Total No. of Questions : 8]

SEAT No. :

PE-2477

[Total No. of Pages : 3

[6583]-1
T.E. (Civil)
WASTE WATER ENGINEERING
(2019 Pattern) (Semester - VI) (301012)

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

Instructions to the candidates :

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

Q1) a) Explain with neat sketch working process of activated sludge process. **[5]**

b) Explain the term sludge volume index(SVI), hydraulic retention time(HRT), BOD LoadingRate (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=32000 m^3/d

Volume of aeration tank = 10500m^3

Influent BOD=250 mg/l

Effluent BOD=20mg/l

Mixed liquor suspended solids=2500mg/l

Effluent suspended solids=30mg/1

Waste sludge suspended solids = 9700mg/l

Quantity of waste sludge=220m^3/d

Based on the information above determine,

i) Aeration period

ii) Food to microorganism ratio (F/M ratio]

iii) Percentage efficiency of BOD removal

iv) Sludge age(days)

OR

P.T.O.

Q2) a) Define sludge bulking. Explain the control measures for the sludge bulking. **[5]**

b) With the help of diagram explain the microbial growth pattern in batch and continuous systems. **[5]**

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

Sewage flow = 4000 m^3/day

Volume of aeration tank = 15000 m^3

influent BOD = 250 mg/lit

Effluent BOD = 20 mg/lit

Mixed liquor suspended solids = 3000 mg/lit

Effluent suspended solids = 30 mg/lit

Waste sludge suspended solids =9700 mg/lit

Quantity of waste sludge = 220 m^3/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) Enumerate principle, advantages and disadvantages aerated lagoon. **[5]**

c) Design an oxidation pond for a colony of 4000 population. The sewage flow is 120 lit/person/day.BOD_5 is 300mg/l. Assume necessary required data. **[7]**

OR

Q4) a) Explain the construction arid working of trickling filter with neat sketch.**[5]**

b) Determine the size of a high rate trickling filter for the following data :**[9]**

Sewage flow = 4.5 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.

c) Define the terms phytoremediation and root zone technology. **[3]**

Q5) a) Explain with neat sketch the construction and working of septic tank. **[9]**

b) With neat sketch explain anaerobic lagoon with advantages and disadvantages. **[9]**

OR

Q6) a) Explain working principle and applications of SBR and MBR. **[9]**

b) Design a septic tank for 350 Users. Water allowance is 150 liters per head per day. Also design a suitable a suitable soil absorption system if the percolation rate is 4 min/cm and depth of ground water table below GL is 1.5 m. **[9]**

Q7) a) Explain the construction and working process of anaerobic digestion tank. **[5]**

b) Write a note on gobar gas plant. **[5]**

c) Explain the various 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. :

PE-2478

[Total No. of Pages : 7

[6583]-2

T.E. (Civil Engineering)

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. 7or 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 = 3.0 kN/m^2 Floor finish= 0.75 kN/m^2;
v) Material = M25, Fe 415, Use LSM
vi) Draw details of reinforcement of only one flight.

b) Explain in detail zoning of shear reinforcement. **[5]**

OR

Q2) a) Design a simply supported ground beam for the following data : **[13]**

i) Center to center Span of beam = 5.5 m
ii) Width of supporting columns = 300mm; Beam width =230 mm
iii) The beam supports 230mm thick brick wall.
iv) Height of wall above plinth level = 2.7m, Plinth height =1.2m.
v) Material- M25, Fe 500
Show details of reinforcement. Use LSM

b) What are the advantages and limitations of using IS code coefficient method for the design of continuous beam. **[5]**

P.T.O.

Q3) Design a continuous floor beam B1-B2-B3 as shown in **Figure 1** using IS code coefficients. Thickness of the all floor slab is 120 mm, live load and floor finish load on all slabs are 3.0 kN/m^2 and 1.5 kN/m^2, respecitively. The wall on this beam is 230 mm thick and 2.7 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 B2**. 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 120 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 BC and support B** after 20 % 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 an axially loaded short column C9 as shown in Figure 1 from terrace to plinth level (floor wise four parts of column) for a G + 2 building with following details : **[13]**

i) Floor to Floor height = 3.6 m, consider both ends fixed.

ii) Live load on all slabs = 3 kN/m^2

iii) Floor Finish Load = 1.5 kN/m^2

iv) Water Proofing Load on roof slab = 1.5 kN/m^2

v) Wall thickness = 150 mm (Internal)

vi) Slab thickness = 130 mm

vii) Size of beams = 230 × 450 mm

Material M 25 and Fe 500 used. Show detailed floorwise load calculations and design the column from plinth level to first floor level. Draw section of column showing reinforcement details.

b) What are interaction curves? Explain the characteristic of a typical interaction curve. **[4]**

OR

Q6) Design a bi-axial short column by limit state method to carry Ultimate load of 1500 kN. Ultimate moment of 110 kN-m about major axis bisecting the depth of column and 50 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.5m. 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 a working axial load of 800 kN. The column size is 300 × 450mm. SBC of soil is 200 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 750 kN and 850 kN, respectively. Center to center to distance between two columns is 2.4m. Size of both the columns is 400 × 400mm. Safe bearing capacity of soil is 160kN/m^2. Use M30 concrete and Fe500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. **[18]**

⌘⌘⌘

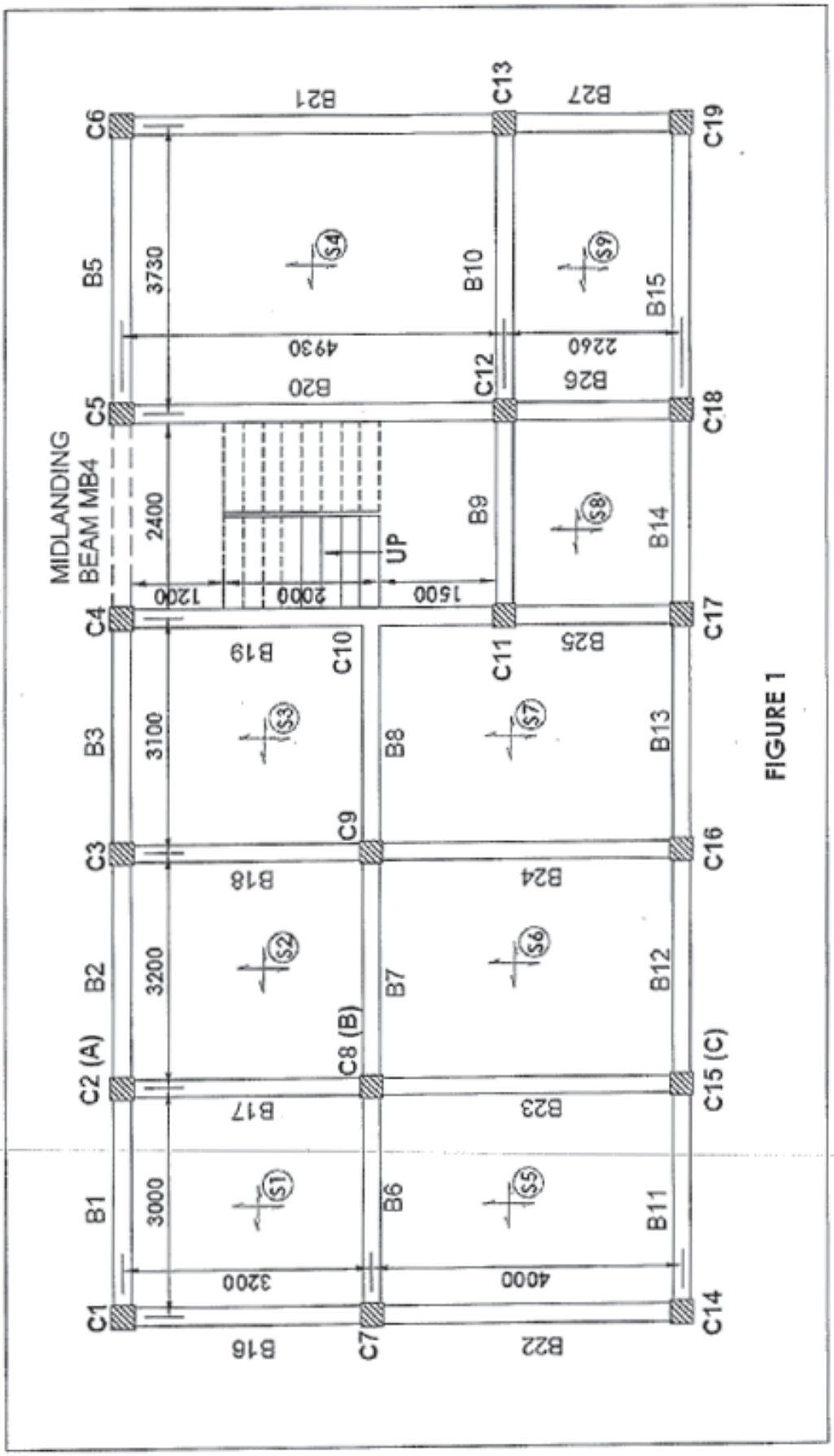

C1
C2 (A)
C3
C4
C5
C6
C7
C8 (B)
C9
C10
C11
C12
C13
C14
C15 (C)
C16
C17
C18
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3200
3100
3730
4930
2260
4000
2400
1200
2000
1500
UP
MIDLANDING
BEAM MB4
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S2
S3
S4
S5
S6
S7
S8
S9

FIGURE 1

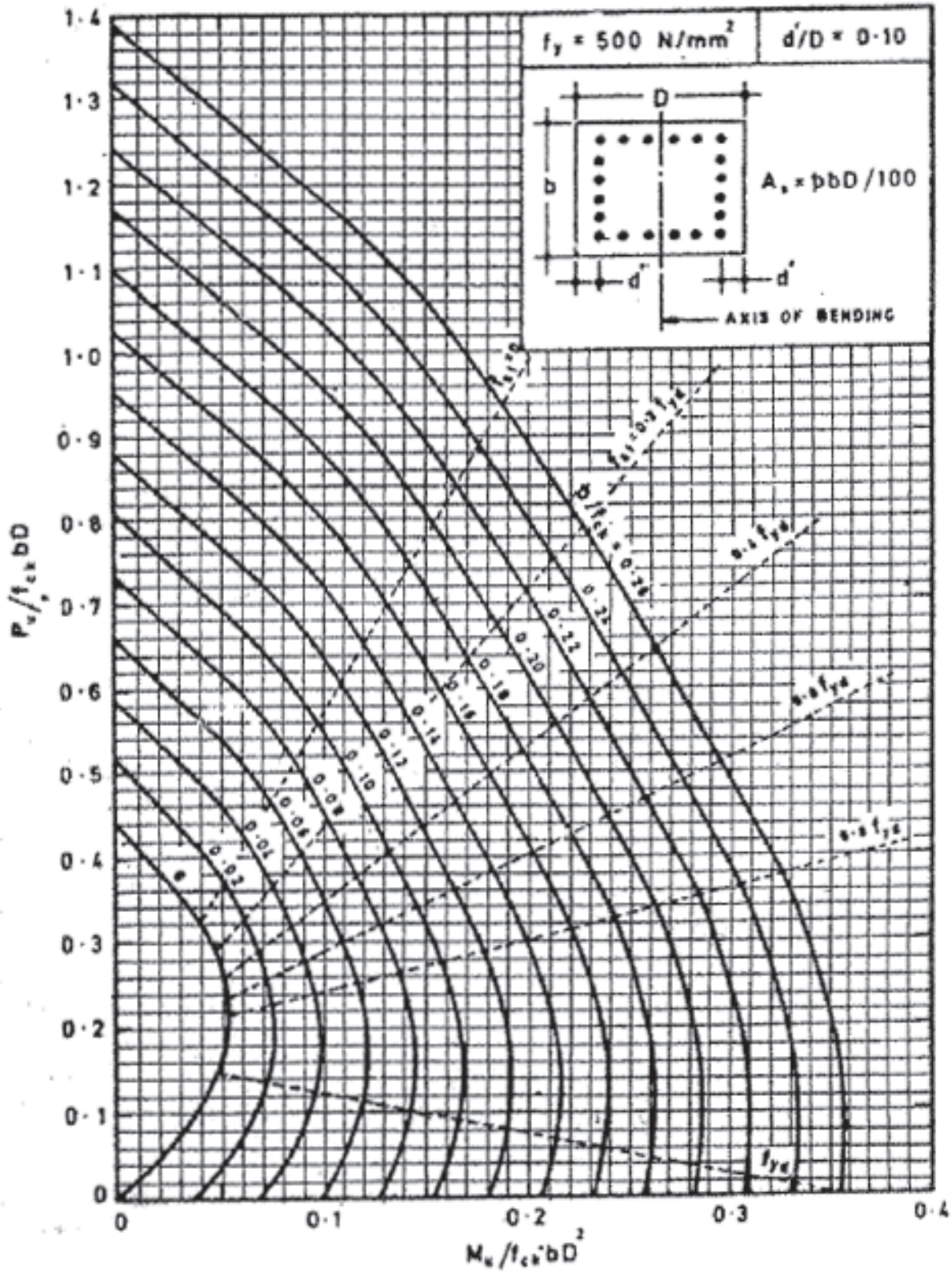


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

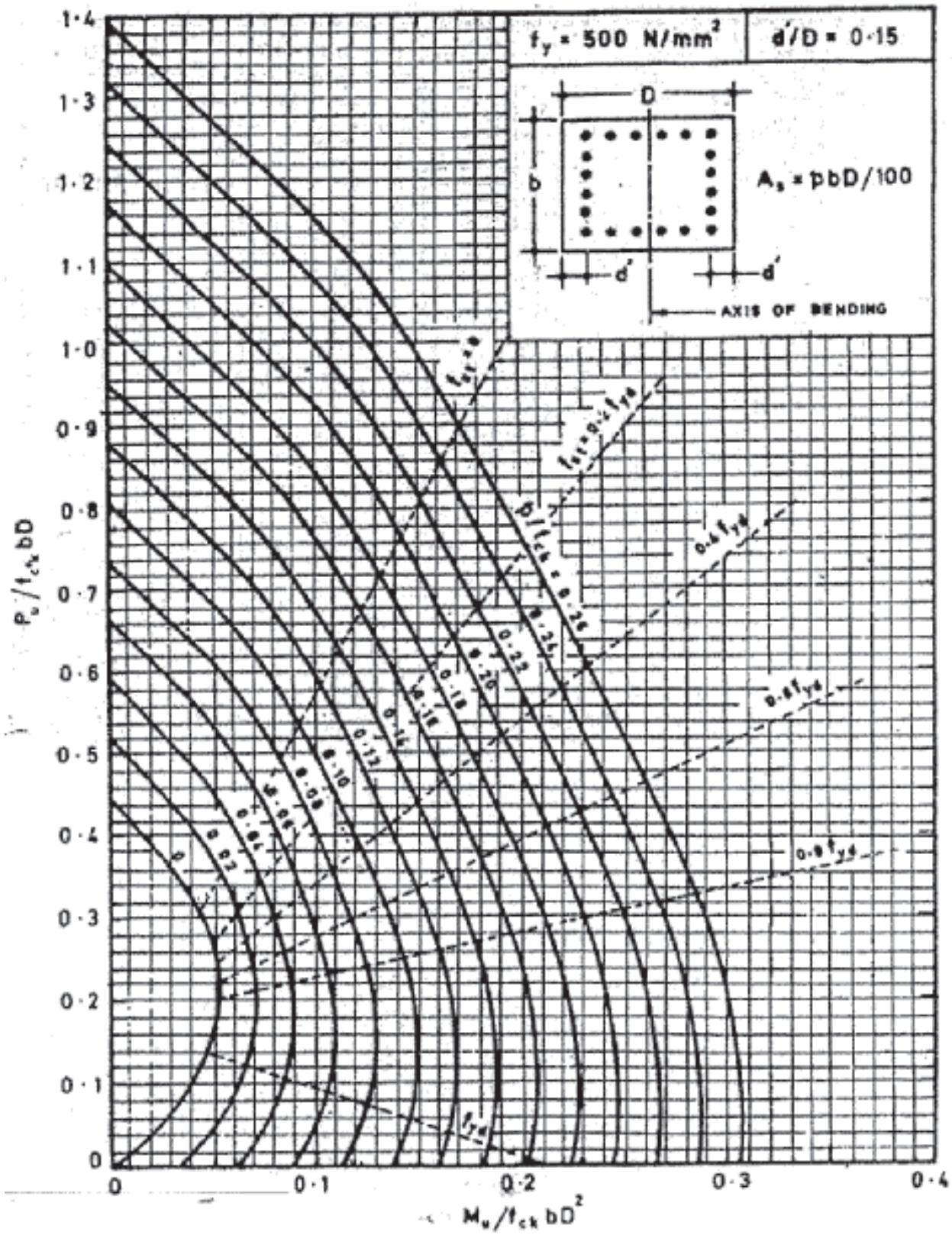


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

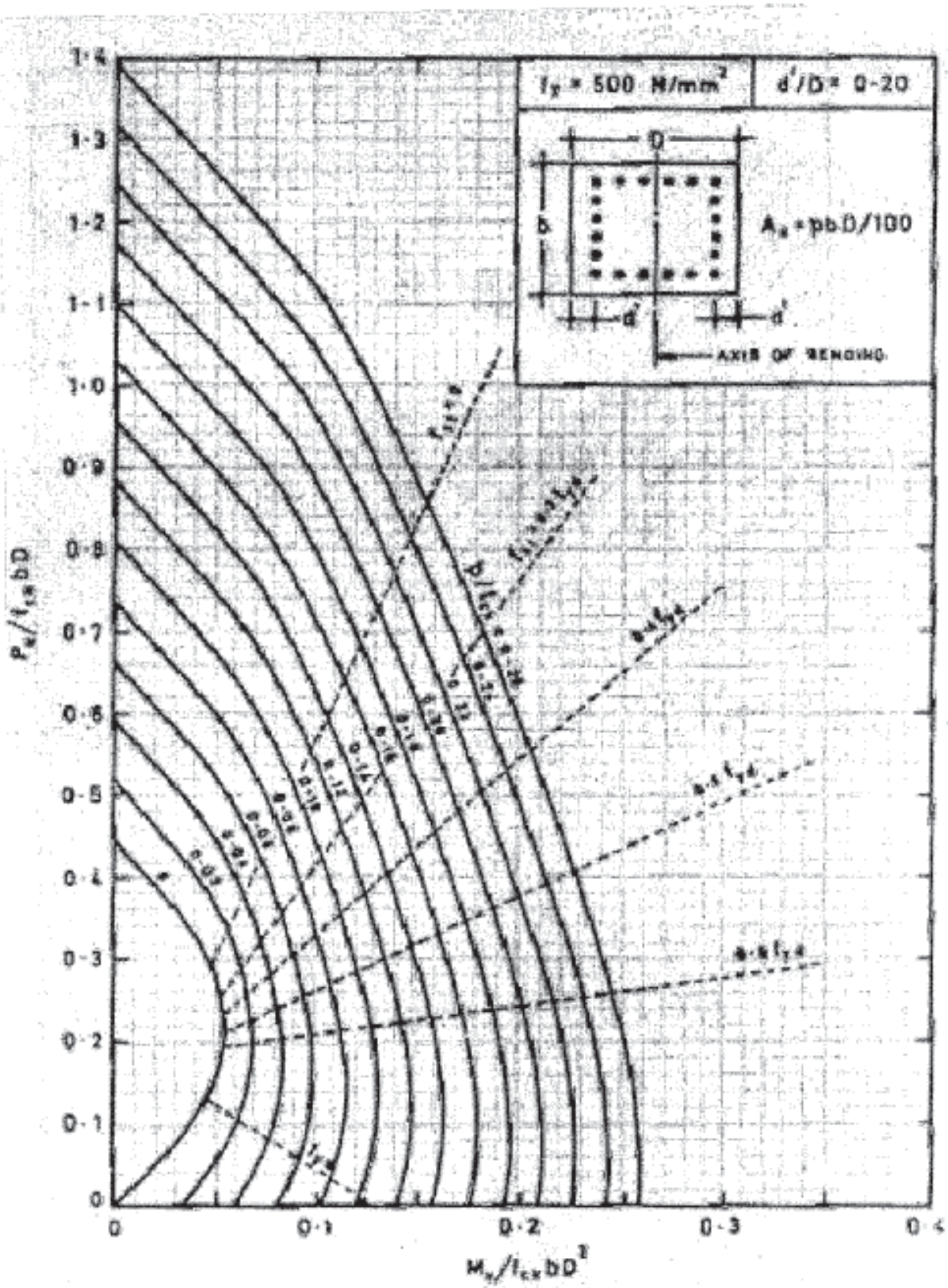


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

Total No. of Questions : 8]

SEAT No. :

PE-2479

[Total No. of Pages : 2

[6583]-3

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 and 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) Express the concept of augmentation and explain about satellite-based augmentation. **[6]**

b) What are the three segments of GPS? Describe them briefly. **[6]**

c) Illustrate the advantages and disadvantages of GNSS. **[5]**

OR

Q2) a) Describe briefly the concept of three-dimensional position location via intersection of multiple spheres. **[6]**

b) Summarize the necessity of GNSS in various fields. **[6]**

c) Describe the different sources of error in GPS. **[5]**

Q3) a) Differentiate between supervised and unsupervised image classification. **[6]**

b) State the application of DEM. **[6]**

c) Define Triangular Irregular Network Model (TIN) and its applications. **[6]**

OR

Q4) a) Write a note on digital image and analog image. **[6]**

b) Explain in detail the concept of post processing and pre possessing. **[6]**

c) Differentiate between Visual and Digital image interpretation. **[6]**

P.T.O.

Q5) a) Illustrate Cloud computing with types and applications. **[6]**

b) Write in detail about various components of GIS. **[6]**

c) List down the differences between drafting software's and GIS. **[5]**

OR

Q6) a) Interpret the fundamentals of Cartography and map creation in GIS. **[6]**

b) Discuss the spatial and non-spatial data with example. **[6]**

c) Compare the various definitions of GIS used globally. **[5]**

Q7) a) Classify the Raster and Vector Data types. Explain with neat diagram. **[6]**

b) Differentiate various Attribute Data models and explain any one of them. **[6]**

c) Explain the application of GIS in Urban Planning. **[6]**

OR

Q8) a) Enlist the applications of GIS in Civil Engineering & Explain any one in detail. **[6]**

b) Outline the Georeferencing of GIS data? And explain its importance in the field of GIS? **[6]**

c) Categorize the different Database? Name the types of database. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2480

[Total No. of Pages : 3

[6583]-4
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) ***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 whenever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) What is landslide? Explain the causes and control measures of landslide. **[6]**

b) Describe various Seismic zones of India. **[6]**

c) Explain suitability of DTB as construction material. **[6]**

OR

Q2) a) Describe influence of geological factors upon urban development and planning. **[6]**

b) Will dam building activity cause a major earthquake? Explain. **[6]**

c) Discuss on compact basalt as a construction material. **[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
0-3 m	1	8	J
	2	16	J
	3	87	M
	4	66	M
	5	10	M
	6	13	J
	7	7	J
	8	6	J
	9	8	J
3 - 6 M	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	$2\pi aR$
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 Bieniawaski'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]**

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Total No. of Questions : 8]

SEAT No. :

PE-2481

[Total No. of Pages : 3

[6583]-5
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 side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss Overfitting of ANN in brief with its cause and effect How to avoid overfitting. Discuss data preprocessing. **[9]**

b) Determine the functional value of the 3 × 2 × 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; –03 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 Linear 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 × 2 × 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]**

Q3) a) Distinguish between Recurrent networks and Radial basis function networks with suitable example for each. **[8]**

b) Discuss working of self-organized feature maps with suitable examples.**[9]**

OR

P.T.O.

Q4) a) Distinguish between Radial basis function networks and Generalized regression neural networks. **[8]**

b) 28-day Compressive strength of concrete (in MPa) depends on the quantity (in kg/m^3) of Cement, Fine aggregate, coarse aggregate and water. Desing 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 layers

v) performance functions/s

Q5) a) Discuss in detail an application of Genetic Algorithm in Civil Engineering. **[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 the Genetic operators in Genetic Algorithm in detail. **[9]**

b) Explain the basic working of support vector Machine. What are hard margin and soft margin SVMs? **[9]**

Q7) a) Discuss working of Random Forest regression. Explain M5 Algorithm in Model Tree. **[8]**

b) 28-day Compressive strength of concrete (in MPa) depends on the quantity (in Kg/m^3) of Cement, Fine aggregate, coarse aggregate and 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 the need of Out of Bag estimates in Random Forest. Explain Bagging in 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

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Total No. of Questions : 8]

SEAT No. : ____

PE-2482

[Total No. of Pages : 2

[6583]-6
T.E. (Civil)
ADVANCED SURVEYING
(2019 Pattern) (Semester - VI) (301015 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) ***Draw neat Figures wherever necessary.***
3) ***Figures to the right indicate full marks.***
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 30º 25' and 45º 25'respectively. The angle ABC measured 130º l0'. AB = 4000m, BC=4995 m. **[8]**

Q3) a) Define relief displacement. Derive an expression for the same. **[6]**

b) Define: i) Air base distance, ii) Parallax, iii) Flying height , iv) Scale. **[4]**

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 20cm. Speed of aircraft is 180 kmph, longitudinal overlap is 60% and side overlap is30%. Determine the number of photographs required to cover an area of 30 km × 22.5 km. Also determine exposure interval and flying height. **[7]**

OR

P.T.O.

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]**

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Total No. of Questions : 8]

SEAT No. : ____

PE-2483

[Total No. of Pages : 2

[6583]-7

T.E. (Civil)

ADVANCED GEOTECHNICAL ENGINEERING

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

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

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4 and 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 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) Explain coulomb's law for shearing strength of soils and its modification by Terzaghi. **[6]**

c) A simple dry sand is subjected to a triaxial test. The angle of internal friction is 32 degrees. If the minor principal stress is 150 kN/m^2, at what value of major principal stress will the soil fail? **[6]**

OR

Q2) a) Explain the following: **[6]**

i) Differentiate between a box shear test and a triaxial shear test for soils.

ii) Differentiate between shear strength parameters obtained from total and effective stress considerations.

b) What is the effect of pore pressure in strength of soils? **[6]**

c) Write a note on unconfined compression test. **[6]**

P.T.O.

Q3) a) What is stress path? State the factors influencing the stress path. **[6]**

b) What are the factors affecting angle of shearing resistance? **[6]**

c) Draw and explain stress path for failure of finite and infinite slope. **[5]**

OR

Q4) a) State and explain the variants of cambridge plot. **[6]**

b) Write short note on determination of shear strength of soil from UU Test with a neat sketch. **[6]**

c) Draw and explain the stress path (t - s,s') for stress changes near retaining wall. **[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. :

PE-2484

[Total No. of Pages : 2

[6583]-8

T.E. (CIVIL)

ARCHITECTURE AND TOWN PLANNING

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

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) Enlist and explain objectives of town planning and state benefits of town planning. **[9]**

b) Elaborate Mechanism of preparation of DP according to MRTP Act 1966. **[9]**

OR

Q2) a) Explain importance of Neighbourhood planning and purpose of it. **[9]**

b) Write a brief note on T P Scheme (Sketch in essential) **[9]**

Q3) a) Explain Organization Structure and purpose of MHADA. **[8]**

b) State & explain the various types of civic surveys required to be conducted for preparation of DP. **[9]**

OR

Q4) a) Write an explanatory note on ITS with sketch. **[9]**

b) Explain Organization Structure and purpose of CIDCO. **[8]**

Q5) a) Write a short note on Land Acquisition Rehabilitation and Resettlement Act2013. **[9]**

b) Elaborate applications of URDPFI guidelines in town planning. **[9]**

OR

P.T.O.

Q6) a) How AMRUT guidelines helpful to overall development of city? **[9]**

b) Explain What do you understand concept of MAHA-RERA. **[9]**

Q7) a) Write a note on SEZ and CRZ with sketch. **[9]**

b) Elaborate what you understand regarding Special Township: Overall. **[8]**

OR

Q8) a) Explain in detail application of GIS, GPS remote sensing in Town Planning. **[9]**

b) Elaborate the need and strategies in relation with, "Rural development". **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2485

[Total No. of Pages : 2

[6583]-9

T.E. (CIVIL)

SOLID WASTE MANAGEMENT

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

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) ***Figures to the right indicate full marks.***
3) ***Draw neat figures wherever necessary.***
4) ***Assume necessary data.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Explain with sketch the Bangalore Method of composting. **[6]**

b) Suggest and justify the criteria adopted for the execution of vermicomposting. **[6]**

c) State the terms related to Solid waste management **[6]**

i) Segregation

ii) Recovery

iii) Recycling

OR

Q2) a) List the factors affecting composting process of solid waste. **[6]**

b) Specify the role of transfer station in municipal solid waste management.**[6]**

c) Explain Integrated Solid Waste Management by citing out the political, environmental and economic aspects along with its advantages. **[6]**

Q3) a) What are the factors affecting anaerobic digestion? **[6]**

b) How to estimate Low and high heating value of solid waste? **[6]**

c) Explain advantages, limitations and applications of plasma gasification.**[5]**

OR

P.T.O.

Q4) a) Explain advantages, limitations and applications of refused derived fuel (RDF). **[6]**

b) What are steps involved in design of incineration plant? **[6]**

c) Write working principles, advantages and disadvantages of anaerobic digestion process. **[5]**

Q5) a) How to control of contamination of ground water during land fill. **[6]**

b) What are steps involved in design of sanitary landfill? **[6]**

c) What is Legacy waste management? **[6]**

OR

Q6) a) Write short note on: Slope stability analysis in landfill. **[6]**

b) What is engineered landfill? Why it is essential? Explain in brief different methods of landfilling. **[6]**

c) Explain economics and time duration of biomining. **[6]**

Q7) a) Suggest the appropriate method for disposal of e-waste and sanitary napkin. **[6]**

b) What are objectives and key points of hazardous waste management rules, 2016? **[6]**

c) What is life cycle assessment (LCA) in solid waste management? **[5]**

OR

Q8) a) Write objectives and major provision in plastic waste management rules - 2016. **[6]**

b) Explain any one case study of processing and reuse of construction & demolition waste. **[6]**

c) Explain any one case study of material recovered from e-waste. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2486

[Total No. of Pages : 2

[6583]-10
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) ***Answer 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) What are the various methods to estimate flood and explain any one method in detail. **[9]**

b) Explain briefly the terms: **[8]**

i) Design flood.

ii) Standard project flood

iii) Probable maximum flood

iv) Design storm

OR

Q2) a) What is flood routing, types of flood routing and explain Muskingum method of flood routing ? **[10]**

b) What are the application of software in hydrology and what are the different hydrological software commonly used. Explain application Q-GIS software in watershed delineation. **[7]**

Q3) a) What are the different types of reservoir explain one reservoir in each type? **[8]**

b) List out the various zones of storage in a reservoir. Explain this with a neat sketch, the sedimentation zones in reservoir and methods to control sedimentation of reservoir. **[9]**

OR

P.T.O.

Q4) a) Explain yield and different types of yield from a reservoir. Explain 'mass curve analysis' for determining the capacity of a reservoir for a specified yield. **[9]**

b) Explain density currents, trap efficiency, useful life of reservoir, reservoir losses. **[8]**

Q5) a) What is water logging, state any four causes of water logging. What are the ill effects of water logging and how it is controlled. **[8]**

b) State Dupit' s assumptions and derive the equation for discharge from unconfined aquifer under steady state condition. **[10]**

OR

Q6) a) Differentiate between aquifer, aquiclude, aquitard and aquifuge with suitable example. **[8]**

b) A well of 300 mm diameter is located in a confined aquifer of 40m thick. The aquifer has a hydraulic conductivity of 25 m/day and the radius of influence is 300m. determine the discharge in m^3/day from the well if the draw down is 3m. Also determine the percentage increase in discharge if the diameter is made to 450mm, with the other conditions remain same.**[5]**

c) How does the permeability of aquifer affect the groundwater movement? Explain the Darcy equation governing the flow of water through aquifer medium. What are the limitations of Darcy equation? **[5]**

Q7) a) What is irrigation? Why is it necessary? What are the benefits and ill effects of irrigation of irrigation projects? **[8]**

b) Explain the following terms **[10]**

i) Crop period
ii) Base period
iii) Intensity of irrigation
iv) Paleo irrigation
v) Consumptive use

OR

Q8) a) Explain the significance of Duty and delta in irrigation and how duty varies with the place of measurement. Develop the relation between delta,base period and duty for crop. **[8]**

b) State concept of PIM and explain role of water user's cooperative society in PIM. What are the merits and demerits of area or crop basis and volumetric assessment of water charges? **[10]**

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Total No. of Questions : 8]

SEAT No. :

PE-2487

[Total No. of Pages : 3

[6583]-11
T.E. (Civil)
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, and Q.7 or Q.8***
2) ***Figures to the right indicates full marks.***
3) ***Draw neat figures wherever necessary.***
4) ***Assume necessary data.***
5) ***Use of scientific calculator is allowed.***

Q1) a) State the principle of coagulation and flocculation. Differentiate between coagulation and flocculation. **[8]**

b) A filter unit has surface area of 5×10 m^2. After filtering 10,000 m^3 for 40 h, the filter is backwashed for 15 min at a rate of 0.5 m/min. Find: (i) the average filtration rate, (ii) the quantity of wash water, (iii) percent of wash water to treated water, and (iv) the flow rate to each of the four troughs. **[6]**

c) Describe the operational troubles in filter. **[4]**

OR

Q2) a) A rapid mixer is to be used for coagulation of surface water with high turbidity. If the flow is 650 m^3/h, find the volume and dimensions of the square tank and the power requirements. Assume that the detention time is 20 seconds and G=1000 s^{-1} and μ = 0.00115 N s/m^2 at T=15°C **[8]**

b) Mention various factors affecting coagulation. **[6]**

c) Discuss the remedial measures for various operational troubles in filter. **[4]**

P.T.O.

Q3) a) A water treatment plant uses 65 kg/d of chlorine to treat 50 MLD of water. The residual chlorine after 30 min contact time is 0.15 mg/L. Determine the chlorine dosage and chlorine demand of the water. **[7]**

b) Explain fluoridation and defluoridation. **[6]**

c) Mention any two different disinfectants and state their characteristics. **[4]**

OR

Q4) a) Enlist and explain various methods of disinfection. Explain the factors affecting the efficiency of disinfection. **[7]**

b) The water works of a town of population 100000 has to meet its water demand at the rate of 135 lit/capita/day. If the disinfection is to be done by bleaching powder having 40% available chlorine, determine the quantity of bleaching powder required per year. The required dose of chlorine at the water works is 0.3 ppm for disinfection. **[6]**

c) State the principle and advantages of water softening by ion exchange method. **[4]**

Q5) a) Describe any four methods for water distribution in detail. **[8]**

b) Explain detection and prevention of leakage. **[6]**

c) Explain balancing capacity of reservoir. **[4]**

OR

Q6) a) Determine the balancing capacity of an elevated service reservoir for a town having a population of 2 million and water supply rate of 280 l/c/d. The water is pumped continuously for 24 hrs. The breakup of demand is as follows. **[8]**

Time	3am-9am	9am-1pm	1pm-7pm	7pm-11pm	11pm-3am
Demand in l/c/d	80	50	85	30	35

b) Mention requirements for good distribution system. **[6]**

c) Write the necessity of rainwater harvesting system. **[4]**

Q7) a) Write and explain use of any three fixtures and any three fittings used for water supply system. **[7]**

b) Explain SMART city mission and AMRUT mission for improvement of infrastructure sector. **[6]**

c) List and draw any four sanitary pipe fittings. **[4]**

OR

Q8) a) Discuss the concept of packaged water treatment plants for townships and mention advantages. **[7]**

b) Explain Jal Jeevan Mission and its impact in rural India before and after its implementation. **[6]**

c) Discuss WTP for swimming pools. **[4]**

Total No. of Questions : 8]

SEAT No. :

PE-2488

[Total No. of Pages : 2

[6583]-12
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, 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) ***IS:800-2007 & IS:875 part I to III are permitted.***

Q1) a) Design moment resisting base for a ISHB 250 @54.7 kg/m column to carrying a factored load of 650 kN and factored bending moment 50 kN-m. **[12]**

b) Which of the two buckling or stiffness of compression members is more critical? **[5]**

OR

Q2) a) Design a column base for the column consisting of ISWB300 @ 48.1 kg/m carrying axial load 740 kN. Design welded connection between column and base plate. The column is to be supported on concrete pedestal to be built with M20 grade. **[12]**

b) In what sense column caps are similar to column base plates? **[5]**

Q3) a) A simply supported beam of 5 m effective span. It carries a uniformly distributed load **w** kN/m throughout the span including self-weight. The compression flange of beam is laterally unsupported throughout the span. Determine the intensity of **udl** of **w**, so that the section ISMB 400 @ 61.6 kg/m use for beam can carry safely. **[10]**

b) A simply supported beam of 4 m effective span. It carries a uniformly distributed load 60 kN/m throughout the span including self-weight. Design the beam if the compression flange is laterally restrained throughout the span. **[8]**

OR

Q4) a) A simply supported beam spanning 8 m carries a uniformly distributed load 5 kN/m throughout the span including self-weight. The compression flange of beam is laterally supported throughout the span. Design section and check for serviceability. **[13]**

b) How are the column buckling and the lateral buckling of beam similar? **[5]**

P.T.O.

Q5) Design a gantry girder supporting an electric overhead travelling crane to the following data: **[17]**

a) Capacity of crane = 280 kN
b) Span between crane rails = 14 m, Self-weight crane girder = 150 kN
c) Weight of crab, electric motor, Hook etc. = 15 kN
d) Minimum hook approach= 1.0m
e) Wheelbase = 3.5m
f) Span of Gantry 7.0 m
g) Self-weight of trolley = l05kN
h) Self-weight of rails = 0.3 kN/m
i) Height of rail section =75 mm

OR

Q6) Determine the design force in the member L_0U_1, L_0L_1, and U_1L_1 of pratt truss as shown in Fig. 1. Assume design wind pressure is 1200 N/m^2, use A.C. Sheet and the C/C spacing of truss is 6m. Assume self-weight of purlin 120 N/m. **[17]**

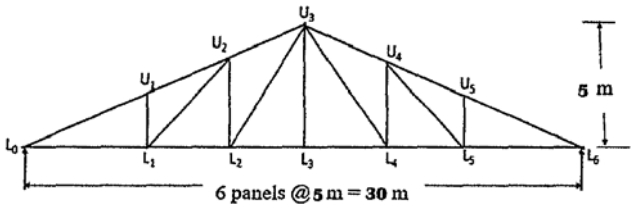


Fig. 1

Q7) A simply supported welded plate girder of an effective span of 26 m subjected to uniformly distributed load 40 kN/m throughout the span exluding the self-weight of plate girder. Assume compression flange laterally supported throughout the span and yield stress of steel is 250 MPa Design cross section of plate girder, bearing and intermediate stiffeners. Draw sectional plan and elevation. **[18]**

OR

Q8) Design a suitable cross section of welded plate girder 30 m in span and laterally supported throughout. It has to support a uniform load of 30 kN/m throughout the span including of self-weight of plate girder. It is also loaded with two concentrated load of 140 kN acting at 10 m from either supports. Design C/S of plate girder without intermediate stiffeners. The steel for the flange and web plates is of grade Fe 410. Yield stress of steel may be assumed to be 250 MPa irrespective of the thickness of plates used. **[18]**

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Total No. of Questions : 8]

SEAT No. :

PE-2489

[Total No. of Pages : 2

[6583]-13
T.E.(Civil)
ENGINEERING ECONOMICS & FINANCIAL MANAGEMENT
(2019 Pattern) (Semester - V) (301004)

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

Instructions to the candidates :

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) a) Discuss the concept of contract costing. **[5]**

b) Write down a role of financial manager in construction Financial management. **[5]**

c) Differentiate between job costing and contact costing **[8]**

OR

Q2) a) What are the features of contract costing? **[5]**

b) Explain method of reporting and recording site accounts between project and head office **[5]**

c) List out various accounting methods and explain any two **[8]**

Q3) a) Write a short note on Rule of 72 **[5]**

b) Define capital budgeting and discuss the importance of Capital budgeting. **[6]**

c) What the methods of capital budgeting? Explain any one with the help of example **[6]**

P.T.O.

OR

Q4) a) What do you understated by concept of time value of money? Explain with example **[5]**

b) Differentiate between master and functional budget **[6]**

c) Explain and differentiate simple and compound interest with the help of example. **[6]**

Q5) a) Why working capital is essential for any business? Enlist components of working capital. **[5]**

b) What do understand by inventory and its types? How it would be manage? **[6]**

c) Write a short note on ABC analysis and Just in time technique **[6]**

OR

Q6) a) Explain factors affecting on working capital requirement. **[5]**

b) Explain inventory management method like VED analysis, FIFO and LIFO **[6]**

c) Explain any two method of estimating the working capital **[6]**

Q7) a) Discuss about the tax exemption for contractors. **[5]**

b) Differentiate between direct tax and indirect tax **[5]**

c) Write down on any two method used to calculate property tax for any two cities. How you will get exemption from property tax? **[8]**

OR

Q8) a) Write down about objectives and Functions of SEBI. **[5]**

b) What are the key roles of IRDA? list out its functions also **[5]**

c) Write down the various taxes replaced by GST in India also mention different reasons to implement GST in our country. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2490

[Total No. of Pages : 2

[6583]-14
T.E. (Civil)
ADVANCED FLUID MECHANICS AND HYDRAULIC MACHINES
(2019 Pattern) (Semester - V) (301005A) (Elective - 1)

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, and Q. No.7 or Q. No.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) Describe various types of surge tanks. **[6]**

b) Prove that for gradual closure of valve rise of pressure $h = \frac{LV}{gt}$ **[6]**

c) Explain one complete cycle of water hammer phenomenon. **[6]**

OR

Q2) a) Explain water hammer phenomenon. **[6]**

b) State and explain various types of unsteady flow **[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 20 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 flat stationary plate held perpendicular to the jet. **[6]**

P.T.O.

OR

Q4) a) Explain impulse momentum principle. **[6]**

b) Derive an expression for force exerted by jet on symmetrical moving curved vane at the centre. **[6]**

c) Derive an expression for force exerted by jet on flat moving plate held normal to the jet. **[6]**

Q5) a) With neat sketch explain various components of hydroelectric power plant. **[6]**

b) Compare pelton wheel and Francis turbine **[6]**

c) Describe various types of turbines. **[6]**

OR

Q6) a) Calculate diameter of jet and mean diameter of pelton wheel turbine working under following conditions. **[6]**

i) Power 10000 KW

ii) Net head available 800 m

iii) Speed 600 rpm

iv) Cv for jet 0.98

v) Speed ratio 0.46

vi) Overall efficiency 90%

b) State and explain various types of draft tubes. **[6]**

c) Explain the measures to reduce cavitation in turbine. **[6]**

Q7) a) Explain cavitation in centrifugal pump. **[6]**

b) Describe multistage pump with impeller in series and parallel. **[6]**

c) Explain advantage and disadvantages of centrifugal pump. **[4]**

OR

Q8) a) With neat sketch explain various components of centrifugal pump. **[6]**

b) Describe various characteristic curves of pump. **[6]**

c) Explain various types of centrifugal pumps. **[4]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2491

[Total No. of Pages : 2

[6583]-15

T.E. (Civil Engg.)

RESEARCH METHODOLOGY AND IPR

(2019 Pattern) (Semester - V) (301005B) (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. 7or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary and clearly state.***

Q1) a) What are the various types of interview? Explain the various advantages and limitations of interview. **[9]**

b) What are the statistical technique which are commonly used in educational research? **[8]**

OR

Q2) a) How will you differentiate between descriptive statistics and inferential statistics? Describe the important statistical measures often used to summarize the survey/research data. **[9]**

b) State the characteristics of Quantitative data. **[8]**

Q3) a) Discuss the linear regression analysis in details. **[9]**

b) Explain the technique and importance of oral presentation of research findings. Is only oral presentation sufficient? If not, why? **[9]**

OR

Q4) a) What are the methods of constructing regression equation? Explain in details. **[9]**

b) Write short notes on Bibliography and its importance in context of research report. **[9]**

P.T.O.

Q5) a) Write few lines about IPR? Do you think this is useful rights for us? Explain. **[9]**

b) Enumerate the salient features of the Design Act 2000. **[8]**

OR

Q6) a) State the criteria of copyright; also write short notes on copyright of author. **[9]**

b) Enumerate the competition issues in intellectual property licensing. **[8]**

Q7) a) What is a trade secret'? And How are trade secrets protected? **[9]**

b) What is the criterion for commercialization of patent? **[9]**

OR

Q8) a) What is valuation? Why is valuation of intellectual property important? **[9]**

b) There is no copyright in an Idea. Explain. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-2492

[Total No. of Pages : 2

[6583]-16
T.E. (Civil)
CONSTRUCTION MANAGEMENT
(2019 Pattern) (Semester - V) (301005C) (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 the importance of labour laws in construction sector. **[6]**

b) Write note on Child Labour Act. **[6]**

c) What is liability? Explain with suitable example. **[6]**

OR

Q2) a) Explain in detail profit loss accounts statement. **[6]**

b) Explain Building and other construction work Act. **[6]**

c) Write a short note on 'Need of Working Capital'. **[6]**

Q3) a) What are the steps involved in mitigation of risk. **[6]**

b) Short note on sensitivity analysis and break-even analysis. **[6]**

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

OR

Q4) a) Write note on break even analysis. **[6]**

b) Explain importance of value analysis and decision tree analysis in construction sector. **[6]**

c) Write note on simulation analysis. **[5]**

P.T.O.

Q5) a) What is performance appraisal State importance of it. **[6]**

b) What is supply chain management and state its importance in construction sector. **[6]**

c) The Zen scientific Equipment Company estimates its carrying cost at 15% and its ordering cost at Rs. 9 per order. The estimated annual requirement is 48,000 units at a price of Rs. 04 per unit. **[6]**

Find out:

i) What is the most economical number of units to order?

ii) How many orders should be placed in a year?

OR

Q6) a) Explain in detail role of ERP in material management. **[6]**

b) Write a short note on importance of HRM in construction industry. **[6]**

c) A Mauli Brick supply company places an annual order of 48,000 units at a price of Rs. 20 per unit. Its carrying cost is 15% and the order cost is Rs. 12 per order.

Find out:

i) What is the most economical order quantity?

ii) How many orders need to be placed in year? **[6]**

Q7) a) Explain in details importance of Artificial Intelligence in Real Estate RERA Projects. **[6]**

b) Explain list of various application using Python Programing and ANN, in Civil Engineering **[6]**

c) What are the application of fuzzy logic in construction industry. **[5]**

OR

Q8) a) Discuss in detail importance of Python Programing and genetic algorithm tool use in construction industry. **[6]**

b) Explain in details characteristic of Artificial Neural Network (ANN). **[6]**

c) What do you mean by fuzzy logic. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2493

[Total No. of Pages : 2

[6583]-17
T.E. (Civil)
ADVANCED CONCRETE TECHNOLOGY
(2019 Pattern) (Semester - V) (301005D) (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 should be drawn wherever necessary.***
3) ***Figures in bold to the right indicate full marks.***

Q1) a) Explain how water-reducing admixtures work. **[6]**

b) What are some common challenges associated with the use of chemical admixtures in concrete production? **[6]**

c) How do admixtures contribute to improving the workability of concrete mixes? **[6]**

OR

Q2) a) What considerations should be taken into account when selecting and dosing admixtures to achieve desired concrete properties and performance characteristics? **[6]**

b) What are the key factors influencing the compatibility of different admixtures when used together in concrete mixes, and how can potential issues be mitigated? **[6]**

c) In what ways do specialty admixtures, such as air-entraining agents and pumping aids, address specific challenges encountered in concrete construction projects? **[6]**

Q3) a) How do synthetic fibers contribute to enhancing the durability and service life of concrete structures? **[6]**

b) Discuss the limitations associated with the use of synthetic fibers in concrete. **[6]**

c) What are the key applications of steel fiber-reinforced concrete in civil engineering? **[5]**

OR

P.T.O.

Q4) a) List the hardened properties of steel fiber reinforced concrete. **[6]**

b) What are synthetic fibers? Describe the properties of any one type of synthetic fibers. **[6]**

c) Which type of fibers are recommended to mitigate shrinkage in concrete? Explain the reasons. **[5]**

Q5) a) What are the different types of sulfate attack, and how do they affect the properties and integrity of concrete? **[6]**

b) What is carbonation in concrete? How is it measured? **[6]**

c) Explain how corrosion occurs in concrete. **[6]**

OR

Q6) a) What methods and materials can be used to reduce chloride penetration and mitigate the risk of corrosion in reinforced concrete structures? **[6]**

b) How do the transport properties of concrete, such as permeability and porosity, influence its durability and resistance to external aggressors? **[6]**

c) Explain the different types of shrinkage in concrete. **[6]**

Q7) a) What types of tests are performed on concrete cores in the laboratory? **[6]**

b) How does the ultrasonic pulse velocity method differ from other non-destructive testing techniques. **[6]**

c) What are the advantages and limitations of in-situ load testing compared to laboratory-based testing methods. **[5]**

OR

Q8) a) What are the different types of in-situ load tests commonly used for assessing the strength of concrete structures? **[6]**

b) Explain the electric resistivity method. **[6]**

c) Discuss the significance of half-cell potential mapping in identifying areas of potential corrosion. **[5]**

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Total No. of Questions : 8]

SEAT No. : ____

PE-2494

[Total No. of Pages : 3

[6583]-18
T.E. (Civil)
MATRIX METHODS OF STRUCTURAL ANALYSIS
(2019 Pattern) (Semester - V) (301005 E) (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 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) Using stiffness member approach, determine overall stiffness matrix for the given truss in Figure 1. Area of all members is given in cm2 in the brackets and E = 200 GPa. Determine the load vector for entire truss. What will be the size of reduced stiffness matrix? **[18]**

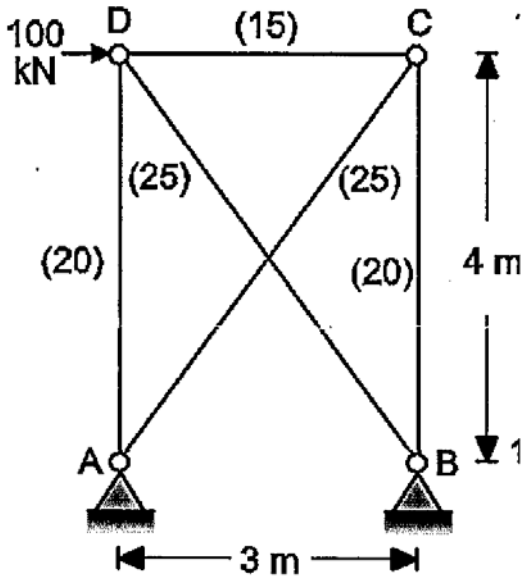


Figure 1

OR

P.T.O.

Q2) a) Derive the member stiffness matrix from fundamentals for a bar element having cross sectional area A and modulus of elasticity e and length L subjected to axial forces. **[4]**

b) For the given bar with diameter of 50 mm, subjected to axial forces as shown, determine the displacements and find the corresponding strains and stresses. Consider end A as fixed. AB= 800 mm, BC = 1000mm and CD =1200mm. Pb = 80kN, Pc = 20kN and Pd = 10kN. **[14]**

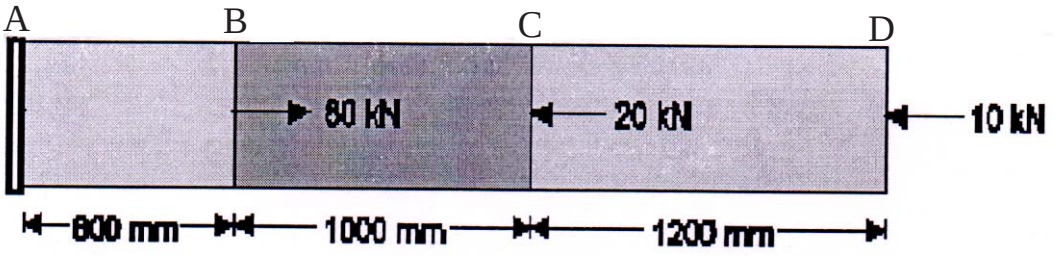


Figure 2

Q3) Analyze the continuous beam simply supported on all supports having two equal spans of 6 m and subjected to udl of 5kN/m on entire beam. Use member stiffness matrix method. Find the rotational displacements and also find the reactions and draw the shear force and bending moment diagram. **[17]**

OR

Q4) a) Derive the transformation matrix for plane frame member. **[8]**

b) Derive the stiffness matrix for plane frame member. **[9]**

Q5) a) Derive the stiffness matrix for grid member. **[9]**

b) State the necessity of transformation matrix. For a grid member, derive the transformation matrix. **[8]**

OR

Q6) A grid consisting of two members AB and BC of length 3.5 m which are perpendicular to each other is fixed at A and subjected to uniformly distributed load of 20 kN/m on AB member only. 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) Write flowchart for solution of beam problem using stiffness member approach. **[9]**

OR

Q8) a) Write flowchart for solution of plane frame problem using stiffness member approach. **[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]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PE-5975

[Total No. of Pages : 3

[6583]-19
T.E. (Civil)
ADVANCED MECHANICS OF STRUCTURES
(2019 Pattern) (Semester - V) (301005 F) (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 length 8 mis subjected to a moving uniformly distributed load W along the entire span. Draw the influence line diagram for : **[9]**

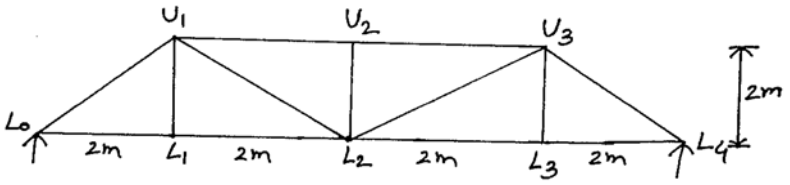
i) Shear at x = 2 from the left support

ii) Bending moment at x = 4m.

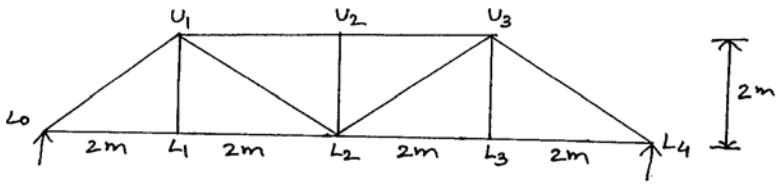
b) Draw the influence line diagram for the reaction at the left support of a beam of span L =10 with an overhang of 2m on the right. **[8]**

OR

Q2) a) Draw the influence line diagram for the member U_2U_2, L_1L_2, and U_3L_4 of a truss as shown in fig below. **[8]**



b) Draw the influence line diagram for the member U_2U_3, L_3L_4, and U_2L_2 of a truss as shown in fig below. **[9]**



P.T.O.

Q3) a) A simply supported beam of 15 m span carries a rolling uniformly distributed load (UDL) of intensity 35 kN/m, with the load length greater than the span. Determine the maximum reactions at the supports, the maximum negative shear force, maximum positive shear force, and maximum bending moment at a section located 6 m from the right support, and finally compute the absolute maximum bending moment developed anywhere along the span. **[12]**

b) Two wheel loads of 60 kN and 250 kN, spaced 3 m apart, move across a simply supported girder having a span of 20 m, with either load allowed to lead. Determine the maximum positive shear force and the maximum negative shear force at a section located 8 m from the left support. **[6]**

OR

Q4) a) Simply supported beam of 30 m span carries a rolling uniformly distributed load (UDL) of 8 m length and intensity 20 kN/m, moving from the left support toward the right. Determine the maximum reactions at the supports, the maximum negative and positive shear forces and the maximum bending moment at a section located 6 m from the left support, and finally compute the absolute maximum bending moment occurring anywhere along the span. **[12]**

b) A uniformly distributed live load of 60 kN/m run of length 10 m moves on a girder of span 19 m. Find the maximum positive and negative bending moment and shear force. **[6]**

Q5) a) Explain the structural behavior of beams curved in plan and elevation, highlighting the effects of curvature on bending moments, torsional moments, and shear distribution. **[9]**

b) Explain the Winkler–Bach theory for curved beams and derive the expression for flexural stresses in a curved beam subjected to bending.**[8]**

OR

Q6) Derive an expression for simply supported semi-circular beam supported on three supported equally spaced. **[17]**

Q7) a) A three hinged parabolic arch of 22 m span and 2.5 m central rise carries a UDL of length 6 m of intensity 29 KN/m on the left half of the span. Find reactions at support, Horizontal thrust, Bending Moment, Normal Thrust, Radial Shear at 6m from left support. **[13]**

b) Define a two-hinged parabolic arch. Explain how the bending-moment distribution differs between a parabolic arch and a circular arch under a uniformly distributed vertical load. **[5]**

OR

Q8) a) For a two-hinged parabolic arch of span L and rise F carrying a uniformly distributed vertical load W per unit horizontal length, derive expressions for **[13]**

i) the horizontal thrust H, and

ii) the maximum bending moment in the arch. State any assumptions.

b) A three hinged parabolic arch of 25 m span & 6 m central rise carries a point load of 175 KN at 5m horizontally from the left hand hinge. Calculate the normal thrust & radial shear at a section under the point load. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2495

[Total No. of Pages : 3

[6583]-20
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, 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) A homogeneous gas phase reaction A $\rightarrow$ 3R proceeds with $-r_A = 10^{-1}C_A$, mol/litre.sec at 473 K. Find space time required to achieve 80% conversion of a 50% A and 50% inerts feed to a plug flow reactor operating at 473 K and 5 atm pressure. The initial concentration of A is 0.0625 mol/litre. **[8]**

b) Derive performance equation of **[9]**

i) Batch Reactor

ii) Mixed Flow Reactor

iii) Plug Flow Reactor

OR

Q2) a) For First order reaction A $\rightarrow$ R for changing density system taking place in Plug Flow Reactor, Prove that **[9]**

$$k\tau = -(1 + \varepsilon_A)\ln(1 - X_A) - \varepsilon_A X_A$$

b) In an isothermal batch reactor, the conversion of a liquid reactant A achieved in 13 minutes is 70%. Find the space velocity necessary to effect this conversion in a plug flow reactor and in mixed flow reactor, considering the reactor as first order. **[8]**

P.T.O.

Q3) a) Explain quantitative treatment for the irreversible unimolecular first order reaction in series occurring in mixed flow reactor. **[10]**

b) The desired liquid phase reaction **[8]**

$$A + B \rightarrow R + T \qquad \frac{dC_R}{dt} = \frac{dC_T}{dt} = k_1 C_A^{1.5} C_B^{0.3}$$

Is accompanied by the unwanted reaction

$$A + B \rightarrow S + U \qquad \frac{dC_S}{dt} = \frac{dC_U}{dt} = k_2 C_A^{0.5} C_B^{1.8}$$

Order the contacting schemes given below for the product distribution from the most favorable to the least favorable.

Contacting schemes.

i) A Plug Flow Reactor

ii) A Plug Flow Reactor with side streams of B

iii) A Plug Flow Reactor with side streams of A

iv) A Mixed Flow Reactor

OR

Q4) a) Give quantitative treatment of product distribution and of reactor size for parallel reaction. **[9]**

b) Liquid reactant A produces R and S by the following reactions in parallel : **[9]**

$$A \rightarrow R \qquad r_R = k_1 C_A^2 \qquad k_1 = 0.4\ m^3/(\text{mol.min})$$

$$A \rightarrow S \qquad r_S = k_2 C_A \qquad k_1 = 2\ \text{min}^{-1}$$

A feed of aqueous A with C_{A0} = 40 mol/m^3 enters a reactor, reacts to produce R and S, and a mixture of A, R and S leaves the reactor. Find C_R, C_S and τ for 90% conversion of A in Mixed Flow Reactor.

Q5) a) Explain in detail the optimum temperature progression for **[9]**
i) irreversible reactions ii) exothermic reversible reaction

b) Draw and explain energy balance equation line for adiabatic operation. **[9]**

OR

Q6) a) For aqueous reaction A $\leftrightarrow$ R between the temperature range 0°C to 100°C determine the equilibrium conversion as a function of temperature in graphical form. What should be the maximum temperature so that the conversion of A achieved is 75% or more? **[9]**

For $C_R^0 = C_A^0 = 1\frac{mol}{lit}$, $\Delta G_{298}^0 = -3375\frac{cal}{mol}$, $\Delta H_{R298}^0 = -18000\frac{cal}{mol}$

b) Explain the effect of temperature, pressure and inert on equilibrium conversion X_C for exothermic and endothermic reactions. **[9]**

Q7) a) Discuss Tank is series model and Dispersion Model. **[9]**

b) A reactor with a number of dividing baffles is used to run the reaction $A \rightarrow B$ with $-r_A = 0.05\ C_A$ mol/litre.min. **[8]**

A pulse tracer test gives the following output curve :

t, min	0	10	20	30	40	50	60	70
C(g/m^3)	35	38	40	40	39	37	36	35

Calculate the following :

i) Required number of tanks to be connected in series to model this reactor.

ii) Percent conversion, assuming tank in series model.

OR

Q8) a) Explain E, F, C Curves and find the relationship between them. **[9]**

b) The following data was obtained from a pulse input to a vessel : **[8]**

t, min	0	1	2	3	4	5	6	7	8	9	10	12	14
C(g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

Determine of following :

i) Fraction of material leaving the vessel that has spent time between 3 and 6 minutes in the vessel.

ii) Variance for a vessel.

Total No. of Questions : 8]

SEAT No. :

PE-2496

[Total No. of Pages : 3

[6583]-21
T.E. (Chemical)
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, 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) Define the following terms in solvent Extraction with their significance; **[5]**

i) Selectivity and Distribution coefficient

ii) Plait point and Tie lines

b) Explain Binodal Solubility Curve and the effect of temperature on Binodal Solubility Curve in solvent Extraction. **[5]**

c) Write a material balance for single stage solvent Extraction with immiscible solvents with graphical representation of equilibrium characteristics. **[8]**

OR

Q2) 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).

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

Where Y = kg of nicotine / kg of kerosene

X = kg of nicotine / kg of water

Determine % extraction of nicotine if 100 kg of the feed solution is extracted with 150 kg of solvent. **[8]**

b) Differentiate between the Solvent Extraction and Distillation for separation of liquid mixtures. **[5]**

c) Explain the principle, construction and mechanism of Mixer and Settler for solvent Extraction with neat diagram. **[5]**

P.T.O.

Q3) a) Enlist the Equipments used for leaching operation and explain any one of them in detail. **[7]**

b) Explain the constant and variable underflow in leaching operation. **[4]**

c) Write the material balance for the single stage leaching operation assuming variable underflow and no insoluble in the overflow. **[6]**

OR

Q4) a) Discuss on the graphical representation of equilibrium characteristics of Leaching operation with diagram and proper notations. **[7]**

b) Crushed oil seeds containing 55 % oil by weight are to be extracted at a rate of 4000 kg/h using 6000 kg/h of Hexane containing 5% by weight as a solvent in a countercurrent two stage Extraction system. The oil seeds retain 1 kg of solution per kg of oil- free cake. Calculate the percentage of oil recovery based on the original feed obtained under the above conditions. **[10]**

Q5) a) Explain the characteristics of adsorbents and mention different types of adsorbents with their specific applications. **[8]**

b) Describe the Freundlich and Langmuir adsorption Isotherms in adsorption operation. **[10]**

OR

Q6) a) Which parameters should affect the shape of Breakthrough curve in adsorption? **[8]**

b) Halibut oil is to be extracted from granulated Halibut livers in a countercurrent Extraction using Ether as solvent. The mass flow rate of Halibut livers to the unit is 350 kg/hr. the fresh livers contain 20% oil and are to be extracted to 1% oil (On solvent free basis). Ether containing 2% oil to be used as a solvent is fed to the unit at the rate of 250 kg/hr. **[10]**

i) Determine the number of theoretical stages required.

ii) Determine % recovery of the oil.

The entrainment data are as follows;

Concentration, kg of oil/kg solution	0	0.1	0.2	0.3	0.4	0.5	0.6
kg solution/kg exhausted livers	0.28	0.34	0.40	0.47	0.55	0.66	0.80

Q7) a) Write the material and energy balance of crystallizer. **[10]**

b) Give classification of membrane processes. What are different membrane modules? **[7]**

OR

Q8) a) Classify the crystallizers and give the significance of vacuum Crystallizer. **[7]**

b) Calculate the yield of $MgSO_4$. $7H_2O$ crystals when 1000 g saturated solution of $MgSO_4$ at 353 K is cooled to 303K assuming 10% of water is lost by evaporation during cooling in crystallization operation.

Data: Solubility of $MgSO_4$ at 353K = 64.2 kg/l00kg water

Solubility of $MgSO_4$ at 303K = 40.8 kg/l00kg water

Molecular weight of $MgSO_4$. $7H_20$ = 246 **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-2497

[Total No. of Pages : 2

[6583]-22

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 and Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume sutiable data, if necessary.***

Q1) a) Derive expression of molar flux, concentration profile and average concentration for diffusion with homogeneous chemical reaction. **[12]**

b) Discuss the shell mass balance equation along with boundary conditions.**[6]**

OR

Q2) a) Derive expression of molar flux, concentration profile and average concentration for diffusion through stagnant gas film. **[12]**

b) Diffusivity of gas-pair oxygen-carbon tetrachloride is determined by observing steady sate evaporation of carbon tetrachloride. The distance between CCl_4 liquid level and top of tube is 17.1 cm. The total pressure on the system is 100.63kN/m^2 and temperature is 0^0C. Vapor pressure of CCl_4 at this temperature is 4.39 kN/m^2. The cross-sectional area of tube is 0.82 cm^2. If is is found that 0.0208 cm^3 of CCl_4 evaporate in 10 hours period, what is diffusivity of gas-pair CCl_4-O_2? (Density of CCl_4 = 1.59 g/cm^3) **[6]**

Q3) a) Use Navier Stoke's equation of motion to derive Hagen Poiseuille equation. **[12]**

b) What do you mean by partial time derivative, total time derivative and substantial time derivative? **[5]**

OR

Q4) a) Derive Newton's second law of motion. **[12]**

b) Explain dimensionless form of equation of change. **[5]**

P.T.O.

Q5) a) Derive Blake Kozeny equation for laminar flow of fluid through packed bed. **[10]**

b) Water is flowing through 0.05 I.D. tube. The pressure drop is 480kN/m^2 per 0.3 m of tube. Find the point velocity at various positions between the wall and the center of the tube. **[8]**

OR

Q6) a) Derive an expression for macroscopic mass, momentum balances for sudden enlargement system? **[12]**

b) Explain macroscopic mass and energy balance equation. **[6]**

Q7) a) Explain in detail about Prandtl's and Chilton-Colburn J-factor Analogy. **[9]**

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

OR

Q8) a) Explain co-relation of binary mass transfer coefficient in one phase at low mass transfer rates. **[9]**

b) Explain Martinnelli's analogy. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2498

[Total No. of Pages : 2

[6583]-23

T.E. (Chemical)

ENERGY CONSERVATION IN CHEMICAL PROCESS INDUSTRIES

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

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, and Q.3 or Q.4 and Q.5 or Q.6and 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 the different energy available for Industrial use. **[10]**

b) Write down motivation program for implementing conservation measures. **[7]**

OR

Q2) Which are different Best practices should be follow in chemical industry for conversation of in chemical industries? Explain with any case study. **[17]**

Q3) Write down Management of Energy Conservation Programs with suitable examples? **[18]**

OR

Q4) Enlist activates for promoting energy conservation in present status. **[18]**

P.T.O.

Q5) a) Distinguish between Batch & continuous process in contest of energy saving. **[10]**

b) How will you save energy in conservation in boilers? **[8]**

OR

Q6) How and where the energy losses can be minimized in a Mixing Vessel. **[18]**

Q7) a) Make detailed report on food industry for saving energy? **[10]**

b) Explain the model role of equipment manufacturer in the development and future prospects for a process industry. **[7]**

OR

Q8) Explain waste minimization and its classification, housekeeping, process change, recycling, product modification, waste minimization methodology steps, benefits of waste minimization in Sugar industry. **[17]**

Total No. of Questions : 8]

SEAT No. :

PE-2499

[Total No. of Pages : 2

[6583]-24

T.E. (Chemical)

PROCESS INSTRUMENTATION AND CONTROL

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q.1 orQ.2, Q.3orQ.4, Q.5orQ.6, Q.7orQ.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Distinguish between active and passive transducers with suitable example. **[8]**

b) Explain with diagram, construction and working of Bellows **[8]**

OR

Q2) a) Explain with diagram, construction and working of Diaphragms. **[8]**

b) Explain construction, working principle and application of McLeod gauge **[8]**

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

b) Explain classification of flow measuring instruments. **[8]**

OR

P.T.O.

Q4) Write Short Notes on **[18]**

a) Turbine type flow meter b) Electromagnetic flow meter

Q5) Describe with neat diagram the following techniques of composition analysis. **[18]**

a) IR absorption Spectroscopy b) Mass Spectroscopy

OR

Q6) a) Write short notes on: **[10]**

i) pH meter ii) Refractometry

b) Explain principle with diagram, construction, working of HPLC. **[8]**

Q7) a) Describe the heat exchanger automatic control system with block diagram. **[9]**

b) Explain modes of control action. **[9]**

OR

Q8) a) Derive the dynamic response equation of first order system for step change. **[9]**

b) State difference between first order and second order system. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2500

[Total No. of Pages : 2

[6583]-25

T.E. (Chemical)

CORROSION ENGINEERING

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

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

Instructions to the candidates:

1) ***Answer five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.***

Q1) a) Explain Galvanic Corrosion in detail. **[8]**

b) Explain Pitting corrosion with example. **[8]**

OR

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

b) Write short note on intergranular and stress corrosion cracking. **[8]**

Q3) a) Write note on Pilling Bed worth ratio and explain in detail. **[9]**

b) What is the mechanisms of Oxidation. Explain with suitable example in detail. **[9]**

OR

Q4) a) Explain High temperature oxidation with example. **[9]**

b) Discuss in detail Corrosion of iron and steel in aqueous media. **[9]**

Q5) a) Explain the testing procedures and evaluation of corrosion. **[9]**

b) Write note on modification of the material by alloying. **[9]**

OR

P.T.O.

Q6) a) Write note on appropriate heat treatment to avoid corrosion. **[9]**

b) What are the Prevention techniques for Corrosion. **[9]**

Q7) Explain Cathodic protection and Anodic protection with proper diagram.**[18]**

OR

Q8) Chemical and Mechanical methods of surface treatment coatings,explain in detail. **[18]**



Total No. of Questions : 8]

SEAT No. :

PE-2501

[Total No. of Pages : 2

[6583]-26

T.E. (Chemical)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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

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 side indicates full marks.***
4) ***Assume Suitable data if necessary.***

Q1) With help of neat diagram explain ANN architecture and discuss the error back propagation strategy in details. **[18]**

OR

Q2) With help of a neat diagram explain Fuzzy logic based control strategy. What are membership functions? Explain application of Fuzzy Logics into Chemical Engineering. **[18]**

Q3) a) What are expert systems? What are the key designing aspects for Expert Systems. **[10]**

b) Explain the advantages and disadvantages of expert system. **[7]**

OR

Q4) With help of relevant examples discuss applications of expert system in Chemical and allied processes. Highlight the importance of process knowledge and data requirement aspects while designing a robust expert system. **[17]**

Q5) a) Differentiate Propositional logic with First order logic. List the Inference rules along with suitable examples for first order logic. **[9]**

b) Explain deductive and retrieval and backward chaining in details. **[9]**

OR

P.T.O.

Q6) Explain the following points in detail (any three): **[18]**

a) Second order Logic

b) Forward Chaining

c) Backward Chaining

d) Deductive Retrieval

Q7) What are the properties of planning problem? Discuss in details on STRIPS planner and its implementation strategies. **[17]**

OR

Q8) a) Explain in details operation and application of Rule based Expert System.**[8]**

b) Explain the concept of problem decomposition with help of goal trees.**[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2502

[Total No. of Pages : 3

[6583]-27

T.E. (Chemical)

MASS TRANSFER - I

(2019 Pattern) (Semester - V) (309341)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and 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) What is absorption & stripping factors? Explain. **[8]**

b) 5,000 kg/hr of a SO_2 - air mixture containing 5% by volume SO_2 is to be scrubbed with 1,00,000 kg/hr. of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relationship is given by Y = 14X Where, Y = Mole SO_2/ Mole air & X = Mole SO_2/Mole water. If the packed height of the tower is 420 cm, estimate the Height of Transfer Unit (HTU)? **[9]**

OR

Q2) a) Explain equilibrium in gas Absorption? **[8]**

b) A packed tower is designed to recover 98% CO_2 from a gas mixture containing 10% CO_2 & 90% air using water The equilibrium relation is given as Y = 14X.

Where Y = kg CO_2/Kg dry air & X = KgCO_2/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]**

P.T.O.

Q3) a) Explain 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. Calculate **[9]**

i) Molal Humidity

ii) Saturation humidity

iii) Percentage humidity

iv) Percentage Relative humidity

v) Relative humidity

vi) Humid Heat

vii) Humid Volume

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

OR

Q4) a) Explain design of cooling tower-HTU, NTU concept? **[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) Helium and

ii) Carbon dioxide. (Data: PA = 0.362 std.atm.)

Q5) a) What are the various equipment's used for gas-liquid contact? Explain Venturi Scrubber? **[9]**

b) What are the different types of Column? Explain different types of packings? **[9]**

OR

Q6) a) Explain mechanically agitated vessels with different types of impellers? **[9]**

b) What is Tray efficiency? Explain Murphree Tray Efficiency? **[9]**

Q7) a) Explain the Rate of drying curve in detail? **[8]**

b) A porous dry solid was dried under constant drying conditions in a batch dryer. It took 5 hrs. to reduce the moisture from 40% to 10%. AIl the moisture content on dry basis. How long will it take to dry a sample of the above solid to dry from 50% to 10% under the same drying conditions? **[10]**

OR

Q8) a) Explain mechanism of moisture movement within solid? **[8]**

b) A batch of solid for which the following table of data applies is to be dried from 30% to 5% (wet basis) moisture under conditions identical to those for which the data were tabulated. The initial weight of the wet solid is 300 kg & the drying surface is 1 m^2/8 kg dry weight. Determine the time for drying? **[10]**

X Kgmoisture / Kg dry solid	0.35	0.25	0.2	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
R Kgmoisture / hr.m^2	0.3	0.3	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.025

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Total No. of Questions : 8]

SEAT No. :

PE-2503

[Total No. of Pages : 2

[6583]-28
T.E. (Chemical)
CHEMICAL TECHNOLOGY - II
(2019 Pattern) (Semester - V) (309342)

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 mast be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.***

Q1) a) Explain the process of manufacturing of Portland cement. Write the different types of Portland cement. **[9]**

b) Draw and explain coke oven construction with its applications. **[9]**

OR

Q2) a) What is carbonization of coal? Compare types of coal carbonization. **[9]**

b) Explain types of steel in detail with their applications. . **[9]**

Q3) a) Explain mechanical and optical properties of surface coatings. **[7]**

b) Write a short note on the following with suitable diagram (any 2) **[10]**

i) Producer Gas

ii) Natural Gas

iii) Water Gas

OR

Q4) a) Explain the manufacturing process, of dyes with unit operations and unit processes involved in it. **[9]**

b) Discuss production of producer gas with its major engineering problems. **[8]**

P.T.O.

Q5) a) Explain properties and applications of Varnishes. **[9]**

b) Write short note on agrochemicals. **[8]**

OR

Q6) a) Describe manufacturing of penicillin with major engineering problems. **[8]**

b) What are different Antibiotics explain their properties and applications. **[9]**

Q7) a) Explain manufacturing of ethylene dichloride (EDC) with major engineering problems. **[9]**

b) Explain production of methanol by catalytic hydrogenation of carbon monoxide. **[9]**

OR

Q8) Draw a neat flow diagram and explain in brief (any 3). **[18]**

a) Production of vinyl chloride

b) Production of Phenol

c) Production of acetone

d) Production of Ethylene

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Total No. of Questions : 8]

SEAT No. : ____

PE-2504

[Total No. of Pages : 3

[6583]-29
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, Q3 or Q4, Q5 or Q6 and 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 the following data with the power model ($y = ax^b$). Use the resulting power equation predict y at $x = 9$. **[10]**

x	2.5	3.5	5	6	7.5	10	12.5	15	17.5	20
y	13	11	8.5	8.2	7	6.2	5.2	4.8	4.6	4.3

b) The velocity distribution of a fluid near a flat surface is given below: **[7]**

x	0.1	0.3	0.6	0.8
y	0.72	1.81	2.73	3.47

x is the distance from the surface (mm) and v is the velocity (mm/see). Use Lagrange interpolation polynomial to obtain the velocity at x = 0.4.

OR

Q2) a) Use least square regression to fit a straight line to **[10]**

x	6	7	11	15	17	21	23	29	29	37	39
y	29	21	29	14	21	15	7	7	13	0	3

b) Evaluate the integral of the following data using Simpson's 1/3rd rule. **[7]**

x	–2	0	2	4	6	8	10
f(x)	35	5	–10	2	5	3	20

P.T.O.

Q3) a) Use Euler's method to solve **[10]**

$$\frac{dy}{dx} = -2y + 4e^{-x}$$

$$\frac{dz}{dx} = -\frac{yz^2}{3}$$

over the range x = 0 to 1 using a step size of 0.2 with y(0) = 2 and z(0) = 4.

b) Derive formula for Euler's method and also give its graphical interpretation. **[8]**

OR

Q4) a) In Chemical engineering one relation is commonly used for the concentration ratio C as $dc/dt = Kc^n$ for time t where K is a reaction rate constant and n is an order of reaction. If K = 0.08 and n = 1.5, find the concentration ratio at t = 2 for initial condition c(0)11.23 for an accuracy of 0.1 using modified Euler's method. **[10]**

b) Use Taylor's series to solve the following IVP **[8]**

$y' = 1 + ty \quad y(0) = 1$

Find approximate solution at $t = 0.1$ correct up to 4 decimal places.

Q5) Use the Liebmaun method to determine temperature distribution on a square heated plate with 4 grids (2×2) and lower edge insulated. The temperature on the left edge of the plate is 75°C, top edge 100°C, right edge 50 °C and bottom edge 0 °C. Solve for three iterations. **[17]**

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$$

OR

Q6) Use explicit method to solve for temperature distribution of a thin rod with length of 12 cm and the following values K' = 0.49 cal/(s cm °C), Δx = 3 cm and Δt = 0.1 see. Δt t = 0, the temperature of the rod is zero and boundary conditions are fixed for all times at T(0) = 100 °C and T(10) = 50 °C. Note that the rod is of aluminum with C = 0.2174 cal/g °C and density(p) = 2.7 g/cm^3, K = 0.835 cm^2/sec. Find the temperature distribution in the thin rod using explicit method. Perform three iterations. The heat conduction equation is **[17]**

$$k\frac{\partial^2 T}{\partial x^2} = \frac{\partial T}{\partial t}$$

Q7) a) What is optimization? Explain. Enlist the applications of optimization in Chemical Engineering. **[8]**

b) Use Newton's method to find the maximum of $f(x) = 2\sin(x) - (x^2/10)$ with initial guess of $x_0 = 0.5$. Perform 4 iterations. **[10]**

OR

Q8) a) What are the six steps of optimization? **[6]**

b) Maximize Z = 5xl + 3 x2 **[12]**

Subject to xl + x2 < = 2

5x1 + 2x2 < 10

3x1 + 8x2 < = 12

xl, x2 > = 0

Use simplex Method.

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Total No. of Questions : 8]

SEAT No. : ____

PE-2505

[Total No. of Pages : 3

[6583]-30
T.E. (Chemical)
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, Q.7or 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) Assuming Raoults 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 (1) and ethyl benzene (2) system. **[18]**

The Antoine equation and parameters are given below :

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

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

OR

Q2) a) Discuss various criteria for phase equilibrium. **[6]**

b) Assuming Raoults law to be valid prepare p-x-y diagram for a temperature of 363.15 K (90°C) for 1- Chlorobutane (1)/Chlorobenzene (2) system. Antoine equation and constants are **[12]**

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

Compound	A	B	C
2-Chlorobutane	13.7965	2723.73	218.265
Chlorobenzene	13.8635	3174.78	211.700

P.T.O.

Q3) Derive the following expression for solid - liquid equilibrium. **[17]**

$$\Psi_i = \exp \int_{Tm}^{T} \frac{Hil - His}{RT2} dt \text{ where } \Psi_i = \frac{fis}{fil}$$

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.

OR

Q4) a) Develop a mathematical expression which will indicate that all irreversible processes occurring at constant T & P proceed in such a direction as to cause decrease in Gibbs free energy of the system. **[8]**

b) Show that at constant T and P. the condition for stability for a single phase binary system is given as **[9]**

$$\frac{dl\, n\gamma 1}{dx1} > -\frac{1}{x1}$$

Q5) a) A system initially containing 3 mol CO_2, 5 mol H_2 & 1 mol H_2O undergoes the following reactions. **[9]**

$CO_2(g) + 3H_2(g) \rightarrow CH_3OH(g) + H_2O(g)$

$CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$

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

b) Calculate the equilibrium constants at 673K and I bar for the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

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. **[9]**

OR

Q6) a) Estimate the equilibrium constant K_a at 1000 K and 0.1 MPa for the reaction.

$CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$.

K_a at 298 K is 8.685×10^{-6} and $\Delta H°_{298}$ = 41.45 KJ, Δa = -15.463, Δb, = 4.489×10^{-3}, Δc = 0, Δd = 0, Δe = 9.677×10^{5}. **[9]**

b) Develop expression for the reacting species as functions of the reaction coordinates for **[9]**

i) A system initially containing 2 mol NH_3 and 5 mol O_2 and undergoing the reaction.

$$4NH_3(g) + 5O_2(g) \rightarrow 4NO\ (g) + 6H_2O(g)$$

ii) A system initially containing 3 mol H_2S and 5 mol O_2 and undergoing the reaction.

$$2H_2S(g) + 3O_2(g) \rightarrow 2H_2O\ (g) + 2SO_2(g)$$

Q7) a) For gas phase reactions explain the relation of equilibrium constant with Composition. **[4]**

b) A stiochiometric mixture of N_2 (g) and H_2(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]**

OR

Q8) a) Write short note on phase rule and Duhems theorem for reacting systems. **[8]**

b) The water gas shift reaction **[9]**

$$CO(g) + H_2O\ (g) \rightarrow CO_2\ (g) + H_2(g)$$

is carried out under different sets of conditions described below. The equilibrium constant for the reaction, K = 1. Calculate the fraction of steam reacted in each case. Assume the mixture behaves as an ideal gas.

i) The reactants consist of 1 mol H_2O vapour and 1 mol CO. The temperature is 1100 K and pressure is 1 bar.

ii) Same as a) except that the pressure is 10 bar.

iii) Same as a) except that 2 mol N_2 is included in the reactants.

Total No. of Questions : 8]

SEAT No. :

PE-2506

[Total No. of Pages : 2

[6583]-31
T.E. (Chemical)
CHEMICAL INDUSTRY MANAGEMENT
(2019 Pattern) (Semester - V) (309345-A) (Elective - 1)

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 mast 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 industrial purchasing process with quotation and comparative statement. **[10]**

b) Explain Economic Ordering Quantity (EOQ). Derive $Q = \sqrt{\frac{2PD}{HC}}$ where ,

Q = Economic Ordering Quantity, C = Unit cost of Production, D = Annual production, P = Set up cost for quantity Q, H =Inventory carrying cost/handling cost. **[8]**

OR

Q2) Explain the following (any three) **[18]**

a) LIFO

b) FIFO

c) Inventory Control

d) Principles of lending

Q3) a) Explain in detail Marketing Mix. **[8]**

b) Write an explanatory note onadvertising. **[9]**

OR

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

b) Explain in detail sales promotion. **[8]**

P.T.O.

Q5) a) Write a explanatory note on Patent and patent rights. **[10]**

b) Explain in detail business cycle with different phases of business cycle. **[8]**

OR

Q6) a) Describe the Total Quality Management (TQM). **[10]**

b) Explain ISO along with it's types. **[8]**

Q7) a) Explain FERA in detail. **[9]**

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

OR

Q8) a) Write a brief note on concept of Monopolies and Restrictive Trade Practices (MRTP) Act **[9]**

b) Write a note on Patent Act, 1970. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE-2507

[Total No. of Pages : 2

[6583]-32
T.E. (Chemical)
FOOD TECHNOLOGY
(2019 Pattern) (Semester - V) (309345B) (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.7or 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, neeessary.***

Q1) a) Discuss about various types of storage of fruits and vegetables. **[8]**

b) Write short notes on preservation of fruits and vegetables by. **[8]**

i) Chemicals.

ii) Salt.

OR

Q2) a) Explain aseptic canning technology for canning of fruits and vegetables. **[8]**

b) Write Short note on preparation of syrups. **[8]**

Q3) a) Explain theory of size reduction equipment's and effect of size reduction on foods. **[10]**

b) Explain applications and effect on food materials for drying and freeze concentration. **[8]**

OR

Q4) Write Short Notes on : **[18]**

a) Evaporation extrusion theory and equipment's.

b) Hot air dehydration theory and equipment's.

c) Baking theory and equipment's.

P.T.O.

Q5) Describe following techniques of foodstuff. **[18]**

a) Packaging methods for prevention of food stuff.

b) Shelf life of packaged foodstuff.

OR

Q6) a) Write short notes on: **[10]**

i) PLywood and wire bound boxes.

ii) Corrugated and fibre board boxes.

b) Explain flexible packaging materials and their properties. **[8]**

Q7) a) Describe Objectives, importance, & functions of quality control of food. **[9]**

b) Explain quality assessment of food materials in fruits and vegetables. **[9]**

OR

Q8) a) Explain concept of Codex Almentarious / HACCP in food quality assurance. **[9]**

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

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Total No. of Questions : 8]

SEAT No. :

PE-2508

[Total No. of Pages : 2

[6583]-33
T.E. (Chemical)
POLYMER ENGINEERING
(2019 Pattern) (Semester - V) (309345C) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and 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 in detail the different molecular weights considered in Polymer engineering. **[9]**

b) What is Polydispersity Index? Explain. **[8]**

OR

Q2) A sample of polystyrene is composed of a series of fractions of different-sized molecules; **[17]**

Fraction	Weight Fraction	Molecular Weight
A	0.1	12,000
B	0.19	21,000
C	0.24	35,000
D	0.18	49,000
E	0.11	73,000
F	0.08	102,000
G	0.06	122,000
H	0.04	146,000

Calculate the number-average and weight-average molecular weights of this polymer sample.

P.T.O.

Q3) Explain in detail the Kinetics of Step Growth Polymerization along with examples. **[18]**

OR

Q4) Explain in detail the Kinetics of Coordination Polymerization along with examples. **[18]**

Q5) a) Explain the use of the fire retardants utilized in the polymers. Give examples for the same. **[8]**

b) With the different examples, explain the properties and use of the UV stabilizers utilized during polymerization. **[9]**

OR

Q6) a) What do you mean by compounding in polymerization? Give examples of the same. **[8]**

b) With suitable examples and properties, explain the need of the fillers in the polymerization process. **[9]**

Q7) With a neat and labelled diagram and reactions involved, properties, explain the method of production of Teflon Polyesters. **[18]**

OR

Q8) With a neat and labelled diagram and reactions involved, properties, explain the method of production of Cynate Esters. **[18]**

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Total No. of Questions : 8]

SEAT No. :

PE-2509

[Total No. of Pages : 2

[6583]-34

T.E. (Chemical)

DOWNSTREAM PROCESSING

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer all 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 off gases with example. **[8]**

OR

Q2) a) Write note on petrochemical off gases. **[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 distillation 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 zeolites preparation 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]**



Total No. of Questions : 8]

SEAT No. :

PE-4223

[Total No. of Pages : 3

[6583]-35
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 whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of Scientific Calculator is permitted.***

Q1) a) What is the data Preparation phase in Data Analytics Lifecycle. What is the Analytics Sandbox and ETLT process in this phase? **[8]**

b) Compare the data acquisition phase with the data preprocessing phase in terms of inputs, outputs, and objectives. **[8]**

OR

Q2) a) List out the activities to be carried out in model planning and model building phase. What are different tools used for these phases? **[8]**

b) For a dataset of online retail transactions, which steps of the Big Data Analytics Lifecycle would you follow to build a recommendation system? **[8]**

Q3) a) What is logistic regression, and how does it differ from linear regression? What is the sigmoid Function, and what role does it play in logistic regression? **[9]**

b) Differentiate between predictive and descriptive analytics. What are NumPy and Pandas used for in Python? List any three essential Python libraries for data analysis **[9]**

OR

P.T.O.

Q4) a) Apply Naïve Bayes classification to a simple weather dataset to predict ''P1ay/Tennis''. **[9]**

Day	Outlook	Play Tennis
1	Sunny	No
2	Sunny	No
3	Overcast	Yes
4	Rain	Yes
5	Rain	Yes
6	Rain	No
7	Overcast	Yes

b) Explain how a decision tree splits data at each node with suitable example. Describe the role of entropy and information gain in determining the best split. **[9]**

Q5) a) Suppose you have the following dataset containing the coordinates of points in a 2-dimensional space : **[9]**

Point	X Coordinate	Y Coordinate
A	2	3
B	4	7
C	3	5
D	6	9
E	8	6
F	7	8

Perform K-means clustering on this dataset With K = 2. Assume the initial centroids to be (2,3) and (8,6). Compute the new centroids after each iteration until convergence, and assign points to their nearest centroids.

b) How do you handle noise and irrelevant information in text data during preprocessing? Explain the terms bag of words and TF IDF in text analytics. **[9]**

OR

Q6) a) Explain the difference between agglomerative and divisive clustering. Compare single complete, and average linkage methods. **[9]**

b) What is the purpose of each of ROC, AUC and an elbow plot? Describe how each of these plots are constructed with suitable example. **[9]**

Q7) a) What is Bar chart, Pie chart and Line chart? Compare the use of bar charts and pie charts for categorical data. Analyze how visualization helps in identifying outliers. **[9]**

b) Compare HDFS and traditional file systems. Define NameNode and DataNode. Analyze how NameNode failure affects the Hadoop cluster. **[9]**

OR

Q8) a) What is a box plot? Explain the different components of a box plot? How do you interpret the median, quartiles, and whiskers in a box plot? What does the Interquartile Range (IQR) represent in a box plot? **[9]**

b) Explain why Pig is called a data flow language. Describe the role of the Pig execution engine. Explain why Hive is suitable for data warehousing. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2510

[Total No. of Pages : 2

[6583]-36
T.E. (Computer Engg.)
WEB TECHNOLOGY
(2019 Pattern) (Semester - VI) (310252)

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 life cycle of servlet. **[6]**

b) What are DTDs? Explain internal DTD with example? **[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) Explain the differences between HTML and XML. **[6]**

c) Write code snippet to design a form to search employee by name using ajax. **[6]**

Q3) a) Write advantages of JSP over Servlets? Also explain life cycle of a JSP. **[9]**

b) Explain the architecture of struts. **[8]**

OR

P.T.O.

Q4) a) Create a JSP page to search a student details from database by studentid. (Assume suitable table structure). **[9]**

b) Write a note on SOAP and UDDI. **[8]**

Q5) a) Write a program in PHP to calculate Square Root of a number? **[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 the PHP code for fetching the data from a database to a webpage? **[6]**

c) What is Node.js? What are the features of Node.js? **[6]**

Q7) a) Explain classes and objects in Ruby with appropriate examples. **[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) What is EJB. Explain Types of Enterprise Java Bean. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2511

[Total No. of Pages : 2

[6583]-37
T.E. (Computer Engineering)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester - VI) (310253)

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) What is adversarial Search and explain features of AI Games? **[9]**

b) Explain MINIMAX search technique/algorithm with an example. **[9]**

OR

Q2) a) Explain in detail the Constraint Satisfaction Problem with a suitable example. Solve following crypto arithmetic problem. **[9]**

S E N D

M O R E

- - - - - - - - - - -

M O N E Y

b) Explain Alpha-Beta Tree Search and Cut-Off Procedure in detail with Example. **[9]**

Q3) a) List the inference rules used in propositional logic. Explain it in detail with suitable example. **[9]**

b) Explain syntax and semantic of First Order Logic in detail. **[8]**

OR

P.T.O.

Q4) a) Detail the algorithm for deciding entailment in prepositional logic. Give Analysis. **[9]**

b) Describe WUMPUS WORD environment & specify PEAS properties with types of environment for the same. **[8]**

Q5) a) Explain knowledge representation structure in detail. **[9]**

b) Explain the unification algorithm with an example. **[9]**

OR

Q6) a) Explain forward and backward chaining. What factors justify whether reasoning is to be done in forward or backward chaining? **[9]**

b) What are the reasoning patterns in propositional logic? Explain them in detail. **[9]**

Q7) a) List and explain AI components of planning. Discuss AI and its ethical concerns. **[9]**

b) What are the algorithms for classical and automated planning? **[8]**

OR

Q8) a) Write a detail note on AI architecture. Explain Limits of AI. **[9]**

b) Analyse various planning approaches in detail. Explain Hierarchical Planning. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2512

[Total No. of Pages : 2

[6583]-38
T.E. (Computer Engineering)
Information Security- (Elective-II)
(2019 Pattern) (Semester - VI) (310254 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) ***Assume suitable data, jf necessary.***
4) ***Figures to the right indicates 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) Discuss elliptic curve cryptography in detail? **[6]**

OR

Q2) a) Explain Diffie-Hellman key exchange algorithm? **[8]**

b) Perform encryption and decryption using RSA algorithm for the following: P = 3; q = 13, d = 9; M = 7 **[8]**

c) Explain El-Gemmal Algorithm in detail? **[6]**

Q3) a) What is a message authentication code? What is the difference between a message authentication code and a one-way hash function? **[8]**

b) Explain the steps to create the digital certificate with diagram? **[8]**

P.T.O.

OR

Q4) a) What is Message Digest? Compare MD-5 with SHA-I? **[8]**

b) Explain the contents of X.509 fomat of certificate with diagram? **[8]**

Q5) a) Write a short note on **[8]**

i) Honeypot ii) Types of DOS attack

b) What are the capabilities and limitations of Firewall? **[8]**

OR

Q6) a) Explain following of Intrusion detection systems in detail? **[8]**

i) Network based IDS ii) Host based IDS

b) Explain access control and its types in detail? [Hint: Role Based AC] **[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 **[8]**

i) Phishing attack. ii) Cyber Stalking.

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

i) Indian IT act 2023 [Information Content Removal].

ii) Security Life Cycle.

Total No. of Questions : 8]

SEAT No. : ____

PE-2513

[Total No. of Pages : 2

[6583]-39

TE (Computer Engg)

AUGMENTED & VIRTUAL REALITY (Elective-II)

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

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, jf necessary.***

Q1) a) What is rendering system? List and explain the different methods of visual rendering. **[9]**

b) Discuss the use of haptic representation in Virtual Reality. **[8]**

OR

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

b) What is rendering system? Describe the geometrically based rendering methods. **[8]**

Q3) a) Explain physical and mental immersion in detail. **[9]**

b) Define the following terms: **[9]**

OR

P.T.O.

Q4) a) Enlist different properties of manipulation of the world. Explain any 4 in detail. **[9]**

b) What is navigation? What are the two components of navigation? **[9]**

Q5) a) What are major hardware components for augmented reality systems? Explain in detail. **[9]**

b) What is augmented reality? Enlist and explain different ingredients of an augmented reality experience. **[8]**

OR

Q6) a) What are different categories of sensors that are used in AR systems? Comment on the application of each category. **[9]**

b) What is Depth Cues? Explain Monoscopic and Stereoscopic image depth in detail. **[8]**

Q7) a) What is Mobile Augmented Reality? Write down different advantages and disadvantages of Mobile Augmented Reality. **[9]**

b) What is marker based and marker-less tracking system in augmented reality? Design and explain one application of each. **[9]**

OR

Q8) a) What is content? Explain in short how visual content is created. **[9]**

b) What is interaction? Between who is interaction established in augmented reality. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2514

[Total No. of Pages : 2

[6583]-40

T.E. (Computer Engineering) (AI & DS)

CLOUD COMPUTING

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

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) ***Figures to the right side indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume Suitable data, if necessary.***

Q1) a) Explain Virtualization in Grid and Virtualization incloud. **[8]**

b) Define Virtualization? Explain different types of Virtualization. **[9]**

OR

Q2) a) Write short notes on the following (any two) **[8]**

i) CPU Virtualization

ii) Storage Virtualization

iii) OS Level Virtualization

iv) Virtualization Application

b) Explain the Functionality of hypervisor? What is type 1 and type 2 hypervisor? **[9]**

Q3) a) Enlist the different services offered by Amazon Web Services? Explain any three. **[9]**

b) Explain an applications of cloud computing in business and consumer Application - CRM & ERP. **[8]**

OR

Q4) a) Explain Google cloud Application in details. (Any three) **[9]**

b) Explain Microsoft Azure with its architecture. **[8]**

P.T.O.

Q5) a) What are different risks in cloud computing and how to manage them? **[9]**

b) Describe the Cloud Security Services in detail, also explain content level security. **[9]**

OR

Q6) a) Explain secure cloud software testing in detail. **[9]**

b) Explain Data Security Advantages and disadvantages in cloud computing. **[9]**

Q7) a) Draw and explain Mobile cloud architecture in details. **[9]**

b) Differentiate between cloud computing Vs edge computing also write short note on Jungle Computing. **[9]**

OR

Q8) a) Explain concept of containers, Dockers and Kubernetes in detail. **[9]**

b) How does the cloud and IoT works together for Home automation? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2515

[Total No. of Pages : 2

[6583]-41

T.E. (Computer Engg./AI &DS)

SOFTWARE MODELING AND ARCHITECTURE

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

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) Consider a software system for managing a library. Draw activity diagram to illustrate the process of borrowing a book by a library member. Use swimlanes and Explain Fork and Join concept in Activity diagram. **[9]**

b) You are to model a software system for CONTROLLING an Air conditioner. The AC can be either ON or OFF. In the ON state there are two possibilities, COOLING mode or HEATING modes. There are buttons to change from one mode to other, or mode can change automatically based on room temperature crossing cut offs (Cooling if temperature greater than 30 degrees centigrade and if temperature is less than 5 degrees then changes automatically to heating mode).user can manually override any mode through by pressing appropriate buttons. All buttons of course work only if the power is ON. For the part of the system described above draw A STATE machine/diagram. **[8]**

OR

Q2) a) Explain the significance of timing diagram and communication diagram with suitable example. **[8]**

b) Explain the importance of sequence diagram. Draw sequence diagram for online shopping system. **[9]**

Q3) a) Explain different Architectural Pattern **[6]**

b) What is Software Architecture? State importance of software architecture. **[6]**

c) What are Quality attributes and considerations. **[6]**

OR

P.T.O.

Q4) a) Explain Client Server architectural pattern. **[6]**

b) Explain Service oriented Architectural pattern. **[6]**

c) Explain Multi tier Pattern. **[6]**

Q5) a) Explain architecture on Agile project. **[6]**

b) Write short note on Documenting behaviour. **[6]**

c) Explain in brief about combining views. **[5]**

OR

Q6) a) Write short note on Architecture and Requirements. **[5]**

b) Write short note on Notations for Architecture Documentation. **[6]**

c) What is view? Explain Allocation views. **[6]**

Q7) a) What is Behavioral Pattern? In which situation you use the Behavioral pattern? What is observer Behavioral pattern? Explain observer Behavioral in detail with the applicability of singleton creational pattern **[9]**

b) What are the different approaches of design patterns in software architecture? **[9]**

OR

Q8) a) Define the Adapter design pattern and describe its purpose in software design. Provide an example scenario where the Adapter pattern would be beneficial. **[9]**

b) Explain the Observer design pattern. Describe a situation where the Observer pattern can be applied effectively in software development, along with its benefits. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2516

[Total No. of Pages : 3

[6583]-42

T.E. (Computer Eng./AI & DS/Computer Science)

DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - V) (310241)

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 functional dependency? Explain its use in database design. **[8]**

Consider the following schema.

Student (RollNo, Branch_Code, Marks_Obtained, Exam_Name, Total_Marks)

Identify the functional dependencies and check whether the given schema is in 3NF or not. If not justify and convert the schema into 3NF.

b) Elaborate the significance of codd's rule. Explain 12 rules proposed by codd's. **[9]**

OR

Q2) a) What is decomposition? Explain the desirable properties of decomposition? Consider the relation F (FN, PN, C, D) with the following Functional Dependencies : **[8]**

FD1: FN, PN ->C

FD2: C ->D

FD3: D -> F

If F is decomposed into Fl(FN, PN ,C) and F2(C, D). Check decomposition is lossless or lossy?

b) Explain why database normalization is required for good relational database design. Explain with example requirements of different normal forms like 1NF, 2NF and 3NF. **[9]**

P.T.O.

Q3) a) What is conflict serializability? Check following schedule is conflict serializable or not? Also, explain the concept of conflict equivalent schedule. **[9]**

T1	T2	T3	T4
R(X)			
R(Z)			
	W(X)		
		R(Y)	
		W(Y)	
			W(X)
			W(Y)
			W(Z)

R(X) denotes read operation on data item X by transaction T_i.

W(X) denotes write operation on data item X by transaction T_i.

b) When do deadlocks happen, how to prevent them, and how to recover if deadlock takes place? **[9]**

OR

Q4) a) How to ensure atomicity using Recovery Methods? Explain the log based recovery method in detail. **[9]**

b) Explain two phase locking protocol. Consider the following two transactions : **[9]**

T31: read(A);

read(B);

if A = 0 then B:=B+1;

Write (B)

T32: read(B);

read(A);

if B=0 then A: =A+1;

write (A).

Add lock and unlock instructions to transactions T31 and T32, so that they observe the two phase locking protocol. Can the execution of these transactions result in a deadlock?

Q5) a) State and explain the concept of CAP theorem and BASE properties with example. **[9]**

b) Explain the NOSQL database types with examples and write down the real time applications. **[8]**

OR

Q6) a) Explain Structured, Semi-structured and Unstructured data types with examples. **[9]**

b) Describe the following operations with MongoDB syntax : **[8]**

i) Map- Reduce

ii) Aggregation pipeline

Q7) a) What is the significance of XML databases? Explain with proper example when to use XML database. **[9]**

b) What is object relational database system. Explain Table inheritance with example. **[9]**

OR

Q8) a) Write short note on Geographic data and Geometric data. **[9]**

b) Explain how encoding and decoding of JSON object is done JAVA with example. **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-2517

[Total No. of Pages : 4

[6583]-43

T.E. (Computer/Computer Science & Engineering(Data Science)/ Computer Science)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - V) (310242)

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

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7or Q8.***
2) ***Neat diagram 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 ∈ {a,b}*|w is string of staring with ‘a’ and ending with ‘b’} show the derivation for “ababab”

ii) $L = a^n b^{2n}$ where n>=1. Show the derivation for “aabbbb”

iii) RE = (0+l)* Show the derivation for “0110”

b) Simplify the following grammar as **[5]**

i) Eliminate Useless production

S->aAa|bBb| ε

A->C|a

B->C|b

C->CDE| ε

D->A|B|ab

ii) Eliminate Unit Production

$S \rightarrow 0A \mid 1B \mid C$

$A \rightarrow 0S \mid 00$

$B \rightarrow 1 \mid A$

$C \rightarrow 01$

OR

P.T.O.

Q2) a) The regular grammar is also called a right-linear grammar. But Every language generated from a left-linear grammar is regular. Why? Prove that Every language generated from a left-linear grammar is regular with the following grammar examples. **[8]**

i) $G = (\{S, A\}, \{0, 1\}, \{S \rightarrow A01, A \rightarrow 10\}, S)$

ii) $G = (\{S, A\}, \{0, 1\}, \{S \rightarrow A1, A \rightarrow A0|\varepsilon\}, S)$

b) i) Show the derivation tree for string 'aabbbb" with the following grammar. **[3]**

$S \rightarrow AB \mid \varepsilon$

$A \rightarrow aB$

$B \rightarrow Sb$

ii) Construct a derivation tree for the string aabbabba for the CFG given by, **[3]**

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

iii) Check whether the given grammar G is ambiguous or not. **[3]**

$A \rightarrow AA$

$A \rightarrow (A)$

$A \rightarrow a$

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

$S \rightarrow 0BB$

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

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

$S \rightarrow aSb$

$S \rightarrow a \mid b \mid \varepsilon$

[10]

b) Draw a PDA for the CFG given below : **[8]**

$S \rightarrow aSb$

$S \rightarrow a \mid b \mid \varepsilon$

Show the simulation of string acceptable by above CFG using PDA transitions

OR

Q4) a) Give a PDA for the following language **[10]**

L = { the set of strings over alphabet {a,b} with exactly twice as many a's as b's} give the demonstration for the string "abaabbaaaaab"

b) Design a PDA for detection of palindrome over {a, b} for even and odd length both. **[8]**

Q5) a) Construct a TM for the language L = $\{0^n1^n2^n\}$ where $n \geq 1$ Show simulation for "001122" **[10]**

b) Write short notes on : **[8]**

i) Halting Problem of Turing Machine

ii) Representation of Turing Machine

iii) Multi-tape Turing Machine

iv) Instantaneous Description of a Turing Machine

OR

Q6) a) Construct TM for the addition function for the unary number system. And show the simulation **[9]**

For example

2 + 3

i.e. 11 + 111 = 11111

b) Draw FA and Corresponding TM With for language L of the following description L={x $\in$ {a, b}*| x ends with aba} **[9]**

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 the Class P and Class NP and Problem with their example in detail. **[8]**

b) Find whether the following lists have a Post Correspondence, if yes give the sequence **[9]**

i) M = (abb, aa, aaa) and N = (bba, aaa, aa)

ii) M = (B, A, CA ,ABC) and N = (CA, AB, A, C)

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Total No. of Questions : 8]

SEAT No. :

PE-2518

[Total No. of Pages : 2

[6583]-44

T. E. (Computer / Science and Engineering (Data Science))

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

Q1) 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]**

OR

Q2) a) Draw and explain Header format of IPV6. **[6]**

b) Give short note on BGP. **[6]**

c) List and explain functions of Networks Layer. **[6]**

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

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

c) What is socket? What are different types of socket? Explain socket functions used in connection less services with diagram. **[6]**

OR

P.T.O.

Q4) a) Explain RTP protocol in detail. **[6]**

b) What is Quality of Service? Explain any two methods to improve QoS? **[6]**

c) 06 32 00 0D 001C E2 17 using this UDP hexadecimal dump find out **[6]**

i) Source port no.

ii) Destination port no.

iii) Total length of user datagram.

Q5) a) What is DNS? Explain DNS working. **[9]**

b) Write short notes on FTP and TELNET. **[8]**

OR

Q6) a) What is DHCP? Explain DHCP working with client state diagram. **[9]**

b) Write short notes on POP3 and Webmail. **[8]**

Q7) 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]**

OR

Q8) a) Explain Types of Network Attacks. **[6]**

b) Explain IPSec in detail. **[6]**

c) Give short note on S/MIME. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2519

[Total No. of Pages : 2

[6583]-45

T.E. (Computer Engg./Computer Science)

SYSTEM PROGRAMMING & OPERATING SYSTEM

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) a) Explain in brief Compile and Go loading scheme. What are advantages and disadvantages of it. **[10]**

b) Describe the concept of DLL? How dynamic linking can be done with or without import. **[8]**

OR

Q2) a) Write short notes on **[10]**

i) Subroutine Linkage ii) Overlays

b) With the help of diagram explain General Loading Scheme. **[8]**

Q3) a) Explain the following types of Schedulers. **[9]**

i) Short Term

ii) Long Term

iii) Medium Term

b) Explain seven state process model with diagram? Also explain difference between Five state process model & Seven state process model? **[8]**

OR

P.T.O.

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]**

Q5) a) write a short note on following with example? **[9]**

i) Semaphore ii) Monitor iii) Mutex

b) Explain Deadlock prevention, deadlock avoidance, deadlock detection, deadlock recovery with example? **[9]**

OR

Q6) a) Explain producer Consumer problem & Dining Philosopher problem with solution? **[9]**

b) What is deadlock? State and explain the conditions for deadlock, Explain them with example? **[9]**

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

b) What is internal fragmentation? Explain same with suitable diagram/ example. **[8]**

OR

Q8) a) Write and explain Deadlock Avoidance Bankers Algorithm. **[9]**

b) Compare Paging and Segmentation with the help of example. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2520

[Total No. of Pages : 2

[6583]-46

T.E. (Computer Engg./ Computer Science)

Internet of Things & Embedded Systems

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

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

Instructions to the candidates :

1) ***Attempt question Q.1 or Q.2, Q.3 or Q.4, Q. 5 or Q. 6, Q. 7 or Q. 8.***
2) ***Draw neat & labelled diagrams if necessary.***
3) ***Assume suitable data if necessary.***
4) ***Figures to the right side indicate full marks.***

Q1) a) Compare REST and WebSocket communication methods used in IoT **[6]**

b) Explain 4 pillars of IoT system with diagram **[5]**

c) Design the purpose and requirement specification for smart IoT-based Home monitoring system. **[6]**

OR

Q2) a) Discuss exclusive pair communication model in IoT communication. **[6]**

b) Explain SCADA system & it's applications. **[5]**

c) Explain the domain model specification step with diagram. **[6]**

Q3) a) Discuss the standardization efforts taken by different systems for IoT Protocols. **[6]**

b) Outline IP-based protocols. Explain the working of 6LoWPAN **[6]**

c) Discuss the ZigBee architecture with diagram. **[6]**

OR

P.T.O.

Q4) a) Explain the working of RFID with any application **[6]**

b) Discuss the working of Modbus? Compare the efficiency of Modbus Vs KNX protocol. **[6]**

c) Write short note on M2M protocol and its applications. **[6]**

Q5) a) Explain with diagram WAMP (AutoBahn for IoT) **[6]**

b) Discuss the services provided by Cloud. **[6]**

c) Why Is MQTT the is the preferred protocol for IoT? **[6]**

OR

Q6) a) Determine the role of cloud storage models in IoT. **[6]**

b) Show the use of Cloud Computing while implementing the parcel tracking application. **[6]**

c) Explain in short Amazon S3, Amazon EC 2 **[6]**

Q7) a) Illustrate the key elements of the IoT security with suitable examples of each. **[6]**

b) What is Skynet? How it is useful to user and developers **[6]**

c) Discuss vulnerabilities in IoT. **[5]**

OR

Q8) a) What is threat modelling? What are the benefits of threat modeling? **[6]**

b) Infer security challenges for intrusion detection system for smart home. **[6]**

c) Discus the Light weight cryptography **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-2521

[Total No. of Pages : 3

[6583]-47

T.E. (Computer/A.I.&D.S./ComputerScience/ Computer Science and Engineering (Data Science)

HUMAN COMPUTER INTERFACE

(2019 Pattern) (Semester - V) (310245 B) (310645 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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***

Q1) a) What is mean by interaction styles? Explain different types of interaction styles such as: **[8]**

i) Command-line interface

ii) Menus

iii) Form-Fills-In

iv) Direct Manipulation.

b) Write down about iterative design and prototyping using suitable example. **[5]**

c) Elaborate characteristics of web using Merging of Graphical Business Systems and Web Characteristics of Intranet Versus Internet. **[5]**

OR

Q2) a) What is mean by design? Which are the important things required to consider for designing? Explain with example. **[8]**

b) Explain advantages, disadvantages and characteristics of Graphical User Interface. **[5]**

c) Write short note on: Popularity of the Web **[5]**

P.T.O.

Q3) a) Write short note on: **[6]**

i) Usability Testing in Laboratory

ii) Controlled Experiments

iii) Heuristic Evaluation

b) Elaborate Evaluation Framework using following point: **[6]**

i) Paradigms and Techniques

ii) DECIDE: a Framework to Guide Evaluation

c) What is significance of multi-modal interaction in HCI System? Explain with example. **[5]**

OR

Q4) a) Elaborate universal design principles in detail. **[6]**

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

i) Empirical Methods: Experimental Evaluation

ii) Field Studies

c) Explain formative and summative evaluation. **[5]**

Q5) a) Discuss about interface design, pattern recognition phases, system architecture using suitable example of HCI system. **[6]**

b) Explain vision-based Hand Gesture Recognition System using HCI paradigms. **[6]**

c) What is mean by ubiquitous computing? Which are the applications of it? Explain with suitable example. **[6]**

OR

Q6) a) Explain the term "data entry and usability using appropriate case study. **[6]**

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

i) Retrieval in Physical World

ii) Retrieval in Digital world

iii) Constrained Natural Language output

c) Compare data integrity and data immunity. **[6]**

Q7) a) Elaborate designing for Mobile and other devices. **[6]**

b) Explain Mobile Navigation, Content, and Control Idioms using appropriate Example. **[6]**

c) What is the significance of navigation and toolbars" in HCI? Explain. **[5]**

OR

Q8) a) What is use of"multi-touch gestures". Explain various multi-touch gestures used in mobile device **[6]**

b) Describe Tap-to-Reveal and Direct Manipulation. **[6]**

c) Explain Norman's Principles of Design in software. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-2522

[Total No. of Pages : 3

[6583]-48
T.E. (Computer Engg./ Computer Science)
DISTRIBUTED SYSTEMS
(2019 Pattern) (Semester - V) (310245(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) Give the difference between Lamport's Logical Clocks and Vector clock? **[6]**

b) What is Bully algorithm for leader election in distributed systems. Explain with an example. **[6]**

c) Compare Centralized algorithm and distributed algorithm in mutual exclusion? **[6]**

OR

Q2) a) What is physical Clock synchronization? How does it work? **[6]**

b) What is Ring algorithm for leader election in distributed systems. Explain with Example. **[6]**

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

i) A Peer-Sampling Service

ii) Gossip-Based Overlay Construction.

Q3) a) What is the purpose of names, identifiers, and addresses in distributed systems? **[5]**

b) What are the principles of attributed-based naming? Explain with an example. **[6]**

c) Explain the following naming in DFS - i) Flat naming and ii) Structured naming. **[6]**

P.T.O.

OR

Q4) a) Why there is a requirement for a distributed file system? **[5]**

b) Explain the concept of file service architecture in detail with an example. **[6]**

c) Explain the following network file systems - **[6]**

i) Sun network file system and

ii) Andrew file system.

Q5) a) Write a short note on : **[8]**

i) Cache Coherence Protocols,

ii) Sequential Consistency protocol.

b) Describe the data-centric consistency model with respect to **[10]**

i) Objective of data-centric consistency models

ii) Fundamental concept behind consistent ordering of operations.

iii) Example of data-centric consistency model

iv) Key principles of Continuous Consistency

v) Advantages of Continuous Consistency

OR

Q6) a) Explain the replica management **[8]**

i) Finding the best server location,

ii) Content replication and placement.

b) Describe the client-centric consistency models, with respect to **[10]**

i) Eventual Consistency

ii) Monotonic Reads

iii) Monotonic Writes

iv) Read Your Writes

v) Writes Follow Reads

Q7) a) What is fault tolerance? Explain failure model with an example. **[5]**

b) How does the Paxos consensus algorithm work in the distributed system? **[6]**

c) Describe the distributed commit in reliable group communication with an example. **[6]**

OR

Q8) a) What is atomic multicast in reliable group communication with an example. **[5]**

b) How does the RPC work in a distributed system to handle failures and ensure reliability? **[6]**

c) What is checkpointing, and how does it contribute to system recovery? **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2523

[Total No. of Pages : 2

[6583]-49

T.E. (Computer Engg./ Computer Science)

SOFTWARE PROJECT MANAGEMENT

(2019 Pattern) (Semester - V) (310245 D) (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***

Q1) a) Explain critical path concept and its remedies. **[6]**

b) Which are the different tools to visualize progress of project for monitoring the project progress? **[6]**

c) How many activity relationships are used in software project management? Explain any two relationships in detail. **[6]**

OR

Q2) a) Explain critical and non-critical activities. **[6]**

b) What is meant by forward pass and backward pass? And Differentiate between those. **[6]**

c) Explain formulating a network model in detail with the neat diagram. **[6]**

Q3) a) Explain Basili and Weiss data collection methodology in detail. **[6]**

b) Apply Earned Value Analysis to suitable example and find out values of PV, AC, EV, SV, CV, SPI, CPI. **[6]**

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

i) Kanban Boards

ii) Project Calendars.

P.T.O.

OR

Q4) a) Explain any two steps of Project Cost management. **[6]**

b) How to track the project effectively? **[6]**

c) Explain in detail change control process with neat diagram. **[5]**

Q5) a) Differentiate between Predictive versus Empirical management. **[6]**

b) Explain three stages of Agile project with suitable example. **[6]**

c) Enlist and describe best practices of project scheduling in an Agile environment. **[6]**

OR

Q6) a) Compare Non-Agile and Agile projects. And suggest how to choose the correct Approach? **[6]**

b) Explain scrum model with suitable example and analyze its effects when compared with traditional approach. **[6]**

c) Write roles and responsibilities in Agile project management. **[6]**

Q7) a) Explain the Oldham, Hackman job characteristic model with example. **[6]**

b) Explain influencing elements of organizational behavior. **[6]**

c) Explain seven strategies for managing dispersed teams. **[5]**

OR

Q8) a) Write short note on Communication Plan. **[6]**

b) What is health and safety management in project management? **[6]**

c) What is Decision Making? Explain its types. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-2524

[Total No. of Pages : 2

[6583]-50
T.E. (Artificial Intelligence & Data Science)
DATA SCIENCE
(2019 Pattern) (Semester - VI) (317529)

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) Explain Model Selection in detail. **[5]**

b) Explain in Detail Data Preparation Phase of Data Analytics life cycle. **[5]**

c) Explain Data Discovery phase in Data analytics Life cycle with example. **[8]**

OR

Q2) a) Write a short note on i) ETL ii) Common tools for model building. **[5]**

b) Why communication is important in Data analytics Life cycle. **[5]**

c) Explain Data Analytics Life Cycle with diagram. **[8]**

Q3) a) Write a short note on Association rule. **[5]**

b) Describe Regression Analysis with example. **[5]**

c) Explain how Apriori algorithm works, with a suitable example. **[7]**

OR

Q4) a) Explain the term Support, Confidence & Lift by taking a suitable example. **[5]**

b) Write a short note on Decision Tree. **[5]**

c) Explain the Naïve Bayes Classifier with its Advantages & Disadvantages. **[7]**

Q5) a) Write a short note on clustering with its properties & types. **[5]**

b) Write a short note on social network analysis. **[5]**

c) With a suitable example explain the steps involved in K-means algorithm. **[8]**

OR

P.T.O.

Q6) a) Explain confusion Matrix with all its key terms. **[5]**

b) What is Hyperparameter tuning. What are the various tuning techniques. **[5]**

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

i) Time series Analysis

ii) TF-IDF

Q7) a) What is mean by Data Visualization and explain its types? **[5]**

b) What are the challenges in big data visualization. **[5]**

c) Explain data visualization tool Tableau. **[7]**

OR

Q8) a) Write a short note on Hadoop Distributed File System and Hive. **[5]**

b) Explain analytical techniques used in Big Data Visualization. **[5]**

c) Explain MapReduce paradigm with example. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PE-2525

[Total No. of Pages : 2

[6583]-51

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, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***

Q1) a) Explain Diffie-Hellman Key Exchange algorithm with example. **[6]**

b) Perform encryption and decryption using RSA algorithm for p=17, q=11, e=7 and M=2. **[6]**

c) Explain the operations of Kerberos. **[6]**

OR

Q2) a) Explain operation of MD5 message digest algorithm. **[6]**

b) Explain RSA algorithm with example. **[6]**

c) Explain X.509 Authentication Service. **[6]**

Q3) a) List and explain components of IPSec protocol. **[6]**

b) What is VPN? Explain components of VPN. **[6]**

c) Explain working of PGP in details. **[6]**

OR

Q4) a) List and explain various participants involved in Secure Electronic Transaction (SET). **[6]**

b) Describe the SSL protocol in details. **[6]**

c) What is S/MIME? What are the benefits of S/MIME? **[6]**

P.T.O.

Q5)	a)	Explain the firewall and its types	**[6]**
	b)	What is trusted system? Explain in brief.	**[6]**
	c)	Difference between IDS and IPS	**[5]**

OR

Q6)	a)	List and explain types of Intrusion Detection System.	**[6]**
	b)	What is access control security service?	**[6]**
	c)	Difference between DAC and RBAC.	**[5]**
Q7)	a)	What is cyber stalking?	**[6]**
	b)	Write short note on PII.	**[6]**
	c)	Explain Indian IT Act.	**[5]**

OR

Q8)	a)	Write a short note on Botnet.	**[6]**
	b)	Write short note on Cybercrime.	**[6]**
	c)	Write Advantages of cyber law.	**[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2526

[Total No. of Pages : 2

[6583]-52

T.E. (AI & DS)

ARTIFICIAL NEURAL NETWORK

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

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) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume sutiable data if necessary.***

Q1) a) What is Hopfield Neural Network? What is a state transition Diagram for Hopfield Neural Network? Explain how to derive it in Hopfield model. **[9]**

b) A hetero associative network is given. Find the weight matrix and test the network with the training input vectors. S1 = (1,1,0,0), S2 = (0,1,0,0), S3 = (0,0,1,1) S4 = (0,0,1,0) t1 = (1,0), t2 = (1,0), t3 = (0,1), t4 = (0,1) **[9]**

OR

Q2) a) Describe Boltzmann Machine and Boltzmann learning Law. What are the limitations of Boltzmann learning. **[9]**

b) For a given input vector (S1,S2,S3,S4) and output vector T=(T1,T2). Find the weight matrix using hetero associative training algorithm.

S1 = (1,1,0,0), S2 = (1,0,0,1), S3 = (1,1,0,0) S4 = (0,1,0,1) t1 = (0,1), t2 = (1,1), t3 = (1,0), t4 = (0,0) **[9]**

Q3) a) Explain ART under the following headings : **[8]**

i) Architecture

ii) Working

iii) Training

iv) Implementation

b) Describe the self-organization map (SOM) algorithm and explain how it can be used for feature mapping. **[9]**

OR

P.T.O.

Q4) a) Discuss in detail the following with diagram: **[8]**

i) Learning vector quantization

ii) Adaptive pattern classification

b) Draw the architecture of Kohonen Network and explain the algorithm for training the weights of the Network. **[9]**

Q5) a) Consider a LeNet-5 a convolutional neural network, we want to perform the classification of digits, Write down the complete procedure followed in its architecture. **[9]**

b) Draw and explain the architecture of Convolutional Neural Network. **[5]**

c) Distinguish between CNN and RNN **[4]**

OR

Q6) a) Exemplify convolution over volume with convolution on RGB images. Also illustrate multiple filters used in it. **[9]**

b) Explain the softmax regression with respect to hypothesis and cost function and write down its properties. **[5]**

c) Distinguish between Pooling and Padding. **[4]**

Q7) a) Discuss the following applications of ANN in detail. **[9]**

i) Recognition of consonant vowel (CV) segments.

ii) Recognition of Olympic games symbols.

iii) Recognition of handwritten characters

b) You have been asked to develop a model of recognizing hand written digits. What are the chosen steps for activity? Explain each with detail. **[8]**

OR

Q8) a) Write short note on the following. **[9]**

i) NET Talk

ii) Texture classification

iii) Pattern classification

b) Describe the Neocognitron model and its significance in the recognition of handwritten characters. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2527

[Total No. of Pages : 2

[6583]-53

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 the different parameters considered during planning of joint interpolated trajectories. **[6]**

b) Explain backward kinematics in detail with suitable examples. **[6]**

c) Explain D-H matrix and its significance in robot kinematics. **[6]**

OR

Q2) a) A planer RR manupulator has first link of 100mm length and second link of 70 mm, state whether the manipulator can reach points P, Q and R separately where P is (15, 15), Q is (15, 70) and R is at (15, 170). **[9]**

b) Explain Denavit-Hertenberg parameters for link transformation. **[9]**

Q3) a) What is the requirement of actuators used in robotics **[6]**

b) Explain hydraulic actuation used in robotics. **[6]**

c) Explain vacuum gripper. **[5]**

OR

Q4) a) A part weighing 15 kg is to be held by a gripper using friction against two opposing fingures. The coefficient of friction between the fingures and the part surface is 0.3, Assume appropriate ‘g’ factor for the gripper. Compute required gripper force. **[10]**

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

Q5) a) What is the significance of trajectory planning in robotics. **[8]**

b) Define ARTIFICIAL INTELLIGENCE in Robotics. Speculate role of AI techniques in Robotic Applications. **[9]**

P.T.O.

OR

Q6) a) Write short note on Robot Controller with required features in controllers. **[6]**

b) Write short note on 'Robotic Simulation' **[6]**

c) Differentiate Open and Closed loop control systems. **[5]**

Q7) a) Explain following terms in Robotics: **[10]**

i) Resolution

ii) Repeatability

iii) Accuracy

iv) Dexterity

v) Compliance

b) Explain, in brief structure of various programming langauges in robotics. **[8]**

OR

Q8) a) Explain lead through programming in robotics. **[6]**

b) Explain features of VAL programming language. **[6]**

c) Write short note on Remote Center Compliance. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2528

[Total No. of Pages : 3

[6583]-54

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

Q1) a) Explain the concept of partial parsing in the context of constituency parsing. How does partial parsing differ from full parsing, and what applications benefit from partial parsing techniques? **[9]**

b) Explain Combinatory Categorical Grammar. List and explain grammar rules for English. **[9]**

OR

Q2) a) Describe dependency parsing and the notion of dependency relations between words in a sentence. Compare and contrast dependency parsing with constituency parsing, highlighting their respective strengths and weaknesses. **[9]**

b) **Write short note on :** **[9]**

i) Context Free Grammar

ii) Partial Parsing

iii) Describe Chomsky's Normal Form (CNF)

Q3) a) Examine the challenges associated with thematic roles in semantic role labeling. Discuss how issues such as selection restrictions and decomposing predicates influence the accuracy of semantic role labeling systems. **[8]**

b) Define connotation frames and explain their significance in understanding the nuanced meaning of words and phrases. Discuss how connotation frames can be utilized in various natural language processing tasks, such as affect recognition and sentiment analysis. **[9]**

OR

P.T.O.

Q4) a) Define word senses and explain the importance of disambiguating word senses in natural language processing tasks. Discuss the challenges associated with word sense disambiguation (WSD) and how it relates to the ambiguity of language. **[8]**

b) Explore the use of lexicons for sentiment recognition in natural language processing. Discuss how sentiment lexicons are utilized to classify the sentiment of words and phrases in text data, highlighting their effectiveness and limitations. **[9]**

Q5) a) Describe the components and functionalities of a Question Answering (QA) system. How do QA systems process natural language questions, retrieve relevant information from textual sources, and generate concise answers? Discuss the challenges associated with QA systems. **[9]**

b) Explain the concept of Direct Machine Translation and its underlying principles. Discuss the advantages and disadvantages of this approach in comparison to other MT methods. **[9]**

OR

Q6) a) Explore Knowledge-Based Machine Translation systems and their reliance on domain-specific knowledge bases. How does knowledge-based MT differ from rule-based and statistical approaches? Discuss the role of semantic knowledge in improving translation. **[9]**

b) Describe the architecture and operation of Rule-Based Machine Translation systems. How do RBMT systems utilize linguistic rules and dictionaries to generate translations? Discuss the challenges associated with rule-based approaches. **[9]**

Q7) a) Explain the Vector Space Model (VSM) in Information Retrieval. How does VSM represent documents and queries as vectors in a high-dimensional space? Discuss the cosine similarity measure and its role in ranking documents for a given query. **[8]**

b) Discuss the ethical considerations and challenges associated with deploying NLP- based systems, such as bias in training data, privacy concerns, and the potential for misuse. How can developers mitigate these issues and ensure responsible use of NLP technologies in real-world applications? **[9]**

OR

Q8) a) Discuss the use of sequence labeling in Information Extraction tasks. What are the key sequence labeling techniques used for tasks such as Named Entity Recognition (NER) and Part-Of-Speech (POS) tagging? Provide examples to illustrate their applications. **[8]**

b) Explain how NLTK (Natural Language Toolkit) facilitates text analysis and processing tasks in Python. Discuss the key features and functionalities provided by NLTK for tasks such as tokenization, stemming, lemmatization, and syntactic parsing. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-2529

[Total No. of Pages : 2

[6583]-55
T.E. (AI & DS)
COMPUTER NETWORKS
(2019 Pattern) (Semester - V) (317521)

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

Instructions to the candidates :

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

Q1) a) Write a short note on **[8]**

i) Network Address Translation

ii) Address Resolution Protocol.

b) Describe ICMP with header format using neat diagram. **[9]**

OR

Q2) a) Differentiate between circuit switching, Packet switching, message Switching. **[9]**

b) Describe in short, the importance and working of ARP Protocol, What is ARP cache. **[8]**

Q3) a) Draw and Explain TCP Segment Header. **[9]**

b) Explain SCTP protocol in detail? **[9]**

OR

Q4) a) Write short note on sockets and sockets programming **[9]**

b) Discuss the Quality-of-Service Parameter in Computer Network. **[9]**

P.T.O.

Q5) a) Explain Simple Network Management Protocol (SNMP). **[9]**

b) Write short note on DNS. **[8]**

OR

Q6) a) Explain FTP in detail and any four commands of FTP. **[9]**

b) Differentiated between Persistant and Nonpersistant HTTP? **[8]**

Q7) a) Explain Binary Exponential Backoff Algorithm **[9]**

b) Differentiate between Pure ALOHA and Slotted ALOHA. **[9]**

OR

Q8) a) Explain the concept of Fast Ethernet and Gigabit Ethernet? **[9]**

b) Explain the concept of CSMA/CD. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-2530

[Total No. of Pages : 2

[6583]-56

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 and 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 Servlets? Explain Servlet Life cycle. Explain HttpServlet class with example. **[9]**

b) Write Short note on: **[9]**

i) XML

ii) AJAX

OR

Q2) a) How can we differentiate between Generic Servlet and HTTP Servlet. Explain with suitable example. **[6]**

b) Explain the differences between HTML and XML. **[6]**

c) Write code snippet to design a form to search employee by name using ajax. **[6]**

Q3) a) Explain life cycle of a JSP. What are advantages and disadvantages over Servlet. **[9]**

b) Explain the architecture of struts. **[8]**

OR

Q4) a) Create a JSP page to search a employee details from database by employee id. (Assume suitable table structure). **[9]**

b) Write a note on SOAP and UDDI. **[8]**

P.T.O.

Q5) a) Write a program in PHP to calculate Square Root of a number? **[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 the PHP code for fetching the data from a database to a webpage? **[6]**

c) What is Node.Js? What are the features of Node.Js **[6]**

Q7) a) Explain classes and objects in Ruby with appropriate examples. **[9]**

b) Introduce the concept of Rails application. Describe layouts & stylesheetin Rail. **[8]**

OR

Q8) a) Explain array in Ruby with example. **[9]**

b) What is EJB. Explain Types of Enterprise Java Bean. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2531

[Total No. of Pages : 2

[6583]-57

T.E. (A.I.& D.S. / Computer Science & Engg.(Data Science))

ARTIFICIAL INTELLIGENCE

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer four questions [(Q.1 or Q.2), (Q.3 or Q.4), (Q.5 or Q.6), (Q.7 or Q.8)]***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the Min Max Algorithm with an example. Comment on the efficiency of the Min-Max Algorithm improvement using Alpha Beta Pruning. **[9]**

b) Solve the crypt-arithmetic problem and show the search space tree for the problem, TWO + TWO = FOUR. Identify the variables, domain and constraints. **[9]**

OR

Q2) a) Explain and solve the graph coloring problem, using constraint satisfaction. **[9]**

b) Explain with an example the Monte Carlo Tree Search. **[9]**

Q3) a) Explain Wumpus world environment giving its PEAS description. **[9]**

b) What is a Knowledge Agent? What are the aspects to be taken into consideration for designing a knowledge-based agent to assist with medical diagnosis? **[8]**

OR

Q4) a) Write in predicate logic the following statements. **[10]**

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

b) Differentiate between propositional logic and First-order logic. **[7]**

P.T.O.

Q5) a) Explain forward chaining and backward chaining for a simple example. **[9]**

b) Explain the process of resolution with a proper example. **[9]**

OR

Q6) a) Explain the Unification Algorithm, wherever necessary take an example to explain the steps. **[9]**

b) Explain the key aspects of ontological engineering, which plays a crucial role in knowledgere presentation. **[9]**

Q7) a) Explain goal stack planning with an example of a blocks world. **[6]**

b) Explain the components of a planning system for a simple Blocks World example. **[6]**

c) What are the ethical considerations and potential limitations that arise in AI development? **[5]**

OR

Q8) a) Explain in brief Planning and its types. **[6]**

b) What emerging trends and challenges in the future of AI. **[6]**

c) Comment on AI Architecture. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2532

[Total No. of Pages : 2

[6583]-58

T.E. (Artificial Intelligence and Data Science/Information Technology)

DESIGN THINKING

(2019 Pattern) (Semester - V) (314445 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) ***Make suitable assumptions if necessary***
4) ***Figures to the right indicate full marks.***

Q1) a) What are the How Might We statements? How to frame a good HMW statements. Explain with examples. **[9]**

b) What is brain storming? Mention the guidelines for an effective brainstorming. **[9]**

OR

Q2) a) What is done in Ideate phase of design thinking? Explain techniques for idea generation. **[9]**

b) What is user experience journey? Explain its steps with suitable example. **[9]**

Q3) a) Why are prototype necessary in design thinking? Explain any two kind of prototype. **[9]**

b) What is the difference between critical experience prototype and critical function prototype? Explain with example. **[8]**

OR

P.T.O.

Q4) a) What are paper prototype and digital prototype? Explain its merits and demerits. **[9]**

b) What is story boarding? Why it is important? How to create a story board? **[8]**

Q5) a) What is reflect in design thinking? How could it be used in process of solving the problem? **[9]**

b) Explain various factors involved in choosing a design testing methodology. **[9]**

OR

Q6) a) What is a road map? How to create a road map. Explain with example. **[9]**

b) What is lean canvas? Explain the steps in lean canvas. **[9]**

Q7) a) Can design thinking lead to innovation. Explain how design thinking can be introduced in any organization. **[9]**

b) How can design thinking improve user's experience? Explain how Toyota applied design thinking process for their customer care. **[8]**

OR

Q8) a) Explain how design thinking has helped uber eats to improve the user experience. **[9]**

b) identity any social problem in health care industry. Explain how design thinking can be used to solve the problem. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2533

[Total No. of Pages : 2

[6583]-59
T.E. (AI&DS)
EMBEDDED SYSTEMS AND SECURITY
(2019 Pattern) (Semester - V) (317522 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) ***Figures to the right indicate full marks.***
4) ***Assume suitable data jf necessary.***

Q1) a) Discuss the function of IODIR, IOSET, IOCLR registers. **[9]**

b) Discuss Embedded firmware design approaches. **[9]**

OR

Q2) a) What do you mean by cross complier. List the files generated after cross compilation. **[9]**

b) Write C program to switch on & off LED connected to LPC2148. **[9]**

Q3) a) Discuss the basic functions of Real Time kernel. **[9]**

b) What do you mean by term ‘Process’. Explain it’s structure. **[9]**

OR

Q4) a) What is multiprocessing and multitasking? Explain Types of Multitasking **[9]**

b) Discuss the factors to be considered to select the RTOS. **[9]**

P.T.O.

Q5) a) Explain the Linux Kernel Architecture. **[9]**

b) Explain Embedded Linux hardware and software components. **[8]**

OR

Q6) a) What is an embedded Linux? What are the advantages of it? State the examples of ES. **[8]**

b) Draw and explain Embedded Linux System architecture. **[9]**

Q7) a) What are the challenges in security of an Embedded System? **[7]**

b) Explain the counter measures to be used for prevention of attacks on Embedded System. **[10]**

OR

Q8) a) What are the effects of an attack on Embedded System? **[7]**

b) Explain the different security threads of ES. **[10]**

Total No. of Questions : 8]

SEAT No. :

PE-2534

[Total No. of Pages : 2

[6583]-60

T.E. (Artificial Intelligence and Data Science)/ Computer Science and Engineering (Data Science)

PATTERN RECOGNITION

(2019 Pattern) (Semester - V) (317522 B) (310645D) (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 jf necessary.***

Q1) a) Give an Abstract view of parsing problem? **[6]**

b) Explain elements of formal grammars? **[6]**

c) Describe any two examples of String Generation as Pattern Description? **[6]**

OR

Q2) a) Describe the Grammar Based Approach and its Application in detail. **[6]**

b) Clarify the Chomsky Normal form with suitable example? **[6]**

c) Give examples of string generation as pattern description. **[6]**

Q3) a) Compare between Top down Parsing and Bottom up Parsing. **[6]**

b) Describe Clique finding algorithm with suitable example **[6]**

c) Explain the Design and Selection of Similarity Measures **[5]**

OR

P.T.O.

Q4) a) Describe Canonical definite finite state grammar (CDFSG) with suitable example? **[6]**

b) Compare Homomorphism and Isomorphism? **[6]**

c) Draw and explain Problem formulation in Learning Grammars **[5]**

Q5) a) Neural Pattern Associates and Matrix Approaches. Explain? **[6]**

b) Describe Neural Networks as a Black Box Approach? Explain **[6]**

c) Explain Neural Network Structures for Pattern Recognition Applications **[6]**

OR

Q6) a) What are the different reasons to adopt a Neural Computational Architecture? **[6]**

b) Describe with neat diagram Artificial Neuron Activation and output characteristics? **[6]**

c) Explain CAM & other Neural Memory Structure? **[6]**

Q7) a) Explain the structure of a Multiple Layer Feed forward Network? **[6]**

b) Explain Unsupervised Learning in NeurPR. **[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) Write a short note on: **[6]**

i) The Delta Rule

ii) The Generalized Delta Rule

c) Draw & explain how to train the feed forward network using Generalized delta Rule? **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-2535

[Total No. of Pages : 3

[6583]-61

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 Q7or Q8.***
2) ***Use of calculator is allowed.***
3) ***Assume suitable data if necessary.***

Q1) a) i) The load impedance is (20+j30) Ohm. If the base power is 100MVA and voltage base 11kV. What is the per unit load impedance. **[2]**

ii) The per unit impedance of a 100MVA, 220kV/132kV transformer is (0.1 + j 0.2) Pu referred to primary. What is the per unit impedance referred to secondary? **[2]**

iii) The per unit reactance of a 50MVA, 10kV alternator is 10%. What is the per unit reactance of the alternator on 100MVA, 20kV Base. **[2]**

iv) A transmission has resistance and reactance of 0.1 Ohm/km and 0.5 Ohm/km respectively. The length of line is 100km. What is the per unit impedance of the line to the base of 100MVA, 20kV. **[2]**

b) Give the details classification of buses with known and unknown variables. Also explain the significance of each type of bus. **[8]**

OR

Q2) a) The parameters of four bus system is given in following table. Determine the Ybus matrix of the system. **[8]**

Bus (From-To)	Reactance (Z) pu	Shunt admittance (B) (pu)
1-2	*j*0.5	*j*0.4
2-3	*j*0.1	*j*1
3-4	*j*0.2	*j*l.2
1-3	*j*0.25	*j*0.8

P.T.O.

b) What do you mean by per units system in power system? How the per unit values are calculated in power system? What are the advantages and disadvantages of per unit system? **[8]**

Q3) Let all phases of an alternator is short circuited at its terminal :

a) Draw the waveform of fault current showing sub transient, transient and steady state period. **[3]**

b) From above diagram comment on time period sub transient, transient and steady state period. **[3]**

c) Draw the reactance diagram and write its formula for sub transient, transient and steady state period. **[6]**

d) If the damper winding reactance is j0.1 pu, field winding reactance is j0.2 pu, armature reactance is j0.3pu and leakage reactance is j0.5pu. Calculate sub- transient, transient and steady state reactance. **[3]**

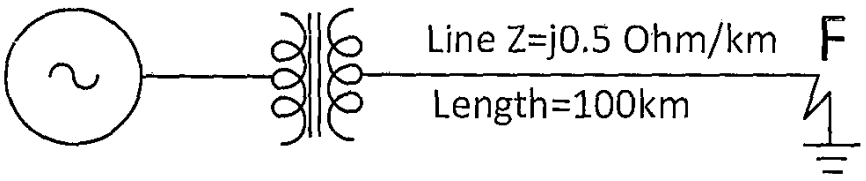
e) Justify that the fault current under sub transient period is more that transient and steady state period. **[3]**

OR

Q4) a) What is the use of current limiting reactor? What are its types based on location and based on construction? Explain any one type with diagram merits and de-merits. **[8]**

b) In following system, the three phase fault is occurred at point F in following: **[10]**

Generator	Transformer
150MVA	10kV/100kV
10kV	200MVA
Xd″ = 10%	X = 5%



i) Draw per unit impedance diagram with generator rating as a base **[3]**

ii) Find the per unit impedance upto fault point **[2]**

iii) Fault MVA supplied by generator **[1]**

iv) Fault current in kA **[2]**

v) Generator terminal voltage under fault. **[2]**

Q5) a) Derive the equation of fault current in case of LG fault. **[9]**

b) In a three phase circuit the phase voltages and currents are given as

$V_a = 100\angle 0°\ V$, $V_b = 90\angle -120°\ V$, $V_c = 110\angle 120°V$

$I_a = 10\angle -30°\ A$, $I_b = 9\angle -150°\ A$, $V_c = 11\angle 90°\ A$

Calculate :

i) Symmetrical component voltage of phase a **[3]**

ii) Symmetrical component current of phase a **[3]**

iii) Complex power using symmetrical components **[3]**

OR

Q6) a) Draw the zero sequence impedance diagram for following connections of transformer

i) Delta-Star **[3]**

ii) Delta-Star with solid ground **[3]**

iii) Delta-star with neutral impedance **[3]**

b) A single line to ground fault is occurred at a star connected 100MVA, 11kV alternator terminal. The sequence impedance of the alternator are $x_1 = j0.2$ pu, $x_2 = j0.1$ pu and $x_0 = j0.05$ pu. Calculate

i) Fault current in kA if neutral is solidly grounded. **[4]**

ii) 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 following components. **[9]**

i) Smoothing reactor

ii) AC side HP filter

iii) Converter transformer

b) Explain the control characteristic of HVDC system with proper characteristic diagram. **[9]**

OR

Q8) Write short note on any three of the following in details : **[18]**

a) Monopolar HVDC

b) Back to back HVDC

c) Multi terminal HVDC

d) HVDC line in Maharashtra

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Total No. of Questions : 8]

SEAT No. :

PE-2536

[Total No. of Pages : 2

[6583]-62
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, 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 Calculator is allowed.***

Q1) a) Explain mechanical axial force developed under short circuit condition in a transformer and the measures to overcome them. **[8]**

b) Explain the procedure to estimate the no load current of three phase transformer. **[4]**

c) Draw and Explain generalized flow chart of design of transformer. **[5]**

OR

Q2) a) A 500 kVA, 11000/440 V, delta/star transformer has the following details: HV turns = 1600, Length of mean turn = 93 cm, Length of coil = 52 cm, short circuit current = 20 × rated current . Find radial force in tonnes on the HV winding under short circuit conditions. **[8]**

b) Derive the equation for magnetizing current in terms of magnetizing Volt-Amps. **[5]**

c) Explain the factors on which the radial force developed in the transformer depends. **[4]**

Q3) a) Discuss the various factors to be considered for selection specific electric loading (ac) for the design of three phase induction motors. **[9]**

b) Derive the output equation of three phase AC machines, from the same equation, derive kVA input equation in terms of mechanical power output of three phase induction motor. **[9]**

OR

P.T.O.

Q4) a) Explain the main dimensions of three phase induction motors. Also explain the factors on which the main dimensions or size of the ac machines depends. **[9]**

b) List the advantages of squirrel cage motor as compared to slip ring induction motor. **[9]**

Q5) a) Estimate the main dimensions for 3 phase, 50 Hz, 10 kW, 400 V, 4 pole, squirrel cage induction motor. Assume full load efficiency of 0.85, full load power factor of 0.86 and winding factor 0.955. The specific magnetic loading is 0.4 wb/m^2 and the specific electric loading = 22000 A/m, stacking factor = 0.9. Take rotor peripheral speed as 20 m/s at synchronous speed. **[9]**

b) Explain the points to be considered while selecting the stator slots of three phase induction motor. **[9]**

OR

Q6) a) A 11 kW, 3-phase, 6 pole, 50 Hz, 220 V, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The numbers of rotor bars is 64. The machine has an efficiency of 0.86 and power factor of 0.85. The stator mmf may be assumed 80 % of stator mmf. Also find bar and end-ring sections if the current density is 5 A/mm^2. **[9]**

b) Explain the effect of length of air-gap on the overload capacity of three phase induction motor. **[9]**

Q7) a) Explain the procedure to find out mmf required for air gap , stator teeth, stator core , rotor teeth , rotor core of three phase induction motor. **[8]**

b) Draw and explain the effect of saturation in Induction Motor. **[9]**

OR

Q8) a) State and explain with neat sketches different types of leakage fluxes in an induction motor and estimate slot leakage reactance in an induction motor. **[8]**

b) Draw and Explain generalized flow chart of design of Induction Motor.**[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PE5081

[Total No. of Pages : 2

[6583]-63
T.E. (Electrical)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - VI) (303150)

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 non programmable calculator is allowed.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Define stability, conditions for stability. Explain Routh criterion for stability. **[8]**

b) For a unity feedback system given sketch the root locus. Find breakaway point, Kmarginal, frequency of sustained oscillations. **[9]**

$$G(s) = \frac{K(s+6)}{s(s+2)(s^2+6s+13)}$$

OR

Q2) a) 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. **[9]**

$$G(s) = \frac{K}{s(s+4)(s^2+s+1)}\ , H(s) = 1$$

b) Explain any 4 rules of root locus. **[8]**

Q3) a) Explain co relation between frequency domain and time domain. **[8]**

b) Explain polar plot. Draw polar plot for system with open loop transfer function as **[9]**

$$G(s) = \frac{20}{s(s+2)(s+3)}$$

OR

Q4) a) State and explain Nyquist Stability Criterion. **[8]**

b) Draw the Nyquist plot of the given system G(S)H(S)=5/[S(S+2)(S+4)] and comment on stability. **[9]**

P.T.O.

Q5) a) Draw magnitude and angle plot for following factors **[6]**

i) 1/jw

ii) 1/(l+jwT)

b) Sketch bode plot for system given by $G(s)H(s)=\frac{12(s+5)}{s(s+1)(s+3)}$ **[12]**

Find GM, PM, gain cross over frequency, phase cross over frequency. Comment on stability of system.

OR

Q6) a) Find the Stability the following system by sketching the Bode plot. **[12]**

$$G(s)=\frac{40(s+2)}{s(s+4)}$$

b) State and explain GM, PM and how to determine stability from it. **[6]**

Q7) a) Explain PID controller with its characteristics and its effect on system performance. **[9]**

b) Explain lag and lead network with their transfer function. **[9]**

OR

Q8) a) Using Ziegler Nichols method design a PID controller for system with unity feedback and $G(s)=\frac{24}{s(s+3)(s+6)}$. **[9]**

b) Derive transfer function of DC servo motor. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2537

[Total No. of Pages : 2

[6583]-64
T.E (Electrical)
Cybernetics Engineering
(2019 Pattern) (Semester-VI) (303151C) (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 side indicate full marks.***
3) ***Assume suitable data wherever necessary.***

Q1) a) Clearly explain the linearization process with examples. **[8]**

b) Write a note on the Nonlinear Control System. What are their properties? **[9]**

OR

Q2) a) Describe the multi-input multi-output control system in detail with a proper block diagram. **[8]**

b) Define and explain the performance index used in the self-adaptive control system. **[9]**

Q3) a) What is mathematical modelling? Derive mathematical model of second order system. **[8]**

b) Obtain the mathematical model of a simple pendulum system **[9]**

OR

P.T.O.

Q4) a) Obtain the mathematical model of Electrical system passive elements. **[9]**

b) Describe the mathematical modeling of the fluid storage system with example and block diagram **[8]**

Q5) a) Provide a detailed explanation of the design of an embedded computer system. Also, write advantages and disadvantages. **[9]**

b) Describe in detail the working of communication interface devices. **[9]**

OR

Q6) a) Explain the basic structure of an embedded computer system. **[9]**

b) Explain the computer architecture with a block diagram. **[9]**

Q7) a) Describe various types of optimization techniques **[9]**

b) What is Particle Swarm Optimization? Explain in detail **[9]**

OR

Q8) a) Explain in Simulated Annealing method used for optimization **[9]**

b) Explain the Ant Colony Algorithm in detail **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2538

[Total No. of Pages : 2

[6583]-65

T.E. (Electrical)

IoT and Its Applications in Electrical Engineering (Elective-II)

(2019 Pattern) (Semester - VI) (303151A)

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

Instructions to the candidates :

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

Q1) a) A switch is connected to digital pin 5 and a LED is connected to digital pin 13 of Arduino UNO board. Write a program in C to glow the LED 10 times when the switch is closed. **[9]**

b) Explain with syntax and example, following control statements in Python. **[9]**

i) if-else ii) while loop iii) for loop iv) nested if-else

OR

Q2) a) Explain with syntax and example, following functions from Arduino IDE. **[9]**

i) pinMode( ) ii) digitalWrite( ) iii) analogWrite( ) iv) analogRead( )

b) Write a program in Python to accept lower and upper limit of a range of numbers from user and print all the even numbers in that range. **[9]**

Q3) a) Explain in detail LM35 sensor. Also, with a neat diagram, show interfacing of LM35 sensor with NodeMCU. **[9]**

b) Write a short note on Ultrasonic sensors. **[8]**

OR

P.T.O.

Q4) a) Write a program to read data from DHT11 sensor and display it on serial monitor using Arduino IDE. Sensor is connected to D4 pin of Node MCU. **[9]**

b) Explain with a neat diagram, interfacing of stepper motor with NodeMCU **[8]**

Q5) a) Write a short note on Wi-Fi communication technology. **[9]**

b) Write a short note on MQTT communication technology. **[9]**

OR

Q6) a) Write a short note on Bluetooth communication technology. **[9]**

b) Write a short note on Zigbee communication technology. **[9]**

Q7) a) Explain the steps in sending the sensor data to cloud platform. **[9]**

b) What is meant by Data Visualization ? Explain in short, any 4 techniques of data visualization. **[8]**

OR

Q8) a) Write a short note on ThingSpeak cloud platform. **[9]**

b) What is API in IoT Cloud ? Explain in short, its 4 types. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2537

[Total No. of Pages : 2

[6583]-64
T.E (Electrical)
Cybernetics Engineering
(2019 Pattern) (Semester-VI) (303151C) (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 side indicate full marks.***
3) ***Assume suitable data wherever necessary.***

Q1) a) Clearly explain the linearization process with examples. **[8]**

b) Write a note on the Nonlinear Control System. What are their properties? **[9]**

OR

Q2) a) Describe the multi-input multi-output control system in detail with a proper block diagram. **[8]**

b) Define and explain the performance index used in the self-adaptive control system. **[9]**

Q3) a) What is mathematical modelling? Derive mathematical model of second order system. **[8]**

b) Obtain the mathematical model of a simple pendulum system **[9]**

OR

P.T.O.

Q4) a) Obtain the mathematical model of Electrical system passive elements. **[9]**

b) Describe the mathematical modeling of the fluid storage system with example and block diagram **[8]**

Q5) a) Provide a detailed explanation of the design of an embedded computer system. Also, write advantages and disadvantages. **[9]**

b) Describe in detail the working of communication interface devices. **[9]**

OR

Q6) a) Explain the basic structure of an embedded computer system. **[9]**

b) Explain the computer architecture with a block diagram. **[9]**

Q7) a) Describe various types of optimization techniques **[9]**

b) What is Particle Swarm Optimization? Explain in detail **[9]**

OR

Q8) a) Explain in Simulated Annealing method used for optimization **[9]**

b) Explain the Ant Colony Algorithm in detail **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2539

[Total No. of Pages : 2

[6583]-66

T.E. (Electrical)

ELECTRIC MOBILITY

(2019 Pattern) (Semester - VI) (Elective - II) (303151B)

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

Instructions to the candidates:

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

Q1) a) Explain Constant current charging algorithm used in battery charging. **[9]**

b) Explain in detail the cell balancing methods. **[8]**

OR

Q2) a) Draw block diagram of Battery Management System and explain it. **[9]**

b) List the methods of SOC estimation and explain any two in detail. **[8]**

Q3) a) Draw schematic diagram of series HEV drive train and explain its working. **[9]**

b) Explain with the help of block diagram the Control Strategies parallel Hybrid Electric Drive. **[9]**

OR

Q4) a) Explain in detail the Brake System of EVs and HEVs. **[9]**

b) Write notes on : **[9]**

i) Energy Consumption in Braking.

ii) Regenerative braking.

P.T.O.

Q5) a) Explain: Sizing of motors and Charging Levels - 01,02 and 03. **[9]**

b) Write notes on following charging Standards: **[8]**

i) SAEJ1772,

ii) IEC 60309,

OR

Q6) a) Explain PMSM drive with advantages and disadvantages. **[9]**

b) Write notes: **[8]**

i) Electric Vehicle Supply Equipment (EVSE).

ii) Bharat DC 001, Bharat AC 001.

Q7) a) Explain in brief role of aggregator for V2G. **[9]**

b) Explain the concept and structure of Vehicle to Vehicle. **[9]**

OR

Q8) a) Explain the concept of V2H with demand response and case study of V2H. **[9]**

b) Explain in detail V2G infrastructure in the smart grid. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2540

[Total No. of Pages : 2

[6583]-67
T.E. (Electrical)
ENERGY MANAGEMENT
(2019 Pattern) (Semester - VI) (303151D) (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.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of lagorithm tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***

Q1) a) What are the advantages and Disadvantages of Supply Side Management? **[9]**

b) With suitable examples discuss tools under demand side management avenues under supply side management. **[9]**

OR

Q2) a) What are the benefits of load curve manipulations? What are the benefits of the same? Explain with examples load curve manipulation. **[9]**

b) What are limitations of demand side management? **[9]**

Q3) a) What is clustering techniques in data analysis? How these can be achieved give suitable example? **[8]**

b) In a company data of energy consumption and production is collected. Use least square method to obtain a linear fit straight line satisfying data set given. **[9]**

Month	Production Tonnes/month (X)	Energy use Toe/month (Y)
1	380	340
2	440	340
3	460	380
4	520	380
5	320	300
6	520	400
7	320	280
8	620	424
9	600	420

P.T.O.

OR

Q4) a) Discuss the steps in detailed energy audit. **[9]**

b) Explain Sankey diagram with suitable examples. **[8]**

Q5) a) The energy manager of company wants 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/k VA per month. **[9]**

Description	Old motor	Energy Efficiency Motors
Rating of machine	200HP	200HP
Operating hours per annum	6500	6500
Efficiency near full load	89%	94%
Power factor near full load	0.85 lag	0.99 lag
Capital cost	--	Rs. 77,5000/-
Scrap value	Rs. 10,0000/-	--

b) Discuss energy audit case study for paper and pulp industry. **[9]**

OR

Q6) a) Calculate net present value for an investment of Rs.500000 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) Discuss Energy saving options in lighting systems. **[9]**

b) Energy saving opportunities in boiler and auxiliaries. **[8]**

OR

Q8) a) How fans, blowers and compressors are classified? Enlist energy conservation measures in fans. **[9]**

b) Explain the method for adequacy assessment for illumination system. What inferences can be drawn after assessment? **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE-2541

[Total No. of Pages : 2

[6583]-68
T.E. (Electrical Engineering)
INDUSTRIAL AND TECHNOLOGY MANAGEMENT
(2019 Pattern) (Semester - V) (303141)

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

Q1) a) What is patents? What do you understand from the patent? **[4]**

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

i) Patent format

ii) Patent structure

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

i) Recruitment

ii) Selection

OR

Q2) a) What is the importance of Human Resource Management? **[4]**

b) Explain copy rights and trademark. **[6]**

c) Explain scope and performance management of HRM. **[8]**

Q3) a) What is 5S? Explain. **[3]**

b) Explain ISO9001 : 2000 Quality Management system standard. **[6]**

c) Define quality. Explain types of quality. **[8]**

OR

Q4) a) What is Quality circles? Explain. **[3]**

b) Explain Quality of Design in detail. **[6]**

c) Explain Basic Software used for inventory management

i) Oracal

ii) Netsuite **[8]**

P.T.O.

Q5) a) What is marketing strategy? **[4]**

b) Explain Different methods of calculation of depreciation. **[6]**

c) Discuss type of taxes in detail. **[8]**

OR

Q6) a) What is product life cycle? **[4]**

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

i) Market planning

ii) Market research.

c) Discuss different types of costs. **[8]**

Q7) a) What are the stages of group dynamics? **[3]**

b) Explain Importance and Limitations of rational decision making. **[6]**

c) Expalin Taylor's motivation theory. **[8]**

OR

Q8) a) What are the qualities of good leader? **[3]**

b) Discuss Democratic and Laissez-faire Leadership. **[6]**

c) Explain Adam's Equity theory. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PE-2542

[Total No. of Pages : 3

[6583]-69
T.E. Electrical Engineering
Power Electronics
(2019 Pattern) (Semester - V) (303142)

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) ***Assume suitable additional data, jf necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Draw and explain Single phase semi converter feeding R load with output voltage and current wave forms. Also derive output average and rms voltage equation. **[9]**

b) Explain working of a single phase half controlled bridge converter without freewheeling diode feeding RL load with neat circuit diagram and output voltage and current waveform. **[9]**

OR

Q2) a) A fully controlled single phase bridge rectifier is supplied from a 50 Hz, 230/100 V transformer. The rectifier supplying a highly inductive load of 15 Ω resistor. For a firing angle of 60°, determine the rectified voltage, the rectified current: **[4]**

b) Explain how single phase full converter can operate as rectification and inversion mode with the help of output voltage waveforms with proper firing angle. **[6]**

c) Describe working of circulating current type single phase dual converter with waveforms. **[8]**

P.T.O.

Q3) a) Compare Three phase Semi converter and Three phase fully controlled converters based on Number of SCRs, Quadrant of Operation, and Modes of Operation. **[3]**

b) Explain working of two stage AC Voltage regulator with RL Load. Draw output voltage waveforms. **[6]**

c) Draw and explain working of Three phase semi controlled converter connected to R Load with neat circuit diagram and waveforms for firing angle $\alpha = 30°$ and $\alpha = 0°$ **[8]**

OR

Q4) a) Draw single phase AC Voltage regulator with R Load and output voltage waveforms. **[3]**

b) Draw and explain 3ϕ full converter with freewheeling diode for RL load. Draw output voltage and current waveforms for $\alpha = 30°$ and $\alpha = 0°$. **[8]**

c) A Three phase full converter operating from three phase, star connected, 415 V, 50 . Hz supply with resistive load. Determine average output voltage for continuous. mode at $\alpha = 65.77°$ and discontinuous mode at $\alpha = l26.l2°$. **[6]**

Q5) a) Compare VSI & CSI (4 Points) **[4]**

b) Explain working of single-phase full bridge voltage source Inverter connected to RL load with neat circuit diagram. Draw output voltage and current waveforms. **[6]**

c) Explain sinusoidal pulse width modulation used in inverters. Show four pulses per half cycle of O/P voltage. **[8]**

OR

Q6) a) What is mean by Load Commutated CSI. **[4]**

b) Explain working of single-phase current source inverter with neat circuit diagram. Draw output voltage and current waveforms **[6]**

c) What is the need of controlling o/p voltage of an inverter? Explain briefly and compare various methods employed for the control of o/p voltage in inverter. **[8]**

Q7) a) With the help of neat circuit diagram, six steps of output voltage waveforms, explain the operation of 180° conduction mode 3ϕ voltage source inverter for resistive load. **[10]**

b) Draw circuit diagram of three level flying capacitor converter and explain its principle and working of operation **[7]**

OR

Q8) a) What is necessity of using Multilevel Inverters? Draw circuit diagram of H bridge multilevel Inverter. . **[5]**

b) Compare multi-pulse and multilevel inverters. **[6]**

c) Draw a neat diagram and explain working of cascaded multilevel converter. **[6]**

Total No. of Questions : 8]

SEAT No. :

PE-2543

[Total No. of Pages : 3

[6583]-70

T.E. (Electrical Engineering)

ELECTRICAL MACHINES - II

(2019 Pattern) (Semester - V) (303143)

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 side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable if necessary.***

Q1) a) Draw the schematic diagram of 3-ph synchronous motor & label it. **[4]**

b) Why 3-ph, synchronous motor is not self-starting? explain with diagrams. **[6]**

c) A 3-phase, 3300 V, 50Hz, delta connected synchronous motor has synchronous reactance Xs = 18 Ω/phase and negligible resistance. It draws 600 kW while working at pf = 0.8 leading. Calculate the excitation emf & power angle. **[8]**

OR

Q2) a) State the methods of starting 3-ph synchronous motor. Which method makes motor self-starting? **[4]**

b) Sketch & explain the "V" curves for the synchronous motor for **[6]**

i) Full load

ii) Half load and

iii) No load condition.

c) A 2300-V, 3-phase star connected synchronous motor has a resistance of 0.3 ohm per phase and a synchronous reactance of 3.3 ohm per phase. The motor is operating at 0.8 power factor lagging with a line current of 180 amp. Determine the value of e.m.f. generated per phase and the angle of retardation. **[8]**

P.T.O.

Q3) a) What is energy efficient three phase induction motor? **[3]**

b) Sketch the schematic Construction diagram of Brushless D.C. motor & explain its working. **[6]**

c) Explain the Construction, principle of working of superconducting alternator. **[8]**

OR

Q4) a) State the various methods of speed control of 3-ph induction motor on stator and rotor side. **[3]**

b) Compare 3-phase synchronous motor with 3-phase induction motor. **[6]**

c) Draw the neat construction diagram and explain the working of variable reluctance stepper motor. Show the truth table. How to reverse the direction of rotation. **[8]**

Q5) a) What are the modifications necessary in construction of dc series motor to operate it on ac supply? **[4]**

b) Draw the approximate phasor diagram of AC series motor & explain. **[6]**

c) A universal series motor when operating on 240 Volt D.C. supply, draws 10 amp and runs at 1400 r.p.m. Find the new speed and power factor, when connected to 240 V, 25 Hz a.c. supply the motor current & voltage remaining the same for both the conditions. The motor has total resistance of 3 Ω and inductance of 0.1 H. **[8]**

OR

Q6) a) Draw the torque - armature current characteristics of AC and DC series motor on common X & Y-axis & comment on armature current & torque. **[4]**

b) Explain inductively compensated A C series motor, with suitable diagram. **[6]**

c) What do you mean by universal motor? Draw its speed vs torque characteristics on A C and D C operation. State applications of universal motor. **[8]**

Q7) a) How to make 1-ph induction motor self-starting? **[3]**

b) Compare single phase induction motor with 3 phase induction motor. **[6]**

c) Sketch the torque-slip characteristics of 1-ph Induction motor based on double field revolving theory. Prove, how the 1-ph induction motor is not self-starting by mathematically & graphically. **[8]**

OR

Q8) a) How to reverse the direction of rotation of a single phase induction motor? Show by circuit diagrams. **[3]**

b) 500W, 240 V, 50 Hz, single phase, capacitor start induction motor has following constants Main winding: Zm= 4.5 + j2.7 Ω & Auxiliary winding: Za=7.5 + j2.5 Ω. Determine value of starting Capacitor which will develop maximum starting torque. . **[6]**

c) Draw the circuit diagram, observation table and write the procedure to conduct open circuit & Blocked rotor test on capacitor start single phase induction motor. Write the formulae used to find equivalent circuit parameters. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2544

[Total No. of Pages : 3

[6583]-71

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

Q1) a) Explain the role of thermography in electrical field. **[4]**

b) State different maintenance strategies and explain any one. **[6]**

c) Explain planned and preventative maintenance of transformer. **[8]**

OR

Q2) a) Explain the process of condition monitoring of Transformer bushings. **[4]**

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

i) Polarization Index

ii) Dielectric Absorption Ratio.

c) How transformer oil gets contaminated? With suitable diagram explain the reconditioning process of transformer oil. **[8]**

Q3) a) Write a short note on Price Catalogue. **[3]**

b) Explain the purpose of Estimating and Costing. **[6]**

c) Explain how to calculate labor rates for internal wiring. **[8]**

OR

P.T.O.

Q4) a) Write a short note on Quotation. **[3]**

b) State and explain essential elements of estimating and costing. **[6]**

c) What is Tender? State & explain Guidelines for inviting tenders. **[8]**

Q5) a) Write a short note on Current carrying Capacity for conductor size calculations. **[4]**

b) Write down all rules for residential wiring work. **[6]**

c) Explain the procedure of installation of underground LT service line. **[8]**

OR

Q6) a) Write a short note on Voltage Drop for conductor size calculations. **[4]**

b) Explain various residential wiring methods with diagrams. **[6]**

c) A single room house receives supply voltage of 200 V. Length of wire from switch fuse unit to the working point is 33 meters. The current requirement is only 5 Ampere. Referring standard table find suitable size of conductor so that voltage drop is within the limit. **[8]**

Size of conductor		2Cables D.C. or Single-phase A.C.		3 or 4 cables of balanced 3-phase		4 cables D.C	
Normal area sq. mm.	Number and diameter of wire in mm.	Current rating in amperes	Approx. length of run for volt-drop in Metres	Current rating in Ampere	Approx. Length of run for 1 volt drop in meters	Current rating In Amperes	Approx. length of run for l volt drop in metres
1.5	1/1.40	10	2.3	9	2.9	9	2.5
2.5	1/1.80	15	2.5	12	3.6	11	3.4
4.0	1/2.24	20	2.9	17	3.9	15	4.1
6.0	1/2.80	27	3.4	24	4.3	21	4.3
10.0	1/3.55	34	4.3	31	5.4	27	5.4
16.0	7/1.70	43	5.4	38	7.0	35	6.8
25.0	7/2.24	59	6.8	54	8.5	48	8.5
35.0	7/2.50	69	7.2	62	9.3	55	9.0
50.0	7/3.0 19/1.80	91	7.9	82	10.1	69	10.0

Q7) a) List out the methods for administering artificial respiration. **[3]**

b) Explain with neat diagram Insulation resistance test between installation and earth. **[6]**

c) Write a short note on CAT Ratings and CAT rated instruments. **[8]**

OR

Q8) a) List out contents of First Aid Box. **[3]**

b) What is the use of Guard Terminal in IR test? Explain in detail. **[6]**

c) Classify Hazardous area and explain how they can be prevented. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE-2545

[Total No. of Pages : 2

[6583]-72

T.E. (Electrical Engineering)

ADVANCED MICROCONTROLLER AND EMBEDDED SYSTEMS

(2019 Pattern) (Semester - V) (303145 A) (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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) List the step for compare mode programming of CCP module of PIC18. **[4]**

b) Draw and explain bitwise CCP 1CON register. **[6]**

c) Write a C program to create 2KHz PWM frequency with 75% duty cycle on CCP1 pin. Assume XTAL=10Mhz. **[8]**

OR

Q2) a) How timer is selected for compare and capture mode of CCP module of PIC18 **[4]**

b) Explain how time period and duty cycle is set for generation of a waveform using PWM mode of CCP module. **[6]**

c) Assume a pulse is being fed to the CCP1 pin. Using Capture mode, write a C language program to measure the period of the pulse and puts the result on PORTB and PORTD. **[8]**

Q3) a) What are the sources of interrupts. **[3]**

b) Explain interrupt structure of PlC 18 with neat diagram. **[6]**

c) Write a C program to toggle an LED connected to pin RB7 on occurrence of an interrupt INT0. **[8]**

P.T.O.

OR

Q4) a) How enabling and disabling hardware interrupt INT0. **[3]**

b) What the steps in executing an interrupt. **[6]**

c) Write a C program to generate square wave on pin RB0 using timer0 interrupt. **[8]**

Q5) a) Which bits are used to set the conversion time of ADC **[4]**

b) State the function of following **[6]**

i) ADFM ii) GO/DONE iii) ADIF

c) Write a C program to get data from Channel 0 (AN0) using ADC interrupt and displays the result on PORTC and PORTD. **[8]**

OR

Q6) a) State the features of ADC of PIC18F458 **[4]**

b) State the Sensors used for temperature measurement. Draw flow chart for temperature measurement using ADC of PIC 18. **[6]**

c) Draw interfacing diagram of LCD with PIC18. Write a C program to initialise the LCD. **[8]**

Q7) a) List steps for programming PIC18 to receive data serially **[3]**

b) Write a program for PIC18 to transfer the letter 'T' serially at the baud rate of 9600, continuously. Assume XTAL=10MHz. **[6]**

c) Draw and explain Serial communication USART transmit block diagram **[8]**

OR

Q8) a) With Fosc=10 MHz and BRGH=0, find the SPBRG value for 4800 baud rate. **[3]**

b) Write a program for PIC18 to receive data serially at the baud rate of 9600, continuously and put result on PORTB. Assume XTAL=10MHz. **[6]**

c) What are the steps for SPI read and write protocol for single byte. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2546

[Total No. of Pages : 3

[6583]-73
T.E. (Electrical)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - V) (303145B) (Elective - 1)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve QI 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) Define DTFT. What is the criteria for existence of DTFT of a signal? State whether DTFT is exists for the signa, $a^n u(n)$, if **[8]**

(i) a < 1 and (ii) a > = 1

b) For the sequence given below find the frequency response, plot magnitude and phase response for $\omega = -\pi$ to π with step size of $\frac{\pi}{3}$. **[9]**

$h(n) = 1$ *for* $n = 0, 1, 2, 3, 4$

$h(n) = 0$ *otherwise*

OR

Q2) a) Explain frequency response of first order system. **[8]**

b) Find the discrete time fourier transform of **[9]**

(i) $u(n - 4)$

(ii) $\delta (n - 4)$

(iii) $0.4^n u(n)$

Q3) a) Explain DIT FFT algorithm with N = 4. **[8]**

b) Find linear and circular convolution of following two sequences

$x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{1, 0, 1, 0\}$ **[9]**

OR

P.T.O.

Q4) a) State and prove following properties of DFT **[8]**

(i) Periodicity

(ii) Time reversal

b) Find the DFT of the sequence using DITFFT for the signal $x(n) = \{1,2,1,2\}$ **[9]**

Q5) a) Obtain Z-transform and direct form - II realization for the system described by difference equation. **[6]**

$$y(n) = \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) + x(n) + \frac{2}{5}x(n-1)$$

b) For the analog transfer function $H(s) = \frac{2}{s^2 + 3s + 2}$. Determine $H(z)$ using impulse invariance method. Assume T = 0.5 sec. **[6]**

c) Explain realization of IIR digital filters using direct form - II structure. **[6]**

OR

Q6) a) Obtain Z-transform and direct form-1 realization for the system described by difference equation. **[6]**

$y(n) = 0.4y(n - 1) - 0.75y(n - 2) + x(n) + 0.25x(n - 1)$

b) Compare FIR and IIR Filters **[6]**

c) Explain bilinear transformation used in design of digital filters from analog filters. **[6]**

Q7) a) Design ideal low pass filter with frequency response. **[12]**

$$H_d(e^{j\omega}) = \begin{cases} 1 & for\ |\omega| \le \frac{\pi}{4} \\ 0 & otherwise \end{cases}$$

Find the value of h(n) for N = 7. Use rectangular window.

b) Explain any one method used for measurement of voltage using DSP. **[6]**

OR

Q8) a) Obtain direct form realization of system function **[6]**

$H(z) = 1 + 0.2z^{-1} + 0.8z^{-2} + 0.3z^{-4}$

b) Differentiate between analog and Digital Filters **[6]**

c) Write short note on "Application of DSP for protective relays" **[6]**

Total No. of Questions : 8]

SEAT No. :

PE-2547

[Total No. of Pages : 2

[6583]-75
T.E. (Electronics)
FUNDAMENTALS OF HDL
(2019 Pattern) (Semester - VI) (304212)

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.***

Q1) a) Distinguish between interconnections among functional blocks in a CPLD and programmable logic blocks in an FPGA. **[9]**

b) With neat schematic explain the architecture of CPLD. **[8]**

OR

Q2) a) Differentiate between CPLD and FPGAs. **[9]**

b) Describe in brief types of FPGA technologies. **[8]**

Q3) a) Explain task syntax with example. **[9]**

b) Write HDL code for 4:1 Mux using 2:1 Mux. Use Procedure and Task. **[9]**

OR

Q4) a) Explain Procedure syntax with example. **[9]**

b) What do you understand by a subprogram? What is subprogram overloading? Explain with VHDL example. **[9]**

P.T.O.

Q5) a) Explain in detail verilog logical operators and expressions. **[8]**

b) Explain the brief history of Verilog HDL with structure and example. **[9]**

OR

Q6) a) Find the value of following expressions if the two unsigned variables A=4'B1101 and B=4'B1001 i) {A&&B} ii) (A||B) iii) {4{A},2{B}} iv) B>>2 **[8]**

b) Write down short notes on following: i) Arrays ii) Variables & Constant declaration. **[9]**

Q7) a) Write Verilog code for 8:1 multiplexer using case statement. **[9]**

b) Explain the syntax of when.. else.. statement with example. **[9]**

OR

Q8) a) Write Verilog code for D flipflop. **[9]**

b) Explain in detail the modelling styles in verilog. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2548

[Total No. of Pages : 2

[6583]-76
T.E. (Electronics Engineering)
EMBEDDED PROCESSORS AND APPLICATIONS
(2019 Pattern) (Semester - VI) (304213)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Ql 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 the function of Pin Connect block of LPC 2148? Also explain the function of PINSEL0 and PINSEL1 registers. **[6]**

b) Draw block diagram of timer of LPC2148.Explain the functions of Timer Counter register and Timer Control register. **[6]**

c) Interface LCD to LPC2148 and write an Embedded C program to display string “SPPU PUNE”. **[8]**

OR

Q2) a) Explain with neat diagram the relation between CCLK and PCLK with the help of VPB/APB divider to achieve CCLK= 60 MHz for Fosc=10 MHz. **[6]**

b) Draw interfacing diagram and write a program for motion sensor interfacing to LPC2148. **[6]**

c) Draw architecture of LPC2148.Explain the function of each block in brief. **[8]**

Q3) a) Draw the architecture of UARTl of LPC2148 and explain the function of each block in detail. **[8]**

b) What is GSM module. Write algorithm and draw flowchart for sending the message through GSM module. **[8]**

OR

P.T.O.

Q4) a) Explain DAC register with its features. Write an Embedded C Program for generation of ramp waveform using on chip DAC of LPC2148 with its interfacing diagram. **[8]**

b) Draw interfacing diagram and write an Embedded C program to transmit character 'A' to PC using LPC2148.Also draw it flowchart. **[8]**

Q5) a) Compare Arm Classical series and ARM Cortex series. State advantages of ARM Cortex series for embedded system design. **[8]**

b) List the features of Cortex M3 Processor. Explain the operating modes of ARM Cortex M3 processor. **[8]**

OR

Q6) a) Draw and explain in detail CMSIS structure of cortex series. **[8]**

b) State the features and applications of ARM Cortex A, Cortex R and Cortex M series processors. Give difference between ARM Cortex R and Cortex M series. **[8]**

Q7) a) Draw and explain the block diagram of Embedded System with IoT. **[9]**

b) Explain case study of Smart Home Automation using IoT with detailed diagram. **[9]**

OR

Q8) a) Define the following terms along with example: **[9]**

i) Sensors

ii) Actuators

iii) Embedded System

b) Explain case study of Transportation Management using IoT with detailed diagram. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2549

[Total No. of Pages : 2

[6583]-77

T.E. (Electronics)

INDUSTRIAL MANAGEMENT

(2019 Pattern) (Semester - VI)(304214)

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) ***Figures to the right indicate full marks.***

Q1) a) Explain Six sigma Quality Management Standards. **[8]**

b) Write a short note on Quality Management Assistance Tools: Five S (5S). **[9]**

OR

Q2) a) Explain quality of design, conformance and performance. **[8]**

b) Explain The ISO - Quality Management System Standard. **[9]**

Q3) a) Explain Changing Concepts and Objectives of Business. **[9]**

b) Write a short note on Business ethics. **[9]**

OR

Q4) a) Explain Technological Development and Social Change. **[9]**

b) What is a Social Responsibility of Business? Explain with suitable examples. **[9]**

Q5) a) Differentiate between Sole Proprietorship and Partnership firms in details. **[8]**

b) Illustrate Joint stock companies - their features, relative merits, demerits & suitability. **[9]**

P.T.O.

OR

Q6) a) Write a short note on Services sector. **[8]**

b) Differentiate between Private sector and Cooperative sector in details. **[9]**

Q7) a) Explain Concept of entrepreneurship, Identification of business opportunities in details. **[9]**

b) Illustrate Preparation of business proposal with suitable example. **[9]**

OR

Q8) a) Explain Business plan in details. **[9]**

b) Compare and contrast the different sources of finance available to small businesses. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2550

[Total No. of Pages : 2

[6583]-78
T.E. (E&TC/Electronics)
ADVANCED JAVA PROGRAMMING
(2019 Pattern) (Semester - VI) (Elective - II) (304195C)

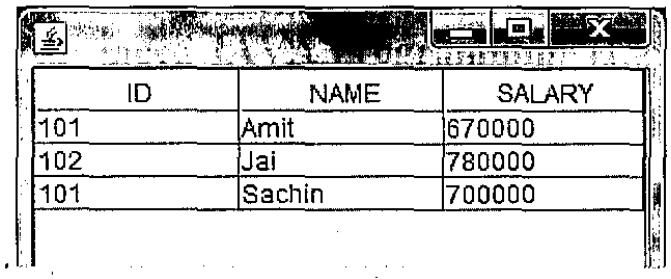
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve question Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the rght side indicate full Marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Describe the collection framework in Java with the collection hierarchy. **[9]**

b) Write a Java program for the following output using Java JTable. **[9]**

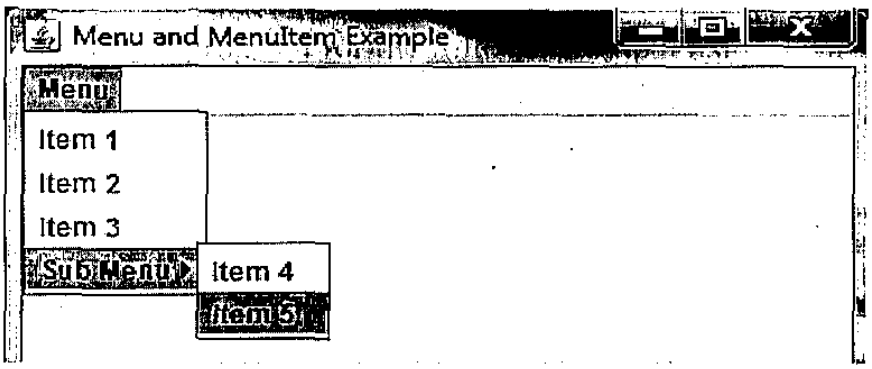


ID	NAME	SALARY
101	Amit	670000
102	Jai	780000
101	Sachin	700000

OR

Q2) a) What is a List interface? Differentiate between Array List & Vector.**[9]**

b) Write a Java program for the following output using the concept of adding Menu to Window. **[9]**



P.T.O.

Q3) a) Explain the JDBC architecture. Explain in detail the steps to establish a connection with a database using JDBC. **[8]**

b) Write a Java Program to Insert the details of Employee:

Employee ID Number, Name, Age, Salary in to a Table using JDBC connection. **[9]**

OR

Q4) a) Explain the types of statement in JDBC. Compare between prepared statement & Callable Statement? **[8]**

b) What is a JDBC? Explain Types of JDBC Driver. **[9]**

Q5) a) Write a short note on : **[9]**

i) RMI Remote Object Activation

ii) RMI Interfaces and Implementation.

b) Write a simple RMI application in which the client invokes the method of the server. **[9]**

OR

Q6) a) Develop a RMI application which accepts a string and checks that string is palindrome or not. **[9]**

b) What is RMI? Explain with neat diagram the RMI Architecture. **[9]**

Q7) a) What is Internet protocol ? Differentiate between TCP and UDP. **[8]**

b) What is URL? Write a Java program to obtain the name of the protocol, port number, host name and file name of the URL. **[9]**

OR

Q8) a) Write a short note on : **[8]**

i) Cookies

ii) Datagram

b) What is servlet? Explain Life cycle of a Servlet with neat diagram. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2551

[Total No. of Pages : 2

[6583]-79
T.E. (Electronics Engineering)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - VI) (304215B) (Elective-II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers the 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 FIR filter design using windowing technique. **[8]**

b) Obtain digital filter transfer function by applying impulse invariance transfer function $H(S)=\frac{S}{(S+5)(S+2)}$ if T = 0.1 sec. **[9]**

OR

Q2) a) Explain the Gibbs phenomenon. How the effect of Gibbs phenomenon is reduced? **[8]**

b) Give the properties and characteristics of Butterworth filter. Give sailent features of Low Pass Butterworth filter. **[9]**

Q3) a) The transfer function of the discrete causal system is given as follows, **[8]**

$$H(Z)=\frac{1+z^{-1}}{1-0.2z^{-1}-0.15z^{2}}$$

Draw cascade and parallel realization.

b) Realize the following system function in cascade form, **[9]**

$$H(Z)=1+\frac{3}{4}z^{-1}+\frac{17}{8}z^{-2}+\frac{3}{4}z^{-3}+z^{-4}$$

OR

P.T.O.

Q4) a) Draw the direct form-I and II structures for the following systems: **[8]**

i) $y(n) = 0.5\,[x(n) + x(n-1)]$

ii) $y(n) - 5y(n-1) = 7\,x(n)$

b) Explain the frequency sampling structures. Also explain the lattice realizations. **[9]**

Q5) a) Explain the interpolation by factor I. Write an expression for interpolated signal at the output. **[9]**

b) With the help of block diagram and mathematical support explain sampling rate conversion by rational factor I/D. **[9]**

OR

Q6) a) Design a three stage decimator that down samples an audio signal by a factor of 96 with the following specifications: F_s = 96 kHz, Highest frequency of interest in data=450 Hz, δp, = 0.01, δp = 0.001. **[9]**

b) Explain decimation by factor D. Write an expression for decimated signal at the output. **[9]**

Q7) a) Draw the architectural block diagram of DSP processor and explain function of each block. **[9]**

b) Explain the need for special architecture of DSP processor. Enlist the features of TMS320C54XX dsp processor. **[9]**

OR

Q8) a) Give the brief comparison between the DSP processors and General purpose processors. **[9]**

b) Explain the application of DSP processor in biomedical signal processing. **[9]**

❖❖❖

Total No. of Questions : 8]

SEAT No. : ____

PE5520

[Total No. of Pages : 2

[6583]-80
T.E. (Electronic Engineering)
E MOBILITY
(2019 Pattern) (Semester - VI) (304215E) (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 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 construction and working principle of a Nickel based battery. What are its advantages, limitations & applications? **[9]**

b) Explain the working principle of a flywheel energy storage system. What are its advantages and limitations in grid and transportation applications? **[8]**

OR

Q2) a) Explain the construction and working principle of sodium-sulfur (NaS) battery. What are its advantages, limitations, and applications? **[9]**

b) Explain the working principle of ultra capacitors. How do they differ from conventional batteries? Give its advantages and applications. **[8]**

Q3) a) Explain the working principle of a microprocessor-based battery charger. How does it improve the safety and efficiency of the charging process? **[9]**

b) Describe the standard power levels for conductive EV chargers? Compare their voltage, current ratings, and typical applications. **[8]**

OR

Q4) a) Explain the charge equalization in EV battery packs. Discuss the need for cell balancing, various equalization techniques, and their impact on battery life and performance. **[9]**

b) Explain the arrangement and block diagram of an off-board conductive charger. Explain the communication between charger and vehicle, isolation requirements, and safety standards involved. **[8]**

P.T.O.

Q5) a) Define a "move-and-charge zone." How does it work, and what are its potential benefits for urban EV users? **[9]**

b) Describe the different types of EV charging connectors. How are they categorized based on charging type (AC/DC) and region? **[9]**

OR

Q6) a) Explain the CHAdeMO charging standard. What are its key characteristics and how does it compare with CCS in terms of performance and adoption? **[9]**

b) Explain the structure and operation of a public charging infrastructure. Explain the site selection, power availability, communication networks and challenges involved in large-scale deployment. **[9]**

Q7) a) Explain the 6LoWPAN protocol. How does it enable IPv6 communication over low-power wireless networks in AMI systems? **[9]**

b) Explain operation of Power Line Carrier communication. What are its advantages 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 IEC 61850 standard and its relevance to substation automation and AMI. What makes it suitable for real-time communication? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2552

[Total No. of Pages : 3

[6583]-81
T.E. (Electronics)
FIBER OPTIC COMMUNICATION
(2019 Pattern) (Semester - VI) (304215D) (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 side indicate full Marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume the suitable data, if necessary.***

Q1) a) Explain the scattering and bending losses that occur in an optical fiber with relevant diagrams and expressions. **[8]**

b) Explain in brief each of the following fiber types: **[10]**

i) Dispersion shifted (DSF)

ii) NZDSF

iii) Dispersion flattened

iv) Polarization maintaining fibers

OR

Q2) a) Explain in detail the intermodal dispersion and intramodal dispersion with relevant diagrams. **[8]**

b) Explain the following with necessary diagram **[10]**

i) Linear and Non linear scattering loss

ii) Intrinsic and Extrinsic absorption Loss

Q3) a) Compare the performance of APD with PIN diode with suitable diagram. List the benefits and drawbacks of avalanche photo diodes. **[9]**

b) Describe the three modes of the cavity of LASER diode with suitable diagram. **[8]**

OR

P.T.O.

Q4) a) Compare LED and LASER as light source for optical fiber transmission system. Justify usage for laser as a light source along single mode fibers. **[9]**

b) What types of materials are used for optical sources? What are the advantages of double Heterostructure? Compare surface emitting and edge emitting LED structures. **[8]**

Q5) a) Explain the architecture of SONET/SDH with neat diagram. **[9]**

b) With the help of neat sketch diagram describe: **[9]**

i) WDM architecture

ii) 2 × 2 Fiber Coupler

iii) Polarization independent isolator

OR

Q6) a) Explain FBG and its usage as a multiplexer and de-mulitiplexer Draw neat diagrams to illustrate the same. **[9]**

b) Explain the principle of operation of Erbium doped fiber amplifiers (EDFA). Draw neatly labeled diagram of EDFA. **[9]**

Q7) a) Components are chosen for a digital optical link of overall 7km and operating at a 20Mbps using an RZ code. It is decided that an LED emitting at 0.85μm with graded index fiber to a PIN photodiode is a suitable choice for the system components, giving no dispersion-equalization penalty. An LED which is capable of launching an average of 100 microwatts of optical power (including the connector loss) into a 50 micron core diameter graded index fiber is chosen. The proposed fiber cable has an attenuation of 2.6dB/km and requires spicing every km with a loss of 0.5dB Per splice. There is also a connector loss at the receiver of 1.5dB. The receiver requires a mean incident optical power of - 41 dBm in order to give the necessary Bit Error Rate (BER) of 10^{-10}. and it is predicted that a safety margin of 6dB will be required. Analyze the optical link and write down the optical power budget for the system and hence determine its viability. **[9]**

b) Explain rise time power budget analysis for optical fiber link. Write expression for it. **[8]**

OR

Q8) a) Describe various system design considerations of point to point link design in optical links. **[9]**

b) Given system:

- Transmitter: 1.55 μm DFB laser with 0 dBm output from the fibre pigtail.
- The spectral width is Δf= FWHM≈l0.B, where B is the bit rate. Rise time = 0.1/B
- Receiver: Sensitivity = -30 dBm for the required BER.
- Rise time = 100 ps.
- Fibre: Attenuation = 0.3 dB/km.
- Splice loss = 0.1 dB.
- Dispersion = 18 ps/(nm km) at 1. 55 μm.
- Available fibre length = 10km (full lengths have to be used)
- System: One fibre connector at the transmitter and one at the receiver with connector loss = 1 dB each.
- Minimum system margin = 10 dB.
- Modulation: 1 Gbit/s RZ.

Analyze the system configuration given above and answer the following questions:

What is the maximum transmission distance in the fibre-optical communication system specified below? Decide whether the system is loss or dispersion limited? What is the real system margin? **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2553

[Total No. of Pages : 2

[6583]-82
T.E. (Electronics Engineering)
PLC AND AUTOMATION
(2019 Pattern) (Semester - VI) (304215A) (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 full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the Retentive timer in detail with timing diagram. **[6]**

b) Write a PLC Ladder program for 24-hour clock program. **[6]**

c) Enlist the types of analog PLC systems? Explain in detail about the PLC Analog signal processing. **[6]**

OR

Q2) a) List various types of counters used in PLC. Explain any one in detail with timing diagram. **[6]**

Develop a PLC Ladder program for the following statement: Motor 1(M1) starts as soon as start switch is ON; after 10 Seconds Ml goes OFF and Motor.

b) 2 (M2) starts. After 5 seconds, M2 goes OFF and M3 starts. After 10 Seconds M3 goes OFF, Ml starts and the cycle is repeated. When stop switch is ON, all Motors are stop. **[6]**

c) Explain PLC matrix functions in detail. **[6]**

Q3) a) Explain in detail about the Electric Noise and suitable example of noise suppression. **[9]**

b) Explain the procedure of PLC Maintenance in detail. **[8]**

OR

P.T.O.

Q4) a) Explain the steps to be followed when commissioning a PLC system. **[9]**

b) Explain in detail about the circuit protections & wiring. **[8]**

Q5) a) Explain any one type of process used in process control Industries. Explain about the structure of control systems. **[9]**

b) Explain in detail about Remote Terminal Unit (RTU). **[8]**

OR

Q6) a) Draw and explain the block diagram of SCADA system in detail. **[9]**

b) Explain in detail about Master terminal unit (MTU). Enlist any three applications of HMI in industry. **[8]**

Q7) a) State the advantages of standard industrial network? Explain the serial communication interface in detail. **[9]**

b) Describe the types of networking channels. Compare the different types of control system buses. **[9]**

OR

Q8) a) Compare the serial and parallel transmission. Explain in detail the concept of Devicenet. **[9]**

b) Explain in detail about Profibus protocol and its types. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE-2554

[Total No. of Pages : 2

[6583]-83
T.E. (Electronics Engineering)
POWER AND INDUSTRIAL ELECTRONICS
(2019 Pattern) (Semester - V) (304201)

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

Instructions to the candidates:

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

Q1) a) Compare 1ϕ controlled rectifier & 3ϕ controlled rectifier. **[4]**

b) Explain advantages & disadvantages of semiconverter. **[6]**

c) Explain 1ϕ semiconverter with R load. **[7]**

OR

Q2) a) Explain power factor improvement techniques. **[6]**

b) Explain Application of Controlled Rectifiers. **[4]**

c) Explain 1ϕ PWM rectifier using IGBT. **[7]**

Q3) a) Explain control strategies of chopper. **[8]**

b) Explain any one 2-quadrant chopper. **[9]**

OR

Q4) a) Explain four quadrant chopper with circuit diagram. **[8]**

b) Explain advanatages, disadvantages & application of chopper. **[9]**

Q5) a) Draw 3ϕ inverter for balanced star R load? Explain its operation of 180º mode with gate signals & Waveforms. **[9]**

b) Explain 1ϕ Full bridge inverter with R-L loads. **[9]**

P.T.O.

OR

Q6) a) What are application of inverter? State advantages & disadvantages of inverter. **[9]**

b) Explain 3 phase variable frequency drives. **[9]**

Q7) a) Explain various performance parameter of batteries used in battery operated power system. **[9]**

b) Explain Battery Charging Application & Traction Application. **[9]**

OR

Q8) a) Write short note on : **[9]**

i) Electrical vehicle

ii) Induction heating application.

b) What is UPS? Explain operation of On-line UPS with block diagram. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE-2555

[Total No. of Pages : 2

[6583]-84

T.E. (Electronics Engineering)

ELECTROMAGNETIC WAVES & PROPAGATION THEORY

(2019 Pattern) (Semester - V) (304202)

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 in necessary.***

Q1) a) Write Maxwell's equations for pure conductor. **[8]**

b) Write Maxwell's equations for time varying field. **[8]**

c) Define time varying potential in time varying field. **[2]**

OR

Q2) a) Write Maxwell's equations for static field. **[8]**

b) Write Maxwell's equations for lossless dielectric medium. **[8]**

c) State & explain Faraday's law of emf. **[2]**

Q3) a) Derive uniform plane wave equations for free space & define uniform plane wave. **[9]**

b) Describe ground, sky & space wave propagation. **[8]**

OR

P.T.O.

Q4) a) Derive uniform plane wave equations for lossless dielectric medium. **[10]**

b) Define depth of penetration. Write relation between δ, α & β **[7]**

Q5) a) Explain primary & secondary constants/parameters in transmission line. **[10]**

b) Describe propagation constant, characteristic impedance and reflection coefficient in transmission line. **[7]**

OR

Q6) a) Explain use of transmission lines with reference to impedance matching. **[4]**

b) Derive expression of characteristic impedance of transmission line. **[8]**

c) Explain SWR & VSWR **[5]**

Q7) a) Define wave guides & its types in detail. **[8]**

b) Explain structural details of stripelines. **[4]**

c) Explain applications, advantages & disadvantages of waveguides. **[6]**

OR

Q8) a) Explain TE and TM modes of waveguides. **[8]**

b) Describe Cavity Resonator in detail **[6]**

c) Define Phase Velocity and Group Velocity **[4]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2556

[Total No. of Pages : 2

[6583]- 85

T.E. (E & TC)

DATABASE MANAGEMENT

(2019 Pattern) (Semester - V) (304183)

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 following questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What are some common clauses used with SELECT query in SQL? Explain any three with example. **[8]**

b) What are different types of joins in SQL? Explain any one with suitable example. **[6]**

c) Define the use of TRUNCATE, DELETE and DROP statements in SQL? Explain any one with example. **[4]**

OR

Q2) a) Explain the use of constraints in SQL. List and explain any three constraints example. **[8]**

b) What is Cursor? Explain Implicit and Explicit cursor in PL/SQL with suitable example. **[6]**

c) Explain with example any two STRING functions used in SQL. **[4]**

Q3) a) When deadlock occurs? How to prevent them? How to recover if dead lock occurs. **[6]**

b) Define transaction. State and explain in brief the ACID properties of a transaction? **[5]**

c) Explain briefly different states of transaction with a neat state transition diagram. **[6]**

OR

P.T.O.

Q4) a) Explain Commit and Rollback operations of Transactions. **[6]**

b) What is Concurrent execution of transaction? Explain any two concurrency problems occurs during Concurrent execution of transaction with examples? **[5]**

c) Explain the term **[6]**

i) Conflict Serializability

ii) View Serializability

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. **[5]**

OR

Q6) a) List the parallel database architectures and explain any one architecture. **[6]**

b) Explain Oracle Database Architecute. **[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]**

OR

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. :

PE-2556

[Total No. of Pages : 2

[6583]- 85

T.E. (Electronics/E & TC)

DATABASE MANAGEMENT

(2019 Pattern) (Semester - V) (304183)

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 following questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What are some common clauses used with SELECT query in SQL? Explain any three with example. **[8]**

b) What are different types of joins in SQL? Explain any one with suitable example. **[6]**

c) Define the use of TRUNCATE, DELETE and DROP statements in SQL? Explain any one with example. **[4]**

OR

Q2) a) Explain the use of constraints in SQL. List and explain any three constraints example. **[8]**

b) What is Cursor? Explain Implicit and Explicit cursor in PL/SQL with suitable example. **[6]**

c) Explain with example any two STRING functions used in SQL. **[4]**

Q3) a) When deadlock occurs? How to prevent them? How to recover if dead lock occurs. **[6]**

b) Define transaction. State and explain in brief the ACID properties of a transaction? **[5]**

c) Explain briefly different states of transaction with a neat state transition diagram. **[6]**

OR

P.T.O.

Q4) a) Explain Commit and Rollback operations of Transactions. **[6]**

b) What is Concurrent execution of transaction? Explain any two concurrency problems occurs during Concurrent execution of transaction with examples? **[5]**

c) Explain the term **[6]**

i) Conflict Serializability

ii) View Serializability

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. **[5]**

OR

Q6) a) List the parallel database architectures and explain any one architecture. **[6]**

b) Explain Oracle Database Architecute. **[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]**

OR

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. :

PE-2557

[Total No. of Pages : 2

[6583]- 86

T.E. (Electronics Engineering)

MICROCONTROLLER 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 indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Draw interfacing diagram of motion detector with 8051 microcontroller. Write Embedded C program to switch on led when motion is detected. **[6]**

b) Explain the term opto-isolators. What are advantages of opto-isolators. Draw interfacing diagram of opto-isolators with 8051 microcontroller. **[6]**

c) Draw interfacing diagram of DAC to 8051 microcontrollers and write an embedded C program to generate ramp wave form. Also draw its flowchart. **[8]**

OR

Q2) a) Write an Embedded C program to rotate stepper motor continuously in anti-clockwise direction along with its interfacing diagram. **[6]**

b) Explain in detail data transmission and reception process in 8051 microcontroller. **[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) Compare PIC 10, PIC12, PIC16, PIC18 series. **[8]**

b) Draw and explain the block diagram of Timer 1 of PIC18Fxx microcontroller in 16- bit mode. **[8]**

OR

P.T.O.

Q4) a) With neat diagram explain RAM memory organization of PIC18Fxx microcontroller. **[8]**

b) Draw and explain PIC18FXXX microcontroller architecture. **[8]**

Q5) a) Draw the neat block diagram of port strucutre of PIC18Fxx and explain it in detail. **[8]**

b) Draw interfacing diagram of LED to Port B of PIC18Fxx microcontroller. Also write an Embedded C program to alternately blink led with same delay. **[8]**

OR

Q6) a) Explain the caputre mode of CCP module with neat diagram for PIC 18Fxx microcontoller. Also write the algorithm for the same. **[8]**

b) Draw interfacing diagram of 4x4 matrix keypad with PIC18FXXX. Draw and explain the flow chart to detect and display key pressed. **[8]**

Q7) a) Draw the neat block diagram of DAS using 8051 microcontroller and explain it in detail. **[9]**

b) Draw the home protection system using PIC18Fxx microcontroller. Also write an Embedded C program for same. **[9]**

OR

Q8) a) Design and explain water level monitoring and control system using PIC18Fxx microcontroller and write the algorithm for the same. **[9]**

b) Design frequency counter using 8051 microcontroller and display the result on LCD. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2558

[Total No. of Pages : 2

[6583]- 87

T.E. (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 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 the difference between method overloading and method overriding? Explain with suitable example. **[9]**

b) What are command line arguments? Write an example program for command line arguments. **[9]**

OR

Q2) a) What is a wrapper class in Java? Explain the meaning of autoboxing and unboxing in wrapper class. **[9]**

b) What is inheritance in Java? Explain various types of inheritance with diagrams and suitable programs. **[9]**

Q3) a) Explain the meaning of interface in Java. Write a suitable example program. **[9]**

b) A Java program that contains two interfaces. The first interface A that contains a method show() and second interface B that contains a method display(). Write a class that suitable implements these two interfaces and their methods. **[8]**

OR

Q4) a) Explain the meaning of package in Java. With suitable example, explain how to add classes and interfaces to a package. **[9]**

b) What are API packages in Java? Explain various API packages in Java. **[8]**

P.T.O.

Q5) a) How to create a simple applet? Explain various types of applets in Java. **[9]**

b) Explain multi-threading in Java. Explain the two ways to create a thread in Java. **[9]**

OR

Q6) a) Explain the exception handling mechanism in Java with suitable code. **[9]**

b) Write a Java program to display "Hello Java" on Applet. **[9]**

Q7) a) Explain the concept of Stream in Java. Explain the various classes of Byte Stream and Character Stream. **[9]**

b) What is an event in AWT components? How events are handled in Java? Explain with suitable example. **[8]**

OR

Q8) a) Explain the hierarchy of the Swing package in Java. What are the various classes in Swing package? **[9]**

b) Write a Java program to read from a text file. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2559

[Total No. of Pages : 2

[6583]- 88

T.E. (Electronics Engineering)

COMPUTER NETWORKS

(2019 Pattern) (Semester - V) (304205) (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) Explain in detail flow control and error control function of Data Link Layer. **[8]**

b) Explain in brief following connecting devices. **[9]**

i) Hub

ii) Switch

iii) Bridge

iv) Router

v) Gateways

OR

Q2) a) What is the significance of sliding window protocol? With neat diagram explain Go Back N & Selective Repeat Protocol. **[7]**

b) What is the function of MAC layer? List the various multiple access techniques. Describe in brief ALOHA protocol. **[8]**

c) What is use of virtual LAN? **[2]**

Q3) a) What is classful addressing technique? Explain classful IPV4 addressing technique. **[6]**

b) Explain use of IGMP. **[6]**

c) Describe in brief DHCP. **[6]**

OR

P.T.O.

Q4) a) With neat diagram describe in brief Transport layer-Process to process delivery using port address. **[8]**

b) Explain in brief Link State Routing algorithm. **[8]**

c) List the functions of Transport layer. **[2]**

Q5) a) Why do we need SMTP and POP3 protocol for electronic mail? Explain in detail. **[8]**

b) Describe in brief DNS protocol. **[9]**

OR

Q6) a) With an example explain how to write a web page using HTML programming. **[8]**

b) Describe in brief NFS & RPC protocols. **[9]**

Q7) a) How UTP Cabling with their standard is utilized for PC to PC communication. **[6]**

b) What is use of Network tester? **[6]**

c) What are the various simulation tools are used for network administration. **[6]**

OR

Q8) a) internet access through Leased Line/Mobile handset. **[9]**

b) Explain in detail use of Protocol Analyzer. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2560

[Total No. of Pages : 2

[6583]-89

T.E. (Electronics)

DATA COMMUNICATION

(2019 Pattern) (Semester - V) (304205) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve question 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 the suitable data if necessary.***

Q1) a) For (6,3) LBC, generator matrix is given by, **[8]**

1 1 1 1 0 0
1 1 0 0 1 0
0 1 1 0 0 1

Find out all code vectors. Also calculate syndrome for any received code vector with error and without error.

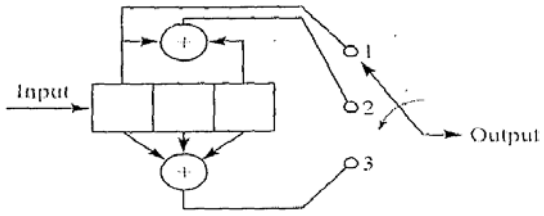
b) Explain Go back N selective repeat ARQ. **[8]**

OR

Q2) a) Define the following with examples : **[8]**

i) Code rate ii) Hamming Distance
iii) Hamming Weight iv) Code Vector

b) **[8]**



For the above convolutional encoder Draw the State diagram, code tree and find code word for 10111

P.T.O.

Q3) a) Apply Huffman coding to following message ensemble. Find efficiency. X = [Xl X2 X3 X4 X5 X6 X7] = probabilities = [0.45, 0.15, 0.1, 0.1, 0.08, 0.08, 0.04] **[9]**

b) State and Explain shannons theorem on channel capacity with mathematical expression. **[9]**

OR

Q4) a) Prove that, **[9]**

H (X, *y*) =H (X/*y*) + H (*y*)

H(X, *y*) = H(*y*/X) + H(X)

b) Write a note on : **[9]**

i) Bandwidth SNR trade-off

ii) Use of orthogonal signal to achieve shannons limit

Q5) a) Derive an expression for error probability of ASK. **[9]**

b) Explain QAM transmitter and receiver block diagram with its waveforms. **[9]**

OR

Q6) a) Explain QPSK with its Transmitter and Receiver. **[9]**

b) Explain FSK in detail with the help of transmitter and receiver block diagram. **[9]**

Q7) a) With the help of mathematical expressions and block diagram explain DS-SS system. **[9]**

b) Derive an expression for error probability of ASK. **[9]**

OR

Q8) a) Write a note on : **[9]**

i) Properties of PN-Sequence

ii) Compare FDMA, TDMA & CDMA

b) Define : **[9]**

i) Chip Rate

ii) Processing gain

Determine the processing gain and jamming margin for DSSS system with Tb = 1 msec and Tc = 1μsec and (Eb/No) = 10.

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Total No. of Questions : 8]

SEAT No. : ____

PE-2561

[Total No. of Pages : 2

[6583]- 90

T.E. (Electronics Engineering)

INSTRUMENTATION SYSTEMS

(2019 Pattern) (Semester - V) (304205) (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) ***Use of non-programmable scientific calculator is allowed.***
4) ***Assume suitable data, if necessary.***

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]**



Total No. of Questions : 8]

SEAT No. :

PE-2562

[Total No. of Pages : 2

[6583]- 91

T.E. (Electronics Engineering)

MACHINE LEARNING

(2019 Pattern) (Semester - V) (304205) (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 do you understand by first order logic in artificial intelligence? Which are the types of quantifiers? Explain each quantifier by giving suitable example. **[9]**

b) Enlist any four applications of naive bayes classifier. What is knowledge representation using propositional logic? **[9]**

OR

Q2) a) Explain the working of Unification algorithm with suitable example. **[8]**

b) What are Bayesian networks explain with help of suitable example. Explain Why they are called probabilistic models? **[10]**

Q3) a) What do you understand by Syntactic analysis? What are the challenges in syntactic analysis? Explain the concept of Augmented grammars.**[10]**

b) In Natural Language Processing, what are the ambiguity? How disambiguation helps to address the ambiguities? **[8]**

OR

Q4) a) What is NLP? Explain all the phases of NLP. **[10]**

b) Explain Semantic interpretation. How it can be used for probabilistic language processing? **[8]**

P.T.O.

Q5) a) What is Reinforcement learning? Give 2 examples of reinforcement learning. Compare and contrast between reinforcement learning and supervised learning. **[8]**

b) What are the different types of learning in machine learning? Explain inductive learning. **[9]**

OR

Q6) a) Explain common active and passive RL techniques and the scenarios in which they are applicable? **[8]**

b) What do you understand by learning decision tree? Explain the decision tree learning with the help of an example. **[9]**

Q7) a) Draw a single neuron structure. Explain working principle of neuron. List various applications of neural networks. Explain any one application. **[9]**

b) With the help of neat block diagram, explain how an induction motor can be controlled using fuzzy logic controller. **[8]**

OR

Q8) a) List the major components of fuzzy logic control, the steps in designing the FLC. **[9]**

b) What do you understand by PWM controller? With the help of block diagram explain how an PWM controller can be designed using neural networks. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2563

[Total No. of Pages : 2

[6583]-92
T.E. (E & TC)
CELLULAR NETWORKS
(2019 Pattern) (Semester - VI) (304192)

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 side indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculators is allowed.***

Q1) a) Define Interference and explain different types of interference in mobile Cellular System. **[5]**

b) Explain the concept of cell sectoring. **[5]**

c) Consider a cellular network with N=48 channels per cell and blocking probability 2%. The traffic per user A0=0.04E, cell radius = 1km of 1 user, city area = 603km. Calculate number of users and number of cells. **[7]**

OR

Q2) a) What are the reasons for choosing Hexagonal cells? List the methods to improve coverage and capacity in cellular systems. **[5]**

b) Briefly discuss the process of channel assignment in cellular networks. **[6]**

c) If a total of 33MHz of a bandwidth is allocated to a particular cellular telephone system, which uses two 25KHz simplex channels to provide a full duplex voice and control channels. Compute number of channels per cell if a system uses: **[6]**

i) Four cell reuse

ii) Seven cell reuse

iii) Twelve cell reuse

P.T.O.

Q3) a) Explain the following terms : **[8]**

i) Trunking

ii) Blocking probability

iii) Grade of service

b) How does SNR affect Link budget? Explain with example. **[10]**

OR

Q4) a) Explain in detail about the link budget design equation using path loss models. **[8]**

b) Determine relationships between the following three factors : **[10]**

- quality of service
- traffic load
- system capacity

Q5) a) List out and explain in brief Disruptive technologies for 5G. **[8]**

b) What is the main role of LTE? Explain the standards of LTE. **[9]**

OR

Q6) a) With a neat block diagram, explain the LTE network architecture. **[9]**

b) List out various challenges and requirements for 5G service. **[8]**

Q7) a) Compute the hamming code for the given data, 1001101 for even parity.

11	10	9	8	7	6	5	4	3	2	1
1	0	0	1	1	1	0	0	1	0	1
			P4				P3		P2	P1

b) What is the full form of MAC? What is the main purpose of MAC layer in mobile communication?

OR

Q8) a) Exblain the layer that,performs scheduling and mapping of logical channel data onto the transport channels provided by the physical layer. **[9]**

b) Explain the significance of scheduling algorithm in improving the communication quality of wireless network. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-2564

[Total No. of Pages : 2

[6583]-93

TE (Electronics & Telecommunication Engineering)

PROJECT MANAGEMENT

(2019 Pattern) (Semester - VI) (304193)

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

Instructions to the candidates :

1) ***Attempt all the Questions out of 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 are different characteristics of an organization? What are different types of organizational links on the basis of functions and projects? **[9]**

b) Enlist different types of organizational structure, explain in detail about functional organization. **[9]**

OR

Q2) a) What is conflict? What are various reasons for conflict within projects? **[9]**

b) Define leadership? State and explain the major leadership attributes. **[9]**

Q3) a) Differentiate between CPM and PERT. **[6]**

b) Enlist the project estimation techniques, explain any one in detail. **[6]**

c) What is cost estimating? Explain which types of estimates has to be undertaken by project manager. **[5]**

OR

P.T.O.

Q4) a) Draw network diagram by using the following data: **[6]**

i) activities A, B, C are starting activity

ii) activity D follows activities C

iii) activity A precedes follows activity F

iv) activity E follows activity B and C

v) activity G follows activity E

vi) activity G is terminal activity

b) State the differences between direct cost and indirect cost. **[6]**

c) Define the term activity? What are various types of activities? **[5]**

Q5) a) Define risk, briefly explain process of risk management. **[8]**

b) Differentiate between sources of long term and short term sources of finance for a business venture. **[9]**

OR

Q6) a) What is risk? What are different categories of risk to identify risk? How risk can be identifying? **[9]**

b) Enlist the key features of JIRA, explain different advantages of Kanban software development methodology for task planning. **[8]**

Q7) a) What is trademark? How trademark is registered? **[6]**

b) Differentiate between Licensing and Franchising. **[6]**

c) State the criteria for securing patents? What are the guidelines of the common IPR policy on patents? **[6]**

OR

Q8) a) What is franchising? Why are franchises so attractive? What are various benefits of franchising? **[6]**

b) What is intellectual property rights (IPR) explain all types of IPR. **[6]**

c) Differentiate between Licensing and Franchising. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2565

[Total No. of Pages : 3

[6583]-94
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 side indicate full marks.***
4) ***Use of nonprogrammable calculator is allowed.***
5) ***Assume Suitable data if necessary***

Q1) a) Single phase full bridge inverter is operated from 120V dc supply, it has a resistive load of R = 20 Ω. Find: **[6]**

i) rms o/p voltages at third & fifth harmonic (V_{O3} & V_{O5})

ii) Distortion factor (DF) of 3rd harmonic component

iii) Total harmonic distortion (THD)

b) Give classification of inverters? Explain role of feedback diodes in inverters. **[4]**

c) Explain working of single phase full bridge inverter (using MOSFET / IGBT) for R load with input & output waveforms. **[7]**

OR

Q2) a) Draw a three phase inverter for balanced star R load? Explain its operation of 180° mode with gate signals & output waveforms. **[11]**

b) What are advantages of PWM techniques in inverter? Explain Multiple PWM technique with waveforms. **[6]**

Q3) a) A step down chopper is operated from dc supply voltage of 200V. It has resistive load with R=20 Ω. When chopper operates, voltage drop across chopper is 2V. If duty cycle is 50%, calculate : **[6]**

i) Average & rms o/p voltages

ii) Average & rms o/p currents

iii) Chopper efficiency

b) Explain with diagrams various control techniques in DC chopper operation. **[6]**

c) Explain with block schematic working of SMPS. **[6]**

P.T.O.

OR

Q4) a) A step up chopper is operated from 230V dc supply and it provides 500V output. If chopping frequency is 2KHz, calculate ON & Off times of chopper. **[4]**

b) Explain with circuit diagram operation of step up chopper and derive an expression for its o/p voltage : $Vo = \frac{Vs}{(1-D)}$ where D is duty cycle. **[8]**

c) Explain operation of step down chopper with R-L load for continuous & discontinuous current mode. **[6]**

Q5) a) What is snubber circuit? Explain with circuit diagram working of snubber circuit. **[6]**

b) Why isolation is required in power electronic circuits? Explain with neat diagram working of isolation transformer. **[7]**

c) For a thyristor, Maximum junction temperature is 200°C. The thermal resistances are $\varnothing_{JC}$ = 0.16°C/W, $\varnothing_{CS}$ = 0.08°C/W. For heat sink temperature of 90°C, calculate total average power loss in thryistor - sink combination.

If heat sink temperature is reduced to 70°C, find new total average power loss in thryistor - sink combination **[4]**

OR

Q6) a) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. **[7]**

b) What are various cooling techniques used in power electronic circuits? Explain in brief any one with thermal equivalent. **[4]**

c) What is EMI? What are various sources? Explain minimizing techniques of EMI. **[6]**

Q7) a) Explain with circuit diagram & various waveforms, how single phase full wave AC voltage controller is used as a fan regulator. **[6]**

b) Explain various battery charging models for EVs **[6]**

c) Explain operation of On-line UPS with block schematic. **[6]**

OR

Q8) a) Explain single phase semi converter drive for single phase separately excited dc motor. **[6]**

b) Why driver is required for LED lamp? Explain with suitable circuit diagram working of a LED lamp driver. **[5]**

c) Explain with neat diagram variable voltage / frequency three phase induction motor drive. **[7]**

Total No. of Questions : 8]

SEAT No. :

PE5521

[Total No. of Pages : 2

[6583]-95
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 indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithic tables slide rule, mollier charts, electronic pocket, calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

Q1) a) Explain Laplacian edge detector. Explain why LoG mask is preferred over Laplacian edge detector? **[6]**

b) Define thresholding in image segmentation differentiate between global thresholding and adaptive (local) thresholding with suitable example. **[6]**

c) What is region-based segmentation? Explain region growing and region splitting discuss their advantages and disadvantages. **[6]**

OR

Q2) a) Explain how though transform is useful for edge linkage? **[6]**

b) Describe the thresholding technique in image segmentation. What is global thresholding and adaptive thresholding, also explain otsu's method. **[6]**

c) Define edge detection? Explain edge detection procedure using sobel mask. **[6]**

Q3) a) What is data compression? Explain the different types of redundancies used in image compression. Give suitable example for each. **[6]**

b) Explain the concept of motion estimation with the help of any one algorithm in detail. **[6]**

c) Describe the Discrete Cosine Transform (DCT) and its applications in image compression. **[5]**

OR

P.T.O.

Q4) a) What is Y-Cb-Cr color space? Explain its transformation from RGB and its relevance in compression. **[6]**

b) Draw and explain JPEG base line encode. Comment on block size used in JPEG. **[6]**

c) Explain the concept of video compression describe intraframe and interframe compression techniques used in modern codecs. **[5]**

Q5) a) Explain the image degradation/restoration model. Draw the basic block diagram and describe each component involved. **[6]**

b) Explain how spatial filters like mean filter and median filter are used for image restoration. **[6]**

c) Describe any two common noise models used in image restoration. **[6]**

OR

Q6) a) Compare in detail between image enhancement and image restoration. **[6]**

b) What are geometric transformations in image restoration? Explain translation rotation, and scaling using appropriate mathematical models. **[6]**

c) Explain the concept of wiener filtering derive the wiener filter expression and describe how it restores images degraded by blur and noise. **[6]**

Q7) a) Define patterns and pattern classes in the context of object recognition. Give suitable examples. **[5]**

b) Explain any one algorithm of content-based image retrieval. **[6]**

c) Explain structural methods of object recognition. Discuss the concept of primitives, relationship and structural descriptions. **[6]**

OR

Q8) a) Describe decision theoretic methods for object recognition. Explain minimum distance classification on Bayes classifies. **[5]**

b) Write a short note on the following structural methods : **[6]**

i) Matching shape numbers

ii) String matching

c) Explain the process of feature extraction in object recognition. Why is feature selection important? **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE-2566

[Total No. of Pages : 2

[6583]-96
T.E. (E & TC)
EMBEDDED PROCESSORS
(2019 Pattern) (Semester - VI) (304195D) (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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain interfacing diagram of GPS using UART with LPC 2148. How latitude and longitude can be found with NEMA standard? **[9]**

b) State features of ADC in LPC2148, Explain the Onchip ADC using Vectored Interrupt (VIC) **[9]**

OR

Q2) a) Draw an interfacing diagram of DHT11 with LPC2148 and write an algorithm to display the temperature on LCD. **[9]**

b) Draw and explain interfacing of EEPROM with LPC2148 using I2C bus. Which are the SFRs involved in I2C bus. **[9]**

Q3) a) What are the features and advantages of ARM CORTEX M4 in embedded system? Compare A, R & M series of Cortex processors. **[9]**

b) Draw and explain architecture of STM32F4xx. **[8]**

OR

Q4) a) Draw and explain CMSIS standard for firmware development in ARM Cortex based system. **[9]**

b) Describe various interrupts and exceptions in STM32F4XX microcontroller? **[8]**

P.T.O.

Q5) a) Draw an interfacing diagram and write a C program to interface "7-Segment" with STM32F4xx controller and display count digit "1" or "7" on it. **[9]**

b) Write a program to generate 100 ms time delay using timer. Assume external clock frequency of 16 MHz **[9]**

OR

Q6) a) Enlist various registers required to configure Serial Communication of STM32F4xx Microcontroller. Explain any one with suitable example.**[9]**

b) Enlist the features of on chip ADC & DAC of STM32F4xx controller. Write program to generate ramp waveform using DAC. **[9]**

Q7) a) Write program to control the Speed of DC motor interfaced with STM32F407XX. **[9]**

b) Explain with Concept of transmitting and receiving of data using CAN bus. **[8]**

OR

Q8) a) Draw an interfacing diagram of STM32F4xx with accelerometer MPU 6050. Write algorithm to display the acceleration parameter in x, y, & z directions. **[9]**

b) What are features of Ultrasonic sensor HCSR04? Explain interfacing with STM32F407XX. Write algorithm to display distance on LCD. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-2567

[Total No. of Pages : 2

[6583]-97

T.E. (Electronics & Telecommunication Engineering)

NETWORK 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 indicates full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Describe the advantages and disadvantages of symmetric and asymmetric key cryptography. Compare them on any two parameters **[9]**

b) Discuss the difference between differential and linear cryptanalysis **[7]**

OR

Q2) a) Which basic steps are performed in one round of operation in DES? Explain in detail. **[9]**

b) Discuss the background of RC4 and its initialization of S processes and stream generation **[7]**

Q3) a) What are biometric authentication techniques? Explain its importance in today's digital world **[6]**

b) What types of attacks are addressed by message authentication? **[6]**

c) What are the important aspect that establish trust in digital signature **[6]**

OR

Q4) a) How the Authentication Applications such as Kerberos work? Explain in detail. **[6]**

b) What changes in HMAC are required in order to replace one underlying hash function with another? **[6]**

c) Write short note : Knapsack algorithm **[6]**

P.T.O.

Q5) a) Explain in detail PGP Pretty Good Privacy concept and services provided by PGP **[6]**

b) What is R64 conversion? Why is R64 conversion useful for an e-mail application **[6]**

c) What is IP security overview, explain IP Security architecture **[6]**

OR

Q6) a) Write short note on Encapsulating Security payload **[6]**

b) Describe Key management use in email security **[6]**

c) Explain in brief S/MIME protocol **[6]**

Q7) a) Explain Firewall design principles and discuss types of firewalls **[6]**

b) What is need of SSL? Explain all Phases of SSL handshake protocol in detail. **[6]**

c) Discuss web security consideration **[6]**

OR

Q8) a) Discuss secure inter-branch payment transactions **[6]**

b) What are the types of intruders and what are intrusion techniques **[6]**

c) List and briefly explain three classes of intruders **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2568

[Total No. of Pages : 2

[6583]-98
TE (E&TC)
SENSORS IN AUTOMATION (Elective-Il)
(2019 Pattern) (Semester - VI) (304195)

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

Q1) a) write a short note (any three) **[12]**

i) Pressure scales

ii) Bernoulli's theorem

iii) Orifice

iv) Hall effect Sensors

b) What is E8FC-25D **[5]**

OR

Q2) a) What is basic Principle of capacitive elements. Explain with the help diagram **[6]**

b) Why installation & calibration need to be understand by an engineer **[5]**

c) Compare Inductive & Capacitive proximity switch **[6]**

Q3) a) Explain working principle of hall effect sensor with labeled diagram Write application of hall effect sensor. **[9]**

b) What is Gyroscope, which are three basic types of Gyroscope, Explain working of any one type in detail? **[9]**

P.T.O.

OR

Q4) a) Explain working principle of potentiometric displacement sensors with diagram .Write its applications. **[9]**

b) What are Optical encoders? Explain its working principle with diagram and write its applications. **[9]**

Q5) a) List out advantages and disadvantages of RFID Sensor. **[8]**

b) Enlist properties and specification of Arduino Data Sheet MLX90614 non-contact temperature sensor. **[5]**

c) Enlist Gas sensors with example. **[4]**

OR

Q6) a) Explain in detail about working principle of photo transistor and photo diode with example **[8]**

b) How the Ultrasonic proximity detector works for motion detection. **[5]**

c) What are the different sensors used for Environmental studies. **[4]**

Q7) a) What is a data acquisition system? What are different types of data acquisition systems? Explain any one DAS system **[7]**

b) With the help of block diagram explain the IOT Functional blocks **[5]**

c) Explain SDI-12 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) Explain the IOT based Engine Management system with the help of block diagram. **[6]**

c) What are different types of sensors in IOT? **[4]**

d) State application of DAC. **[2]**

Total No. of Questions : 8]

SEAT No. :

PE-2569

[Total No. of Pages : 3

[6583]-99
T.E. (E&TC)
DIGITAL COMMUNICATION
(2019 Pattern) (Semester - V) (304181)

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

Instructions to the candidates:

1) ***Answer any one Question out of Q. No. 1 or Q.2, Q. No. 3 or Q.4, Q.No.5 or Q.6 and Q. No.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 M array QAM in following terms. **[8]**

i) Draw signal space diagram of 16 - QAM

ii) Comment on Euclidean distance for 16 QAM

b) Calculate bandwidth requirement and minimum separation (Euclidean distance) of signal points in signal space for

i) 16-PSK

ii) 16-FSK

iii) 16-QAM.

Given that input bit rate is 8kbps and bit energy is 1×10^{-4} J. **[9]**

OR

Q2) a) Compare M-ary PSK and M-ary FSK. **[8]**

b) What is OFDM? Draw and Explain block diagram of generation and reception of the OFDM. **[9]**

Q3) a) Draw the block diagram of spread spectrum digital communication and explain the various blocks. **[9]**

b) A spread spectrum communication system has the following parameters. Information bit duration Tb = 4.095 ms, PN chip duration , Tc = 1 microsecond. Find the processing gain. What is the number of shift registers required? Also find the jamming margin if Eb/N0 = 10 for BPSK Scheme. **[9]**

OR

P.T.O.

Q4) a) Draw and explain FHSS spread spectrum system with transmitter and reciever section. **[9]**

b) Design a three stage feedback shift register with proper taps to generate N=7 PN sequence. Draw the generator block and if the initial state of shift register is 100 (from left to right). Find the output sequence. **[9]**

Q5) a) Define all five Types of Entropies and Mutual Information in communication system. **[8]**

b) Apply Shannon-Fano code for following message ensemble and find coding efficiency **[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 1/16 ¼ 1/16 1/8]

OR

Q6) a) An analog signal is band-limited to 4 kHz. It is sampled at the Nyquist rate and samples are quantized into 4 levels. The quantization levels Q_1, Q_2, Q_3, and Q_4 are independent messages and have the probabilities $P_1=P_2=1/8$ and $P_3=P_4=3/8$, Find the information rate of the source.**[8]**

b) A discrete memory less source has an alphabet of five symbols with their probabilites shown. Construct Huffman code and calculate code efficiency redundancy of the code. **[9]**

Symbol	M_1	M_2	M_3	M_4	M_5
Probability	0.4	0.19	0.16	0.15	0.10

Q7) a) For a systematic linear block code, the three parity check digits, are given by **[9]**

$$C_4 = d_1 \oplus d_2 \oplus d_3$$

$$C_5 = d_1 \oplus d_2$$

$$C_6 = d_1 \oplus d_3$$

i) Construct Generator Matrix

ii) Construct All Code generated by this matrix

iii) Determine error correcting capability

iv) Prepare suitable decoding table

v) Decode the received words 0 0 0 1 1 0

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) A (7,4) cyclic code is described by a generator polynomial $g(x) = 1 + x^2 + x^3$ **[9]**

i) Find the codeword using polynomial division method for m = 1010

ii) Design an encoder for systematic code generation and explain its working

b) Explain Properties of Linear Block code and Cyclic Code with example **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2570

[Total No. of Pages : 3

[6583]-100

T.E. (Electronics & Telecommunication)

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, and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume the suitable data, if necessary.***

Q1) a) Derive electrostatic boundary condition at an interface between conductor and free space. **[8]**

b) A current element $I_1\Delta L_1 = 10^{-5}\,\bar{a}_z A.\ m$ located at (1, 0, 0) and $I_2\Delta L_2 = 10^{-5}(0.6\bar{a}_x - 2\bar{a}_y + 3\bar{a}_z) A\ m$ located at (–1,0,0) in free space. Find the vector force exerted on $I_2\Delta L_2$ *by* $I_1\Delta L_1$. **[8]**

OR

Q2) a) Derive an expression of parallel plate capacitor for more than one dielectric interface. **[8]**

b) A boundary exits at z = 0 between two dielectrics $\varepsilon_{r1} = 2.5$ in $z < 0$ and $\varepsilon_{r2} = 4$ in $z > 0$. The field region of ε_{r1} is $\bar{E} = -30\bar{a}_x + 50\bar{a}_y + 70\bar{a}_z$ V/m. Find. **[8]**

i) Normal and tangential component of E_1 and D_2

ii) Angle between E_1 & normal to surface and Angle between E_2 & normal to surface

P.T.O.

Q3) a) State Maxwell's equation for static and time varying electric and magnetic fields in both integral and differential form. **[9]**

b) In a region where $\varepsilon_r = \mu_r = 1$ and $\sigma = 0$. Find electric and magnetic field intensity.If

$$\bar{A} = 10^{-3} y \cos 3\times10^{8} t \cos z\bar{a}_z \frac{wb}{m} \quad and \quad \bar{V} = 3\times10^{5} y \sin 3\times10^{8} t \sin zV.$$

[9]

OR

Q4) a) State pointing vector. Derive the expression for pointing vector. What is its significance? **[9]**

b) The electric field $\bar{E} = 200 \sin wt\ \bar{a}_z$ V/m exit at a certain point in the lossy dielectric **[9]**

i) At what frequency will the conduction current and displacement current densities have equal magnitude?

ii) At this frequency find the instantaneous displacement current density

iii) What is the phase angle between these two.

Assume $\mu = 4\pi \times 10^{-7}$ *H/m*, $\varepsilon = 8.854 \times 10^{-12}$ & $\sigma = 2 \times 10^{-8}$ *S/m*.

Q5) a) For electromagnetic wave, derive the expression for velocity and wavelength in terms of conductivity of good conductor. **[9]**

b) A plane wave propagation through a medium $\varepsilon_r = 8$, $\mu_r = 2$ has $\bar{E} = 0.5 \sin(10^6 t - \beta z)\bar{a}_x$ V/m. Determine **[9]**

i) β

ii) η

iii) Velocity and Magnetic field intensity at t = 1 sec.

OR

Q6) a) Explain the concept of uniform plane wave. Also explain polarization of uniform plane wave. **[9]**

b) Determine the amplitude of the reflected and transmitted E & H at the interface of two media with medium-1 $\varepsilon_r = 8.5$, $\mu_r = 1$ and $\sigma = 0$ & medium-2 is free space. Assume normal incidence and the amplitude of $\bar{E}$ in medium-l at the interface is 1.5 V/m. **[9]**

Q7) a) A transmission line has a characteristic impedance of 300Ω and terminated in load $150 + j\,150\Omega$. Find the following using smith chart. **[10]**

i) VSWR

ii) reflection coefficient

iii) i/p impedance at distance 0.1λ from the load

iv) i/p admittance at distance 0.1λ from the load &

v) position of first minima and maxima form the load.

b) What is mean by dissipationless line? Derive an expression for input impedance of dissipationless line. **[8]**

OR

Q8) a) State primary and secondary constants and derive the relationship between primary and secondary constant. **[10]**

b) If attenuation constant is $18 \times 10^{-3}\ N/m$, Velocity of propagation V is 1.8×10^{8} m/*sec* and characteristic impedance is 60Ω. Find out the primary line constant of such distortionless line at a frequency of 100Mhz. **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-2571

[Total No. of Pages : 2

[6583]-101

T.E. (E&TC/E.C -A.C.T.)

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) State features of PIC. Compare the different families of PIC Microcontroller. **[6]**

b) Draw and explain program memory organization of PIC18F4550. **[6]**

c) Draw and explain flag register of PIC and also explain programming model of PIC18FXXXX. **[6]**

OR

Q2) a) Draw and explain data memory organization and stack of PIC18F4550. **[6]**

b) Draw and explain the RESET functional diagram. **[6]**

c) List the various oscillator options. How to select it using configuration register? **[6]**

Q3) a) Write a program for 2.5kHz and 75% duty cycle PWM generation with N=4. **[9]**

b) Write an embedded C program for reading single analog input range from 0V to 5V and display it on LCD. **[8]**

OR

Q4) a) Write a C program to toggle all bits of PORT B continuously with delay of 5 ms using timer 0, 16 bit and no prescaler XTAL=10MHz. **[9]**

b) Explain the capture and PWM mode of PIC18F4550 in detail. **[8]**

P.T.O.

Q5) a) Draw the interfacing of LCD with any port with PIC18F4550. Write C code to display "Gudhi-Padhwa". **[6]**

b) Draw and explain interfacing of 3×3 matrix keypad with PIC. Draw the flowchart for it. **[6]**

c) Design step by step and explain a PIC test board. **[6]**

OR

Q6) a) Draw the interfacing of LCD with PIC18F4550. Write C code to display "SPPU" on first line. **[6]**

b) Interface LEDs to PIC18F4550 and write C program to flash LEDs after 1sec. **[6]**

c) Draw an interfacing diagram of motion detector with PIC18F4550 and write code for it. **[6]**

Q7) a) State features of RTC and draw an interfacing diagram to interface it with PIC. Write an initialization program. **[9]**

b) State features of SPI and I2C protocols. Compare RS232 and RS485.**[8]**

OR

Q8) a) Design a traffic light controller system. **[9]**

b) Explain the I2C mode of MSSP structure and SPI mode of MSSP structure used for serial communication. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE5978

[Total No. of Pages : 2

[6583]-102R

T.E. (E & TC)

COMPUTER NETWORKS

(2019 Pattern) (Semester-V) (Elective-I) (304185)

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 various performance parameters of network layer. Explain. **[7]**

b) Explain in details classful and classless addressing. **[7]**

c) Give comparison between IPV4 and IPV6. **[4]**

OR

Q2) a) Discuss packet switching technique in detail. **[7]**

b) Explain ICMPV6 protocol (ICMPv6). **[7]**

c) Discuss the network layer services. **[4]**

Q3) a) Explain Dijkstra's algorithm for shortest path routing. **[6]**

b) Discuss border gateway protocol (BGP). **[5]**

c) What is Routing? Explain unicast and multicast routing. **[6]**

OR

Q4) a) What is the use of OSPF? Discuss OSPF. **[6]**

b) Compare Intra and Interdomain routing. **[5]**

c) Explain IGMP protocol (IGMP protocol). **[6]**

Q5) a) Explain the difference between TCP and UDP. **[9]**

b) Explain the leaky bucket algorithm with suitable diagram. **[9]**

OR

P.T.O.

Q6) a) Explain stream control transmission protocol. **[9]**

b) Discuss the scheduling Technique to Improve the Quality of Services (QoS). **[9]**

Q7) a) List the functions of application layer. Explain the DNS in detail. **[9]**

b) Write short notes: **[8]**

i) DHCP

ii) FTP

OR

Q8) a) Explain HTML programming and related TAGS in brief. **[6]**

b) Explain how DNS server work. **[6]**

c) Explain Dynamic host configuration protocol. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE2573

[Total No. of Pages : 2

[6583]-103
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) ***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) Compute the 5-point DFT for the given sequence x n[] ={1, 0, 1, 0, l}. **[8]**

b) Compare DFT and FFT on the basis of computational complexity for N = 64, 256 and 1024. **[6]**

c) Compare linear and circular convolutions. **[4]**

OR

Q2) a) Find linear convolution using overlap add method of the following sequence x(n) and h(n) **[8]**

x(n) = {l, 2, –l, 2, 3, –2, –3, –1, l, 1, 2, –l}

h(n) = {1, 2, 3}

b) State and prove any two important properties of DFT. **[6]**

c) Explain the linear filtering using overlap save and overlap add methods. **[4]**

Q3) a) Explain the concept of filter design. Explore the cascade and parallel form in filter realization. **[8]**

b) Find out H(z) using impulse invariance method at 5 Hz sampling frequency from H(s) as given **[6]**

$$H(s)\frac{2}{(s+1)(s+2)}$$

c) Explain the finite word length effect in filter design. **[4]**

OR

Q4) a) Explain DIT and DIF using Radix 2 FFT algorithm for 4-point sequences. **[8]**

b) Compare impulse invariance and bilinear transformation method. **[6]**

c) Realize the following IIR filter using direct form I and direct form II **[4]**

$$H(z)\frac{1+2z^{-1}+3z^{-2}}{1+4z^{-1}+5z^{-2}+7z^{-3}}$$

P.T.O.

Q5) a) Design FIR filter to meet following specifications using rectangular window. **[7]**

$$Hd(e^{jw}) = e^{-5jw},\ 0 \le |w| \le 0.3 * pi,\ 0.5\pi \le |w| \le \pi$$
$$= 0,\ otherwise$$

b) Explain three linear phase conditions. **[6]**

c) Explain the Gibb's phenomenon. **[4]**

OR

Q6) a) List out and elaborate advantages and disadvantages of FIR filter. **[8]**

b) List out all the windowing techniques? Describe any three with its mathematical formulas characteristics and compare them. **[9]**

Q7) a) Write short notes on: **[9]**

i) Identification of voiced and unvoiced sound

ii) LTI representation of speech signal

iii) Power line interference

b) Describe the ECG signal with the help of neat sketch and elaborate types of interference. **[8]**

OR

Q8) a) List out the R-peak detection methods and explain in detail any one of the prominent technique. **[9]**

b) Write short notes on: **[8]**

i) Spatial and temporal resolution

ii) 2D convolution for feature extraction



Total No. of Questions : 8]

SEAT No. :

PE2574

[Total No. of Pages : 2

[6583]-104

T.E. (Electronics & Telecommunication)

ELECTRONIC MEASUREMENTS

(2019 Pattern) (Semester - V) (304185 (B)) (Elective-I)

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

Q1) a) Explain with Block diagram Audio Signal generators. **[6]**

b) Explain working of function generator. **[6]**

c) With the help of block diagram, explain digital signal generator. **[6]**

OR

Q2) a) With the help of block diagram explain the operation of RF Signal generator. **[6]**

b) With the help of block diagram explain the function of microwave signal generator. **[6]**

c) Explain role of Noise generator. Explain how it works. **[6]**

Q3) a) Why to use DSO? What are the applications of DSO? **[6]**

b) Draw block diagram of Sampling Oscilloscope. **[5]**

c) Illustrate the z - modulation in oscilloscope. **[6]**

OR

Q4) a) Describe an overview of application of a CRO. **[6]**

b) Draw block diagram of Power Oscilloscope. **[5]**

c) Discuss the advantages and disadvantages of analog and digital type of oscilloscope. **[6]**

P.T.O.

Q5) a) With the help of block diagram explain LCD display. Explain all functional pins. **[6]**

b) Explain working IEEE 488 bus. **[6]**

c) Draw Block diagram of Strip Chart recorder. **[5]**

OR

Q6) a) Why the name Universal Counter/Timer? **[4]**

b) What is Period Mode, Time Interval mode and Ratio mode?

Explain above modes with suitable diagram. **[8]**

c) Why to use acquisition cards? Explain its use. **[5]**

Q7) a) What is Automatic Test Equipment (ATE)? What are its benefits? **[6]**

b) What is OTDR? Why to use it? Draw its Block Diagram? **[6]**

c) Explain Spectrum Analyzer with Neat Block Diagram. **[6]**

OR

Q8) a) Why to use Network Analyzer? What are their applications? **[6]**

b) Explain with the help of block diagram field strength meter. **[6]**

c) Explain "Industrial revolutions and their impact on Industrial Automation". **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2575

[Total No. of Pages : 2

[6583]-105

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, 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 any of the following with suitable example. **[8]**

i) FP Based Estimation

ii) Process Based Estimation

b) What is project Scheduling? What are the basic principles of project scheduling? **[6]**

c) Write a short note on: Object Point (OP) based estimation. **[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 Component level design steps in detail. **[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

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) Differentiate between Abstraction and Refinement. **[4]**

P.T.O.

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) What are the different categories of risk? **[4]**

OR

Q6) a) Write a short note on. **[8]**

i) Version Control

ii) Change control process

b) How risk projection is carried out using a risk table. **[6]**

c) What is a software SCM repository? **[4]**

Q7) a) Explain the following **[7]**

i) Unit testing

ii) Integration testing

iii) System testing

iv) Acceptance testing

b) What is software testing? Write down the differences between White box and black box testing. **[6]**

c) Compare verification and validation. **[4]**

OR

Q8) a) Explain Bug life cycle or defect life cycle. **[7]**

b) What is the test plan? Write down a test plan for Mobile App testing. **[6]**

c) What are the benefits of Automation testing? List out some automation testing tools/frameworks. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE-2576

[Total No. of Pages : 2

[6583]-106

TE (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) Explain Services provided by the data link layer **[8]**

b) Describe in brief HDLC frame format. **[6]**

c) Write a note on Backbone networks **[4]**

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? **[9]**

Q3) a) What is use of IP address? Explain in brief IPV4 classful addressing technique **[6]**

b) Explain shortest path algorithm **[6]**

c) Explain the functipn of ARP packet? Draw and explain ARP packet format in details. **[5]**

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 **[5]**

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? Exp1ain 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. **[8]**

b) Write note on **[9]**

i) Network Monitoring ii) Network Simulator

OR

Q8) a) What is network monitoring, how to perform network monitoring effectively **[7]**

b) Explain Basics of security requirement **[6]**

c) Explain working of DSL **[4]**

Total No. of Questions : 8]

SEAT No. :

PE-2577

[Total No. of Pages : 2

[6583]-107

T.E. (Electronics and 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 side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Draw interfacing diagram and write an Embedded C program to transmit character 'A' to PC using LPC2148. **[6]**

b) Draw GPS module interfacing to LPC2148. Write algorithm and draw flowchart for the same. **[6]**

c) Draw and explain interfacing of I 2C EEPROM with LPC2148. Write an algorithm and flowchart for reading and writing data from EEPROM. **[8]**

OR

Q2) a) Explain ADCR (A/D Control Register) and ADDR (A/D Data Register) of LPC2148. **[6]**

b) Draw the architecture of UART1 of LPC2148 and explain the function of each block in detail. **[6]**

c) Enlist the features of on chip DAC of LPC2148. Write an Embedded C Program for generation of triangular waveform using on chip DAC of LPC2148 with its interfacing diagram. **[8]**

Q3) a) Draw the block diagram of Cortex M3 processor. List features of it and explain its operating modes. **[8]**

b) Compare Arm Classical series and ARM Cortex series. State advantages of ARM Cortex series for embedded system design. **[8]**

OR

Q4) a) Draw and explain CMSIS standard for ARM Cortex. **[8]**

b) Explain Cortex A series in detail. Compare Cortex A series, Cortex R series and Cortex M series. **[8]**

P.T.O.

Q5) a) Draw and explain the following **[8]**

i) Interfacing Light Dependent Resistor with STM32F4xx

ii) Interfacing MQ3 sensor with STM32F4xx

b) List out the features of timer/counter in STM32F4xx series. Using TIM2 of STM32F4xx, write the steps to generate a delay of 20 milli second. Assume SYSCLK = 16 MHz (Assume Prescaler M=64) **[8]**

OR

Q6) a) Draw block diagram of clock system of STM32F4xx series and explain different sources of clock. **[8]**

b) With the help of diagram explain ARM CORTEX M4 Thread and Handler Operating modes. Compare Thread and Handler Operating modes. **[8]**

Q7) a) Draw and explain the block diagram of Embedded System with IoT. **[9]**

b) Explain case study of Smart Home Automation using IoT with detailed diagram. **[9]**

OR

Q8) a) Explain the following terms along with example: **[9]**

i) Sensors

ii) Actuators

iii) Embedded System

b) Explain case study of Transportation Management using IoT with detailed diagram. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-5518

[Total No. of Pages : 2

[6583]-108

T.E. (Electronics & Computer Engineering)

SOFTWARE MODELING AND DESIGN

(2019 Pattern) (Semester - VI) (310355A) (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) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the basic components of a sequence diagram. What are the Differences between an Activity diagram and a Flowchart? **[8]**

b) What are some limitations or challenges associated with using activity diagrams. **[6]**

c) What is activity diagram? Explain the basic elements of an activity diagram. **[6]**

OR

Q2) a) Explain the key difference between state diagrams, sequence diagrams and activity diagrams in software modeling. **[8]**

b) What is a state diagram and what is its purpose in software engineering? Explain Triggers and Ports related to state diagram. **[6]**

c) Describe the difference between association roles and link names in a collaboration diagram. **[6]**

Q3) a) Explain Method Design Using UML, Activity Diagram. **[8]**

b) What is object - oriented constraints language? Explain object oriented constraints Language. **[8]**

OR

Q4) a) Describe Macro-Level Design Process. **[8]**

b) Describe object Relation Mapping and Table Class Mapping. **[8]**

P.T.O.

Q5) a) Explain Types of design patterns in brief. **[8]**

b) Explain General Responsibility Assignment Software Patterns. **[8]**

OR

Q6) a) Explain the difference between structural design patterns and other categories of design patterns, such as creational and behavioral patterns. **[8]**

b) Describe the Facade pattern and its use in providing a simplified interface to a complex system. **[8]**

Q7) a) Explain designing Client/Server Software Architecture. **[9]**

b) Describe the role of software architecture in shaping the structure, behavior and performance of a software system. **[9]**

OR

Q8) a) Explain designing Concurrent and Real Time Software Architectures. **[9]**

b) Explain designing Component-Based Software Architectures. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2578

[Total No. of Pages : 2

[6583]-109

T.E. (Electronics and Computer Engineering)

Advanced Database Management Systems (Elective-Il)

(2019 Pattern) (Semester - VI) (310355B)

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) List Various types of NoSQL databases. Explain four types of NoSQL databases. **[9]**

b) What is NoSQL database? Compare relational and NoSQL databases.**[8]**

OR

Q2) a) Explain features and advantages and disadvantages of MongoDB. **[9]**

b) What is JSON? Explain different data types and list out the features of JSON. **[8]**

Q3) a) What is Data Warehouse? Explain characteristics and limitations of a Data Warehouse. **[9]**

b) What is Online Analytical Processing (OLAP)? Explain different types of OLAP in detail. **[8]**

OR

Q4) a) Explain star schema and snowflake schema in detail with examples. . **[9]**

b) Explain in detail the various components of Data Warehouse. List out the features of Data Warehouse. **[8]**

P.T.O.

Q5) a) What is knowledge discovery in a database (KDD)? Explain KDD seven step process in detail. **[9]**

b) Define Data Mining. Explain application of Data Mining in Telecommunication Industry. **[9]**

OR

Q6) a) Draw and explain the architecture of Data Mining. List the various features of Data Mining. **[9]**

b) Why data Mining is Necessary? Explain the applications briefly different applications of Data Mining. **[9]**

Q7) a) Explain Multimedia databases and Mobile databases in detail with examples. **[9]**

b) Explain Spatial and Temporal databases. Compare Spatial and Temporal databases. **[9]**

OR

Q8) a) Explain Geographical Information Systems and Genome data management. **[9]**

b) Explain Deductive database in detail with example. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PE-2579

[Total No. of Pages : 2

[6583]-110

T.E. (Electronics and Computer Engineering)

POWER ELECTRONICS

(2019 Pattern) (Semester - VI) (310355C) (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.7or 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) Draw the circuit diagram voltage and current wave forms for $\alpha = 60°$, R-L load of semiconverter. **[8]**

b) Draw the circuit diagrams for three phase fully controlled converter with R load. Draw load current and load voltage wave forms with $\alpha = 60°$ and $90°$ **[9]**

OR

Q2) a) Derive the equation for average and RMS output voltage of single phase semi controlledconverter connected to RL load. **[8]**

b) What is power factor? Explain power factor improvement techniques.**[9]**

Q3) a) Explain with circuit diagram, single phase full wave AC voltage controller of R load. Also draw following waveforms. **[9]**

i) Input voltage

ii) Gate signals for power devices

iii) Output voltage

iv) Output current

b) Explain with circuit diagram, operation of set up shopper and derive an expression for its output voltage $Vo = \frac{Vs}{(1-D)}$ where D is duty cycle.

[9]

P.T.O.

OR

Q4) a) Explain in details the operation of step-down chopper. Derive the expression for average output voltage. **[9]**

b) Explain with block schematic working of SMPS. State its advantage and disadvantages. **[9]**

Q5) a) What is mean by harmonics in inverters? Explain effects of harmonics. **[7]**

b) Draw a three phase inverter for balanced star R load? Explain its operation operation of 180°mode with get signals and output waveforms. **[10]**

OR

Q6) a) What are PWM techniques in inverter? Explain anyone PWM technique with waveforms. **[7]**

b) Give classification of inverters? Explain role of feedback in inverters. Explain, working of single phase full bridged inverter for R load with input and output waveforms. **[10]**

Q7) a) Explain various performance parameters of batteries used in batteries operated power systems. **[6]**

b) Explain working of electronic ballast with blocks schematic. **[6]**

c) Explain application of power electronics in induction heating. **[6]**

OR

Q8) a) Explain the principle of induction heating and state its application. Also give 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. :

PE-2580

[Total No. of Pages : 2

[6583]-111

T.E. (Electronics and Computer Engineering)

PLC AND AUTOMATION

(2019 Pattern) (Semester - VI) (Elective - II)(310355D)

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 Retentive timer in detail with timing diagram. **[6]**

b) Write a PLC Ladder program for 24-hour clock program. **[6]**

c) Enlist the types of analog PLC systems? Explain in detail about the PLC Analog signal processing. **[6]**

OR

Q2) a) List various types of counters used in PLC. Explain any one in detail with timing diagram. **[6]**

Develop a PLC Ladder program for the following statement: Motor 1(M1) starts as soon as start switch is ON; after 10 Seconds Ml goes OFF and Motor

b) 2 (M2) starts. After 5 seconds, M2 goes OFF and M3 starts. After 10 Seconds M3 goes OFF, Ml starts and the cycle is repeated. When stop switch is ON, all Motors are stop. **[6]**

c) Explain PLC matrix functions in detail. **[6]**

Q3) a) Explain in detail about the Electric Noise and suitable example of noise suppression. **[9]**

b) Explain the procedure of PLC Maintenance in detail. **[8]**

OR

P.T.O.

Q4) a) Explain the steps to be followed when commissioning a PLC system. **[9]**

b) Explain in detail about the circuit protections & wiring. **[8]**

Q5) a) Explain any one type of process used in process control Industries. Explain about the structure of control systems. **[9]**

b) Explain in detail about Remote terminal unit (RTU). **[8]**

OR

Q6) a) Draw and explain the block diagram of SCADA system in detail. **[9]**

b) Explain in detail about Master terminal unit (MTU). Enlist any three applications of HMI in industry. **[8]**

Q7) a) State the advantages of standard industrial network? Explain the serial communication interface in detail. **[9]**

b) Describe the types of networking channels. Compare the different types of control system bases. **[9]**

OR

Q8) a) Compare the serial and parallel transmission. Explain in detail the concept of data communication in PLC based industrial networking. **[9]**

b) Explain in detail about Profibus protocol and its types. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2581

[Total No. of Pages : 2

[6583]-112
T.E. (Electronics and Computer Engineering)
DATABASE MANAGEMENT SYSTEM
(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, Q.7 or Q.8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) What are the advantages of SQL? **[6]**

b) Explain the various Set Operations with example. **[6]**

c) Explain following terms in SQL: **[8]**

i) Order by clause

ii) Having clause

iii) Group by clause

iv) In Operator

OR

Q2) a) Explain Primary Key, Foreign Key and Unique Key related to DBMS **[6]**

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

i) Commit

ii) Rollback

iii) Save-point

c) Explain string handling functions in SQL. **[8]**

Q3) a) What is a transaction in SQL? Explain different transaction states **[8]**

b) Define schedule in SQL. Explain recoverable and non-recoverable schedules. **[8]**

OR

P.T.O.

Q4) a) Explain the need of concurrency control. Discuss two phase locking protocol and strict two phase locking protocols? **[8]**

b) Explain about different types of locks? Describe Timestamp based locking protocols? **[8]**

Q5) a) Explain 2 tier and 3 tier architecture with example **[8]**

b) What are the design considerations for distributed databases? **[8]**

OR

Q6) a) Describe concurrency control in distributed databases. **[8]**

b) Define a distributed database. Explain advantages and disadvantages of distributed database. **[8]**

Q7) a) Explain the difference betweep SQL and No SQL. **[6]**

b) List NoSQL databases and explain key value database **[6]**

c) Enlist CRUD operations in MongoDB database with syntax **[6]**

OR

Q8) a) Explain concept of indexing in MongoDB **[6]**

b) Explain the need of NoSQL and state its advantages over RDBMS. **[6]**

c) Consider following structure for MongoDB collections and write a query for following requirements in MongoDB **[6]**

Book(Book Title, Author ISBN, Version, Year, Subject)

i) Write a MongoDB query to create the above collections.

ii) Find the information about all books of Author “Korth”

iii) Find all Authors who wrote database subject books

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-2582

[Total No. of Pages : 2

[6583]-113

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 side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Define Applet. Explain the types of Applet with suitable diagram in detail. **[6]**

b) Describe the various sections of Web page in the context of Applet. **[6]**

c) Compose an Applet program to change the Foreground and Background Color. **[5]**

OR

Q2) a) Explain with suitable example to pass parameters to an Applet using <PARAM> tag. **[6]**

b) Explain the following Swing components in detail: **[6]**

i) JButton ii) Comboboxes

c) Compose a Java Applet program to implement a JCheckBox class. **[5]**

Q3) a) Describe the following: **[6]**

i) Foreground Events and Background Events

ii) Event Classes

b) Sketch and explain the hierarchy of classes in the java.awt package. **[6]**

c) Compose a program to implement the Java AWT Button. **[5]**

OR

P.T.O.

Q4) a) Explain in detail about the event handling mechanism in Java. **[6]**

b) Explain the concept of Inner Classes and Anonymous Inner Classes with suitable example. **[6]**

c) Write a Java program to handle mouse events implementing the Mouse Listener interface. **[5]**

Q5) a) Explain Flow and Border layout management classes with examples of each. **[6]**

b) Describe the following : **[6]**

i) JMenu

ii) JMenuitem.

c) Describe the Arraylist Class in Java Collection framework with suitable example. **[6]**

OR

Q6)a) Explain the Java AWT container and components in detail. Define the containers window and Panel. **[6]**

b) Describe the Collection Framework. Explain Map Interface in detail. **[6]**

c) Compose a Java Swing program to implement a simple Notepad application consisting of JFrame, JMenubar, Jmenu (file, edit, help) and JMenultem (copy, paste). **[6]**

Q7) a) Sketch the JDBC architecture. Using JDBC, explain in detail about the steps to connect to the database in java. **[6]**

b) Explain in detail about the overview of the JDBC process. **[6]**

c) Develop a program to insert a table having the fields such as Roll No., Name, Mobile No. and also retrieve the same data from the database using JDBC. **[6]**

OR

Q8) a) Compare between prepared statement & Callable Statement? **[6]**

b) Develop a program to insert and retrieve the data from the database using JDBC. **[6]**

c) Explain how SQL Exception help to determine the cause of the error encounters during execution of JDBC process. **[6]**

Total No. of Questions : 8]

SEAT No. :

PE-2583

[Total No. of Pages : 2

[6583]-114

T.E. (Electronics & Computer Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - V)(310343)

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.***
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

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 Mutliple Access? **[6]**

P.T.O.

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, **[6]**

i) Measure of Information

ii) Unit of Information

iii) Information Rate

c) In binary sequence '0' occur with probability of ½ and '1' occur with probability of 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. Drive 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. **[6]**

i) code word

ii) code rate

iii) code efficiency

iv) hamming distance

v) Minimum distance

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. :

PE-2583

[Total No. of Pages : 2

[6583]-114

T.E. (Electronics & Computer Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - V)(310343)

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.***
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

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 Mutliple Access? **[6]**

P.T.O.

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, **[6]**

i) Measure of Information

ii) Unit of Information

iii) Information Rate

c) In binary sequence '0' occur with probability of ½ and '1' occur with probability of 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. Drive 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. **[6]**

i) code word

ii) code rate

iii) code efficiency

iv) hamming distance

v) Minimum distance

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. :

PE-2584

[Total No. of Pages : 2

[6583]-115

T.E. (Electronics & Computer Engineering)

MICROCONTROLLER & 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 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 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]**

b) Draw interfacing diagram of DAC to 8051 microcontroller and write an Embedded C program to generate sine wave form. **[6]**

c) Explain the working principle of motion detector (PIR) sensor. Draw interfacing diagram of motion detector sensor and buzzer with 8051 microcontroller and write a Embedded C program to turn on buzzer when motion is detected. **[8]**

OR

Q2) a) Interface buzzer with 8051 microcontroller. Write an Embedded C program for the same. **[6]**

b) Draw interfacing diagram of opto - isolator with 8051 microcontoller. Also write an Embedded C program for same. **[6]**

c) Draw interfacing diagram of stepper motor with 8051 microcontoller. Write an Embedded C program to rotate stepper motor continuously in clockwise direction. **[8]**

Q3) a) List features and applications of variants of MSP430 family MSP430x2x, MSP430x4x,MSP430x5x. **[8]**

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

i) Low power modes in MSP430 microcontroller.

ii) Compare FRAM and Flash memory.

OR

P.T.O.

Q4) a) State the function of following registers of MSP430 microcontroller. **[8]**

i) Status Register

ii) Program Counter

iii) Stack pointer

b) Explain in detail any four addressing modes of MSP430 microcontroller. **[8]**

Q5) a) Write an Embedded C program for blinking of LED with and without switch using MSP430. Also draw its interfacing diagram. **[8]**

b) Interface relay with MSP430 microcontroller. Write an Embedded C program for the same and draw its flowchart. **[8]**

OR

Q6) a) Draw interfacing diagram of IR sensor with MSP430 microcontroller. Also write Embedded C program for the same along with its flowchart. **[8]**

b) Draw and explain interrupt structure of MSP430. **[8]**

Q7) a) Explain with neat block diagram DAS using 8051 microcontoller. **[9]**

b) Design environment Monitoring System using MSP430 microcontroller. Also draw the flowchart for same. **[9]**

OR

Q8) a) Design Home Automation System using MSP430 microcontroller. Also draw the flowchart for same. **[9]**

b) Design frequency counter using 8051 microcontroller which will display the result of various frequency ranges on LCD. Also write the algorithm for same. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2585

[Total No. of Pages : 2

[6583]-116

T.E. (Electronics and Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - V) (Elective - I) (310345 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) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the Andrew file system and file sharing semantics. **[6]**

b) Explain the Domain Name System service and BIND implementation of DNS. **[6]**

c) What is Peer to Peer system? Explain the working of Peer to Peer System. What are the features of Peer to Peer system? State the advantages of Peer to Peer system. **[8]**

OR

Q2) a) What is distributed file systems? Write the Key design issues for distributed file systems? **[6]**

b) With the help of neat sketch explain Routing Overlays in detail. **[6]**

c) Explain the following in detail **[8]**

i) Napster and its legacy

ii) Peer to Peer middleware

Q3) a) What is replication? Write about motivations for replication. What are replica managers? Explain the passive replication? **[8]**

b) What is a transaction? Explain flat transaction and nested transaction with suitable example. **[8]**

OR

Q4) a) Explain the terms: Clocks, Clock Skew, Clock Drift, Co-ordinated Universal Time. **[8]**

b) What is distributed deadlock? Explain with example. Explain phantom deadlocks. Explain edge chasing deadlock detection technique in distributed systems. **[8]**

P.T.O.

Q5) a) What is process management in distributed systems? What is the main goal of process management in distributed systems? Explain the main functions of distributed process management. **[8]**

b) Explain the steps involved in process migration. Write the advantages of Process migration. State the desirable features of a good process migration mechanism. **[8]**

OR

Q6) a) What is Process migration? Give the classification of Process migration. Explain non-preemptive and preemptive migration during its execution.**[8]**

b) Explain about various thread models in detail. Explain the design issues in threads Package. How to implement a thread package? **[8]**

Q7) a) What do you mean by Coda file system? Explain the disconnected operation in the Coda File System. **[6]**

b) What is distributed file system? Explain challenges associated with distributed file system. **[6]**

c) Explain in detail Google file system design requirements. **[6]**

OR

Q8) a) State the features of Google file system. State the advantages and disadvantages of Google file system? **[6]**

b) With the help of neat diagram explain Network File System (NFS) of distributed file system. **[6]**

c) With the help of neat diagram explain structure of distributed file system.**[6]**



Total No. of Questions : 8]

SEAT No. :

PE2586

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[6583]-117

T.E. (Electronics & Computer Engineering)

BLOCK CHAIN TECHNOLOGY

(2019 Pattern) (Semester - V) (310345 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 the significance of public key encryption. **[6]**

b) Describe hashing with data structure through an example. **[6]**

c) Explain working of message authentication code. **[6]**

OR

Q2) a) Explain cryptography primitives. **[6]**

b) What is hashing? Explain in detail. **[6]**

c) Explain the significance of cryptography premitives. **[6]**

Q3) a) Write features of ethereum. **[5]**

b) Explain ethereum accounts. **[6]**

c) What is ethereum wallet? Explain. **[6]**

OR

Q4) a) Explain Ethereum languages & consensus algorithm. **[5]**

b) Explain the working of Ethereum Virtual Machine. **[6]**

c) Compare proof of work & proof of stake consensus algorithms. **[6]**

Q5) a) Draw and explain structure of Merkel Tree with example. **[6]**

b) Explain Bitcoin Network in detail. **[5]**

c) Explain Bitcoin client in detail. **[6]**

OR

P.T.O.

Q6) a) Explain types of Bitcoin Wallet. **[6]**

b) Draw & explain block structure of Bitcoin. **[5]**

c) What is Bitcoin? Write history of Bitcoin. **[6]**

Q7) a) Explain characteristics of cloud technology. **[6]**

b) Explain concept of IoT with Blockchain Technology. **[6]**

c) Explain : Enhancement of Blockchain with machine learning. **[6]**

OR

Q8) a) Explain, how artificial intelligence in blockchain technology can upgrade the technology. **[6]**

b) Write benefits of blockchain technology with Robotics Process automation. **[6]**

c) Describe Blockchain with IoT for data security of IoT enabled systems. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE2587

[Total No. of Pages : 2

[6583]-118

T.E. (Electronics and Computer Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - V) (310345 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) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain Properties of FIR filters. **[9]**

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. **[9]**

b) Convert an analog filter with system function H(s) into digital IIR filter using impulse-invariance method. $H(s) = 10/S^2 + 7S + 10$ Draw the direct form-I and II structures for the following systems. **[9]**

Q3) a) i) $3y(n) - 2y(n-1) + y(n-2) = 4x(n) - 3x(n-1) + 2x(n-2)$ **[8]**

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. **[8]**

b) Obtain the system function H(z) for h (n) = {4, 2, –2, –3} and draw a direct form FIR filter structure. **[9]**

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

P.T.O.

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]**



Total No. of Questions : 8]

SEAT No. :

PE2588

[Total No. of Pages : 2

[6583]-119

T.E. (Electronics and Computer Engineering)

SENSORS AND APPLICATIONS

(2019 Pattern) (Semester - V) (310345 D) (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) ***Assume suitable data, if necessary.***

Q1) a) Define flow and flow rate. Explain different types of flows. Explain basic principle of flow meter. **[6]**

b) Draw neat diagram of float type liquid level sensor and explain it in detail. **[6]**

c) Define differential flow meter/obstruction type flow meter. Explain Orifice, venture and flow nozzle type differential transducer for flow measurement. **[8]**

OR

Q2) a) With the help of neat diagram explain working of Electromagnetic flow meter. **[6]**

b) Draw neat diagram Ultrasonic type liquid level sensor and explain it in detail. **[6]**

c) With the help of neat diagram explain Capacitance Level Sensor for the following **[8]**

i) Conductive liquid

ii) Non-conductive liquid

Q3) a) Explain operating principle of PIR sensor. With the help of neat diagram explain working of optoelectronics Motion Sensor. **[8]**

b) Explain the following type accelerometer **[8]**

i) Capacitive accelerometer

ii) Thermal accelerometer

iii) Piezoelectric accelerometer

iv) Piezoresistive accelerometer

OR

P.T.O.

Q4) a) With the help of neat diagram explain Rotary/Angular incremental optical Encoder. **[8]**

b) Draw neat construction diagram of LVDT. Explain working and characteristics of LVDT. State its advantages and disadvantages of LVDT. **[8]**

Q5) a) With the help of neat construction diagram explain Hall Effect Magnetic field sensors. Explain working of PZT sensors and actuators. **[8]**

b) Explain Bulk Micromachining process and Surface Micromachining process and compare them. **[8]**

OR

Q6) a) Draw neat block diagram Smart sensor and explain functioning of each block. State the advantages and disadvantages of Smart Sensor. **[8]**

b) With the help of neat diagram explain the following **[8]**

i) Micro Resonator

ii) Hot wire anemometer micro miniature temperature sensor

Q7) a) With the help of neat diagram explain solenoid operated spool valve. **[6]**

b) Explain poppet bidirectional Control Valve. Compare finite position valve and infinite position valve. **[6]**

c) Draw construction of a DC motors and explain its operating principle. **[6]**

OR

Q8) a) Explain the following w.r.t. valve characteristics. **[6]**

i) Linear flow characteristic

ii) Equal percentage

iii) Quick opening

b) Explain single acting cylinder and double acting cylinder with suitable diagram and compare them. **[6]**

c) Draw relay driver circuit using transistor and explain design of relay driver circuit using transistor. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2589

[Total No. of Pages : 2

[6583]-120
T.E. (Information Technology)
COMPUTER NETWORK AND SECURITY
(2019 Pattern) (Semester - VI) (314451)

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 markc.***
4) ***Assume suitable data necessary.***

Q1) a) Explain MACAW protocol in detail with the help of diagram. **[8]**

b) Explain the connection establishment and data transfer phase in the following routing protocols with suitable diagram. **[9]**

i) AODV

ii) DSR

OR

Q2) a) Differentiate between infrastructure network and infrastructure less network. What are issues in Adhoc wireless network? **[8]**

b) List types of Wireless Sensor Network architecture. Explain the phases of LEACH routing protocol in detail. **[9]**

Q3) a) What is Cipher Block Chaining (CBC)? Explain the process and Characteristics of CBC with suitable diagram. **[10]**

b) What is substitution cipher? Explain the types of mono alphabetic cipher with suitable example. **[8]**

OR

Q4) a) Explain different types of attacks on message integrity and availability. **[10]**

b) What is network attack? Differentiate between active and passive attack. **[8]**

Q5) a) Explain the working of DES with suitable example. **[10]**

b) Describe how digital signature standard scheme generate and verify the digital signature. **[8]**

OR

P.T.O.

Q6) a) Explain Diffie Hellman algorithm with suitable example. **[9]**

b) Explain RSA algorithm with suitable example. **[9]**

Q7) a) What is the difference between hardware attack and software attack? Write a note on MIM attack. **[9]**

b) Define Vulnerability. Explain types of vulnerabilities in detail. **[8]**

OR

Q8) a) Define cyber security and explain the different layers of security. **[9]**

b) Write a short note on : **[8]**

i) Cyber Stalking

ii) Internet Governance in cyber security



Total No. of Questions : 8]

SEAT No. :

PE-2590

[Total No. of Pages : 2

[6583]-121

T.E. (Information Technology)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semseter - VI) (314452)

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

Q1) a) i) Draw architecture of Google File system and explain its advantages. **[5]**

ii) Describe with example the types of classes to handle big data. **[5]**

b) Draw architecture of Hadoop distributed file system and explain. **[8]**

OR

Q2) a) i) Write 5 Hadoop Shell commands **[5]**

ii) Explain Role Job tracker and Task Tracker in Hadoop Architecture. **[5]**

b) Explain Read operations in HDFS with suitable diagram. **[8]**

Q3) a) Explain different types of Big Data Analysis. How it will perform analysis. **[8]**

b) i) Explain Different Data Transformation techniques with its applications. **[3]**

ii) What is dataset? Explain with python syntax of 2 different types of dataset used in Big data. **[6]**

OR

Q4) a) i) Explain Mean, Mode and variance with suitable example. **[6]**

ii) Explain Data Standardization and its necessity. **[4]**

b) Draw and explain Architecture of HIVE. **[7]**

P.T.O.

Q5) a) i) How data visualization help Big data Analytics. Explain **[4]**

ii) List the conventional Data visualization tools. Explain any Two **[6]**

b) Explain data visualization with the help of example? What are the advantages of data visualization? **[8]**

OR

Q6) a) Explain any 4 Types of data visualization with example. **[8]**

b) i) List challanges in data visualization with example. **[6]**

ii) Explain Data Visualization with Tableau **[4]**

Q7) a) Explain Text mining with example. **[8]**

b) Explain Big Data Analytics Challenges in brief. **[9]**

OR

Q8) a) Explain four Big Data use cases with example. **[8]**

b) Explain types of Mobile Analytics with real time example. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2591

[Total No. of Pages : 2

[6583]-122

T.E. (Information Technology)

WEB APPLICATION DEVELOPMENT

(2019 Pattern) (Semester - VI) (314453)

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 MVC? Explain MVC architecture in detail. **[6]**

b) How would you use the term typescript? Give the advantages and disadvantages of using it? **[6]**

c) List and explain different types of structural directives in Angular. **[5]**

OR

Q2) a) Explain variables and constant in TypeScript and how they differ from traditional JavaScript. **[6]**

b) Explain the basic hooks in ReactJS with simple demo applications. **[6]**

c) What is Pipe? Explain with example. **[5]**

Q3) a) List and explain the features of any three popular web frameworks. **[6]**

b) What is socket? Write a client server communication in node JS using socket programming. **[6]**

c) What is API? Explain REST HTTP API's in detail. **[5]**

OR

Q4) a) Write a code using ExpressJS to illustrate the concept of routes. **[6]**

b) What is CRUD? Explain CRUD operations in node.JS **[6]**

c) What is NoSQL? Explain different features of MongoDB. **[5]**

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) List any five widgets in jQuery mobile. **[6]**

b) What is page? Write a code to create a page in jQuery mobile. **[6]**

c) What way would you design a code to make slide up transition in jQuery mobile? **[6]**

Q7) a) What is cloud computing, benefits of cloud computing & types of cloud computing. **[6]**

b) List steps to deploy the application on elastic beanstalk. **[6]**

c) What are the different components of VPC? **[6]**

OR

Q8) a) List steps to deploy website in EC2. **[6]**

b) How to convert EC2 Instance with PuTTY. **[6]**

c) What is S3 bucket and how to create a bucket? **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2592

[Total No. of Pages : 2

[6583]-123

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

Q1) a) Describe in brief the role of Knowledge Agents in representing and utilizing knowledge in AI systems. **[6]**

b) Explain the main components of Rule-Based Systems and how it is used in representing the knowledge? **[6]**

c) What is Non-Monotonic Reasoning? Discuss its importance in handling incomplete and uncertain knowledge. **[6]**

OR

Q2) a) Identify sources of uncertainty in AI systems. How does uncertainty impact decision-making and knowledge representation? **[8]**

b) Explain the concepts of slots and inheritance in Semantic Nets. **[6]**

c) Discuss any fuzzy logic based application where it handles uncertain and imprecise information. **[4]**

Q3) a) What is Natural Language Processing (NLP) and explain its significance in the field of artificial intelligence. **[6]**

b) What are the principles of Unification Grammars? How are they applied in syntactic analysis? **[6]**

c) Define semantic analysis in the context of NLP and its role in understanding the meaning of sentences. **[5]**

OR

P.T.O.

Q4) a) Discuss the role of grammars and parsers in syntactic analysis. **[6]**

b) Explain the process of text classification in NLP and list its applications. **[5]**

c) Explain the importance of discourse and pragmatic processing in NLP for understanding context and speaker intentions. **[6]**

Q5) a) What is the MiniMax algorithm? How it is applied in game playing? **[6]**

b) Define the Alpha-Beta cut-off in the context of game playing. Discuss suitable applications. **[6]**

c) List and explain the key components of a planning system. **[6]**

OR

Q6) a) What are reactive systems in the context of artificial intelligence? How does it differ from other types of systems? **[6]**

b) What is Goal Stack Planning? Give an example of a problem solved using Goal Stack Planning **[8]**

c) What is meant by heuristic functions? How are they incorporated in game playing? **[4]**

Q7) a) Draw and explain the architecture of deep neural networks. **[6]**

b) Describe the key features and components of the Tensor Flow framework. **[6]**

c) How does Deep Learning differ from Machine Learning? **[5]**

OR

Q8) a) Write short note on (Any Two) **[12]**

i) Case Study - Automatic bird identification using deep learning techniques

ii) Brief explanation on Deep learning platforms like Google Cloud AI Platform and Microsoft Azure AI.

iii) AI and IOT based any real world application.

b) Describe in short AI in Robotics. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE2593

[Total No. of Pages : 2

[6583]-124

T.E. (Information Technology)

CYBER SECURITY

(2019 Pattern) (Semester - VI) (314454(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) What are the challenges in cyber forensic? **[6]**

b) What is "Cyber Forensics"? Explain importance of cyber forensics. **[6]**

c) How does Computer Forensics differ from data recovery? **[6]**

OR

Q2) a) Explain E-mail Forensics in detail. **[6]**

b) What is mean by anti-forensic? Explain detection techniques of anti forensics. **[6]**

c) Explain the malware analysis in short? **[6]**

Q3) a) Explain the importance of digital forensics. **[6]**

b) What are the five elements of digital forensics? Explain in detail. **[6]**

c) How the analysis of audio video evidences does is performed? **[5]**

OR

Q4) a) How does digital forensics relate to cyber security analytics? What is cyber threat forensics? **[6]**

b) Explain the preservation of digital evidences. **[6]**

c) What is IRIS recognition? Explain working of IRIS recognition. **[5]**

P.T.O.

Q5) a) What is social engineering? Explain the phases of social engineering. **[6]**

b) What are the various social engineering attacks? Explain any one in detail. **[6]**

c) What technique is used in social engineering attacks? What makes social engineering such an effective technique for hackers? **[6]**

OR

Q6) a) Explain the various ways in preventions of social engineering attacks. **[6]**

b) What are the types of computer based on social engineering attacks? **[6]**

c) Explain conceptual evolution of social engineering. **[6]**

Q7) a) What is E Governance in cyber laws? Explain in short. **[6]**

b) Explain Intellectual Property Rights in cyberspace. **[6]**

c) What are the challenges of cyber law? Explain in short. **[5]**

OR

Q8) a) What are various offenses in IT Act? Explain in short. **[6]**

b) What are the differences between digital signature and electronic signature? **[6]**

c) Which acts have recognized digital signature in India? **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE2594

[Total No. of Pages : 2

[6583]-125

T.E. (Information Technology)

CLOUD COMPUTING

(2019 Pattern) (Semester - VI) (314454(C)) (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) ***Assume Suitable data if necessary***

Q1) a) Explain application life cycle of Google AppEngine. **[6]**

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

i) Ajax

ii) JSON

c) Explain features of Azure SQL database. **[6]**

OR

Q2) a) Draw and explain architecture of Google AppEngine. **[6]**

b) What is AWS compute service? Elaborate on each category of compute services. **[6]**

c) Differentiate between Azure SQL and SQL Database. **[6]**

Q3) a) Explain advantages and disadvantages of Cloud-Based Solutions. **[6]**

b) Draw & explain General Architecture of Google File System (GFS)? **[6]**

c) List and explain the security issues in cloud. **[5]**

OR

Q4) a) What is fault tolerance. Explain characteristics of fault tolerance. **[6]**

b) Differentiate between GFS and HDFS. **[6]**

c) Justify the statement “Prepare for graceful failure in case of a cloud provider outage”. **[5]**

P.T.O.

Q5) a) Explain the Architecture of the Internet of Things. **[6]**

b) Write a short note on Global Positioning System (GPS). **[6]**

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

i) Smart Power Grid

ii) Smart Buildings

OR

Q6) a) Explain Cloud Mashups for Agility & Scalability in detail. **[6]**

b) Explain Data Intensive Scalable Computing. Differentiate between Conventional Supercomputer and Data Intensive Scalable Computing.**[6]**

c) Write a short note on Wireless Sensor Networks (WSN). **[6]**

Q7) a) What exactly is Docker? Draw and describe the docker deployment workflow. **[6]**

b) What is an energy-conscious cloud? Explain in detail. **[6]**

c) Explain cloudlets in terms of mobile cloud computing with a diagram.**[5]**

OR

Q8) a) Explain traditional deployment workflow and docker, docker's client server architecture. **[6]**

b) Write a short note about: Intelligent fabric and Paints. **[6]**

c) Discuss the future of cloud Based on Smart devices **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE2595

[Total No. of Pages : 2

[6583]-126

T.E. (Information Technology)

SOFTWARE MODELING AND DESIGN

(2019 Pattern) (Semester - VI) (314454D) (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 and Q.7 or Q.8.***
2) ***Assume suitable data if required.***
3) ***Figures to the right indicates full marks.***

Q1) a) What is state? Explain the contents of a state in detail. **[6]**

b) Draw a sequence diagram for online shopping system. **[4]**

c) What do you mean by activity? Consider the ATM system scenario. Identify and explain at least five activities involved in the ATM system scenario. **[8]**

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. **[6]**

c) In the context of sequence diagram, what is an entity and a controller class? **[4]**

Q3) a) Describe the Macro level process of identification of view layer classes by analysing use case. **[6]**

b) Explain the difference between component and deployment diagram by using example. **[6]**

c) With the help of UML, how can we package the classes involved within a system scenario? **[6]**

OR

P.T.O.

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) Draw the class diagram for mobile scenario using state design pattern. **[6]**

b) Draw a Singleton design pattern structure and explain in brief. **[6]**

c) What is GRASP? Explain Low Coupling and high Cohesion in detail. **[6]**

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. **[8]**

OR

Q8) a) List and explain multiple views of a software architecture. **[8]**

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

i) Client-Server software Architecture

ii) Service-Oriented software Architecture



Total No. of Questions : 8]

SEAT No. :

PE-2596

[Total No. of Pages : 4

[6583]-127

T.E. (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - V) (314441)

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 diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Write a formal definition of a Regular Grammar? Explain Chomsky Hierarchy of Grammar. **[6]**

b) Convert the following Left Linear Regular Grammar (LRG) into Right Linear Regular Grammar (RLG) : **[6]**

G = {V, T, S, P} where V = {S, A, B, C}, T = {0, 1}, S = {S} and P are given as

S -> B1 | A0 | C0

B -> B1 | 1

A -> A1 | B1 | C0 | 0

C -> A0

c) Derive the leftmost and rightmost derivation for the string “ibtibtaea” using following Context Free Grammar (CFG). **[6]**

S -> iCtS | iCtSeS | a

C -> b

OR

P.T.O.

Q2) a) Simplify the following CFG (Context Free Grammar) **[6]**

S -> aSa | bSb | ε | A

A -> aA | ε

D -> b | bD | ε

b) Convert the CFG (Context Free Grammar) with productions **[6]**

S -> bA | aB

A -> bAA | aS | a

B -> aBB | bS | b

to Chomsky Normal Form (CNF).

c) Write a short note on the Pumping Lemma for Context Free Language. **[6]**

Q3) a) Construct a Push Down Automata (PDA) for accepting language containing odd length palindrome over $\Sigma = \{0, 1\}$. **[6]**

b) Give the Context Free Grammar (CFG) generating the language accepted by the following Pushdown Automata (PDA) **[6]**

$M = (\{p, q\}, \{0, 1\}, \{Z_0, X\}, \delta, q, Z_0, \phi)$ when δ is given by

$\delta(q, 1, Z_0) \rightarrow (q, XZ_0)$

$\delta(q, 1, X) \rightarrow (q, XX)$

$\delta(q, 0, X) \rightarrow (p, X)$

$\delta(q, \in, X) \rightarrow (q, \in)$

$\delta(p, 1, X) \rightarrow (p, \in)$

$\delta(p, 0, Z_0) \rightarrow (q, Z_0)$

c) Define the following terms with example. **[6]**

i) Pushdown Automata

ii) Post Machine

OR

Q4) a) Construct a Push Down Automata (PDA) that accepts the following language. L ={ $a^n b^n$ | n > = 0 } **[6]**

b) Design a Post Machine which accepts the string with an equal number of a's and b's. **[6]**

c) Construct a Push Down Automata (PDA) for a language L = {$a^n b^{2n}$ | n > = 0} **[6]**

Q5) a) Construct a Turing Machine (TM) for checking if a set of parenthesis are well formed. **[6]**

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

i) Church-Turing thesis

ii) Multi-tape TM

c) Explain the power of Turing Machine over Push Down Automata. **[5]**

OR

Q6) a) Design a TM to compute proper subtraction of two unary numbers. The proper subtraction function f is defined as follows. **[6]**

f(m,n) = m - n if m > n

= 0 otherwise

b) Construct a Turing Machine to accept a language L = {$a^{n+1} b^n$ | n > = 0} **[6]**

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

Q7) a) Write Short note on : **[6]**

i) Un-decidable Problem

ii) Measuring Complexity

b) Let HALT TM ={where M is a TM and M halts on input w}. Prove that HALT TM is undecidable. **[6]**

c) Define the following. **[5]**

i) NP Hard Problem

ii) NP Complete Problem

OR

Q8) a) Prove that A_{DFA} is a decidable language. **[6]**

A_{DFA} ={ | B is a DFA that accepts input string w}.

b) Write a short note on Normal Forms of Boolean Expressions. **[6]**

c) Write a short note on NP Completeness of SAT Problem. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE-2597

[Total No. of Pages : 3

[6583]-128
T.E. (Information Technology)
OPERATING SYSTEM
(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) ***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 critical section? Write parameters to control access to critical section and explain the requirements to be satisfied for its solution. **[9]**

b) What is deadlock? What are the necessary conditions for deadlock? How deadlock is detected in a system having single instance of each type? **[9]**

OR

Q2) a) Explain any two approaches for Recovery from deadlock. **[6]**

b) Write bankers safety algorithm. **[12]**

Consider the following system snapshot

Process	MAX				Allocation				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	3	2	2	0	2	1	2	2	5	3	2
P1	2	7	5	2	1	1	0	2				
P2	2	3	7	6	2	2	5	4				
P3	1	6	4	2	0	3	1	2				
P4	3	6	5	8	2	4	1	4				

Answer the following questions

i) What is the content of need matrix?

ii) Is the system in a safe state?

iii) If the request from process p1 arrives for (0,2,2,0), can it be granted immediately?

P.T.O.

Q3) a) Given references to the following pages by a program **[9]**

0,1,4,2,0,2,6,5,1,2,3,2,1,2,6,2,1,3,6,2.

Compute number of page faults if the system has 3 page frames for the following policies

i) FIFO

ii) LRU

iii) Optimal Page replacement

b) Explain paged memory management in detail. **[8]**

OR

Q4) a) What is Belady's anomaly? Explain with suitable example. **[6]**

b) Consider the following segment table : **[5]**

Segment	Base	Length
0	330	124
1	876	211
2	111	99
3	498	302

What are the physical addresses for the following logical addresses? If the address generates a segment fault indicate so.

i) 0,99 ii) 2,78

iii) 1,265 iv) 3,222

v) 0,111

c) Explain memory partition selection algorithms **[6]**

Q5) a) A disk drive has 1000 cylinders, numberd 0-999. The drive is currently serving the request at track no. 345 and head is moving towards track 0. The queue of pending requests in FIFO order is 123,874, 692,475,105,376. Starting from the current head position what is the total distance that disk arm moves to satisfy all the pending requests for the following disk scheduling algorithms. **[12]**

i) FCFS ii) SCAN

iii) LOOK iv) SSTF

b) Explain Record blocking with the help of neat diagrams. **[6]**

OR

Q6) a) Write different file system free space management techniques. **[9]**

b) Explain different file allocation methods. **[9]**

Q7) a) Define the following terms : **[3]**

i) Macro processor

ii) Interpreter

iii) Linker

b) Differentiate between a system software and application software. **[6]**

c) Explain Pass 1of assembler with flowchart. **[8]**

OR

Q8) a) Explain the phase structure of a compiler with neat diagram. **[9]**

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

i) Compile and Go Loader

ii) Absolute Loader

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-2598

[Total No. of Pages : 2

[6583]-129

T.E. (IT)

MACHINE LEARNING

(2019 Pattern) (Semester - V)(314443)

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 side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What do you understand by overfitting data? Gives any two methods to avoid overfitting. **[6]**

b) Given the set of values X = (3, 9, 11, 5, 2)T and Y=(1, 8, 11, 4, 3)T. Evaluate the regression coefficients**.** **[5]**

c) Compare the linear regression model and the logistic regression model.**[6]**

OR

Q2) a) What are the metrics used to validate the result of the regression and explain each? **[6]**

b) Distinguish between overfitting and underfitting. How it can affect model generalization. **[5]**

c) Discuss linear regression with examples. Explain the role of the hypothesis function in ML. **[6]**

Q3) a) What is Gini impurity? Briefly explain the properties of Gini Impurity.**[8]**

b) [CO4, L_1] How does the decision tree handle missing attribute Values?**[4]**

c) [CO4, L_2] What do you understand by Information gain? Explain the mathematical formula associated with it. **[6]**

OR

P.T.O.

Q4) a) Write short notes on **[12]**

i) Conditional probability

ii) Tree Pruning

iii) Bayesian Network

b) What do the root node, leaf node, and parent node represent in a decision tree model? Represent them pictorially. **[6]**

Q5) a) What is the difference between the Manhattan distance and Euclidean distance? **[4]**

b) Explain in detail Apriori Algorithm. **[8]**

c) Define the following terms concerning K - Nearest Neighbor Learning **[6]**

i) Regression

ii) Residual

iii) Kernel Function

OR

Q6) a) What is the difference between k-Means and K-Medians and when would you use one over another? **[6]**

b) What is hierarchical clustering? Explain the issue of connectivity constraints. **[8]**

c) What are support and confidence measures in data mining? **[4]**

Q7) a) With suitable equations, explain any two types of activation functions used in a neural network. **[8]**

b) Explain why the initialization process of weight and bias is important for neural networks. **[6]**

c) Write short notes on Mean square Error. **[3]**

OR

Q8) a) Explain with a neat diagram how neural networks are modeled. **[6]**

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

i) Sigmoidal Neuron

ii) McCulloch Pitts Neuron

c) Explain the working of a Perceptron with a neat diagram. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2598

[Total No. of Pages : 2

[6583]-129

T.E. (IT)

MACHINE LEARNING

(2019 Pattern) (Semester - V)(314443)

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 side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What do you understand by overfitting data? Gives any two methods to avoid overfitting. **[6]**

b) Given the set of values X = (3, 9, 11, 5, 2)T and Y=(1, 8, 11, 4, 3)T. Evaluate the regression coefficients**.** **[5]**

c) Compare the linear regression model and the logistic regression model.**[6]**

OR

Q2) a) What are the metrics used to validate the result of the regression and explain each? **[6]**

b) Distinguish between overfitting and underfitting. How it can affect model generalization. **[5]**

c) Discuss linear regression with examples. Explain the role of the hypothesis function in ML. **[6]**

Q3) a) What is Gini impurity? Briefly explain the properties of Gini Impurity.**[8]**

b) [CO4, L_1] How does the decision tree handle missing attribute Values?**[4]**

c) [CO4, L_2] What do you understand by Information gain? Explain the mathematical formula associated with it. **[6]**

OR

P.T.O.

Q4) a) Write short notes on **[12]**

i) Conditional probability

ii) Tree Pruning

iii) Bayesian Network

b) What do the root node, leaf node, and parent node represent in a decision tree model? Represent them pictorially. **[6]**

Q5) a) What is the difference between the Manhattan distance and Euclidean distance? **[4]**

b) Explain in detail Apriori Algorithm. **[8]**

c) Define the following terms concerning K - Nearest Neighbor Learning **[6]**

i) Regression

ii) Residual

iii) Kernel Function

OR

Q6) a) What is the difference between k-Means and K-Medians and when would you use one over another? **[6]**

b) What is hierarchical clustering? Explain the issue of connectivity constraints. **[8]**

c) What are support and confidence measures in data mining? **[4]**

Q7) a) With suitable equations, explain any two types of activation functions used in a neural network. **[8]**

b) Explain why the initialization process of weight and bias is important for neural networks. **[6]**

c) Write short notes on Mean square Error. **[3]**

OR

Q8) a) Explain with a neat diagram how neural networks are modeled. **[6]**

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

i) Sigmoidal Neuron

ii) McCulloch Pitts Neuron

c) Explain the working of a Perceptron with a neat diagram. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2599

[Total No. of Pages : 2

[6583]-130

T.E. (Information Technology)

HUMAN COMPUTER INTERACTION

(2019 Pattern) (Semester - V) (314444)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) a) What is KLM (Keystroke Level Model)? Discuss the steps involved in estimating task execution time using KLM. **[8]**

b) 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. **[9]**

OR

Q2) a) What is a Dialogue? Why do we need separate dialogue notation? Explain with example? **[9]**

b) Differentiate User Profiles with respect to Interface design with example **[8]**

Q3) a) What is the. definition of usability as per ISO 9241 standard? Describe any four usability goals of Internet Explorer? **[9]**

b) What is design? What is the golden rule of design? Illustrate the process of Interaction design? **[9]**

OR

P.T.O.

Q4) a) Write short notes on: **[9]**

1) Learnabillity

2) Flexibility

3) Robustness

b) What is User Centric Design? Why design teams involve user throughout the design process Justify your answer with proper example? **[9]**

Q5) a) List & Explain Neilsen's ten heuristics? **[8]**

b) Explain user interface management system (UIMS) with its architecture? **[9]**

OR

Q6) a) What is Usability Testing? Explain why usability testing is important with proper example? **[8]**

b) Complete the cognitive Walk-through example for the video remote control design? **[9]**

Q7) a) What is Ubiquitous Computing? How Ubiquitous Computing is used in Application Justify with Suitable example? **[10]**

b) Explain five stages of design thinking process with suitable example? **[8]**

OR

Q8) a) Differentiate Augmented and Virtual Reality. Also explain both with real life examples. **[8]**

b) In today's world finding things on the web has become easy Discuss how multimodal interaction has enriched the experience. **[10]**

Total No. of Questions : 8]

SEAT No. :

PE2600

[Total No. of Pages : 3

[6583]-131

T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHM

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

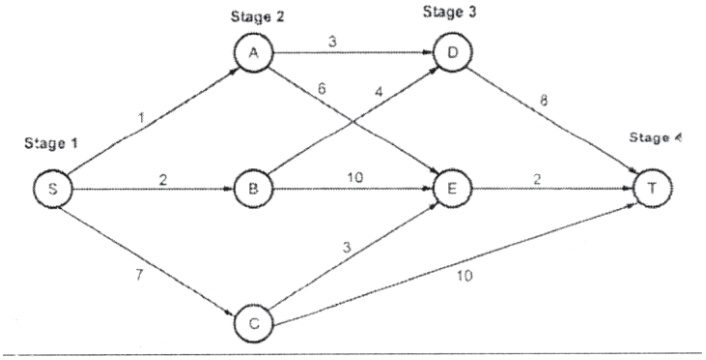
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Compare dynamic programming with greedy approach. **[4]**

b) A thief enters a house for robbing it. He can carry a maximal weight of 5 kg into his hag. There are 4 items in the house with the following weights and values. What items should thief take if he either takes the item completely or leaves it completely? **[7]**

Item	Weight (kg)	Value($)
Mirror	2	3
Silver nugget	3	4
Painting	4	5
Vase	5	6

c) Find minimum path cost between vertex s and t for following multistage graph using dynamic programming. **[7]**

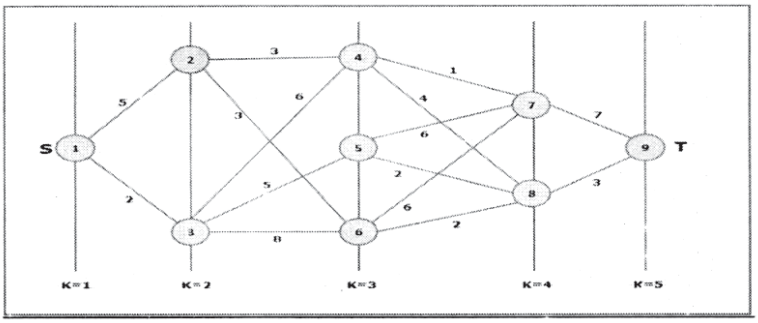


OR

P.T.O.

Q2) a) Differentiate between dynamic programming methods and divide and conquer method. **[6]**

b) Find minimum path cost between vertex *s* and *t* for following multistage graph using dynamic programming **[6]**



c) Solve the knapsack problem using Dynamic programming for no. of objects n = 4, given capacity M = 8 **[6]**

Items	1	2	3	4
Value	15	10	9	5
Weight	1	5	3	4

Q3) a) Explain how backtracking can be used to solve the N-Queens problem and provide a general recursive algorithm for solving it using backtracking. **[10]**

b) How backtracking strategy is useful to solve the graph coloring problem, explain with the help of algorithm and example. **[7]**

OR

Q4) a) Write a short note on: **[4]**

i) State Space tree

ii) Live Node

iii) Expanding Node

iv) Bounding function

b) Let W={5, 10, 12, 13, 15, 18} and M = 30. Find all possible subsets of W that sum to M. Draw the portion of the state space tree. **[7]**

c) Differentiate between Backtracking and Branch and Bound method. **[6]**

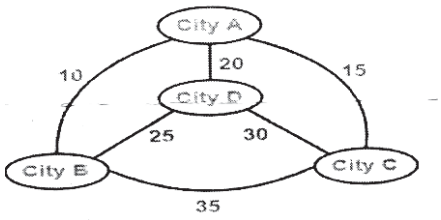
Q5) a) Describe branch and bound strategy and its types with example. **[9]**

b) Describe the branch and bound algorithm strategy for solving the 0/1 knapsack problem using LCBB 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) What is the shortest possible route that the salesman must follow to complete his tour by LCBB Method? **[9]**



Travelling Salesman Problem

Q7) a) Differentiate between P and NP Class problem with example. **[9]**

b) What is Boolean Satisfiability Problem? Explain 3-SAT problem. Prove 3- SAT in NP-complete. **[8]**

OR

Q8) a) Explain Nondeterministic algorithm? Write the Nondeterministic algorithm for searching the element of an array. **[9]**

b) What do you mean by NP Hard and NP Complete problems? Give an Example. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE2601

[Total No. of Pages : 2

[6583]-132
T.E. (IT)
INTERNET OF THINGS
(2019 Pattern) (Semester - V) (314445 D) (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) Why 6LoWPAN plays important role in IOT. Explain in detail 6LoWPAN. **[8]**

b) What are advantages of Zigbee? Explain in detail Zigbee protocol stack. **[9]**

OR

Q2) a) Explain in detail IEEE 802.15.4. **[8]**

b) What is Bluetooth? Explain in detail Bluetooth Technology. **[9]**

Q3) a) Explain Arduino. What are the things need to be considered for developing on the Arduino? Which is the official Arduino Boards? **[9]**

b) Compare Arduino Uno and Raspberry Pi Model. **[9]**

OR

Q4) a) Draw and explain interfacing of input device (LED) using Arduino Uno with program. **[9]**

b) What is an IOT Device? List different IOT Devices. Explain any 2 devices. **[9]**

Q5) a) Explain Cloud storage models (SaaS, Paas, laaS) and Communication APIs Web server in details. **[8]**

b) Explain Python Web Application Framework in detail. Explain How different Amazon web services can be used for IOT? **[9]**

OR

P.T.O.

Q6) a) What is the Vulnerability of IOT? Explain in details. **[8]**

b) What is threat analysis in IOT? Explain threat analysis in detail. **[9]**

Q7) a) Explain smart city architecture with diagram also state security and privacy challenges in smart transportation in smart city. **[9]**

b) Explain in detail How IOT can be used in home automation? **[9]**

OR

Q8) a) Explain how you will design a smart water management system for agriculture using IOT. **[9]**

b) Explain in detail any two application of health monitoring using IOT. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2602

[Total No. of Pages : 2

[6583]-133
T.E. (Instrumentation & Control)
INTERNET OF THINGS
(2019 Pattern) (Semester - VI) (306268)

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

Instructions to the candidates :

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) a) Elaborate the network, device, application enablement & deployment, data and subscriber management IoT platform. **[8]**

b) How industry accepted protocols used for the development of IoT applications. **[9]**

OR

Q2) a) Classify the types of IOT platforms also explain them in detail. **[8]**

b) Sketch the GPIO of Arduino Uno. **[9]**

Q3) a) Elaborate in detail software as a service in service models. What is data Synchronization? **[8]**

b) How cloud of things acts as an enabler for new value added services and applications explain with a neat diagram. **[9]**

OR

P.T.O.

Q4) a) Analyze the Infrastructure as a Service (IaaS) cloud model. **[8]**

b) Elaborate the service models of cloud computing and explain each model in detail. **[9]**

Q5) a) Illustrate the protocols used in Network and Transport Layer to provide security in IoT application. **[9]**

b) Analyze the application areas for deploying the IoT project architecture. **[9]**

OR

Q6) a) How might wireless communications have an effect on the development and implementation of the internet of things (IoT)? **[9]**

b) Explain briefly the broad categories of threats? Which are the well-known active threats? **[9]**

Q7) a) Sketch the smart city frameworks and smart parking eco-system. **[9]**

b) What are the enabling technologies in Health Care IoT and challenges in it? **[9]**

OR

Q8) a) Draw a architecture of smart grid IoT system. What are the security aspects in smart grid system? **[9]**

b) Which are the different smart city frameworks? Write short note on Energy management in Smart cities. **[9]**

Total No. of Questions : 8]

SEAT No. :

PE-2603

[Total No. of Pages : 2

[6583]-134

T.E. (Instrumentation & Control)

INDUSTRIAL AUTOMATION - II

(2019 Pattern) (Semester - VI) (306269)

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 Open System Interconnection (OSI) Model of networking. **[7]**

b) How RS 232 Communication works? Explain with suitable example.**[10]**

OR

Q2) a) Describe the HART protocol and its operation. **[9]**

b) Explain the concept of OPC (Object Linking and Embedding) for Process Control. **[8]**

Q3) a) How does a Human Machine Interface (HMI) function in a DCS? **[9]**

b) Explain Integration and Optimization of DCS. **[9]**

OR

Q4) a) How does alarm management work in a DCS? **[9]**

b) What are the benefits of implementing advanced alarming and event management in a DCS? **[9]**

P.T.O.

Q5) a) Which programming languages are commonly used in DCS? **[8]**

b) Give a relevant example to illustrate Sequential Flow Chart for DCS. **[10]**

OR

Q6) Write a note on **[18]**

a) Advanced Functions in DCS

b) Advanced function of fuzzy logic in DCS

c) MPC for process control.

Q7) a) What is the impact of Industrial loT on DCS? **[7]**

b) How loT is used in Distributed Control Systems. **[10]**

OR

Q8) a) How is DCS automation used in an oil refinery? **[8]**

b) How is DCS systems used in paper and pulp industry? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2604

[Total No. of Pages : 2

[6583]-135
T.E. (Instrumentation and Control)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - VI) (306270)

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

Instructions to the candidates :

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

Q1) a) Determine DTFT of signal $h(n) = (1,1,1)$. Plot its magnitude and phase response also. **[9]**

b) List out the properties of Discrete Time Fourier Transform. Prove the Time shifting and Time reversal property of DTFT. **[8]**

OR

Q2) a) Determine the Fourier Series of discrete time signal **[9]**

$$x(n) = 4.\cos\left(\frac{\pi n}{2}\right)$$

b) State and Prove the Parseval's Relation with respect to DTFS. What is mean by Power Density Spectrum? **[8]**

Q3) a) Using circular convolution, find the linear convolution between the following sequences **[12]**

$x_1(n) = (4, 1, 0, 2)$ and $x_2(n) = (4, 2, 3, 1)$.

b) Determine DFT of sequence, $x(n) = (1, 2, 1, 3)$. **[6]**

OR

Q4) a) Find $X(k)$ using DIF-FFT algorithm if $x(n) = (1, 1, 1, 1, 0, 0, 0, 0)$. **[12]**

b) Sketch the butterfly structure of 4-point DIT-FFT algorithm. Calculate the number of complex multiplications required to get Fourier Transform using this algorithm. **[6]**

P.T.O.

Q5) a) Design a digital Butterworth filter that satisfies following constraints using bilinear transformation. Assume $T = 1$ Sec. **[12]**

$0.85 \leq |H(e^{j\omega})| \leq 1;\ 0 \leq \omega \leq 0.3\pi$

$|H(e^{j\omega})| \leq 0.2;\ 0.7\pi \leq \omega \leq \pi$

b) Sketch the response of Butterworth, Chebyshev-I and Chebyshev-II low pass filters show all details. **[6]**

OR

Q6) a) Design a digital low-pass Chebyshev filter that satisfies the following. **[12]**

$0.7 \leq |H(e^{j\omega})| \leq 1;\ 0 \leq \omega \leq 0.3\pi$

$|H(e^{j\omega})| \leq 0.3;\ 0.7\pi \leq \omega \leq \pi$

Use Impulse Invariance transformation. Assume $T = 1$ Sec.

b) Transform the analog filter transfer function. **[6]**

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

into a digital filter $H(z)$ using impulse invariance method.

Q7) a) Design a Low Pass FIR Filter with the following desired frequency response. **[12]**

$$H_d(e^{j\omega}) = 1;\ 0 = \omega \leq \frac{\pi}{3}$$

$$H_d(e^{j\omega}) = 0;\ \frac{\pi}{3} \leq \omega \leq \pi$$

Use Triangular Window with N=9. Plot the magnitude response also.

b) With the help of suitable waveform, explain 'Gibbs Phenomenon'. **[5]**

OR

Q8) a) Design a digital High Pass FIR filter with a frequency response. **[12]**

$$|H_d(e^{j\omega})| = 1;\ \frac{\pi}{3} \leq \omega \leq \pi$$

$$|H_d(e^{j\omega})| = 0;\ \omega \leq \frac{\pi}{3}$$

and $N = 9$. Plot the magnitude response also.

b) Discuss various properties of FIR Filters. **[5]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PE2605

[Total No. of Pages : 2

[6583]-136

T.E. (Instrumentation & Control)

BUILDING AUTOMATION

(2019 Pattern) (Semester - VI) (306271A) (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 whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Describe the working principles of cooling coils and heating coils in an AHU. **[10]**

b) Elaborate on the concept of Variable Air Volume (VAV) systems. **[8]**

OR

Q2) a) Describe the various types of humidification systems employed in HVAC applications. **[10]**

b) Explain the different types of filters commonly used in HVAC systems. **[8]**

Q3) a) Explain the functioning and design considerations of different types of heat exchangers used in hot water systems. **[10]**

b) Describe the concept of a geothermal system. **[7]**

OR

Q4) a) Discuss the components and working principles of a geothermal heat pump system. **[10]**

b) Elaborate on the working principles and design variations of various types of boilers in hot water systems. **[7]**

P.T.O.

Q5) a) Discuss how different components work together to detect and respond to fire incidents in fire alarm system. **[8]**

b) Differentiate between the classifications of fire alarm systems. **[10]**

OR

Q6) a) Analyze the importance of fire safety codes and standards in ensuring the effectiveness and reliability of fire alarm systems. **[8]**

b) Classify SLC wiring types. **[10]**

Q7) a) Discuss the concepts of Secure and Non-Secure access control in ensuring controlled access to restricted areas within a facility. **[7]**

b) Discuss the fundamental concept of an Access Control System (ACS). **[10]**

OR

Q8) a) Describe the system architecture of an Access Control System. **[7]**

b) Describe the different types of Video Management Systems (VMS) used in CCTV systems. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE2606

[Total No. of Pages : 2

[6583]-137
T.E. (Instrumentation & Control Engineering)
MACHINE LEARNING
(2019 Pattern) (Semester - VI) (306271B) (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 Q.6, Q. 7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) What is bayes theorem also discuss the Naïve Bayes classifier. **[8]**

b) The following table gives data set about stolen vehicles. Using Naïve Bayes classifier classify the new data (Red, SUV, Domestic) **[10]**

Table

Color	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

OR

Q2) a) Explain K nearest learning algorithm with example. **[10]**

b) Explain the sigmoid function in brief. **[8]**

P.T.O.

Q3) a) What is Machine learning? Explain Supervised Machine Learning using example. **[9]**

b) Define Regression. How Multivariate Regression is different from Univariate regression? **[8]**

OR

Q4) a) i) Linear separable data Vs Non-Linear separable data.

ii) Hard Margin vs Soft Margin

[9]

b) Explain true positive, true negative, false positive, false negative and class ratio. **[8]**

Q5) a) List and explain the issues in Decision tree. **[10]**

b) Explain random forest algorithm using example. **[8]**

OR

Q6) a) Draw a neat diagram and explain the over fitting and underfitting also give the example of it. **[10]**

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

i) Gin index

ii) entropy,

iii) chi square test

iv) pruning

Q7) a) Give suitable example and explain K means clustering. **[9]**

b) Differentiate between supervised and unsupervised machine learning. **[8]**

OR

Q8) a) Using suitable diagram elaborate silhouette method. **[5]**

b) Write a note on (any two) **[12]**

i) Over fitting and under fitting

ii) Ensemble Learning,

iii) Elbow method

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. : ____

PE2607

[Total No. of Pages : 2

[6583]-138

T.E. (Instrumentation & Control Engineering)

ELECTRICAL DRIVES

(2019 Pattern) (Semester - VI) (306271C) (Elective - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
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 are the Time ratio control strategies in DC chopper? **[9]**

b) Give the types of DC motor. Describe a DC Shunt motor. **[9]**

OR

Q2) a) Describe a DC permanent-magnet motor. **[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 Motor by Variable Frequency Control. **[8]**

b) Explain the Speed Control of Induction Motors. **[9]**

OR

Q4) a) Explain the features by which the Variable Frequency Control of Induction Motor Drive provides good running and transient performance. **[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 electrical drives for Lathes, Milling and Grinding Machines. **[9]**

b) Explain the electrical drives for Electric Traction and Refrigeration and Air Conditioning. **[9]**

OR

Q6) a) Elaborate on Machine Tool Drives as a Applications of Electric Drives.**[9]**

b) Discuss electrical drives for Pumps and Air Compressor. **[9]**

Q7) a) Explain the Speed control of three phase induction motor using pole changing method and Changing Supply Voltage Method. **[8]**

b) Discuss the Non-isolated converters and isolated converters types of DC/DC converters. **[9]**

OR

Q8) a) Explain the Function of an Inverter. Enlist Limitations of DC-to-AC Converters (Inverters). Applications. **[8]**

b) Describe a DC/DC converter in electric vehicle. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2608

[Total No. of Pages : 2

[6583]-139
T.E. (Instrumentation and Control)
ANALYTICAL INSTRUMENTATION
(2019 Pattern) (Semester - VI) (306271-D) (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, and 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 wherever 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) Enlist the types of the 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 Instrumentusing 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) Explain in detail about various pollution monitoring instruments? Draw and explain how NOx 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 quadrupolemass 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) 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]**

OR

Q8) a) Explain principle, working and construction of Geiger-Muller tube (GM tube) in detail? Draw suitable diagram of it? **[8]**

b) Describe how radiation interacts with matter? Define Photoelectric and Compton effect related to this interaction? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-2609

[Total No. of Pages : 2

[6583]-140
T.E. (Instrumentation and Control)
EMBEDDED SYSTEMS
(2019 Pattern) (Semester - V) (306261)

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) Compare following instructions with an example. **[8]**

i) LJMP and SJMP

ii) RET1 and RET

b) What are the assembler directives? Explain any two with example. **[9]**

OR

Q2) a) Explain in detail following instructions of 8051 μC. **[8]**

i) CPL A

ii) MOVC A, @A+DPTR

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 = (CS), 43 = (5B), 44 = (30).

Q3) a) Develop and explain an interfacing diagram of electromechanical relay with 89C51. **[9]**

b) Develop an interfacing diagram of 2x16 LCD display with 8051 μC. Explain in brief. **[9]**

OR

Q4) a) Discuss interfacing scheme of temperature sensor LM35 with 89C51 μC. **[9]**

b) Draw and explain interfacing scheme of stepper motor with 89C51 μC. **[9]**

P.T.O.

Q5) Design Line Follower Robot using 89C5 1 μC. Discuss the design based on following points.

a) Block diagram and sensor selection. **[9]**

b) Circuit diagram. **[9]**

OR

Q6) Design on/off temperature control system using 89C51 μC. Discuss the design based on following points.

a) Block diagram and sensor selection. **[9]**

b) Circuit diagram. **[9]**

Q7) a) Draw block diagram of general purpose computer model and elaborate the operation. **[8]**

b) Elaborate structure of an operating system processes. **[9]**

OR

Q8) a) Compare SISC and RISC system. **[8]**

b) Discuss quality attributes of embedded system. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE2610

[Total No. of Pages : 2

[6583]-141
T.E. (Instrumentation and Control)
INDUSTRIAL AUTOMATION - I
(2019 Pattern) (Semester - V) (306262)

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

Instructions to the candidates:

1) ***All questions are compulsory. Do not write anything on question paper.***
2) ***Illustrate your answer with suitable figures/sketches wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain logical instructions of PLC with suitable example. **[8]**

b) Explain: **[8]**

i) Comparison instructions.

ii) Arithmetic instructions.

OR

Q2) a) Explain SQO instructions of PLC with suitable example. **[8]**

Draw the ladder diagram using JMP instruction, to turn ON the RED bulb after 5 seconds. If switch SW1 is pressed otherwise if switch SW2 is pressed, turn ON GREEN bulb after 10 seconds.

b) Draw the ladder diagram using MCR instruction, to check healthy condition of process by checking the status of switch SW1. If SW1 gets closed then turn OFF motor M1 after 10 seconds. And then turn OFF motor M2 after 10 seconds. **[8]**

Q3) a) Explain analog modules in PLC with any one analog module signal processing in PLC. **[9]**

b) Give the overview of any two industrial PLC. **[9]**

OR

Q4) a) With a neat diagram, illustrate PID modules in PLC. **[9]**

b) Compare various instructions of any two industrial PLC. **[9]**

P.T.O.

Q5) a) What is the need of HMI? Explain the advantages of HMI. **[9]**

b) Explain the need, advantages and objective of Drives. **[9]**

OR

Q6) a) What is the VFD? Explain the application of VFD. **[9]**

b) Explain the block diagram of Motion control. **[9]**

Q7) a) Explain the need of SCADA system. List out the applications and benefits of the SCADA system. **[9]**

b) Draw and explain MTU block diagram. **[9]**

OR

Q8) a) Write short note on **[9]**

i) RTU

ii) MTU communication interface

b) Explain any one application of SCADA system with a neat diagram. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PE-2611

[Total No. of Pages : 3

[6583]-142

T.E. (Instrumentation and Control Engineering)

MODERN CONTROL THEORY

(2019 Pattern) (Semester - V) (306263)

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

Instructions to the candidates :

1) ***Answers Q.1 or Q.2, Q3 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 necessary.***
5) ***Use of calculator is allowed.***

Unit - I

Q1) a) Represent the following system in controllable canonical form and check its controllability $\frac{C(s)}{R(s)} = \frac{s+5}{s^2+3s+2}$ **[10]**

b) An autonomous system is given below $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ Examine the stability using Liapunov theorem. **[7]**

OR

Q2) a) Represent the following system in observable canonical form and check its state observability $\frac{C(s)}{R(s)} = \frac{s+5}{s^2+3s+2}$ **[10]**

b) Check the controllability and Observability of the system with following canonical form $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u \; y = \begin{bmatrix} 2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ **[7]**

P.T.O.

Unit - II

Q3) Consider a system defined by **[18]**

$$\dot{x} = Ax + Bu$$
$$y = Cx$$

Where $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$ *and* $C = \begin{bmatrix} 1 & 0 \end{bmatrix}$

It is desired to have eigenvalues at $\mu_1 = -3$ and $\mu_2 = -5$ by using control law $u = -Kx$ determine the required state feedback gain matrix *K*.

OR

Q4) The plant is given by $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 15 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \; y = \begin{bmatrix} 0 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ **[18]**

Design the full order state observer gain matrix K_e such that desired closed loop poles of the plant are located at $s = -2 + j3, s = -2 - j3$.

Unit - III

Q5) a) Explain the role of sampler, ADC and DAC in digital control system. **[9]**

b) Determine the z-transform of the signal $x(t) = \begin{cases} e^{-at} \; for & t \geq 0 \\ 0 & t < 0 \end{cases}$. **[8]**

OR

Q6) a) Explain the impulse sampler as modulator. **[9]**

b) Explain the following terms about digital control system **[8]**

i) Multiplexer

ii) Demutiplexer

iii) Encoder

iv) Decoder

Unit - IV

Q7) a) Examine stability using jury's stability test for the system with characteristic equation $P(z)=z^3 - 1.1z^2 - 0.1z + 0.2 = 0$ **[9]**

b) With the help of neat sketch explain the s-plane to z-plane mapping. **[9]**

OR

Q8) a) Determine the open loop transfer function and close-loop transfer function of the sampled data system shown in the figure 1. **[9]**

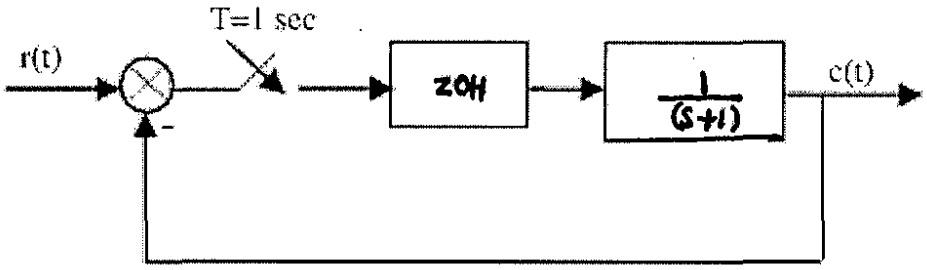


Figure 1: Closed Loop Control System

b) Examine stability using jury's stability test for the system with characteristic equation $P(z)=z^3 - 1.1z^2 - 0.1z + 0.2 = 0$ **[9]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE2612

[Total No. of Pages : 2

[6583]-143

T.E. (Instrumentation and Control Engineering)

OPERATING SYSTEMS

(2019 Pattern) (Semester - V) (306264)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat diagrams should be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Write a note on contiguous memory allocation. Also explain internal and external fragmentation. **[8]**

b) What is page fault and page replacement? Describe the steps in handling a page fault with the suitable figure. **[9]**

OR

Q2) a) Explain briefly the concept of paging. Describe with neat figure the paging hardware that uses translation look-aside buffer (TLB). **[8]**

b) Enlist various algorithms used for Page Replacement policies. Explain any one of them in detail. **[9]**

Q3) a) What do you mean by deadlock avoidance? What is safe state? Describe resource allocation graph algorithm for deadlock avoidance. **[9]**

b) What is a Deadlock? What are the importance characteristics that cause a deadlock? **[9]**

OR

Q4) a) Write a note on recovery from deadlock. **[9]**

b) Describe the role of safety algorithm and resource-request algorithm used in the Banker's algorithm for deadlock avoidance. **[9]**

P.T.O.

Q5) a) Enlist methods to allocate space to the files which are stored on disk. Explain linked allocation method with suitable figure. **[8]**

b) Define a file. Briefly explain file attributes and file operations. **[9]**

OR

Q6) a) What is the need of free space management? Explain linked list approach. **[8]**

b) Describe file access methods. Briefly explain single level directory. **[9]**

Q7) a) What do you mean by system protection? What are the goals? Explain the access matrix. **[8]**

b) Describe the types of security violations. **[10]**

OR

Q8) a) Enlist different methods to implement access matrix. Explain any two of them. **[9]**

b) Write a note on user authentication in operating systems. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2613

[Total No. of Pages : 2

[6583]-144

T.E. (Instrumentation & Control)

MECHATRONICS & ROBOTICS

(2019 Pattern) (Semester - V) (306265A) (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) ***Figures to the right 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 criterions 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 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 criterion of components for designing of Robotics arm? Explain with example. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE2614

[Total No. of Pages : 2

[6583]-145
T.E. (Instrumentation and Control)
DATA SCIENCE
(2019 Pattern) (Semester - V) (306265 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) ***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) Explain the various mathematical operations that can be performed on arrays using Numpy. **[9]**

b) Give explanation of the various graphical data representation used in Matplotlib. **[9]**

OR

Q2) a) Discuss the differentiation between Data Visualization tools: Matplotlib Vs Seaborn. **[9]**

b) Explain with applications the concepts of append, merge, loc and iloc and concatenation of data. **[9]**

Q3) a) Describe the concept of categorical, numerical data with examples. **[8]**

b) Discuss the various statistical approaches for compensating missing values in a dataset. **[9]**

OR

Q4) a) Analyze the concept of 'Outlier' and discuss the various Outlier detection algorithms. **[9]**

b) Discuss on the analysis of univariate, bivariate data. **[8]**

Q5) a) Explain the concept of 'One Hot Encoding' with example. **[9]**

b) Differentiate between One Hot Encoding and Label Encoding with advantage and applications. **[9]**

OR

P.T.O.

Q6) a) Explain the concept of data scaling. Discuss about Min-max scaling and mean scaling in detail. **[9]**

b) Discuss about the concept of feature selection and how it can affect ML modeling. **[9]**

Q7) a) Differentiate between traditional BI and Tableau. **[8]**

b) Explain the different data types and databases in Tableau. **[9]**

OR

Q8) a) Explain the 'live' and 'extract' connections between Tableau and database in detail. **[9]**

b) Discuss the different types of Charts in Tableau. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2615

[Total No. of Pages : 2

[6583]-147

T.E. (Instrumentation and Control)

BIOMEDICAL INSTRUMENTATION

(2019 Pattern) (Semester - V) (306265 D) (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) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define heart Sound? Draw and Discuss the working principle of Phonocardiography with neat diagram. **[10]**

b) Draw and Discuss the working principle of Cardiac Output with neat diagram. **[7]**

OR

Q2) a) Define Blood Flow. Describe the Working Principle of any one type of Electro-magnetic type Blood Flow meter with neat diagram. **[10]**

b) Draw and Discuss the working principle of Direct Blood pressure measurement with neat diagram. **[7]**

Q3) a) Define Neuron? Draw and Describe the structure of Neurons with neat diagram. **[10]**

b) Explain the working principle of EEG Amplifier with the help of neat diagram. **[8]**

OR

Q4) a) List the different waves and its significance from different parts of the brain. Explain the concept of Electroencephalography with the help of neat diagram. **[10]**

b) Explain the concept of Biofeedback with the help of neat diagram. **[8]**

Q5) a) State the types of Conduction system in ear. Explain the mechanism of hearing system with the help of neat diagram. **[10]**

b) With the help of neat diagram, Explain the Anatomy of Eye. **[7]**

OR

P.T.O.

Q6) a) Define Audiometer? Elaborate on Pure Tone Audiometer system with the help of neat diagram. **[10]**

b) Describe the Visual Acuity (Errors in Vision) and its remedy. **[7]**

Q7) a) Define Regulation of Breathing. Explain the working of Air flow Measurement with the help of neat diagram. **[10]**

b) With the help of neat diagram, Explain the working of Oxygen Gas Analyzer with the help of neat diagram. **[8]**

OR

Q8) a) State the function of Oxygenator. With the help of neat diagram, Explain the working of Oxygenator Type Oxygenators. **[10]**

b) With the help of neat diagram, Explain the working of Ventilators with the help of neat diagram. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2616

[Total No. of Pages : 2

[6583]-148

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 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 Psychrometric chart is allowed.***

Q1) a) Explain the factors that influence thermal comfort in a vehicle's cabin. How does the air distribution system play a role in achieving these comfort conditions? **[8]**

b) Describe the importance of maintaining clean air filters in a vehicle's air distribution system. **[6]**

c) Explain Ventilation System of vehicle. **[4]**

OR

Q2) a) Explain Automotive Heating System with neat diagram. **[6]**

b) Explain different types of Air Filters. **[6]**

c) Explain in brief Cool-down Performance. **[6]**

Q3) a) Explain Psychrometric Properties of Air. **[7]**

b) In a cooling application, moist air enters a refrigeration coil at the rate of 100 kg of dry air per minute at 35^0 C and 50% RH. The apparatus dew point of coil is 5^0 C and by-pass factor is 0.15. Determine the outlet state of moist air and cooling capacity of coil in TR. **[10]**

OR

Q4) a) Explain Psychrometric Processes in short and draw on psychrometric chart outline (any 3). **[7]**

b) 800 m^3/min of recirculated air at 22^0 C DBT and 10^0 C dew point temperature is to be mixed with 300 m^3/min of fresh air at 30^0 C DBT and 50% RH. Determine the enthalpy, specific volume, humidity ratio and dew point temperature of the mixture. **[10]**

P.T.O.

Q5) a) An air-conditioned hall is to be maintained at 27^0C dry bulb temperature and 21^0C 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 38^0C dry bulb temperature and 27^0C wet bulb temperature is 25m^3/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 15^0C. The quantity of recirculated air from the hall is 60%. This quantity is mixed with the conditioned air after the cooling coil. Determine **[18]**

i) condition of air after the coil and before the recirculated air mixes with it.

ii) condition of air entering the hall, e, after mixing with recirculated air.

iii) mass of fresh air entering the cooler:

iv) by-pass factor of the cooling coil, and

v) refrigerating load on the cooling coil.

OR

Q6) a) Explain Outside & inside design considerations 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) Explain Leak detection methods in AC (any 2). **[6]**

b) Explain Refrigerant Handling. **[6]**

c) Explain lubricants used in Refrigeration and AC systems. **[5]**

OR

Q8) a) Explain Pinpoint temperature measurement in AC. **[6]**

b) Explain Automotive AC system flushing. **[6]**

c) Write a short note on Odor removal in AC. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-2617

[Total No. of Pages : 2

[6583]-149
T.E. (Automobile)
AUTOMOTIVE CHASSIS AND TRANSMISSION
(2019 Pattern) (Semester - VI) (316486)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer four questions from the following.***
2) ***Draw the neat sketches wherever required.***

Q1) a) Explain the wheel balancing procedure. **[10]**

b) What are the merits of Tubeless over Tubed Tyres? **[8]**

OR

Q2) a) Explain the construction and working of Hydraulic brake system with neat sketch. **[10]**

b) What are the functions and requirements of braking system? **[8]**

Q3) a) Explain the construction and working of Multiplate clutch with neat sketch. **[10]**

b) Discuss about the clutch plate lining materials. **[7]**

OR

Q4) a) Explain the working of Synchromesh gearbox with neat sketch. **[10]**

b) Discuss about gear selector mechanism. **[7]**

Q5) a) Explain the real axle with types of load acting on rear axle. **[10]**

b) Explain Torque tube Drive with neat sketch. **[8]**

OR

Q6) a) Explain the constructional details of differential with sketch. **[10]**

b) Explain the features of Propeller shaft with types. **[8]**

P.T.O.

Q7) a) Discuss the construction and working of Torque convertor with sketch. **[10]**

b) Explain the construction & working of simple epicyclic gear train. **[7]**

OR

Q8) a) Explain Continuous Variable Transmission with advantages & disadvantages. **[10]**

b) Discuss about fully automatic transmission. **[7]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE2618

[Total No. of Pages : 4

[6583]-150
T.E. (Automobile Engineering)
DESIGN OF ENGINE COMPONENTS
(2019 Pattern) (Semester-VI) (316487)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain the design of lubricating system used in an IC engine. **[7]**

b) Calculate the height and volume of lubricating oil required in sump of a 3.5kw, Single cylinder diesel engine, with the lubricating oil cooling system based on natural convection from the side edges of the sump. Fuel consumption of engine = 1.2 kg/hr, Calorific value of diesel = 42×10^6 J/kg, Assume, 0.006 times of heat of combustion of fuel is absorbed by lubricating oil, convective heat transfer coefficient = 25 W/m^{2}K, Temperature difference between ambient temperature and temperature of lubricating oil as 45 K. Peripheral area of sump size = (30×20) cm. **[10]**

OR

Q2) a) Calculate the Force acting on the rocker arm due to the exhaust valve of a 4 stroke diesel engine. The data for the valve of diesel engine is as follow: **[10]**

Diameter of valve port = 75mm

Diameter of valve head = 84mm

Seat angle of valve = 45º

Mass of valve = 0.5 kg

Speed of engine = 450 rpm

Back pressure when the exhaust valve opens = 0.4 MPa

Maximum suction pressure = 0.02 MPa (below atmosphere)

The valve opens 33º before outer dead centre and closes 1º after inner dead centre. The valve is to open and close with constant acceleration and deceleration for each half of the lift.

b) Explain with neat diagram the poppet valve used in the IC Engine. **[7]**

P.T.O.

Q3) a) Explain the applications of Flywheel with an example. **[5]**

b) A machine is driven by a motor, which exerts a constant torque. The resisting torque of the machine increases uniformly from 700 N-m to 1500 N-m through a 360º rotation of the driving shaft and drops suddenly to 700N-m again at the beginning of next revolution. The mean angular velocity of machine is 30 rad/s and the coefficient of speed fluctuation is 0.2. A solid circular steel disk, 20mm thick, is used as flywheel. The mass density of steel is 7800kg/m^3 while poission's ratio is 0.3. Calculate the outter radius of flywheel disk and maximum stresses induced in it.**[12]**

OR

Q4) a) Explain the stresses in solid disk flywheel. **[5]**

b) The intercepted areas between the output torque curve and the mean resistance line of a turning moment diagram for a multi-cylinder engine, taken in order from one end are as follows:

–35, + 410, –285, + 325, –335, + 260, – 365, + 285, –260 mm^2.

The diagram has been drawn to a scale of 1 mm = 70 N-m and 1 mm = 4.5º. The engine speed is 900 r.p.m. and the fluctuation in speed is not to exceed 0.02 of the mean speed. Find the mass and cross-section of the flywheel rim having 650 mm mean diameter. The density of the material of the flywheel may be taken as 7200 kg / m^3. The spokes, hub and shaft are assumed to contribute 10% of the required moment of inertia. The rim is rectangular with the width 1.5 times the thickness. **[12]**

Q5) a) Explain the different functions of bearings. Also, classify the different types of bearings and briefly explain any one type with neat diagram.**[9]**

b) A single-row deep groove ball bearing is subjected to a pure radial force of 4 kN from a shaft that rotates at 500 rpm. The expected life L_{10h} of the bearing is 30000 hours. The minimum acceptable diameter of the shaft is 40 mm. Select a suitable ball bearing for this application from the manufacturer's catalogue. **[6]**

Principal dimensions (mm)			Basic load ratings (N)		Designation
d	D	B	C	C_0	
40	52	7	4160	3350	61808
	68	9	13300	7800	16008
	68	15	16800	9300	6008
	80	18	30700	16600	6208
	90	23	41000	22400	6308
	110	27	63700	36500	6408
45	58	7	6050	3800	61809
	75	10	15600	9300	16009
	75	16	21200	12200	6009
	85	19	33200	18600	6209
	100	25	52700	30000	6309
	120	29	76100	45500	6409

c) Write the assumptions considered under Stribeck's equation for determining the static load carrying capacity of ball bearing. **[3]**

OR

Q6) a) Explain the selection parameters in bearing design. **[8]**

b) The following data is given for a 360° hydrodynamic bearing: **[10]**

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=l

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate:

i) Dimensions of bearing;

ii) Coefficient of friction;

iii) Power lost in 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	–
	1.0	0	0	0	0	0	0	0
1	0	1.0	∞	(85)	∞	π	0	–
	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

Q7) a) The mechanical efficiency of a single cylinder 4-stroke diesel engine is 80%. The frictional power is estimated to be 25kW. Calculate the indicated power and brake power developed by the engine. **[4]**

b) Write down the design considerations for combustion chamber. **[9]**

c) Enlist the different types of cylinder arrangements in IC Engines. Explain any one in detail. **[5]**

OR

Q8) Write note on: **[18]**

a) Exhaust gas CO and HC analyzer.

b) Cylinder power balance.

c) Distributor dwell angle.



Total No. of Questions : 8]

SEAT No. :

PE2619

[Total No. of Pages : 2

[6583]-151

T.E. (Automobile Engineering)

AUTOMOTIVE AERODYNAMICS NAD BODY ENGINEERING

(2019 Pattern) (Semester - VI) (316488 A) (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 indicate full marks.***

Q1) a) What are the characteristics of external flow on a body? **[9]**

b) Explain in details about **[9]**

i) Climatic tunnels

ii) Small full-scale wind tunnels

iii) Large full-scale wind tunnels

OR

Q2) a) Discuss the effect of aerodynamic noise on the motion of a road vehicle.**[9]**

b) Explain the features of aerodynamic stability of a vehicle and describe the effect of wind forces resulting from non-steady side winds on a vehicle.**[9]**

Q3) a) What are the methods of improving space in cars? Discuss. **[8]**

b) What is the importance of weight to power ratio of a car? **[9]**

OR

Q4) a) Explain the compactness of driver's cabin. **[8]**

b) List out the points to be considered while designing a driver's seat. **[9]**

P.T.O.

Q5) a) What are the possible locations of engine in a bus body layout? **[8]**

b) What is the influence of the floor height in the bus body layout? **[9]**

OR

Q6) a) How does the entrance and exit location influences the bus body layout? **[8]**

b) Explain the constructional details of s conventional bus body. **[9]**

Q7) a) List out the points to be considered for Impact protection from steering controls. **[9]**

b) Explain the longitudinal load and load distribution on vehicle structure. **[9]**

OR

Q8) a) Explain the types of seat used in automobiles. **[9]**

b) Write down the Importance of Bumper in automobile. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2620

[Total No. of Pages : 2

[6583]-152

T.E. (Automobile Engineering)

AUTOMOTIVE MATERIALS

(2019 Pattern) (Semester - VI) (316488 - B) (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 indicate full marks.***

Q1) a) Explain the Reinforcement of fibres in composites. **[9]**

b) Compare Pultrusion with Compression moulding. **[8]**

OR

Q2) a) Explain the Resin transfer moulding. **[9]**

b) Describe the Spray up process. **[8]**

Q3) a) Explain the properties and composition of glass. **[9]**

b) Describe the use of nanoparticles in paints to make them self- cleaning. **[9]**

OR

Q4) a) Explain the various approaches in tempering of glass for shatter resistance. **[9]**

b) Discuss the sequences of application of paint on automotive body. **[9]**

Q5) a) Explain the Electro- or magneto-rheological engine mounts. **[9]**

b) Discuss the use of ER fluids in dampers in automobiles. **[8]**

OR

P.T.O.

Q6) a) Describe the use of ceramics as fuel injectors in automotive engines. **[9]**

b) Explain the powder metallurgy process for making disc brake pads. **[8]**

Q7) a) Explain the criteria for selection of materials for different systems in automobiles. **[9]**

b) Describe the materials developments by Honda. **[9]**

OR

Q8) a) Explain the developments in materials by FIAT. **[9]**

b) Discuss the Ashby charts. **[9]**



Total No. of Questions : 8]

SEAT No. : [ ]

PE-2621

[Total No. of Pages : 3

[6583]-153

T.E. (Automobile)

NUMERICAL & OPTIMIZATION METHOD

(2019 Pattern) (Semester - V) (316481)

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) Obtain the solution of $\frac{dy}{dx} = 3x + y^2$ using the Taylor's series method. Given: $y(0) = 1$. Determine $y(0.1)$. **[9]**

b) $\frac{dy}{dx} = x + 2y,$ for the boundary condition that at $x = 1$, $y = 1$ find y at $x = 1.4$. Take step size h = 0.1. **[8]**

OR

Q2) a) Solve $x^2 \frac{d^2y}{dx^2}(x-2)\frac{dy}{dx} - 3y = 10x$ subject to consideration $y(0) = 0$, $y(0.3) = 10$, h = 0.1 . Solve by finite difference method. **[9]**

b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following condition using Schmidt method at $x = 0$ and $x = 0.5$, $u = 1$ for all values of t at $t = 0$ $u = 2x + 1$ for $0 < x < 0.5$

Take increment in x as 0.1 and increment in t as 0.01

Find all values of u for t = 0 to t = 0.03 **[8]**

P.T.O.

Q3) a) Find the integration of $(4x + 2)$ in the limits 1 to 4 by trapezoidal rule using six strips. **[9]**

b) Evaluate $\int_0^4 e^x dx$ using Simpson $\frac{1}{3}$ Rule using four strips. **[9]**

OR

Q4) a) Solve the trapezoidal rule, for double integration of $f(x) = x^2 y^2\, dx\, dy$ for $x = 0$ to 1 and $y = 0$ to 1. **[9]**

Take step length in x and y as 0.25

b) Find double integration of $f(x) = e^{(x+2y)}$ for $x = 0$ to 1 and $y = 0$ to 1 using Simpson $1/3^{rd}$ rule : Take h = k = 0.5 **[9]**

Q5) a) Determine the maximum value of root of equation $0.51x - \sin x$ by Newton method. Take the initial guess as 2 and do 4 iterations. **[4]**

b) What is optimization? Give a classification of optimization problem. **[4]**

c) Find the initial basic feasible solution for the transportation problem by Vogel's approximation method **[9]**

	D_1	D_2	D_3	D_4	Supply
O_1	11	13	17	14	250
O_2	16	18	14	10	300
O_3	21	24	13	10	400
Demand	200	225	275	250	950

OR

Q6) a) Using Newton method calculates the maximum value of the equation $2\sin x - 0.1x^2$ Take initial guess 2.5 and do 3 iterations. **[4]**

b) Explain constrained optimization. **[4]**

c) Maximize $Z = 6x_1 + 4x_2$ subjected to condition **[9]**

$2x_1 + 3x_2 \leq 100$

$4x_1 + 2x_2 \leq 120$

$x_1, x_2 \geq 0$

Using Simplex method to calculate x_1, x_2 and maximum profit Z.

Q7) a) Explain Genetic algorithms. **[9]**

b) Explain Simulated Annealing. **[9]**

OR

Q8) a) Explain Particle swarm optimization. **[9]**

b) Explain Ant Colony optimization. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2622

[Total No. of Pages : 3

[6583]-154
T.E. (Automobile)
HEAT TRANSFER
(2019 Pattern) (Semester - V) (316482)

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 Local and Average heat transfer coefficient. **[6]**

b) Explain concept of velocity boundary layer. **[6]**

c) Air at 20°C is flowing along a heated plate at 134°C with a velocity of 3 m/s. The plate is 2m long. Heat transferred from first 40cm from the leading edge is 1.45 KW. Determine the width of the plate. **[5]**

Properties of air at 77°C : $\rho = 0.998$ kg/m^3;

$C_p = 1.009$KJ/KgK; $\nu = 20.76 \times 10^{-6}$ m^2/s; k = 0.03W/mK

Use the following correlation

$Nu_x = 0.332\ Re^{0.5}\ Pr^{0.33}$

OR

Q2) a) Define and explain significance of Nusselt number and Prandtl number. **[6]**

b) Define the forced convection and give three practical examples of forced convection. **[5]**

c) For forced convection from a flat plate, the local Nusselt number is given by the following correlations. **[6]**

Laminar : $Nu_x = 0.331\ Re_x^{0.5}\ Pr^{0.33}$

Turbulent : $Nu_x = 0.0288\ Re_x^{0.8}\ Pr^{0.33}$

The fins on an air-cooled motor cycle engine may be considered as individual flat plates of length L= 0.2 m owing to disturbances in the free stream, transition occurs at $Re_{trans} = 2 \times 10^5$. Calculate for a road speed of 140 kmph; the average heat transfer coefficient from the fin surface allowing for separate laminar and turbulent section and compare this result obtained assuming purely turbulent flow.

Assume: $\rho = 1.1$ kg/m^3 , $\mu = 1.7 \times 10^{-5}$kg/ms, k = 0.026W/mk, Pr = 0.7.

P.T.O.

Q3) a) Write the characteristics dimension for following cases in natural convection. **[4]**

i) Vertical cylinder

ii) Horizontal cylinder

iii) Horizontal plate

iv) Sphere

b) Show that the coefficient of volumetric expansion for an ideal gas is $\beta=1/T$, where T is absolute temperature of gas. **[4]**

c) Find rate of heat loss from a cubical furnace kept on a concrete floor, if the outside surface temperature of the furnace is 80ºC and the surrounding air at 20°C. Sides of furnace are 1m each . Neglect radiation mode of heat transfer. **[10]**

Use:

i) $Nu = 0.13(GrPr)^{1/3}$ for vertical surfaces.

ii) $Nu = 0.13(GrPr)^{1/3}$ for horizontal surfaces.

At 50°C, the properties of air :

$\rho = 1.013$ kg/m^3, $\nu = 17.95 \times 10^{-6}$ m^2/s

$\mu = 19.6 \times 10^{-6}$ Ns/m^2.

$C_p = 1005$ J/KgK, $k = 0.0283$W/mK

$Pr = 0.698$

OR

Q4) a) Differentiate between filmwise and drop wise condensation . Which type of condensation is desirable and which type of condensation occurs in actual? State. **[8]**

b) A sheet metal air duct carries air-conditioned air at an average temperature of 10°C. The duct size is 320 min × 200 mm and length of the duct exposed to the surrounding air at 30°C is 15 m long. Find the heat gain by the air in the duct. Assume 200 mm side is vertical surface and top surface of the duct is insulated. Use the following properties: **[10]**

$Nu = 0.6\ (GrPr)^{0.25}$ for vertical surface.

$Nu = 0.27\ (GrPr)^{0.25}$ for horizontal surface

Take the properties of the air at mean temperature of 20°C

$\rho = 1.204$ kg/m^3; $\mu = 18.2 \times 10^{-6}$ Ns/m^2; $\nu = 15.1 \times 10^{-6}$m^2/s;

$k = 0.0256$ W/mK and $Pr = 0.71$.

Q5) a) Draw labeled temperature profiles of the following types of heat exchangers **[4]**

i) Parallel flow heat exchanger

ii) Counter flow heat exchanger

b) What do you mean by fouling in heat exchangers? State the causes of fouling. **[5]**

c) A counter flow double pipe heat exchanger using superheated steam is used to heat water at the rate of 10500 kg/hr. The steam enters the heat exchanger at 180° C and leaves at 130°C. The inlet and exit temperature of water are 30°C and 80°C respectively. If the overall heat transfer coefficient from steam to water is 814 $W/m^2°C$, calculate the heat transfer area. What would be the increase in area if the fluids flows were parallel. **[8]**

OR

Q6) a) What is LMTD for a heat exchanger? Derive an expression for LMTD of parallel flow heat exchanger. **[10]**

b) Explain the concept of overall heat transfer coefficient in shell and tube type of heat exchanger. **[7]**

Q7) a) What is solid angle? Explain with diagram. **[6]**

b) Define Kirchhoff's law and prove that when the black body is thermally equilibrium with the surrounding its emissivity is equal to absorptivity. **[4]**

c) Two parallel planes with emissivity 0.6 are at 900 K and 300K. A radiation shield with side polished and having emissivity of 0.05, while emissivity of other side is 0.4 is proposed to be used. Which side of the shield to face the hotter plane, If the temperature of the shield kept to be minimum? Justify your answer. **[8]**

OR

Q8) a) Define black body radiations, Radiocity and Irradiation with their characteristics. **[6]**

b) Define total emissive power and Intensity of radiation. **[4]**

c) A hot water radiator of overall dimensions $2 \times 1 \times 0.2$m is used to heat the room at 18°C. The surface temperature of radiator is 60°C and its surface is black. The actual surface of radiator is 2.5 times the area of its envelope for convection for which the convection coefficient is given by $hc=4.51W/m^2K$ calculate the rate of heat loss from the radiator by convection and radiation. **[8]**



Total No. of Questions : 8] **SEAT No. :**

PE2623 **[Total No. of Pages : 2**

[6583]-155

T.E. (Automobile Engineering)

DESIGN OF MACHINE COMPONENTS

(2019 Pattern) (Semester - V) (316483)

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

Instructions to the candidates:

1) ***Answer Four questions from the following.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) A power screw of square threaded type has a nominal diameter of 30 mm and pitch of 6 mm with double threads. The load on the screw is 6 KN and the mean diameter of thrust collar is 40 mm. The coefficient of friction for the screw is 0.1 and for the collar is 0.9. Determine the torque required to raise the load and torque required to lower the load. **[12]**

b) Deduce an expression for torque required to lower the load in power screws. **[6]**

OR

Q2) a) Explain the types of fastenings. **[6]**

b) A double riveted lap joint is made between 15 mm 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) Explain about S-N diagram. **[7]**

b) Derive soderberg equation. **[10]**

OR

Q4) a) Narrate the causes of stress concentration and the methods to improve the same. **[10]**

b) A mass of 500Kg is being lowered by means of steel wire rope having cross sectional area 250mm^2. The velocity of weight is 0.5m/sec. When the length of extended rope is 20m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take E = 0.8×10^6 Mpa. **[7]**

P.T.O.

Q5) a) Discuss about herringbone gears with sketch. **[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 α = 20°FDI, β = 45°. σ_d = 193.2Mpa, BHN = 250 for pinion and gear. Check only tangential tooth load.
Y=π (0.154-0.912/Z_e), C_v=5.55/5.55+$V^{0.5}$ **[12]**

OR

Q6) a) Explain spur gear nomenclature. **[6]**

b) A spur gear set to transmit 20 KW at 900rpm of pinion. The transmission ratio is 7/3:1. Take 20° FDI, Z_1 = 18, σ_d = l40Mpa for pinion and σ_d = 55Mpa for gear. The diameter of the pinion is 105 mm. Design number of teeth, module and face width for strength only.
Y= π (0.154-0.912/Z), C_v =3.05/3.05+V **[12]**

Q7) Worm and worm wheel is to transmit 10 KW with transmission ratio 20:1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take σ_d =207 Mpa, for worm and σ_d =82.4 Mpa, for worm wheel. Form factor Y= π (0.154-0.912/Z). **[17]**

OR

Q8) A pair of bevel gears are connected by 20° full depth involute teeth. 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 σ_d = 233.4 Mpa, BHN = 200 for pinion and σ_d = 172.6 Mpa, BHN=150 for gear. Form factor Y= π (0.154- 0.912/Z_e), C_v=6.1/6.1+V **[17]**



Total No. of Questions : 8] **SEAT No. :**

PE2624 **[Total No. of Pages : 2**

[6583]-156

T.E. (Automobile)

AUTOMOBILE ELECTRICAL AND ELECTRONICS

(2019 Pattern) (Semester - V) (316484)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Write down the principle and construction of starter motor. **[6]**

b) Explain with neat sketch the starter motor characteristics. **[6]**

c) Discuss the selection of cranking motor with the help of performance curve. **[6]**

OR

Q2) a) Explain the construction and working of alternator. **[8]**

b) Explain working of Fuel Gauge. **[10]**

Q3) a) Write a note on injection timing control. **[5]**

b) Write down the design considerations of Starter Motor. **[5]**

c) Explain working of Oil Pressure Gauge. **[7]**

OR

Q4) a) What are the 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]**

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

P.T.O.

Q6) a) Explain CRDI system with neat sketch. **[5]**

b) Explain collision avoidance system with layout. **[5]**

c) Write short note on Smart Parking Assist System (SPAS) **[7]**

Q7) a) Explain Radar Warning System. **[6]**

b) What is Driver State Monitoring? Explain in brief. **[6]**

c) Explain MPFI system with neat sketch. **[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. : ____

PE2625

[Total No. of Pages : 2

[6583]-157

T.E. (Mechanical/Automobile)

ADVANCED FORMING AND JOINING PROCESSES

(2019 Pattern) (Semester - V) (302045A) (Elective - I) (Theory)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right 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 principle 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]**

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Total No. of Questions : 8]

SEAT No. :

PE2626

[Total No. of Pages : 2

[6583]-158

T.E. (Mechanical)/(Automobile)

MACHINING SCIENCE & TECHNOLOGY

(2019 Pattern) (Semester - V) (302045B) (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) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain and classify grinding wheels selection factors. **[10]**

b) Explain honing process with neat sketch and state its applications. **[7]**

OR

Q2) a) Explain Ball burnishing process with neat sketch. State its advantage and applications. **[10]**

b) How is a grinding wheel mounted on the spindle? What precautions should be taken when mounting a grinding wheel? **[7]**

Q3) a) Define jig and fixture. Differentiate between them with suitable examples. Write industry significance for jig and Fixture.(Minimum Five points).**[10]**

b) With neat sketch describe the concept of degree of freedom. Explain the six point location principle with neat sketch. **[8]**

OR

Q4) a) What is indexing in jig and fixture? Explain with neat sketch indexing jig. **[10]**

b) Explain with neat sketch inspection fixture. **[8]**

P.T.O.

Q5) a) Evaluate the phase of drawing interpretation in process planning activity. **[9]**

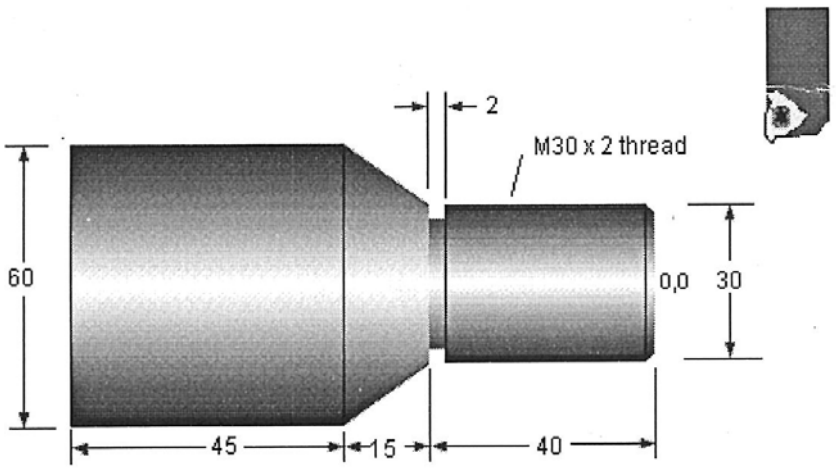
b) Explain production equipment & tooling selection in process planning. **[8]**

OR

Q6) a) Explain with neat sketch and the steps followed for material selection process and methods. **[9]**

b) Explain with flowchart process selection. **[8]**

Q7) a) Generate CNC part programming for the below part which requires only threading operation as shown. **[10]**



b) Explain the steps involved in CNC part programming. **[8]**

OR

Q8) a) What is tool length and cutter radius compensation used in CNC part program? Explain with neat sketches. **[10]**

b) Explain with figure circular and linear interpolation functions used in CNC programming. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2627

[Total No. of Pages : 3

[6583]-159
T.E. (Mechanical)
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(2019 Pattern) (Semester - VI) (302049)

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, wherever necessary.***
5) ***Use of electronic pocket calculators is allowed.***

Q1) a) Describe the difference between decision trees and random forests, discuss advantages and disadvantages of using random forests over a single decision tree. **[8]**

b) Define the K-Nearest Neighbor (KNN) clustering algorithm. Explain how KNN differs from K-Means and discuss its key, parameters. **[9]**

OR

Q2) a) Write a short note on : **[8]**

i) Entropy

ii) Information Gain

b) Given following dataset, Find out it is likely that *Blue Jeans from Brand X* would be on Sale Using Bayes Classifier. **[9]**

Colour	Cloth Type	Brand	On Sale?
Blue	Jeans	Y	Yes
Blue	Shirt	X	No
Blue	Jeans	Y	Yes
Black	Jeans	Y	Yes
Black	Jeans	X	No
Black	Shirt	X	Yes
Black	Shirt	Y	Yes
Blue	Jeans	Y	No
Black	Jeans	X	Yes
Blue	Shirt	X	Yes

P.T.O.

Q3) a) What is training data? What is labeled data? What is unlabeled data? What are key steps involved in developing training data? **[8]**

b) Explain different performance evaluators used for interpretation/ assessment of classification models. Explain 2 × 2 confusion matrix and explain its terminology. Explain Cohen's Kappa, F Score, ROC Curve. **[10]**

i) Accuracy ii) Precision

iii) Recall iv) Fl Score

OR

Q4) a) From the below confusion matrix, determine accuracy, recall,precision, F1-score, True Positive Rate (TPR), False Positive Rate (FPR), True Negative Rate (TNR), and False Negative Rate (FNR). Interpret the Result. **[10]**

		Actual Values	
		1	0
Predicted Values	1	540	150
	0	110	200

b) You are a data scientist working for a healthcare organization where a machine learning model has been developed to predict the risk of patients developing a specific medical condition based on their health indicators. The model's predictions were as follows: it correctly identified 350 cases as negative and 270 cases as positive. However, it misclassified 50 cases as negative when they were positive, and 30 cases as positive when they were negative. Prepare confusion matrix and calculate the following parameters to evaluate the model's performance i) Accuracy ii) Precision iii) Recall (Sensitivity) iv) Fl-score Interpret the Result. **[8]**

Q5) a) Explain any five applications of reinforced and deep learning in mechanical engineering. **[10]**

b) Explain Convolution Neural Network (CNN) using a neat flow diagram. Discuss in brief different types of pooling and padding used in CNN.**[8]**

OR

Q6) a) A neuron with 4 inputs has the weights 0.3, 0.2, 01, 0.5 and bias 0. The activation function is linear, say the function $f(x) = 2x$. If the inputs are 0.8, 0.3, 0.2, 0.1 compute output and compare it with a neuron with same input parameters but with tanh and sigmoid activation function and interpret the result. **[10]**

b) Explore value-based, policy-based, and model-based reinforcement learning approaches with examples. **[8]**

Q7) a) How deep learning can be used for image classification? **[8]**

b) Explain in detail how machine learning is used for fault detection in the manufacturing industry. **[9]**

OR

Q8) a) Write a short note on use of AIML in tuning of control algorithms with example. **[8]**

b) Explain in detail different applications of AIML. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PE2628

[Total No. of Pages : 4

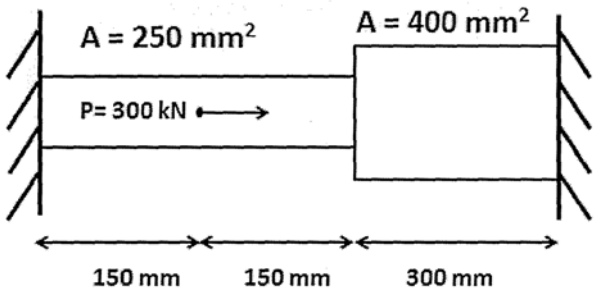
[6583]-160
T.E. (Mechanical)
COMPUTER AIDED ENGINEERING
(2019 Pattern) (Semester - VI) (302050)

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

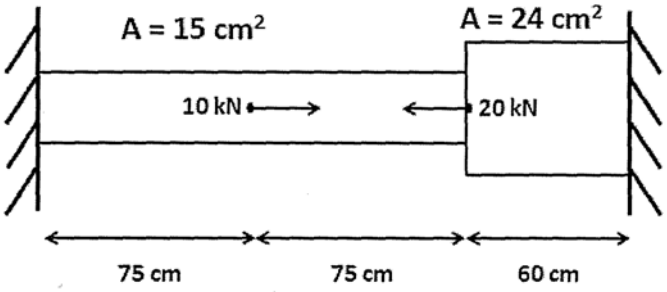
Instructions to the candidates:

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

Q1) a) A stepped bar subjected to an axial load of 300 kN as shown in figure. Find the nodal displacement, element stress and support reaction. Consider E = 200 GPa **[12]**



b) For a stepped bar as shown in figure determine load vector. **[6]**



Consider : $E = 20 \times 10^6 N/cm^2$

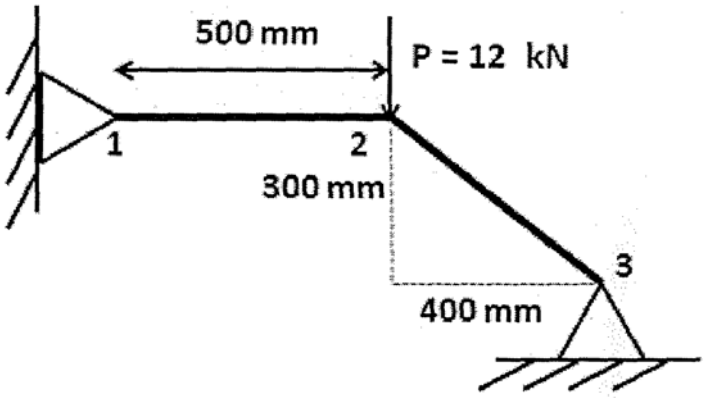
$\Delta t = 10^oC$

$\alpha = 11 \times 10^{-6}$ cm/cm^oC

OR

P.T.O.

Q2) a) For the two bar truss element determine the displacements at node 2.**[12]**



For both element consider

E = 70 Gpa

A = 200 mm^2

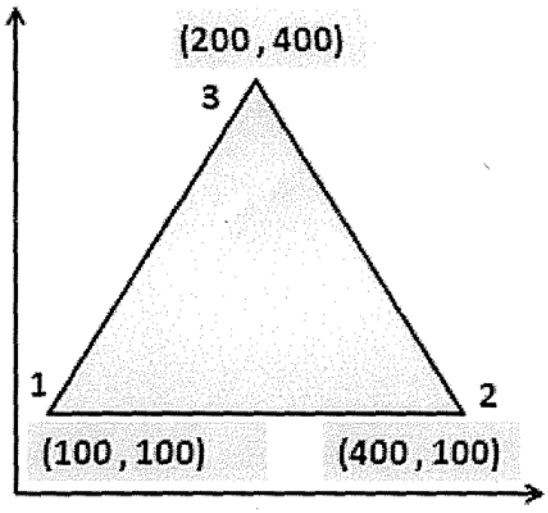
b) State and explain the concept of minimum potential energy approach.**[6]**

Q3) a) For the place stress element the nodal displacement are **[12]**

u_1 = 2.0 mm, u_2 = 1.0 mm u_3 =2.5 mm

v_1= 1.0 mm V_2= 1.5 mm V_3= 0.5 mm

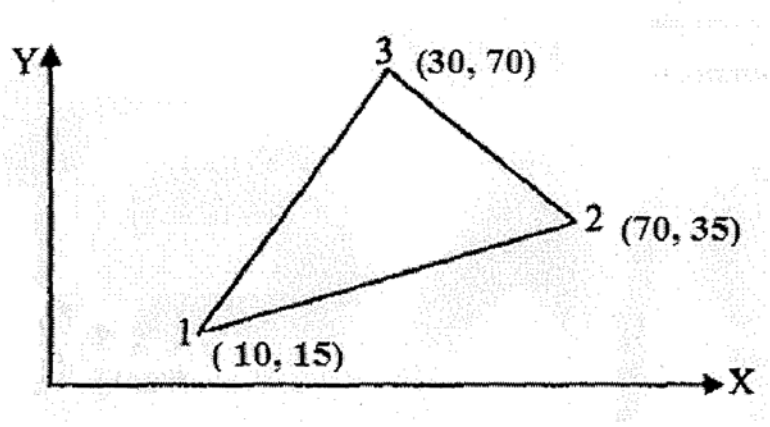
Determine element stress. Assume E = 200 GN/m^2 μ = 0.3.



b) How to verify (check) accuracy and validate the result in Computer Aided Engineering? **[6]**

OR

Q4) a) A CST element has nodal coordinates are (10, 15), (70, 35) and (30, 70) for node 1, 2 and 3 respectively. The element has material property as E = 200 GPa and μ = 0.3. **[12]**



The deflection observed in these nodes are;

u_1 = 0.01 mm, u_2 = 0.03 mm u_3 = –0.02 mm

v_1 = –0.02 mm V_2 = 0.02 mm V_3 = 0.05 mm

Assume Plane stress condition.

Determine:

i) The Stresses

ii) The stains

b) How to interpret the CAE result and what modifications are suggested based on it. **[6]**

Q5) a) What is nonlinearity? What are the different kinds of geometric non-linearities in CAE project? Explain with figures. **[9]**

b) Describe the solution techniques for nonlinear analysis. **[8]**

OR

Q6) a) Explain modal analysis, harmonic analysis and transient analysis to study the dynamic properties of the structures. **[9]**

b) Explain the following terms in dynamic analysis **[8]**

- Time domain analysis
- Frequency domain analysis

Q7) a) What are the Benefits of CFD Analysis? Also explain its application in following industry. **[9]**

- Aircraft industry
- Automobile industry
- Civil industry

b) What is durability, reliability and fatigue? Explain S-N Curve with low cycle, high cycle fatigue life. **[8]**

OR

Q8) a) Explain in detail what different types of analysis need to be consider while making a motor car. **[9]**

b) Elaborate the use of CAE in casting and sheet metal simulations. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2629

[Total No. of Pages : 3

[6583]-161
T.E. (Mechanical)
DESIGN OF TRANSMISSION SYSTEM
(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 Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to Right indicates full Marks.***
4) ***Assume Suitable data wherever if necessary.***

Q1) a) A single-row deep groove ball bearing is subjected to a 30 second work cycle that consists of the following two parts: **[10]**

	Part 1	Part 2
Duration (S)	10	20
Radial load kN	45	15
Axial load kN	12.5	6.25
Speed rpm	720	1440

The static and dynamic load capacities of the ball bearing are 50 and 68 kN respectively. Calculate the expected life of the bearing in hours. X and Y factors for single row deep groove ball bearing

$[F_a/C_0]$	$[F_a/F_r] \leq e$		$[F_a/F_r] > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

b) Derive the Stribeck equation for the static capacity of bearings. State the assumption made. **[7]**

OR

P.T.O.

Q2) a) Explain with a neat sketch hydrodynarnic bearing and derive Petroff's equation for hydrodynamic bearing. **[9]**

b) Explain design variables and performance variables of hydrodynamic journal bearing. **[8]**

Q3) a) With the help of neat sketch, explain the working of cone clutch, state its advantages, limitations and applications. **[10]**

b) Draw a neat sketch and explain centrifugal clutch. **[7]**

OR

Q4) a) Draw a figure for the internal expanding shoe brake and write the assumptions on which its analysis depends. Also state the advantages and disadvantages of the internal expanding shoe brake. **[9]**

b) Explain the band brake with a neat sketch and find the effort applied at the end of the lever for Simple band brakes also state the advantages and disadvantages of band brakes. **[8]**

Q5) a) Draw the structure diagrams for the following structural formulae and identify the optimum structural formula out of them. Draw the gearing diagram for the structural formula. **[10]**

i) 2(1) 3(2)

ii) 2(3) 3(1)

iii) 3(2) 2(1)

iv) 3(1) 2(3)

b) Differentiate between structure diagram and speed diagram. **[8]**

OR

Q6) a) A six speed gear box is to be designed for a machine tool drive. The spindle speeds range between 200 rpm and 1200 rpm. If the gear box is driven by 8 KW, 1200 rpm electric motor through the belt drive **[10]**

i) Draw the speed diagram

ii) Draw the gearing diagram

b) Explain in detail Arithmetic Progression and Geometric Progression laws for stepped regulation of speeds in multi-speed gear boxes. **[8]**

Q7) a) Explain a hybrid electric vehicle with the help of a block diagram and state its advantages and disadvantages. **[10]**

b) Define Degree of Hybridization. Explain in details Micro Hybrid and Mild Hybrid. **[8]**

OR

Q8) a) Explain Power Split Device with neat sketch. **[10]**

b) Explain the sizing performance for HEV components. Explain the optimal sizing in HEV components. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2630

[Total No. of Pages : 2

[6583]-162
T.E. (Mechanical)
COMPOSITE MATERIALS
(2019 Pattern) (Semester - VI) (302052 - 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, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) What is MMC? Explain their mechanical properties. **[9]**

b) What are the different types of reinforcement in MMC? Explain any two in details. **[9]**

OR

Q2) a) What is the Powder Metallurgy Process for MMC? What are the steps of Powder Metallurgy Process? **[9]**

b) Write Short Note on **[9]**

i) Squeeze casting

ii) A spray process

Q3) a) Write Short Note On **[8]**

i) Micromechanics of a Lamina

ii) Unidirectional continuous fiber

b) The following data is obtained from the burn-out test conducted in a glass- epoxy composite. Weight of empty crucible is 46.5 g. Weight of crucible and composite is 66.3 g. Weight of crucible and glass fiber is 58.6 g. Find the volume fraction of fiber and actual density of composite. Take density of glass fiber as 2.49 g/cm^3 and that of matrix as 1.1 g/cm^3.**[9]**

OR

P.T.O.

Q4) a) Find the major and minor Poisson's ratio of a glass/epoxy lamina with a 70% fiber volume fraction. Take poisons ratio of fiber (0.2 = ν_f ; ν_m = 0.3, E_f = 85 GPa; E_m = 3.4 GPa). **[9]**

b) Explain any four ultimate strength parameters for a unidirectional lamina.**[8]**

Q5) a) List and explain any four types of mechanical test in short. **[8]**

b) Write Short Note on **[9]**

i) Ply adhesion ASTM F904

ii) Double cantilever beam test

iii) End notch flexure test and its purpose

OR

Q6) a) Explain nondestructive inspection of composites. What are the most commonly used NDT methods in composites with short description?**[9]**

b) How are ASTM and ISO standards for a composite material classified?**[8]**

Q7) a) Write a short note: **[9]**

i) multi-material technology

ii) applications of Composite for the Transportation Sector

iii) applications of Composite for the Automobile Industry

b) Describe in detail the Light Combat Helicopter (LCH) and Light Combat Aircraft (LCA). Also, List the numerous uses of composite materials in the aerospace sector. **[9]**

OR

Q8) a) What are the advantages and applications of composites in the sport industry? **[9]**

b) List & describe the applications of composite for the energy sector. **[9]**

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. : ____

PE2631

[Total No. of Pages : 2

[6583]-163
T.E. (Mechanical Engineering)
SURFACE ENGINEERING
(2019 Pattern) (Semester - VI) (302052 - B) (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 indicate full marks.***
4) ***Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define Diffusion. Explain diffusion process with example. State applications of diffusion process. **[9]**

b) Explain drip feed carburizing process in detail. List the advantages and limitations of this process. **[8]**

OR

Q2) a) Explain the principles behind flame hardening and its applications in different industries. **[7]**

b) Draw neat labeled sketch of the following surface hardening. processes and mention medium used, temperature range, case depth and time required for each process. **[10]**

i) Solid Carburizing Process

ii) Liquid Carbonitriding Process

Q3) a) Why coating is required to increase corrosion resistance of components? List various types of corrosion resistance coating methods. **[8]**

b) Write a short note on : **[10]**

i) Laser Surface Alloying Process

ii) Chemical Conversion Coatings

OR

P.T.O.

Q4) a) Explain the dielectric coatings of Si-C alloy films and their role in wear resistance. **[8]**

b) Discuss Electroless Copper, Gold and Nickel coating. How they differ from electrolytic coating process. **[10]**

Q5) a) Explain cold spray coating process. State the advantages, limitations and application. **[7]**

b) What do you mean by Anodic and Cathodic type of coating? Explain following processes in detail. **[10]**

i) Electrodeposition Process

ii) Hot Dipping Process

OR

Q6) a) Explain the spraying process for applying inorganic coatings and its advantages in surface protection. **[7]**

b) Explain the purpose and characteristics of the following organic coating systems. **[10]**

i) Prime Coating

ii) Hard-Facings

Q7) a) Differentiate between Overspray and Dry Spray coating defects. **[8]**

b) What are general causes of coating defects? Write causes and remedies for the following coating defects. **[10]**

i) Bubbling

ii) Pin-Holing

iii) Blistering

iv) Cratering

OR

Q8) a) State Non-Destructive film thickness measurement processes. How Film Thickness is measured using eddy currents? **[9]**

b) What are the requirement and use of spectroscopic analysis of modified surfaces? List applications of it. **[9]**



Total No. of Questions :8]

SEAT No. : ____

PE2632

[Total No. of Pages : 3

[6583]-164

T.E. (Mechanical/Mechanical-Sandwich)

NUMERICAL AND STATISTICAL METHODS

(2019 Pattern) (Semester-V) (302041)

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 Scientific Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Find double integral of $f(x,y) = x^3 + y^2 - 5$ 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. **[12]**

b) Draw a flow chart for Gauss 2 Point formula to evaluate integration of any function. **[6]**

OR

Q2) a) Find integration of $x^3 + y^2 - 5$ in limits 0 to 1 by using 3-point Gauss Legendre formula with 6 strips. **[5]**

b) Draw a flow chart for Trapezoidal rule to evaluate integration of any function. **[5]**

c) The data listed in table gives measurements of heat flux *q* at the surface of a solar collector. Estimate the total heat absorbed by a 2×10^5 cm^2 collector panel during 14 hours period. The panel has an absorption efficiency $\varepsilon = 42\%$. The total heat absorbed is given by, $H = \varepsilon \int qA.t0dt$ where A is area, q is heat flux and t is time **[8]**

t(hr)	0	1	2	3	4	6	8	11	14
Q(cal/cm^2hr)	0.05	1.72	5.23	6.38	7.86	8.05	8.03	5.82	0.24

P.T.O.

Q3) a) Fit a parabola of the form $y = a + bx + cx^2$. Using the least square method to the following data. **[9]**

x	–2	–1	0	1	2
y	–2	5	8	7	2

b) The following data gives the values of y corresponding to certain values of x. Find the value of x when y= 167 by applying Lagrange's method. **[9]**

x	1	2	5	7
y	1	12	117	317

OR

Q4) a) From the following table of yearly premium for policies maturing at coming ages, estimate the premiums for policies maturing at the age of 46 years. Use suitable method **[10]**

Age	x:	45	50	55	60	65
Premium	y:	2.871	2.404	2.083	1.862	1.712

b) Fit a straight line of the form $y = a + bx$ to the following data by the leastsquare method. **[8]**

x	–2	1	3	6	8	9
y	17	14	12	9	7	6

Q5) a) Illustrate the following statistical diagrams with real life example **[8]**

i) Coefficient of variation

ii) Histogram

iii) Pie chart

b) Runs scored in 10 matches of current IPL season by two batsmen A and B are tabulated as under **[9]**

Batsman A	46	34	52	78	65	81	26	46	19	47
Batsman B	59	25	81	47	73	78	42	35	42	10

Decide who better batsman is and who is more consistent.

OR

Q6) a) Find the correlation coefficient between age in years (x) and glucose level (y) from the data of 5 people as follows. **[7]**

x	43	22	25	42	58
y	99	65	79	75	87

b) Compute Karl Pearson's coefficient of correlation between X and Y for the following data: **[10]**

X	100	98	78	85	110	93	80
Y	85	90	70	72	95	81	74

Q7) a) From the following data of marks obtained by 8 students in Numerical and Statistical methods (NSM) and Heat and mass transfer (HMT) papers, compute rank coefficient of correlation. **[9]**

NSM	15	20	28	12	40	60	20	80
HMT	40	30	50	30	20	10	30	60

b) In a distribution of 'NSM' marks exactly normal, 7% of students are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. [A_1= 0.43, Z_1=1.48, A_2 = 0.39, Z_2=1.23] **[8]**

OR

Q8) a) A bank utilizes four 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	Number of Customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows.

[Given χ^2=7.815] [Use 5% level of significance]

b) Let F: $R^4 \rightarrow R^3$ be the linear mapping defined by F*(x, y, z, t) = (x-y+z+t,* $x+2z-t$, *x+y+3z-3t)*. Find a basis and the dimension of **[8]**

i) The image of F,

ii) The kernel of F.



Total No. of Questions : 8]

SEAT No. : ____

PE2633

[Total No. of Pages : 3

[6583]-165
T.E. (Mechanical/Mechanical - S.W.)
HEAT AND MASS TRANSFER
(2019 Pattern) (Semester - V) (302042)

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

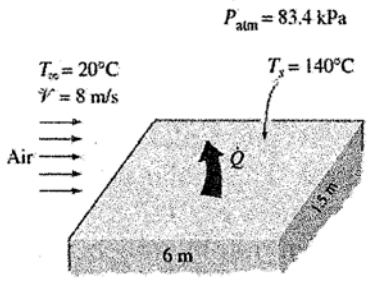
Instructions to the candidates:

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 wherever necessary.***

Q1) a) The local atmospheric pressure in Denver, Colorado (elevation 1610 m), is 83.4 kPa. Air at this pressure and 20°C flows with a velocity of 8 m/s over a 1.5 m 6 m flat plate whose temperature is 140°C (Figure). Determine the rate of heat transfer from the plate if the air flows parallel to the **[9]**

i) 6-*m*-long side and

ii) the 1.5-*m* side.



Properties : k = 0.02953 W/m ºC Pr = 0.7154 υ @ 83.4kPa = 2.548×10^{-5} m^2/s
Use the correlation for Turbulent Flow Nu = $(0.037\ Re_L^{0.8} – 871)Pr^{1/3}$.

b) When 0.5 kg of water per minute is passed through a tube of 20 mm diameter, it is found to be heated from 20°C to 50°C. The heating is accomplished by condensing steam on the surface of the tube and subsequently the surface temperature of the tube is maintained at 85°C. Determine the length of the tube required for fully developed flow.
Take the thermo-physical properties of water at 60°C as: ρ = 983.2 kg/m^2, C_p = 4.178 kJ/kgK, k = 0.659 W/m°C, $\nu = 0.478 \times 10^{-6}$ m^2/s For Laminar and fully development flow N*u* =3.65 **[9]**

OR

P.T.O.

Q2) a) Explain pool boiling and Regimes of pool boiling. **[8]**

b) Differentiate between Thermal Boundary layer and Hydrodynamic boundary layer. **[6]**

c) Explain significance of Grashoff number and Nusselt number. **[4]**

Q3) a) What do you understand by surface resistance and space resistance? **[7]**

b) Explain the following **[10]**

i) Stefan's Boltzmann's law

ii) Wiens Displacement law

iii) Kirchoff's law

iv) Plank's law

OR

Q4) a) A sphere of radius 5cm is concentric with another sphere. Find the radius of the outer sphere so that the shape factor of outer sphere with respect to the inner sphere is 0.6. Let shape factor of inner with respect to the outer sphere is 1. **[8]**

b) Determine the radiant heat exchange in W/m^2 between two large plates of emissivities 0.8 and 0.3 held at temperatures of 1000 K and 500 K respectively, if a thin copper plate of emissivity 0.1 is introduced as a radiation shield between the two plates. Use $\sigma = 5.67 \times 10^{-3}$ W/m^2K^4. **[9]**

Q5) a) A steel rectangular container having walls 16mm thick is utilized to store hydrogen gas at elevated pressure. The molar concentrations of hydrogen in the steel at the inside and outside surfaces are 1.2kg $mole/m^3$ and zero respectively. Assuming the diffusion coefficient for hydrogen in steel as $0.248 \times 10^{-12} m^2/s$, Calculate the molar diffusion flux for hydrogen through the steel. **[9]**

b) Define: **[8]**

i) Mass Diffusion velocity

ii) Molar Diffusion velocity

iii) Mass Diffusion Flux

iv) Molar Diffusion Flux

OR

Q6) a) State and explain Fick's law for mass diffusion. **[8]**

b) Pipe carrying ammonia at 1 bar and 40°C is vented into a large tank containing dry air at 1 bar and 40°C to avoid pressure build up. The pipe is 5 mm in diameter and 5 m long. Determine the rate of diffusion of air into the ammonia stream. Take $D = 0.28 \times 10^{-4}$ m^2/s as diffusion coefficient or mass diffusivity. **[9]**

Q7) a) Derive an expression for LMTD of a Parallel flow heat exchanger. **[8]**

b) Define following terms. **[10]**

i) Fouling factor

ii) Capacity ratio

iii) Effectiveness

iv) NTU

v) Over all heat transfer coefficient

OR

Q8) a) Derive an expression for effectiveness of a parallel-flow heat exchanger in terms of NTU and capacity ratio. **[8]**

b) In a counter flow double pipe heat exchanger, water is heated from 25°C to 65°C by an 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 the overall heat transfer coefficient is 420 $W/m^{2o}C$, calculate the following **[10]**

i) The rate of heat transfer

ii) The mass flow rate of water and

iii) The surface area of the heat exchanger.



Total No. of Questions : 8] **SEAT No. :**

PE2634 **[Total No. of Pages : 4**

[6583]-166

T.E. (Mechanical) (Mechanical Sandwich Engg.)
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, 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 expression for torque required to raise the load with suitable sketch. **[6]**

b) A 26×5 square threaded, single start power screw is used to support a load of 12 KN. The effective diameter to the collar is 46 mm and the coefficient of friction is 0.15. The nut is made of phosphor bronze having 0.12 as coefficient of friction and 6 MPa as allowable bearing pressure. The length of handle is 300 mm. Calculate: **[12]**

i) The force required to raise the load;

ii) The force required to lower the load;

iii) The yield strength of material for a factor of safety of 4;

iv) The overall efficiency of the screw and

v) The number of threads in nut.

OR

Q2) a) Explain with neat sketch recirculating ball screw and state it's application. **[6]**

b) The load screw of a lathe has a single start I.S.O metric trapezoidal threads of 52 mm nominal diameter and 8 mm pitch. The screw is required to expert on axial force of 2 KN in order to drive the tool carriage during the turning operation. The thrust is carried on collar of 100 mm outer diameter and 60 mm inner diameter. The value of coefficient of friction at the screw threads and collars are 0.15 and 0.12 respectively. If the load screw rotates at 30 r.p.m Calculate: **[12]**

i) The power required to drive the lead screw.

ii) The efficiency of screw.

Evaluate the result using Uniform wear theory.

P.T.O.

Q3) a) Explain with neat sketch the Gerber curve, Soderberg and Goodman lines? **[5]**

b) The work cycle of mechanical component subjected to completely reversed bending stresses consist of following three elements. **[12]**

i) ± 350 N/mm^2 for 85 % of time.

ii) ± 500 N/mm^2 for 3 % of time.

iii) ± 400 N/mm^2 for remaining time.

The component is made of plain carbon steel 50C4 (Sut = 660 N/mm^2). If endurance limit of component is 280 N/mm^2 , determine its life.

OR

Q4) a) What is stress concentration? State various causes of stress concentration? Explain any two methods to reduce it. **[5]**

b) A cantilever beam made of cold drawn steel 20C8 (Sut = 540 N/mm^2) is subjected to a completely reversed load of 1000 N as shown in Fig1. The notch sensitivity factor q at the fillet can be taken as 0.85 and the expected reliability is 90%. Determine the diameter d of the beam for a life of 10000 cycles. Assume surface finish, size and reliability factors are 0.78,0.85 and 0.897 respectively. Also assume K_t = 1.35. **[12]**

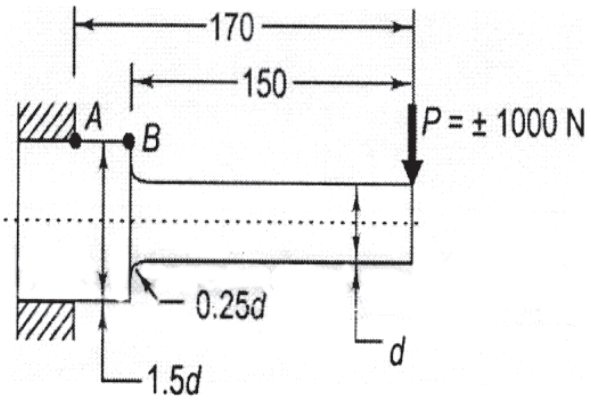


Fig1.

Q5) a) Write a note on bolt of uniform strength and explain the methods for achieving bolts of uniform strength. **[5]**

b) A steel plate subjected to a force of 5 kN and fixed to a channel by means of three identical bolts is shown in Fig2.The bolts are made from plain carbon steel 45C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 3. Specify the size of bolts. **[12]**

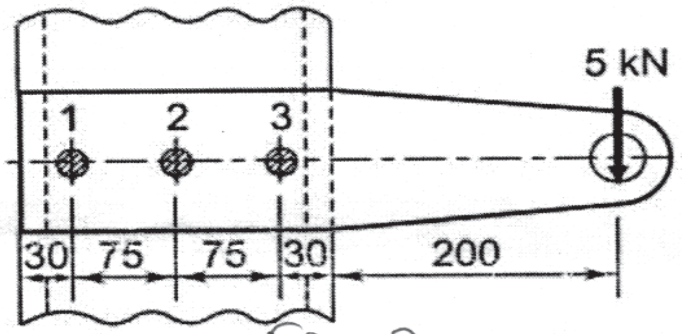


Fig. 2

OR

Q6) a) Explain the design procedure for the welded joint subjected to the Bending Moment. **[5]**

b) A steel plate, 100mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds, as shown in Fig3.The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 70 and 50 N/mm^2 respectively. Find the length of each parallel fillet weld. Assume the tensile force acting on the plates as static. **[12]**

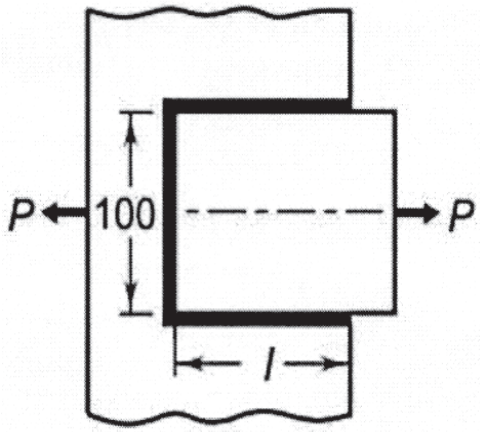


Fig. 3

Q7) a) Explain the following terms related to the Helical compression spring along with the equations required to calculate it. **[6]**

i) Solid Length
ii) Compressed length
iii) Free Length

b) A helical compression spring, made of circular wire, is subjected to an axial force, which varies from 2.5 kN to 3.5 kN. Over this range of force, the deflection of the spring should be approximately 5 mm. The spring index can be taken as 5. The spring has square and ground ends. The spring is made of patented and cold-drawn steel wire with ultimate tensile strength of 1050 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate **[12]**

i) Wire diameter;
ii) Mean coil diameter;
iii) Number of active coils;
iv) Total number of coils;
v) Solid length of the spring;
vi) Free length of the spring;

OR

Q8) a) Explain Nipping of Leaf springs. **[6]**

b) It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81 370 N/mm^2 respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate: **[12]**

i) Wire diameter;
ii) Mean coil diameter;
iii) Number of active coils;
iv) Total number of coils;
v) Free length of the spring; and
vi) Pitch of the coil. Draw a neat sketch of the spring showing various dimensions.

✡ ✡ ✡

Total No. of Questions : 8] **SEAT No. :**

PE2635 **[Total No. of Pages : 4**

[6583]-167

T.E. (Mechanical) (Mechanical Sandwich Engg.)

MECHATRONICS

(2019 Pattern) (Semester - V) (302044)

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

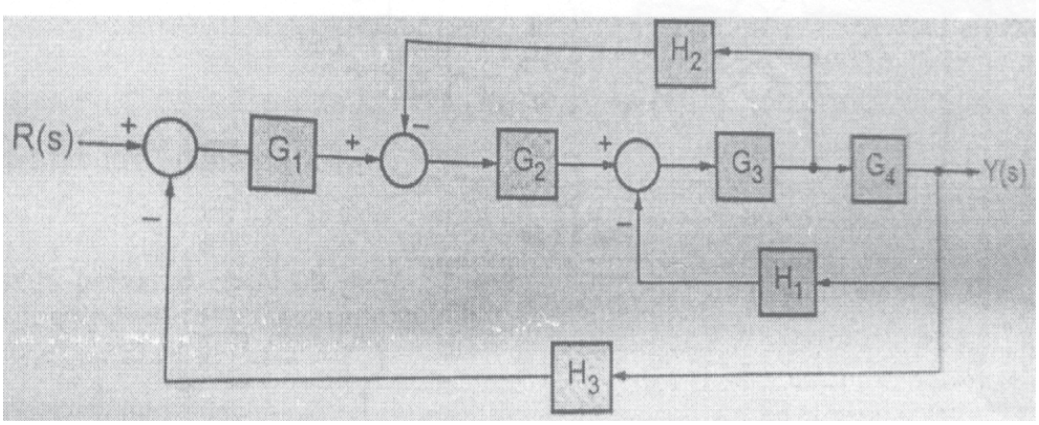
Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Use of drawing instruments, electronic pocket calculators are allowed.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain Open loop control system with a case study/application. **[5]**

b) Explain concept of transfer function and state its properties. **[5]**

c) Reduce the block diagram and find the transfer function of the following Figure. **[8]**



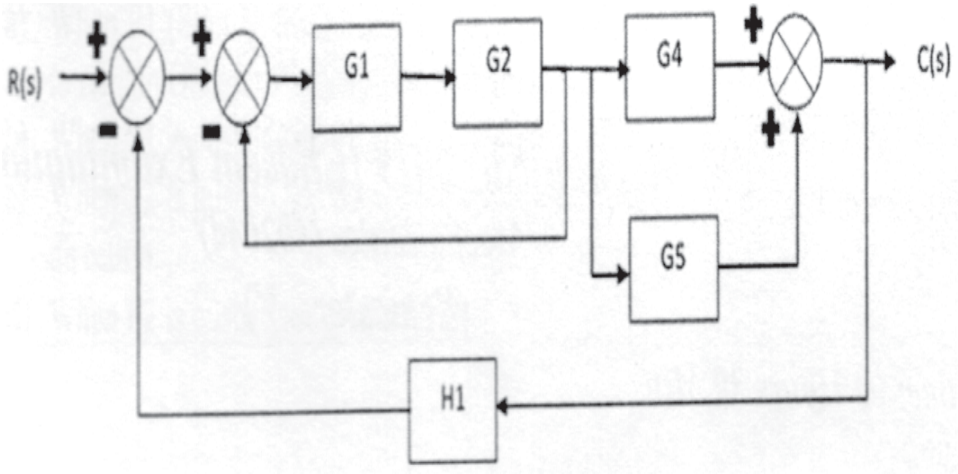
OR

Q2) a) Compare open loop and closed loop control system. **[5]**

b) Explain application of mechatronics: Anti-lock braking system (ABS). **[5]**

P.T.O.

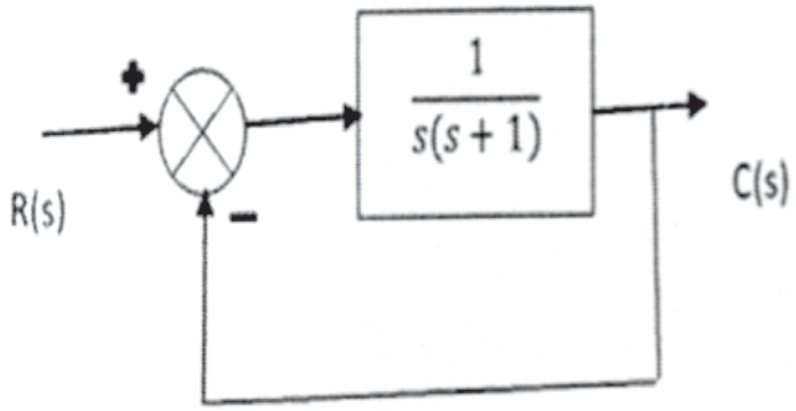
c) Reduce the block diagram and find the transfer function of the following Figure. **[8]**



Q3) a) Explain frequency response specifications and resonant peak, resonant frequency, band width. **[5]**

b) Explain gain margin and phase margin. **[5]**

c) Determine the value of delay time, rise time, peak time, settling time and peak overshoot when control system shown in Figure below is subjected to unit step input. **[7]**



OR

Q4) a) Compare time response and frequency response analysis. **[5]**

b) Explain natural frequency, damped frequency and damping ratio in detail. **[5]**

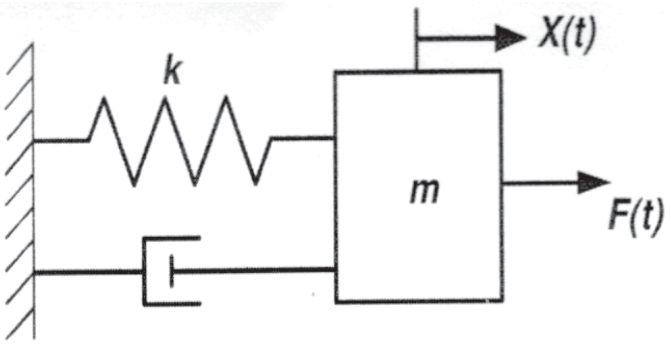
c) For the system in Figure below; assume mass=3kg, stiffness=3.5 N/m and damping coefficient= 0.3 Ns/m. Also, F=Force input in N and x = displacement output in m. **[7]**

Find:

i) Derive the transfer function X(s)/F(s)

ii) Poles and zeros plot

iii) Comment on stability



Q5) a) Why derivative controller is not used in control systems? **[5]**

b) Using a suitable block diagram explain the working of PID control in parallel form. **[5]**

c) A PI controller is reverse acting, PB = 20, 12 repeats per minute. Find **[8]**

i) Proportional gain

ii) Integral gain

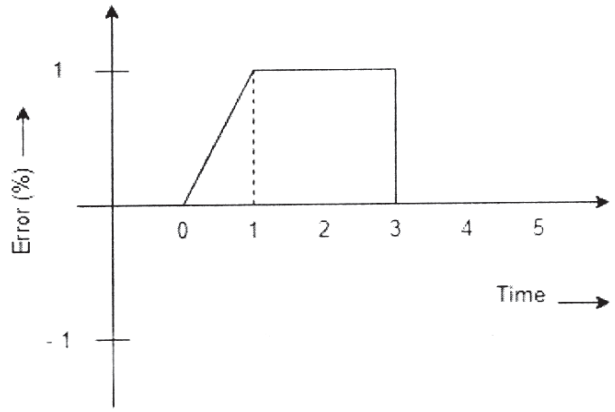
iii) Time that the controller output will reach 0 % after a constant error of 1.5 % starts.
The controller output when the error occurred was 72 %.

OR

Q6) a) Explain the Proportional-Integral controller with a block diagram. **[5]**

b) Explain the manual procedure for PID controller tuning with a suitable example. **[5]**

c) Fig. shows an error time graph. Sketch PID controller (Parallel form) output with respect to time. Assume Kp = 10, K_I = 2, K_D = 0.5, and P_o = 0 i.e. the controller output is zero when the error is zero. **[8]**



Q7) a) Explain the basic components of PLC. **[5]**

b) What is the function of timers in PLC programming? Explain any one of them. **[5]**

c) Given four normally open switches (P1, P2, S1, and S2), with DC motor (M) write a PLC program to satisfy following objectives: **[7]**

i) When P1 (Start Button) is pushed the cycle shall start. The cycle shall continue to remain ON unit 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.

OR

Q8) a) List and discuss, in brief, any five specifications of PLC. **[5]**

b) Using a suitable diagram explain the working of the counter in a PLC. **[5]**

c) A conveyor is run by switching ON or OFF a motor. We are positioning parts on the conveyor with an optical detector. When the optical sensor goes on,we want to wait 1.5 seconds, and then stop the conveyor. After a delay of 2 seconds the conveyor will start again. We need to use a start and stop button-a light should be ON when the system is active. **[7]**

✡ ✡ ✡

Total No. of Questions :8]

SEAT No. : ____

PE2636

[Total No. of Pages : 2

[6583]-168

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) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables, slide rule, Steam table, psychrometric Chart. And electronic pocket calculator is allowed.***
4) ***Figure to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define work-piece control, what are the variable which interfere with work-piece control?-Discuss. **[8]**

b) What do you mean by major operations, critical operations? How to identify critical operations? **[9]**

OR

Q2) a) How can supporting operation be distinguished from auxiliary operation? **[8]**

b) What do you mean by qualifying and re-qualifying operations and how to identify them? **[9]**

Q3) a) What are the most influencing factors in terms of tool performance? **[8]**

How selection of cutting fluid will affect on tool performance in various processes?

b) What are the main constraining factors on tool selection? **[9]**

OR

Q4) a) Distinguish between General Pupose Machine (GPM) and Special Purpose Machine (SPM) with examples. **[8]**

b) What are the types of drill bushes? Explain any three with neat sketch. **[9]**

P.T.O.

Q5) a) What are the three classifications of part that are used in a make or buy scenario? **[8]**

b) How do you calculate machining time for Turning and drilling operations? Explain with suitable sketch. **[9]**

OR

Q6) a) What are the factors involved in calculation of machining time. How to Calculate cycle time? **[8]**

b) What other costs are used with the production costs to estimate the total cost? **[9]**

Q7) a) Explain the Automatic Time Standard System (ATS) in CAPP. **[9]**

b) Explain the need of CAPP. Also discuss the role of expert system in Generative Computer Aided Process Planning (CAPP) System. **[10]**

OR

Q8) a) Discuss various steps involved in manual process planning. **[9]**

b) Draw a format for operation route sheet and explain its elements in short. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE2637

[Total No. of Pages : 2

[6583]-169

T.E. (Mechanical Sandwich)

ADVANCED MATERIALS AND 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) Explain the construction & working of spray process of MMC. State the advantages & limitations. **[8]**

b) What is matrix interface? State different interface measurement techniques for composites. Explain pull out test. **[10]**

OR

Q2) a) Explain the concept of MMC and classify MMC with suitable examples.**[9]**

b) Explain squeeze casting of metal matrix composites. State it's advantages & disadvantages. **[9]**

Q3) a) State the specifications of high-speed extrusion process and explain the process in detail. **[9]**

b) Draw a neat sketch of hydroforming process. Explain in detail construction and working. Name common applications of the process. **[8]**

OR

Q4) a) State the different metals used in metal spinning operations. Explain the process in detail along with its applications. **[9]**

b) Elaborate the process with the applications, advantages and limitations Magnetic pulse forming process. **[8]**

P.T.O.

Q5) a) Briefly explain the principle and working of Plasma are welding process. State it's advantages and limitations. **[10]**

b) Differentiate between electron beam and laser beam welding. **[8]**

OR

Q6) a) State the principle of friction stir welding process and explain the construction and working. **[10]**

b) Write a short note on Cold metal transfer process and applications. **[8]**

Q7) a) Briefly explain the principle and working of ultrasonic machining process. State it's advantages and limitations. **[9]**

b) Explain the construction and working of Electrochemical machining process. **[8]**

OR

Q8) a) Comment on Material removal rate of various non-conventional machining processes. Explain the influence of tool material, geometry, di-electric fluid and process parameters on machining characteristics. **[9]**

b) Write a short note on micro-machining. **[8]**



Total No. of Questions : 8]

SEAT No. : ____

PE2638

[Total No. of Pages : 3

[6583]-170

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:

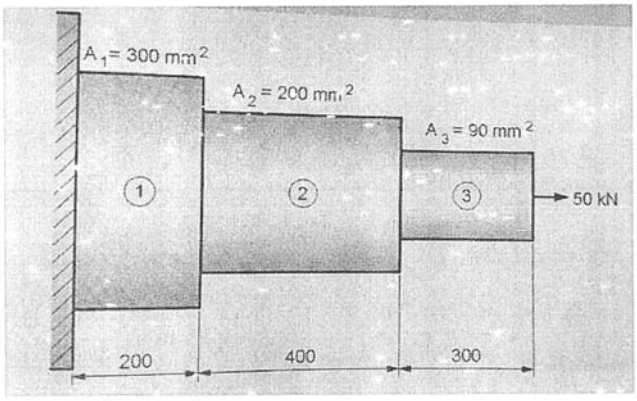
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat figures wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of non-programmable scientific calculator is allowed.***

Q1) a) An axial stepped bar shown in below figure, is subjected to an axial load of 50 kN. If the material of the bar is uniform and has a modulus of elasticity as 200 GPa, determine : **[12]**

i) the nodal displacements

ii) the stresses in each element; and

iii) the reactions at the supports.



b) Write a short note of Rayleigh-Ritz method. **[5]**

OR

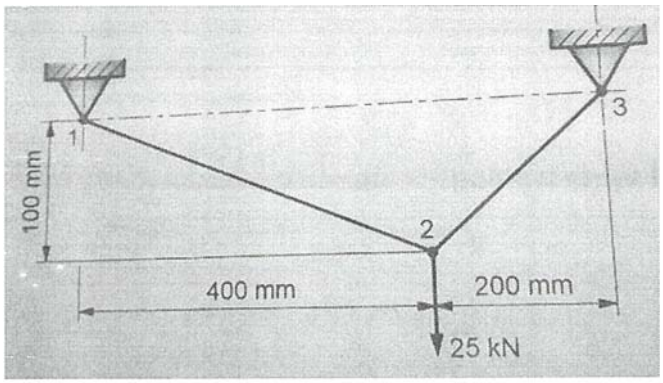
P.T.O.

Q2) The arrangement of a two bar truss is shown in the below figure. Using the finite element method, determine : **[17]**

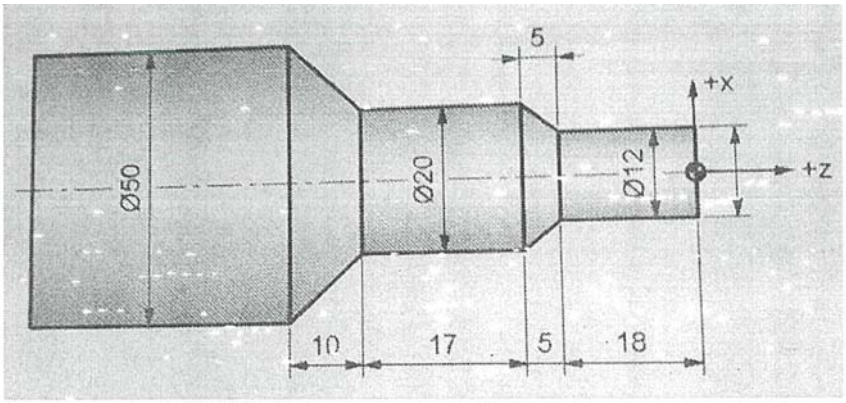
a) Nodal displacements

b) Stress in each element

c) Reaction force at the support



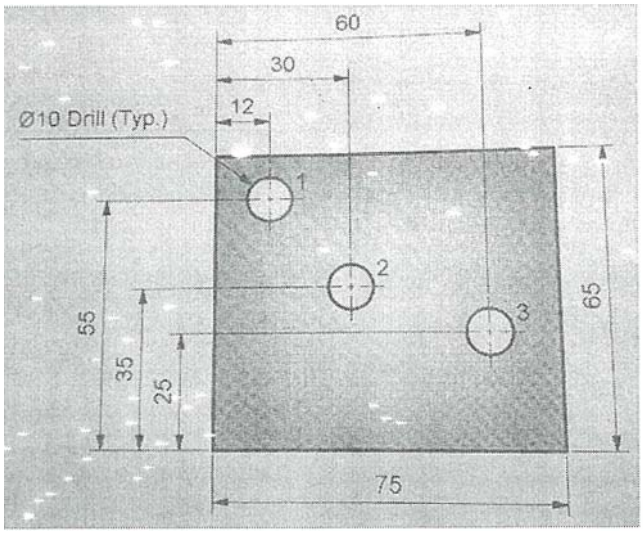
Q3) a) Write a part program using G and M code to turn mild steel job as shown in below figure. Use canned cycles for both rough turning and finishing. Take feed rate of 0.35 mm/rev and spindle speed of 400 RPM. Take raw material size as MS $\phi 60 \times 60$mm. **[12]**



b) Explain Hybrid controller and straight controller CNC machines with block diagram. **[5]**

OR

Q4) a) Write a CNC part using G and M code for contouring a component of 10mm thickness as shown in the below figure. Assume suitable data for machining parameters. **[12]**



b) Explain various elements of NC machine tool system with block diagram. **[5]**

Q5) a) Classify various types of grippers. Explain any one type of gripper with neat sketch. **[9]**

b) Explain four islands of automation of computer integrated manufacturing. **[9]**

OR

Q6) a) Explain the Flexible manufacturing systems based on type of layouts. **[9]**

b) Explain with neat sketch, the vacuum gripper and enlist its advantages, disadvantages and applications. **[9]**

Q7) a) What are the common mistakes made by CAE Engineers? **[9]**

b) What is Computational Fluid Dynamics (CFD)? Explain the three dimension of fluid dynamics. **[9]**

OR

Q8) a) Explain in brief about how to view and interpret the CAE results. **[9]**

b) Discuss the concept of FEA for structural dynamics and acoustics used in NVH analysis. **[9]**



Total No. of Questions :8]

SEAT No. :

PE2639

[Total No. of Pages : 2

[6583]-171

T.E. (Automation and Robotics)

SENSORS AND VISION SYSTEMS IN ROBOTS

(2019 Pattern) (Semester-VI) (302527)

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

Instructions to the candidates:

1) ***Answer four questions from the follwing.***
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 the correlation of human eye and camera. **[8]**

b) Draw and Explain components of a general-purpose image processing system. **[9]**

OR

Q2) a) Draw the structure of human eye and explain any eight parts of eye. **[8]**

b) Draw and Explain Stereo Imaging Model and calculate equation of disparity. **[9]**

Q3) a) Explain Gray Level Transformation and its types with Transformation Curves. **[9]**

b) Explain Mechanics of Linear Spatial filtering with neat diagram of kernel. **[9]**

OR

Q4) a) Explain smoothing (low pass) spatial filter and its two types of kernels. **[9]**

b) Explain histogram equalization with example. **[9]**

P.T.O.

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

Q6) a) Explain Edge Linking using Hough Transform. **[8]**

b) Explain Topological Descriptor using suitable examples. **[9]**

Q7) a) Write Installation and testing of ROS camera Drivers. **[9]**

b) Explain image processing using MATLAB programming. **[9]**

OR

Q8) a) Explain Open CV image processing library. **[9]**

b) Explain ROS to Open CV - The CV bridge Package. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2640

[Total No. of Pages : 3

[6583]-172
T.E. (Automation and Robotics)
ARTIFICIAL INTELLIGENCE IN ROBOTS
(2019 Pattern) (Semester - VI) (302528)

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) What is feature? What do you mean by feature engineering? Explain various processes involved in the feature engineering. **[8]**

b) What is significance of the outlier? Explain outlier detection techniques with suitable examples. **[9]**

OR

Q2) a) Explain the different encoding techniques used in the data pre-processing. **[7]**

b) Refer the following datasheet and write the python code for the followings: **[10]**

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

i) Write a python code for the detection of outliers for feature 'EstimatedSalary' by Inter Quantile Range (IQR).

ii) Write a python code for the imputation of missing values in the feature 'Age'.

P.T.O.

Q3) a) Explain the assumptions in the linear regression with respect to how to check the assumption and how to handle the assumption. **[8]**

b) Write a note on following algorithms. **[10]**

i) Support Vector Machine (SVM)

ii) K-means clustering

OR

Q4) a) Write a note on types of logistic regression. Distinguished between linear and logistic regression. **[8]**

b) Calculate Gini Impurity or Gini Index for the features 'outlook', 'temperature', 'humidity' and 'windy'. Refer following datasheet. **[10]**

	outlook	temperature	humidity	windy	play
0	overcast	hot	high	False	yes
1	overcast	cool	normal	True	yes
2	overcast	mild	high	True	yes
3	overcast	hot	normal	False	yes
4	rainy	mild	high	False	yes
5	rainy	cool	normal	False	yes
6	rainy	cool	normal	True	no
7	rainy	mild	normal	False	yes
8	rainy	mild	high	True	no
9	sunny	hot	high	False	no
10	sunny	hot	high	True	no
11	sunny	mild	high	False	no
12	sunny	cool	normal	False	yes
13	sunny	mild	normal	True	yes

Q5) a) Explain different approaches used in implementation of reinforcement learning. **[5]**

b) Write a note of elements of deep learning networks with diagram. Explain any two activation functions in details used in ANN and CNN. **[7]**

c) Explain feedforward vs backpropagation implemented in the ANN. **[5]**

OR

Q6) a) How to choose the suitable activation function in ANN and CNN? **[5]**

b) How does reinforcement learning works? **[7]**

c) Explain positive and negative reinforcement learning. **[5]**

Q7) a) Explain evaluation metrices in the classification problems with suitable examples. **[10]**

i) Confusion matrix

ii) Accuracy

iii) Precision

iv) Recall

v) F1 score

vi) Micro-average

vii) Weighted-average

b) What do you mean by hyper-parameter tunning. Explain in detail the hyperparameter tunning for ANN. **[8]**

OR

Q8) a) Comment on terms used in Support Vector Machine (SVM). **[10]**

i) Support vectors

ii) Hyperplane

iii) Soft and hard margins

iv) Kernal used in SVM

b) Describe the use of machine learning techniques in the field of materials science. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE2641

[Total No. of Pages : 2

[6583]-173
T.E. (Automation and Robotics)
MODELLING AND SIMULATION
(2019 Pattern) (Semester-VI) (302529)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full Marks.***
4) ***Use of Non-programmable scientific calculators is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain any one technique for generating random numbers. **[8]**

b) 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, ... **[9]**

OR

Q2) a) Explain timing and relationship of validation, verification and establishing credibility. **[9]**

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

i) Verification

ii) Validation

iii) Credibility

iv) Accreditation

Q3) a) What are the different techniques for generating random variates? Explain any one of them. **[9]**

b) List out the potential issues to overcome in output data analysis. **[9]**

OR

Q4) a) Explain inverse transform technique for Uniform and Weibull distribution with detailed procedure. **[9]**

b) Explain inverse transform technique for exponential distribution with detailed procedure. **[9]**

P.T.O.

Q5) a) What is material handling system and list out the input parameters for Automated Material Handling Systems (AMHS)? **[8]**

b) Consider any case study related to manufacturing system and explain the random events and performance measures concerned with the taken case study. **[9]**

OR

Q6) a) Define the following terms with respect to manufacturing system: **[9]**

i) Downtime

ii) Rework

iii) Reentrancy

b) Explain vehicle system with regard to material handling system and also list its input parameters that should be considered when designing and implementing them. **[8]**

Q7) a) Compare simulation software with the programming languages. **[6]**

b) Explain the features needed in programming the discrete-event type simulation model. **[6]**

c) List out the desirable software features in detail. **[6]**

OR

Q8) a) Define simulation software and list out its key features. Also mention few popular simulation software used in different domains. **[6]**

b) State advantages and disadvantages of object oriented simulation approach. **[6]**

c) What is general purpose software package? Explain any one example of it. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE2642

[Total No. of Pages : 2

[6583]-174
T.E. (Automation and Robotics)
MACHINING SCIENCE AND TECHNOLOGY
(2019 Pattern) (Semester - VI) (302530-A) (Elective - II)

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) Write a short note on Tool life Equation. **[8]**

b) A tool life 80 minutes is obtained at a speed of 30 m/min and 8 minutes in 60 m/min. Determine the following: **[10]**

i) Tool life Equation

ii) Cutting speed for 4 minutes of tool life.

OR

Q2) a) Tool life of 10 hours is obtained when cutting with a single point tool at 63 m/min. If Taylors constant C=257.35, what will be the tool life if cutting velocity is increased to its double. **[8]**

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: **[10]**

i) Tool life Equation.

ii) Calculate percentage of increase of tool life when cutting speed reduced by 50%.

Q3) a) Write a classification of cutting force dynamometers. Explain mechanical type dynamometers. **[8]**

b) What is drilling tool dynamometer, explain its construction and working with neat sketch. Write its applications. **[9]**

OR

P.T.O.

Q4) a) What is the need of measurement of cutting forces? **[8]**

b) Write a classification of cutting force dynamometers. Explain strain gauge type dynamometers. **[9]**

Q5) a) Explain in details Economics of Machining. **[7]**

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 = 500 mm and diameter = 100 mm. Feed = 0.25 mm/rev. Handling time par piece = 5.0 min, and tool change time = 2.0 min. Cost of machine and operator $30/hr, and tooling cost = $3per 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. **[10]**

OR

Q6) a) Derive equation for optimum cutting speed and tool life for maximum production. **[7]**

b) A high-speed steel tool is used to turn a steel work part that is 300 mm long and 80 mm 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/hr, and the tooling cost per cutting edge = $4. 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). **[10]**

Q7) a) Write a short note on Modern Machining Techniques. **[8]**

b) Describe in detail Electrical Discharge Machining (EDM) with working principle, diagram, construction, working and application. **[10]**

OR

Q8) a) Differentiate between conventional and non-conventional machining process. **[8]**

b) Describe in detail Abrasive Water Jet Machining (AWJM) with working principle, parameters, diagram, construction, working and application.**[10]**

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Total No. of Questions : 8]

SEAT No. : ____

PE2643

[Total No. of Pages : 2

[6583]-175
T.E. (Automation and Robotics)
MAINTENANCE AND SAFETY ENGINEERING
(2019 Pattern) (Semester - VI) (302530B) (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 breakdown maintenance and state its advantages and limitations. **[9]**

b) Explain corrective maintenance in detail and state its limitations. **[9]**

OR

Q2) a) Explain preventive maintenance and state its advantages and limitations. **[9]**

b) Write a short note on following parameter in CBMS: **[9]**

i) Vibration monitoring

ii) Crack monitoring

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

Q4) a) Explain factors involved in effective planning of maintenance work. **[8]**

b) Write a short note on: **[9]**

i) Major repair

ii) Modernization

P.T.O.

Q5) a) Discuss various types and categories of accidents. **[9]**

b) Write a short note on onsite and offsite emergency plans. **[8]**

OR

Q6) a) Explain Job Safety Analysis (JAS) study and steps involved in JAS process. **[9]**

b) Discuss various accident prevention tools and techniques. **[8]**

Q7) a) Why process design is important from safety point of view? Explain. **[9]**

b) Write a short note on: **[9]**

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: **[9]**

i) Personal safety

ii) Personal protective equipment



Total No. of Questions : 8]

SEAT No. : [ ]

PE2644

[Total No. of Pages : 4

[6583]-176

T.E. (Automation and Robotics)

DESIGN OF ROBOT ELEMENTS

(2019 Pattern) (Semester - V) (302521)

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

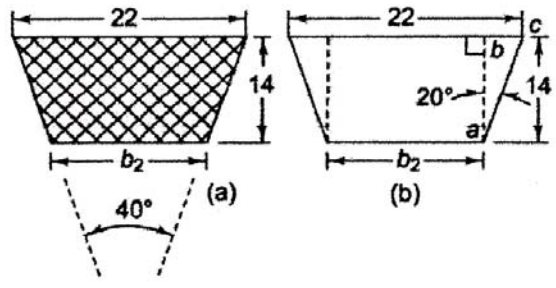
Instructions to the candidates:

1) ***Answer 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 equations of flat belt for analysis of tensions in the belt. **[7]**

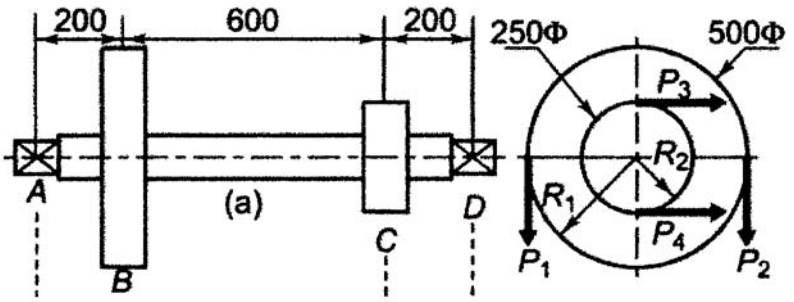
b) The following data is given for a V-belt drive connecting a 20-kW motor to a compressor. The centre distance between pulleys is 1 m and the dimensions of the cross-section of the belt are given in Figure. The density of the composite belt is 0.97 g/cc and the allowable tension per belt is 850 N. How many belts are required for this application? **[11]**

	Motor-pulley	*Compressor-pulley*
Pitch diameter (mm)	*300*	*900*
Speed (rpm)	*1440*	*480*
Coefficient of friction	*0.2*	*0.2*



OR

Q2) a) 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 (Syt = 400 N/mm^2) and the factor of safety is 3. Determine the shaft diameter on strength basis. **[13]**



b) Explain significance of equivalent bending moment and equivalent twisting moment. **[5]**

Q3) a) Write a note on remote compliance center design with neat labelled diagram. **[9]**

b) Explain in detail with examples and diagrams elements required for the physical support of the end effector. **[8]**

OR

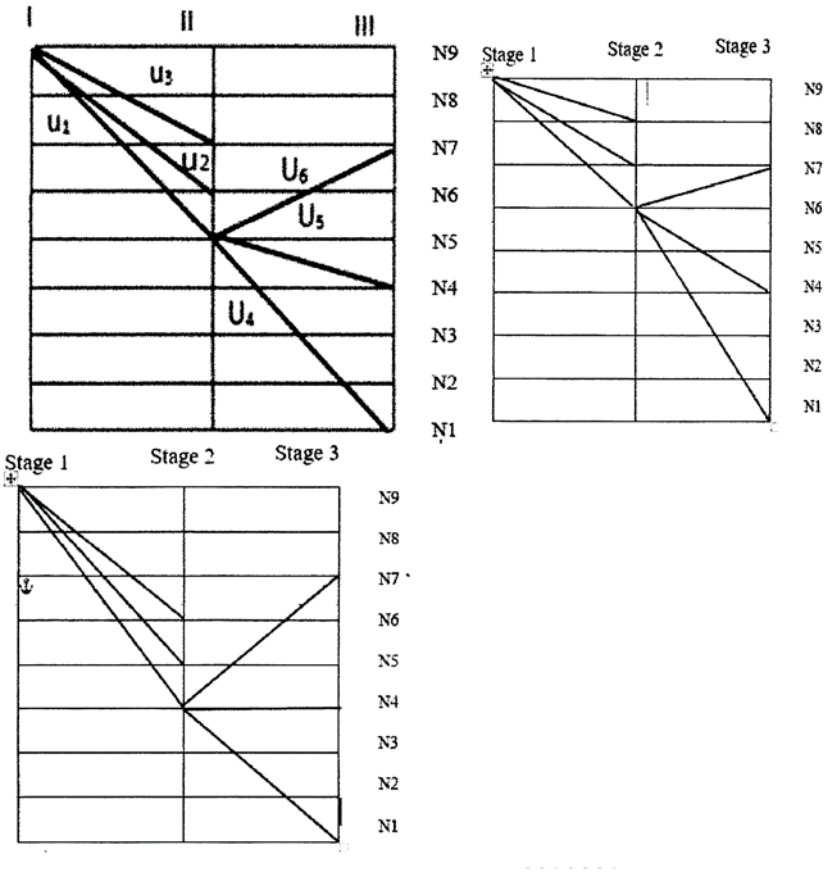
Q4) a) What do you mean by payload in the design of robots. Explain payload force analysis with neat diagram and mathematical equations. **[9]**

b) Write basic design process of gripper. **[8]**

Q5) Design a nine-speed gear box having N_{min} = 100 rpm and N_{max} = 630 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 RPM. **[10]**



b) Write a note on general recommendation for developing the gearing diagram. Explain with suitable example. **[8]**

Q7) a) Derive Petroff's Equation for sliding contact bearing. **[7]**

b) Design a full hydrodynamic journal bearing with the following specification for machine tool application: journal diameter = 75 mm, radial load = 10 kN, journal speed = 1440 rpm, minimum oil film thickness = 22.5 microns, inlet temperature = 40°C, bearing material = babbitt. Determine the length of the bearing and select a suitable oil for this application. Assume permissible bearing pressure for the application is 2 MPa. **[10]**

OR

Q8) a) 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. **[5]**

b) Explain load life relationship in rolling contact bearing. **[5]**

c) A single-row deep groove ball bearing is subjected to a 30 second work cycle that consists of the following two parts: The static and dynamic load capacities of the ball bearing are 50 and 68 kN respectively. Calculate the expected life of the bearing in hours. **[7]**

	Part I	*Part II*
duration (s)	*10*	*20*
radial load (kN)	*45*	*15*
axial load (kN)	*12.5*	*6.25*
speed (rpm)	*720*	*1440*

Refer table for values of X and Y factors as follows:

$\left(\frac{F_a}{C_0}\right)$	$\left(\frac{F_a}{F_r}\right) \le e$		$\left(\frac{F_a}{F_r}\right) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

Total No. of Questions : 8]

SEAT No. :

PE2645

[Total No. of Pages : 2

[6583]-177

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 Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
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) Explain the inverse kinematics with geometrical method for two degree of freedom. **[9]**

b) Can you elucidate the concept of inverse kinematics and its significance in controlling a robot's end-effector across different applications? Explain.**[9]**

OR

Q2) a) In the context of robotic motion, what distinguishes forward kinematics from inverse kinematics? **[9]**

b) Explain the concept of tool configuration of five axis articulated robot in details. **[9]**

Q3) a) What does workspace analysis entail in robotics, and what makes it crucial for the design and operation of robots? **[9]**

b) What are the benefits of using the Cartesian space approach in scenarios where task-related positions and orientations are critical? **[8]**

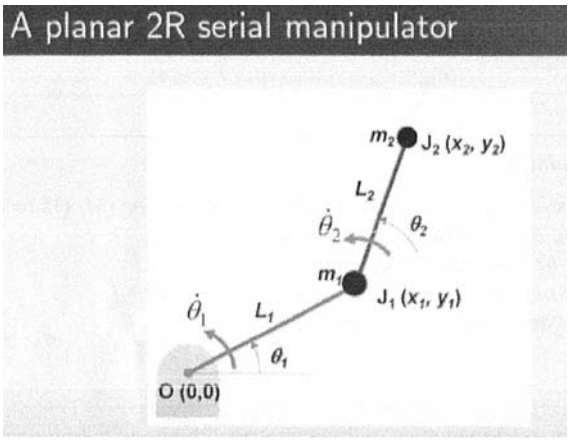
OR

Q4) a) What is the joint space technique in trajectory planning, and how does it differ from other approaches like Cartesian space? **[9]**

b) What does a "pick and place" operation involve in robotics, and how is it commonly applied across different industries and uses? **[8]**

P.T.O.

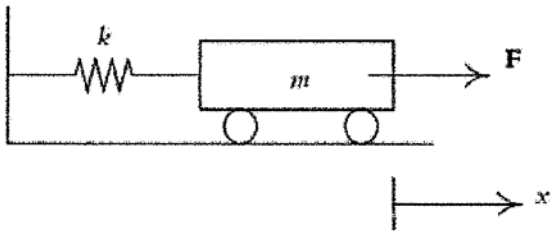
Q5) a) Find the equation of motion for following configuration by using lagrangian formulation method. (refer figure) **[9]**



b) What impact do factors like link mass distribution, inertia, and joint friction have on the dynamics of a robots manipulator? **[9]**

OR

Q6) a) Derive the force-acceleration relationship for the 1-DOF system shown in Figure using both the Lagrangian mechanics as well as the Newtonian mechanics. Assume the wheels have negligible inertia. **[9]**



b) How do the joint torques and forces affect the motion and behavior of a robot's end-effector, and how are they computed in the context of manipulator dynamics? **[9]**

Q7) a) What hardware and software prerequisites are needed for a robot controller? **[9]**

b) What are the pros and cons of online programming? **[8]**

OR

Q8) a) Describe the kinematic structure of the PUMA robot. How many degrees of freedom does it have, and what are the types of joints used? **[9]**

b) What is a teach pendant in the context of robotics? Describe its primary functions and how it is used in programming and controlling robots. **[8]**



Total No. of Questions : 8] **SEAT No. :**

PE2646 **[Total No. of Pages : 3**

[6583]-178

T.E. (Automation and Robotics)

COMPUTER AIDED ENGINEERING AND MANUFACTURING

(2019 Pattern) (Semester - V) (302523)

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

Instructions to the candidates:

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

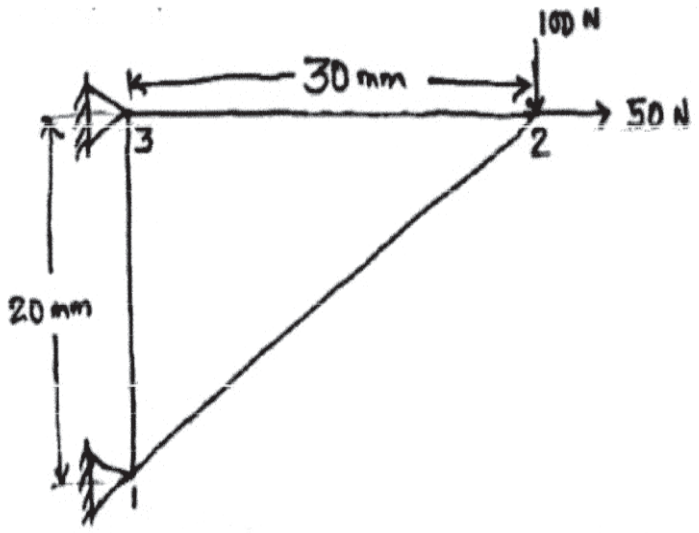
Q1) a) Distinguish between plain stress and plain strain condition. **[6]**

b) A triangular plate, subjected to various loads, as shown in figure. The modulus of elasticity is 70×10^3 N/mm^2, the poisson's ratio is 0.3, and thickness of plate is 10mm. Model the plate with CST element and determine: **[12]**

i) Element stiffness matrix

ii) Nodal displacements, and

iii) Stresses



OR

P.T.O.

Q2) a) Explain pre-processing and post-processing steps in FEA. **[8]**

b) In a triangular element, the nodes 1, 2 and 3 have cartesian coordinates: (30, 40), (140, 170) and (80, 140) respectively. The displacements at nodes 1, 2 and 3 are: (0.1, 0.5), (0.6, 0.5) and (0.4, 0.3) respectively. The point P within the element has cartesian coordinates (77,96). For point P, determine: **[10]**

i) The natural coordinates.

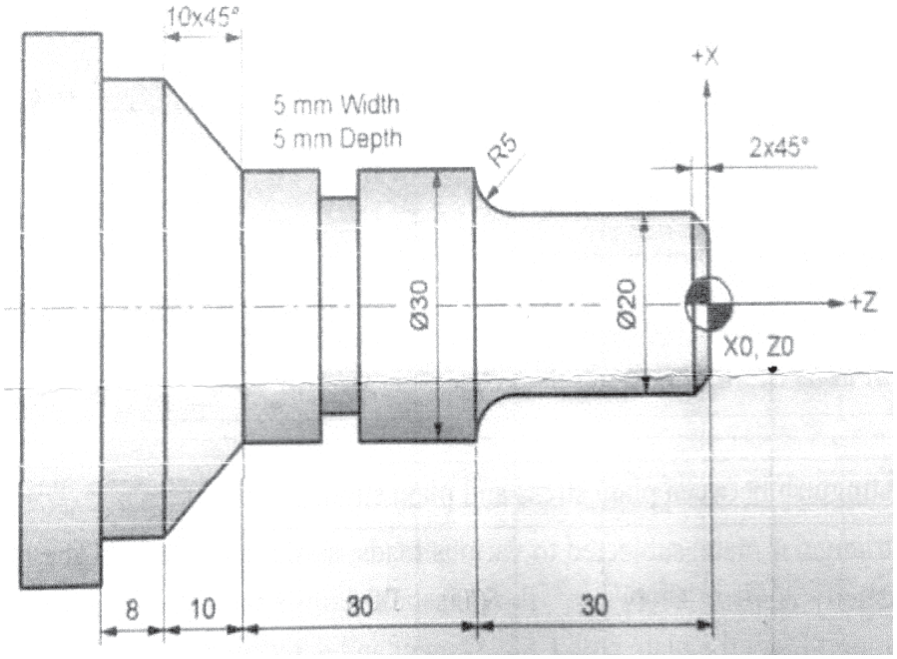
ii) The shape function

iii) The displacement.

Q3) a) Compare closed loop NC system with open loop system. **[5]**

b) Write NC part program to generate the profile as shown in Fig. Assume suitable machining data for feed and speed etc. All the dimensions are in mm. **[12]**

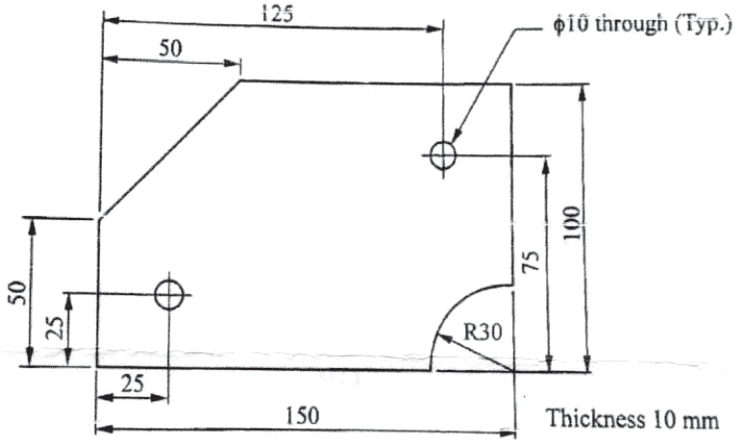
Note: Raw Material: MS Ø60 × 90mm.



OR

Q4) a) Explain the cutter radius compensation with suitable G Code. **[5]**

b) Write a manual part program for the component shown in fig. Assume the raw product as cast iron and the machining is to achieve the various dimensions. **[12]**



Q5) a) How does lean manufacturing aim to reduce waste in comparison to conventional manufacturing? **[9]**

b) What are the key principles of JIT, and how do they relate to inventory management? **[9]**

OR

Q6) a) How does "5S" contribute to the organization and cleanliness of a workplace in lean manufacturing? **[9]**

b) List and briefly describe the pillars of Total Productive Maintenance (TPM). **[9]**

Q7) a) Give a procedure for planning for the manufacturing of a component in machine shop. **[9]**

b) Discuss the factors that need to be considered when evaluating materials for a specific product. **[8]**

OR

Q8) a) Provide examples of process parameters for machining and casting processes. **[9]**

b) Discuss the factors that affect machining time and their impact on production costs. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2647

[Total No. of Pages : 3

[6583]-179

T.E. (Automation and Robotics)

SIGNAL PROCESSING AND CONDITIONING

(2019 Pattern) (Semester - V) (302524)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer any four questions from the following.***
2) ***Draw neat labelled diagrams wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of non programmable electronic calculator is permitted.***
5) ***Assume suitable/standard data if necessary.***

Q1) a) With the help of neat diagrams explain sampling theorem and Aliasing effect. **[8]**

b) Explain signal communication and the types of data transmission. **[9]**

OR

Q2) a) With the help of neat diagram explain working of the 4 bit SAR type ADC. **[8]**

b) What is amplifier? Explain with the help of neat diagram Voltage & Current Amplifier. **[9]**

Q3) a) Draw and explain Architecture of PLC. **[9]**

b) Write at least 9 aspects to be considered while selection of a PLC for the application. **[9]**

OR

Q4) a) Draw and explain Ladder Logic programming for any three logic gates. **[9]**

b) Explain a PLC ladder diagram for Bottle filling machine with the help of neat diagram of this system. **[9]**

P.T.O.

Q5) a) A mass spring damper system is mounted on and massless cart as shown in below figure. Derive the transfer function between output y and input u. **[8]**

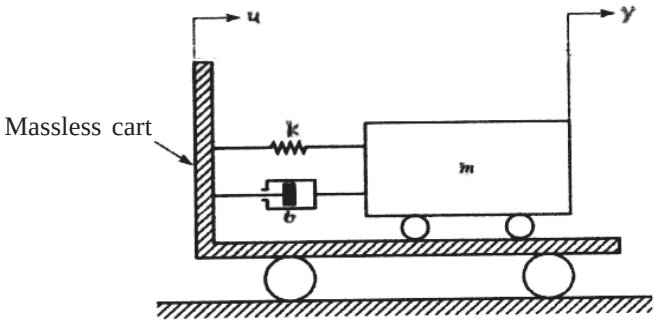


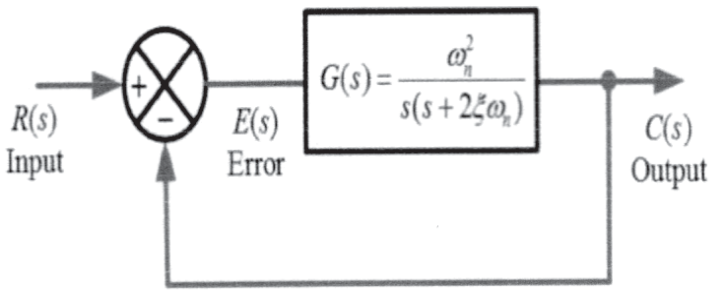
Figure : A spring-mass-dashpot system

b) Write a short note on Bode Plot, Gain margin and Phase margin with the help of neat diagram. **[9]**

OR

Q6) a) Using Suitable diagram explain Unit step response analysis via transient response specifications. **[8]**

b) Draw pole zero map for following second order control system. **[9]**



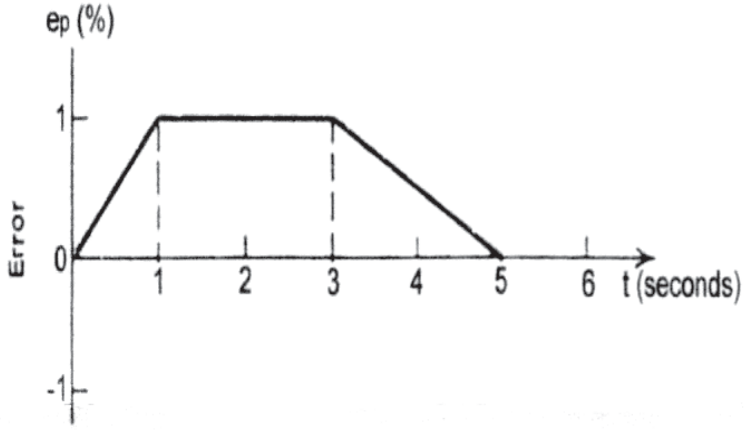
Q7) a) Explain Proportional (P), Integral (I) and Derivative (D) control actions. **[9]**

b) Explain Manual tuning of PID control with variation in different values of control parameters and plot the respective graphs. **[9]**

OR

Q8) a) Draw and explain PI and PID control systems in parallel form. **[9]**

b) Following figure shows an error time graph, sketch the PID controller (parallel form) output w.r.t. time. Assume Kp =10, K_I = 2, K_D = 0.5 and P_0 = 0 i.e. the controller output is zero when the error is zero. **[9]**



✡ ✡ ✡

Total No. of Questions : 8]

SEAT No. : ____

PE2648

[Total No. of Pages : 2

[6583]-181

T.E. (Automation and Robotics Engg.)

OPTIMIZATION TECHNIQUES

(2019 Pattern) (Semester - V) (302525B) (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) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) What do you mean by Simulation? Explain Monte-Carlo Simulation. **[5]**

b) Solve the following Integer LP problem using Gomory's Cutting Plane method. **[12]**

Max Z = $x_1 + x_2$

Subject To : $3x_1 + 2x_2 \leq 5$

$x_2 \leq 2$

$x_1, x_2 \geq 0$ and are integers

OR

Q2) a) Explain the necessity and applications of simulation. **[5]**

b) Solve the following using Branch and Bound Method. **[12]**

Max Z = $3x_1 + 5x_2$

Subject To : $2x_1 + 4x_2 \leq 25$

$x_1 \leq 8$

$2x_2 \leq 10$

$x_1, x_2 \geq 0$, all integers

P.T.O.

Q3) a) Explain the concept of Ant colony Optimization? **[6]**

b) Explain the concept of Genetic Algorithm with suitable examples? **[6]**

c) What do you mean by Multi objective decision making methods? **[6]**

OR

Q4) a) What is the concept of Goal programming? **[6]**

b) What is the principle of simulated annealing? **[6]**

c) State applications of Particle Swarm Optimization? **[6]**

Q5) a) Explain brief about PROMETHEE? **[6]**

b) Short note on Weighted Product Method (WPM). **[5]**

c) What is the concept of analytical Hierarchy Process (AHP) with steps? **[6]**

OR

Q6) a) Write brief note on TOPSIS. **[6]**

b) Which is the highest accuracy method in MCDM? Why? **[6]**

c) Explains Multiple Criteria Decision Making (MCDM)? List out its method. **[5]**

Q7) Write a short note on : **[18]**

a) Fuzzy based Optimization

b) Ant Colony Optimization

c) Artificial Neural Network.

OR

Q8) a) What are the uses and disadvantages of Genetic Algorithm? **[6]**

b) Explain the training or learning process in ANN with diagram. **[6]**

c) Write down application of Modern Optimization Techniques. **[6]**



Total No. of Questions :8]

SEAT No. : ____

PE2649

[Total No. of Pages : 2

[6583]-182
T.E. (Biotechnology)
FERMENTATION TECHNOLOGY
(2019 Pattern) (Semester-VI) (315471)

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

Instructions to the candidates:

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

Q1) a) Discuss the process of fermentative production of ethanol. **[6]**

b) What are metabolites? At what phase primary metabolites get forms, explain the fermentative production of citric acid through fermentation. **[6]**

c) What are vitamins? Describe the detail process of Microbial production of vitamins B2, B12. **[6]**

OR

Q2) a) Explain how the starting culture of yeast is activated? Illustrate the detail process of bakers yeast production. **[6]**

b) Discuss the fermentative production of Streptomycin. **[6]**

c) What are secondary metabolites? At what phase secondary metabolites get forms, describe the fermentative production of penicillin through fermentation? **[6]**

Q3) a) Write detail note on microbial transformation with neat labeled diagram. **[9]**

b) Explain about Single Cell Protein (SCP) production. **[8]**

OR

Q4) a) What is immobilization? Discuss the various techniques involved in immobilization of enzymes. **[9]**

b) Define enzymes. Discuss the different sources of enzymes and discuss their applications in various sectors. **[8]**

P.T.O.

Q5) a) Write note on solid state fermentation (SSF)? Explain the various types of SSF reactors in detail. **[8]**

b) Write in detail about Mixed flow reactor, Plug flow reactor with neat labeled diagram. **[10]**

OR

Q6) a) What is batch reactor? Illustrate and explain its components along with functions with neat sketch. **[10]**

b) Illustrate the design and working of Fluidized bed reactor with neat sketch. **[8]**

Q7) a) Discuss about scale up process? Discuss its objectives and types of scale up processes in the field of fermentation technology. **[8]**

b) Explain how the fermentation efficiency is analyzed by considering what parameters? **[9]**

OR

Q8) a) Explain about the concept of Good Manufacturing Practices (GMP) in detail. **[8]**

b) Elaborate the concept of Inoculum development and sterilization in detail. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2650

[Total No. of Pages : 2

[6583]-183
T.E. (Biotechnology)
MASS TRANSFER
(2019 Pattern) (Semester - VI) (315472)

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

Instructions to the candidates:

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

Q1) a) Define following terms: **[9]**

i) Saturation/Saturated solution

ii) Yield of Crystallization

iii) Mother Liquor

b) Give any two methods of supersaturation in detail. **[9]**

OR

Q2) a) Why crystallization is an important operation in downstream processing? **[9]**

b) Calculate the yield of $MgSO_4,7H_2O$ crystals when 1000 kg saturated solution of $MgSO_4$ at 353 K is cooled to 303K assuming 10% of the water is lost by evaporation during cooling. **[9]**

Solubility of $MgSO_4$ at 353K =64.2 kg/100 kg water

Solubility of $MgSO_4$ at 303 K = 40.8 kg/100 kg Water

At. Wt. Mg=24,S=32, H=1 and O =16

Q3) a) What is distillation? Define terms more volatile and less volatile components and give one example. **[9]**

b) A simple batch still is used to distill 1000 kg of a mixture containing 60 mass % ethyl alcohol and 40 mass % of water. After distillation the bottom product contains 5 mass % of alcohol. Determine the composition of the overhead product, its mass and mass of the bottom product. Equilibrium data is with respect to weight percentage values. Data is given as, **[8]**

x	5	10	20	30	40	50	60
y	36	51.6	65.5	71	74	76.7	78.9

OR

P.T.O.

Q4) a) Write a short note on "Flooding in a distillation column". **[8]**

b) What is optimum reflux ratio? Draw and explain diagram showing relationship of cost versus reflux ratio. **[9]**

Q5) a) What are types of efficiencies? How overall plate efficiency is calculated? **[9]**

b) Write material balance over distillation column and derive an expression of operating line in rectifying section. **[9]**

OR

Q6) a) Draw neat sketches and write a short note on different types of packings used in packed column. **[9]**

b) What are HETP, HTU and NTU? When concept of HETP is used? **[9]**

Q7) a) Explain important factors considered in selection of solvent for gas absorption operation. **[9]**

b) Draw a schematic sketch for co-current and countercurrent operation and show in graphs how height of column varies with slope of operating line? **[8]**

OR

Q8) a) What is the difference between absorption and stripping? Why absorption is much preferred operation? **[9]**

b) Discuss with a neat diagram channeling misdistribution phenomena of liquid flow. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2651

[Total No. of Pages : 2

[6583]-184
T.E. (Biotechnology)
BIOSEPARATION ENGINEERING
(2019 Pattern) (Semester-VI) (315473)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full Marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Give few applications of adsorption in biotechnology. **[9]**

b) The lab scale experimental data for the adsorption of an antibiotic on activated carbon are as follows. The solute concentration in the feed and the corresponding amounts of solute adsorbed on activated carbon are as follows: **[9]**

S (mg/cm^3)	0.3	0.12	0.040	0.018	0.006	0.001
Ca (mg/g)	0.15	0.12	0.095	0.08	0.06	0.045

Find out to which adsorption isotherm the data fit.

OR

Q2) a) Explain in detail principle and continuous operation of adsorption process. **[9]**

b) Write difference between physical and chemical adsorption. **[9]**

Q3) a) What are the different types of detectors? Explain FID in detail. **[9]**

b) Explain different peak broadening effects. How Van Deemter plot co-relates peak broadening effect? **[8]**

OR

Q4) a) What are the types of columns present in gas chromatography? **[8]**

b) A chromatographic separation of a two component samples on a 50 cm column gave the retention times for the solutes A and B as 2.5 and 3.1 min with base widths of the two chromatographic peaks being 0.24 and 0.3 min respectively. Calculate the parameters: **[9]**

i) Number of theoretical plates,

ii) Plate height

iii) Resolution of the two peaks

P.T.O.

Q5) a) What is membrane fouling? How to avoid it? **[9]**

b) Write short note on: **[9]**

i) Osmosis and Reverse Osmosis

ii) Ultrafiltration

OR

Q6) a) Enlist the factors affecting the performance of membranes? How are they minimized? **[9]**

b) Draw the diagram of membrane separation process and explain all components in the diagram. **[9]**

Q7) a) How supercritical extraction is used in extraction of caffeine? Write principle and process of supercritical extraction. **[9]**

b) What are the different types of molecular sieves? Give one recent application from literature where is it applied. **[8]**

OR

Q8) a) How Isoelectric point principle is utilised in Dairy industry? Explain with one application. **[9]**

b) What is the purpose of using mass spectrometry in combination with GC and LC? Explain it with one case study of GC-MS and LC-MS. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2652

[Total No. of Pages : 2

[6583]-186
T.E. (Biotechnology)
FOOD BIOTECHNOLOGY
(2019 Pattern) (Semester - VI) (315474B) (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 indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) Answer the following. **[18]**

a) Give an overview of refrigeration processes in food preservation.

b) Factors affecting drying rate and quality of dried products

OR

Q2) Answer the following. **[18]**

a) Explain how temperature is calculated for HTST sterilization

b) Explain the principles of refrigeration and freezing applied in food biotechnology

Q3) Answer the following. **[17]**

a) Significance of microbial biotechnology in food flavor enhancement.

b) What are the current process developments in solid state fermentation for food applications?

OR

Q4) Answer the following. **[17]**

a) Discuss the functional properties and nutritional benefits of algae-based food ingredients.

b) Challenges and future prospects in utilizing microbial polysaccharides in food industries

P.T.O.

Q5) Answer the following. **[18]**

a) Explain the role of enzymes in bakery industry

b) Explain in detail about application of proteases

OR

Q6) Answer the following. **[18]**

a) Explain how enzymes are utilized to enhance meat texture, juiciness, and flavor.

b) Describe the role of enzymes in the mashing process during beer production.

Q7) Answer the following. **[17]**

a) Discuss the challenges associated with the management of food industrial waste

b) Describe the following physical methods used for waste disposal in the food industry - incineration and composting.

OR

Q8) Answer the following. **[17]**

a) Explain in short about chemical treatment techniques - Coagulation and flocculation.

b) Write a short note on following two food waste disposal methods - physical and biological



Total No. of Questions :8]

SEAT No. :

PE2653

[Total No. of Pages : 2

[6583]-188
T.E. (Biotechnology)
ANALYTICAL TECHNIQUES
(2019Pattern) (Semester-V) (315461)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) Discuss in detail the construction and working principle of Electrophoresis. Draw a labeled diagram of the horizontal electrophoresis system and discuss it in detail. **[18]**

OR

Q2) What are the major classes of electrophoresis methods? Explain each technique in detail. **[18]**

Q3) a) Define Sedimentation? Discuss in detail the particle removel in Sedimentation. **[10]**

b) What is a Centrifuge? Discuss in brief the types of baskets used in Centrifuge ? **[7]**

OR

Q4) a) Define filter media? What are the properties of an ideal filter medium.**[10]**

b) Discuss in detail the construction and working of plate and frame filter press with a neat sketch. **[7]**

Q5) What do you mean by Spectrophotometry? Discuss any two methods used for the quantitative analysis in Spectrophotometry. **[18]**

OR

P.T.O.

Q6) Write about: **[18]**

a) Gamma rays

b) X- rays

c) UV light

d) Visible light

Q7) a) What is NMR? How is it used in the characterization of atoms and molecules **[10]**

b) What are the two major types of radiation detectors used in spectrophotometers? **[7]**

OR

Q8) How many types of Mass Spectrometry techniques are available ? Give their Classification. Explain the suitability for biological sample analysis. **[17]**

● ● ●

Total No. of Questions : 8]

SEAT No. :

PE2654

[Total No. of Pages : 4

[6583]-189

T.E. (Biotechnology)

MATERIAL BALANCES AND STOICHIOMETRY

(2019 Pattern) (Semester - V) (315462)

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) A stream flowing at a rate of 15000 mol/h containing 25 mole % N_2 and 75 mole % H_2 is to be heated from 298 K to 473 K. Calculate the heat that must be transferred using C_p^0 data given below $C_p^0 = a + bT + cT^2 + dT^3$. **[9]**

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

b) Define **[3]**

i) Sensible Heat

ii) Latent Heat

iii) Heat Capacity

c) Pure ethylene is heated from 303K to 523K at atmospheric pressure. Calculate the head added per kmol ethylene using the heat capacity data given below **[6]**

$C_p^0 = 4.1261 + 155.0213*10^{-3}\ T - 81.5455*10^{-6}\ T^2 + 16.9755*10^{-9}\ T^3$

OR

P.T.O.

Q2) a) Explain Phase change Operation and Write Energy Balance during Phase Change **[6]**

b) Heat Capacity data for Gaseous SO_2 is given by the following Equation

$C_p^0 = 43.458 + 10.634*10^{-3}\ T - [(5.945*10^5)/T^2]$.

Calculate the head needed to raise the temperature of 1 kmol pure sulphur dioxide from 300K to 1000K. **[6]**

c) Temperature of Oxygen is raised from 350 K to 1500 K. Calculate the amount of heat that must be supplied for raising the temperature of 1 kmol oxygen using C_p^0 data, $C_p^0 = a + bT + cT^2 + dT^3$ **[6]**

Gas	a	$b*10^3$	$c*10^6$	$d*10^9$
O_2	26.0257	11.7551	–2.3426	–0.5623

Q3) a) Wet solids containing 60% water and 40% solids are to be dried in dryer to get solids containing 8% water by weight. Fresh air contains 0.015 kg water vapour per kg dry air and air leaving the dryer contains 0.06 kg water vapour per kg dry air, if quantity of dry air entering the dryer per kg of solids (dry) is 100 kg **[12]**

Calculate

i) Quantity of fresh air

ii) Fraction of air recirculated and

iii) Recycle ratio.

b) Write a short note on **[5]**

i) Excess and Limiting Reactant

ii) Stoichiometric Coefficient and Stoichiometric Ratio

OR

Q4) a) Formaldehyde is produced by dehydrogenation of methanol. **[12]**

$CH_3OH \longrightarrow HCHO + H_2$

The per pass conversion is 67%. The product leaving the reactor is fed to separation unit where formaldehyde is separated from methanol and hydrogen. The separated methanol is recycled to reactor. If the production rate of formaldehyde is 1000 kg/h.

Calculate:

i) Combined feed ratio

ii) Flow rate of methanol required to the process as fresh feed.

b) Write a short note on **[5]**

i) Conversion

ii) Yield

iii) Selectivity

Q5) a) Calculate the heat of formation of glycerol liquid ($C_3H_8O_3$) using Hess's law **[9]**

Standard heat of formation of $CO_2(g)$ = -393.51 kJ/mol

Standard heat of formation of $H_2O(l)$ = -285.83 kJ/mol

Standard heat of combustion of glycerol liquid at 298.15 K = –1659.10 kJ/mol

b) Calculate the heat of formation of ethane gas at 298.15 K from its elements using Hess's law **[9]**

Standard heat of formation of $CO_2(g)$ -393.51 kJ/mol

Standard heat of formation of $H_2O(l)$ = -285.83 kJ/mol

Standard heat of combustion of ethane gas at 298.15 K = –1560.69 kJ/mol

OR

Q6) Write a note on **[18]**

a) Hess's Law of Constant Heat Summation

b) Effect of temperature on heat of reaction

c) Adiabatic flame temperature

Q7) a) Write a note on Heating values of fuels **[7]**

b) A natural gas contains 85 % methane and 15 % ethane by volume. Calculate the GHV of this fuel in KJ/Kg from the standard heats of combustion of methane and ethane. **[10]**

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O,\ \Delta H_C^0 = -802.62$ kJ/mol

$C_2H_6 + 3.5O_2 \longrightarrow 2CO_2 + 3H_2O,\ \Delta H_C^0 = -1428.64$ kJ/mol

Latent heat of water vapour at 298 k = 2442.5 kJ/kg.

OR

Q8) a) The orsat analysis of the flue gases from a boiler house chimney by mole is as given below: **[9]**

CO_2 : 11.4%, O_2 : 4.2%, and N_2 : 84.4%

Assuming that complete combustion takes place,

i) Calculate the % excess air and

ii) Find the C:H ratio in the fuel.

b) The GCV of liquid acetone at 298 K is 1791.21 KJ/mol. Find its NCV using latent heat of water at 298 K. **[8]**



Total No. of Questions : 8] **SEAT No. :**

PE2655 **[Total No. of Pages : 2**

[6583]-190

T.E. (Biotechnology)

GENETIC ENGINEERING

(2019 Pattern) (Semester - V) (315463)

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

Instructions to the candidates:

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

Q1) a) Describe Gene Cloning strategies with its applications. **[9]**

b) Write advantages and disadvantages of PCR cloning. **[9]**

OR

Q2) a) Write principle of blue white selection and its advantages over other strategies. **[9]**

b) Write short note on use of hybridization techniques for screening of libraries. **[9]**

Q3) a) What are competent cells? How they are produced and used? **[9]**

b) Write application of engineered *Pichia pastoris*. **[8]**

OR

Q4) a) Describe principle of cloning in yeast with its applications. **[9]**

b) Give significance of broad host range plasmids in cloning with examples. **[8]**

Q5) a) Write methodology of Transformation and its applications. **[10]**

b) Write short note on protoplast transformation and its applications. **[8]**

OR

P.T.O.

Q6) a) Enlist different Gene transfer to plants. Elaborate Agrobacterium mediated gene transfer method with its applications. **[10]**

b) Give strategies for transformation of animal cells with its significance. **[8]**

Q7) a) Give examples of transgenic animals and transgenic plants with its significance. **[8]**

b) Illustrate Gene therapy and its potential in biomedical applications. **[9]**

OR

Q8) a) Describe DNA marker technology for improvement of quality and yield of crops. **[8]**

b) Give overview of DNA Diagnostics. **[9]**



Total No. of Questions : 8] **SEAT No. :**

PE2656 **[Total No. of Pages : 2**

[6583]-191

T.E. (Biotechnology)

INTRODUCTION TO IMMUNOLOGY

(2019 Pattern) (Semester - V) (315464)

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

Instructions to the candidates:

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

Q1) a) What are monoclonal antibodies? What are their applications? **[12]**

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

OR

Q2) a) Discuss the structure and function of IgG and IgM. **[12]**

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

Q3) a) How is cell mediated immunity different than humoral immunity? **[10]**

b) Write a note on GVHR. **[7]**

OR

Q4) a) Sheep skin graft is made in a rabbit. With the help of a diagram describe the consequences. Comment on why the graft will be accepted or rejected. **[15]**

b) Antigen presenting cells present antigens to _____ cells. **[2]**

Q5) a) Give comparative account of Type I, II, III and IV hypersensitivity. **[12]**

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

OR

Q6) a) What is an autoimmune disease? Giving two examples discuss organ specific autoimmune diseases. **[12]**

b) Write a note on anaphylaxis. **[6]**

P.T.O.

Q7) a) Write notes on **[12]**

i) whole-cell vaccine

ii) sub-unit vaccine

iii) recombinant vaccine

b) Write a note on Radio Immuno Assay. **[5]**

OR

Q8) a) With the help of a diagram illustrate various types of ELISA tests, their principles and applications. **[12]**

b) Write a note on DNA vaccines**.** **[5]**



Total No. of Questions : 8]

SEAT No. :

PE2657

[Total No. of Pages : 2

[6583]-192

T.E. (Biotechnology)

ENZYME TECHNOLOGY

(2019 Pattern) (Semester - V) (315465A) (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) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) What is the role played by : **[18]**

a) Coenzyme A in the oxidation of fatty acids for membrane lipid synthesis.

b) Biotin in carboxylation reactions.

OR

Q2) Answer the following : **[18]**

a) Differentiate between

i) PLP and TPP

ii) Coenzyme A and Biotin

b) Describe the steps involved in conversion of pyruvate into acetyl Co A.

Q3) Answer the following : **[17]**

Write a short note on

a) Significance of enzyme inhibition

b) Allosteric inhibition

c) Feedback inhibition

OR

P.T.O.

Q4) You have performed a series of experiments determining the Ki values for three competitive inhibitors. The following table lists the results. **[17]**

Inhibitor	Ki
A	5
B	1
C	0.2

Which inhibitor binds with higher affinity to the free enzyme and why? If the same concentration of inhibitor were used in each experiment, which inhibitor would give the smallest value of Km, approximately and why?

Q5) Answer the following : **[18]**

a) What are the different methods of enzyme immobilization? Explain any one in detail with its advantages and disadvantages.

b) Compare between immobilization of enzyme by covalent bonding and encapsulation.

OR

Q6) What is matrix? What are the different types of matrices used? Enlist the factors which need to be considered while selecting the matrix for enzyme immobilization and explain any two in detail. **[18]**

Q7) Answer the following : **[17]**

a) Why there is need for enzyme immobilization in clinical medicine? Write advantages of enzyme immobilization.

b) Describe bio components of biosensors and write characteristics of biosensors.

OR

Q8) What is the advantages of immobilized enzyme in biosensors over soluble enzyme? Explain any one application of immobilized enzyme in biosensor.**[17]**

Total No. of Questions : 8]

SEAT No. : [ ]

PE2658

[Total No. of Pages : 2

[6583]-194

T.E. (Biotechnology)

AGRICULTURAL BIOTECHNOLOGY

(2019 Pattern) (Semester - V) (315465C) (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) ***Figures to the right indicate full marks.***

Q1) a) What is surface sterilization? Give methods and significance of surface sterilization in PTC. **[9]**

b) What do you mean by suspension culture? Explain the principle and applications of cell suspension culture. **[9]**

OR

Q2) a) What is embryo culture? How this technique could be utilized for improvement of crops? **[9]**

b) Differentiate between somoclonal and gametoclonal variations. **[9]**

Q3) a) Describe Randomly Amplified Polymorphic DNA (RAPD) techniques with its principle and applications. **[9]**

b) Differentiate between structural and functional genomics. **[8]**

OR

Q4) a) Briefly describe Molecular marker assisted selection for crop improvement with example. **[9]**

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

i) RFLP and

ii) 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]**

i) Biopesticides

ii) Biostimulants

OR

Q6) a) Give significance of Rhizobacteria in sustainable agriculture. **[10]**

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

i) BGA

ii) Antioxidants

iii) PGRs

Q7) a) Summarize role of Genetic Engineering Appraisal Committee (GEAC)**[8]**

b) What is the risk assessment of GMOs? **[9]**

OR

Q8) a) Write functional role of Environment Protection Act (EPA) 1986. **[8]**

b) What is the purpose of Cartagena protocol on biosafety? **[9]**

Total No. of Questions : 8]

SEAT No. :

PE3224

[Total No. of Pages : 2

[6583]-195

T.E. (Printing Engineering)

FLEXO PRINTING TECHNIQUES

(2019 Pattern) (Semester-VI) (308289)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.***
2) ***Figures to the right indicate full Marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume Suitable data, if necessary.***

Q1) a) Discuss Standardization of Conventional Flexo Plate. **[17]**

b) Define Back-exposure and its purpose and effect and how to test it?

c) Explain washout solution and different type of solutions.

OR

Q2) a) Prepare a conventional photopolymer plate for flexo press systematically. **[17]**

b) Define Main-exposure and its purpose and effect.

c) Explain different aspect of Environmental in flexo industry.

Q3) a) Explain different type of image used in pre-press. **[18]**

b) Discuss different type of dot: Flat top dot and Round top dot.

c) Discuss Raster image process digital workflow.

OR

Q4) a) Discuss different characteristics of digital plates. **[18]**

b) Define CTP imaging technique: Ablation technique.

c) Explain digital workflow.

P.T.O.

Q5) a) Explain wide web press with diagram. **[18]**

b) Explain platform narrow web press and its advantages.

c) Explain Central impression narrow web press with diagram.

OR

Q6) a) Discuss different type of tapes and its impact on print quality. **[18]**

b) Define in-line narrow web press with diagram.

c) Explain hot air dryer.

Q7) a) Define fountain roller and its specification. **[17]**

b) Explain different ink metering system used in flexography.

c) Explain different method of anilox engraving.

OR

Q8) a) Define anilox cells and its type. **[17]**

b) Explain different method of Anilox cleaning.

c) Explain doctor blade in detail with diagram.



Total No. of Questions : 8]

SEAT No. :

PE3225

[Total No. of Pages : 2

[6583]-196
T.E. (Printing)
COLOR MANAGEMENT
(2019 Pattern) (Semester - VI) (308290)

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) Explain LCD display Technology. **[6]**

b) Why to set white point of Monitor? **[6]**

c) Explain monitor gamma setting and importance. **[5]**

OR

Q2) a) Explain CRT display technology. **[6]**

b) Comment on environment setting for monitor display. **[5]**

c) How display profiling is done? **[6]**

Q3) a) How to construct output device profile? **[6]**

b) What are output devices for printing? **[6]**

c) What is importance of printer profiling? **[6]**

OR

Q4) a) How to ensure consistency of gravure press? **[6]**

b) List the parameters to be considered for offset printing press. **[6]**

c) State improtance of rendering intents. **[6]**

Q5) a) Define merits of device link. **[6]**

b) Where do you use device link? **[6]**

c) How do you do hard proofing? **[5]**

OR

Q6) a) How do you profile your proofing device? **[6]**

b) Comment on extended gamut printing. **[5]**

c) Explain disadvantages of using device link. **[6]**

P.T.O.

Q7) a) Discuss visual color evaluation method. **[6]**

b) What parameters affect visual color evaluation? **[6]**

c) Comment on illumination for visual evaluation. **[6]**

OR

Q8) a) Comment on role of halftone in color reproduction. **[6]**

b) Why gray balance setting is important in color management? **[6]**

c) Comment on TRC. **[6]**



Total No. of Questions :8]

SEAT No. :

PE3226

[Total No. of Pages : 4

[6583]-197
T.E. (Printing Engineering)
DESIGN OF EXPERIMENTS
(2019 Pattern) (Semester-VI) (308291)

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 side indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necesary.***

Q1) a) A pollution control officer has reported average fine of 500 printing presses that he has to deal with during a month amount to Rs. 36,000/- with a standard deviation of Rs. 10,000/-. Assuming that the fine in these businesses are normally distributed, find: The number of businesses the fine is over Rs. 40,000. **[6]**

b) Also find if the percentage of business the fine is likely to range between Rs. 30,000 and Rs. 40,000 **[6]**

c) Describe t-test **[5]**

OR

Q2) a) Hourly wages of 1000 workmen are normally distributed around a mean of Rs. 70 and with a standard deviation of Rs. 5. Estimate the number of wages whose hourly wages will be: Between Rs. 70 and Rs. 72 **[6]**

b) Between Rs. 69 and 72 **[5]**

c) What is Type 1 error and Type II error **[6]**

Q3) a) To adjust the contact pressure between plate cylinder and blanket cylinder, which move towards each other at a fixed axial clearance, the plate or the blankets are underlaid, a process which results in a 0.05–0.15 mm radial deformation of the blanket. The changes in the underlay resulted in variations in tone value increase in the highlight areas and print contrast. The operator collected data for 6 of its treatments of underlay. **[12]**

P.T.O.

Treatment in micron thickness of packing					
0.01	0.05	0.075	0.08	0.1	0.2
27	29.3	29.3	29.45	30.11	34.7
26.7	27	28.99	30.33	33.47	31.77
28	28.01	29.02	31.1	31.55	32.98
27.3	25.9	29.1	31	34	33.0

Using the data given below for TVI, test whether the mean tone value increase due underlay is same for all thicknesses at 0.05 level of significance

b) Explain degrees of freedom in ANOVA **[6]**

OR

Q4) a) A CTP unit manufacturer is experimenting on time required for imaging in CTP plates. It is of interest for the researcher to study the effects of following factors: types of laser diodes and the coating type. Each factor is run at 3 levels. The setup is that of a completely randomized design. The data are given in table. The time measured is in microseconds. **[12]**

Factors	Coating Type	
Laser Power in Watt	A	B
60	39.5	47.4
	45.7	43.5
	49.8	39.8
	50.2	36.1
	63.8	41.2
80	33.5	44
	36.7	41.2
	42	47.3
	38.1	45.3
	31.2	42.7

Prepare ANNOVA Table (4)

b) i) What effect does coating type have on the time to image?

ii) What effect does power have on the time to image?

iii) Do both coating types behave in the same manner in the two types?

[6]

Q5) a) Consider a 2^2 factorial with factors A and B and n experimental observations per factor combination. Prepare a geometric view and in tabular form of the 2^2. Define Contrast A, B and AB among treatment totals. **[6]**

b) Offset Industries statistics report states information of 276 packaging presses and 24 publication presses facing strong environmental issues due to air pollutants released from the presses. Explain with the help of a cause-and-effect diagram his problem in order to reduce emissions. **[6]**

c) Explain general full factorial in DOE. **[5]**

OR

Q6) a) In 2^k series consider following factors polymer 1 and polymer 2. Each run at 2 levels low and high indicating concentration of the polymers. These experiments are conducted to test additives to inks. Data given is change in plastic viscosity which is a rheological measure reflecting the change in thickness of the ink. Various polymers are added to the ink to increase the viscosity. **[11]**

Prepare and display treatment combinations in graphical form.

	Polymer 1			
Polymer 2		Low		High
Low	3	3.5	11.3	12.0
High	11.7	12.0	21.7	22.4

Calculate main effect and interaction effect.

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

Q7) A book making machine is set to deliver packets of a given weight, 10 samples of size 5 each were recorded. Below given are relevant data: **[18]**

Sample no	1	2	3	4	5	6	7	8	9	10
Mean xbar	15	17	15	18	17	14	18	15	17	16
Range	7	7	4	9	8	7	12	4	11	5

Calculate the values for the central line and control limits for mean chart and range chart and then comment on the state of control.

OR

Q8) a)

345	530	556	354	590
395	515	479	494	420
563	444	629	440	485
505	604	490	445	605
402	406	730	506	516
472	475	610	586	523
691	520	465	468	545
523	582	570	578	505
461	575	420	605	527
624	440	585	420	384

[6]

Construct a frequency distribution table with appropriate class limits and class boundaries. With reference to G chart divide the measurement scale into 8 groups

b) Draw histogram to represent the above frequency distribution **[6]**

c) Comment on the results. **[6]**



Total No. of Questions :8]

SEAT No. :

PE3227

[Total No. of Pages : 2

[6583]-198

T.E. (Printing Engineering)

MAINTENANCE MANAGEMENT OF PRINTING MACHINES

(2019 Pattern) (Semester-VI) (308293A) (Elective-II)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.No.1 or Q.No.2, Q.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No7 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) Describe the role of lubricants and lubrication in preventive maintenance. **[6]**

b) How does effective lubrication contribute to equipment longevity and performance? **[6]**

c) Discuss common challenges encountered in implementing preventive maintenance programs. **[6]**

OR

Q2) a) Describe predictive maintenance strategies based on analysis of electrical current and temperature parameters. **[7]**

b) What are the advantages of adopting predictive maintenance practices in industrial operations? **[6]**

c) Discuss the challenges associated with implementing condition monitoring programs. **[5]**

Q3) a) What safety precautions should be followed when working with electrical equipment? **[8]**

b) Discuss the proper handling procedures for hazardous chemicals in maintenance activities. **[9]**

OR

P.T.O.

Q4) a) Explain the concept of re-rubberizing and its application in maintenance activities. **[7]**

b) Describe different replacement models used for determining optimal equipment replacement schedules. **[10]**

Q5) a) What are the benefits of proactive maintenance over reactive maintenance approaches? **[9]**

b) How can preventive maintenance be integrated into existing production schedules to minimize downtime? **[8]**

OR

Q6) a) How can condition monitoring technologies improve overall equipment reliability and performance? **[10]**

b) What are the key considerations when selecting condition monitoring tools and techniques for specific equipment types? **[7]**

Q7) a) How can safety measures be implemented when dealing with heavy machinery during maintenance tasks? **[7]**

b) Describe fire protection measures relevant to maintenance operations in industrial facilities. **[6]**

c) Discuss the importance of wearing appropriate personal protective equipment (PPE) in maintenance work environments. **[5]**

OR

Q8) a) Discuss the factors influencing replacement policy decisions in maintenance management . **[6]**

b) Explain the importance of critical spares inventory management in minizing equipment downtime. **[6]**

c) How is the average life of equipment determined in maintenance planning and what factors influence it? **[6]**

● ● ●

Total No. of Questions :8]

SEAT No. :

PE3228

[Total No. of Pages : 2

[6583]-199

T.E. (Printing Engineering)

BASIC COMMUNICATION SYSTEMS & ELECTRONIC INSTRUMENTATION

(2019 Pattern) (Semester-VI) (308293B) (Elective-II)

Time : 2½Hours] *[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 wireless communication with examples. **[8]**

b) Describe the FHSS and DSSS modulation in detail. **[9]**

OR

Q2) a) Explain Infrared LED in plate making. **[8]**

b) Describe RFID and inventory management. **[9]**

Q3) a) Explain the general instrumentation system in detail. **[9]**

b) Explain statistical analysis and probability of errors used in industrial instruments. **[9]**

OR

Q4) a) Explain classification of transducers. **[9]**

b) Explain calibration certificate and traceability in detail. **[9]**

Q5) a) Explain resistive and inductive sensors used in the printing industry. **[8]**

b) Describe piezoelectric and ultrasonic transducers working principle and applications. **[9]**

OR

P.T.O.

Q6) a) Explain working of LVDT and differential capacitive sensors. **[8]**

b) Describe the applications of Explain electromagnetic tachometer in printing industry. **[9]**

Q7) a) Explain SAMA classification of temperature sensors. **[9]**

b) Describe a filled system thermometer. **[9]**

OR

Q8) a) Explain temperature standards and units. **[9]**

b) Describe thermocouple with Seebeck effect used in printing and packaging. **[9]**

● ● ●

Total No. of Questions : 8]

SEAT No. :

PE3229

[Total No. of Pages : 2

[6583]-201
T.E. (Printing)
PRINT STATISTICS
(2019 Pattern) (Semester - V) (308281)

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) ***Neat diagrams must be drawn wherever necessary.***

Q1) Explain the following : **[17]**

a) Histogram and its significance in data interpretation.

b) Measure of accuracy or centering.

c) Measures of precision or spread.

OR

Q2) From the given data, construct a frequency distribution and draw a histogram, then comment on data distribution. **[17]**

0.902, 0.904, 0.907, 0.909, 0.910, 0.911, 0.912, 0.913, 0.914, 0.915, 0.909, 0.910, 0.911, 0.908, 0.907, 0.912, 0.913, 0.909, 0.908, 0.911, 0.912, 0.914

Form 7 groups using range ÷ 7 method & round to 3 decimal.

Q3) Draw an $\overline{X} - R$ chart for the given samples and comment on process stability. **[18]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurement	890	910	900	920	915	930	905	910	920	905
Measurement	895	905	910	925	918	932	910	915	918	900
Measurement	885	908	905	918	912	928	908	912	922	906

Use constants $A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.114$

OR

P.T.O.

Q4) Using the data below. Draw two pareto charts - **[18]**

a) one for number of defectives

b) one for dollor loss

including cumulative percentage graphs

Department	Defectives	Dollor loss
A	15	100
B	100	400
C	80	800
D	60	300
E	30	90
F	20	60

Q5) Explain with examples : **[17]**

a) Random samples and statistical model.

b) Correlation coefficient and its interpretation.

c) Simple linear regression and its applications in printing industries.

OR

Q6) From the given data, compute the correlation coefficient and comment on the relationship. **[17]**

X : 2, 4, 6, 8, 10

Y : 3, 5, 7, 9, 11

Q7) Calculate the process capability index Cp & Cpk for the given data. **[18]**

USL = 20, LSL = 10 σ = 1.5

Sample readings 12, 14, 13, 15, 16, 12 ,14 ,13 15 ,14

OR

Q8) Explain the DMAIC process in six sigma with suitable example from manufacturing or printing industry. **[18]**

Total No. of Questions : 8]

SEAT No. :

PE-3230

[Total No. of Pages : 2

[6583]-202
T.E. (Printing Engineering)
OFFSET PRINTING TECHNIQUES
(2019 Pattern) (Semester - V) (308282)

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) Explain in detail the feeder system of an offset press. **[18]**

OR

Q2) Explain different types of plates used on an offset machine **[18]**

Q3) Describe contact and non-contact dampening systems used in offset press **[17]**

OR

Q4) Describe the impact of dampening systems' pH and conductivity in ink transfer. **[17]**

Q5) Explain the different types of folders used in the web-fed offset press. **[18]**

OR

Q6) Explain the working of drying systems used in the web-offset press. **[18]**

P.T.O.

Q7) a) Mention the various auxiliary equipment on a web offset press. **[7]**

b) Calculate the Rewind Tension with the following specifications: **[10]**

Tension in the previous zone: 0 lb.

Nip Roll Velocity: 101 fpm

Rewind Velocity: 104 fpm

Elasticity* Cross-sectional Area of the Material: 500 lbs.

Also, calculate the error in tension for a 0.25% error in speed.

OR

Q8) Explain in detail the auto registration control system on a web press. **[17]**

♦ ♦ ♦

Total No. of Questions : 8] **SEAT No. :**

PE3231 **[Total No. of Pages : 2**

[6583]-203

T.E. (Printing)

COLOR SCIENCE AND MEASUREMENT

(2019 Pattern) (Semester - V) (308283)

Time : 2½Hours] ***[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) Describe the Munsell Color model system. **[6]**

b) Define saturation and explain out of 2 same samples, which attribute will visually show higher degree of difference. **[6]**

c) Describe the CIE 1931 Y*xy* System. **[5]**

OR

Q2) a) Explain the three basic perceptual attributes of color. **[6]**

b) Draw a neat diagram of a color wheel indicating the different colors. **[5]**

c) Explain the L*a*b color system. **[6]**

Q3) a) Density is not a CIE-type color metric and therefore densitometry is only indirectly used in color management, Justify. **[12]**

b) Draw a neat diagram of spectrum of the sample which the spectrophotometer considers during measurement. **[6]**

OR

Q4) a) Densitometers can be used to measure film, printing plates and press sheets, explain this application in detail. **[12]**

b) Compare following 2 measurement conditions: M_0 and M_1 in spectrophotometers. **[6]**

P.T.O.

Q5) a) Solve following using delta Eab equation between Sample 1 & 2 And Sample 3 & 4 **[5]**

Sample 1
L1* 56.2
a1* -32.5
b1* 4.9
&
Sample 2
L2* 56.0
a2* -45.7
b2* 5.7
Sample 3
L3* 60.3
a3* 33.0
b3* 64.3
&
Sample 4
L4* 41.0
a4* 33.2
b4* 25.5

b) State role of spectrophotometer in measurement of color difference. Why is it important to measure color difference with a device and not visually. **[12]**

OR

Q6) a) State the significance of measuring color difference with help of instrument. **[5]**

b) Draw a neat diagram of L*C*h that shows a color difference in hue and chroma. **[6]**

c) Compare any 2 color difference equations. State their differences. **[6]**

Q7) a) Two objects can look the same under one illuminant but different under another light source, explain this phenomenon. **[12]**

b) Explain the Colour Index^{TM} Classification and Overview. **[6]**

OR

Q8) a) Explain the term lightfastness and how are dyes and pigments having these different properties. **[6]**

b) Explain particle size of colorants. Why is it important in ink making. **[6]**

c) What are the causes of metamerism? **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE3232

[Total No. of Pages : 2

[6583]-204
T.E. (Printing)
INK TECHNOLOGY
(2019 Pattern) (Semester - V) (308284)

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) Write short note on Behavior of Inks on machines. **[6]**

b) Compare Newtonian and non Newtonian liquids. **[6]**

c) Write short note on Rheology. **[6]**

OR

Q2) a) Factors which affects the rheological behavior of printing inks. **[6]**

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

c) Write short note on Viscometer. **[6]**

Q3) a) Explain in brief factors affecting ink drying. **[5]**

b) Compare evaporation and absorption drying. **[6]**

c) Compare UV and IR curing. **[6]**

OR

Q4) a) Write short note on EB ink drying. **[5]**

b) Write short note 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 formulartion. **[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

P.T.O.

Q6) a) Describe the ink manufacturing process and different methods for pigment dispersal. **[6]**

b) Explain in brief 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 short note 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 gloss 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) Explain in brief the VOC. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE3233

[Total No. of Pages : 2

[6583]-205

T.E. (Printing Engineering)

CYBER SECURITY

(2019 Pattern) (Semester - V) (308286A) (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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain how ransomware attacks differ from traditional computer virus. **[9]**

b) Describe two ways in which a virus can impact a corporate network. **[9]**

OR

Q2) a) What is a logic bomb? Describe its triggering mechanism with an example. **[9]**

b) Differentiate between a virus and a logic bomb based on working and threat level. **[9]**

Q3) a) Define steganography and explain its importance in information security. **[8]**

b) Explain data hiding in BMP images with an example. **[9]**

OR

Q4) a) Compare data hiding in GIF and JPEG images. **[8]**

b) Discuss the advantages and disadvantages of steganography. **[9]**

P.T.O.

Q5) a) Explain the basic principles of Patent Law. **[9]**

b) Describe the steps involved in the Patent Application procedure. **[9]**

OR

Q6) a) Describe Intellectual Property Laws. **[9]**

b) Discuss the difference between Trademark and Design Rights. **[9]**

Q7) a) Define Cybercrime and explain its types. **[8]**

b) Discuss the classification of cybercrimes with suitable examples. **[9]**

OR

Q8) a) Explain Cyber Stalking and its legal implications. **[8]**

b) Describe how Cloud Computing can be exploited for cybercrime. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-3234

[Total No. of Pages : 2

[6583]-206

T.E. (Printing Engineering)

Elective - I : WOOD GLASS AND METAL BASED PACKAGING

(2019 Pattern) (Semester - V) (308286B)

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 electronic pocket calculator is allowed.***

Q1) a) Explain manufacturing of glass. **[9]**

b) Explain standards of glass packaging. **[9]**

OR

Q2) a) Explain composition of glass containers. **[9]**

b) Explain Glass containers advantages and disadvantages with applications. **[9]**

Q3) a) Explain gauging of glass testing. **[9]**

b) Explain Pressure Test, and Density Test of glass packaging. **[8]**

OR

Q4) a) Explain the cause of glass to spoil with advantages and disadvantages. **[9]**

b) Explain about USP glass types and testing procedures. **[8]**

Q5) a) Explain about packaging and marking of metal containers. **[9]**

b) Discuss advantages and Disadvantages of Metal Based Packaging. **[9]**

OR

P.T.O.

Q6) a) Summarize type of Metals box used in Industrial packaging in automotive sector as returnable packaging. **[9]**

b) Explain manufacturing of aluminium foil. **[9]**

Q7) a) Discuss on plastic drums and steel drums. **[9]**

b) Explain GI drums. **[8]**

OR

Q8) a) Explain type of closures. **[9]**

b) Explain recent developments of closures and drums. **[8]**



Total No. of Questions :8]

SEAT No. :

PE2659

[Total No. of Pages : 2

[6583]-208
T.E. (Production Engineering)
PRODUCTION TOOLING
(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) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) To design a drawing die for a cup component as shown in figure no.1, calculate following values for a sheet of thickness 2.5 mm and yield strength 370 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

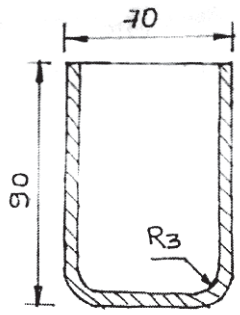


Figure No.1 All dimensions in mm.

b) Calculate bending force required for steel sheet 2mm thick and width 4 meter to be bent in a wiping die. The upper and lower die radius is 6 mm and UTS is equal to 550 MPa. **[6]**

OR

P.T.O.

Q2) a) What is the meaning of bend allowance in sheet bending? Explain working of types of bending dies with suitable sketches. **[9]**

b) Discuss various empirical relations used for calculation of blank size in drawing operation. **[9]**

Q3) a) List various operations performed in forging? Explain design of fuller with suitable sketches. **[9]**

b) Explain design of trimming die in forging die design with suitable sketch. **[8]**

OR

Q4) a) Describe the rules of upset forging with suitable sketches. **[9]**

b) What is the purpose of edging operation in forging? With suitable example explain design of edging impression in forging die design. **[8]**

Q5) a) Explain working of cold chamber die casting machine with suitable sketches. **[9]**

b) Why are cores used in die casting? Explain various types of cores used in die casting. **[9]**

OR

Q6) 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) What are the types of dies in die casting? Explain various types of die casting dies in detail **[9]**

Q7) a) Discuss compression moulding with suitable sketches. **[9]**

b) Explain with the help of neat sketches disc gate, fan gate and spoke gate. **[8]**

OR

Q8) a) Describe working principle of blow moulding with suitable sketches. **[9]**

b) Determine,

i) Shot capacity with acrylic.

ii) Number of cavities for a mould by shot capacity method for a given data. Material = acrylic, Mass of the component = 32 g., Swept volume = 100 cm^3, Density = 1.18 g/cm^3, Constant = 0.92 **[8]**



Total No. of Questions : 8]

SEAT No. : ____

PE2660

[Total No. of Pages : 2

[6583]-209
T.E. (Production)
PRODUCTION AND OPERATIONS MANAGEMENT
(2019 Pattern) (Semester - VI) (311089(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 whenever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary***

Q1) a) Describe the Factors determining Production Planning & Control. **[8]**

b) Describe in detail Centralized PPC and Decentralized PPC. **[10]**

OR

Q2) a) Explain the procedure role of PPC w.r.t. different factors in planning and control stages. **[8]**

b) Describe in detail functions of PPC. **[10]**

Q3) a) What are the types of material handling equipments? **[9]**

b) Describe in short CRAFT input requirements and Procedure adopted for using CRAFT. **[9]**

OR

Q4) a) Explain procedure for making location decisions. **[9]**

b) Discuss in detail the 9 principles of material handling? **[9]**

Q5) a) Explain in detail types of inventories. **[7]**

b) ABC corporation has got a demand for particular part at 10000 units per year. Shortages are not permitted. It costs Rs.40 to place an order and to process the delivery. The inventory carrying cost is Rs. 1.25 per unit per annum. Determine. **[10]**

i) Economic order quantity.

ii) Optimum number of orders to be placed per annum.

iii) Minimum total cost of inventory per annum.

iv) Optimum period of supply per optimum order.

OR

P.T.O.

Q6) a) What are the benefits and importance of inventory management? **[7]**

b) Explain in detail 'P' system and 'Q' system of Inventory control. **[10]**

Q7) a) What is block chain technology? How it can be used in Supply Chain Management? **[8]**

b) What is Enterprise Resource Planning (ERP)? What are it's benefits? **[9]**

OR

Q8) a) What are the stages in drawing Line of Balance? **[8]**

b) Explain in detail Enterprise Resource Planning (ERP). **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2661

[Total No. of Pages : 2

[6583]-210

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 Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full Marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) What are the different variables influencing work-piece control? **[8]**

b) State and explain auxiliary process operations. **[9]**

OR

Q2) a) Explain in detail equilibrium theories. **[8]**

b) What are the six possible movements of an object in space? **[9]**

Q3) a) State and explain different factors in selection of machine. **[9]**

b) What are the factors considered while selecting the tooling? **[8]**

OR

Q4) a) Compare General purpose machine with Special purpose machine. **[8]**

b) Explain different sources of information for process engineer in making equipment selection. **[9]**

Q5) a) What is capacity and capacity utilization? State different capacities. **[9]**

b) Explain in details OEE. **[9]**

OR

P.T.O.

Q6) a) Define- Normal capacity, Expected actual capacity, Rated capacity, Capacity efficiency. **[9]**

b) Explain-Availability × Performance Efficiency × Quality Rate terms in OEE. **[9]**

Q7) a) What are advantages of CAPP over manual process planning. **[9]**

b) Explain the concept of Generative Computer-Aided Process Planning (G-CAPP) and its significance in modern manufacturing. **[9]**

OR

Q8) a) Explain knowledge based CAPP. **[9]**

b) How does CAPP improve the efficiency and effectiveness of the manufacturing process. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2662

[Total No. of Pages : 2

[6583]-211

T.E. (Production Engineering)

PRODUCT DESIGN AND DEVELOPMENT

(2019 Pattern) (Semester - VI) (311091A-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) What is product life cycle? Explain it in brief. **[9]**

b) Elaborate role of economics in product development. **[8]**

OR

Q2) a) State functions of marketing department. **[9]**

b) Classify types of products in detail. **[8]**

Q3) a) Explain steps for building a house of quality. **[9]**

b) Classify various needs of customer in automobile field. **[8]**

OR

Q4) a) Explain engineering characteristics with suitable case study. **[9]**

b) What is Quality function deployment. **[8]**

P.T.O.

Q5) a) Brief DFM guidelines in detail. **[9]**

b) How to do estimation of manufacturing cost? Explain. **[9]**

OR

Q6) a) Explain DFM guidelines for closed-die forging. **[9]**

b) State procedure for Design for Plastic processing. **[9]**

Q7) a) Discuss case studies in PLM for Auto Industry. **[9]**

b) Explain Components of PLM. **[9]**

OR

Q8) a) Discuss case studies in PLM for Home appliances. **[9]**

b) Write a short note on: Product Data Management. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PE2663

[Total No. of Pages : 2

[6583]-212

T.E. (Production)

NANO MANUFACTURING

(2019 Pattern) (Semester - VI) (311091 A-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, 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 are the different energy sources used in nonconventional machining processes? **[10]**

b) What are the needs of unconventional manufacturing process? **[6]**

OR

Q2) a) What is the reason for using unconventional or advanced machining?**[10]**

b) Which non-conventional machining process has highest material removal rate? **[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? **[12]**

b) What are the key issues in the synthesis of nanomaterials? **[6]**

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]**



Total No. of Questions : 8]

SEAT No. : ____

PE2664

[Total No. of Pages : 2

[6583]-213

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 are different types of errors? Explain in detail. **[9]**

b) Suppose 1.414 is used as an approximation to 2 . Find the absolute and relative errors. **[9]**

OR

Q2) a) Discuss Newton Raphson method? And write procedure of it. **[9]**

b) Find the real root of the equation $x \log_{10} x = 1.2$ by Bisection method correct to four decimal places. Assume initial interval [2:3]. **[9]**

Q3) a) What are various methods of curve fitting? **[9]**

b) How is a power equation fitted in curve? Explain in detail. **[8]**

OR

Q4) a) Discuss various methods of least square criteria's. **[9]**

b) Explain exponential curve fitting. **[8]**

P.T.O.

Q5) a) A set of values of x and f(x) are given below, using Lagrange interpolation formula, find y_g at $x_g = 1.1$ **[9]**

x	1	1.2	1.3	1.5
Y=$f(x)$	1	1.0954	1.1402	1.2247

b) Construct the forward difference table, given that **[9]**

x :	5	10	15	20	25	30
y :	9962	9848	9659	9397	9063	8660

and point out the values of $\Delta^2 y_{10}$,$\Delta^4 y_5$.

OR

Q6) a) Evaluate $\int_0^6 \frac{dx}{1+x^2} dx$, taking 6 intervals by Trapezoidal rule. **[9]**

b) Evaluate $\int_0^{0.8} ln(x+1) + \sin(2x).dx$ where x in radians. Using Simpson's 1/3 rule, derive entire interval in 8 strips. **[9]**

Q7) a) What do you understand from optimization? Explain multiple optimization in detail. **[9]**

b) Explain Genetic Algorithm (GA) with one of case study. **[8]**

OR

Q8) a) How is multiple optimization useful for manufacturing? Explain in detail.**[9]**

b) What is classical optimization? Discuss Simulated Annealing (SA) optimization. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PE2665

[Total No. of Pages : 4

[6583]-214
Third Year (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) ***Figures to the right indicate full marks.***

Q1) a) Explain the risk-return trade-off of current assets financing. **[6]**

b) X Ltd. issues Rs. 50,000 8% debenture. The tax rate applicable is 50%. Compute the cost of debt capital, if debentures are issued (i) at par (ii) at Premium of 10% (iii) at discount of 10% **[6]**

c) Explain the current assets holding period method of estimating working capital. **[5]**

OR

Q2) a) What do you mean by operating efficiency? How does it affect working capital? **[6]**

b) Hi-tech Ltd. plans to sell 30,000 units next year. The expected cost of goods sold is as follows: **[6]**

	₹ (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

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.

c) What is the significance of current assets to fixed assets ratio? **[5]**

P.T.O.

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
		Walfare	₹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) What items constitute (i) Prime Cost (ii) Cost of Production and (iii) Cost of Goods Sold. **[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 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 (i) Process Account and (ii) Abnormal Loss Account. **[6]**

OR

Q8) 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

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Total No. of Questions : 8]

SEAT No. :

PE2666

[Total No. of Pages : 2

[6583]-215
T.E. (Production)
ENGINEERING METROLOGY & INSTRUMENTATION
(2019 Pattern) (Semester-V) (311081A)

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 neccessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume Suitable data if neccessary.***

Q1) a) Define Quality of conformance and explain in detail cost of Quality. **[8]**

b) In automobile filling process 551 gms. of certain liquid was to be filled in plastic bags. The permissible variation is ± 5 gms. For investigating the process capability, 6 bags were taken at random from each batch for 10 successive batches and results were plotted as follows. **[10]**

Batch	1	2	3	4	5	6	7	8	9	10
Mean, gms.	550	551	549	549	551	552	552	549	548	552
Range	1	2	2	3	2	1	2	3	2	2

Find out control limits for x- bar chart.

Take A_2= 0.483,D_3=0,D_4=2.004, d_2=2.534. Will the process be able to meet the specifications?

OR

Q2) a) Explain with neat sketch Operating characteristics (O.C.) curve. **[8]**

b) A subgroup of 5 items is taken from the manufactured items. After 24 Subgroups the values of $\bar{x}$ and R were found to be $\Sigma\bar{x} = 251$ and $\Sigma R = 5.5$. The specification limits for the part are 15.6± 0.30. 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= 0.483, D_3 = 0, D_4 = 2.004, d_2 = 2.534 for subgroup size of 6.**[10]**

P.T.O.

Q3) a) Explain JURAN's approach in quality. **[9]**

b) Describe the contributions of Deming in the area of total quality management. **[9]**

OR

Q4) a) Write a short note on Pareto Chart. **[9]**

b) Explain in detail 5S in KAIZEN practice. **[9]**

Q5) a) Explain the stages in generalized measuring system? **[7]**

b) Explain in detail Readout-Recording stage in generalized measuring system **[10]**

OR

Q6) a) Explain the following features of measuring instrument **[10]**

i) Precision

ii) Accuracy

b) Define Force. Explain in detail Direct and Indirect methods of force measurement. **[7]**

Q7) a) Explain with neat sketch temperature measuring Arrangement using Thermocouple. **[8]**

b) What are the different types of dynamometers? Explain with neat sketch Prony Brake type dynamometer in Torque measurement. **[9]**

OR

Q8) a) What is vibration and explain with neat sketch any one vibration measuring instrument. **[8]**

b) Explain in detail active and passive sensors with example. **[9]**

● ● ●

Total No. of Questions : 8]

SEAT No. : ____

PE2667

[Total No. of Pages : 3

[6583]-216

T.E. (Production)

MATERIAL FORMING TECHNOLOGY

(2019 Pattern) (Semester - V) (311082A)

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

Instructions to the candidates:

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

Q1) a) Explain with neat sketch drawing die. **[5]**

b) In wire drawing operation, show that the drawing stresses is given by the equation. **[12]**

$$\sigma_d = \frac{1+B}{B}\sigma_o\left(1-\left(1-RA\right)^B\right)$$

Where,

$B = \mu\cot(\alpha)$

μ = Coefficient of friction

α = Semi die angle

RA = Reduction in area

σ_d = Drawing stress.

σ_o = Yield stress before drawing

OR

P.T.O.

Q2) a) Describe various type of tube drawing operation with neat sketch. **[10]**

b) How stock is prepared in drawing operation? Elaborate it. **[7]**

Q3) a) Describe with neat sketch the following types of rolling mill. **[10]**

i) Planetary Rolling Mill

ii) Sendzimir Cluster Rolling Mill

b) Describe the different rolling defects and their causes. State the remedies to overcome these defects. **[8]**

OR

Q4) a) In rolling process 25mm thick plate is rolled to 20mm in four high rolling mill. Determine coefficient of friction if this is maximum reduction possible. The roll diameter is 500mm and yield strength of material is $100N/mm^2$. Find neutral plane section, its position, backward and forward slip and maximum pressure. **[14]**

b) Explain the following term in rolling process: **[4]**

i) Angle of bite

ii) Neutral plane

Q5) a) Clearly illustrate the differences between direct and indirect extrusion with an application and a sketch. **[12]**

b) Describe how ram travel affects extrusion pressure in both forward and backward extrusion, using a sketch. **[5]**

OR

Q6) a) What is impact extrusion? Elaborate different types with sketch. **[7]**

b) An Aluminium billet of 250mm diameter and 1m long is extruded to the final shape shown in Fig 1. **[10]**

Calculate:

i) Extrusion Ratio

ii) CCD

iii) Shear (Shape) Factor

iv) Work done

The flow stress of Aluminium is 60N/mm^2 and coefficient of friction between billet and container is 0.2.

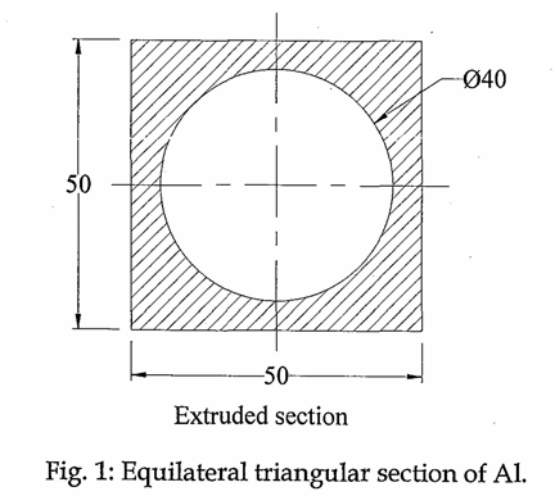


Fig. 1: Equilateral triangular section of Al.

Q7) a) Compare high velocity forming with conventional forming. **[8]**

b) What is mean by flow forming? What distinguishes flow forming from metal spinning? **[10]**

OR

Q8) Write short note on **[18]**

a) Explosive forming

b) Electro hydraulic forming

c) EMF



Total No. of Questions : 8] **SEAT No. :**

PE2668 **[Total No. of Pages : 2**

[6583]-217

T.E. (Production Engineering)

MACHINING SCIENCE AND TECHNOLOGY

(2019 Pattern) (Semester - V) (311083A)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams 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 functions of coolants and lubricants. Discuss types of cutting fluids in detail. **[9]**

b) Discuss formation of primary and secondary shear zone in metal cutting with suitable sketches. **[9]**

OR

Q2) a) Explain machinability, machinability rating and various machinability criterias. **[9]**

b) A tool cutting at 35 m/min has a life of 4 hours when used for a rough cut. What will be probable tool life when engaged on light finish cut? Take n = 0.l25 for rough cut, n = 0.1 for finish cut. **[9]**

Q3) a) Explain effect of tool geometry on tool life. **[9]**

b) Describe formation of crater wear and flank wear with suitable sketches. **[8]**

OR

Q4) a) Describe in brief wear mechanisms due to fatigue, electrochemical effect, oxidation effect, and chemical decomposition. **[9]**

b) For a metal machining, the following information is available: Tool change time = l0 min. Tool re-grind time = 7 min. Machine running cost = Rs. 8 per hour, Tool depreciation per re-grind = 40 paise, n = 0.25, C = 150. Calculate the optimum cutting speed. **[8]**

P.T.O.

Q5) a) Explain design procedure of single point cutting tool for square shank with suitable sketches. **[9]**

b) List various shapes of inserts used in metal cutting. Explain any two shapes of inserts with suitable sketches and comment on their strength. **[9]**

OR

Q6) a) Explain types of chip breakers with suitable sketches. **[9]**

b) Design a single point cutting tool to turn a M S bar with a linear cutting speed of 45 m/min on a lathe equipped with a 10 KW motor. Safe stress for tool material is 320 MPa and efficiency of machine tool is 75%. **[9]**

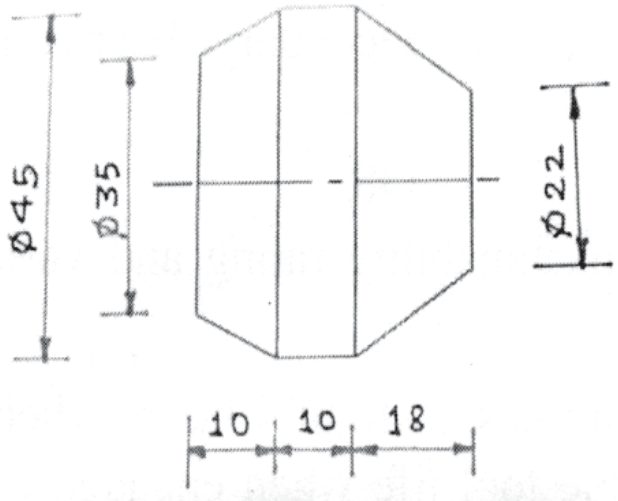
Q7) a) Explain guidelines for designing length of body and number of teeth for reamer with suitable sketch. **[9]**

b) Discuss in detail with suitable sketches the procedure to be followed in designing a circular form tool by graphical method. **[8]**

OR

Q8) a) State various guidelines to be used in design of broach. **[8]**

b) Design a flat form tool for a given job by graphical method when, rake angle = 23° and relief angle = 28°, Raw material – mild steel. **[9]**



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Total No. of Questions : 8]

SEAT No. :

PE2669

[Total No. of Pages : 3

[6583]-218

T.E. (Production Engineering)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester - V) (311084(A))

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.***

Q1) a) Explain why uniform velocity follower motion is not practicable at high speed unless it is modified. How it is modified? **[7]**

b) A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion:

i) Follower to move outwards through a distance of 30 mm during 120º of cam rotation;

ii) Follower to dwell for 60º of cam rotation;

iii) Follower to return to its initial position during 90° of cam rotation ; and

iv) Follower to dwell for the remaining 90º of cam rotation. The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile. **[10]**

OR

Q2) a) Explain the turning moment diagram for four stroke I. C. engine. **[7]**

b) A machine punching 38 mm holes in 32 mm thick plate requires 7 N-m of energy per square mm of sheared area, and punches one hole in every 10 seconds. Calculate the power of motor required. The mean speed of the flywheel is 25 m/sec. The punch has a stroke of 100 mm. Find mass of flywheel required, if total fluctuation of speed is not to exceed 3% of mean speed. Assume that motor supplies energy to machine at uniform rate. **[10]**

P.T.O.

Q3) a) Explain modified Goodman's diagram for axial and bending fluctuating stresses. **[8]**

b) A cantilever beam of circular cross section. made of steel with ultimate tensile strength of 540 N/mm^2, is fixed at one end and subjected to a completely reversed force of 10 kN at free ends. The force is perpendicular to beam axis. The distance between free and fixed end of beam is 100 mm. The construction of cantilever is such that there is no stress concentration. The corrected endurance limit is 160.96 N/mm^2. If the diameter of beam is 35 mm, determine life of beam. Assume factor of safety is 1. **[10]**

OR

Q4) a) Discuss stress concentration and methods to reduce it. **[6]**

b) A transmission shaft made of cold drawn steel having ultimate tensile strength of 630 N/mm^2 and tensile yield strength 360 N/mm^2 is subjected to a fluctuating torque which varies from 600 Nm clockwise to 400 Nm clockwise. The surface finish factor and size factor are 0.8 and 0.85 respectively. The reliability factor is 0.897.
If the factor of safety is 2, determine diameter of shaft. Use maximum shear stress theory of failure. **[12]**

Q5) a) Explain design based on factor of safety and design based on reliability.**[7]**

b) The mean tensile strength and the standard deviation of 250 nuts are 310 N/mm^2 and 35 N/mm^2 respectively. Determine:

i) The number of nuts expected to have a strength less than 270 N/mm^2

ii) The number of nuts expected to have a strength between 270 N/mm^2 and 360 N/mm^2. **[10]**

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

OR

Q6) a) Discuss the causes of variations in dimensions of component. **[7]**

b) It is observed from the sample of 1000 bearings bushes that the internal diameters are normally distributed with a mean of 50.015 mm and standard deviation of 0.08 mm. Dimension of this diameter specified on the drawing is 50.00 ± 0.1 mm. Calculate the approximate number of rejected bushes from the sample. **[10]**

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) Explain with example, what are functional requirements and undesirable effects in design of mechanical system. **[6]**

b) A tensile bar of length 400 mm is subjected to constant tensile force of 4000 N. If the factor of safety is 2, design the bar with objective of minimizing the material cost out of following material. What will be the cost of bar. **[12]**

Material	Mass density Kg/m^3	Material cost per unit mass,Rs/kg	Yield strength N/mm^2
Plain Carbon Steel	7800	28	400
Alloy steel	7850	150	900
Aluminium Alloy	2800	140	150
Titanium Alloy	4500	2200	800

OR

Q8) a) What is design for safety? Explain the general principles to be followed while designing the product for safety. **[8]**

b) Explain the following terms used in Johnson's method of optimum design: **[10]**

i) Geometrical parameter

ii) Material parameter



Total No. of Questions : 8]

SEAT No. : ____

PE2670

[Total No. of Pages : 3

[6583]-219

T.E. (Production Engineering)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - V) (311085(A) - I) (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 calculators is allowed.***
5) ***Figures to the right indicate full marks.***

Q1) a) Determine the stresses and strains for the 2D CST element. **[8]**

b) A triangular membrane element of thickness t = 0.15 cm, with the (x, y) coordinates of nodes indicated beside the node numbers, is shown in Fig. Take E = 207 GPa and μ = 0.15, 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.

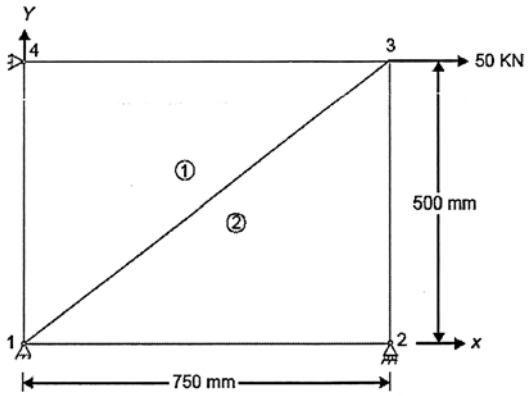
iii) Elasticity matrix [D].

iv) Element stiffness matrix,

OR

Q2) a) Describe 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. Take μ =0.15, E = 2.5×10^5 N/mm^2, Thickness = 12mm. **[8]**



P.T.O.

Q3) a) Determine the structural stresses and strains for 1D bar element and also determine the thermal stresses and strains for the 1D bar element. **[9]**

b) Narrate the procedure to determine the stresses and strains for the truss element. **[8]**

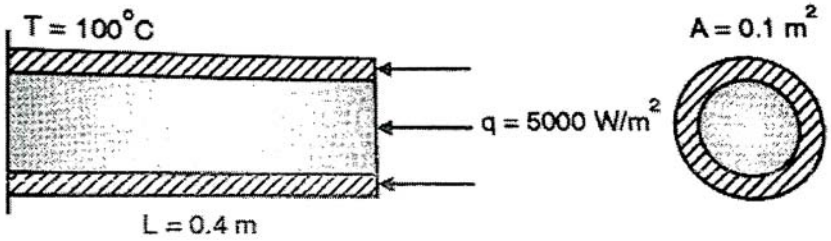
OR

Q4) a) Derive the element stiffness matrix formulation for 1D steady state heat conduction problems. **[9]**

b) Explain the boundary conditions that prevail in 1D steady state heat conduction. **[8]**

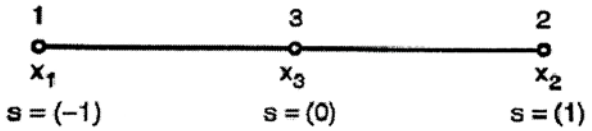
Q5) a) Write notes on steps involved in processing step, to solve 1D heat transfer problem using FE Problem. **[8]**

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 = 6500 W/m^2 acts on the right end. Let K_{xx}= 7 W/m°C and cross sectional area A = 0.15 m^2. Determine Global matrix. **[10]**



OR

Q6) a) For the three-node diso-parameteric 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 $u = a_1 + a_2 s + a_3 s^2$. **[10]**



b) Define warp angle and skewness and their significance in FEM. **[8]**

Q7) a) A three stepped rod of diameter 90mm, 100mm with length 1000mm and 250mm is fixed at one end. Let density = 0.00074kg/m^3, E = 250 × 100000N/mm^2, 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 diameter 70mm, 110mm with length 110mm and 300mm is fixed at one end. Let density = 0.00074kg/m^3, E = 210 × 10^5N/mm^2, 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. : [ ]

PE2671

[Total No. of Pages : 2

[6583]-220

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) ***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) Explain with neat sketch the principle of working, advantages and applications of ceramic-mold casting. **[6]**

b) Explain with neat sketch the principles of working, advantages and applications of evaporative-pattern casting. **[6]**

c) Explain why squeeze casting produces parts with better mechanical properties, dimensional accuracy and surface finish than do expendable-mold processes. **[6]**

OR

Q2) a) Outline of production steps in a typical sand-casting operation. **[6]**

b) Explain with neat sketch the principle of working, advantages and applications of vacuum-mold casting. **[6]**

c) Explain with neat sketch the principle of working, advantages and applications of continuous casting. **[6]**

Q3) a) With neat sketches discuss the defects in the welds their causes and remedies. **[9]**

b) Discuss the types of joints used in the welds. State the factors which are considered in the design of welded joints . **[8]**

OR

P.T.O.

Q4) a) Classify the measurement methods for residual stresses in weldments. Explain any one method in brief. **[8]**

b) What is meant by welding position? With neat sketches explain the different types of welding positions. Define the terms "weld slope" and "weld rotation" in this regard. **[9]**

Q5) 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]**

OR

Q6) 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]**

Q7) a) Explain the principle of gear shaping. List advantages and limitations of gear shaping. **[6]**

b) Explain principle of Gear hobbing. List advantages & disadvantages of gear hobbing. **[6]**

c) What are the different methods of thread manufacturing? Explain anyone with a neat sketch. **[6]**

OR

Q8) a) Explain continuous horizontal broaching machine with neat sketch. **[6]**

b) List the various gear grinding methods. Explain in brief the gear grinding process with neat sketch. **[6]**

c) Write short note on thread grinding and thread rolling. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE2672

[Total No. of Pages : 2

[6583]-221
T.E. (Production)
MECHATRONICS
(2019 Pattern) (Semester - V) (311085A-III) (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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss the significance of mechatronics in automobile. **[9]**

b) Describe the working of RVDT with a neat sketch. **[8]**

OR

Q2) a) Describe proximity sensor with application. **[8]**

b) A 350º wire-wound potentiometer has 300 turns and a total resistance of 1kΩ. What is the resolution in ohms? In degrees? **[9]**

Q3) a) Explain significance of status flags in a microprocessor. **[9]**

b) Develop a conceptual design of a sensors based control system for an oven. Assume suitable data if necessary. **[9]**

OR

Q4) a) Write the instructions to load two hexadecimal numbers 59D and 80C in the registers A and B respectively. Add the numbers, and store the result in memory location 657B. **[9]**

b) Write a note on ADC (Analog to Digital Conversion) and how it is done? **[9]**

P.T.O.

Q5) a) Construct the ladder logic diagrams for **[6]**

i) the NAND gate and

ii) the NOR gate.

Also develop a truth table for both logics.

b) Explain application of PLC system for Bottle Filling Machine. **[12]**

OR

Q6) Write short notes on the following **[18]**

a) Interfacing of microprocessor

b) PD controllers

c) Microcontroller

Q7) a) Write the instructions to load two hexadecimal numbers 78D and 96C in the registers A and B respectively. Add the numbers, and store the result in memory location 429B. **[12]**

b) Write a note on signal conversion. **[5]**

OR

Q8) a) Construct the ladder logic diagrams for **[12]**

i) the OR gate and

ii) the NOR gate

Also develop a truth table for both logics.

b) Explain application of PLC system for traffic signal. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE2673

[Total No. of Pages : 2

[6583]-222

T.E. (Production)

SUPPLY CHAIN MANAGEMENT

(2019 Pattern) (Semester - V) (311085A-IV) (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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain how to manage supply chain cycle inventory. **[10]**

b) Identify factors influencing supply chain network decisions. **[6]**

OR

Q2) a) How do you measure warehouse performance? **[10]**

b) What are the objectives of warehouse management? **[6]**

Q3) a) What is supply chain network design and how does it work? **[10]**

b) What are the supply chain network models? **[8]**

OR

Q4) a) How can you explain the role of network design in the supply chain? **[10]**

b) Why are RFID tags used in warehouse? **[8]**

P.T.O.

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

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]**

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Total No. of Questions :8]

SEAT No. :

PE2674

[Total No. of Pages : 5

[6583]-223

T.E. (Production/Sandwich)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester-VI) (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) ***Figure 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 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:

i) To raise the valve through 50 mm during 120° rotation of the cam;

ii) To keep the valve fully raised through next 30°;

iii) To lower the valve during next 60°; and

iv) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when the line of 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) Draw the neat sketch of turning moment diagram for four stroke IC engine and explain it. **[6]**

OR

P.T.O.

Q2) a) Define the following terms as applied to cam with neat sketch: **[6]**

i) Base Circle

ii) Pitch Circle

iii) Pressure angle

iv) Stroke of the follower

b) A machine punching 38 mm holes in 32 mm thick plate requires 7 N-m of energy per sq. mm of sheared area, and punches one hole in every 10 seconds. Calculate the power of the motor required. The mean speed of the flywheel is 25 metres per second. The punch has a stroke of 100 mm. Find the mass of the flywheel required, if the total fluctuation of speed is not to exceed 3% of the mean speed. Assume that the motor supplies energy to the machine at uniform rate. **[12]**

Q3) a) Define the following terms: **[8]**

i) Notch sensitivity

ii) Fatigue stress concentration factor K_f

iii) Reverse Stress

iv) SN Curve

b) A cantilever beam made of cold drawn steel 35C8(Sut = 550 N/mm^2 and Syt = 320 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]**

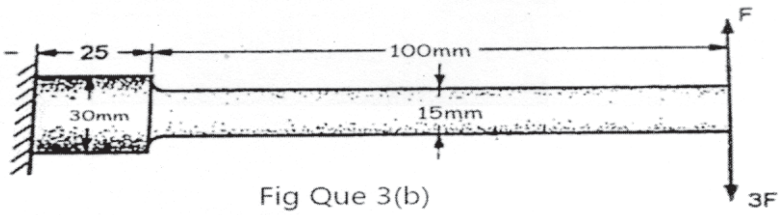


Fig Que 3(b)

OR

Q4) a) Explain the experimental procedure for finding endurance limit of the ferrous material with neat sketch. **[8]**

b) A plate made of plain carbon steel 40C8(Sut = 580 N/mm^2), shown in Fig. (A), is subjected to a completely reversed axial force of 40 kN. The theoretical stress concentration factor at the change in the cross-section is 2.27 and the notch sensitivity is 0.8. The surface finish factor and the size factor are 0.75 and 0.85 respectively. The load factor is 0.923. The expected reliability is 90%, for which the reliability factor is 0.897. If the required factor of safety is 2, determine the plate thickness for infinite life. **[9]**

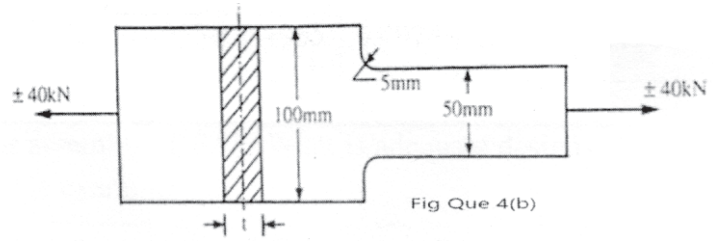


Fig Que 4(b)

Q5) a) Explain the terms: **[8]**

i) Assignable causes

ii) Chance causes

iii) Design tolerance

iv) Natural tolerance

b) The bolt diameters are normally distributed with a mean of 10.01 mm and a standard deviation of 0.015 mm. The tolerance specified by the designer for the bolt diameter is 10±0.025 mm. Calculate the percentage of bolts likely to be rejected.

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554
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				

[Use linear interpolation for values in between.] **[10]**

OR

Q6) a) What is the importance of the reliability in the modern engineering design? How it differs from the factor of safety? **[6]**

b) The breaking capacities of the batch of two hundred wires are tabulated as follows:

Breaking capacity, N	Number of Wires
260-280	4
280-300	24
300-320	100
320-340	64
340-360	8

The designer has specified 270N and 350N as lower and upper limits respectively for the breaking capacity of wires. Determine the percentage of wires likely to be rejected.

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	2.8	2.9	3.0	3.1
Area	0.4918	0.4938	0.4953	0.4965	0.4974	0.4981	0.4987	0.4990

Use linear interpolation for values in between. **[12]**

Q7) a) What is design for assembly (DFA)? What is adequate design and optimum design? Explain with suitable examples. **[9]**

b) Explain the following terms with suitable examples: **[8]**

i) Functional requirement parameter

ii) Unspecified and unlimited parameter

iii) Material parameter

iv) Limited parameter

OR

Q8) a) Explain the guidelines to be followed in the design of **[8]**

i) Casting process

ii) Forging process

iii) Welding process

iv) Machining process

b) What is concurrent engineering? What are its benefits in the product design? **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE2675

[Total No. of Pages : 2

[6583]-224

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 Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Determine rolling load based on deformed roll radius of CI rolls 600 mm diameter while rolling copper strip of 800 mm wide & 75 mm thick to give 30% reduction given that yield stress of copper is 675 N/mm^2. Assume young's modulus (E) as 1.005 MN/mm^2 and Poissons ratio (r) as 0.35. **[9]**

b) Explain automatic gauge control rolling. **[8]**

OR

Q2) a) Explain explosive forming in detail with neat sketch. **[8]**

b) Explain following in case of rolling: **[9]**

i) Two High Mill

ii) Three High Mill

iii) Four High Mill

Q3) a) Explain following in case of sand casting. **[8]**

i) Pouring time

ii) Choke area

iii) Chvornov's rule

iv) Gating ratio

b) Explain following with neat sketch **[10]**

i) Hot chamber die casting

ii) Cold chamber die casting

OR

P.T.O.

Q4) a) What is chovornov's rule? Explain its importance in design of casting. **[6]**

b) Explain about the various methods available for trapping slag in pouring basin. **[6]**

c) Explain pressurized & unpressurized gating system. **[6]**

Q5) a) Explain various forging operations to be carried out in multi-impression die with neat sketch. **[9]**

b) Explain how stock size is determined for forging operation. **[8]**

OR

Q6) a) Explain following. **[6]**

i) No draft forging

ii) Powder metallurgy forging

b) Explain friction screw press with neat sketch. **[6]**

c) Write down advantages of forging over other processes. **[5]**

Q7) a) For injection moulding explain following types of gates with their advantages & disadvantages. **[8]**

i) Sprue gate

ii) Rectangular edge gate

b) Explain pin ejection technique for injection moulding with suitable sketch. **[6]**

c) Explain Cooling systems and heat transfer consideration in injection moulding. **[4]**

OR

Q8) a) Explain various design consideration for runner design in injection moulding. **[8]**

b) Explain stripper plate ejection technique for injection moulding with suitable sketch. **[6]**

c) Write a short note on runner layout & runner balancing. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE2676

[Total No. of Pages : 2

[6583]-225
T.E. (Production (S/W)
METROLOGY & QUALITY CONTROL
(2019 Pattern) (Semester - VI) (311125(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) ***Assume suitable data if necessary.***

Q1) a) Classify types of CMM with neat sketch. **[9]**

b) Explain concept of interchangeability. **[8]**

OR

Q2) a) Explain basic concept of lasers with its advantages and limitations. **[9]**

b) Explore concept of machine vision system. **[8]**

Q3) a) Why surface finish measurement is essential? Explain methods to measure surface finish. **[9]**

b) Elaborate various methods to measure gear. **[8]**

OR

Q4) a) Explain principle of measurement of straightness. **[9]**

b) Which are various techniques available to measure roundness. **[8]**

Q5) a) How to measure power? Explain various measuring techniques of power. **[9]**

b) Compare concept of readability and reliability. **[9]**

OR

P.T.O.

Q6) a) Elaborate working principle of venturimeter with neat sketch. **[9]**

b) Explain various technique to measure temperature in detail. **[9]**

Q7) Write a short note on :

a) X & R chart **[6]**

b) P, np & C char **[6]**

c) Process capability attributes. **[6]**

OR

Q8) Write a short note on :

a) Frequency distribution need. **[6]**

b) Process capability techniques. **[6]**

c) Importance of statistical quality control. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2677

[Total No. of Pages : 3

[6583]-226

T.E. (Production Engineering) (Sandwich)

STATISTICS AND NUMERICAL OPTIMIZATION METHODS

(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, and 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) Solve the following system of linear equations using the Gauss elimination method **[9]**

$$2x - y + z = 5$$

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

$$x + 3y + z = 3$$

b) Find a root of an equation $f(x) = \sin(x) - x$ using bisection method. Within accuracy to 0.001. Start with interval $[0, \pi]$ **[9]**

OR

Q2) a) Solve following equation using gauss elimination method **[9]**

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

$$2x - 3y + z = 5$$

$$x + y + 2z = 7$$

b) Use the Newton-Raphson method to find a root of the equation $f(x) = x^2 - 5$ with an initial guess of $x_0 = 3$. Perform three iterations. **[9]**

P.T.O.

Q3) a) Given the following set of data points for x and y, use Newton's forward difference method to find the value of y at $x = 4$. **[9]**

X	1	2	3	5
Y	3	9	21	75

b) Given the following set of data points for x and y, use Lagrange interpolation polynomial to find the value of y at $x = 2.5$. **[9]**

x	1	2	4	5
y	2	3	5	6

OR

Q4) a) Given the following set of data points for x and y, use Lagrange interpolation polynomial to find the value of y at $x = 2.3$. **[9]**

x	1	2	4	5
y	3	5	11	15

b) Given the following set of data points for x and y, use Newton's forward difference method to find the value of y at $x = 2.5$. **[9]**

X	1	2	3	4
Y	4	11	24	45

Q5) a) Use the Trapezoidal rule to approximate the integral of $(x) = x^2 + 2x$ from $x = 0$ to $x = 2$. **[8]**

b) Use Simpson's 1/3 rule to approximate the integral of $(x) = e^x$ from $x = 0$ to $x = 1$. **[9]**

OR

Q6) a) Given the following set of data points, use Newton's divided difference method to find the interpolating polynomial and use it to estimate the value of $f(1.5)$ **[8]**

x	0	1	2	3
f(x)	1	2	4	5

b) Use Simpsons l/3rd rule to evaluate e^{-x^2}. **[9]**

Q7) a) Describe the challenges associated with solving large-scale optimization problems. **[9]**

b) Discuss the role of uncertainty in optimization problems. **[8]**

OR

Q8) a) Write in brief implantation of Genetic Algorithm with suitable example. **[9]**

b) Brief on: Generalized reduced gradient Method. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE2678

[Total No. of Pages : 2

[6583]-227

T.E. (Production Engineering) (Sandwich)

ADVANCED MATERIALS

(2019 Pattern) (Semester-VI) (Elective-II) (311126 A-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 Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What are the manufacturing methods involved in Autoclave for advanced materials production? **[8]**

b) Explain generalized Hooke's law? Explain the reduction of Hooke's law from three dimensions to two dimensions in the context of a lamina? **[9]**

OR

Q2) a) How is tape production utilized in the manufacturing process of advanced materials? **[8]**

b) How are the compliance and stiffness matrices related to the engineering elastic constants of an orthotropic lamina? **[9]**

Q3) a) What are different systems used in the preparation of Functionally Graded Materials? Explain some notable properties? **[8]**

b) Explain the Shape Memory Alloys (SMAs) with its Classifications, Composition and Applications? **[9]**

OR

Q4) a) Explain the classification 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]**

P.T.O.

Q5) a) What are the unique properties exhibited by materials at the nano scale? State their advantages and disadvantages? **[9]**

b) What is the importance of biocompatibility in biomaterials and its impact on medical applications? **[9]**

OR

Q6) 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]**

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 Magnesium alloys with their properties and Applications? **[9]**

OR

Q8) a) Explain the composition of Cobalt base super alloys and their role in enhancing properties and State their Applications? **[9]**

b) What are the significant properties of Titanium alloys? State their important metallurgical aspects and Applications? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2679

[Total No. of Pages : 4

[6583]-228

T.E. (Production Engineering) (Sandwich)

COSTING AND COST CONTROL

(2019 Pattern) (Semester-VI) (311126 A-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 Q6, Q.7 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) Distinguish between reducing costs and controlling costs. **[8]**

b) Following information is made available from the costing records of a factory: **[9]**

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.

OR

P.T.O.

Q2) a) What kinds of costs are there? List the steps involved in estimating each type's cost. **[8]**

b) The Vardhman Ltd. manufactures one product. A summary of its activities for the year 2008 is given below: **[9]**

	Units	Rs.
Sales	80,000	8,00,000
Material inventory 1-1-08		40,000
Material inventory 31-12-08		32,000
W.I.P. 1-1-08		55,000
W.I.P. 31-12-08		72,000
Finished goods 1-1-08	16,000	64,000
Finished goods 31-12-08	34,000	1,51,265
Material Purchases		1,52,000
Direet Labour		1,45,000
Manufacturing overhead		1,08,000
Selling expenses		50,000
General expenses		40,000

Prepare a cost sheet.

Q3) a) A factory has three production departments (P_1, P_2, and P_3) and two service departments (S_1 and S_2,). Budgeted overheads for the next year have been allocated /apportioned by the cost department among the five departments. The secondary distribution of service department overheads is pending and the following details are given to you: **[9]**

Department	Overheads apportioned/ allocated to activity	Estimated level
P_1	Rs. 48,000	5,000 labour hours
P_2	Rs. 1,12,000	12,000 machine hours
P_3	Rs.52,000	6,000 labour hours
		Apportionment of service department costs
S_1	Rs.16,000	P_1(20%), P_2(40%), P_3(20%),S_2(20%)
S_2	Rs. 24,000	P_1(10%),P_2(60%), P_3(20%),S_1(10%)

Calculate the overhead rate of each production department after completing the distribution of service department Costs,

b) Write down the processes for estimating the machine hour rate for CNC lathes, machining centers, and conventional machines. **[9]**

OR

Q4) a) Describe the broad guidelines that should be followed when deciding whether an expense item qualifies as overhead. **[9]**

b) A factory has three production departments A, B and C and also two service departments X and Y. The primary distribution of the estimated overheads in the factory has just been completed. These details and the quantum of service rendered by the service departments, to the other departments are given below: **[9]**

Departments	A	B	C	X	Y
Primary distribution (Rs.)	2,40,000	2,10,000	2,50,000	1,40,000	96,000
Service rendered by					
Deptt. 'X'	30%	20%	35%	-	15%
Deptt. 'Y'	25%	40%	25%	10%	-

Prepare a statement showing the distribution of service deptt. overheads to the production departments by the simultaneous equation method.

Q5) a) Discuss the distinguishing features of a process cost system? **[8]**

b) ABC manufacturing Co. has been using a cost system that allocates all factory overhead costs to products based on 350 per cent of direct labour cost. The company has just decided to use Activity-Based Cost System (ABC) that traces indirect costs to products based on consumption of major activities as indicated below, **[9]**

Activity	Annual cost driver quantity	Cost (Rs.)	Product cost Driver consumption
Labour	Rs. 3,00,000	30,000	Rs. 10,000
Machining	20,000 hours	5,00,000	800 hours
Setup	10,000 hours	1,00,000	100 hours
Production order	2000 orders	2,00,000	12 orders
Material handling	1000 requisitions	20,000	5 requisitions
Parts administration	12,000 parts	4,80,000	18 parts

Required:

Compare the total annual costs of the product using both the traditional volume-based and new ABC system.

OR

Q6) a) Differentiate between the traditional costing approach and activity-based costing. **[8]**

b) A product passes through three distinct processes A, B and C. The normal loss of units in each process is 5%, 10% and 15% and the same is sold at Rs. 2, Rs. 4, Rs. 5 per unit respectively. Expenses for the month were as follows: **[9]**

	Process		
	A	B	C
Sundry Materials (Rs.)	5,200	3,960	5,924
Wages (Rs.)	4,000	6,000	8,000
Actual output in unit	1,900	1,680	1,500

2000 units @ Rs. 3 per unit were put into Process A. The total overheads are Rs. 18,000 which are to be recovered at 100% of wages. Prepare necessary Process Account.

Q7) a) Pragati Company manufactures a product P by mixing three raw materials. For every 100 kg of output 125 kg of raw material input are used. In April 1997, there was an output of 5600 kg. of product P. The standard and actual particulars of April, 1997 are as follows: **[9]**

Raw Material	Standard		Actual	
	Mix	Price per kg	Mix	Price per kg
I	50%	Rs.40	60%	Rs.42
II	30%	Rs.20	20%	Rs.16
III	20%	Rs.10	20%	Rs.12

Calculate all material variances. The actual quantity of material used was 7000 kg.

b) Write a brief essay about the zero base budget. **[9]**

OR

Q8) a) Describe value engineering and value analysis in brief. **[9]**

b) The standard cost on 'Material' and 'Labour' for the making of a unit of a certain product is estimated as under -

Material 80 kg at Rs. 1.50 per kg.

Labour 18 hrs. at Rs. 1.25 per hr.

On completion of the production of a unit, it was found that 75 kg of material costing Rs. 1.75 per kg has been consumed and that the time taken was 16 hours, the wage rate being Rs. 1.50 per hour.

You are required to analyse material and labour variances. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE2680

[Total No. of Pages : 2

[6583]-229

T.E. (Production/Production Sandwich)

ADVANCED JOINING TECHNOLOGY

(2019 Pattern) (Semester - VI) (Elective - II) (311126(A)-III)

Time : 2½ Hour] ***[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.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain Explosive weldingstating its advantages, disadvantages, and applications of the process. **[10]**

b) Explain Roll welding and Hot pressure welding processes in short. Give its applications. **[8]**

OR

Q2) a) Write short notes on: **[10]**

i) Adhesive bonding

ii) Cladding

b) Explain Friction welding stating its advantages, disadvantages, and applications of the process. **[8]**

Q3) a) Explain Thermit welding stating its advantages, disadvantages, and applications of the process. **[9]**

b) Explain laser beam welding stating its advantages, disadvantages, and applications of the process. **[8]**

OR

Q4) a) Explain Friction stir welding stating its advantages, disadvantages, and applications of the process. **[9]**

b) Write short notes on: **[8]**

i) Cold Metal Transfer Joining

ii) Welding automation in aerospace

P.T.O.

Q5) a) Describe various types of joints used in welding with sketch in short. **[9]**

b) Describe in short, the Ultrasonic Testing of weldments. **[9]**

OR

Q6) a) Write short notes on: **[8]**

i) Radio graphs of weldments

ii) Life assessment of weldments

b) Describe in short, the liquid penetration test of weldments. **[10]**

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) Porosity

iii) Lack of fusion

b) What are different weldability test? Describe any one in short. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PE2681

[Total No. of Pages : 2

[6583]-230

T.E. (Production Engineering)/(Sandwich)

WORLD CLASS MANUFACTURING

(2019 Pattern) (Semester - VI) (Elective - II) (311126(A)-IV)

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 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]**

b) Explain in details the Opitz classification system. **[8]**

OR

Q2) a) State and explain Group Technology. Its methods of Codification & Classification of Systems. **[9]**

b) What are the various types of coding systems widely used? Explain in brief. **[8]**

Q3) a) Distinguish between preventive maintenance and breakdown maintenance. **[9]**

b) What do you understand by maintenance categories? Explain common types and explain the basis of their selection. **[8]**

OR

Q4) a) What is Quality Function Deployment? Explain in brief. **[9]**

b) State & explain the concept of Total Productive Maintenance with the help of pillars. **[8]**

P.T.O.

Q5) a) What is Theory of Constraints? What are the Steps of Theory of Constraints? **[9]**

b) Explain the arrangement of any four of the following components at workplace. **[9]**

i) Visual Displays

ii) Control Panels

iii) Hand Controls

iv) Multifunction Hand controls

v) Mirror hand arrangements

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 Drum-Buffer-Rope Approach? Explain it in detail. **[9]**

Q7) a) Discuss the globalization and emerging issues associated with Industry 4.0. How does the integration of advanced technologies impact global trade, labor markets and economic development? **[9]**

b) What do you mean by Lean Logistics? What is the benefit of lean processes in the logistics operation? **[9]**

OR

Q8) a) Discuss the impact of reducing non-value-added activities in healthcare processes on patient satisfaction and healthcare costs. **[9]**

b) Evaluate the challenges and security concerns related to the adoption of Cyber-Physical Systems and IIoT in Industry 4.0. How can organizations mitigate these risks and ensure the reliability and safety of their operations? **[9]**

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Total No. of Questions :8]

SEAT No. :

PE2682

[Total No. of Pages : 2

[6583]-231

T.E. (Production Engineering) (Sandwich)
MANUFACTURING TECHNOLOGY (SELF STUDY)
(2019Pattern) (Semester-V) (311122-A)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks***
3) ***Neat diagram must be drawn wherever necessary***
4) ***Assume Suitable data if necessary***
5) ***Use of Logarithmic Table Slide rule is Electronic pocket calculator is allowed***

Q1) a) How do you prioritize maintenance tasks within a facility, considering both preventive and corrective measures? **[8]**

b) What role does technology play in modern maintenance management and how has it changed the way maintenance is performed? **[9]**

OR

Q2) a) Can you discuss a situation where you had to balance the trade-offs between preventive maintenance costs and potential downtime risks? **[8]**

b) What are the key challenges in implementing a succesful predictive maintenance program, and how can they be overcome? **[9]**

Q3) a) Explain with examples Deming's PDCA Cycle and PDSA Cycle. **[8]**

b) Write Short Notes (Any two) **[9]**

i) 5 S

ii) Concurrent Engineering

iii) JIT

OR

Q4) a) Describe House of Quality with suitable example **[10]**

b) Explain in brief Quality Circle Structure **[7]**

P.T.O.

Q5) a) Explain the steps involved in Material Requirement Planning. also brief on types of data considerd by material requirement planning **[10]**

b) Write Short Notes (Any Two) **[8]**

i) Computer Aided process planning

ii) Scheduling and Dispatching

iii) Money Market

OR

Q6) a) Explain the requirements of 4 M's while selecting for welding operation **[10]**

b) Enlist types of charts and forms used in production planning and explain any two charts with neat sketch. **[8]**

Q7) a) Explain the objectives of cost estimation What are the different factors considered for cost optimization of Smartphone? **[9]**

b) Write short notes **[9]**

i) Provision for scrap

ii) Estimation of Volume

iii) Need of Depreciation

OR

Q8) a) Discuss the role of historical data and benchmarks in developing accurate cost estimates for mechanical projects? **[9]**

b) Enlist the types of Depreciation and Explain Declining Balance Depreciation and Units of production Depreciation. **[9]**

● ● ●

Total No. of Questions :8]

SEAT No. : ____

PE2683

[Total No. of Pages : 2

[6583]-232
T.E. (Mechatronics Engineering)
INDUSTRIAL AUTOMATION
(2019 Pattern) (Semester-VI) (317547)

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

Instructions to the candidates:

1) ***Answer Q.No. 1 or Q.No.2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No.7 or Q.No. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figure to the right indicates full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) Draw a ladder diagram for MUL, DIV and SQR math operations. **[9]**

b) Draw a ladder diagram for following comparison operations: **[8]**

i) Less than

ii) Greater than

OR

Q2) a) Draw a ladder diagram for following comparison operations: **[9]**

i) Equal

ii) Not equal to

iii) Greater than or equal to

b) Explain the PLC basic comparison functions **[8]**

Q3) a) Explain the SKIP function and its application. **[9]**

b) Explain analog signal processing for analog input signal with example. **[8]**

OR

Q4) a) Explain analog output application for Analog In/Analog or BCD out with neat sketch. **[9]**

b) Explain multi-bit data processing with suitable diagram. **[8]**

P.T.O.

Q5) a) Explain working of HMI with suitable example. **[6]**

b) State the need of HMI with its advantages. **[6]**

c) State the need of drives and explain variable frequency drive (VFD) in detail. **[6]**

OR

Q6) a) Compare PLC and SCADA on any six points. **[6]**

b) Explain Selection criterion for drives and also enlist various methods of speed control for PLC. **[6]**

c) Draw a block diagram for motion control and state its different elements. **[6]**

Q7) a) Explain SCADA system with its benefits. **[6]**

b) Explain Internet based SCADA system and also list down its advantages. **[6]**

c) State the applications of SCADA and explain any one application related to our day today life. **[6]**

OR

Q8) a) State different SCADA packages and compare among each other's. **[6]**

b) Differentiate between PLCs and RTUs. **[6]**

c) Write a short note on: Master Terminal Units (MTU). **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE2684

[Total No. of Pages : 2

[6583]-233
T.E. (Mechatronics Engineering)
ELECTRO-MECHANICAL SYSTEMS
(2019 Pattern) (Semester - VI) (317548)

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 wherever necessary.***
4) ***Use of non programmable calculator & drawing instruments is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Define and classify Accumulators. Explain any one type of Accumulator in detail. **[9]**

b) Draw the construction and explain the function of following flow control components: **[9]**

i) Shuttle valve

ii) Pressure reducing valve

iii) Sequence valve

OR

Q2) a) Explain with a neat sketch the types of Pressure Intensifiers. **[9]**

b) Differentiate between Meter in and Meter out circuits with schematic diagrams. **[9]**

Q3) a) Sketch and explain the general layout of Pneumatic Systems. **[9]**

b) Explain the types of compressors used in pneumatic systems. **[8]**

OR

Q4) a) Write a short note on "Lubricators, Mufflers and Dryers" for a pneumatic system. **[9]**

b) Describe the advantages and applications of pneumatic system. **[8]**

P.T.O.

Q5) a) Explain the considerations to be taken into account while designing a pneumatic circuit. **[9]**

b) Draw the Circuit for the speed Control of a Pneumatic motor and explain it. **[9]**

OR

Q6) a) Draw the Pneumatic Circuit for operating Single Acting Cylinder using 3/2 DCV and explain it. **[9]**

b) Draw the Circuit for operating Single Acting and Double Acting Cylinder in Sequence and explain it. **[9]**

Q7) a) Explain the selection criterion of PLC in detail. **[9]**

b) What is ladder logic diagram in PLC? Explain its functions. **[8]**

OR

Q8) a) Explain Electro-pneumatic systems with examples. **[9]**

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

i) Electrical control solenoid valves

ii) Relays



Total No. of Questions : 8]

SEAT No. :

PE2685

[Total No. of Pages : 3

[6583]-234

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 Q6, Q.7 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 CST element? Derive the equation for stiffness matrix and load vector for CST. **[8]**

b) Determine the shape functions for the Constant Strain Triangle (CST) using polynomial functions. **[7]**

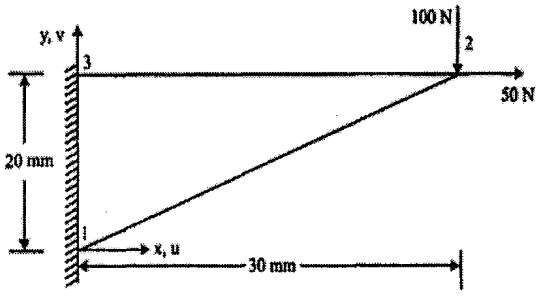
c) Discuss Pascal's triangle with convergence conditions. **[3]**

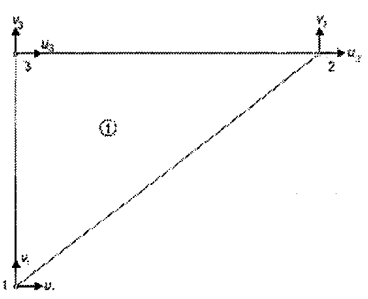
OR

Q2) a) How to verify and validate results in FEA post-processing? **[6]**

b) Calculate displacements in a triangular plate, fixed along one edge and subjected to concentrated load at its free end. **[6]**

Assume E = 70,000 MPa, t = 10mm and v = 0.3.





c) Derive the strain displacement matrix and stiffness matrix for LSR (Linear Strain Rectangle) element **[6]**

P.T.O.

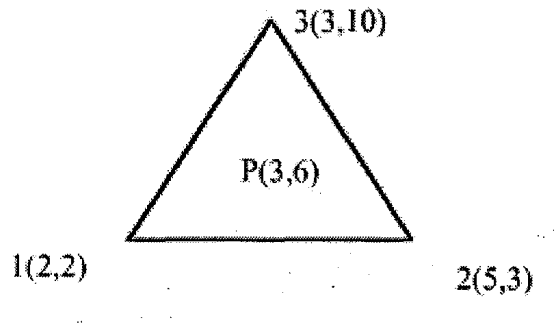
Q3) a) Explain the terms isoparametric, subparametric and superparametric elements. **[6]**

b) Using Lagrangian polynomials, find the shape function for two, three and four noded elements in the natural coordinate system. **[6]**

c) Explain the modeling techniques: sub structuring and sub modeling. **[5]**

OR

Q4) a) The iso parametric shape functions for CST elements as shown in fig. are given as $N_1=\zeta$, $N_2=\eta$ and $N_3=1-\zeta-\eta$. Evaluate the shape functions of interior point P. If temperature of node 1, 2 and 3 are 25º, 30º, 50º respectively, evaluate the temperature at the interior point P. **[6]**



b) Describe the concept of Uniqueness of Mapping. Derive the equation for assembling a stiffness matrix for isoparametric elements. **[6]**

c) Derive the elements of the Jacobian Matrix of transformation in three noded triangular elements (CST). **[5]**

Q5) a) Explain essential and natural boundary conditions and solving for temperature distribution. **[6]**

b) Explain steps involved in the processing to solve for 1D heat transfer problem using Finite Element Problem. **[6]**

c) Define heat transfer. Define conduction, natural convection, forced convection and radiation. **[6]**

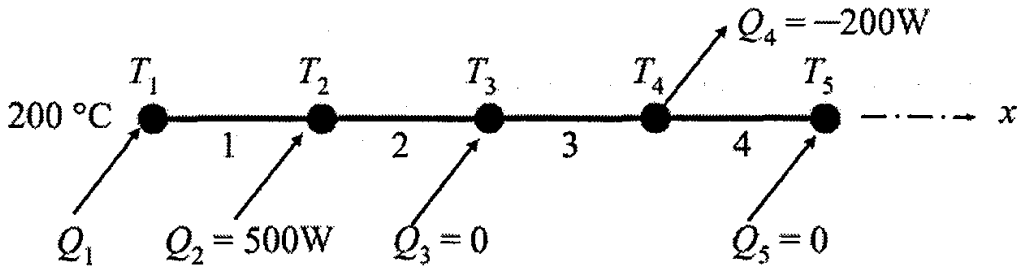
OR

Q6) a) Write the finite element formulation for the composite wall. **[6]**

b) Define Fin. Explain with appropriate governing equations. **[6]**

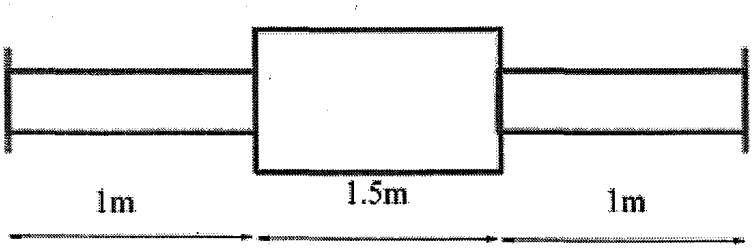
c) Calculate nodal temperature of four elements. **[6]**

Use A= 1 m^2, L= 1m, k =10 W/m/°C



Q7) a) Enlist and explain different types of Dynamic Analysis. **[5]**

b) For the stepped bar shown in fig., determine the first two natural frequencies in terms of rad/s for undamped free vibration. Let A1=A3=5cm^2, A^2=10cm^2, E = 210 GPa and density = 7860kg/m^3 . Use consistent mass matrices for each element. **[6]**



c) Write the governing equation of motion for dynamic analysis. Explain damped and Undamped free vibration. **[6]**

OR

Q8) a) Write down Consistent and Lumped mass matrices for following elements. **[9]**

i) Bar Element

ii) Plane Stress Element

iii) Triangular Element

b) Explain importance of eigenvalues and eigenvectors. **[4]**

c) Differentiate between Lumped mass system and Consistent mass system. **[4]**



Total No. of Questions : 8]

SEAT No. : ____

PE2686

[Total No. of Pages : 2

[6583]-235
T.E. (Mechatronics Engg.)
EMBEDDED SYSTEM DESIGN
(2019 Pattern) (Semester - VI) (317550)

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) ***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 PIC 18FXX. **[6]**

b) Explain the compare mode of operation of PIC18XX in detail with a proper neat diagram. **[6]**

c) Design a DC Motor control using PWM of CCP mode in PIC18FXX. **[6]**

OR

Q2) a) Explain the concept of CCP modes of PIC18458. **[9]**

b) Draw an interfacing diagram and write an algorithm for DC Motor speed control using PIC18XXX. **[9]**

Q3) a) Explain Interrupt Structrue of PIC 18FXXX. **[5]**

b) Explain external hardware interrupts in PIC18FXX. **[5]**

c) Explain in detail the steps in executing an interrupt for PIC18FXX. **[8]**

OR

Q4) a) Write a short note on sources of interrupts in PIC18FXX. **[5]**

b) Explain PORTB Change on interrupt of PIC18FXX. **[5]**

c) Explain External Interrupt INT0 and its programing in PIC18FXX. **[8]**

P.T.O.

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 a 16x2 LCD with PIC18FXX to display "SPPU" on the first line and "UNIVERSITY" on the second line, and 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 the 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 diagramm. **[10]**

b) Explain in detail MODBUS with its types and physical media. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PE2687

[Total No. of Pages : 2

[6583]-236

T.E. (Mechatronics Engineering)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(2019 Pattern) (Semester - VI) (317551)

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 Logistic regression in machine learning. **[9]**

b) Explain K-Nearest Neighbor algorithm. **[8]**

OR

Q2) a) Calculate the gini index of below data and construct a decision tree. **[9]**

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

b) Explain application of Classification & regression in Mechanical Engineering. **[8]**

P.T.O.

Q3) a) What is training data? What is labeled data? What is unlabeled data? What are key steps involved in developing training data? **[9]**

b) Explain Cohen's Kappa, F Score, ROC Curve. & Problems on calculating parameters required for model evaluation such as True positive, True negative, False positive, False negative. **[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) Explain with neat sketch K-fold cross-validation mode. **[6]**

Q5) a) State key features of reinforcement learning. **[5]**

b) Explain Markov Decision Process. **[6]**

c) Explain Q-Learning. **[6]**

OR

Q6) a) How does Reinforcement Learning Work? **[6]**

b) What is deep learning? **[6]**

c) Explain Artificial Neural Network (ANN). **[5]**

Q7) a) What opportunities and challenges arise from human-machine interaction? **[6]**

b) Make a list of maintenance and explain in brief. Discuss the scope of AIML. **[6]**

c) Explain scope of ML for Materials Science. **[6]**

OR

Q8) a) Explain an intelligent approach for classification of Nuts, Bolts, Washers and Locating Pins? **[6]**

b) Explain fault diagnosis (of any suitable machine element) using ML. **[6]**

c) Explain Image based part classification. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE2688

[Total No. of Pages : 4

[6583]-237

T.E. (Mechatronics Engineering)

MACHINE DESIGN

(2019 Pattern) (Semester - V) (317541)

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) ***Assume suitable data wherever necessary.***
4) ***Use of non programmable calculator & drawing instruments is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Write the advantages, disadvantages and applications of Power Screws. **[6]**

b) A machine vice has single-start, square threads with 22 mm nominal diameter and 5 mm pitch. The outer and inner diameters of the friction collar are 55 and 45 mm respectively. The coefficients of friction for thread and collar are 0.15 and 0.17 respectively. The machinist can comfortably exert a force of 125 N on the handle at a mean radius of 150 mm. Assuming uniform wear for the collar, calculate (i) the clamping force developed between the jaws; and (ii) the overall efficiency of the clamp. **[12]**

OR

Q2) a) Derive the formula for torque required to lower the load by a square threaded power screw. **[6]**

P.T.O.

b) The lead screw of a lathe has single-start ISO metric trapezoidal threads of 52 mm nominal diameter and 8 mm pitch. The screw is required to exert an axial force of 2 kN in order to drive the tool carriage during turning operation. The thrust is carried on a collar of 100 mm outer diameter and 60 mm inner diameter. The values of coefficient of friction at the screw threads and the collar are 0.15 and 0.12 respectively. The lead screw rotates at 30 rpm. Calculate (i) the power required to drive the lead screw; and (ii) the efficiency of the screw. **[12]**

Q3) a) Explain the terms: **[8]**

i) Fatigue Failure

ii) Endurance limit

iii) S-N Curve

iv) Notch Sensitivity

b) A rod of a linkage mechanism made of steel 40Crl (Sut = 550 N/mm^2) is subjected to a completely reversed axial load of 100 kN. The rod is machined on a lathe and the expected reliability is 95%. There is no stress concentration. Determine the diameter of the rod using a factor of safety of 2 for an infinite life condition. Take surface finish factor as 0.78, size factor as 0.85 and reliability factor as 0.868. **[10]**

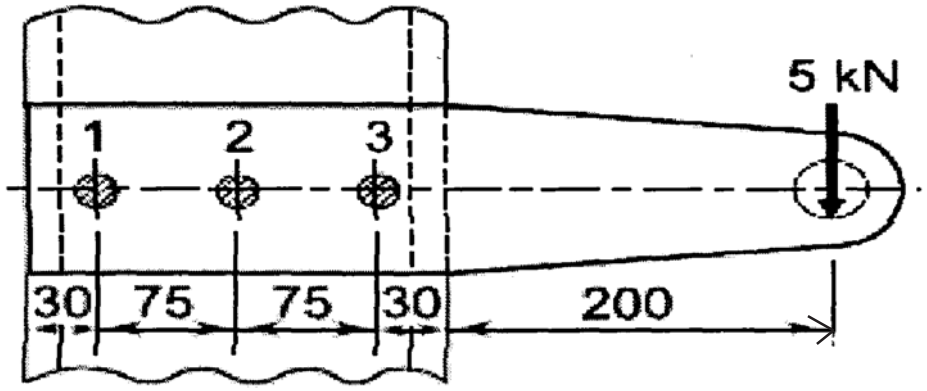
OR

Q4) a) Explain the Soderberg and Goodman's diagram for fluctuating stresses.**[6]**

b) A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2, The corrected endurance limit stress for the machine component is 270 N/mm^2. The ultimate tensile strength and yield strength of the material are 600 and 450 N/mm^2 respectively. Find the factor of safety using (i) Gerber theory (ii) Soderberg line (iii) Goodman line Also, find the factor of safety against static failure. **[12]**

Q5) a) Define threaded joint. What do you understand by the single start and double start threads? **[7]**

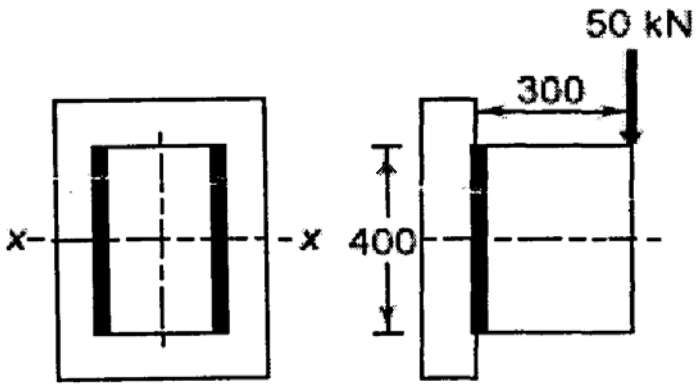
b) A steel plate subjected to a force of 5 kN and fixed to a channel by means of three identical bolts is Shown in Fig. The bolts are made from plain carbon steel 45C8 (Syt = 380 N/mm^2) and the factor of safety is 3. Calculate the size of bolts. **[10]**



OR

Q6) a) Define Welded Joints with its advantages and disadvantages. **[7]**

b) A bracket is welded to the vertical plate by means of two fillet welds as shown in Fig. Determine the size of the welds, if the permissible shear stress is limited to 70 N/mm^2. **[10]**



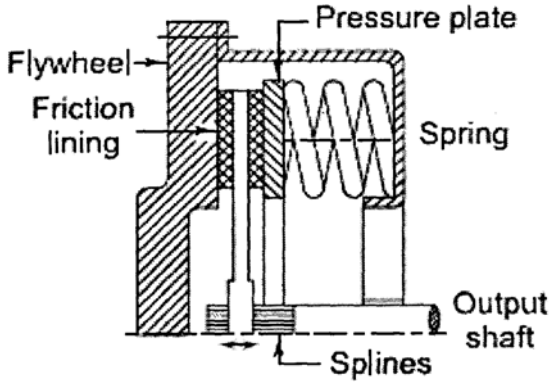
Q7) a) Define Spring and write the functions and applications of springs. **[5]**

b) A helical compression spring, made of circular wire, is subjected to an axial force, which varies from 2.5 kN to 3.5 kN. Over this range of force, the deflection of the spring should be approximately 5 mm. The spring index can be taken as 5. The spring has square and ground ends. The spring is made of patented and cold-drawn steel wire with ultimate tensile strength of 1050 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Calculate: (i) wire diameter; (ii) mean coil diameter; (iii) number of active coils; (iv) total number of coils; (v) solid length of the spring; (vi) free length of the spring. **[12]**

OR

Q8) a) Write a short note on Surge in spring. **[5]**

b) An automotive single plate clutch consists of two pairs of friction surfaces, one between the friction lining and the pressure plate and the other between the friction lining and the flywheel as shown in Fig. Eight identical helical compression springs, arranged in parallel, provide the required axial thrust on the friction surface. The total spring force exerted by all springs is 2400 N and the corresponding deflection of each spring is approximately 15 mm. The spring index can be taken as 8. The springs are made of patented and cold-drawn steel wire with ultimate tensile strength of 1390 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire can be taken as 30% of the ultimate tensile strength. Design the springs and calculate: (i) wire diameter; (ii) mean coil diameter; (iii) number of active coils; (iv) total number of coils; (v) solid length; (vi) free length. **[12]**



Total No. of Questions : 8]

SEAT No. :

PE2689

[Total No. of Pages : 2

[6583]-238

T.E. (Mechatronics Engineering)

MANUFACTURING PROCESSES

(2019 Pattern) (Semester - V) (317542)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figure to the right indicates full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) Define Machining & differentiate between orthogonal & oblique cutting. **[8]**

b) Describe the tool geometry of single point cutting tool with neat sketch. **[9]**

OR

Q2) a) Classify the Milling Machine. Compare Shaping and plaining Machine. **[8]**

b) What are the various type of chips? Explain with neat sketch. **[9]**

Q3) a) Short note on: **[8]**

i) Soldering method

ii) Brazing method

b) Draw neat sketch of Oxy Acetylene gas welding and explain important points regarding oxy Acetylene welding. **[9]**

OR

Q4) a) Write short note on: **[8]**

i) Forge welding

ii) Ultrasonic welding

b) What are the type of brazed joint? Compare Soldering and Brazing processes. **[9]**

P.T.O.

Q5) a) Explain with neat sketch Electrical Discharge Machining (EDM). **[6]**

b) Classify the unconventional machining processes. **[6]**

c) Explain with neat sketch laser beam machining. **[6]**

OR

Q6) a) Explain with neat sketch Electron Beam Machining (EBM). **[6]**

b) Write short note on Fundamental of Rapid prototyping. **[6]**

c) Write short notes on Stereo lithography. **[6]**

Q7) a) Explain silicon processing with neat sketch. (circuit). **[6]**

b) Explain photolithography and layer processes used in IC fabrication. **[6]**

c) State the procedure for PCB fabrication. **[6]**

OR

Q8) a) Explain IC packaging. **[6]**

b) Explain PCB assembly with neat sketch. **[6]**

c) What do you mean by PCB structure. What are the types and materials required? **[6]**



Total No. of Questions : 8]

SEAT No. :

PE5930

[Total No. of Pages : 2

[6583]-239R
T.E. (Mechatronics Engineering)
CONTROL SYSTEM
(2019 Pattern) (Semester - V) (317543)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve 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) ***Use of electronic pocket calculators is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the various steps while sketching Root Locus also state the advantages of Root Locus. **[8]**

b) Sketch the Root Locus of system with open loop transfer function G(S) H(S) = $K(S^2 + 4S + 13)/S(S+4)$. **[9]**

OR

Q2) a) Investigate the stability. **[8]**

$Q(S) = S^4 + 3S^3 + 2S^2 + 6S + 4 = 0$

b) Explain in detail Routh Harwite stability Criteria with one suitable example. **[9]**

Q3) a) Sketch the Polar Plot of system **[8]**

i) $G(S)H(S) = 50/(S+1)(S+2)(S+5)$

ii) $G(S)H(S) = 1–2S/S(S(1+2S))$

b) Explain the correlation between frequency and time domain specifications. **[9]**

OR

Q4) a) Derive the expression for Resonant Frequency and Resonant Peak. **[8]**

b) Sketch the Nyquist Plot of system with open loop Transfer Function. **[9]**

$G(S)\ H(S) = 50/(S+1)(S+2)(S+5)$ and comment on stability.

P.T.O.

Q5) a) Write a short note on Asymptotic Bode Plot. **[8]**

b) Draw the Bode Plot of System with open loop Transfer Function $G(S) = 10/S(S+2)(S+5)$
Also determine Gain Crossover Frequency, Phase Crossover Frequency, Gain Margin and Phase Margin and comment on stability. **[10]**

OR

Q6) a) Draw the Bode plot of system with open loop Transfer Function $G(S) = 100/(S+1)(S+2)(S+5)$
Also determine Gain Crossover Frequency, Phase Crossover Frequency, Gain Margin and Phase Margin and comment on stability. **[10]**

b) What is Bode Plot? State the application of Bode plot, Explain the procedure to sketch actual Bode plot. **[8]**

Q7) a) Explain in details Step and Ramp Response of Control action and controller modes. **[9]**

b) Explain in details

i) ON-OFF controller

ii) PID Controller **[9]**

OR

Q8) a) Determine P,PI,PID controller tuning Parameter using Z-N open loop step response method if the experiment has resulted transfer function $G(S) = 1.5e^{-2S}/1+9S$. **[9]**

b) Explain Ziegler and Nichols closed loop step response method of PID tuning. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE5757

[Total No. of Pages : 2

[6583]-240
T.E. (Mechatronics Engineering)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - V) (317544)

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 any three properties of DTFTs. **[6]**

b) Find the DTFT of the sequence, $x(n) = \{1, 1, -1, 0\}$. **[8]**

c) Obtain DTFT of rectangular pulse $x(n) = A; 0 < n < L - 1 = 0$. **[4]**

OR

Q2) a) Find the impulse response of following difference equation using DTFT

$$y(n) + \left(\frac{1}{4}\right) y(n-1) + \left(\frac{1}{8}\right) y(n-2) = x(n) - x(n-1).$$ **[10]**

b) Write symmetry, convolution, frequency shifting & time shifting property of DTFT. **[8]**

Q3) a) Define DFT & state & explain properties of DFT. **[6]**

b) Find linear & circular convolution of following sequences. **[8]**

$x_1(n) = \{4, -2, 2, 1\}$

$x_2(n) = \{1, 2, 3\}$

c) Find N = 5 point DFT for $x(n) = \{1, 0, 1, 0, 1\}$. **[4]**

OR

Q4) a) State & prove circular time shift & circular frequency shift property of Fourier transform. **[4]**

b) Explain relationship between DTFT & DFT. **[4]**

c) A 8 point sequence $x(n)$ is given by $x(n) = \{1, 2, 3, 2, 1, 5, 2, 1\}$. Find DFT using DIF-FFT. **[10]**

P.T.O.

Q5) a) Explain in brief the digital filters. **[4]**

b) Design a digital low pass Butterworth filter using bilinear transformation for the Fc = 1KHz, Fs = 8KHz, Ap = 2dB, As = 15dB. **[8]**

c) Comparison between butterworth & chebyshev filter. **[6]**

OR

Q6) a) Compare analog & digital filters. **[4]**

b) Explain the designing steps to design a digital Butterworth filter. **[6]**

c) Using bilinear transformation method find $H(z)$ for $H(s) = \frac{1}{\left(S^2 + 7S + 15\right)}$, for T = 1 sec. **[8]**

Q7) a) Explain Gibbs phenomenon. **[6]**

b) Draw basic structure of direct form of FIR system. **[10]**

OR

Q8) a) Design a low pass FIR filler with cut-off frequency $W_c = 0.8\pi$ radl sample, using Hamming window for N = 7, with magnitude. **[10]**

b) Discuss interference cancellation in ECG using DSP. **[6]**

Total No. of Questions : 8] **SEAT No. :**

PE2691 **[Total No. of Pages : 2**

[6583]-241
T.E. (Mechatronics Engineering)
MICROCONTROLLER
(2019 Pattern) (Semester - V) (317545)

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

Instructions to the candidates:

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

Q1) a) Explain various timer modes for 8051. **[6]**

b) Explain with the help of diagrams the structure of TCON and TMOD Register. **[6]**

c) Write an Embedded c program for 8051 to count 00H to FFH on port P2. **[6]**

OR

Q2) a) Explain the modes of operation of the timer/counter 8051. **[6]**

b) Write a detailed note on Time delay programming in C. **[6]**

c) Describe the value to be loaded in TH, TL and TMOD on register for delay calculations of 1 msec using timer 1. (Assuming oscillatory frequency 10MHZ). **[6]**

Q3) a) Write a detailed note on the interrupt structure and priorities of the 8051 microcontroller. **[5]**

b) Draw an interfacing diagram of ADC 0809 with 8051. **[5]**

c) Write an Assembly program to switch “ON” OR “OFF” A LED connected on P 1.3 when external interrupt INTO is activated. **[8]**

OR

Q4) a) Write a note on Programming of External hardware interrupts in C. **[5]**

b) Explain different types of SFR’s associated with Interrupt. **[5]**

c) Write an 8051 C program to switch “ON” OR “OFF” A LED connected on P 1 .3. Complement the LED whenever the switch is connected on P 3.2 is pressed. **[8]**

P.T.O.

Q5) a) Write a note on serial communication in 8051. **[5]**

b) Write short notes on : SCON Register of 8051. **[5]**

c) Explain interfacing diagram for measurement of apparent power with the help of 8051. **[7]**

OR

Q6) a) Discuss the modes of operation of the serial port of the 8051 microcontroller. **[5]**

b) Describe the SBUF - SFR in 8051. Explain serial port in full duplex mode. **[5]**

c) Explain interfacing diagram for 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. Write an assembly language program to rotate stepper motors in clockwise direction with full step sequence. **[10]**

b) Draw and explain temperature measurement using 8051. **[7]**

OR

Q8) a) Draw and explain the interfacing diagram of LED with 8051 microcontroller. Write a program to ON and OFF the led with a delay of 1 ms. Consider PORT 3 as the output port. **[10]**

b) Draw and explain the interfacing diagram of Single key with 8051 microcontroller. **[7]**



Total No. of Questions :8]

SEAT No. : ____

PE2692

[Total No. of Pages : 3

[6583]-242
T.E. (Robotics and Automation)
ROBOT PROGRAMMING
(2019 Pattern) (Semester-VI) (311508A)

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

Instructions to the candidates:

1) ***Answer Q1, or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8.***
2) ***Neat diagrams must be drawn wherver necessary.***
3) ***Figure to the right indicates full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain the following instructions with relevant examples in VAL II programming language. **[10]**

i) FLIST

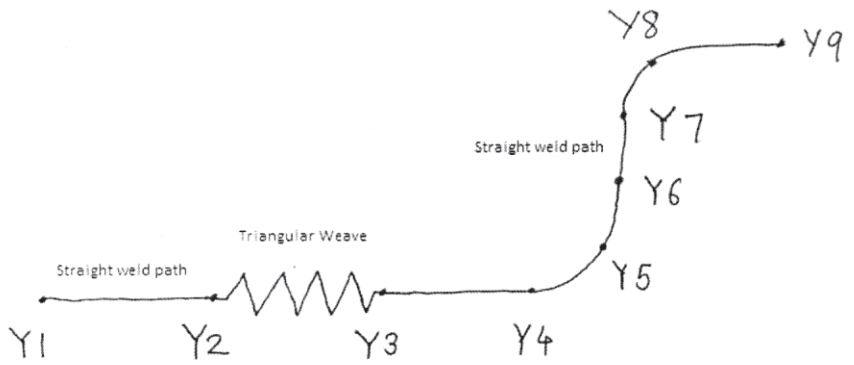
ii) DPART

iii) IOGET

iv) WVSET

v) ABORT

b) Write a VALII language code for weldment of the following path: **[8]**



Details of trajectory path: Y1 is Home position, Y1-Y2 is straight path, Y2-Y3 triangular weave, Y4-Y5-Y6 circular arc, Y6-Y7 is straight path, and Y7-Y8-Y9 circular arc.

OR

P.T.O.

Q2) a) Write a short note on production rate calculations using robot. **[9]**

b) Explain the following codes and comment on output after execution of codes in VAL II programming language. **[9]**

i)
```
APPRO P1 50
MOVE P1
CLOSEI
DEPART 150
OPENI
END
```

ii)
```
WSET 1= 15, 27, 37
MOVE X1
WSTART 1
CIRCLE X1, X2, X3
DEPART 150
```

Q3) a) Explain the following instructions in detail: **[9]**

i) SetDo do 15, 1;

ii) MoveAbsJ p50, v50, z30, tool2;

iii) MoveL offs(p2, 0, 0, 10), v100, z50, too11;

iv) VAR num length;

v) MoveL p10, v1000, z50, too10/WObj:=wobj1;

b) Write a short note on pick and place commands in RAPID language. **[9]**

OR

Q4) a) Write a RAPID language code and flowchart to calculate the volume of sphere. **[9]**

b) Explain the programme structure of RAPID language. State the general rules to write programs in RAPID language. **[9]**

Q5) a) Write a short note on Variable declaration in AML programming language. **[9]**

b) Explain the following instructions in detail in AML language: **[8]**

i) MOVE (<JX, JY>, <9.5, 1.4>);

ii) DEFIO (21, 0, 1, 1, 1);

iii) READ (0, DATA2)

iv) DISPLAY ('Hello', EOL);

OR

Q6) a) Write a short note on sensor commands in AML language. **[9]**

b) Explain the following instructions with relevant examples in AML language: **[8]**

i) ERASE

ii) ENDMONITOR

iii) ACCEL

iv) QGOAL

Q7) a) What are the key features of Robot Studio online software, and how are they utilized in different stages of robot programming? **[9]**

b) What challenges arise in scenarios involving multiple robots and machine interference, and how are they typically addressed? **[8]**

OR

Q8) a) How is jogging performed in virtual robotics, and what are the primary components involved? **[9]**

b) Write a short note on Robot cycle time analysis. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2693

[Total No. of Pages : 3

[6583]-243
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) ***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) Using Greedy search algorithm, determine the minimum number of coins required from a set of coins having values {1, 7, 10, 15} to change for 28. If the solution obtained is not the global best, which other search algorithm would you recommend to obtain the global best solution? **[9]**

b) Explain the steps of ant colony optimization algorithm. Also state its applications. **[8]**

OR

Q2) a) Determine the initial temperature if simulated annealing algorithm is used to minimize the function $z = 2.x_1.x_2+6x_2$ such that $1 \leq x_1 \leq 4$ and $3 \leq x_2 \leq 7$.**[10]**

b) What is the basic concept of Tabu search? Explain its algorithm. **[7]**

Q3) a) For the image and template shown in Figure, determine the performance index for translation (2, 1) using template matching technique. **[10]**

Template n0

6	2	7
7	2	7
1	5	6

m0

y → Image n

x ↓

7	3	7	3	8
7	4	3	4	4
5	2	9	3	5
4	7	1	7	6
8	8	1	7	6
5	1	6	6	6

m

P.T.O.

b) Determine the gradient of intensity of a pixel having intensity 8 in the image given below. Use Sobel operator. **[7]**

6	9	3
4	8	6
1	0	5

OR

Q4) a) Using run length encoding determine the compression ratio for the following image. **[9]**

1	2	0	0	1	1
1	1	1	0	0	0
0	0	0	0	0	0
1	1	1	1	1	1
1	1	1	1	1	0
0	0	0	0	0	0

b) For the image shown below, determine the moment of inertia about y axis. **[8]**

1	0	1	0	0
1	0	1	1	1
0	0	1	0	1
1	1	1	0	0
0	1	1	0	1

Q5) a) Explain bubble sort algorithm and its applications in robotics. **[10]**

b) Explain with suitable example the application of real coded genetic algorithm for AGV route optimization. **[8]**

OR

Q6) a) A perceptron having weights corresponding to the three inputs have the following values: w1 = 2.6 ; w2 = -0.56; and w3 = -1.3 . The activation of the unit is given by the step-function: **[8]**

$\varphi(v)$ 1 if $v \geq 0$ otherwise 0

b) Calculate the output value y of the given perceptron for each of the following input patterns: **[10]**

Pattern	P1	P2	P3	P4
X1	1	0	1	1
X2	1	1	1	0
X3	0	1	1	1

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 (2, 5), (1, 3) and (4,4). **[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: Flexible manufacturing system. **[9]**

OR

Q8) a) For a scheduling task, the table of activities, their representation in the vertex, and the weights is as shown below. Draw the activity chart and obtain the critical path using depth first search method. **[9]**

No	Activity's Name	Vertex	Weight
1	A	0-1	13
2	B	1-2	13
3	C	2-3	15
4	D	2-4	13
5	E	3-5	14
6	F	4-5	16
7	G	5-6	15

b) Explain route optimization for AS/RS systems. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2694

[Total No. of Pages : 2

[6583]-244

T.E. (Robotics & Automation)

FLEXIBLE MANUFACTURING SYSTEMS

(2019 Pattern) (Semester-VI) (311510A)

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) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***
5) ***Figures to the right indicates full marks.***

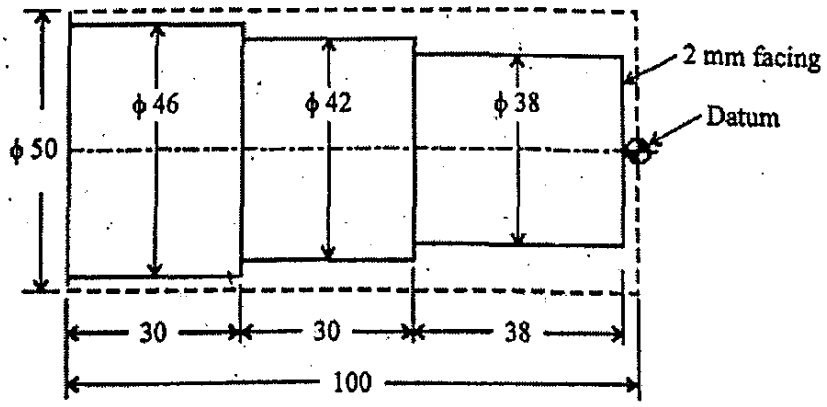
Q1) a) Describe various G and M codes used in CNC machines. **[8]**

b) Define NC machine and write the advantages of NC machine system over manual methods. **[9]**

OR

Q2) a) Write a note on preset and qualified tools. **[8]**

b) Prepare part programming of following component. **[9]**



Raw workpiece = ϕ 50 × 100 mm

..... (Dotted line) = Raw workpiece

_____ (Continuous line) = Final part (Finished part)

All the Dimentions are in mm.

P.T.O.

Q3) a) Explain in brief benefits obtained by CIM. **[9]**

b) Explain the concept of ERP. **[9]**

OR

Q4) a) What is a material requirement planning? Explain the various inputs to the MRP system? **[9]**

b) Explain the term Rapid Product Development and Manufacture. **[9]**

Q5) a) Explain the basic components of a robotic system. **[9]**

b) Explain the following terms. **[9]**

i) Unit load AS/RS

ii) Mini load AS/RS

iii) Carousel AS/RS

OR

Q6) a) Explain the importance of automated work-in-process storage systems. **[9]**

b) What is computer aided inspection (CAI) and how can we control quality with the help of CAI? **[9]**

Q7) a) Explain the term Tool Monitoring and Fault Detection. **[8]**

b) Write note on Mass Exchange, Tool Sharing and Tool Migration. Give suitable example to each. **[9]**

OR

Q8) a) Describe Tool Preset, Identification and Data Transfer. **[8]**

b) What are the different types of tool strategies? Explain Each. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2695

[Total No. of Pages : 2

[6583]-245

T.E. (Robotics and Automation)

MICRO ELECTRO MECHANICAL SYSTEMS

(2019 Pattern) (Semester - VI) (311511(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) What is the principle of electrostatic sensor? What do electrostatic sensors measure? **[9]**

b) Discuss key components of magnetic actuators. **[8]**

OR

Q2) a) Explain significance of thermocouple in MEMS also classify thermocouples. **[9]**

b) Explore various applications of micro motors. 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) Brief on various applications of flow sensors. **[8]**

OR

Q4) a) Brief working principle of acoustic sensor. What are the advantages and limitation of acoustic sensor? **[9]**

b) Describe methods associated with stress analysis of various elements in MEMS. **[8]**

P.T.O.

Q5) a) Classify types of polymers. State mechanical and chemical properties of various polymers. **[9]**

b) Explain the concept of optical MEMS. How it is important in semiconductor industry. **[9]**

OR

Q6) a) Explain applicability of Liquid crystal polymer and parylene. Also write advantages and limitations. **[9]**

b) Write a short note on SU-8 with its product characteristics. **[9]**

Q7) a) Why acceleration sensors are essential in semiconductor industry? Elaborate its significance. **[6]**

b) Elaborate case study related to acceleration sensor. **[6]**

c) Brief on Metal detector. How it is applicable in defense sector? **[6]**

OR

Q8) a) Explain concept of Gyros. **[6]**

b) Write a short note on.: Ultrasonic Distance Ranging Sensors. **[6]**

c) Write a case study related to microphone. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE2696

[Total No. of Pages : 2

[6583]-246

T.E. (Robotics & Automation Engineering)

HUMANOID ROBOTS

(2019 Pattern) (Semester-VI) (Elective-II) (311511(A)-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 indicates full marks.***

Q1) a) Give significance of angular momentum and the inertia tensor in humanoid robotics. **[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 feel with contact points at (0. 0) and (0.2.0) in a 2D plane. The robot's center of mass is located at (0.1 0.1). Calculate the net torque around the center of mass and determine if the robot is in balance. **[10]**

OR

Q2) a) What is the Zero Moment Point (ZMP) in humanoid robotics, and why is it important in measuring stability? **[8]**

b) What is the significance of 2D analysis in humanoid robotics, and how does it contribute to understanding robot behaviour? **[10]**

A humanoid robot has a mass of 10 kg. The inertia lensor of the robot's body is given as follows: lxx = 2 kgm^2. lyy = 3 kgm^2, lzz = 1kg*m^2 Calculate the total moment of inertia for the robot's body.

Q3) a) How does the field of humanoid robotics contribute to the study and understanding of neuroscience? **[8]**

b) How can foveal vision be implemented in humanoid robots? What is cognitive human robotics, and how does it integrate cognitive abilities into robot systems? **[9]**

OR

P.T.O.

Q4) a) Explain foveal vision and it's important for humanoid robots. **[8]**

b) How can humanoid robots be used to emulate neuro-mechanisms and contribute to our understanding of brain function? **[9]**

Q5) a) What is multi-fingered grasping, and why is it important in robotics? Discuss some applications of 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]**

OR

Q6) a) What are the challenges in achieving effective multi-fingered grasping in robotics? **[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]**

Q7) Write short note on: **[18]**

a) Search and rescue humanoid robots

b) Humanoids in sports

c) Concept of AI

OR

Q8) Write short note on: **[18]**

a) A.I. in Robotics

b) Service robots

c) Social Robotics



Total No. of Questions : 8]

SEAT No. :

PE2697

[Total No. of Pages : 2

[6583]-247

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

Q1) a) What is the nature of simulation models? **[6]**

b) Which are the inputs of simulation model? **[6]**

c) When to use simulations? **[5]**

OR

Q2) a) What is input modeling in simulation? **[6]**

b) Which are the four phases of input modeling for simulation? **[6]**

c) What is a Histogram? **[5]**

Q3) 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 Uniform. **[5]**

OR

Q4) 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 Weibull. **[5]**

P.T.O.

Q5) a) Discuss "simulation is more widely applied to manufacturing systems than to any other application area". **[6]**

b) Describe types of manufacturing issues typically addressed by simulation. **[6]**

c) Which are the common measures of performance obtained from a simulation study of a manufacturing system? **[6]**

OR

Q6) 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]**

Q7) a) Which features needed in programming most discrete-event simulation models? **[6]**

b) What are the advantages of using a 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]**



Total No. of Questions : 8]

SEAT No. :

PE2698

[Total No. of Pages : 3

[6583]-248

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) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) 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	14	16	19	12
2	14	0	15	13	10
3	16	15	0	11	17
4	19	13	11	0	21
5	12	10	17	21	0

b) Explain applications of ant colony optimization algorithm to solve combinatorial optimization problems. **[7]**

OR

P.T.O.

Q2) 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]**

Q3) a) Explain Artificial Bee colony algorithm. What are its algorithm specific parameters? How they are determined? **[8]**

b) In a minimization problem, the objective function 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 hybrid artificial bee colony-simulated annealing algorithm. **[8]**

b) What is the role of scout bees in Artificial Bee colony algorithm? How the number of scout bees are decided? **[9]**

Q5) a) The objective function values of 10 different solutions are as given below:

Solution No.	1	2	3	4	5	6	7	8	9
Objective function value	39	22	26	30	35	39	22	26	30

For a minimization of objective function value, shuffled frog algorithm is used. If number of memeplexes are three, determine the solutions in each memeplex. **[10]**

b) Draw the flowchart and explain Lion algorithm. **[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 work station 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) Explain application of swarm intelligence in route optimization for AS/RS systems. **[9]**

OR

Q8) a) Explain the use of swarm intelligence in obstacle avoidance for mobile robots in dynamic environment. **[9]**

b) Write note on: Swarm robotics. **[9]**

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. :

PE2699

[Total No. of Pages : 2

[6583]-249

T.E. (Robotics & Automation)

EMBEDDED SYSTEMS IN ROBOTICS

(2019 Pattern) (Semester-V) (311501(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 Diagram must be drawn wherever necessary..***
3) ***Assume Suitable data if necessary.***
4) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***
5) ***Figures to the right indicates full marks.***

Q1) a) Explain Serial Communication with their types. **[8]**

b) Explain the Architecture of the kernel and task scheduler. **[9]**

OR

Q2) a) Explain UART & USART with suitable diagram. **[8]**

b) Describe various Special Function Registers. **[9]**

Q3) a) Explain Wireless sensor network with diagram. **[9]**

b) Explain Bluetooth and Zig-Bee. **[8]**

OR

Q4) a) Explain communication protocols SPI and SCI (RS232, RS485). **[9]**

b) Explain the CAN and USB protocol with suitable diagram. **[8]**

Q5) a) Explain Interprocess communication & Round-robin scheduling Algorithm. **[9]**

b) Compare Monolithic RTOS with Micro kernel RTOS. **[9]**

OR

P.T.O.

Q6) a) Compare General Purpose Operating System (GPOS) and RTOS with respect to: **[9]**

i) Time

ii) Memory management

b) Explain the following functions: **[9]**

i) OSQCreate()

ii) OSSemPend()

iii) OSQPost ()

Q7) a) Compare Kernel Module with Application. **[9]**

b) Explain the Role of Device Driver. **[9]**

OR

Q8) a) Explain the device driver with a simple application. **[9]**

b) What is Embedded Linux? Explain Embedded Linux development setup. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE2700

[Total No. of Pages : 2

[6583]-250

T.E. (Robotics & Automation)

HYDRAULICS AND PNEUMATICS

(2019 Pattern) (Semester - V) (311502(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) ***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) With Neat Sketch, Explain Operation of Poppet check valve and state its advantages & Disadvantages. **[8]**

b) With Neat sketch, Explain Operation of pressure and temperature of compensated FCV. **[9]**

OR

Q2) a) With Neat Sketch, explain construction and working of pilot operated pressure valve. **[8]**

b) With neat sketch Explain 4/2 DCV with any one application. **[9]**

Q3) a) With neat circuit diagram explain the control of double acting hydraulic cylinder. **[9]**

b) Explain speed control of a hydraulic motor circuit. **[9]**

OR

Q4) a) Explain the pump unloading circuit. **[9]**

b) With neat sketch explain the spring loaded accumulator. **[9]**

P.T.O.

Q5) a) Write the advantages,. disadvantages and applications of pneumatic system. **[9]**

b) With neat sketch explain the working of FRL unit. **[9]**

OR

Q6) a) Draw circuit for **[9]**

i) Controlling speed of pneumatic double acting cylinder.

ii) Speed control of pneumatic motor.

b) Explain with neat sketch working of AND valve and with the help of circuit diagram explain any one typical application. **[9]**

Q7) a) Explain PLC with block diagram, also explain the ladder logic for PLC programming. **[8]**

b) With neat sketch explain 5/2-way single solenoid valve, spring return. **[9]**

OR

Q8) a) Draw and Explain the direct control of single cylinders using electro pneumatics. **[8]**

b) Explain an Electro-hydraulic servo system with neat sketch. **[9]**



Total No. of Questions : 8] **SEAT No. :**

PE2701 **[Total No. of Pages : 2**

[6583]-251

T.E. (Robotics and Automation)

ROBOT KINEMATICS AND DYNAMICS

(2019 Pattern) (Semester - V) (311503A)

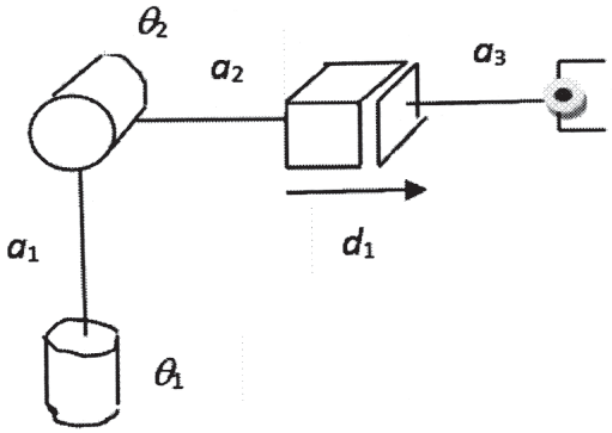
Time : 2 Hours] ***[Max. Marks : 70***

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) What is inverse kinematics problem? What are advantages of using metaheuristic methods over numerical methods to solve inverse kinematics problems? **[6]**

b) For the kinematic diagram of robot as shown in Fig., Obtain the values of joint parameters θ1, θ2, and d_1 to bring the end effector to position (1.00, 1.10, -1.50). The link lengths are: a_1=2.5, a_2=2, $a_3$1.25. **[12]**



OR

Q2) a) Explain the steps of steepest descent algorithm to solve inverse kinematics problems. **[8]**

b) Genetic algorithm is to be used to minimize the function $z = 3xy + x^2y$ such that $2 \leq x,y \leq 6$. Preform the following: **[10]**

i) Generate initial population of 5 solutions in binary coded form with string length as 4.
ii) Obtain the decoded values.
iii) Convert decoded values into actual values of variables.
iv) Obtain the values of objective function *z*.

P.T.O.

Q3) a) Explain the design consideration of electromagnetic grippers. **[8]**

b) A vacuum gripper is to be designed to handle flat plate glass in an automobile windshield plant. Each plate weighs 175 N. A single suction cup will be used, and the diameter of the suction cup is 125 mm. Determine the negative pressure required to lift each plate. Use a safety factor of 2 in your calculations. **[6]**

c) What are the advantages and limitations of mechanical grippers? **[4]**

OR

Q4) a) Explain the design aspects of pneumatic grippers. **[6]**

b) What are various criteria for selection of grippers in robotics applications? **[6]**

c) A magnet with 1,000 turns and a cross-sectional area of 0.5 m^2 is operated with 10 amperes of current, 1.5 meters from a piece of metal. **[6]**

Q5) a) What is robot dynamics? What is its significance? **[8]**

b) A robot arm with revolute joint is stationary at $\theta = 25^o$. It is required to move it to $\theta = 70°$ in 8 seconds. Find the coefficients of cubic polynomial that accomplishes this motion and brings the manipulator to rest at goal point. Hence determine the angular position, angular velocity, and angular acceleration at t = 3 seconds. **[9]**

OR

Q6) a) What is gradient of a function? What is its significance? Determine the gradient of a function : **[5]**

4. $x_1 . x_2 - 2x_2^2 + 12$ at $x_1 = 3$ and $x_2 = 2$

b) For a single rotary manipulator link, the gripper force is = [0, -30 N, 0], mass of the link = 30 Kg, Angular velocity of link (ω) = 6 rad/s, Angular acceleration of link = -18 rad/s^2, Length of link = 2 m with CG located at 0.8 m from joint. Determine the resultant joint reaction force in base co-ordinate system for angular position of 40°. **[12]**

Q7) a) Discuss the balancing of V-engines. **[7]**

b) Define the following terms: **[10]**

i) Swaying Couple
ii) Hammer blow
iii) Tractive force
iv) Primary balancing
v) Secondary balancing

OR

Q8) a) What is balancing? What are types of balancing? **[8]**

b) A circular disc mounted on a shaft carries three attached masses of 4 kg, 3 kg, and 2.5 kg at radial distances of 75 mm, 85 mm and 50 mm and at the angular positions of 45°, 135° and 240° respectively. The angular positions are measured counter-clockwise from the reference line along the x-axis. Determine the amount of the counter mass at a radial distance of 75 mm required for the static balance. **[9]**

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Total No. of Questions : 8] **SEAT No. :**

PE2702 **[Total No. of Pages : 2**

[6583]-252

T.E. (Robotics & Automation)

SENSOR TECHNOLOGY

(2019 Pattern) (Semester - V) (311504(A))

Time : 2½Hours] ***[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) ***Assume suitable data, if necessary.***

Q1) a) Write a various characteristics of thermistors. **[9]**

b) What is absolute and relative temperature? Explain it necessary. **[8]**

OR

Q2) a) Explain with a neat sketch Resistance temperature detector. **[9]**

b) Explore thermo-electric effects. **[8]**

Q3) a) Discuss latest developments in position sensors. **[9]**

b) Explain working principle of piezo resistive accelerometers. **[8]**

OR

Q4) a) Compare performance of capacitive and inductive sensor. **[9]**

b) Elaborate on shock and vibration sensor. **[8]**

Q5) a) Why load cell are needed? Explain its working. **[9]**

b) What are quartz sensors? Explain its applications. **[9]**

OR

Q6) a) How to measure force? Discuss few methods to measure force. **[9]**

b) Compare metal strain guage to semiconductor strain guage. **[9]**

P.T.O.

Q7) Write short note on : **[18]**

a) Thermal detector **[6]**

b) Motion sensor **[6]**

c) Biosensors **[6]**

OR

Q8) Write short note on : **[18]**

a) Nanotechnology enabled sensors **[6]**

b) Application of sensors in an automobile **[6]**

c) Phototransistors **[6]**

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Total No. of Questions : 8]

SEAT No. :

PE2703

[Total No. of Pages : 3

[6583]-253

T.E. (Robotics &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 indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***

Q1) a) Perform five iteration of the bisection method to obtain the smallest positive root of the equation $f(x) = x^3 - 5x + 1 = 0$. **[9]**

b) Perform the Newton Raphson method to obtain the root of the equation $f(x) = \cos x - xe^x = 0$. **[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

P.T.O.

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

Q4) a) State the order of the polynomial which might be suitable for the following Function. Calculate f(160) using Newton Forward Difference Method.**[9]**

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.90	21.27

b) Using a mathod 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) State the order of the polynomial which might be suitable for the following function. Calculate $f(1.5)$ using Newton Divided Difference Method. **[9]**

i	0	1	2	3	4
x	1	2	3	4	5
$f(x)$	0	7	26	63	124

b) Evaluate $\int_0^{0.6} e^{x^{-2}}$ by using Trapezoidal Method and Simpson's 1/3rd 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 l/3rd rule and Trapezoidal Method to evaluate $\int_0^1 \left(\frac{x^2}{1+x^3} \right) dx$ corresponding to Four intervals. **[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]**



Total No. of Questions : 8] **SEAT No. :**

PE2704 **[Total No. of Pages : 3**

[6583]-254

T.E. (Robotics and Automation)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - V) (311505 A-II) (Elective-I)

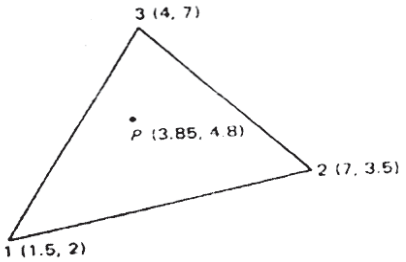
Time : 2½ Hours] ***[Max. Marks : 70***

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) ***Use of scientific calculator is allowed.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain the concept of the Finite Element Method (FEM). Explain its importance in solving complex engineering problems and give examples of applications in structural and thermal analysis? **[9]**

b) Consider a triangular element shown below. Evaluate the shape functions N1, N2 and N3 at an interior point P. **[9]**



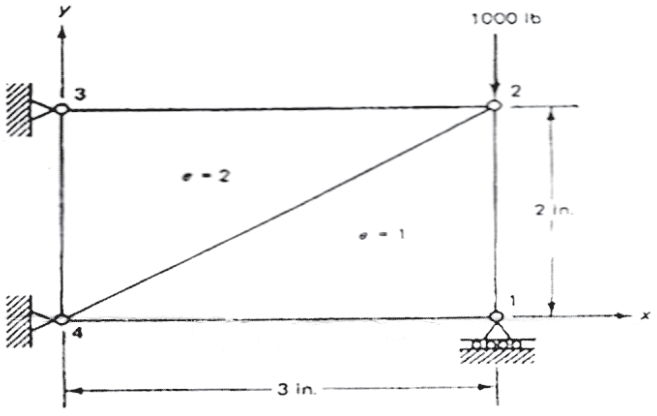
OR

Q2) a) Formulate the elemental stiffness matrix and load vector for a plane stress problem using a Linear Strain Rectangle (LSR) element. Discuss the assumptions involved in the formulation? **[9]**

b) 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



Thickness t = 0.5 in., E = 30 × 10^6 psi, ν = 0.25

P.T.O.

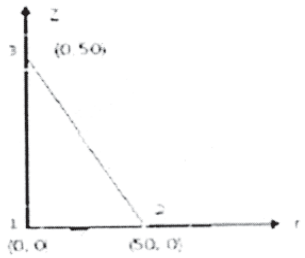
Q3) a) Explain the concept of axi-symmetric problems in finite element analysis. Explain how these problems differ from 2D and 3D problems and provide examples of typical engineering applications? **[9]**

b) Derive the shape functions for axisymmetric element? **[8]**

OR

Q4) a) Discuss the applications of higher-order finite elements in engineering analysis. Provide examples of situations where higher-order elements would be preferable over lower-order elements and explain in detail?**[9]**

b) For axisymmetric element shown in figure, determine the strain-displacement matrix. Let E = 2.l $\times 10^5$N/mm^2 and ν = 0.25. The co-ordinates shown in figure are in millimeters. **[8]**



Q5) a) Explain the process of heat transfer by convection. Discuss the differences between forced convection and natural convection, and describe the governing equations and boundary conditions for each case? **[9]**

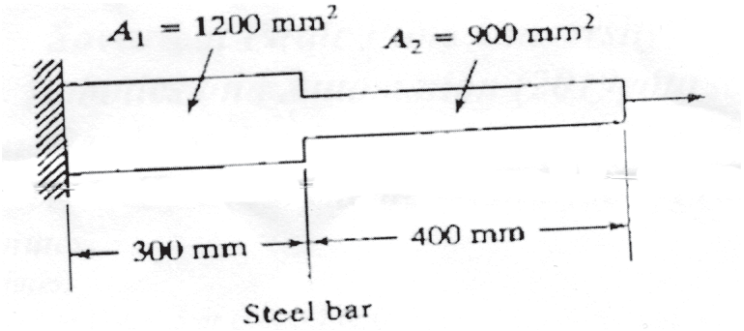
b) A composite slab consists of 3 materials of different conductivities i.e. 22W/m K, 32 W/m K, 52 W/m K of thickness 0.31 m, 0.14 m and 0.14 m, respectively. The outer surface is 220 C and the inner surface is exposed to the convective heat transfer coefficient of 28 W/m^2 K, 8000 C. Determine the temperature distribution within the wall. **[8]**

OR

Q6) a) 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? **[9]**

b) Derive the shape functions for axisymmetric element. **[8]**

Q7) a) Determine natural frequencies for a Steel bar as shown in figure. **[9]**



b) Derive the general dynamic equation of motion for a structural system subjected to dynamic loading. Explain the significance of each term in the equation, including mass, damping, and stiffness matrices? **[9]**

OR

Q8) a) Explain the different types of dynamic analysis used in finite element methods (FEM). Compare and contrast the approaches for solving transient dynamic, steady-state dynamic, and modal analysis problems? **[9]**

b) Derive the mass matrix for a bar element using the lumped mass approach. Explain how the mass matrix is incorporated into the overall system of equations for dynamic analysis? **[9]**

Total No. of Questions : 8]

SEAT No. :

PE2705

[Total No. of Pages : 2

[6583]-255

T.E. (Robotics and Automation)

INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS

(2019 Pattern) (Semester - V) (311505(A)-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, 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) Describe briefly the various types of motion controls possible in robots. **[9]**

b) Explain in brief Robot centered cell used in manufacturing industries. **[9]**

OR

Q2) a) List and explain the general considerations in Robotic material handling. **[9]**

b) Explain in detail CNC machine tool loading. **[9]**

Q3) a) Show the following grippers with the help of a diagram: **[8]**

i) Two finger gripper

ii) Internal and external gripper

iii) Angular and parallel gripper

b) Write a short note on active and passive grippers. **[9]**

OR

Q4) a) List and Explain different types of end effectors used in robots and their applications. **[9]**

b) The data for the pneumatic gripper is as given below.

Given: d = 35 mm, s = 80 mm, Gripper force 700 N, n = 50 rpm. Determine the motor power required in HP. **[8]**

P.T.O.

Q5) a) Explain Material handling Robots used in warehouse. **[8]**

b) Explain in detail Robotic vision systems. **[9]**

OR

Q6) a) Explain continuous arc welding Robots used in Automobile industry. **[8]**

b) Explain Robots used in Die Casting. **[9]**

Q7) Write a short note on: **[18]**

a) Lee's Algorithm for obstacle avoidance.

b) Underwater applications Robots.

OR

Q8) Write a short note on: **[18]**

a) Medical applications.

b) Interfacing Robots with computers.

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Total No. of Questions : 8] **SEAT No. :**

PE2706 **[Total No. of Pages : 3**

[6583]-256
T.E. (Robotics and Automation)
INTELLIGENT MANUFACTURING SYSTEM
(2019 Pattern) (Semester - V) (311505 (A-IV)) (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) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) In a minimization problem, current value of a certain parameter *x* is 20. The lower and upper bounds of parameter *x* are 10 and 50 respectively. If simulated annealing algorithm is used to update *x* using 5 random numbers having sum 1.87, what will be the updated value? **[12]**

b) Explain the application of simulated annealing algorithm to inventory control problem. **[6]**

OR

Q2) a) Using a simulated annealing algorithm to solve a minimization problem. function value of 20 is updated to new value of 30 at temperature of 55ºC. What is the probability of accepting the new solution? **[9]**

b) Explain with suitable example the use of fuzzy logic in defect analysis in sand casting. **[9]**

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]**

		Part					
		1	2	3	4	5	6
Machine	A	1		1			
	B		1		1		1
	C				1		1
	D	1		1		1	
	E		1				

b) Explain the 'Weighted Minkowski metric' method of group technology. **[8]**

OR

P.T.O.

Q4) a) Apply clustering using similarity coefficient method for following machine part data: **[9]**

	J_1	J_2	J_3	J_4	J_5	J_6	J_7	J_8
M_1	1		1			1		
M_2		1		1	1			
M_3				1		1	1	1
M_4		1		1	1	1		
M_5			1				1	1

b) Explain application of k-means clustering algorithm for solving group technology problems. **[8]**

Q5) a) Explain Rapidly-exploring Random Tree (RRT) algorithm for robot path planning. **[9]**

b) Explain the task based hybrid closure grasping optimization for Autonomous Robot Hand. **[8]**

OR

Q6) a) What is real coded genetic algorithm? How it is used in robot path planning? **[9]**

b) Write note on: Obstacle avoiding robots. **[8]**

Q7) a) Explain the route optimization techniques in automated storage and retrieval systems (AS/RS)? **[9]**

b) A perceptron having weights corresponding to the three inputs have the following values: w1= 2 ; w2 = – 4; and w3 = 1 and the activation of the unit is given by the step-function: $\varphi(v) = 1$ if $v \geq 0$ otherwise 0 **[9]**

Calculate the output value y of the given perceptron for each of the following input patterns:

Pattern	P1	P2	P3	P4
X1	1	0	1	1
X2	0	1	0	1
X3	0	1	1	1

OR

Q8) Write a short notes on: **[18]**

a) Application of artificial intelligence in flexibe manufacturing system

b) Automated guided vehicles

c) Building blocks of FMS



Total No. of Questions :8]

SEAT No. :

PE2707

[Total No. of Pages : 2

[6583]-257
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 wherver necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) a) What are the main components of statistical linear models, and how are residuals utilized? **[6]**

b) Explain the concept of logistic regression and its significance in interpreting odds ratios. **[6]**

c) How does logistic regression employ maximum likelihood estimation? **[6]**

OR

Q2) a) How does Poisson regression differ from other regression models? **[6]**

b) Explain interpretation and visualization of logistic regression? **[6]**

c) Briefly discuss the role of generalized linear models in regression analysis. **[6]**

Q3) a) What are the fundamenal principles of Support Vector Machine classification and hyperplanes? **[6]**

b) How do kernel functions influence the performance of Support Vector Machines? **[6]**

c) Describe Bagging and Bootstrap techniques within ensemble methods. **[5]**

OR

P.T.O.

Q4) a) Explain the basics of random forest, including feature selection. **[6]**

b) Explain the effectiveness of SVM and random forest with an example? **[5]**

c) How do ensemble methods improve classification accuracy compared to individual classifiers? **[6]**

Q5) a) Define decision trees and their relationship with entropy. **[6]**

b) Compare and contrast ID4, C4.5, and CART algorithms. **[6]**

c) Discuss the impact of bagging and boosting on bias and variance in ensemble methods. **[6]**

OR

Q6) a) What are the key characteristics of Random Forests and Gradient Boosting Machines? **[6]**

b) Highlight the advantages of ensemble methods over standalone classifiers. **[6]**

c) What distinguishes XG Boost from traditional gradient boosting techniques? **[6]**

Q7) a) Provide an overview of clustering and its relevance in unsupervised learning. **[6]**

b) Explain the concept of partitioning methods and their applications. **[6]**

c) Describe Density-Based Spatial Clustering and its suitability for various datasets. **[5]**

OR

Q8) a) Discuss the principles of Hierarchical clustering, including dendrograms. **[6]**

b) What are the challenges associated with determining the number of clusters in Hierarchical clustering? **[5]**

c) Compare and contrast divisive clustering techniques with other clustering methods. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE2708

[Total No. of Pages : 2

[6583]-258
T.E. (Artificial Intelligence and Machine Learning)
DATA MINING & WAREHOUSING
(2019 Pattern) (Semester - VI) (318553)

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.***
4) ***Assume Suitable data if necessary.***

Q1) a) Compare K-Means with K-Medoids techniques for clustering. **[6]**

b) Explain the concept of data, information, and knowledge in the context of BI. **[6]**

c) Explain the categories of clustering methods. **[6]**

OR

Q2) a) Explain DBSCAN method in details. **[6]**

b) Describe Design and implementation aspect of OLTP. **[6]**

c) What are the business applications of BI? **[6]**

Q3) a) Explain about the Three-tier data warehouse architecture with a neat diagram. **[6]**

b) Write a note on Decision support systems. **[6]**

c) Write difference between Operational & informational data systems. **[5]**

OR

Q4) a) Describe in brief about Data warehouse implementation. **[6]**

b) What is a data mart? Discuss its role in data warehousing. **[6]**

c) Discuss the characteristics of a data warehouse. **[5]**

Q5) a) Differentiate between OLTP and OLAP with example. **[6]**

b) Write short note on Data Integration and Transformation. **[6]**

c) Describe applications of Data warehouse. **[6]**

OR

P.T.O.

Q6) a) Explain data discretization techniques in details. **[6]**

b) Explain different data cleaning techniques. **[6]**

c) Give an overview of the data life cycle and its stages. **[6]**

Q7) a) Explain Relational Online Analytical Processing(ROLAP) and Hybrid Online Analytical Processing (HOLAP). **[6]**

b) Write a note on a Multidimensional Data Model. **[6]**

c) What is the difference between a fact table and a dimension table in a multidimensional database? **[5]**

OR

Q8) a) Differentiate between ROLAP, MOLAP and HOLAP. **[6]**

b) Describe stars, snowflakes schemas used for representing multidimensional databases. **[6]**

c) Explain Concept Hierarchies in details. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE2709

[Total No. of Pages : 2

[6583]-259

T.E. (Artificial Intelligence and Machine Learning)

ARTIFICIAL NEURAL NETWORKS

(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 Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the architecture of a multilayer perceptron (MLP). How it differs from a single-layer perceptron? **[6]**

b) Explain in detail Error Back Propagation Algorithm. **[6]**

c) Explain in detail momentum based GD. **[6]**

OR

Q2) a) Explain Gradient Descent with example. **[6]**

b) Explain how multilayer perceptron can be used in image classification tasks. **[8]**

c) What are different discriminant functions. **[4]**

Q3) a) Explain Training and Testing algorithm in discrete Hopfield network. **[7]**

b) What are stochastic network and Boltzmann machines and what are some applications of these models? **[10]**

OR

Q4) a) What is the Simulated Annealing? Give its advantages and disadvantages. **[7]**

b) Explain Pattern Storage Networks and Stochastic Networks. **[10]**

P.T.O.

Q5) a) What is an auto-associative feedforward network and How it differ by FFNN. **[8]**

b) Explain Semantic Networks in competitive Learning. **[6]**

c) Provide an example where ART can be used. **[4]**

OR

Q6) a) Explain Feature Mapping Network and its role in pattern recognition. **[10]**

b) Explain Adaptive Resonance Theory and its applications. **[8]**

Q7) a) Explain with appropriate example Deep Recurrent Neural Network. **[7]**

b) Explain with diagram Long short-term memory (LSTM) Networks and Recurrent neural network. **[10]**

OR

Q8) a) Explain the challenges faced in training Deep Learning Networks, including overfitting, vanishing gradients and exploding gradients. **[8]**

b) Explain Convolutional Neural Networks(CNN) .State it's application with examples. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2710

[Total No. of Pages : 2

[6583]-260

T.E. (Artificial Intelligence and Machine Learning)

INDUSTRIAL INTERNET OF THINGS

(2019 Pattern) (Semester - VI) (318555(A)) (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) How Integration of Knowledge is done in CMS? **[6]**

b) Explain in detail Communication in IIoT. **[6]**

c) Explain in detail CPS-based manufacturing and industries. **[6]**

OR

Q2) a) Explain in detail Networking in IIoT. **[6]**

b) Write a note on Interoperability in Smart Automation. **[6]**

c) Write a note on enhancing resiliency in production facilities through CPS. **[6]**

Q3) a) What is Big Data and how is it used in IIoT? **[6]**

b) How can Machine Learning be applied in condition monitoring? **[6]**

c) What are the challenges in implementing AI and Data Analytics in Manufacturing? **[5]**

OR

P.T.O.

Q4) a) How is CPS used in machine tools? **[6]**

b) What are the advantages of using AI and Data Analytics in Manufacturing? **[6]**

c) What is cyber physical system intelligence? **[5]**

Q5) a) How can IIoT improve Human-Machine Interaction in the manufacturing sector? **[6]**

b) What are the challenges of evaluating the workforce in IIoT? **[6]**

c) What strategies can be used to support user intervention in CPS? **[6]**

OR

Q6) a) How do workers and CPS interact with each other? **[6]**

b) How does Innovation Ecosystems support Human-Machine Interaction? **[6]**

c) Write a note on Advance Manufacturing. **[6]**

Q7) a) Write a note on City Automation, and also state its advantages? **[6]**

b) Write a note on e-Health Body Area Networks. **[6]**

c) How does smart metering work, and what are its benefits? **[5]**

OR

Q8) a) What are the different Automotive Applications in IIoT and explain any one. **[6]**

b) Which are the different applications of IIoT? Explain Smart Cards in detail. **[6]**

c) Explain in detail Plant Automation. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PE2711

[Total No. of Pages : 2

[6583]-261

T.E. (Artificial Intelligence and Machine Learning)

BRAIN COMPUTER INTERFACE

(2019 Pattern) (Semester - VI) (Elective - II) (318555(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) What is an Wavelet analysis? **[6]**

b) What is the Independent Component Analysis? **[6]**

c) Explain Properties Time domain analysis. **[6]**

OR

Q2) a) Explain the Spike sorting? **[6]**

b) What is Phase synchronization and coherence? **[6]**

c) Explain Artefacts reduction. **[6]**

Q3) a) Explain Evaluation of classification performance of BCI. **[6]**

b) Which is the Multiclass Classification? **[6]**

c) Explain Multilayer neural networks. **[5]**

OR

Q4) a) Explain Binary classification of MACHINE LEARNING. **[6]**

b) Explain graph theoretical functional connectivity analysis. **[5]**

c) Explain Ensemble classification. **[6]**

P.T.O.

Q5) a) Explain Flash visual evoked potentials. **[6]**

b) Explain Machine learning approach in BCI. **[6]**

c) Discuss in brief determination of gazed target. **[6]**

OR

Q6) a) Which Generalized Support Vector Machine for Brain-Computer Interface? **[6]**

b) Explain offset Peak-to-valley amplitudes. **[6]**

c) Explain availability of transient VEPs. **[6]**

Q7) a) Why we use decoding and tracking arm? **[6]**

b) Explain functional electrical stimulation. **[6]**

c) What is Machine learning approach? **[5]**

OR

Q8) a) Explain the task Invasive BCIs. **[6]**

b) Explain Cursor and Robotic control using multi electrode array implant. **[5]**

c) How controlling of prosthetic devices such as orthotic hands is done? **[6]**



Total No. of Questions : 8]

SEAT No. :

PE2712

[Total No. of Pages : 2

[6583]-262

T.E. (Artificial Intelligence and Machine Learning)

AI FOR CYBER SECURITY

(2019 Pattern) (Semester - VI) (318555C) (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 indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain different machine learning (ML) algorithms for botnet detection. **[8]**

b) Explain Random forest and SVM algorithm. **[6]**

c) Explain different approaches used to identify botnet topology. **[4]**

OR

Q2) a) Explain how to classify network attacks? **[8]**

b) Explain how to detect botnet topology and explain its types? **[6]**

c) Explain different network anomaly detection techniques. **[4]**

Q3) a) Explain key elements of account reputation scoring. **[7]**

b) Explain user authentication with keystroke recognition. **[6]**

c) Explain Biometric authentication with facial recognition. **[4]**

OR

Q4) a) Explain leverage machine learning (ML) algorithms for fraud detection. **[7]**

b) Explain Fraud Prevention with Cloud AT Solutions and its benefits. **[6]**

c) Explain how to protect sensitive information and assets? **[4]**

P.T.O.

Q5) a) Explain how to defend against adversarial attacks using facial recognition. **[8]**

b) Explain the attacks against deep neural networks (DNNs) via model substitution. **[6]**

c) Explain the fundamental concepts of GAN. **[4]**

OR

Q6) a) What is intrusion detection systems? Explain GAN attacks used against IDS. **[8]**

b) Explain the steps involved in model substitution. **[6]**

c) Explain the main libraries and tools for developing adversarial examples. **[4]**

Q7) a) What is cross validation? Explain its technique used for bias-variance trade-offs. **[7]**

b) Explain how ROC curve is used to visualize the performance of binary classifier? **[6]**

c) Explain how to manage algorithms' overfitting. **[4]**

OR

Q8) a) Explain the steps to be followed in preparation of raw data in Feature engineering. **[7]**

b) Explain how to split sample data into training and test sets? **[6]**

c) Explain bias-variance trade-offs with cross validation. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE2713

[Total No. of Pages : 2

[6583]-263

T.E. (Artificial Intelligence and Machine Learning)

VIDEO ANALYTICS

(2019 Pattern) (Semester - VI) (318555(D)) (Elective - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 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) List and explain applications of HMM based Classifier. **[6]**

b) Write a note on Deep learning networks. **[6]**

c) Explain fuzzy pattern classifier. **[6]**

OR

Q2) a) Explain briefly a HMM based classifier. **[6]**

b) Explain in detail back propagation algorithm. **[6]**

c) Define Bayesian classifier? What are the different types of Bayesian classifiers? **[6]**

Q3) a) Describe the implementation of perimeter security in video analytics. **[6]**

b) What is crowd analysis? Explain methods of crowd analysis? **[6]**

c) Write a note on Abandoned object detection in video analytics. **[5]**

OR

Q4) a) Define human action recognition in the context of video analytics. **[6]**

b) How does video analytics helpful in human behavioral analysis? **[6]**

c) Explain the importance of predicting crowd congestion using video analytics. **[5]**

P.T.O.

Q5) a) How video Analytics is used in traffic congestion identification for route planning. **[6]**

b) Define driver assistance and its role in video analytics. **[6]**

c) Explain Customer behavior analysis in video Analytics. **[6]**

OR

Q6) a) How Traffic rule violation detection is done by using video Analytics.**[6]**

b) Discuss the significance of people counting in retail analytics using video technology. **[6]**

c) Write short note on Traffic Monitoring and assistance. **[6]**

Q7) a) Explain in detail Video Analysis in Action Recognition. **[6]**

b) How does video analytics useful in context and scene understanding in surveillance systems? **[6]**

c) How does video analytics useful in action recognition. **[5]**

OR

Q8) a) Describe the role of video analytics in Advanced Driver Assistance Systems (ADAS). **[6]**

b) Write the benefits of using Video Analytics for Surveillance. **[6]**

c) What is meant by video rendering? Explain the process of rendering?**[5]**



Total No. of Questions :8]

SEAT No. :

PE2714

[Total No. of Pages : 2

[6583]-264

T.E (Artificial Intelligence and Machine Learning)
DESIGN AND ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester-V) (318541)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain principal of optimality with 0/1 Knapsack problem. **[8]**

b) Differentiate between dynamic programming and greedy method. **[6]**

c) Explain Warshal's algorithm with suitable example. **[4]**

OR

Q2) a) Explain Floyd's algorithm and give example. **[8]**

b) Consider following instance for simple knapsack problem.Find the solution using greedy method. **[6]**

N=8

P={11,21,31,33,43,53,55,65}

W={1,11,21,23,33,43,45,55}

M=110

c) What is optimal binary search tree? Explain with optimality **[4]**

Q3) a) Apply backtracking technique to solve the following instance of the subset sum problem S=[1,3,4,5] and d=[11 16]. **[7]**

b) Write the backtracking algorithm for N-Queen problem and explain with Suitable example. **[6]**

c) Draw state space tree for 4-Queen's problem. **[4]**

OR

P.T.O.

Q4) a) Explain algorithm of graph coloring using backtracking. Give suitable example. **[7]**

b) Write an algorithm to find Hamiltonian Path using backtracking method **[6]**

c) Write recursive backtracking algorithm for sum of subset problem. **[4]**

Q5) a) What is travelling saleman problem? Find the solution of following travelling salesman problem using branch and bound method. **[8]**

Cost	∞	20	30	10	11
Matrix	15	∞	16	4	2
	3	5	∞	2	4
	19	6	18	∞	3
	16	4	7	16	∞

b) Compare backtracking and branch and bound method. **[6]**

c) Write an algorithm for least cost (LC) branch and bound. **[4]**

OR

Q6) a) Explain the concept of bounding function using branch and bound. **[8]**

b) Explain strategies of branch and bound. **[6]**

c) Write an algorithm for FIFO Branch and Bound. **[4]**

Q7) a) Prove that Clique problem is NP complete. **[7]**

b) Explain Vertex Cover Problem in detail. **[6]**

c) Write applications of NP classes of computational complexity. **[4]**

OR

Q8) a) Write non deterministic algorithm for sorting elements of an array. **[7]**

b) Write an algorithm for pointer doubling problem. What is its time complexity. **[6]**

c) Explain in detail Parallel Computing. **[4]**

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Total No. of Questions : 8]

SEAT No. :

PE2715

[Total No. of Pages : 2

[6583]-265

T.E. (Artificial intelligence and Machine Learning)

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) What are the different physical and MAC layers in IoT? **[6]**

b) Write a note on application layer protocol : MQTT. **[6]**

c) What do you mean by 6LoWPAN. **[6]**

OR

Q2) a) Explain in detail application transport method: SCADA. **[6]**

b) Explain in detail Network Layer: IP versions. **[6]**

c) What are the IoT access technologies and their security? **[6]**

Q3) a) What is Data acquisition related to IoT application development. **[6]**

b) Write a note on Authentication in IoT application development. **[6]**

c) How is device integration implemented in IoT? **[5]**

OR

Q4) a) What is the solution framework for IoT applications, explain detail. **[6]**

b) What is Data integration related to IoT application development. **[6]**

c) Write a note on Unstructured data storage on cloud. **[5]**

P.T.O.

Q5) a) Write a note on Cloud Service Models. **[6]**

b) What are the challenges of data analytics in IoT? **[6]**

c) State different Supporting Services for Computing Using a Cloud Platform for IoT Applications. **[6]**

OR

Q6) a) Explain in detail what is Data in Motion & Data at Rest. **[6]**

b) What are the supporting services in IoT? **[6]**

c) What is the difference between structured and unstructured data in IoT? **[6]**

Q7) a) Explain smart grid in detail. **[6]**

b) State & explain different Management Tools for IoT Cloud Storage. **[6]**

c) Write a note on Amazon Web Services for IoT. **[5]**

OR

Q8) a) Write a note on use of IoT in Industrial automation. **[6]**

b) What are the real-world design constraints in IoT? **[6]**

c) Explain in detail how a smart cities should be? **[5]**



Total No. of Questions : 8]

SEAT No. :

PE2716

[Total No. of Pages : 2

[6583]-266

T.E. (Artificial Intelligence and Machine Learning)

WEB TECHNOLOGY

(2019 Pattern) (Semester - V) (318543)

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 are web frameworks? Explain advantages of web framework. What are the different types of web frameworks? **[8]**

b) Explain angular forms with example. **[6]**

c) What are routers ? Explain the steps to create angular routers. **[4]**

OR

Q2) a) Explain angular project structure. State and explain any 4 components and modules of Angular JS. **[8]**

b) What is type script? Explain variables and Modules in TS. **[6]**

c) What is CLI? Explain any 4 Commands in angular CLI. **[4]**

Q3) a) What are modules in Node.JS? List the different types of built in modules in Node.JS. **[7]**

b) Explain the different file operations in Node.JS with proper syntax and example. **[6]**

c) What is difference between JavaScript and Node.js? **[4]**

OR

Q4) a) Write the steps to perform any three CRUDE operations using Node.JS and MongoDB **[7]**

b) How to create HTTP server and socket server? **[6]**

c) What is Express JS? **[4]**

P.T.O.

Q5) a) What is basic structure of jQuery Mobile page? Name the CDN files which are used with jQuery Mobile? **[8]**

b) Write a code to create any two widgets of your choice in JQuery Mobile. **[6]**

c) Explain any four form components in JQuery mobile. **[4]**

OR

Q6) a) Explain list in JQuery Mobile. How to divide list in JQuery mobile? **[8]**

b) Explain multipage template in JQuery mobile. **[6]**

c) List all the roles in JQuery mobile. **[4]**

Q7) a) What is AWS Elastic Beanstalk? What are the benefits of AWS Elastic Beanstalk? **[7]**

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

i) Application loadbalancer

ii) Network load balancer

c) What is Amazon EC2? Explain the features of Amazon EC2. **[4]**

OR

Q8) a) Explain the steps to deploy a web application an amazon EC2. **[7]**

b) What is PUTTY? How to connect EC2 instance with PUTTY? **[6]**

c) What are the Important AWS Cloud Services? **[4]**



Total No. of Questions : 8] **SEAT No. :**

PE2717 **[Total No. of Pages : 2**

[6583]-267

T.E. (Artificial Intelligence and Machine Learning)

MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY

(2019 Pattern) (Semester - V) (318544)

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

Instructions to the candidates:

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

Q1) a) Define the term "Entrepreneur" and provide key characteristics of entrepreneurs. **[6]**

b) Describe the concept of feasibility analysis in the context of entrepreneurship in details. **[6]**

c) Explain market feasibility study and technical feasibility study in India. **[6]**

OR

Q2) a) Discuss the stages involved in the entrepreneurial process in details. **[6]**

b) Explain the classification of entrepreneurs based on business size and provide an example of each. **[6]**

c) Define and explain financial feasibility study and social feasibility study in India. **[6]**

Q3) a) Define the term "project" and provide a brief description of its key characteristics. **[6]**

b) Explain the functional areas of management covered by Enterprise Resource Planning. **[6]**

c) Explain the Supply Chain Management with a case study. **[5]**

OR

P.T.O.

Q4) a) Explain the role of the Planning Commission in providing guidelines for project reports. **[6]**

b) Explain project selection and project identification processes in details. **[6]**

c) Explain the Types of reports and methods of report generation. **[5]**

Q5) a) Define Micro and Small Enterprises (MSEs) and list the characteristics. **[6]**

b) What is the Government of India Industrial Policy 2007? **[6]**

c) Explain the Institutional support to SSIDC and TECSOK. **[6]**

OR

Q6) a) Explain steps involved in establishing Micro and Small Enterprises. **[6]**

b) Describe the role of legal formalities in the establishment of MSMEs. **[6]**

c) Explain the Institutional support to MSME-DI and NSIC. **[6]**

Q7) a) Define Intellectual Property Rights (IPR) and list three kinds of IPR. **[6]**

b) Explain recommendations for addressing Marxist criticisms of IPR. **[6]**

c) Write short note on Concept and Theories and Kinds of Intellectual Property Rights. **[5]**

OR

Q8) a) Explain the economic analysis of IPR highlighting its impact on innovation. **[6]**

b) Explain the effectiveness of the TRIPS agreement in harmonizing international standards for IPR. **[6]**

c) Write short note on Criticisms of Intellectual Property Rights. **[5]**



Total No. of Questions : 8] **SEAT No. :**

PE2718 **[Total No. of Pages : 2**

[6583]-268

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) ***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) When encountering a DH matrix for a robotic system, how do you approach interpreting its parameters and understanding their implications for the robot's kinematics? **[5]**

b) Derive the rotation formula using vector techniques. **[5]**

c) How would you explain the significance of the dot product and cross product in real-world applications? Give examples. **[8]**

OR

Q2) a) Draw and explain below controller architectures **[9]**

i) Joint position control (JPC)

ii) Resolved motion position control (RMPC)

iii) Resolved motion rate control (RMRC)

b) Show how to add two vectors represented in homogeneous coordinates with different scale factors. What is the scale factor of the result? **[9]**

Q3) a) What are the different types of Grippers? Explain Mechanical Grippers with specification. **[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 different types of Safety sensor used in Robotics? Explain any one of them with the help of neat sketch. **[9]**

b) Explain uses of sensors in robotics. **[9]**

P.T.O.

Q5) a) List and Explain different Computational Elements in Robotic Applications. **[8]**

b) Define the sequence of operations of a manipulator. **[9]**

OR

Q6) a) Write short note on Robot Programming Languages. **[9]**

i) Al

ii) AML

iii) RAIL

b) Explain standard techniques of demonstrating points to a robot. **[8]**

Q7) a) Explain how to use robot for defence & surveillance industry application. **[9]**

b) List and explain characteristics of future robot task. **[8]**

OR

Q8) a) Write a short note on robotics applications like arc welding, spot welding, spray painting, assembly operation. **[8]**

b) How do you perceive the relationship between robotics adoption and productivity growth? Are there potential impacts on capital formation, and how might these influence economic structures? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2719

[Total No. of Pages : 2

[6583]-269

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

Q1) a) Explain Fermat theorem with an example. **[9]**

b) In an RSA cryptosystem, a participant uses two prime numbers p = 13 and q = 5 to generate his public and private keys. If the private key, e is 7, then calculate the public key, d, cipher text, C for the plain text, M = 6.**[9]**

OR

Q2) a) Explain Chinese reminder theorem with an example. **[9]**

b) Two parties A and B wish to set up a common secret key between them using the Diffie Hellman key exchange technique. They agree on P = 23 as a Prime number and g = 9 as the primitive root. Party A chooses 4 and party B chooses 3 as their respective private keys. Calculate the secrete key. **[9]**

Q3) a) Explain PKI X.509 Certificate standard. **[8]**

b) Explain MD5 algorithm. Compare it with MD4. **[9]**

OR

Q4) a) Calculate the number of padding bits, if the length of the original message is 1050 bits in SHA algorithm. **[8]**

b) List out different web security issues. How to get out of it? **[9]**

P.T.O.

Q5) a) What is a honeypot? Explain types of honeypots. **[9]**

b) Explain ESP protocol of IPSec in detail. **[9]**

OR

Q6) a) Explain different Intrusion prevention systems. **[9]**

b) Explain DMZ networks. What is the use of such networks? **[9]**

Q7) a) Classify cyber-crimes in broad categories. **[9]**

b) What is Social Engineering? Explain types of Social Engineering. **[8]**

OR

Q8) a) Discuss the different challenges to Indian laws. **[9]**

b) Explain Spywares in detail. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE2720

[Total No. of Pages : 2

[6583]-270
T.E. (AI & ML)
BUSINESS INTELLIGENCE
(2019 Pattern) (Semester - V) (318545 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) ***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 Key Performance Indicators with an exmples. **[8]**

b) Explain Balanced Scorecards in detail with suitable example. **[9]**

OR

Q2) a) Discuss any BI tool in detail with suitable example. **[8]**

b) Explain Oracle BI in detail with an example. **[9]**

Q3) a) Explain the concept of Decision Support Systems Modeling with example. **[6]**

b) Explain Multi-criteria Decision Making With Pairwise Comparisons. **[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 short note on predictive analytics with and example. **[6]**

c) Explain certainty & uncertainty related to Decision Making in detail. **[6]**

Q5) a) Illustrate how various forms of BA are supported in practice with an example. **[8]**

b) Illustrate the use of Visual and Business Analytics (BA) in BI with an example. **[9]**

OR

P.T.O.

Q6) a) Illustrate various applications of Business Intelligence with an example. **[8]**

b) Illustrate role of BI in Logistics and Production with an example. **[9]**

Q7) a) Describe Analytics Applications for Consumers in detail. **[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 Rich Report 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. :

PE2721

[Total No. of Pages : 2

[6583]-271
T.E. (AI & ML)
PATTERN RECOGNITION
(2019 Pattern) (Semester - V) (318545 (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 Naive-Bayes Classifier with example. **[6]**

b) What is the difference between maximum likelihood and Bayes method. **[6]**

c) Prove that the bayes classifier is equivalent to the minimum distance classifier, assuming that the feature vector is Gaussian. **[6]**

OR

Q2) a) Explain Gaussian mixture models. **[6]**

b) Explain maximum likelihood parameter estimation. **[6]**

c) Explain the following terms: **[6]**

i) The Nearest Neighbor Rule.

ii) Bayesian Interference

Q3) a) Explain decision hyperplane. **[5]**

b) Explain any Linear discriminant-based algorithm. **[4]**

c) What are linear classifiers? Explain with example. **[8]**

OR

Q4) a) Explain the perceptron learning algorithm in detail. **[5]**

b) Explain the following terms: **[4]**

i) Sum of Error Estimate

ii) Mean Square Error Estimate

c) State and explain Stochastic Approximation of LMS Algorithm. **[8]**

P.T.O.

Q5) a) Define clustering and explain clustering algorithms. **[6]**

b) Explain in detail the Back propagation Algorithm. **[6]**

c) Draw the model of single artificial neuron. **[6]**

OR

Q6) a) Define the terms weight, bias, activations with respect to neural network. **[6]**

b) What is The XOR Problem? Explain in detail. **[6]**

c) Explain Three Layer Perceptron model. **[6]**

Q7) a) What are different types of Dimension reduction methods? Explain Principal Component Analysis (PCA) in detail. **[6]**

b) Explain Gaussian mixture models. **[5]**

c) Explain the following terms: **[6]**

i) Classifiers

ii) Fisher Linear discriminant analysis

OR

Q8) a) Explain Bayesian Decision Theory in detail. **[6]**

b) Explain following normal density function with formula **[6]**

i) Univariant normal density

ii) Multivariant normal density

c) Explain Hidden Markov Models (HMM). **[5]**



Total No. of Questions : 8]

SEAT No. :

PE3235

[Total No. of Pages : 2

[6583]-272
T.E. (Computer Science and Design)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester - VI) (318251)

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 How use of alpha and beta cut-offs will improve performance of minimax algorithm? **[9]**

b) Explain constraint satisfaction problem with suitable example. Describe backtracking search for CSPs. Explain CSP with an example graph coloring problem. **[8]**

OR

Q2) a) Describe the environment and constraints of games that are typically solved using Adversarial Search techniques. Provide a detailed, step-by-step example of how a two-player, zero-sum game is modeled and evaluated using this search paradigm. **[9]**

b) Define Monte Carlo Tree Search (MCTS)? Explain its working steps and advantages over mini-max in stochastic games with an example. **[8]**

Q3) a) List the inference rules used in prepositional logic? Explain them in detail with suitable example. **[9]**

b) State the difference between Propositional logic and First order logics with example. **[8]**

OR

Q4) a) Detail the algorithm for deciding entailment in propositional logic? **[9]**

b) Write 1st order predicate logic of **[8]**

i) Mary loves everyone

ii) No one talks

iii) Everyone who owns a dog loves some animal

iv) Not all students use PyTorch, but there is at least one who uses TensorFlow

P.T.O.

Q5) a) Explain Unification algorithm using suitable examples **[8]**

b) Explain FOL inference for following Quantifiers. **[4]**

i) Universal

ii) Existential

c) How does the backward chaining algorithm work? **[6]**

OR

Q6) a) What is Ontological Engineering, in details with its categories object and Model **[9]**

b) Consider the following statements: **[9]**

i) John is an athlete.

ii) All athletes are strong

iii) Anyone who is strong is healthy

Perform the following tasks:

1) Represent above statements in FOL

2) Convert each to CNF

3) Prove that someone is smiling using resolution technique.

Q7) a) Discuss AI and its ethical concerns. Explain limitations of AI. **[9]**

b) Explain Planning in a non-deterministic domain. **[5]**

c) Explain The Blocks World in detail. **[4]**

OR

Q8) a) Explain Classical Planning and its advantages with example. **[6]**

b) Explain AI components and AI architecture. **[6]**

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

i) Heuristics for Planning

ii) Hierarchical Planning



Total No. of Questions : 8]

SEAT No. :

PE3236

[Total No. of Pages : 2

[6583]-273

T.E. (Computer Science and Design)

WEB TECHNOLOGY AND APPLICATION DESIGN

(2019 Pattern) (Semester - VI) (318252)

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) ***Make suitable assumptions if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Write a Java Servlet Program which will display "Welcome Servlet" Message. **[5]**

b) What is difference between server side & client side scripting language? **[5]**

c) Write HTML form to read user name & password. This data is sent to the servlet. If the correct user name and password is given then welcome him/her by his/her name otherwise display the message for invalid user. **[8]**

OR

Q2) a) Enlist the steps for connectivity between servlet and database. **[5]**

b) What are the strengths of XML technology? Also enlist the limitations of XML. **[5]**

c) Write a AJAX script to obtain the student information stored in XML document the information should displayed on clicking the button. It should be displayed on tabular form. **[8]**

Q3) a) Write a advantages of JSP over servlet. Also explain the lifecycle of JSP. **[5]**

b) Explain the scripting elements in JSP. **[5]**

c) What is MVC? Draw and Explain MVC architecture for developing web applications. **[7]**

OR

Q4) a) Write a short note or SOAP. **[5]**

b) Draw and Explain neat diagram which depicts MVC to Struts architectures. **[5]**

c) Write a client server JSP Program to find the simple interest and display the result in the client. **[7]**

P.T.O.

Q5) a) Classify the data types of PHP and describe various data types. **[5]**

b) Explain how session and cookies are used for session management in PHP. **[8]**

c) What is associative arrays in PHP? Explain it with help of simple PHP code. **[5]**

OR

Q6) a) Identify and Explain step invoved in connecting to MySQL with PHP. **[8]**

b) How does ASP.NET works? Also enlist the features of ASP.NET. **[5]**

c) Explain the lifecycle of ASP.NET application. **[5]**

Q7) a) Explain the scalar types and their operation in RUBY. **[6]**

b) Write a program in Rails for displaying the current date & time. **[6]**

c) Write a RUBY program to add two numbers. **[5]**

OR

Q8) a) Write a RUBY program that sorts the array and searches the desired elements from array. **[8]**

b) Explain how to write a student's class in RUBY program. **[9]**



Total No. of Questions :8]

SEAT No. :

PE3237

[Total No. of Pages : 2

[6583]-274
T.E. (Computer Science & Design)
UI/UX DESIGN
(2019 Pattern) (Semester-VI) (318253)

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 the significance of expert reviews in interface design. **[6]**

b) Apply the principle of "feedback" by giving an example in an E-commerce App. **[6]**

c) Explain the effectiveness of different development methodologies (e.g,Agile, Waterfall) in supporting usability in interface design. **[6]**

OR

Q2) a) What is the difference between usability testing and expert review? **[6]**

b) Explain any 4 golden rules of interface design. **[6]**

c) List the principles of user interface (UI) design. What does the term Wireframe mean in UI/UX design? **[6]**

Q3) a) Explain the function of system menus. **[6]**

b) Explain the concept of direct manipulation in user interface design. **[6]**

c) Describe why consistency is important in interface design. **[5]**

OR

Q4) a) Explain the difference between hierarchical and flat menu structures. **[6]**

b) Why is phrasing important when designing menu options? **[6]**

c) Compare form fill-in and dialog boxes: When would you use each one ? **[5]**

P.T.O.

Q5) a) Explain the difference between a checkbox and a radio button. **[6]**

b) Create a short error message for a failed login attempt. **[6]**

c) Analyze how using natural language interfaces (like voice assistants) can make systems easier for new users. **[6]**

OR

Q6) a) Design a basic layout for a form with radio buttons, checkboxes, and a submit button for newsletter subscription preferences . **[6]**

b) Explain the purpose of progress indicators. **[6]**

c) Compare and contrast the operable controls of buttons, sliders tabs and scroll bars in user interfaces. **[6]**

Q7) a) Explain the concept of balancing function and fashion in user interface design. **[6]**

b) Develop a usability test plan for a new e- learning platform. **[6]**

c) Write any five differences between Heuristic Evaluation and Cognitive Walkthrough. **[5]**

OR

Q8) a) Explain the two models used to represent response time impacts on quality of service in user interfaces. **[6]**

b) Create a person and journey map for an online food delivery app. **[6]**

c) How would you measure user satisfaction using surveys? **[5]**

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Total No. of Questions :8]

SEAT No. :

PE5082

[Total No. of Pages : 2

[6583]-275

T.E. (Computer Science & Design)

MULTIMEDIA TECHNIQUES

(2019 Pattern) (Semester-VI) (318254A) 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.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the Ultra High Definition TV? **[6]**

b) Draw and explain a typical electronic signal for one scan line of NTSC composite video. **[6]**

c) How would you differentiate between conventional TV and HDTV **[5]**

OR

Q2) a) What are three different interfaces for analog video signal transmission? Explain anyone in detail. **[6]**

b) How would you identify the limitations of CRT? Draw and explain a typical electronic signal for one scan line of NTSC composite video **[6]**

c) Explain the advantages of digital representation for video. **[5]**

Q3) a) Using the information, you have learned about Dictionary-Based coding , construct LZW compression for string ABABBA BCABABBA. **[6]**

b) Explain any two types of wavelet transforms. **[6]**

c) How would you demonstrate coding tree for HELLO using Shannon Fano algorithm. **[5]**

OR

Q4) a) What is JPEG Standard? Draw and explain block diagram for JPEG encoder. **[6]**

b) Identify the Advantages and disadvantages of Arithmetic Coding as compared to Huffman Coding? **[6]**

c) What are three most used numerical distortion measures in image compression? Explain in detail. **[5]**

P.T.O.

Q5) a) Explain at least two future applications of Immersive Technologies **[6]**

b) Compose Applications, Challenges & Future Potential of AR display. **[6]**

c) Explain about AR, VR and MR **[6]**

OR

Q6) a) Enlist types of head-mounted displays? Explain Mobile VR with suitable Example. **[6]**

b) Explain functional requirements for augmented reality ecosystem. **[6]**

c) Enlist the input devices that are popularly used in immersive experience systems. Explain any input device in detail. **[6]**

Q7) a) What changes would you make in the medical field using Big Data and AI technology **[6]**

b) Draw and explain each layer from the architecture of the Internet of Things (IoT). **[6]**

c) Judge the importance of immersive experiences for designing academic applications which serve communication between educators, researchers and students. **[6]**

OR

Q8) a) Explain the use of Big Data and AI technology in medical field. **[6]**

b) Decide the major functions of AI-Based software? Explain how AI achieves incredible accuracy. **[6]**

c) What alternative services would you suggest using M-IoT for road safety system. **[6]**

● ● ●

Total No. of Questions :8]

SEAT No. :

PE3238

[Total No. of Pages : 2

[6583]-277

T.E. (Computer Science and design)

CLOUD COMPUTING

(2019 Pattern) (Semester-VI) (318254C) (Elective-II)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain the concept of Virtualization. Explain CPU Virtualization. **[6]**

b) Explain-Network and Storage Virtualization. **[6]**

c) Differentiate between-full Virtualization and para Virtualization. **[6]**

OR

Q2) a) Differentiate between- Virtualization in the Grid and Virtualization in the cloud. **[6]**

b) Explain -Virtual Infrastructure in detail **[6]**

c) What is the need of Virtualization? Explain -Virtual Clustering. **[6]**

Q3) a) Explain -Amazon web services and its Components. **[6]**

b) Explain -Microsoft Azure Core Concepts and its Components. **[6]**

c) Explain-OpenStack Architecture. **[6]**

OR

Q4) a) Explain with diagram Amazon simple DB. **[6]**

b) Explain with diagram Elastic Cloud Computing (EC2) **[6]**

c) Explain Amazon Database services (Dynamo DB) **[6]**

P.T.O.

Q5) a) Explain in detail -Content - Level Security in Cloud Computing? **[6]**

b) How to provide Security to Data in the Cloud? **[6]**

c) What is Risk Management in Cloud Computing? What are the different types of risks in cloud computing? **[5]**

OR

Q6) a) What are the Security Authentication Challenges in the Cloud? **[6]**

b) Explain -Secure Cloud Software Testing. **[6]**

c) What are the Secure Cloud Software Requirements? **[5]**

Q7) a) Explain the concept of Container and Docker in the cloud Computing. **[6]**

b) Explain in detail Comet Cloud. **[6]**

c) What are future trends in cloud computing ? Explain with examples. **[5]**

OR

Q8) a) Explain the concept of Jungle Computing. **[6]**

b) Explain in detail -Kubernetes. **[6]**

c) Explain in detail Mobile Cloud. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE5522

[Total No. of Pages : 2

[6583]-278

T.E. (Computer Science and Design)

BUSINESS INTELLIGENCE AND DATA ANALYTICS

(2019 Pattern) (Semester - VI) (318254 D) (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 short note on output forms : PDF, XLS, CSV. **[6]**

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

c) How to build dimensional data models? **[5]**

OR

Q2) a) Explain in detail any two types of reports. **[6]**

b) Explain the filtering of reports in detail. **[6]**

c) Explain in detail drill up and drill down operations. **[5]**

Q3) a) Explain Data exploration in detail with example. **[7]**

b) Explain Data transformation in detail with example. **[5]**

c) Write short note on Data Validation. **[5]**

OR

Q4) a) Explain data reduction in detail with example. **[7]**

b) Difference between Univariate, Bivariate, Multivariate analysis. **[5]**

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

P.T.O.

Q5) a) Explain Association rule and its types. **[5]**

b) Write a short note on Classification. **[5]**

c) Consider the following dataset and we will find frequent item sets and generate association rules for them using Apriori algorithm, Consider minimum support count is 2 & minimum confidence is 60%. **[8]**

TID	items
T1	I1 I2, I5
T2	I2, I4
T3	I2, I3
T4	I1, I2, I4
T5	I1, I3
T6	I2, I3
T7	I1, I3
T8	I1, I2, I3, I5
T9	I1, I2, I3

OR

Q6) a) Explain Bayes theorem in detail. **[5]**

b) Difference between Classification and Clustering. **[5]**

c) Explain Logistic regression in detail with example. **[8]**

Q7) a) Explain role of BI in ERP. **[6]**

b) Explain Roles of Analytical tools in BI. **[6]**

c) Explain BI application in CRM. **[6]**

OR

Q8) a) Explain applications of BI in telecommunication and banking. **[6]**

b) Explain BI application in Logistics and Production. **[6]**

c) Explain Role of BI in Finance and marketing. **[6]**

Total No. of Questions :8]

SEAT No. :

PE2722

[Total No. of Pages : 2

[6583]-279

T.E. (Computer Science and Design Engineering)
SOFTWARE ENGINEERING AND PROJECT MANAGEMENT
(2019 Pattern) (Semester-V) (318241)

Time : 2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Draw neat and clean diagram.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain the quality attributes considered in software design. **[6]**

b) Abstraction & refinement are complementary concepts. Justify. **[6]**

c) What are the characteristics of a well formed design class? **[6]**

OR

Q2) a) Explain the user interface design steps. **[6]**

b) Explain any 3 architecture styles. **[6]**

c) Describe the design model with a neat diagram and give the traceability of each layer of the design model to analysis model. **[6]**

Q3) a) Explain the term people and the product of management spectrum. **[6]**

b) What are the categories of stakeholders? What are the characteristics of effective project manager? **[6]**

c) Explain the FP based estimation technique. **[6]**

OR

Q4) a) Explain COCOMO model for project estimation. **[6]**

b) Explain the role of people, product and process in project management. **[6]**

c) What is LOC based estimation? Explain with an example. **[6]**

P.T.O.

Q5) a) What are the types of risks? Explain in brief. **[6]**

b) How risk projection is carried out in risk table? **[6]**

c) Compare forward engineering with reverse engineering. **[5]**

OR

Q6) a) What do you understand by Software Configuration Management (SCM)? Discuss the importance of SCM. **[6]**

b) Explain Business Process Reengineering Model. **[6]**

c) Explain SCM repository in detail. What are advantages of SCM repository? **[5]**

Q7) a) Explain following testing types.

i) Validation testing

ii) acceptance testing

iii) smoke testing process. **[6]**

b) Write a short note on test management and Automation. **[6]**

c) Explain the strategic approach to software testing. **[5]**

OR

Q8) a) What is GUI Testing? Explain in detail. **[6]**

b) What is importance of testing practices? What are principles of testing practices? **[6]**

c) Differentiate between alpha and beta testing. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PE2723

[Total No. of Pages : 3

[6583]-280

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) ***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) Write context free grammar for the following language **[9]**

i) $0(0 + 1)^* 01(0 + 1)^* 1$

ii) $(a + b)^* bbb (a + b)^*$

b) Write an equivalent left-linear grammar for the right-linear grammar. **[9]**

$S \rightarrow 0A|1B$

$A \rightarrow 0C|1A|0$

$B \rightarrow 1B|1A|1$

$C \rightarrow 0|0$

OR

Q2) a) Explain with suitable examples, any two applications of Context Free Grammar. **[6]**

b) Simplify the following Context Free Grammar (CFG). **[6]**

$S \rightarrow ASB|\in$

$A \rightarrow aAS|\in$

$B \rightarrow Sbs|A|bb$

G = {(S,A,B), (a,b), S,P : Productions are given above

c) Write a note on Chomsky hierarchy. **[6]**

P.T.O.

Q3) a) Consider the PDA with following rules **[9]**

$\delta(q_0, a, Z_0) = (q_0, aZ_0)$

$\delta(q_0, a, a) = (q_0, aa)$

$\delta(q_0, b, a) = (q_1, \varepsilon)$

$\delta(q_1, b, a) = (q_1, \varepsilon)$

$\delta(q_0, \varepsilon, Z_0) = (q_1, \varepsilon)$

Obtain the CFG equivalent to PDA.

b) Design a PDA for accepting a language L = $\{w \mid w \in (a + b)^*$ and $n_a(w) > n_b(w)\}$

Also simulate it for the input string 'aababab' **[9]**

OR

Q4) a) Define PDA. What are different types of PDA? Applications of PDA? **[9]**

b) Convert following CFG to PDA **[6]**

S -> aSb | A

A -> bSa | S | ε

c) Explain Closure property of PDA with suitable example. **[3]**

Q5) a) Construct a TM to compute L = $\{a^n b^{2n} \mid n > 0\}$ Write simulation for the string. **[9]**

i) abb

ii) aabbbb

b) Construct a Turing Machine to accept the language **[6]**

L = $\{a^n b^n a^n \mid n >= 1\}$

c) Differentiate between FA and TM. **[3]**

OR

Q6) a) Construct TM for – L = {All string with equal nos of a's and b's.) **[4]**

b) Write a short note on Halting Problem of Turing Machine. **[6]**

c) What is Turing Machine? Give the formal definition of TM. Design a TM that replaces every occurrences of abb by baa **[8]**

Q7) a) What do you mean by NP-Problems? Justify that Travelling Salesman problem is NP Problem. **[8]**

b) What do you mean by Polymonial Time Reduction? Explain with suitable example. **[8]**

OR

Q8) a) Differentiate between P-class problems and NP-class problems. **[6]**

b) What are Tractable and Intractable problems? Explain in detail. **[6]**

c) Define and explain Recursive and Recursively enumerable languages. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE2724

[Total No. of Pages : 2

[6583]-281

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 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 functional dependency? Explain partial dependency and transitive dependency. Suppose, a relational schema R (A, B, C, D, E) and set of functional dependencies: F { A -> BC, CD ->E, B ->D, E ->A } Compute CD^+, E^+(closure of attribute set CD, attribute E respectively). **[8]**

b) Explain three types of anomalies in the database with suitable example.**[9]**

OR

Q2) a) What is Normalization? Why it is required? Explain any two normal form with example. **[8]**

b) Given a relation R(A, B, C, D) and Functional Dependency set FD = { $AB \rightarrow CD, B \rightarrow C$ }, determine whether the given R is in 2NF? If not, convert it into 2 NF. **[9]**

Q3) a) What is a transaction? List and explain different states through which a transaction goes during its execution. **[9]**

b) Explain two phase locking protocol. How does it ensure serializability?**[9]**

OR

Q4) a) Write short note on conflict & view serializability. **[9]**

b) Explain properties of transaction. **[9]**

Write short note on Log based recovery.

P.T.O.

Q5) a) Compare homogeneous and heterogeneous distributed databases. **[8]**

b) What is structured, semi-structured and unstructured data? Explain CAP theorem and BASE property. **[9]**

OR

Q6) a) Discuss MongoDB aggregation framework with suitable examples. **[8]**

b) Explain different building blocks of Hadoop. **[9]**

Q7) a) What are the applications of Advanced databases in real time environment? **[9]**

b) Explain active and deductive databases. **[9]**

OR

Q8) a) What is XML? What is need of XML? Also explain XML database types. **[9]**

b) Explain nested data types : JSON and XML with suitable example. **[9]**



Total No. of Questions : 8] **SEAT No. :**

PE2725 **[Total No. of Pages : 2**

[6583]-282

T.E. (Computer Science & Design)

DESIGN AND ANALYSIS OF ALGORITHM

(2019 Pattern) (Semester - V) (318244)

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

Instructions to the candidates:

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

Q1) a) Find optimum solution using fractional greedy algorithm for following knapsack problem with capacity = 15, Items (I1, I2, I3, I4, I5, I6, I7) , profit P=(10,5,15,7,6,18,3) and weightw= (2,3,5,7,1,4,1). State whether the result is an optimum solution or not. Why doesn't Greedy algorithm work for 0/1 knapsack Problem? Explain with above example. **[10]**

b) Illustrate and explain greedy algorithm for problem job sequencing with deadline and discuss analysis of same. **[8]**

OR

Q2) a) Consider a knapsack instance n = 4, (w_1,w_2, w_3,w_4) = (1,2,4,5), (p_1, p_2, p_3,p_4) = (5,4,8,6) and M = 5. Find optimal solution using dynamic programming. Design a linear time algorithm for solving fractional Knapsack problem. Prove that the time complexity of presented algorithm is indeed linear. **[10]**

b) Discuss and write algorithm for Chain Matrix Multiplication problem using dynamic programming strategy? Also discuss time and space complexity of same. **[8]**

Q3) a) Let w = {3, 5, 6, 7} and m =15. Produce all possible subsets of w that sum to m. Draw the state space tree that is generated. **[8]**

b) Elaborate LC branch & bound and FIFO branch and bound for knapsack problem. Also discuss time and space Complexity. **[10]**

OR

P.T.O.

Q4) a) Give the problem statement of n-queens problem. Construct the solution for 8-queens problem using state space tree. **[8]**

b) State graph coloring problem with example. Explain solution using backtracking strategy and discuss analysis of same. **[10]**

Q5) a) Explain is amortized analysis? Discuss aggregate and accounting techniques with example. **[8]**

b) Discuss algorithms used for embedded System? Explain power optimized scheduling algorithm used in embedded system. **[9]**

OR

Q6) a) Elaborate following concepts with example. **[8]**

i) Randomized algorithm

ii) Tractable and Non tractable Problems

b) Explain in brief amortized analysis. Find the amortized cost with respect to stack operations. **[9]**

Q7) a) Discuss the race condition in multithreaded environment. How parallel loops are executed in multithreaded algorithms? Discuss with suitable example. **[8]**

b) How to find Minimum Spanning Tree using distributed algorithm? Explain GHS algorithm to find Minimum Spanning Tree. **[9]**

OR

Q8) a) Write an algorithm for multithreaded matrix multiplication and analyze the same. **[8]**

b) Write algorithm and explain the working of Rabin Karp string matching algorithm with suitable example compare its performance with Naïve string matching algorithm. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2726

[Total No. of Pages : 2

[6583]-283

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) ***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 IoT communication Models. **[6]**

b) Illustrate the different pillars of IoT. **[6]**

c) Write short note on sensor networks. **[6]**

OR

Q2) a) Illustrate any two Communication API with Suitable IoT System. **[6]**

b) List and explain the steps involved in IoT system design methodology with diagram. **[6]**

c) Explain the concept of M2M communication in the context of IoT. **[6]**

Q3) a) Explain the Modbus Protocol in detail with the help of a suitable example. **[6]**

b) Compare the advantages and disadvantages of RFID and SCADA protocols. **[6]**

c) What is the need of the MQTT (Secure) protocol? Demonstrate how the IoT applications can be secured using MQTT (Secure) protocol. **[6]**

OR

Q4) a) Classify between M2M and SCADA protocol with proper example. **[6]**

b) Explain development of smart irrigation system by applying appropriate IoT protocol. **[6]**

c) Classify the different IoT Protocols used at Network layer and explain any one of them in brief. **[6]**

P.T.O.

Q5) a) Explain: **[6]**

i) Auto Bahn for IoT

ii) Xively Cloud for IoT

b) Explain Django python web application framework. **[6]**

c) Illustrate the need for the SkyNet IoT Messaging Platform in IoT applications? show how the IoT devices can communicate with each other using this platform. **[5]**

OR

Q6) a) Explain in brief Model, Template and View in Django architecture. **[6]**

b) Draw and explain the publish-subscribe messaging using WAMP-AutoBahn. **[6]**

c) Explain the concept of GRPC with the help of its architecture. How does the GRPC differ from-REST and SOAP. **[5]**

Q7) a) What are the Challenges for Secure IoT? **[6]**

b) Explain in detail the security model for IoT. **[6]**

c) How Lightweight Cryptography can be used to provide security to IoT applications? Write its advantages. **[5]**

OR

Q8) a) Illustrate the challenges in designing IoT Applications. **[6]**

b) Examine how the threat model is useful in securing IoT applications. **[6]**

c) Predict the possible vulnerabilities in designing a smart home intrusion detection system. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE5083

[Total No. of Pages : 2

[6583]-287
T.E. (E & C) (ACT)
CELLULAR NETWORKS
(2019 Pattern) (Semester - V) (304301)

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

Instructions to the candidates:

1) ***Answer any one Question out of Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is Handoff? Why is it necessary in Mobile Cellular System? Explain hand off scenario at cell boundary. **[8]**

b) Write a brief note on Cell Geometry in mobile communication. **[5]**

c) What is Cell Sectoring? Explain with neat diagram. **[4]**

OR

Q2) a) Draw a neat diagram of GSM Architecture and explain the function of each block in it. **[9]**

b) Explain the following terms with diagram : **[8]**

i) Macro cell

ii) Micro cell

iii) Pico cell

iv) Femto cell

Q3) a) Write a brief note that includes a neat diagram of the wireless system's Tele Traffic System model. **[6]**

b) Explain the significance of link budget analysis for wireless systems. **[6]**

c) Explain the term Blocking Probability and its expression to calculate Blocking Probability. **[6]**

OR

P.T.O.

Q4) a) What is lost call system? Derive the first Erlang distribution for Lost call systems. **[9]**

b) A group of 5 trunks is offered 2 Erlang of traffic. Find Grade of service, probability that only one trunk is busy, probability that only one trunk is free, probability that at least one trunk is free. **[9]**

Q5) a) Describe with neat diagram wireless LAN. Compare Infrastructure and Adhoc based wireless LAN. **[9]**

b) Draw and explain Radio protocol Architecture for LTE-Advanced System. **[9]**

OR

Q6) a) With Block Diagram, Explain GSM Architecture. **[6]**

b) Compare 3G and 4G. **[6]**

c) With diagram explain component of 5G Network Architecture. **[6]**

Q7) a) Explain with neat diagram, the operation of Network Coding in Mobile Communication. **[6]**

b) Explain in brief following QoS parameters. **[5]**

i) Throughput

ii) Latency

iii) Packet Loss

iv) Availability

v) Reliability

c) What are four mechanisms to improve link robustness of wireless network. Explain any one in detail. **[6]**

OR

Q8) a) Explain the classification of scheduling algorithm & explain the types of scheduling. **[9]**

b) Explain following terms with reference to schedular Design. **[8]**

i) Classifier

ii) Channel Quality



Total No. of Questions : 8]

SEAT No. :

PE5084

[Total No. of Pages : 2

[6583]-288

T.E. (Electronics & Communication-Advanced Communication Technology)

RADIATION AND MICROWAVE TECHNIQUES

(2019 Pattern) (Semester - V) (304302)

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) ***Assume suitable data if necessary.***
4) ***Use of non-programmable scientific calculator is allowed.***

Q1) a) State the properties of S-matrix and derive S matrix for H plane Tee. **[6]**

b) Explain the operating principle of two hole directional coupler with its S-matrix. **[6]**

c) An isolator has an insertion loss of 0.5 dB and an isolation of 30 dB. Determine the scattering matrix of the isolator if the isolated ports are perfetly matched to the junction. **[6]**

OR

Q2) a) Explain how Magic Tee is used for impedance measurement. **[6]**

b) With neat schematic diagram explain the operation of Isolator. Also State S-matrix for it. **[6]**

c) Draw and explain two-hole directional coupler with neat diagram. **[6]**

Q3) a) Explain the construction of Single Cavity klystron Tube. **[6]**

b) Explain the Cavity Magnetron with Hull cut off condition in detail. **[6]**

c) What are the limitation of conventional tubes at microwave frequencies? **[6]**

OR

Q4) a) Explain the phase focusing effect in cavity magnetron. **[6]**

b) Explain construction, operation of Two Cavity Klystron. **[6]**

c) Distinguish between TWTA and Klystron Tube. **[6]**

Q5) a) Explain construction and working of PIN diode. State applications of pin diode. **[6]**

b) Write the comparison between PN junction diode and Schottky diode. **[6]**

c) Write a Short note on IMPATT diode. **[5]**

OR

P.T.O.

Q6) a) Explain Gunn Effect using two valley theory. **[6]**

b) Explain construction and working of shottky barrier diode. **[6]**

c) Explain the operation of Varactor diode. Discuss the constructional details, equivalent ciruit and figure of merit. Mention its applications. **[5]**

Q7) a) List Industrial and Medical applications of microwave communication. **[6]**

b) Differentiate between Satellite and Terrestrial Communication System. **[6]**

c) Write a note on : Medical Application such as Microwave Diathermy. **[5]**

OR

Q8) a) Calculate the SWR of a transmission system operating at 10 GHz. Assume TE10 wave transmission inside a waveguide of dimensions a = 4 cm, b = 2.5 cm. The distance measured between twice minimum power points = 1 mm on a slotted line. **[6]**

b) Using suitable block diagram explain the operating principle of RADAR. Enlist the applications of RADAR. **[6]**

c) Write short note on effect of Microwave radiation on human. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE5088

[Total No. of Pages : 2

[6583]-293

T.E. (Electronics & Communication - Advanced Communication Technology) (Electronics (VLSI Design & Technology)

COMPUTER NETWORKS

(2019 Pattern) (Semester - V) (304403/304403) (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) ***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 various performance parameters of network layer. **[8]**

b) Compare IPV4 and IPV6. **[8]**

OR

Q2) a) Explain Classful and Classless Addressing. **[8]**

b) Explain addressing classes in IP addressing in details. **[8]**

Q3) a) Explain RIP massage format with operation. **[9]**

b) Explain distance vector routing algorithm. **[9]**

OR

Q4) a) Differentiate between MAC and IP Address. **[9]**

b) Explain unicast routing and multicast routing protocol. **[9]**

P.T.O.

Q5) a) What is Multiplexing and DeMultiplexing? Explain in detail (in Transport Layer). **[9]**

b) Explain various transport layer quality of services parameters. **[9]**

OR

Q6) a) What is congestion control? Explain the leaky bucket algorithm with suitable diagram. **[9]**

b) Explain User Datagram Protocol in details. **[9]**

Q7) Write short notes : **[18]**

a) DHCP

b) BOOTP

c) SMTP

OR

Q8) a) List the functions of application layer. Explain the DNS in detail. **[9]**

b) Explain telnet and FTP. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE5085

[Total No. of Pages : 2

[6583]-296

T.E. (Electronics Engineering) (VLSI Design & Technology)

COMPUTER ARCHITECTURE

(2019 Pattern) (Semester - V) (304401)

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) Compare and contrast the Single-Cycle Data Path and the Multi-Cycle Data Path. **[6]**

b) Draw and explain a simple block diagram of a generic 4-bit Arithmetic Logic Unit (ALU). **[6]**

c) Define Register Transfer Language (RTL) and explain its significance in the micro-level description of computer architecture. **[5]**

OR

Q2) a) Briefly define the three main types of pipeline hazards. **[6]**

b) With the help of a neat block diagram, explain the design of a basic CPU. Describe the roles of the control unit, ALU, register set, and internal data buses. **[6]**

c) Differentiate between Hardwired Control and Microprogrammed Control. **[5]**

Q3) a) Explain the hierarchy of memory. Discuss the characteristics and importance of RAM, ROM. **[6]**

b) Compare direct mapping, fully associative mapping, and set- associative mapping with examples. **[6]**

c) Explain the working of virtual memory using paging. Describe page table structure,TLB, and address translation. **[6]**

OR

Q4) a) Compare segmentation and paging. **[6]**

b) Explain write-back and write-through policies in detail. Discuss their advantages, disadvantages, and impact on performance. **[6]**

c) Explain the difference between SRAM and DRAM. **[6]**

P.T.O.

Q5) a) Describe the architecture of an I/O interface in detail. **[6]**

b) Compare programmed I/O, interrupt-driven I/O, and DMA. **[6]**

c) Explain programmed I/O. Describe its working and limitations. **[5]**

OR

Q6) a) Explain the working of a DMA controller. Describe cycle stealing and burst mode of DMA operation. **[6]**

b) Explain the concept of interrupt priority. Differentiate between vectored and non-vectored interrupts. **[6]**

c) Classify I/O devices. Briefly explain any two devices with their working principles. **[5]**

Q7) a) Describe the basic stages of an instruction pipeline with a neat diagram. Explain how pipelining improves CPU performance. **[6]**

b) Explain Instruction-Level Parallelism (ILP). Discuss static and dynamic techniques. **[6]**

c) Explain VLIW architecture. Discuss its features, advantages. **[6]**

OR

Q8) a) Explain the basic architecture of a GPU. Compare CPU and GPU processing models. **[6]**

b) Describe the architecture of multi-core processors. **[6]**

c) Explain Flynn's classification of computer architectures. Compare SIMD and MIMD. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-5086

[Total No. of Pages : 2

[6583]-297

T.E. (Electronics Engineering) (VLSI Design & Technology)

Analog and Digital CMOS Design

(2019 Pattern) (Semester - V) (304402)

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 comparator? Explain its static and dynamic characteristics. **[8]**

b) Explain regenerative comparator with suitable diagram. **[9]**

OR

Q2) a) How auto zeroing technique is used for improving the performance of open loop comparator? **[8]**

b) Explain push pull output comparator. **[9]**

Q3) a) Draw and explain the IC fabrication process of CMOS technologies. **[9]**

b) Draw the stick diagram for AND & OR gate. **[9]**

OR

Q4) a) Explain CMOS design rules in details. **[9]**

b) Draw and explain the CMOS circuit for Full Adder. **[9]**

Q5) a) What are the common pitfalls and fallacies in CMOS circuit design? Explain with suitable example. **[9]**

b) Explain the equivalent RC circuit of RC delay model. **[8]**

OR

P.T.O.

Q6) a) Explain the delay in multistage logic circuit. **[9]**

b) Explain the design rules for Manufacturability (DFM) related to manufacturing of complex process of CMOS design. **[8]**

Q7) a) Discuss the various factors affecting dynamic power consumption in CMOS logic circuits. **[9]**

b) What is meant by logical effort with wires? Explain how wire parasitic influence on delay and power? **[9]**

OR

Q8) a) Discuss the impact of interconnects on delay power and signal integrity in CMOS VLSI design. **[9]**

b) What is energy delay optimization? Explain its importance in low-power CMOS design. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-12114

[Total No. of Pages : 2

[6583]-298
T.E. (Electronics Engineering)
VLSI DESIGN & TECHNOLOGY
Database Management
(2019 Pattern) (Semester - V) (304403) (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) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain following terms with examples. **[6]**

i) Procedure

ii) Function

b) Describe role of Primary key, Foreign key, Uruque key**.** **[6]**

c) Explain any two transaction control commands. **[5]**

OR

Q2) a) Explain with example, sub-queries and correlated subqueries. **[6]**

b) Explain use group by, having, order by, join and its types **[6]**

c) Explain any three SQL data types with example. **[5]**

Q3) a) What is the ACID properties of the transaction? Explain it. **[6]**

b) Explain the transaction states with state diagram. **[6]**

c) Explain advantages and disadvantages of concurrent execution of transactions. **[6]**

OR

Q4) a) What is need of concurrency control in database management? **[6]**

b) Explain how deadlock occurs? Which are the actions required for the deadlock recovery process? **[6]**

c) Explain with example, recoverable and non recoverable schedules. **[6]**

P.T.O.

Q5) a) Explain in detail an architecture of a parallel database. **[6]**

b) With schematic diagram, explain the architecture of Oracle Database. **[6]**

c) What is necessity of distributed database management system? What are advantages of distributed database. **[6]**

OR

Q6) a) Explain multiuser DBMS architecture. **[6]**

b) Explain the real life example of Real Life Example of Distributed transaction. **[6]**

c) What is distributed transaction? Explain failure modes of distributed transaction. **[6]**

Q7) a) Explain two phase commit protocol in distributed database. **[6]**

b) Explain the Characteristics of Homogeneous Databases. **[6]**

c) What are the differences between synchronous and asynchronous replication? **[5]**

OR

Q8) a) With suitable example, explain design of distributed database. **[5]**

b) What is distributed transaction? Explain failure modes of distributed transaction. **[6]**

c) Explain in short: Comment protocols and concurrency control in distributed database. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-5087

[Total No. of Pages : 2

[6583]-299

T.E. (Electronics Engineering) (VLSI Design & Technology)

DESIGN FOR TESTABILITY

(2019 Pattern) (Semester - V) (304403) (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) Define controllability and observability in sequential circuits. **[8]**

b) Examine how boundary scan differs from internal scan methods. **[9]**

OR

Q2) a) List common ad-hoc design rules for improving testability. **[8]**

b) Explain the role of boundary scan in board-level testing. **[9]**

Q3) a) Compare deterministic and pseudo-random test pattern generation methods. **[9]**

b) Explain how a Multiple Input Signature Register (MISR) is used in self-testing. **[9]**

OR

Q4) a) Define the function of a Built-In Logic Block Observer (BILBO). **[9]**

b) Analyze the advantages of Circular BIST compared to standard BIST methods. **[9]**

Q5) a) Demonstrate how BIST can be applied to test on-chip RAM. **[8]**

b) Apply the Galloping 0's and 1's algorithm to detect faults in a 4x4 memory array. **[9]**

OR

P.T.O.

Q6) a) Describe the difference between Galloping and March test algorithms. **[8]**

b) Develop a combined RAM test strategy to detect stuck-at, transition, and pattern-sensitive faults. **[9]**

Q7) a) What is meant by "Totally Self-Checking" (TSC) design? **[9]**

b) Compare the performance of m/n code-based checkers and parity-based checkers. **[9]**

OR

Q8) a) Judge whether equality checkers can achieve total self-checking property. Justify your answer. **[9]**

b) Evaluate the limitations of using Berger codes for sequential circuit error detection. **[9]**



Total No. of Questions : 8]

SEAT No. : ____

PE-5758

[Total No. of Pages : 3

[6583]-300
T.E. (Electronics Engineering)
VLSI DESIGN & TECHNOLOGY
Statistics and Numerical Techniques
(2019 Pattern) (Semester - V) (304403) (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) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain Mean, Median,variance and standard deviation with related to Probability Density Function. **[8]**

b) Compare Probability Density Function with Cumulative Density Function **[9]**

OR

Q2) a) Write short note on standard Probability distribution. **[8]**

Let X be a continuous random variable with PDF

f X (x) = {x +1200 ≤ x ≤ 1otherwise

Find E(Xn), where n∈N.

b) Let X be a continuous random variable with PDF **[9]**

f X (x) = {3 × 40 x ≥ 1otherwise

Find the mean and variance of X.

Q3) a) What is Newton Raphson Method? Write the steps of algorithm. List the application of this method. **[9]**

b) List and explain the principles of Least square method. Consider the set of points :(-1,0), (0,2), (1,4), and (k, 5). The values of slope and y-intercept in the equation of least squares are 1.7 and 1.9 respectively. Can you determine the value of k? **[9]**

OR

P.T.O.

Q4) a) Determine the minimum number of iterations of the Bisection Method necessary to approximate a root of $f(x) = x^3 + x - 4$ on [1,4] with $\in$ =10–4. Find the approximation with this accuracy. **[9]**

b) Explain false position method and state formula. Also correct the following up to three decimal places using the False Position Method. **[9]**

$f(x) = 2e^x \sin x - 3$

Q5) a) Following is the table of square roots. Calculate the values of by Newton's interpolation. **[9]**

X	150	152	154	156
Y = *X*	12.247	12.329	12.410	12.490

b) Fit a straight line to given data regarding x as the independent variable.**[8]**

x	l	2	3	4	5	6
y	1200	900	600	200	110	50

OR

Q6) a) Find the least square polynomial approximation of quadratic curve **[9]**

x	0	1	2	3	4
y	- 4	-1	4	11	20

b) The following data gives the values of y corresponding to certain values of x, Find the value of *x* when *y* = 167.59789 by applying Lagrange's method. **[8]**

x	1	2	5	7
y	1	12	117	317

Q7) a) State rectangular rule and find the Solution using Simpson's 1/3 rule.**[10]**

x	*f*(*x*)
0.0	1.0000
0.1	0.9975
0.12	0.9900
0.3	0.9776
0.4	0.8604

b) Differentiate between Simpson's 1/3 rule and Trapezoidal Rule. **[8]**

OR

Q8) a) Draw a flow chart for Simpson's 1/3rd rule to evaluate integration of any function. **[9]**

b) Explain Picards iterative method. Calculate y when $x = 0.3$ up to 3 iterations. **[9]**

♦ ♦ ♦

Total No. of Questions :8]

SEAT No. : ____

PE3239

[Total No. of Pages : 2

[6583]-302

T.E. (Computer Science and Engineering) (Data Science)
DATA WAREHOUSING AND MINING
(2019 Pattern) (Semester-V) (310641)

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

Instructions to the candidates:

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

Q1) a) Explain Data Warehouse implementation using the Architectural Components. **[6]**

b) Describe different Data Cube operations with examples. **[6]**

c) Explain the process of Data Cleaning and Data Integration with suitable examples. **[6]**

OR

Q2) a) Discuss the steps involved in Attribute-Oriented Induction (AOI). **[6]**

b) Explain Data Reduction techniques used in Data Warehousing. **[6]**

c) Illustrate OLAP operations using a Banking case study. **[6]**

Q3) a) Consider the following transactional database and find out Frequent Itemsets using Apriori algorithm with minimum support count = 2. **[6]**

TID	List_of _Items_IDS
T_1	I_1, I_2, I_5
T_2	I_2, I_4
T_3	I_2, I_3
T_4	I_1, I_2, I_4
T_5	I_1, I_3
T_6	I_2, I_3
T_7	I_1, I_3

b) Describe Frequent Pattern Tree (FP-Tree) and its construction. **[6]**

c) List and explain different pattern evaluation measures. **[5]**

OR

P.T.O.

Q4) a) Explain different types of Association Rules with an example. **[6]**

b) Differentiate between Support and Confidence metrics in Association Mining. **[6]**

c) Explain the terms Closed Frequent Itemset and Maximal Frequent Itemset. **[5]**

Q5) a) Define a classification problem and explain the process of building a classification model. **[6]**

b) Explain Decision Tree Induction with an example. **[6]**

c) Discuss the working principle of the Naïve Bayes classifier. **[6]**

OR

Q6) a) Compare K-Nearest Neighbour (KNN) and Bayesian Classification. **[6]**

b) Explain the structure and functioning of Neural Network-based classification. **[6]**

c) Discuss characteristics of Rule-based classifiers with examples. **[6]**

Q7) a) Explain the concept of Clustering and its applications. **[6]**

b) Describe Hierarchical Clustering with a suitable diagram. **[6]**

c) Explain K-means clustering with an example. **[5]**

OR

Q8) a) Discuss Density-Based Clustering (DBSCAN) and its advantages. **[6]**

b) Compare Supervised and Unsupervised learning in the context of clustering. **[6]**

c) Explain Link-Based Clustering with its applications. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE5976

[Total No. of Pages : 2

[6583]-304

T.E. (Computer Science and Engineering (Data Science))
INTERNET OF THINGS AND EMBEDDED SYSTEM
(2019 Pattern) (Semester - V) (310645 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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Demonstrate the use of different networking components and devices required for the IoT application design. Consider smart irrigation system as an example for it. **[6]**

b) Illustrate any communication API with suitable IoT system. **[6]**

c) Illustrate the different pillars of IoT. **[6]**

OR

Q2) a) Illustrate steps of IoT design methodology for weather forecasting system. **[6]**

b) Demonstrate the IoT communication Models. **[6]**

c) Demonstrate the use of RFID with the help of suitable IoT application. **[6]**

Q3) a) Demonstrate the need of standardization of IoT Protocols. **[6]**

b) Classify between M2M and WSN Protocol. **[6]**

c) Explain the 6LoWPAN Protocols with features. **[6]**

OR

Q4) a) Classify the different IoT Protocols used at Network layer and explain any one of them in brief. **[6]**

b) Explain the merits and demerits between RFID and SCADA protocol. **[6]**

c) Explain the usability of MQTT protocol for IoT applications. **[6]**

P.T.O.

Q5) a) Explain Cloud Storage Model for IoT. **[6]**

b) Demonstrate the Django framework with the suitable supporting application. **[6]**

c) Explain GRPC, SOAP. **[5]**

OR

Q6) a) Explain Communication API. **[6]**

b) Show how WAMP, its related concepts are useful in Cloud based IoT application Development. **[6]**

c) Explain SkyNet IoT Messaging Platform. **[5]**

Q7) a) Predict the possible vulnerabilities in designing smart home intrusion detection system. **[6]**

b) Design an introduction to IoT security, highlighting the unique challenges and vulnerabilities associated with IoT deployment. **[6]**

c) Illustrate the challenges in securing IoT applications. **[5]**

OR

Q8) a) Predict the possible challenges in designing secure IoT applications. **[6]**

b) Use security concepts to identify different misuse cases of the following IoT Smart Home Automation applications. **[6]**

c) Illustrate the classic pillars of information assurance while securing the IoT application. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-3240

[Total No. of Pages : 2

[6583]-305

T.E. (Computer Science and Engineering)(Data Science)

SOFTWARE MODELLING AND DESIGN

(2019 Pattern) (Semester - V) (310645 C)

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 concept of Dynamic Modelling in system design. **[6]**

b) Explain State Transition Diagrams with examples. **[6]**

c) How does Dynamic Modelling help in Object-Oriented Design? Justify with an example. **[6]**

OR

Q2) a) Differentiate between Sequence Diagrams and Collaboration Diagrams. **[6]**

b) Describe various approaches to Dynamic Modelling. **[6]**

c) Critically analyze the limitations of Dynamic Modelling.. **[6]**

Q3) a) Describe different types of architectural styles with examples. **[6]**

b) Explain how architectural decisions impact software quality attributes. **[6]**

c) Explain the concept of Modifiability and Maintainability in software architecture. **[5]**

OR

Q4) a) What is Architectural Design? Explain its importance in Software Development. **[6]**

b) Compare different Quality Attributes such as Performance, Security, and Usability. **[6]**

c) What is the significance of Availability and Scalability in Software Architecture? **[5]**

P.T.O.

Q5) a) Explain the role of architecture in Agile projects and how it adapts to iterative development. **[6]**

b) Describe the process of designing an architecture and key considerations involved. **[6]**

c) Compare and contrast different notations used for documenting software architecture. **[6]**

OR

Q6) a) Explain the concept of architectural views and their role in documentation. **[6]**

b) What is a documentation package? Explain its importance in software projects. **[6]**

c) Illustrate the impact of incomplete or improper documentation on software development. **[6]**

Q7) a) Draw the structure of observer pattern with suitable class diagram including subject and observer. **[6]**

b) What are the different creational pattern? Explain any three creational patterns in short. **[6]**

c) What are the benefits of Design Patterns? Explain Factory and abstract factory patterns in detail with applications. **[5]**

OR

Q8) a) What are the different structural pattern? Explain any three structural patterns in short. **[6]**

b) What is observer Behavioral pattern? Explain observer Behavioral in detail with the applicability of singleton creational pattern. **[6]**

c) Explain the broker pattern for design of service-oriented architecture. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE5089

[Total No. of Pages : 2

[6583]-306
T.E. (Computer Science)
TCP/IP NETWORKING
(2019 Pattern) (Semester - V) (310544)

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) ***Make suitable assumptions if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) What is the purpose of an IP address? List the different classes of IPv4 addresses with suitable example? **[6]**

b) Explain the difference between Virtual Networks and Datagram Networks with suitable examples. **[6]**

c) Draw and explain the header format of IPv6? **[6]**

OR

Q2) a) Describe how NAT (Network Address Translation) works in connecting private networks to the Internet. **[6]**

b) Explain working of ARP Network layer Protocols in details? **[6]**

c) Describe distance vector routing algorithms in details with suitable example. **[6]**

Q3) a) Describe how CSMA/CD works in Ethernet networks. **[6]**

b) Explain the difference between error detection and error correction techniques with examples. **[6]**

c) Justify answer using CRC for divisor : 1101 divided : 100100 **[6]**

OR

P.T.O.

Q4) a) What is the main function of the Link Layer in computer networks? **[6]**

b) Compare Pure ALOHA and Slotted ALOHA in terms of efficiency and transmission method. **[6]**

c) Write short note on : Hamming Code. **[6]**

Q5) a) Compare Bluetooth and Zigbee technologies. Discuss their architecture, frequency bands, range, and applications. **[9]**

b) Describe the structure and fields of the IEEE 802.11 frame. Explain how each field contributes to data transmission ad reliability. **[8]**

OR

Q6) a) What is Mobile IP? Explain the need for Mobile IP. **[9]**

b) Explain the architecture of cellular networks in detail. Discuss how 3G and LTE (4G) networks provide Internet access to mobile subscribers.**[8]**

Q7) a) Explain the Principles of Cryptography? Define in detail public Key Cryptography. **[9]**

b) Describe how digital Signatures provide message integrity nad authenticaition. **[8]**

OR

Q8) a) Define in a detail Cryptographic Hash Function. **[9]**

b) What is the purpose of a Firewall in network security? **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-2728

[Total No. of Pages : 2

[6583]-308

T.E. (Civil Engineering)

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) ***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 sutiable data if required.***
5) ***Use of non programmable scientific calculator is allowed.***

Q1) a) Write a note on features and benefits of Green Residential Cluster. **[6]**

b) Which are the different activities to be taken up for restroration and rejuvenation of water bodies? What are the benefits of this development? **[6]**

c) Explain in brief any five features of Smart City. **[5]**

OR

Q2) a) Explain the concept Eco City with its features and benefits. **[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) Write a note on

i) Surface drainage system and

ii) Subsurface drainage system, in landscape planning. **[6]**

c) Write a note on different environmental factors considered in landscape planning. **[5]**

OR

P.T.O.

Q4) a) Explain in detail economic, social and ecological importance of landscaping? **[6]**

b) Write a note on Landscape Suitability Analysis. **[5]**

c) Explain different types of landscaping in detail. **[6]**

Q5) a) Explain in detail any three factors affecting on landscape design. **[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) Write a note on "Impact of landscaping on environment". **[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) Write a note on following: **[6]**

i) Landscape treatment for highly industrialized areas

ii) Landscape treatment for water logged areas

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 "Landscape treatment for desert areas". **[6]**

c) Write a note on "Landscape treatment for coastal highways". **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2729

[Total No. of Pages : 2

[6583]-309
T.E. (Mechanical)
302013MJ : HONORS IN DESIGN FOR ADDITIVE MANUFACTURING
(2019 Pattern) (Semester - VI)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Ql 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) Enlist various AM technologies? Explain how to select AM technologies using decision methods. **[9]**

b) What is form fit function? Why they are important? Explain with the help of suitable example. **[9]**

OR

Q2) a) Explain distortion control methods in AM? Write a short note on Composition and Phase transformation in process monitoring and control of Additive Manufacturing. **[8]**

b) Explain any two defects and its rectification in 3d printing. **[6]**

c) Write a short note on residual stresses in additive manufacturing. **[4]**

Q3) a) Write Classification and Types of 2D and 3D path Planning. Explain Path sequencing strategy. **[9]**

b) What are different types of post processing methods for additive manufacturing? explain support removal techniques with its advantages and disadvantages. **[8]**

OR

P.T.O.

Q4) a) What do you mean by slicing? Explain components of slicing software. **[7]**

b) Explain the importance of heat treatment in AM. **[6]**

c) Write a short note on Support Material. **[4]**

Q5) a) What is the role of Infill in 3D printing? Explain different Infill patterns. **[9]**

b) Explain CAD file and format for engineering and non-engineering applications in AM. **[9]**

OR

Q6) a) Explain ISO and ASTM standards for Additive Manufacturing. **[8]**

b) What is topology optimization? Explain the benefits of topology optimization in additive manufacturing. **[6]**

c) How to Repair an STL File or scanned data file? **[4]**

Q7) a) Classify and Explain the types of measuring devices used in reverse engineering. **[9]**

b) Explain 3D Scanning and Reverse Engineering for 3D Printing Applications with their file format. **[8]**

OR

Q8) a) Write a short note on Scanned Geometry Refinement. How repairing is done of scanned geometry? **[8]**

b) Explain data handling and reduction process in AM. **[5]**

c) Explain Point Cloud data. **[4]**

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Total No. of Questions : 8]

SEAT No. :

PE-2731

[Total No. of Pages : 2

[6583]-311

T.E. (Mechanical/Electrical)

(302033MJ) HONORS IN E-VEHICLE SYSTEM DESIGN

(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 side indicate full marks.***
4) ***Use of non-programmable electronic calculator is permitted.***
5) ***Assume Suitable / Standard data if necessary.***

Q1) a) Explain traction control system in EV. **[8]**

b) Classify braking system used in automotive. **[9]**

OR

Q2) a) Explain elements of vehicle dynamics system. **[8]**

b) Explain with neat diagram regenerative breaking system (ABS). **[9]**

Q3) a) Explain Powertrain in e-vehicle. **[8]**

b) Explain Two wheel drive layout design. **[9]**

OR

Q4) a) Explain Transmission system in HEV. **[8]**

b) What is Torsen and active differential system. **[9]**

Q5) a) Explain battery compartment and its need in E-vehicle. **[9]**

b) Write short note on: **[9]**

i) Battery life analysis

ii) Pack cooling system

OR

P.T.O.

Q6) a) Explain battery performance degradation modelling. **[9]**

b) Explain with neat diagram Air and Liquid cooling used for battery compartment. **[9]**

Q7) a) Explain crash analysis of EV **[9]**

b) Explain the importance and process involved in Crash/Impact analysis. **[9]**

OR

Q8) a) What do you mean by Vehicle dynamics? Explain components of vehicle dynamics with neat sketches. **[9]**

b) Explain Vehicle dynamics and its components. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-5782

[Total No. of Pages : 2

[6583]-312
T.Y. B.E. (Mechanical Engineering)
HONORS IN SYSTEMS ENGINEERING
Model Based Systems Engineering
(2019 Pattern) (Semester - VI) (302043MJ)

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.7or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data wherever necessary.***
4) ***Draw neat diagrams wherever required.***

Q1) a) Explain the purpose of the structural aspect and the behavioural aspect in SysML. How do they support consistent system modelling? **[9]**

b) Describe Block Definition diagrams (BDD) and Internal Block Diagrams (IBD) and explain how they support system architecture visualisation. **[9]**

OR

Q2) a) Discuss the importance of model abstraction in SysML and explain how various diagram types enable multi-level representation of a complex engineering system. **[9]**

b) Elaborate the concept of allocation of SysML. Provide an example showing allocation between logical behaviour and physical structure.**[9]**

Q3) a) Explain the role of methodology in ensuring model completeness and consistency during MBSE implementation. **[9]**

b) Discuss the criteria for selecting an appropriate MBSE modelling tool for a large-scale system. Provide suitable examples. **[9]**

OR

Q4) a) Describe the phases of Object-Oriented Systems Engineering Method (OOSEM) with a suitable real-word example. **[9]**

b) Explain how modelling languages and modelling tools together improve system verification and validation in MBSE. **[9]**

P.T.O.

Q5) a) Compare the waterfall model and the iterative model in the context of systems engineering. Which model better aligns with MBSE and why? **[9]**

b) Explain the role of feedback loops in process modelling and how they contribute to improved system quality. **[8]**

OR

Q6) a) Discuss the importance of lifecycle process modelling in MBSE. Illustrate how lifecycle activities are represented in a process model.**[9]**

b) Explain how MBSE facilitates process integration across requirement analysis, design and verification phases. **[8]**

Q7) a) Explain the characteristics of well-formed system requirements and describe how MBSE tools help enforce these characteristics. **[9]**

b) Describe the concept of requirements traceability matrices (RTM) and explain how they ensure completeness of requirements. **[8]**

OR

Q8) a) Discuss the challenges in requirement elicitation for complex systems and explain how MBSE addresses these challenges. **[9]**

b) Differentiate between functional and non-functional requirements with suitable examples. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-2732

[Total No. of Pages : 2

[6583]-313

T.E. (Electronics & Telecommunication)

HONORS IN DECENTRALIZE & BLOCKCHAIN TECHNOLOGIES

(2019 Pattern) (Semester - VI) (304183 HBCT)

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

Instructions to the candidates:

1) ***Answer Q1 orQ2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate 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 future scope of blockchain in detail? **[8]**

b) Where is blockchain used in real life? Explain the use of blockchain in IoT. **[9]**

OR

Q8) 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]**

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Total No. of Questions : 8]

SEAT No. : ____

PE2733

[Total No. of Pages : 2

[6583]-314

T.E. (E & TC Engineering) (Honors)

ROBOT PROGRAMMING & SIMULATION

(2019 Pattern) (Semester - VI) (304183 HR)

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.***

Q1) a) What is VAL Language in Robotics? **[6]**

b) Explain palletizing applications using VAL. **[6]**

c) Explain VAL Program for PICK and PLACE robotic applications. **[6]**

OR

Q2) a) Explain Robot welding application using VAL program. **[6]**

b) What are the motion commands used in robotics? **[6]**

c) Explain Robot welding application using VAL program-WAIT, SIGNAL and DELAY command for communications using simple applications. **[6]**

Q3) a) What is rapid language for Robotics? What are advantages of Robotics RAPID language? **[6]**

b) What are instructions in automatic mode and subroutine command based programming for PICK and PLACE robotics? **[6]**

c) What is Motion, Sensor commands-Data processing? **[5]**

OR

Q4) a) What are Motion Instructions-Pick and place operation using Industrial robot-manual mode? **[6]**

b) What is the Difference Between Robotics and Automation. **[6]**

c) What are elements and functions, Statements, constants and variables in AML? **[5]**

P.T.O.

Q5) a) What is soft robotics? **[6]**

b) How AR and VR used in Robotics? **[6]**

c) Explain Robot studio online software. **[5]**

OR

Q6) a) Explain concept of RPA. **[5]**

b) What the terms resolution, accuracy and repeatability are as applied to robotics? **[6]**

c) What is jogging in a robot? What are the 5 main components of robots? **[6]**

Q7) a) Explain Monte Carlo Localization for Mobile Robot. **[9]**

b) What are the 4 types of models in simulation in robotics? Why is the Cobweb theory important? **[9]**

OR

Q8) a) What is the continuous cobweb model? **[9]**

b) Explain software used for design robotics application. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2734

[Total No. of Pages : 2

[6583]-315
T.E. (Printing) (Honors)
SMART PACKAGING
(2019 Pattern) (Semester - VI) (308213)

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) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) What is smart packaging? Describe in details active packaging. **[10]**

b) What is interactive packaging? **[7]**

OR

Q2) a) What are advantages of smart packaging? **[6]**

b) Describe in details with examples the use of various sensors and indicators in packaging. **[11]**

Q3) a) Name five RFID applications in daily life and describe the principle and functioning of anyone. **[12]**

b) Describe in brief the different types of RFID antennae. **[6]**

OR

Q4) a) Briefly explain any three NFC Applications. **[6]**

b) State the different types of RFID printers and enumerate the main differences between them. **[12]**

P.T.O.

Q5) a) What do you understand by NFC? How do NFC systems vary from RFID systems? **[12]**

b) Explain in terms of functionality and applications of NFC. **[5]**

OR

Q6) a) How is data transmission done in NFC. **[10]**

b) What are the advantages of NFC as compared to RFID systems? **[7]**

Q7) a) Give examples use of intelligent packaging in Food packaging. **[12]**

b) Describe any implementation stage of smart packaging in a food packaging industry. **[6]**

OR

Q8) a) Give examples use of intelligent packaging in pharma packaging. **[6]**

b) Describe any implementation stage of smart packaging in a pharma packaging industry. **[12]**

Total No. of Questions : 8]

SEAT No. : ____

PE2735

[Total No. of Pages : 2

[6583]-316

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) ***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) Define Propositional logic. Explain types of propositional logic in detail. **[9]**

b) Explain the concept of resolution in first order resolution with its applications. **[8]**

OR

Q2) a) Explain Basian networks in detail with example. **[9]**

b) Describe the following terms in detail: **[8]**

i) Hidden Markov model

ii) Kalman filter

Q3) a) Explain linear regression. Find linear regression equation for the following two sets of data: **[8]**

X	Y
2	3
4	7
6	5
8	10

b) Explain why to use decision trees in AI? Explain Decision tree algorithm. Explain Advantages and disadvantages of decision tree. **[9]**

OR

P.T.O.

Q4) a) Explain various types of: **[8]**

i) Regression

ii) Classification

b) Write a Short note on: **[9]**

i) Support Vector Machine

ii) Ensemble learning

iii) Reinforcement Learning.

Q5) a) Explain adversarial game in AI. Explain zero sum game in detail. **[9]**

b) Explain four types of games in detail. **[9]**

OR

Q6) a) Explain min max algorithm with alpha beta pruning. **[9]**

b) Explain in brief: **[9]**

i) Stochastic games

ii) Partially observable games.

Q7) a) Explain the concept of forward chaining and backward chaining with example. **[9]**

b) Explain expert system. Explain components of expert system. **[9]**

OR

Q8) a) Explain general framework for text processing using Natural Language Processing. **[9]**

b) Explain computer vision as an expert system application with example of CV framework. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2736

[Total No. of Pages : 2

[6583]-317

T.E. (Cyber Security) (Honors)

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 side indicates full mark***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Describe how a component relationship diagram aids in system design. **[5]**

b) Define a component model in software engineering. **[6]**

c) How would you use a component description to document a software component? Provide an example. **[6]**

OR

Q2) a) Describe how component relationship diagrams help in understanding system architecture. Provide an example to support your explanation. **[9]**

b) Design a component interaction diagram for a real-time messaging application, and explain your design choices. **[8]**

Q3) a) Define 'operational model' in the context of software engineering. **[6]**

b) Describe the role of service qualities in shaping operational model design decisions. **[6]**

c) List three service qualities relevant to operational models. **[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) Discuss the advantages and disadvantages of various operational model design techniques in different project contexts. Use specific scenarios to illustrate your points. **[9]**

P.T.O.

Q5) a) Identify and discuss service qualities crucial for effective metadata management. Explain how these qualities contribute to the success of metadata management initiatives. **[6]**

b) Define "metadata" and "master data' in the context of data management. Explain the importance of clear terminology in data-related projects. **[6]**

c) 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. **[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) 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]**

OR

Q8) a) 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]**

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. :

PE2737

[Total No. of Pages : 2

[6583]-318

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, if necessary.***

Q1) a) Explain **[9]**

i) Eigen Value

ii) Eigen Vector

Find Eigen Values of a 2 by 2 matrix $A = \begin{bmatrix} 2 & -1 \\ -4 & 5 \end{bmatrix}$.

b) Write formulae for Jacobian matrix and Hessian Matrix. Find the Jacobian matrix at the point (1,2) of the following function: $f(x, y) = (x^4 + 3y^2x, 5y^2 - 2xy + 1)$. **[9]**

OR

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

i) Chain Rule and its Significance

ii) Partial Derivatives

b) What is linear equation? What are the different methods to solve system of linear equation? Explain with suitable example. **[9]**

Q3) a) Explain different ways in which Netflix uses Machine Learning Algorithms. **[9]**

b) Explain in detail Supervised and Unsupervised learning in Machine Learning. **[8]**

OR

P.T.O.

Q4) a) What is Machine Learning, with the help of an example and diagram explain Reinforcement Learning. **[9]**

b) List and explain various **[8]**

i) Applications of Machine Learning

ii) Issues in machine learning

Q5) a) What is Regression. Explain different types of Regressions in detail. **[9]**

b) Explain gradient descent algorithm. Elaborate, how it can be used to get minimum cost function. **[9]**

OR

Q6) a) Write short note on **[9]**

i) Model training

ii) Model Evaluation

iii) Confusion Matrix

b) Explain Data Normalization and its necessity. Explain in detail any one data normalization technique. **[9]**

Q7) a) What are the Advantages, Disadvantages and Applications of Naïve Bayes Model. **[9]**

b) What is a decision tree and how to construct it? Explain the various decision tree terminologies. **[8]**

OR

Q8) a) Explain with example hypothesis space search in decision tree learning? **[9]**

b) For the given data set where R stands for Rainy, O stands for Overcast and S stands for Sunny using Naïve bayes algorithm check if the player would play or not if the weather is sunny. **[8]**

Dataset														
Weather	R	S	O	O	S	R	S	O	R	S	S	R	O	O
Play	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes

Total No. of Questions : 8]

SEAT No. :

PE2738

[Total No. of Pages : 2

[6583]-319

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 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.***
4) ***Use of Non-Programmable scientific Calculators is allowed***

Q1) a) Explain the difference between TCP and UDP Protocols? **[6]**

b) Explain HTTP and CoAP in detail. **[6]**

c) What are the responsibilities of transport layer in IoT? **[5]**

OR

Q2) a) Explain DCCP and SCTP protocol in detail. **[6]**

b) Explain MQTT protocol architecture. **[6]**

c) Explain transport layer security protocol? **[5]**

Q3) a) Explain IoT vulnerabilities and security challenges. **[6]**

b) What are the misuse cases in IoT security? Explain. **[6]**

c) Explain IoT Architecture with its layers? **[6]**

OR

Q4) a) Describe IoT security model. **[6]**

b) Explain key elements in IoT security. **[6]**

c) Explain the attacks in different layer of IoT. **[6]**

P.T.O.

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 the role of IoT for Home Automation. **[6]**

b) Describe the role of IoT for Agriculture applications. **[6]**

c) Describe the role of IoT for Health and Lifestyle. **[6]**

OR

Q8) a) Describe the role of IoT for Smart Cities development. **[6]**

b) Describe the role of IoT for Industry. **[6]**

c) Describe the role of IoT for Telecom/5G. **[6]**

Total No. of Questions : 8]

SEAT No. :

PE2739

[Total No. of Pages : 2

[6583]-320

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 indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What are the major software components of Augmented reality systems? **[9]**

b) Explain simultaneous localization and mapping in details. **[8]**

OR

Q2) a) Describe the various software components used in AR. **[9]**

b) Explain natural feature tracking by detection in AR. **[8]**

Q3) a) What are different types of Markers in AR? Explain the Template markers. **[6]**

b) Explain the term mathematical representation of matrix multiplication. **[6]**

c) Write a short note on Location based augmentation and visual tracking. **[6]**

OR

Q4) a) When to use marker based tracking? Explain. **[6]**

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

i) 2D barcode markers

ii) Hybrid tracking.

c) Explain the term feature based tracking. **[6]**

P.T.O.

Q5) a) What are different projection displays? **[8]**

b) Write a short note on **[9]**

i) Scene generation

ii) Optical see - through HMD

iii) Virtual Retina System

OR

Q6) a) Describe the various AR components in detail. **[8]**

b) Enlist the AR devices and explain Video See through systems. **[9]**

Q7) a) Explain the term computer vision and mixed reality. **[10]**

b) Write a short note on Dense tracking and mapping(DTAM). **[8]**

OR

Q8) a) Describe the term semi-direct monocular visual odometry(SVO). **[10]**

b) Explain the term PTAM in detail. **[8]**

Total No. of Questions : 10]

SEAT No. : ____

PE-2740

[Total No. of Pages : 2

[6583]-321
T.E. (Civil) (Honors)
Surveying in Metro Construction
(2019 Pattern) (Semester - V) (301301)

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

Instructions to the candidates :

1) ***Attempt Q.1 orQ. 2, Q.3orQ.4, Q.5orQ.6,Q.7orQ.8& Q.9orQ.10***
2) ***Neat diagram must be draw,? 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 in brief on Importance of Good Alignment for Metro. **[7]**

b) Explain Modern surveying techniques for difficult terrain for Metro. **[7]**

OR

Q2) a) Explain Traffic survey for Metro project. **[7]**

b) Explain on need for construction of a new Metro line. **[7]**

Q3) a) Explain the types of track moduli. **[7]**

b) Explain the various stresses generated in Metrorail track? **[7]**

OR

Q4) a) Explain in brief track Structure should fulfil which conditions & requirements? **[7]**

b) The technical standards for Track structure deals with which components? Explain any two in detail. **[7]**

P.T.O.

Q5) a) Explain the criteria for selection of site for a metro railway station. **[7]**

b) Explain functions of Main Building Areas for different Types of Metro Stations? **[7]**

OR

Q6) a) Explain kind of facilities should provide at metro station? **[7]**

b) Explain construction types of Metro station? **[7]**

Q7) a) Explain on Tunnel alignment and grade **[7]**

b) Explain various methods for 'Tunnel ventilation' **[7]**

OR

Q8) a) Enlist the various factors controlling the alignment of metro track. Explain any two in detail. **[7]**

b) Explain on 'Safety Precautions in tunneling'. **[7]**

Q9) a) Explain in brief Reconnaissance survey for metro construction. **[7]**

b) Explain Final Location Survey for Metro project. **[7]**

OR

Q10)a) Difference between Track Modulus andTrack stiffness. **[7]**

b) Explain Vertical track stiffness and its measurement techniques. **[7]**

Total No. of Questions : 8]

SEAT No. :

PE-2741

[Total No. of Pages : 2

[6583]-322

T.E. (Civil Engineering)

URBAN HOUSING AND INFRASTRUCTURE PLANNING

(Honora In "Architecture and Town 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 sutiable data, if required.***

Q1) a) Describe the housing demand model. **[6]**

b) Explain in detail objectives and function of housing board HUDCO. **[6]**

c) What is the need of Housing Policies to fulfill demand of housing. **[5]**

OR

Q2) a) Elaborate the role of Cooperative Housing sectors. **[6]**

b) Explain the strategy of Rural Housing Finance. **[6]**

c) What are the advantages of Housing Finance Institutions (HFIs)? Write down the name of any four HFIs in India. **[5]**

Q3) a) Enlist types of urban infrastructure and explain any one in detail. **[6]**

b) Write a note on "Financial aspect for water supply system". **[6]**

c) Which factors affect while planning of urban infrastructure. **[5]**

OR

Q4) a) How urban infrastructure change overall scenario of land as well as community. **[6]**

b) What are the norms and financial strategy follow while planning of infrastructure activity. **[6]**

c) Write a short note on area allocation for any two infrastructure activity as per URDPFI. **[5]**

P.T.O.

Q5) a) Explain the different components of storm water drainage system. **[6]**

b) How to design water and drainage network to urban area. **[6]**

c) What is the significance of urban services. **[6]**

OR

Q6) a) Explain in detail Municipal Solid Waste Management Plan. **[6]**

b) Which are the techniques used to generate cost recovery from infrastructure. **[6]**

c) Which are the components and appropriate technology required for planning of road network activity. **[6]**

Q7) a) Which factors to be considered while planning of city network scenario. **[6]**

b) Write a note on "National Urban Sanitation Policy-2008". **[6]**

c) Explain in detail policies and norms of any one infrastructural network. **[6]**

OR

Q8) a) Write a note on "National Water Policy-2012". **[6]**

b) How infrastructure city network scenario affect on land use pattern of city. **[6]**

c) Enlist different categories of green space and its norms as per URDFI guidelines. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE-2742

[Total No. of Pages : 2

[6583]-323
T.E. (Mechanical) (Honors)
302011MJ : Additive Manufacturing Technology
3D Printing
(2019 Pattern) (Semester - V)

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.7or Q.8.***
2) ***Draw suitable neat diagrams, whenever necessary.***
3) ***Figure to the right indicate full marks.***
4) ***Assume suitable data f required.***

Q1) a) Explain with neat sketch construction & working, Advantages & limitations of Digital Light Processing (DLP) additive manufacturing technology. **[10]**

b) Explain Scan, Spin & Selectively Photocure process with diagram. **[8]**

OR

Q2) a) Sketch and explain Continuous Liquid Interface Production (CLIP) additive manufacturing technology **[10]**

b) Write Difference between: SLA and DLP. **[8]**

Q3) a) Explain with neat sketch process mechanism and parameters of Electron-Beam Melting (EBM) process. **[10]**

b) Write difference between: Metal Laser Sintering and electron Beam Melting. **[7]**

OR

P.T.O.

Q4) a) Explain any two concepts: **[10]**

i) Layer Adhesion

ii) Shrinkage and Warping

iii) Over sintering

b) Explain with neat sketch Laser Engineered Net Shaping (LENS) **[7]**

Q5) a) Explain with neat sketch Plasma Deposition. **[10]**

b) Explain with neat sketch Electron Beam-based DED. **[8]**

OR

Q6) a) Explain 3D Laser Cladding and Direct Metal deposition in short with its advantages and applications. **[10]**

b) Differentiate between Directed Energy Deposition and Powder Bed Fusion technologies. **[8]**

Q7) a) Explain the applications of additive manufacturing technology in fashion and jewellery industry. **[10]**

b) Compare between 3D Printing with 4D Printing. **[7]**

OR

Q8) a) What are the applications of additive manufacturing technology in aerospace and automotive industry? **[10]**

b) Explain the biomedical applications of additive manufacturing technology. **[7]**

Total No. of Questions : 8]

SEAT No. :

PE-2743

[Total No. of Pages : 2

[6583]-324

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 side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain the main features of Electricity act-2003. **[10]**

b) How do an Industry, Nation and Globe would benefit from energy efficiency programs? **[8]**

OR

Q2) a) Explain briefly schemes of BEE under energy conservation act-2001.**[10]**

b) Explain PAT scheme in brief. **[8]**

Q3) a) Define Energy audit and Distinguish between 'preliminary energy audit' and 'detailed energy audit'? **[10]**

b) Define 'Energy management' and state the objectives of energy management. **[7]**

OR

Q4) a) List the different instruments used for energy audit along with their applications. **[10]**

b) Discuss energy audit report format. **[7]**

Q5) a) Explain 'Internal Rate of Return' method of financial analysis with its advantages and disadvantages? **[10]**

b) Write a note on Risk and sensivity analysis. Discuss factors considered for sensitivity analysis. **[8]**

OR

P.T.O.

Q6) a) Annual saving after replacement of boiler for three years is Rs. 5,00,000, Rs. 5, 50,000, Rs. 6,50,000. Total project cost is Rs. 13.5 lakh. Considering cost of capital as 12%, what is the net present value of the proposal? **[10]**

b) Explain ROI and its advantages and disadvantages. **[8]**

Q7) a) Explain in detail about Ozone Layer depletion process and its various effects. **[10]**

b) Explain Clean Development Mechanism (CDM). **[7]**

OR

Q8) a) Explain the importance of various international agreements for protecting the environment. **[10]**

b) Discuss on energy and environment. **[7]**



Total No. of Questions : 8]

SEAT No. :

PE-2744

[Total No. of Pages : 2

[6583]-325

T.E. (Mechanical / Automobile)

Honors in 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 and Q.7or Q.8.***
2) ***Figures to the right indicate full marks***
3) ***Draw the neat sketch wherever necessary.***

Q1) a) Explain working of Li-ion battery cell. Also mention two applications. **[9]**

b) What are the different chemistries of li-ion batteries? Mention in short significance of each of them for electric vehicle. **[8]**

OR

Q2) a) Explain the following parameters of li-ion batteries **[9]**

i) State of Charge

ii) Energy density

iii) C Rating

b) What is the type of charging li-ion battery? Explain the precautions needs to be taken while charging. **[8]**

Q3) a) Explain Nickel-Metal Hydride Batteries with advantages, disadvantages and applications **[9]**

b) Write a short not on need of thermal management system in e-vehicles? Explain with mechanism **[9]**

OR

P.T.O.

Q4) a) Explain Li-ion super capacitor with advantages, disadvantages and applications **[9]**

b) Explain lead acid batteries with advantages, disadvantages and applications **[9]**

Q5) a) Write a short note on Mechanical and electrical connections of motors. **[8]**

b) Explain following types of motor. **[9]**

i) Series Motor

ii) Parallel/Shunt DC Motor

iii) Compound DC motor

OR

Q6) a) Write a short note on Output Characteristics of Motor Drives in EVs? **[8]**

b) Explain with neat sketch working of BLDC Motor. Give two application **[9]**

Q7) a) Write a short note on Battery Standards in electric vehicles with any two types? **[10]**

b) Write a short note on intelligent transport system with its advantages?**[8]**

OR

Q8) a) What is battery swapping? Explain with Advantages And Challenges Of Battery Swapping p **[8]**

b) Explain the significance of implementation of lOT in electric vehicle on basis of wireless sensor network with neat sketch wherever required. **[10]**

Total No. of Questions : 8]

SEAT No. :

PE-2745

[Total No. of Pages : 2

[6583]-326

T.E. (Mechanical)

FOUNDATIONS OF SYSTEMS AND SYSTEMS ENGINEERING

(Honors of Systems and Engineering)

(2019 Pattern) (Semester - V) (302041 MJ)

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.***

Q1) a) Explain Systems Science and illustrate the relationship between the systems science, System thinking and General system approach as applied to Engineered system. **[9]**

b) List and explain the life cycle stages of the system with a sketch. **[9]**

OR

Q2) a) Write short notes on system complexity and Emergence in System Engineering. **[9]**

b) Illustrates the relationship of the System of Interest (SOI), enabling systems, and the other systems in the operational environment. **[9]**

Q3) a) Explain the architecture definition process with an IPO diagram. **[9]**

b) State and explain the types of System Architecture. **[8]**

OR

Q4) a) Write short notes on Architectural views. **[8]**

b) Write short notes on Architectur Development and Traceability. **[9]**

Q5) a) What is MBSE and explain the evolution of MBSE. **[9]**

b) Explain and demonstrate the purpose of System modelling language-SysML. **[9]**

OR

P.T.O.

Q6) a) With a neat sketch explain the basic structure of SysML. **[9]**

b) Write a short notes on Modelling, simulation and trade-off analysis. **[9]**

Q7) a) Demonstrate the concept of Simulation modelling in the SE lifecycle. **[8]**

b) Write short notes on the basis of quantitative modelling. **[9]**

OR

Q8) a) Explain the role of modelling in decision making. **[8]**

b) Write a short notes on System dynamics modelling. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE5953

[Total No. of Pages : 2

[6583]-327

T.E. (Honors)

304181 HBCT : INTRODUCTION TO BLOCK CHAIN

(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 Q6, Q.7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain core components of Block Chain: **[6]**

i) Nodes

ii) Ledger

iii) Transactions

b) How does following of Block Chain works. **[6]**

i) Private Block chain

ii) Public Block chain

c) What is Block chain protocol and explain how it addresses Security & Decentralization principles. **[6]**

OR

Q2) a) Compare permissionless and permission Block chain in terms of following features: **[6]**

i) Access control

ii) Decentralization

iii) Validation

iv) Scalability

v) Use cases

b) Describe how Block chain is used in the creation of Crypto Currencies application. **[6]**

c) Explain with diagram, Block chain secures digital contracts and transactions. **[6]**

P.T.O.

Q3) a) With neat diagram, explain applications of distributed ledger technology in Health care. **[6]**

b) Explain in brief: (any one) **[6]**

i) Distributed Ledger

ii) Hyper Ledger

c) What is a digital ledger in Block chain? List out advantages of using digital ledger technology in Block chain. **[6]**

OR

Q4) a) Define Hyper ledger composer. List out various components of Hyper ledger composer. **[6]**

b) Write a short note on Hyper ledger fabric and its architecture. **[6]**

c) Compare Hyper Ledger and Digital Ledger. **[6]**

Q5) a) Explain Multi chain-Block chain Technology with neat diagram. **[8]**

b) Write a short note on cloud based Block chain. List & Benefits. **[9]**

OR

Q6) a) Describe Geth and Stellar in brief as emerging trends in block chain. **[8]**

b) Explain following block chain related technologies : **[9]**

i) Ripple

ii) R3 corda

Q7) With neat diagram, describe in brief following block chain use cases : (any two). **[17]**

a) Supply chain management

b) Finance

c) Health care

OR

Q8) With neat diagram, describe in brief following block chain use cases : (any two). **[17]**

a) Remittance

b) Hand records

c) Voting and Election



Total No. of Questions : 8]

SEAT No. :

PE2746

[Total No. of Pages : 2

[6583]-328
T.E. (Robotics) (Honors)
304181 HR : PRINCIPLES OF ROBOTICS - I
(2019 Pattern) (Semester - V)

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) ***Draw sketches wherever required.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain design considerations of gripper selection. **[5]**

b) Classify grippers on various parameters. **[6]**

c) Explain mechanical grippers with neat sketch. **[6]**

OR

Q2) a) Explain vacuum grippers with neat sketch. **[5]**

b) Explain various tools used as end effectors. **[6]**

c) Explain magnetic grippers with sketch. **[6]**

Q3) a) Define a Robotic sensor. State desirable features of sensors. **[6]**

b) Explain range sensors with neat sketch. **[6]**

c) What is compliance used in Robotics? What is significance of compliance? **[6]**

OR

Q4) a) Explain important characteristics of Robot Sensors. **[6]**

b) Explain capacitive sensor with neat sketch. **[6]**

c) Explain with neat sketch LVDT. **[6]**

P.T.O.

Q5) a) With the help of suitable diagram explain the significance of D-H- Parameter. **[5]**

b) Write short Note on

i) Singularity

ii) Kinematic Calibration **[6]**

c) Write short note on Jacobian transformation with one example. **[6]**

OR

Q6) a) A 2 DOF planar R-R Manipulator has L_1= 120 mm & L_2 = 75mm. Determine joint angles using geometric approach, so that face end is located at (100, 70). **[6]**

b) With the help of suitable illustration, explain difference between forward & Inverse kinematics. **[5]**

c) Explain with neat sketch D-H Parameters. **[6]**

Q7) a) Explain economical aspects of Robot Design. **[6]**

b) Write a short Note of Robot Safety. **[6]**

c) Explain 3 major functions of Machine Vision systems alongwith diagram. **[6]**

OR

Q8) a) Explain application of robotics is areas of **[6]**

i) Health care

ii) Research & exploration

iii) Various industry

iv) Home sector

b) Explain Robot vision systems. Also explain 3 levels of processing. **[6]**

c) Explain various Image processing techniques. **[6]**



Total No. of Questions : 8]

SEAT No. : ____

PE2747

[Total No. of Pages : 1

[6583]-329
T.E. (Printing Engineering) (Honors)
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 whenever necessary.***

Q1) a) Explain the static characteristics of sensors and actuators. **[9]**

b) Explain the LED and switch interfacing using Arduino Board. **[9]**

OR

Q2) a) Explain working and characteristics of any two types of actuator used in printing industry. **[9]**

b) Explain the DC motor interfacing using Arduino Board. **[9]**

Q3) a) Explain the Wi-Fi Communication system and explain the RTS and CTS handshaking signals used in WiFi. **[8]**

b) Explain the pinouts of ESP8266. **[9]**

OR

Q4) a) Explain any two protocols used in IOT applications. **[8]**

b) Compare Node MCU and Ardinuo Uno board. **[9]**

Q5) Describe the types and cloud services in detail for IOT applications. **[18]**

OR

Q6) Describe the issues and challenges in IOT. **[18]**

Q7) Describe in detail about application of IOT in Auto sector and smart home. **[17]**

OR

Q8) Explain the role of IOT implementation in Printing industry. **[17]**

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Total No. of Questions : 10]

SEAT No. :

PE-5954

[Total No. of Pages : 2

[6583]-330

T.E. (A.I. & M.L.) (Honours)

COMPUTATIONAL STATISTICS

(2019 Pattern) (Semester - V) (310301)

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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
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 Chi-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]**

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Total No. of Questions : 8]

SEAT No. :

PE2748

[Total No. of Pages : 2

[6583]-331
T.E. (Cyber Security) (Honour)
INFORMATION AND CYBER SECURITY
(2019 Pattern) (Semester - V) (310401)

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

Instructions to the candidates:

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

Q1) a) Explain RSA algorithm in detail with example. **[8]**

b) What is Chinese Remainder Theorem? Explain with example. **[9]**

OR

Q2) a) Explain in detail Diffie-Hellman with justification. **[8]**

b) Explain Elliptic Curve Arithmetic and Elliptic curve Cryptography. **[9]**

Q3) a) Explain the types of Cyber-Crimes. Explain Cybercrime scenario in India. **[9]**

b) What are challenges in Social engineering? Explain Cyber Stalking? **[9]**

OR

Q4) a) List the steps for risk identification and assessment in risk management for Information Security. **[9]**

b) What are the types of Laws? Differentiate between Law and Ethics. **[9]**

Q5) a) What protocols comprise SSL with neat diagram? What is the difference between SSL connection and SSL session? **[8]**

b) What services are provided by IPSec? Give difference between Transport mode and Tunnel Mode. **[9]**

OR

P.T.O.

Q6) a) What is the role of X.509 in cryptography? **[8]**

b) What are various types of firewall? Discuss limitations of firewall. **[9]**

Q7) a) What is a phishing attack explain with an example. What are the different types of phishing? **[9]**

b) What is computer worm and virus? How does computer virus spread? How to protect against computer virus and worms. **[9]**

OR

Q8) a) Write short note on Intrusion Detection System with Types. Limitations and challenges. **[9]**

b) What is DoS & DDoS Attacks? Explain with suitable examples. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2749

[Total No. of Pages : 2

[6583]-332
T.E. (Computer Engineering) (Honors)
DATA SCIENCE AND VISUALIZATION
(2019 Pattern) (Semester - V) (310501)

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

Instructions to the candidates:

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

Q1) a) What is Linear regression? List the applications where linear regression can be applied? **[6]**

b) State and explain how Naïve Bayes classifier can be used to solve the classification problems? **[6]**

c) Write a note on association rules. **[6]**

OR

Q2) a) What is clustering? Explain K-means clustering algorithm. **[6]**

b) Explain Apriori Algorithm used in machine learning with valid example. **[6]**

c) Illustrate how will you evaluate association rules. **[6]**

Q3) a) State and explain the different constituents of the decision tree. **[9]**

b) Write a note on the perceptron model. **[8]**

OR

Q4) a) When do you use backpropagation in Neural Networks? Explain by taking a suitable example. **[9]**

b) What is entropy? How entropy is calculated explain with a suitable example. **[8]**

Q5) a) Define the term Dashboard along with its evolution and steps to design the dashboard. **[9]**

b) Write a note on : **[9]**

i) Pie charts

ii) Bar graphs

iii) Scatter plots

OR

P.T.O.

Q6) a) Explain the terms Network hierarchies and reports associated with data visualization. **[6]**

b) Write a note on advanced visualization techniques and explain anyone of them. **[6]**

c) Write a note on 'display media for Dashboard'. **[6]**

Q7) a) What are different types of data model explain in brief. **[6]**

b) List the advantages of multi-dimensional data model? **[6]**

c) Discuss the challenges of clustering High-Dimensional data. **[5]**

OR

Q8) a) Explain the need of data modelling. **[6]**

b) Explain multidimensional data model with one example. **[6]**

c) What do you mean by Principal Component Analysis? **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-5955

[Total No. of Pages : 2

[6583]-333
T.E. (Computer Engineering)
(Internet of Things)(Honors)
EMBEDDED SYSTEMS AND INTERNET OF THINGS
(2019 Pattern) (Semester - V) (310601)

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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Briefly explain the principles of sensors. **[6]**

b) Define Actuators? Mention the different types of Actuation systems. **[6]**

c) Write the difference between Arduino and Raspberry Pi and Beagle Bone? **[8]**

OR

Q2) a) Define sensor. Classify different types of sensors. **[6]**

b) Explain about the different mechanisms used in rotary actuators. **[6]**

c) Write a note on following sensors. **[8]**

i) Active and passive
ii) Analog and digital
iii) Contact and no-contact
iv) Absolute and relative

Q3) a) Why is testing and validation particularly important in embedded systems, and what tools assist with it? **[4]**

b) Draw the architecture of SDLC and explain. **[6]**

c) What are common challenges in embedded application development and how to overcome them? **[8]**

OR

Q4) a) Explain SDLC components in detail. **[4]**

b) What are common security challenges in Embedded system? **[6]**

c) How can real-time constraints complicate embedded application development? **[8]**

P.T.O.

Q5) a) List the Main stages in the IoT architecture? And Explain. **[6]**

b) List and explain various application areas of IoT. **[6]**

c) Explain the role of sensors and actuators in an IoT system. **[4]**

OR

Q6) a) What is an IoT device? Give examples of different types of IoT devices. **[6]**

b) List and explain the enabling technologies for IoT **[6]**

c) How can interoperability issues create risks in IoT systems? **[4]**

Q7) a) How does NFC differ from RFID in terms of range and security features? **[6]**

b) What are the main IoT communication models? Explain each with an example. **[6]**

c) Define MQTT. What are its main features and typical use cases in IoT? **[4]**

OR

Q8) a) Describe the security features of MQTT, CoAP, XMPP and AMQP. **[6]**

b) Compare Bluetooth, BLE, Zigbee, Z-Wave, NFC, RFID and Wi-Fi in terms of range, data rate, power consumption and topology. **[6]**

c) What is XMPP? How is it used in IoT and what are its security mechanisms? **[4]**



Total No. of Questions : 8]

SEAT No. : ____

PE2750

[Total No. of Pages : 2

[6583]-334
T.E. (Honors) (Computer Engineering) (Virtual & Augmented Reality)
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) Discuss the concept of Chaining Transformations and give an example of its use in VR. **[10]**

b) Explain the role of human eye movements in VR and their implications for VR system design. **[8]**

OR

Q2) a) What role does transformation chaining play in VR, and how does it enhance a VR user's spatial awareness? **[10]**

b) How does understanding the physiology of human vision, specifically eye movements, influence the design of VR applications? **[8]**

Q3) a) Explain the concept of Depth Perception in VR and discuss two techniques used to create a sense of depth. **[10]**

b) How does the perception of motion contribute to realism in VR environments? Describe one challenge associated with motion perception in VR. **[8]**

OR

Q4) a) Describe how color perception is managed in VR and why it is important for user experience. **[10]**

b) What is Ray Tracing, and how does it differ from Rasterization in the context of VR rendering? **[8]**

P.T.O.

Q5) a) Describe the concept of vection and its relevance in VR. What challenges does it present for VR design? **[8]**

b) How does the vestibular system contribute to motion perception, and what implications does it have for VR experiences? **[9]**

OR

Q6) a) Explain the importance of tracking 2D and 3D orientation in VR and provide an example of how it is implemented. **[8]**

b) What are the implications of mismatched motion in VR, and how do VR systems address this issue to enhance user comfort? **[9]**

Q7) a) Explain the concept of "motor programs" in the context of VR and how it relates to user interaction. **[8]**

b) Discuss the concept of "remapping" in motor programs during VR interaction. How does it improve user experience in VR? **[9]**

OR

Q8) a) Describe the role of locomotion in VR. What are the challenges in implementing realistic locomotion in virtual environments? **[8]**

b) What is the significance of social interaction in VR, and how do VR systems enable users to interact with others in virtual spaces? **[9]**



Total No. of Questions : 8]

SEAT No. :

PE2751

[Total No. of Pages : 2

[6583]-335

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

Q1) a) What is Cassandra? Draw and explain Cassandra Architecture. **[9]**

b) What is JSON? How to create object and array object in JSON? Explain with example. **[9]**

OR

Q2) a) What is NOSQL database? Explain different types of NOSQL databases with example. **[10]**

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

i) MongoDB Database

ii) XML

Q3) a) What is data warehousing? Draw and explain data warehouse architecture. **[9]**

b) Explain different analytical operations of OLAP. **[8]**

OR

Q4) a) Define OLAP. What are different types of OLAP? Explain in detail. **[9]**

b) Explain star and snowflake schemas of data warehouse with example. **[8]**

Q5) a) What is KDD? Explain knowledge discovery process in detail. **[9]**

b) What is data mining. What are different applications of data mining? **[9]**

OR

P.T.O.

Q6) a) Define data mining. Explain data mining tasks with suitable example. **[10]**

b) Explain architecture of data mining system. **[8]**

Q7) a) Write a short note on **[10]**

i) Spatial Databases

ii) Temporal Databases

b) Draw and explain the architecture of mobile database. **[7]**

OR

Q8) a) Write a short note on **[10]**

i) Geographical Information Systems

ii) Genome data management

b) Draw and explain Hive architecture **[7]**

