

Total No. of Questions : 8]

SEAT No. :

PA-895

[Total No. of Pages : 2

[5927]-301

B.E. (Automobile Engineering)
AUTOMOTIVE TESTING AND CERTIFICATION
(2019 Pattern) (Semester-VII) (416481)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Explain Mud track and Water Wade track with figures. **[9]**

b) Explain High speed performance test and its significance. **[9]**

OR

Q2) a) What is meant by proving ground? Enlist the different types of tracks used for vehicle testing. **[9]**

b) Explain free acceleration test as per IS standard. **[9]**

Q3) a) Explain Oil consumption test in detail. **[8]**

b) Explain any two following transient cycles tests. **[9]**

i) World Harmonized Transient Cycle (WHTC)

ii) European Transient Cycle (ETC)

iii) Non Road Transient Cycle (NRTC)

OR

Q4) a) Explain Evaporative Emission test as per IS standard. **[8]**

b) Write a short note on driving cycles used across globe for vehicle testing. **[9]**

P.T.O.

- Q5)** a) What is the pass-by noise limit for M1 category of vehicles? Also explain pass by noise test requirements. [8]
- b) Explain wind noise and its measurement methods. [9]

OR

- Q6)** a) What are the different sources of interior noise generation of a vehicle? What are the ways to eliminate/ reduce interior noise? Explain briefly.[8]
- b) Explain Briefly. [9]
- i) Exhaust Noise
- ii) Engine Noise
- iii) Transmission Noise

- Q7)** a) Explain the procedure for Horn testing. [9]
- b) How air bag test is performed on the vehicle? Explain briefly. [9]

OR

- Q8)** a) Explain the procedure for Tyre & Wheel Rim test. [9]
- b) Explain the procedure for metallic and plastic fuel tank test [9]



Total No. of Questions : 8]

SEAT No. :

PA-896

[Total No. of Pages : 3

[5927]-302

B.E. (Automobile Engineering)
MACHINE & VEHICLE DYNAMICS
(2019 Pattern) (Semester - VII) (416482)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain the terms: transient vibration and steady state vibration, related to forced vibration with neat diagram and example. **[8]**

b) A spring-mass damper system has a mass of 80 kg suspended from a spring having stiffness of 1000 N/m. and a viscous damper with a damping coefficient of 80 N-s/m. If the mass is subjected to a periodic disturbing force of 50 N at undamped natural frequency, determine : **[10]**

- i) the undamped natural frequency;
- ii) the damped natural frequency;
- iii) the amplitude of forced vibrations of mass ; and
- iv) the phase difference between force and displacement

OR

Q2) a) Explain, forced vibration with rotating unbalance system. **[9]**

b) Explain the term : Force transmissibility. **[9]**

Q3) a) Explain with neat sketch and equations, the various cases of dynamic axle loading. **[9]**

b) Explain briefly the various resistive forces acting on vehicle in dynamic state. **[8]**

P.T.O.

OR

Q4) a) Explain vehicle coordinate system and earth fixed coordinate system with neat sketch. [8]

b) The curb weight of a car without passengers or cargo are 1049.15 kg on the front axle and 599.64 kg on the rear axle. The wheelbase is 2.76 m. considering, the car in static state and on level road. Determine the position of center of gravity for the car from front and rear axle of the car.

Also, determine the magnitude of normal reaction acting on the front and rear wheel axles of the car, when the vehicle is in static state at a grade of 9° . Assume height of center of gravity from road surface as 0.508 m. [9]

Q5) a) Write a short note on Automatic transmission. [7]

b) Following data is obtained from Passenger car test : [10]

Engine inertia : 0.0092 kg-m-s^2

RPM versus Torque (N-m) :

RPM	Torque	RPM	Torque
800	120	3200	190
1200	132	3600	198
1600	145	4000	200
2000	160	4400	201
2400	175	4800	198
2800	181	5200	180

Transmission data :

Gear	1	2	3	4	5
Inertia (kg-m-s^2)	0.0161	0.0092	0.0069	0.0046	0.0023
Gear Ratio	4.28	2.79	1.83	1.36	1.00
Drive efficiency	0.966	0.967	0.972	0.973	0.970

Final drive data :

Inertia (kg-m-s^2)	Gear Ratio	Drive efficiency
0.0138	2.92	0.99

Wheel inertia 0.1267 kg-m-s^2

Calculate effective inertia of each gear.

OR

Q6) a) A car weighing 1800 kg travelling at a speed of 60 km/hr. The driver puts on the brakes with a steady brake force of 8000 N, when he sees a stop sign. Determine, the : **[12]**

- i) Deceleration of the car.
- ii) Stopping distance of the car.
- iii) Time to stop the car.
- iv) Energy dissipated during braking.
- v) Brake power dissipated at point of brake application.
- vi) Brake power dissipated average at the stop.

Neglect, aerodynamic, rolling and drawbar pull resistances.

b) Explain briefly the various forces on vehicle producing braking deceleration in vehicle. **[5]**

Q7) a) Explain in brief understeer, over steer and neutral steer. **[9]**

b) Explain in brief the yaw velocity response used for comparing the steering response of road vehicles. **[9]**

OR

Q8) Write short note on : **[18]**

- a) Semi-Active suspension system.
- b) Constant radius test for vehicle handling.
- c) Vehicle ride model



Total No. of Questions : 8]

SEAT No. :

PA-897

[Total No. of Pages : 2

[5927]-303

B.E. (Automobile Engineering)
INDUSTRIAL ENGINEERING
(2019 Pattern) (Semester - VII) (416483)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the 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 indicates full marks.*

- Q1)** a) Discuss the scope and objective of industrial engineering. [6]
b) Explain in brief the productivity improvement methods for organization. [6]

OR

- Q2)** a) Explain the contribution of Maynard and Henry Ford in industrial engineering. [6]
b) The following information available for a company given below : [6]
i) Daily working hours = 8
ii) Number of working days in week = 6
iii) Number of operators = 20
iv) Standard hours per unit production = 4
During a particular week
v) Number of unique produced = 48
vi) Absentee Man days = 40
vii) Idle time due to load shedding = 30 Man days
Find absenteeism percentage productivity, labour utilization percentage and overall productivity of labour in terms of unit produced/week/employee.

- Q3)** a) Define Method study. Explain procedure of method study. [6]
b) Explain SIMO chart with suitable example. [7]

OR

P.T.O.

- Q4) a)** Describe operation process chart with suitable example. [6]
b) Following are the element times of a machining operation. The corresponding rating and relaxation allowances are given in table as below. [7]

Element	Observed Time (Min)	Frequency	Performance Rating	Relaxation Allowance (%)
1	0.15	1	100	12
2	0.12	1	90	15
3	0.08	1	75	11
4	10.00	1/50	80	11
5	6.00	1/55	90	13

Calculate normal time, standard time for this job.

- Q5) a)** Explain Product Layout with advantages and disadvantages. [6]
b) Describe material flow patterns in material handling. [6]

OR

- Q6) a)** Define plant layout. What are various factors involved in selection of site for good plant? [6]
b) List material handling equipment and describe any four of them. [6]

- Q7) a)** Explain functions of production planning and control. [6]
b) A manufacturing company requires 9000 units per year. Ordering cost is Rs. 125/- per order and carrying cost is 20%. Purchase price per unit is Rs. 42/- determine [7]
 i) EOQ
 ii) Optimum number of orders
 iii) Total cost including acquisition of material

OR

- Q8) a)** What are the different techniques of production control? [6]
b) Discuss MRP-I with suitable example. [7]



[5927]-304

B.E. (Automobile)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(2019 Pattern) (Semester - VII) (Elective - III) (416484A)

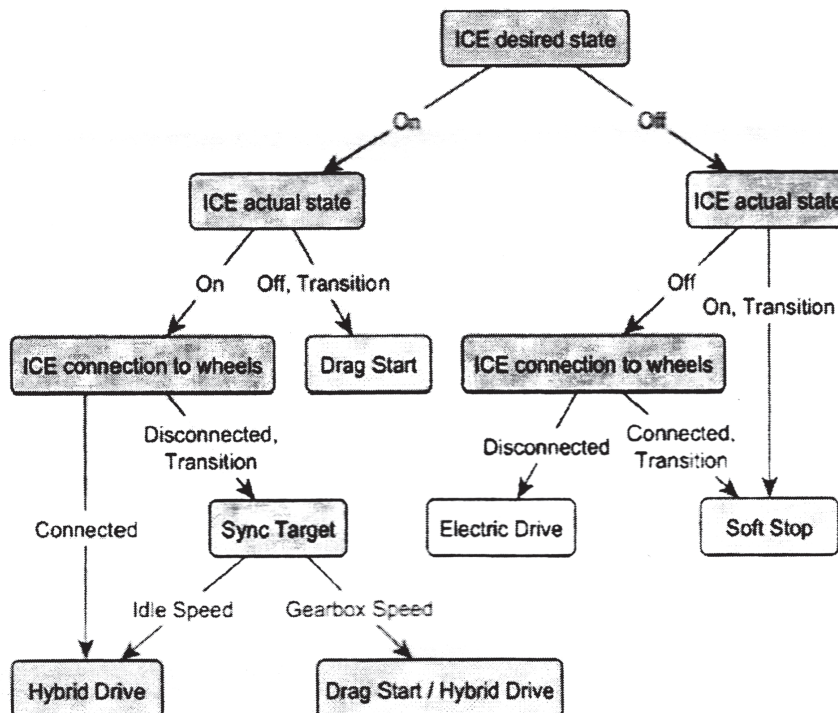
Time : 2½ Hours]

[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) Figures to right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data wherever necessary.

Q1) a) Explain how does following decision tree algorithm work for buying a car? Also, identify various nodes, attributes and features. [7]



- b) Explain hard and soft margins of Support Vector Machine (SVM) with the help of sketch. [5]
- c) List down advantages and limitations of the Logistic Regression. [5]

OR

P.T.O.

- Q2)** a) Explain with neat sketch Kernel functions of SVM - rbf and sigmoid.[7]
 b) Explain cost function in linear and logistic Regression. [5]
 c) What are advantages and limitations of KNN and K means? [5]

- Q3)** a) Observe the following confusion matrix and calculate : [8]

Accuracy of classification

Correctly classified samples (considering all classes and per class)

Incorrectly classified samples (considering all classes and per class)

True positive, true negative, false positive, false negative.

Predicted class				Actual class
Passenger car	SUV	Pick-up truck		
414	9	5	Passenger car	
1	103	2	SUV	
11	4	62	Pick-up truck	

- b) Enlist steps involved in development of machine learning based classification model. [5]
 c) Explain with neat sketch K-fold cross-validation mode. [5]

OR

- Q4)** a) What are the sources of the data that is needed for training the classification model for condition monitoring of bearings, gears, rotating elements? Explain in detail. [8]
 b) Differentiate between clustering and classification. [5]
 c) Explain any 5 hyper-parameter tuning parameters in decision tree. [5]

- Q5)** a) Explain the architecture of Convolutional Neural Networks (CNN). [8]
b) What is reinforcement learning? State one practical example. [5]
c) What is Q-Learning? How is it helpful in machine learning? [5]

OR

- Q6)** a) State key constituents of reinforcement learning. (Explain key terms in reinforcement learning) [8]
b) How to choose the right activation function? [5]
c) What does a Neural Network mean? How many layers are needed to call it a “Deep” neural network? What does a Neural Network mean? [5]

- Q7)** a) Explain role of AI & ML in Autonomous Vehicles. [6]
b) How can predictive vehicle maintenance be achieved using machine learning? [5]
c) State the significance of computer vision in automotive industry by describing one example. [6]

OR

- Q8)** a) Explain role of AI & ML in connected Vehicles. [6]
b) Describe how can machine learning assist Automatic Guided Vehicles?[5]
c) What do you mean by access control using facial recognition? State its importance with respect to automotive industry. [6]

x x x

[5927]-307

**B.E. (Automobile Engineering)
FINITE ELEMENTS ANALYSIS**

(2019 Pattern) (Semester - VII) (416485A) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** A constant Strain triangle is defined by three nodes 1 (1.5, 2), 2(7, 3.5) and 3(4, 7). Evaluate the shape function N_1 , N_2 and N_3 for interior point P (3.85, 4.8). Also calculate the Jacobian of transformation J . [10]

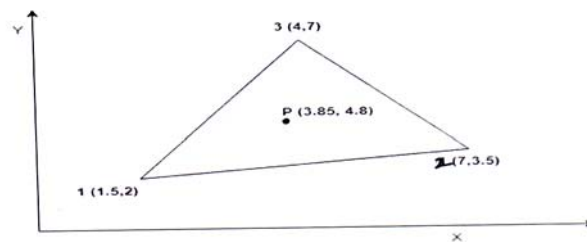


Fig. 1

- b) Write the short note on [8]
- i) Plane stress
 - ii) Plane strain

OR

- Q2) a)** Determine the Cartesian Coordinate of point P ($\xi=0.5$, $\eta=0.6$), shown in Fig.2 [10]

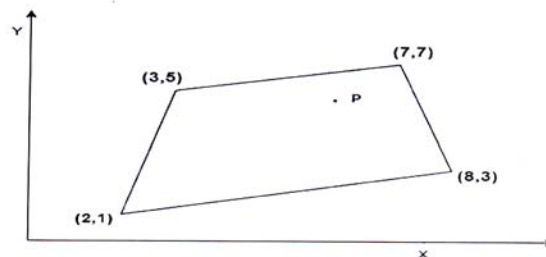


Fig. 2

P.T.O.

- b) Explain different types of 2D element with their approximation function. [8]

Q3) a) Briefly explain the concept of P and H formulation in meshing, and how it use for improving the FEA results accuracy. [9]

- b) Explain the following terminologies in element meshing. [8]
- Aspect ratio
 - Warp angle

OR

Q4) a) What is the Convergence test in FEA? [5]

b) What is the critical region in FEA model? Which are the different way to improve the FEA results accuracy in critical region? [4]

c) Explain the following terminologies in element meshing. [8]

- Jacobian
- Stretch

Q5) a) What is the Non-linear analysis? Write down the difference between linear and non-linear analysis. [10]

b) What is the material model? Explain any type of material model in non linear analysis. [7]

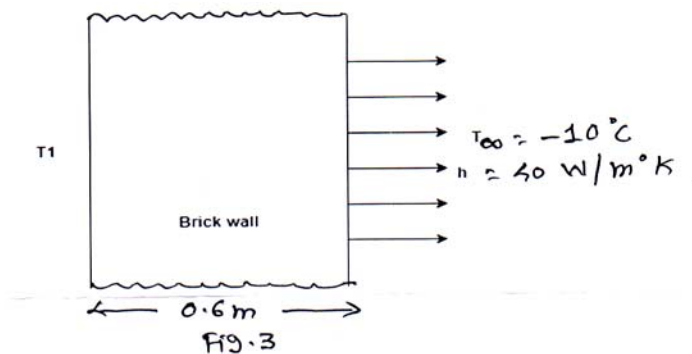
OR

Q6) a) Explain the following in nonlinear analysis. [10]

- geometry nonlinearity
- material non linearity

b) Explain the stress measure in non-linear analysis. [7]

Q7) a) A brick wall shown in fig. 3 has thickness of 0.6m and thermal conductivity of $0.8 \text{ W/m}^\circ\text{K}$. The inner surface of wall is at 28°C and outer surface is exposed to cold air at -10°C . The heat transfer coefficient at outer surface is $40 \text{ W/m}^\circ\text{K}$. Determine the steady- state temperature distribution within the wall. Considered the two elements. [12]



- b) Explain the consistency and lumped mass matrix technique for model analysis. [6]

OR

- Q8) a) The bar shown in Fig. 4 having uniform cross-section with cross-section area $A = 50 \times 10^{-6} \text{ m}^2$, length $L = 1.5 \text{ m}$, modulus of elasticity $E = 2 \times 10^{11} \text{ N/m}^2$ and density $\rho = 7800 \text{ kg/m}^3$. Estimate the natural frequency of bar. Model the bar by using two elements. [12]

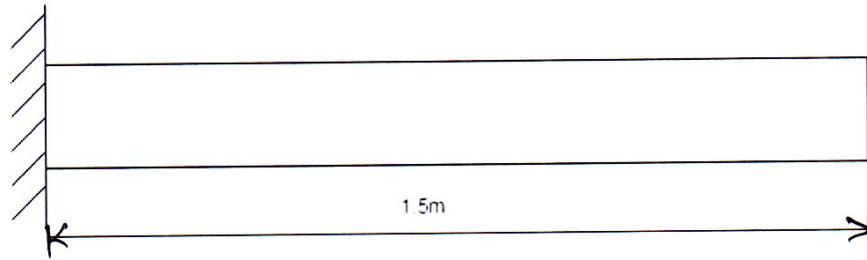


Fig. 4

- b) What is the shape function? How it is used in thermal analysis to find the temperature distribution within the wall? [6]



Total No. of Questions : 8]

SEAT No. :

PA-899

[Total No. of Pages : 2

[5927]-309

B.E. (Biotechnology)

BIOCHEMICAL ENGINEERING

(2019 Pattern) (Semester - VII) (415461)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Draw a neat sketch of a fermenter and write functions and importance of various fittings and three major auxiliaries. [12]

b) Give detailed effect of rheological properties in fermentation operations. [6]

OR

Q2) a) Why is it necessary to maintain positive pressure inside the fermenter? Explain its importance in oxygen delivery system. [9]

b) What are types of sampling ports? Explain it's working in detail. [9]

Q3) a) Is it convenient to use $k_L a$ as a yardstick of fermenter performance? How? [9]

b) What are different types of spargers? Draw neat diagrams and explain. [8]

OR

Q4) a) What is critical concentration (C_{crit}) on DO concentration curve and how it affects growth of microorganisms? [8]

b) Explain in detail case study of production of amino acids by using *B.flavin*. [9]

Q5) a) What are thumb rules considered while scaling up of a plant? [9]

b) What is scale up and scale down approach? How is it used in industries? [9]

OR

P.T.O.

Q6) Consider the scale up of a fermentation from a 10 l to 10,000 l vessel. The small fermenter has height to diameter ratio of 3. The impeller diameter is 30% of the tank diameter. Agitator speed is 500 rpm and three Rushton impellers are used. Determine the dimensions of the large fermenter and agitator speed for: **[18]**

- a) Constant P/V
- b) Constant Impeller Tip speed
- c) Constant Reynolds Number

Q7) a) What are different techniques used in enzyme immobilization? **[9]**

b) Write a short note on alginate and carrageenan covalent gel. **[8]**

OR

Q8) a) Give one detailed case study on plant cell reactor. **[9]**

b) What are disposable reactors? Give Pros and cons over conventional reactors. **[8]**



Total No. of Questions : 8]

SEAT No. :

PA-900

[Total No. of Pages : 2

[5927]-310

B.E. (Biotechnology)

BIOINFORMATICS

(2019 Pattern) (Semester - VII) (415462)

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) Write a note on Data mining? Explain its application in protein sequences. [9]

b) What are the different levels of protein structure classification? Does it aid or hinder in creating structural databases of proteins? [9]

OR

Q2) a) Write a note on TrEMBL, include what it is, what is its significance and how does it help further the research? [9]

b) What are Heuristic algorithms like BLAST? What is the significance of E value in BLAST? [9]

Q3) a) What is protein structure prediction? Can we do function prediction as well? Explain with a suitable example. [9]

b) Give the significance of protein structure visualization. What softwares used for it? [8]

OR

Q4) a) Differentiate between BLOCKS and PROFILES. [9]

b) How is the protein 3D structure determined? What are the different methods and what are the different outputs? Where are the structural information stored? [8]

P.T.O.

- Q5)** a) What are Pairwise sequence alignment methods? [8]
b) Discuss the difference in the approach of Global Alignment and Local alignment. Also give a narrative of the difference between them at the algorithm level. [10]

OR

- Q6)** a) What are STS and how it is used to assemble genome? [10]
b) How does the BLOSUM differ from PAM? [8]

- Q7)** a) What is the difference between Dendogram and Phylogenetic Tree? [8]
b) What is phylogenetic analysis? Explain with an example. [9]

OR

- Q8)** a) What is CLUSTAL-OMEGA? Explain the algorithm and narrate steps to do Multiple Sequence Alignment. [8]
b) What is Neighbour Joining Tree and UPGMA Tree? [9]



Total No. of Questions : 6]

SEAT No. :

PA-1792

[Total No. of Pages : 4

[5952]-311

S.Y.B.Com.

236 (F) : BUSINESS STATISTICS - I
(2019 Pattern) (Semester - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question No.1 and question No.6 are compulsory.*
- 2) *Solve any three questions from the remaining question from 2,3,4 and 5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator and statistical table is allowed.*

Q1) Choose the correct alternative from each of the following. (any ten): **[10]**

- a) Total fertility rate (TFR) refers to _____
 - i) Number of births per one thousands woman
 - ii) Number of women between 15-49 years
 - iii) Number of children per women approximate completed family size
 - iv) Number of female births per one thousands woman
- b) Expected number of years lived between ages x and $x+1$ by survivors of the initial group of l_0 lives denoted by _____
 - i) T_x
 - ii) L_x
 - iii) e_x
 - iv) d_x
- c) Let $r_{13}=0.8$, $r_{12}=0.5$ then find R_{22}
 - i) 0.36
 - ii) 0.45
 - iii) 0.37
 - iv) 0.5
- d) If $N.R.R > 1$ then we say that there is
 - i) reduction in population
 - ii) population in constant
 - iii) increase in population
 - iv) all the above
- e) A measure of extent of linear relationship between X_1 with the other variables X_2 and X_3 is given by
 - i) Simple correlation
 - ii) Partial correlation
 - iii) Multiple correlation
 - iv) Simple regression

P.T.O.

- f) If the class frequency $(AB)=0$, the value of Q is equal to:
- i) 0
 - ii) -1
 - iii) 1
 - iv) 0 or 1
- g) Marks secured by students (Y_1) may be related with their I.Q(Y_2) and the number of hours of study (Y_3) this is example of _____
- i) Simple regression
 - ii) Multiple regressions
 - iii) Time series
 - iv) All of the above
- h) If for two attributes A and B, $(A) = 50$, $(B) = 60$, $(AB) = 40$, $N=100$ then
- i) A and B are independent
 - ii) A and B are positively associated
 - iii) A and B are negatively associated
 - iv) Nothing can be said about association between A and B without further information
- i) Let $l_{10} = 400$ and $l_{18} = 60$ then the probability that a person aged 10 will die in next 8 years is _____
- i) 0.15
 - ii) 0.85
 - iii) 0.52615
 - iv) 0.32156
- j) If two attributes the class frequencies $(AB) (\alpha\beta)=(A\beta)(\alpha B)$, then A and B are called
- i) Independent
 - ii) Negatively associated
 - iii) Positively associated
 - iv) All of the above
- k) The expected number living between ages 5 and 10 is _____
- i) l_{10}
 - ii) $T_5 - T_{10}$
 - iii) e_5
 - iv) p_{10}
- l) The main drawback of gross reproduction rate is
- i) the neglect of the number of unmarried women
 - ii) non-consideration of divorces
 - iii) assumption of no mortality of female children till their fertility age
 - iv) all the above

Q2) Attempt the following.

- Explain ultimate class frequency and Yule's coefficient of association. [3]
- Of 598 men in a locality exposed to a particular disease, 147 in all were attacked. Of 598 men 137 were vaccinated and of those only 14 were attacked. Construct the contingency table and compute the number of persons not vaccinated but not attacked. [4]
- Given the frequency of positive classes, find the frequencies of the rest of the classes : $N = 800$; $(A) = 224$; $(B) = 301$; $(C) = 150$; $(AB) = 125$; $(AC) = 72$; $(BC) = 60$; $(ABC) = 32$ [8]

Q3) Attempt the following.

- Define the terms : Partial correlation coefficient, Coefficient of determination. [3]
- Let $r_{12} = 0.80$, $r_{13} = 0.70$, $r_{23} = 0.85$. Compute (i) $R_{1,23}$ (ii) $r_{12,3}$ [4]
- In a trivariate distribution [8]

$$\sigma_1^2 = 4, \sigma_2^2 = \sigma_3^2 = 9, r_{12} = 0.7, r_{13} = r_{23} = 0.5$$

Q4) Attempt the following.

- Define Age specific birth rate and age specific death rate. [3]
- Calculate S.T.D.R. for districts A and B and compare them and comment on it [4]

Age group	District A		District B		Standard
	Population	Death	Population	Death	Population
0-10	2000	50	1000	20	20000
10-20	7000	49	3000	30	58000
20-60	1000	25	2000	40	22000
60-100	400	20	700	21	12000

- For the following data, Calculate G.F.R., A.S.F.R., T.F.R., G.R.R. and comment on it: [8]

Age group	15-19	2024	25-29	30-34	35-39	40-44
Female population	9000	9200	8900	8600	8400	8500
No. of births	180	1012	1068	774	420	170
Survival factor	0.92	0.91	0.90	0.89	0.89	0.86

Q5) Attempt the following:

a) Give any three application of life table [3]

b) Give the following data [4]

Age (x)	61	62	63	64	65	66
l_x	871	575	366	222	129	71

Find the probability that,

i) A person aged 63 will die in next three years

ii) A person aged 62 will survive in next 2 years

c) Consider $l_0 = 1000$ and Complete the life table having columns p_x, l_x, d_x, L_x

Age (x)	0	1	2	3	4	5	6
q_x	0.1	0.2	0.3	0.4	0.5	0.6	0.7

[8]

Q6) Attempt any three of the following. [15]

a) Explain the construction of life table.

b) State the limitation of G.R.R. and N.R.R.

c) Define the concept of multiple correlations in case of trivariate data. State any two practical situations where multiple regressions can be used.

d) Explain the terms : dichotomy, positive association between the two attributes.

e) Distinguish between T.F.R. and G.R.R.



Total No. of Questions : 8]

SEAT No. :

PA-901

[Total No. of Pages : 2

[5927]-312

B.E. (Biotechnology)

ENVIRONMENTAL BIOTECHNOLOGY

(2019 Pattern) (Semester-VII) (415463B) (Elective-III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Enlist various methods used in Industrial effluent treatment. Explain any one method in detail. **[9]**

b) What are the general processes used in the textile industry? Explain the problems related to the processes. **[9]**

OR

Q2) Which processes are followed by Pulp and Paper Industries to develop products? Write the characteristics of effluents in the Paper and Pulp industry. Describe the primary methods of effluent treatment. **[18]**

Q3) a) How many forms of air emission control are mentioned in the literature? Explain the process of condensation in detail. **[10]**

b) What is the working principle of Incineration? Explain in detail. **[7]**

OR

Q4) Describe the working principles and applications of the following equipment. **[17]**

a) Wet Scrubber

b) Venturi Scrubber

P.T.O.

Q5) What are Xenobiotic Compounds? Draw a flowsheet for remedial measures for solid industrial waste. Explain the techniques used in detail. [18]

OR

Q6) a) Classify the medical solid waste and write a note on the management of medical solid waste. [9]

b) Explain in detail the ways used for evaluation of the medical waste management system. [9]

Q7) a) Write a note on Microorganisms used in Bioremediation. [10]

b) Explain the working principle of Ex-situ Bioremediation and Bioreactors used for the same. [7]

OR

Q8) Describe how bioremediation can be carried out using fungi and bacteria. Explain the In-situ method for Bioremediation. [17]



Total No. of Questions : 8]

SEAT No. :

PA-902

[Total No. of Pages : 2

[5927]-313

B.E. (Biotechnology)

GENOMICS

(2019 Pattern) (Semester-VII) (415463C) (Elective-III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw the labeled diagram of Eukaryotic gene structure. [6]
b) Write a note on Northern Blotting. [6]
c) Give definitions of [6]
i) Transcriptome,
ii) EST,
iii) RT-PCR

OR

- Q2)** a) Give a flow chart indicating various steps for comparison of a gene expression in normal and cancer tissue. [6]
b) Write a note on Microarray. [6]
c) Draw the labeled diagram of mRNA conversion to cDNA. [6]
- Q3)** a) What is Epigenetics? Briefly write on epigenetic mechanisms. [9]
b) Write a short note on methylation specific PCR. [8]

OR

- Q4)** a) Justify-Gene environment interactions modulate gene expression through Epigenetics. [9]
b) Write short notes on (4 marks each) [8]
i) Bi-sulphite sequencing,
ii) *Drosophila melanogaster* as a model for Epigenetics

P.T.O.

- Q5) a)** Write notes on [8]
i) ADME,
ii) Benefits of Pharmacogenomics
b) Give an overview of genomics in Personalized medicine. [10]

OR

- Q6) a)** Discuss DME Gene polymorphism and drug response. [10]
b) A single dose of Warferin is given to patients. There are two groups of patients with high and low levels of Waferin in blood. How would you predict their drug metabolism? In which group Warferin treatment may be effective or useless? [8]

- Q7) a)** Discuss Genomic technologies in Nutrigenomics research. [9]
b) Diet, genes and diseases is a triad of Nutrigenomics-Explain. [8]

OR

- Q8) a)** Write a note on Personalized nutrition. [8]
b) Design a study flow chart to prove/disprove the hypothesis “Turmeric, a source of Curcumin in diet prevents Cancer”. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1648

[Total No. of Pages : 2

[5927]-315

Final Year B.Tech. (Biotechnology)

NANOTECHNOLOGY

(2019 Pattern) (Semester - VII) (415464B) (Elective - IV(B))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Write a note on diagnostics application based on: **[8]**
- i) Nanomolecular and
 - ii) Cytoenetics
- b) Write down the definition, methodology and applications of nanosurgery. **[6]**
- c) What is targeted drug delivery system? Explain its strategies. **[4]**

OR

- Q2) a)** Discuss the application of nanotechnology in: **[15]**
- i) Vaccination
 - ii) Cell therapy
 - iii) Gene therapy
 - iv) Nanomedicine
 - v) Cardiac therapy
- b) Discuss the advantages of nanotechnology in drug targeting and drug delivery. **[3]**

- Q3) a)** Write a short note on : **[6]**
- i) Polymer based sensor and
 - ii) Sensors for biomedical application
- b) Give principles and application of nanodevices in details. **[6]**
- c) Comment on why nanodevices are replacing other devices in biomedical field. **[5]**

OR

P.T.O.

- Q4)** a) State the different types of nanodevices used in biotechnology field and explain each. [12]
b) Discuss in details about molecular nanotechnology. [5]

- Q5)** a) What is a Biochip? Discuss. [6]
b) Give a explanation on Transponder and Reader components used in biochip. [6]
c) What are the application of biomaterial in biosensing and bioelectronics? Discuss. [6]

OR

- Q6)** a) Discuss in details about: [12]
i) DNA biosensor and
ii) Optical biosensor
b) What are the several features of biomaterials as building blocks for nanoparticle architectures? [6]

- Q7)** a) What are the potential risks and benefits of nanobiotechnology for human health? Discuss. [8]
b) What is a fuel cell? Explain in details. [9]

OR

- Q8)** a) Write a details note on: [12]
i) Enzyme based biosensors
ii) DNA based biosensor
iii) Electrochemical biosensors
iv) Conductometric biosensors
b) Discuss the various application of biosensor in environment. [5]

x x x

Total No. of Questions : 8]

SEAT No. :

PA-903

[Total No. of Pages : 2

[5927]-316

B.E. (Biotechnology)

STEM CELL BIOLOGY AND REGENERATIVE MEDICINE

(2019 Pattern) (Semester - VII) (415464 C) (Elective - 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 indicate full marks.
- 3) Assume suitable data if necessary.

- Q1)** a) Write note on facultative stem cells. [6]
b) Write note on stem cells differentiation and plasticity. [6]
c) Describe in detail characterization protocols of stem cells. [6]

OR

- Q2)** a) Describe the method involved in isolation and culturing of somatic stem cells. [6]
b) Explain the process of regeneration of stem cells in planaria. [6]
c) Write in detail about tissue regenerative capacity of adult stem cells. [6]

- Q3)** a) Describe in detail about the stem cells interventions. [9]
b) Explain the guidelines for stem cells therapy and clinical trials in India. [8]

OR

- Q4)** a) Write note on Embryo Ethics and Egg donation Ethics. [9]
b) Explain about Ethics involved in Gene editing. [8]

- Q5)** a) What are the computational tools involved to dissect stem cells, describe in detail. [8]
b) Write note on natural and synthetic scaffolds for tissue engineering. [10]

P.T.O.

OR

- Q6)** a) Describe in detail about synthetic and 3D polymeric scaffolds. [10]
b) What are leveraging tools are used to study stem cell biology explain it in detail. [8]

- Q7)** a) Write short note on disease modeling and drug screening. [8]
b) Describe in detail about in-vivo transdifferentiation in cardiac fibroblasts into cardiomyocytes. [9]

OR

- Q8)** a) Describe the cell replacement therapies from Pluripotent cells considering dopaminergic neurons. [8]
b) Write note on cell replacement therapies from Pluripotent stem cells. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1649

[Total No. of Pages : 2

[5927]-317

B.E. (Chemical Engineering)
PROCESS DYNAMICS AND CONTROL
(2019 Pattern) (Semester - VII) (409341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 Time integral performance criteria? Explain it in detail. [9]
b) Draw root locus of the control system with following transfer function
$$G(S)H(S) = K / S(S+1(S+5))$$
 [9]

OR

- Q2)** a) What is one quarter decay ratio criteria used for tuning of controllers? Explain it in detail. [9]
b) What is Cohen Coon technique used for tuning of controllers? Explain in detail. [9]
- Q3)** a) Draw Bode plot for First order system. [8]
b) Draw Bode plot for Second order system. [9]

OR

- Q4)** a) Draw Nyquist plot for first order system. [8]
b) Draw Nyquist plot for second order system. [9]
- Q5)** a) What is split range control? Explain with suitable diagram and example. [9]
b) What is ratio control? Explain with suitable diagram and example. [8]

OR

P.T.O.

- Q6)** a) What is Gain scheduling adaptive control? Explain with suitable diagram and example. [9]
- b) What is Programmed or scheduled adaptive control? Explain with suitable diagram and example. [8]

- Q7)** a) Write short note on [9]
- i) Sampler
- ii) Hold elements
- b) Explain digital Multiple loop control with neat diagram. [9]

OR

- Q8)** a) Write short note on Supervisory control. [6]
- b) Write short note on DCS. [6]
- c) Write short note on PLC. [6]

Total No. of Questions : 8]

SEAT No. :

PA-1650

[Total No. of Pages : 3

[5927]-318

B.E. (Chemical)

CHEMICAL REACTION ENGINEERING - II

(2019 Pattern) (Semester - VII) (409342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the different type of adsorption isotherm observed in case of heterogeneous catalytic chemical reaction. [9]

- b) For 8 gm of catalyst sample is studied with N₂ adsorption at -195.8 C. the following data were obtained. The vapor pressure of N₂ at - 195.8C is taken as 1 atm. Estimate surface area of the catalyst. [9]

P in mm Hg-	6	25	140	230	285	320	430	505
N ₂ adsorbed (O°C & 1 atm)	61	127	170	197	215	230	277	335

OR

Q2) a) Explain the helium-mercury method for determination of catalyst pore volume. [9]

- b) Explain the pore volume distribution methods of porous catalyst. [9]

Q3) a) Derive an expression for diffusion of gaseous in single cylindrical pore of catalyst. [9]

- b) Derive the expression for effectiveness factor of single cylindrical pore of the catalyst. [9]

OR

Q4) a) Explain Thiele modulus and give the significance of the Thiele modulus. [9]

- b) Explain the selectivity for a porous catalyst in parallel and series catalytic reaction. [9]

P.T.O.

Q5) The kinetics of the reaction is as follows:



The feed rate is 2000 mol/hr of pure A at 3.2 atm and 117 °C temperature. The conversion in the packed bed reactor is 35% of A to R. Determines the amount of catalyst needed in a packed bed reactor with.

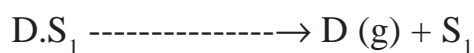
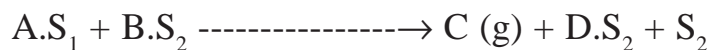
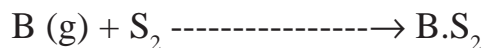
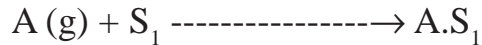
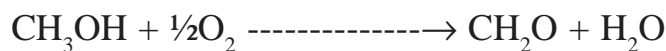
a) Very large recycle rate and

b) No recycle rate

[18]

OR

Q6) a) For the following reaction occurring on the catalyst; derive the rate expression for surface reaction to be rate controlling and dual site mechanism. S_1 are the site occupied by H_2O and CH_3OH and S_2 are occupied by O_2 .



[9]

b) The results of the kinetic runs on the reaction $A \rightarrow R$ made in an experimental packed bed reactor using a fixed feed rate $F_{A0} = 10 \text{ kmol/h}$ are as follows.

W, Kg catalyst -	1	2	3	4	5	6	7
X_A	- 0.12	0.2	0.27	0.33	0.37	0.41	0.44

i) find the reaction rate at 40% conversion

ii) for feed rate of 400 kmol/h to large scale packed bed reactor, find the amount of catalyst needed for 40% conversion. [9]

- Q7) a)** Explain the slurry reactor in detail. [8]
- b) Explain the inhibition in the enzyme catalyzed reaction with foreign substrate. [8]

OR

- Q8) a)** Explain the procedure for determining the M-M kinetic constants in batch or plug flow and mixed flow reactor. [8]
- b) A sucrose is hydrolyzed at ambient temperature by the enzyme sucrose as follows:

Sucrase

Sucrose -----> Products

Starting with a sucrose concentration $CA_0 = 1 \text{ mol/m}^3$ & Sucrase (enzyme) concentration $CE_0 = 0.01 \text{ mol/m}^3$. The following kinetic data are obtained in a batch reactor.

t, hr	2	6	10
CA, mol/m ³	0.68	0.16	0.006

Find a rate equation to represent the kinetics of this hydrolysis reaction. [8]



Total No. of Questions : 08]

SEAT No. :

PA-1651

[Total No. of Pages : 3

[5927]-319
B.E. (Chemical)
CHEMICAL ENGINEERING DESIGN
(2019 Pattern) (Semester-VII) (409343)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is temperature correction factor? How is it calculated in design of heat Exchanger? **[9]**
- b) Discuss on fluid allocation on tube side and shell side in shell and tube Exchanger **[9]**

OR

- Q2)** 1800 kg/hr of ethylene glycol is to be cooled from 100 °C to 60 °C by water available at 15 °C. The maximum temperature to which water can be heated is 42 °C. Ethylene glycol is circulated through the tubes while water flows through the annulus of a concentric tube heat exchanger. **[18]**

Inside tube is of copper while outside tube is of steel.

Inside diameter of copper tube = 12.5 mm.

Outside diameter of copper tube = 14.5 mm.

Inside diameter of steel tube = 22 mm.

Fouling resistance and metal wall resistance can be neglected.

Suggest a suitable design of concentric tube heat exchanger.

The properties of ethylene glycol and water at mean temperature are:

P.T.O.

Properties	Ethylene glycol	Water
Specific heat, J/kg K	2650	4180
Viscosity, N-s/m ²	3.2×10^{-3}	0.853×10^{-3}
Density, kg/m ³	1078	995
Thermal conductivity, W/mK	0.261	0.614

Q3) a) Explain design variables in distillation. [6]

b) Find the diameter of the plate column for the following : [11]

System: Acetone - water distilled to recover acetone.

Minimum feed rate to the column = 9100 kg/h, Turn down ratio 70%

Molar feed rate = 673 kmol/h

No. of ideal stages = 16

Slope of bottom operating line = 5.0, Slope of top operating line = 0.57

Top composition = 94 mol% acetone, Bottom composition = essentially water

Reflux ratio = 1.35

Vapour rate at the top = 55.5 kmol/h., Vapour rate at the bottom = 162.3 kmol/h. At the bottom

ρ ; V = 0.73 kg/m³ , L = 954 kg/m³

Bottom pressure = 1.26 bar, Liquid surface tension = 57×10^{-3} N/m At the top:

ρ ; V = 2.05 kg/m³, L = 754 kg/m³

Pressure = 1 bar, Surface tension 23×10^{-3} N/m

Assume tray spacing = 0.5m

K_1 bottom = 7.5×10^2 , K_1 top = 9×10^2

OR

Q4) a) Explain the following method of calculating plate and column efficiencies.
i) AIChE method ii) Van winkles method. [9]

b) Give comparison of plate contactor used in plate distillation column. [8]

Q5) a) Explain design procedure with equations for packed column in details. [8]

b) Explain packing support, liquid distributors, and liquid redistributors in the column internals with neat sketch. [9]

OR

- Q6)** a) Explain Cornell's method for prediction of height of transfer units in details. [8]
b) Give reasons why channeling and bypassing may occur in a packed column. [9]

- Q7)** a) Write the equations & design considerations for natural gas pipe line. [9]
b) Water flows through a pipeline/38 @ 1 kg/s., over a distance of 2 km. The impressed head of water= 9.8 m. What is the diameter of pipeline if $\rho = 1000 \text{ kg/m}^3$ & $\mu = 1 \text{ m-Ns/m}^2$. [9]

OR

- Q8)** a) How is appropriate material selection important for piping? Explain with example. [9]
b) What are the various types of supports used for piping? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1652

[Total No. of Pages : 2

[5927]-320

B.E. (Chemical)

ENVIRONMENTAL ENGINEERING

(2019 Pattern) (Elective-III) (Semester-VII) (409344(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) *Assume suitable data if necessary.*

Q1) a) Explain any three ways to reduce the NO_x emissions from the stationary source. **[12]**

b) A multi-tray settling chamber having 8 tray, including the bottom surface handles. 6m³/s of air at 20 °C. The trays are spaced 0.25 m apart and the chamber is to be 1 m wide and 4 m long. What is the minimum particle size of density 2000 kg. m³ that can be collected with 100% efficiency? What will be the efficiency of the settling chamber if 50 µm particles are to be removed? Laminar flow condition within the chamber and presence of no dust initially on trays may be assumed. **[6]**

OR

Q2) Explain following pollution control equipment with a neat sketch **[18]**

- i) Venturi Scrubber
- ii) Fabric Filter

Q3) a) Explain in detail the effect of following water pollutant. **[12]**

- i) Detergent
- ii) Plant nutrient
- iii) Inorganic Chemicals and Minerals

b) Write an explanatory one on dissolved Oxygen. **[5]**

OR

P.T.O.

- Q4) a)** Liquid effluent ($104 \text{ m}^3/\text{day}$) from a food processing unit is to be treated by the activated sludge process at 30°C from an initial (BOD) 5 days of 650 mg/l to a final (BOD) 5 days of 25 mg/l . Bench-scale studies at 20°C and mixed-liquor biomass concentration of 3000 mg/l , gave BOD removal rate coefficient of 14 (day)^{-1} . Estimate the retention time and size of the unit. θ_1 (temperature coefficient)=1.02. [12]
- b) Write a note on Chemical Oxygen Demand (COD). [5]

Q5) Explain principle, construction and working of Trickling filter. [18]

OR

Q6) Explain the process design and basic operating principle of activated sludge (Suspended growth) Process. [18]

Q7) What do you mean by disinfection? Enlist the various agents used in disinfection. Explain with a neat sketch process involved in tertiary waste water treatment. [17]

OR

- Q8) a)** Explain in detail composting. [9]
- b) Discuss in detail about incineration. [8]



Total No. of Questions : 10]

SEAT No. :

PA-1653

[Total No. of Pages : 2

[5927]-321

B.E. (Chemical Engg.)

MEMBRANE TECHNOLOGY

(2019 Pattern) (Elective-III) (Semester-VII) (409344B)

Time : 2½Hours]

[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 indicate full marks.
- 3) Neat diagram must be drawn whenever necessary.
- 4) Assume suitable data if necessary.

Q1) a) Define membrane? What are criteria for selection of membrane for industrial separation? [6]

b) Define: [4]

- i) Selectivity
- ii) Molecular weight cut off
- iii) Trans membrane pressure.
- iv) Flux rate.

OR

Q2) a) Explain in details types of polymeric material used for preparation of membrane. [6]

b) Explain with neat sketches isotropic and anisotropic membrane. [4]

Q3) a) Explain in details phase inversion techniques for membrane casting. [5]

b) Explain in details Knudsen diffusion and surface diffusion through micro porous membranes. [5]

OR

Q4) a) Give short notes with neat sketches the following. 1 Hollow fibre membrane module. [6]

b) Give short notes on transport through micro porous and dense membrane. [4]

P.T.O.

- Q5) a)** What is temperature polarisation? Explain in details with suitable example. [8]
b) Explain in details about types of cleaning membrane. [8]

OR

- Q6) a)** What is concentration polarization? And give the methods to reducing concentration polarization. [8]
b) Explain in details with suitable gel layer model. [8]

- Q7) a)** Define reverse osmosis? And explain in details with suitable sketches application of reverse osmosis for desalination of sea water. [10]
b) Give the applications of microfiltration membrane for sterile filtration in pharmaceuticals. [6]

OR

- Q8) a)** Describe in details application of ultrafiltration membranes in classification of fruit juice. [10]
b) Give the application of Nano filtration membrane for organic solvent separation. [6]

- Q9) a)** Describe in details application of membrane for separation for hydrogen. [10]
b) Define membrane distillation? Give types of membrane distillation. explain any one with suitable example. [8]

OR

- Q10) a)** Distinguish between membrane reactor and membrane bioreactor with suitable example. [8]
b) Describe in details application membrane for recovery of metals from dilute solution. [10]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PA-1654

[5927]-322

B.E. (Chemical)

INDUSTRIAL PIPING

(2019 Pattern) (Semester-VII) (Elective-III) (409344 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, and Q.7 or Q.8.*
- 2) *Figures to right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain BOM and piping isometrics. [9]

- b) Explain the piping layout consideration of. [9]
- i) Pipe racks
 - ii) Pumps.

OR

Q2) a) Explain the plot plan and equipment layout. [9]

- b) Explain the piping layout consideration of [9]
- i) Heat exchangers.
 - ii) Storage tank.

Q3) a) Discuss the complex pipelines systems in series and parallel configuration. [9]

- b) Write a note on pipeline storage capacity. [8]

OR

Q4) a) Write the design procedure of the dispersed flow. [9]

- b) Discuss the various steps and design parameters for slurry pipelines. [8]

Q5) a) Discuss piping arrangements and factors considered in the piping design of the heat exchanger. [9]

- b) Discuss piping techniques for pumps and compressors. [8]

OR

P.T.O.

- Q6)** a) Discuss various empirical correlations for the flow of oil, gasoline, and hydrocarbon. [9]
- b) Discuss various empirical correlations for the flow of oil. [8]

- Q7)** a) A 40 mm diameter electric cable of an Aluminium conductor of thermal conductivity 240 W/mK is to be insulated with rubber of thermal conductivity 0.15 W/mK. The cable is to be located in the air with a heat transfer coefficient of 6 W/m²K. Calculate the critical thickness of insulation. [9]
- b) Write down the different types of insulation material. Discuss mostly used insulating materials in the industrial and commercial piping industry. [9]

OR

- Q8)** Write a short note on: [3×6]
- a) Critical thickness of insulation.
- b) Hot and cold insulation in piping.
- c) The optimum thickness of insulation.



Total No. of Questions : 8]

SEAT No. :

PA-1655

[Total No. of Pages : 2

[5927]-323

B.E. (Chemical)

PETROLEUM REFINING

(2019 Pattern) (Semester-VII) (Elective-III) (409344D)

Time : 2 ½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3. or Q4, Q5 or Q6, and Q7 or Q8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain the operation and working of the thermal cracking process with a neat schematic diagram. **[9]**

b) Write the recent development of FCC along with a neat schematic diagram. **[8]**

OR

Q2) a) What is the reforming process? Discuss the mechanism and working of the reforming process with a neat schematic diagram? **[9]**

b) What is the mechanism of the hydrocracking process? Describe the hydrocracking process with a neat schematic diagram. **[8]**

Q3) a) Explain the manufacturing of Bitumen with a schematic diagram. **[9]**

b) Discuss various additives for lube oil. **[8]**

OR

Q4) a) Describe the solvent extraction process with a typical diagram. **[10]**

b) Explain in detail about various properties of lube oil. **[7]**

Q5) a) Why desulphurization is necessary for the refinery? Discuss the Hydrodesulphurization process with a typical schematic diagram along with reaction and operating parameters. **[12]**

b) Write in detail about environmental aspects used in the refineries. **[6]**

OR

P.T.O.

- Q6)** a) Describe the process of hydrogen treatment with the typical schematic diagram. [9]
- b) What is the blending operation and explain the line blending operation. [9]

- Q7)** a) Discuss the impact of refinery processes and operations on health, safety and the environment. [9]
- b) Write in detail about housekeeping strategies used for petroleum and petroleum products. [9]

OR

- Q8)** a) Discuss the various strategies for marketing petroleum products. [9]
- b) What safety aspects are practiced in the refineries. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1656

[Total No. of Pages : 2

[5927]-324

B.E. (Chemical)

CHEMICAL PROCESS SYNTHESIS

(2019 Pattern) (Elective - IV) (Semester - VII) (409345A)

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 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 simple distillation for separation of heterogeneous mixtures with example. **[8]**

b) Discuss various types of dryers. **[8]**

OR

Q2) Write notes on: **[16]**

a) Centrifugation.

b) Azeotropic distillation.

Q3) Explain with sketches the concept of heat integration of sequences of distillation sequencing using thermal coupling. **[18]**

OR

Q4) a) Discuss integration of heat pump. **[9]**

b) Explain optimization of reducible structure in detail. **[9]**

P.T.O.

- Q5)** a) Explain the concept of Energy targets in Heat Exchanger Network. [9]
b) Explain graphically heat recovery pinch. [9]

OR

- Q6)** a) Explain the concept of Threshold problems in heat exchanger network.[9]
b) Explain the Problem Table Algorithm in Pinch technology. [9]

- Q7)** a) Explain the intensification of hazardous materials. [9]
b) Write in brief on Toxic releases from chemical processes industries. [9]

OR

- Q8)** a) Explain overall safety and health considerations in Chemical industries.[9]
b) Attenuation of hazardous materials. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PA-904

[Total No. of Pages : 2

[5927]-325

B.E. (Chemical)

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

(2019 Pattern) (Semester - VII) (Elective - IV) (409345 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Discuss Peter Drucker theory about entrepreneurial pitfalls. **[9]**

b) Explain the role of the National Institute of Entrepreneurship and Small Business Development (NIESBUD). **[9]**

OR

Q2) a) Describe the role, problems and prospects for women entrepreneur's development. **[9]**

b) What is the role of central government and state government in promoting entrepreneurship. **[9]**

Q3) a) Explain various theories of team development. **[9]**

b) Explain the use of visual and presentation aids. **[8]**

OR

Q4) a) Write an explanatory note of team the role theory by Henry Mintzberg. **[9]**

b) Discuss various management theories and managerial work with typical examples. **[8]**

P.T.O.

- Q5)** a) Describe resource management & the crashing techniques. [9]
b) Elaborate on the Six Sigma concept. Enlist its advantages and requirements [8]

OR

- Q6)** a) Explain various project management based on Microsoft project. [9]
b) Describe various uncertain activity times and tracking techniques. [8]

- Q7)** a) Describe the sampling design and data collection methods. [9]
b) Discuss the various strategies of integrated marketing communications.[9]

OR

- Q8)** Write a note on following : [18]
a) Business-to-Business marketing
b) Promotion and Pricing
c) Channel of Distribution



Total No. of Questions : 8]

SEAT No. :

PA-905

[Total No. of Pages : 2

[5927]-327

B.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(2019 Pattern) (Semester - VII) (Elective - IV) (409345D)

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 reactive distillation process. [8]
b) Explain in detail separation based on reversible chemical complexation. [10]

OR

- Q2)** a) Give the solute characteristics of reversible chemical complexation. [10]
b) Explain reactive extraction process with applications. [8]

- Q3)** a) Explain Liquid Emulsion membrane. [7]
b) Discuss the classification of membrane processes along with its applications. [10]

OR

- Q4)** a) Explain basic types of modules used in Reverse Osmosis. [7]
b) Explain dialysis and electrodialysis with neat sketches and its applications. [10]

P.T.O.

- Q5)** a) Give application of chromatography in separation of enzymes and proteins. [10]
b) Describe the types of chromatography. [8]

OR

- Q6)** Explain in detail with neat diagram i) Pressure Swing adsorption (PSA) and ii) Temperature Swing adsorption (TSA). [18]

- Q7)** a) Explain on Zone Electrophoresis. [7]
b) Explain adsorption properties and applications of Molecular sieves. [10]

OR

- Q8)** a) Explain the Zone refining process in details with its applications. [10]
b) Explain short note on properties of Foam. [7]



Total No. of Questions : 8]

SEAT No. :

PA-906

[Total No. of Pages : 2

[5927]-328

B.E. (Civil Engg.)

FOUNDATION ENGINEERING

(2019 Pattern) (Semester - VII) (401001)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

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

- i) Coeff. of Compressibility
 - ii) Compression Index
 - iii) Coefficient of volume Compressibility
 - iv) Degree of Consolidation
 - v) Coeff. of Consolidation.
- b) Draw contact pressure diagram for surface and deep footing in clay for flexible and rigid footing. **[6]**
- c) An oedometer test gives time for 90% consolidation as 16 minutes on a 20 mm thick specimen (double drainage). Determine the time required for 50% consolidation for a clay bed 3m thick with single face drainage. **[6]**

OR

Q2) a) Discuss with sketch, logarithm of time fitting method for determination of coefficient of consolidation. **[5]**

- b) Explain the following terms: **[6]**
- i) Normally consolidated soil
 - ii) Pre consolidated soil
 - iii) Under consolidated soil.
- c) The overburden pressure at the middle of 7.5 mm thick clayey layer increased from 2kg/cm² to 3.5kg/cm². Find the settlement due to consolidation assuming liquid limit and initial void ratio of the clay as 36% and 0.82 respectively. **[6]**

P.T.O.

- Q3)** a) Discuss the necessity of pile foundation. [5]
b) What is negative skin friction? How it is calculated for single pile embedded in two layers of clay. [6]
c) 20 piles are arranged in four rows and five columns. Calculate the efficiency of the pile group by Feld's rule. [6]

OR

- Q4)** a) Explain the procedure for calculation of bearing capacity of single pile by static method? [5]
b) Discuss static pile load test. [6]
c) A circular pile with 0.35m diameter and 10m length penetrates a deposit of clay having cohesion 5 kN/m² and mobilizing factor of 0.8. Calculate the ultimate frictional resistance of the pile. [6]

- Q5)** a) Explain design steps of raft foundation by conventional (rigid) method. [6]
b) Draw well foundation and state the function of each component. [6]
c) Write a note on [6]
i) Uses of caissons
ii) Sand island method

OR

- Q6)** a) Explain the steps involved in proportioning of isolated footing. [6]
b) Define shift and tilt of well foundation. Enlist any four ways to rectify the tilt. [6]
c) How the depth of well foundation is decided? Enlist the forces acting on well foundation. [6]
- Q7)** a) Enlist types of cofferdams. Explain any one type with a neat sketch. [6]
b) Discuss the design principle of undreamed pile. [6]
c) Describe Stone Column Technique with a neat sketch. [6]

OR

- Q8)** a) Discuss preloading with prefabricated vertical drains/sand drains with a neat sketch. [6]
b) Explain with a neat sketch the construction method of R.C. diaphragm wall. [6]
c) Describe engineering problems associated with black cotton soil. [6]

Total No. of Questions : 8]

SEAT No. :

PA-2672

[Total No. of Pages : 3

[5927]-329

B.E. (Civil)

**TRANSPORTATION ENGINEERING
(2019 Pattern) (Semester - VII) (401002)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** The design speed of a highway is 90 kmph. There is horizontal curve of radius 200 m on a certain section. Allowable limit of lateral coefficient of friction is 0.15. **[10]**
- i) Calculate the superelevation required to maintain this speed.
 - ii) If the maximum allowable superelevation is 7.0 percent, calculate the allowable speed on this horizontal curve.
- b) Draw a neat cross section of **[6]**
VR in embankment and MDR in cutting in rural area: **[2]**
- c) Define Camber?

OR

- Q2) a)** The ascending gradient of 2 per cent meets a descending gradient of 1 in 80. Determine the length of summit curve to provide **[10]**
- i) SSD and
 - ii) OSD of 470 m, for design speed of 80 kmph. Assume all other data as per IRC guidelines.
- b) Calculate the stopping sight distance on a highway at an ascending gradient of Two percent for a design speed of 60 kmph. Assume other data as per IRC recommendations? **[6]**
- c) List the various types of transition curves used on horizontal curves of highways. **[2]**

P.T.O.

- Q3)** a) What are the different types of bituminous binders used in highway construction? Under what circumstances each of these materials is preferred? [6]
- b) Define Flakiness Index (FI). How FI is determined in the laboratory. [6]
- c) Write a note on Marshall method of bituminous mix design. [5]

OR

- Q4)** a) For a construction of a bituminous road in a certain locality, contractor has received 30/40 grade of bitumen from refinery. Explain in brief the test to be carried out to confirm the grade of the bitumen. [6]
- b) Define Elongation Index (EI). How EI is determined in the laboratory. [6]
- c) Explain in brief the importance of gradation of aggregates in design of bituminous and Non bituminous layer of flexible pavement. [5]

- Q5)** a) Using the following data calculate the wheel load stress at the edge region of a cement concrete pavement using H.M. Westergaards's equation:
Wheel load = 5100 kg, Modulus of Elasticity of concrete = 3×10^5 kg/cm², Pavement thickness = 15 cm, Poisson's ratio = 0.15, Modulus of subgrade reaction = 7.0 kg/cm³, Radius of wheel load contact = 16 cm. [8]
- b) Differentiate between warping stress and frictional stress in rigid pavement. [6]
- c) Write a note on joints in cement concrete pavement. [4]

OR

- Q6)** a) A two lane two way road is carrying an initial traffic of 1600 Commercial Vehicles per day (CVPD) is to be strengthened to cater the need of growing traffic. The rate of growth of traffic is 8% per annum. The pavement is to be designed for 20 years. Calculate the VDF if pavement has to sustain cumulative standard axle load repetitions of 33.40 million during its design life. It is suggested to use the factor of 0.5 to account for lateral placement of wheel loads. [8]
- b) What do you mean by pavement design? State the any five factors to be considered for the design of rigid pavement (explanation of factors is not required) [6]
- c) Differentiate between flexible and rigid pavements. [4]

- Q7)** a) A bridge is proposed to be constructed across an alluvial stream carrying a discharge of 400 m^3 per second. Assume Lacey's silt factor equal to 1.5. Calculate the scour depth when
- i) Bridge consists of Two spans of 40 m each
 - ii) Three spans of 35 m each. **[8]**
- b) Define bridge. State the various components of bridge. **[4]**
- c) State the various requirements of an ideal permanent way. **[5]**

OR

- Q8)** a) Define the following terms: **[8]**
- i) Submersible bridge
 - ii) Skew bridge
 - iii) Class B bridge
 - iv) Through bridge
- b) State the merits and demerits of railway transportation. **[4]**
- c) State the various ideal bridge site characteristics. **[5]**

Total No. of Questions : 8]

SEAT No. :

PA-907

[Total No. of Pages : 2

[5927]-330

B.E. (Civil)

COASTAL ENGINEERING

(2019 Pattern) (Semester-VII) (401003A) (Elective-III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Write a detail note on tidal power and discuss the issues in establishing a tidal power plant in a country like India considering the economic feasibility, engineering feasibility, geometeorological feasibility. [9]
- b) Elaborate in detail dynamic theory of tides- types. [9]

OR

- Q2) a)** Define tidal currents in shallow sea? What are the spring and neap currents? What are the forces which affects the tidal currents in shallow sea? What are the storm surges? [9]
- b) How the tides in rivers and estuaries are different than oceanic tides? What are the storm surges? What are the effects of tides on day-to-day lifelong activities along the nearshore region? What are the preventive measures in practice which are necessary to be taken in nearshore region? [9]

- Q3) a)** Differentiate between the offshore and nearshore sediment transport. What is sediment budget? Give expression to determine the sediment budget for longshore sediment transport. Explain the effect of different wave conditions on sediment transport. [8]
- b) Compare the enlisted factors determining Littoral Wave Climate and explain their interdependency at the time of longshore sediment transport. [9]
- i) Offshore Wave Climate
 - ii) Effect of Bottom Topography
 - iii) Nearshore Wave Climate

OR

P.T.O.

- Q4)** a) Draw a schematic profile of nearshore zone showing the sediment transport along with proper titles of different parts and elaborate in detail the mechanism of nearshore sediment transport. [8]
- b) Write detail note about the enlisted factors determining Littoral Wave Climate and explain interdependency of these factors at the time of longshore sediment transport. [9]
- i) Effect of Bottom Topography
 - ii) Winds and Storms.
 - iii) Nearshore Wave Climate

- Q5)** a) Characterize the various types of coastal structures based on coastal protection, shore protection, mixed coastal and shore protection, draw schematic or line diagrams representing the any 4 structures and write 2 applications of each. [9]
- b) What is the concept breakwater? How it useful shore protection? Explain following types of breakwaters in depth. [9]
- i) Reef breakwaters
 - ii) Detached breakwaters
 - iii) Floating breakwaters

OR

- Q6)** a) Draw the representative diagrams of sea walls, sea dikes, revetments, bulkheads and explain each of them in depth along with their functions.[9]
- b) Draw the figures and explain Artificial Beach Nourishment and beach dewatering (or beach drain) as shore protection measures. [9]
- Q7)** a) Which are the coastal zone management activities? What is integrated coastal zone management? Discuss the issues related to coastal zone management? Enlist 2 innovative practices in coastal zone management.[8]
- b) Write short note about the estuaries, wet lands and lagoons, coastal dunes. [9]

OR

- Q8)** a) What are the causes of pollution in coastal zone? Discuss the various issues for disposal of waste/dredged spoils in the coastal zones. [8]
- b) How the oil spills and contaminants causes the pollution in sea water? What are the primary reasons of oil pills? What are remedial measures to reduce the pollution caused by the oil spills? [9]



Total No. of Questions : 8]

SEAT No. :

PA-2620

[Total No. of Pages : 3

[5927]-331

B.E. (Civil)

**ADVANCED DESIGN OF CONCRETE STRUCTURES
(2019 Pattern) (Semester - VII) (Elective - III) (401003 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) *Figures in bold to the right, indicate full marks.*
- 3) *IS 456, IS 3370, IS1893 and IS 13920 are allowed in the examination.*
- 4) *The designs should comply with the latest codal provisions.*
- 5) *If necessary, assume suitable data and indicate clearly.*
- 6) *Use of electronic pocket calculator is allowed.*

Q1) a) Explain with neat sketches, different types of retaining walls. **[4]**

- b) Propose suitable dimensions and perform the stability analysis for L-shaped retaining wall provided to retain a horizontal leveled back fill of height 3m having unit weight respectively equal to 18 kN/m³. Angle of repose = 31°, Coefficient of friction between concrete and soil = 0.6, SBC of soil = 150 kN/m², depth of foundation = 1.0m. **[13]**

OR

Q2) A L-shaped retaining wall of height 4 m is to be provided to retain a levelled backfill having unit weight equal to 18 kN/m³, with angle of repose = 30°. Coefficient of friction between concrete and soil = 0.55, SBC of soil = 150 kN/m², depth of foundation = 1.0m. Carry the stability analysis and design the retaining wall showing the details of reinforcement. **[17]**

Q3) a) Using coefficients from IS 3370, determine the bending moments and hoop tension at 1m interval of height for a circular water tank of height 4m and diameter 7.7 m. The tank wall is free at top and hinged at bottom. Design the wall for the maximum actions. Detailing not required. **[10]**

P.T.O.

- b) Describe the approximate method of analysis for rectangular water tank of length L , width B and height H for conditions $L/B \leq 2$ and $L/B > 2$. [8]

OR

Q4) Design the wall of a rectangular water tank of size $5.0\text{m} \times 4.0\text{m} \times 3.0\text{m}$. Use Fe 500 grade of steel and M30 grade of concrete. Draw the detailing of reinforcement in sectional plan and elevation. [18]

- Q5) a)** Explain in detail the steps for design of shear wall with boundary elements and show schematic sketch of the ductile detailing of the reinforcement for shear wall. [10]
- b) Draw schematic sketches of types of shear wall. Describe the functions of shear walls. Also emphasis the role of boundary elements in the shear wall. [8]

OR

Q6) a) How is the location of shear wall decided? Explain the failure patterns for a shear wall. [4]

- b) Design a ductile solid shear wall with boundary elements, for a residential building, located in seismic zones IV. Use M30 grade concrete and Fe500 grade of steel. Consider the height of shear wall as 15m & length of shear wall as 4.5m.

The RC shear wall is subjected to the following loadings, Shear Force = 600 kN, axial force = 8000 kN, and moment = 5,200 kNm. [14]

Q7) a) Using seismic coefficient method calculate the base shear for an unbraced building located in Pune. The building is having plan dimensions $20\text{ m} \times 20\text{ m}$ having 4 similar bays in both direction. The soil conditions are medium stiff. The R.C. frames are infilled with brick-masonry. The lumped weight due to dead loads is 12 kN/m^2 on floors and 10 kN/m^2 on the roof. The floors are to cater for a live load of 3 kN/m^2 on floors and 1.5 kN/m^2 on the roof. The total height of the building is 10.5 m with floor height as 3.5 m. Calculate the base shear and show shear distribution over the height of the building. [12]

- b) Explain the approximate method of analysis for gravity loads for a multistory frame. [5]

OR

- Q8)** a) Analyse the substitute frame consisting of two bays of equal length of 4.5 m and column of length 3.5 m. The continuous beam may be designated as ABC. Find the maximum sagging moment at the center of span and maximum hogging moment at A and B. Assume the frames of the building to be spaced at 3.5 m c/c. Consider the following data for analysis.

Thickness of floor = 150 mm

Live load = 2kN/m²

Floor finish = 1kN/m²

Overall size of beam = 230 mm × 450 mm [13]

Size of column = 400 mm × 40 mm

- b) Explain in brief the seismic coefficient method of analysis to find the lateral forces on a multistory frame. [4]



Total No. of Questions : 8]

SEAT No. :

PA-908

[Total No. of Pages : 2

[5927]-332

B.E. (Civil)

**INTEGRATED WATER RESOURCES PLANNING AND
MANAGEMENT**

(2019 Pattern) (Elective-III) (Semester-VII) (401003 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 side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Justify importance assessment of river water quality and write a brief note on prevention and control of surface water pollution. **[10]**

b) What is water quality monitoring for basins. **[8]**

OR

Q2) a) What is Environmental Impact Assessment (EIA) and what are its objectives, state methodology to carryout EIA. **[10]**

b) State any four CPCB regulations regarding water pollution control. **[8]**

Q3) a) State and explain principles of planning and financing water of water resources projects. **[10]**

b) Explain how water is economic good. **[7]**

OR

Q4) a) Explain framework for planning a sustainable water future. **[10]**

b) Explain in brief economics and decision making in IWRPM **[7]**

P.T.O.

- Q5) a) What are water crises, explain its global and national perspective [10]**
b) State and explain rural local governing body water laws. [8]

OR

- Q6) a) State and explain UN laws on non-navigable uses of international water courses [10]**
b) State any four municipal corporation laws regarding water supply and drainage. [8]

- Q7) a) Explain in detail role of dam in flood control and power generation and its importance in IWRPM. [10]**
b) Explain importance of management of flood plains [7]

OR

- Q8) a) What is flood forecasting, what are the methods to forecast flood. [10]**
b) Explain application of soft computing in flood control. [7]



Total No. of Questions : 8]

SEAT No. :

PA-1657

[Total No. of Pages : 3

[5927]-333

B.E. (Civil Engineering)

FINITE ELEMENT METHOD

(2019 Pattern) (Elective-III) (Semester-VII) (401003D)

Time : 2 ½Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write short note on CST and LST elements. [6]
- b) Write short note on Principle of minimum potential energy. [6]
- c) Determine the shape functions for a CST element. Show that they are nothing but area co-ordinates. [8]

OR

- Q2)** a) Write short note on shape functions and enlist the various methods for deriving the shape function. [6]
- b) Enlist the various types elements used in finite element analysis with their applications. [6]
- c) Obtain strain displacement matrix for CST element. [8]

- Q3)** a) Derive shape functions for four noded and nine noded rectangular element in natural coordinate (ξ, η) system using Lagrange's interpolation function. [10]

- b) State advantages of isoparametric formulation over the explicit formulation. [6]

OR

P.T.O.

Q4) a) Derive the element stiffness matrix for a 4 noded rectangular isoparametric element using natural coordinate (ξ, η) system. [10]

b) Derive the shape functions of 4 noded tetrahedron element. [6]

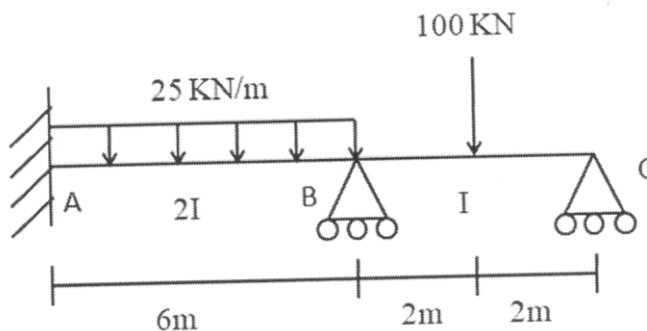
Q5) a) Derive the stiffness matrix of beam element by Direct approach. [8]

b) Determine elongations at each node of the spring assembly as shown in Figure. [8]



OR

Q6) Analyse the continuous beam as shown in figure using finite element method. Take E constant. [16]

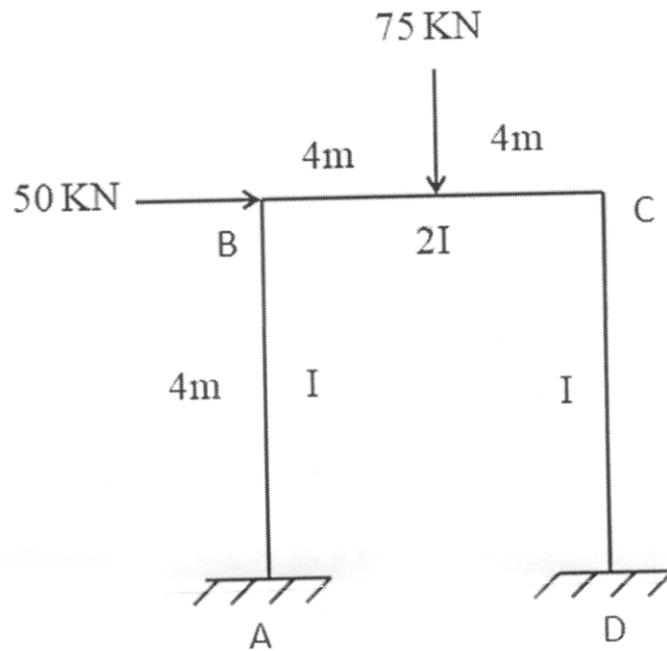


Q7) a) Derive the stiffness matrix and Transformation matrix of Frame element. [9]

b) Explain the Grid structure and derive the stiffness matrix of typical grid element. [9]

OR

Q8) Analyze the portal frame as shown in figure using finite element method. Take EI constant. [18]



Total No. of Questions : 8]

SEAT No. :

PA-909

[Total No. of Pages : 4

[5927]-334

B.E. (Civil)

DATA ANALYTICS

(2019 Pattern) (Semester - VII) (Elective - III) (401003 E)

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) *Assumes suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Discuss Data sampling, its types, methods of sampling and ideal sample size selection with relevant examples. **[6]**

- b) From following information find the correlation coefficient between advertisement expenses and sales volume using Karl Pearson's coefficient of correlation method.

Firm	1	2	3	4	5	6	7	8	9	10
Advertisement Exp. (Rs. In Lakhs)	11	13	14	16	16	15	15	14	13	13
Sales Volume (Rs. In Lakhs)	50	50	55	60	65	65	65	60	60	50

Calculate the coefficient of correlation between the import values and export values. **[6]**

- c) Calculate the coefficient of correlation from the data given below by the direct method, **[6]**

X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

OR

P.T.O.

Q2) a) Explain Sampling Distribution of the Mean and the Central Limit theorem. [6]

b) The ranking of 10 individuals at the start and finish of a training course are as follows: Calculate the Spearman's Rank correlation coefficient and interpret the value. [6]

Individual	A	B	C	D	E	F	G	H	I	J
Rank (Before)	1	6	3	9	5	2	7	10	8	4
Rank (After)	6	8	3	2	7	10	5	9	4	1

c) The following table gives indices of the industrial production of registered unemployed (in lakhs). Calculate the value of the coefficient of correlation. [6]

Year	2008	2009	2010	2010	2012	2013	2014	2015
Index of Production	100	102	104	107	105	112	103	99
Number Unemployed	15	12	13	11	12	12	19	29

OR

Q3) a) Explain following methods of Hypothesis testing: [5]

- i) Z test
- ii) t test

b) The life time of electric bulbs for a random sample of 10 from a large consignment gave the following data from the table. Can we accept the hypothesis that the average lifetime of bulbs is 4000 hours? (Apply t test. At $v = 9, t_{0.05} = 2.262$) [6]

Item	1	2	3	4	5	6	7	8	9	10
Life in 000 hours	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

c) The specimen of copper wires drawn from a large lot have the following breaking strength (in kg-weight). Test (using Student's t-statistic) whether the mean breaking strength of the lot may be taken to be 578 kg - weight (Test at 5 per cent level of significance). 578, 572, 570, 568, 572, 578, 570, 572, 596, 544. (As the observed value of t is - 1.488 for degrees of freedom = 9). [6]

OR

Q4) a) Explain: [5]

- i) Hypothesis and hypothesis testing.
- ii) Null and Alternate Hypothesis.

b) In an anti-corona compain in a certain area vaccine was administered to 1624 persons out of total population of 6496. The number of corona cases is shown below: Discuss the usefulness of vaccine in checking corona. (for $v=1, \chi^2_{0.05} = 3.84$) [6]

Treatment	Corona	No Corona	Total
Vaccine	40	1584	1624
No Vaccine	440	4432	4872
Total	480	6016	6496

c) The sales data of an item in six shops before and after a special promotional campaign are: [6]

Shops	A	B	C	D	E	F
Before the campaign	53	28	31	48	50	42
After the campaign	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5 per cent level of significance. Use paired t-test. As per t table $t < - 2.015$.

Q5) a) Explain with suitable examples: [6]

- i) Data analytics life cycle.
- ii) Data cleaning.
- iii) Data transformation.

b) From the following data, obtain the two regression equations. [6]

X	6	2	10	4	8
Y	9	11	5	8	7

c) The mean of a certain production process is known to be 50 with a standard deviation of 2.5. The production manager may welcome any change in mean value towards higher side but would like to safeguard against decreasing values of mean. He takes a sample of 12 items that gives a mean value of 48.5. What inference should the manager take for the production process on the basis of sample results? Use 5 per cent level of significance for the purpose. (table value: $R : z < - 1.645$) [6]

OR

- Q6)** a) Explain with suitable examples: [6]
 i) Data Comparing.
 ii) Data Reporting.
 iii) Data Analysis.

- b) Given the following data obtain the yield when the rainfall is 75cm. The coefficient of correlation between yield and rainfall is 0.8. [6]

	Rainfall (cm)	Yield per acre
mean	67.5	90
S.D.	7.5	15

- c) Fit a regression of expenditure (Y) on Income (X) by method of least squares. [6]

Income (₹'000)	41	65	50	57	96	94	110	30	79	65
Expenditure (₹'000)	44	60	39	51	80	68	84	34	55	48

- Q7)** a) Define Machine learning, and explain different types of machine learning and its components. [5]
 b) Explain with an example “Decision Tree” and its classifications. [6]
 c) Discuss the technique of Support vector machines. [6]

OR

- Q8)** a) Define and explain types of machine learning: supervised, unsupervised, reinforced learning. [5]
 b) Explain in detail Regression and Regression Analysis in Machine learning. [6]
 c) Explain K means Clustering. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1658

[Total No. of Pages : 4

[5927]-335

B.E. (Civil)

OPERATIONS RESEARCH

(2019 Pattern) (Semester-VII) (Elective-III) (401003-F)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Use of calculator is allowed.
- 4) Assume suitable data if necessary.

Q1) a) Solve following example using simplex method. **[8]**

$$\text{Maximize } Z=20x_1+25x_2$$

Subject to

$$12x_1 + 16x_2 \leq 100$$

$$16x_1 + 8x_2 \leq 80$$

$$x_1, x_2 \geq 0$$

b) State the advantages of dual-primal equations. **[4]**

c) Define the following terms and indicate their significance of decision making with linear programming and simplex method: **[6]**

i) Key Column

ii) Key row

OR

Q2) a) Solve using simplex method. **[8]**

$$\text{Maximize } Z=2x_1+x_2$$

Subject to

$$4x_1 + 3x_2 \leq 12$$

$$4x_1 + x_2 \leq 8$$

$$4x_1 - x_2 \leq 8$$

$$x_1, x_2 \geq 0$$

P.T.O.

- b) Write the steps involved in two phase simplex method. [4]
 c) Explain the following w.r.t. LPP. Give suitable example. [6]
 i) Entering variable.
 ii) Leaving variable.
 iii) Artificial variable.

- Q3) a) Explain steps involved in VAM. [6]
 b) Optimize following transportation problem using VAM. Optimize using u-v method for one iteration only. [12]

	D1	D2	D3	D4	Supply
S1	5	3	6	4	30
S2	3	4	7	8	15
S3	9	6	5	8	15
Demand	10	25	18	7	

OR

- Q4) a) A company has four machines on which four jobs are performed. Each job can be assigned to only one machine. The cost of each job on each machine is given in the following table. Optimize the assignment to get minimum cost. [8]

		Machines			
		A	B	C	D
Jobs	1	41	72	39	52
	2	22	29	49	65
	3	27	39	60	51
	4	45	50	48	52

- b) Find initial solution of the following transportation problem using [6]
 i) Column minima method
 ii) Row minima method

	A	B	C	Supply
1	20	70	40	50
2	30	30	10	80
3	50	40	70	70
4	10	60	20	140
Demand	70	90	180	

Which method gives the least cost for the above problem?

- c) What is meant by unbalanced assignment problem? State the steps to solve such problem. [4]

Q5) a) Optimize $Z = x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$ [6]

Subject to $x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

Use Lagrangian multiplier technique.

b) Carry out the calculation for finding the maxima of following equation using Fibonacci method with 1% accuracy in the interval (2,5) upto two iterations only.

Maximize $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$ [8]

c) What are similarities between Golden section method and Fibonacci method? [3]

OR

Q6) a) Maximize $Z = 6x_1 + 8x_2 - x_1^2 - x_2^2$ using Lagrangian multiplier method. [8]

Subject to

$4x_1 + 3x_2 = 16$

$3x_1 + 5x_2 = 15$

$x_1, x_2 \geq 0$

b) What are the managerial decision making applications of mathematical non linear programming models? [5]

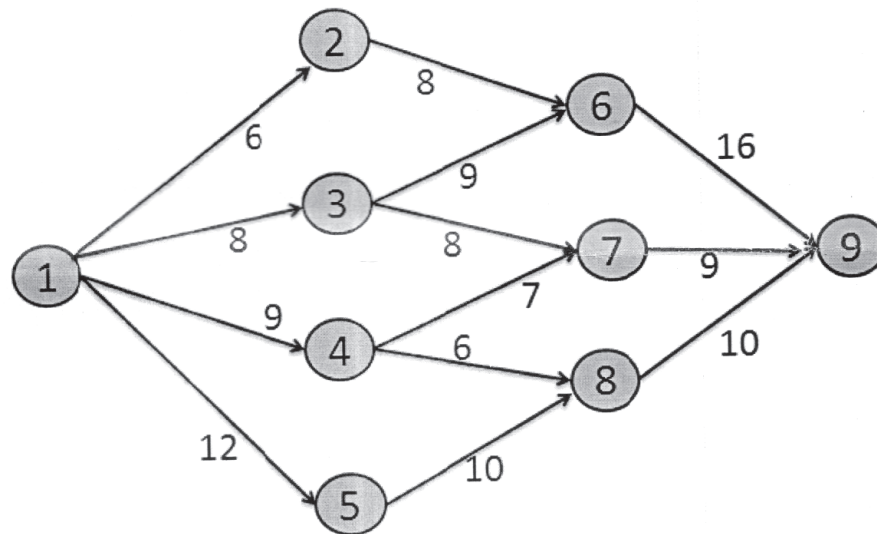
c) Using Hessian matrix, determine whether following function is convex or concave. $f(x) = 7x_1^2 + 10x_2^2 + 7x_3^2 - 4x_1x_2 + 2x_1x_3 - 4x_2x_3$ [4]

Q7) a) Consider following payoff matrix for two opponents. [9]

		Opponent2			
		P	Q	R	S
Opponent 1	A	1	7	2	5
	B	0	3	7	8
	C	5	2	6	10

- i) Check whether there exists saddle point.
- ii) Give optimum strategy for both the firms
- iii) Find the value of Game

- b) Find the shortest path between nodes 1 and 9 using Dynamic programming method [8]



The numbers on the arrows represent the distance in kms.

OR

- Q8) a) A transit mixer is purchased for Rs. 30 lacs with expected life as 10 years. The running cost and resale price in lacs of Rs. is given in the following table. [9]

Year	1	2	3	4	5	6	7	8	9	10
Running Cost	6	6	6.4	6.5	7.5	9.5	10.9	12.8	14	16
Resale Price	28	27.5	27	26	24	22.5	21	20	17	13

Find the replacement year for the wheel loader.

- b) Write the applications of following OR techniques in the field of Civil engineering [8]
- Replacement analysis.
 - Dynamic Programming.



Total No. of Questions : 8]

SEAT No. :

PA-1659

[Total No. of Pages : 2

[5927]-336

B.E. (Civil)

AIR POLLUTION AND CONTROL

(2019 Pattern) (Semester - VII) (Elective - IV) (401004A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) State the objectives of ambient air monitoring. [6]
b) Convert $80 \mu\text{g}/\text{m}^3$ of SO_2 in ppm. Assume temperature 25°C and pressure at 103.193 kPa. [6]
c) Discuss the components of air quality standards. [6]

OR

- Q2)** a) Discuss basis and statistical considerations of sampling sites. [6]
b) Convert $120 \mu\text{g}/\text{m}^3$ of SO_2 in ppm. Assume temperature 25°C and pressure at 103.193 kPa. [6]
c) Compare national ambient air quality standards, 2009 and WHO air quality guidelines 2021. [6]

- Q3)** a) Explain the role of emission inventory in air quality management. [6]
b) Classify air quality models based on time period, pollutant type and level of sophistication. [6]
c) State the basic equation of emission estimation and describe its terminologies. [5]

OR

- Q4)** a) Discuss the utilization of emission inventory. [6]
b) Deliberate the strengths and limitations of AERMOD model USEPA. [6]
c) Explain activity data in emission estimation with examples. [5]

P.T.O.

- Q5)** a) Explain the natural self-cleansing properties of environment in respect of air pollution control. [6]
- b) Calculate the minimum size of the particle that will be removed with 100 percent efficiency from gravitational settling chamber under the following conditions. (i) Air: Horizontal velocity - 1.2 m/s, temperature — 75°C (ii) Particle: SP. Gr. — 1.5 (iii) Chamber: Length — 10 m, height — 1.5 m (iv) At 75°C, viscosity of air — 2.1×10^{-5} kg/ms. [6]
- c) Describe the factors responsible for selection of particulate control equipment. [6]

OR

- Q6)** a) State the principle mechanism, advantages and applications of cyclone as a particulate control equipment. [6]
- b) Find the collection efficiency of a horizontal flow, single stage electrostatic precipitator consisting of two sections formed by plates 4 m wide and 6 m high on 25 cm centers, handling a gas flow of 2.5 m³/s. Assume that a migration velocity is 12 cm/s. [6]
- c) Discuss the measures taken to control the emissions from vehicles. [6]

- Q7)** a) List and explain the sources of contaminants in indoor air pollution. [5]
- b) Explain sick building syndrome and its solution. [6]
- c) Discuss the causes and mitigation technologies for indoor air pollution. [6]

OR

- Q8)** a) List and explain the factors affecting indoor air quality. [5]
- b) Discuss the practical considerations using portable and in-duct air cleaners. [6]
- c) Explain the sources and remedial measures to control odour. [6]



Total No. of Questions : 8]

SEAT No. :

PA-2634

[Total No. of Pages : 2

[5927]-337

B.E.(Civil)

ADVANCED DESIGN OF STEEL STRUCTURES
(2019 Pattern) (Semester - VII) (Elective - IV) (401004 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 and Q.7 or Q.8.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of electronic pocket calculator and relevant IS code are allowed.*
- 6) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) Explain in brief advantage and disadvantage of cold form light gauge section. [6]
- b) A light gauge steel rectangular box section 180 mm × 90 × 2.0 mm is used for a column. The effective length of a column is 2.8 m. Determine safe load carrying capacity of the section assuming basic design stress, $\sigma_b = 125 \text{ N/mm}^2$. Adopt the properties of box section from IS: 811-1961. [12]

OR

- Q2)** a) Differentiate cold formed light gauge and hot rolled steel section. [6]
- b) A simply supported beam of span. 4.0 m carrying uniformly distributed load 20 kN/m over entire span. If the beam is laterally supported throughout the span. Design cross section of beam using two channels with bent lips. [12]

- Q3)** a) Explain in brief disadvantage of tubular section. [5]
- b) A tubular column consists of IS: 1161 grade st. 35 steel with effective length 4.5 m. The outside diameter of tube is 219.1 mm. The weight of 1 meter length of tube is 310 N. Determine the safe load carrying capacity of the column. [12]

OR

- Q4)** a) Explain in brief advantage of tubular section. [5]
- b) Design a tubular column of length 4.5 m and subjected to an axial load of 400 kN. The column is fixed at both ends. [12]

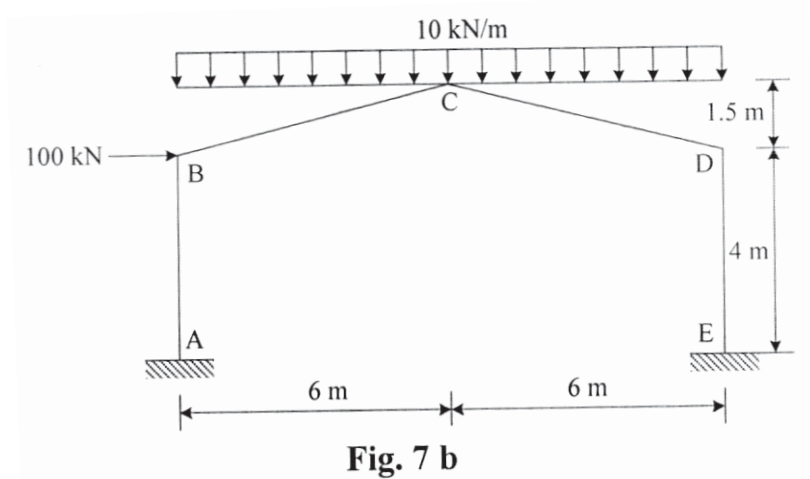
P.T.O.

- Q5)** a) State the advantage and disadvantage of Castellated beam. [5]
 b) A simply supported beam carries live load 6 kN/m and dead load 4 kN/m over a span of 12 m. Find maximum shear & moment and design castellated beam. [12]

OR

- Q6)** a) Explain in brief application of castellated beam. [5]
 b) A simply supported beam carries live load 4kN/m and dead load 4kN/m over a span of 16 m. Design a castellated beam and check for deflection, assuming the compression flange is restrained. [12]

- Q7)** a) State and explain the mechanisms for a gable frame with sketches. [6]
 b) Analysis the gable frame as shown in Fig. 7 b. [12]



OR

- Q8)** a) Determine the collapse load for a portal frame ABCDE as per the following details. [18]
 b) End condition: Both ends A and E are fixed.
 Height of columns AB and ED: 3 m,
 Span of beam BCD is 6 m is loaded at mid span with 100 kN
 Horizontal rightward load at joint B is 50 kN.

✳ ✳ ✳

Total No. of Questions : 8]

SEAT No. :

PA-910

[Total No. of Pages : 3

[5927]-338

B.E. (Civil)

**STATISTICAL ANALYSIS AND COMPUTATIONAL -
METHODS**

(2019 Pattern) (Semester - VII) (Elective - IV) (401004C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume Suitable data, if necessary.*
- 4) *Use of electronic pocket calculator is allowed in the examination.*
- 5) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) Write a short note on Sampling Distribution of the Mean and the Central Limit. [5]
b) Write a short note on Process of sampling and explain what is the meaning of “Null Hypothesis”. [6]
c) Explain with an example Chi Square test [6]

OR

- Q2)** a) Write a short note on Data sampling, its types, methods of sampling and ideal sample size selection with relevant examples. [5]
b) Write a short note on different types of samples with suitable examples on each. [6]
c) Explain with an example Student T test. [6]

- Q3)** a) Explain in detail assumptions of Z test of Hypothesis. [6]
b) The demand for a particular spare part in a factory was found to vary from day-to-day. In a sample study the following information was obtained. [6]

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat
No. of Parts Demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week. Apply Chi Square Test

P.T.O.

- c) Suppose that sweets are sold in packages of fixed weight of the contents. The producer of the packages is interested in testing that average weight of contents in packages in 1 kg. Hence a random sample of 12 packages is drawn and their contents found (in kg) as follows : [6]
 1.05, 1.01, 1.04, 0.98, 0.96, 1.01, 0.97, 0.99, 0.98, 0.95, 0.97, 0.95.
 Using the above data what should he conclude about the average weight of contents in the packets? Apply Student T Test

OR

- Q4)** a) Explain in detail assumptions of Chi Square test of Hypothesis. [6]
 b) The figures given below are (a) the theoretical frequencies of a distribution and (b) the frequencies of a normal distribution having the same mean, standard deviation and the total frequency as in (a). [6]
 i) 1,5,20,28,42,22,15,5,2.
 ii) 1,6,18,25,40,25,18,6,1.

Apply the χ^2 test of goodness of fit.

- c) In order to start new S.T. bus to a certain remote village it is required to get the average fare of ₹ 400 daily. Reports on number of passengers for 21 days revealed that the average daily collection of fare from the passengers was ₹ 390 with standard deviation of ₹ 40. Do these data support the demand of people for starting new bus to the village? [Use 5% l.o.s.] [6]

- Q5)** a) Explain Regression analysis and its significance to civil engineering with examples. [6]
 b) Obtain regression lines for the following data : [6]

x	2	3	5	7	9	10	12	15
y	2	5	8	10	12	14	15	16

Find estimate of :

- i) Y when X = 6 and
 ii) X when Y = 20.
 c) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y = \mu$ and the means of x and y are 2 and -3 respectively, find the values of λ , μ and the coefficient of correlation between x and y. [6]

OR

Q6) a) Explain Correlation and its significance to civil engineering with examples. [6]

b) Find the lines of regression for the following data. [6]

x	10	14	19	26	30	34	39
y	12	16	18	26	29	35	38

and estimate y for x = 14.5 and x for y = 29.5.

c) Determine regression line for price, given the supply, hence estimate price when supply is 180 units, from the following information :
 x = supply, y = Price, n = 7, $\Sigma(x - 150) = 119$, $\Sigma(y - 160) = 84$,
 $\Sigma(x - 150)^2 = 2835$, $\Sigma(y - 160)^2 = 2387$, $\Sigma(x - 150) \Sigma(y - 160) = 525$.
 Also, find correlation coefficient between price and supply. [6]

Q7) a) Explain K-S test for goodness of fit. [5]

b) Given the table of points: Use least square method to fit a straight line to the data and find the value of y (22) [6]

x	0	2	4	6	8	12	20
y	10	12	18	22	20	30	30

c) Fit a curve $y = a \times b$ using the following data : [6]

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

OR

Q8) a) Explain one and two-sided hypothesis. [5]

b) Fit a straight line of the form $y = mx + c$ to the following data, by using the method of least squares. [6]

x	0	1	2	3	4	5	6	7
y	-5	-3	-1	1	3	5	7	9

c) Following data refers to the load lifted and corresponding force applied in a pulley system. If the load lifted and effort required are related by equation $\text{effort} = a * (\text{load lifted}) b$, where a and b are constants. Evaluate a and b by linear curve fitting. [6]

Load lifted in kN	10	15.0	20.0	25.0	30.0
Effort applied in kN	0.750	0.935	1.100	1.200	1.300



Total No. of Questions : 8]

SEAT No. :

PA-911

[Total No. of Pages : 3

[5927]-339

B.E. (Civil)

AIRPORT AND BRIDGE ENGINEERING

(2019 Pattern) (Semester - VII) (401004D) (Elective - IV)

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 right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*

- Q1)** a) Explain with suitable example, application of Building Information Modelling (BIM) in airport engineering. [6]
- b) Discuss in brief Augmented Reality (AR) and Virtual Reality (VR) in airport planning and design. [6]
- c) State and explain the factors affecting the design of Airport capacity. [6]

OR

- Q2)** a) Explain planning and design of airport pavement. [6]
- b) State the comparison between highway and airfield pavements. [6]
- c) Discuss in brief the necessity of airport drainage. [6]
- Q3)** a) What do you understand by the term visual aid in connection with airport? Name the different visual needs. [6]
- b) Describe in brief the following : [5]
- i) Taxiway shoulder marking
 - ii) Apron marking
- c) Explain vertical take-off and landing (VTOL), short take-off and landing (STOL). [6]

P.T.O.

OR

- Q4)** a) What are the chief characteristics of the helicopter. [6]
- b) Explain with sketch various markings on runways. [5]
- c) How do you decide the size of the heliport area? Sketch the layout of a typical heliport for large size helicopters. [6]

- Q5)** a) Discuss briefly the characteristics of an ideal site for a bridge. [6]
- b) The catchment area of a stream is of sandy soil with thick vegetation cover and the area of the catchment is 8000 hectares. The length of the catchment is 20 km and the fall in level from the critical point to the bridge site is 160 meters. Calculate the peak runoff for designing the bridge, if the severest storm as recorded yielded 16 cm of rain 4 hours. [8]
- c) What is necessity of providing cut-water in a bridge pier? Sketch the various shapes of cut water. [4]

OR

- Q6)** a) How will you account for the following in the design of highway bridge : [6]
- i) Impact
- ii) Wind Load
- iii) Forces due to water currents
- b) A bridge is proposed to be constructed across an alluvial stream carrying a discharge of 300 meter cube per second. Assuming the value of silt factor = 1.1 determine the maximum scour depth when the bridge consists of [8]
- i) Two spans of 35 m each
- ii) Three spans of 30 m each
- c) Describe with neat sketch the any two types of wing walls indicating their suitability. [4]

- Q7)** a) Distinguish between : [6]
- i) Culvert
 - ii) Causeway and Submersible bridge
- b) Compare the salient features of Simply supported, continuous and cantilever bridges. [6]
- c) State precisely the purpose of providing bearings in bridges. Name the various types of bearings. [5]

OR

- Q8)** a) What is culvert? State and explain any two types of culverts. [6]
- b) Explain with neat sketch the following : [6]
- i) Bascule bridge
 - ii) Lift bridge
 - iii) Transporter bridge
- c) State the requirements of an ideal bridge bearings. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1660

[Total No. of Pages : 3

[5927]-340

B.E. (Civil)

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(2019 Pattern) (Semester - VII) (Elective - IV) (401004E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 Right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *IS1343:2012 and IS456:2000 code of practice are allowed.*
- 6) *Assume suitable data if necessary.*

Q1) a) A post-tensioned prestressed beam of rectangular section 250mm wide is to be designed for an imposed load of 12 kN/m, uniformly distributed on a span of 12m. The stress in the concrete must not exceed 17 N/mm² in compression or 1.4 N/mm² in tension at any time and the loss of prestress may be assumed to be 15%. Calculate **[10]**

- i) The minimum possible depth of the beam
- ii) For the section provided, the minimum prestressing force and the corresponding eccentricity.

b) An end block of a post tensioned beam is 350 mm×500 mm. The prestressing force 900 kN with the tendon placed centrally at the ends. A bearing plate of 200 mm×200 mm is provided. Check the bearing stresses developed in concrete having strength, at transfer equal to 40 MPa.**[7]**

OR

Q2) a) A pre-tensioned T-section has a flange which is 300mm wide and 200mm deep. The rib is 150mm wide and 350mm deep. The effective depth of the cross section is 500mm. If $f_{ck}=50$ N/mm², $f_{pu}=1600$ N/mm², and the area of prestressing steel $A_{ps}=200$ mm², Calculate the ultimate flexural strength of the section using IS1343 code provisions. **[8]**

b) A c/s of a prestressed concrete beam is an unsymmetrical T section with the following dimensions. **[9]**

Overall depth=1200 mm

Web = 200mm

Flange = 1000×200 mm

P.T.O.

At a particular section the beam is subjected to ultimate moment & shear force of 2000 kNm & 250 kN resp. Estimate the flexural shear resistance of 'the cracked section as per IS code.

Grade of concrete=M40

Effective depth = 1100mm

$A_p = 2310\text{mm}^2$

$f_p = 1500\text{Mpa}$

$\eta = 0.6$

Effective prestress at extreme tensile face of the beam=19.3 Mpa

Q3) a) A slab spanning 10m is to be designed as a one way prestressed concrete slab with parallel post tensioned cables carrying an effective force of 620kN. The deck slab is required to support a udl of 25kN/m². The permissible stresses in concrete should not exceed 15 N/mm² in compression and no tension is permitted at any stage. Design the spacing of the cables and their position at mid span section. Assume loss ratio 0.8. **[8]**

b) Design a post tension two way slab of effective span 6m×8m with continuity on all side, subjected to superimposed load 4 kN/m². Take F.F. load = 1.5 kN/m². Use cable S₃ or S₄, $f_{ck}=45\text{ N/mm}^2$, f_y of S₃ or S₄= 1900 N/mm². Design the spacing of cable in both direction. Don't apply checks. **[10]**

OR

Q4) a) A slab spanning 8m is to be designed as a one way prestressed concrete slab with parallel post tensioned cables carrying an effective force of 620kN. The deck slab is required to Support a udl of 25kN/m². The permissible stresses in concrete should not exceed 15 N/mm² in compression and no tension is permitted at any stage. Design the spacing of the cables and their position at mid span section. Assume loss ratio 0.8. **[8]**

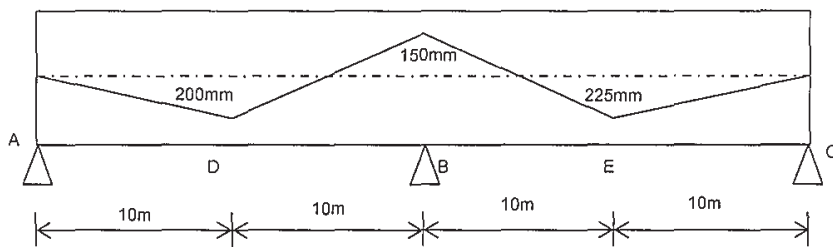
b) Design a post tension two way slab of effective span 5m×7m with continuity on all sides, subjected to superimposed load 4 kN/m². Take F.F. load = 1.5 kN/m². Use cable S₃ or S₄ $f_{ck} = 45\text{ N/mm}^2$, f_y of S₃ or S₄= 1900 N/mm². Design the spacing of cable in both directions. Don't apply checks. **[10]**

- Q5)** Design a post tensioned flat slab for the following data **[18]**
 Centre to centre distance between columns=8m in both directions
 Column size-800mm square
 Floor is to be used for a shopping mall.
 Live load-5 kN/m²
 Floor finish- 1kN/m²
 Materials- M40, multistrand cables
 Slab with drop

OR

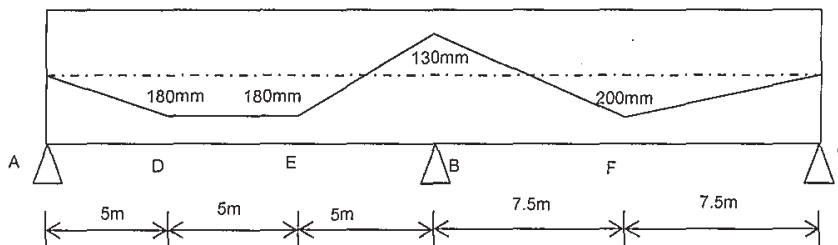
- Q6)** Design a post tensioned fiat slab for the following data **[18]**
 Centre to centre distance between columns=9m in both directions
 Column size-900mm diameter
 Floor is to be used for an pharmaceutical company
 Live load-4 kN/m²
 Floor finish- 1kN/m²
 Materials- M40 , multistrand cables
 Slab with drop

- Q7)** Fig. shows a two span continuous beam. Corresponding to the cable profile provided locate the pressure line due to prestress alone. The prestressing force is 1250kN. **[17]**



OR

- Q8)** Fig. shows a two span continuous beam. Corresponding to the cable profile provided locate the pressure line due to prestress alone. The prestressing force is 1200kN. **[17]**



Total No. of Questions : 10]

SEAT No. :

PA-1661

[Total No. of Pages : 2

[5927]-341

B.E. (Civil)

FORMWORK AND PLUMBING ENGINEERING
(2019 Pattern) (401004 F) (Elective - IV) (Semester - VII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Figures to the right indicates full marks.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) Explain formwork system and its concepts. **[10]**

OR

Q2) Explain term involved in flying formwork, table formwork, tunnel formwork and slip formwork. **[10]**

Q3) Explain formwork design for slab and beam with the help of suitable examples. **[10]**

OR

Q4) Discuss formwork issues in multistory building construction. **[10]**

Q5) a) Explain horizontal wet vent and vertical wet vent with neat sketch. **[8]**

b) Comment on “plumbing system needs to breathe”. State maximum value of pneumatic pressure difference in Pascal’s so that the seal is protected, State vent terminals as per code. **[8]**

OR

Q6) a) How does grease trap works explain with neat sketch also explain its maintenance? **[8]**

b) State the trap requirements as per uniform plumbing code for **[8]**

- i) Design of trap
- ii) Trap seal and trap seal protection
- iii) Trap setting and protection

P.T.O.

- Q7)** a) State requirements of a sanitary closet. Explain Washout Water Closets & Hopper Closets with neat sketch. [8]
b) Explain drainage air test & drainage water test procedures. [8]

OR

- Q8)** a) Explain sizing of house drain & sizing its vent pipe. [8]
b) Explain basic guide to calculate falls and gradients for drainage. [8]

- Q9)** a) Explain RCC, PVC, Nu-Drain, and Stoneware for building sewers. [8]
b) Explain requirements for brick built manholes for sewer line with neat sketch. [10]

OR

- Q10)**a) Explain design of plumbing systems for multi-storey buildings. [8]
b) Explain drainage system considerations for multi-storey buildings. [10]



Total No. of Questions : 8]

SEAT No. :

PA-912

[Total No. of Pages : 3

[5927]-342

B.E. (Computer Engineering)
DESIGN AND ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester - VII) (410241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 marks.
- 4) Assume suitable data, if necessary.

Q1) a) Solve the matrix chain multiplication for the following 6 matrix problem using Dynamic programming. [10]

Matrix	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆
Dimensions	10×20	20×5	5×15	15×50	50×10	10×15

b) Explain Greedy strategy: Principle, control abstraction, time analysis of control abstraction with suitable example. [8]

OR

Q2) a) Explain the 'dynamic programming' approach for solving problems. Write a dynamic programming algorithm for creating an optimal binary search tree for a set of 'n' keys. Use the same algorithm to construct the optimal binary search tree for the following 4 keys. [10]

Key	A	B	C	D
Probability	0.1	0.2	0.4	0.3

b) Explain Dynamic programming: Principle, control abstraction, time analysis of control abstraction with suitable example. [8]

Q3) a) Explain the 'branch and bound' approach for solving problems. Write a branch and bound algorithm for solving the 0/1 Knapsack problem. Use the same algorithm to solve the following 0/1 Knapsack problem. The capacity of the Knapsack is 15 kg. [9]

Item	A	B	C	D
Profit (Rs.)	18	10	12	10
Weight (kg.)	9	4	6	2

b) Explain with suitable example Backtracking: Principle, control abstraction, time analysis of control abstraction. [8]

OR

P.T.O.

Q4) a) What is Branch and Bound method? Write control abstraction for Least Cost search? [9]

b) Explain the backtracking with graph coloring problem. Find solution for following graph [8]

	C_1	C_2	C_3	C_4	C_5
C_1	0	1	0	1	0
C_2	1	0	1	0	0
C_3	0	1	0	1	1
C_4	1	0	1	0	1
C_5	0	0	1	0	0

Adjacency matrix for graph G

Q5) a) Write short notes on the following. [10]

- i) Aggregate Analysis
- ii) Accounting Method
- iii) Potential Function method
- iv) Tractable and Non-tractable Problems

b) Write short notes on with suitable example of each [8]

- i) Randomized algorithm
- ii) Approximation algorithm

OR

Q6) a) What is Potential function method of amortized analysis? To illustrate Potential method, find amortized cost of PUSH, POP and MULTIPOP stack operations. [9]

b) What is embedded algorithm? Explain Embedded system scheduling using power optimized scheduling algorithm. [9]

- Q7)** a) Write short notes on the following. **[10]**
- i) Multithreaded matrix multiplication.
 - ii) Multithreaded merge sort
 - iii) Distributed breadth first search
 - iv) The Rabin-Karp algorithm
- b) With respect to Multithreaded Algorithms explain Analyzing multithreaded algorithms, Parallel loops, Race conditions. **[7]**

OR

- Q8)** a) Write and explain pseudo code for Multi-threaded merge sort algorithm. How parallel merging gives a significant parallelism advantage over Merge Sort? **[9]**
- b) Write a pseudo code for naïve string matching algorithm and Rabin-Karp algorithm for string matching and analyze the same. **[8]**



Total No. of Questions : 8]

SEAT No. :

PA-913

[Total No. of Pages : 3

[5927]-343

B.E. (Computer)

MACHINE LEARNING

(2019 Pattern) (Semester - VII) (410242)

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) Make suitable assumption whenever necessary.

Q1) a) Explain in brief techniques to reduce under fitting and over fitting. [6]

b) Find the Equation of linear Regression line using following data : [6]

X	Y
1	3
2	4
3	5
4	7

c) Write short note on : [6]

- i) MAE
- ii) RMSE
- iii) R^2

OR

Q2) a) Explain in brief lasso and Ridge Regression. [6]

b) What is Bias and variance trade off for machine learning model? [6]

c) Write short note on Evaluation metrics. [6]

P.T.O.

Q3) a) Explain in brief methods used for Evaluating classification models. [5]

b) Consider the following data to predict the student pass or fail using the K-Nearest Neighbor Algorithm (KNN) for the values physics = 6 marks, Chemistry = 8 marks with number of Neighbors K = 3. [6]

Physics (marks)	Chemistry (marks)	Results
4	3	Fail
6	7	Pass
7	8	Pass
5	5	Fail
8	8	Pass

c) Write short note on Ensemble learning methods : [6]

- i) Simple
- ii) Advanced

OR

Q4) a) Explain Random forest Algorithm with example. [5]

b) Write short note on importance of confusion matrix. [6]

c) Define following terms with reference to SVM. [6]

- i) Separating hyperplane
- ii) Margin

Q5) a) Explain Density Based clustering with reference to DBSCAN, OPTICS and DENCLUE. [6]

b) What is K mean clustering? Explain with example. [6]

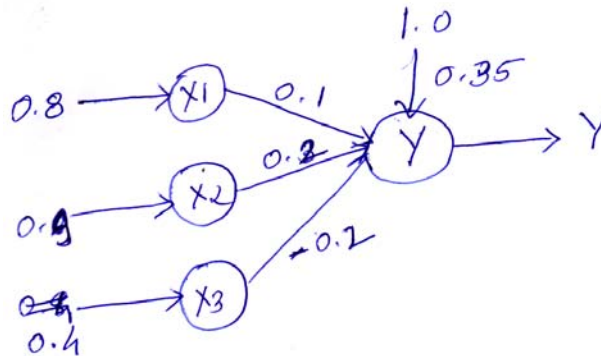
c) Write short note on following Hierarchical clustering method : [6]

- i) Agglomerative
- ii) Dendogram

OR

- Q6)** a) What is LOF? Explain it with its advantages and disadvantages. [6]
 b) Explain Graph Based clustering. [6]
 c) Define following terms : [6]
 i) Elbow method
 ii) Extrinsic and Intrinsic method

- Q7)** a) Explain ANN with its Architecture. [5]
 b) Obtain the output of Neuron Y for the Network shown in following fig. Using activation function as : [6]
 i) Binary sigmoidal
 ii) Bipolar sigmoidal



- c) Write short note on Back propagation network. [6]

OR

- Q8)** a) Explain in brief types of ANN based on layers. [5]
 b) What is Recurrent Neural Network? Explain with suitable example. [6]
 c) Write short note on with reference with CNN. [6]
 i) Convolution layer
 ii) Hidden layer



Total No. of Questions : 8]

SEAT No. :

PA-914

[Total No. of Pages : 2

[5927]-344

**B.E. (Computer Engineering)
BLOCKCHAIN TECHNOLOGY
(2019 Pattern) (Semester - VII) (410243)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 in detail following blockchain platforms. **[8]**
- i) Public
 - ii) Private
 - iii) Consortium
 - iv) IoTA
- b) Discuss following consensus algorithms used in blockchain technology. **[6]**
- i) Proof of work
 - ii) Proof of activity
- c) Explain proof of stake (POS)? **[4]**

OR

- Q2) a)** Explain consensus in blockchain in details. **[8]**
- b) Explain in detail **[6]**
- i) Bitcoin
 - ii) Ethereum
 - iii) Hyperledger
- c) Discuss Byzantine General problem. **[4]**

OR

P.T.O.

- Q3)** a) List & explain types of crypto currency. [6]
b) What is Metamask? Illustrate in detail. [6]
c) Differentiate between coinbase & Binance. [5]

OR

- Q4)** a) What is cryptocurrency? Explain in detail. [6]
b) Explain in detail crypto wallets. [6]
c) Explain in detail Bitcoin. [5]

- Q5)** a) What is Ethereum? Explain. [8]
b) Explain solidity in detail. [6]
c) Discuss swarm Decentralized storage platform. [4]

OR

- Q6)** a) What is smart contract? Explain types of smart contracts. [8]
b) Discuss whisper Decentralized Messaging platform. [6]
c) Explain Ethereum Virtual Machine in detail. [4]

- Q7)** a) Explain Block chain applications in retail & banking services. [6]
b) Explain role of blockchain in IoT. [6]
c) Explain role of blockchain in Healthcare. [5]

OR

- Q8)** a) Discuss integration of blockchain with other domains. [6]
b) Explain blockchain applications in financial services. [6]
c) Explain application of blockchain government sector. [5]

Total No. of Questions : 8]

SEAT No. :

PA-1662

[Total No. of Pages : 2

[5927]-345

B.E. (Computer Engg.)

PERVASIVE COMPUTING

(2019 Pattern) (Elective-III) (Semester-VII) (410244(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3. orQ4, Q5 or Q6, and Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

- Q1)** a) Explain context aware computing and types of contexts with examples. [9]
b) Describe how to determine the location in mobile networks. [8]

OR

- Q2)** a) Describe the different challenges in context awareness. [9]
b) Explain the architecture of a context aware system. [8]

- Q3)** a) Explain reactive type intelligent system model in detail. [9]
b) Explain hybrid intelligent system based upon horizontal and vertical layering. [9]

OR

- Q4)** a) Explain different intelligent system operations. [9]
b) Describe the use of an agent interaction protocol suite in the interaction of multiple ISs designed as MAS. [9]

- Q5)** a) Describe Wearable Computing Architecture. [9]
b) Define HCI. Explain explicit and implicit HCI [8]

OR

P.T.O.

Q6) a) What is HCI? What is the importance of HCI? What are different advantages and disadvantages of HCI? [9]

b) What is the difference between interaction design and UX design? [8]

Q7) a) Explain different open issues in pervasive computing. [9]

b) What are the security challenges in pervasive computing? [9]

OR

Q8) a) Explain secure resource discovery in detail. [9]

b) What are the solutions for pervasive computing challenges? [9]



Total No. of Questions : 8]

SEAT No. :

PA-915

[Total No. of Pages : 2

[5927]-346

**B.E. (Computer Engineering)
MULTIMEDIA TECHNIQUES**

(2019 Pattern) (Semester - VII) (Elective - III) (410244 B)

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) How would you differentiate between conventional TV and HDTV. [5]
b) Explain the Ultra High Definition TV. [6]
c) What are three different interfaces for analog video signal transmission? Explain anyone in detail. [6]

OR

- Q2)** a) Draw and explain a typical electronic signal for one scan line of NTSC composite video. [5]
b) Based on color coding and lines per frame rate identify the similarities between the PAL video and SECAM video. Explain in a brief NTSC video. [6]
c) Explain the advantages of digital representation for video. [6]

- Q3)** a) What are three most used numerical distortion measures in image compression? Explain in detail. [5]
b) Explain any two types of wavelet transforms. [6]
c) What is JPEG Standard? Draw and explain block diagram for JPEG encoder. [6]

OR

- Q4)** a) How would you demonstrate coding tree for HELLO using Shannon-Fano algorithm. [5]
b) Using the information, you have learned about Dictionary-Based coding, construct LZW compression for string ABABBABCABABBA. [6]
c) Identify the advantages and disadvantages of Arithmetic coding as compared to Huffman coding? [6]

P.T.O.

- Q5)** a) Explain functional requirements for augmented reality ecosystem. [6]
b) Enlist types of head-mounted displays? Explain Mobile VR with suitable example. [6]
c) Compose Applications, Challenges & Future potential of AR display.[6]

OR

- Q6)** a) Explain about AR, VR and MR. [6]
b) Explain at least two future applications of Immersive Technologies. [6]
c) Enlist the input devices that are popularly used in immersive experience systems. Explain any input device in detail. [6]

- Q7)** a) Decide the major functions of AI-Based software? Explain how AI achieves incredible accuracy. [6]
b) Explain the use of Big Data and AI technology in medical field. [6]
c) What alternative services would you suggest using M-IoT for road safety system. [6]

OR

- Q8)** a) What can be possible challenges to implementing AR Technology? Explain how AR can be used for the employee training. [6]
b) Judge the importance of immersive experiences for designing academic applications which serve communication between educators, researchers, and students. [6]
c) Draw and explain each layer from the architecture of the Internet of Things (IoT). [6]



Total No. of Questions : 8]

SEAT No. :

PA-1663

[Total No. of Pages : 2

[5927]-347

B.E. (Computer Engg.)

CYBER SECURITY AND DIGITAL FORENSICS

(2019 Pattern) (Elective-III) (Semester-VII) (410244(C))

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 calculator is permitted.*

- Q1)** a) What is computer forensics? What is the use of Computer Forensics in Law Enforcement? What are different computer forensics schemes? [9]
- b) Explain in detail different Computer Forensics Services. [9]

OR

- Q2)** a) Explain in details Computer Forensics Assistance to Human Resources.[9]
- b) What are the benefits of professional forensics methodology? What are steps taken by computer forensics specialist? [9]

- Q3)** a) What are evidences? What are the simple reasons to collect evidences? What are different options for collecting evidences? [8]
- b) What is chain of custody? Explain the process of chain of custody. [9]

OR

- Q4)** a) What is the general procedure for evidence collection? [8]
- b) What are general computer evidence processing steps? Explain in detail.[9]

- Q5)** a) Explain how to perform remote and live acquisitions with an appropriate example. [9]
- b) What are the different approaches for validating forensic data? [9]

OR

P.T.O.

- Q6)** a) Brief about the approaches for seizing digital evidence at the crime scene.[9]
b) Give in detail the different techniques to hide data in digital forensics.[9]

- Q7)** a) Explain types of digital forensics tools. Also explain the task performed by these tools. [8]
b) State the features of any five computer forensics software tools. [9]

OR

- Q8)** a) Explain the role of client and server in email and some of the tools for email forensics. [8]
b) Explain the process for validating and testing forensics software. [9]



Total No. of Questions : 8]

SEAT No. :

PA-916

[Total No. of Pages : 2

[5927]-348

B.E. (Computer Engineering)

OBJECT ORIENTED MODELING AND DESIGN

(2019 Pattern) (Semester - VII) (410244 D) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is Interaction Diagram? Explain Different Components of Sequence diagram. [6]
- b) Compare Sequence diagram and Activity diagram. [6]
- c) Design use case diagram for online reservation system. [6]

OR

- Q2)** a) What are Composite states? Explain Categories of Composite states. [6]
- b) Explain following terms with respect to use case. [6]
- i) Use Case.
 - ii) Actor.
 - iii) System Boundary.
- c) Draw Activity Diagram for ATM Machine. [6]

- Q3)** a) Discuss the steps involved in constructing Application class model. Explain with suitable example. [6]
- b) What is meant by sub system in system design? Explain breaking of system into subsystems and allocation of subsystems. [6]
- c) What are categories of External Control? Explain in Detail. [5]

OR

- Q4)** a) Explain in detail components of a component diagram. [6]
- b) Explain following with respect to deployment diagram. [6]
- i) Node.
 - ii) Association.
 - iii) Dependency
- c) Draw Deployment diagram for ATM System. [5]

P.T.O.

- Q5)** a) Prepare a data dictionary for a ATM system scenario. Explain each element in a brief. [6]
b) What is abstraction? Explain different categories of abstraction. [6]
c) What do you mean by System Design? Explain with suitable example.[6]

OR

- Q6)** a) Give detailed guidelines for finding and defining classes involved in software system scenario. [6]
b) List and Explain different types of dependencies in package. [6]
c) Discuss how you identify use cases and actors with respect to use case diagrams? [6]

- Q7)** a) Explain. [6]
i) Creational Patterns.
ii) Structural Patterns.
iii) Behavioral Pattern.
b) Discuss Adapter Design Pattern. [6]
c) Discuss Observer Design Pattern. [5]

OR

- Q8)** a) What is Design Pattern? Explain different types of design Patterns. [6]
b) State and explain entities involved in design pattern. [6]
c) Explain Strategy Design patterns. [5]



Total No. of Questions : 10]

SEAT No. :

PA-917

[Total No. of Pages : 2

[5927]-349

B.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - VII) (410244E) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figure to the right indicate full marks.
- 4) Your answer will be valued as a whole.
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

Q1) a) Find the Z - transform of the following discrete time signal and find the ROC. **[8]**

i) $x(n) = \left(-\frac{1}{5}\right)^n u(n) + \left(\frac{1}{2}\right)^{-n} u(-n-1).$

ii) $x(n) = (n + 0.5) \left(\frac{1}{5}\right)^n u(n).$

b) State and prove the convolution property of Z - transform. **[6]**

OR

Q2) a) An LTI system is described by equation $y(n) = x(n) + 0.8x(n-1) + 0.8x(n-2) - 0.49y(n-2)$. Determine the transfer function of the system. Sketch the poles and zeros on the z - plane. **[8]**

b) Find the impulse response of the system described by the difference equation, $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$. **[6]**

Q3) a) The transfer function of a system is given by, $H(z) = \frac{1}{1-0.5z^{-1}} + \frac{1}{1-2z^{-1}}$
Determine the stability and causality of the system for **[8]**

i) ROC : $|z| > 2$;

ii) ROC : $|z| < 0.5$

b) State and prove the following properties of DFT: **[6]**

i) Time reversal property.

ii) Complex conjugate property.

OR

P.T.O.

- Q4)** a) If $x_1(n) = \{1, 2, 1, -2\}$ and $x_2(n) = \{3, -2, 1, -3\}$ compute the circular convolution using DFT-IDFT method. [8]
 b) Explain Gibbs phenomenon in detail. [6]

- Q5)** a) Find 8-point DFT using radix-2 DIF FFT algorithm for the given sequence:
 $x(n) = \{-1, 0, 2, 0, -4, 0, 2, 0\}$. [8]
 b) Show and compare computational complexity is reduced if 16-point DFT is computed using radix-2 DIT FFT algorithm. [6]

OR

- Q6)** a) Compute the DFT of following sequences using DIT FFT algorithm. [8]
 i) $x(0) = \{1, 2, 3, 4\}$
 ii) $x(n) = \{1, 2, 3, 1\}$
 b) Explain in detail DIF FFT algorithm. [6]

- Q7)** a) Realize the following FIR system with minimum number of multipliers.
 $h(n) = \{-0.5, 0.8, -0.5\}$ [8]
 b) Compare FIR and IIR filters. [6]

OR

- Q8)** a) Design a Butterworth filter using impulse invariant method transformation to satisfy the following specifications.
 $0.707 \leq |H(e^{j\omega})| \leq 1$; for $0 \leq \omega \leq 0.2\pi$
 $|H(e^{j\omega})| \leq 0.2$; for $0.6\pi \leq \omega \leq \pi$. [8]
 b) What is bilinear transformation? Explain the properties of BLT. [6]

- Q9)** a) Write a short note on: SHARC DSP processor. [6]
 b) What are the desirable features of DSP processors? [4]
 c) What is prewarping? [4]

OR

- Q10)** a) Realize the cascade and parallel structure of the system governed by the difference equation,
 $y(n) - \frac{3}{10}y(n-1) - \frac{1}{10}y(n-2) = x(n) + \frac{1}{9}x(n-1)$. [6]
 b) Explain following window functions:
 i) Hamming window [4]
 ii) Hanning window [4]



Total No. of Questions : 8]

SEAT No. :

PA-918

[Total No. of Pages : 2

[5927]-350

B.E. (Computer Engineering)
INFORMATION RETRIEVAL

(2019 Pattern) (Semester - VII) (410245 A) (Elective - 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 indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain Data Compression with Huffman Coding. [9]

b) **What are the Context-Aware Compression Methods? Explain it in detail.[9]**

OR

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

- i) **Decoding Performance**
- ii) **Document Reordering**
- iii) **Arithmetic Coding**

b) **Explain in detail Invalidation List, Garbage Collection, Document Modifications in document deletion. [9]**

Q3) a) Explain Categorization and Filtering with any two detailed Examples. [9]

b) **Explain the Information-Theoretic Model in detail. [8]**

OR

Q4) a) Explain Probabilistic Classifiers & Generalized Linear Models. [9]

b) **Describe Language Models and Smoothing. [8]**

P.T.O.

- Q5) a)** Explain Traditional effectiveness measure and The Text Retrieval Conference (TREC) with suitable examples. [9]
- b) Write a short note on : [9]
- i) Nontraditional effectiveness measures
 - ii) Measuring efficiency

OR

- Q6) a)** What is Scheduling and Caching in Measuring Efficiency?. Explain in detail. [9]
- b) Write a short note on : [9]
- i) Using statistics in evaluation
 - ii) Minimizing adjudication Effort

- Q7) a)** Describe Parallel Query Processing with suitable examples. [8]
- b) Write a short note on : [9]
- i) The structure of the web
 - ii) Quires and Users
 - iii) Static ranking

OR

- Q8) a)** Describe MapReduce with suitable examples. [9]
- b) Write a short note on : [8]
- i) Evaluation web search
 - ii) Web Crawlers
 - iii) Web crawler libraries
 - iv) Dynamic ranking



Total No. of Questions : 8]

SEAT No. :

PA-919

[Total No. of Pages : 2

[5927]-351

B.E (Computer Engineering)

GPU PROGRAMMING AND ARCHITECTURE

(2019 Pattern) (Semester - VII) (410245B) (Elective - IV)

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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Make suitable assumptions wherever necessary.*

Q1) a) Describe CUDA error handling APIs and explain how they can be used for error checking. [9]

b) Describe parallel programming issues. [9]

OR

Q2) a) Explain synchronization problems along with possible solutions. [9]

b) What are tools and techniques that you should employ for finding and solving CUDA errors? [9]

Q3) a) What are various OpenCL components? [9]

b) In brief explain OpenCL memory hierarchy. [8]

OR

Q4) a) Explain OpenCL architecture. [8]

b) Explain kernel programming model. [9]

Q5) a) Explain MPI communication on GPU. [9]

b) In brief discuss CSR format for sparse matrix. [9]

OR

P.T.O.

- Q6)** a) Explain convolution parallel algorithm. [9]
b) What is task parallelism and data parallelism? [9]

- Q7)** a) Explain how OpenCL can be used for Heterogeneous Computing? [9]
b) Enlist and explain few OpenCL applications. [8]

OR

- Q8)** a) Write short note on - Efficient Neural Network Training/ Inferencing. [9]
b) Explain OpenCL application design process. [8]



Total No. of Questions : 8]

SEAT No. :

PA-920

[Total No. of Pages : 2

[5927]-352

B.E. (Computer Engineering)

MOBILE COMPUTING (Theory)

(2019 Pattern) (Semester-VII) (410245C) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write a short note on GSM. [6]
b) Write a short note on UMTS. [6]
c) Explain the protocol architecture of IEEE 802.11. [6]

OR

- Q2)** a) Write a short note on: Authentication and privacy in GSM. [6]
b) Explain the relationship between the Base Station and Mobile Switching Centre? Discuss the role of the EIR entity of GSM network. [6]
c) What are the characteristics of SIM? [6]

- Q3)** a) Explain the process of call origination and call termination in GSM. [6]
b) Write a short note on the GSM MAP service framework. [6]
c) Write a short note on VLR identification algorithm O-I. [5]

OR

- Q4)** a) Discuss the GSM interface and GSM protocol architecture. [6]
b) Write a short note on VLR failure restoration. [6]
c) Difference between the Soft Hand-off and Hard Hand-off. [5]

P.T.O.

- Q5)** a) What is the goal of mobile MP? [6]
b) Describe DSDV and DSR routing algorithms for ad hoc networks. [6]
c) Discuss how tunneling works for Mobile IP using IP-in-IP encapsulation. [6]

OR

- Q6)** a) Write a short note on IPv6. [6]
b) Write a short note on Macro mobility. [4]
c) Write a short note on [8]
i) MANET
ii) VANET

- Q7)** a) Define the role of 5G in IoT. [6]
b) Explain block diagram for UMTS in detail. [6]
c) State and explain the features of W-CDMA. [5]

OR

- Q8)** a) Write a short note on Quality of service in the 3G network. [6]
b) Explain Forward W-CDMA channel and reverse W-CDMA channel. [6]
c) Write a short note on Long Term Evolution (LTE) in 4G. [5]



Total No. of Questions : 8]

SEAT No. :

PA-921

[Total No. of Pages : 2

[5927] - 353

B.E. (Computer) (Semester - VII)
SOFTWARE TESTING & QUALITY ASSURANCE
(2019 Pattern) (Elective - IV) (410245 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)* a) What do you think about static techniques? [6]
- b) State in your own words Error guessing and exploratory testing. [6]
- c) How would you explain System Testing and Acceptance Testing? [6]

OR

- Q2)* a) Can you explain path coverage testing & conditional coverage testing. [6]
- b) Identify the importance of Regression Testing & explain it. [6]
- c) Explain in detail performance testing with example. [6]
- Q3)* a) Differentiate between Quality Assurance and Quality Control. [6]
- b) Can you Clarify Quality Management system. [6]
- c) Why software has Defects? Explain in detail. [5]

OR

P.T.O.

- Q4)** a) Explain why ISO-9001 standard and it's important in software testing? [6]
b) Illustrate selenium's IDE and explain in detail. [6]
c) Can you clarify different levels of CMM. [5]

- Q5)** a) How would you explain selenium IDE explain in detail? [6]
b) Explain Robotic Process Automation in detail. [6]
c) Construct different automated testing process. [6]

OR

- Q6)** a) Illustrate selenium tool suite in detail. [6]
b) Identify different benefits of Automation testing. [6]
c) How would you explain selenium Web Driver? Explain it. [6]

- Q7)** a) Compare the Ishikawa's Flow chart and Histogram tool. [6]
b) Explain in detail six sigma characteristics in details. [6]
c) Can you explain How to maintain SQA? [5]

OR

- Q8)** a) Explain the six sigma characteristics in details. [6]
b) Explain in detail Total Quality Management. [6]
c) Compare Run charts and Control chart in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PA-922

[Total No. of Pages : 2

[5927]-354

B.E. (Computer)

COMPILERS (Elective - IV)

(2019 Pattern) (Semester - VII) (410245-E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What is Three Address Code? Explain Quadraples & Triples. [10]

b) Explain about Syntax Directed Translation Scheme. [8]

OR

Q2) a) Explain the terms : [7]

- i) S - attributed Grammar
- ii) L - attributed Grammar

b) Generate Annotated Parse Tree– $a*b-c|e+f$. [6]

c) Explain Syntax Tree. [5]

Q3) a) Explain Static & Dynamic Scope. [9]

b) Explain any 2 Storage Allocation methods. [8]

OR

Q4) a) Explain the Dangling Pointer. [6]

b) What is activation Record. [6]

c) Explain about Heap Allocation. [5]

P.T.O.

- Q5)** a) Explain in brief the DAG Representation of Basic Blocks. [10]
b) List & explain the Issues in Code Generation. Explain 2 issues. [8]

OR

- Q6)** a) Explain the decisions of Code Generator Function/Procedure for statement. [7]
$$x = y \text{ op } z$$

b) Construct the DAG for assignment statement. [6]
$$a+b*c+b*c+d.$$

c) Explain Peephole Optimization. [5]

- Q7)** a) Explain any 2 Code Optimization Technique with example. [9]
b) List & explain loops in Flow Graph. [8]

OR

- Q8)** a) Explain Loop Optimization Technique - Code Motion. [6]
b) Draw a Flow Graph & explain generation of killing of expression. [6]
c) Explain Data Flow Analysis. [5]



Total No. of Questions : 8]

SEAT No. :

PA-923

[Total No. of Pages : 3

[5927]-355

B.E. (Electrical Engineering)

POWER SYSTEM OPERATION AND CONTROL

(2019 Pattern) (Semester - VII) (403141)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** What is a coherent and non-coherent group of generators? Explain. [4]
- b)** Derive the steady-state frequency analysis of single area LFC. [6]
- c)** With the neat block diagram, explain two areas of load frequency control. [8]

OR

- Q2) a)** Draw the schematic diagram of the steam turbine speed governor system indicating all its components. [4]
- b)** Draw the complete block diagram of single area load frequency control. Write the associated equations of the speed governor system, turbine model, and generator load model. [6]
- c)** Explain the block diagram as well as the frequency response of the proportional plus integral controller in the single area load frequency control. [8]

- Q3) a)** What is the concept of unit commitment in the power system? Explain the need for Unit Commitment. [4]

- b)** The fuel cost of two units is given by, [6]

$$F_1 = 1.5 + 25P_{g1} + 0.12P_{g1}^2 \text{ Rs/hr}$$

$$F_2 = 1.8 + 35P_{g2} + 0.12P_{g2}^2 \text{ Rs/hr}$$

Where P_{g1} , P_{g2} are in MW.

Find the optimum scheduling neglecting losses for a demand of 150 MW.

P.T.O.

- c) Determine the Priority list method using full-load average production cost for the data given below. If the load demand is 1100 MW, which units should be prioritized? Comment. [7]

Unit No.	Loading Limits		Heat rate curve Parameters			Fuel Cost (Ki) (Rs/kCal)
	Min (MW)	Max (MW)	a	b	c	
1	80	400	0.007	2	300	1.1
2	20	300	0.01	3	200	1.2
3	120	500	0.003	7	100	1.0

OR

- Q4) a) Define the Economic Load Dispatch (ELD) studies in the power system. [4]
- b) There are three power plants having a total capacity of 425 MW are scheduled for an operation to supply total load demand of 250 MW. Find the optimum load scheduling if plants have the following incremental cost characteristics and generator constraints? [6]

$$(IC)_1 = \frac{dC_1}{dP_{g1}} = 30 + 0.2P_{g1}; \quad 50 \leq P_{g1} \leq 125$$

$$(IC)_2 = \frac{dC_2}{dP_{g2}} = 40 + 0.18P_{g2}; \quad 20 \leq P_{g2} \leq 100$$

$$(IC)_3 = \frac{dC_3}{dP_{g3}} = 15 + 0.2P_{g3}; \quad 100 \leq P_{g3} \leq 165$$

- c) Obtain the economic scheduling for the two units, the production cost of which is given as follows to supply a load of 3 MW, in the step of 1 MW. [7]

$$F_1 = C_1 = 0.25P_1^2 + 30P_1$$

$$F_2 = C_2 = 1.25P_2^2 + 35P_2$$

Use the Dynamic Programming (DP) method.

- Q5) a) What is the interconnection of the power system? State its advantages. [4]
- b) Consider that there are two cities A and B operating in different time zone. It is required to transmit the power from city A to city B when there is an increase in load demand at city B at different time spans. How the interchange of power takes place? Explain in detail. [6]
- c) Explain the concept of a power pool in energy control. What are the potential advantages associated with a power pool? Explain. Also, discuss constraints related to the power pool. [8]

OR

- Q6)** a) Explain in detail: Interchange evaluation with unit commitment. [4]
b) Write a short note on: Capacity Interchange. [6]
c) Explain: [8]
i) Energy Banking
ii) Emergency Power Interchange
- Q7)** a) Draw the QV curve with appropriate labeling showing stable and unstable regions. What is the use of the QV curve in voltage stability study? [4]
b) Explain the following voltage stability indices with their formula: [6]
i) Fast Voltage Stability Index (FVSI)
ii) Line Stability Index (L_{mn})
iii) Line stability factor (LQP)
c) What happens when there is voltage instability in the power system? Explain in detail. [7]

OR

- Q8)** a) Define the following terms: [4]
i) Voltage Stability
ii) Voltage Collapse
b) Give the detailed classification of the voltage stability based on the time frame and based on nature of the disturbance. [6]
c) Derive the expression of the power-voltage relationship for drawing the PV curve in detail and hence draw the PV curve with appropriate labeling showing stable-unstable region. [7]



[5927]-356
B.E. (Electrical)
ADVANCED CONTROL SYSTEM
(2019 Pattern) (Semester - VII) (403142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

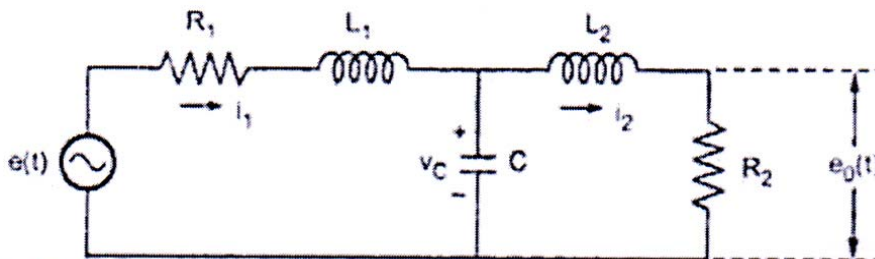
- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of algorithmic tables slide rule, and electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Derive the formula to get transfer function from the state model. [6]

b) Determine state transition matrix for the system give below by using

Lapalce transformation technique
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \quad [6]$$

c) Write a set of state equations for the circuit given below. [6]



OR

Q2) a) Obtain the state model of the following differential equation

(phase variable representation) $4\ddot{\ddot{y}} + 3\ddot{y} + \dot{y} + 2y = 5u \quad [6]$

b) What is state transition matrix? List the properties of state transition matrix. [6]

c) Define state, state variable, state vector, state equation and output equation. Draw state diagram. [6]

P.T.O.

- Q3)** a) Check the observability of the state model given below using Kalman's Test [6]

$$\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -9 & -11 & -6 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$Y = [-10 \quad -10 \quad 5]x$$

- b) Explain the effect of pole zero cancellation. [6]
- c) Explain full order observer with proper block diagram. [6]

OR

- Q4)** a) What is controllability? How to investigate controllability of a system using Gilbert's test for [6]

- i) Distinct eigenvalues and
- ii) Repeated eigenvalues

- b) Determine state feedback gain matrix for the system given below to place the closed loop poles at $s_1 = -1.8 + j2.4$ and $s_2 = -1.8 - j2.4$ by matrix transformation technique. [6]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 20.6 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

- c) Explain the principle of duality. [6]

- Q5)** a) State and explain Shannon's Sampling theorem. How to select the sampling period? [6]

- b) Explain mapping between s-plane and z-plane. [6]

- c) Determine the stability of sampled data control system using Jury's stability analysis having following polynomial $z^3 + 2.1z^2 + 1.44z + 0.32 = 0$. [5]

OR

- Q6)** a) Explain the concept of Zero Order Hold and First Order Hold operations. Derive the transfer function of ZOH. [6]
- b) Draw block diagram of the digital control system. State function of each block. [6]
- c) Determine the stability by using Bilinear transformation for sampled data control system having polynomial [5]

$$z^3 - 4z^2 + 5z - 2 = 0$$

- Q7)** a) Define adaptive control. Explain the need of adaptive control. What is adaption mechanism? [6]
- b) If the system is given by $\dot{x} = Ax + Bu$ and sliding surface is given by $s = Sx$, prove that the closed loop system obtained by applying the equivalent control is $\dot{x} = (I_n - B(SB)^{-1}S)Ax$. [6]
- c) State and explain the linear quadratic regulator problem. [5]

OR

- Q8)** a) Draw block diagram of Model Reference Adaptive Control scheme and explain it. [6]
- b) What is reaching law? Why is it required? Write expressions of constant rate reaching law, constant plus proportional rate reaching law and power rate reaching law. [6]
- c) What is optimal control? Write down the steps in linear quadratic regulator problem. [5]



Total No. of Questions : 8]

SEAT No. :

PA-925

[Total No. of Pages : 2

[5927]-357

**B.E. (Electrical)
PLC AND SCADA**

(2019 Pattern) (Semester - VII) (Elective - III) (403143A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 rules for proper construction of ladder diagram? [9]

b) Draw ladder diagram, $I_1, I_2 =$ Input & $Q_1, Q_2, Q_3, Q_4 =$ outputs. [8]

I_1	I_2	Q_1	Q_2	Q_3	Q_4
0	0	1	1	1	0
0	1	0	1	1	1
1	0	1	0	1	1
1	1	1	1	0	1

OR

Q2) a) Explain ON delay timer in detail along with its timing diagram. [9]

b) Three Motors are being controlled using three separate timers, each motor will remain ON for 10 sec. After every 10 sec, previous motor stops and the next motor becomes ON. This will continue in a cycle. Switch I_1 is used to start and I_2 is used to stop the cycle. Following table explains the function. [8]

Input Switches - I_1 and I_2

Outputs-Motors M_1, M_2 and M_3

$I_1 = 1$ and $I_2 = 0$	Timer	Time	M_1	M_2	M_3
----	T_1	10 sec	1	0	0
----	T_2	10 sec	0	1	0
----	T_3	10 sec	0	0	1
$I_1 = 0$ and $I_2 = 1$	----	----	0	0	0

P.T.O.

- Q3)** a) Explain simple closed loop systems with Block Diagram. [9]
b) Explain Temperature Control using PLC with the help of block diagram. [9]

OR

- Q4)** a) Explain “Adjust and Observe” method of PID tuning. [9]
b) Explain analog Signal Processing. Assume input 0 to 80 V AC, input module 0 to 5 V DC, 8 bit base. How 31 V AC is converted and scaled up to CPU Input Register. [9]

- Q5)** a) State and explain different features of SCADA systems. [9]
b) Explain three SCADA Generations. [9]

OR

- Q6)** a) Draw and explain block diagram of SCADA. [9]
b) Explain automatic substation control through SCADA system. [9]

- Q7)** a) Explain Open systems interconnection (OSI) Model. [9]
b) What are Features, Advantage & Applications of DCS? [8]

OR

- Q8)** a) Explain Distributed Control system with neat and labelled diagram. [9]
b) Differentiate between PLC and DCS. [8]



Total No. of Questions : 8]

SEAT No. :

PA-926

[Total No. of Pages : 2

[5927]-358

B.E. (Electrical)

POWER QUALITY MANAGEMENT

(2019 Pattern) (Semester - VII) (403143B) (Elective - III)

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) Discuss sag requirements for computer and allied equipment. Explain CBEMA and ITIC curve in reference to power quality. [9]
- b) Differentiate between voltage sag and interruptions. What are the major causes of voltage sag. [8]

OR

- Q2)** a) Explain influence of fault location and fault level on voltage sags. [8]
- b) Explain procedure for assessment of equipment sensitivity to voltage sag. [9]

- Q3)** a) Explain various causes, effects and mitigation methods in brief for generation of Harmonics. [10]
- b) Describe Voltage versus current Harmonics. [8]

OR

- Q4)** a) Explain in brief, following terms related with power system under non sinusoidal condition in system. [10]
- i) Active power
 - ii) Reactive power
 - iii) Apparent power
 - iv) Power factor
 - v) Phase sequence
- b) Describe how harmonics are produced due to use of SMPS. Draw nature of distorted waveform in this case, also state which harmonics are dominant. [8]

P.T.O.

- Q5) a)** What are harmonic resonances? State the effect of production of [10]
- i) Series resonance
 - ii) Parallel resonance on the system
- b) What is harmonic filtering? Explain various tuned filters. [8]

OR

- Q6) a)** Explain Harmonic study procedure hence describe various computer tools used for Harmonic analysis. [10]
- b) With neat diagram, describe the concept of point of common coupling hence explain impact of circuit impedance on system response. [8]
- Q7) a)** Explain selection procedure of transducers and various transducers used for power quality monitoring. [9]
- b) What are the requirements of power quality monitor to monitor various power quality parameters and various techniques of data collection? [8]

OR

- Q8) a)** Explain need of power quality Monitoring. What is reactive and proactive approach. [7]
- b) In context to power quality monitoring explain following : [10]
- i) Initial site selection for power quality monitoring.
 - ii) Requirement of power quality monitors and duration of monitoring.



Total No. of Questions : 8]

SEAT No. :

PA-1664

[Total No. of Pages : 2

[5927]-359

B.E. (Electrical)

HIGH VOLTAGE ENGINEERING

(2019 Pattern) (Elective-III) (Semester-VII) (403143C)

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) *You are advised to attempt not more than 6 questions.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) a) Describe in detail Lightning phenomenon. **[8]**

b) Write a short note on insulation co-ordination. **[9]**

OR

Q2) a) Explain Reynolds & Mason's Theory. **[8]**

b) State & explain with diagram causes of power frequency over voltages & switching surges. **[9]**

Q3) a) Explain with suitable Diagram Voltage Doubler circuits for producing high dc voltage. **[9]**

b) What is the principle of operation of a resonant transformer? List advantages over the cascade connected transformer. **[9]**

OR

Q4) a) Explain with suitable diagram Impulse Current Generator. Also give the function of different parts of an impulse current generator. **[9]**

b) A 12 stage impulse generator has 0.2 μ F capacitors. The wave front and the wave tail resistance connected are 600 ohms and 4000 ohms respectively. If load capacitor is 1000pF, find the front and tail times of the impulse wave produced. **[9]**

P.T.O.

- Q5)** a) Describe Electro-optical signal converter for EHV system. [8]
b) Explain how a sphere gap can be used to measure the peak value of voltages. What are factors that influence such voltage measurement? [9]

OR

- Q6)** a) Explain the generating voltmeter used for measuring high dc voltages. [8]
b) With a neat diagram explain capacitive voltage transformer. How it can be used for voltage measurement in power system? [9]

- Q7)** a) Describe earthing and shielding of high voltage laboratories. [9]
b) Describe for bushing
i) Wet power frequency voltage withstand test
ii) Momentary power frequency voltage withstand test
iii) Visible discharge test. [9]

OR

- Q8)** a) Discuss following tests carried out on porcelain insulator: [9]
i) 50% Dry impulse flashover test
ii) Impulse withstand test
b) Write a short note on Design, layout and grounding of HV laboratory. [9]



Total No. of Questions : 8]

SEAT No. :

PA-2621

[Total No. of Pages : 2

[5927]-360

B.E. (Electrical Engineering)

ROBOTICS AND AUTOMATION

(2019 Pattern) (Semester - VII) (403143D)(Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat Diagrams must be drawn wherever it is necessary.*
- 3) *The figures to the right indicate full marks.*

- Q1)** a) Explain Denavit - Hartenberg (D - H) representation assigned for right-handed orthonormal coordinate frames. Write the algorithm (steps) for D-H representation for deriving the forward kinematics for any manipulator. **[9]**
- b) Explain the general properties of inverse solution methods, i.e., the existence and uniqueness of the solution in detail. **[5]**
- c) Explain the rules for establishing the link coordinate frames. **[4]**

OR

- Q2)** a) Draw the link coordinate diagram and explain the arm matrix equation for the four-axis SCARA robot. **[9]**
- b) A vector $v = 3i + 2j + 7k$ is rotated by 60° about the z -axes of the reference frame. It is then rotated by 30° about the x -axes of the reference frame. Find the rotation transformation. **[5]**
- c) What is the difference between direct and inverse kinematics? Explain in detail. **[4]**
- Q3)** a) What are the different proximity sensors used in Robotics? Explain any one with the schematic diagram. **[6]**
- b) Explain absolute and incremental encoders along with the diagram. Explain based on construction, advantages, disadvantages and applications. **[6]**
- c) What are the basic parameters of photoelectric sensors that need to be considered during the selection of it. **[5]**

OR

P.T.O.

- Q4)** a) Explain the construction and working of LVDT along with its schematic diagram. [6]
- b) What is position sensors? How position sensors are used in Robotics. Enlist the different types of position sensors used in robotics. [6]
- c) What is the significance (importance) of the sensors in robotics? Explain with any application. [5]

- Q5)** a) Explain Resolved Motion Position Control (RMPC) with the help of a neat sketch. [6]
- b) Explain the concept of manipulator Jacobian, Jacobian inverse and singularities in brief. [6]
- c) Establish the relation between the rotation matrix and angular velocity in detail. [6]

OR

- Q6)** a) Explain Joint Position Control (JPC) with the help of a neat sketch. [6]
- b) Explain the modeling of the D.C. motor with load with relevant equations and diagrams. [6]
- c) Explain the trapezoidal velocity profile for robotic arm position control. [6]

- Q7)** a) Explain robot application in case of Arc welding. [6]
- b) Explain the spray-painting robot in detail. [6]
- c) Explain how robots can be used in material handling, picking, and packaging. [5]

OR

- Q8)** a) Explain how robots can be used in the defense and surveillance industry. [6]
- b) Explain how robots can be used in home automation. [6]
- c) Explain the selection criteria of the robot for industrial applications. [5]



Total No. of Questions : 8]

SEAT No. :

PA-927

[Total No. of Pages : 2

[5927]-361

B.E. (Electrical)

ALTERNATE ENERGY SYSTEM

(2019 Pattern) (Semester - VII) (403144A) (Elective - 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) Draw neat diagrams whenever necessary.
- 3) Assume suitable data if necessary.

Q1) a) Define :

[10]

- i) Yaw control
 - ii) Pitch control
 - iii) Power coefficient
 - iv) Power contained in wind
 - v) Pitch angle
- b) Wind speed is 10 m/s at the standard atmospheric pressure. Calculate
- i) Total power density in wind stream
 - ii) The total power produced by a turbine of 100 m diameter with an efficiency of 40%. Given = Air density at standard atm. Pressure & temp = 1.226 J/kg. k/m³.

[8]

OR

Q2) a) Derive the expression for maximum power that can be extracted from wind. [9]

b) Write a short note on wind speed statistics and statistical wind speed distributions. [9]

Q3) a) What is biogas? What are the various factors that affect biogas generation? [8]

b) Explain fluidized bed type biomass gasifier in detail with diagram. [9]

P.T.O.

OR

Q4) a) What is biomass and biomass energy? State the classification of biomass energy resources in detail. [8]

b) State various biomass, conversion processes? Explain any two in detail. [9]

Q5) a) State various methods of Hydrogen production. Describe any one method with suitable diagram. [9]

b) What are the various factors for choice of type of battery? [9]

Draw a neat diagram of battery charging scheme. Describe the components of the scheme.

OR

Q6) a) Describe use of Hydrogen as a fuel in IC engines. State the advantages and disadvantages of its use as a fuel. [9]

b) Describe Pumped hydroelectric storage with diagram. [9]

Q7) a) What is meant by time value of money? Why it should be considered? Explain Net Present value (NPV) [9]

b) Draw a neat diagram of renewable energy source connected to the grid. State various parameters required for synchronization of renewable energy source with grid. [8]

OR

Q8) a) Define with example :

i) Simple payback period.

ii) Return on Investment. [8]

b) A person wants to purchase solar water heating system of Rs. 20,000/- It is required to do a down payment of Rs. 4,000/-. An annual end of year payment of Rs. 2,400/- is required for 10 years. However, the person elects to pay Rs. 2,200/- yearly and a balance payment at the end Determine the value of balance payment if money is worth 10% interest. [9]



Total No. of Questions : 08]

SEAT No. :

PA-928

[Total No. of Pages : 2

[5927]-362

B.E. (Electrical)

ELECTRIC AND HYBRID VEHICLE

(2019 Pattern) (Semester - VII) (403144B) (Elective - 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) Draw neat diagrams whenever necessary.
- 3) Assume Suitable Data if necessary.

- Q1)** a) Draw & explain the EV Fleet Management. [8]
b) State the strategies and explain the general architecture of Energy management system. [6]
c) Mention the advantages and disadvantages of fuel cell vehicles. [4]

OR

- Q2)** a) Explain the mechanism of a fuel cell electric vehicle's drive train. [5]
b) List and describe the various sensors applicable to electric vehicles in brief. [6]
c) Write a short note on Battery swapping system. [7]

- Q3)** a) Describe the HEV modelling considering forward approach and reverse approach. [6]
b) How fuel efficiency analysis is carried for PHEV. [5]
c) Draw and explain HEV Subsystem. [6]

OR

- Q4)** a) Write a short note on vehicle dynamics. [5]
b) Describe the control of power flow in Series-Parallel Hybrid Vehicle with neat diagram. [7]
c) Explain the strategies used in Power Management systems for HEV. [5]

P.T.O.

- Q5)** a) State the criteria for battery selection in EV. [5]
b) Mention important considerations for Sizing the Power converter. [5]
c) Draw and explain PMSM motor control for an EV application. [8]

OR

- Q6)** a) Which are various forces to be consider for EV design? Write equations for power calculation. [8]
b) How to select size of EV motor? Which are the factors considered for the same? [6]
c) Write a short note on CAN vehicle network. [4]

- Q7)** a) Explain revised guidelines and standards for charging infrastructure?[8]
b) What are Star Labeling Schemes for Lithium - ion Packs and Systems? [5]
c) List Li-ion recycling policy and standards. [4]

OR

- Q8)** a) Explain EV tariff rate considerations declare by government for EV charging. [6]
b) State the Fame - II policy for EV and which type of EV is eligible for Fame - II. [6]
c) What is start up? Mention any one EV startup in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PA-2635

[Total No. of Pages : 2

[5927]-363

B.E. (Electrical)

SPECIAL PURPOSE MACHINES

(2019 Pattern) (Semester - VII) (Elective - IV) (403144C)

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 diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) Obtain mathematical expressions for abc to $\alpha\beta$ coordinates. [9]
b) Describe the mathematical model of PMSM. State clearly the assumptions made. [9]

OR

- Q2)** a) Explain with block diagram control strategies for PMSM. [9]
b) Explain significance of various transformations used in machine modelling. [9]

- Q3)** a) With a neat diagram explain construction of Switch Reluctance motor. State its applications. [9]
b) Draw and explain the phasor diagram of synchronous reluctance motor. [8]

OR

- Q4)** a) With suitable diagrams explain construction and working axial air gap synchronous reluctance motors. [9]
b) Discuss selection of number of poles and pole arc in switched reluctance machine. [8]

P.T.O.

- Q5)** a) Explain construction of permanent magnet stepper motor with a neat diagram. [9]
b) Explain concept of lead angle. How this is used in control of stepper motor? [9]

OR

- Q6)** a) Explain static and dynamic characteristics of stepper motors. [9]
b) Explain the theory of torque production in case of stepper motor. [9]

- Q7)** a) Explain process of torque production in linear induction motor. [9]
b) Explain construction and working of double sided linear induction motor. [8]

OR

- Q8)** a) Explain different types of linear induction motors with their construction. State the advantages of linear induction motor. [9]
b) Differentiate between single sided and double sided linear induction motor. [8]



Total No. of Questions : 7]

SEAT No. :

PA-929

[Total No. of Pages : 2

[5927] - 364

B.E. (Electrical)

HVDC & FACTS

(2019 Pattern) (Semester - VII) (Elective - IV) (403144 D)

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

Q1) a) Describe VSC based HVDC system and its detailed operation. [9]

b) How active and reactive power can be controlled by VSC? Explain in detail with suitable diagrams. [8]

OR

Q2) a) State the applications of VSC based HVDC systems. Explain any two in detailed. [9]

b) Discuss the latest trends in VSC based HVDC systems. [8]

Q3) Solve any two : [18]

a) With suitable diagrams explain dc link converter topologies. Which is the most commonly used converter topology? Why?

b) Elaborate with illustrative figures ; converter control schemes for controlling output of converters and harmonic generation.

c) Discuss the need of power electronic converters in power network. What are the different challenges faced by power electronic controllers deployed in power network?

P.T.O.

- Q4)** a) Explain shunt compensation provided by SVC. Also discuss V-I Characteristics and control schemes of SVC. [10]
- b) Compare SVC and STATCOM on the basis of response time, hardware requirements, characteristics and operation. [8]

OR

- Q5)** a) With schematic diagram explain construction and operation of STATCOM. Also explain VI Characteristics of STATCOM. [9]
- b) Explain operating modes of TCSC with suitable characteristics. [9]

- Q6)** a) Explain different operating modes of UPFC by using generalised power flow controllers. [9]
- b) What is active power filter? Explain operation of active power filters. [8]

OR

- Q7)** a) Elaborate Power flow studies in UPFC embedded systems. [9]
- b) With suitable diagram explain Interline power flow controller. [8]



Total No. of Questions : 8]

SEAT No. :

PA-930

[Total No. of Pages : 2

[5927]-365

B. E. (Electronics Engineering)

VLSI DESIGN

(2019 Pattern) (Semester - VII) (404201)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Draw circuit Diagram, waveforms and explain the operation of 6T SRAM cell. [8]

b) Explain the classification of memory. Explain the random access memory array organisation in detail. [9]

OR

Q2) a) Draw the schematic of DRAM cell with necessary peripherals and explain read-write cycles with the help of timing diagram. [9]

b) Write short notes on [8]
i) Refresh circuit
ii) Sense amplifier

Q3) a) Explain in detail about the Block Placement and channel definition. [9]

b) Explain Power distribution and power optimization in details. [8]

OR

Q4) a) Explain Global Routing and Switchbox Routing in detail. [9]

b) Explain in detail about I/O Architectures and Pad Design. [8]

Q5) a) Describe configurable logic block in FPGA? Explain 4-bit LUT in FPGA with an example. [9]

b) Explain fast carry chains and cascade carry chains in FPGA with neat sketch. [9]

P.T.O.

- Q6) a)** Sketch the block diagram of TAP controller and explain it in detail. [9]
- b) Describe the need of boundary scan? Explain boundary scan techniques in detail. [9]

- Q7) a)** Define scaling. Explain the scaling technique in detail. [9]
- b) Draw Stick Diagram for a CMOS Inverter. List down different layout editors/tools available in VLSI Design. [9]

OR

- Q8) a)** Describe design rules available in Layout Design. Explain design rules for NMOS. [9]
- b) Explain modeling and extraction of circuit parameters from physical layout using suitable diagram. [9]



Total No. of Questions : 8]

SEAT No. :

PA-931

[Total No. of Pages : 3

[5927]-366

B.E. (Electronics)

**ADVANCED POWER ELECTRONICS
(2019 Pattern) (Semester - VII) (404202)**

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) Explain block diagram of closed loop DC drive. What are speed control techniques of DC motors? Explain any one. **[8]**

b) Explain 3 Φ converter fed drives for separately excited DC motor for continuous operation with the help of circuit diagram and waveforms. **[9]**

OR

Q2) a) The speed of a separately excited DC motor is controlled by a 1 Φ full converter. The field circuit is also controlled by a full converter and field current is set to maximum possible value. The ac supply voltage to the armature and field converters is single phase 230 V, 50 Hz, $R_a = 0.25 \Omega$, $R_f = 150\Omega$. The motor voltage constant $K_v = 1.4$ V/A-rad/s. The armature current corresponding to load demand is $I_a = 50$ A. If the firing angle for the armature converter $\alpha_a = 45^\circ$ and armature current $I_a = 50$ A. Determine, **[12]**

- i) Torque developed by the motor
- ii) The speed w and
- iii) The input power factor (PF) of the drive

b) Explain Regenerative braking of DC motors. **[5]**

P.T.O.

- Q3)** a) Explain principle of operation of Induction motor and also state Advantages and Disadvantages. [6]
- b) Explain power flow diagram for Induction Motor. Explain Synchronous speed and Slip. [6]
- c) What is difference between CSI and VSI drives. [6]

OR

- Q4)** a) Explain speed control of induction motor using rotor resistance control and also explain rotor resistance control using chopper. [10]
- b) Compare DC and AC Drives. [8]

- Q5)** a) Explain with neat circuit diagram and waveforms working of 3Φ half wave brushless DC motor drive. [9]
- b) Explain Servomechanism and also explain operation of DC servo motor drive with neat circuit diagram and waveforms. [9]

OR

- Q6)** a) Explain types and working of any one stepper motor drive with neat circuit diagram, waveform and advantages. [9]
- b) Explain working of synchronous reluctance motor drive with neat circuit diagram and waveforms. Explain Pull-in and Pull-out torque. [9]

- Q7)** a) Explain block diagram of solar photovoltaic system (SPS). [4]
- b) Explain working of Wind power system. [6]
- c) Explain types of PV system [7]
- i) Stand-alone PV system
- ii) Grid connected PV system

OR

- Q8)** a) Explain the working of solar power system. [4]
- b) Compare Standalone wind energy system and Grid connected wind energy system. [6]
- c) Explain types of wind generator control of wind turbines. [7]



Total No. of Questions : 8]

SEAT No. :

PA-932

[Total No. of Pages : 2

[5927]-367

B.E. (Electronics Engineering)
ELECTRONICS SYSTEM DESIGN
(2019 Pattern) (Semester - VII) (404203)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Compare serial interface & parallel interface in micro-controller. [6]
b) Explain interfacing of DAC with microcontroller. [6]
c) Write short note on: [6]
i) LIN Bus
ii) I²C Bus

OR

- Q2)** a) Explain the selection of micro-controller for particular DAS application. [6]
b) Explain interfacing of temperature sensor with microcontroller. [6]
c) Compare SPI & CAN bus. [6]
- Q3)** a) With the help of diagram, explain different phases of software design. [9]
b) Explain with neat diagram different constructs of regular programming. [8]

OR

- Q4)** a) What are the features of assemblers & cross compiler. [9]
b) Explain factors affecting the choice of assembly language & high level language. [8]

P.T.O.

- Q5)** a) Explain PCB design rules for analog circuits. [9]
b) What is EMI & EMC? Explain the different standards for same. [8]

OR

- Q6)** a) Discuss the details of the recommended PCB design practices for various sub-circuits on same PCB & draw sketch indicating relative placement of the sub circuits. Justify answer for placement. [9]
b) Explain rules of PCB Design for mixed signal circuits. [8]

- Q7)** a) Explain the terms : ALT / Chop, Normal / Auto, & triggering in case of DSO? [6]
b) Explain various analysis used in finding fault in circuit. [6]
c) Explain Logic Analyzer with the help of block diagram & data acquisition modes. [6]

OR

- Q8)** a) Explain how dc or operating point analysis helps in finding faults in analog circuits. [6]
b) Explain DSO with the help of diagram and triggering methods. [6]
c) What is the need of probes & what are the different brobes used in logic analyzer. [6]

Total No. of Questions : 8]

SEAT No. :

PA-933

[Total No. of Pages : 2

[5927]-370

B.E. (Electronics Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester - VII) (404204A) (Elective - III)

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) Draw and explain in detail architecture of Wireless Sensor Network. [6]
b) Draw and explain the basic architecture of cloud computing. [6]
c) What is cloud? What are different types of cloud? With the help of neat diagram explain each type in detail. [8]

OR

- Q2)** a) List and elaborate the benefits of cloud computing. [6]
b) What is WSN? Elaborate features of WSN. [6]
c) Where does WSN find applications? Explain any one application in detail with appropriate diagram. [8]

- Q3)** a) Write the features of Arduino UNO board. Explain functions of following keyword with suitable example. [8]
i) pinMode()
ii) analogRead()
iii) digitalWrite()
b) Explain the sensor DHT 11. Draw the interfacing diagram of DHT11 with Arduino Board. Also write the program for same. [8]

OR

- Q4)** a) What is Raspberry Pi? Elaborate the features of Raspberry Pi. Why Raspberry Pi is more successful than other? [8]
b) What is ultrasonic sensor? Draw interfacing diagram of ultrasonic sensor with Raspberry Pi. Also write the program for same. [8]

P.T.O.

- Q5)** a) What is big data? Elaborate the characteristics of Big data? Explain meaning of structured and unstructured data. [8]
- b) Explain the following terms : [8]
- i) Statistical Models
 - ii) Regression analysis

OR

- Q6)** a) Draw and explain the basic architecture of Big data solution. [8]
- b) What is Hadoop? Why is Hadoop used for big data analysis? Explain different features of Hadoop technology. [8]
- Q7)** a) Explain in brief modern trends in wearable technology. [6]
- b) Draw and explain Greenhouse Monitoring system using IoT. [6]
- c) Explain Smart Health care monitoring system using IoT. [6]

OR

- Q8)** a) Write short note on Industrial standards in IoT. [6]
- b) Explain with neat block diagram IoT based Smart car parking. [6]
- c) Explain Smart Agriculture system using IoT. [6]



Total No. of Questions : 8]

SEAT No. :

PA-934

[Total No. of Pages : 2

[5927]-372

B.E. (Electronics)

TESTING AND VERIFICATION FOR SOC DESIGN

(2019 Pattern) (Semester - VII) (Elective - III) (404204C)

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 in detail various Fault models with its level in details. [6]
b) Explain in brief statistical models used for fault simulation. [6]
c) Explain following testing techniques with respect to test equipment. [6]
i) Electrical parameter testing
ii) Automatic test equipment
iii) Chip testing technique

OR

- Q2)** a) Explain analog and digital testing processes of VLSI. [6]
b) What are the steps of enhance testability of circuit. [6]
c) Design algorithm for true value simulation with example. [6]

- Q3)** a) What is simulation-based sequential circuit ATPG? Explain in detail. [8]
Differentiate between testing methodology for combinational and sequential circuits. [5]
b) Explain testing methodology for Combinational and sequential circuits. [5]

OR

- Q4)** a) What are the significance for combinational ATPG program? [10]
b) Elaborate briefly redundancy identification for combinational and sequential circuit. [8]

P.T.O.

- Q5)** a) Explain DFT methods for scan design. [9]
b) Explain Random Logic Built in self test (BIST). [8]

OR

- Q6)** a) Explain Built in self test (BIST) for VLSI chip in brief. [9]
b) What are the importance of Digital DFT scanning methods? Explain in brief. [8]

- Q7)** a) Give different description languages for boundary scan. [9]
b) Explain system configuration steps with boundary scan. [8]

OR

- Q8)** a) Is any factor responsible for the selection of scanning Memory BIST? If yes, then explain 4 in brief. [9]
b) How to configure a system for BIST? [8]



Total No. of Questions : 8]

SEAT No. :

PA-935

[Total No. of Pages : 2

[5927]-375

B.E. (Electronics Engineering)

MOBILE COMMUNICATION

(2019 Pattern) (Semester - VII) (404205A) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain with block diagram communication system using adaptive equalizers. [6]
- b) Explain in details spread spectrum modulation technique. [6]
- c) With neat diagram explain the operation of RAKE receiver. [8]

OR

- Q2)** a) Explain in details with neat diagram BPSK receiver. [6]
- b) Explain in details lattice equalization technique. [6]
- c) What is mean by diversity technique? Explain in any two space diversity methods. [8]

- Q3)** a) Explain data transmission in AMPS on forward & reverse channel. [8]
- b) What are the different logical channel in GSM & explain each channel. [8]

OR

- Q4)** a) Explain in details AMPS radio interface with diagram. [8]
- b) Explain in details Call processing of Mobile terminated call in AMPS. [8]

P.T.O.

- Q5)** a) Draw & explain with diagram Mobile IP & Simple IP. [8]
b) Draw & explain GSM burst structures. [8]

OR

- Q6)** a) Explain different radio network components use in CDMA 2000. [8]
b) Explain packet data transport process flow for Simple IP with VPN & Mobile IP with VPN. [8]

- Q7)** a) Compare wireless network & fixed telephone network. [6]
b) Explain in details with diagram circuit switching method. [6]
c) With neat diagram explain network architecture for UMTS. [6]

OR

- Q8)** a) Draw and explain X.25 protocol in details. [6]
b) Explain with diagram cellular packet-switched architecture. [6]
c) Write note on development in wireless network. [6]



Total No. of Questions : 8]

SEAT No. :

PA-936

[5927]-376

[Total No. of Pages : 2

B.E. (Electronics)

EMBEDDED SYSTEMS

(2019 Pattern) (Elective- IV)(Semester - VII) (404205- B)

Time :2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain Mailbox, Message queue, Event Register, Pipes. [8]
b) Elaborate Interrupts: ISR, Latency, Response and Recovery, Memory management in Embedded System. [9]

OR

- Q2)** a) Explain Pre-emptive and non-preemptive Schedulers. [8]
b) Elaborate Foreground and background Systems. [9]
- Q3)** a) Explain Embedded Linux, overview, advantages, disadvantages. [9]
b) Differentiate QNX Neutrino, Vx Works, MicroC/OS. [9]

OR

- Q4)** a) Differentiate between OS and RTOS. [9]
b) What are different types of RTOS? Elaborate Selection criteria for RTOS. [9]
- Q5)** a) Elaborate use of Software tools for development of an Embedded System. [8]
b) Write a short note on Embedded System Project Management. [9]

OR

P.T.O.

- Q6)** a) Explain Design and Co-design issues in the development Process of Embedded System. [8]
b) Write a short note on Scopes and Logic Analyzer. [9]

- Q7)** a) Explain a case study of Coding steps for Smart Card. [9]
b) Elaborate Case study of Coding steps for transmission of stream on a TCP/IP Network using RTOS. [9]

OR

- Q8)** a) Explain Case study of Coding steps for Adaptive Cruise Control System in a car. [9]
b) Elaborate Case Study of Coding steps for an Automatic Chocolate Vending Machine. [9]



[5927]-378

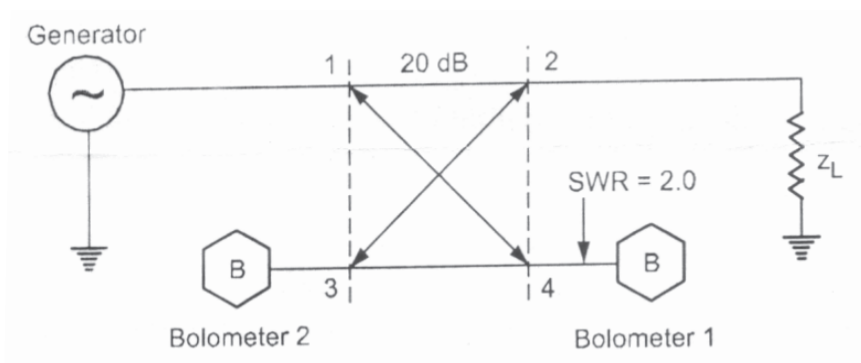
B. E. (Electronics and Telecommunication Engg.)**RADIATION AND MICROWAVE THEORY****(2019 Pattern) (Semester - VII) (404181)***Time : 2½ Hours]**[Max. Marks : 70**Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Draw neat diagrams wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) With the help of suitable diagram explain the how Magic Tee is used for measurement of unknown impedance. [6]

- b) A symmetric directional coupler with infinite directivity and a forward attenuation of 20Db is used to monitor the power delivered to a load Z_L in below Figure. Bolometer 1 introduces a VSWR of 2.0 on arm 4; bolometer 2 is matched to arm 3. If bolometer 1 reads 8mW and bolometer 2 reads 2 mW, find: [6]

- i) the amount of power dissipated in the load Z_L ;
- ii) the VSWR on arm 2.



- c) With the help of constructional details explain the operating principle of Isolator. [5]

OR

P.T.O.

- Q2)** a) Explain the roll of Microwave Attenuator. Explain the Card/Fixed type of attenuator. [5]
- b) Enlist the characteristics of Scattering Matrix. Derive the scattering matrix for H-Plane Tee. [6]
- c) With the help of suitable diagram explain the operation of Two-hole directional coupler. [6]
- Q3)** a) What is the slow wave structure? Explain how a helical TWT achieves amplification. [6]
- b) With the help of Constructional Details explain the operating principle of Reflex Klystron. [6]
- c) How bunching is achieved in cavity Magnetron. Explain the phase focusing effect. [5]

OR

- Q4)** a) Distinguish between the Klystron tube and Travelling wave tube amplifier. [6]
- b) A 2-cavity Klystron amplifier has the following characteristics: Voltage. [6]
 gain = 15 dB
 Input power = 5 mV
 Rsh of input cavity = 30 K Ω
 Rsh of output cavity = 40 K Ω
 RL (load impedance) = 40 K Ω
 Determine:
 i) The input r.m.s. voltage
 ii) The output r.m.s. voltage
 iii) The power delivered to the load.
- c) What are the limitations of conventional tubes at microwave Frequencies. [5]
- Q5)** a) Explain the constructional detail and operation of Microwave transistor. [6]
- b) Define negative differential resistivity. Explain the V-I characteristics of Gunn diode using two valley theorem. [6]
- c) What is a PIN diode? Describe the construction of a PIN diode and also its characteristics. [6]

OR

- Q6)** a) Explain the operation of Varactor diode. Discuss the constructional details, equivalent circuit and figure of merit. Mention its applications. [6]
- b) An IMPATT diode has a drift length of $2\mu\text{m}$. Determine [6]
- the drift time of the carrier
 - the operating frequency of the diode.
- c) What are the avalanche transit time devices? Explain the working principle of TRAPATT diode. [6]
- Q7)** a) Calculate the SWR of a transmission system operating at 10 GHz. [6]
Assume TE₁₀ wave transmission inside a waveguide of dimensions $a = 4\text{ cm}$, $b = 2.5\text{ cm}$. The distance measured between twice minimum power points = 1 mm on a slotted line.
- b) Using suitable block diagram explain the operating principle of RADAR. Enlist the applications of RADAR. [6]
- c) What is Terrestrial microwave Communication System. Enlist its advantages and Limitations. [6]

OR

- Q8)** a) Write a note on : Medical Application such as Microwave Diathermy. [6]
- b) What are the hazards of Electromagnetic Radiations? Explain the different types of Radiation Hazards. [6]
- c) A 10GHz RADAR has the following characteristics, peak transmitted power = 250kW; power gain of antenna = 2500; minimum detectable peak signal power by receiver = 10^{-14} watts; cross sectional area of the RADAR = 10m^2 . If this RADAR were to be used to detect a target of 2m^2 equivalent cross section, find the maximum range possible. [6]



Total No. of Questions : 8]

SEAT No. :

PA-938

[Total No. of Pages : 2

[5927]-379

B.E. (Electronics & Telecommunication Engineering)

VLSI DESIGN & TECHNOLOGY

(2019 Pattern) (Semester - VII) (404182)

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) Draw and explain the architecture of CPLD. Explain Macrocell in detail. [10]
b) What are the technologies supported by FPGA? Explain any two of it detail. [8]

OR

- Q2)** a) List and Explain in brief various Simulation and Synthesis Tool. [6]
b) Draw and Explain the following for FPGA : [12]
i) Logic Cell
ii) Programmable Switch Matrix
iii) I/O Block

- Q3)** a) Design CMOS logic for $F = AB + C(D+E)$. [5]
b) Draw 2:1 Mux using CMOS as well as TG. Comment on the savings of transistors using TG and CMOS method. [12]

OR

- Q4)** a) Define Scaling and Explain any one type of scaling and its effect on at least 4 parameters. [9]
b) Explain the following terms : [8]
i) Velocity Saturation
ii) Hot Electron Effect

P.T.O.

- Q5)** a) Which Lambda rules are used for CMOS Layout? Give its significance. [6]
b) Explain the steps involved in fabrication of CMOS transistor with suitable diagram. [12]

OR

- Q6)** Draw the block diagram of half adder and its truth table. Draw its CMOS transistor level circuit. Draw Euler's Path for both networks. Draw the stick diagram for sum and Carry (outputs) of HALF ADDER. [18]

- Q7)** a) Explain different types of faults existing in VLSI chips. [8]
b) Explain Controllability, Observability and Predictability in testability. [9]

OR

- Q8)** a) Explain Path sensitization method. [8]
b) Explain JTAG boundary Scan, Explain all the pins involved. [9]



Total No. of Questions : 8]

SEAT No. :

PA-939

[Total No. of Pages : 2

[5927]-380
B.E. (E & TC)
CLOUD COMPUTING
(2019 Pattern) (Semester - VII) (404183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2 and 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.*

- Q1)** a) Define virtualization. Explain the characteristics and benefits of virtualization. [6]
- b) Describe operating system virtualization with the help of suitable diagram. [6]
- c) Differentiate between Type 1 and Type 2 hypervisor. [6]

OR

- Q2)** a) Explain benefits of virtual clusters and differentiate between virtual cluster and physical cluster. [6]
- b) Explain the methods of storage virtualization. [6]
- c) Describe various implementation levels of virtualization. [6]
- Q3)** a) Discuss the types of data security in detail. [6]
- b) Draw and explain the cloud CIA security model. [6]
- c) Write a note on cloud computing life cycle. [5]

OR

- Q4)** a) Describe fundamental components and characteristics of service oriented architecture. [6]
- b) Explain the role of host security in SaaS, Paas and IaaS. [6]
- c) Write a note on Firewall. [5]

P.T.O.

- Q5)** a) Explain the different cloud computing platforms. [6]
b) Draw and explain the architecture of Google App Engine. [6]
c) Differentiate between Google cloud platform and Amazon Web Services. [6]

OR

- Q6)** a) Discuss the various roles provided by Azure operating system in compute services. [6]
b) Draw and elaborate various components of Amazon Web Service (AWS) architecture. [6]
c) Describe the steps involved in creating an EC2 instance. [6]
- Q7)** a) Write a note on distributed computing. [6]
b) Identify and elaborate different IoT enabling technologies. [6]
c) Describe the different types of distributed systems. [5]

OR

- Q8)** a) Write a note on role of embedded system in implementation of IoT. [6]
b) Describe any two innovative applications of Internet of Things. [6]
c) Describe the IoT application for online social networking. [5]

***** END *****

Total No. of Questions : 8]

SEAT No. :

PA-940

[5927]- 381

[Total No. of Pages : 2

B.E. (Electronics /E& TC)

SPEECH PROCESSING

(2019 Pattern) (Elective- III) (Semester - VII) (404184 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) Figures to the right indicate full marks.
- 3) Assume necessary data.

- Q1)** a) With the help of basic speech production model, explain the principles of LPC analysis. How to decide number of formants? [10]
- b) How to use LPC parameter for computation of pitch & formants? Explain it. [8]

OR

- Q2)** a) Define & explain mel frequency cepstrum (MFC). Draw schematic for the computation of MFCC. [10]
- b) Explain Levinson-Durbin recursive algorithm for linear predictor analysis. [8]

- Q3)** a) What is adaptive PCM? How can be SNR improved using ADPCM? [9]
- b) Explain filter bank analysis of speech signal and further explain in detail sub-band speech encoding. [8]

OR

- Q4)** a) Draw and explain the block schematic for a basic LPC vocoder. [9]
- b) Explain in detail adaptive transform coder (ATC). [8]

P.T.O.

- Q5)** a) Explain in brief speaker recognition system. What are the different features used for speaker recognition. Explain in brief. [9]
- b) Discuss text-to-speech system with necessary block schematic with respect to [8]
- i) Prosody
 - ii) Phonetic transcription

OR

- Q6)** a) Explain phoneme based concatenative speech synthesis. What are the different challenges faced in synthesizing near natural speech. [9]
- b) Explain automatic speech recognition system for automatic telephone dialing system (use of statistical method). Explain feature extraction, training & testing phase. [8]
- Q7)** a) Describe how convolutional Neural networks can be used for automatic speech recognition. [9]
- b) Explain following performance parameters [9]
- i) Sensitivity
 - ii) Specificity
 - iii) Area under curve

OR

- Q8)** a) Explain training phase for Recurrent Neural Networks (RNN). Write any two advantages & disadvantages of RNN. [9]
- b) Compare CNN & RNN with respect to fixed length input, Recurrent connections performance, advantages & disadvantages. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1665

[Total No. of Pages : 2

[5927]-382

**B.E. (Electronic and Telecommunication)
PLC, SCADA AND AUTOMATION
(2019 Pattern) (Semester-VII) (Elective-III) (404184 (B))**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is the function of timer in PLC? Draw ladder diagram using timer function. [4]
- b) Explain the NO/NC concept with the help of a ladder diagram. [7]
- c) Explain the following terms in detail with respect to PLC. [7]
- i) Input Scan Time
 - ii) Output Scan Time

OR

- Q2)** a) What is the function of counter in PLC? Draw ladder diagram using counter function. [4]
- b) Draw a ladder diagram to satisfy the truth table of a NAND logic gate with three inputs and one output. [7]
- c) Explain concept of P, PI, PD, PID control actions with respect to PLC. [7]
- Q3)** a) Define the term SCADA and list the components of SCADA system. [4]
- b) Explain the functions of MTU and RTU in detail. [7]
- c) Explain an application of SCADA system in industrial Automation. [7]

OR

P.T.O.

- Q4)** a) Define the following terms: [4]
i) MTU
ii) RTU
b) Draw & Explain the architecture of SCADA. [7]
c) Explain an application of SCADA system in industrial automation [7]

- Q5)** a) Explain the need of DCS. [4]
b) Write on types of DCS [7]
c) Explain the application of DCS in water treatment plant. [7]

OR

- Q6)** a) Explain the basic concept of DCS. [4]
b) Compare PLC, DCS and SCADA. [7]
c) Explain the DCS architecture. [7]

- Q7)** a) What is DNC system? [2]
b) Explain PROFIBUS Protocol in detail [7]
c) What are the main components of NC machine? [7]

OR

- Q8)** a) What is TCP/IP? [2]
b) Explain MODBUS protocol in detail. [7]
c) Explain CNC with block diagram. [7]



Total No. of Questions : 8]

SEAT No. :

PA-2629

[Total No. of Pages : 2

[5927]-383

B.E. (E & TC)

JAVA SCRIPT

(2019 Pattern) (Semester-VII) (Elective - III) (404184C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 function? Explain with example how to pass and return parameters and arguments from called function to the calling function. [6]
- b) What are Common properties and methods of object in JavaScript? [6]
- c) Write a JavaScript program to pass the function by reference, perform addition of two objects inside the function and display the result in calling function. [6]

OR

- Q2)** a) What is Anonymous Functions in JavaScript? Explain its use with an example. [6]
- b) Write a JavaScript program that will append an object to an array and will check if an object is an array datatypes. [6]
- c) Explain data types in JavaScript? Differentiate between primitive and non-primitive [6]
- Q3)** a) What is Regular Expression in JavaScript and explain the need of regular expressions. [6]
- b) Explain Look ahead and Look behind concepts in JavaScript. [6]
- c) Write a program to study string related built-in methods in JavaScript.[5]

OR

P.T.O.

- Q4)** a) Explain string methods for Regular Expression in JavaScript. [6]
b) Explain Character Classes in JavaScript. [6]
c) What are the limitations of Regular Expression. [5]

- Q5)** a) Define JavaScript object model and explain four distinct object models used in JavaScript. [6]
b) Explain event and event handler with an example. [6]
c) Write a JavaScript program to create a Home page of any website and change background color using [6]
On mouse over event (mouse over)
On focus event (focus)

OR

- Q6)** a) Describe Document properties and methods with their HTML relationship. [6]
b) Differentiate between HTML. and DHTML. [6]
c) Explain DOM and CSS Elements with example. [6]

- Q7)** a) Explain Various methods to control windows and list out window features. [6]
b) Explain the form handling and the terms form fields, validations. Dynamic forms, Form usability with an example. [5]
c) Design and implement a simple calculator using Java script for operations like **addition, multiplication, subtraction. division, square of a number.**[6]

OR

- Q8)** a) List and explain various popular windows events? [6]
b) What is frame and explain the HTML tags to create frames and how to change the properties of the frame [5]
c) Create a student information Form to accept information like Name, Address, City, State ,Gender, Mobile Number, and email id. Perform validations for: [6]
• Correct Names
• Mobile Names
• Email I.D.'s



Total No. of Questions : 8]

SEAT No. :

PA-941

[5927]-384

[Total No. of Pages : 2

B.E. (Electronics & Telecommunication)

EMBEDDED SYSTEM & RTOS

(2019 Pattern) (Elective- III) (Semester - VII) (404184 D)

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) State the features of μ COS- II Real Time Operating System (RTOS). [4]
b) What is intertask communication in RTOS? Explain the use of semaphore for event signaling using following functions: OSSemPost() and OSSemPend(). [8]
c) Explain with state diagram the states of a task in RTOS. [6]

OR

- Q2)** a) Explain the following μ COS- II functions. [4]
i) OSInit()
ii) OSStart()
b) Define clock tick in RTOS. Explain with functions any two time management services in μ COS- II. [8]
c) Explain the following Inter-Process Communication functions: [6]
i) OSMBBoxCreate()
ii) OSTaskCreate()
iii) OSMBBoxPend()

- Q3)** a) Differentiate between BIOS and Boot-loader. [4]
b) Explain cross-development tools for Embedded Linux target. [8]
c) Explain the following tool utilities in Embedded Linux system: [6]
i) GCC compiler
ii) glibc

OR

- Q4)** a) What are the memory requirements of embedded Linux. [4]
b) Explain typical set up for embedded Linux application development. [8]
c) Explain in detail the role of GNU debugger. [6]

P.T.O.

- Q5)** a) List and explain in brief the various boot-loaders used for Embedded System. [5]
- b) Explain the following file systems used in Embedded Linux. [5]
- i) JFFS2
 - ii) ext4
 - iii) cramfs
 - iv) ext2
 - v) ReiserFS
- c) Explain with diagram the architecture of Linux kernel. [7]

OR

- Q6)** a) State the features of Universal Boot-loader. [5]
- b) State the various boot-loader challenges in terms of DRAM and image complexity, flash vs RAM [5]
- c) Explain the device driver for Linux kernel. [7]
- Q7)** a) Explain structure of Arduino program? Write a program to blink a LED connected to any port of Arduino board. [9]
- b) Explain the embedded software development tools. [8]

OR

- Q8)** a) Explain the development platform of Raspberry Pi with reference to IDE, Board Details and application. [9]
- b) State the features that an Integrated Development Environment (IDE) should have. List the hardware present in the host machine and target machine. [8]



Total No. of Questions : 8]

SEAT No. :

PA-942

[Total No. of Pages : 2

[5927]- 385

B.E. (E & TC)

MODERNIZED IOT

(2019 Pattern) (Elective- III)(Semester - VII) (404184 E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe in detail the wireless HART communication protocol. **[9]**

b) Write a note on : CoAP & XMPP **[8]**

OR

Q2) a) Explain HTTP and MQTT session layer protocol in IoT. **[9]**

b) Write a note on : IPV4 and IPV6 **[8]**

Q3) a) Explain connection of microcontroller with mobile devices through blue-tooth. **[9]**

b) List out and explain any 8 Arduino Functions in detail. **[8]**

OR

Q4) a) Explain deployment of IoT with raspberry PI platform. **[9]**

b) Explain connection of microcontroller with mobile devices through Wi-fi. **[8]**

Q5) a) Describe the Catalysts, precursors of IIoT and innovations in IIoT with its challenges. **[9]**

b) How IoT in OIL and GAS industry works, also identify the challenges in same. **[9]**

OR

P.T.O.

- Q6)** a) Illustrate the three-tier topology in IIoT. [9]
b) Explain in detail about the industrial internet architecture framework. [9]

- Q7)** a) Explain Forest Fire Detection- Monitoring of combustion gases and preemptive fire conditions to define alert zones. [9]
b) Describe Photovoltaic Installations-Monitoring and optimization of performance in solar energy plants. [9]

OR

- Q8)** a) Describe the sportsmen care application for vital signs monitoring in high performance centers and fields. [9]
b) Illustrate the Ultraviolet Radiation mechanism for Measurement of UV sun rays to warn people not to be exposed in certain hours. [9]



Total No. of Questions : 8]

SEAT No. :

PA-943

[Total No. of Pages : 1

[5927]-386

B.E. (Electronics & Telecommunication)

DATA MINING

(2019 Pattern) (Semester-VII) (404185A) (Elective-IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 to 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) Discuss on the basic concept of Aprori Algorithm and write its drawbacks. **[9]**

b) What are the different methods through which pattern can be evaluated?**[9]**

OR

Q2) a) Give significance of Market Basket Analysis with example. **[9]**

b) Describe different data vasualization techniques. **[9]**

Q3) a) Give the points of differences between ID3 and CART algorithm. **[9]**

b) Explain Regression. Detail linear regression with an example. **[9]**

OR

Q4) a) Explain the procedure involved in rule based classification. **[9]**

b) Explain the concept of Support Vector Machines. **[9]**

Q5) a) What is outlier analysis and what are different types of outliers? **[9]**

b) With the help of suitable example, explain k-means algorithm. **[8]**

OR

Q6) a) What are different types of data in cluster analysis? **[9]**

b) Give the point of differences between classification and clustering. **[8]**

Q7) a) Explain the concept of text mining and the different approaches for text mining? **[9]**

b) Write short notes on web usage mining. **[8]**

OR

Q8) a) Give points of differences between data mining and text mining. **[9]**

b) Discuss on spatial data mining. **[8]**



Total No. of Questions : 8]

SEAT No. :

PA-2636

[Total No. of Pages : 2

[5927]-387

B.E. (E & TC)

ELECTRONIC PRODUCT DEVELOPMENT

(2019 Pattern) (Semester - VII) (404185B) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

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

- Q1)** a) Articulate software with reference to algorithmic, languages, methods, selection, and purchase. [8]
- b) Illustrate prototyping model and spiral model for software development.[9]

OR

- Q2)** a) What are the metrics to assess performance and progress? Explain. [8]
- b) What are software bugs introduced, how to locate and eliminate them.[9]

- Q3)** a) Explain different mechanisms used for cooling of electronic circuits.[9]
- b) What are the different types of PCB? Explain one. [9]

OR

- Q4)** a) Discuss about PCB partitioning Design Rules for EMC improvement.[9]
- b) Explain configurations of routing topologies in PCB layout designing.[9]

P.T.O.

Q5) a) Explain the steps of Debugging and techniques for trouble shooting and characterization. [9]

b) Explain Analog-Digital conversion in detail. [9]

OR

Q6) a) Explain techniques for Trouble shooting. [9]

b) State the important parameters to be considered while selecting passive, active and switching components. [9]

Q7) a) With the help of suitable example explain how the bill of material is prepared. [8]

b) Discuss about records, accountability and liability with respect to documentation. [9]

OR

Q8) a) Explain need of Layout of Documentation. What is proper Layout of Documentation? [8]

b) Explain with example what do you mean by preparation, presentation, and preservation of documents. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1666

[Total No. of Pages : 2

[5927]-388

B.E. (E&TC)

DEEP LEARNING (Elective - IV)

(2019 Pattern) (Semester - VII) (404185C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the term batch normalization with respect to Neural Network. [6]
b) Explain the architecture of Neural Network and comment on width and depth of Neural network. [6]
c) Write a short note on auto encoders. [6]

OR

- Q2)** a) Explain various activation functions used in neural network. [6]
b) Explain the term over fitting and dropout with respect to Neural Network. [6]
c) Explain in detail any two applications of deep learning. [6]

- Q3)** a) Write a short note on deep CNN architecture: AlexNet. [6]
b) Explain the term parameter sharing in CNN. [5]
c) Explain the terms weight initialization and hyper parameter training with respect to training of CNN. [6]

P.T.O.

OR

- Q4)** a) Write a short note on deep CNN architecture: PlaceNet. [6]
b) Explain the terms motivation and layers in CNN. [5]
c) Write a short note on convolution pooling. [6]

- Q5)** (a) What is NLP? Explain its significance. [6]
(b) Explain the term long short term memory RNN. [6]
(c) Write a short note on BPTT for training the RNN. [6]

OR

- Q6)** a) What is Recurrent Neural Network? How it is different from Neural Network? [6]
b) Explain the term GRU with respect to RNN. [6]
c) Write a short note on Generative Adversarial Network. [6]

- Q7)** a) Explain Image recognition using deep learning. [9]
b) Explain chatbot architecture using NLP? [8]

OR

- Q8)** (a) Explain spam mail classification applications using NLP. [8]
(b) Explain sentiment analysis of any social media application? [9]



Total No. of Questions : 8]

SEAT No. :

PA-2637

[Total No. of Pages : 2

[5927]-389

B.E. (Electronics/E&TC)

LOW POWER CMOS

(2019 Pattern) (Semester-VII) (Elective-IV) (404185D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 in detail transistor and gate sizing with respect to inverter chain, dynamic power reduction and leakage power reduction. [9]

b) Explain self Gating flip flop and double edge triggered flip flop. [9]

OR

Q2) a) What is transistor network restructuring and how it will help circuit. Explain with example. [9]

b) Write note on Cell sizes and spacing and varieties of Boolean functions. [9]

Q3) a) Write note on modelling of signal and define signal probability and signal activity. [8]

b) Explain in detail what is estimation of glitching power. Define static hazard and dynamic hazard. [9]

OR

Q4) a) Explain Power sensitivity analysis and estimation. [9]

b) Explain circuit reliability in detail. [8]

Q5) a) Explain in detail software power dissipation at gate level and architecture level. [9]

b) Explain in detail co-design for low power. [9]

OR

P.T.O.

- Q6)** a) Explain in detail software power dissipation at bus level and instruction level. [9]
b) Explain in detail software power optimization. [9]

- Q7)** a) Explain what is adiabatic switching and compare it with voltage scaling. [9]
b) Explain Optimization algorithms in CAD tools. [8]

OR

- Q8)** a) Explain what is adiabatic logic gates. [9]
b) Explain Variation tolerant design in detail. [8]



Total No. of Questions : 8]

SEAT No. :

PA-944

[Total No. of Pages : 2

[5927]-390

B.E. (Electronics/E&TC)

SMART ANTENNAS

(2019 Pattern) (Semester-VII) (Elective-IV) (404185 E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 the need of smart antennas, give its advantages and disadvantages. [6]
- b) What is the mutual coupling effect in a smart antenna array? How to achieve maximum directivity considering mutual coupling effect? [6]
- c) What are the different types of smart antennas? What are the different smart antenna configuration? [6]

OR

- Q2)** a) Differentiate between switched beam and adaptive antenna approach. [6]
- b) Explain the architecture of a smart antenna system with suitable diagram. [6]
- c) Explain the beam steering and degree of freedom for smart antennas. [6]

- Q3)** a) Explain in detail Maximum entropy method for DOA estimation. [7]
- b) What are the advantages and disadvantages of the Eigen structure method for spectral estimation? [5]
- c) Explain in detail the linear prediction method for spectral estimation. [5]

OR

- Q4)** a) What is a MUSIC algorithm? Compare root music and cyclic music algorithm for DOA estimation. [7]
- b) What is ESPRIT algorithm for DOA estimation? [5]
- c) Explain in detail Maximum likelihood method for DOA estimation. [5]

P.T.O.

- Q5)** a) Explain the design of beam former for Multiple Side lobe Canceler and maximum SNR beam former? [6]
b) Explain how to design a beam former to achieve Maximum SINR. [6]
c) How to achieve Minimum Mean Square Error (MMSE) using beamforming algorithms? [6]

OR

- Q6)** a) Explain the concept of Classical Beam former and Statistically Optimum Beam-forming Weight Vector. [6]
b) What is Linearly Constrained Minimum Variance (LCMV) beamforming method? Explain it in detail. [6]
c) Elaborate Direct Matrix Inversion (DMI) beamforming method. [6]

- Q7)** a) What is the principle of MIMO systems? List down various types and explain any one in detail. [6]
b) Explain state-of-the-art for development of mm-Wave hybrid arrays, and discuss important issues for the same. [6]
c) Compare SISO, SIMO, MISO, MIMO systems with respect to data throughput, link range, bandwidth, and transmit power. [5]

OR

- Q8)** a) What are the different types of MIMO systems? Explain each type in brief. [6]
b) Explain the design of Hybrid antenna array for mm wave considering Channel modeling and capacity characterization. [6]
c) What is the concept of Massive MIMO? Give its applications. [5]



Total No. of Questions : 8]

SEAT No. :

PA-945

[Total No. of Pages : 2

[5927]-391

B. E. (Information Technology)

INFORMATION AND STORAGE RETRIEVAL

(2019 Pattern) (Semester - VII) (414441)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) In information retrieval, if q is the information request and a set of relevant documents for query q is $R_q = (d3, d5, d9, d25, d39, d44, d50, d70, d80, d120)$. Consider new retrieval algorithm has been designed and has been evaluated for information request q returns, ranking of the documents in the answer set is as follows. [6]

- | | |
|----------------|----------------|
| 1) <u>d120</u> | 9) d143 |
| 2) d84 | 10) <u>d25</u> |
| 3) <u>d50</u> | 11) d38 |
| 4) d6 | 12) d48 |
| 5) d8 | 13) d230 |
| 6) <u>d9</u> | 14) d113 |
| 7) d58 | 15) <u>d3</u> |
| 8) d129 | |

The documents that are relevant to the query q are underlined. Calculate precision and recall for the documents that are relevant to the query q .

- b) What are measures used to evaluate system performance? [6]
- c) What are various techniques used to specify query in information visualization? [6]

OR

P.T.O.

- Q2)** a) What are User oriented measures used in performance evaluation of IR systems. [6]
b) Define Precision and Recall. Give example of each and justify its use in evaluating IR system. [6]
c) What is relevance Judgement? Explain the term group relevance judgements, pseudo relevance feedback. [6]

- Q3)** a) What is distributed IR? Explain the architecture of distributed IR in detail. [9]
b) What is Collection Partitioning with respect to distributed IR Explain in detail. [8]

OR

- Q4)** a) Explain in details the working of MULTOS data model. [9]
b) What is Query Languages with respect to multimedia IR Explain it in detail. [8]

- Q5)** a) Write a short note on Searching the Web. [6]
b) Explain Crawler-Indexer Architecture with neat diagram. [6]
c) What is role of crawler in web searching? Explain the strategies used by the web crawler. [6]

OR

- Q6)** a) What is hyperlink? Explain structure of hyperlink and also explain searching using hyperlinks. [6]
b) Write a note on characterizing the web. [6]
c) Explain Web Scrapping with suitable example. [6]

- Q7)** a) Define Recommender system? Explain in brief Collaborative Filtering. [9]
b) Explain semantic web in details. [8]

OR

- Q8)** a) Explain difference between Text-centric and Data-centric XML retrieval. [9]
b) Explain in detail Content Based Recommendation of Documents. [8]



Total No. of Questions : 8]

SEAT No. :

PA-946

[Total No. of Pages : 2

[5927]-392

B.E. (Information Technology)
SOFTWARE PROJECT MANAGEMENT
(2019 Pattern) (Semester - VII) (414442)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 objectives of activity planning in detail with suitable example. [9]
b) List different project scheduling Techniques? Explain the Difference between CPM and PERT. [9]

OR

- Q2)** a) What is network Model? Explain with neat sketch. [9]
b) Explain with suitable example forward pass and Backward Pass. [9]

- Q3)** a) What are the different tools and methods used for monitoring and regulating project operations? [8]
b) What are the different methods used in visualizing progress. Explain in detail? [9]

OR

- Q4)** a) What is project control? Explain the different types of control mechanism in details. [8]
b) Explain plan monitor control cycle used in the project in detail with example. [9]

- Q5)** a) How to select a right person for the job? Explain the recruitment process in detail. [9]
b) What is Leadership? Explain Different approaches of leadership. [9]

OR

P.T.O.

- Q6)** a) Explain Oldham-Hackman job characteristic model. [9]
b) Explain five fundamental stages of development [9]

- Q7)** a) What is visibility in Devops? What are the different ways to enable the visibility in Azure Devops? [6]
b) Define Application Lifecycle Management (ALM) tools? What feature should be considered while choosing an ALM Tools? List some examples of ALM tools? [6]
c) What is Azure Board? Explain with suitable example? [5]

OR

- Q8)** a) Explain application life cycle with its phases? [6]
b) Explain any four metrics used for developer practices? [6]
c) List any four examples of reports for metrics in agile projects? [5]



Total No. of Questions : 8]

SEAT No. :

PA-947

[Total No. of Pages : 2

[5927]-393

B.E. (Information Technology)

DEEP LEARNING

(2019 Pattern) (Semester - VII) (414443)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Differentiate between feed-forward neural networks and recurrent neural networks. Explain the types of Recurrent Neural Network (RNN). [9]
b) Explain how sequence to sequence model works. [9]

OR

- Q2)** a) Describe the general layout of a Long Short-Term Memory Network (LSTM) with suitable diagram. [9]
b) What is Recurrent Neural Network (RNN)? State and explain types of RNN in brief. [9]
- Q3)** a) Autoencoders use unsupervised learning approach. Justify the statement. [9]
b) Explain the concept of contractive autoencoder and its need. [8]

OR

- Q4)** a) State the applications of Autoencoders. Explain how the dimensionality reduction feature of autoencoder is useful in information retrieval task? [9]
b) Explain denoising autoencoders with suitable figure. [8]
- Q5)** a) Why is the network called Greedy Layer Wise Pretraining Network? [9]
b) State and Justify Role of Representation Learning. [9]

OR

P.T.O.

- Q6)** a) Explain distributed representation with example. [9]
b) Justify when to use domain adaptation and when to use transfer learning. [9]
- Q7)** a) Explain graph convolution approach for social network analysis? Describe RNN based framework for NLP. Write any four applications of NLP. [9]
b) What are the application areas of image classification? Explain CNN for image Classification. [8]

OR

- Q8)** a) Explain content based, collaborative and hybrid recommender system with pros and cons. [9]
b) Explain basic architecture of Automatic Speech Recognition system. Why RNN is suitable for speech recognition? How bidirectional RNNs are used in automatic speech recognition? [8]

Total No. of Questions : 8]

SEAT No. :

PA-948

[5927]- 394

[Total No. of Pages : 2

B.E. (Information Technology)

MOBILE COMPUTING

(2019 Pattern) (Elective- III)(Semester - VII) (414444 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) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Electronic calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1) a)** Explain the LTE network architecture. **[9]**
- b) Explain the Second Generation of wireless communication with its standards. **[9]**

OR

- Q2) a)** Write short note on: Fifth generation telecommunication standard or 5G. **[9]**
- b) Write a note on Third Generation Wireless Networks (3G). **[9]**
- Q3) a)** Describe DSDV and DSR routing algorithms for adhoc networks. **[8]**
- b) How the agent can be discovered using Mobile IP? Give the overlay of agent advertisement packet which includes mobility extension. **[9]**

OR

- Q4) a)** Write a short note on **[9]**
- i) Hidden and exposed terminal problem
 - ii) Mobility of nodes
 - iii) Resource Constraint
- b) What is Tunnelling and Encapsulation and Reverse Tunnelling in Mobile IP? **[8]**

P.T.O.

- Q5) a)** Explain in detail WML and explain its features. [9]
- b) Explain Indirect-TCP and Snooping TCP with diagram. [9]

OR

- Q6) a)** Explain briefly WAP model architecture. [9]
- b) Explain Slow start, Fast retransmit/fast recovery in regard with TCP.[9]

- Q7) a)** Explain Mobile Device Operating Systems with Special Constraints & Requirements. [9]
- b) Write a note on Software Development Kit-iOS SDK and Android SDK. [8]

OR

- Q8) a)** Explain Mobile Payment System with security issues involved in it. [9]
- b) Write a short note on : [8]
- i) Palm OS
 - ii) Symbian OS
 - iii) iOS
 - iv) Android.



Total No. of Questions : 8]

SEAT No. :

PA-1667

[Total No. of Pages : 2

[5927]-395

B.E. (Information Technology)
HIGH PERFORMANCE COMPUTING
(2019 Pattern) (Elective-III) (Semester-VII) (414444B)

Time : 2 ½Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write a short note on All-to-one reduction with suitable example. [9]
b) Explain term of all-to-all broadcast on linear array, Mesh & Hypercube topologies. [9]

OR

- Q2)** a) Explain circular shift operation on mesh network. [6]
b) Explain all-to-one broadcast and reduction on a ring? [6]
c) Explain Non-Blocking and Blocking communications. [6]

- Q3)** a) Explain the performance metrics for parallel system in detail. [8]
b) Write a note on minimum and cost optimal execution time. [9]

OR

- Q4)** a) What do you mean by Asymptotic Analysis of Parallel Programs? [8]
b) Interpret the effect of Granularity on the performance of parallel execution. [9]

- Q5)** a) Explain the following OpenMP directives:
Barrier, Single, Master, Critical, And Atomic. [9]
b) Design a simple CUDA kernel Function to Multiply two integers. [9]

OR

P.T.O.

Q6) a) Write advantages and limitations of CUDA. Also write four applications of CUDA. [9]

b) How the number of threads and processes are controlled in Open MP? Explain in detail. [9]

Q7) a) Modify Depth First Search for parallel execution and analyze its complexity. [8]

b) Explain Matrix-Vector multiplication in detail. [9]

OR

Q8) a) Explain compare-exchange and compare-split operation on parallel, computers. [8]

b) Discuss the issues in sorting for parallel computers. [9]



Total No. of Questions : 8]

SEAT No. :

PA-949

[5927]-396

[Total No. of Pages : 2

B.E. (Information Technology)
MULTIMEDIA TECHNOLOGY
(2019 Pattern) (Elective- III)(Semester - VII) (414444 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is a Sound wave? Explain the characteristics of sound waves. Explain AIFF and VOC audio file formats. [8]
- b) What is Audio compression? Explain the ADPCM Audio compression technique with suitable example. [9]

OR

- Q2)** a) What is Video Signal? Explain the video signals format with a figure. Explain AVI and MOV video file formats. [8]
- b) Describe H-261 and H-263 Video compression techniques. Explain any one in detail with suitable example. [9]
- Q3)** a) Elaborate the role of animation on web. Explain with suitable example. [8]
- b) What is 3D animation? Explain 3D animation with suitable example. [9]

OR

- Q4)** a) Explain in detail 2D and 3D type of animation. State any two applications of 2D and 3D animation. [8]
- b) Write a short note on rendering algorithms. [9]
- i) Wire Frame Rendering
 - ii) Hidden Line Rendering.

P.T.O.

- Q5) a)** Explain different types of virtual reality systems. What is the difference between them. [9]
- b) How is VR used in the military operations? Explain in detail with suitable scenario. [9]

OR

- Q6) a)** What are the advantages and disadvantages of Virtual Reality? [9]
- b) What is the significance of modeling in virtual reality? Explain anyone modeling technique used in virtual reality. [9]

- Q7) a)** Explain general architecture of Multimedia database with suitable diagram. [9]
- b) Explain Android Multimedia Framework architecture with suitable diagram. [9]

OR

- Q8) a)** Define video streaming and write a short note on [9]
- i) Multimedia networking
- ii) Quality of multimedia data transmission.
- b) What is Visual Effect? Explain features of any one VFX software. [9]



Total No. of Questions : 8]

SEAT No. :

PA-950

[Total No. of Pages : 2

[5927]-397

B.E (Information Technology)

SMART COMPUTING

(2019 Pattern) (Semester - VII) (414444D) (Elective - III)

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 process of Ubiquitous system environment interactions. [6]
b) Explain the basic concept of ubiquitous computing, and its advantages. [6]
c) Explain the three main types of environment context. [6]

OR

- Q2)** a) Describe the UbiCom system model and SMART DEI Model. [10]
b) List and explain core properties of UbiCom systems. [8]

- Q3)** a) Explain Service Life-Cycle. [9]
b) Discuss mobility support provided by OS for Mobile Computers and Communicator Devices. [8]

OR

- Q4)** a) Describe Service Architecture Models. [6]
b) Write short note on: Mobile Service Design. [5]
c) Enlist and explain Smart Device and Service Characteristics. [6]

- Q5)** a) Explain Characteristics of sensors and Explain components of Sensor Networks. [9]
b) Write short note on; Embedded Systems and Real Time Systems. [9]

OR

P.T.O.

- Q6)** a) Explain components and different types of robots. [6]
b) Explain different types of control systems. [6]
c) Discuss Micro- Electro-Mechanical Systems (MEMS). [6]

- Q7)** a) Explain Definition and characteristics of IoT. [6]
b) Describe Technical Building blocks of IoT. [5]
c) Explain Physical design of IoT, IoT enabling technologies. [6]

OR

- Q8)** a) write short note on smart agricultural system. [6]
b) Write short note on: smart home systems. [5]
c) What are the security and challenges of smart home systems. [6]



Total No. of Questions : 8]

SEAT No. :

PA-951

[Total No. of Pages : 2

[5927]-398

B.E. (Information Technology)

BIOINFORMATICS

(2019 Pattern) (Semester-VII) (Elective-IV) (414445 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 labelled diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Describe Scoring Matrix : PAM, BLOSUM [8]

b) Define Sequence Visualization? Discuss the concept of Structure Visualization and rendering tools? [9]

OR

Q2) a) State the difference between PAM and BLOSUM [8]

b) Enlist and discuss methods of Sequence Alignments. [6]

c) What is the role microarray in bioinformatics? [3]

Q3) a) Explain in brief different Clustering, and classification algorithms used in Bioinformatics. [9]

b) BLAST and FASTA are two widely used tools for sequence alignment. What are the similarities and differences in their approaches? [9]

OR

Q4) a) Define and discuss Biological algorithm vs. Computer algorithms. [6]

b) Explain FASTA in detail with neat diagrams. [6]

c) Define and write short notes: Hidden Markov Models, Dynamic Programming. [6]

P.T.O.

- Q5) a)** Explain the methods of protein structure prediction and determination. [8]
i) Experimental
ii) An-initio
- b) What are the component of modeling and simulation system? Explain in detail with neat diagram. [9]

OR

- Q6) a)** Explain Principles of protein structure and anatomy of proteins. [8]
b) What is Drug and Drug discovery process? Explain Applications of Bioinformatics in Drug Discovery Process. [9]
- Q7) a)** Discuss concept of Genetic engineering and therapeutic application of stem cell. [9]
b) What is the role of biotechnology in environment? [9]

OR

- Q8) a)** List and explain various applications of genetic engineering. [9]
b) What are nanotechnology and its application? [9]



Total No. of Questions : 8]

SEAT No. :

PA-952

[Total No. of Pages : 2

[5927]-399

B.E. (Information Technology)

INTRODUCTION TO DEVOPS

(2019 Pattern) (Semester-VII) (Elective-IV) (414445 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define continuous integration? Explain benefits of continuous integration. [5]
- b) Compare continuous delivery and continuous deployment. [5]
- c) Draw a diagram to visualize CI/CD pipeline and explain all stages in detail. [8]

OR

- Q2)** a) Write a note on code repository server. [5]
- b) Explain role of continuous integration server. What operations a CI server can executes? [5]
- c) What are strategies for continuous delivery? [8]
- Q3)** a) Explain integration testing with the help of example. [6]
- b) Draw and explain basic deployment pipeline. [6]
- c) Explain the changes moving through the deployment pipeline in DevOps.[5]

OR

- Q4)** a) Comment on Trade-offs in the deployment pipeline. [6]
- b) List and explain the strategies which are useful to manage defects list? [6]
- c) Write a short note on the Commit Stage. [5]

P.T.O.

- Q5)** a) What is a Monitoring System? Explain Factors involved in the Monitoring System. [6]
b) List and explain tools used for monitoring? Explain its use [6]
c) Explain the Roles and responsibilities of an SRE. [6]

OR

- Q6)** a) Write a short on white box and black box monitoring. [6]
b) What is Behavior-Driven Monitoring? How it works? [6]
c) What does a site reliability engineer do? List Common tools used by SREs with example. [6]

- Q7)** a) How do you maintain version control? What are the benefits of using version control? [6]
b) Write a note on Prometheus [6]
c) Explain continuous delivery in Jenkins? [5]

OR

- Q8)** a) Explain serverless architecture in Kubernetes? [6]
b) Write a short note on Docker [6]
c) Explain continuous Testing with Selenium [5]



Total No. of Questions : 8]

SEAT No. :

PA-953

[Total No. of Pages : 1

[5927]-400

B.E. (Information Technology)

COMPUTER VISION

(2019 Pattern) (Semester-VII) (Elective-IV) (414445 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 side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain the Feature tracking applications. [9]

b) Explain the Feature Matching and Descriptors. [9]

OR

Q2) a) How Feature extraction affects the performance-driven animation. [9]

b) Explain the Edge editing and Enhancement. [9]

Q3) a) Explain “the Problem of Unknown Circle Radius”. [8]

b) Explain the Hough-Based Schemes for Circular Object Detection. [9]

OR

Q4) a) How the Generalized Hough Transform (GHT) can be used for Feature Collation? [8]

b) Explain the foot-of-normal method. [9]

Q5) a) How to achieve 3D Reconstruction in Computer Vision? [9]

b) Explain the Dense motion estimation. [9]

OR

Q6) a) Explain Triangulation and bundle adjustment. [9]

b) Explain with comparison parametric, layered and spline-based motion. [9]

Q7) a) Explain face detection in detail. [8]

b) Explain how the views of multiple cameras are combined. [9]

OR

Q8) a) Explain the Tracking and Occlusion? [8]

b) Write a note on Surveillance Applications. [9]



Total No. of Questions : 8]

SEAT No. :

PA-2638

[Total No. of Pages : 2

[5927]-401

B.E. (Information Technology)

WIRELESS COMMUNICATIONS

(2019 Pattern) (Semester - VII) (Elective - IV) (414445D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 Principal of TDMA. What are different features of TDMA? **[9]**

b) How Code Division Multiple Access Technique is implanted while accessing a channel for multiple users? Support your theory with example. **[9]**

OR

Q2) a) What is MIMO? Explain two formats of MIMO. **[9]**

b) What is OFDM technique? Also, explain OFDMA transmitter and receiver. **[9]**

Q3) a) What are the different challenges in WAP? Also, write down the advantages and disadvantages of WAP. **[9]**

b) What is LoRaWAN? Elaborate LoRaWAN network elements. **[8]**

OR

Q4) a) What is Wi-Fi Direct? What are the different types of Wi-Fi Direct? **[9]**

b) What is NFC? What are the different characteristics of NFC? **[8]**

P.T.O.

Q5) a) What is security? What are the different security issues in 1G, 2G, 3G, and 4G? [9]

b) Explain in details Visible Light Communication. Also, explain its applications. [9]

OR

Q6) a) Explain security issues and challenges in GSM. [9]

b) What is multimedia security? Explain multimedia security in 5G and 6G. [9]

Q7) a) Explain how 5G network works along-with its benefits. [9]

b) Enlist and explain application of Holographic MIMO surface. [8]

OR

Q8) a) What is quantum Technology? Explain quantum Technology for a 5G/6G wireless network? [9]

b) Explain Simultaneous Transmission and Reflection (STAR) for 360° coverage in details. [8]



Total No. of Questions : 8]

SEAT No. :

PA-954

[Total No. of Pages : 2

[5927]-402

B. E. (Instrumentation & Control Engineering)

PROCESS CONTROL TECHNIQUES

(2019 Ptttern) (Semester - VII) (406261)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 calculator is allowed.

Q1) a) Draw closed loop block diagram of feedback loop and explain its elements. **[8]**

b) Determine closed loop stability conditions of P controller for given first order plant $G_p(s)$ for set point change. **[9]**

$$G_p(s) = \frac{k_p}{\tau_p s + 1}$$

OR

Q2) a) Discuss control performance measures in feedback control loop in detail. **[8]**

b) Determine closed loop stability conditions of PI controller for given first order plant $G_p(s)$ for set point change. **[9]**

$$G_p(s) = \frac{k_p}{\tau_p s + 1}$$

Q3) a) Discuss combined Feed-Forward and Cascade control with suitable example. **[9]**

b) Explain ratio control and its two arrangements in detail. **[9]**

OR

Q4) a) With neat sketch explain selective control and its application. **[9]**

b) Illustrate split range control with suitable example. **[9]**

P.T.O.

- Q5) a)** Explain relative gain array (RGA) and its important properties. Using RGA determine the recommended controller pairing for process transfer function model: [9]

$$G_p(s) = \begin{bmatrix} \frac{-2e^{-s}}{10s+1} & \frac{1.5e^{-s}}{s+1} \\ \frac{1.5e^{-s}}{s+1} & \frac{2e^{-s}}{10s+1} \end{bmatrix}$$

- b) Discuss decoupling control approach to multivariable control with neat sketch. [8]

OR

- Q6) a)** Discuss procedure for calculation of RGA and pairing cases from λ . Calculate λ for below process model and comment on loop interaction and pairing. [9]

$$G_p(s) = \begin{bmatrix} \frac{12.8e^{-s}}{16.7s+1} & \frac{-18.9e^{-3s}}{21s+1} \\ \frac{6.6e^{-7s}}{10.9s+1} & \frac{-19.4e^{-3s}}{14.4s+1} \end{bmatrix}$$

- b) Analyze the direct and indirect effect of interaction with help of 2×2 systems. [8]

- Q7) a)** Give different methods for determination of PID controller settings. Determine PID structure and its setting for FOPDT model using direct synthesis method in detail. [9]

- b) Discuss PID controller design for the FOPDT model using IMC method. [9]

OR

- Q8) a)** With neat block diagram discuss model predictive controller and give its advantages. [9]

- b) Explain Smith Predictor technique for compensation of delay time. [9]



Total No. of Questions : 8]

SEAT No. :

PA-955

[Total No. of Pages : 2

[5927]-403

B.E (Instrumentation & Control)

PROJECT ENGINEERING AND MANAGEMENT

(2019 Pattern) (Semester - VII) (406262)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *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) Illustrate the significance of bidding process with appropriate example and comment on Bid evaluation process. [9]
- b) Elaborate the Process of Vendor registration and vendor evaluation for the purchase of the equipment. [8]

OR

- Q2)** a) Illustrate the significance of purchase order with appropriate example.[9]
- b) State the importance of tender document and what general information is to be furnished in tender document. [8]

- Q3)** a) Develop Piping and Instrumentation diagram(P&ID) diagram for feedback control of Heat exchanger. [9]
- b) Explain the significance of Process flow diagram(PFD) in detail engineering. [9]

OR

- Q4)** a) Discuss the importance & scope of material balance sheet in Project Engineering with suitable example. [9]
- b) Discuss the significance of network layout diagrams &Control room layouts with suitable example. [9]

P.T.O.

- Q5)** a) Evaluate the Process of Earthing and Grounding for general and power Signals. [9]
- b) Develop the loop wiring diagram for a loop having following instruments.
- i) Capacitance type level sensor
 - ii) Indicating controller panel mounted
 - iii) High low level alarm point and recorder (Panel mounted)
 - iv) Pneumatically operated control valve for the supply of liquid in the tank. [8]

OR

- Q6)** a) Prepare bill of material(BOM) for any one application. [9]
- b) Discuss the significance of Instrument diagram and Hook up diagram with suitable example. [8]

- Q7)** a) Illustrate the Panel testing Procedure and its documentation require at this stage. [9]
- b) Explain the significance of Factory Acceptance Test (FAT) with suitable example. [9]

OR

- Q8)** a) Discuss the important feature Cold Commissioning and hot commissioning. [9]
- b) Prepare a factory acceptance test (FAT) for a control panel. [9]



Total No. of Questions : 8]

SEAT No. :

PA-956

[Total No. of Pages : 2

[5927]-404

B.E. (Instrumentation & Control)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester-VII) (406263A) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is image enhancement in frequency domain. Explain with neat diagram and example? [9]

b) Explain sharpening in image processing. [8]

OR

Q2) a) Explain the non-linear stretching. [8]

b) Explain the homomorphic filtering in image enhancement. [9]

Q3) a) Explain image pattern and pattern classes. [9]

b) Explain the need of classifiers in image processing. Explain the methodology using any application. [9]

OR

Q4) a) Explain in brief the edge linking in case of image segmentation. [9]

b) Enlist the different types of classifiers. Explain any one in detail. [9]

Q5) a) Explain the JPEG compression technique. [9]

b) Explain the use of shift codes in image compression. [8]

OR

P.T.O.

- Q6)** a) Explain the JPEG 2000 compression technique. [8]
b) Write a short note on Huffman coding. [9]

- Q7)** a) Explain the role of image processing in biometrics. [9]
b) How image processing is used in launching the satellite at space station. [9]

OR

- Q8)** a) Explain the application in image processing in weather forecasting. [9]
b) Write a short note on application of image processing in robot surgery. [9]



Total No. of Questions : 8]

SEAT No. :

PA-2622

[Total No. of Pages : 2

[5927]-405

B.E. (Instrumentation & Control)

DATA ANALYTICS

(2019 Pattern) (Semester - VII) (406263 B) (Elective - III)

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) List and explain the association rules. [8]
b) Differentiate between linear and logistic regression. [8]
c) What are the different methods of advanced analytical theory? [2]

OR

- Q2)** a) Explain in detail the transactions that occur in grocery stores. [10]
b) Elaborate on a-priori algorithm. [8]

- Q3)** a) What is Decision tree classification? Explain its algorithm. [9]
b) How would you evaluate a Decision tree classification, [8]

OR

- Q4)** a) Apart from Decision tree and Naïve Bayes classifiers, elaborate on other classifiers used for data analysis. [9]
b) What is Naïve Bayes classifiers? Explain its algorithm. [8]

- Q5)** a) Explain at least four conventional data visualization tools. [8]
b) What is Big data visualization? [5]
c) Differentiate between data visualization and Big data visualization, [5]

OR

P.T.O.

- Q6)** a) What are the tools used in data visualization? [8]
b) Explain the analytical techniques used in Big data visualization, [10]

- Q7)** a) How would you analyse unstructured data? [8]
b) Differentiate between structured data and unstructured data. [4]
c) Explain the Hadoop ecosystem. [5]

OR

- Q8)** a) What is role of HIVE in Hadoop ecosystem? [4]
b) What is role of NoSQL in Hadoop ecosystem? [4]
c) Explain with advantages and disadvantages of Map Reduce. [9]



Total No. of Questions : 8]

SEAT No. :

PA-957

[Total No. of Pages : 2

[5927] - 406

B.E. (Instrumentation & Control)

WIRELESS SENSOR NETWORKS

(2019 Pattern) (Semester - VII) (Elective - III) (406263C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Define MAC protocol. List the types of MAC protocol. Explain in detail Schedule-Based MAC protocol. **[9]**

b) Define the concept of Routing Protocol. Explain in detail Low-energy adaptive clustering hierarchy (LEACH) protocol. **[9]**

OR

Q2) a) What are the fundamentals of MAC Protocols? List the performance requirements of MAC protocol. List out the various types of MAC protocol. **[9]**

b) What are the performance requirements of Routing Protocols for Wireless Sensor Networks? With neat sketch explain in detail Geographical routing. **[9]**

Q3) a) Differentiate Transmission control protocol (TCP) Vs User Datagram protocol (UDP). **[9]**

b) Explain the role of ESRT (Event-to-Sink Reliable Transport) in transport control protocol. **[8]**

OR

P.T.O.

Q4) a) List the existing transport control protocols. Elaborate the CODA (Congestion Detection and Avoidance) system in transport control protocol. [9]

b) Explain the feasibility of using transport control protocol (TCP) for wireless sensor network. [8]

Q5) a) Draw and explain the Middleware architecture for wireless sensor network. [9]

b) Explain with neat sketch Middleware IrisNet (Internet-Scale Resource Intensive Sensor Networks Services) for wireless sensor network. [9]

OR

Q6) a) Explain with neat sketch Middleware MiLAN (Middleware Linking Applications and Networks) for wireless sensor network. [9]

b) Define Middleware for wireless sensor network. What is the principle of Middleware? Give the significance of middleware in wireless sensor network. [9]

Q7) a) What are the network security requirements in Ad Hoc wireless network? List the Challenges in security provisioning network. [9]

b) Define the concept of security attack. Elaborate layer wise attack in wireless sensor network. [8]

OR

Q8) a) Explain with neat sketch the tampering black hole attack. What are the various sensor network platforms for wireless sensor network? [9]

b) Suggest what are the secure SPINS reliability requirements in sensors networks? [8]



Total No. of Questions : 8]

SEAT No. :

PA-2623

[Total No. of Pages : 2

[5927]-407

B.E. (Instrumentation & Control)

PROCESS MODELLING AND OPTIMIZATION

(2019 Pattern) (Semester - VII) (Elective - III) (406263 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate the full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic Pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) a) Explain ATV identification Method. **[9]**

b) Explain least square method for fitting experimental data. **[8]**

OR

Q2) a) Explain relationships among time, Laplace and frequency domain. **[8]**

b) Explain sin wave testing method. **[9]**

Q3) a) Determine the RGA for following process and state interacting variable pair. **[9]**

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \frac{e^{-3s}}{(2s+1)} & 15 \frac{e^{-2s}}{(4s+1)} \\ 2 \frac{e^{-6s}}{(6s+1)} & \frac{e^{-2s}}{(3s+1)} \end{bmatrix} \begin{bmatrix} P \\ Q \end{bmatrix}$$

b) Explain Nyquist plot for determining stability of multivariable process. **[9]**

OR

Q4) a) How interaction between loops can be determine? Explain limitation of method. **[9]**

P.T.O.

- b) For the system given Find NI and MRI for this comment on stability also find proper pairing of control and manipulated variables. [9]

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \frac{e^{-3s}}{(5s+1)} & \frac{e^{-2s}}{(s+1)} \\ 2 \frac{e^{-5s}}{s+1} & 7 \frac{e^{-2s}}{(5s+1)} \end{bmatrix} \begin{bmatrix} P \\ Q \end{bmatrix}$$

- Q5) a) For the functions given below, analyze the concavity and convexity in each case. [9]

i) $f(x_1, x_2) = x_1^2 + x_2^2$

ii) $f(x) = x_1^2 + 5x_1x_2 + 4x_2^2 + 2x_1 + 6x_2 + 2$

iii) $f(x_1, x_2) = 2x_1^2 - 5x_1x_2 + 3x_2^2$

- b) Explain Payback period, Return of Investment, Net Present Value, internal Rate of Return. [8]

OR

- Q6) a) What is optimization? Explain features of optimization problem. [9]

- b) A company borrow a loan of Rs. 30,00,000/- with interest rate of 5%. If monthly repayment is done with Rs. 30,000, calculate duration required to repay loan with interest. [8]

- Q7) a) Explain Steepest Descent method. [9]

- b) Explain Secant methods for unconstraint optimization. [9]

OR

- Q8) Minimize following function using simplex method [18]

Minimize $f = -40x_1 - 100x_2$

Subject to $10x_1 + 5x_2 \leq 2500$

$4x_1 + 10x_2 \leq 2000$

$2x_1 + 3x_2 \leq 900$

$x_1 \geq 0$ and $x_2 \geq 0$



Total No. of Questions: 8]

SEAT No. :

PA-2639

[5927]-408

[Total No. of Pages : 2

B.E. (Instrumentation & Control)

CLOUD COMPUTING

(2019 Pattern) (Semester-VII) (Elective-IV) (406264A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 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 significance of hypervisor in cloud. [9]
b) Comment on “Although virtualization is widely accepted today, it does have its limits”. [9]

OR

- Q2)** a) Analyze the architecture of Virtual Machine with its brief operations. [9]
b) Analyze the standards used by application developers in detail. [9]

- Q3)** a) How pay per usages concept linked to the cloud computing technologies? [9]
b) Comment on the performance expectations by customer on Elastic Block storage. [8]

OR

- Q4)** a) Summarize the steps to create EBS volume snapshot? [9]
b) Comment on the performance expectations by customer on Elastic Block storage. [8]

- Q5)** a) Comment on: [9]
i) WSN: a driving force of IoT and cloud computing
ii) IAM: Identity and Access Management in Cloud computing
iii) Significance of GPS In IoT
b) Illustrate the RFID Tags and Device components? [9]

OR

P.T.O.

- Q6)** a) Elaborate the cyber physical system (CPS) and their components. [9]
b) Justify “Zigbee technology in one of the enabling technologies for IoT.” [9]
- Q7)** a) Comment on: [9]
i) Location aware applications.
ii) Energy aware cloud computing
iii) Intelligent fabrics and paints.
b) Elaborate the docker deployment workflow with diagram. [8]
- OR
- Q8)** a) Sketch the architecture of mobile cloud computing. [9]
b) Justify the impact of cloud on operating system in future. [8]



[5927]-409

B.E. (Instrumentation & Control)

SOFT COMPUTING

(2019 Pattern) (Semester-VII) (Elective-IV) (406264 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Difference between Crisp Set and Fuzzy Set. [8]
 b) For the following fuzzy sets, find Union, Intersection and Complement operation. [9]

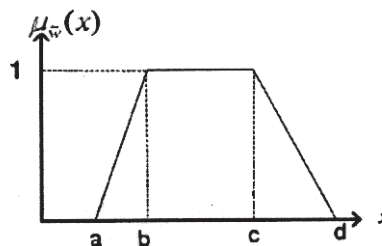
$$A = \{(x_1, 0.2), (x_2, 0.5), (x_3, 0.6), (x_4, 0.8), (x_5, 1.0)\}$$

$$B = \{(x_1, 0.8), (x_2, 0.6), (x_3, 0.4), (x_4, 0.2), (x_5, 0.1)\}$$

OR

- Q2)** a) What is Fuzzy Logic? State the characteristics of Fuzzy Logic. [8]
 b) Explain the following properties in Fuzzy Sets [9]
 i) Commutativity
 ii) Associativity
 iii) Demorgan's Law

- Q3)** a) What is Fuzzy Inference System? Explain Mamdani FIS. [8]
 b) What is membership function? [9]
 For given values, $a=2$, $b=4$ and $c=8$, $d=10$, compute the fuzzy value corresponding to $x=3.5$



OR

- Q4)** a) Explain the fuzzy if then rules with example. [8]
 b) What is the purpose of Defuzzification? Explain any one method of Defuzzification. [9]

P.T.O.

Q5) a) Construct a Fuzzy Controller with a suitable block diagram for a daily routine application. [9]

b) Discuss on the static and dynamic properties of Fuzzy Controller. [9]

OR

Q6) a) Appraise the fuzzy system for speed control in Smart Car. [9]

b) Explain a Fuzzy Logic Control System with an example. [9]

Q7) a) What is the need to use Fuzzy Logic in Neural Network? Mention a commercial example of Neural trained Fuzzy System. [9]

b) Write a note on Fuzzified RBF network based self-learning controllers.[9]

OR

Q8) a) Explain the architecture of Neuro-Fuzzy system with a labeled diagram.[9]

b) Elaborate the neuro-fuzzy method to learn fuzzy classification rules from data. [9]



Total No. of Questions : 8]

SEAT No. :

PA-959

[Total No. of Pages : 2

[5927]-410

B.E. (Instrumentation & Control)

AUTOMOTIVE INSTRUMENTATION

(2019 Pattern) (Semester-VII) (Elective-IV) (406264 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 side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Classify active and passive safety systems. Explain any one active safety system with neat diagram. **[9]**

b) State the difference between active and passive safety system in vehicle. Explain any one passive safety system. **[9]**

OR

Q2) a) Classify active and passive safety systems. Explain any two passive safety system. **[9]**

b) Explain dynamic radar cruise control system in vehicle. **[9]**

Q3) a) Explain in detail the architecture of CAN network in vehicle. **[8]**

b) Define protocol. State the role of protocols in vehicles. Explain LIN protocol. **[9]**

OR

Q4) a) Why communication protocols are important in vehicles? Explain Media Oriented Systems Transport protocol. **[9]**

b) Explain the FlexRay protocol. **[8]**

Q5) a) Explain minimum five infrastructure requirement for electrical vehicles. **[10]**

b) Explain the construction and working of axial flux motor with neat diagram. **[8]**

OR

P.T.O.

- Q6)** a) Explain minimum five electrical motor topologies in detail. [10]
b) Explain specification of the electrical vehicle in concordance with driving cycle and range. [8]

- Q7)** a) State the advantages of IoT in automotive. Explain Vehicle to Network (V2N) communication network in vehicles. [9]
b) Describe Vehicle to Pedestrians (V2P) communication network in detail. [8]

OR

- Q8)** a) Describe Vehicle to Infrastructure (V2I) communication network in detail. [9]
b) Explain Vehicle to Network (V2N) communication network in detail. [8]



[5927]-411

B.E. (Instrumentation & Control)
ADVANCED CONTROL SYSTEM
(2019 Pattern) (Semester - VII) (Elective - IV) (406264 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of Non - programmable calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Derive the state equation for the state transition matrix. **[6]**

b) Diagonalise the plant matrix for the system having the state equation as,

$$x(k+1) = \begin{bmatrix} -4 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

Find the diagonal matrix also. **[12]**

OR

Q2) a) For a system with the state equation, $x(k+1) = Gx(k) + Hu(k)$ and $y(k) = cx(k)$, where

$$G = \begin{bmatrix} 0 & 0 & -2 \\ 0 & 1 & 0 \\ 1 & 0 & 3 \end{bmatrix}, H = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \text{ and } C = [1 \ 0 \ 1]$$

Find the pulse transfer function. **[12]**

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

- i) State
- ii) State Variable
- iii) State Space
- iv) State Vector

Q3) a) Explain the following terms: [9]

- i) Full Order State Observer
- ii) Minimum Order State Observer
- iii) Reduced Order State Observer

b) Find the state controllability, state observability and output controllability for the given system. [9]

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ 5 & 6 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$$
$$y(k) = [1 \quad 0] x(k)$$

OR

Q4) a) Explain the duality property of the controllability and observability. [6]

b) Find the state feedback gain matrix for the system, [12]

$x(k+1) = Gx(k) + Hu(k)$ and $y(k) = cx(k)$, with

$$G = \begin{bmatrix} 0 & 0 & -6 \\ 1 & 0 & -11 \\ 0 & 1 & -6 \end{bmatrix}, H = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \text{ and } C = [0 \quad 0 \quad 1]$$

the system is placed at the desired pole locations at, $2 \pm j4, 5, -3$.

Q5) a) Explain the following terms: [9]

- i) Positive definiteness.
- ii) Positive semi-definiteness.
- iii) Negative definiteness.

b) Determine the stability of the equilibrium state of the following system using Lyapunov method, [8]

$$\dot{x} = \begin{bmatrix} -3 & 7 \\ -6 & -5 \end{bmatrix} x(t)$$

OR

Q6) a) Write a short note on, Lyapunov's direct and second method for stability analysis of Continuous and Discrete Time LTI systems. [9]

b) Determine the stability of the equilibrium state of the following system using Lyapunov method, [8]

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+2) \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ -0.5 & -5 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$

Q7) a) Explain the characteristics of non-linear systems. [9]

b) Explain the concept of describing function and use of the describing function of ideal relay. [8]

OR

Q8) a) List out the common non-linearities. Explain any three. [9]

b) Write a short note on stability analysis using describing function. [8]



Total No. of Questions : 8]

SEAT No. :

PA-960

[Total No. of Pages : 5

[5927]-412

B.E. (Mechanical & Automobile)

**HEATING, VENTILATION, AIR - CONDITIONING AND
REFRIGERATION**

(2019 Pattern) (Semester - VII) (402041)

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 scientific calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain with a neat sketch Thermostatic Expansion Valve. [5]
- b) Discuss the following terms used in thermodynamic analysis of Simple Ejector Refrigeration Cycle. [6]
- i) Entrainment Ratio
 - ii) Entrainment efficiency
 - iii) Nozzle efficiency
- c) Explain with a neat sketch Low Pressure (LP) cut off used in VCR cycle. [6]

OR

- Q2)** a) Distinguish between the air cooled and water cooled condensers. [4]
- b) Explain with neat schematic low temperature control in VCR cycle. [6]
- c) Explain with neat schematic Simple Ejector Refrigeration System. [7]

- Q3)** a) What is CLTD method? How it connects with time lag and decrement factor? [6]
- b) A commercial shop has following loads : [12]
- Room sensible heat : 58.15 kW
- Room latent heat : 14.54 kW

P.T.O.

The summer outside and inside design conditions are :

Outside : 40°C DBT, 27°C WBT

Inside 25°C DBT, 50% RH

70 m³/min of ventilation air is used. Determine the following if the by-pass factor of the cooling coil is 0.15.

- i) Ventilation load
- ii) Grand total heat
- iii) Grand sensible heat factor
- iv) Effective room sensible heat factor
- v) Apparatus dew point

OR

Q4) a) Explain the ASHARE comfort chart showing the comfort zones for winter and summer. Also explain factors (any two) affecting human comforts. **[10]**

b) Atmospheric air at 30°C dry bulb temperature and 75% relative humidity enters a cooling coil at a rate of 200m³/min. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. **[8]**

Determine :

- i) The temperature of air leaving the cooling coil;
- ii) The capacity of the cooling coil in tonnes of refrigeration and in kW
- iii) The amount of water vapour removed per minute; and
- iv) The sensible heat factor for the process.

Q5) a) What is infiltration and Ventilation? **[4]**

b) A Duct of Rectangular cross section 600mm × 400mm carries 90m³/min of air having density of 1.2kg/m³. Determine the equivalent diameter of the circular duct; **[8]**

- i) When the quantity of air carries in both the cases is same;
- ii) When velocity of air in both cases is same.

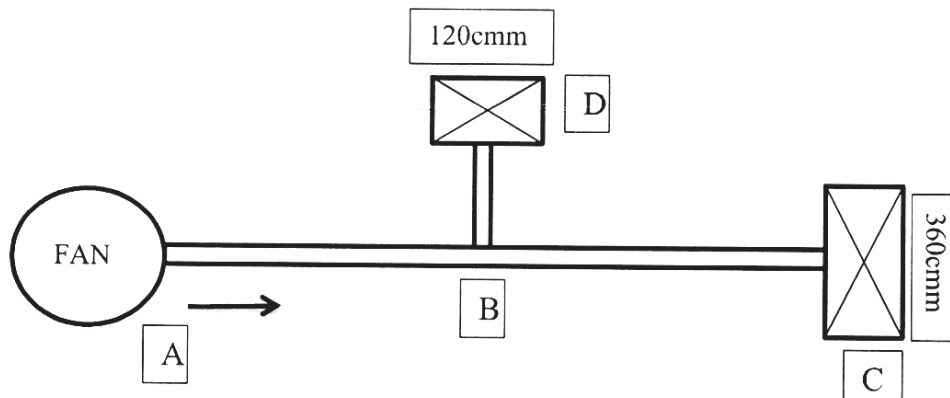
Take friction factor is 0.011. Also calculate pressure loss per 100m length of duct.

c) Explain Fan Coil System? Write application of various types of Fans. **[6]**

OR

Q6) a) What do you mean by Infiltration? Explain Natural Ventilation induced by wind. [5]

b) Using Equal friction method, determine the duct diameter and velocity for section AB, BD and BC. Assume velocity in the main duct AB = 600m/min. Also Calculate maximum pressure drop in the duct system. Distance AB = 30m, Distance BC = 30m and Distance BD = 10m. Refer the figure as given below : [7]



c) Explain any two types of “Air Distribution System” used in Air Conditioning system. [6]

Q7) a) Explain with neat sketch winter air conditioning system. [6]

b) Explain Thermal storage air conditioning system. [6]

c) Write a short note on liquid spray tower. [5]

OR

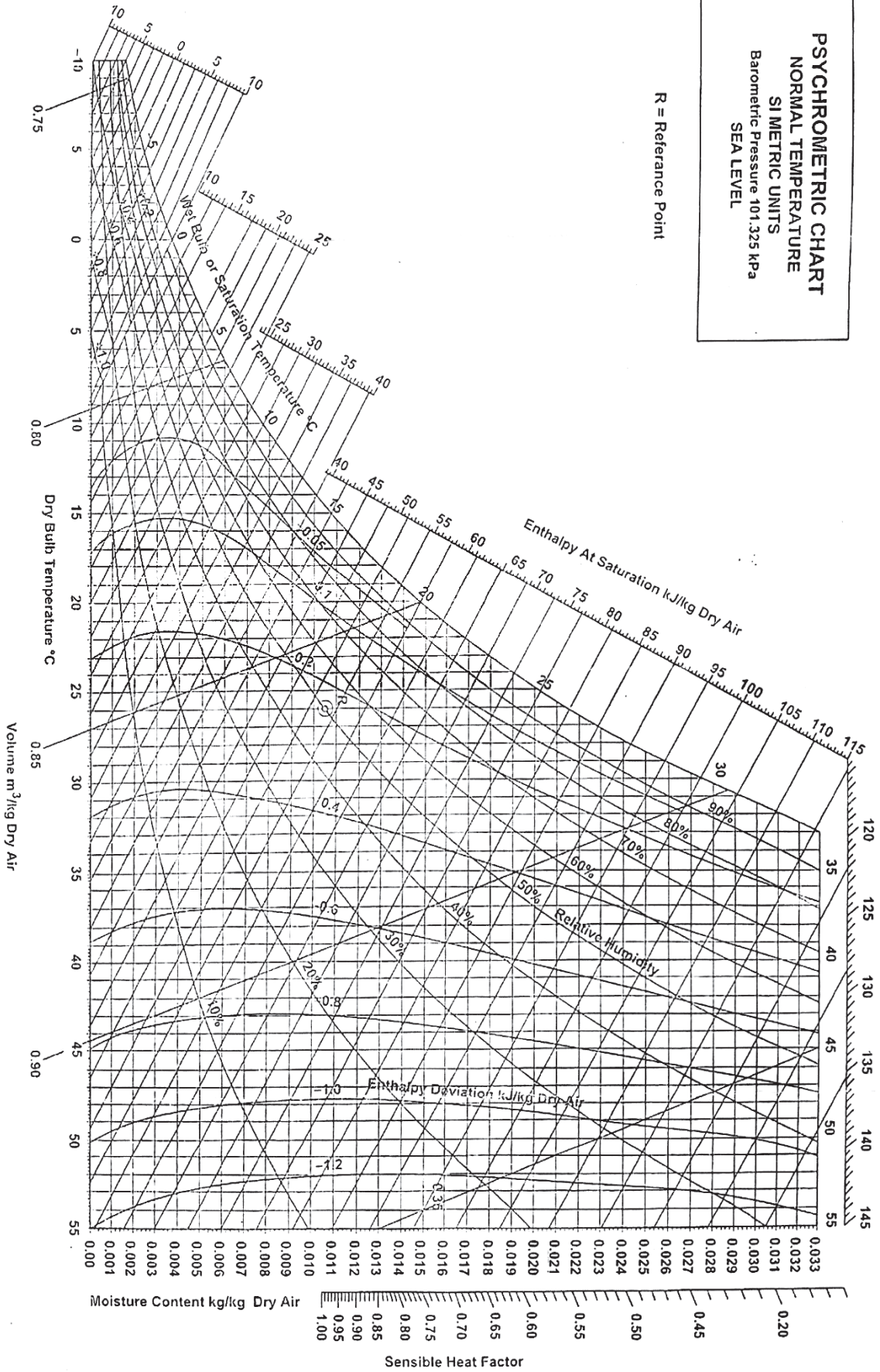
Q8) a) Explain with neat sketch central air conditioning system. [6]

b) Explain with neat diagram indirect evaporative cooling air conditioning system. [6]

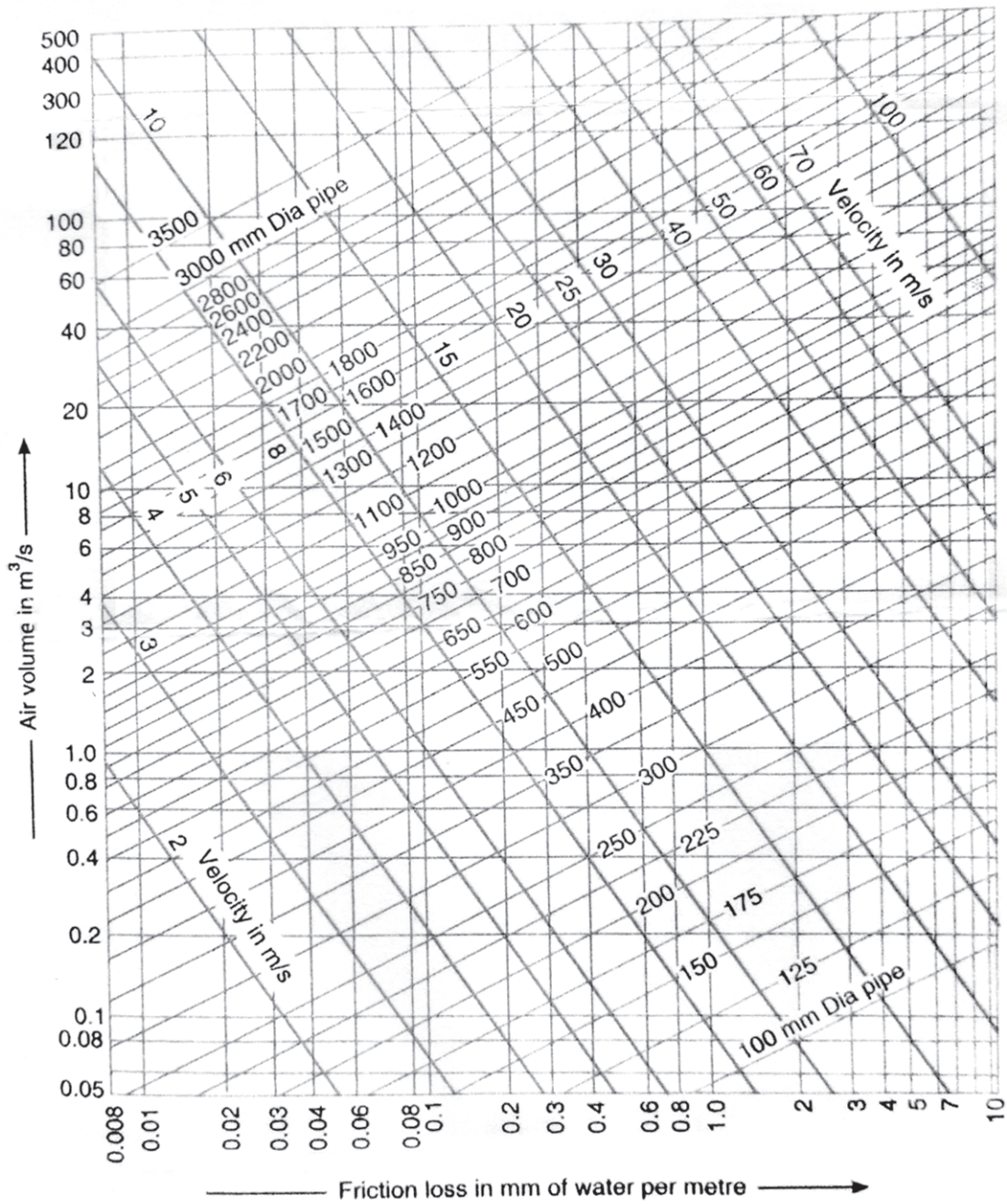
c) Write a note on clean room air conditioning system. [5]

PSYCHROMETRIC CHART
NORMAL TEMPERATURE
SI METRIC UNITS
 Barometric Pressure 101.325 kPa
 SEA LEVEL

R = Reference Point



Friction Chart for Circular Ducts



Total No. of Questions : 8]

SEAT No. :

PA-961

[Total No. of Pages : 3

[5927]-413

B.E. (Mechanical)

DYNAMICS OF MACHINERY

(2019 Pattern) (Semester - VII) (402042)

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.*

UNIT - I

- Q1)** a) A vibrating system is defined by the following parameters $m=3\text{kg}$, $K=100\text{N/m}$, $C=3\text{N-sec/m}$. Determine (i) Damping factor (ii) Natural frequency of damped vibration (iii) Logarithmic decrement (iv) Ratio of two consecutive amplitude and (v) Number of cycles after which the original amplitude is reduced to 20 percent. **[8]**
- b) Derive the differential equation of motion for undamped free torsional vibration. **[5]**
- c) What are the causes of vibration? Explain the advantages of vibration. **[4]**

OR

- Q2)** a) A spring mass system has spring stiffness 'K' N/m and a mass of 'm' kg it has a natural frequency of vibration as 112Hz. An extra 2kg mass is coupled to 'm' and the natural frequency is reduced by 2Hz. Find the values of 'K' and 'm'. **[8]**
- b) By using energy method find the natural frequency of undamped free longitudinal vibrations. **[5]**
- c) List the different types of damping and explain in detail any one type of damping? **[4]**

P.T.O.

UNIT - II

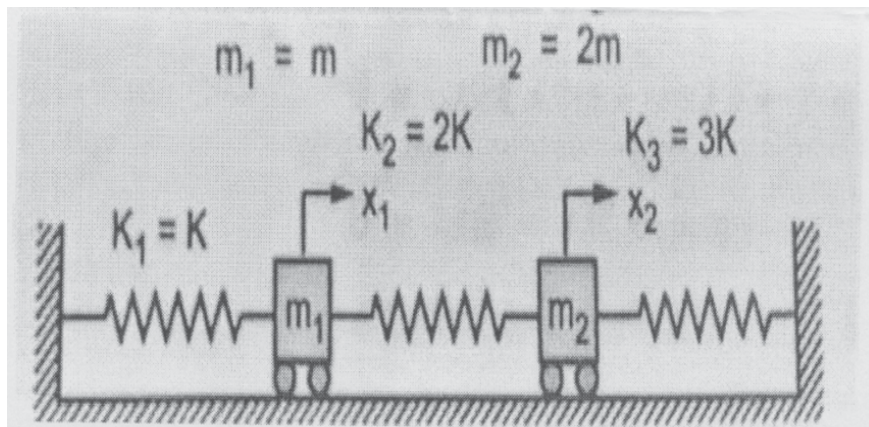
- Q3) a)** Explain critical speed of shaft carrying single rotor. [8]
- b) A machine of mass 1000kg is acted upon by an external force of 2450N in 1500rpm. To reduce the effect of vibration, isolators of rubber having a static deflection of 2mm under machine weight and an estimated damping factor of 0.2 are used. Determine. [10]
- i) Amplitude of vibration of machine.
 - ii) Force transmitted to the foundation.
 - iii) Phase lag
 - iv) Phase angle between transmitted force and exciting force.
 - v) Speed at which the maximum amplitude of vibration would occur.

OR

- Q4) a)** Explain the significance of frequency response curves. [8]
- b) An electric motor running at 1500 rpm is mounted on five springs and the force transmitted is one eleventh of the impressed force. The weight of the motor is 125 N while the armature weighs 35 N with its center of gravity 0.05 cm from the rotational axis. Determine: (i) Stiffness of each spring, (ii) Natural frequency of the system, (iii) Dynamic force transmitted to the base at operating speed. [10]

UNIT - III

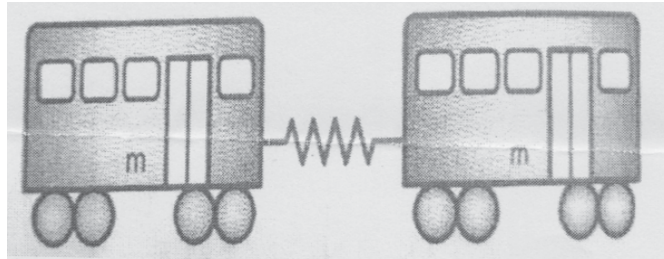
- Q5) a)** An electric motor running at 1500 rpm is mounted on five springs and the force transmitted is one eleventh of the impressed force. The weight of the motor is 125 N while the armature weighs 35 N with its center of gravity 0.05 cm from the rotational axis. Determine: (i) Stiffness of each spring, (ii) Natural frequency of the system, (iii) Dynamic force transmitted to the base at operating speed. [10]



- b) Explain the concept of torsionally equivalent shaft and derive the equation for its equivalent length. [8]

OR

- Q6)** a) Two subway cars as shown in Fig. have 2000 kg mass each and are connected by a coupler. The coupler can be modelled as a spring of stiffness $k = 280 \text{ kN/m}$. Write down the equations of motion and determine the natural frequencies and mode shapes. [10]



- b) Explain the combined rectilinear and angular modes of vibration. [8]

UNIT - IV

- Q7)** a) What are various frequency measuring instruments? Explain any one in detail. [8]
- b) Explain in brief various sources of noise. [5]
- c) Explain anechoic chamber and reverberant chamber? [4]

OR

- Q8)** a) What is meant by time domain and frequency domain analysis? Explain how frequency spectrum can be used to detect vibration related faults. [8]
- b) Write short note on “Noise control in industries”. [5]
- c) Write short note on Condition monitoring of machines. [4]



Total No. of Questions : 8]

SEAT No. :

PA-962

[Total No. of Pages : 3

[5927]-414

B.E. (Mechanical Engineering)

TURBOMACHINERY

(2019 Pattern) (Semester - VII) (402043)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the 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, and electronic pocket calculator is allowed.*
- 4) *Figure to the right indicate full marks.*
- 5) *Assume Suitable data, if necessary.*

- Q1)** a) Classify Turbo machines. [2]
b) State Impulse Momentum Principle. Derive an expression for force exerted by jet of water on flat inclined plate. [6]
c) A Pelton wheel is to be designed for the following specifications: Shaft Power = 11,772kW; Head = 380 meters; Speed = 750 r.p.m; Overall efficiency = 86%; Jet diameter is not to exceed one sixth of the wheel diameter. Determine: [6]
i) The wheel Diameter
ii) The number of jets required, and
iii) Diameter of the jet.
Take $K_{v_1} = 0.985$ and $K_{u_1} = 0.45$

OR

- Q2)** a) Explain construction and working of Kaplan Turbine with neat sketch. [6]
b) What is the need of draft tube? Enlist types of draft tube with neat diagram. [4]
c) The external and internal diameters of inward flow reaction turbines are 1.20 m and 0.6 m respectively. The head on the turbine is 22 m and velocity of flow through the runner is constant and equal to 2.5 m/s. The guide blade is given as 10° and runner vanes are radial at inlet. If the discharge at outlet is radial, determine: [4]
i) The speed of the turbine
ii) The vane angle at the outlet of the runner

P.T.O.

- Q3) a)** What do you mean by compounding of steam turbines? Explain any one suitable example with neat sketch. [6]
- b) In a De Laval Steam turbine steam issues from the nozzle with a velocity of 1200 m/s. The nozzle angle is 20° , the mean blade velocity is 400 m/s, the inlet and outlet angles of blades are equal. The mass of steam flowing through turbine per hour is 1000 kg. Determine the following by graphical method [6]
- i) Tangential Force
 - ii) Power Developed
 - iii) Blade Efficiency
- Take Velocity blade coefficient as 0.8

OR

- Q4) a)** Explain governing of steam turbine with any one method. [6]
- b) Following data refers to particular stage of Parson's reaction turbine. [6]
The speed of turbine = 1500 rpm
Mean Diameter of rotor = 1m
Stage efficiency = 0.8
Blade outlet angle = 20°
Speed Ratio = 0.7
Determine the available enthalpy drop in the stage by graphical method.
- Q5) a)** State & explain: [6]
- i) Unit Speed
 - ii) Unit Discharge
 - iii) Unit Power
- b) A centrifugal pump delivers water against a net head of 14.5 meters and a design speed of 1000 r.p.m. The vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 300 mm and outlet width is 50 mm. Determine the discharge of the pump if manometric efficiency is 95%. [6]

OR

- Q6) a)** Explain the following: [6]
- i) Priming of Centrifugal Pump
 - ii) Net Positive Suction Head
 - iii) Cavitation
- b) A centrifugal pump discharges $0.15 \text{ m}^3/\text{s}$ of water against head of 12.5m , the speed of impeller being 600 r.p.m. The outer and inner diameters of impeller are 500 mm and 250 mm respectively and the vanes are bent back at 35° to the tangent at exit. If the area of flow remains 0.07 m^2 from inlet to outlet, Calculate: [6]
- i) Manometric Efficiency of pump
 - ii) Vane angle at inlet
- Q7) a)** Explain construction and working of Axial flow Compressor with neat diagram. [6]
- b) A centrifugal compressor develops a pressure ratio of 5 and an air consumption of 30 kg/s . The inlet temperature and pressure are 15°C and 1 bar respectively. If isentropic efficiency is 0.85 , Calculate [6]
- i) Work done
 - ii) Exit total temperature
 - iii) The power required

OR

- Q8) a)** Explain surging and choking phenomenon in centrifugal compressors with neat diagram. [6]
- b) Differentiate between centrifugal compressor and axial flow compressor. [4]
- c) Give classification of centrifugal compressors. [2]



Total No. of Questions : 8]

SEAT No. :

PA-963

[Total No. of Pages : 3

[5927]-415

B.E. (Mechanical)

AUTOMOBILE DESIGN

(2019 Pattern) (Semester - VII) (Elective - III) (402044A)

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 suitable neat diagrams, whenever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Assume suitable data if required.*

- Q1)** a) A pair of bevel gears, with 20° pressure angle, consists of a 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm, while the face width is 20 mm. The material for the pinion and gear is steel 50C4 ($S_{ut} = 750 \text{ N/mm}^2$). The gear teeth are lapped and ground (Class-3) and the surface hardness is 400 BHN. The pinion rotates at 500 rpm and receives 2.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Determine the factor of safety against bending failure and against pitting failure. **[10]**
- b) Explain how wheel alignment is performed in service station. **[8]**

OR

- Q2)** a) A pair of straight bevel gears, mounted on shafts which are intersecting at right angles, consists of a 24 teeth pinion meshing with a 32 teeth gear. The pinion shaft is connected to an electric motor developing 12.5 kW rated power at 1440 rpm. The starting torque of the motor is 150% of the rated torque. The pressure angle is 20° . Both gears are made of case-hardened steel ($S_{ut} = 750 \text{ N/mm}^2$). The teeth on gears are generated and finished by grinding and lapping processes to meet the requirements of Class-3 Grade. The factor of safety in the preliminary stages of gear design is 2. (i) In the initial stages of gear design, assume that velocity factor accounts for the dynamic load and that the pitch line velocity is

P.T.O.

7.5 m/s. Estimate the module based on beam strength. (ii) Select the first preference value of the module and calculate the main dimensions of the gears. (iii) Determine the dynamic load using Buckingham's equation and find out the effective load for the above dimensions. What is the correct factor of safety for bending? (iv) Specify the surface hardness for the gears assuming a factor of safety of 2 for wear consideration. [12]

b) Explain construction details of automobile propeller? [6]

Q3) a) Explain internal expanding shoe brake with advantages and Disadvantages And also state the guidelines for the design of automotive brake. [10]

b) State the types of rims. Draw any one type of rim and write its construction. [7]

OR

Q4) a) Explain with the help of neat sketch working of Hydraulic Brake and write its advantages and disadvantages. [10]

b) What are the different factors which affecting tyre life? [7]

Q5) a) 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/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate i) wire diameter; ii) mean coil diameter; number of active coils; total number of coils; solid length of the spring; free length of the spring; required spring rate; and actual spring rate. [10]

b) Explain the Wishbone Type Suspension System with the help of neat sketch. [8]

OR

Q6) a) A semi-elliptic leaf spring used for automobile suspension consists of three extra full-length leaves and 15 graduated-length leaves, including the master leaf. The centre-to-centre distance between two eyes of the spring is 1 m. The maximum force that can act on the spring is 75 KN. For each leaf, the ratio of width to thickness is 9:1. The modulus of elasticity of the leaf material is 207 000 N/mm². The leaves are pre-stressed in such a way that when the force is maximum, the stresses induced in all leaves are same and equal to 450 N/mm². Determine: i) the width and thickness of the leaves; ii) the initial nip; and the initial pre-load required to close the gap C between extra full-length leaves and graduated-length leaves. [10]

b) Explain construction and working of the shock absorber. [8]

Q7) a) Explain step by step in Occupant Packaging [10]

b) What are the principles used in vehicle packaging. [7]

OR

Q8) a) Explain following constraints of anthropometrics: clearance, reach, posture, and strength. [10]

b) Explain Use of Anthropometry In Designing Vehicles. [7]



Total No. of Questions : 08]

SEAT No. :

PA-964

[Total No. of Pages : 2

[5927]-416

B.E. (Mechanical Engineering)

DESIGN OF HEAT TRANSFER EQUIPMENT

(2019 Pattern) (Semester - VII) (402044B) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 , Q.7 or Q.8.*
- 2) *Use of thermodynamic tables and charts permitted.*
- 3) *Assume suitable data, if necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) a) Explain the basic design procedure of a shell and tube heat exchanger.[9]

- b) Distilled water with a mass flow rate of $80,000 \frac{\text{kg}}{\text{hr}}$ enters the shell -side of a exchanger at 35°C and leaves at 25°C. The heat will be transferred to $1,40,000 \frac{\text{kg}}{\text{hr}}$ of raw water from supply at 20°C. The baffles are spaced 12 inches apart. Single shell and single tube pass is preferred. The tubes are 18 BWG tubes with a 1 inch outside diameter (OD = 0.0254 m and ID = 0.0229 m) and they are laid out in square pitch. Shell diameter is 15.25 inch. A pitch size of 1.25 inch and clearance of 0.25 inch are selected. Calculate the length of the heat exchanger. [9]

OR

Q2) a) What are the sources of Noise in a heat exchanger? How it can be minimized? [9]

- b) Explain the selection criteria of a shell and tube heat exchanger. What are the assumptions that needs to be considered in the process of design of a heat exchanger? [9]

Q3) a) Explain the design considerations involved in a evaporative condenser. [9]

- b) Explain in brief the standards for an evaporator and condenser. [8]

P.T.O.

OR

- Q4)** a) How do you classify the condensers used in a refrigeration system? [9]
b) Explain the design considerations of heat exchangers for a air conditioning application. [8]

- Q5)** a) Explain in brief the mini and micro channel Heat exchanges. [9]
b) Explain plate heat exchangers in brief. What are its advantages over shell and tube heat exchangers. [9]

OR

- Q6)** a) Explain how thermal analysis is performed in a compact heat exchanger. [9]
b) Classify the compact heat exchangers. Also enumerate the factors affecting the design of a heat exchanger. [9]

- Q7)** a) Explain how will you perform heat balance of cooling towers in detail.[9]
b) How the number of diffusion units in a direct heat exchanger in determined? [8]

OR

- Q8)** a) Explain the design methodology for a counter flow direct contact heat exchanger. [9]
b) Briefly analyse the various cooling tower requirements. [8]



Total No. of Questions : 8]

SEAT No. :

PA-1668

[Total No. of Pages : 2

[5927]-417

B.E. (Mechanical Engineering)

MODERN MACHINING PROCESSES

(2019 Pattern) (Elective-III) (Semester-VII) (402044 C)

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 photochemical machining process with principle, Construction, working process parameters and applications. **[9]**
- b) Explain in detail with suitable sketch of electro chemical machining. Also discuss the effect of process parameters, merits, demerits and applications. **[8]**

OR

- Q2) a)** Explain in detail electrochemical grinding process with principle, construction, working process parameters. **[8]**
- b) Explain the effect of process parameters on material removal rate in electro chemical machining. **[5]**
- c) Differentiate chemical machining and photochemical machining process. **[4]**

- Q3) a)** Explain the effect of following factors on metal removal rate and accuracy in EDM **[9]**
- i) Tool material
 - ii) Dielectric fluid
 - iii) Process parameters.
- b) Explain in detail with suitable sketch of electro chemical discharge machining. Also discuss the effect of process parameters, merits, demerits and applications. **[9]**

OR

P.T.O.

- Q4)** a) Explain Wire electric discharge machining process with principle, construction, working process parameters and applications. [8]
b) Explain the significance of dielectric fluid in EDM [6]
c) Explain the principle of EDM with suitable sketch. [4]

- Q5)** a) Explain with suitable sketch diamond turn machining process. Also discuss the effect of process parameters on surface roughness. [8]
b) Explain micro electric discharge machining process with principle, construction, working process parameters and applications. [9]

OR

- Q6)** a) Write note on [8]
i) Micro milling.
ii) Micro drilling.
b) Explain micro engraving process with suitable sketch. [5]
c) Draw neat labeled diagram of diamond turn machine and also list application of diamond turn machining. [4]

- Q7)** a) What is micro and nano system? Explain wet and dry etching process with suitable sketch. [9]
b) Explain the LIGA process with principle, construction, working process parameters and applications. [9]

OR

- Q8)** a) Explain Magnetorheological Finishing with principle, construction, working process parameters and applications. [8]
b) Write note on MEMS in brief. [6]
c) Compare MAF and AFF. [4]



Total No. of Questions : 08]

SEAT No. :

PA-965

[Total No. of Pages : 3

[5927]-418

**B.E. (Mechanical Engineering)
INDUSTRIAL ENGINEERING**

(2019 Pattern) (Semester - VII) (402044D) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 , Q.7 or Q.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of electronic calculator is allowed.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) What do you mean by plant Location? Mr. Vishal wants to start his new plant, for this suggests which are the different factors that he should consider while selecting location for his new plant? [6]
- b) Explain process layout with suitable sketch. [6]
- c) Explain types of material flow patterns to achieve optimum flow of material in the plant? [5]

OR

- Q2)** a) Explain the term material handling equipment's? Elaborate any four different types of material handling equipment's with suitable applications? [9]
- b) Compare product layout and Process Layout and explain factors affect while selecting plant layout? [8]
- Q3)** a) Explain the term Line Balancing with its objectives? Compare Job Production and Batch Production? (any 4 points) [9]

P.T.O.

- b) List any six functions of production planning and control. [9]

Past data on the sale of Diesel engines for the last 12 years is given below. By the method of three yearly moving averages establish the trend values and forecast demand for 13th year. If the actual demand for 13th year is 540 nos. What shall be the forecast of 14th year. Take value of smoothing constant is 0.3.

Year	1	2	3	4	5	6	7	8	9	10	11	12
Sale numbers	335	350	330	340	380	410	430	440	430	460	500	560

OR

- Q4)** a) What is demand forecasting? What are applications of demand forecasting? Explain Moving average method of demand forecasting. [9]
- b) For a water bottle, demand is given below. Forecast for the month May was 160 Units with a smoothing constant of 0.20 and using first order exponential smoothing what is forecast for month of October? [9]

Month	Actual Demand
May	250
June	180
July	200
August	260
September	250

- Q5)** a) Elaborate role of materials management in cost reduction and value improvement? Also explain the term “ABC analysis”. [9]
- b) Explain vendor rating system with vendor rating criteria? Also explain objectives of JIT. [9]

OR

- Q6) a) What is inventory control? Explain [9]**
- i) MRP - I
 - ii) ERP with different module
- b) The Prisha enterprises use EOQ logic to determine the order quantity for its various components and are planning its orders. The Annual consumption is 80,000 units, Cost to place one order is Rs.1200, Cost per unit is Rs.50 and carrying cost is 6% of unit cost. Find, [9]
- i) EOQ,
 - ii) No. of order per year,
 - iii) Ordering Cost and Carrying Cost
 - iv) Total Cost of Inventory.

- Q7) a) What is “value analysis”? Explain types of value? [6]**
- b) Explain Rapid Entire Body Assessment (REBA) with level of MSD risk. [6]
- c) Write a short note on “KRA”? [5]

OR

- Q8) a) Elaborate the term “merit rating”? Explain any 4 methods of merit rating? [9]**
- b) Define job evaluation? What are its objectives? Explain procedure of job evaluation? [8]



Total No. of Questions: 8]

SEAT No. :

PA-2624

[5927]-419

[Total No. of Pages : 2

B.E. (Automobile/Mechanical)

INTERNET OF THINGS

(2019 Pattern) (Semester-VII) (Elective-III) (402044E)

Time : 2 ½Hours]

[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) Explain and illustrate Arduino board hardware. [6]
b) Explain I₂C communication interface. [6]
c) Write a short note on Arduino Programming. [6]

OR

- Q2)** a) Explain Arduino's ten Control Structure with example. [8]
b) Explain the Motion Sensor interfacing with any board. [5]
c) What are the main design principles and needed capabilities in IoT? [5]

- Q3)** a) Explain in detail IoT Communication APIs and their types. [6]
b) Compare serial versus parallel communication. [6]
c) Write a short note on/Explain Radio-Frequency identification (RFID) communication [5]

OR

- Q4)** a) Write a short note on Global Positioning System (GPS) communication. [6]
b) Explain Real Time Location Sensing (RTLS) communicaton. [6]
c) What are the limitations of cloud Computing? [5]

- Q5)** a) Explain Client (the user agent) as a component of HTTP. [6]
b) Explain the features of Hyper Text Transport Protocol (HTTP). [8]
c) What are the objectives of HTTP Response made by a server to a client? [4]

OR

P.T.O.

- Q6)** a) Explain in detail the Representational State Transfer (REST) protocol. [6]
b) Explain REST ful Web Service along with examples. [6]
c) Describe features of Message Queueing Telemetry (MQTT) protocol. [6]
- Q7)** a) Describe existing IoT platforms/middleware. [9]
b) Explain use of IoT in Connected Vehicles applications. [8]

OR

- Q8)** a) Explain the steps towards a secure IoT platform for varieties of applications. [6]
b) Explain the future IoT ecosystem. [6]
c) Explain use of IoT in Activity Monitoring applications. [5]



Total No. of Questions : 8]

SEAT No. :

PA-2625

[Total No. of Pages : 2

[5927]-420

B.E (Mechanical Engineering)

COMPUTATIONAL FLUID DYNAMICS

(2019 Pattern) (Semester - VII) (402044F) (Elective - III)

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 whenever 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 and illustrate the solution of two dimensional steady heat convection-diffusion equation. [6]
- b) Define Peclet number and state its importance? [6]
- c) Explain the significance of 1-D transient convection-diffusion system.[6]

OR

- Q2)** a) Derive 1-D transient convection-diffusion system. [8]
- b) What is implicit finite volume method (FVM)? [5]
- c) Write a short note on stability criteria. [5]

- Q3)** a) Derive solution of Navier-Stoke' equation for incompressible flow. [6]
- b) Explain the applications of CFD for external flow over aerfoil simulation. [6]
- c) Explain the importance of Pressure correction method in SIMPLE algorithm. [5]

OR

P.T.O.

- Q4)** a) Discuss the challenges in solving Navier-Stokes Equations numerically? Suggest two remedies to overcome these challenges. [6]
- b) Write down the steps taken for solving a problem of an external incompressible flow over a flat plate. [6]
- c) Describe the applications of external flow simulation. [5]

- Q5)** a) Classify turbulence modeling in detail. [6]
- b) Write a short note on Reynolds Averaged Navier-Stokes (RANS) equation. [4]
- c) Derive two equation model for Turbulent Flow Modeling. [8]

OR

- Q6)** a) Explain the Direct Numerical Simulation (DNS) and its applications. [6]
- b) Write a short note on mixing length theory. [6]
- c) Give suitable example where $k-\omega$ turbulence model is used. [6]

- Q7)** a) Describe applications of Fluid-Structure interaction with illustrations. [9]
- b) What are balance laws in Lagrangian form? [8]

OR

- Q8)** a) Explain and illustrate Lagrangian Solid System. [6]
- b) Describe the continuum mechanics of moving domains. [5]
- c) Explain and illustrate Arbitrary Lagrangian Eulerian Description. [6]



Total No. of Questions : 8]

SEAT No. :

PA-2641

[Total No. of Pages : 2

[5927]-421

B.E. (Mechanical Engineering)

PRODUCT DESIGN AND DEVELOPMENT

(2019 Pattern) (Semester - VII) (Elective - IV) (402045A)

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) List down different methods used for product teardown process and explain any one. [7]
- b) Describe in detail benchmarking. [6]
- c) What is concept analysis? List down different aspects of concept analysis. [4]

OR

- Q2)** a) What is concept selection? Explain Pugh's chart with example. [7]
- b) Write a short note on FAST method. [6]
- c) What is product policy of an organization? List down various product policies. [4]

- Q3)** a) What is product modularity? Explain types of Modularity. [7]
- b) Explain BOM with example. [6]
- c) What is Tolerance? Describe the types of tolerances. [4]

OR

- Q4)** a) What is product architecture? Explain types of product architecture. [7]
- b) What is dimensioning? Describe arrangement of dimensioning. [6]
- c) What is Fit? Describe the types of Fits. [4]

P.T.O.

- Q5)** a) List down different methods of economic analysis of product and explain break even analysis. [8]
b) What is Rapid prototyping? Define and enlist various methods of prototyping. [6]
c) Define letter of intent, purchase order and product costing in vendor development. [4]

OR

- Q6)** a) Explain stereo lithography in detail with suitable sketch. [8]
b) What is production capacity planning? Explain the steps followed in planning. [6]
c) Why homologation certificate is important in design and development? Explain with example. [4]

- Q7)** a) Write a short note on APQP. [8]
b) Write a short note on DFMEA. [6]
c) Discuss the elements of PLM in detail. [4]

OR

- Q8)** a) List down types of FMEA and explain any one with example. [8]
b) Write a short note on PDM. [6]
c) Discuss design for robustness in detail. [4]



Total No. of Questions : 8]

SEAT No. :

PA-966

[Total No. of Pages : 2

[5927]-422

B.E. (Mechanical)

EXPERIMENTAL METHODS IN THERMAL ENGINEERING

(2019 Pattern) (Semester-VII) (Elective-IV) (402045B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is Thermocouple? Describe the types of thermocouples with significance applications? What are the issues in heat flux measurement? **[9]**

b) Define the properties emissivity, reflectivity and transmissivity? What is the solar constant? **[8]**

OR

Q2) a) Write short notes on **[9]**

- i) Thermistor
- ii) Thermopile
- iii) Optical Pyrometer.

b) How do you measure the solar radiation? What are the type of instruments used for solar radiation measurement and explain? **[8]**

Q3) a) What type of pressure sensors used in pressure measurement? Explain any two in details. **[10]**

b) Classify the working principal of Bourdon tube pressure gauge and diaphragm gauge. **[8]**

OR

Q4) a) Difference between high pressure measurement and low-pressure measurement? How to measure the pressure in combustion? **[10]**

b) What is transducer? Describe transient response of pressure transducers in detail. **[8]**

P.T.O.

- Q5) a)** Describe briefly Laser Doppler Anemometer (LDA) and Magnetic flow meter. [8]
- b) How the flow measurement techniques used to validate CFD results?[10]

OR

- Q6) a)** How to measure the flow in micro channel? [8]
- b) What is the difference between orifice meter and venturi meter? How does temperature relate to velocity? Explain the thermal effect on Velocity measurement? [10]

- Q7) a)** What is the main purpose of Data Acquisition system (DSA)? Describe the Data Acquisition methods briefly? [8]
- b) How to apply the AI & ML in mechanical measurement process? What is regression used for? [9]

OR

- Q8) a)** Describe prediction of measurement parameter using ML Approaches such as Regression. [8]
- b) What is ANOVA in statistical analysis? What type of ML used for prediction of measurement parameter? [9]



Total No. of Questions : 8]

SEAT No. :

PA-2642

[Total No. of Pages : 3

[5927]-423

B.E. (Mechanical Engineering)

(402045C) ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VII) (Elective - 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) *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 process Fused Deposition Modeling (FDM) with suitable sketch. Also write merits, demerits and application. [8]
- b) Explain process Direct Ink Writing (DIW) with suitable sketch. [5]
- c) Explain process Polyjet Printing with suitable sketch. [5]

OR

- Q2)** a) Explain process Color-Jet Printing (CJP) with suitable sketch. List it's Benefits, Drawbacks, Limitations and Applications. [8]
- b) Explain process Electron Beam-based DED with suitable sketch. [5]
- c) Compare Extrusion-Based Deposition with Energy Deposition Techniques. [5]

- Q3)** a) Explain use of Metals in Additive Manufacturing with important process parameters, benefits, drawbacks, Limitations and appropriate applications. [6]

P.T.O.

- b) Explain varieties of heat treatment applied in pre- and post-processing of additive manufacturing based products. [6]
- c) Write a short note on acetone treatment in post-processing of additive manufacturing based products. [5]

OR

- Q4)**
- a) Explain the Process specific strategies used in quality control of material specific additive manufacturing based products. [6]
 - b) Write a short note on DfAM based Process specific strategies. [6]
 - c) Write a short note on Support Removal in post-processing of additive manufacturing based products. [5]
- Q5)**
- a) Explain the two approaches used in Photopolymerization process based 3D printers. [6]
 - b) Explain the Construction, Layout and sub-system of Selective Laser Sintering [SLS] process based 3D Printers. [6]
 - c) Explain the Construction, Layout, sub-system and sub-type of Cartesian based 3D Printers' Topology/Layout Frame Designs. [6]

OR

- Q6)**
- a) Explain the Construction, Layout and sub-system of Binder Jetting process based 3D Printers. [6]
 - b) Explain the Construction, Layout, sub-system and sub-type of Extruder Design used in Polymer based 3D Printer Construction. [6]
 - c) Explain the M-codes used in the Control software of Additive Manufacturing based 3D Printers. [6]
- Q7)**
- a) Explain how additive manufacturing is used in Aerospace Industries. Also write merits, demerits and practical feasible applications with illustrations. [9]
 - b) Write a short note on 4D Printing and its applications. [8]

OR

- Q8)** a) Explain how additive manufacturing is used in Machine-Tools Industries. Also write merits, demerits and practical feasible applications with illustrations. [9]
- b) Explain how additive manufacturing is used in Personalized Surgery Sector. Also write merits, demerits and practical feasible applications with illustrations. [8]



Total No. of Questions : 8]

SEAT No. :

PA-2643

[Total No. of Pages : 6

[5927]-424

B.E. (Mechanical)

OPERATIONS RESEARCH

(2019 Pattern) (Semester - VII) (Elective - IV) (402045-D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Answers in one answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Use Graphical method to solve the following LPP

[10]

$$\text{Minimize } Z = 10 X_1 + 4 X_2$$

Subject to Constraints

$$3X_1 + 2X_2 \geq 60$$

$$7X_1 + 2X_2 \geq 84$$

$$3X_1 + 6X_2 \geq 72$$

$$X_1, X_2 \geq 0$$

b) Write the generalised syntax of LPP and discuss the following terms related to LPP **[7]**

- i) Objective function.
- ii) Constraint surface.
- iii) Feasible and infeasible points.
- iv) Optimum solution.

OR

P.T.O.

Q2) a) Use Simplex method to solve the following LPP [10]

$$\text{Maximize } Z = 80 X_1 + 55 X_2$$

Subject to Constraints

$$4X_1 + 2X_2 \leq 40$$

$$2X_1 + 4X_2 \leq 32$$

$$X_1, X_2 \geq 0$$

b) i) Limitations of graphical method. [3]

ii) Explain with the help of example conversion of Primal to Dual LPP problem. [4]

Q3) a) Discuss with the help of flow chart Hungarian method to solve the assignment problems. [8]

b) Find out the initial feasible solution by **Vogel's Approximation Method (VAM)**. [10]

	W_1	W_2	W_3	W_4	Availability
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	

OR

Q4) a) An airline company has drawn up a new flight schedule that involves five flights. To assist in allocating five pilot to the five flights, it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater is the preference. A few of these flights are unsuitable to some pilots, owing to domestic reasons. These have been marked with "X".

		Flight Number				
		I	II	III	IV	V
Pilot	A	8	2	X	5	4
	B	10	9	2	8	4
	C	5	4	9	6	X
	D	3	6	2	8	7
	E	5	6	10	4	3

What should be the allocation of the pilots in order to meet **maximum preference**? [12]

- b) Explain the generalised syntax of assignment and transportation problem. [6]

- Q5) a) A small project involves 7 activities and their times estimates are listed in the following table. Activities are identified by their beginning (i) and ending (j) node numbers. [12]

Activities (i-j)	Estimated Duration (Weeks)		
	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- i) Draw the network diagram of the activities in the projects.
- ii) Find expected duration and variance for each activity. What is the expected project length?
- iii) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed :
 - 1) At least 4 weeks earlier than expected time.
 - 2) No more than 4 weeks later than expected time.

Given

Z (0-Z)	1.33
Probability	0.4082

- b) Explain with example what is looping and Dangling errors in the network. [6]

OR

- Q6)** a) A taxi owner estimates from his past records that the costs per year for operating a taxi whose purchase price when new is Rs. 60,000 are as given below :

Year	1	2	3	4	5
Operating Cost (Rs)	10,000	12,000	15,000	18,000	20,000

After 5 years, the operating cost is Rs. 6000 *K where K = 6, 7, 8, 9 and 10 (K denotes the age of in years) If the resale value decreases by 10% of purchase price each year, what is the best replacement policy? Cost on money is zero. [12]

- b) Explain different types of floats involved in the in CPM analysis of network and how it is calculated during the analysis. [6]

- Q7)** a) A dentist scheduled all his patients for 30 minute appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probability and time actually needed to complete the work :

Category of service	Time required in Minute	Probability
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check tip	15	0.20

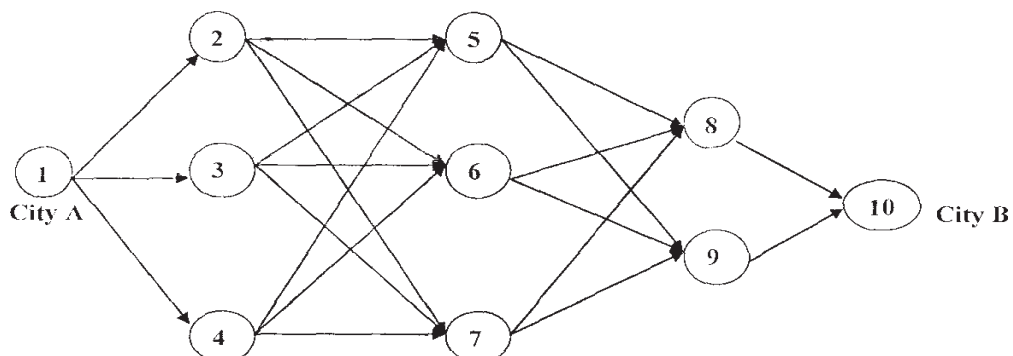
Simulate the dentist's clinic for four hours and determine the average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8 : 00 a.m. Use the following sequence of random numbers to stimulate the above problem.

Random Numbers : 40, 82, 11, 34, 25, 66, 17, 79. [12]

- b) Write short note on Monto Carlo Simulation. [5]

OR

- Q8)** a) A salesman located in a city A decided to travel to city B. He knew the distances of alternative routes from city A to city B. He then drew a highway network map as shown in following figure. The city of origin A. is city 1. The destination city B is city 10. Other cities through which the salesman will have to pass through are numbered 2 to 9. The arrow representing routes between cities and distances in kilometres are located on each route. The salesman problem is to find the shortest route that covers all the selected cities from A to B. The time for each activity is given in the table. (Solve by using Dynamic programming) [12]



Activity	Duration	Activity	Duration
1-2	4	4-5	6
1-3	6	4-6	10
1-4	3	4-7	5
2-5	7	5-8	4
2-6	10	5-9	8
2-7	5	6-8	3
3-5	3	6-9	7
3-6	8	7-8	8
3-7	4	7-9	4
		8-10	7
		9-10	9

b) Explain in brief various steps involved in the simulation. [5]



Total No. of Questions : 8]

SEAT No. :

PA-2644

[Total No. of Pages : 2

[5927]-425

B.E (Mechanical Engineering)

AUGMENTED REALITY AND VIRTUAL REALITY

(2019 Pattern) (Semester - VII) (Elective - IV) (402045E)

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 whenever 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 the computer environment. [6]
b) What are the three system outputs signals of VR system? [6]
c) Explain and illustrate head-mounted displays used in VR technology.[6]

OR

- Q2)** a) Explain with neat sketch the integration of various elements of a generic VR system. [8]
b) Explain Virtual lights. [5]
c) What are the four modes of interaction in immersive interaction? [5]

- Q3)** a) Define Augmented Reality (AR) and its capability. Also define “What is not Augmented Reality (AR)?” [6]
b) Write a short note on Handheld displays and available technology in market. [6]
c) Explain the five domains where and how Augmented Reality is used today. [5]

OR

P.T.O.

- Q4)** a) Explain following Augmented Reality (AR) methods: (a) Pattern, (b) Outline, (c) Location and (d) Surface. [6]
- b) Explain Tangible User AR Interface. [6]
- c) Write a short note on Marker-based Augmenting Reality (AR). [5]

- Q5)** a) Explain the steps of starting of a VR session till the exhibition of a steady-state behavior. [6]
- b) Explain the four types of head-coupled displays used in VR systems.[4]
- c) Explain human ear's following features and characteristics:
Sound, Sound perception, Frequency range, Sound intensity, Sound direction The sound stage, Head-related transfer functions (HRTFs), Measuring HRTFs. [8]

OR

- Q6)** a) Describe the actor concept and their functions used in VR kits. [6]
- b) Describe and illustrate tracking sensors, its characteristics and market available technology used in VR systems. [6]
- c) Explain the general-purpose interactive environment for manipulating articulated geometric figures. [6]

- Q7)** a) Explain how VR can be subjected to Finite Element Analysis (FEA) techniques to identify areas of stress. [9]
- b) How to simulate the combined augmented and virtual reality application in training domain. [8]

OR

- Q8)** a) Explain how VR can be used in medical simulation before operation.[6]
- b) Explain how AR can be used in Policing and Law Enforcement. [5]
- c) Explain how AR/VR can be used in military training. [6]



Total No. of Questions : 8]

SEAT No. :

PA-2651

[Total No. of Pages : 2

[5927]-426

B.E. (Mechanical -Sandwich)

ENERGY ENGINEERING AND MANAGEMENT (Self-study-III)

(2019 Pattern) (Semester-VII) (402064)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the need of renewable energy sources and how do an industry, nation and globe would benefit from energy efficiency? [8]
- b) What is wave energy? Explain the working principle of a wave energy conversion system. [9]

OR

- Q2)** a) With a neat sketch explain the working of a wind energy conversion system with main components. [8]
- b) Explain the working principles of an OTEC plant. [9]

- Q3)** a) Discuss the energy policy of the government and explain the concept of energy management. [9]
- b) Describe energy and environment. [9]

OR

- Q4)** a) What are the principles of energy management and need of managerial skills in energy management? [9]
- b) Write note on energy policy. [9]

- Q5)** a) Explain stepwise procedure to carry out detailed energy audit. [8]
- b) Give a typical energy audit reporting format. [9]

OR

P.T.O.

Q6) a) What are the different types of energy audit? Discuss the scope of preliminary energy audit. [8]

b) Write short notes on current energy conservation act and electricity act.[9]

Q7) a) With neat sketch of each differentiate between load curve and load duration curve. [9]

b) Short notes: [9]

i) CDM projects

ii) Carbon credit calculation.

OR

Q8) a) Define waste heat recovery. Describe its benefits and potentials of savings in industry. [9]

b) Define the following: [9]

i) Connected load

ii) Maximum demand



Total No. of Questions : 8]

SEAT No. :

PA-1669

[Total No. of Pages : 3

[5927]-427

B.E. (Mechanical - Sandwich)

**INDUSTRIAL ENGINEERING AND ORGANIZATIONAL
MANAGEMENT (Self-Study - IV)**

(2019 Pattern) (Semester - VII) (402065)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data wherever necessary.*

- Q1)** a) Explain in detail factors affecting selection of location for the industrial plant. [7]
- b) Write a short note on : [6]
- i) Product layout
 - ii) Process layout
- c) Explain the objectives of material handling and material handling equipments. [5]

OR

- Q2)** a) Categorize factors responsible for selection of plant location for a water pump manufacturing company. [7]
- b) Distinguish between single facility location and multi-facility location. [6]
- c) Which principles are to be considered while deciding material handling system? [5]

P.T.O.

- Q3) a)** Estimate the sales forecast for the year 2000, using exponential smoothing forecaster. Take $\alpha = 0.5$ and the forecast for the year 1995 as 160×10^5 units. Compare the forecast with least square method. [7]

Year	1995	1996	1997	1998	1999
Sale Rs. (X 10^5)	180	168	159	170	188
Forecast (X 10^5)	160				

- b) Explain the functions of production planning and control. [6]
 c) Discuss MRP-II with suitable example. [4]

OR

- Q4) a)** For a particular product demand is given below. With a smoothing constant of 0.20 and using first order exponential smoothing what is forecast for month of September? [7]

Month	Actual Demand
April	200
May	150
June	180
July	220
August	200

- b) Define inventory and its importance. Enlist different types of inventories. [6]
 c) Explain the concept of supply chain. [4]

- Q5) a)** Define Process design and explain the framework of process design by means of block diagram. [7]
 b) How do you define group technology? Describe with suitable example. [6]
 c) What are applications of CPM / PERT? [5]

OR

- Q6) a)** What is assembly line balancing? Explain in detail. [7]
 b) What is PERT? Explain objectives in the analysis through PERT. [6]
 c) Enlist and explain CPM/PERT chart terminology. [5]

- Q7)** a) Explain rapid upper limb assessment. [7]
b) Write short note on value engineering. [6]
c) What is social significance of ergonomics? [4]

OR

- Q8)** a) What are the characteristics of a good wage system and what are the factors influencing the wage systems? [7]
b) Explain principles of ergonomics. [6]
c) Write a short note on KRA. [4]



Total No. of Questions : 8]

SEAT No. :

PA-967

[Total No. of Pages : 2

[5927]-428

B. E. (Printing Technology)

GRAVURE PRINTING TECHNIQUES

(2019 Pattern) (Semester - VII) (408283)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain gravure process in detail with diagram. [8]
b) Explain gravure product and application. [5]
c) Define Hybrid Process. [4]

OR

- Q2)** a) Explain rotogravure press configuration in detail. [12]
b) Define NTNK inks. [5]

- Q3)** a) Explain doctor blade and its type. Discuss different type of assembly. [12]
b) Define dryer and its Types. Need of Dryers used on a gravure press. [5]

OR

- Q4)** a) Explain solvent recovery plant with diagram. [12]
b) Define OSHA (Occupational Safety and Health Association) Standards. [5]

- Q5)** a) Explain impression cylinder and its type. [8]
b) Explain specifications for impression rollers. [5]
c) Explain impression cylinder testing properties. [5]

OR

P.T.O.

- Q6)** a) Explain ESA and Effect of ESA on Print Quality. [13]
b) Describe effect of ESA parameters on ink transfer. [5]

Q7) Write a note on:

- a) Splicing Mechanism [6]
b) Web aligner [6]
c) Turret Systems and Mechanism [6]

OR

Q8) Write a note on:

- a) What is idler roller and its purpose? [6]
b) Electronic Line Shaft [6]
c) Gravure Troubleshooting [6]



Total No. of Questions : 08]

SEAT No. :

PA-968

[Total No. of Pages : 2

[5927]-429

B.E. (Printing Technology)
DIGITAL PRINTING TECHNIQUES
(2019 Pattern) (Semester-VII) (408284)

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) *Figure to the right indicates full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain functions of Digital Image Processing and its applications. [10]
b) Explain Dye Sublimation Printing process [8]

OR

- Q2)** a) Explain 5 classifications of the proof. [10]
b) Explain the concept of OCR and its applications. [8]

- Q3)** a) Draw the diagram of digital camera and explain the structure. [10]
b) Explain Concept of Input resolution. [7]

OR

- Q4)** a) Explain working of the scanner with diagram. [10]
b) Explain various barcode scanners. [7]

- Q5)** Explain Inkjet Process - Continuous and Drop on Demand. Also discuss advantages and disadvantages of both the processes. [18]

OR

P.T.O.

Q6) Explain Principal and Application of-Electrophotography, Magnetography and logography. **[18]**

Q7) Explain all the applications of variable data printing. **[17]**

OR

Q8) Explain communication link between Designer and Trade Shop with neat diagram **[17]**



Total No. of Questions : 8]

SEAT No. :

PA-969

[Total No. of Pages : 2

[5927]-430

B.E. (Printing Technology)

PAPER BOARD AND CORRUGATION PACKAGE TECHNOLOGY

(2019 Pattern) (Semester - VII) (408281A) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain in detail the process of manufacturing glue applied labels along with its applications. [10]

b) Explain “Shrink sleeves” with applications and diagram. [7]

OR

Q2) a) Explain in detail the process of manufacturing self adhesive labels along with its applications. [10]

b) Explain “In mold labels” with applications and diagram. [7]

Q3) Explain in detail the manufacturing of jigged punching die with complete manual method along with neat diagrams. [18]

OR

Q4) a) Explain what is bridge and notch in die making along with neat diagrams.[9]

b) Draw a neat diagram of RTE and label all the parts. Also explain the application of each part in brief. [9]

P.T.O.

Q5) Explain in detail the manufacturing of single facer corrugation board along with neat diagram of machine. **[17]**

OR

- Q6)** a) Explain various types of flutes used in corrugation industry along with their technical specifications and applications. **[10]**
- b) Draw a diagram of single wall corrugated board, label the diagram and explain the applications of the same. **[7]**

Q7) Explain the ECT in detail along with diagram and its application. **[18]**

OR

- Q8)** a) Write a short note on RCT. **[9]**
- b) Write a short note on FCT. **[9]**



Total No. of Questions : 8]

SEAT No. :

PA-970

[Total No. of Pages : 1

[5927]-432

B.E. (Printing Technology)

MULTIMEDIA ADVERTISING

(2019 Pattern) (Semester-VII) (Elective-IV) (408282A)

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) Numbers to right indicate full marks.

Q1) Explain concept of Brand and its personality, image, property, value and equity. What are different dimensions and advantages of brand equity? [18]

OR

Q2) State features, advantages and limitations of

- a) Print media [9]
- b) Television (audio visual) medium [9]

Q3) What is AIDA model, where and how it is used in field of advertising? Explain with suitable example. [17]

OR

Q4) What are different types of market segmentation, explain with suitable example. [17]

Q5) Explain public service advertisement and public relations advertisement in details. [18]

OR

Q6) What are different types of market survey are more effective, why? Explain with suitable case. [18]

Q7) Why campaigning is preferred for advertising, justify with suitable case study. [17]

OR

Q8) Explain any 4 types of headlines with suitable example of advertisement. Also describe types of advertisement copy. [17]



Total No. of Questions : 8]

SEAT No. :

PA-971

[Total No. of Pages : 2

[5927]-433

B.E. (Printing Technology)

**PROCESS OPTIMIZATION AND TOTAL QUALITY
MANAGEMENT IN PRINTING**

(2019 Pattern) (Semester-VII) (Elective-IV) (408282B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) What is the total measurement uncertainty? How it is calculated? Please calculate the measurement uncertainty of the below-given color difference measurements using the sample standard deviation equation. **[17]**

Measurements	1	2	3	4	5	6	7	8	9
Delta Eab (x)	1.896	1.333	0.523	0.663	0.340	0.449	0.231	1.287	1.825

OR

Q2) What is TPM? Explain 5S philosophy in detail along with some suitable examples with reference to printing industry. **[17]**

Q3) What is the purpose of ICC (International Color Consortium)? Explain the role of an ICC profile in print production. **[18]**

OR

Q4) What are standards? Explain the structure of a standardizing body that is involved in defining standards used in the Printing and Packaging industry. **[18]**

P.T.O.

Q5) What is Characterisation? Calculate CIEXYZ of the given colour patches using the below given 3×3 matrix **[17]**

	R	G	B
Patch 1	0.408	0.60	0.075
Patch 2	0.114	0.114	0.866

$$\text{Matrix: } \begin{bmatrix} 0.412 & 0.357 & 0.181 \\ 0.212 & 0.715 & 0.072 \\ 0.019 & 0.119 & 0.950 \end{bmatrix}$$

OR

Q6) What is the purpose of ISO13655 standard? Explain the ISO13655 standard in detail. **[17]**

Q7) How to characterize a scanner with 3 sensors (RGB) to estimate the Colorimetric values (CIEXYZ) using multiple linear regression? Describe in detail. **[18]**

OR

Q8) What is Multiple Linear Regression? Calculate CIEXYZ of the given colour patches using the below given 3×3 matrix **[18]**

	R	G	B
Patch 1	0.808	0.40	0.055
Patch 2	0.214	0.214	0.966

$$\text{Matrix: } \begin{bmatrix} 0.412 & 0.357 & 0.181 \\ 0.212 & 0.715 & 0.072 \\ 0.019 & 0.119 & 0.950 \end{bmatrix}$$



Total No. of Questions : 8]

SEAT No. :

PA-972

[Total No. of Pages : 3

[5927]-434

B.E. (Production Engineering)

AUTOMATION AND CONTROL ENGINEERING

(2019 Pattern) (Semester - VII) (411081)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Use of calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Draw suitable pneumatic circuit to execute following Boolean expression:

$$y = (A.\bar{B}.\bar{C}) + (B.C) \quad [6]$$

- b) Explain the working of FRL unit used in pneumatic system. [6]
- c) Draw a pneumatic circuit showing an application of time delay valve. [6]

OR

Q2) a) A single stage air compressor compress an air from 1 bar pressure to 6 bar pressure. Determine the volumetric efficiency and volume of air induced for the following data: [6]

i) Clearance volume = 0.040 m³

ii) Swept volume = 0.60 m³

iii) Compression and expansion to follow the law $PV^{1.3} = C$

- b) Design a pneumatic circuit using roller operated valve to extend two cylinders in a sequential manner. [6]
- c) Explain with neat sketch the working of quick exhaust valve. [6]

Q3) a) Explain 8051 microcontroller's External memory and I/O addressing modes. [9]

- b) Write an assembly program to find greatest between two numbers 25H and 52H. [8]

OR

P.T.O.

Q4) a) Explain clearly the difference between microprocessor and microcontroller. [7]

b) Explain with suitable example the significance of following status flags: [10]

- i) Sign
- ii) Carry
- iii) Auxillary carry
- iv) Zero
- v) Parity

Q5) a) Sketch the configuration of electro-hydraulic system clearly indicating input and output devices for PLC and draw ladder logic diagram to actuate two cylinders in following sequence: [9]

- i) Cylinder A and B extends simultaneously
- ii) Cylinder B retracts
- iii) Cylinder A retracts

b) Write the transfer functions for proportional, integral, and derivative control actions. Why derivative and integral controls are not used alone? [8]

OR

Q6) a) Write a PLC program for following case: [9]

One open tank is installed in the plant of which liquid level is to be controlled. When level reaches the Level Low, Outlet flow is blocked and inlet flow is allowed until high level is achieved. And when Level High is detected, outlet flow is allowed and inlet flow is blocked.

b) Obtain the controller output of an Integral controller for a process having transfer function $\frac{2}{s+4}$ for step response of 4. Feedback transfer function is the gain of 0.1 and proportional gain $K = 3$. [8]

- Q7) a)** Explain the following server systems in SCADA [9]
- i) Information storage and retrieval server
 - ii) Network management server
 - iii) Application server
- b) What is fail safe system in SCADA? Explain PLC redundancy method to make design fail safe. [9]

OR

- Q8)** Write short notes on: [18]
- i) Building blocks of HMI.
 - ii) Supervisory control and data acquisition (SCADA)
 - iii) Data concentrators and merging units.



[5927]-435
B.E. (Production Engineering)
OPERATIONS RESEARCH
(2019 Pattern) (Semester-VII) (411082)

Time : 2½ Hours]

[Max. Marks : 70

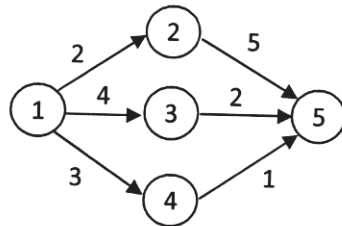
Instructions to the candidates:

- 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 graph paper for graphical solution.

- Q1)** a) Describe the procedure adopted in the analysis of dynamic problem. [9]
 b) Explain zero-one implicit enumeration technique of solving 0-1 programming problem. [8]

OR

- Q2)** a) What is Goal programming? Distinguish Goal programming from linear programming. [7]
 b) Find the optimal path by using dynamic programming for the following Network path. [10]



- Q3)** a) Explain the theory of replacement used in when maintenance cost varies with time. [5]
 b) The initial cost of the machine is Rs.5000.As the time passes the resale value is decreased and after some period it remains constant Rs. 500. Year end resale value, Yearly operating cost, Yearly maintenance cost is shown in table. Determine the optimum length of service of a machine before it should be replaced. [12]

P.T.O.

Year of service	1	2	3	4	5
Yearend sales value	3000	2500	2000	1500	500
Annual operating cost	1600	1900	2200	2500	2800
Annual maintenance cost	400	500	700	900	1100

OR

Q4) a) A machine costs Rs 50000/-. Operating costs are Rs. 5000/- for the first year and succeeding years operating cost increases by Rs. 500/- per year. Assuming 10% value of money per year. Find the optimum length of time to hold the machine before we replace it. **[12]**

b) Describe the types of sudden Failures. **[5]**

Q5) a) The pay off of different strategies against conditions (events) shown in following table. **[12]**

Which strategy should the concerned executive will choose on the basis of

- i) MaxiMax criteria or criteria of optimism
- ii) MaxiMin criteria or criteria of Pessimistic[Wald Criteria]
- iii) MiniMax Regret criteria or Savage Criteria

Strategy	Status of Nature (Product Demand)			
	N1	N2	N3	N4
S1	72	73	70	71
S2	74	71	79	71
S3	71	73	72	69

b) Describe the following with illustration **[6]**

- i) Laplace criteria
- ii) Hurwicz criteria or criteria of Realism

OR

Q6) a) The pay off of different strategies against conditions (events) shown in following table. **[8]**

Which strategy should the concerned executive will choose on the basis of

- i) Hurwicz criteria or criteria of Realism [alfa=0.6]
- ii) Laplace criteria or Criteria of Rationality

	Status of Nature (Product Demand)			
Strategy	N1	N2	N3	N4
S1	72	73	70	71
S2	74	71	79	71
S3	71	73	72	69

- b) Solve the following game by dominance and select the strategies and find the game value. [10]

		Player B			
		I	II	III	IV
Player A	I	1	1	3	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

- Q7)** a) Describe Multi server queuing model and state the applications. [6]
 b) In a bank 12 customers arrives on an average after every 7.5 minutes for withdrawing the cash. On an average the cashier at the payment counter takes 7.5minutes to serve 15 customers. [12]

Calculate:

- i) Arrival rate and service rate
- ii) Average number of customers in the bank(in the system)
- iii) Average number of customers in the queue or average queue length
- iv) Average time of a customer spends in the system
- v) Average waiting time of a customer in the queue before service

OR

- Q8)** a) Describe the following customer behaviour in the queue [8]
 i) Balking ii) Reneging
 iii) Collusion and iv) Jockeying
 b) Describe dynamic queue disciplines/rules. [10]



Total No. of Questions : 8]

SEAT No. :

PA-974

[Total No. of Pages : 2

[5927]-436

B.E. (Production Engineering)

Elective - III : SIMULATION, MODELING AND DIGITAL TWIN

(2019 Pattern) (Semester - VII) (411083A)

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) Write a short note on design of simulation models. **[8]**

b) How the model can be validated using three step approach? **[9]**

OR

Q2) a) Write short note on accreditation of models. **[8]**

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

i) Verification of simulation model

ii) Validation of simulation model

Q3) a) Define digital twin. Explain the types of industries it is used. **[9]**

b) Along with suitable example, explain application of digital twin in service sector. **[9]**

OR

Q4) a) Explain the key requirements and importance of implementing digital twin. **[9]**

b) Write short note on tools and techniques used in incorporating digital twin in industries. **[9]**

P.T.O.

- Q5)** a) Explain the working of process industry in detail. [8]
b) Write short note on : [9]
i) Automation Simulation
ii) Digital enterprise

OR

- Q6)** a) Briefly explain digital thread in a process industry. [8]
b) How the data is collected and analyzed for improvement of process in digital twin? [9]
- Q7)** a) How the efficiency can be improved by identifying bottlenecks? Give suitable example. [9]
b) Explain how the time is reduced by applying the digital twin in a industry. [9]

OR

- Q8)** a) Explain how digital twin can be applied for improvement in product quality. [9]
b) Write short note on continuous prediction and tuning of production process through Simulation. [9]



Total No. of Questions : 8]

SEAT No. :

PA-975

[Total No. of Pages : 2

[5927]-437

B.E. (Production Engineering)

TOTAL QUALITY MANAGEMENT

(2019 Pattern) (Semester - VII) (Elective - III) (411083B)

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 Ishikawa's Seven Quality Tools in detail. [9]

b) Describe concept Total Productive Maintenance (TPM) in detail. [9]

OR

Q2) a) Explain concept Zero defect, Just in time (JIT). [9]

b) Explain code of conduct for Benchmarking [9]

Q3) a) What are the types of failures? [9]

b) How to achieve higher reliability in the system? [8]

OR

Q4) a) Explain concept of reliability and components in reliability. [9]

b) Describe concept of maintainability and availability in detail. [8]

Q5) a) How to evaluate an organization for quality? [9]

b) How to organize for creating change for quality? [9]

OR

P.T.O.

- Q6)** a) Discuss various teams used for TQM. [9]
b) How to do value -addition process during Internal Audit? [9]

- Q7)** a) Discuss ISO documentation. [9]
b) Describe quality system 9000. [8]

OR

- Q8)** a) What are the major elements of ISO 9001:2000? [8]
b) Discuss ISO 14000 series standards. [9]



Total No. of Questions : 8]

SEAT No. :

PA-976

[Total No. of Pages : 2

[5927]-438

B.E. (Production Engg.)

**ARTIFICIAL INTELLIGENCE IN MANUFACTURING
(2019 Pattern) (Semester - VII) (411083C) (Elective - III)**

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) Are uniform crossover with probability 0.5 and bit-wise mutation with probability 0.5 the same? Explain it. **[10]**

b) Why do we prefer ranking selection to a Roulette-Wheel selection in GA? **[8]**

OR

Q2) a) Why do we use a high value of crossover probability and low value of mutation probability in GA applications? **[10]**

b) Do you prefer a Gray-coded GA to a binary coded GA? Explain it. **[8]**

Q3) a) What are the advantages and disadvantages of artificial neural networks. **[10]**

b) What are back propagation networks? **[8]**

OR

Q4) a) What are the limitations of backpropagation algorithm? **[10]**

b) What is Adaptive Resonance Theory network? Explain. **[8]**

P.T.O.

- Q5)** a) How AI is used in manufacturing industry? [10]
b) What are the key steps in the monitoring and controlling process? [7]

OR

- Q6)** a) Explain AI process automation. [10]
b) How computer vision can transform manufacturing industry with automation? [7]

- Q7)** a) Explain the role of Artificial Intelligence in Predictive maintenance. [10]
b) What are the applications of artificial intelligence in live stock and inventory management? [7]

OR

- Q8)** a) How AI can be used in quality control? [10]
b) Explain the use of artificial intelligence in process planning. [7]



Total No. of Questions : 8]

SEAT No. :

PA-977

[Total No. of Pages : 2

[5927]-439

B.E. (Production Engineering)

WORLD CLASS MANUFACTURING

(2019 Pattern) (Semester - VII) (Elective - III) (411083D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Discuss various Information Management Tools in detail. [8]

b) Explain the Purchase cycle in detail. [9]

OR

Q2) a) Discuss various Material Processing and Handling Tools in detail. [8]

b) Explain various types of Stores. [9]

Q3) a) Discuss 5S in detail. [9]

b) Discuss FMS in detail. [9]

OR

Q4) a) What is SQC? Explain various tools used in SQC. [9]

b) Explain Just in time system used in any commercial business system in detail. [9]

Q5) a) Write short note on “people are used as problem solver” in WCM. [8]

b) Discuss organization structure of any world class organization. [9]

OR

Q6) a) Explain characteristics of learning organization. [8]

b) Explain various motivation techniques. [9]

P.T.O.

- Q7)** a) Discuss effect of Green Manufacturing. [9]
b) What do you understand from clean manufacturing? And how it affects on WCM? [9]

OR

- Q8)** a) Explain agile manufacturing. [9]
b) Discuss a case study related to WCM of any organization. [9]



Total No. of Questions : 8]

SEAT No. :

PA-978

[Total No. of Pages : 2

[5927]-440

B.E. (Production Engineering)

PLANT MAINTENANCE AND INDUSTRIAL SAFETY

(2019 Pattern) (Semester-VII) (Elective-IV) (411084 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the wear debris analysis. [5]
b) What is condition monitoring and equipment health monitoring? [6]
c) Describe the on-load and off-load testing. [6]

OR

- Q2)** a) List the vibration measuring instruments and explain any one in detail.[7]
b) Explain the principle and working of pistol thermometer with suitable diagram. [10]

- Q3)** a) Safety at work increase Productivity of Industry: Justify. [8]
b) Explain the History and development of Industrial safety. [10]

OR

- Q4)** a) Explain the implementation of Factories Act-1948. [8]
b) Describe roll of management and roll of government in Industrial safety. [10]

- Q5)** a) List the personal protective equipments for following human body parts.[7]
i) Head
ii) Ear
iii) Face

P.T.O.

- iv) Eye
 - v) Overall body
 - vi) Foot and Leg
 - vii) Fingers and Hands
- b) Discuss various causes of accidents in industrial plant. [10]

OR

- Q6)** a) Explain following terms. [7]
- i) Housekeeping
 - ii) First AID
- b) Explain various factors affecting the selection of plant location. [10]

- Q7)** a) Explain the importance of Occupational safety in industry. [8]
- b) Discuss salient features of Factory Act, 1948 [10]

OR

- Q8)** a) Discuss in detail the control of industrial noise and protection against it. [8]
- b) Explain the Indian Boilers Act-1923 [10]



Total No. of Questions : 8]

SEAT No. :

PA-979

[Total No. of Pages : 2

[5927]-441

B.E. (Production Engineering)

SURFACE ENGINEERING

(2019 Pattern) (Semester-VII) (Elective-IV) (411084 B)

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.*

Q1) a) Describe anodic coatings. [10]

b) What is difference between anodic and cathodic coating. [8]

OR

Q2) a) What is the Principle of Nitriding? Explain gas nitriding process. [10]

b) State the advantages of metal cladding process. [8]

Q3) a) What is influence of manufacturing processes on various surface properties of an engineering component? Discuss. [10]

b) Describe physical vapor deposition process with its advantages. [8]

OR

Q4) a) Which are surface engineering problems related to substrate characteristics? [10]

b) Explain any Plasma-based surface engineering processes for wear and corrosion protection. [8]

Q5) a) Describe Stylus-Based Approach of surface roughness measurement. [10]

b) Describe measurement of Thickness of Coatings and Films by weight measurement of coating deposited. [7]

OR

Q6) a) How do you measure the adhesion strength of coating? [10]

b) Which are the conventional methods of surface testing? Explain in brief. [7]

P.T.O.

- Q7)** a) How do you measure mechanical properties of nanomaterials? [10]
b) Write note on simulation of actual application environment in tribometer. [7]

OR

- Q8)** a) Which coating is best for high temperature application? Discuss. [10]
b) State popular types of wear resistant coatings. Describe one. [7]



Total No. of Questions : 8]

SEAT No. :

PA-980

[Total No. of Pages : 2

[5927]-442

B.E. (Production Engineering)

REVERSE ENGINEERING

(2019 Pattern) (Semester-VII) (Elective-IV) (411084 C) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q. 1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn 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) Classify the software used in reverse engineering based on the applications. **[8]**

b) Write short note on destructive method in reverse engineering. **[9]**

OR

Q2) a) Discuss contact method used in data collection in reverse engineering along with it's advantages and disadvantages. **[8]**

b) Write short notes on **[9]**

i) Point and images phase

ii) Curve phase

Q3) a) With suitable example explain the concept of post processing of captured data in RE. **[9]**

b) Write short note on: **[9]**

i) Internal Measurement Systems

ii) X-ray Tomography

OR

Q4) a) Briefly discuss with a example the selection process for a reverse engineering system. **[9]**

b) Explain Curve and Surface Creation with suitable application. **[9]**

P.T.O.

- Q5)** a) Explain how the cloud data is modeled in reverse engineering. [8]
b) With appropriate diagram briefly explain the concept of integration of reverse engineering and rapid prototyping for layer-based model generation. [9]

OR

- Q6)** a) Write short note on Adaptive Slicing Approach for Cloud Data Modeling. [8]
b) With suitable example explain the concept of construction of remaining line segment excluding first line segment. [9]

- Q7)** a) What are the legal aspects of reverse engineering? [9]
b) Write short notes on application of [9]
i) Aerospace industries
ii) Automotive industries

OR

- Q8)** a) What are the barriers to adopt reverse engineering? [9]
b) How the reverse engineering concepts can be applied in Medical device industries? [9]



Total No. of Questions : 8]

SEAT No. :

PA-1670

[Total No. of Pages : 3

[5927]-443

B.E. (Production Engineering)

ENTREPRENEURSHIP AND INNOVATIONS

(2019 Pattern) (Semester - VII) (411084D) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is the Contribution of Industry to National Economy? [9]
- b) What are the policies that government can use to encourage entrepreneurship? [9]

OR

- Q2)** a) What is the Role of Entrepreneurship in Small Scale Enterprises and Economic Development? [9]
- b) In the Indian context, explain the specific role that entrepreneurship has fulfilled in the development of small scale sector. [9]

- Q3)** a) What are the three elements in the project identification? [8]
- b) What are the tools used in project identification? What are the objectives of project identification? [9]

OR

P.T.O.

Q4) a)

[9]

Liabilities	Rs.	Assets	Rs.
Equity Share Capital	10,000	Fixed assets (less depreciation Rs. 10,000)	26,000
7% Preference Share Capital	2,000	Current Assets:	
Reserves and Surplus	8,000		
6% Mortgage Debentures	14,000	Cash	1,000
Current Liabilities :		Investments (10%)	3,000
Creditors	1,200	Sundry debtors	4,000
Bills payable	2,000	Stock	6,000
Outstanding expenses	200		
Tax Provision	2,600		
	40,000		40,000

From the following balance sheet of Mr. Arvind Industries Ltd., as 31st March 2022.

Other information :

1. Net sales Rs. 60,000
2. Cost of goods sold Rs. 51,600
3. Net income before tax Rs. 4,000
4. Net income after tax Rs. 2,000

Calculate :

- i) Current Ratio
 - ii) Proprietary Ratio
 - iii) Stock turnover ratio
- b) What are the different sources from which a project idea can be generated? [8]

Q5) a) Why is planning and control essential for a project? [8]

b) What is planning and control in project? [9]

OR

- Q6)** a) What are project controls in project management? [8]
b) What is project control Example? [9]

- Q7)** a) What are the legal issues for the entrepreneur? [9]
b) What are the five most important business issues that can lead to legal problems for global marketers? [9]

OR

- Q8)** a) How does the law affect the business? [9]
b) What are some basic laws associated with doing business? [9]



Total No. of Questions : 8]

SEAT No. :

PA-981

[Total No. of Pages : 3

[5927]-444

**B.E. (Production Sandwich Engineering)
MANUFACTURING AUTOMATION
(2019 Pattern) (Semester - VII) (411121)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is a quick exhaust valve? Explain construction and working of quick exhaust valve with schematic diagram used in pneumatics (Please don't draw pneumatic Circuit) [6]
- b) Draw neat sketch and List four stages of compressed air preparation? Explain working of Air Compressor. [6]
- c) Explain construction and working of time delay valve with schematic diagram used in pneumatics. [6]

OR

- Q2)** a) What are functions of a Shuttle valves (OR gate fluid logic control valve) valve. Explain construction and working of Shuttle valve with schematic diagram used in pneumatics (Please don't draw pneumatic Circuit) [6]
- b) Explain construction and working of Twin pressure/dual pressure valve with schematic diagram used in pneumatics. Also explain electrical equivalent circuit, truth table. [6]
- c) List the conditions for cascading when is cascade control needed? Write down the principles of cascade control. Draw the figure to show the group changing valves for 5 groups showing clearly input, output and reset signal. [6]

P.T.O.

- Q3)** a) What is a microprocessor and Microcontroller? Give some applications of microprocessor. What are the differences between a Microcontroller and Microprocessor? [6]
- b) Explain with block diagram the architecture of 8051 microcontroller. [6]
- c) Explain the interrupt structure of 8051 microcontroller. [6]

OR

- Q4)** a) Explain with diagram function of each pins of 8051. [6]
- b) Compare any three derivatives of 8051 microcontroller on the basis of RAM, ROM, Timer and Interrupts. [6]
- c) Draw the format of PSW register of 8051 microcontroller and explain the function of each bit. [6]

- Q5)** a) Define Material Handling. What are the limitations of automated material handling systems? What are the 20 Principles of Material Handling. [6]
- b) A rotary indexing table is driven by a Six-slotted Geneva mechanism. The driver rotation is 6 revolutions per minute. Determine: [6]
- i) The total cycle time of the indexing table.
- ii) The available processing time for the indexing table.
- The time lost each cycle to index the table (repositioning time) Express all answers in seconds.
- c) List principal components of automatic identification technologies, List AIDC technologies six categories. What are the common applications of AIDC technologies in production and distribution? What are the parameters to measure the error rate in AIDC? [5]

OR

- Q6)** a) Explain the following powered conveyor mechanism used for transporting materials. [6]
- b) Why we choose ASRS. What are the problems of conventional storage system? Define AS/RS. Mention Reasons for selecting AS/RS, what are the functions of storage system. [6]
- c) Explain the type AGVS Vehicle Guidance Technology. [5]

- Q7)** a) Define Human Computer Interface Introduction (HCI), In which areas and where HCI can be implemented with distinctive importance, what are the Guidelines in (HCI), What are the software tools in HCI. [6]
- b) What are Artificial Neural Networks (ANNs)? Explain Basic Structure of ANNs, types of artificial Neural Networks, explain Machine Learning in ANNs strategies, what are the common types of discrete nodes, explain applications of Neural Networks. [6]
- c) Explain the Elements of Digital Communication Systems, advantages, disadvantages of digital communication, what is the need for Pulse Modulation? [5]

OR

- Q8)** a) What is Fuzzy Logic? Explain Fuzzy Logic systems architecture and its four main parts, Give example of a Fuzzy Logic system write its Algorithm, what are the application Areas. [6]
- b) Define (RTU) Remote Terminal Unit, discuss RTU benefits over the PLC. Explain RTU advantage and disadvantage programming over the PLC explains Remote Terminal Unit (RTU). [6]
- c) Explain with block diagram of SCADA Graphics, List SCADA functions and their components. [5]



Total No. of Questions : 8]

SEAT No. :

PA-1671

[Total No. of Pages : 4

[5927]-445

**B.E. (Production Sandwich)
OPERATIONS RESEARCH**

(2019 Pattern) (Semester - VII) (411122)

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 Calculators is allowed.*

- Q1)** a) Explain in brief Dynamic programming model. [6]
- b) Describe Gromory's method of solving an all integer programming problem. [6]
- c) What is Goal programming? State its assumptions. [5]

OR

- Q2)** a) Describe Branch & Bound Method for the solution of integer programming problem. [6]
- b) What are essential characteristics of dynamic programming problem. [6]
- c) State the applications of Non linear programming. [5]

- Q3)** a) The cost of the machine is Rs 6100/- and its scrap value is Rs 100 at the end of every year. The Maintenance Costs found from experience are as follows: [8]

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

P.T.O.

- b) The following failure rates have been observed for a certain type of transistors in a digital computer.

Week	1	2	3	4	5	6	7	8
Probability of failure to data	0.05	0.13	0.25	0.43	0.68	0.88	0.96	1

The cost of replacing an individual failed transistor is Rs1.25. The decision is made to replace all these transistors simultaneously at fixed intervals and to replace the individual transistor as they fail in service. There are 1000 transistors are in use. If the cost of group replacement is 30 paise per transistor. What is the interval between group replacements? It is preferable over individual replacement policy? [10]

OR

- Q4) a) i)** A machine A costs Rs.9000/-. Annual operating costs are Rs. 200/- for the first year and then increases by Rs.2000/- every year. Determine the best age at which the machine A is to be replaced? If the optimum replacement policy is followed, what will be the average yearly cost of owning and operating the machine? Assume machine has no resale value when replaced and that future costs are not discounted.
- ii) Machine B costs Rs. 10000/-. Annual operating costs are Rs. 400/- for the first year and then increases by Rs. 800/- every year. You have now a machine of type A, which is of one year old. Should you replace it with B, and if so, when?

[12]

- b) Discuss different types of failure.

[6]

- Q5) a)** Solve the following game by dominance and find the game value. [10]

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

- b) Discuss different types of Decision making environments.

[7]

OR

- Q6) a)** Two players P and Q play the game. Each of them has to choose one of the three colours: White (W), Black (B) and Red (R) independently of the other. Thereafter the colours are compared. If both P and Q has chosen white (W, W), neither wins anything If player P selects white and Player Q black (W, B), player P loses Rs.2/- or player Q wins the same amount and so on. The complete payoff table is shown below. Find the optimum strategies for P and Q and the value of the game. **[10]**

		Player A		
		W	B	R
Player B	W	0	-2	7
	B	2	5	6
	R	3	-3	8

- b) Explain various ingredients of a decision problem. **[7]**

- Q7) a)** Draw the sketch of queuing system and explain various components of it. **[8]**

- b) Workers come to tool store room to enquire about special tools (required by them) for accomplishing a particular project assigned to them. The average time between two arrivals is 60 seconds and the arrivals are assumed to be in Poisson distribution. The average service time (of the tool room attendant) is 40 seconds. **[10]**

Determine:

- i) average queue length,
- ii) average length of non-empty
- iii) average number of workers in system including the worker being attended
- iv) Mean waiting time of an arrival
- v) average waiting time of an arrival who waits

OR

Q8) a) Write short on Monte Carlo Simulation. [8]

b) The automobile company manufactures around 150 scooters. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions: -

Production per day	Probability
146	0.04
147	0.09
148	0.12
149	0.14
150	0.11
151	0.10
152	0.20
153	0.12
154	0.08

The finished scooters are transported in a specially arranged lorry accommodating 150 scooters. Using the random numbers 80, 81, 76, 75, 64, 43, 18, 26, 10, 12, 65, 68, 69, 61, 57, simulate the process to find out: -

- i) What will be the average number of scooters waiting in the factory?
- ii) What will be the average number of empty space on the lorry?

[10]



Total No. of Questions : 8]

SEAT No. :

PA-982

[Total No. of Pages : 2

[5927]-446

B.E (Production Engineering) (Sandwich)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VII) (411123(A)) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are the basic microfabrication techniques? What is the difference of microfabrication and nanotechnology? [9]
- b) Elaborate on how rapid prototyping is transforming the jewellery industry. [8]

OR

- Q2)** a) What is Solid Ground Curing (SGC) Process? Explain in detail. [9]
- b) What is rapid freeze prototyping? Explain in detail. [8]

- Q3)** a) What is the working principle of Laminated Object Manufacturing? What are the applications of Laminated Object Manufacturing? [9]
- b) Write a short note on Multi-Functional RPM Systems (M-RPM). [8]

OR

- Q4)** a) With a neat diagram, explain Melted Extrusion Modelling (MEM). [9]
- b) What is MAGICS software used for? Explain in detail. [8]

- Q5)** a) List out Solid Based Additive Manufacturing Systems and explain any one method in detail. [9]
- b) Explain the critical factors that influence the performance and functions of Selective Laser Sintering and 3-Dimensional printing : [9]

OR

P.T.O.

- Q6)** a) What is the principle of Electron Beam Melting? What materials are used in Electron Beam Melting? What are the applications of Electron Beam Melting? [9]
- b) What is Three Dimensional Printing? Write down its Principle, process, advantages and applications. [9]

- Q7)** a) Write Short notes on Scaffolds for Tissue Engineering. [9]
- b) What is cranial implant? Explain in detail. [9]

OR

- Q8)** a) Categorize the applications of Additive Manufacturing in the areas of customized implants and prosthesis. [9]
- b) Discuss with a cases study how design and production of medical devices are done by Additive Manufacturing. [9]



Total No. of Questions : 08]

SEAT No. :

PA-983

[Total No. of Pages : 2

[5927]-447

B.E. (Production Sandwich Engineering)

INDUSTRIAL ROBOTICS

(2019 Pattern) (Semester-VII) (411123 B) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figure to the right indicates full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*
- 5) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

- Q1)** a) Differentiate between sensor & transducer with example and explain the role of sensors in robots. [9]
- b) Explain the working of Slip Sensor with application. [9]

OR

- Q2)** a) With neat sketch explain the working of following sensors in robots: -[9]
- i) Tactile array sensor
 - ii) Proximity & Range Sensor
- b) Classify sensors & explain the other factors considered in sensing device. [9]

- Q3)** a) A cardboard carton weighing 10 pounds is held in a gripper using friction against two opposing fingers. The coefficient of friction is 0.25 & the weight of the carton is directed parallel to finger surfaces the g factor used for calculation is 3. [7]
- i) Determine required gripping force
 - ii) If safety factor is 1.5 calculate gripping force.
- b) A vacuum gripper is to be designed to handle flat glass in an automobile windshield plant. Each plate weighs 35 pounds. A single suction cup will be used and the diameter of suction cup is 5 inch. Determine the negative pressure required to lift each plate. Use safety factor of 2 for the calculations. [10]

OR

P.T.O.

- Q4)** a) A 5Kg rectangular block is gripped in the middle & lifted vertically at velocity 1 m/s. If it accelerates to velocity of 27.5 m/S² and the coefficient of friction between the gripping pad and block is 0.48. calculate the minimum force that would prevent slippage. [7]
- Determine required gripping force
 - If safety factor is 1.5 calculate gripping force.
- b) Explain the following types of magnetic grippers with neat sketch. [10]
- Permanent Magnetic gripper
 - Electro Magnetic gripper

- Q5)** a) Explain following Programming Languages [10]
- High level language
 - Machine language
- b) Explain the programming methods [8]
- Teach Pendant
 - Walk Through

OR

- Q6)** a) With neat sketch explain levels of robot programming. [8]
- b) Explain the following methods for defining positions in space. [10]
- By joint movements
 - By x, y, z coordinate motions (world coordinates)
 - By tool coordinate motions

- Q7)** a) Explain 3D printing applications of robots. [8]
- b) Explain any three processing operations performed by robots. [9]

OR

- Q8)** a) Write a note on: - [9]
- Pick & Place Robots
 - Welding Robots
 - Climbing Robots
- b) What is Artificial Intelligence & explain role of Artificial Intelligence in robotics. [8]



Total No. of Questions : 8]

SEAT No. :

PA-984

[Total No. of Pages : 4

[5927]-448

B.E. (Production Sandwich Engineering)

RELIABILITY ENGINEERING

(2019 Pattern) (Semester - VII) (Elective - III) (411123 (C))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 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) Explain Characteristics of Exponential Distribution. **[7]**

- b) In life testing of 100 specimens of a particular device the number of failures during each interval of twenty hours is shown in table. Estimate the MTTF for these specimens. **[6]**

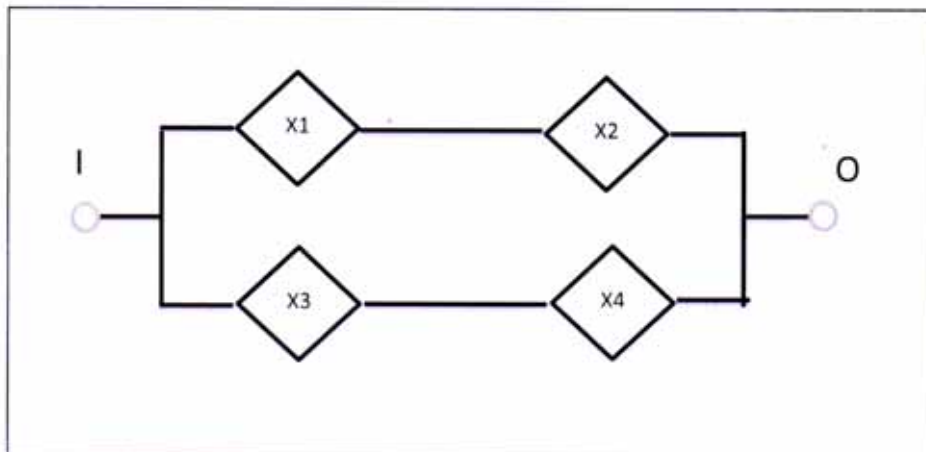
Time Interval Hours	Number of failures during the interval
$T < 1000$	0
$1000 < T \leq 1020$	25
$1020 < T \leq 1040$	40
$1040 < T \leq 1060$	20
$1060 < T \leq 1080$	10
$1080 < T \leq 1100$	5

- c) A system is composed of 4 units connected in series. The rates for these units are $\lambda_1 = 0.002$, $\lambda_2 = 0.003$, $\lambda_3 = 0.004$, $\lambda_4 = 0.007$. It is desired that the maximum failure rate for the system be $S^A = 0.01$. Allocate this among the four units. **[5]**

OR

P.T.O.

- Q2)** a) For the computer unit a suitable air-conditioning system has to be design it should have a minimum reliability values of 0.95 for an operation of values of 800 Hours. The minimum reliability availability value over the same period of time is required to be 0.98. Assuming constant hazards for failure and repair. Estimate the time to failure and mean repair time. [7]
- b) Write the formulas for MTTF, MTTR and MTBF. [3]
- c) Explain MTTF for series and parallel system. [8]
- Q3)** a) Explain DE Morgan's Theorem. [7]
- b) Let A and B be two variable each of which can be in a binary state 0 or 1. What are the possible values of $A + B$ and $A * B$. [4]
- c) For a logic diagram shown in figure. Construct fault tree. [6]



OR

- Q4)** a) The function of strategic experiment is monitored continuously by two observation Station A and B, functioning independently. It is necessary that at least 2, one of them function satisfactorily to monitor the progress of the experiment. Each of these observations stations receives power supply from two independent sources connected in parallel. A receives a power from C & D, and B receives a power from E & F for each observation station, the power from any one source is sufficient for operation. Draw the block diagram and the fault tree diagram for the system. [6]
- b) Explain in brief Fault Tree Analysis (FTA). [8]
- c) Let A and B be two variables, each of which can be in a binary state 0 or 1. What are the possible values for $\bar{A} + B$ & $\bar{B} * A$. [3]

- Q5)** a) Compare Normal Distribution and Uniform Distribution. [8]
 b) What are the characteristics of Weibull Distribution. [6]
 c) Explain the concept Correlation. [4]

OR

- Q6)** a) The distribution function for a random phenomenon obeying a uniform probability Law over an interval “a” and “b” is expressed by [8]

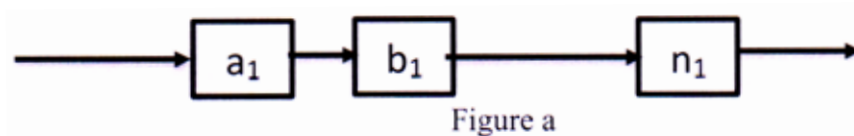
$$F_x(x) = 0 \quad \text{for} \quad x \leq a$$

$$F_x(x) = (x - a) / (b - a) \quad \text{for} \quad a \leq x \leq b$$

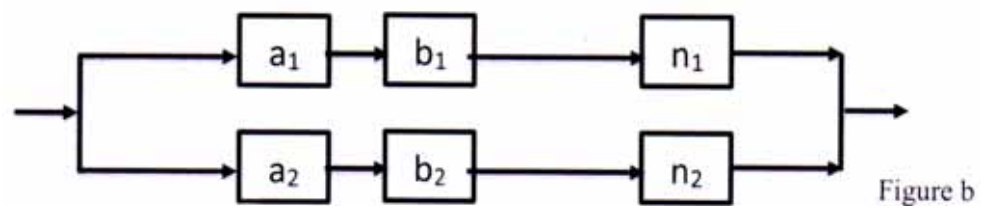
$$F_x(x) = 1 \quad \text{for} \quad x > b$$

Compute the mean and variance for the uniform probability law.

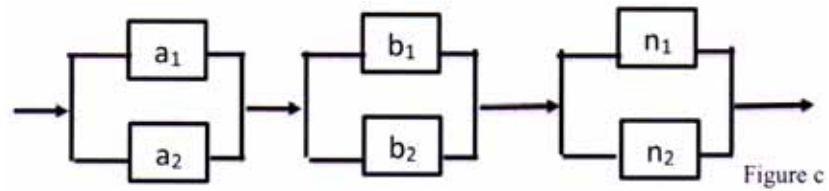
- b) Explain lognormal distribution. [6]
 c) What are the properties of Auto and Cross correlation function? [4]
- Q7)** a) i) Explain unit redundancy and element redundancy.
 ii) Consider two elements a and b with reliabilities 0.7 and 0.8 respectively to be connected in series as shown in Figure a



If redundancies are introduced in the form shown in Figure b and Figure c. What are resultant system reliabilities?



[8]



- b) Explain Component redundancy. [5]
- c) Explain in brief redundancy. [4]

OR

- Q8) a) Explain imperfect switching in redundancy. [7]
- b) Explain component verses unit redundancy. [6]
- c) The power supply to the operating unit of a hospital is provided by a generator whose Failure rate follows an exponential distribution law with parameters $\lambda_1 = 0.005$ per hour. A standby battery unit is coupled through a decision switch which has a reliability $r_d = 0.90$. Calculate the reliability of the power supply s/m for a mission time of 10 hours if the battery failure rate follows a distribution law with parameter $\lambda_2 = 0.001$ per hour. [4]



Total No. of Questions : 8]

SEAT No. :

PA-985

[Total No. of Pages : 2

[5927]-449

B.E. (Production S/W)

MICRO ELECTRO MECHANICAL SYSTEMS

(2019 Pattern) (Semester - VII) (Elective - III) (411123D)

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.*

Unit - I

- Q1)** a) Write a short note on Engineering Mechanics for Microsystems Design an Introduction. **[8]**
- b) Explain the concept of Fracture Mechanics in relation to MEMS with a suitable example. **[9]**

OR

- Q2)** a) How is stress analysis related with MEMS? Explain its process with FEA? **[9]**
- b) Can Mechanical Vibrations be controlled with MEMS? Discuss with an example. **[8]**

Unit - II

- Q3)** a) Discuss the concept of Scaling. Explain it in relation to Rigid Body Dynamics. **[9]**
- b) How are electrostatic forces acting in an Electromechanical System? Can they be optimized with MEMS? How? **[9]**

P.T.O.

OR

- Q4)** a) How is Heat Transfer affected and restrained with MEMS. [9]
b) What do you mean by Scaling Laws? How are they influenced in MEMS? [9]

Unit - III

- Q5)** a) Discuss the concept of Bulk Manufacturing for Micro Machining. [8]
b) Summarize the concept of Micromachining in brief. [9]

OR

- Q6)** a) Why is it critical to control Surface Micromachining Process? Discuss its concept and Process with Parameters. [9]
b) Write a note on Micromanufacturing. [8]

Unit - IV

- Q7)** a) Discuss the various Membrane-Transducer Materials. [9]
b) Discuss the concept of fluorescence detection. [9]

OR

- Q8)** a) Discuss any 2 of following : [9]
i) CLOC
ii) E Nose
iii) Chemotransistors
iv) Mass sensitive Chemosensors
b) What is calorimetric spectroscopy? Explain in brief. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PA-986

[Total No. of Pages : 2

[5927]-450

B.E. (Production Sandwich)

CREATIVE PRODUCT DESIGN

(2019 Pattern) (Semester-VII) (Elective-IV) (411124A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of a programmable calculator is not allowed.*
- 4) *Write all necessary steps.*

Q1) a) Explain the process of executing Morphological analysis and give example with the help of Diagram. **[10]**

b) Draw a Memory (Mind) Map for any potential problem. **[7]**

OR

Q2) a) What are the key points of Traditional Brainstorming. **[10]**

b) Write short note on Pugh's concept. **[7]**

Q3) a) What is Product Portfolio Architecture? Discuss with example. **[7]**

b) Discuss the steps followed in Benchmarking Approach. **[7]**

c) What do you understand about Benchmarking? **[4]**

OR

Q4) a) Discuss the Steps in Product Teardown. **[10]**

b) What do you understand as "Develop a Redesign"? **[8]**

Q5) a) Give any ten guidelines for Design for Assembly. **[10]**

b) Mention Material Selection guidelines and reasons in DFE. **[7]**

OR

Q6) a) Discuss Global, Regional and Local Issues related to Environment. **[10]**

b) Mention Product Structure Guidelines and reasons in DFE. **[7]**

P.T.O.

- Q7)** a) Explain the various stages of Product Life Cycle with the help of Diagram. [8]
b) State the Advantages of Product Life Cycle. [5]
c) Discuss the Key Areas of Product Life Cycle Management. [5]

OR

- Q8)** a) Discuss following terms in context of Product data/Information. [3×4=12]
i) Definition data of the product
ii) Life cycle data of the product
iii) Metadata that describes the product and life cycle data
b) Write short note on Reliability in Product Development. [6]



Total No. of Questions : 8]

SEAT No. :

PA-1672

[Total No. of Pages : 2

[5927] - 451

B.E. (Production Sandwich)
MECHATRONICS (2019 Pattern)
(Semester - VII) (Elective - IV) (411124B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Figures to the right indicate full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

- Q1)** a) Write an assembly language code that reverse the data stored in BX. [8]
- b) Write a program in 8086 assembly language that accepts a character string of maximum size of 10 characters from the keyboard and converts the string to upper case. [10]

OR

- Q2)** a) Explain the concept of Asynchronous Communication. [8]
- b) Write a short note on : [10]
- i) Serial Interface Standards.
 - ii) Interface adapters.

- Q3)** a) Explain in detail about the internal architecture of the (PLC) programmable logic Controllers. [9]
- b) Discuss about the programmable logic controllers and configurations. [8]

OR

P.T.O.

- Q4)** a) An automatic car parking system, when the parking area is full with 10 cars the red bulb at entry should ON to indicate it is full. If the number of car within the parking area is less than 10 the green bulb should ON to indicate that the space of parking is available. [9]
- b) Explain the working of PLC based Traffic light control with the help of ladder diagram. [8]
- Q5)** a) Explain the role of modelling and simulation in the analysis of Mechatronics systems. [7]
- b) Explain the System Modelling [10]
- i) Mechanical System.
- ii) Thermal System.

OR

- Q6)** a) Discuss in detail the advanced approaches in Mechatronics such as intelligent Supervisory control structure and model based monitoring system. [9]
- b) Describe the Following with example : [8]
Damping Frequency and Damping Factor.
- Q7)** a) State the objectives of Engineering measurements. [6]
- b) List the types of Errors in measurement. Give their and state the remedies. [6]
- c) State and explain any, here desirable static and dynamic characteristics of an instrument. [6]

OR

- Q8)** a) Explain with neat diagram Feedback transducer system. [9]
- b) Explain with neat diagram electromagnetic flow-meter. Distinguish between 'Photovoltaic', 'Photo emissive' and 'Photoconductive' cells. [9]



Total No. of Questions : 8]

SEAT No. :

PA-987

[Total No. of Pages : 2

[5927]-452

B.E. (Production Sandwich)

CAD/CAM

(2019 Pattern) (Semester-VII) (Elective-IV) (411124 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) *Figures to the right indicate full marks.*
- 3) *Use of a programmable calculator is not allowed.*
- 4) *Write all necessary steps.*

Q1) a) Discuss important features of Rapid Prototyping & applications. [9]

b) Discuss classification of Rapid Prototyping-FDM, LOM, SLA, SLS.[9]

OR

Q2) a) Explain CAD and Data exchange format & data format details. [9]

b) Discuss Part Slicing and Orientation and its importance. [9]

Q3) a) Explain computer integrated production management system & enterprise resource planning. [9]

b) Discuss working principles of CNC Turning center and Milling center.[8]

OR

Q4) a) Discuss The Siemens Model of CIM & IBM concept of CIM. [9]

b) Discuss steps in developing CNC part program in detail [8]

Q5) a) Discuss Computer Aided Process Planning. [9]

b) Computer integrated production management system, inventory material requirement planning. [9]

OR

P.T.O.

Q6) a) Explain manufacturing resource planning & enterprise resource planning. [9]

b) Discuss Computer application in manufacturing & inspection and quality control. [9]

Q7) a) Discuss the elements of Product Life Cycle. [9]

b) Discuss machine cell design and Cellular manufacturing. [8]

OR

Q8) a) Explain Part-Families, Part classification and coding. [9]

b) Explain production flow analysis & Rank Order Clustering Algorithm. [8]



Total No. of Questions : 8]

SEAT No. :

PA-2645

[Total No. of Pages : 3

[5927]-453

B.E (Production Sandwich)

DATA ANALYTICS (Elective - IV)

(2019 Pattern) (Semester - VII) (411124(D))

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 side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume Suitable data if necessary.*

- Q1) a)** The following data shows the box office collection of three films 'A', 'B'. and 'C', which were released in the years 1975, 2001, and 2020 respectively, and having a box office collection 35, 137 and 332 Cr in the order mention above. **[12]**

Movie	Year	Movie income (Cr)	Average movie income in box office in particular year (Cr)	Std. deviation
A	1975	35	12.5	4.65
B	2001	137	35	12.95
C	2020	332	169	51.52

From the above given data, which movie shows the maximum collection in respective year as compare to others?

- b) In a class, average placement salaries of the student are 3.1 LPA and given salaries are normally distributed with standard deviation of 2. Then, find how many percentages of student lies between salaries offered from 7.46 LPA to 10 LPA? **[6]**

OR

P.T.O.

- Q2)** a) The average IQ of the adult population is 100. A researcher believes the average IQ of adults is lower. A random Sample of five are tested and scored 69, 79, 89, 99, and 109 with standard deviation 15.81.
- i) State null hypothesis (H_0) and alternative hypothesis (H_a)
 - ii) At 99% confidence interval level, is there enough evidence to suggest that the average IQ is lower. [9]
- b) Discuss the following : [9]
- i) Expert system
 - ii) Principal component analysis
 - iii) Genetic algorithm
- Q3)** a) A factory has machine that dispenses 80 ml of the fluid in a bottle. An employee believes the average amount of fluid is not 80 ml. Using 40 sample, he measures the average amount dispensed by the machine is 78 ml with std. dev. of 2.5.
- i) State null hypothesis (H_0) and alternative hypothesis (H_a)
 - ii) At 95% confidence interval level, is there enough evidence to support the idea that machine not working properly? [10]
- b) Assume that SAT score are normally distributed and the SAT score of 1150 has a z score of 0.44. Find out how many percentages of students scored above and below the 1150 SAT score? Show the answers using normal distribution plot. [6]

OR

- Q4)** Discuss the following : [16]
- a) Markov chain analysis
 - b) Monte carlo simulation
 - c) Q Learning
 - d) SARSA

- Q5)** a) What is predictive analysis? Discuss with at least five real-time applications. [9]
- b) What is invariate, bivariate, and multivariate analysis? Write the difference between them? Discuss with examples. [9]

OR

Q6) a) The job market is being studied in several neighborhoods. Let x represent total number of jobs in a given neighborhood, and y represents entry level jobs in the same neighborhood. A sample six neighborhood gave the following information.

- i) Find out the linear regression model using least square method
- ii) For a neighborhood with 40 jobs, how many jobs are predicted at entry level? [12]

x	16	33	50	28	50	25
y	2	3	6	5	9	3

b) What do you understand by neural network in deep learning? Write the advantages, disadvantages and application of the neural network.

[6]

Q7) a) The following is data collected by the ‘A’ ice-cream manufacturer’s sales department in the ‘P’ city. Let x represent temperature observed in months (), and y represents sell of the ice- cream in the same month (tons). They want to analyze their sells with months and their temperatures. The collected data is transferred to R&D department and you are the head of R&D. The company asking you to find out covariance and correlation between temperature and monthly ice-cream sell? [12]

Months	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
X	15	21	31	34	38	37	31	28	23	25	16	13
Y	09	18	21	23	25	19	14	12	10	12	09	08

b) Write the difference between covariance and correlation. [6]

OR

Q8) What is mean by classification algorithm in machine learning? Discuss any three from the following: [18]

- a) Logistic regression
- b) Naive bays
- c) K-NN
- d) Decision Tree
- e) Random Forest



Total No. of Questions: 8]

SEAT No. :

PA-988

[5927]-454

[Total No. of Pages : 2

B.E. (Civil Engineering) (Honors)
ARCHITECTURE AND TOWN PLANNING
Traffic and Transportation Planning
(2019 Pattern) (Semester-VII) (401401)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Enlist few elements and elaborate minimum 2 geometric desing elements with appropriate sketch. [6]
- b) Explain minimum 2 norms and standards for parking. (Appropriate Sketch is expected) [6]
- c) Write a note on public transport and its importance in today's context. [5]

OR

- Q2)** a) Write a note on hierarchy of roads. Explain the precautions to be taken at any hierarchial junction [6]
- b) What design standards are considered for on-street parking facilities? Give an example. [6]
- c) What is meant by Para-transit and what is the need of Para-transit in India? [5]
- Q3)** a) What are the different types of road intersection? Elaborate any one with sketch. [6]
- b) What are road safety issues? Explain the need of safety management. [6]
- c) What facilities are provided at Passenger terminals? [5]

OR

P.T.O.

- Q4)** a) Enlist the components of at grade intersection and explain importance of at grade intersection. [6]
b) What is logistics management? What is the need of it in today's context. [6]
c) What facilities are provided at Freight terminals? [5]

- Q5)** a) Write a note on: Salient features of Nagpur 20 year road plan. [6]
b) What is the purpose of LU model? Explain Lowry Model. [6]
c) Enlist urban system components and mention issues normally observed in India. [6]

OR

- Q6)** a) Write a note on: Salient features of Bombay 20 year road plan. [6]
b) Write a note on urban spatial structure and its influence on transport linkages. [6]
c) Explain Lowry - Garin Model. [6]

- Q7)** a) Elaborate urban transport problems in India. [6]
b) Write a note on BRTS. [6]
c) Elaborate: Transportation System Management (TSM) process [6]

OR

- Q8)** a) Explain the need and components of sustainable urban transportation. [6]
b) Write a note on Metro rail by mentioning names of case studies. [6]
c) Elaborate different special aspects in case of sea shore cities in transportation planning. [6]



Total No. of Questions : 10]

SEAT No. :

PA-1673

[Total No. of Pages : 2

[5927]-455

B.E. (Civil)

HONORS IN METRO CONSTRUCTION

Work Method Statement Making

(2019 Pattern) (Semester - VII) (401301)

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 and Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data, if necessary and clearly state.*
- 5) *Use of cell phone is prohibited in the examination hall.*
- 6) *Use of electronic pocket calculator is allowed.*

Q1) Explain in details for Methods of excavation for metro projects. **[14]**

OR

Q2) Explain General Safety measures while excavation. **[14]**

Q3) Explain in brief Method Statement for Pile Cap. **[14]**

OR

Q4) Write Method statement for Open Foundation in case of metro projects. **[14]**

Q5) Explain Quality assurance Plate Load Test in detail. **[14]**

OR

Q6) Explain in brief Work Method Statement for Pier construction. **[14]**

P.T.O.

Q7) Explain Sequence of Work for construction of Concourse Pier arm Platform Pier armwith integrated pier cap & portal beams. **[14]**

OR

Q8) Explain in brief Method Statement for Overhead Launching Girder. **[14]**

Q9) Explain in brief for Underslung Segment Launcher erection of Ground Supported Staging System. **[14]**

OR

Q10) Write a Method Statement for Load Testing of Launching Girder. **[14]**



Total No. of Questions: 8]

SEAT No. :

PA-989

[5927]-456

[Total No. of Pages : 2

B.E. (Honors)

**ADDITIVE MANUFACTURING SYSTEM DESIGN
(2019 Pattern) (Semester-VII) (402014)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Draw suitable neat diagrams, whenever necessary.*
- 2) *Figures to the right indicates full marks.*
- 3) *Assume suitable data if required.*

- Q1) a)** What is Atomization? Types of Atomization. Explain Plasma Atomization and it's Benefits. [10]
- b) Explain Melt spinning process with its figure, working and benefits. [8]

OR

- Q2) a)** Explain Mechanical wheel or screw powder feeder with it's schematic figure and working & advantages. [10]
- b) Explain in detail the common chemical powder treatments. [8]
- Q3) a)** Explain the design and structure of nozzle. Explain Nozzle heating for raw material. [10]
- b) Explain: [7]
- i) Inert gas cooling system
 - ii) Gas recirculating system

OR

- Q4) a)** What is the powder feed system? Explain it's types in short note. [10]
- b) Explain the auxiliary system on 3D printing. [7]
- Q5) a)** Explain in detail Preparation and setup of 3D printer before calibration. [10]
- b) Why is it so important to calibrate your 3D printer? [8]

OR

P.T.O.

- Q6)** a) Explain: [10]
i) X-axis calibration
ii) Y-axis calibration
iii) Z-axis calibration
b) What is the importance of the first layer explain in detail. [8]

- Q7)** a) What are the common faults and trouble shooting in 3D Printing system? [10]
b) What is the project planning in additive manufacturing system. [7]

OR

- Q8)** a) Explain different operations and maintenance for additive manufacturing system. [10]
b) Explain in short Part shielding and thermal management. [7]



Total No. of Questions : 8]

SEAT No. :

PA-1674

[Total No. of Pages : 2

[5927]-457

B.E (Mechanical)

(Honors/Minors)

ELECTRICAL ENERGY SYSTEMS

(2019 Pattern) (Semester - VII) (402024)

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 side indicate full marks.*
- 4) *Assume Suitable data jf necessary.*

Q1) a) What are the uses of compressed air? Explain working of centrifugal compressor with schematic diagram. **[10]**

b) Discuss compressor capacity assessment test. **[8]**

OR

Q2) a) Discuss energy efficiency opportunities in compressed air system. **[10]**

b) If the compressor of 200 m³/min loads in 10 seconds and unloads in 20 seconds, calculate the amount of air leakages in the system. **[8]**

Q3) a) Discuss parameters that a psychometric chart provide for an air conditioning engineer. **[10]**

b) What is function of cooling tower? What are the components of the cooling tower? **[7]**

OR

Q4) a) Explain Aqua Ammonia Vapour absorption Refrigeration system with schematic diagram. **[10]**

b) Discuss the performance parameters of cooling tower. **[7]**

Q5) a) Discuss different capacity control methods for the fans. **[10]**

b) Discuss the parameters affecting pump system curves. **[8]**

OR

P.T.O.

- Q6)** a) Discuss energy conservation opportunities in a pumping system. [10]
b) Discuss the difference between fan, blower and compressor. [8]

- Q7)** a) What is a lamp? Explain the principle of operation and features of LED lamp. [10]
b) Discuss the factors that need to be considered for DG set selection. [7]

OR

- Q8)** a) Explain energy efficient lighting controls. [10]
b) Discuss function of electronic choke in lighting system. [7]



Total No. of Questions : 8]

SEAT No. :

PA-2673

[Total No. of Pages : 2

[5927]-458

B.E (Mechanical/Automobile)

(Honors/Minors)

MODELLING AND SIMULATION OF EHV

(2019 Pattern) (Semester - VII) (402034MJ)

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 side indicate full marks.*
- 3) *Draw the neat sketch wherever necessary.*

- Q1)** a) Explain Battery Management System along with its main features? [4]
b) Explain The Electric Machine Control System (EMCS) and The Stability Control System (SCS) with its important features? [8]
c) What is Battery/Cell Control System in EV? Explain with its functions and working principal? [8]

OR

- Q2)** a) Explain Torque and speed coupling in electric vehicle? [4]
b) Explain Electronic Control Unit of electric vehicle with its types and working principal? [8]
c) Explain the importance of Sensor Management and Integration for electric vehicle with functional and application point of view? [8]

- Q3)** a) Explain, “Placement of Motors” in electric vehicle system? [8]
b) Explain, “Battery and Motion Transmission Systems” in electric vehicle system? [8]

OR

- Q4)** a) List and explain with suitable sketches, the configurations of possible drivetrain systems in electric vehicle? [8]
b) Explain Propulsion and Power distribution system in electric vehicle with its main components? [8]

P.T.O.

- Q5)** a) What are Requirements of body structural system for a road vehicle?[8]
b) Explain causes for safety-related failure for lithium ion battery? [8]

OR

- Q6)** a) What do you mean by dynamics of motor vehicle? List out various force and performance parameters consider in it? [8]
b) Explain Chassis frame layout with suitable sketch? Also list out various types Loads on the Chassis frame? [8]

- Q7)** a) Explain Vehicle Structure design against Noise and Vibration exposure with suitable sketches? [8]
b) Explain the phases involved in Crashworthiness Design along with its important features? [10]

OR

- Q8)** a) Explain Noise Factors & Failure Modes in electric vehicle? [10]
b) What are Human Characteristics and Capabilities in ergonomics design of electric vehicle? [8]



Total No. of Questions: 8]

SEAT No. :

PA-990

[5927]-459

[Total No. of Pages : 2

B.E. (Mechanical Engineering) (Honors)
SYSTEM MODELLING AND SIMULATION
(2019 Pattern) (Semester-VII) (402044)

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) *Assume suitable data, if necessary.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*

- Q1)** a) Explain the 1-Port resistor element with an example. [9]
b) Explain the 2-Port element with an example. [9]

OR

- Q2)** a) Explain the 3-Port Junction elements with an example. [9]
b) Describe in brief the causality for basic 3-Port element. [9]

- Q3)** a) Describe in brief the circuit construction procedure. [9]
b) Explain the term fluid resistance in detail. [8]

OR

- Q4)** a) Explain different steps for fluid circuit construction. [8]
b) Explain the term fluid inertia in detail. [9]

- Q5)** a) Describe the basic causality assignment procedure with an example. [9]
b) Explain in brief nonlinear simulation. [9]

OR

P.T.O.

- Q6)** a) Explain the standard form for system equations. [9]
b) Explain in brief automated simulation. [9]

- Q7)** a) Explain the first-order system with an example. [8]
b) Describe the procedure for finding the free response. [9]

OR

- Q8)** a) Explain solution techniques for ordinary differential equation. [8]
b) Explain the second-order system with an example. [9]



Total No. of Questions: 8]

SEAT No. :

PA-991

[5927]-460

[Total No. of Pages : 2

B.E. (Honors in Robotics)

INDUSTRIAL ROBOTICS AND AUTOMATION

(2019 Pattern) (Semester-VII) (404181)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2 and Q3 or Q4 and Q5 or Q6 and Q7 or Q8.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) What is pneumatic system? List the industrial applications of it and elaborate any one. [6]
- b) List different methods to control pneumatic control system. What is Karnaugh - Veitch mapping? [6]
- c) Enlist the basic components in pneumatic system and explain them in detail. [6]

OR

- Q2)** a) Draw different types of valve symbols and explain any one with the example. [6]
- b) List the advantages and disadvantages of pneumatic system. [6]
- c) Draw and explain single acting and double acting cylindrical actuators with proper operation. [6]

- Q3)** a) Write the steps to design of parts for high speed feeding and orienting. State different feeding difficulties. [9]
- b) How to perform the analysis of an assembly. Explain with one example. [8]

OR

- Q4)** a) Explain in detail how high speed automatic insertion is possible in robotic assembly. State general rules for product design and automation. [9]
- b) State design features of CNC systems. Explain drive system for CNC machine tools. [6]

P.T.O.

- Q5)** a) Define Mechatronics. Explain different key elements of the Mechatronics system. [6]
b) State and explain different stages in designing a Mechatronics system. [6]
c) Write a case study on Pick and Place robot. [6]

OR

- Q6)** a) Give the classification of a Mechatronics System. [6]
b) How mechatronics system design is different than traditional system? [6]
c) Write a case study on engine management system. [6]

- Q7)** a) Classify the pumps. Give characteristics and selection criteria for Pumps. [9]
b) With an example explain the calculations for power and velocity during extension and retraction. [8]

OR

- Q8)** a) With a suitable diagram and PLC ladder diagram explain how to control two cylinders? [9]
b) Classify the control valves used in hydraulic system. Explain pressure control valves in detail with its functions. [8]



Total No. of Questions : 08]

SEAT No. :

PA-1675

[Total No. of Pages : 2

[5927]-461

B.E. (E & TC)(Honors/Minors)
HONORS IN BLOCK CHAIN TECHNOLOGY
Smart Contracts & Cryptocurrency (404181)
(2019 Pattern) (Semester-VII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain what is Bitcoin Mining and rewards for bitcoin mining. [8]
b) Define Ethereum and discuss various constructing components of Ethereum. [9]

OR

- Q2)** a) Explain the Smart contract and its Working in detail. [8]
b) Explain Bitcoin Protocols in detail. [9]

- Q3)** a) Discuss the detailed Roots of Bitcoin along with Legal Aspects of Cryptocurrency Exchange. [9]
b) List and explain different domain name services available for blockchain cryptocurrencies. [9]

OR

- Q4)** a) Discuss Applications of Cryptocurrency for IoT. [9]
b) Discuss Use of blockchain technology in medical record management system. [9]

- Q5)** a) Explain what is bitcoin, its working and limitations in detail. [8]
b) List and explain types of bitcoin wallets. [9]

OR

P.T.O.

- Q6)** a) Explain how bitcoin transaction works and pros and cons of it. [8]
b) Write a short note on following terms [9]
i) Digital Signature
ii) Digital Keys
iii) Private Keys

- Q7)** a) Discuss IBM Block chain In detail. [9]
b) Discuss Block chain use cases in Healthcare. [9]

OR

- Q8)** a) Discuss different investment management platforms of blockchain in detail. [9]
b) Discuss Use cases for blockchain and AI together in various domains.[9]



Total No. of Questions : 8]

SEAT No. :

PA-2674

[Total No. of Pages : 2

[5927]-463

B.E.

**HONOURS IN ARTIFICIAL INTELLIGENCE & MACHINE
LEARNING**

(2019 Pattern) (Semester - VII) (410301)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What is out of bag samples in random forest? Explain it with example. [8]
b) Explain with example the variant of SVM, the Support vector regression. [9]

OR

- Q2)** a) State and explain different types of kernel functions in SVM? [9]
b) What is random Forest? Write an algorithm for random forest. [8]

- Q3)** a) Explain Bayesian View of Learning and Dimensionality Reduction neural network. [9]
b) What is perceptron? Explain how to train perception in detail. [9]

OR

- Q4)** a) What are two paradigms for Parallel Processing of neural network. State the scenario when to use which type of paradigm. [9]
b) Write a short note on : [9]
i) Multilayer perceptrons
ii) MLP as a Universal Approximator

P.T.O.

- Q5) a)** Using K-means clustering algorithm, cluster following data into two cluster. {2, 4, 10, 12, 3, 20, 30, 11, 15} Explain each step in detail. [9]
- b) Write a short note on : [8]
- Self - Organizing Maps
 - PCA - Spectral Clustering

OR

- Q6) a)** A database has five transactions. min sup = 40% and confidence = 40%. [8]

TID	Items Bought
T1	A, B, C
T2	A, B, C, D, E
T3	A, C, D
T4	A, C, D, E
T5	A, B, C, D

Find all frequent itemsets using Apriori algorithm.

- b) Write and explain K-means clustering algorithm with example. [9]
- Q7) a)** Why is naive Bayesian classification called “naive”? Explain naive Bayesian classification algorithm in detail. [9]
- b) What is HMM? Explain three Basic Problems of HMMs in detail. [9]

OR

- Q8) a)** What is regression and state its applications. Find linear regression equation for the following two sets of data : [9]

x	2	4	6	8
y	3	7	5	10

- b) Write a short note on : [9]
- d-Separation
 - Junction Trees



Total No. of Questions : 8]

SEAT No. :

PA-1676

[Total No. of Pages : 2

[5927] - 464

B.E. (HONORS/MINORS)

INTERNET OF THINGS AND EMBEDDED SECURITY

(2019 Pattern) (Semester - VII) (410401)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Explain the detail IoT security life cycle. **[9]**

b) Explain data purging. **[8]**

OR

Q2) a) Explain following : **[8]**

i) Security monitoring.

ii) Penetration testing.

b) Explain the concept of secure device disposal and zeroization. **[9]**

Q3) a) Explain the use of cryptographic primitives in the IoT. **[9]**

b) Enlist and explain the phases of cryptographic key management fundamentals. **[9]**

OR

Q4) a) Explain in detail how digital signature work for IoT. **[9]**

b) Explain cryptographic control for IoT protocols. **[9]**

P.T.O.

- Q5)** a) Explain holistic IAM program for IoT. [8]
b) Describe naming conventions & Uniqueness requirements in IoT. [9]

OR

- Q6)** a) Explain account monitoring & control for IoT. [8]
b) Explain identity management & access management for the IoT. [9]

- Q7)** a) Explain the following identity management model [9]
i) Local identity.
ii) Federated identity.
b) Explain Identity portrayal for IoT. [9]

OR

- Q8)** a) Explain the following identity management models. [9]
i) Network identity.
ii) Global web identity.
b) Explain hybrid IoT management in IoT. [9]



Total No. of Questions : 8]

SEAT No. :

PA-1677

[Total No. of Pages : 2

[5927]-465

B.E. (Computer Engineering)
HONOURS IN DATA SCIENCE
Machine Learning and Data Science
(2019 Pattern) (Semester - VII) (410501)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 K-Means algorithm with an example. [6]
b) How to measure the quality of clustering? Explain any three measures. [6]
c) What are different types of partitional clustering? Explain any two of them. [6]

OR

- Q2)** a) Explain KNN algorithm with example. [6]
b) Cluster the following dataset using Agglomerative Hierarchical clustering technique - [6]

	X_1	X_2
A	10	5
B	1	4
C	5	8
D	9	2
E	12	10
F	15	8
G	7	7

Also show intermediate steps

- c) What is the role of dendrograms in choosing number clusters in hierarchical clustering? [6]

P.T.O.

- Q3)** a) Enlist limitations of MLP. [4]
b) What are the types of artificial neural network? [6]
c) What is the role of the activation functions in Neural Networks? List down the names of some popular activation functions used in Neural Networks. [7]

OR

- Q4)** a) Explain Multilayer Perception. [4]
b) Explain Generalized Delta Learning Rule. [6]
c) How does the learning rate affect the training of the Neural Network? What do you mean by Hyperparameters? [7]

- Q5)** a) Explain the different layers in CNN. Explain the significance of the RELU Activation function in Convolution Neural Network. [6]
b) Illustrate Long-short Term Memory along with its structure. [6]
c) Explain the terms “Valid Padding” and “Same Padding” in CNN. List down the Hyperparameters of a Pooling Layer. [6]

OR

- Q6)** a) Explain CNN Architecture along with diagram. [6]
b) Explain Recurrent Neural Network. [6]
c) Illustrate Gradient descent optimization using an example. [6]

- Q7)** a) Explain the process of text preprocessing. [6]
b) Write short note on document representation. [6]
c) What are the practical uses of feature extraction? [5]

OR

- Q8)** a) What are various text similarity measures? Explain any two of them. [6]
b) Explain various feature selection methods. [6]
c) Illustrate tokenization with an example. [5]



Total No. of Questions: 8]

SEAT No. :

PA-992

[5927]-466

[Total No. of Pages : 2

B.E. (Honors)

MACHINE LEARNING FOR INTERNET OF THINGS

(2019 Pattern) (Semester-VII) (410601)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q1 or Q2 and Q3 or Q4 and Q5 or Q6 and Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain SVM algorithm with an example. [6]
b) Explain random forest algorithm with working. [6]
c) Why are Boltzmann Machines called restricted? Give detail explanation [6]

OR

- Q2)** a) Explain CNN with any one application. [6]
b) Compare CNN with RNN. [6]
c) What are the steps to apply PCA in computer vision? [6]

- Q3)** a) What is Edge Computing? Why are edge devices essential for IoT? [6]
b) Explain Algorithm optimization in Least-Squares-Solver for Shallow Neural Network. [6]
c) Explain the concept of distributed machine learning. [5]

OR

- Q4)** a) What is smart building? What are the analytics advantages? [6]
b) Explain Hardware Implementation in Least-Squares-Solver for shallow Neural Network. [6]
c) Explain the concept of Machine Learning Accelerator. [5]

- Q5)** a) Explain any one application for deep learning for sensor data. [9]
b) For Forecasting future sensor output which deep learning architecture can be used? Why . [9]

OR

P.T.O.

- Q6)** a) Explain any one application for Embedded deep learning. [9]
b) For Pre-training the network which deep learning architecture can be used? Why? [9]

- Q7)** a) Write a short Note on IoT for Agriculture? [9]
b) What are different benefits and examples of smart transportation? [8]

OR

- Q8)** a) Write a Short Note on Remote Patient Monitoring? [9]
b) What do you mean by IoT security using ML? [8]



Total No. of Questions: 8]

SEAT No. :

PA-993

[5927]-467

[Total No. of Pages : 2

B.E. (Computer Engineering) (Honours)
VIRTUAL REALITY IN GAME DEVELOPMENT
(2019 Pattern) (Semester-VII) (410701)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 block diagram for a multimodal VR system developed at HRL Laboratories. [6]
- b) Explain different types of project constraints in define stage. [6]
- c) What is INVEST in user stories? [5]

OR

- Q2)** a) State different tools for building VR applications. [6]
- b) Write short note on: [6]
- i) Define Stage
 - ii) Make Stage
 - iii) Learn Stage
- c) Virtual reality is both an art and a science. Justify. [5]
- Q3)** a) What are Fundamentals of sprite animation? [9]
- b) Comparison between animations in Unreal Engine and Unity Engine. [9]

OR

- Q4)** a) Explain step to develop town view using unity. [9]
- b) Explain working with Sprites in Unity. Also describe how to actually use Sprites in Unity. [9]
- Q5)** a) How to building in-game menu structures. Explain. [9]
- b) Write unity code to prepare attack a single enemy in battle system. [9]

OR

P.T.O.

- Q6)** a) How to Implement the turn-based battle system. Explain. [9]
b) Explain workflow of Mecanim Animation System. [9]
- Q7)** a) Explain unified model of motion sickness with diagram. [6]
b) Write short note on: (Any 2). [6]
i) Binocular-Occlusion Conflict
ii) Flicker
iii) Aftereffects
c) State hardware design guidelines to avoid adverse health effects in VR System. [5]

OR

- Q8)** a) Explain different physical issues involved with the use of VR equipment. [6]
b) What are different application design factors that have adverse effects on VR system? [6]
c) What is Timing Analysis? Draw timing diagram for a typical VR system. [5]

