- b) What are the general considerations done for selecting a robotic material handling system? [9]

- Q3) a) If the material and the vacuum end effector has following condition:
 m = mass of the object = 120 kg, S = Factor of safety = 2, Z = Number of suction cups = 6, P_u = Applied pressure = 0.8 bar = 0.08 MPa, μ = coefficient of friction = 0.7, a = vertical acceleration = 3 m/s^2 , F_D = Damping force of each disc = 10 N [9]

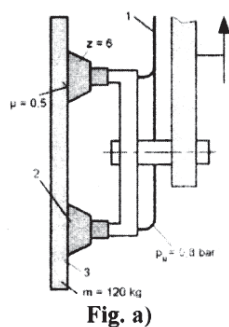


Fig. a)

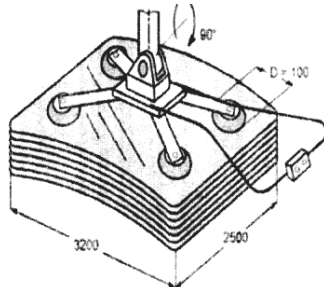


Fig. b)

- Determine the required cup diameter for the vacuum grippers shown above for steady 90° tilt, as shown in Fig. a)
- Determine the gripping force for the vacuum grippers shown above following horizontal tilt if diameter of cup, $D = 100 \text{ mm}$, as shown in Fig. b).

- b) Write a short note on 'Passive Grippers'. [9]

OR

- Q4) a)** How is the performance of a robot tested? Explain in details various methods with certain case studies. **[9]**
- b)** Define Electromagnetic Grippers? An electromagnetic gripper has following specification as given below: **[9]**

<u>Specification</u>	<u>Values</u>
No. of coil winding	1000
Current Supply	10 A
Length of coil	1.5 m
Permeability of wire	$1.2556629 \times 10^{-6} \text{H/m}$
Permeability in vacuum	$4\pi \times 10^{-7} \text{H/m}$
Cross section area	0.5 m^2

- i) Find the gripping force of the electromagnetic gripper if there are 10 such grippers used.
- ii) Check if the gripper can hold the payload of 10kg.
(consider $g = 9.81 \text{ m/s}^2$)

- Q5) a)** Write a short note on any one type of manufacturing robot in details. **[9]**
- b)** Differentiate between conventional palletizing and robotic palletizing. **[9]**

OR

- Q6) a)** Explain the principle of operation of Robotic Vision. **[9]**
- b)** Explain the various types of Painting Robots. **[9]**

- Q7) a)** Write a short note on 'Climbing Robots'. **[8]**
- b)** Explain the principle of operation and working of Underwater Robots. **[9]**

OR

- Q8) a)** Explain various types of 'Medical Robots'. **[8]**
- b)** Explain the Lee's Algorithm of Obstacle Avoidance. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4444

[Total No. of Pages : 2

[6403]-249

T.E. (Robotics and Automation Engg.)

INTELLIGENT MANUFACTURING SYSTEM

**(2019 Pattern) (Semester - V) (311505(A) - IV) (Elective - I)
(Theory)**

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.
- 5) Use of Calculator is allowed.

Q1) a) Explain the applications of simulated annealing algorithm to inventory control problem. [9]

b) Explain applications of fuzzy logic in manufacturing automation. [8]

OR

Q2) a) Explain artificial neural network modeling of surface quality characteristics in machining processes. [9]

b) Draw flow chart of Simulated annealing and explain the algorithm steps for applications to inventory control. [8]

Q3) a) Apply rank order clustering technique to arrange the parts (P) and machines (M) into groups from the following part machine incidence matrix. [9]

	P ₁	P ₂	P ₃	P ₄	P ₅	P ₆
M _b			1		1	
M _c				1	1	1
M _d	1	1				
M _e			1		1	1
M _f	1	1		1		

b) Explain Similarity Coefficient (SC) method for grouping of parts and machines. [9]

OR

P.T.O.

- Q4) a)** Apply row and column masking algorithm for grouping of the parts (P) and machines (M) from the following part machine incidence matrix. [9]

	p ₁	p ₂	p ₃	P ₄	P ₅	P ₆	P ₇	P ₈
M ₁		1				1		1
M ₂				1		1		
M ₃	1				1		1	1
M ₄		1	1					1
M ₅	1				1		1	
M ₆		1	1					1
M ₇				1		1		

- b) Explain Group technology and methods of group technology. [9]

- Q5) a)** Applications of intelligent systems for mobile robot motion planning. [9]
b) Explain various clustering algorithms. [8]

OR

- Q6) a)** Explain Dijkstra algorithm. Draw Flowchart of the improved Dijkstra algorithm used in path planning. [9]
b) Write short note on : A* algorithm in robot path planning. [8]

- Q7)** Explain the following algorithms and their applications to flexible manufacturing system. [18]

- a) Random forest.
b) Naive Bayes.
c) K-Means Clustering.

OR

- Q8)** Write short notes on : [18]

- a) Route optimization algorithm for AS/RS.
b) Real time scheduling in FMS.
c) Automated guided vehicles



Total No. of Questions : 8]

SEAT No. :

PD-4445

[Total No. of Pages : 2

[6403]-250

T.E. (Robotics & Automation)

ROBOT PROGRAMMING

(2019 Pattern) (Semester - VI) (311508 A)

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 diagram must be drawn wherever necessary.
- 3) Use of Logarithmic Table slide rule is electronic pocket, calculators are allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data if necessary.

- Q1) a)** Differentiate between the command structure of VAL-I and VAL- II language in Robot Programming. **[8]**
- b) Explain how the sensory instructions for vision system using VAL-II. **[9]**

OR

- Q2) a)** Develop a program using VAL II robot programming language for a PUMA 560 robot when setting output signal at 105th port and 5V voltage supply in controller it unloads a cylindrical part of 10mm diameter, from Machine1 positioned at point P1 with coordinates (200,250,0) mm and orientation (0,90,0)° and load the part on Machine 2 positioned at P2 with coordinates(200,250,50)mm and orientation (0,90,0)°. The speed of robot motion is 40 in/s. However, because of safety precautions, the speed is reduced to 10 in/s while moving to a machine for an unloading or loading operation. **[9]**
- b) Explain the following instruction in VAL-II with example: **[8]**
- | | |
|------------|-----------|
| i) MOVET | ii) DRIVE |
| iii) APPRO | iv) DELAY |

- Q3) a)** Develop a program using RAPID robot programming language using RAPID procedure for pick and place operation from point P1(500,100,50)mm to P2(-500,100,50)mm such that, it starts from *home* position and ends at *home* position. While executing the program the orientation of end effector remains same as (0,90,0)°. **[9]**

P.T.O.

- b) Define Motion Command. Explain at least four Move Motion Commands Used in RAPID language. Explain with examples for each Motion Command. [9]

OR

- Q4)** a) Explain the Position Instructions and Input/Signal Instructions in RAPID with the help of examples of programs. [9]
b) Define function. Explain any four function used in RAPID with the help of examples of programs. [9]

- Q5)** a) Explain the following instruction in AML with example: [9]
i) DECEL ii) STOPMOVE
iii) SETTLE iv) DMOVE
v) DELIO vi) REMONITOR
b) Explain the following code & output when executed in AML : [9]
i) MONITOR (LED, 2,0,0,1.5, 'passed');
MOVE (ARM, fgoal, LED);
ii) ATTN:SUBR;
MOTPARMS: NEW STOPMOVE;
WAITMOVE;
BREAK (EOL, 'ATTENTION REQUESTED');
APPLY (AMOVE', MOTPARMS);
END;
iii) DMOVE(<4,5,6>,<30,-60,90>)
iv) SPEED (0.8)

OR

- Q6)** a) Define Sensor Instruction Explain any four sensor instructions with examples used in AML. [9]
b) Define Motion Control. Explain any four motion controls with examples used in AML. [9]

- Q7)** a) Define the concept of singularities. Explain the methods of detecting possible collision of robots and what are the features added to avoid it. [9]
b) Write a short note on " Robotic Economics". [8]

OR

- Q8)** a) Explain in details about "Robot cycle time analysis". [9]
b) Explain the "repeatability measurement of robot". [8]



Total No. of Questions : 8]

SEAT No. :

PD-4446

[Total No. of Pages : 3

[6403]-251

T.E. (Robotics and Automation)

ARTIFICIAL INTELLIGENCE FOR ROBOTICS

(2019 Pattern) (Semester - VI) (311509 - A)

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.
- 4) Use of Calculator is allowed.

Q1) a) Explain with suitable example the greedy search method. [9]

- b) Using a simulated annealing algorithm to solve minimization problem, function value of 15 is updated to new value of 25 at temperature 20°C. What is the probability of accepting the new solution? What is criterion of accepting this new solution? [8]

OR

Q2) a) Explain crossover and mutation operator in genetic algorithm. [7]

- b) Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering starting station as A, what is the initial % probability that an ant will choose the path 1 to 4? Assume initial pheromone deposition level as 1. [10]

	1	2	3	4	5
1	0	10	12	11	14
2	10	0	13	15	8
3	12	13	0	9	14
4	11	15	9	0	16
5	14	8	14	16	0

P.T.O.

Q3) a) For the image and template shown in Figure, determine the performance index for translation (2, 1) using template matching method. **[10]**

Diagram illustrating the input data for the proposed method. It shows a 3x3 Template matrix and a 7x5 Image matrix. The Template matrix has values $\begin{bmatrix} 0 & 5 & 1 \\ 8 & 9 & 3 \\ 8 & 6 & 3 \end{bmatrix}$ and is indexed by m_0 and n_0 . The Image matrix has values $\begin{bmatrix} 3 & 7 & 7 & 7 & 7 \\ 1 & 5 & 2 & 7 & 9 \\ 4 & 0 & 0 & 4 & 0 \\ 0 & 0 & 9 & 9 & 3 \\ 7 & 3 & 8 & 6 & 3 \\ 7 & 3 & 9 & 8 & 5 \end{bmatrix}$ and is indexed by x and y . Arrows indicate the spatial coordinates for the template and image.

b) Explain with suitable example region growing method for image segmentation. [7]

OR

Q4) a) Determine the gradient of intensity of a pixel having intensity 3 in the image given below, Use Prewitt operator. **[10]**

4	6	3
6	3	4
8	5	1

b) Explain run length encoding method for image compression. [7]

Q5) a) Explain with suitable example, the path planning robot control in dynamic environments. **[10]**

b) Write note on visibility graph method for robot path planning. [8]

OR

Q6) a) What are different methods to deal with moving obstacles? [8]

b) With suitable examples, the bug 0 and bug 1 strategies for obstacle avoidance in mobile robot navigation. **[10]**

- Q7) a)** Use A* algorithm to determine the shortest path for an automated guided vehicle while moving from work station at (4, 6) to workstation at (1, 1) shown in Fig. below. The obstacles are in the form of tool storage racks at locations (3, 3), (1,4) and (4, 2). **[9]**

(1,1)	(2,1)	(3,1)	(4,1)
(1,2)	(2,2)	(3,2)	(4,2)
(1,3)	(2,3)	(3,3)	(4,3)
(1,4)	(2,4)	(3,4)	(4,4)
(1,5)	(2,5)	(3,5)	(4,5)
(1,6)	(2,6)	(3,6)	(4,6)

- b) Write note on: Route optimization for AS/RS systems **[9]**

OR

- Q8) a)** Explain with suitable example techniques for automatic tool path generation. **[9]**
- b) Write note on: Flexible manufacturing system. **[9]**



[6403]-252

T.E. (Robotics & Automation)

FLEXIBLE MANUFACTURING SYSTEMS

(2019 Pattern) (Semester - VI) (311510(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

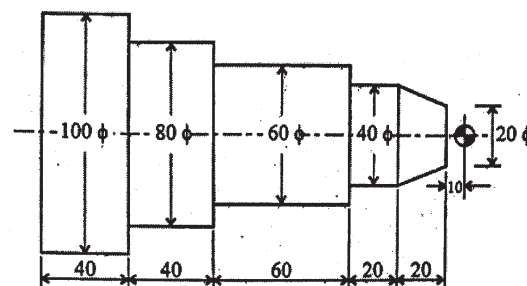
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.
- 5) Use of Logarithmic Table, Slide rule or Electronic pocket calculator is allowed.

Q1) a) Sketch and explain the DNC setup. [9]

b) Describe various G and M codes used in CNC machines. [9]

OR

Q2) a) Prepare part programming of following component. [9]



All dimensions in mm.

- b) Explain the salient features of any two CAM software that are being currently used in the industry. What factors may influence the selection of particular software? [9]

Q3) a) Briefly explain Extended Enterprises? [9]

b) What is computer aided inspection (CAI) and how can we control quality with the help of CAI? [8]

OR

Q4) a) Explain with block diagram the main elements of CIM system. [9]

b) What is a material requirement planning? Explain the various inputs to the MRP system? [8]

P.T.O.

- Q5)** a) What are the types of inventory? [9]
b) Briefly explain types of Bucket Elevators. [9]

OR

- Q6)** a) What are the different types of materials handling equipment? [9]
b) What are different types of AGV explain with their principle of working. [9]

- Q7)** a) Explain the term Tool Monitoring and fault Detection. [9]
b) Write note on Mass Exchange, Tool Sharing and Tool Migration. Give suitable example to each. [8]

OR

- Q8)** a) What are the different types of tool strategies? Explain Each. [9]
b) Draw and explain block diagram offered detection in vibration. [8]



Total No. of Questions : 8]

SEAT No. :

PD4448

[6403]-253

[Total No. of Pages : 2

T.E. (Robotics and Automation)

MICRO ELECTRO MECHANICAL SYSTEM

(2019 Pattern) (Semester - VI) (311511-(A)-I) (Elective - II)

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 side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) Discuss key components of magnetic actuators. **[9]**

b) Explain working principle of thermal resistors. **[8]**

OR

Q2) a) Compare parallel plate capacitor to inter digitated finger capacitor. **[9]**

b) Explore various applications of micro grippers. Elaborate any two applications in detail. **[8]**

Q3) a) Explain how MEMS based sensors and actuators are contributing to the development of smart cities. **[9]**

b) Write characteristics of selection of piezoresistive sensors. **[8]**

OR

Q4) a) Brief working principle of tactile and flow sensors. **[9]**

b) Describe challenges associated with stress analysis of mechanical elements in MEMS. **[8]**

P.T.O.

- Q5) a)** Discuss the role of polymers in MEMS. Describe its applications. **[9]**
- b)** Explain the concept of optical MEMS. How it is important in semiconductor industry. **[9]**

OR

- Q6) a)** Compare characteristics of SU-8, Liquid crystal polymer and parylene with each other. **[9]**
- b)** Write a short note on Lenses and Mirrors. **[9]**

- Q7) a)** Write a short note on.: Wireless cameras and voice transmission. **[6]**
- b)** Elaborate case study related to metal detector. **[6]**
- c)** Brief on Acceleration sensor. **[6]**

OR

- Q8) a)** Explain concept of Zigbee. **[6]**
- b)** Why acceleration sensors are essential in cellphone? Elaborate it. **[6]**
- c)** Write a short note on.: Blood pressure sensor. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PD4449

[6403]-254

[Total No. of Pages : 2

T.E. (Robotics and Automation Engineering)

HUMANOID ROBOTS

(2019 Pattern) (Semester - VI) (311511(A)-II) (Elective -II)

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 dynamic simulation in the context of humanoid robots, and how does it contribute to their development and analysis? **[8]**

b) How can the dynamic equations of motion be derived for a humanoid robot in 3D analysis? Explain the steps involved in the derivation process.

A humanoid robot has two feet with contact points at (0,0) and (0.4,0) in a 2D plane. The robot's center of mass is located at (0.2, 0.2). Calculate the net torque around the center of mass and determine if the robot is in balance. **[10]**

OR

Q2) a) Explain the concept of ZMP (Zero Moment Point) and its role in ZMP-based walking pattern generation for humanoid robots. **[8]**

b) Perform the kinematic and dynamic analysis of 2 DOF serial planar robot arm. **[10]**

Q3) a) Explain the neuroscience and its relevance in robotics. **[8]**

b) Discuss cognitive robotics and its applications. **[9]**

OR

Q4) a) How does cognitive human robotics contribute to the development of more intelligent and interactive robots? **[8]**

b) How does humanoid locomotion relate to the brain, and its role in movement control? **[9]**

P.T.O.

- Q5)** a) Discuss Humanoid-assisted Healthcare. [8]
- b) What are the challenges in controlling multiple robot arms for object manipulation? Explain the significance of cooperation between multiple humanoids in robotics. [9]

OR

- Q6)** a) What are the challenges in achieving effective multi-fingered grasping in robotics? [8]
- b) What is multi-arm object manipulation control? State the advantages of using multiple robot arms for object manipulation. [9]

Q7) Write short note on [18]

- a) Cognitive robotics
- b) ANN
- c) Concept of AI

OR

Q8) Write short note on [18]

- a) A.I. in Robotics
- b) Medical Robots
- c) Behavioral Robotics

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Total No. of Questions : 8]

SEAT No. :

PD4450

[6403]-255

[Total No. of Pages : 2

**T.E. (Robotics and automation)
MODELING AND SIMULATION**

(2019 Pattern) (Semester - VI) (311511(A)-III) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Practical applications and uses of random number generation. [6]

b) What is the nature of simulation models? [6]

c) Which are the inputs of simulation model? [5]

OR

Q2) a) Which are the four phases of input modeling for simulation? [6]

b) What is input modeling in simulation? [6]

c) Describe Generation of pseudo random numbers. [5]

Q3) a) Explain generating continuous random variates like Exponential. [6]

b) Which are types of simulations with regard to output analysis? [6]

c) Explain generating continuous random variates like Uniform. [5]

OR

Q4) a) What is random variate generation? [6]

b) Which are the factors to be considered in selecting generator? [6]

c) Explain generating continuous random variates like Normal. [5]

P.T.O.

- Q5)** a) Discuss the need for and the quantity of equipment and personnel in manufacturing system design. [6]
- b) Describe Evaluation of operational procedures in simulation in manufacturing system design. [6]
- c) What is a Manufacturing System? Which are the basic components of manufacturing system? [6]

OR

- Q6)** a) Write short note on reentrant manufacturing system. [6]
- b) How to Reduce Downtime in Manufacturing? [6]
- c) Which are sources of randomness in manufacturing system? [6]

- Q7)** a) Which features needed in programming most discrete-event simulation models? [6]
- b) What are the advantages of using simulation package rather than a general-purpose programming language? [6]
- c) Describe classification of simulation software. [6]

OR

- Q8)** a) Which are the features to be considered while selecting simulation software? [6]
- b) What is SLAM? Which are applications of it? [6]
- c) Describe ARENA simulation software package. [6]

x x x

[6403]-256**T.E. (Robotics and Automation)****SWARM INTELLIGENCE IN ROBOTICS****(2019 Pattern) (Semester - VI) (311511(A) - IV) (Elective - II)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates :**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.
- 5) Use of calculator is allowed.

Q1) a) For the distance matrix shown in Fig. below, what is the pheromone deposition by an ant which moves along path A-C-D-B-E-A? **[10]**

	A	B	C	D	E
A	0	10	12	11	14
B	10	0	13	15	8
C	12	13	0	9	14
D	11	15	9	0	16
E	14	8	14	16	0

b) Explain the steps of recursive ant colony algorithm. **[7]**

OR

Q2) a) Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering starting station as A, what is the % probability that an ant will choose the path 1 to 3? Assume initial pheromone deposition level as 1. **[10]**

	1	2	3	4	5
1	0	11	15	18	12
2	11	0	15	13	13
3	15	15	0	11	15
4	18	13	11	0	21
5	12	13	15	21	0

b) Explain applications of ant colony optimization algorithm to solve combinatorial optimization problems. **[7]**

P.T.O.

- Q3) a)** Explain hybrid artificial bee colony-simulated annealing algorithm. [8]
b) In a minimization problem, the objective functions of 5 initial solutions are: 20, 26, 18, 32, 41. If there are 20 onlooker bees, how many bees will be assigned to each solution? [9]

OR

- Q4) a)** Explain Artificial Bee colony algorithm. What are its algorithm specific parameters? How they are determined? [8]
b) What is the role of scout bees in Artificial Bee colony algorithm? How the numbers of scout bees are decided? [9]

- Q5) a)** The objective function values of 10 different solutions are as given below :[10]

Solution No.	1	2	3	4	5	6	7	8	9
Objective function value	37	22	25	31	33	39	22	27	30

For a minimization of objective function value, shuffled frog algorithm is used. If number of memplexes are three, determine the solutions in each memplex.

- b)** Draw the flowchart and explain the Cat Swarm Optimization. [8]

OR

- Q6) a)** Explain the teacher phase and learner's phase in Teaching learning based optimization algorithm. [8]
b) Explain Fish School algorithm. [10]

- Q7) a)** Explain the application of particle swarm optimization algorithm to determine the shortest path for an automated guided vehicle while moving from work station at (4,6) to workstation at (1, 1) shown in Fig. below. The obstacles are in the form of tool storage racks at locations (3, 3), (1, 4) and (4,2). [9]

(1,1)	(2,1)	(3,1)	(4,1)
(1,2)	(2,2)	(3,2)	(4,2)
(1,3)	(2,3)	(3,3)	(4,3)
(1,4)	(2,4)	(3,4)	(4,4)
(1,5)	(2,5)	(3,5)	(4,5)
(1,6)	(2,6)	(3,6)	(4,6)

- b)** Write note on: Swarm robotics. [9]

OR

- Q8)** a) Explain the use of swarm intelligence in obstacle avoidance for mobile robots in dynamic environment. **[9]**
- b) Explain application of swarm intelligence in route optimization for AS/RS systems. **[9]**



[6403]-257

T.E. (Artificial Intelligence and Machine Learning)
DESIGN AND ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester - V) (318541)

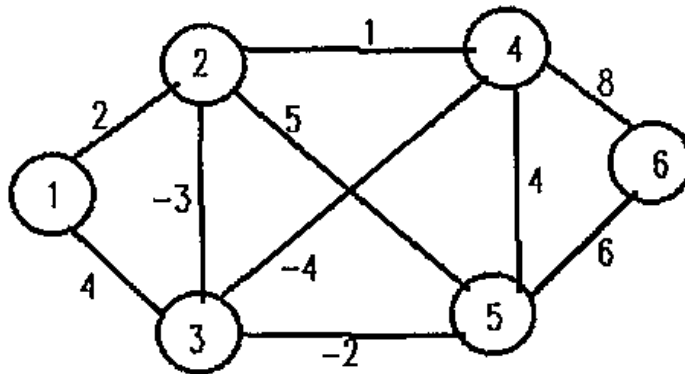
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, 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)** Solve making change problem for $d_1 = 1$, $d_2 = 4$, $d_3 = 6$, $n = 3$ and $N = 8$ units. [10]
- b)** Find shortest path from node 1 to every other node in the graph as given below using Bellman Ford Algorithm. [8]



OR

- Q2) a)** Solve the Knapsack problem using Dynamic programming for number of objects $n = 4$, given capacity $M = 8$. [8]

Items	1	2	3	4
Value	15	10	9	5
Weight	1	5	3	4

- b)** Write Bellman ford algorithm to find shortest path and analyze it. [6]
- c)** Give difference between. Divide and conquer and Dynamic programming. [4]

P.T.O.

- Q3) a)** Explain n queen's problem with suitable example. [7]
b) Analyze sum of sub set algorithm on data : [10]
 $M = 35$
 i) $W = \{5, 7, 10, 12, 15, 18, 20\}$
 ii) $W = \{20, 28, 15, 12, 10, 7, 5\}$
 iii) $W = \{15, 7, 20, 5, 18, 10, 12\}$
 Are there any discernible differences in computing time?

OR

- Q4) a)** Consider a set $S = \{5, 10, 12, 13, 15, 18\}$ and $d = 30$. Solve it for obtaining sum of subset. [7]
b) Generate the least three solutions for 5 queen's problem. [6]
c) Enlist the applications of backtracking. [4]
- Q5) a)** Compare backtracking and branch and bound method. [5]
b) Write an algorithm for FIFO branch and bound. [6]
c) Consider 0/1 Knapsack instance $n = 4$ with capacity 10 kg such that

Item	Profit	Weight (in kg)
1	40	4
2	42	7
3	20	5
4	12	3

Find maximum profit using first in first out branch and bound (FIFOBB) method. Use fixed size formation for state space tree. [7]

OR

- Q6) a)** Explain dynamic reduction with all steps with respect to travelling salesperson problem. [8]
b) What is travelling salesman problem? Find the solution for following travelling salesman problem using branch and bound method.

$$\text{Cost matrix} = \begin{matrix} & \infty & 11 & 10 & 9 & 6 \\ 8 & \infty & 7 & 3 & 4 & \\ 8 & 4 & \infty & 4 & 8 & \\ 11 & 10 & 5 & \infty & 5 & \\ 6 & 9 & 5 & 5 & \infty & \end{matrix} \quad [10]$$

- Q7) a)** Write non deterministic algorithm for sorting elements of array. [7]
- b) Explain in brief NP hard problem. State difference between NP-hard and NP-complete problem. [10]

OR

- Q8) a)** Explain the following : [8]
- i) Computational complexity
 - ii) Decision problems
 - iii) Deterministic and non-deterministic algorithm.
 - iv) Complexity classes
- b) Specify any one example of NP-hard problem. Also mention that why it is NP hard. [9]



Total No. of Questions : 8]

SEAT No. :

PD4453

[Total No. of Pages : 2

[6403]-258

T.E. (AIML)

IOT WITH ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - V) (318542)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the features of IEEE 802.15.4 protocol. [6]
b) What is Lora WAN. Explain its network architecture. [6]
c) State and explain the functionalities of IoT network layer protocols. [6]

OR

- Q2)** a) What is SCADA? Draw and explain different components in SCADA architecture. [6]
b) What is MQTT? Explain its architecture along with the message format. [6]
c) Explain the features of 6LoWPAN and why it is mostly used in IoT application. [6]

- Q3)** a) What is Cloud? What is the use of cloud in developing IoT Application? [6]
b) Write short notes on data acquisition and data integration. [6]
c) Write and explain any five IoT application which uses cloud? [5]

OR

- Q4)** a) What is meant by device data storage? What is the necessity to use cloud for data storage? [6]
b) Explain any two mechanisms by which you can ensure security to data stored on cloud? [6]
c) What is IoT cloud platform? Write any three-cloud platform available of IoT application. [5]

P.T.O.

- Q5)** a) Explain different cloud service models. [6]
b) Write short notes on different types of data and its handling mechanism. [6]
c) IoT application can generate continuous stream of data. What could be the challenges in handling such data? Explain with example. [6]

OR

- Q6)** a) What is data analytic? Explain its benefits in IoT. [6]
b) Compare with example data in motion and data at rest. [6]
c) What is M2M? Explain the role of cloud platform in developing M2M application. [6]

- Q7)** a) What is AWS? Explain its any of the three services. [6]
b) What is API? Explain different communication API used in IoT. [6]
c) What is industrial automation? Explain the role of IoT in industrial automation. [5]

OR

- Q8)** a) Explain different cloud storage models. [6]
b) What is participatory sensing? Explain the application and challenges of it. [6]
c) Explain with example the role of IoT in developing smart cities. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4454

[Total No. of Pages : 2

[6403]-259

T.E.(Artificial Intelligence and Machine Learning)

Web Technology

(2019 Pattern) (Semester - V) (318543)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 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 side indicate full marks.
- 4) Assume Suitable data if necessary

- Q1)** a) What is Web Framework? Give various Types of Web Framework [8]
b) What is React JS? Explain its Features. [6]
c) Explain angular lifecycle: [4]

OR

- Q2)** a) What are Directives and Pipes? Explain any 2 types of Directives and Pipes? [8]
b) Explain MVC in web framework. State its advantages and disadvantages [6]
c) What is typescript? Explain variables in TS. [4]
- Q3)** a) What is Middleware in Express.js? What are the different types of middleware? [7]
b) State and explain any 3 builds in modules in node.JS [6]
c) What is node.JS? Enlist its features. [4]

OR

P.T.O.

- Q4)** a) How many types of API functions are available in Node.js? Explain with example. [7]
- b) What are the key differences between Angular.js and Node.js? [6]
- c) Write a short note on PM2 Micro services [4]
- Q5)** a) Explain any four form components in JQuery Mobile. [8]
- b) What is mobile Web? Difference between website and web app. [6]
- c) What is mobile first and user Interface? [4]

OR

- Q6)** a) Explain list in JQuery Mobile. How to divide list in JQuery mobile? [8]
- b) How to setup jQuery mobile? What is difference between jQuery and jQuery mobile [6]
- c) List all the roles in JQuery mobile. [4]
- Q7)** a) What is amazon VPC? Name all the components of amazon VPC and explain any four components of amazon VPC. [7]
- b) What is AWS storage service? List of the main storage services available on the AWS Cloud. [6]
- c) 'What is S3, EBS? [4]

OR

- Q8)** a) Explain the steps to deploy a web application on amazon EC2. [7]
- b) What is Cloud storage? Explain its types [6]
- c) What is ELB? How does it work? [4]



Total No. of Questions : 8]

SEAT No. :

PD4455

[Total No. of Pages : 2

[6403]-260

**T.E. (Artificial Intelligence and Machine Learning)
MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY
(2019 Pattern) (Semester - V) (318544)**

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 the term “Entrepreneur” and provide key characteristics of entrepreneurs. **[9]**

b) Describe the concept of feasibility analysis in the context of entrepreneurship in details. **[9]**

OR

Q2) a) Discuss the stages involved in the entrepreneurial process in details. **[9]**

b) Explain the classification of entrepreneurs based on business size and provide an example of each. **[9]**

Q3) a) Define the term “project” and provide a brief description of its key characteristics. **[8]**

b) Explain the functional areas of management covered by Enterprise Resource Planning (ERP). **[9]**

OR

Q4) a) Explain the role of the Planning Commission in providing guidelines for project reports. **[8]**

b) Explain project selection and project identification processes in details. **[9]**

Q5) a) Define Micro and Small Enterprises (MSEs) and list the characteristics that differentiate them from larger enterprises. **[9]**

b) What is the Government of India Industrial Policy 2007? And how does it impact Micro and Small Enterprises? **[9]**

OR

P.T.O.

- Q6)** a) Explain steps involved in establishing Micro and Small Enterprises. **[9]**
b) Describe the role of legal formalities in the establishment of Micro and Small Enterprises. **[9]**

- Q7)** a) Define Intellectual Property Rights (IPR) and list three kinds of IPR. **[8]**
b) Explain recommendations for addressing Marxist criticisms of Intellectual Property Rights. **[9]**

OR

- Q8)** a) Explain the economic analysis of Intellectual Property Rights, highlighting its impact on innovation. **[8]**
b) Explain the effectiveness of the TRIPS agreement in harmonizing international standards for IPR. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4456

[Total No. of Pages : 2

[6403]-261

T.E. (Artificial Intelligence and Machine Learning)

ROBOTICS

(2019 Pattern) (Semester - V) (318545(A)) (Elective - I)

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 homogenous coordinate system in detail. [6]
b) Derive the rotation formula using vector techniques. [6]
c) How would you explain the significance of the dot product and cross product in real-world applications? Give examples. [6]

OR

- Q2)** a) What is the inverse or back solution and how is it used to control a manipulator's motion? [9]
b) Draw and explain below controller architectures. [9]
i) Joint position control (JPC)
ii) Resolved motion position control (RMPC)
iii) Resolved motion rate control (RMRC)

- Q3)** a) What are the different types of grippers used in robotics? [9]
b) Enlist what are the various process tools which can be used as end effectors. Explain any one in detail. [9]

OR

- Q4)** a) What are some miscellaneous sensors and sensor-based systems used in robotics and what are their applications? [9]
b) What are different types of Safety sensor used in Robotics? Explain any one of them with the help of neat sketch. [9]

P.T.O.

- Q5)** a) Explain robot control sequencing in detail. [8]
b) What are some of the computational elements used in robotic applications. [9]

OR

- Q6)** a) Write short note on robot programming Languages. [9]
i) RAIL
ii) RPL
iii) Val
b) How is path planning used to optimize the movement of a robot? [8]

- Q7)** a) What are some of the different assembly and inspection tasks that robots are used for and what are some of their benefits and drawbacks? [8]
b) Explain how to use robot for defence & surveillance industry application. [9]

OR

- Q8)** a) Explain the terms [9]
i) Social Issues
ii) Labor issues
iii) Capital formation
b) Write a short note on robotics applications like arc welding, spot welding, spray painting, assembly operation. [8]



Total No. of Questions : 8]

SEAT No. :

PD4457

[Total No. of Pages : 2

[6403]-262

T.E. (Artificial Intelligence and Machine Learning)
INFORMATION SECURITY
(2019 Pattern) (Semester - V) (318545(C) (Elective - I)

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 Fermat theorem with an example. **[9]**
b) Use RSA algorithm to perform encryption and decryption. Find d and C. P=7, q=11, e=17, M=8. **[9]**

OR

- Q2) a)** Elaborate Euler theorem with an example. **[9]**
b) Users A and B use the Diffie-Hellman key exchange technique with a common prime $q=71$ and a primitive root, $a=7$ **[9]**
If user A has private key $X_A=5$, what is A's public key Y_A ?
If user B has private key $X_B=12$, what is B's public key Y_B ?
What is the shared secret key?

- Q3) a)** Calculate the number of padding bits, if the length of the original message is 230 bits in MD5 algorithm. **[8]**
b) Explain with diagram, the process of Digital Certificate Creation and Verification. **[9]**

OR

- Q4) a)** Calculate the number of padding bits, if the length of the original message is 252 bits in SHA1 algorithm. **[8]**
b) Explain with diagram Authentication Header (AH) protocol of IPSec. **[9]**

- Q5) a)** What are DoS/DDoS attacks? How to detect DoS/DDoS attacks? How to protect from them? Elaborate. **[9]**
b) Explain the need and characteristics of Firewall. **[9]**

OR

P.T.O.

- Q6)** a) Elaborate the Host based intrusion prevention system. [9]
b) Explain the role based access control mechanism in detail. [9]

- Q7)** a) Explain the concept of Social engineering and provide examples of common social engineering techniques. [9]
b) What is Phishing? Explain the working of phishing in detail. [8]

OR

- Q8)** a) Discuss the challenges and importance of international cooperation in dealing with cybercrimes. [9]
b) Elaborate Cyber-terrorism. Give real time examples of Cyber-terrorism.[8]



Total No. of Questions : 8]

SEAT No. :

PD4458

[Total No. of Pages : 2

[6403]-263

T.E. (Artificial Intelligence and Machine Learning)

BUSINESS INTELLIGENCE

(2019 Pattern) (Semester - V) (318545(D) (Theory) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in detail different BI tools with an example. **[8]**
b) Explain Business report and components of Business report in detail. **[9]**

OR

- Q2)** a) Explain Business Performance Measurement in detail with suitable example. **[8]**
b) Explain the 4 Perspectives of BSC in detail. **[9]**

- Q3)** a) Explain the concept of What –if analysis with example. **[6]**
b) Write a note on decision tree related to decision analysis. **[6]**
c) Write short note on Structure of Mathematical Models for Decision Support. **[6]**

OR

- Q4)** a) Explain Multiple Goals & Goal Seeking in detail. **[6]**
b) Write a note on Decision Support Systems Modeling. **[6]**
c) Explain certainty & uncertainty related to Decision Making in detail. **[6]**

- Q5)** a) Illustrate the use of Business Intelligence in Fraud Detection with an example. **[8]**
b) Illustrate the use of Visual and Business Analytics (BA) in BI with an example. **[9]**

OR

- Q6)** a) Illustrate various applications of Business Intelligence with an example. **[8]**
b) Illustrate Business Intelligence in logistics and Production with an example. **[9]**

P.T.O.

- Q7)** a) Explain the Issues of Legality related to Business Analytics. [6]
b) Explain the critical success factors for Implementing a BI strategy. [6]
c) Explain BI Search & Text Analytics in detail. [6]

OR

- Q8)** a) Explain business analytics applications for the consumers in detail. [6]
b) Explain Advanced Visualization in detail with an example. [6]
c) Discuss how to Predict the Future with the help of Data Analysis. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4459

[Total No. of Pages : 2

[6403]-264

T.E. (AI & ML)

PATTERN RECOGNITION

(2019 Pattern) (Semester - V) (Elective - I) (318545(B))

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) Briefly describe Maximum-likelihood estimation. [6]
b) Explain Maximum A Posteriori (MAP) Estimation. [6]
c) Explain what the Naive Bayes algorithm does? [6]

OR

- Q2) a) Explain why the maximum likelihood estimation is not working with uniformly distributed training sets. [6]
b) Explain nearest neighbour algorithm with example. [6]
c) Prove that a Bayes classifier is equivalent to a minimum distance classifier, assuming that the feature vector is Gaussian. [6]

- Q3) a) Explain the Perceptron algorithm. [5]
b) List the three methods for evaluating the error rate of a classifier. Explain. [4]
c) Elaborate on the key principles of Stochastic Approximation when applied to the Least Mean Squares (LMS) Algorithm. [8]

OR

- Q4) a) Define Linear Discriminant Functions (LDFs) and explain their significance in the context of pattern recognition and classification. [5]
b) What is Mean Square Error? How it is evaluated? [4]
c) Define a Decision Hyperplane in the context of pattern recognition. Explain its role in separating classes in a feature space. [8]

P.T.O.

- Q5) a)** What is XOR problem in classification? With a neat diagram explain the solution of XOR problem. [6]
- b) Differentiate between agglomerative and divisive clustering techniques. [6]
- c) Apply K-means clustering algorithm on given data for K=3. Use C1(2), C2(16), C3(38) as initial cluster centres. Data: [6]
2, 4, 6, 3, 31, 12, 15, 16, 38, 35, 14, 21, 23, 25, 30.

OR

- Q6) a)** Describe the architecture and learning algorithm of back propagation networks. List its limitations. [6]
- b) Explain the types of hierarchical clustering. [6]
- c) Explain K means clustering algorithm. [6]
- Q7) a)** What are dimension reduction methods? Explain Principle Component Analysis algorithm for dimension reduction. Also write its limitations. [6]
- b) Describe the basic concept of Expectation-Maximization (EM) and its role in statistical modeling. [6]
- c) What is Bayesian decision theory? Explain 2 category classification. [5]

OR

- Q8) a)** Explain Hidden Markov model. How Hidden Markov model is different from traditional markov model? Explain. [6]
- b) Describe the key components of Gaussian Mixture Models (GMMs) and how they are used for probability density estimation. [6]
- c) Write the various approaches in statistical pattern recognition. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4460

[Total No. of Pages :2

[6403]-265

T.E. (AIML Engg.)

MACHINE INTELLIGENCE FOR DATA SCIENCE

(2019 Pattern) (Semester - VI) (318552)

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) How are residuals used in statistical linear models for regression inference? [6]
- b) Explain logistic regression and its real-world applications. [6]
- c) What is the role of maximum likelihood estimation in logistic regression? [6]

OR

- Q2)** a) Compare Poisson regression with other regression models. [6]
- b) Provide examples illustrating the interpretation of logistic regression outcomes. [6]
- c) How are logistic regression curves visualized and interpreted? [6]

- Q3)** a) What makes Support Vector Machine algorithms unique, and how do they function? [6]
- b) Discuss the significance of kernel functions in SVM classification. [6]
- c) Explain Bagging and Bootstrap techniques in ensemble methods. [5]

OR

P.T.O.

- Q4)** a) How does random forest differ from traditional decision trees, and what's its key feature? [6]
b) Explain with an example where SVM and random forest classifiers excel. [5]
c) How do ensemble methods enhance classification accuracy compared to single classifiers? [6]

- Q5)** a) Define decision trees and their use of entropy. [6]
b) Compare ID4, C4.5, and CART algorithms. [6]
c) Discuss the impact of bagging and boosting on bias and variance. [6]

OR

- Q6)** a) Explain Random Forests and Gradient Boosting Machines. [6]
b) What advantages do ensemble methods offer over individual classifiers? [6]
c) How does XGBoost improve traditional gradient boosting? [6]

- Q7)** a) What is the purpose of clustering in unsupervised learning and how is it achieved? [6]
b) Describe partitioning methods in clustering and provide examples. [6]
c) Explain Density-Based Spatial Clustering and its suitability for different data. [5]

OR

- Q8)** a) Discuss Hierarchical clustering, including the role of dendrograms. [6]
b) What challenges arise in determining the optimal number of clusters in Hierarchical clustering? [5]
c) Compare divisive clustering techniques with other methods. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4461

[Total No. of Pages :2

[6403]-266

T.E. (AI & ML Engg.)

DATA MINING & WAREHOUSING

(318553) (2019 Pattern) (Semester - VI)

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 Hierarchical Clustering techniques. [8]
- b) Explain the concept of data, information, and knowledge in the context of BI. [6]
- c) Write short Note on Business Intelligence (BI). [4]

OR

- Q2) a) Explain in detail Grid Based Clustering technique and write its advantages and disadvantages. [8]
- b) Describe Design and implementation aspect of OLTP. [6]
- c) What are the business applications of BI? [4]

- Q3) a) Write a note on Decision support systems. [7]
- b) Explain the three-tier data warehouse architecture. [6]
- c) Write difference between Operational & informational data systems.[4]

OR

- Q4) a) Describe Top-down and Bottom-up Data Warehouse design approaches.[7]
- b) What is a data mart? Discuss its role in data warehousing. [6]
- c) Discuss the characteristics of a data warehouse. [4]

P.T.O.

- Q5)** a) What is Data Discretization? Explain different techniques of data discretization in data mining. [8]
b) Write short note on Data Integration and Transformation. [6]
c) Describe applications of Data warehouse. [4]

OR

- Q6)** a) Describe in detail Components of ETL Architecture. [8]
b) Explain different data Cleaning techniques. [6]
c) Give an overview of the data life cycle and its stages. [4]

- Q7)** a) Explain Relational Online Analytical Processing (ROLAP) and Hybrid Online Analytical Processing (HOLAP). [7]
b) Write a note on Mutlidimensional Data Model. [6]
c) What is the difference between a fact table and a dimensional table in a multidimensional database? [4]

OR

- Q8)** a) Describe stars, snowflakes schemas used for representing multidimensional databases. [7]
b) Define the concept hierarchies in the context of a multidimensional data model. [6]
c) Discuss the need for OLAP. [4]



Total No. of Questions : 8]

SEAT No. :

PD4462

[Total No. of Pages : 2

[6403]-267

T.E. (Artificial Intelligence and Machine Learning)

ARTIFICIAL NEURAL NETWORK

(2019 Pattern) (Semester - VI) (318554)

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 Architecture of Neural Network. [6]
b) Explain in detail Error Back Propagation Algorithm. [6]
c) Explain Gradient Descent with example. [6]

OR

- Q2)** a) Write Applications of Feed Forward Neural Networks with examples. [6]
b) Explain Sigmoid Neurons with example. [8]
c) Explain in detail Multilayer Perceptrons (MLPs) [4]

- Q3)** a) Explain Auto associative Feed back Neural Networks. [7]
b) What are the different types of Hopfield Networks. [10]

OR

- Q4)** a) What is the Simulated Annealing . Write an algorithm for it.State it's Advantages. [7]
b) Explain different types of Boltzman Machines. [10]

- Q5)** a) What are different Components of competitive Learning. [8]
b) Explain Semantic Networks in competitive Learning with examples. [6]
c) Write an Advantage and Disadvantage of Self-Organizing Map. [4]

OR

P.T.O.

- Q6)** a) Explain Pattern Clustering Networks and applications of ART. [10]
b) Explain Adaptive Resonance Theory and it's significant in pattern recognition. [8]

- Q7)** a) Write architectures of Deep Learning Networks. [7]
b) Explain with diagram Long short-term memory (LSTM) Networks and Deep Recurrent Neural Networks (RNN) with examples. [10]

OR

- Q8)** a) Explain Convolutional Neural Networks(CNN). [8]
b) Write difference between Traditional Machine Learning and Learning in Deep Neural Networks. [9]



Total No. of Questions : 8]

SEAT No. :

PD4463

[Total No. of Pages : 2

[6403]-268

T.E. (AIML)

INDUSTRIAL INTERNET OF THINGS

(2019 Pattern) (Semester - VI) (318555A) (Elective - II)

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) Explain industry 4.0 in manufacturing process. **[8]**
b) Explain communication technology in IIoT. **[6]**
c) Explain Interoperability in Smart Automation. **[4]**

OR

- Q2)** a) Explain work piece's memory Contents with the help of neat diagram. **[6]**
b) Describe knowledge Mining in Databases. **[6]**
c) Explain Enhancing Resiliency in Production Facilities through CPS. **[6]**

- Q3)** a) Explain features of Cyber Physical system. **[6]**
b) Explain the role of computer control of machine tools and machine centers in today's industry. **[5]**
c) Explain the need for data and system interoperability in smart automation. **[6]**

OR

- Q4)** a) Explain conditional monitoring in machine learning. **[6]**
b) Explain exemplary plant setup of two drives with the help of a diagram. **[6]**
c) Explain the working of digital technology in manufacturing industry. **[5]**

P.T.O.

- Q5)** a) Explain Smart Factory and Industry 4.0 in advanced Manufacturing in detail. [6]
b) Explain Centralized user intervention in detail. [6]
c) Explain key terms in advanced Manufacturing with suitable diagram. [6]

OR

- Q6)** a) Write short note on [6]
i) Product Innovation.
ii) Service Innovation,
b) Explain skills and tools of open manufacturing with the help of neat diagram. [6]
c) Explain the role of innovation ecosystems in Industry 4.0 adoption. [6]

- Q7)** a) Explain examples of Industrial IoT using real time. [6]
b) Explain [6]
i) Application of IoT in healthcare.
ii) Application of IoT in City Automation.
c) Explain the Smart Metering with example. [5]

- Q8)** a) Explain the architecture of an IoT system in Smart Card. [6]
b) Explain the application of IoT in manufacturing plant. [7]
c) Explain the Major Applications of IoT In The Automotive industry. [4]

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Total No. of Questions : 8]

SEAT No. :

PD4464

[6403]-269

[Total No. of Pages : 2

T.E. (Artificial Intelligence and Machine Learning)

BRAIN COMPUTER INTERFACE

(2019 Pattern) (Semester - VI) (318555(B)) (Elective - II)

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 wavelet analysis, its types, and the process of decomposing signals into wavelet coefficients. **[10]**

b) Discuss the advantages and limitations of frequency domain analysis in real-world signal processing. **[8]**

OR

Q2) a) Define phase synchronization and coherence and explain how they are computed. **[10]**

b) Explain the types and sources of artifacts in biomedical signals. **[8]**

Q3) a) Compare and contrast binary classification, ensemble classification, and multiclass classification in terms of their methodology and applications. **[9]**

b) How can SVMs be extended for nonlinear classification using kernels? Provide an example. **[8]**

OR

Q4) a) Discuss how backpropagation is used to train multilayer neural networks. **[5]**

b) Explain the structure of a perceptron and its working principle for binary classification. **[6]**

c) Explain how confusion matrices can be used to derive precision, recall, F1-score with a Practical example. **[6]**

P.T.O.

- Q5) a)** Compare at least two machine learning algorithms commonly used for VEP analysis, discussing their strengths and limitations. **[8]**
- b)** Describe how gazed target determination is achieved using VEPs in BCIs. Include the role of visual stimuli and signal processing techniques. **[10]**

OR

- Q6) a)** Explain how machine learning algorithms are utilized in analysing transient VEPs for BCI applications. **[10]**
- b)** What factors influence the availability and reliability of transient VEPs in BCI systems? **[8]**
- Q7) a)** What are visual cognitive BCIs, and how are they used in real-world applications? **[8]**
- b)** How do multi-electrode array implants enable cursor and robotic control? Discuss the mechanism, applications, and challenges of this approach. **[9]**

OR

- Q8) a)** Explain how cortical signals are used to control muscles through functional electrical stimulation (FES). **[8]**
- b)** Explain the working principle of the P300 Mind Speller and its significance in non-invasive BCIs. Discuss its advantages and limitations. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PD4465

[6403]-270

[Total No. of Pages : 2

T.E. (Artificial Intelligence and Machine Learning)

AI FOR CYBER SECURITY

(2019 Pattern) (Semester - VI) (318555(C)) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss some techniques for network anomaly detection using AI how can they be used to identify potential cyber security threats? **[8]**
- b) Elaborate how networks attacks can be classified using machine learning algorithm **[6]**
- c) Explain Random forest and SVM algorithm. **[4]**

OR

- Q2)** a) Explain different types of botnet topologies. **[8]**
- b) Explain distributed denial of service attack. **[6]**
- c) Explain Naïve bias and KNN algorithm. **[4]**

OR

- Q3)** a) Explain leverage machine learning (ML) algorithms for fraud detection. **[7]**
- b) Explain how to protect sensitive information and assets. **[6]**
- c) Explain Biometric authentication with facial recognition. **[4]**
- Q4)** a) Explain authentication abuse prevention techniques. **[7]**
- b) Explain key elements of account reputation scoring. **[6]**
- c) Explain bagging and boosting techniques can improve an algorithm's effectiveness. **[4]**

P.T.O.

- Q5)** a) Explain the attacks against facial recognition procedures using adversarial examples. [8]
b) What is GAN. Explain its use in attack and defense scenarios. [6]
c) Explain attack against DNNs, via model substitution. [4]

OR

- Q6)** a) Explain the steps involved in model substitution. [8]
b) Explain the main libraries and tools for developing adversarial examples.[6]
c) Explain the attacks against intrusion detection systems (IDS) via GANs.[4]

- Q7)** a) Explain Feature engineering best practices in dealing with raw data. [7]
b) Explain how to split sample data into training and test sets. [6]
c) Explain how to manage algorithms' overfitting. [4]

OR

- Q8)** a) Explain how ROC curve is used to visualize the performance of binary classifier. [7]
b) What is cross validation. Explain its technique used for bias-variance trade-offs. [6]
c) Explain bias-variance trade-offs with cross validation. [4]

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Total No. of Questions : 8]

SEAT No. :

PD-4466

[Total No. of Pages : 2

[6403]-271

T.E. (Artificial Intelligence and Machine Learning)

VIDEO ANALYTICS

(Elective - II) (2019 Pattern) (Semester - VI) (318555 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or 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) Explain different types of Deep learning networks. [8]
- b) Discuss how a fuzzy classifier can be applied to improve video analytics accuracy. [6]
- c) Describe the fundamental concept behind HMM-based classifiers. [4]

OR

- Q2)** a) Explain the concept of back propagation in neural networks and its advantages and disadvantages. [8]
- b) Discuss the role of deep learning networks such as Convolutional Neural Networks (CNNs) in video analytics and its advantages. [6]
- c) List applications of Bayesian classifier. [4]
- Q3)** a) Describe the implementation and impact of perimeter security in video analytics. [7]
- b) How does video analytics contribute to human behavioral analysis? [6]
- c) Explain the importance of predicting crowd congestion using video analytics. [4]

P.T.O.

OR

- Q4)** a) Explain the process and significance of abandoned object detection in video analytics. [7]
b) Explain the key features of crowd analysis in video analytics. [6]
c) Describe human action recognition in the context of video analytics. [4]
- Q5)** a) Explain the methodology and applications of traffic rule violation detection using video analytics. [8]
b) How traffic congestion is identified for route planning in video analytics. [6]
c) What is lane change warning and how does it utilize video analytics? [4]

OR

- Q6)** a) How does video analytics contribute to customer behavior analysis in retail settings? [8]
b) Discuss the significance of people counting in retail analytics using video technology. [6]
c) Define driver assistance and its role in video analytics. [4]
- Q7)** a) Explain the process of video-based rendering in video analytics. [7]
b) Describe the role of video analytics in Advanced Driver Assistance Systems (ADAS). [6]
c) List the benefits of video-based rendering. [4]

OR

- Q8)** a) Explain the significance of video analysis in action recognition for surveillance applications. [7]
b) How does video analytics contribute to context and scene understanding in surveillance systems? [6]
c) Explain a case study demonstrating the effectiveness of video analysis in ADAS. [4]



Total No. of Questions : 8]

SEAT No. :

PD-4467

[Total No. of Pages : 2

[6403]-272

T.E. (Computer Science & Design)

**SOFTWARE ENGINEERING AND PROJECT
MANAGEMENT**

(2021 Pattern) (Semester-V) (318241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Draw Neat and Clean Diagram*
- 2) *Assume Suitable Data if Necessary*
- 3) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*

- Q1)** a) Explain the user interface design principles. [5]
b) What are the software design quality attributes and quality guidelines? [6]
c) Write short note on Designing class based components. [6]

OR

- Q2)** a) What do you understand by refactoring? Give the importance of refactoring in improving the quality of software. [5]
b) Enlist and explain the golden rules for User Interface Design. [6]
c) Explain the elements of design model. [6]
- Q3)** a) Write about Daily Activity Reporting & Tracking (DART). [7]
b) Explain Time Line chart? With suitable example. [7]
c) Explain FP based estimation technique. [4]

OR

P.T.O.

- Q4)** a) Explain W5HH principle in detail. [7]
b) Explain Risk identification and assessment process for software project. [7]
c) What is the need of project estimation? What are the steps while estimation. [4]
- Q5)** a) What is Risk Mitigation, Monitoring and Management (RMMM). [4]
b) What is software SCM repository? Explain various risk associated with software project. [6]
c) How risk projection is carried out using risk table? [8]

OR

- Q6)** a) Prepare RMMM plan for late delivery of software product to the customer. [4]
b) Explain Software Reengineering Process model in detail. [6]
c) How forward engineering is applied to Client Server Architectures? [8]
- Q7)** a) What is integration testing? Explain its type in detail. [4]
b) Define error, fault and failure with suitable example. [6]
c) What is GUI testing ? Explain in detail. [7]

OR

- Q8)** a) Explain difference between verification & validation. [4]
b) What do you understand by System Testing? What are the different kinds of system testing that are usually performed on large software testing [6]
c) Define test case? What is the importance of test case? Give example.[7]



Total No. of Questions : 8]

SEAT No. :

PD4468

[Total No. of Pages : 2

[6403]-273

T.E. (Computer Science and Design)
THEORY OF COMPUTATION
(2019 Pattern) (Semester - V) (318242)

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) State and explain closure properties of Grammar. [5]
i) Concatenation
ii) Intersection
b) Define the following and give appropriate examples : [6]
i) Unrestricted Grammar
ii) CFG
iii) Derivation Tree
c) What is the ambiguous grammar? Show that the grammar below is ambiguous & find the equivalent un-ambiguous grammar. [6]
 $S \rightarrow SS \mid a \mid b$

OR

- Q2)** a) Explain the Chomsky Hierarchy of grammar and describe the machine that accept each type of grammar. [5]
b) Construct a PDA equivalent to the following CFG $S \rightarrow 0BB \mid 1S \mid 0$
Test if 010^4 is in the language. [6]
c) Simplify and convert the following CFG to Chomsky Normal Form [6]
 $S \rightarrow AACD$
 $A \rightarrow aAb \mid \epsilon$
 $C \rightarrow aC/a$
 $D \rightarrow aDa/bDb \mid \epsilon$

- Q3)** a) Define push down automata (PDA). What are the different types of PDA? Give the applications of PDA. [7]
b) Design a PDA for accepting a language $L = \{WcW^T \mid W \in \{a, b\}^*, W^T \text{ is reverse of } W \text{ and } c \text{ is middle character of string } \}$ [7]
simulate the working of PDA for input string abbcbbba.
c) Explain NPDA in detail. [4]

OR

P.T.O.

- Q4)** a) Consider the PDA with following moves, obtain its equivalent CFG [7]
 $(q_0, a, z_0) = (q_0, az_0),$
 $(q_0, a, a) = (q_0, aa),$
 $(q_0, b, a) = (q_1, \epsilon),$
 $(q_1, b, a) = (q_1, \epsilon),$
 $(q_1, \epsilon, z_0) = (q_1, \epsilon)$
 b) Design a PDA for language $L = \{a^i b^j c^k | i, j, k \geq 1 \text{ and } i + j = k\}$ that accepts language via final State and Empty stack. [7]
 c) Compare FA and PDA. [4]

- Q5)** a) Write short note on Universal Turing Machine. [4]
 b) Construct a TM that accepts a language L, a^*ba^*b [6]
 c) Construct a TM to compute $L = \{a^n b^{2n} | n > 0\}$ Write simulation for string aabbbb. [8]

OR

- Q6)** a) Explain in detail concept of extensions to basic Turing Machine. [4]
 b) Design a TM to compute multiplication of two unary numbers. [6]
 c) Design a TM which accepts all strings of the form $a^n b^n$ for $n \geq 1$ and rejects all other strings. [8]

- Q7)** a) Justify whether the Traveling Salesman Problem is a class P or class NP problem. [4]
 b) Define recursive and recursively enumerable languages and specify relationship between them. [6]
 c) What is Clique Problem? Show that it is a NP-Complete problem. [7]

OR

- Q8)** a) Explain Tractable and In-tractable Problem. [4]
 b) Explain the following with example. [6]
 i) Computational complexity
 ii) 3-SAT problem
 c) Justify “Halting problem of Turing machine is undecidable”. [7]



Total No. of Questions : 8]

SEAT No. :

PD-4469

[Total No. of Pages : 2

[6403]-274

T.E. (Computer Science and Design Engineering)

DATABASE SYSTEM DESIGN

(2019 Pattern) (Semester - V) (318243)

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 do you mean by decomposition? What are the desirable properties of it? How can we implement them? **[8]**
- b) Elaborate the significance of codd's rule. Explain 12 rules proposed by codd's. **[9]**

OR

- Q2) a)** What is normalization and need of normalized database? Explain BCNF with a suitable example. **[8]**
- b) Compute the closure of the following set F of functional dependencies for relation schema $R = \{A, B, C, D, E\}$. **[9]**
- A $\rightarrow$ BC
CD $\rightarrow$ E
B $\rightarrow$ D
E $\rightarrow$ A
List the candidate keys for R.

- Q3) a)** Explain the concept of conflict serializability? Decide whether following schedule is conflict serializable or not. Justify your answer. **[9]**

T1	T2	T3
R(x)		
	R(z)	
R(z)		
		R(x)
		R(y)
		W(x)
	R(y)	
	W(z)	
	W(y)	

P.T.O.

- b) State and explain the ACID properties. During its execution a transaction passes through several states, until it finally commits or aborts. Explain all the possible sequence of states through which a transaction may pass with suitable diagram. [9]

OR

- Q4)** a) Write a short note on “Log based recovery”. [9]
b) What do you mean by time stamp-based protocol? Explain timestamp modeling protocol with suitable example. [9]

- Q5)** a) What is NOSQL? Explain CRUD operations with suitable example. [8]
b) What is distributed system? Give its advantages and disadvantages. [9]

OR

- Q6)** a) Explain BASE properties of NOSQL database with suitable example. Write difference between ACID and BASE Properties. [8]
b) Explain the concept of aggregation in MongoDB. [9]

- Q7)** a) What is semantic databases? Write any five applications of semantic databases. [9]
b) Difference between relational databases and object relational databases with example. [9]

OR

- Q8)** a) What is JSON? What are advantages and limitations of JSON. Why do we use JSON? [9]
b) Explain active and deductive databases. [9]



Total No. of Questions : 8]

SEAT No. :

PD4470

[Total No. of Pages : 2

[6403]-275

T.E. (Computer Science & Design)
DESIGN AND ANALYSIS OF ALGORITHM
(2019 Pattern) (Semester - V) (318244)

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 job scheduling algorithm? How job scheduling algorithm can be solved using Greedy algorithmic approach? Explain your answer with respect to Principle, control abstraction, time analysis of control abstraction, of greedy approach for the following instance of knapsack problem. [8]

Each job is associated with a deadline and profit.

Job	J ₁	J ₂	J ₃	J ₄
Deadline	2	1	2	1
Profit	100	10	15	27

- b) Consider the following instance of the knapsack problem Find the optimal solution by using dynamic programming approach. Capacity of the knapsack = 3. [10]

Item	Weight	Profit
1	5	15
2	4	20
3	3	21

OR

- Q2) a)** What is an OBST? Write advantages and disadvantages of imbalanced binary search tree? [8]

- b) Explain Greedy strategy: Principle, control abstraction, time analysis of control abstraction with suitable example. [10]

- Q3) a)** Explain with suitable example Backtracking: Principle, control abstraction, time analysis of control abstraction. [8]

- b) Compare between greedy method and dynamic programming with respect to. [10]

- i) Feasibility
- ii) Optimality
- iii) Recursion
- iv) Memorization
- v) Time complexity

OR

P.T.O.

- Q4) a)** What is Branch and Bound method? Write control abstraction for Leastcost search? [8]
- b) Consider the sum-of-subset problem, $n = 4$, Sum = 13, and $w_1 = 3$, $w_2 = 4$, $w_3 = 5$ and $w_4 = 6$. Find a solution to the problem using backtracking. Show the state-space tree leading to the solution. [10]

- Q5) a)** Write short notes on the following. [9]
- i) AggregateAnalysis
 - ii) Accounting Method
 - iii) Potential Function method
 - iv) Tractable and Non-tractable Problems
- b) Write notes on the following. [8]
- i) Approximation algorithm
 - ii) Randomized algorithm

OR

- Q6) a)** What is amortized analysis? Explain aggregate and potential function methods used for amortized analysis with respect to stack operations.[8]
- b) What is potential function method, of amortized analysis? To illustrate potential method, find amortized cost of PUSH, POP and MULTIPOP stack operations. [9]

- Q7) a)** i) Explain an algorithm for Distributed Minimum Spanning Tree. [8]
- ii) Write and explain Rabin-Karp algorithm for string matching.
- b) Write and explain pseudo code for multi-threaded merge sort algorithm. How parallel merging gives a significant parallelism advantage over merge Sort? [9]

OR

- Q8) a)** Write short notes on the following. [9]
- i) Multithreaded matrix multiplication.
 - ii) Multithreaded merge sort.
 - iii) Distributed breadth first search.
 - iv) The Rabin-Karp algorithm.
- b) With respect to Multithreaded Algorithms explain Analyzing multithreaded algorithms, Parallel loops, Race conditions. [8]



Total No. of Questions : 8]

SEAT No. :

PD4471

[Total No. of Pages : 2

[6403]-276

T.E. (Computer Science and Design Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester - V) (318245(A)) (Elective - I)

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) What is WSN? Explain in detail WSN with neat diagram. **[9]**

b) What is Sensor Networks? Explain in detail how Sensor network are used in IoT. **[9]**

OR

Q2) a) What is RFID? Explain in detail RFID Technology with neat diagram. **[9]**

b) What is role of connectivity technologies in IoT? Categorize different connectivity technologies required for IoT system development and explain any one of them in detail. **[9]**

Q3) a) Explain in detail Modbus Protocol and M2M protocol. **[8]**

b) Write advantages of 6LoWPAN. Explain in detail 6LoWPAN. **[9]**

OR

Q4) a) What are the advantages of ZigBee protocol? Explain in detail Zigbee protocol with neat diagram. **[8]**

b) What is MQTT protocol? Explain with detail example how MQTT protocol is used for IoT application. **[9]**

Q5) a) What is SOAP? Explain in detail SOAP used in IoT. **[8]**

b) How Software Defined Networking plays important role in IoT? Explain in detail Software defined Networking used for IoT. **[9]**

OR

P.T.O.

- Q6)** a) Illustrate in detail SkyNet IoT Messaging Platform with suitable example. [8]
b) List applications of Amazon Web Services. Explain in detail Amazon Web Services for IoT. [9]

- Q7)** a) Explain in detail Security model for IoT. [9]
b) What is threat model? How threat model is used in securing IoT applications? [9]

OR

- Q8)** a) What is Identity establishment? Explain in detail Identity establishment used for IoT. [9]
b) Explain in detail Security Requirements for IoT. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4472

[Total No. of Pages : 2

[6403]-280

T.E. (Computer Science and Design)

ARTIFICIAL INTELLIGENCE

(318251) (2019 Pattern) (Semester - VI)

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) Assume suitable data if necessary.

- Q1)** a) Explain Adversarial Search with an example. Explain Features of AI games. **[9]**
- b) Explain Mini-max Algorithm in brief with an example. **[8]**

OR

- Q2)** a) What is CSP? What are the issue that need to be addressed for solving CSP efficiently? Explain the Solution to them. **[9]**
- b) Explain Alpha-Beta Tree search and cutoff procedure in detail with an example. **[8]**

- Q3)** a) What are the various approaches to knowledge representation? Difference between knowledge representation and knowledge acquisition? **[9]**
- b) Explain WUMPUS World Environment giving its PEAS description. **[8]**

OR

- Q4)** a) What is Propositional logic? Write syntax and semantics for propositional logic. **[8]**
- b) Explain Predicate logic? Write 1st order predicate logic of **[9]**
- i) Everyone loves everyone except himself
 - ii) Every student except George smiles

P.T.O.

- Q5) a)** What is Inference? Explain different types of Inference rule for FOL.[9]
- b)** Explain Modus Ponens with suitable example. [9]

OR

- Q6) a)** Explain backward chaining and forward chaining algorithm with an example. [9]
- b)** Consider the following statements: [9]

- i) All people who are earning are happy
- ii) All happy people smile
- iii) Someone is earning

Perform the following tasks:

- i) Represent above statements in FOL
- ii) Convert each to CNF
- iii) Prove that someone is smiling using resolution technique.

Draw the resolution tree

- Q7) a)** What is planning in AI? Discuss partial order planning and hierarchical planning in detail. [9]
- b)** Write a short note on: [9]
- i) Limits of AI
 - ii) Ethics of AI
 - iii) Future of AI

OR

- Q8) a)** Explain Classical planning and Hierarchical Planning. [9]
- b)** Write a short note on AI Architecture. Discuss its ethical concerns. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4473

[Total No. of Pages : 2

[6403]-281

**T.E. (Computer Science and Design Engineering)
Web Technology and Application Design
(318252) (2019 Pattern) (Semester - VI)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q1or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Make suitable assumptions if necessary*
- 4) *Figure to the right indicates full marks.*

- Q1)** a) Explain the need of XML. List strengths of.XML technology? [6]
- b) Explain the lifecycle of servlet. Write a simple servlet to print “Hello, Good Day”? [6]
- c) Explain cookies in servlet with example. [6]

OR

- Q2)** a) Describe servlet architecture in detail? [6]
- b) Explain DTD in XML with schemes, elements & attributes? [6]
- c) Explain Working of AJAX. [6]
- Q3)** a) Write and Explain a JSP program to demonstrate use of page directive, scriptlet and expression tag? [6]
- b) Explain the concept of WSDL and SOAP [6]
- c) What is JSP? Enlist advantages of JSP over servlet? [5]

OR

P.T.O.

- Q4)** a) Draw and explain neat diagram architecture of Struts? [6]
- b) Explain JSP support for MVC i.e. model, view controller for developing web application? [6]
- c) Identify & justify the benefits of using Web Services. [5]
- Q5)** a) Describe various (at least 3) data types in PHP with example? [6]
- b) Explain session management in PHP? [6]
- c) Explain overview of node JS. [6]

OR

- Q6)** a) Write short notes on: Overview of ASP. NET [6]
- b) List and Explain steps involved in connecting to MySQL with PHP? [6]
- c) What is multi-dimensional arrays in PHP? Explain it with simple PHP code [6]
- Q7)** a) Explain the scalar types (At least 3) & their operations in Ruby? [6]
- b) Explain Rails with AJAX in detail. [6]
- c) Explain classes and objects in Ruby with appropriate examples. [5]

OR

- Q8)** a) Describe layouts & stylesheet in Rail? [6]
- b) Draw and explain the role of EJB container in Enterprise applications?[6]
- c) Explain how to write the methods and call the method in RUBY with example. [5]



Total No. of Questions : 8]

SEAT No. :

PD4474

[Total No. of Pages : 2

[6403]-282

T.E. (Computer Science and Design)

UI/UX DESIGN

(2019 Pattern) (Semester - VI) (318253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn whenever necessary.*
- 4) Make suitable assumption whenever necessary.*

- Q1)** a) Explain the role of usability testing in the design process. Discuss the steps involved in conducting a successful usability test. [8]
- b) Describe three common usability problems in interface design. Provide brief explanations of each problem. [5]
- c) Discuss the significance of expert reviews in interface design. [5]

OR

- Q2)** a) Explain the effectiveness of different development methodologies (e.g., Agile, Waterfall) in supporting usability in interface design? [8]
- b) Explain the concept of objective measures of usability and provide two examples of such measures used in interface evaluation. [5]
- c) What is interface design? Provide two advantages and two limitations of expert reviews in interface design. [5]

- Q3)** a) Explain the concept of direct manipulation in user interface design. [6]
- b) Explain the function of menus, the content they should contain, and strategies for organizing and phrasing menu items effectively. [6]
- c) Evaluate the role of collaboration features and social media integration in modern user interfaces. [5]

OR

- Q4)** a) Describe two key principles of direct manipulation interfaces and how they enhance user experience compared to indirect manipulation methods. [6]
- b) Explain the difference between hierarchical and flat menu structures. [6]
- c) Discuss two strategies for encouraging user participation in social media activities within a digital interface. Provide examples of interfaces that successfully implement each strategy. [5]

P.T.O.

- Q5)** a) Explain three elements commonly found in windowing systems? Provide a brief explanation of each. [6]
- b) Given a scenario where a user needs to select multiple options from a list, propose an appropriate interface design using check boxes. Justify your design based on usability principles. [6]
- c) Discuss two potential benefits and two challenges associated with incorporating natural language processing capabilities into screen-based controls. [6]

OR

- Q6)** a) Explain the purpose and functionality of radio buttons, check boxes, and list boxes as selection controls in user interfaces. [6]
- b) Compare and contrast the operable controls of buttons, sliders, tabs, and scroll bars in user interfaces. [6]
- c) Explain the effectiveness of using natural languages in computer interfaces. [6]

- Q7)** a) Explain the two models used to represent response time impacts on quality of service in user interfaces? [6]
- b) Explain the challenges associated with information visualization. [6]
- c) What are the societal and individual impacts of user interface design? [5]

OR

- Q8)** a) Discuss two ways in which user interfaces can influence societal behavior and two ways they can impact individual user experiences. [6]
- b) Explain the concept of balancing function and fashion in user interface design. [6]
- c) Given a scenario where a user encounters an error message on a website, propose two design strategies for displaying error messages effectively. Justify your choices based on usability principles. [5]



Total No. of Questions : 8]

SEAT No. :

PD4475

[6403]-283

[Total No. of Pages : 2

T.E. (Computer Science and Design Engineering)

MULTIMEDIA TECHNIQUES

(2019 Pattern) (Semester - VI) (318254 A) (Elective - II)

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) Mobile phones and programmable calculators are strictly prohibited.
- 3) Assume suitable data whenever required.

Q1) a) What is UHD TV, and how does it differ from HDTV? **[9]**

b) Explain the role of HDMI in digital video transmission? **[9]**

OR

Q2) a) Discuss the advantages and disadvantages of CRT displays compared to modern display technologies? **[9]**

b) Explain Nyquist theorem in detail? **[9]**

Q3) a) Explain Differential Binary Coding (DBC) and Arithmetic Coding (AC)? **[9]**

b) Explain the main components and processes involved in JPEG compression? **[9]**

OR

Q4) a) Explain MPEG-1 standard in detail? **[9]**

b) Explain the principles behind lossless (Lossy) compression algorithms? **[9]**

P.T.O.

Q5) a) Explain the concept of VRML (Virtual Reality Modelling Language) and its role in modelling objects and virtual environments? **[9]**

b) Outline some best practices for designing and developing VR, AR, and MR applications? **[8]**

OR

Q6) a) Distinguish between Virtual reality and Augmented reality? **[9]**

b) Write short note on Head Mounted VR displays? **[8]**

Q7) a) Discuss the types of sensors and devices used in health monitoring IoT systems? **[9]**

b) Discuss the Big Data Layered architecture used in Multimedia IoT applications? **[8]**

OR

Q8) a) Differentiate between IoT and multimedia-IoT. **[9]**

b) Discuss the use of Multimedia IoT in industrial applications such as manufacturing, logistics, and supply chain management? **[8]**

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Total No. of Questions : 8]

SEAT No. :

PD4476

[6403]-284

[Total No. of Pages : 2

T.E. (Computer Science and Design Engineering)

AUGMENTED AND VIRTUAL REALITY

(2019 Pattern) (Semester - VI) (318254(B)) (Elective -II)

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) How to render complex sounds in Aural Rendering Systems? [6]
b) Explain Visual Rendering Systems in detail? [6]
c) List out different methods for simplifying the amount of information needed to pass between simulation and haptic rendering. Explain any three in detail. [6]

OR

- Q2)** a) Describe haptic rendering methods in detail. [6]
b) Explain aural and haptic representation in Virtual reality. [6]
c) What is rendering system? Describe different methods of aural rendering. [6]

- Q3)** a) State and explain different Properties of Manipulation. [6]
b) Explain Manipulation Operations in detail. [6]
c) Write a short note on Interacting with the VR System. [6]

OR

- Q4)** a) What is Way finding? Enlist real and virtual-world aids to improve way finding in navigation. [6]
b) Explain User Interface Metaphors. [6]
c) Explain the four categories of substance in the virtual world. [6]

P.T.O.

- Q5)** a) What is Depth Cues? Explain Monoscopic and Stereoscopic image depth in detail. [6]
- b) Describe Registration and Latency related to AR systems. [6]
- c) Explain which displays are used as an Augmented Reality Hardware.[5]

OR

- Q6)** a) What is augmented reality? Enlist different ingredients of an augmented reality experience. [6]
- b) What are different categories of processors that are used in AR systems?[6]
- c) Explain the working of augmented reality in detail. [5]

- Q7)** a) What are marker based and marker-less tracking system in augmented reality? Explain. [6]
- b) Describe different software components used for the augmented reality software. [6]
- c) Write short note on mobile augmented reality. [5]

OR

- Q8)** a) State advantages and disadvantages of Augmented Reality Systems. [6]
- b) Explain software tools used for content creation in AR? [6]
- c) Write short note on Interaction in Augmented Reality. [5]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4477

[6403]-285

[Total No. of Pages : 2

T.E. (Computer Science And Design)

CLOUD COMPUTING

(2019 Pattern) (Semester - VI) (318254C) (Elective - II)

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 the Virtualization Architecture and software with neat diagram.[9]
b) Explain in brief Virtual Clusters and Resource Management. [8]

OR

- Q2)** a) What is virtualization in grid. Explain the Virtualization Software Security and Cloud Security. [9]
b) Write note on [8]
i) CPU virtualization
ii) Memory virtualization
iii) Desktop virtualization
iv) OS Level virtualization

- Q3)** a) What are AWS load balancing services? Explain the Elastic load Balancer and its types with its advantages. [9]
b) What is AWS? What are the services provided by AWS & AWS components. [8]

OR

- Q4)** a) Write Application for Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing.[9]
b) Explain Openstack Architecture in details with Diagram. [8]

P.T.O.

- Q5) a)** What is in cloud. How to manage the risk in cloud explain in brief. **[9]**
- b)** Explain the Cloud Security Services in details. **[9]**

OR

- Q6) a)** What are the Challenges, Advantages and Disadvantages of Data Security in Cloud. **[9]**
- b)** What do you mean by Cloud Digital persona and Data security? **[9]**

- Q7) a)** Explain the Mobile Cloud Computing with its architecture. **[9]**
- b)** What is Docker in Cloud Computing. Explain docker Architecture with neat diagram. **[9]**

OR

- Q8) a)** Describe DevOps Architecture in Cloud Computing. And its applications. **[9]**
- b)** Explain the Applications of IoT and Cloud in **[9]**
- i)** Your Home.
 - ii)** Your Vehicles.
 - iii)** in healthcare

x x x

Total No. of Questions : 8]

SEAT No. :

PD4478

[6403]-286

[Total No. of Pages : 2

T.E. (Computer Science and Design Engineering)
BUSINESS INTELLIGENCE AND DATAANALYTICS
(2019 Pattern) (Semester - VI) (318254D) (Elective -II)

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) Explain any three types of reports in detail. [6]
b) Differentiate between relational vs Multidimensional data models. [6]
c) Write short note on Filtering Reports. [5]

OR

- Q2)** a) Explain in detail drill up, drill down & drill-through operations. [6]
b) Write short note - Power BI Case Study. [6]
c) Write short note on Run or schedule report. [5]

- Q3)** a) Explain Data validation in detail with example. [7]
b) Explain Identification of outliers for numerical attributes. [5]
c) Write a short note on Data reduction. [5]

OR

- Q4)** a) Explain Data transformation in detail with example. [7]
b) Difference between Univariate, Bivariate, Multivariate analysis. [5]
c) Write short note on Data discretization. [5]

P.T.O.

- Q5)** a) Explain concept of Logistic regression in detail. [5]
b) Write a short note on Classification problems. [5]
c) Explain Clustering and its methods in details with examples. [8]

OR

- Q6)** a) Explain Association rule and its types. [5]
b) Explain Evaluation of classification models in detail. [5]
c) Write the steps of Apriori Algorithm to find frequent item set in details with example. [8]

- Q7)** a) Explain different tools for Business Intelligence with Example. [6]
b) Explain Role of BI in salesforce management. [6]
c) Explain role of BI in Human Resource Management. [6]

OR

- Q8)** a) Explain BI application in CRM. [6]
b) Explain BI application in inventory management system. [6]
c) Explain Case study of Analytical Tools-WEKA, KNIME. [6]

x x x

Total No. of Questions : 10]

SEAT No. :

PD4479

[Total No. of Pages : 2

[6403]-287

T.E. (Civil) (Honors)

**PLANNING & QUANTITY ESTIMATION FOR METRO
CONSTRUCTION**

(2019 Pattern) (Semester - VI) (301303)

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 and Q.7 or Q.8.Q.9 or Q.10.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary and clearly state.*
- 5) *Use of cell phone is prohibited in the examination hall.*
- 6) *Use of electronic pocket calculator is allowed.*

Q1) a) Explain the purpose of land acquisition under the Right to fair compensation Act 2013. [7]

b) Explain the important features of the new Land Acquisition Act 2013? [7]

OR

Q2) a) Explain 3G and 3H in land acquisition? [7]

b) Explain the types of Land acquisition? [7]

Q3) a) Prepare detailed estimate of Elevated section (viaduct). [7]

b) Explain steps involved in construction of Underground section by Cut and Cover. [7]

OR

Q4) a) Prepare detailed estimate of Underground station (Civil work). [7]

b) Explain steps involved in construction of Elevated station (E&M work including lift and escalator) [7]

Q5) a) Which factors are influencing the investment decision? [7]

b) Enlist capital budgeting techniques and explain any 2 in brief. [7]

OR

P.T.O.

- Q6)** a) Define the concept of cost of capital. State how you would determine the weighted average cost of capital of firm. [7]
b) Explain Risk identification techniques? [7]

- Q7)** a) Define Financial Support for PPPs in Infrastructure. [7]
b) Explain types of contract documents used for construction. [7]

OR

- Q8)** a) Describe types of Construction Contract Specifications. [7]
b) Define how to calculate compensation under Land Acquisition Act 2013? [7]

- Q9)** a) Explain are merits and demerits of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (New Act)? [7]
b) Explain the rules for land acquisition? [7]

OR

- Q10)** a) Explain Construction Contract Specifications? [7]
b) Explain the benefits of land acquisition? [7]



Total No. of Questions : 8]

SEAT No. :

PD4480

[Total No. of Pages : 2

[6403]-288

T.E. (Civil)

HONORS IN ARCHITECTURE AND TOWN PLANNING

Sustainable Architecture and Landscape Design

(2019 Pattern) (Semester - VI) (301403)

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 required*
- 5) *Use of calculator is allowed.*

- Q1)** a) Write a note on features and benefits of Green Residential Cluster. [6]
b) How existing water bodies are developed for benefitting adjoining area? [6]
c) Explain in brief any five features of Smart City. [5]

OR

- Q2)** a) Explain the need of green belt and its outcome. [6]
b) What are the roles of an architect and an urban planner in sustainable planning? [6]
c) Explain in brief any five core infrastructure elements of a smart city. [5]

- Q3)** a) Enlist the different principles considered for landscape design and explain any 2 in detail. [6]
b) What is the need of drainage in landscaping? [6]
c) Write a note on different environmental factors considered in landscape planning. [5]

OR

- Q4)** a) Explain in detail economic, social and ecological importance of landscaping? [6]
b) What is the need of landscape assessment and its use in planning? [5]
c) Explain different types of landscaping in detail. [6]

P.T.O.

- Q5)** a) What is meant by a green roof? How it is beneficial? [6]
b) Write down in detail any six purposes of landscaping. [6]
c) Which factors are considered while designing a green roof for residential building? Explain in detail. [6]

OR

- Q6)** a) Elaborate how to plan landscape area. [6]
b) What are the purposes of green roofing? [4]
c) Explain in detail the process of landscape planning. [8]

- Q7)** a) Explain the following factors that affects the landscape development in rural areas : [6]
i) Road land width,
ii) Drainage
b) In what way landscape is developed in urban area? [6]
c) Explain various measures taken to improve landscape of existing road. [6]

OR

- Q8)** a) Explain in detail any three factors affecting landscaping development in urban areas. [6]
b) Write a note on desert area as a type of landscape. [6]
c) Write a note on “Landscape treatment for coastal highways” [6]



Total No. of Questions : 8]

SEAT No. :

PD4481

[Total No. of Pages : 2

[6403]-289

T.E. (Mechanical Engineering) (Honors)
DESIGN FOR ADDITIVE MANUFACTURING
(2019 Pattern) (Semester - VI) (302013MJ)

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) Use of Non-Programmable Scientific Calculators is allowed.*
- 4) Figures to the right indicate full marks.*

Q1) a) What kind of defects generated in AM system? How to rectify them?
Discuss in detail. **[9]**

b) What does “relative fit” mean? Why is it only relevant for AM? **[8]**

OR

Q2) a) Why anisotropy is an important problem for AM? Which plastic AM processes show anisotropic effects to what extend? **[9]**

b) Enlist various AM technologies? Explain how to select AM technologies using decision methods. **[8]**

Q3) a) What is slicing & why is it important in AM? Explain 3D Slicing Strategies. **[9]**

b) Classify and Explain 2D and 3D Path Planning in AM. **[9]**

OR

Q4) a) Enlist path planning strategies in AM and explain any three strategies in details. **[9]**

b) Write short note on : **[9]**

i) Acetone treatment

ii) Heat Treatment

iii) Hot Isostatic Pressing

P.T.O.

- Q5)** a) What is use of FEA and CFD in additive manufacturing? Explain with suitable example. [9]
- b) What is topology optimization? Explain the benefits of topology optimization in additive manufacturing. [8]

OR

- Q6)** a) What are ISO and ASTM standards? Explain ISO and ASTM standards for Additive Manufacturing. [9]
- b) Write short note on point cloud data processing. [8]

- Q7)** a) What is 3D scanning process? Classify and Explain the types of 3D scanners. [9]
- b) Explain the significance of Reverse engineering in Biomedical Engineering, Product Development and Manufacturing. [9]

OR

- Q8)** a) What is the relationship between Reverse Engineering and Rapid Prototyping for Layer-based Model generation. [9]
- b) Classify and Explain the types of measuring devices used in reverse engineering. [9]



Total No. of Questions : 8]

SEAT No. :

PD4482

[Total No. of Pages : 2

[6403]-290

T.E. (Mechanical) (Honors)

ENERGY EFFICIENCY IN THERMAL UTILITIES

(2019 Pattern) (Semester - VI) (302023MJ)

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 wherever necessary and mention the same clearly.*
- 5) *Use of steam tables, Mollier chart and calculator is allowed.*

- Q1)** a) Discuss various ways for efficient steam utilization. [8]
b) Explain the major causes for steam trap blowing. [5]
c) Give suggestive guidelines for the installation of steam traps. [5]

OR

- Q2)** a) What are the different energy conservation opportunities in steam distribution system? [8]
b) What are the benefits of condensate recovery? [5]
c) Define dry saturated steam and why dry saturated steam is preferred for heating applications? [5]

- Q3)** a) What are the energy conservation opportunities in furnaces? [7]
b) Explain any five important properties of Ceramic Fibers used in furnaces. [5]
c) Explain Heat Transfer in Furnaces. [5]

OR

- Q4)** a) Explain different ways of heat losses in furnaces? What is direct and indirect method of assessment of furnace? [7]
b) Explain the need of high emissivity coating. [5]
c) Explain the significance of furnace draught control. [5]

P.T.O.

- Q5)** a) Explain the need and principal of cogeneration. [8]
b) List down all the Important Technical Parameters for Cogeneration. [5]
c) Explain steam turbine and gas turbine cogeneration system. [5]

OR

- Q6)** a) Explain gas turbine cogeneration system with neat schematic sketch. [8]
b) Give classification of cogeneration system. Explain any one type in detail. [5]
c) Explain Grid Dependent System Versus Independent System. [5]

- Q7)** a) Explain the role of economizer in steam generation. [7]
b) What are the direct and indirect benefits of waste heat recovery? [5]
c) Explain the operating principle of a regenerator. [5]

OR

- Q8)** a) Give typical examples of high, medium and low temperature heat recovery sources. [7]
b) What are the different heat recovery devices which are used commercially? [5]
c) What are the major points to be considered for developments of WHRS? [5]



Total No. of Questions : 8]

SEAT No. :

PD4483

[Total No. of Pages : 2

[6403]-291

T.E. (Mechanical/Electrical) (Honors)
e-VEHICLE SYSTEM DESIGN
(2019 Pattern) (Semester - VI) (302033MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) Draw neat labeled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of non-programmable electronic calculator is permitted.*
- 5) Assume Suitable/Standard data if necessary.*

Q1) a) Classify braking system used in automotive. **[8]**

b) Explain traction control system in EV. **[9]**

OR

Q2) a) Explain regenerative braking system. **[8]**

b) Explain traction control system in EV. **[9]**

Q3) a) Explain all wheel drive layout design. **[8]**

b) Explain Transmission system in e-Vehicle. **[9]**

OR

Q4) a) Explain Transmission system in e- Vehicle. **[8]**

b) What is open and locked differential system. **[9]**

Q5) a) Explain battery compartment and its need in E-Vehicle. **[9]**

b) Write short note on : **[9]**

i) Vent management system

ii) Pack cooling system

OR

P.T.O.

- Q6)** a) Explain battery performance degradation modelling. [9]
b) Explain effect of Overcharging and Deep Discharging EV Batteries. [9]

- Q7)** a) Explain ergonomics base Roll cage with neat sketches. [9]
b) Explain the importance and process involved in Crash/Impact analysis. [9]

OR

- Q8)** a) Explain Vehicle dynamics and its components. [9]
b) Explain structural design aspect of roll cage/body frame. [9]



Total No. of Questions : 8]

SEAT No. :

PD4484

[Total No. of Pages : 2

[6403]-292

T.E. (Mechanical Engineering)(Honors in Systems Engineering)

MODEL BASED SYSTEMS ENGINEERING

(2019 Pattern) (Semester - VI) (302043MJ) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Provide an overview of the various types of diagrams in SysML and their structures. Explain the purpose and use of each diagram type. [9]
- b) Discuss how behavioral diagrams in SysML relate to the structural level of system models. Explain how changes in one aspect may impact the other. [9]

OR

- Q2)** a) Describe the methodology used in Model-Based Systems Engineering (MBSE). Discuss its importance in system modeling and development. [9]
- b) Explain the different formats used in SysML, such as XML, REQIF, and UXF. Discuss their purposes and compatibility with various tools. [9]

- Q3)** a) Describe the methodologies used in Object Oriented Systems Engineering (OOSE). Discuss how these methodologies are applied in system modeling. [9]
- b) Provide an introduction to process modeling in Systems Engineering. Explain its importance and how it contributes to system development. [8]

OR

- Q4)** a) Describe the general framework used in Systems Engineering processes. Discuss its components and how they interact. [8]
- b) Describe the framework used for requirements modeling in MBSE. Discuss its components and how they are used to capture system requirements. [9]

P.T.O.

- Q5)** a) Explain the Vee-Model and Iterative Model frameworks used in Systems Engineering. Discuss their structure and application in system development processes. [9]
- b) Explain the viewpoint relationship in brief. [9]

OR

- Q6)** a) Discuss the process of requirement and assumption validation in MBSE. Explain its importance in ensuring the quality and reliability of system designs. [9]
- b) Explain the Vee-Model framework in detail. Discuss its structure and the relationship between different stages of the model. [9]

- Q7)** a) Explain the approach to Context-based Requirements Engineering (ACRE). Discuss how it helps in capturing and analyzing system requirements. [8]
- b) Discuss the concept of requirements traceability in MBSE. Explain how it helps in managing changes and ensuring alignment with stakeholder needs. [9]

OR

- Q8)** a) Explain the importance of stakeholders in requirement modeling. Discuss how their involvement influences the modeling process and the quality of requirements. [8]
- b) Describe the various tools and techniques available for requirement modeling in MBSE. Discuss their features and applications in capturing and managing requirements. [9]



Total No. of Questions : 8]

SEAT No. :

PD4485

[Total No. of Pages : 2

[6403]-293

T.E. (Electronics & Telecommunication) (Honors)
DECENTRALIZE & BLOCKCHAIN TECHNOLOGIES
(2019 Pattern) (Semester - VI) (304183 HBCT)

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 indicates full marks.

- Q1)** a) Explain consensus algorithm in detail [6]
b) What are hash functions and Hash puzzles? [6]
c) Explain terms : [6]
i) Proof of Activity
ii) Proof of Burn

OR

- Q2)** a) Explain Byzantine General Problem. [6]
b) What is Proof of stake? Enlist Types of PoS. [6]
c) What are Blocks in a Blockchain? Enlist the disadvantages of Proof of work. [6]

- Q3)** a) What is Ethereum? Enlist benefits of building on Ethereum. [6]
b) Explain Ethereum Virtual Machine (EVM) in detail. [6]
c) What is the Difference Between Bitcoin and Ethereum Blockchain. [6]

OR

- Q4)** a) What are the Real-World Use Cases of Ethereum? [6]
b) Explain the terms : [6]
i) Ethereum Clients
ii) Ethereum Wallets
c) Explain the terms : [6]
i) Ethereum Accounts
ii) Ethereum Platforms

P.T.O.

- Q5)** a) What are the factors to consider when choosing Blockchains? Explain two factors in detail. [8]
- b) What is the goal of blockchain? How does blockchain help in decision making? [9]

OR

- Q6)** a) What are the 4 different types of blockchain technology? Explain one of blockchain technology type in detail. [8]
- b) What are the most important opportunities for deploying blockchain technology in business? Explain one in detail. [9]

- Q7)** a) Explain how blockchain used in Medical record management system. [8]
- b) What is meant by Domain Name Service in blockchain? Explain in detail. [9]

OR

- Q8)** a) Explain future scope of blockchain in detail. [8]
- b) Where is blockchain used in real life? Explain the use of blockchain in IoT. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4486

[Total No. of Pages : 2

[6403]-294
T.E. (E&TC)
Honors in Robotics
ROBOT PROGRAMMING & SIMULATION
(2019 Pattern) (Semester - VI) (304183HR)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, 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 indicate full marks.*

- Q1)** a) Explain motion control, hand control, program control commands used in robotic programming with example [6]
- b) Briefly explain the Production rate calculations used for robot in detail [6]
- c) Explain any three basic commands in VAL-II with example. [6]

OR

- Q2)** a) W.r.t. VAL-II programming language explain simple pick and place application. [6]
- b) Explain WAIT, SIGNAL and DELAY commands used in robotics for communications using simple application. [6]
- c) With schematic diagram, explain the robotic applications in welding industry. [6]
- Q3)** a) Explain manual and automatic mode of operation of industrial robot. [6]
- b) With simple example explain move master command language. [6]
- c) With suitable example explain different constants and variables used in AML Language of robot. [6]

P.T.O.

OR

- Q4)** a) Describe Pick and place operation using Industrial robot. [6]
b) With suitable example explain different Program control statements are used in AML language of robot. [6]
c) Describe the different Motion & Sensor commands of AML language of robot. [6]
- Q5)** a) Write short note on Virtual robotics. [5]
b) Discuss the concept of soft robotics? Explain Robotic Process Automation in details. [6]
c) Discuss in detail about Robot studio online software. [6]

OR

- Q6)** a) What is role of Computer vision in AR and VR. [6]
b) Discuss machine interference w. r.t. Multiple robots. [5]
c) Write advantages and disadvantages of simulation. [6]
- Q7)** a) Explain Distributed lag models in details. [5]
b) What are the basics of simulation? Discuss different Steps in simulation [6]
c) Describe role of simulation in decision making. [6]

OR

- Q8)** a) Discuss different techniques of simulation? Explain monte carlo method in details. [7]
b) Compare simulation packages with programming languages. [5]
c) Describe general purpose simulation packages in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4487

[Total No. of Pages : 2

[6403]-295

T.E. (Printing) (Honors)

SMART PACKAGING

(2019 Pattern) (Semester - II) (308213)

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 and 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 whenever necessary.*

Q1) a) Describe in detail active packaging. State 2 examples to explain the concept of active packaging. **[10]**

b) State the basic concepts of active and intelligent packaging. **[7]**

OR

Q2) a) Give an overview of smart packaging in the food industry. **[6]**

b) What are advantages of smart packaging? **[5]**

c) How to choose the correct type of packaging for the particular application? **[6]**

Q3) a) Explain the advantages of using IOT in smart packaging. **[12]**

b) Which were first applications of RFID technology. Describe any one application in brief. **[6]**

OR

Q4) a) State the classification of RFID tags based on frequency, power source and chip. **[6]**

b) State the different types of RFID tags available in the market. Briefly explain the utility of each type. **[12]**

P.T.O.

- Q5)** a) Explain the working principle of the operation of NFC. Name the different modes of operation of NFC systems. [11]
b) Briefly explain any three NFC applications. [6]

OR

- Q6)** a) Explain any 3 applications used for packaging that use NFC tags. [10]
b) Write short notes on Networking nodes and Connecting nodes. [7]

- Q7)** a) Give an overview of smart packaging in the pharma industry. [12]
b) How to choose the correct types of packaging for the particular application? [6]

OR

- Q8)** a) Give examples use of intelligent packaging in Food packaging. [6]
b) Describe any implementation stage of smart packaging in a food packaging industry. [12]



Total No. of Questions : 8]

SEAT No. :

PD-4488

[Total No. of Pages : 3

[6403]-296

T.E. (Artificial Intelligence and Machine Learning) (Honors)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - VI) (310303)

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 whenever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Represent the following sentences into formulas in predicate logic. **[9]**

- i) John likes all kinds of food.
- ii) Apples are food.
- iii) Chicken are food.
- iv) Anything anyone eats and isn't killed by is food.
- v) Bill eats peanuts and is still alive.
- vi) Sue eats everything Bill eats.

b) Explain Unification algorithm with suitable example. **[8]**

OR

Q2) a) Explain various operators used in propositional logic for knowledge base building. **[9]**

b) Explain Bayesian inference using a suitable example. **[8]**

Q3) a) Explain how Support vector Machines are used for classification with suitable example. **[6]**

b) Explain how Decision Trees are used in Learning. **[6]**

c) Explain : **[6]**

- i) Supervised Learning
- ii) Unsupervised Learning

P.T.O.

OR

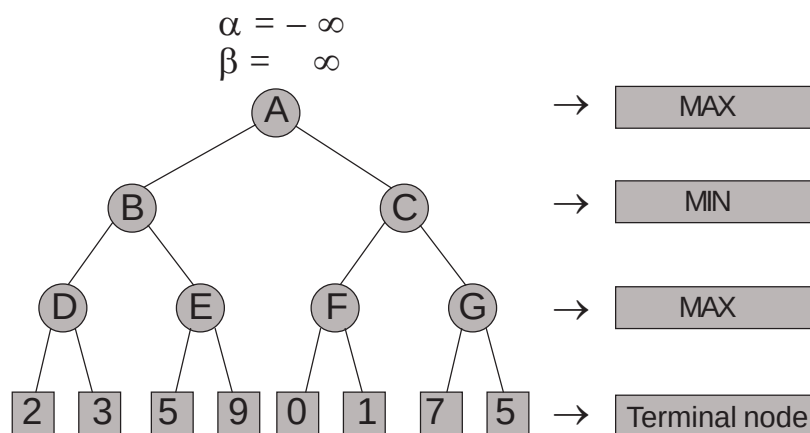
- Q4)** a) What is Artificial Neural Network? Give two applications of artificial neural networks in detail. [6]
- b) With the help of an architecture diagram explain multilayer feed forward artificial neural network. [6]
- c) Explain linear regression. Find linear regression equation for the following two sets of data : [6]

X	Y
2	3
4	7
6	5
8	10

- Q5)** a) Illustrate Mini-Max search for the tic-tac-toe game. [9]
- b) Explain Alpha-Beta Pruning with an example. [8]

OR

- Q6)** a) Write anote on : [9]
- i) Types of Games in AI.
- ii) State-of-the-art Game Programs
- b) Solve given two player search tree using Alpha-beta pruning. [8]



- Q7)** a) Explain forward chaining and backward chaining for a simple example. **[9]**
b) What is NLP? Explain all five phases of NLP. **[9]**

OR

- Q8)** a) Explain the applications of Natural Language Processing. **[9]**
b) Represent the architecture of an expert system. label the various components in the diagram and explain. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4489

[Total No. of Pages : 2

[6403]-297

T.E. (Honors) (Cyber Security)

ENTERPRISE ARCHITECTURE AND COMPONENTS

(2019 Pattern) (Semester - VI) (310403)

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) Explain the significance of the component model in software architecture. [5]
- b) Identify the key elements found in a component interaction diagram. [6]
- c) How would you use a component description to document a software component? Provide an example. [6]

OR

- Q2)** a) Compare and contrast component interaction diagrams and component relationship diagrams. Provide examples for each. [9]
- b) Design a component interaction diagram for a real-time messaging application, and explain your design choices. [8]

- Q3)** a) List three service qualities relevant to operational models. [6]
- b) Explain the importance of understanding operational model design techniques in software development. [6]
- c) Describe the role of service qualities in shaping operational model design decisions. [6]

OR

- Q4)** a) Explain the role of context in selecting operational model design techniques for a given project. Provide examples to support your explanation. [9]
- b) Define the term 'operational pattern' and discuss its relationship with operational models. Provide examples to illustrate your explanation. [9]

P.T.O.

- Q5) a)** Provide definitions for ‘business scenario’ and ‘component deep dive’ in the context of software engineering. Explain how these terms are relevant to system design and development. **[6]**
- b)** Identify and explain three service qualities relevant to metadata management systems. Discuss their importance in ensuring the effectiveness of such systems. **[6]**
- c)** Define “metadata” and “master data” in the context of data management. Explain the importance of clear terminology in data-related projects. **[5]**

OR

- Q6) a)** Identify and explain three service qualities relevant to metadata management systems. Discuss their importance in ensuring the effectiveness and reliability of such systems. **[8]**
- b)** Describe a business scenario where effective metadata management is critical. Explain how proper metadata management practices can benefit the scenario. **[9]**
- Q7) a)** Describe how SABSA, COBIT, and TOGAF frameworks can be used to develop an enterprise security architecture. Provide a step-by-step approach, highlighting the key considerations at each stage. **[9]**
- b)** Explain how CMMI can be used to monitor, measure, and report the progress of architecture development activities within an organization. Discuss the key process areas and metrics relevant to this task. **[9]**

OR

- Q8) a)** Provide a real-life example of an organization that has successfully implemented SABSA, COBIT, and TOGAF frameworks in its enterprise architecture. Discuss the benefits achieved and challenges encountered during the implementation process. **[9]**
- b)** Outline the steps involved in using SABSA, COBIT, and TOGAF to develop an enterprise security architecture. Discuss the specific contributions of each framework in the process. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4490

[Total No. of Pages : 2

[6403]-298

T.E. (Computer Engineering) (Honors)
STATISTICS AND MACHINE LEARNING
(2019 Pattern) (Semester - VI) (310503)

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 diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, necessary.

- Q1)** a) Explain Matrix and Vector algebra with example. [6]
b) What is Matrix factorization concept explain with example? [6]
c) Explain systems of linear equations using matrices with one example. [6]

OR

- Q2)** a) What is concept of function and derivative, explain with example? [6]
b) What is concept of Multivariate calculus? [6]
c) Write short note on chain rule, Jacobian and Hessian. [6]

- Q3)** a) What is Machine Learning? What are the Applications of machine learning? [6]
b) How to design Learning system? [6]
c) What are the Machine Learning types? [6]

OR

- Q4)** a) What are the perspectives and issues in Machine Learning? [6]
b) Differentiate between supervised and unsupervised learning. [6]
c) Write short note on Reinforcement learning. [6]

P.T.O.

- Q5)** a) What are types of Regression? [6]
b) Write short note on simple regression. [6]
c) Describe Multivariable regression. [5]

OR

- Q6)** a) Differentiate between simple regression and multivariable regression. [6]
b) Describe in detail training and model evaluation of simple regression. [6]
c) Explain training and model evaluation of multivariable regression. [5]

- Q7)** a) Describe and explain the construction of decision tree. [6]
b) What are the classification of regression tree? [6]
c) Explain Bayes Theorem in detail. [5]

OR

- Q8)** a) Explain the working of Naïve's Bayes classifier. [6]
b) What are the types of Naïve's Bayes Model? [6]
c) Explain the advantages, disadvantages of Naïve's Bayes Model? [5]



Total No. of Questions : 8]

SEAT No. :

PD-4491

[Total No. of Pages : 2

[6403]-299

**T.E (Honors) Computer Engineering
Internet of Things Architectures, Protocols and
Systems Programming
(2019 Pattern) (Semester - VI) (310603)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume Suitable data, if necessary.*
- 4) *Use of Non-Programmable scientific Calculators is allowed.*

- Q1)** a) Explain the working of DTLS. [6]
b) Explain in brief session layer protocols. [6]
c) Explain in detail CoAP. [5]

OR

- Q2)** a) Describe in brief transport layer protocols. [6]
b) Explain in detail DCCP. [6]
c) Describe in detail SCTP. [5]

- Q3)** a) Explain in detail vulnerabilities security requirements and threat analysis. [6]
b) What is IoT Security Tomography? Explain. [6]
c) Describe IoT layered attacker model in detail. [6]

OR

P.T.O.

- Q4)** a) Describe Identity Management and Establishment in detail. [6]
b) Describe IoT Security Models. [6]
c) Explain in brief IoT Security Protocols [6]

- Q5)** a) Describe the components of Arduino [6]
b) Describe the role of Web/Cloud Services for IoT development. [6]
c) Explain the use of APIs. [5]

OR

- Q6)** a) Describe the components of Raspberry Pi. [6]
b) Explain essential features of web APIs. [6]
c) Describe the components of Intel Galileo [5]

- Q7)** a) Describe role of IoT for Smart Cities development. [6]
b) Describe the role of IoT for Industry. [6]
c) Describe the role of IoT for Health and Lifestyle [6]

OR

- Q8)** a) Explain the role of IoT for Home Automation [6]
b) Explain the role of IoT for Agriculture applications. [6]
c) Explain the role of IoT for Telecom/5G. [6]



Total No. of Questions : 8]

SEAT No. :

PD4492

[Total No. of Pages : 2

[6403]-300

T.E. (Computer Engineering) (Honors)

VIRTUAL REALITY AND AUGMENTED REALITY

Augmented Reality

(2019 Pattern) (Semester - VI) (310703)

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 indicates full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain natural feature tracking by detection in augmented reality. [9]
b) How pose estimation from Homography is done in marker tracking. Explain. [8]

OR

- Q2)** a) Explain incremental tracking in details. [9]
b) What are multiple cameras infrared tracking in AR? [8]

- Q3)** a) Explain Marker detection procedure. [6]
b) Write note on : [6]
i) 2D Barcode marker
ii) Imperceptible markers
c) Explain the term Hybrid tracking in detail. [6]

OR

- Q4)** a) Explain Visual tracking in AR. [6]
b) When to use marker-based tracking and how to speed up marker detection in detail? [6]
c) How to select a marker type. Explain with respect to system requirement. [6]

- Q5)** a) Write note on : [8]
i) Scene generator
ii) Projection display
b) Explain virtual retinal system in detail. [9]

OR

P.T.O.

Q6) a) Explain optical see-through and video see-through head mounted display. [8]

b) Explain with diagram monitor based augmented reality display. [9]

Q7) a) What is mixed reality? Explain the different application of mixed reality. [9]

b) Explain parallel tracking and mapping (PTAM) in detail. [9]

OR

Q8) a) Explain in detail working principle of SLAM. [9]

b) Explain Semi-direct monocular Visual Odometer (SVO) in detail. [9]



Total No. of Questions : 8]

SEAT No. :

PD4493

[Total No. of Pages : 2

[6403]-301

T.E. (Civil) (Honors)

SURVEYING IN METRO CONSTRUCTION

Metro Construction

(2019 Pattern) (Semester - V) (301301)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is the importance of good alignment in metro railway lines. **[9]**

b) Explain the traffic survey for metro construction. **[9]**

OR

Q2) a) Write a short note on Final Location Survey. **[9]**

b) Explain the construction of new lines of metro railways. **[9]**

Q3) a) Explain the various forces acting on the track. **[8]**

b) How the track performs as an elastic structure? Explain. **[9]**

OR

Q4) a) How the maintenance of permanent way is done, explain. **[8]**

b) Explain the requirements of a good track. **[9]**

P.T.O.

- Q5)** a) Write a short note on metro railway stations and yards. [9]
b) Explain the purpose of a metro railway station. [9]

OR

- Q6)** a) Write a short note on facilities required at a Metro Railway Stations. [9]
b) What are the different classification of metro railway stations. [9]

- Q7)** a) Write a short note on the size and shape of tunnel. [8]
b) Write a short note on shaft of tunnel. [9]

OR

- Q8)** a) Write a short note on lighting of Tunnels. [8]
b) Explain tunnel lining in details. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4494

[Total No. of Pages : 2

[6403]-302

T.E. (Civil)

HONORS IN “ARCHITECTURE AND TOWN PLANNING”

Urban Housing and Infrastructure Planning

(2019 Pattern) (Semester - V) (301401)

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.*

- Q1)** a) What is co-operative housing? Explain role of co-operative housing. [6]
b) Write a note on HUDCO. [6]
c) How housing demand models are useful? [5]

OR

- Q2)** a) Write a note on NHB. [6]
b) Explain the scenario of Rural housing finance. [6]
c) What is the role of urban local bodies for housing. [5]

- Q3)** a) Which Data is required for provision & planning of urban infrastructure?[6]
b) What is the need of urban infrastructure? Enlist the types. [6]
c) Write a note on: URDPFI guidelines and its contents for infrastructure.[5]

OR

- Q4)** a) What is the significance of urban infrastructure? [6]
b) For physical infrastructure what guidelines are mentioned? [6]
c) Elaborate : modes of transport as a major component of infrastructure.[5]

P.T.O.

- Q5)** a) Classify urban services mentioning its significance. [6]
- b) What are the requirements of appropriate technology. [6]
- c) How the services are designed and planned? [6]

OR

- Q6)** a) Enlist the services you observe normally in urban areas and explain its need. [6]
- b) Elaborate cost recovery means for providing services. [6]
- c) Mention the components with its usage of any two urban services. [6]

- Q7)** a) Mention the norms for water supply. [6]
- b) Elaborate the need of health service provisions. [6]
- c) Why recreation and open spaces are essential? [6]

OR

- Q8)** a) Mention the provisions for fire fighting. [6]
- b) Elaborate the need of educational service provisions. [6]
- c) Why street lighting and telecommunication are essential? [6]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4495

[6403]-303

[Total No. of Pages : 2

T.E. (Mechanical) (3D printing) (Honors)
ADDITIVE MANUFACTURING TECHNOLOGY
(2019 Pattern) (Semester - V) (302011MJ)

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 suitable neat diagrams, whenever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Assume suitable data if required.*

Q1) a) Sketch and explain Continuous Liquid Interface Production (CLIP) additive manufacturing technology. **[10]**

b) List out benefits and drawbacks of Digital Light Processing (DLP). **[8]**

OR

Q2) a) Explain with neat sketch working principle and process parameters of Stereolithography (SLA) additive manufacturing technology. **[10]**

b) Write the advantages, disadvantages and applications of light-based photo-curing technologies. **[8]**

Q3) a) Explain any two concepts: **[10]**

- i) Layer Adhesion
- ii) Shrinkage and Warping
- iii) Over sintering

b) Enlist materials used in laser based melting additive manufacturing technologies and state their applications in various industries. **[7]**

OR

Q4) a) Explain mechanism and parameters of Direct Metal Laser Sintering (DMLS) process with neat sketch. **[10]**

b) Write difference between: Metal Laser Sintering and electron Beam Melting. **[7]**

P.T.O.

- Q5) a)** Explain 3D Laser Cladding and Direct Metal deposition in short with its advantages and applications. **[10]**
- b)** Short note on Multi-jet Modeling (MJM). **[8]**

OR

- Q6) a)** What is Nanoparticle jetting? Explain the Color Jet Printing in detail with its neat sketch, advantages & applications? **[10]**
- b)** Explain with neat sketch Electron Beam-based DED. **[8]**

- Q7) a)** What are the applications of additive manufacturing technology in aerospace and automotive industry? **[10]**
- b)** What are the future trends in additive manufacturing? **[7]**

OR

- Q8) a)** Give short note on Bio-printing and its applications. **[10]**
- b)** Compare between 3D Printing with 4D Printing. **[7]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4496

[6403]-304

[Total No. of Pages : 2

T.E. (Mechanical) (Honors)

ENERGY MANAGEMENT

(2019 Pattern) (Semester - V) (302021MJ)

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)** Discuss the energy policy of the Government. **[10]**
- b) Write the responsibilities of energy auditor. **[8]**

OR

- Q2) a)** Discuss National Action Plan on Climate Change (NAPCC). **[10]**
- b) How do an Industry, Nation and Globe would benefit from energy efficiency programs? **[8]**

- Q3) a)** Give any five bench marking parameters followed in equipment/utility related in Industries. **[5]**
- b) Explain Preliminary energy audit and its importance. **[5]**
- c) Define the energy audit as per the energy conservation Act 2001. Discuss the need of energy audit. **[7]**

OR

- Q4) a)** List the different instruments used for energy audit and explain any two instruments. **[10]**
- b) Discuss energy audit report format. **[7]**

P.T.O.

- Q5) a)** Discuss simple payback period with its advantages and disadvantages.[8]
- b)** What is the NPV of a project (Life 2 years) which require an investment of Rs. 70000 and yield Rs. 50000 in the first year and Rs. 50000 in the next year, if the interest rate 10%. Comment on this investment whether it is worth or not. [10]

OR

- Q6) a)** Explain 'Internal Rate of Return' method of financial analysis with its advantages and disadvantages? [8]
- b)** Annual savings after replacement of boiler for three years is Rs. 6,00,000, Rs. 6,50,000, Rs. 6,50,000. Total project cost is Rs. 14.5 lakh. Considering cost of capital as 10%, what is the net present value of the proposal? [10]

- Q7) a)** Explain Global warming and its impact on environment. [10]
- b)** Discuss Kyoto Protocol. [7]

OR

- Q8) a)** Discuss International agreements about Environment and climate change.[10]
- b)** Explain Clean Development Mechanism (CDM). [7]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4497

[6403]-305

[Total No. of Pages : 2

T.E. (Mechanical/Automobile) (Honors)
E-VEHICLE TECHNOLOGY
(2019 Pattern) (Semester - V) (302031MJ)

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) *Draw the neat sketch wherever necessary.*

- Q1)** a) Write a short note on different components of li-ion battery with neat sketch? **[4]**
- b) What are the different chemistries of li-ion batteries? Mention in short significance of each of them for electric vehicle. **[8]**
- c) Explain the advantages and disadvantages and applications of li-ion batteries. **[8]**

OR

- Q2)** a) Explain the following parameters of li-ion batteries in short (any two), **[4]**
- i) Cell voltage
 - ii) Energy density
 - iii) Power density
- b) What is the type of charging li-ion battery? Explain the precautions needs to be taken while charging. **[8]**
- c) Write a short note on Availability of lithium ion batteries and government policies to fulfill the demands of lithium batteries for Indian e-vehicles. **[8]**

- Q3)** a) Explain battery management system with working mechanism and neat sketch? **[8]**
- b) Explain lead acid batteries with advantages, disadvantages and applications. **[8]**

OR

P.T.O.

- Q4) a)** Write a short note on need of thermal management system in e-vehicles? Explain with mechanism. **[8]**
- b) Explain Li-ion supercapaciter with advantages, disadvantages and applications. **[8]**

- Q5) a)** Write a short note on Mechanical and electrical connections of motors. **[8]**
- b) List out the Output characteristics of electric motor drives for EVs? **[8]**

OR

- Q6) a)** Write a short note on Output Characteristics of Motor Drives in EVs? **[8]**
- b) Explain different types of drives used in electric vehicle with neat sketches. **[8]**

- Q7) a)** Explain the significance of implementation of IOT in electric vehicle on basis of wireless sensor network with neat sketch wherever required. **[10]**
- b) What is battery swapping? Explain with Advantages And Challenges of Battery Swapping. **[8]**

OR

- Q8) a)** Explain the Significance of IOT for modes of fast and efficient charging in electric vehicles. **[8]**
- b) Write a short note on Battery Standards in electric vehicles with any two types? **[10]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4498

[6403]-306

[Total No. of Pages : 2

**T.E. (Mechanical Engineering)(Honors in Systems Engineering)
FOUNDATIONS OF SYSTEMS AND SYSTEMS ENGINEERING
(2019 Pattern) (Semester - V) (302041MJ)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Use a diagram to depict how other systems in the operational environment interact with the System of Interest (SOI), enabling systems, and other relevant systems. **[9]**
- b) Outline the stages of the system life cycle with a diagram and describe each stage. **[9]**

OR

- Q2)** a) Provide an illustrative example showcasing the concept of systems of systems. **[9]**
- b) Define systems science and provide examples demonstrating its interaction with the general systems approach, system thinking, and engineered systems. **[9]**
- Q3)** a) Utilizing an IPO diagram, elucidate the architectural definition procedure. **[9]**
- b) Provide a concise explanation of the trade-offs involved in system architecture. **[8]**

OR

- Q4)** a) Enumerate and explain various forms of system architecture. **[8]**
- b) Describe two different architectural types from the list provided in part. **[9]**

P.T.O.

- Q5)** a) Use a sketch to illustrate the fundamental structure of SysML (Systems Modeling Language). [9]
- b) Briefly discuss Modelling, Simulation, and Trade-off analysis. [9]

OR

- Q6)** a) Detail the development of Model-Based Systems Engineering (MBSE). [9]
- b) Describe the concept of Model-Based Systems Engineering (MBSE) modeling. [9]

- Q7)** a) Evaluate system dynamics models in a few succinct statements. [8]
- b) Explain the integration of simulation modeling within the Systems Engineering (SE) lifecycle. [9]

OR

- Q8)** a) Provide concise comments on quantitative modeling. [8]
- b) Explain the role of modeling in decision-making processes. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PD-5340

[Total No. of Pages : 2

[6403]-307

T.E. (Honors)

**INTRODUCTION TO BLOCK CHAIN
(2019 Pattern) (Semester - V) (304181HBCT)**

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 whenever necessary.*
- 3) *Figures to the right indicate full marks.*

- Q1)** a) Explain with diagram, core components of Block Chain networks in brief. [6]
- b) Classify and explain in brief various types of Block Chains. [6]
- c) List out need of a protocol in Block Chain Technology and key components of Block Chain Protocols. [6]

OR

- Q2)** a) Explain Permission and Permission less Block Chain in terms of access control and level of decentralisation. [6]
- b) With neat diagram, explain one applications of Block Chain Technology. [6]
- c) Describe supply chain, a block chain case studies to improve compliance. [6]

- Q3)** a) Explain in brief Digital hedger Technology with its features and advantages. [6]
- b) With neat diagram, explain how Block Chain is a decentralised digital hedger. [6]
- c) With neat diagram, explain application of distributed ledger technology in supply chain management. [6]

OR

P.T.O.

- Q4)** a) What is Hyperledger? Explain following components and modules that are given significance over functions and interactions. [6]
- i) Modular
 - ii) Highly secure
 - iii) Interoperability
- b) With neat diagram, explain Hyperledger and its architecture. [6]
- c) Describe Hyperledger composer in Block Chain Technology. [6]
- Q5)** a) Write a short note on (Any one) : [8]
- i) Cloud Based Block Chain
 - ii) Multi Chain Block Chain
- b) Elaborate following Block Chain related Technologies. [9]
- i) Geth
 - ii) Stellar

OR

- Q6)** a) Write a short note on Block Chain Application programming Interface.[9]
- b) List out 4 Benefits and applications of Block Chain Sandboxes. [8]
- Q7)** a) With neat diagram, explain supply chain management as Blockchain use cases. [9]
- b) Write a short note on following Block Chain use cases (Any one) [8]
- i) Loyalty programs
 - ii) Renewable Energy

OR

- Q8)** Write a short note on Block Chain use cases (Any two) : [17]
- a) Health care
 - b) Internet of Things
 - c) Supply chain management



Total No. of Questions : 8]

SEAT No. :

PD4499

[6403]-308

[Total No. of Pages : 2

T.E. (E&TC) (Honors in Robotics)

PRINCIPLES OF ROBOTICS-I

(2019 Pattern) (Semester - V) (304181HR)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt all questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Draw sketches where required.*

Q1) a) Explain principle, working & characteristics of vacuum grippers. [9]

b) Explain internal & external grippers with neat sketch. [9]

OR

Q2) a) Enlist the factors considered in selection & design of grippers. [9]

b) Explain with neat sketch Magnetic grippers. [9]

Q3) a) Explain force sensors with neat sketch. [9]

b) Explain LVDT. [8]

OR

Q4) a) Explain piezoelectric sensor with neat sketch. [9]

b) Explain capacitive sensors with neat sketch. [8]

P.T.O.

- Q5)** a) Enlist steps in forward kinetic analysis. [9]
b) Explain with neat sketch D-H parameter. [9]

OR

- Q6)** a) A 2DDF Planar RR manipulator has $L_1 = 120$ mm & $L_2 = 75$ mm. Determine joint angles using geometric approach, so that free end is located at (100, 70). [9]
b) State properties of generalised composite Rotation Matrix. [9]

- Q7)** a) Write short notes on (Any 3) : [3×4=12]
i) Pick & Place Robots
ii) Arc Welding Robots
iii) Home Automation
iv) Hospital care
b) Explain functions of Machine Vision Systems. [5]

OR

- Q8)** a) Draw Block diagram of Robot Vision System & explain its components. [8]
b) Write short notes on : [3×3=9]
i) Packaging industry
ii) AIML in Robotic industry
iii) Hospital & Patient care



Total No. of Questions : 8]

SEAT No. :

PD-4500

[Total No. of Pages : 2

[6403]-309

T.E. (Honors) (Printing Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester - V) (308211)

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) Explain the working of any Optical sensors and ultrasonic sensor used in IOT application. **[9]**

b) Explain the LDR interfacing using Arduino Board. **[9]**

OR

Q2) a) Explain the working of any two types of actuator used in IOT application. **[9]**

b) Explain the switch interfacing using Arduino Board. **[9]**

Q3) a) Explain the FHSS and DSSS technique used in WiFi communications. **[8]**

b) Explain the features and pinouts of ESP8266. **[9]**

OR

Q4) a) Explain role of web-server and mention the steps to be taken for posting the sensor data to the web- server. **[8]**

b) Explain the functional block diagram and advantages of ESP 8266. **[9]**

P.T.O.

Q5) Describe the benefits of cloud server and describe IaaS **[18]**

OR

Q6) Describe the issues and challenges in IOT **[18]**

Q7) Describe in detail about the role of IOT in smart city applications. **[17]**

OR

Q8) Explain implementation of IOT in Printing industry. **[17]**



Total No. of Questions : 10]

SEAT No. :

PD-5305

[Total No. of Pages : 2

[6403]-310R

T.E. (Honours in Artificial Intelligence and Machine Learning)

COMPUTATIONAL STATISTICS

(2019 Pattern) (Semester-V) (310301)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q 10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumptions whenever necessary.

- Q1)** a) What is Mean, Median and Mode with example? [5]
b) Difference between Univariate and Bivariate Analysis? [5]

OR

- Q2)** a) Explain the Histogram, Statistical Thinking with example? [5]
b) Difference between the Standard Deviation & Harmonic Mean with example? [5]

- Q3)** a) Explain Normal Distributions with example? [5]
b) Difference between the Characterizing a Distribution & Discrete Distributions? [5]

OR

- Q4)** a) Write down short note on Lognormal, Weigh bull, Exponential, Uniform? [5]
b) What is Poisson Distribution with suitable example? [5]

P.T.O.

- Q5) a)** Explain the Hypothesis Concept with example. [8]
b) What is Confusion Matrix in detail. [8]

OR

- Q6) a)** What is Test on Numerical Data- Distribution of a Sample Mean with example. [8]
b) Comparison of Two Groups Multiple Groups. [8]
- Q7) a)** Write down the short no Normalization- Feature Scaling. [8]
b) Difference between the Ridge Regression, Lasso Regression. [8]

OR

- Q8) a)** Explain in detail Cross Validation Techniques- K-fold with example. [8]
b) Difference between the Grid Search CV & CV Error. [8]
- Q9) a)** What is the different Dimensionality Reduction Techniques. Explain with example. [9]
b) Where we use the Chi2 square method with example. [9]

OR

- Q10)a)** When we used the Correlation coefficient, Rank Correlation & how with example. [9]
b) Difference between the Bayes' Theorem & Monte Carlo Method. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4502

[Total No. of Pages : 2

[6403]-311

T.E. (Cyber Security Honour Course)
INFORMATION AND CYBER SECURITY
(2019 Pattern) (Semester - V) (310401)

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,orQ.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.
- 5) Use of Calculator is allowed.

Q1) a) Explain SHA-1 in detail and explain how can mail security be achieved? [9]

b) Explain RSA algorithm. Perform encryption and decryption using RSA algorithm for following values $p=17$, $q=11$, $e=7$, $M=2$. [9]

OR

Q2) a) Explain Diffie-Hellman with justification. Give the details of attack on Diffie Hellman algorithm. [9]

b) Explain Elliptic curve Arithmetic and Elliptic Curve cryptography in details. [9]

Q3) a) Illustrate with a neat diagram components of risk identification and risk assessment. [8]

b) Explain in detail Indian legal perspective on cybercrimes. [9]

OR

Q4) a) What are the types of Laws? Differentiate between Law and Ethics in information security. [8]

b) List and explain any four commandments of computer ethics. [9]

Q5) a) Explain Kerberos. What four requirements were defined for Kerberos? [9]

b) What is the role of X.509 in cryptography? [9]

OR

P.T.O.

- Q6)** a) Discuss SSL with respect to four phases [9]
- Establish security capabilities
 - Server authentication and key exchange
 - Client authentication and key exchange
 - Finish
- b) Explain IP security protocols AH and IPS in detail. [9]
- Q7)** a) Define list and explain different types of worms. [8]
- b) What is an Intrusion Detection System? Describe types of IDS based on method of Detection? [9]

OR

- Q8)** a) What is a phishing attack explain with an example. What are the different types of phishing? [8]
- b) Explain following terms - (any 3) [9]
- i) SQL injection
 - ii) Spyware
 - iii) Adware
 - iv) Ransomware



Total No. of Questions : 8]

SEAT No. :

PD-4503

[Total No. of Pages : 2

[6403]-312
TE (Honours in Data Science)
DATA SCIENCE AND VISUALIZATION
(2019 Pattern) (Semester - V) (310501)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 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) Describe the concept of clustering and discuss the challenges associated with clustering in large datasets **[6]**
- b) What are the steps involved in building a linear regression model? Explain with an example. **[6]**
- c) Explain the concept of interestingness measures in association rule mining. Why are they important? **[6]**

OR

- Q2)** a) Describe how Naïve Bayes classification can be used for text categorization tasks **[6]**
- b) Differentiate between hierarchical clustering and Distribution model-based clustering methods **[6]**
- c) Write a note on association rules and its applicability. **[6]**
- Q3)** a) Explain the process of building a Decision Tree using the ID3 algorithm **[9]**
- b) What is a Feed-Forward Neural Network? Explain its architecture with a neat diagram. **[8]**

OR

P.T.O.

- Q4)** a) What is MapReduce? Explain the role of MapReduce in handling data with examples of Word Count and Matrix Multiplication. [9]
- b) What is Backpropagation? Describe its working with an example. [8]

- Q5)** a) Discuss the key challenges faced during data visualization and suggest ways to overcome them. [9]
- b) Explain different types of dashboards (strategic, analytical, operational) with examples [9]

OR

- Q6)** a) Write a note on: [6]
- i) Bar Charts
- ii) Line Charts
- iii) Area Charts
- b) What are statistical visualizations? Explain with suitable examples. [6]
- c) Explain the principles for designing an effective dashboard. [6]

- Q7)** a) What is the need for visualizing multidimensional data? Explain with suitable cases. [6]
- b) Explain Entity - Relationship (ER) Data Modelling. [6]
- c) What are the steps in performing Principal Component Analysis (PCA) on a dataset? [5]

OR

- Q8)** a) Differentiate between logical data models and physical data models. [6]
- b) What are the key steps in data modelling process? Enlist and Explain [6]
- c) What are the major challenges when performing clustering on high-dimensional data? Suggest some solutions [5]



Total No. of Questions : 8]

SEAT No. :

PD-5000

[Total No. of Pages : 2

[6403]-313
T.E. (Honors)
EMBEDDED SYSTEMS AND INTERNET OF THINGS
(2019 Pattern) (Semester - V) (310601)

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) Define sensor. Explain various types of sensors in detail. **[8]**

b) With a neat block diagram explain working of the pressure sensor. **[9]**

OR

Q2) a) Differentiate between active and passive sensor. **[8]**

b) Write a short note on ESP8266. **[9]**

Q3) a) List the phases of SDLC. Explain SDLC requirements in detail. **[8]**

b) List the open source IDE for embedded system application development. Explain any one in detail. **[9]**

OR

Q4) a) Explain in detail testing of embedded system. **[8]**

b) With a neat diagram explain object detection embedded system. **[9]**

Q5) a) List and explain different components of an IoT system. **[9]**

b) Explain service specification step of IoT system design methodology, consider smart IoT-based home automation system as example. **[9]**

OR

Q6) a) Define Internet of things and briefly explain its characteristics. **[9]**

b) List different IoT enabling technologies. With the help of a diagram list and briefly explain the steps involved in the IoT system design methodology. **[9]**

P.T.O.

- Q7)** a) Explain Zigbee architecture with suitable diagram. [9]
- b) Design smart irrigation system based on followings : [9]
- i) Define process specification for smart irrigation IoT system
 - ii) Domain model of Smart irrigation IoT system
 - iii) Information model of Smart irrigation IoT system
 - iv) Controller service of Smart irrigation IoT system

OR

- Q8)** a) Explain MQTT IoT protocol in detail. [9]
- b) Explain LiFi in detail. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4504

[Total No. of Pages : 2

[6403]-314

T.E. (Computer Engineering) (Honours)

VIRTUAL REALITY

(2019 Pattern) (Semester - V) (310701)

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) Describe the concept of axis-angle rotation representation and provide an example of its use in VR. **[10]**

b) Explain how geometric models contribute to realism in VR and provide an example of a commonly used geometric modeling technique. **[8]**

OR

Q2) a) How do viewing transformations differ from geometric transformations, and why are they essential in VR? **[10]**

b) What are the implications of depth perception techniques, such as stereoscopic vision, in VR? Discuss any challenges associated with implementing depth perception. **[8]**

Q3) a) Explain the process of correcting optical distortions in VR and why it is necessary. **[10]**

b) How does improving latency and frame rates impact the VR experience? Discuss one method used to achieve lower latency. **[8]**

OR

Q4) a) How is the perception of color adjusted in VR systems to accommodate users with color vision deficiencies? **[10]**

b) Discuss how combining multiple sensory sources, such as visual and auditory cues, enhances depth perception in VR. **[8]**

P.T.O.

- Q5) a)** Explain the differences between velocity and acceleration in the context of motion in real and virtual worlds. How are these quantities important for VR systems? [8]
- b)** What is the role of the vestibular system in motion perception? Discuss how VR systems address challenges associated with vestibular mismatch. [9]

OR

- Q6) a)** Discuss how physics principles are applied in the virtual world to simulate realistic motion. What are some challenges in maintaining this realism? [8]
- b)** What isvection and how does mismatched motion affect the user's experience in VR? [9]

- Q7) a)** Explain the physics of sound and how it is used in VR to create an immersive auditory experience. [8]
- b)** How does the physiology of human hearing influence the design of audio in VR? [9]

OR

- Q8) a)** What is auditory perception, and how does it contribute to realism in VR environments? [8]
- b)** Describe the concept of auditory rendering in VR and how it enhances the user experience. [9]



Total No. of Questions : 10]

SEAT No. :

PD5306

[Total No. of Pages : 4

[6403]-1503
T.E. (Mechanical)
THEORY OF MACHINES -II
(2015 Pattern) (Semester - V) (302043)

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, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1) a)** Explain the term interference in connection with gear and the various methods used to avoid it. **[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.**[6]**

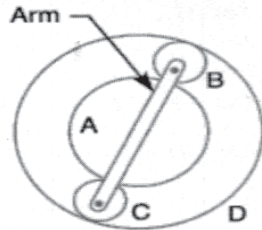
OR

- Q2) a)** Define the terms related to bevel gears with the help of a sketch. **[6]**
- i) Pitch cone angle
 - ii) Shaft angle
 - iii) Back cone
 - iv) Face width
 - v) lead angle and
 - vi) shaft angle
- b) A three start worm rotating at 750 rpm drives a 40 teeth worm gear. The pitch of teeth is 20 mm on an 80 mm pitch diameter. If coefficient of friction is 0.06, find **[6]**
- i) The helix angle of the worm
 - ii) The speed of the worm gear
 - iii) Centre distance
 - iv) The efficiency of drive
 - v) The lead angle for maximum efficiency and corresponding value of efficiency

P.T.O.

Q3) An epicyclic train of gears is arranged as shown in Fig. How many revolutions does the arm, to which the pinions B and C are attached, make:[8]

- When A makes one revolution clockwise and D makes half a revolution anticlockwise, and
- When A makes one revolution clockwise and D is stationary? The number of teeth on the gears A and D are 40 and 90 respectively.



OR

Q4) Explain the following terms with the help of a neat sketch: [8]

- Reverted gear train
- Bevel epicyclic gear train

Q5) Draw the profile of a cam with oscillating follower for the following motion: Follower to move outward through an angular displacement of 20° during 90° of cam rotation, Follower to dwell for 45° of cam rotation, Follower to return to its original position of zero displacement in 75° of cam rotation, and Follower to dwell for the remaining period of the revolution of the cam. The distance between the pivot centre and the follower roller centre is 70 mm and the roller diameter is 20 mm. The minimum radius of the cam is 50 mm. The location of the pivot point is 70 mm to the left and 60 mm above the axis of rotation of the cam. The motion of the follower is to take place with S.H.M. during out stroke and with uniform acceleration and retardation during return stroke. [18]

OR

Q6) a) Write short note on undercutting in cam with neat sketch. **[6]**

b) A flat faced mushroom follower is operated by a uniformly rotating cam. The follower is raised through a distance of 45 mm in 120° rotation of cam, remains at rest for the next 30° & is lowered during further 120° rotation of cam. The raising of follower take place with cycloidal motion & lowering with uniform acceleration and deceleration. However uniform acceleration is 2/3 of the uniform deceleration. The least radius of cam is 25 mm which rotate at 300 rpm. Draw the cam profile. **[12]**

Q7) a) Write short notes on **[6]**

i) Function generation

ii) Path generation and

iii) Body guidance

b) Determine the proportions of four bar mechanism by using three precision points, to generate $y = x^{1.5}$, where x varies between 1 and 4. Assume $\theta_s = 30^\circ$; $\Delta\theta = 90^\circ$; $\phi_s = 90^\circ$; and $\Delta\phi = 90^\circ$. Take length of the fixed link AD as 25 mm. **[10]**

OR

Q8) a) Explain the following terms related to kinematic synthesis **[6]**

i) Type synthesis

ii) Number synthesis and

iii) Dimensional synthesis.

b) Synthesize a four bar linkage, as shown in Fig, using Freudenstein's equation to satisfy in one of its positions. The specification of position θ , velocity ω and acceleration α are as follows: **[10]**

$$\theta = 60^\circ, \omega_\theta = 5 \text{ rad/s}; \alpha_\theta = 2 \text{ rad/s}^2$$

$$\phi = 90^\circ; \omega_\phi = 2 \text{ rad/s}; \alpha_\phi = 7 \text{ rad/s}^2.$$

Q9) a) Write short note on: **[6]**

- i) Faceplate variators.
 - ii) Cone variators.
- b) An automobile car is travelling along a track of 100 m mean radius. The moment of inertia of 500 mm diameter wheel is 1.8 kg m^2 . The engine axis is parallel to the rear axle and crank shaft rotates in the same sense as the wheel. The moment of inertia of rotating parts of the engine is 1 kg m^2 . The gear ratio is 4 and the mass of the vehicle is 1500 kg. If the centre of gravity of the vehicle is 450 mm above the road level and width of the track of the vehicle is 1.4 m, determine the limiting speed of the vehicle for condition that all four wheels maintain contact with the road surface. **[10]**

OR

Q10)a) Explain CVT with neat sketch State its advantages, disadvantages and applications. **[6]**

- b) A turbine rotor of a ship has a mass of 3500 kg and rotates at a speed of 2000 rpm. The rotor has a radius of gyration of 0.5m and rotates in clockwise direction when viewed from the stern (rear) end. Determine the magnitude of gyroscopic couple and its direction for the following conditions. **[10]**
- i) When the ship runs at a speed of 12 knots (1 Knots = 1855 m/hr) and steers to the left in a curve of 70 m radius.
 - ii) When the ship pitches 6° above and 6° below the horizontal position and the bow (Front) end is lowered. The pitching motion is simple harmonic with periodic time 30 sec.
 - iii) When the ship rolls and at a certain instant, it has an angular velocity of 0.05 rad/s clockwise when viewed from the stern.

Also find the maximum angular acceleration during pitching.

* * *

[6403]-1504

T.E. (Mechanical Engineering)

TURBO MACHINES

(2015 Pattern) (Semester - V) (302044)

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, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Draw neat and suitable figure wherever necessary.
- 4) Use of non-Programmable Scientific Calculator is allowed.
- 5) Use of steam table is permitted.

Q1) a) A jet of water of 80mm diameter strikes a stationary fixed flat plate. The jet strikes the plate normally with velocity of 22 m/sec. Assuming weight density or specific weight of water as 9810 N/m³, determine the force exerted by jet of water on stationary fixed flat plate? **[4]**

b) A jet of water strikes at the center of a series of curved vanes. The jet speed is 'V' m/s, the vane moves at 'u' m/s in the direction of jet. If the outgoing jet makes an angle of 'θ' with the entering jet, Prove that the efficiency is, **[6]**

$$\eta = \frac{2(V - u)(1 + \cos \theta)u}{V^2}$$

OR

Q2) a) A jet of water moving with a velocity of 40 m/s strikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of vane at inlet and leaves at an angle of 90° to the direction of vane at outlet. Determine vane angle at inlet and outlet so that water enters and leaves the vane without shock? **[6]**

b) Write a note on the Classification of Turbomachines w.r.t. **[4]**

- i) Direction of energy flow in the machine
- ii) Type of fluid used
- iii) Dynamic action of fluid
- iv) Direction of fluid flow.

P.T.O.

- Q3) a)** Derive an expression for Unit Discharge and Unit Power and state their significance. [6]
- b)** A Kaplan turbine develops 1500 kW under a head of 6 m. The turbine is set 2.5 m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.2 m. If the turbine efficiency is 85%, what will be efficiency of the draft tube having inlet diameter of 3 m. (Neglect losses in draft tube). [6]

OR

- Q4) a)** A reaction (Francis) turbine runs at 450 rpm under head of 120 m. Its diameter at inlet is 120 cm and flow area is 0.4 m^2 . The angles made by the absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine: [6]
- Volume flow rate
 - Hydraulic Power developed
 - Hydraulic efficiency. Assume no whirl at outlet
- b)** Compare Impulse and Reaction Turbines. [6]

- Q5) a)** Derive an expression for diagram efficiency of single stage Impulse Turbine. Obtain the Condition for Maximum efficiency & its value. [8]
- b)** In a single stage impulse turbine the mean diameter of the blade ring is 1 m and the rotational speed is 3000 rpm. The steam is issued from the nozzle at 300 m/sec and nozzle angle is 20° . The blades are equiangular. If the friction loss in the blade channel is 19% of the kinetic energy corresponds to relative velocity at the inlet to the blades. What is the power developed in the blading, when the axial thrust on the blades is 98 N. Solve the problem graphically or Analytically. [8]

OR

- Q6) a)** Write difference between throttle and nozzle governing used in steam turbines and explain with neat sketch of nozzle governing. [8]
- b)** A 50% reaction turbine (with symmetrical velocity triangles) is running at 400 rpm has the exit angle of blades as 20° and the velocity of the steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33 kg/s and at a particular stage the specific volume is $1.381 \text{ m}^3/\text{kg}$. Calculate for the stage: [8]
- A suitable blade height, assuming the rotor mean diameter 12 times the blade height.
 - The diagram work.

- Q7) a)** Name the various types of casings used in centrifugal pump. Explain briefly any two types of casings with neat sketches. [8]
- b)** A centrifugal pump running at 800 rpm is working against a total head of 20.2m. The external diameter of the impeller is 480mm and outlet width 60mm. If the vanes angle at outlet is 40 degree and manometric efficiency is 70%, Determine: [8]
- Flow velocity at outlet
 - Absolute velocity of water leaving the vane
 - Angle made by the absolute velocity at outlet with direction of motion at outlet and
 - Rate of flow through pump
 - Specific speed.

OR

- Q8) a)** Write a note on main and operating characteristics of Centrifugal Pump. [8]
- b)** Power input to centrifugal pump is 50 kW at the shaft while running the pump at 1440 rpm. The impeller tip diameter is 30 cm and the blade width at the tip is 1.5 cm. The water flow rate is 110 lit/sec. The vacuum gauge reading at the suction flange is – 20 cm of mercury (minus 20 cm of Hg) and at the delivery flange the pressure gauge reading is 370 KPa. The blade outlet angle is 65°. Calculate: [8]
- Theoretical head
 - Ideal head
 - Hydraulic efficiency
 - Mechanical efficiency
- Assume radial entry and constant flow velocity.

- Q9) a)** A Centrifugal compressor running at a speed of 15000 rpm admits 25m³/sec air at static states 1 bar and 300 K and compresses it adiabatically by the pressure ratio of 2. The air velocity at inlet and the radial velocity at exit is the same as 75 m/sec. The inlet and outlet impeller diameters are 60 cm and 80 cm respectively. Considering the inlet to be axial find: [8]
- Blade angles at inlet and outlet of impeller?
 - Angles at which air leaves the impeller?
 - Impeller breadth at inlet and exit?
- b)** Explain Surging and Stalling with reference to axial flow compressors. [8]

OR

- Q10)a)** Explain pressure coefficient, flow coefficient and work input factor. [8]
- b)** Explain the performance characteristics curves of rotary compressors. [8]

