

Total No. of Questions : 8]

SEAT No. :

PD4505

[Total No. of Pages : 2

[6404]-1

B.E. (Automobile)

AUTOMOTIVE TESTING & CERTIFICATION

(2019 Pattern) (Semester - VII) (416481)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 necessary.

Q1) a) Explain the test procedure of Coast Down Test. Why coast down test is performed on the vehicle? **[9]**

b) Explain the following. **[9]**

- i) Split-mu track
- ii) External noise track
- iii) Steering pad

OR

Q2) a) Explain the test procedure of Pass by noise test and noise limits for various vehicle categories. **[9]**

b) What is the importance of proving ground vehicle testing? Explain high speed track and gradient track. **[9]**

Q3) a) What is meant by chassis dynamometer? Explain its working and enlist its different types. **[8]**

b) Explain procedure of two wheeler testing on chassis dynamometer for emissions. **[9]**

OR

Q4) a) What is meant by Real Drive Emission (RDE) Testing? How does RDE test work in practice? What are the different equipment's used for RDE Test? **[8]**

b) What is meant by World harmonized Test Procedures? What are its different types? Explain WLTP? **[9]**

P.T.O.

- Q5) a)** Explain mechanism of noise generation? What are the different sources of noise and vibration in vehicle? **[8]**
- b)** Write a short note on exhaust noise and methods to reduce it. Explain with examples. **[9]**

OR

- Q6) a)** Define and differentiate Sound Pressure, Sound Intensity & Sound Power levels and write the relationship between them. **[8]**
- b)** How do you minimize unwanted vibrations? Explain with examples. **[9]**

- Q7) a)** Explain Demist and Defrost Test. **[9]**
- b)** What are the different types of tests performed on rear view mirrors? Explain any one. **[9]**

OR

- Q8) a)** Explain Steering Impact test. **[9]**
- b)** Explain Seat anchorages & head restraints test. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4506

[Total No. of Pages : 2

[6404]-2

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the 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. **[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]**

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 1000 kg on the front axle and 550 kg on the rear axle. The wheelbase is 2.75 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 0.5 m. **[9]**

P.T.O.

- 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)** Explain the terms: [12]
 i) Braking efficiency
 ii) Brake factor
 iii) Driveline drag
 iv) Stopping distance and Stopping time
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



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SEAT No. :

PD4507

[Total No. of Pages : 2

[6404]-3

B.E. (Automobile)

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 and Q.7 or Q.8.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Assume suitable data, if nessacary.*

Q1) a) Explain Roles of Industrial Engineer. **[7]**

b) Explain Five S technique of Productivity Improvement. **[6]**

OR

Q2) a) Explain briefly the factors affecting productivity. **[7]**

b) There are two industries manufacturing two types of plugs. The standard time per piece is 1.5 minute. Output of the two industries is 300 and 200 respectively per shift of 8 hours then, **[6]**

- i) What is productivity of each industry per shift of 8 hours?
- ii) What is production of each industry per week (6 days) on the basis of double shift?

Q3) a) Explain objectives, scope of Work Study. What are human factors in work study? **[6]**

b) Explain factors affecting rate of working. **[6]**

OR

Q4) a) What is Allowance? Explain any two types of Allowance. **[6]**

b) Write short note on MOST(Maynard Operation Sequence technique)[6]

P.T.O.

Q5) a) Explain in detail factors affecting selection of location for the industrial plant. [6]

b) Explain the difference between product layout and process layout. [7]

OR

Q6) a) Explain factors affecting plant layout. [6]

b) Define material handling. What are the objectives of material handling?[7]

Q7) a) Explain the functions of Production Planning and Control. [6]

b) Explain the objectives of Inventory Control. [6]

OR

Q8) a) Explain the difference between Production Planning and Production Control. [6]

b) Write a short note on Material Requirement Planning. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4508

[Total No. of Pages : 2

[6404]-4

B.E. Automobile Engineering

Artificial Intelligence & Machine Learning

(416484 A) (2019 Pattern) (Semester - VII) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) List and explain various terminologies used in SVM. [6]
- b) What are the advantages and disadvantages of random forest algorithm? [6]
- c) List and Explain the different steps used in KNN algorithm. [6]

OR

- Q2)** a) Describe the Naive Bayes algorithm with its features. [6]
- b) Explain the working steps of K- means algorithm. [6]
- c) State the difference between simple decision tree and random forest tree? [6]
- Q3)** a) Describe the following terms related to classification model. [8]
- i) True positive rate ii) False positive rate
- iii) Recall iv) F1 - Score
- b) List and explain the various steps in development of machine learning model. [9]

OR

P.T.O.

- Q4)** a) List and explain various hyper tuning parameter in decision tree. [8]
b) List and explain the evaluation parameter of regression model. [9]

- Q5)** a) What is deep learning? Explain characteristics of deep learning with its application. [8]
b) Define reinforcement learning and explain the value based and policy based reinforcement learning. [9]

OR

- Q6)** a) List and explain the various types of activation function used in deep learning. [8]
b) Explain the Artificial Neural Network with neat architecture and write its automotive applications. [9]

- Q7)** a) How can predict the preventative maintenance of vehicle by using AIML? [6]
b) Discuss the role of AIML in enhancing manufacturing system of automobile vehicle. [6]
c) Explain how AI is used in route optimization. [6]

OR

- Q8)** a) How machine learning used in autonomous driving? Describe in detail. [6]
b) Explain the role of AI in Automatic Guided Vehicles. [6]
c) Describe the significance of digital twins in auto parts design. [6]



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SEAT No. :

PD-4509

[Total No. of Pages : 2

[6404]-6

B.E (Automobile/Mechanical/Mechanical S.W)

Internet of Things

(402044 E) (2019 Pattern) (Semester - VII) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

Q1) a) Explain the characteristics of IoT. **[10]**

b) What are the various sensors and actuators used in IoT. **[8]**

OR

Q2) a) What is 3 layer and 5 layer IoT Architecture and what is IoT Protocols **[10]**

b) Difference Between Microprocessor and Microcontroller. **[8]**

Q3) a) “What is the role and function of input and output interfaces in IoT systems?” **[10]**

b) What is the difference between public, private and hybrid deployment cloud models in IoT. **[8]**

OR

Q4) a) What advantages does posting sensor data to a web server provide? **[10]**

b) What are the different key elements and entities in M2M value chains? **[8]**

P.T.O.

- Q5)** a) What are the different Key Features and Characteristics of MQTT along with the Common Use Cases of MQTT protocol? [9]
- b) What benefits does JSON offer in comparison to other data interchange formats or languages? [8]

OR

- Q6)** a) What is the key difference between MongoDB and SQL databases [9]
- b) State how REST is relevant in the context of IoT and data communication [8]

- Q7)** a) How IoT plays a vital role in Health and Lifestyle with suitable example. [9]
- b) What challenges or limitations should be considered when implementing IoT-based surveillance systems? [8]

OR

- Q8)** a) “What are some essential applications of IoT technology in connected vehicles?” [9]
- b) “How does IoT technology contribute to the field of home automation?” [8]



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SEAT No. :

PD4510

[6404]-7

[Total No. of Pages : 3

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

- Q1) a)** A constant Strain triangle is defined by three nodes 1(1,1), 2(6,3) and 3(4,5). Point P located inside the element Evaluate the shape function N_1 , N_2 and N_3 for interior point P (3.85, 4.8). **[8]**

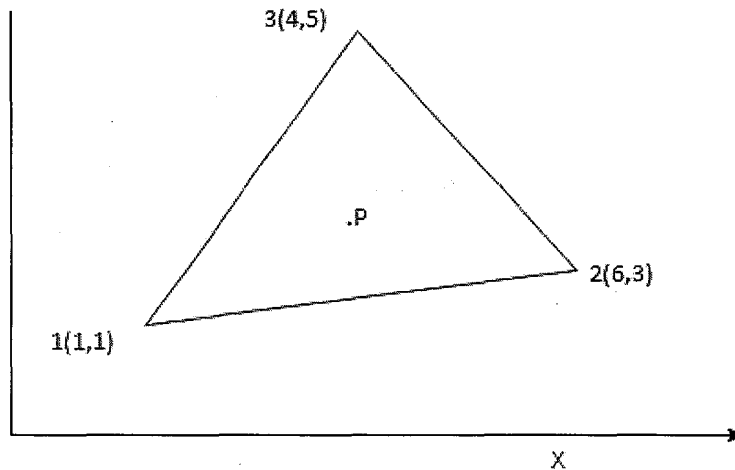


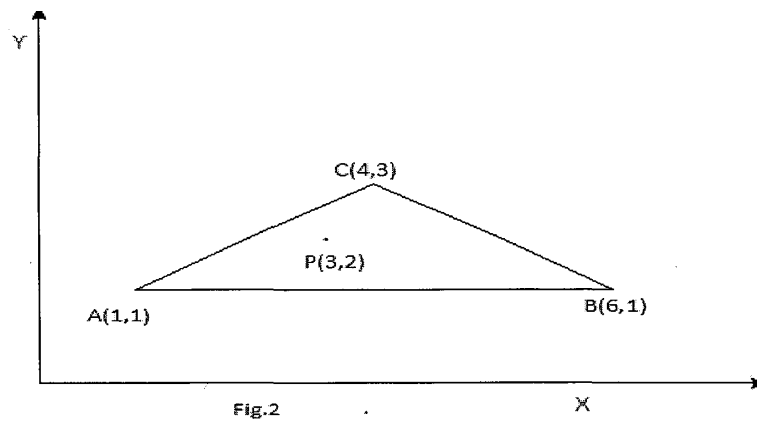
Fig. 1

- b) Explain with neat sketch Plane Stress and Plane Strain condition and how it is used? **[10]**

OR

P.T.O.

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



- b) Explain the different types of 2D element with diagrams and examples. [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]

- i) Aspect ratio
- ii) warp angle

OR

- Q4) a)** Write a note on element quality is check 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]

- i) Jacobian
- ii) Stretch

- Q5) a)** Compare the linear and non-linear FEA analysis with respective its characteristic and feature. [10]

- b) Explain Geometric Nonlinearity and Material Nonlinearity related to nonlinear problems. [7]

OR

Q6) a) Why is material modelling critical in nonlinear analysis? Explain any type of material model in nonlinear analysis. [10]

b) Write the general procedure for non-linear analysis solid mechanics. [7]

Q7) a) A composite wall consists of three materials, the outer temperature is 20°C the convection heat transfer on the inner surface of the wall with temperature) is 800°C , $h=25 \text{ W/m}^2\text{C}$. Determine the temperature distribution the T_∞ (Ambient wall. Take the values $k_1 = 20 \text{ W/m}^\circ\text{C}$, $k_2 = 30 \text{ W/m}^\circ\text{C}$, $k_3 = 50 \text{ W/m}^\circ\text{C}$ and $L_1 = 0.3\text{m}$, $L_2 = 0.15\text{m}$, $L_3 = 0.15$, $T_o = 20^\circ\text{C}$. [12]

b) Explain the different types of boundary conditions. [6]

OR

Q8) a) Find the un-damped natural frequencies of longitudinal vibration of stepped bar shown fig.3 with following data using consistent mass matrices. $L_1 = L_2 L_3 = 0.2\text{m}$, $E = 2.1 \times 10^{11}\text{N/m}^2$ and $\rho = 7.8 \times 10^3 \text{ Kg/m}^3$, $A = 2 A_2 = 3 A_3 = 0.4 \times 10^{-3} \text{ m}^2$. [12]

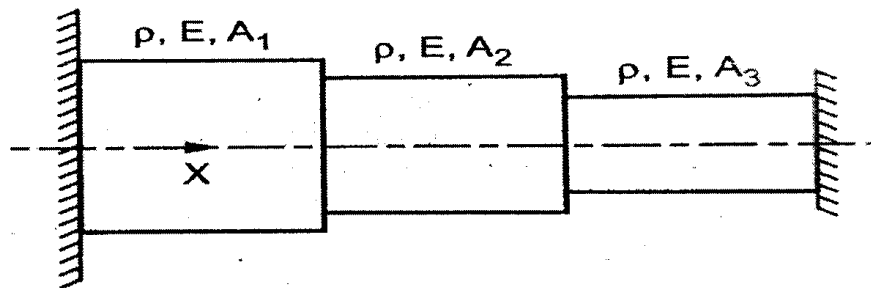


Fig. 3

b) Derive an expression for mass matrix of bar element. [6]



Total No. of Questions : 8]

SEAT No. :

PD4511

[Total No. of Pages : 2

[6404]-9

**B.E. (Automobile Engineering)
HYBRID AND ELECTRIC VEHICLE
(2019 Pattern) (Semester - VIII) (416489)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any four questions from the following Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Assume suitable data, if necessary.

- Q1)** a) Explain with neat sketch the working of BLDC Motor. [8]
b) Enumerate and compare the various types of electric motors commonly used in E.V. [9]

OR

- Q2)** a) A motor delivers 5kW power at 3500 rpm. Its efficiency is 90%. Half the losses are due to steel and rest due to copper. It is coupled to a constant load. [4]
i) How much heat does it generate?
ii) How much power does it consume?
b) If the speed of the motor is reduced to 1000 rpm, then what will be the efficiency of Motor now? [4]
c) If the motor is coupled to a gear box of gear ratio 80%, then what will be the output torque? [4]
d) If motor is running at 3500 rpm and above gearbox (mentioned in (c)) is used, then how much will be the vehicle speed in kmph?. Take wheel rolling radius = 0.3m. [5]

- Q3)** a) How does temperature affect the charging and discharging performance of electric vehicle batteries? [10]
b) Explore the economic and environmental considerations of reusing electric vehicle batteries in stationary energy storage systems. [8]

OR

- Q4)** a) What are the requirements of energy storage device of electric vehicle? [10]
b) Following two batteries are used for two 4-wheeler electric vehicle for city operation (Average driving is 30km per day). Which battery needs first replacement? [8]

Vehicle	Range	Cycle Life
Alpha	600 km	500 cycle
Beta	150 km	1500 cycle

P.T.O.

Q5) a) How does a battery management system handle cell balancing and why is it important? **[8]**

b) What are the components of Battery Management System? **[9]**

OR

Q6) a) What are the potential risks of inadequate battery thermal management? **[8]**

b) State different methods used in Battery Thermal Management System. Explain any one method with neat sketch. **[9]**

Q7) It is decided to design an E-2Wheeler with following specifications:- (1) Gross Vehicle Weight (GVW) = 180 kg, (2) Maximum Speed = 90 kmph, (3) Acceleration = 0 to 90 kmph in 20 seconds, (4) Grade = 5° , (5) Radius of wheel = 0.292m, (6) Coe. Of Drag = 0.90, (7) Gear Ratio = 9:1, (8) Air Density = 1.225kg/m^3 , (9) Front Area = 0.50 m^2 , (10)Coe. of rolling resistance = 0.013, (11) Speed on grade road =45 kmph, (12) Coe. of sliding friction = 0.3. Calculate :- (i) Motor Power in kW, (ii) Battery Pack Capacity in kwhr, (iii) Energy Efficiency in Watt hour/km, (iv) Actual Max. Vehicle Speed in kmph, and (v) EV range (in km) for plane road at constant speed of 60kmph. **[18]**

OR

Q8) It is decided to design an E-Scooter with following specifications:- (1) Gross Vehicle Weight (GVW) = 191kg, (2) Maximum Speed = 80kmph, (3) Acceleration = 0 to 40kmph in 4 seconds, (4) Grade = 0° , (5) Radius of wheel = 0.1524m, (6) Coe. Of Drag = 0.22, (7) Gear Ratio = 7.8:1, (8) Air Density = 1.225kg/m^3 , (9) Front Area = 0.875m^2 , (10) Coe. of rolling resistance = 0.015, (11) Coe. of sliding friction = 0.3. Calculate :- (i) Motor Power in kW, (ii) Battery Pack Capacity in kwhr, (iii) Energy Efficiency in Watt-hour/km, (iv) Actual Max. Vehicle Speed in kmph, and (v) EV range (in km) for plane road at constant speed of 60kmph. **[18]**



Total No. of Questions : 8]

SEAT No. :

PD-4512

[Total No. of Pages : 2

[6404]-10

B.E. (Automobile Engineering)
AUTOMOTIVE SYSTEM DESIGN
(2019 Pattern) (Semester - VIII) (416490)

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) Why a hollow propeller shaft normally used? **[4]**
b) A three speed gear box gives 3 forward speeds and one reverse with a top gear of unity and bottom and reverse gear ratio of approximately 3.3:1. The centre distance between the shafts is to be 110 mm approximately. Gear teeth of module 3.25 mm. find the number of gear teeth. **[6]**
c) Explain the design procedure of live axles. **[7]**

OR

- Q2)** a) An engine develops 28 kW at 1500 rpm and its bottom gear ratio is 3.06. if a propeller shaft of 40mm outside diameter is to be used, determine the inside diameter of mild steel tube to be used, assuming a safe shear stress of 55×10^3 kPa for MS. **[8]**
b) Explain the design procedure of propeller shaft with sketch. **[9]**

- Q3)** In a hydraulic braking system the force on foot pedal is 100N, pedal leverage ratio is 4.4, cross sectional area of master cylinder is 4 cm^4 , cross sectional area of front piston 20 cm^4 . Cross sectional area of the rear piston is 5 cm^4 . Distance moved by effort is 1 cm.

Calculate the following.

[18]

a) Front to rear brake ratio	b) Total force ratio
c) Distance moved by output	d) Cylinder movement ratio
e) Total movement ratio	

P.T.O.

OR

- Q4) a)** A light motor vehicle has a wheel base of 2.64m, the height of its CG above the ground is 0.61m and it is 1.12 m in front of the rear axle. if the car is travelling at 40km/h on a level track, determine the minimum distance in which the car may be stopped, when, i. The rear wheels are braked. [12]
ii) The front wheel are braked iii) All wheels are braked
b) What is the braking efficiency? Explain in detail. [6]

- Q5) a)** A semi elliptic type spring has leaves of 75 mm width and 10 mm thickness, effective length is 900 mm. If the stress is not to exceed 220.725 MPa, when the spring is loaded to 4905 N. Estimate the required number of leaves and the deflection under this condition. If the spring is just flat under load, what is the initial radius? Take $E = 196.2 \text{ GPa}$. [10]
b) Write a note on air springs. [7]

OR

- Q6)** Discuss on: [17]
a) What is nipping in leaf springs?
b) Brake fade and Brake torque.
c) Brake balance and Braking efficiency.
d) Components used in hydraulic brake system

- Q7)** Design a Tensile Bar for Minimum Cost of the following materials. [18]
Assume Factor of Safety of 2.0

Material	Mass density (Kg/m ³)	Yield strength (MPa)	Material cost Rs/N
Steel	3000	16	130
Al alloy	3000	32	50
Magnesium alloy	2100	32	20

Length of the bar is 200mm and a constant tensile load on bar is of 5000N.

OR

- Q8) a)** What do you understand by, [12]
i) Optimum and adequate design
ii) Significance of free variable and constrained variable in Johnson's method of optimum design.
iii) Design for natural tolerances.
b) Explain about aspects of Aesthetic Design. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4513

[Total No. of Pages : 2

[6404]-11

B.E. (Automobile Engineering)

**ALTERNATIVE FUELS AND EMISSION CONTROL
(2019 Pattern) (Semester - VIII) (Elective - V) (416491A)**

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 side indicate full marks.

- Q1)** a) What are the Various vegetable oils and write their important properties?[9]
b) Explain the Nano fluids, additives and certain improves for performance improvement of vegetable oils? [9]

OR

- Q2)** a) What are difference between biodiesel and Vegetable Oil. [6]
b) Write a short note on degumming of Vegetable Oil. [6]
c) Write advantages and limitation of Vegetable Oil. [6]

- Q3)** a) What are the various production methods used for generating biogas, and how do they differ in terms of feedstock, process, and efficieny?[8]
b) Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines? [9]

OR

- Q4)** a) Which is safer fuel between CNG and LPG? [6]
b) Discuss storage facility for LPG. [5]
c) What are the advantages of using biogas as a fuel? [6]

- Q5)** a) Explain the contruction and working of NDIR. [9]
b) Discuss the effects of pollutants on environment human beings. [9]

P.T.O.

OR

- Q6)** a) Explain the construction and working of FID. [9]
b) Describe the SHED Test with the help of a neat sketch. [9]

- Q7)** a) Explain the remedies for engine emission. [9]
b) List the negative effects of CO emission on human health, what is treatment to CO intoxication person? [8]

OR

- Q8)** a) Write a short note on following : [9]
i) Secondary Air Injection
ii) Laser Assisted Combustion.
iii) HCCI
b) Write a note on Indian emission norms. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4514

[Total No. of Pages : 2

[6404]-12

B. E. (Automobile Engineering)

RENEWABLE ENERGY

(2019 Pattern) (Semester - VIII) (416491B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Draw and explain the working of Solar-wind hybrid system. **[9]**

b) Write a note on “control and monitoring of a wind Farm”. **[9]**

OR

Q2) a) Classify wind -turbines used to Extract wind energy. Explain the different types in brief. **[9]**

b) What do you mean by wind velocity duration curve? Explain it. **[9]**

Q3) a) Describe a binary cycle liquid dominated geothermal power plant. **[9]**

b) What are the advantages and disadvantages of Geothermal Energy forms. **[8]**

OR

P.T.O.

Q4) a) Classify prime movers for Geothermal energy Conversion. Explain any one with neat diagram. **[9]**

b) Describe a Vapour dominated geothermal power plant. **[8]**

Q5) a) Explain different technologies of Biomass Conversion. **[9]**

b) Describe MHD open cycle system. What are advantages of MHD power generation? **[9]**

OR

Q6) a) Explain Waste Incineration Energy plant with its schematic. **[9]**

b) What is Gasifier? Describe up-draught Gasifier with neat sketch. **[9]**

Q7) a) What are different types of Ocean Thermal Energy Conversion system (OTEC) and Explain Open cycle OTEC System with neat sketch. **[9]**

b) Explain different Ocean Energy Resources in brief. **[8]**

OR

Q8) a) Write a note on Small hydel power Plant. **[9]**

b) What are advantages and limitations of Ocean Energy. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4515

[Total No. of Pages : 2

[6404]-13

B. E. (Automobile Engineering)

**Transport Management and Automobile Industry
(2019 Pattern) (Semester - VIII) (416492 A) (Elective - VI)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) What are the provisions regarding construction of motor vehicles as per MVA? [6]
- b) Why road tax is levied on vehicle. [6]
- c) Explain one Time tax for Maharashtra State. [6]

OR

- Q2)** a) Define Tax. What are the objectives of Tax? [6]
- b) Explain the structure and method of Taxation. [6]
- c) Which vehicles are the exempted from tax payment & why? [6]
- Q3)** a) Explain different types of Traffic Signs? [6]
- b) Explain the Procedure for accident claim. [5]
- c) What is third party insurance? [6]

OR

P.T.O.

- Q4)** a) What are the Duties of driver in case of accident? [6]
b) Explain Hit & Run case. [6]
c) Distinguish between Insurance & Assurance. [5]

- Q5)** a) Explain the functions of good transport organization with the structure. [9]
b) Describe briefly the Records keeping importance and fleet management.[8]

OR

- Q6)** a) Describe basic elements of transport system. [8]
b) What is the procedure for transportation of petroleum product? [9]
- Q7)** a) Explain seven quality tools. [6]
b) Explain Criteria for International Quality Award. [6]
c) Explain Automotive Industry standards. [6]

OR

- Q8)** a) Explain Quality Circle. [6]
b) Explain Six Sigma. [6]
c) Discuss Juran Trilogy approach [6]



Total No. of Questions : 8]

SEAT No. :

PD-4516

[Total No. of Pages : 2

[6404]-14

B.E. Automobile

AUTOMOTIVE SAFETY

(Elective-VI) (2019 Pattern) (Semester - VIII) (416492B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Explain the cadaver testing and crashworthiness. **[9]**
b) Compare the rear testing with side impact testing in a vehicle. **[8]**

OR

- Q2)** a) Explain the proving-ground testing in a vehicle. **[9]**
b) Describe the in-field testing for a hatchback. **[8]**

- Q3)** a) Explain the role of occupant packaging in car design. **[10]**
b) Explain the strategies for improving occupant accommodation and comfort in a car. **[8]**

OR

- Q4)** a) Explain the five steps of occupant package development process for a sedan car. **[9]**
b) Discuss the vehicle seating configuration for a multi utility vehicle as per sae norms. **[9]**

P.T.O.

- Q5)** a) Explain Severity Index (SI) and Head Injury Criteria (HIC). [9]
b) Describe the side impact and rear impact dummies. [8]

OR

- Q6)** a) Write a short note on energy absorbing systems. [9]
b) Design a Bio-RID as per percentile statures. [8]

- Q7)** a) Explain the tyre pressure monitoring system. [9]
b) Describe the working of adaptive front lighting system. [9]

OR

- Q8)** a) Explain the working of sensotronic brake control. [9]
b) Discuss the working of intelligent airbag sensing system. [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4517

[6404]-16

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)** Explain in detail role and working of temperature controller system. **[9]**
b) What are different types of sampling ports? Explain it's working in detail. **[9]**

OR

- Q2) a)** Explain in detail role and working of pH controller system. **[9]**
b) What is the effect of rheological properties in fermentation operation? State its importance. **[9]**

- Q3) a)** Is it convenient to use $k_L a$ as a yardstick of fermenter performance? How? **[9]**
b) Describe with the help of TCA cycle biosynthetic routes for the production of amino acid. **[8]**

OR

- Q4) a)** Describe effect of dissolved oxygen concentration on specific oxygen uptake rate. How is it correlated with Michaelis-Menten kinetics curve? **[8]**
b) List out techniques used for calculation of oxygen uptake rate. **[9]**

- Q5) a)** What are thumb rules considered while scaling up a plant? **[9]**
b) Explain in detail regimen analysis for pilot plant. **[9]**

OR

P.T.O.

- Q6)** a) Explain terms: [9]
- i) Compatibility of the equipment
 - ii) Technology transfer and sourcing
- b) What is pilot plant? Why there is a need to develop a pilot plant before scale up? [9]

- Q7)** a) What are advantages and disadvantages of using immobilized cells over whole cells? [9]
- b) Give one detailed case study of semisynthetic process. [8]

OR

- Q8)** a) What are disposable reactors? Give Pros and cons over conventional reactors. [9]
- b) What are types of immobilized cell reactors? Draw sketches and explain in detail. [8]



Total No. of Questions : 8]

SEAT No. :

PD4518

[Total No. of Pages : 2

[6404]-17

B.E. (Biotechnology)

BIOINFORMATICS

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

Q1) a) Compare and contrast the primary protein databases UNIPROT, PIR, and TrEMBL. Describe the type of information included in these databases, their structure, and their primary purposes. Additionally, explain how a scientist can access and use the sequence data from these databases. **[9]**

b) Explain a typical sequence data file entry of SWISSPROT, give the important parts of the that file which gives important annotational information about the sequence. **[9]**

OR

Q2) a) Write a note on Ramachandran Plot. **[9]**

b) Explain the uniqueness of polypeptide sequences and their properties. How does the uniqueness of a polypeptide sequence relate to the structure and function of proteins? Provide examples to illustrate your points. **[9]**

Q3) a) Explain the significance of secondary protein databases, including databases such as PROSITE, PRINTS, and BLOCKS, in the field of bioinformatics. Discuss how these databases facilitate the identification of patterns, motifs, and profiles in protein sequences. Provide examples to illustrate their utility in biological research. **[9]**

b) What are the advantages of visualization softwares like RasMol software? Give the significance of protein structure visualization. **[8]**

OR

Q4) a) Describe protein fold classification systems such as SCOP, CATH, and FSSP. Discuss their roles in categorizing and understanding the structural diversity of proteins. **[9]**

b) What is Proteomics? How does proteomics help in advancing healthcare research. **[8]**

P.T.O.

- Q5) a)** Explain the fundamental concepts of pairwise sequence alignment. Discuss the terms similarity, identity, and homology in the context of sequence alignment. **[8]**
- b)** Differentiate between local and global sequence alignment. Provide examples to illustrate the differences and use cases. **[10]**

OR

- Q6) a)** Write a note on BLAST as a way of alignment. What are the types of BLAST? **[10]**
- b)** Compare and contrast the Needleman-Wunsch and Smith-Waterman algorithms for sequence alignment. Describe the scenarios in which each algorithm is most suitable. **[8]**

- Q7) a)** Differentiate between rooted and unrooted trees and provide examples of their applications in phylogenetic analysis. **[8]**
- b)** What is Clustal W? how does the algorithm function? What are the output of clustal W? What is the significance of this software? **[9]**

OR

- Q8) a)** Define Phylogeny and explain the concept of Phylogenetic trees in evolutionary biology. Discuss the various methods and algorithms used for constructing phylogenetic trees. **[8]**
- b)** Draw a Phylogenetic tree depicting orthologs, paralogs and homologs, write a note on each of them. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4519

[Total No. of Pages : 2

[6404]-19

B.E. (Biotechnology)

Environmental Biotechnology

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

Q1) Answer the following **[18]**

- a) Compare the disposal standards for dairy industry effluents with those for tannery effluents
- b) Describe the chemical processes involved in neutralizing acidic and alkaline effluents in industrial wastewater treatment

OR

Q2) Answer the following **[18]**

- a) What are the potential consequences of improper proportioning in the treatment of effluents from the textile industry?
- b) What are the treatment schemes for wastewater of dairy?

Q3) Answer the following **[17]**

- a) Discuss the impacts of air pollutants on ecosystems, including the effects on plant growth and animal populations
- b) Describe the challenges and considerations involved in implementing algae-based CO² sequestration on a large scale.

OR

P.T.O.

Q4) Answer the following [17]

- a) Describe the operating principles of spray towers and centrifugal scrubbers in the removal of gaseous pollutants from industrial emissions
- b) Compare the advantages and disadvantages of combustion, and catalytic oxidation methods for the removal of gaseous pollutants.

Q5) Answer the following [18]

- a) Describe the unique challenges and health risks associated with hospital waste management.
- b) Explain how biotechnology can be applied to hazardous waste management, specifically through biodegradation and biological detoxification

OR

Q6) Answer the following [18]

- a) Provide detailed examples of hazardous waste containing cyanide highlight its sources and potential environmental and human health risks.
- b) Describe the various sources of solid wastes in an urban environment. Provide examples of each source.

Q7) Answer the following [17]

- a) How do membrane-based wastewater treatment processes differ from conventional treatment methods in terms of efficiency and sustainability?
- b) Compare between bio stimulation and bio augmentation as strategies for enhancing bioremediation

OR

Q8) Answer the following [17]

- a) Describe the fundamental differences between in situ and ex situ bioremediation approaches. When would you choose one over the other?
- b) Describe the role of biofilms in liquid phase bioremediation processes and their advantages in treating different types of contaminants



Total No. of Questions : 8]

SEAT No. :

PD-5283

[Total No. of Pages : 2

[6404]-20

B.Tech. (Biotechnology)

GENOMICS

(2019 Pattern) (Semester - VII) (415463 C) (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) Assume Suitable data if necessary.

Q1) a) How will you detect global mRNA transcripts in a given cancer tissue?[12]

b) Give names of three miRNA and their functions. [6]

OR

Q2) a) Write a note on Real Time PCR and its applications. [6]

b) Write a note on Volcano plot. [6]

c) Write a note on RISC. [6]

Q3) a) Discuss the role of DNA methylation in Epigenetic regulation. [12]

b) Write a note on Bisulphide sequencing. [5]

OR

Q4) a) Discuss "Epigenetics plays role in diseases". [10]

b) Write a notes on Histone code. [7]

Q5) a) What is personalized medicine? [10]

b) What is ADME of a drug and its role in adverse reactions in patients.[8]

OR

Q6) a) What are the advanced technologies used in Pharmacogenomics? [10]

b) Justify CYP450 enzyme polymorphism plays role in drug response. [8]

P.T.O.

- Q7) a)** Explain with example phenotype plasticity? **[9]**
b) Write a note on Nutrigenomics. **[8]**

OR

- Q8) a)** What is personalized nutrition? **[8]**
b) Design a prospective study to test relationship between micronutrients deficiency and developing diabetes in adults. (Make a flow chart of study plan). **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4520

[Total No. of Pages : 2

[6404]-22

B.E. (Biotechnology)

NANOTECHNOLOGY

(2019 Pattern) (Semester - VII) (415464 B) (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 the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) What are the requirements for a successful targeted drug delivery system? Discuss in details. [8]
- b) How nanoparticle achieved a key role in detection of infectious diseases? Discuss. [6]
- c) What is bionanosensors? Discuss. [3]

OR

- Q2)** a) Explain drug targeting and drug delivery system in to: [9]
- i) Respiratory
 - ii) Brain and
 - iii) Eye
- b) Discuss about term imaging agent in nanobiotechnology. [8]

- Q3)** a) Discuss in detail about nanodevices used in biomedical field. [6]
- b) What are the ideal characteristics for nanodevices? Explain. [6]
- c) Discuss the functioning of sensing substrates in nanodevices. [6]

OR

P.T.O.

- Q4)** a) What is the future potential of nanodevices in food industry? Discuss. [6]
b) Give the application of polymer based nanosensors. [6]
c) Comment why the nanodevices are useful. [6]

- Q5)** a) What are the different types of biochip? Explain any two in details. [10]
b) Write a detail note on nanosensors. [7]

OR

- Q6)** a) Discuss advantages and disadvantages of biochip. [7]
b) Explain the concept of Electron transfer of biomolecules with reference to biosensors in details. [10]

- Q7)** a) Give the classification of biosensors based on biological receptor. Explain each. [12]
b) Write down the application of mass based biosensors. [6]

OR

- Q8)** a) Explain the biosensor design in detail. [6]
b) Discuss about the ethical issues and its analysis about biosensors. [6]
c) What is fuel cell? Explain its ethical consideration. [6]



Total No. of Questions : 8]

SEAT No. :

PD4521

[6404]-23

[Total No. of Pages : 2

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 the detail process of regeneration of stem cells in planaria. [6]
- b) Explain in detail about protocol of isolation of stem cells with neat sketch. [6]
- c) Write in detail about tissue regenerative capacity of adult stem cells or mammals. [6]

OR

- Q2)** a) Explain the transdifferentiation involved in stem cells. [6]
- b) Discuss about the process of regeneration of stem cells in axolotl. [6]
- c) Explain the techniques in characterization of stem cells. [6]

- Q3)** a) Discuss the guidelines for stem cells therapy and clinical trials in India. [9]
- b) Write detail note on egg donation ethics. [8]

OR

- Q4)** a) Explain about embryo ethics. [9]
- b) Describe about stem cell interventions in stem cell translations. [8]

P.T.O.

Q5) a) Discuss the phenomenon of In vitro cultures of adult stem cells to analyse differentiation and other properties. **[8]**

b) What are leveraging tools are used to study stem cell biology explain it in detail. **[10]**

OR

Q6) a) Write detail note on 3D polymeric scaffold, porous microsphere scaffolds. **[10]**

b) Explain about in vivo tools in stem cell biology. **[8]**

Q7) a) Write about Cell replacement therapies includes disease modeling & drug screening. **[8]**

b) Elaborate about clinical translation process of stem cell technologies. **[9]**

OR

Q8) a) Explain in detail about in-vivo transdifferentiation in cardiac fibroblasts into cardiomyocytes. **[8]**

b) Elaborate in detail about various clinical applications of stem cells by considering regenerative property. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4522

[Total No. of Pages : 2

[6404]-24

B.E. (Biotechnology)

BIO PROCESS MODELING AND SIMULATION

(2019 Pattern) (Semester - VIII) (415471)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Write short notes on the following terms:

[18]

- a) Mathematical modeling
- b) Lumped Parameter model
- c) Distributed parameter model

OR

Q2) Discuss in detail how mathematical models are classified based on the state of the process. Cite examples for each type of model.

[18]

Q3) Define the following terms:

[17]

- a) Recycle ratio of a Chemostat
- b) Concentration factor
- c) Dilution rate
- d) Washout of the cells

OR

Q4) What is a Chemostat? List out the assumptions of an ideal chemostat. Derive an equation for maximum dilution rate in a Chemostat. Take proper assumptions wherever required.

[17]

Q5) Model an activated sludge process with necessary assumptions wherever required accompanied by a neat sketch.

[18]

OR

P.T.O.

Q6) What do you mean by Waste water treatment? Where does the waste water come from? Discuss in detail all the stages of waste water treatment. **[18]**

Q7) Model a Reactor with mass transfer accompanied by a neat sketch. Take proper assumptions wherever necessary. **[17]**

OR

Q8) Model a Single component vaporizer accompanied by a neat sketch. Take proper assumptions wherever necessary. **[17]**



Total No. of Questions : 8]

SEAT No. :

PD-4523

[Total No. of Pages : 2

[6404]-25

Final Year B.Tech. (Biotechnology)

PLANT ENGINEERING AND PROJECT COSTING

(2019 Pattern) (Semester - VIII) (415472)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss in detail the importance of preparing utility line diagram. [6]
- b) Give the importance of process piping diagram of equipment and the symbols used in P & ID diagram. [6]
- c) Discuss the concept isometric of piping with example. [6]

OR

- Q2)** a) Comment expansion and contraction of piping. [6]
- b) Draw a symbolic representation of [6]
- i) Plug valve
 - ii) Needle valve
 - iii) Vacuum pump
 - iv) Pressure relief or Safety valve
 - v) Pneumatic control valve
 - vi) Butterfly valve
- c) Explain the procedure to preparing a bill of material. [6]

P.T.O.

- Q3)** a) Discuss about the properties of steam and its uses in bioprocess industry. [6]
b) Give the importance of preventive and predictive maintenance. [6]
c) What are the disadvantages of corrective maintenance? Discuss. [5]

OR

- Q4)** a) Discuss the importance of process utilities. [6]
b) Write short note on: Water treatment process used in chemical/biochemical industry. [6]
c) What are the advantages and disadvantages of preventive maintenance? [5]
- Q5)** a) Discuss with example about manufacturing and nonmanufacturing capital investment. [6]
b) With a sketch explain a simplified cash flow schemes. [6]
c) Discuss the factors affecting investment and production cost. [6]

OR

- Q6)** a) Explain the Type of taxes and Insurance in details. [6]
b) Discuss the different practical factors used in alternative-investment and replacement analysis? [7]
c) Explain any one method used for the determination of depreciation? [5]
- Q7)** a) Explain the payback period method used to calculate the profitability. [8]
b) Differentiate between CPM and PERT technique. [6]
c) Define Turnover ratio. [3]

OR

- Q8)** a) Discuss about the evaluation of total product cost considering general expenses. [10]
b) Comments on evaluation of breakeven point in manufacturing plant. [7]



Total No. of Questions : 8]

SEAT No. :

PD4524

[6404]-27

[Total No. of Pages : 2

B.E. (Biotechnology)

MOLECULAR DIAGNOSTICS

(2019 Pattern) (Semester - VIII) (415473 B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe the principles of Enzyme linked Immunosorbent assay (ELISA) and prove its importance in diagnostics. [9]

b) Evaluate the significance of Monoclonal antibodies and its medical applications. [9]

OR

Q2) a) Write the principle and methodology for Radioimmunoassay (RIA). [9]

b) Write short note on Antigen-Antibody Interactions. [9]

Q3) a) What are different types of traditional disease diagnosis methods used in diagnostics? [9]

b) Explain with example the methodology used for diagnosis of viral pathogens. [8]

OR

Q4) a) Describe microbial identification and strain typing methods in diagnostics. [9]

b) Discuss a molecular diagnostics case studies in molecular testing of food pathogens. [8]

P.T.O.

- Q5)** a) Recommend methods for diagnosis of Sickle cell anemia. [10]
- b) Give important methods of Neonatal and Prenatal disease diagnostics with its significance. [8]

OR

- Q6)** a) How to detect genetic disorders? Explain with examples. [10]
- b) Write a short note on Down's syndrome. [8]

- Q7)** a) What are POC devices? Describe working principle and applications of POC in disease diagnosis. [8]
- b) Explain Omics Technologies and its applications for molecular diagnosis of diseases. [9]

OR

- Q8)** a) Describe working principle of High-Throughput NGS Approaches for diagnostics. [8]
- b) Design Enzyme based biosensors for diagnostics. Give one example. [9]



Total No. of Questions : 8]

SEAT No. :

PD4525

[6404]-28

[Total No. of Pages : 2

B.E. (Biotechnology)

BIO-THERAPEUTICS TECHNOLOGY

(2019 Pattern) (Semester - VIII) (Elective - V) (415473C)

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) Give schematic outline of hybridoma technique for production of MAb. [12]

b) Give three examples of recombinant vaccines approved by FDA. [6]

OR

Q2) a) What are transgenic plants? Discuss the methods used for development of transgenic plants. Name any two biotherapeutics produced in them. [14]

b) Give any four therapeutic applications of MABs. [4]

Q3) a) Illustrate Four major aspects of pharmaceutical manufacturing with clean room design. [14]

b) What are pyrogens? [3]

OR

Q4) a) How will you detect and remove altered forms in your Biotherapeutic product? [13]

b) Match the following [4]

Class of clean room	Maximum permitted viable microorganisms per mL

i) Class A	1) 1000
ii) Class B	2) 500
iii) Class C	3) 100
iv) Class D	4) 5
	5) <1

P.T.O.

Q5) a) Write in details on routes of drug administration. [10]

b) Write on Liposomes in drug delivery. [8]

OR

Q6) a) Discuss briefly five major criteria for stability testing. [12]

b) What is ADME? [6]

Q7) a) Discuss Patenting in Biotechnology. [12]

b) What does CGMP, CDSCO, DCGI, GMP, CGMP stand for [5]

OR

Q8) a) With the help of flow diagram give Biotechnology Industry organization. [12]

b) Write a note on trademark. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4526

[Total No. of Pages : 2

[6404]-29

B.E. (Biotechnology)

Management and Entrepreneurship

(2019 Pattern) (Semester - VIII) (415474 A) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) How does effective coordination contribute to improve organizational performance and success? [6]
- b) What are the different methods used for coordinating activities within an organization? Provide with examples. [6]
- c) How leadership styles impact employee motivation and performance in an organization? [6]

OR

- Q2)** a) What is the meaning of directing in the context with organizational management? Explain. [6]
- b) What is communication? Explain its meaning and importance in detail. [6]
- c) Discuss significance of co-ordination in promoting efficiency, avoiding duplication of efforts. [6]
- Q3)** a) Define entrepreneurship and who is an entrepreneur. Discuss [7]
- b) Discuss in detail about contribution of entrepreneur to the economic development of India? [10]

OR

P.T.O.

- Q4)** a) Discuss in detail about the achievements of women as entrepreneurs.[8]
b) How to identify a business opportunity? Discuss. [5]
c) State the different functions of an entrepreneur. [4]
- Q5)** a) What is the role of small scale industry in Economic Development? State its advantages. [6]
b) How the role of small scale industry is important in Economic Development? Discuss. [6]
c) State advantages of small scale Industry. [6]

OR

- Q6)** a) Give characteristics of small scale industry in details. [6]
b) Discuss in detail the functions of the government policy towards small scale industry. [6]
c) What is an ancillary and tiny industry? [6]
- Q7)** a) Discuss in detail the factors to be considered in the process of project selection [8]
b) What is network analysis and how does it relate to project management? Discuss. [9]

OR

- Q8)** a) Discuss in details about project appraisal [8]
b) Write a details note on : Guidelines by Planning Commission for Project report [9]



Total No. of Questions : 8]

SEAT No. :

PD-4527

[Total No. of Pages : 2

[6404]-30

B.E. (Biotechnology)

INTELLECTUAL PROPERTY RIGHTS

(2019 Pattern) (Semester - VIII) (415474 B) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Answer the following : [18]

- a) What are the different types of trademark infringement. Explain any one in detail.
- b) Write down the flow chart to register a trademark?

OR

Q2) Answer the following : [18]

- a) Illustrate the benefits of registering a trademark. What is protectable matter under trademark law?
- b) What essential steps ensure a trademark remains protected over time, and what strategies can individuals use to effectively enforce their trademark rights?

Q3) Answer the following : [17]

- a) How can false advertising be categorized, and what legal strategies effectively combat deceptive marketing practices.
- b) How do the six critical considerations guide the evaluation of whether corporate information merits trade secret status and the requisite level of security for its preservation?

OR

P.T.O.

Q4) Answer the following : [17]

- a) What preventative measures ensure trade secrets remain protected, and what factors could cause a business to lose such protections?
- b) What are the core principles underlying trade secret misappropriation, and what legal avenues exist for enforcement?

Q5) Answer the following : [18]

- a) How is copyright applied to literary, dramatic and musical works, and what types of content are ineligible for copyright protection in India?
- b) What are the special moral rights conferred upon authors under copyright law?

OR

Q6) Answer the following : [18]

- a) Discuss the fundamental principles underlying copyright law and their importance.
- b) Discuss the significance of copyright protection for software and the criteria for registration.

Q7) Answer the following : [17]

- a) Analyze the fundamental characteristics of geographical indications (GIs) and elucidate how they conceptually and legally diverge from trademarks.
- b) What are the key provisions of geographical indication legislation, and how can one ascertain whether a particular product is protected under GI status?

OR

Q8) Answer the following: [17]

- a) Can geographical indications be registered under the name of an individual producer? Evaluate the legal implications and conditions under which this may or may not be permissible.
- b) Provide an illustrative examination of notable Indian geographical indications, explaining their economic and cultural significance.



Total No. of Questions : 8]

SEAT No. :

PD-5308

[Total No. of Pages : 2

[6404]-31

Final Year B.E. (Biotechnology)

**INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2019 Pattern) (Semester - VIII) (415474 C) (Elective - VI)**

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) State and explain the various functions of purchase department. [6]
b) Differentiate between inspection and quality control. [6]
c) State various conditions mentioned in quotation form. [6]

OR

- Q2)** a) State requirements of successful store keeping. [6]
b) State the different elements of inventory carrying cost. Explain each. [6]
c) State the advantages of inventory control. [6]

- Q3)** a) Discuss the “Marketing Mix” in detail. [8]
b) What is the importance of marketing management for growth of industrial organization? [5]
c) Enlist various price fixation factors. [4]

OR

- Q4)** a) Differentiate between marketing and selling. [6]
b) State the advantages of penetration pricing. [6]
c) What are the advantages of price skimming? [5]

P.T.O.

- Q5) a)** Write a short note on : **[10]**
- i) ISO system
 - ii) ISO 9001
- b) Comment on : The concept of International trade. **[7]**

OR

- Q6) a)** Explain in detail Total Quality Management (TQM) system. **[8]**
- b) Explain in detail the procedure to import equipment from foreign source. **[6]**
- c) Write a note on Bill of entry. **[3]**
- Q7) a)** Explain the penalties violation to Boiler Act. **[6]**
- b) Explain in detail on the payment of gratuity Act 1972. **[6]**
- c) Define the term wages in detail. **[6]**

OR

- Q8) a)** Discuss in detail on : **[9]**
- i) Factories Act and
 - ii) Contract Act
- b) Discuss in detail the various methods of payment of wages Act. 1936, Which interest of the employee's are safeguarded by this Act? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4528

[Total No. of Pages : 2

[6404]-32

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 and Q.7 or Q.8.
- 2) Assume suitable data if necessary.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of electronic pocket calculator is allowed.

Q1) a) Explain the fundamentals of stability in terms of the pole-locations of a system on the complex plane.

Determine the stability of a process with following transfer function based on its pole-locations: **[9]**

$$G(s) = \frac{1}{3s^2 + 4s + 1}$$

- b) Using the Routh-Hurwitz criteria determine the stability of the closed loop system with the following characteristic equation: $CE = s^4 + 4s^3 + 6s^2 + 2s + 3 = 0$. **[9]**

OR

Q2) a) What is Root Locus plot? Mention the steps to draw the root locus diagram from the transfer function of a system. **[10]**

- b) Explain the selection of the type of controller (P, PI, PID) for various processes such as for liquid-level control, gas pressure control, flow control and temperature control. **[8]**

Q3) Sketch the Bode plots of the following system, listing each step in detail **[17]**

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

OR

Q4) a) State the Nyquist stability criteria. Draw the nature of Nyquist plots of I - order, II - order and dead-time systems and comment on their stability. **[7]**

- b) Derive the response equation of first-order system to a sinusoidal input. **[10]**

P.T.O.

Q5) Explain feed-forward control of a constant stirred tank heater with a neat process diagram. Derive the steady-state feed-forward controller equation. **[17]**

OR

Q6) Explain with a neat block diagram and relevant equations, how a Smith predictor is designed for a control system with dead time in the process. **[17]**

Q7) a) Describe the reconstruction of continuous signal from discrete time values using the zero-order and first-order hold elements. **[10]**

b) Design a ladder diagram of a liquid mixer system mixing inputs from two streams. **[8]**

OR

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

a) Microcomputer-based control systems

b) Heat Exchanger control system



Total No. of Questions : 8]

SEAT No. :

PD4529

[Total No. of Pages : 2

[6404]-33

B.E. (Chemical)

CHEMICAL REACTION ENGINEERING - II
(2019 Pattern) (Semester - VII) (409342)

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

- Q1)** a) What is catalyst Poisoning? Explain with various types of poisons. [9]
b) How the BET method used for determination of surface area of catalyst? [9]

OR

- Q2)** a) Derive the Langmuir adsorption isotherm equation and explain with assumptions. [9]
b) Explain the pore volume distribution methods of porous catalyst. [9]

- Q3)** a) Explain the selectivity for a porous catalyst in detail. [9]
b) Derive the expression for effectiveness factor of single cylindrical pore of the catalyst. [9]

OR

- Q4)** a) Explain the effectiveness factor in detail. [9]
b) Explain the significance of pore diffusion resistance. [9]

- Q5)** The second order reaction $A \rightarrow R$ is studied in a recycle reactor with large recycle ratio and the following data are recorded: [18]

Void volume of reactor = 1 lit

Weight of catalyst using : 3 gm

Feed to the reactor : $C_{A0} = 2$ mol/lit, $v_0 = 1$ lit/hr

Exit stream concentration = $C_{Aout} = 0.5$ mol/lit

- i) Find the rate constant for this reaction
- ii) How much catalyst is needed in a packed bed reactor for 80% conversion of 1000 lit/hr of feed of concentration, $CA0 = 1$ mol/lit.

Repeat part (b) if the reactor is packed with 1 part of catalyst to 4 part inert solid. This addition of inert helps maintain isothermal conditions and eliminate hot spots.

OR

P.T.O.

Q6) A small experimental packed bed reactor ($w = 1 \text{ Kg}$) using very large recycle of product stream given the following kinetic data: **[18]**

$A \rightarrow R$, and $C_{A0} = 10 \text{ mol/m}^3$.

$C_A, \text{ mol/m}^3$: 1 2 3 6 9

$V_0, \text{ lit/hr}$: 5 20 65 133 540

Find the amount of catalyst needed for 75% conversion for a flow rate of 1000 mol A/hr of $C_{A0} = 8 \text{ mol/m}^3$ feed stream

- a) in a packed bed reactor with no recycle of exit fluid,
- b) in a packed bed reactor with very high recycle.

Q7) a) Derive the M-M kinetic equation. **[8]**

b) Explain the fluidized bed reactor in detail. **[8]**

OR

Q8) a) Explain the inhibition in the enzyme catalyzed reaction. **[8]**

b) Give the features of M-M kinetic equation. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4530

[Total No. of Pages : 2

[6404]-34

B.E. (Chemical)

CHEMICAL ENGINEERING DESIGN

(2019 Pattern) (Semester-VII) (409343)

Time : 2½ Hours]

[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) *Figure to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Describe advantages and disadvantages of Double Pipe Heat Exchangers. [9]

b) Write a short note on plate type of heat exchanger. [9]

OR

Q2) a) Explain design procedure of Double Pipe Heat Exchanger. [7]

b) 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. 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:[11]

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

P.T.O.

- Q3)** a) Give the AIChE method for prediction of plate efficiency. [9]
b) Draw a neat sketch of a sieve plate performance diagram. [8]

OR

- Q4)** a) Describe the total plate pressure drop for the plate column in distillation. [7]
b) A mixture of benzene and toluene containing 50 mol% benzene is to be continuously distilled in a plate column, to give distillate containing 90 mol% benzene and bottom product containing 90 mol % toluene. The feed enters the column @10,000 kg/day. The relative volatility is 2.28 and the reflux ratio is 1.5 times the minimum. If the overall plate efficiency is 0.75 calculate the actual number of plates required. Find the column height if plate spacing in 450 mm. [10]

- Q5)** a) What are liquid distributors, their types & function? [9]
b) In which method for estimation of H_{OG} for a packed column is wetted area considered? Give details. [9]

OR

- Q6)** a) Write in short about. [9]
i) Installation of packing
ii) Liquid hold - up and
iii) Wetting rates
iv) Hold - down plate.
b) What is the significance of mGm/Lm in the design of packed column. [9]

- Q7)** a) Write the equations & design considerations for natural gas pipe line. [8]
b) Give the design considerations in condensate pipeline. [9]

OR

- Q8)** a) Write short notes on: [8]
Material for corrosion resistance
Pipe fittings
Pipe supports
Gasket Types, material and selection criteria
b) Explain Pipe line networks and their analysis for flow in branches. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4531

[Total No. of Pages : 2

[6404]-35
B.E. (Chemical)
ENVIRONMENTAL ENGINEERING
(Elective - III) (2019 Pattern) (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 and Q7 or Q8*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to right side indicate full marks.*
- 4) Assume suitable data if necessary.*

Q1) Explain following pollution control equipment with a neat sketch **[18]**

- a) Cyclone Separator
- b) Electrostatic Precipitator

OR

Q2) a) Explain in detail Source Correction Method for control of air pollutants. **[12]**

- b) A plate type electrostatic precipitator for use in a cement plant for removing dust particles consists of 0 equal channels. The spacing between the plates is 0.15 m and the plates are 2 m high and 2 m long. The unit handles 10000 m³/h of gas. What is the efficiency of collection? What should be the length of the plates for achieving 99% collection efficiency if other condition are the same? (Given $v_{pm} = 0.10$) **[6]**

Q3) a) What is Biochemical Oxygen Demand (BOD)? Derive the following relation for determining the 5-day BOD at 20 °C **[12]**

$$Y_5 = L_u - L_5 = L_u (1 - 10^{-Sk_1'})$$

- b) Write a note on Oxygen Sag Curve. **[5]**

OR

P.T.O.

- Q4) 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 note on Biochemical Oxygen Demand (BOD). [5]

Q5) Explain the process design and basic operating principle of activated sludge (suspended growth) process. [18]

OR

- Q6) a)** Explain with a neat sketch Upflow anaerobic sludge blanket reactor (UASB). [12]
- b) Write an explanatory note on photocatalytic reactors. [6]

Q7) Write notes on : [17]

- a) Sanitary land filling
- b) Disinfection by UV

OR

- Q8) a)** What are the principle sources of solid wastes? Discuss on classification of solid waste. [9]
- b) Write an explanatory note on nitrification. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4532

[Total No. of Pages : 2

[6404]-36

B.E. (Chemical)

MEMBRANE TECHNOLOGY

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define pervaporisation? Explain in details with suitable examples. [10]
- b) Derive an equation transport through microporous and dense membranes. [7]

OR

- Q2)** a) Explain in details about solution diffusion theory for dialysis. [10]
- b) Explain in details Knudsen diffusion and surface diffusion through microporous membranes. [7]
- Q3)** a) What is concentration polarisation? Give any one examples. [10]
- b) Explain methods of reducing concentration polarization. [7]

OR

- Q4)** a) What is membrane fouling? Explain with any one suitable example. [10]
- b) What is osmotic pressure? Give any one example. [7]

P.T.O.

- Q5) a)** Explain in details with neat sketches application of reverse osmosis for waste water treatment. **[10]**
- b) Explain in details application of nanofiltration membrane for organic solvent separation. **[8]**

OR

- Q6) a)** What is desalination? Give types of desalination? Explain in details problems in desalination. **[10]**
- b) Explain in details application of ultrafiltration membrane for separation of oil-water emulsions. **[8]**
- Q7) a)** Describe in detail with neat sketches application of membrane for carbon dioxide separation. **[10]**
- b) Define membrane distillation? Explain in details with neat sketches the type membranes distillation. **[8]**

OR

- Q8) a)** What is membrane bioreactor? Explain in details with neat sketches any one application of it. **[10]**
- b) Describe in details application of membrane for natural gas separation. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4533

[Total No. of Pages : 2

[6404]-37
B.E. (Chemical)
INDUSTRIAL PIPING
(2019 Pattern) (Semester - VII) (Elective - III) (409344C)

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) Which are the factors considered when the designer is locating equipment in the plot plan? **[9]**

b) Explain the piping layout consideration of **[9]**

i) Heat Exchangers

ii) Storage Tank

OR

Q2) a) Discuss different types of vibrations, their prevention and control. **[9]**

b) Describe the cathode protection for piping systems. **[9]**

Q3) a) Discuss the various steps and design parameters for slurry pipelines. **[9]**

b) Write detailed design procedure for dispersed flow. **[8]**

OR

Q4) a) Discuss the complex pipelines in series arrangement with typical examples. **[9]**

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

Q5) a) Describe the various steps for designing utility piping. **[9]**

b) Discuss piping design strategies for corrosive materials. **[8]**

P.T.O.

OR

Q6) a) Discuss piping arrangements and factors considered in the piping design of the heat exchanger. [9]

b) Discuss various empirical correlations for the flow of oil. [8]

Q7) a) Write down the different insulation material classifications mostly used in the industrial and commercial piping industry? [9]

b) An idealized centrifugal pump (blade outer radius of 50 mm) consumes 1.5 kW power while running at 2500 rpm. The entry of the liquid into the pump is axial and the exit from the pump is radial with respect to the impeller. If the losses are neglected, calculate the mass flow rate of the liquid through the pump kg/s. [9]

OR

Q8) Write a short note on : [18]

- a) Purpose and selection of insulation
- b) Optimum thickness of insulation
- c) Insulation for piping system



Total No. of Questions : 8]

SEAT No. :

PD-4534

[Total No. of Pages : 2

[6404]-38

B.E. (Chemical)

PETROLEUM REFINING

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

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) What is the coking process? Describe the coking process with a schematic diagram. [9]

b) Discuss various conversion processes used in refineries? Describe thermal cracking with a schematic diagram. [8]

OR

Q2) a) Describe the mechanism and working of the catalytic cracking process with a schematic diagram [9]

b) Describe the process of Hydro treating with typical schematic diagram[8]

Q3) a) What is a solvent extraction technique? Describe solvent extraction with a schematic diagram. [9]

b) Explain in detail about various properties of lube oil. [8]

OR

Q4) a) Discuss various types of lube oil additives and their properties. [10]

b) Describe the dewaxing process with a neat schematic diagram. [7]

Q5) a) Write in detail about the thermal cracking of H₂S. [10]

b) Discuss the environmental pollution aspects in the refinery. [8]

OR

P.T.O.

Q6) a) Describe the process of hydrogen treatment with the typical schematic diagram. **[9]**

b) Describe the hydrogen management systems in the refinery with neat schematic diagram. **[9]**

Q7) a) What is the blending operation and explain the line blending operation?**[9]**

b) What are the recent advances in the transportation techniques used in refineries? **[9]**

OR

Q8) a) Explain the effect of additives on the quality of refinery products **[9]**

b) Write in details about housekeeping strategies used for petroleum and petroleum products. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4535

[6404]-39

[Total No. of Pages : 2

B.E. (Chemical)

CHEMICAL PROCESS SYNTHESIS

(2019 Pattern) (Semester - VII) (409345A) (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 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) Discuss various types of dryers. [8]

b) Explain simple distillation with suitable example. [8]

OR

Q2) Write notes on following for separation of mixtures: [16]

- a) Filtration
- b) Electrostatic Precipitation.

Q3) Write short note on. [18]

- a) Process Constraints
- b) Furnaces

OR

P.T.O.

- Q4)** a) Discuss integration of refrigeration cycle. [9]
b) Explain threshold problems in integration of heat pump network. [9]

- Q5)** a) Explain the concept overall heat exchanger network and utilities. [9]
b) Explain the Problem Table Algorithm in Pinch technology. [9]

OR

- Q6)** Write short note on: [18]
a) Energy Targets.
b) Composite Curves.

- Q7)** Write short notes on: [18]
a) Fire Hazards in Chemical Industry.
b) Hazard triangle.

OR

- Q8)** a) Explain the attenuation of hazardous materials on human health. [9]
b) Write in brief role of safety engineer in chemical industry. [9]



Total No. of Questions : 8]

SEAT No. :

PD4536

[6404]-40

[Total No. of Pages : 2

B.E. (Chemical)

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

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

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) Write an explanatory note on the successful entrepreneurial ventures development. **[9]**

b) Why do entrepreneurs fail? Discuss along with the typical examples. **[9]**

OR

Q2) a) Explain the role of EDII and NIESBUD in entrepreneurship development. Discuss successful entrepreneurial ventures development. **[9]**

b) Describe the role of central and state government in promoting entrepreneurship development **[9]**

Q3) a) Explain verbal and nonverbal communication skills in managerial work. **[9]**

b) Write an explanatory note on team role theory by Belbin. **[8]**

OR

Q4) a) Discuss the management roles and theories of Henry Mintzberg. **[9]**

b) Explain the hierarchy of needs given by Abraham Maslow. **[8]**

P.T.O.

- Q5)** a) Elaborate on computer-based project management. [9]
- b) Discuss the concept of adding resources to the model for project development. [8]

OR

- Q6)** a) Elaborate on handling multiple projects with typical examples. [9]
- b) Describe business excellence techniques through six sigma and kaizen. [8]

- Q7)** a) Write a note on marketing research, product & brand management. [9]
- b) Describe the role of marketing in society and the firm. [9]

OR

- Q8)** a) Describe the sampling design and data collection methods. [9]
- b) Describe promotion and pricing techniques with typical examples. [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4537

[6404]-41

B.E. (Chemical)

GREEN TECHNOLOGY

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Life Cycle Assessment in detail. **[8]**

b) Discuss Environmental Management Systems. **[8]**

OR

Q2) a) Explain Integrated Pollution Prevention and its Control in detail. **[8]**

b) The Importance of Measurement in Production of Safer Gasoline. **[8]**

Q3) Explain with example and applications of Supercritical Fluids, Supercritical Carbon Dioxide, Supercritical Water. **[18]**

OR

Q4) a) Discuss Solvent-free Systems with example. **[9]**

b) Explain Water-based Coatings in detail. **[9]**

P.T.O.

Q5) a) Explain the Design for Energy Efficiency in Chemical industry with example. [9]

b) Explain applications of Sonochemistry in Green Chemistry. [9]

OR

Q6) a) Explain the concept of Designing greener processes for Conventional Reactors. [9]

b) Explain the Microwave-assisted Reactions. [9]

Q7) a) Explain the Greening in Leather Manufacture and Tanning industry. [9]

b) Write in brief on Electrochemical Synthesis with example. [9]

OR

Q8) a) Explain An integrated approach to a greener chemical industry in detail.[9]

b) Write note on Green Chemical Supply Strategies. [9]



Total No. of Questions : 8]

SEAT No. :

PD4538

[6404]-42

[Total No. of Pages : 2

B.E. (Chemical)

ADVANCED SEPARATION PROCESSES - I

(2019 Pattern) (Semester - VII) (409345D) (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 the right indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) Explain in detail separation based on reversible chemical complexation. **[10]**

b) Explain reactive extraction process with applications. **[8]**

OR

Q2) a) Explain reactive distillation process with applications. **[10]**

b) Explain characteristics of the complexing agents used in chemical complexation. **[8]**

Q3) a) What is working principle and mechanism of pervaporation? Discuss the flux equation along with applications **[7]**

b) Explain dialysis and electrodialysis with neat sketches and its applications. **[10]**

OR

Q4) a) What is fouling and concentration polarization? discuss the methods of controlling fouling. **[7]**

b) Explain the principle, working and applications of reverse osmosis technique with design principles. **[10]**

P.T.O.

Q5) Explain in details with neat diagram (i) Pressure Swing Adsorption (PSA) and (ii) Temperature Swing Adsorption (TSA). **[18]**

OR

Q6) a) Describe the types of chromatography. **[8]**

b) Give the characteristics of solid adsorbents and liquid chromatography. **[10]**

Q7) a) Give industrial examples of Molecular sieves. **[7]**

b) Explain the principle and applications of froth floatation with neat diagram. **[10]**

OR

Q8) a) Explain zone electrophoresis and its industrial applications in detail. **[10]**

b) Explain Ultracentrifuge in details. **[7]**



Total No. of Questions : 8]

SEAT No. :

PD4539

[Total No. of Pages : 1

[6404]-43

B.E. (Chemical Engineering)

PROCESS MODELLING & SIMULATION

(2019 Pattern) (Semester - VIII) (409349)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Developed the Mathematical model for mixing process. Draw Neat Labeled Diagram and also state the assumption. [17]

OR

Q2) Developed the Mathematical model for double pipe heat exchanger. [17]

Q3) Develop a mathematical model for Flash Distillation column. Use usual notification. Write assumptions. Draw neat figure. [18]

OR

Q4) Develop a mathematical model for Mixer-Settler Extraction. Write assumptions. Draw neat figure. [18]

Q5) Consider a CSTR where an irreversible, first-order endothermic reaction takes place. Let C_A denote the concentration of the species A in the reactor, T_R and T_{in} denote the temperatures of the reactor and of the inlet stream, respectively, Q , is the heat added to/removed from the reactor, C_{A0} is the concentration of A in the inlet stream, V is the volume of the reactor, k_0 , E , ΔH are the pre-exponential constant, the activation energy, and the enthalpy of the reaction and C_p and ρ are the heat capacity and fluid density in the reactor. Develop a model that describes the evolution of the concentration and temperature in the reactor, using a systematic modeling approach that also outlines all assumptions made. [18]

OR

Q6) Develop a mathematical model for Trickle bed reactor. Use usual notification. Write assumptions. Draw neat figure. [18]

Q7) Describe in Detailed about Transient analysis of staged absorbers. [17]

OR

Q8) Develop a mathematical model for Effluent Treatment Plant. [17]



Total No. of Questions : 8]

SEAT No. :

PD-4540

[Total No. of Pages : 3

[6404]-44

B.E. (Chemical)

**PROCESS ENGINEERING COSTING & PLANT DESIGN
(2019 Pattern) (Semester - VIII) (409350)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Illustrate by using a tree diagram : Capital inputs and outputs for on industrial operation. **[8]**

- b) The purchased cost of a shell-and-tube heat exchanger (floating head and carbon-steel tubes) with 100m² of heating surface was \$ 4200 in 1990. What will be the 1990 purchased cost of a similar heat exchanger with 20m² of heating surface if the purchased cost capacity exponent is 0.60 for surface areas ranging from 10 to 40m²? If the purchased cost capacity exponent for this type of exchanger is 0.81 for surface areas ranging from 40 to 200m², What will be the purchased cost of a heat exchanger with 100m² of heating surface in 2000? **[10]**

OR

Q2) a) A company has three alternative investments, which are being considered. If incharge expects 15% rate of return on original investment, which one is better? **[8]**

Item	Investment 1	Investment 2	Investment 3
Initial fixed capital (Rs.)	100000	170000	220000
Working capital Investment (Rs.)	10000	10000	20000
Annual cash flow (Rs.)	30000	55000	60000
Annual expenditure (Rs.)	15000	25000	22000

- b) Explain in brief cumulative cash position with the graph showing effects of each flow with time for an industrial operation. **[10]**

P.T.O.

- Q3) a)** Illustrate the basic principle of an optimum design for thickness of insulation. [7]
- b)** The following equation shows the effect of the variables x & y on the total cost for a particular operation.

$$C_T = 2.33x + \frac{11900}{xy} + 1.86y + 10$$

Determine the values of x & y that will give the least total cost. [10]

OR

- Q4) a)** An organic chemical is being produced by a batch operation in which no product is obtained until the batch is finished. Each cycle consists of the operating time necessary to complete the reaction plus an additional time of 1.4 h required for discharging & charging. The operating time per cycle is equal to $1.5 P_b^{0.25}$ h, Where P_b is the kilograms of product produced per batch. The operating costs during the operating period are \$ 20 per hour, While the costs during the discharge charge period are \$ 15 per hour. The annual fixed costs C_F for the equipment vary with the size of the batch in the following manner :

$$C_F = 340P_b^{0.8} \text{ \$/yr}$$

Inventory & storage charges may be neglected. If necessary the plant can be operated 24 h/day for 300 days/yr. The annual production is 10^6 kg of product. At this capacity, raw material & miscellaneous costs, other than those already mentioned, amount to \$ 260000 per year. Determine the cycle time for conditions of minimum total cost per year. [10]

- b)** Explain Breakeven Chart for optimum analysis of production. [7]
- Q5) a)** Derive an expression for finding the optimum exit temperature of cooling water from a heat exchanger when the temperature of the material being cooled is not constant. [8]
- b)** Explain in brief about Pinch Technology Analysis as optimization application. [10]

OR

- Q6) a)** With an expression explain in brief optimum flow rate of cooling water in condenser. [10]
- b)** Describe in brief preparation of techno-economic feasibility report to establish a plant for refining of edible oil. [8]

- Q7)** a) Explain in brief role of project Engineer in plant design. [7]
b) Explain how to apply PERT for project development. [10]

OR

- Q8)** a) Differentiate between CPM and PERT with examples. [8]
b) Describe in brief procedures of start up and shut down in a chemical process plant. [9]



Total No. of Questions : 8]

SEAT No. :

PD4541

[6404]-45

[Total No. of Pages : 1

B.E. (Chemical)

ENERGY AUDIT AND CONSERVATION

(2019 Pattern) (Semester - VIII) (409351A) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write a note on impact of renewable energy on energy audit recommendations. [8]
b) What are the points which are required as the Post monitoring of energy conservation projects. [9]

OR

- Q2)** What are the different instruments which are utilized on the basis of types and accuracy for the audit and monitoring of the energy and its savings. [17]

- Q3)** Write all the points for evaluating costs and benefits of conservation measures. [18]

OR

- Q4)** Write a note on motivation of implementing energy conservation measures. Also provide the evaluating costs and benefits of conservation measures. [18]

- Q5)** With respect to the Energy Conservation Programs, explain about the program planning, setting goals and setting priorities. [17]

OR

- Q6)** a) Write a note on various elements of energy management program. [8]
b) What do you understand by Plant level organization? Explain with respect to the energy conservation programs. [9]

- Q7)** Provide in details the guidelines for improving heat pumps and cooling systems for energy conservation. [18]

OR

- Q8)** Provide in details the guidelines for improving lighting systems, motors and transformers for energy conservation. [18]



Total No. of Questions : 8]

SEAT No. :

PD4542

[Total No. of Pages : 2

[6404]-46

B.E. (Chemical)

CHEMICAL PROCESS SAFETY

(2019 Pattern) (Semester - VIII) (409351B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain following terms briefly : **[9]**

- i) Flammability limits,
- ii) Fire point,
- iii) Detonation,
- iv) Deflagration
- v) Mechanical Explosion

b) Describe ignition and auto-ignition temperature. **[9]**

OR

Q2) a) With the help of diagram, describe the Fire Triangle. **[9]**

b) Create a checklist with at least six items to identify fire hazards in any workplace. **[9]**

Q3) a) Describe various methods of Storage and handling of flammable and toxic chemical. **[9]**

b) List and explain miscellaneous design aspects for Preventing Fires and Explosions. **[8]**

OR

Q4) a) What bonding and grounding procedures must be followed to transfer a drum of flammable solvent into a storage tank? **[9]**

b) Explain working of ventilation and sprinkler systems for preventing fires and explosions. **[8]**

P.T.O.

Q5) a) Describe in short about the review of probability theory for risk assessment. [9]

b) Explain event tree and fault tree in the context of process safety. [9]

OR

Q6) a) Discuss in detail hazard and operability studies (HAZOP). [9]

b) Discuss in detail about the concept of risk assessment. [9]

Q7) a) Discuss in detail hazard models and risk data. [9]

b) Write short notes on: [8]

i) Technology and process selection.

ii) Prevention of hazard human element.

iii) Role of a Computer in safety.

OR

Q8) a) Explain emergency shutdown systems. [9]

b) Discuss in detail prevention of hazard human element. [8]



Total No. of Questions : 8]

SEAT No. :

PD4543

[6404]-47

[Total No. of Pages : 2

B.E. (Chemical Engineering)

COMPUTATIONAL FLUID DYNAMICS

(2019 Pattern) (Semester - VIII) (Elective - V) (409351C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Differentiate between Finite Volume and Finite Difference Methods with mesh grids. **[9]**

b) Differentiate between SIMPLE, SIMPLEC and SIMPLER algorithms. **[9]**

OR

Q2) a) What is pressure-velocity coupling? Explain in detail: **[9]**

b) What are upwind schemes? Discretize 2-D steady state Diffusion Equation using first order upwind scheme. **[9]**

Q3) a) Derive Reynold's averaged Continuity Equation for turbulent flow. **[9]**

b) What are Reynold's stresses? Derive equation for the Reynold's stresses for Turbulence flow. **[8]**

OR

Q4) a) List down turbulent models and explain k-ε equation model. **[8]**

b) Explain the turbulent flow modeling. Give the characteristics of turbulent flows. **[9]**

P.T.O.

- Q5) a)** What is slug flow? Explain in detail with the help of equations. [9]
- b) Differentiate between Euler-Euler and Euler-Lagrangian Models for multiphase flows. [9]

OR

- Q6) a)** Give detailed classification of multiphase flows. Explain slug flow pattern for horizontal flows. [9]
- b) Give governing equations for Multiphase flows based on homogeneous and heterogeneous flow considerations. Explain each term involved. [9]
- Q7) a)** What is post processing in CFD Simulation? Explain various results of post processing. [8]
- b) Give different models for CFD simulation. Explain various boundary conditions. [9]

OR

- Q8) a)** Write ten Applications of CFD simulations. Explain in detail use of CFD in Convective Heat transfer. [8]
- b) What are various stages of CFD simulations? Explain any one in detail. [9]



Total No. of Questions : 8]

SEAT No. :

PD4544

[6404]-48

[Total No. of Pages : 2

B.E. (Chemical Engineering)

ADVANCED MATERIALS

(2019 Pattern) (Semester - VIII) (Elective - V) (409351D)

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.*

Q1) a) What are ceramic materials? Explain in details types of ceramic materials and its properties. [10]

b) Explain in details about grain boundary engineering of ceramic materials. [7]

OR

Q2) a) Explain in details about advancement in ceramic materials. [10]

b) Describe in details advanced powder synthesis techniques of ceramic materials. [7]

Q3) a) Explain in details with neat sketches about factors influencing the properties of composite materials. [9]

b) What is polymerisation? Explain in details about condensation polymerisation. [8]

OR

Q4) a) What are polymer composites? Explain in details with suitable examples. [9]

b) Explain in details about reinforcing and matrix materials used for polymer composites. [8]

P.T.O.

Q5) a) What are metal composites? Explain in details its mechanical behaviour and properties. [10]

b) Explain in details about significance of reinforce ceramics. [8]

OR

Q6) a) Explain in details with suitable examples ceramic composites. [10]

b) Short notes on : [8]

i) fabrication methods of ceramic composite

ii) Crack propagation and mechanical behaviour of ceramic composite

Q7) a) Describe in details fabrication methods and properties of carbon composites. [10]

b) Explain in details about ablative polymers and its applications. [8]

OR

Q8) a) What is nanomaterial? Explain in details any one methods of synthesis of nanomaterials. [10]

b) What are carbon composites? Explain in details its properties and uses. [8]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4545

[6404]-49

B.E. (Chemical)

CATALYSIS

(2019 Pattern) (Semester - VIII) (409352A) (Elective -VI)

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

Q1) Explain the mechanism of adsorption and its isotherms in detail. **[16]**

OR

Q2) Write short notes on the following. **[16]**

- a) Adsorption theories and concept of active site.
- b) Gas – solid catalytic reactions.

Q3) a) Explain mechanism of catalyst poisoning. **[9]**

b) Explain major steps involved in catalyst preparation and formation. **[9]**

OR

Q4) a) Explain the pore volume distribution in the catalyst. **[9]**

b) Explain mass transfer in the catalysis. **[9]**

Q5) Write short notes on the following. **[18]**

- a) Modification of zeolites
- b) Size and shape selectivity of zeolites

OR

P.T.O.

- Q6)** a) Explain the structure of Zeolites in details. [9]
b) Explain the catalyst cracking in detail. [9]

- Q7)** a) Write short note on lipases and microbes as catalyst. [9]
b) Give the features of MM kinetic equation. [9]

OR

- Q8)** a) Explain inhibition in biocatalyst. [9]
b) Give the kinetics of noncompetitive inhibition of enzyme reaction. [9]



Total No. of Questions : 8]

SEAT No. :

PD4546

[Total No. of Pages : 2

[6404]-50

B.E. (Chemical Engineering)

NANOTECHNOLOGY

(2019 Pattern) (Semester - VIII) (Elective-VI) (409352B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain principle and operation of SPM-AFM with neat sketch. **[8]**

b) State the basic difference between SEM and TEM. **[8]**

OR

Q2) a) Explain principle and operation of X-Ray Diffraction with neat sketch. **[8]**

b) Explain principle and operation of Scanning electron microscope with neat sketch. **[8]**

Q3) a) Explain de Broglie's hypothesis with necessary expressions. **[8]**

b) Define Semiconductors and write note on extrinsic and intrinsic semiconductors. **[10]**

OR

Q4) a) Explain the principle of Pauli exclusion and its application. **[8]**

b) Derive Schrodinger's equation. Explain it's any two applications. **[10]**

Q5) a) Explain the different chemical properties useful for nanocolloids. **[10]**

b) Explain the concept of colloidal stability and zeta potential. **[8]**

OR

P.T.O.

- Q6)** a) Explain the role of nanomaterials in photocatalysis. [10]
b) Explain experimental procedure for measuring contact angles with neat sketch. [8]

- Q7)** a) Explain health and environmental Impacts of nanotechnology? [10]
b) Describe the uses of nanomaterials in and as nano-machines and nano-electronics. [8]

OR

- Q8)** a) Explain application of nanotechnology in self cleaning materials. [8]
b) Explain in detail the use of nano-clay and nano-composites with their applications. [10]



Total No. of Questions : 8]

SEAT No. :

PD4547

[Total No. of Pages : 2

[6404]-51

B.E. (Chemical Engineering)

FUEL CELL TECHNOLOGY

(2019 Pattern) (Semester - VIII) (409352C) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss various hydrocarbon-based fuel cells with typical examples.[9]
b) Explain the cost estimation of H₂ fuel cell. [9]

OR

- Q2)** a) Explain internal Reforming. [9]
b) Discuss the general issues related to hydrocarbon-based fuel cell. [9]

- Q3)** a) Describe various anodic catalyst materials used in the construction of a Proton Exchange Membrane Fuel Cell and their possible functions in its working. [9]
b) Describe the working of PEMFC. [8]

OR

- Q4)** a) Describe in detail the osmotic drag coefficient, back diffusion flux and fuel crossover for PEMFC. [9]
b) Explain porous backing layer. [8]

- Q5)** a) Explain the Electrochemical Kinetics. [9]
b) Describe with the help of a diagram oxidation reaction on the TPB of an anode made of Ni - YSZ. [8]

OR

P.T.O.

Q6) a) Describe the Modeling of SOFC. **[9]**

b) Describe the concept of an Ohmic over potential for SOFC. **[8]**

Q7) Explain Microbial Fuel Cell and Enzymatic Fuel Cell with their advantage, limitations and application. **[18]**

OR

Q8) Explain Fuel Cell System Optimization. **[18]**



Total No. of Questions : 8]

SEAT No. :

PD4548

[Total No. of Pages : 1

[6404]-52

B.E. (Chemical)

PETROCHEMICAL ENGINEERING

(2019 Pattern) (Semester - VIII) (Elective - VI) (409352D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Write in detail the various separation and purification techniques involved in petrochemical industries. **[17]**

OR

Q2) Explain in detail the various furnaces utilized in the petroleum industry. **[17]**

Q3) With a neat and labelled diagram and reactions involved, explain the production of acids. **[18]**

OR

Q4) With a neat and labelled diagram and reactions involved, explain the production of glycols. **[18]**

Q5) With a neat and labelled flowsheet and reactions involved, explain the production of nylon 6. **[17]**

OR

Q6) With the help of the examples, explain the different types of polymerization involved in polymer industry in detail. **[17]**

Q7) Explain in detail about the integration of refinery and petrochemical plants with power generation. **[18]**

OR

Q8) Explain in detail about the safety considerations with respect to the petrochemical industry. **[18]**

x

x

x

Total No. of Questions : 8]

SEAT No. :

PD4549

[Total No. of Pages : 2

[6404]-53

B.E. (Civil Engineering)

FOUNDATION ENGINEERING

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the laboratory consolidation (Oedometer) test and its applications. **[6]**

b) Explain the graphic procedure for determination of preconsolidation pressure. **[5]**

c) If the average effective stress on 3.1m thick clay layer ($e_0 = 0.95$, $W_L = 60\%$) sandwiched between top pervious and bottom impervious layer increases from 76.45 kN/m^2 to 115 kN/m^2 . Calculate total consolidation settlement. If coefficient of consolidation is $5.6 \text{ mm}^2/\text{min}$, how many days it will take to reach 50% consolidation settlement, assume time factor of 0.197. **[6]**

OR

Q2) a) State any six assumptions of Terzaghi's 1-dimensional consolidation Theory. **[6]**

b) Explain logarithm-of-time method for determination of coefficient of consolidation. **[5]**

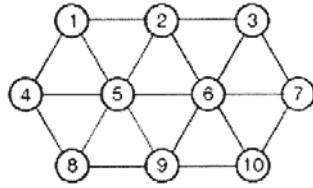
c) For a normally consolidated clay, $\sigma_0 = 200 \text{ kN/m}^2$, $e = e_0 = 1.22$, $\sigma_0 + \Delta\sigma' = 400 \text{ kN/m}^2$, $e = 0.98$. The hydraulic conductivity, k , of the clay for the loading range is $0.61 \times 10^{-4} \text{ m/day}$. How long (in days) will it take for a 4-m-thick clay layer (drained on one side) in the field to reach 60% consolidation? Assume for $U = 60\%$, the value of $T_{60} = 0.286$. **[6]**

Q3) a) Explain with neat sketch the separation of pile load into skin friction and point resistance using cyclic pile load test. **[6]**

b) Explain the classification of piles based on mode of transfer of loads. **[5]**

P.T.O.

- c) Explain Feld's rule for calculation of efficiency of pile groups. Determine the group capacity, for group of 10 piles, arranged in 3 rows spaced at 1m c/c. if single pile capacity is 450 kN. [6]



OR

- Q4)** a) Explain the consolidation settlement of pile group using approximate method with neat sketch. [6]
 b) What are the Micropiles? Give the applications of Micropiles. [5]
 c) A square pile group (3×3 formation) consist of 9 piles of 30 cm diameter, center to center distance of 0.75 m and 10 m length driven in the clay $C_u = 100 \text{ kN/m}^2$, $\gamma = 20 \text{ kN/m}^3$, Determine the safe load for the group if $N_c = 9$, factor of safety $FS=3$ and adhesion factor $\alpha=0.6$. [6]

- Q5)** a) Explain the concept of floating raft with neat sketch. [6]
 b) List the forces considered in the design of Well Foundations and explain any two forces in detail. [6]
 c) Distinguish the assumptions involved in analysis of a raft foundation by Rigid Foundation (Conventional Method) and Simplified elastic (Flexible) Foundation Method. [6]

OR

- Q6)** a) Explain proportioning of combined trapezoidal footing with neat sketch. [6]
 b) Explain the depth selection and ultimate bearing capacity of well foundation. [6]
 c) Explain with neat sketch the remedial measures for rectification of Tilts during sinking of well. [6]

- Q7)** a) What are coffer dams? Explain any one Cellular coffer dams with neat sketch. [6]
 b) Explain with neat sketch the design principles to be followed for construction of foundations on black cotton soil. [6]
 c) Explain R C Diaphragm Wall-Construction stages with neat sketch. [6]

OR

- Q8)** a) Explain with neat sketch the load carrying capacity of under-reamed pile in clayey soils. [6]
 b) List the methods for evaluation of swelling potential. Explain any one method for measurement of swelling pressure. [6]
 c) Explain the soil improvement method by pre loading with prefabricated vertical drains. [6]



Total No. of Questions : 8]

SEAT No. :

PD4550

[Total No. of Pages : 2

[6404]-54

B.E. (Civil Engineering)

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

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) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *Neat diagrams must be drawn wherever necessary.*

- Q1) a)** Explain any two important pavement surface characteristics with respect to highway geometric design. **[6]**
- b) Distinguish clearly between Camber and Super elevation. How super elevation is provided in the field. **[6]**
- c) Calculate the absolute minimum and ruling minimum radius of horizontal curve for a design speed of 80 kmph. **[6]**

OR

- Q2) a)** State and explain the factors governing the stopping sight distance. **[6]**
- b) Calculate safe stopping sight distance for a design speed of 100 kmph. Assume any other data suitability. **[6]**
- c) What are the various vehicular characteristics which affects the road design? Briefly explain. **[6]**

- Q3) a)** What are the desirable properties of the sub grade soil? **[6]**
- b) Explain the CBR and the test procedure for laboratory and field tests. How are the results of the test obtained and interpreted? **[6]**
- c) Explain how Impact Test on aggregates is done in the laboratory. How are the results of the test interpreted? **[6]**

OR

- Q4) a)** What is Foamed Bitumen? How foamed bitumen is prepared and where it is used. **[6]**
- b) Explain the Flash and Fire Point Test. **[6]**
- c) Discuss the desirable properties of bitumen. Compare tar and bitumen. **[6]**

P.T.O.

- Q5) a)** Draw a neat cross section of flexible pavement. Explain in brief functions of various layers of flexible pavement. [5]
- b)** Explain different stresses in flexible pavements. [6]
- c)** Compute the radius of relative stiffness of 15cm thick cement concrete slab from the following data: [6]

Modulus of elasticity of cement concrete = 210000 kg/cm^2

Poisson's ratio for concrete = 0.13

Modulus of subgrade reaction,

K =

i) 3.0 kg/cm^3

ii) 7.5 kg/cm^3

OR

- Q6) a)** Explain with sketch equivalent single wheel load ESWL. [5]
- b)** Calculate the stresses at interior and corner regions of cement concrete pavement using Westergaard's stress equations. Use the following data: [6]
- Modulus of elasticity of cement concrete = 300000 kg/cm^2
- Wheel load = 5100kg
- Pavement thickness = 18 cm
- Poisson's ratio for concrete = 0.15
- Modulus of subgrade reaction 6.0 kg/cm^3
- Radius of contact area = 15 cm
- c)** Explain the importance of dowel and tie bars in rigid pavements. [6]

- Q7) a)** Define Pier. Draw a neat sketch of the Hammer head shape pier and Multiple bent Pier. [6]
- b)** A bridge is proposed to be constructed across an alluvium stream carrying a discharge of $300 \text{ m}^3/\text{s}$. Assume silt factor, $f = 1.10$, determine the maximum scour depth when the bridge consists of 5 spans of 20 m each. [6]
- c)** Define Rail Gauge and explain its types. [5]

OR

- Q8) a)** Define Abutment. State the various types of abutments. Also State the requirements of good Abutments. [6]
- b)** A bridge has a linear waterway of 110m constructed across a stream, whose natural waterway is 190m. If the flood flow is 950 Cumecs and the mean depth of flow is 2.75m, Calculate the Afflux under the bridge. [6]
- c)** Explain the function of ballast. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4551

[Total No. of Pages : 3

[6404]-55

B.E. (Civil Engg.)

COASTAL ENGINEERING

(2019 Pattern) (Semester - VII) (401003A) (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) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) Define tide. What are the basic characteristics of tides? Explain the process of generation of tides? What affects tides in addition to Sun and Moon? [9]

b) 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, geo meteorological feasibility. [9]

OR

Q2) a) Classify the tides in detail based on the position of Earth, Sun and the Moon and based on the frequency of occurrence. Draw the neat diagrams wherever necessary. [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]

P.T.O.

- Q3) a)** Enlist the various factors which effect on the long shore sediment transport (littoral drift)? What are the characteristics of littoral drift materials? How particle fall velocity influences the littoral drift process? **[9]**
- b)** 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]**

OR

- Q4) a)** Write detail note about the enlisted factors determining Littoral Wave Climate and explain interdependency of these factors at the time of long shore sediment transport. **[9]**
- i)** Effect of Bottom Topography
- ii)** Winds and Storms,
- iii)** Nearshore Wave Climate
- b)** Draw a schematic profile representing the effect of littoral drift on shoreline and explain various effects of littoral drifts on the shoreline. What remedial measures should be provided to reduce the loss which occurs due to the littoral drift. **[8]**
- 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 for 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 in detail. **[9]**

- Q7) a)** What is a coastal zones? Draw a schematic diagram of coastal zone representing beach profile, surf zone, off shore zone and explain each term in detail. **[8]**
- b) What are the causes of pollution in coastal zone? Discuss the various issues for disposal of waste/dredged spoils in the coastal zones. **[9]**

OR

- Q8) a)** 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? **[8]**
- b) 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. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4552

[Total No. of Pages : 3

[6404]-56

B.E. (Civil Engg.)

**ADVANCED DESIGN OF CONCRETE STRUCTURES
(2019 Pattern) (Semester - VII) (401003B) (Elective - III)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat sketches must draw wherever necessary.*
- 3) *Figures to right indicate full marks.*
- 4) *Assume suitable data if necessary.*
- 5) *IS 456, IS 3370, IS 1893 and IS 13920 is allowed in the examination hall.*
- 6) *Use of non-programmable electronic calculator is allowed.*

Q1) a) For a T- shaped retaining wall draw the active earth pressure diagram showing the expression for maximum earth pressure for the following conditions. **[5]**

- i) Backfill is a completely submerged soil with top surface horizontal, and
 - ii) Backfill is horizontal with uniform surcharge w_s / unit run.
- b) Propose suitable dimensions and perform the stability analysis for L-shaped retaining wall provided to retain a horizontal levelled backfill of height 4.5 m having unit weight respectively equal to 16 kN/m^3 . Angle of repose = 30° , Coefficient of friction between concrete and soil = 0.54, SBC of soil = 165 kN/m^2 , depth of foundation = 0.95 m. **[12]**

OR

Q2) Design T-shaped retaining wall for levelled backfill for following data. Height of retaining wall is 5.2 m, angle of internal friction 30° , unit weight of soil is 19 kN/m^3 and SBC is 170 kN/m^2 . Coefficient of friction between base slab and underlying strata is 0.51. Draw lateral pressure diagram and details of reinforcement detailing of base and stem showing curtailment. **[17]**

P.T.O.

- Q3) a)** Design of circular water tank using IS code method for 2.1 lakh litres capacity. The joint between the wall and base of tank is rigid. The tank rests on ground. M-30 & Fe500. **[14]**
- b)** Enlist Methods for design of water tank & Explain any one. **[4]**

OR

- Q4)** Design the long wall for a rectangular water tank open at top resting on ground having a size of 8.0 m × 3.6 m × 2.5 m high. Use M 30 and Fe 500 grade material. Sketch details of reinforcement for the wall. **[18]**

- Q5) a)** Discuss different types of shear wall and explain the lateral load resistance mechanism for the shear wall. **[5]**
- b)** Design a ductile RC shear wall subjected to Shear Force = 521 kN, axial force = 8450 kN, and moment = 4850 kNm. Consider the height of the shear wall as 14m and length as 4.8m. Draw the ductile detailing of the shear wall. **[12]**

OR

- Q6)** Design a ductile solid shear wall with boundary elements, for a residential building, located in seismic zones V. Use M30 grade concrete and Fe500 grade of steel. Consider the height of shear wall as 16 m & length of shear wall as 4 m. The RC shear wall is subjected to the following loadings. Shear Force = 378 kN, axial force = 6700 kN, axial force on boundary element = 1180 kN and moment = 4650 kNm. **[17]**

- Q7)** Determine the seismic forces at each floor level for the commercial RCC structure. The building is a Four storey structure having total height 12 m with three frames placed c/c distance of 8 m forming two bay of size 6 m each. Storey height of 3 m is provided. The building is located in seismic zone III. The soil investigation revealed well graded gravel. The special moment resisting RC frames are in-filled with brick-masonry. The lumped weight due to dead loads may be taken as 16 kN/m². The floors are to cater a live load of 3.5 kN/m² on floors and 1.85 kN/m² on the roof. **[18]**

OR

- Q8) a)** Explain the Seismic Coefficient method for analysis to find lateral forces on a multi-storey Frame. **[4]**
- b)** A continuous three span beam ABCD have equal span of 6 m. The design data for the beam is as follows. The moments due to vertical loads are Support moments $M_A (-) = 54.78 \text{ kNm}$; $M_B (-) = 81.24 \text{ kNm}$, Mid span moments: $M_{AB} (+) = 49.51 \text{ kNm}$ and $M_{BC} (+) = 54.20 \text{ kNm}$. Earthquake moments are 167 kNm. Design the beam ABCD for combined effect of lateral and gravity loads for flexure only. Draw the ductile detailing of the reinforcement. **[14]**



Total No. of Questions : 8]

SEAT No. :

PD4553

[Total No. of Pages : 2

[6404]-57

B.E. (Civil)

**INTEGRATED WATER RESOURCES PLANNING AND
MANAGEMENT**

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Justify importance assessment of river water quality and write a brief note on prevention and control of surface water pollution. **[10]**
b) Explain polluters pay principle. **[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 water pricing. **[7]**

OR

- Q4)** a) Explain framework for planning a sustainable water future. **[10]**
b) Explain in brief economics and decision making in IWRPM. **[7]**

- 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

P.T.O.

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 plain. **[7]**

OR

Q8) a) Explain in detail Use of QGIS in IWRPM. **[10]**

b) Explain application of soft computing in flood control. **[7]**

* * *

[6404]-58

B.E. (Civil Engineering)

FINITE ELEMENT METHOD

(2019 Pattern) (Semester - VII) (Elective - III) (401003 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.
- 4) Assume suitable data, if necessary.

Q1) a) Derive the strain displacement matrix for four noded rectangular element using finite element formulation. [9]

b) Derive the natural coordinates of 1D bar element in $x - y$ coordinate systems. [8]

OR

Q2) a) What are the Serendipity element explain with example? Derive shape functions for 4 noded Serendipity elements. [9]

b) Derive the shape function for two noded beam element using polynomial in Cartesian coordinate system. [8]

Q3) a) Derive the formulation of stiffness matrix for 1D isoparametric element. [8]

b) Obtain strain displacement matrix for the quadrilateral element as shown in figure 1 using isoparametric formulation. [9]

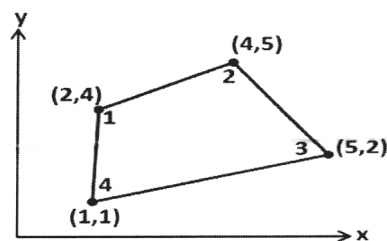


Fig. 1

OR

P.T.O.

- Q4) a) Explain in brief isoparametric, superparametric and subparametric elements with suitable example. [8]
- b) Derive the Jacobian matrix for the four noded quadrilateral isoparametric element having Cartesian coordinates at node 1(2, 1) node 2(4,2), node 3(3,4) and node 4(1,3). [9]

- Q5) Analyze the continuous beam as shown in figure 2 using finite element method. Take EI constant. [18]

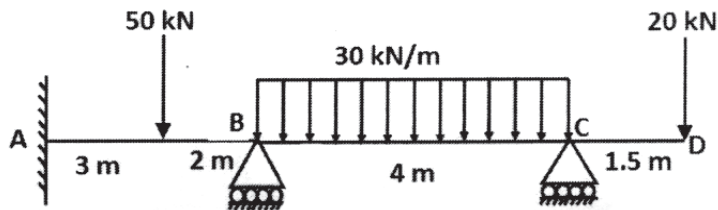


Fig. 2

OR

- Q6) Analyze the truss as shown in figure 3. Cross-sectional area of members are $AB = 1000 \text{ mm}^2$, $BC = 800 \text{ mm}^2$, $CA = 800 \text{ mm}^2$. Take $E = 2 \times 10^5 \text{ MPa}$. [18]

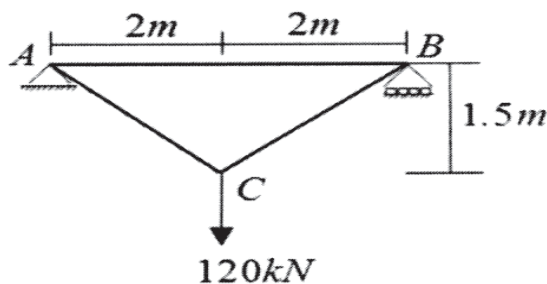


Fig. 3

- Q7) Analyze the rigid frame as shown in Fig 4 by using finite element method. Take EI constant. Neglect axial deformation. [18]

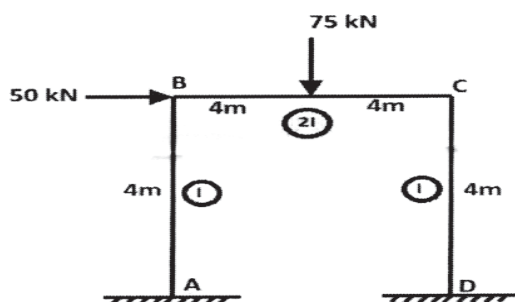


Fig. 4

OR

Q8) Using finite element method, determine unknown joint displacements of the grid as shown in figure 5. $E = 2 \times 10^5$ MPa, $I = 20 \times 10^5 \text{ mm}^4$, $G = 0.8 \times 10^5$ MPa, $J = 50 \times 10^5 \text{ mm}^4$. **[18]**

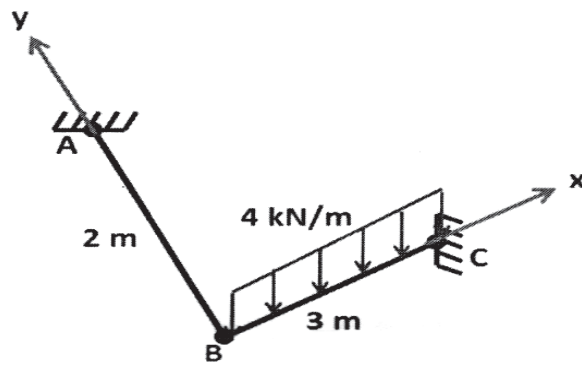


Fig. 5

* * *

[6404]-59

B.E. (Civil)

DATA ANALYTICS

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

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

- Q1) a)** The following table gives indices of the industrial production of registered unemployed (in lakhs). Calculate the value of the coefficient of correlation. [9]

Year	2008	2009	2010	2011	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

- b)** Suppose we have ranks of 8 students of B.Sc. in Statistics and Mathematics. On the basis of rank we would like to know that to what extent the knowledge of the student in Statistics and Mathematics is related. [9]

Rank in Statistics	1	2	3	4	5	6	7	8
Rank in Mathematics	2	4	1	5	3	8	7	6

OR

- Q2) a)** 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. [9]

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

P.T.O.

- b) Suppose we have ranks of 5 students in three subjects Computer, Physics and Statistics and we want to test which two subjects have the same trend. [9]

Rank in Computer	2	4	5	1	3
Rank in Physics	5	1	2	3	4
Rank in Statistics	2	3	5	4	1

- Q3) a)** Explain: [10]

- Hypothesis and hypothesis testing.
- Null and Alternate Hypothesis.

- b) The sales data of an item in six shops before and after a special promotional campaign are: [7]

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 percent level of significance. Use paired t-test. As per t table $t < -2.015$.

OR

- Q4) a)** Explain following methods of Hypothesis testing: [10]

- Z test
- t test

- 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 $v = 1$, $X^2_{0.05} = 3.84$) [7]

- Q5) a)** Explain with suitable examples. [9]

- Data Comparing
- Data Reporting
- Data Analysis

- b) The mean of a certain production process is known to be 70 with a standard deviation of 1.5. 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 10 items that gives a mean value of 46.5. What inference should the manager take for the production process on the basis of sample results? Use 5 percent level of significance for the purpose. (Table value: $R : z < -1.645$) [9]

OR

- Q6)** a) Enlist and explain needs of data Analytics lifecycle. Explain in detail. [9]
b) From the following data, obtain the two regression equations. [9]

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

- Q7)** a) What is Machine Learning? [6]
b) Explain linear regression with suitable example. [5]
c) Describe support vector machine with suitable example. [6]

OR

- Q8)** a) What are the applications of machine learning? [6]
b) Explain logistic regression with suitable example. [5]
c) Describe time series analysis with suitable example. [6]

* * *

[6404]-60
B.E. (Civil)
OPERATIONS RESEARCH
(2019 Pattern) (Semester - VII) (Elective - III) (401003 F)

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) Figures to the right indicate full marks.
- 3) Use of Calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the steps to handle following situations in assignment problem.[6]

- i) Restrictions on assignments
- ii) Unbalanced problem

b) Unit cost of transporting precast blocks from four factories to three sites is given along with availability at each factory and the requirement on each site. Obtain optimal solution to minimize cost of transportation.[12]

- i) Use VAM to find the initial feasible solution.

	1	2	3	supply
A	2	7	4	5
B	3	3	7	8
C	5	4	1	7
D	1	6	2	14
Demand	7	9	18	

- ii) Due to some reasons, transportation to site1 from factory A is not possible. Give the solution in this scenario.

OR

Q2) a) What are the applications of transportation problem in Construction industry? [4]

- b) Enlist methods for initial feasible solution of transportation problem. Explain any two in brief. [6]

P.T.O.

- c) A sales manager has to assign salesman to four cities. He has four candidates with varying experience and capabilities. The possible profits from each candidate as per the assignment are given below. Maximize the profit. [8]

	Cities			
Salesman	A	B	C	D
1	35	27	28	37
2	28	34	29	40
3	35	24	32	33
4	24	32	25	28

- Q3) a)** Solve following example using simplex Method. [8]

$$\text{Maximize } Z = x_1 + 0.5x_2$$

$$\text{Subject to } 3x_1 + 2x_2 \leq 12$$

$$5x_1 \leq 10$$

$$x_1 + x_2 \leq 8$$

$$-x_1 + x_2 \geq 4$$

$$x_1, x_2 \geq 0$$

- b) What are the limitations of Linear programming problems? [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

- Q4) a)** Solve using Simplex method [8]

$$\text{Minimize } Z = 60x_1 + 40x_2$$

$$\text{Subject to } 30x_1 + 10x_2 \geq 240$$

$$10x_1 + 10x_2 \geq 160$$

$$20x_1 + 60x_2 \geq 480$$

$$x_1, x_2 \geq 0$$

- b) Under which circumstances, Big M method is used? [4]

- c) Explain the significance of surplus and slack variables. [6]

- 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) Give the steps involved in steepest ascent/descent method. [8]
- c) What are similarities between Golden section method and Fibonacci method? [3]

OR

- Q6) a)** Optimize $Z = 4x_1 + 2x_2^2 + x_3^2 - 4x_1x_2$ using Lagrangian Multiplier method [10]
 Subject to $x_1 + x_2 + x_3 = 15$
 $2x_1 - x_2 + 2x_3 = 20$
 $x_1, x_2, x_3 \geq 0$
- b) Explain the following. [4]
 i) Hessian matrix
 ii) Gradient vector
- c) Write short note on non linear programming. [3]
- Q7) a)** Consider following payoff matrix for two opponents. [9]

		Opponent 2			
		P	Q	R	S
Opponent 1	A	6	4	8	0
	B	6	8	4	8
	C	8	4	8	0
	D	0	8	0	16

- i) Check whether there exists saddle point.
 ii) Give optimum strategy for both the opponents and find value of games
- b) In an investment project, seven units of money are available and its returns from three investment programs are as given under. What is the optimal investment policy? [8]

	0	1	2	3	4	5	6	7
Program 1	0	2	6	8	11	15	25	38
Program 2	0	3	5	9	12	15	25	40
Program 3	0	3	6	9	13	16	27	41

OR

Q8) a) Find the values of X and Y so that following game has a saddle point.**[6]**

		PlayerQ			
Player P	X	9	6	0	
	2	3	8	-1	
	-5	-2	10	-3	
	7	4	-2	Y	

b) Write the application of following OR techniques in the field of Civil Engineering. **[8]**

i) Replacement analysis

ii) Dynamic Programming

c) What are the applications of Dynamic Programming? Give suitable example in the Civil Engineering domain. **[3]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4557

[Total No. of Pages : 2

[6404]-61

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, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume any other data, if necessary.*

- Q1)** a) Enlist Various methods of Sampling Particulate matter and Explain any one in detail. [7]
- b) Describe WHO, Air Quality guidelines 2021. [5]
- c) Describe the Important functions of CPCB. [5]

OR

- Q2)** a) Explain with neat sketch location of sampling ports and traverse point.[7]
- b) Write a short note on high volume sampler. [5]
- c) What is iso kinetic, sub iso kinetic iso kinetic sampling? Why is it required?[5]
- Q3)** a) Describe the importance of Air Quality Modelling? [7]
- b) Explain the strength and limitation of clear ACT(1970). [5]
- c) Describe the responsibilities of Environmental Protection agencies. [5]

OR

- Q4)** a) State Classification of Air quality Modelling. [7]
- b) Write short note on USEPA. [5]
- c) Write short note on EPA. [5]

P.T.O.

- Q5)** a) A cylindrical Electrostatic precipitator of Diameter 0.3 m is used for Separating pulverized coal fly ash particles from a furnace gas stream. If volumetric flow rate of the gas is $0.05 \text{ m}^3/\text{s}$, what will be the length of the precipitator for obtaining a collection efficiency of 99.9%? what percent change in electrode collection area is required to increase the collection efficiency from 99.9 to 99.95%. [8]
- b) Write note on Fabric Filters. [5]
- c) What are the incinerators? Draw sketch and explain its working. [5]

OR

- Q6)** a) A monodispersed aerosol $1.99 \mu\text{m}$ in diameter is passed through a gravity settler 20 cm wide and 50 cm long with 18 plates and channel thickness 0.124 cm. the gas flow is rate 8.6 LPM and it is observed that it operates at an efficiency of 64.9% how many plates would be required to have the unit operate at 80% efficiency. [8]
- b) Write a note on flood and ducts. [5]
- c) Describe advantage and disadvantages of gravity settling chamber. [5]
- Q7)** a) Define indoor air pollution, state causes and effects of indoor air pollutants. [6]
- b) Explain Sick building Syndrome. [6]
- c) Explain air cleaning system for indoor air pollution control. [6]

OR

- Q8)** a) How can the indoor air pollution be controlled using ventilation? [6]
- b) Explain method of Measurements of odor. [6]
- c) Describe the method of oxidation used to eliminate odor. [6]



Total No. of Questions : 8]

SEAT No. :

PD4558

[Total No. of Pages : 2

[6404]-62

B.E. (Civil)

ADVANCED DESIGN OF STEEL STRUCTURES

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

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss the concept of buckling in light gauge sections and how it affects their design and stability. [5]
- b) Find permissible load on column for rectangular light gauge section $200 \times 120 \times 2$ mm. The effective length of column is 3.6m, Assume $f_y = 235$ N/mm². [12]

OR

- Q2)** a) Explain the advantages and disadvantages of using light gauge sections in steel structures. [5]
- b) Two 180×80 mm channel sections with folded lips are joined by their webs to function as a beam. The plate thickness is 2.5 mm, and the lip depth is 25 mm. The beam spans effectively for 4.1 meters. Calculate the permissible load that the beam can support, considering a material yield strength of 235 N/mm². [12]

- Q3)** a) How does the selection of circular hollow sections in tubular trusses influence the design procedure? [5]
- b) Design a hollow circular steel section to carry axial tensile load of 150 kN. Its length is 2.1 m. It is at right angle with other member. Also design welded connection. [13]

OR

P.T.O.

- Q4)** a) Explain the role of standard codes in the design of tubular structures. [5]
 b) Design a hollow circular steel section to carry axial compressive load of 150 kN. Its length is 1.8 m. It is at right angle with other member. Also design welded connection. [13]

- Q5)** a) What is a castellated beam, and how is it fabricated from a rolled steel section? [5]
 b) Design castellated beam for a simply supported beam carries live load of 5 kN/m and dead load of 4 kN/m over a span of 10 m. Assume compression flange of beam is laterally supported throughout the span. [12]

OR

- Q6)** a) Provide an overview of the codal provisions relevant to the design of castellated beams for bending and shear. [5]
 b) Design castellated beam for a simply supported beam carries live load of 9 kN/m and dead load of 6 kN/m over a span of 12 m. Assume compression flange of beam is laterally supported throughout the span. [12]

- Q7)** Find the collapse load W for the portal frame as shown in figure 1. [18]

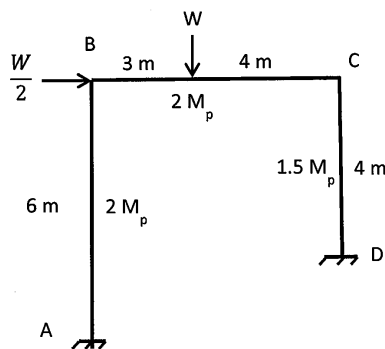


Figure 1

OR

- Q8)** Analyse the gable frame loaded and supported as shown in figure 2 and find plastic moment capacity M_p . Assume uniform cross section for all members of the frame. [18]

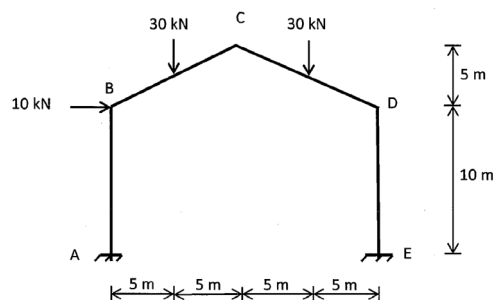


Figure 2



Total No. of Questions : 8]

SEAT No. :

PD4559

[Total No. of Pages : 3

[6404]-63

B.E. (Civil)

STATISTICAL ANALYSIS AND COMPUTATIONAL METHODS

(2019 Pattern) (Semester - VII) (401004C) (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) *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 Data sampling, its types, methods of sampling and ideal sample size selection with relevant examples. [5]
- b) Explain with an example Chi Square test. [6]
- c) Write a short note on Process of sampling and explain what is the meaning of “Null Hypothesis”. [6]

OR

- Q2)** a) Write a short note on Sampling Distribution of the Mean and the Central Limit. [5]
- b) Explain with an example Z test. [6]
- c) Write a short note on different types of samples with suitable examples on each. [6]
- Q3)** a) Explain in detail assumptions of Z test of Hypothesis. [6]
- b) 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.] Use Student T Test. [6]

P.T.O.

- c) 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.

OR

- Q4)** a) Explain : [6]

- Hypothesis and hypothesis testing
- Null Hypothesis
- One and two-sided hypothesis

- b) The figures given below are (i) the theoretical frequencies of a distribution and (ii) the frequencies of a normal distribution having the same mean, standard deviation and the total frequency as in (i). [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) 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 is 1 kg. Hence a random sample of 12 packages is drawn and their contents found (in kg) as follows: 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? Use Student T Test. [6]

- Q5)** a) Explain Correlation Analysis and its application to Civil Engineering. [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 Regression analysis and its applications to civil Engineering. [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 one and two-sided analysis of variance. [5]

- b) If X and Y are connected by the relation $ax^2 + by^2 = X$, find the value of a and b by rearranging the relation into linear form by using least square criteria for following data: [6]

x	1	2	3	4	5
y	3.35	5.92	8.43	10.93	13.45

- c) If the relation between x and y is of the type $y = a + bx$. Using following values of x and y, find the values of constants a and b for the best fitting curve. [6]

x	2.1	2.5	3.1	3.5	4.1
y	5.14	6.788	10.29	13.58	20.578

OR

- Q8)** a) Explain K-S test for goodness of fit. [5]

- b) For the tabulated values of x and y given below fit a linear curve of the type $y = mx + c$. [6]

x	1.0	3.0	5.0	7.0	9.0
y	1.5	2.8	4.0	4.7	6.0

- c) Fit a curve $y = ax^b$ using the following data: [6]

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



Total No. of Questions : 8]

SEAT No. :

PD4560

[Total No. of Pages : 2

[6404]-64

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, and Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of electronic pocket calculator is allowed.*

- Q1)** a) What is airport drainage? What are the functions and basic requirements of airport drainage? [6]
- b) Write note on (i) Augmented reality (ii) Virtual Reality. [6]
- c) Explain CBR method of flexible pavement design. [6]

OR

- Q2)** a) What is BIM (Building Information Modeling)? Explain in detail. [6]
- b) Define Airport Capacity. State the various factors affecting airport operating capacity. [6]
- c) Name the various methods used for designing flexible airport pavement and discuss in brief any one method. [6]
- Q3)** a) Describe the following terms :- (i) Apron marking (ii) Landing Direction Indicator (iii) Threshold marking [6]
- b) Discuss in brief the ICAO system of approach lighting. [6]
- c) What is heliport? State the various helicopter characteristics. [6]

OR

P.T.O.

- Q4)** a) Explain marking of heliport with neat sketch. [6]
b) What is VTOL and STOL? What are the advantages of STOL? [6]
c) Why lighting and marking of airport is required? Enlist parameters considered for heliport planning. [6]

- Q5)** a) What are the various methods commonly used in estimation of the flood discharge at a bridge site? [6]
b) What do you mean by economical span? Derive the equation for economical span, stating clearly the assumptions made in the derivation. [5]
c) Calculate flood discharge from a catchment of 65 square kilometer when the rainfall during a storm was 15 cm in two hours. The time of concentration is 20 hours and the runoff coefficient is 0.35. [6]

OR

- Q6)** a) Define following terms related to bridge (i) Effective span (ii) Freeboard (iii) Afflux. [6]
b) Sketch any two types of abutments and piers used in the construction of bridges. [5]
c) Describe in brief IRC class A and Class B Loading used for the design of bridges. [6]

- Q7)** a) Describe with neat sketch (i) Bascule bridge (ii) Suspension bridge. [6]
b) Differentiate between temporary and permanent bridges with example. [5]
c) Define culvert. Describe box culvert with neat sketch. [6]

OR

- Q8)** a) State the purpose of providing bearing in bridges. Enlist different types of bearing. [5]
b) Discuss any three types of movable bridges. [6]
c) Write short note on rigid frame bridges and cable stayed bridges. [6]



Total No. of Questions : 8]

SEAT No. :

PD4561

[6404]-65

[Total No. of Pages : 3

B.E. (Civil)

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

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

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *IS1343:2012 and IS456:2000 code of practice are allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) a) Explain the role of high-grade materials in pre-stress concrete. **[6]**

- b) An I Section post tensioned beam has 400mm × 100mm top flange; 200mm × 100 mm bottom flange; 100 mm thick web and 500mm overall depth. The pre-stressing force is 1200kN with the tendon placed centrally at the ends. Design the end bearing plate. The strength of concrete at transfer is 40 MPa. **[12]**

OR

Q2) a) Explain the concept of concordant cable profile with neat sketch. **[6]**

- b) A prestress concrete T-section beam is to be designed to support imposed load of 4.40kN/m² over an effective span of 5m the T-beam having flange 400 × 40mm & 100 × 200mm web The stress in concrete shall not exceed 15 MPa in compression and zero in tension at any stage. Check adequacy of section provides and find minimum prestressing force and corresponding eccentricity. Take Loss ratio 0.8. **[12]**

P.T.O.

- Q3) a)** Discuss the key factors influencing the determination of cable spacing in post-tensioned one-way slabs. [7]
- b) A highway bridge deck slab having span 10 m is to be design as one way pre-stress concrete slab with parallel post tension cables carrying an effective force of 620kN. The deck slab is required to support a UDL of 25kN/m. The permissible stress in concrete should not exceed 15 Mpa in compression and no tension is permitted at any stage. Design the spacing of the cable at their mid span section. Assume loss of pre-stress 20 %. [10]

OR

- Q4) a)** Evaluate the importance of serviceability considerations in determining the spacing of post-tensioning cables for two- way slabs with suitable example. [7]
- b) A simple flat slab $12\text{m} \times 9\text{m}$ supported by four columns. The 150 mm concrete slab weighs 3.5 kN/m^2 and carries a roof live load of 1.0 kN/m^2 , if grade of concrete 34 MPa, 6.4 mm wires grouped in 4 wires per unit are to be used for pre-stressing in two directions, Ultimate strength of the wires is 1724MPa with an initial prestress of 1034 MPa and an effective prestress of 862 MPa. Minimum Clear coverage of the cable is to be 20 mm which is equivalent to 35 mm protection measured to the center line of the cables. Compute the required numbers of cables per slab. [10]
- Q5) a)** Explain the design of a prestressed section for shear using the codal provisions. [7]
- b) A continuous flat slab spread over an area of $24\text{ m} \times 24\text{ m}$ is supported by columns of 500 mm x 500 mm with drop of $2\text{m} \times 2\text{ m}$ at 8 m c/c in both directions. Calculate design moments for an interior and exterior slab panel. Adopt $LL=4\text{ kN/m}^2$ and $FFL = 1.0\text{ kN/m}^2$. [10]

OR

- Q6) a)** Explain preliminary design considerations for prestressed two-way flat slabs using the direct design method. [7]
- b) A post tensioned prestressed concrete two-way slab $6.5 \times 9\text{m}$ with discontinuer edges to support imposed load of 4 kN/m^2 . Use S_3 having $F_y = 1900\text{ Mpa}$. Area of each strand is 100mm^2 , check against collapse and deflection at service load. Take Grade of concrete M40. [10]

- Q7) a)** A continuous pre-stressed - concrete beam with bonded tendons is shown in fig. :1 The C.G.s has an eccentricity at A is bent sharply at D and B and has parabolic curve for span BC. Locate the line of pressure (the C-line) in the concrete due to prestress alone not considering the dead load of the beam consider a prestress of 1112 kN. [10]

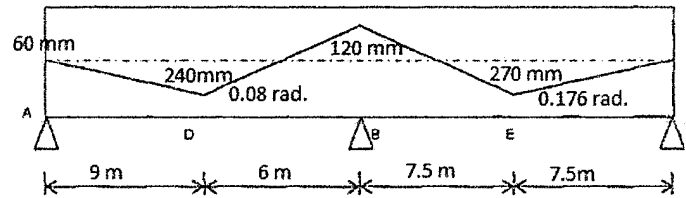


Figure No.1

- b)** A continuous prestressed concrete beam ABC ($AB=BC=10\text{m}$) has a uniform rectangular cross section with a width of 100 mm and depth of 300mm. The cable carrying an effective pre-stressing force of 360kN is parallel to the axis of the beam and located at 100 mm from the soffit.[8]
- Determine the secondary and resultant moment at the central support B.
 - If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. Assume density of concrete as 25 kN/m^3 .
 - Locate the resultant line of thrust through beam AB.

OR

- Q8) a)** Fig.2 shows a two span continuous beam. Corresponding to the cable profile provided locate the pressure line due to pre-stress alone. The pre-stressing force is 1250 kN. [10]

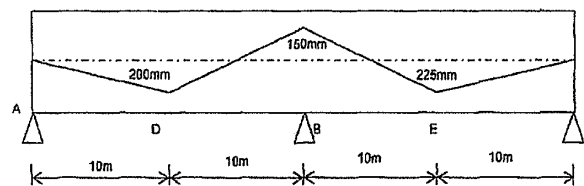


Figure No.2

- b)** Determine assumptions made for continuous pre-stress concrete beam and their effects and explain with neat sketch deviation of C-line from C.G.S. line moment in concrete due to pre-stressing in a continuous beam. [8]



Total No. of Questions : 8]

SEAT No. :

PD4562

[Total No. of Pages : 2

[6404]-66

B.E. (Civil)

FORMWORK AND PLUMBING ENGINEERING

(2019 Pattern) (Semester - VII) (401004 F) (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 indicates full marks.*
- 3) *Draw neat figures wherever necessary.*

- Q1)** a) Describe the formwork system typically used for columns, highlighting its features and advantages. [8]
- b) Explain the design consideration of formwork in details. [5]
- c) Draw the neat sketch of RCC wall formwork with its component parts. [4]

OR

- Q2)** a) How does proper formwork design ensure the strength and durability of a structure? [8]
- b) Draw the neat sketch of slab formwork with its component parts. [5]
- c) Enlist the Environmental load on formwork. [4]

- Q3)** a) Discuss the significance of premise plumbing in preventing waterborne diseases and ensuring public health. [9]
- b) Why is it important to adopt sustainable practices in plumbing? Discuss the environmental and economic benefits. [9]

OR

- Q4)** a) Role and responsibilities of plumbing designer. [9]
- b) Explain in detail role of plumber. [9]

P.T.O.

- Q5)** a) Explain frictional losses in pipes and state common plumbing fixtures. [5]
b) Give in details about types of fitting in plumbing. [6]
c) Which are different types of water supply systems in buildings? [6]

OR

- Q6)** a) Explain minor losses in pipes and state water efficient fixtures. [5]
b) Enlist and explain types of traps in plumbing. [6]
c) Which are different types of drainage systems in buildings? [6]

- Q7)** a) Calculate the total number of fixture unit for the G+1 residential building having 2 bath room shower, 1 kitchen sink with 15 mm tap, 2 water closet, 2 bath tub, 3 wash basin. [8]
b) Explain in detail about manhole in sewer line with neat sketch. [6]
c) Write down the different water supply demand based on population projection for different type of building as per Indian Standard. [4]

OR

- Q8)** a) State and explain methods for pipe sizing. [6]
b) Explain drainage fixture units for different plumbing fixtures. [6]
c) Draw plumbing plan for kitchen room with detailing. [6]



Total No. of Questions : 8]

SEAT No. :

PD4563

[Total No. of Pages : 2

[6404]-67

B.E. (Civil Engineering)

DAMS AND HYDRAULICS STRUCTURES

(2019 Pattern) (Semester - VIII) (401011)

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 for the sub-questions.*
- 4) *Assume suitable data if necessary and state them in your answer clearly.*
- 5) *Use non-programmable pocket size electronic calculator is allowed.*

- Q1)** a) Explain any one type of spillway in details. [5]
b) Differentiate between controlled and uncontrolled spillway. [5]
c) Design an ogee spillway for concrete gravity dam, for the following data. [7]

- i) Average river bed level = 160 m
- ii) Slope of D/S = 0.75 H: 1V, u/s face is vertical
- iii) Spillway crest RL = 265 m
- iv) Design discharge = 5750 m³/s
- v) Spillway length is 6 spans with a clear length of 7 m each.
- vi) Pier thickness= 2m.

OR

- Q2)** a) Explain the importance of energy dissipater. [5]
b) Draw a neat sketch of the type II stilling basin. [5]
c) Draw typical layout of radial gate showing all the components and explain their purposes. [7]

- Q3)** a) Explain the function of hearting and rock toe in earthen dam. [5]
b) Describe the method of plotting phreatic line for an earth dam with horizontal filter at the downstream. [5]
c) With the help of appropriate sketches explain Swedish slip circle method of stability analysis of an earth dam. [8]

OR

P.T.O.

- Q4)** a) Draw a neat sketch of a cross-section of earthen dam indicating the various components. [5]
 b) Briefly explain various causes of modes of failure of earthen dams. [5]
 c) Determine the factor of safety of downstream slope of (homogeneous section) an earth dam [8]

drawn to a scale of 1:650, for the following data:

Area of N-rectangle = 20 cm^2

Area of T-rectangle = 10 cm^2

Area of U-rectangle = 5 cm^2

Length of slip circle arc = 20 cm

angle of internal friction = 26°

cohesion $c = 24 \text{ kg/m}^2$

specific weight of soil = 18 kN/m^3

- Q5)** a) Explain the advantage and disadvantages of lining of canals. [5]
 b) What are the drawbacks of Kenned's theory. [5]
 c) Write short note on. [7]
 i) canal escapes
 ii) canal regulators

OR

- Q6)** a) Write note on Lacey's regime theory. [5]
 b) Explain necessity of canal lining. [5]
 c) Write short note on. [7]
 i) Canal falls
 ii) Canal outlets

- Q7)** a) Explain Khosla's theory of independent of seepage variable. [5]
 b) Explain the importance of exit gradient. [5]
 c) Explain in brief: [8]
 i) inlet and outlet
 ii) aqueduct

OR

- Q8)** a) Draw a labelled sketch of diversion headworks. [5]
 b) Compare bligh's and lane's creep theories of seepage. [5]
 c) Explain in brief: [8]
 i) Level crossing
 ii) Super passage



[6404]-68

B.E. (Civil)

QUANTITY SURVEYING, CONTRACTS AND TENDERS (2019 Pattern) (Semester - VIII) (401012)

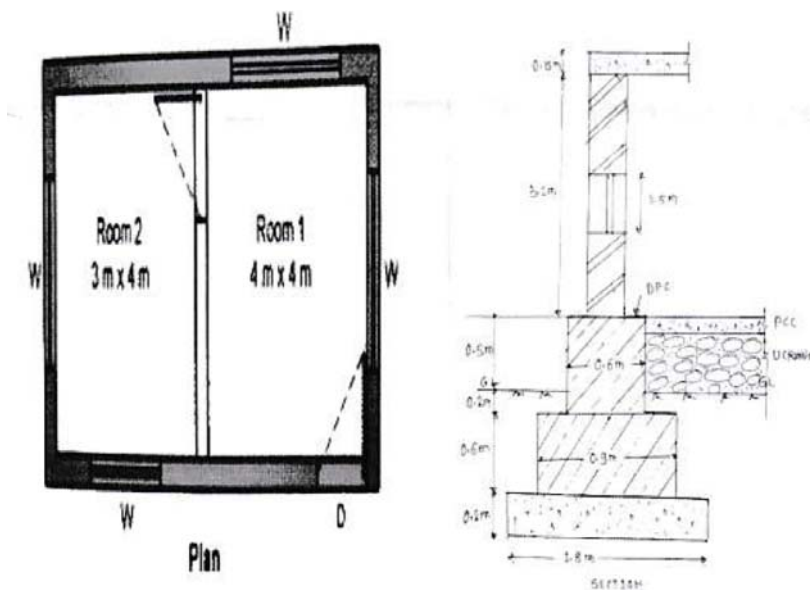
Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Describe in detail the concepts of the PWD method and the Centre Line method, using examples for better understanding. [6]
- b)** Figure shows plan and section of residential building, Determine the quantities of following item (PWD method) [12]
- i) Excavation in Foundation
 - ii) PCC in Foundation
 - iii) UCR masonry in CM (1 : 6) in foundation
 - iv) CR masonry in CM (1 : 6) in foundation
 - v) Damp proof course 3 cm thick

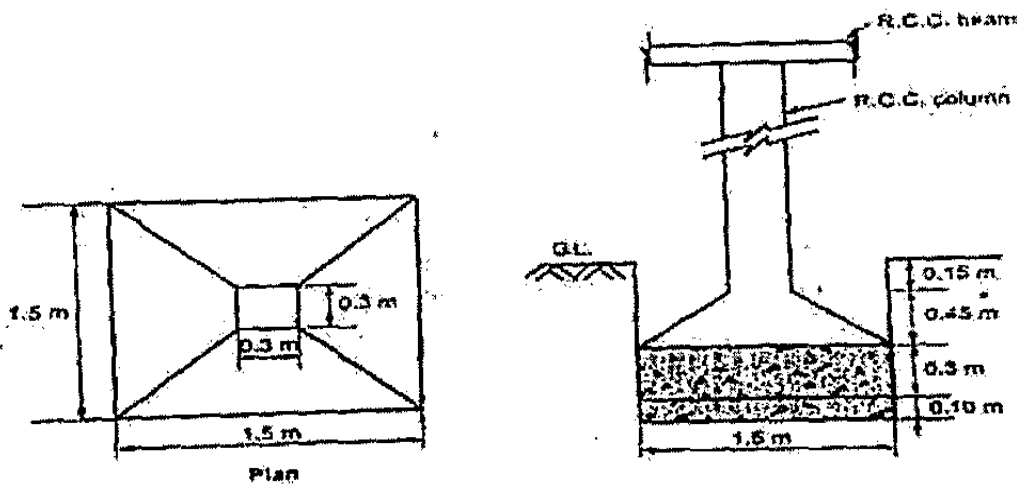


P.T.O.

OR

Q2) a) The plan and elevation for the column footing for an R.C.C. framed structure is shown in Figure work out the quantities for the following item of works. **[10]**

- i) Earth work excavation for foundation
- ii) Cement Concrete (1:2:4) for column footing



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

- i) Bar Bending Schedule
- ii) Types of Steel reinforcement
- iii) Weight of Steel Bar
- iv) Number of Bars or Stirrups

Q3) a) Differentiate between following methods **[8]**

- i) Mid sectional area method & Mean Sectional area method.
- ii) Trapezoidal formula method & Prismoidal formula method.

-
- Diagram illustrating the cross-section of a road with a formation line and a 3.5 m depth. The road is divided into sections with widths of 2.30, 0.90, 1.70, and 1.5. The total width is 180. The formation line is labeled 'Formation line' and the depth is labeled '3.5 m'. The road is labeled 'R.L. = 370.00'.

Q4) a) Explain different method to work out quantity of earthwork for Canal, Railway Embankment & Dam. **[8]**

b) Prepare an estimate of a pipe culvert for following item as shown in Fig. 4(a) and Fig. 4(b) **[10]**

i) Excavation ii) Earth filling iii) Rubble soling

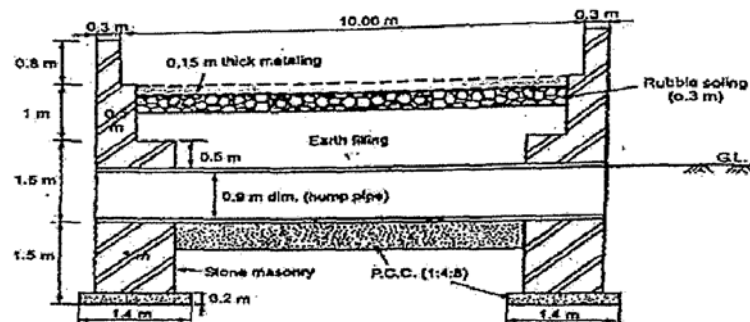
[illegible]

Fig. 4(b)

Q5) a) Using the standard format, conduct the rate analysis for the following item of work. Brickwork in a cement mortar 1:6. (take brick size as $19\text{cm} \times 9\text{ cm} \times 9\text{cm}$) [9]

b) Write a detailed specification for RCC work in superstructure. [8]

OR

Q6) a) Write a detailed specification for BBM in CM 1:6 for superstructure. [9]

b) What is task work? Why does it vary? Explain how the task work is useful in rate analysis of an item. [8]

Q7) a) A building is constructed at a cost of ₹ 30,00,000. The estimated useful life of the building is 70 years, and its residual (scrap) value at the end of its life is expected to be 10% of the original cost. Calculate the amount of depreciation for the 40th year using the following methods : [6]

i) Straight Line Method

ii) Diminishing Balance Method (Constant Percentage Method)

b) What do depreciation occur in the valuation of property. [5]

c) Identify six major factors that impact the assessment of property value, and explain it. [6]

OR

Q8) a) The depreciated replacement value of building has to be found with following details. [6]

i) Total built up area = 400 sq-m

ii) Age of building = 20 years

iii) Life of building = 80 years

iv) Scrap value = 10%

v) % of sinking fund = 5%

vi) Assume rate of construction as Rs. 2000/- per sq-m

b) Explain the concept of free hold and lease hold property. What are the reasons under which the property is leased and what are the liabilities of leaser and lease? [5]

c) Explain the following terms : [6]

i) Belting method of land valuation

ii) Sinking Fund Method



Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6; and Q.7 or Q.8.
- 2) Figures to the right, indicate full marks.
- 3) Neat diagrams should be drawn where ever necessary.
- 4) IS 1893 and IS 13920 are permitted in the examination.

Q1) Derive the expression for eigen values and eigen vectors for the system shown in Fig. 1. [18]

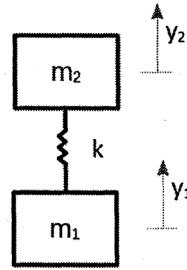


Fig. 1

OR

Q2) Calculate the natural frequencies and plot the mode shapes for the system shown in Fig. 2. Consider $m_1 = m_2 = m$ and $k_1 = k_2 = k_3 = k$. [18]

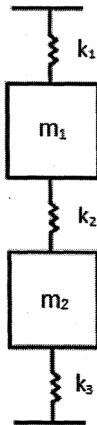


Fig. 2

Q3) Determine the total base shear as per the provisions of IS: 1893 and distribute along the height of the building for the building shown in Fig. 3. Consider the following data for the calculation.

- size of columns - (350×450) mm;
- size of beams - (350×450) mm;
- thickness of slab - 180 mm;
- live load - 3.5 kN/m²
- location of the building - zone II;
- soil condition - rock.

Any additional data required may be suitably considered.

[17]

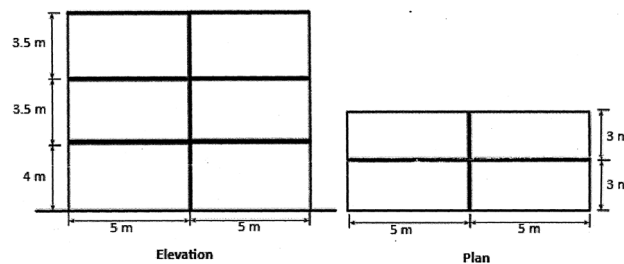


Fig. 3

OR

Q4) For the data given in Q.3, determine the total base shear as per the provisions of IS: 1893 and distribute along the height of the building if it is located in zone III.

[17]

Q5) The natural periods, and mode shapes for vibration of a building are given below. Calculate the design seismic forces by the dynamic analysis method. Any additional data needed may be suitably considered and clearly mentioned.

[18]

Natural		Mode 1	Mode 2	Mode 3	Mode 4
period, s		0.85	0.77	0.31	0.17
	Weight, kN	Mode shapes			
4 th floor	6,450	1.0	1.0	1.0	1.0
3 rd floor	8,860	0.9	0.6	-1.2	-0.8
2 nd floor	8,860	0.7	-1.1	-0.4	-0.8
1 st floor	8,900	0.2	-0.5	0.3	0.4

OR

- Q6)** The natural periods, and mode shapes for vibration of a building are given below. Calculate the design seismic forces by the dynamic analysis method. Any additional data needed may be suitably considered and clearly mentioned. [18]

Natural		Mode 1	Mode 2	Mode 3
period, s		0.82	0.55	0.32
	Weight, kN	Mode shapes		
3 rd floor	4,500	1.0	1.0	1.0
2 nd floor	4,500	0.2	-0.5	-0.4
1 st floor	4,500	0.8	-0.5	0.6

- Q7)** a) With suitable examples, explain how torsion is created in a structure. [9]
- b) Explain the different types of lateral load-resisting systems with neat diagrams. [8]

OR

- Q8)** a) How does ductile detailing contribute to the earthquake-resistant design of buildings? [9]
- b) What are shear walls? Explain, with neat diagrams, the different types. [8]



STRUCTURAL DESIGN OF BRIDGES

(2019 Pattern) (Semester - VIII) (401013 B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6; and Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *IS 1343, IRC 6, IRC 112, Bridge Rules and steel table are permitted in the examination.*

Q1) Design the intermediate prestressed post-tensioned concrete girder shown in Fig. 1. **[18]**

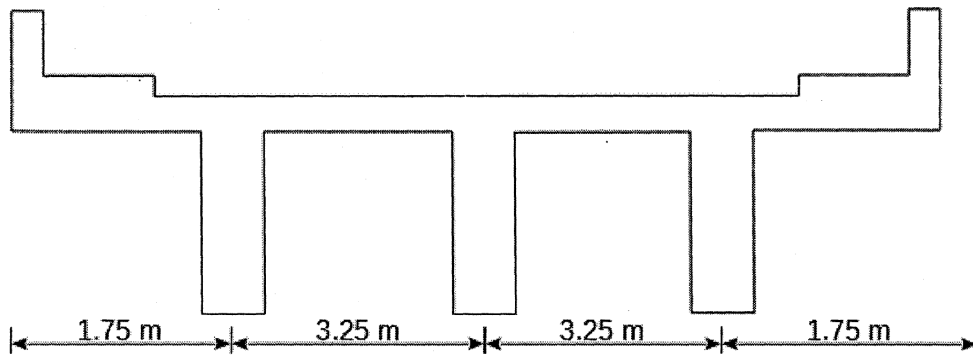


Fig. 1

The live load on the deck slab is IRC Class AA tracked loading. The following design parameters shall be considered for the design.

- a) grade of concrete for the girders = M-60;
- b) ultimate tensile of the steel = 2400 MPa. Any additional data may be suitably considered.

OR

Q2) For the problem data given in Q.1, design the external prestressed post-tensioned concrete girder. **[18]**

Q3) A simply supported railway welded plate girder bridge is to be designed for the given data: [17]

- a) Span 20.0 m;
- b) total load for bending moment = 2600 kN;
- c) total load for shear force = 2865 kN;
- d) CDA = 0.56
- e) yield stress of steel = 400 N/mm².

Design the plate girder and the end stiffeners. Assume suitably if additional data is required.

OR

Q4) For the data given in Q.3, design the cross section and the intermediate transverse stiffeners. [17]

Q5) Figure 2 shows the schematic of a single line BG railway bridge. [18]

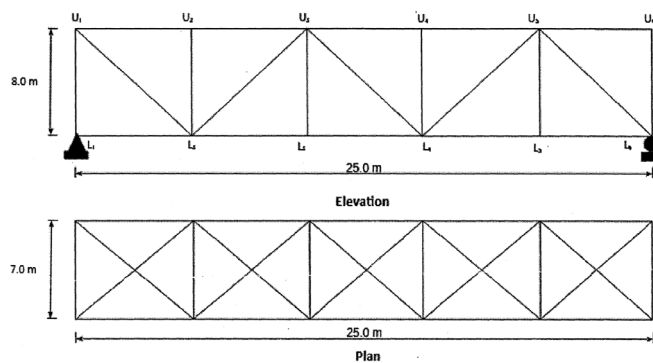


Fig. 2

The details for bridge are as follows:

- a) spacing of stringers = 1.8 m;
- b) weight of sleeper per meter on each girder = 0.72 kN/m;
- c) weight of rail per meter = 0.65 kN/m;
- d) EUDL for BM and SF = 3800 kN and 3000 kN respectively;
- e) CDA = 0.47;
- f) intensity of windload = 2.0 kN/m²
- g) racking force = 8.0 kN/m.

Design the stringers and the bracings for the stringers. If additional data is required, assume suitably and mention clearly.

OR

Q6) For the problem given in Q.6, design the top chord and the bottom chord members. [18]

Q7) a) Classify the different types of bearings used in concrete and steel bridges. [8]

b) What are elastomeric bearings? How are they designed? [9]

OR

Q8) a) Why are steel bearings preferred for steel bridges? [9]

b) How are steel bearings designed? Explain with a suitable example. [8]



Total No. of Questions : 8]

SEAT No. :

PD4566

[Total No. of Pages : 3

[6404]-71

B.E. (Civil)

IRRIGATION AND DRAINAGE

(2019 Pattern) (Semester - VIII) (401013 C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q. 6, Q.7 or Q.8.*
- 2) *Answers to the all questions should be written in single answer-book.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What is the NPSH of centrifugal pump? Distinguish between available NPSH and required NPSH. [6]
- b) Explain with neat sketch arrangement of various possible fittings at a submain intake from the main in a drip irrigation system. [6]
- c) Enlist component parts of lift irrigation system. Explain how to calculate power requirement of centrifugal pump in lift irrigation. [6]

OR

- Q2)** a) Define following terms related to centrifugal pump: [6]
- | | |
|---------------------|---------------------------|
| i) static head, | ii) manometric head, |
| iii) delivery head, | iv) gross head, |
| v) suction head, | vi) manometric efficiency |
- b) What is the general information required for the design of a drip irrigation system? [6]
- c) What are the advantages and disadvantages of drip irrigation system. [6]

- Q3)** a) Explain the steps for sprinkler irrigation system design. [9]
- b) Determine the system capacity for a sprinkler irrigation system to irrigate 20 hectares of a crop. Design moisture use rate is 7 mm/day. Moisture replaced in soil at each irrigation is 7.5 cm. Irrigation efficiency is 75 %. Irrigation period is 11 days in a 14-day interval. The system is to be operated for 19 hours per day. [8]

OR

P.T.O.

- Q4) a)** A sprinkler irrigation system is to be designed to irrigate 8 hectares of vegetables crops in deep silt loam soil in moderate dry climate. The field is flat. Determine the irrigation period, the net depth of water per application, the depth of water pumped per application and the required system capacity in hectare-cm per day. Assuming that the system is operated for 15 hours each day, determine the pump capacity in lit/sec.

Assume following data: [6]

Limiting application rate = 1.3 cm/hr

Moisture holding capacity of the soil = 9.5 cm/meter depth

Root zone depth = 60 cm

Irrigation to be stated at 50 % moisture depletion.

- b) Draw a labelled sketch showing components of a sprinkler irrigation system. What are advantages and disadvantages of sprinkler irrigation system. [6]
- c) Explain with neat sketch Fertilizer Applicator in sprinkler irrigation system. [5]

- Q5) a)** Explain influence of salts on the physical properties of soil. [5]
- b) Explain different engineering practices for salinity management. [6]
- c) Estimate the leaching requirement when the electrical conductivity (EC) of the saturation extract of the soil is 11 mmhos/cm at 25 percent reduction in the yield of cotton. The EC of irrigated water is 1.5 mmhos/cm. [6]

OR

- Q6) a)** What is leaching fraction? Explain how to compute leaching fraction. [6]
- b) What is sodicity? Explain how to calculate SAR? [5]
- c) A quantity of 100 ml of gypsum solution, having 29 meq/l concentration as calcium, on reacting with 6.5 gm of an alkali soil showed 30 meq/l of Ca+Mg concentration in the filtrate. Estimate the gypsum requirement in meq/100 gm soil. [6]

- Q7)** a) Explain steps involved in land forming in surface drainage. [6]
- b) It is required to design surface drainage for a new agricultural farm to drain out irrigation tail-water and seasonal rainfall runoff. The maximum rainfall intensity at the site in 30 years record is 40 mm/h. The tertiary drain would have to carry runoff from 6.5 ha land. The secondary drain would have to carry thrice of tertiary, and the main drain to carry discharge of five secondary drains (of similar flow). Determine the design discharge capacity of the [8]
- tertiary,
 - secondary, and
 - main drain.
- c) Enlist different types of drain pipes used for subsurface drainage and brief about anyone. [4]

OR

- Q8)** a) Explain different surface drainage system layouts. [6]
- b) What is composite drainage system? [3]
- c) Determine the required drain spacing (L) for the basic design criteria $q = 8$ mm/d, $H = 0.85$ m, pipe with outer diameter = 0.3 m and wet entry perimeter (u) = 0.45 m. $K_1 = 3.5$ m/day, $K_2 = 2.0$ m/day. $W = 1.5$ m, $D = 3$ m. Refer Fig. 8 (c). Use Hooghoudt's formula. Take only two trials. [9]

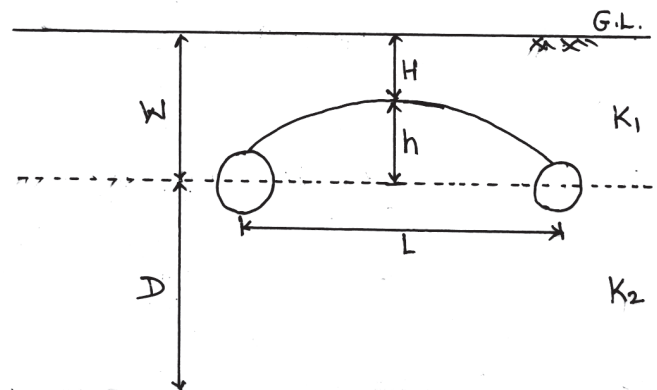


Fig. 8 (c)



Total No. of Questions : 8]

SEAT No. :

PD4567

[Total No. of Pages : 2

[6404]-72

B.E. (Civil)

**DESIGN OF PRECAST AND COMPOSITE STRUCTURES
(2019 Pattern) (Semester - VIII) (401013D) (Elective - V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures in bold to the right indicate full marks. .*
- 3) *IS 15916, IS 11384, IS 800 and IS 3935 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) Design a precast hollow-core slab to be used in a residential building. The slab is required to span a distance of 6 meters and support a uniformly distributed load of 5 kN/m². The live load is estimated to be 2 kN/m². The hollow-core slab will be made of high-strength concrete ($f_{ck} = 35 \text{ N/mm}^2$) and will have a total depth (h) of 200 mm, with a clear span (L) of 6 meters. The slab will have a width (b) of 1200 mm

[17]

OR

- Q2)** a) Describe design considerations for precast rectangular beam and I beam. **[9]**
- b) Calculate the number of precast slab panels and number of beams using specifications for components as per IS 15916 : 2010 for the room of size 3m × 4m. **[8]**

Q3) Compare the deflection of a steel-concrete composite beam(as described above)to that of a monolithic ISMB 400 steel beam. Use IS 456 : 2000 for concrete and IS 800 : 2007 for steel. Determine which design offers superior performance in terms of deflection under a uniformly distributed load of 12 kN/m. **[17]**

OR

- Q4)** a) Write a short note on “Composite Construction”. **[6]**
- b) Explain types of profile deck with the help of neat sketches. **[11]**

P.T.O.

- Q5) a)** Explain types of shear connectors with the help of neat sketches. [9]
- b) Explain load bearing mechanism of shear connectors. [9]

OR

Q6) Given the dimensions and material properties of the shear connectors (e.g., diameter, height, and shear strength), analyze and calculate the maximum shear load that the shear connection between the concrete slab and steel beam can withstand without failure. Compare this value with the applied load to ensure the design complies with IS codes. [18]

- Q7) a)** What are the various advantages of composite columns. [9]
- b) Explain with help of neat sketches partially and fully encased concrete encased column. [9]

OR

Q8) Assess the design of an encased composite column based on IS 11384: 2006, considering its capacity to withstand both axial loads and moments. Calculate the moment-curvature response of the column and ensure it complies with the Indian code. Discuss the implications for structural safety and potential design improvements. [18]



Total No. of Questions : 8]

SEAT No. :

PD4568

[Total No. of Pages : 2

[6404]-73

B.E. (Civil)

HYDROPOWER ENGINEERING

(2019 Pattern) (Semester - VIII) (401013-E) (Elective - V)

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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator (non-programmable) and steam tables is allowed.*

- Q1)** a) What is sedimentation in reservoir? How it is caused? [5]
- b) Explain the methods used in fixing installed capacity of hydroelectrical power plant. [6]
- c) In a power station annual factors are as under, Load factor = 60%, capacity factor=50% and use factor= 60%. The power plant has maximum demand of 450000kW, Find [6]
- i) Annual Energy Production
 - ii) Reserve capacity above peak point
 - iii) Hours per year the plant is not in use

OR

- Q2)** a) What are the functions of Forebay and Surge Tank? [5]
- b) The thermal power plant consists of 2×60MW units running for 8000 hours and one 30MW unit running for 2000h per year. Energy produced by power plant is 876×10^6 kWh per year. Determine plant load factor and plant load use factor. Assume maximum demand is equal to the plant capacity. [6]
- c) Define the terms : [6]
- i) Connected Load
 - ii) Diversity factor
 - iii) Maximum Demand

P.T.O.

- Q3)** a) What is instrumentation in power house? How instrumentation and control is achieved in case of powerhouse? [5]
b) Explain different types of intake structure in hydro power plant. [6]
c) Discuss different methods of designing penstock. What is meant by economical diameter. [6]

OR

- Q4)** a) Explain the three main divisions of power house structure with neat sketch. [5]
b) Explain underground powerhouse and types of layouts of underground powerhouse with neat sketches. [6]
c) Define Power house? Explain any four electrical equipment for the power house. [6]

- Q5)** a) Enlist types of Turbines. Write note on selection of turbines for power generation. [9]
b) Define Reaction turbine and Impulse turbine with Example. Differentiate between reaction and impulse turbine [9]

OR

- Q6)** a) What is cavitation? How can you minimize it? Also state effect of Cavitation. [9]
b) Define Turbine. Write short notes on : [9]
i) Governing of turbines
ii) Water hammer in turbines

- Q7)** a) What are the provisions related to licensing in case of hydroelectric power generation as per electricity act 2003? [9]
b) Write short note on tariff for electrical energy and types of tariffs for hydropower plants. [9]

OR

- Q8)** a) Explain the concept of carbon credit? Give its significance. Write long term plans to reduce CO₂. [9]
b) What are the duties of electricity generation companies. [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4569

[6404]-74

B. E. (Civil)

**STRUCTURAL AUDIT AND RETROFITTING OF STRUCTURES
(2019 Pattern) (Semester - VIII) (401013-F) (Elective - V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.*
- 2) *Neat 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 allowed.*
- 6) *Use of cellphone is prohibited in the examination hall.*

Q1) a) Detail the significance of Structural Health Monitoring (SHM), emphasizing the distinctions between short-term and long-term monitoring. Elaborate on how these monitoring durations cater to different aspects of structural assessment and contribute to the overall health and integrity of structures. **[9]**

b) Explain in detail the process of data acquisition in structural health monitoring. **[9]**

OR

Q2) a) State and explain the concept of global structural health monitoring techniques emphasizing the application. **[9]**

b) Explain in brief the role of artificial intelligence in structural health monitoring with a suitable example. **[9]**

Q3) a) Explore the role and application of jacketing as a retrofitting method. Include a detailed explanation of the process and benefits. Discuss any limitations associated with this technique. **[8]**

b) Explain process for retrofitting of historical structures in details with suitable example. **[9]**

OR

P.T.O.

- Q4)** a) Discuss the mass reduction technique as a method of retrofitting. Explain how this technique contributes to enhancing the seismic performance of structures. Provide examples and scenarios where the mass reduction technique is suitable and effective for retrofitting. [8]
- b) Explain the application and benefits of Ferro cement mesh in retrofitting structures. Evaluate the suitability of Ferro cement mesh for retrofitting RC structures, steel structures, and masonry structures. [9]
- Q5)** a) Discuss in detail the key considerations and limitations associated with the use of FRP in retrofitting. Discuss how international standards contribute to the development and implementation of FRP retrofitting techniques. [9]
- b) Explain the provisions outlined in ACI 440 regarding the retrofitting of RC columns using FRP for axial confinement. [9]

OR

- Q6)** a) Explain the concept of use of Fiber Reinforced Polymer (FRP) in retrofitting. Explain types of FRP and their properties. [9]
- b) Detail the process of FRP retrofitting using FRP plates. Include steps involved and discuss how this application improves the structural behavior of elements. [9]
- Q7)** a) Detail the process of shear strengthening in RC beams using FRP wrapping. Discuss the specific advantages and limitations of this technique. [8]
- b) Explain how the application of FRP for flexural strengthening improves the flexural strength and ductility of RC beams. [9]

OR

- Q8)** a) Describe the procedure for Retrofitting of RC Beams using FRP for flexural strengthening as per provisions of ACI440. [8]
- b) Explain in details retrofitting of structures using Fiber Reinforced polymers. [9]



Total No. of Questions : 10]

SEAT No. :

PD4570

[Total No. of Pages : 2

[6404]-75

B.E. (Civil)

TQM AND MIS

(2019 Pattern) (Semester - VIII) (401014A) (Elective - VI)

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, Q.9 or Q.10.
- 2) Neat diagrams should be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain in details Contribution in the field of quality by Deming & Cross by. **[6]**

b) Explain in details different measures to be taken on construction site to overcome the problem of poor quality? **[6]**

OR

Q2) a) Explain in details TQM? Explain need of TQM in construction industry. **[6]**

b) Explain in details quality control tools and explain any two in detail. **[6]**

Q3) a) Explain in details the types of construction defect? Explain any two with examples. **[6]**

b) Explain the historical evolution of TQM. **[6]**

OR

Q4) a) Explain in details principles of ISO 9001 and explain any two. **[6]**

b) Explain in details a checklist for RCC work for column. **[6]**

Q5) a) Explain CONQAS with suitable example. **[8]**

b) Explain in details Quality Function Deployment (QFD). **[6]**

OR

P.T.O.

- Q6)** a) Explain in details the contests of quality manual? Describe in brief. [8]
b) What do you mean by Quality Circle? List out its benefits. [6]

- Q7)** a) Explain CIDC-CQRA certifications. [8]
b) Explain in brief Benchmarking in TQM? Explain the benefits & limitations of the same. [8]

OR

- Q8)** a) Explain in brief cost of Quality with case study. [8]
b) Explain in details data & Information with suitable example. [8]

- Q9)** a) Explain zero defects with suitable example. [8]
b) Explain in brief Deming Prize & Malcolm baldrige award. [8]

OR

- Q10)**a) Explain subsystems of MIS in brief. [8]
b) Explain in brief any two National quality awards. [8]



Total No. of Questions : 8]

SEAT No. :

PD4571

[Total No. of Pages : 2

[6404]-76

B.E. (Civil)

**ADVANCED TRANSPORTATION ENGINEERING
(2019 Pattern) (Semester - VIII) (401014B) (Elective-VI)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Explain the significance of Non-Motorized Transportation (NMT) System for any country. **[6]**
- b) Explain the concept of pedestrian Level of Service. **[6]**
- c) Give your Suggestions for improvement of NMT system operating in your city. **[6]**

OR

- Q2) a)** Discuss the benefits of Non-Motorized Transportation System. **[6]**
- b) How NMT can help in Urban transport planning? Discuss. **[6]**
- c) What is active transport in NMT? Explain its types. **[6]**

- Q3) a)** The average normal flow of traffic on cross roads A & B during design period are 400 & 250 PCU per hour, the saturation flow values on these roads are estimated as 1250 & 1000 PCU per hour respectively . The All-Red time required for pedestrian crossing is 12 sec. design two phase traffic signal with pedestrian crossing by Webster's method. **[10]**
- b) Explain the relationship between speed, travel time, volume, density and capacity. **[7]**

OR

- Q4) a)** At right angled intersection of two roads, Road 1 has 4 lanes with total width 12 m & Road 2 has 2 lanes with total width of 6.6 m. The volume of traffic approaching the intersection during hour are 900 and 743 PCU/hr on the two approaches of Road 1 & 278 and 180 PCU/hr on two approaches of Road 2. Calculate pedestrian crossing time and minimum and revised green time for traffic as per IRC guidelines. **[10]**
- b) Write a note on the various traffic regulations & control measures. **[7]**

P.T.O.

- Q5) a)** Discuss in detail design of flexible pavement as per IRC 37. **[10]**
b) Differentiate between Rigid Pavement and Flexible Pavement. **[4]**
c) State the requirements of an ideal pavements. **[4]**

OR

- Q6) a)** Determine the total thickness of flexible pavement using equation for single layer **[6]**

Use following data:

Design wheel load = 4200 kg

Tyre Pressure = 6.0 kg/cm²

Elastic Modulus = 150 kg/cm²

Permissible Deflection = 0.25 cm

- b) What do you mean by pavement unevenness? How it is measured? What are the permissible limits as per IRC guidelines. **[6]**
c) Explain with neat sketch the functions of the component parts of the flexible pavement. **[6]**

- Q7) a)** Classify the various types of joints in rigid pavement and mention the object of each. **[6]**
b) What are the objects of providing dowel bar in rigid pavement? Explain. **[6]**
c) Compute the radius of relative stiffness of 25 cm thick cement concrete pavement. **[5]**

slab using the following data:

Wheel Load = 7000 kg

Modulus of Elasticity of concrete = 3.0×10^5 kg / cm²

Poisson's ratio = 0.15

Modulus of subgrade reaction = 30 kg / cm²

Radius of contact area = 28 cm

OR

- Q8) a)** Explain in brief the various types of overlays. **[6]**
b) Explain With neat sketches the various distresses in rigid pavements. **[6]**
c) What are the factors causing warping stresses in rigid pavement. **[5]**



Total No. of Questions : 8]

SEAT No. :

PD4572

[Total No. of Pages : 2

[6404]-77

B.E. (Civil)

GEO SYNTHETIC ENGINEERING

(2019 Pattern) (Semester - VIII) (401014C) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write the role of Geo-synthetics in effective filtration process. [9]
b) Define the erosion control design process. [9]

OR

- Q2)** a) Explain in detail the concept of re-composite drainage and its field application. [9]
b) How are wind and precipitation-related erosion managed with geo-grids? [9]

- Q3)** a) What are the different aspects that Geo-composites takes into account while designing pavements? [9]
b) What are the different mechanisms of crack propagation in asphalt overlays? [8]

OR

- Q4)** a) Describe in detail how geosynthetics are used in the design of airport pavement. [9]
b) What do mean by unpaved age of a paved roadway? [8]

- Q5)** a) What are the various failure modes of geosynthetic-reinforced soil retaining walls? Explain them briefly. [9]
b) Exactly how should geo-grids be positioned to reinforce soil? Use a clean drawing to help you illustrate. [9]

OR

P.T.O.

- Q6)** a) Explain in detail concept of geo-grid reinforced soil wall. [9]
b) Provide a list of various facing elements. Which one is the most economical? [9]

- Q7)** a) List the parameters affecting the load-bearing capacity of a geosynthetic-reinforced foundation soil. [9]
b) Give a brief description of a geocell mattress foundation. How will you assess its load bearing capacity? [8]

OR

- Q8)** a) Write a note on ground instrumentation and monitoring in ground improvement. [9]
b) Explain the step by step design of encased stone column used for soil improvement. [8]



Total No. of Questions : 8]

SEAT No. :

PD4573

[Total No. of Pages : 2

[6404]-78

B.E. (Civil)

STRUCTURAL DESIGN OF FOUNDATIONS

(2019 Pattern) (Semester - VIII) (401014D) (Elective - VI)

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) Assume suitable data, if necessary.
- 4) Use of electronic pocket calculator is allowed in the examination.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) When laterally loaded piles should be used? How modulus of subgrade reaction and relative stiffness is determined in laterally loaded piles? [5]
- b) 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]
- c) Classify the pile foundation with significance? [6]

OR

- Q2)** a) What is negative skin function? How it is calculated for single pile embedded in two layers of clay. [6]
- b) Explain steps for conducting static pile load test. [5]
- c) In a 16 pile group, the pile diameter is 45cm and center to center spacing of the square group is 1.5m. If $c=50$ kN/m², determine whether the failure would occur with the pile acting individually or as a group? Neglect bearing at the tip of the pile. All are 10m long. Take $m=0.7$ for shear mobilization around each pile. [6]

- Q3)** a) Explain in which conditions well foundation is useful for safe foundation? Enlist the forces acting on a well foundation. [6]
- b) Define shift and tilt of well foundation. Enlist any four ways to rectify the tilt. [6]
- c) Describe the components of Well foundation with neat sketch. [5]

OR

P.T.O.

- Q4)** a) Explain procedure for design of Well foundation by IRC method. [5]
b) Write a note on Pneumatic Caisson Foundation with neat sketch. [6]
c) Explain the procedure of sinking of well. [6]

- Q5)** a) What is the natural frequency of the foundation soil system? Explain Barken's method for its determination. [6]
b) What is requirements of machine foundation. [6]
c) State the criteria for design of foundation for Reciprocating type of machine (IS 2974 Part I: 1960). [6]

OR

- Q6)** a) State the criteria for design of foundation for Impact type of machine (IS 2974 Part II: 1966). [6]
b) Using Barken's expression for natural frequency and the amplitude of vibrations, calculate the change in the percentage amplitude in terms of r if the soil mass participating in the vibrations is 23% of m . Also calculate this change for $r = 0.3$ and $r = 2$. [6]
c) Explain the bulb of pressure concept. [6]

- Q7)** a) Write the assumptions made for the design of reinforced earth wall. Write steps involved in design of reinforced earth wall. [9]
b) Write the steps of stability analysis of gravity retaining wall. [9]

OR

- Q8)** a) Write a note on Flexible and rigid earth retaining structures with a neat sketch. [9]
b) Design cantilever retaining wall for the following data: [9]
Total height of wall is 5.5 m, depth of foundation is 1.8m, density of soil is 19 kN/m^3 , angle of internal friction is 30° , SBC of soil 285 kN/m^2 , coefficient of friction between base & soil is 0.5, level backfill. Assume M20 & Fe415 material, check the stability of retaining wall.



Total No. of Questions : 8]

SEAT No. :

PD4574

[Total No. of Pages : 2

[6404]-79

B.E. (Civil Engineering)

GREEN STRUCTURES AND SMART CITIES

(2019 Pattern) (Semester - VIII) (401014E) (Elective - VI)

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) Your answers will be valued as a whole.
- 4) Assume suitable data, if necessary.
- 5) Use of electronic pocket calculator and steam table is allowed.

Q1) Answer the following-

- a) How does BIPV technology impact the energy efficiency and overall performance of a building? **[6]**
- b) What is the role of government and regulatory bodies in promoting the adoption of ECBC 2017? **[5]**
- c) What are some of the challenges associated with implementing low OTTV design strategies in buildings? **[6]**

OR

Q2) Answer the following-

- a) What are the advantages of using BIPV technology in building design?**[5]**
- b) How does ECBC-2017 help in reducing energy consumption and greenhouse gas emissions in buildings? **[6]**
- c) What role can technology and innovation play in improving the OTTV of buildings? **[6]**

Q3) Answer the following-

- a) How can smart cities contribute to sustainable development and the achievement of the Sustainable Development Goals? **[6]**
- b) What are the key dimensions of a smart city, and how do they contribute to its functionality? **[6]**
- c) What are the key differences between conventional cities and smart cities, in terms of their components and infrastructure? **[5]**

OR

P.T.O.

Q4) Answer the following-

- a) What are the key phases/stages involved in a smart city project, and what are the objectives of each phase? [6]
- b) What are the key differences between primary energy demand and final energy demand? [5]
- c) How can statistical analysis help us to identify patterns and trends in data, and what are some of the common methods used for this purpose? [6]

Q5) Answer the following-

- a) How can human error be reduced in situations where reliability is important? Give suitable example. [6]
- b) How can reliability on the predictability scale be improved in complex and dynamic systems? Give suitable example. [6]
- c) How has the “100” smart cities initiative contributed to the sustainable development of Indian cities? [5]

OR

Q6) Answer the following-

- a) Write a note on: [12]
 - i) PV application
 - ii) Solar thermal energy
 - iii) Singular solar cells
 - iv) Hybrid solar cells
- b) What are the potential drawbacks of upgrading conventional cities to smart cities? [5]

Q7) Answer the following-

- a) Discuss the benefits of using AI in smart city projects and how it can improve the quality of life for citizens. [7]
- b) Explain the role of government, private sector, and civil society in achieving the SDGs. [7]
- c) What are the Sustainable Development Goals (SDGs) and why were they created? [5]

OR

Q8) Answer the following-

- a) What is SDG 11, and why is it important? [5]
- b) Discuss the role of municipal bonds in financing smart city projects in India. [7]
- c) What are the future prospects for using AI in smart city development, and how can it help to build more sustainable and efficient cities? [7]



Total No. of Questions : 8]

SEAT No. :

PD4575

[Total No. of Pages : 2

[6404]-80

B.E. (Civil Engineering)

RURAL WATER SUPPLY & SANITATION

(2019 Pattern) (Semester - VIII) (Elective- VI) (401014F)

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 calculator is allowed.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain in detail the criteria for site selection for an intake well of a village. [6]
- b) Explain in detail: need and components of WTP w.r.t. village WS scheme. [5]
- c) Compare Gravity Flow v/s Pumped Flow based system. [6]

OR

- Q2)** a) Explore different examples of retrofitting projects in water supply systems. Discuss in detail: the methodologies, techniques, and technologies used to adapt existing infrastructure to enhance water availability, quality, and distribution. [6]
- b) Explain importance of understanding and calculating scour depth for an intake well of a rural WS scheme. [6]
- c) Explain with neat sketch: MBR [2+3=5]

- Q3)** a) Enlist any 04 electro – mechanical components used in rural WS scheme. Explain any 01 in detail. [2+4=6]
- b) Explain in detail how the pumping capacity will vary for 08 hour supply scheme and 24 hour supply scheme. [6]
- c) Explain in detail: how the hydraulic testing of pipeline is carried out. [6]

OR

- Q4)** a) Enlist any 04 valves used in WS scheme. Explain in detail: importance of any one type of valve used in WS scheme. [2+4=6]
- b) Enlist any 02 materials that are commonly used for Rising Main. Explain any one in detail. [6]
- c) Discuss the potential benefits and outcomes of interdisciplinary research in rural water supply management and policy-making. [6]

P.T.O.

- Q5)** a) Explain in detail: use of GPS in WS scheme designing. [6]
b) Explain the significance of pH sensors in water supply schemes. How do pH measurements help in assessing water quality, corrosion potential, and the effectiveness of disinfection processes. [6]
c) Explain the operational principle of an auto pump controller. How does it monitor and respond to changes in water demand, pressure levels, or tank levels to automatically start, stop, or adjust pump operation accordingly. [5]

OR

- Q6)** a) Explain how telescopic water metering in Malakapur City has resulted into awareness of water conservation amongst the villagers? [6]
b) Explain the concept of remote monitoring and control in auto pump controllers. How can they be integrated with supervisory control systems or connected to IoT platforms for centralized monitoring, data logging, and remote operation? [6]
c) Explain in detail: how does SCADA facilitate real-time monitoring and control of water supply systems. [5]

- Q7)** a) Explain in detail: participatory rural appraisal and it's documentation for rural WS scheme. [6]
b) Explain in detail: how the type of material selection affects the probable leakages in WS project? [6]
c) Explain in detail: role of villagers in preventive maintenance of the village WS Scheme. [6]

OR

- Q8)** a) Explain in detail: how workmanship affects the leakages in a WS scheme. [6]
b) Explain various drawings required to be prepared for a rural WS project at various stages of the project. [6]
c) Explain importance of participatory approach and training to villagers for making the village rural WS scheme sustainable. [6]



Total No. of Questions : 8]

SEAT No. :

PD4576

[Total No. of Pages : 3

[6404]-81

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

Q1) a) Give a mathematical formulation for:

[8]

- i) Fractional Knapsack problem
- ii) 0/1 Knapsack problem.

b) Consider a set of seven activities. The start and finish time of these activities are given in the following table. **[9]**

Activity	Start time	Finish time
A	1	3
B	3	4
C	2	5
D	0	7
E	5	9
F	8	10
G	11	12

Use the greedy algorithmic strategy to compute an execution schedule having maximum number of non-conflicting activities.

OR

P.T.O.

Q2) a) With respect to dynamic programming, what is the principle of optimality? Give a mathematical representation for the same. [7]

b) Consider the 0/1 Knapsack problem with the total weight capacity of 7. The weights and associated values (profits) of 4 items are given below. Use dynamic programming approach to find the optimal solution to this problem. [10]

Item	Weight	Value(Profit)
A	1	1
B	3	4
C	4	5
D	5	7

Q3) a) Consider a graph, which is represented by the adjacency matrix given below: [10]

	A	B	C	D
A	0	1	1	0
B	1	0	0	1
C	1	0	0	1
D	0	1	1	0

We wish to colour this graph using Red and Black colours using a backtracking algorithm. Show the process of colouring it in stepwise manner using state space diagram.

b) Prove that the full state space tree of finding sum of subset of n elements using backtracking will have (excluding the leaf nodes) $2^n - 1$ nodes. [4]

c) What are the major drawbacks of branch and bound method? [4]

OR

Q4) a) State the sum of subsets problem. Write an algorithm to solve this problem using backtracking method. Comment on the time complexity of this algorithm. [8]

b) Consider the three objects. The weights and associated values are given below.

	weight	value
O_1	5	6
O_2	4	5
O_3	3	4

Assume the Knapsack capacity $m = 7$. Solve this 0/1 Knapsack problem using LC branch and bound method. [10]

- Q5)** a) Give an amortized analysis of a k bit binary counter using aggregate method. [6]
- b) What are tractable and non-tractable problems? Give examples. [7]
- c) Does randomized algorithm for quick sort, improves the average case time complexity? [4]

OR

- Q6)** a) Explain with the help of example the methods of amortized analysis. [6]
- b) What is an approximation algorithm? How does performance ratios useful in approximation algorithms? [7]
- c) What are randomized algorithms? Enlist few reasons to use randomized algorithms. [4]
- Q7)** a) Write a simple multithreaded matrix multiplication algorithm based on parallelizing relevant loops of the conventional procedure. [8]
- b) Explain in brief race condition in multithreaded algorithms. [4]
- c) What do you understand by *spawn* and *sync* keywords used in multithreaded programming? [6]

OR

- Q8)** a) Write distributed breadth search algorithm. What is its advantage over the conventional approach? [8]
- b) Write a Rabin-Karp string matching algorithm. Input to the algorithm be: Original text “t” of length n and pattern text being matched is “p” of length m. What is the expected runtime and worst-case runtime of this algorithm? [10]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4577

[Total No. of Pages : 2

[6404]-82

B.E. (Computer Engineering)

MACHINE LEARNING

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain Linear Regression in brief. [6]
b) Differentiate overfitting and under fitting with example. [6]
c) Write short note on Training error and Generalization error in machine learning. [6]

OR

- Q2)** a) Explain in brief importance of Evaluation matrix. [6]
b) Write short note on Lasso and Ridge Regression. [6]
c) Memory (Capacity) and cost of RAM as shown in below table. [6]

X (Memory Capacity) in GB	2	4	8	16
Y (Cost in \$)	12	16	28	62

- i) Find Regression line $Y = aX + b$ using least square method.
- ii) Estimate the cost of 32 GB RAM using line as equation.

- Q3)** a) Differentiate Binary classification with multiclass classification with example. [5]
b) Explain with example ensemble learning in ML. [6]
c) Write short note on metrics for Evaluating classifier performance. [6]

OR

- Q4)** a) Explain KNN with example. [5]
b) Write short note on handling imbalance data in multiclass classification. [6]
c) Explain Bagging and Boosting used in ensemble learning. [6]

P.T.O.

- Q5)** a) Explain Hierarchical clustering with example. [6]
b) What is outlier Analysis? Explain it with importance, advantages & disadvantages. [6]
c) Write short note on Elbow method used in K-mean clustering. [6]

OR

- Q6)** a) Compare Intrinsic motivation with extrinsic motivation. [6]
b) Explain K mean clustering with essential steps used in it. [6]
c) Write short note on. [6]
i) Graph Based clustering
ii) Density Based clustering

- Q7)** a) Write short note on importance of Activation function used in Neural Network. [5]
b) Explain Recurrent Neural Network with Example. Compare it simple CNN. [6]
c) Draw & Explain CNN architecture. [6]

OR

- Q8)** a) Compare Back propagation Network with feed forward Network. [5]
b) What are different types of padding used in CNN? [6]
c) Write short note on layers used in CNN. [6]
i) Convolutional layer
ii) Pooling layer



Total No. of Questions : 8]

SEAT No. :

PD4578

[Total No. of Pages : 2

[6404]-83

B.E. (Computer Engineering)

BLOCK CHAIN 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 and Q.7 or Q.8.*
- 2) Neat diagram must be drawn whenever necessary.*
- 3) Figure to the right indicate full marks.*
- 4) Assume suitable data, if nessacary.*

Q1) a) State and discuss bitcoin mining? Elaborate the functionality of miners.

[8]

b) Describe the features of Corda Block chain? Justify how makes it so different? Elaborate CorDapps?

[9]

OR

Q2) a) Give the different types of block chain. State their advantages and disadvantages.

[8]

b) Illustrate 5 different types of consensus algorithm with example.

[9]

Q3) a) Enlist and discuss types of cryptocurrency “Is cryptocurrency is safe”. Justify according to your opinion.

[9]

b) Describe Zero coin and its successor Zero cash in details.

[8]

OR

Q4) a) Compare Custodial and non-custodial cryptowallets.

[8]

b) Define the term Hot wallet storage and Cold Wallet storage. Discuss Meta mask and its importance along with its various benefits and drawbacks.

[9]

P.T.O.

Q5) a) Enlist features of Ethereum. Compare Ethereum Mainnet, Testnet, and Private Networks. [9]

b) Define smart contracts with an example of a real-world scenario which will evaluate its benefits. Discuss the role of gas in the Ethereum network and its significance in smart contract execution. [9]

OR

Q6) a) List Decentralized Messaging Platform. Discuss Whisper and its purpose in the Ethereum ecosystem. [9]

b) Discuss in brief two types of smart contracts commonly used on the Ethereum platform. Elaborate the basic steps involved in deploying a smart contract on the Ethereum block chain. [9]

Q7) a) List the prominent block chain application. Explain in detail any one with the architecture. [9]

b) Discuss in brief how cyber hack can be reduced for Digital identity using block chain. [9]

OR

Q8) a) Elaborate the use of block chain technology in the government sector. Which are the different block chain based applications available/proposed for it? [9]

b) Discuss the impact made by block chain with IOT and Block chain in banking. [9]



Total No. of Questions : 8]

SEAT No. :

PD4579

[Total No. of Pages : 2

[6404]-84

B.E. (Computer Engineering)

PERVASIVE COMPUTING

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain context aware computing and types of contexts with examples. **[9]**
b) Describe the different challenges in context awareness. **[9]**

OR

- Q2)** a) How do Context-Aware Systems optimize resource allocation based on user context? **[9]**
b) Explain general architecture for context aware systems. **[9]**

- Q3)** a) Explain reactive type intelligent system model in detail. **[8]**
b) Explain different intelligent system operations. **[9]**

OR

- Q4)** a) Explain the concept of Interaction Multiplicity in the context of Intelligent Systems. **[8]**
b) Draw and explain Environment Model-based Intelligent Systems Architectures. **[9]**

- Q5)** a) Describe Wearable Computing Architecture. **[9]**
b) What is the difference between interaction design and UX design? **[9]**

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 do you mean by interaction design? Discuss the need of it in respect to pervasive environment? [9]

- Q7)** a) Explain different open issues in pervasive computing. [8]
b) How can pervasive computing be useful in handling social digital divide? [9]

OR

- Q8)** a) Explain secure resource discovery in detail. [8]
b) Which is different Role of Ethics in pervasive computing security? Explain. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4580

[Total No. of Pages : 2

[6404]-85

**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) 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) How would you identify the limitations of CRT? Draw and explain a typical electronic signal for one scan line of NTSC composite video. [5]
- b) Define the Nyquist Theorem and explain its relevance in digital audio sampling. [6]
- c) Compare and contrast PCM, DPCM, and DM (Delta Modulation) in audio coding techniques. [6]

OR

- Q2)** a) Define chroma subsampling and its importance in digital video compression. [5]
- b) Differentiate between SNR (Signal-to Noise Ratio) and SQNR (Signal-to -Quantization Noise Ratio) in evaluating audio quality. [6]
- c) Outline the hardware components involved in MIDI systems and their role in music production. [6]

- Q3)** a) Explain the fundamental concepts of multimedia, focusing on graphics, image, and video representations. [5]
- b) Explain the need for compression in multimedia applications and discuss the lossy compression in detail. [6]
- c) Differentiate between RLC, VLC, DBC, and AC as lossless compression algorithms, highlighting their applications in multimedia. [6]

OR

P.T.O.

- Q4)** a) Explain the process of differential coding of images and its role in lossless image compression techniques. [5]
- b) Discuss the evolution of MPEG video coding standards, including MPEG-1, MPEG-2, MPEG-4, and later versions, and their significance in video compression. [6]
- c) Write a short note on: [6]
- i) Wavelet based coding
 - ii) Quantization

- Q5)** a) Describe the design principles for creating immersive experiences in VR and AR. [6]
- b) Write short note on-1. Haptic and vibrotactile devices 2. Role of immersive surround sound in virtual experiences. [6]
- c) Explain input devices in detail-controllers, motion trackers and motion capture technologies for tracking. [6]

OR

- Q6)** a) Enlist the input devices that are popularly used in immersive experience systems. Explain any input device in detail. [6]
- b) Differentiate between Virtual Reality and Augmented Reality. [6]
- c) Write short note on - [6]
- i) Head Mounted VR Displays
 - ii) Augmented and Mixed reality glasses.

- Q7)** a) Describe the basic architecture of IoT in detail with diagram. [6]
- b) What are the key components of AI-Based Software-Defined IoT architecture? [6]
- c) How can M-IoT be utilized in a Road Management System? [6]

OR

- Q8)** a) What are the benefits of using M-IoT for Health Monitoring? [6]
- b) Describe the M-IoT Architecture in detail with diagram. [6]
- c) Outline the layers in Big Data Layered IoT architecture. [6]

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Total No. of Questions : 8]

SEAT No. :

PD4581

[Total No. of Pages : 2

[6404]-86

B.E. (Computer Engineering)

CYBER SECURITY AND DIGITAL FORENSICS

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** What is primary purpose of computer forensics & how does computer forensic differ from other forensic disciplines? **[9]**
- b) How do law enforcement computer forensic technologies aid in criminal investigation? **[9]**

OR

- Q2) a)** What are some examples of technologies used in computer forensic investigation? Explain any two. **[9]**
- b) What strategies can individuals & organizations use to ensure effective data backup for recovery purposes? Describe any two in detail. **[9]**
- Q3) a)** What are some common obstacles faced when collecting digital evidence. Explain in detail. **[8]**
- b) What method & techniques are commonly used to verify & authenticate computer images? Explain any two? **[9]**

OR

- Q4) a)** Describe the general procedure for collecting and archiving digital evidence in computer forensics? **[9]**
- b) Explain duplication & Preservation of digital evidence? **[8]**

P.T.O.

- Q5) a)** What steps should be taken to secure computer incident or crime scene before beginning the search for digital evidence? **[8]**
- b)** What is the honeyenet project, and how does it contribute to network forensics? **[9]**

OR

- Q6) a)** Why is obtaining a digital has important while storing digital evidence, and how is it generated? Explain in detail. **[9]**
- b)** What are some common network tool used in network forensics, Explain any one detail? **[8]**
- Q7) a)** What factor should be considered when evaluating the computer forensics tool need for an investigation? Explain any two in detail? **[9]**
- b)** What is role of hardware tool in computer forensics, and howduthey differ form software tools? **[9]**

OR

- Q8) Write short note on (any 2) [18]**
- a)** Validating & testing forensics software
- b)** e-mail investigation
- c)** Computer forensics software tool

* * *

Total No. of Questions : 8]

SEAT No. :

PD4582

[Total No. of Pages : 2

[6404]-87

B.E. (Computer Engineering)

OBJECT ORIENTED MODELING & DESIGN

(2019 Pattern) (Semester - VII) (Elective - III) (410244 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 whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Write a short note on Use case. [5]
- b) What is Sequence model? Explain with suitable example. [5]
- c) Draw and explain use case diagram for ATM system. Explain at least two use case with the help of use case scenario. [8]

OR

- Q2)** a) Explain the relation of class model and state model. [5]
- b) Design use case diagram for online reservation system. [5]
- c) What do you mean by activity? Consider the ATM system scenario. Identify and explain at least three activities involved in the ATM system scenario. [8]

- Q3)** a) Write a short note on: Architecture style. [5]
- b) What are the different categories of External Control? Explain in Detail. [5]
- c) Explain [7]
- i) Batch Transformation
- ii) Continuous Transformation

OR

P.T.O.

- Q4)** a) Explain Global Resource Handling [5]
b) Explain: [5]
i) External Control
ii) Internal Control
c) Explain: [7]
i) Interactive interface
ii) Dynamic simulation
iii) Real time system
iv) Transaction manager

- Q5)** a) Write short note on Data Dictionary. [5]
b) Explain data storage management in software modeling. [5]
c) What do you mean by scenario? What is the purpose of defining the scenario? Explain with Example. [7]

OR

- Q6)** a) Explain in detail the process of preparing an Activity Diagram from Use case Diagram. [5]
b) What do you mean by system design? Illustrate with suitable example. [5]
c) Prepare a data dictionary for ATM system scenario. Explain each element in brief. [7]

- Q7)** a) What is Design Pattern? Explain in Detail. [5]
b) Explain: Strategy Design Pattern. [5]
c) Explain: i) Creational Pattern [8]
ii) Structural Pattern
iii) Behavioral Pattern

OR

- Q8)** a) Explain the basic elements of design pattern. [5]
b) State and explain the entities involved in a design pattern. [5]
c) List and explain different types of design pattern. [8]

* * *

[6404]-88

B.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - VII) (Elective - III) (410244 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) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) The transfer function of a system is given by, [10]

$$H(z) = \frac{1}{1-0.5z^{-1}} + \frac{1}{1-2z^{-1}}$$

Determine the stability and causality of the system for

- i) ROC: $|Z| > 2$;
 - ii) ROC: $|Z| < 0.5$;
- b) State and prove the following properties of DFT: [7]
- i) Time reversal property
 - ii) Complex conjugate property

OR

Q2) a) Find 8-point DFT using radix -2 DIF FFT algorithm for the given sequence $x(n) = \{-1, 0, 2, 0, -4, 0, 2, 0\}$ [10]

- b) Show and compare computational complexity is reduced if 16-point DFT is computed using radix -2 DIT FFT algorithm. [7]

Q3) a) Find the magnitude response and impulse response of a system described by the difference equation. $-y(n) - 1/2y(n-1) = x(n) - 1/4x(n-1)$ [10]

- b) Define Unilateral Z-transform. What are the different characteristics of it? State Time Delay & time Advance property of unilateral Z - transform. [7]

OR

P.T.O.

- Q4) a)** An LTI system is described by equation **[10]**
 $y(n) = x(n) + 0.8x(n-1) + 0.8x(n-2) - 0.49y(n-2)$. Determine the transfer function of the system. Sketch the poles and zeros on the z - plane.
- b)** Find the impulse response of the system described by the difference equation, $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$. **[7]**

- Q5) a)** Realize the following FIR system with minimum number of multipliers. **[10]**
 $h(n) = \{-0.5, 0.8, -0.5\}$
- b)** Compare FIR and IIR filters. **[8]**

OR

- Q6) a)** Design a Butterworth filter using impulse invariant method transformation to satisfy the following specifications. **[10]**

$$0.707 \leq |H(e^{j\omega})| \leq 1; \text{ for } 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2; \text{ for } 0.6\pi \leq \omega \leq \pi$$

- b)** What is bilinear transformation? Explain the properties of BLT. **[8]**
- Q7) a)** Explain Direct form, cascade Form and parallel form of IIR System. **[10]**
- b)** What are the desirable features of DSP Processors? **[8]**

OR

- Q8) a)** Explain SHARC DSP Processor. **[10]**
- b)** Discuss OMAP (Open Multimedia Application Form) **[8]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4584

[6404]-89

[Total No. of Pages : 2

**B.E. (Computer Engineering)
INFORMATION RETRIEVAL**

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Describe a Huffman coding. [6]
- b) If you want to reduce total size of index what you would focus on justify your answer. [6]
- c) How to measure performance and what are the ways for Index Compression for High Query Performance. [6]

OR

- Q2)** a) Explain the Arithmetic coding with suitable example. [6]
- b) Explain Dynamic Inverted Indices with suitable example. [6]
- c) Differentiate between Contiguous Inverted Lists and Non-contiguous Inverted. [6]

- Q3)** a) Illustrate Generalized Linear Models. [7]
- b) What is Language Modelling explain Related Methods. [5]
- c) When estimating the probabilities in language modelling what are the problems observed and how to resolve it? [5]

OR

P.T.O.

- Q4)** a) Explain The Binary Independence Model in detail. [7]
b) Why BM25 is better than TF-IDF? [5]
c) Explain the smoothing probability estimates. [5]

- Q5)** a) What is precision and recall? [6]
b) What are the Characteristics of TREC collection. [6]
c) Write the types of performance measure optimization. [6]

OR

- Q6)** a) What are the challenges with online evaluation? [6]
b) What are the Efficiency measures in information retrieval? [6]
c) Differentiate between Redis and Memcached. [6]

- Q7)** a) Examine various ways of making information retrieval systems scale to very large text collections such as the Web. [6]
b) Write Basic PageRank algorithm. [6]
c) Draw and explain Components of a Web crawler. [5]

OR

- Q8)** a) Explain Map reduce basic framework. [6]
b) How to evaluate a web search. [6]
c) Differentiate between Python Scrapy and BeautifulSoup. [5]



Total No. of Questions : 8]

SEAT No. :

PD4585

[6404]-90

[Total No. of Pages : 2

B.E. (Computer Engineering)

GPU PROGRAMMING AND ARCHITECTURE

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Identify various common problems faced by CUDA programmers? [6]
- b) Define synchronization? Classify different synchronization issues in CUDA.? [6]
- c) Describe Race Hazard parallel programming issue? [6]

OR

- Q2)** a) List different CUDA error handling APIs & Explain how these are useful to solve the error? [6]
- b) Explain different techniques for finding and solving CUDA error? [6]
- c) Draw & Explain Image feature extraction algorithm based on CUDA Architecture? [6]

- Q3)** a) List and explain the alternatives to OpenCL for GPU Programming? [6]
- b) Draw & Explain OpenCL Execution Model? [6]
- c) What is OpenCL? Explain the various features of OpenCL standard?[5]

OR

P.T.O.

- Q4)** a) Discuss the memory object queries? [6]
b) Describe OpenCL memory hierarchy? [6]
c) List and explain different OpenCL components? [5]

- Q5)** a) List and explain various GPU parallel algorithms? [6]
b) Draw & explain the sparse matrix multiplication model with suitable example? [6]
c) Draw & explain heterogeneous cluster in detail? [6]

OR

- Q6)** a) Define Parallelism? Explain Task based parallelism and data-based parallelism? [6]
b) Describe Parallel Prefix Sum algorithms with suitable example? [6]
c) Describe Common parallel Patterns: Loop-based and fork/join Pattern? [6]

- Q7)** a) Describe how OpenCL can be used for Heterogeneous computing. [9]
b) Describe Efficient Neural Network Training/Inferencing? [8]

OR

- Q8)** a) Explain the different methods in Image Format Descriptor. [9]
b) Identify different steps to design efficient neural network. Explain it. [8]



Total No. of Questions : 8]

SEAT No. :

PD4586

[6404]-91

[Total No. of Pages : 2

B.E. (Computer Engineering)

MOBILE COMPUTING

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw and explain Mobile computing architecture for a mobile device. **[5]**
- b) Explain using block diagram the process of authentication in a GSM Service. **[6]**
- c) Write a short note on SIM. **[6]**

OR

- Q2)** a) Explain the Virtual Home Environment (VHE). **[5]**
- b) Describe the functions of HLR and VLR in call routing and roaming. **[6]**
- c) Explain the GSM System Protocol Architecture. **[6]**

- Q3)** a) Explain mobility management with neat diagram. **[5]**
- b) Explain the process of call origination and call termination in GSM. **[6]**
- c) What do you mean by tunneling, encapsulation and decapsulation? **[6]**

OR

- Q4)** a) Discuss the Handover mechanism in GSM. **[5]**
- b) Short note on Handoff Strategies. **[6]**
- c) Write a short note on VLR failure restoration. **[6]**

P.T.O.

- Q5)** a) Describe data transfer from a mobile node to a fixed node and vice versa. [5]
- b) Short note on MANET. [5]
- c) Describe DSDV and DSR routing algorithms for ad hoc networks. [8]

OR

- Q6)** a) Explain the VANET. [6]
- b) Explain generic routing encapsulation. [5]
- c) How to achieve the optimization in mobile IP? Why? [7]

- Q7)** a) Explain block diagram for UMTS in detail. [6]
- b) Write a short note on Quality of service in the 3G network. [6]
- c) State and explain the features of W-CDMA. [6]

OR

- Q8)** a) Explain UTRA-Network (UTRAN) Architecture. [5]
- b) Write a note on CDMA 2000. [5]
- c) Write a short note [8]
- i) HSPA
- ii) HSDPA



Total No. of Questions : 8]

SEAT No. :

PD4587

[6404]-92

[Total No. of Pages : 2

B.E. (Computer Engineering)

SOFTWARE TESTING & QUALITY ASSURANCE

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) State in your own words White Box Testing. [6]
- b) How would you explain performance & security testing? [6]
- c) Explain Risk Based Testing in detail. [6]

OR

- Q2)** a) State in your own words Black Box Testing. [6]
- b) Can you explain compatibility testing & security testing? [6]
- c) What do you think about Exploratory testing. [6]

- Q3)** a) Can you clarify quality management system. [6]
- b) Illustrate selenium's IDE and explain in detail. [6]
- c) Can you clarify different levels of CMM. [5]

OR

P.T.O.

- Q4)** a) Explain why ISO-9001 standard and it's importance in software testing. [6]
b) Can you clarify Quality Assurance. [6]
c) Why software has defects? Explain in detail. [5]

- Q5)** a) What is performance testing. What is use of it? [6]
b) Illustrate selenium tool suite in detail. [6]
c) How would you explain Selenium Web Driver? Explain it. [6]

OR

- Q6)** a) Explain Robotic process Automation in detail. [6]
b) How to choose automation testing tools. Explain it. [6]
c) Can you explain Selenium Grid in detail. [6]

- Q7)** a) Explain in detail six sigma characteristics in details. [6]
b) Can you explain how to maintain SQA? [6]
c) Explain Detect Removal Effectiveness in detail. [5]

OR

- Q8)** a) Compare Ishikawa's flow chart and Histogram tool. [6]
b) Explain in detail Total Quality Management. [6]
c) Compare Run Chart's and Control Chart in details. [5]



Total No. of Questions : 8]

SEAT No. :

PD4588

[6404]-93

[Total No. of Pages : 2

B.E. (Computer Engineering)

COMPILERS

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Directed Acyclic Graph & its algorithm for creating DAG. [10]

b) Write SDT to generate IC of Declarative statement. [8]

OR

Q2) a) Describe S-attributed & L-attributed Grammar for Bottom Up & Top-Down Evaluations. [10]

b) Describe Triples & Indirect Triples with examples. [8]

Q3) a) Explain various Storage Management Schemes in details. [10]

b) Explain Activation Record & write various fields. [8]

OR

Q4) a) Explain Dangling Pointer in detail. Compare Static & Dynamic Scope.[10]

b) Write SDT for if-else & do-while statements. [8]

P.T.O.

Q5) a) What is Peephole Optimization? Explain its working & different techniques with example. [9]

b) Explain Code Generation Algorithm. [8]

OR

Q6) a) Explain Register Allocation & Assignment in detail. [9]

b) Discuss various Issues in Code Generation. [8]

Q7) a) What is DAG based Local Optimization? Explain with example. [9]

b) What is Common-Sub Expression. Explain how to eliminate it with example. [8]

OR

Q8) a) Explain following Optimization Techniques in detail : [9]

i) Dead Code Elimination

ii) Strength Reduction

iii) Code Movement

b) Write short note on : [8]

i) Data Flow Equation

ii) Iterative Data Flow



Total No. of Questions : 8]

SEAT No. :

PD4589

[Total No. of Pages : 2

[6404]-94

**B.E. (Computer Engineering)
HIGH PERFORMANCE COMPUTING
(2019 Pattern) (Semester - VIII) (410250)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain Broadcast and Reduce operation with diagram. [6]
b) Explain Scatter and Gather operation. [6]
c) Write a short note on Circular shift on a mesh. [5]

OR

- Q2)** a) Explain prefix-sum operation for an eight-node hypercube. [6]
b) Explain All-to-One Broadcast and Reduction on a ring. [6]
c) Explain with example and algorithm all-to-all broadcast on 3×3 mesh. [5]

- Q3)** a) Explain performance matrices of parallel system. [6]
b) Explain Matrix – Matrix multiplication in details. [6]
c) Write a note on minimum and cost optimal execution time. [5]

OR

- Q4)** a) Write a short note on Matrix vector multiplication using: [9]
i) Row-wise 1D partitioning
ii) 2 D partitioning
iii) Comparison of 1D and 2D partitioning
b) Explain the Dense matrix algorithms. [8]
i) Matrix vector multiplication.
ii) Matrix-Matrix multiplication.

- Q5)** a) Explain CUDA architecture in details. [9]
b) Write a short note on: Managing GPU Memory. [9]

OR

P.T.O.

- Q6)** a) Modify DFS for parallel execution and analyze it's complexing. [9]
b) Explain Dijkstra's algorithm in parallel formulation. [9]

- Q7)** a) Write a short note on Parallel BFS. [4]
b) Explain the term: Communication strategies in BFS. [5]
c) Write a note on: [9]
i) Random Communication Strategy
ii) Ring Communication Strategy
iii) Blackboard Communication Strategy

OR

- Q8)** a) Explain odd-even transportation in bubble sort using suitable example. [6]
b) Write a short note on parallel formulation for CRCW PRAM. [6]
c) Explain Distributed Computing for Document Classification. [6]



Total No. of Questions : 8]

SEAT No. :

PD4590

[Total No. of Pages : 2

[6404]-95
B.E (Computer Engineering)
DEEP LEARNING
(2019 Pattern) (410251) (Semester - VIII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw and Explain CNN Architecture in detail. [6]
b) Explain working of Convolution Layer. [6]
c) Explain pooling layers and its type. [6]

OR

- Q2)** a) Explain all the features of pooling layer. [6]
b) Explain local response Normalization. [6]
c) Explain ReLU Layer in detail. [6]

- Q3)** a) Explain recursive neural network. [6]
b) Explain the LSTM in RNN. [6]
c) Explain in brief about working of RNN. [5]

OR

- Q4)** a) Difference between CNN Vs RNN. [6]
b) What are the challenges of long term dependencies? [6]
c) Explain Encoder-Decoder RNN model. [5]

P.T.O.

- Q5)** a) Explain Deep Generative Model. [6]
b) Explain Boltzmann Machine in details. [6]
c) Explain in brief GAN with an example. [6]

OR

- Q6)** a) Explain deep belief networks in detail. [6]
b) What is Generative Adversarial Network? Explain its component. [6]
c) Explain types of GAN. [6]

- Q7)** a) Explain Markov Decision Process. [6]
b) Explain deep reinforcement learning. [6]
c) What are the challenges of reinforcement learning? [5]

OR

- Q8)** a) Explain the process of Deep Q-learning. [6]
b) Explain reinforcement learning for Tic-Tac-Toe game. [6]
c) Explain Dynamic programming algorithm for reinforcement learning. [5]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4591

[6404]-96

[Total No. of Pages : 2

B. E. (Computer Engineering)
NATURAL LANGUAGE PROCESSING
(2019 Pattern) (Semester - VIII) (410252(A)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the concept of log-linear models in NLP. How do these models work, and what are some common applications of this approach? [6]
- b) Explain the concept of doc2vec and its use in generating document embeddings. Discuss the differences between doc2vec and word2vec. [8]
- c) Explain Non-Negative Matrix Factorization (NMF) in the context of topic modeling [4]

OR

- Q2)** a) What is a Markov model, and how is it used to generate language sequences? Describe the process of training and using a Markov model for language generation. [6]
- b) Explain the concept of Latent Semantic Analysis (LSA) and how it is used for identifying relationships between words. [8]
- c) Write a short note on TF-IDF (Term Frequency-Inverse Document Frequency) representation. [4]

- Q3)** a) Explain the concept of reference resolution and coreference resolution in NLP. How do these techniques help in understanding the relationships between entities in a text? Provide examples. [8]
- b) Explain the concept of Cross-Lingual Information Retrieval (CLIR). Discuss the challenges of retrieving information across languages, and what techniques or models are commonly used to address these challenges? [8]
- c) What is Information Retrieval, and how is it used in NLP? [2]

OR

P.T.O.

- Q4)** a) Explain the process of Entity Extraction in Information Retrieval. Discuss the various techniques and algorithms used for Entity Extraction. [8]
- b) Describe the Vector Space Model (VSM) for information retrieval. How does VSM represent documents and queries, and how are similarities calculated? Discuss the strengths and weaknesses of VSM. [8]
- c) What is Named Entity Recognition (NER)? [2]
- Q5)** a) Explain how NLTK, spaCy, and Gensim handle tokenization and part-of-speech tagging. Discuss the advantages and disadvantages of each library's approach. [9]
- b) Explain the concept of WordNet as a lexical knowledge network. How can WordNet be used in natural language processing, and what are its limitations? [8]

OR

- Q6)** a) Discuss the role of Treebanks and Universal Dependency Treebanks in NLP research. How do they contribute to syntactic analysis and parsing in various languages? [9]
- b) Explain the Lesk Algorithm for word sense disambiguation . How does it work, and what are its advantages and limitations? [8]
- Q7)** a) Explain the key principles of rule-based machine translation. How do rule-based techniques differ from statistical approaches in machine translation? Provide an example of a rule-based translation. [9]
- b) Explain the fundamental components of a question-answering system. How do question answering systems utilize machine learning and NLP techniques to find accurate answers to questions? [8]

OR

- Q8)** a) Define text entailment and describe its importance in natural language understanding. How does text entailment differ from text similarity or paraphrasing? Provide an example of text entailment. [9]
- b) Explain Natural Language Generation with reference architecture. [8]



Total No. of Questions : 8]

SEAT No. :

PD4592

[6404]-97

[Total No. of Pages : 2

B. E. (Computer Engineering)

IMAGE PROCESSING

(2019 Pattern) (Semester - VIII) (410252(B)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) What is thresholding and signification of thresholding method for image segmentation? **[10]**

b) Discuss in detail the Gradient operators Sobel and Prewitt operators for edge detection. **[8]**

OR

Q2) a) Explain in detail region splitting and merging technique used in image segmentation and discuss the problems with region splitting and merging technique? **[10]**

b) Summarize the process of edge linking using Hough transform. **[8]**

Q3) a) What is the redundancy? Explain any 3 type of redundancies useful for compression. **[6]**

b) Find the set of code words and average word length using Huffman Coding scheme for a set of gray levels with probabilities given below. **[6]**

Input	G1	G2	G3	G4	G5	G6	G7	G8
Probability	0.03	0.05	0.02	0.15	0.05	0.15	0.25	0.3

c) Describe arithmetic coding with an example for compression of image. **[6]**

OR

Q4) a) Explain RLC coding with examples. **[6]**

b) What are the different image compression standards? Explain. **[6]**

c) With the help of neat block diagram explain Lossy Predictive Coding. **[6]**

P.T.O.

- Q5)** a) Explain the concept of Inverse Filtering and also mention the limitations of it. [6]
- b) List out some important noise probability density functions used in image processing and sketch their plots. [6]
- c) What is the purpose of image restoration? Explain the model of image degradation and restoration process using suitable block diagram. [5]

OR

- Q6)** a) What spatial transformation techniques are used for image restoration? Explain them in detail. [6]
- b) Explain different noise models in detail. [6]
- c) Explain any 2 methods of Image restoration. [5]

- Q7)** a) Explain basic principles of photogrammetry, multispectral and thermal?[10]
- b) How medical Images are enhanced. [7]

OR

- Q8)** a) Explain any two medical image processing methods. [10]
- b) Write a note on ‘ Satellite Image Processing. [7]



Total No. of Questions : 8]

SEAT No. :

PD4593

[6404]-98

[Total No. of Pages : 2

B.E. (Computer Engineering)
SOFTWARE DEFINED NETWORKS
(2019 Pattern) (Semester - VIII) (410252(C)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is traffic Engineering? Explain its challenges. [6]
- b) What is VPN? Explain benefits of VPN. [6]
- c) What is NVGRE? Explain its features. [6]

OR

- Q2)** a) Define Data Center? Explain components of data Centre. [6]
- b) Explain the Tunneling Technologies for the Data Center. [6]
- c) Define and explain VxLAN? [6]

- Q3)** a) Explain Current Languages and Tools used for SDN programming. [6]
- b) Explain Software Defined Networks Concepts, and Implementation. [6]
- c) Explain Benefits of Network Functions Virtualization. [5]

OR

- Q4)** a) Explain Northbound Application Programming interface with neat diagram. [6]
- b) What is Mininet? Explain basic components of Mininet? [6]
- c) Discuss the Case study: Ballarat Grammar uses SDN to fight malware. [5]

P.T.O.

- Q5)** a) Compare between NFV and NV. [6]
- b) Discuss Challenges for Network Functions Virtualization. [6]
- c) Draw and Explain Network Function Virtualization architecture? [6]

OR

- Q6)** a) What are benefits of NFV? [6]
- b) Explain NFV use case in detail. [6]
- c) What are In-line network functions? [6]

- Q7)** a) Explain the case study - Cloud Seeds automate IaaS using SDN. [6]
- b) Write short note on Open Daylight Controller. [6]
- c) Explain Juniper SDN Framework. [5]

OR

- Q8)** a) Write short note on Floodlight Controller. [6]
- b) Explain Bandwidth Calendaring. [6]
- c) Explain Data Center Orchestration. [5]



Total No. of Questions : 8]

SEAT No. :

PD4594

[6404]-99

[Total No. of Pages : 2

B.E. (Computer Engineering)

ADVANCED DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - VIII) (410252D) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is multi rate signal processing? Explain any two applications of multi rate signal processing. [7]

b) Describe the decimation process with a factor of 'D'. Obtain necessary expression, sketch frequency response. Also discuss aliasing effect.[10]

OR

Q2) a) Describe ARMA lattice-ladder filters. [7]

b) Determine the Fourier transform of the signal $x(n)$ when it is: [10]

i) Down sampled by factor D and

ii) Up sampled by factor I.

Q3) a) Compare various non-parametric methods of power spectrum. [6]

b) Discuss about computation of energy density spectrum. [6]

c) Briefly explain STFT and applications. [6]

OR

Q4) a) Differentiate and compare Harr Wavelet and Daubechies Wavelet. [6]

b) Elaborate on DCT and KL transform. [6]

c) Discuss applications of DCT and WT. [6]

P.T.O.

- Q5)** a) Explain Vector Quantization based Coders for speech coding. [7]
- b) What is the process for speech recognition and speech segmentation? Enlist the techniques and describe with suitable example. [10]

OR

- Q6)** a) Discuss harmonic coding and its application in speech processing. [7]
- b) What is speaker verification? Why is it important? Justify with appropriate applications. How is it different from speaker identification? [10]

- Q7)** a) Describe the use of lowpass, highpass and bandpass filters for image smoothing and edge detection. [10]
- b) What are the different types of optimum linear filter? Describe in brief. [8]

OR

- Q8)** a) What is image enhancement? Why is it needed? Enlist and explain the image enhancement techniques. [10]
- b) Enlist the different types of optimum linear filter. Discuss the applications of Wiener and Median filters in brief. [8]



Total No. of Questions : 8]

SEAT No. :

PD4595

[Total No. of Pages : 2

[6404]-100

B.E. (Computer Engineering)

PATTERN RECOGNITION

(2019 Pattern) (Semester - VIII) (Elective-VI) (410253A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in detail Tree Classifiers-Decision Trees. [6]
b) Explain in detail Elements of formal grammars. [6]
c) Explain in detail the Stochastic method: Boltzmann learning. [5]

OR

- Q2)** a) Compare Decision Trees and Random Forests. [6]
b) Explain how graph-based structural representations used in pattern recognition. [6]
c) Explain in detail the stochastic method and its applications. [5]

- Q3)** a) Explain K means algorithm with example. [6]
b) Explain minimum spanning tree with example. [6]
c) Explain Hierarchical Clustering in detail. [5]

OR

- Q4)** a) Explain simulated annealing optimization in clustering. [6]
b) Explain Partition clustering in detail. [6]
c) Explain in detail the single linkage, complete linkage and average linkage algorithm. [5]

- Q5)** a) Explain the edit distance and its applications. [6]
b) Explain Bellman ford algorithm with example. [6]
c) Explain the Pearson correlation coefficient and the Spearman rank correlation coefficient. [6]

OR

P.T.O.

- Q6)** a) What is dynamic time warping and how is it used in pattern recognition?[6]
b) What are the optimal path searching techniques in pattern recognition?[6]
c) Explain deformable template models in pattern recognition. [6]

- Q7)** a) What is fuzzy logic in pattern recognition and how is it used in classification? [6]
b) Define pattern recognition. State various applications of pattern recognition. [6]
c) Explain in detail Biometrics system. [6]

OR

- Q8)** a) Explain the steps involved in genetic algorithm for pattern classification.[6]
b) Write note on Fuzzy pattern classifiers. [6]
c) Explain IRIS scanner and give its application. [6]



Total No. of Questions : 8]

SEAT No. :

PD4596

[Total No. of Pages : 2

[6404]-101

B.E.(Computer Engg.)

SOFT COMPUTING

(2019 Pattern) (Semester - VIII) (410253 B) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Elaborate on the scope of Evolutionary Computing. [6]
- b) What is the difference between single and multi-objective optimization?[6]
- c) Comment on the statement “genetic programming good for”. [6]

OR

- Q2)** a) What is the difference between PSO and binary PSO? [5]
- b) Describe Hill climbing algorithm and how it is different from Simulated Annealing. [7]
- c) Explain artificial hummingbird algorithm. [6]

- Q3)** a) “Fuzzy system has limitation”-Comment on the statement. [6]
- b) Draw and explain System Architecture and Operation of FLC System.[5]
- c) Discuss Fuzzy Inference process. [6]

OR

- Q4)** a) List and explain applications of FLC System. [6]
- b) What are the properties and operations of classical sets? [5]
- c) Explain different types of membership functions used in fuzzy sets. [6]

P.T.O.

- Q5)** a) What are constraints in Genetic Algorithms? [6]
b) Describe Genetic Algorithm with conventional Artificial Intelligence. [5]
c) Explain in detail Holland Classifier System. [6]

OR

- Q6)** a) Explain in detail Bucket Brigade algorithm and Rule generation. [6]
b) State and explain applications of Genetic Algorithms. [5]
c) Comment on the Stopping Condition for GA Flow? [6]

- Q7)** a) Explain latest applications of soft computing. [9]
b) Mention the characteristics and properties of Neuro-fuzzy hybrid systems. [9]

OR

- Q8)** a) Describe Fuzzy sets and Genetic Algorithms in Game Playing. [9]
b) Explain the application of Hybrid systems for speech and language processing. [9]



Total No. of Questions : 8]

SEAT No. :

PD4597

[Total No. of Pages : 2

[6404]-102

B.E.(Computer Engg.)

BUSINESS INTELLIGENCE

(2019 Pattern) (Semester - VIII) (410253 C) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in detail business intelligence architectures with suitable diagram. [6]
b) Explain the role of mathematical models in BI. [6]
c) What is data, information and knowledge explain with suitable examples. [5]

OR

- Q2)** a) Explain different types of report in detail. [6]
b) Explain Decision Support System in detail. [6]
c) Write short note on Ethics and business intelligence. [5]
- Q3)** a) Explain data reduction in detail with example. [7]
b) Difference between Univariate, Bivariate, Multivariate analysis. [5]
c) Write a short note on data discretization. [5]

OR

- Q4)** a) Explain data exploration in detail with example. [7]
b) Explain Data transformation in detail with example. [5]
c) Write short note on Data Validation. [5]
- Q5)** a) Explain Association rule and its types. [5]
b) Write a short note on Classification. [5]

P.T.O.

- c) Consider the following dataset and we will find frequent item sets and generate association rules for them using Apriori algorithm, Consider minimum support count is 2 & minimum confidence is 60%. [8]

TID	Items
T1	I1, I2 ,I5
T2	I2, I4
T3	I2, I3
T4	I1, I2, I4
T5	I1, I3
T6	I2, I3
T7	I1, I3
T8	I1, I2, I3, I5
T9	I1, I2, I3

OR

- Q6)** a) Explain Bayes theorem in detail. [5]
b) Difference between Classification and Clustering. [5]
c) Explain Logistic regression in detail with example. [8]

- Q7)** a) Explain applications of BI in telecommunication and banking. [6]
b) Explain BI application in Logistics and Production. [6]
c) Explain Role of BI in Finance and marketing. [6]

OR

- Q8)** a) Explain BI application in CRM. [6]
b) Explain Roles of Analytical tools in BI. [6]
c) Explain role of BI in ERP. [6]



Total No. of Questions : 8]

SEAT No. :

PD5335

[Total No. of Pages : 2

[6404]-103R
B.E.(Computer Engg.)
QUANTUM COMPUTING
(2019 Pattern) (Semester - VIII) (410253 D) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Describe the distinction between a classical bit and a quantum bit (qubit) and explain how this difference contributes to the improved efficiency observed in Deutsch's algorithm compared to classical algorithms. **[8]**
- b) What is deferred measurement in quantum computing? Provide a simple explanation of the Controlled-U operation and describe its equivalence using basic quantum circuit components. **[9]**

OR

- Q2) a)** Explain the process by which universal quantum gates enable the representation of any arbitrary unitary matrix within a d-dimensional Hilbert space as a composition of two-level unitary matrices. Provide the mathematical principles and quantum circuit implementations. **[8]**
- b) What constitutes a universal quantum gate set and how does the selection of such a set impact the efficiency and precision of quantum algorithms?**[9]**
- Q3) a)** Explain the mathematical representations and concepts behind the Fourier Transform and the Discrete Fourier Transform, clarify their respective roles in signal processing and data analysis. **[8]**
- b) Create a detailed circuit diagram depicting the Quantum Fourier Transform (QFT) and thoroughly explain its functionality when applied to a set of qubits. Additionally, analyze the underlying quantum principles involved in the QFT process and applications. **[9]**

OR

P.T.O.

- Q4) a)** Discuss the input operation required for algorithms such as period-finding and discrete logarithms that utilize the quantum Fourier Transform. Describe the nature of the output produced by these algorithms, in the context of quantum computation and cryptography.[8]
- b)** Provide concise notes on the following: [9]
- i) Essential components of the quantum circuit model of computation
 - ii) The exponential growth of complexity in quantum systems

- Q5) a)** Explain the quantum phase estimation procedure, including the number of registers involved and the criteria for selecting qubits (denoted as 't') within the state. Elaborate on how these parameters contribute to the accuracy and efficiency of the phase estimation process in quantum computation. [9]
- b)** Discuss the constraints associated with Kitaev's phase estimation algorithm when applied to the order-finding application [9]

OR

- Q6) a)** Describe the procedural steps involved in applying the phase estimation algorithm to order-finding scenarios. Outline how the algorithm is utilized to determine the order of elements within a mathematical structure, emphasizing its computational complexity and efficiency in solving such problems. [9]
- b)** Elaborate on how the efficient quantum Fourier transform algorithm can be employed to solve the hidden subgroup problem. [9]

- Q7) a)** Explain the following terms with respect to Quantum Machine Learning [9]
- i) Quantum-Like Learning
 - ii) Computational Intelligence
- b)** Construct the architecture of a hybrid feedforward quantum neural network, integrating both quantum and classical components. Provide a detailed explanation of how these components interact and contribute to the network's operation, provide the advantages and challenges associated with hybrid quantum-classical neural networks in machine learning tasks. [9]

OR

- Q8) a)** Explain how quantum cryptography deals with the secure exchange of quantum information. [9]
- b)** Analyze the application potential of quantum machine learning in diverse domains. Provide an example of a specific application, in which the utilization of a specialized quantum device tailored for simulating small quantum systems. [9]



[6404]-104

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 non-programmable calculator is allowed.

- Q1) a) Explain the concept of Area Control Error (ACE). [4]
b) With a neat block diagram explain two area load frequency control. [6]
c) Explain the dynamic change in frequency as a function of time for a step change in load in case of single area case. [8]

OR

- Q2) a) Draw and explain the working of speed governor system of turbo generator. [4]
b) Obtain the generator model, turbine model and power system model of single area load frequency control. [6]
c) Explain with a block diagram the working of proportional puls integral load frequency controller for an isolated power system. [8]

- Q3) a) Explain the heat rate and cost curve of thermal generating units. [4]
b) Explain the dynamic programming method used for unit commitment with an example. [6]
c) On the system consisting of two generating plants the incremental costs in ruppees per megawatt hour with Where P_1 and P_2 are in MW are. [7]

$$\frac{dC_1}{dP_1} = 0.15P_1 + 150$$

$$\frac{dC_2}{dP_2} = 0.25P_2 + 175$$

The system is operating at economic load dispatch with

$$P_1 = P_2 = 200 \text{ MW and } \frac{\partial P_L}{\partial P_2} = 0.2$$

Find penalty factor of plant 1 and plant 2.

OR

P.T.O.

- Q4)** a) Define term penalty factor and write its formula. [3]
b) State the various methods for the unit commitment. Hence, explain the 'priority list method' for unit commitment. [6]
c) Explain with mathematical formulation the economic load dispatch without transmission loss and including equality constraints of meeting load. [8]

- Q5)** a) Explain in detail: Interchange evaluation with unit commitment. [4]
b) Explain in detail- Capacity Interchange. [6]
c) Explain the concept of a power pool in energy control. State and explain the advantages associated with a power pool? Also, discuss constraints related to the power pool. [8]

OR

- Q6)** a) What are benefits of diversity interchange? [4]
b) Explain the concept of energy banking and how it facilitates power exchange between utilities. [6]
c) What are the challenges associated with coordinating interchange evaluation with unit commitment across multiple utilities? [8]

- Q7)** a) Explain the term "Voltage stability". [4]
b) Explain various voltage stability indices with their formula. [6]
c) Derive the expression of the power-voltage relationship for drawing the PV curve in detail and hence draw the PV curve with showing stable-unstable region. [7]

OR

- Q8)** a) Define the term Voltage Collapse. [4]
b) Give the detailed classification of the voltage stability based on the time frame and based on nature of the disturbance. [6]
c) State the procedure to draw the QV curve. Hence, draw the QV curve with showing stable-unstable regions. [7]



Total No. of Questions : 8]

SEAT No. :

PD4600

[Total No. of Pages : 2

[6404]-105

B.E. (Electrical)

**ADVANCED CONTROL SYSTEM
(2019 Pattern) (Semester - VII) (403142)**

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) The use of algorithmic tables slide rules, and electronic pocket calculators is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Consider the system given below. Compute state transition matrix using Laplace transform method. **[9]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & -3 \\ 1 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

b) Explain the various state space representations given below with examples. **[9]**

- i) Physical Variable representation
- ii) Phase variable representation
- iii) Jordon / diagonal canonical form

OR

Q2) a) Find the transfer function of the system given below **[9]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -5 & -1 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 5 \end{bmatrix} u$$
$$y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

b) Define state, state variable, state vector, state equation, and output equation. Draw a state diagram. **[9]**

P.T.O.

- Q3) a)** Check the controllability of the state model given below using Kalman's Test [8]

$$\dot{X} = \begin{bmatrix} -1 & 0 & 0 \\ 1 & -2 & 0 \\ 2 & 1 & -3 \end{bmatrix} X + \begin{bmatrix} 10 \\ 1 \\ 0 \end{bmatrix} u$$

- b) Explain the concept of state feedback with a proper block diagram. Write down the steps for designing a state feedback controller using a transformation matrix. [9]

OR

- Q4) a)** What is observability? How to investigate the observability of a system using Gilbert's test for. [8]

- i) Distinct eigenvalues and
- ii) Repeated eigenvalues

- b) Determine the state observer for the system given below to place the observer poles at $s_1 = -5$ and $s_2 = -5$ by direct substitution technique. [9]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & 1 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

- Q5) a)** State and explain Shannon's Sampling theorem. How to select the sampling period? [9]

- b) Explain mapping between the s-plane and z-plane. [9]

OR

- Q6) a)** Explain the concept of Zero Order Hold and First Order Hold operations. Derive the transfer function of ZOH. [9]

- b) Explain the block diagram of the digital control system. State the advantages and disadvantages of the digital control system. [9]

- Q7) a)** Define adaptive control. Explain any one scheme of adaptive control. [9]

- b) Explain the various reaching laws of sliding mode control. [8]

OR

- Q8) a)** Explain the sliding mode control technique with respect to equivalent control and chattering. [9]

- b) Define the optimal control problem and write down the steps to solve problem using linear quadratic regulator. [8]



Total No. of Questions : 8]

SEAT No. :

PD4601

[Total No. of Pages : 2

[6404]-106

B.E. (Electrical Engineering)

PLC & SCADA

(2019 Pattern) (Semester - VII) (403143A) (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 indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of non-programmable calculator is allowed.

- Q1)** a) Explain Master control relay (MCR) Instruction with diagram? [4]
b) Explain UP counters in details along with its ladder diagram? [6]
c) Draw and explain the ladder diagram for car parking. [8]

OR

- Q2)** a) Explain rule for proper construction of PLC ladder diagram? [4]
b) Explain latching (OTL) and unlatching (OTU) instruction in detail with the example. [6]
c) Draw the ladder diagram for following function table. Input I1, I2 output Q1, Q2, Q3, Q4? [8]

I1	I2	Q1	Q2	Q3	Q4
0	0	0	1	0	0
0	1	0	1	1	1
1	0	0	1	1	1
1	1	1	0	1	0

- Q3)** a) Draw and Explain the block diagram for PID interfacing with PLC. [3]
b) Explain “Adjust and Observe” method of PID Tuning. [6]
c) Explain Variable speed AC Motor Drive. [8]

OR

- Q4)** a) Draw and Explain PID controller module. [3]
b) Draw and Explain AC Motor Starter. [6]
c) Explain the temperature control using PLC with the help of block diagram. [8]

P.T.O.

- Q5)** a) Explain the desirable properties of SCADA. [4]
b) Explain SCADA generations in detail. [6]
c) Explain SCADA system implemented for Petroleum Refining Process. [8]

OR

- Q6)** a) Explain advantages and Disadvantages of SCADA. [4]
b) Draw and Explain typical SCADA system architecture. [6]
c) Explain application of SCADA system in Automatic Substation Control. [8]

- Q7)** a) Explain Applications of DCS. [3]
b) Differentiate between DCS & PLC. [6]
c) Explain Open System Interconnection (OSI) model in detail. [8]

OR

- Q8)** a) Explain Advantages of DCS. [3]
b) Explain DNP3 protocol. [6]
c) Explain TCP/IP SCADA Protocols. [8]



Total No. of Questions : 8]

SEAT No. :

PD4602

[Total No. of Pages : 2

[6404]-107

B.E. (Electrical Engineering)

POWER QUALITY MANAGEMENT

(2019 Pattern) (Semester - VII) (403143B) (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 indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable additional data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) Define voltage sag and interruptions with suitable waveforms. [4]
b) Discuss the concept of area of vulnerability. [6]
c) Explain any two voltage sag mitigation techniques in detail. [8]

OR

- Q2)** a) List voltage sag characteristics and explain any one characteristic. [4]
b) With neat diagram, discuss CBEMA and ITIC curves. [6]
c) Explain in brief the major causes and effects of voltage sags. [8]

- Q3)** a) List the effects of harmonics. [3]
b) Explain voltage and current distortion with relevant figures. [6]
c) Explain harmonic indices and their use for assessing impacts of harmonics. [8]

OR

- Q4)** a) Define harmonics, inter-harmonics, and sub-harmonics. [3]
b) Explain in brief any three harmonic generating sources. [6]
c) With relevant waveforms, write detail note on triple harmonics. [8]

- Q5)** a) Discuss IEEE 519-2014 standard for harmonic control. [7]
b) Explain in detail the step-by-step procedure for a harmonic study. [10]

OR

P.T.O.

- Q6)** a) Explain the methods for reducing harmonic currents in loads. [7]
b) Discuss the computer tools for harmonic analysis along with advantages and disadvantages. [10]

- Q7)** a) Explain the selection of transducers for power quality monitoring. [8]
b) Justify the need of power quality monitoring and describe the approaches followed in power quality monitoring. [10]

OR

- Q8)** a) Specify the power quality analyser requirements as per EN50160 standard. [8]
b) Describe harmonic monitoring, transient monitoring in detail. [10]



Total No. of Questions : 8]

SEAT No. :

PD4603

[Total No. of Pages : 2

[6404]-108

B.E. (Electrical Engineering)

HIGH VOLTAGE ENGINEERING

(2019 Pattern) (Semester - VII) (403143C) (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 indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator & steam tables is allowed.
- 5) Assume suitable data, if necessary.

- Q1) a)** Explain Reynolds & Mason's Theory. **[8]**
b) State & explain with diagram causes of power frequency over voltages & switching surges. **[9]**

OR

- Q2) a)** Describe in detail Lightning phenomenon. **[8]**
b) Write a short note on insulation co-ordination. **[9]**

- Q3) 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]**

OR

- Q4) 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]**

- Q5) 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]**

OR

P.T.O.

- Q6)** 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]

- Q7)** 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]

OR

- Q8)** a) Describe earthing and shielding of high voltage laboratories. [9]
b) Describe for bushing [9]
i) Wet power frequency voltage withstand test
ii) Momentary power frequency voltage withstand test
iii) Visible discharge test



Total No. of Questions : 8]

SEAT No. :

PD4604

[Total No. of Pages : 2

[6404]-109

**B.E. (Electrical Engineering)
ROBOTICS & AUTOMATION**

(2019 Pattern) (Semester - VII) (403143D) (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 indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Define the terms: [4]

- i) Orthonormal coordinate;
- ii) Coordinate transformation;
- iii) Inverse coordinate transformation;
- iv) Orthogonality.

b) Draw and explain the link coordinate diagram of four axis SCARA robot. [6]

c) Write the algorithm for Denavit – Hartenberg representation. [8]

OR

Q2) a) Explain the rules for establishing the link coordinate frames. [4]

b) State and explain inverse kinematics problem. [6]

c) Explain general properties of solution i.e. existence of solution and uniqueness of solution. [8]

Q3) a) Explain different classes of sensors and enlist two examples of each.[3]

b) Write a short note on photoelectric sensors. [6]

c) Explain the construction and working of safety light curtain sensors. [8]

OR

Q4) a) What is the importance of the sensors in robotics? Explain with any application. [3]

b) What are position sensors? How position sensors are used in Robotics. Enlist the different types of position sensors used in robotics. [6]

c) Explain the construction and working of LVDT along with its schematic diagram. [8]

P.T.O.

- Q5)** a) Explain the concept of linear and angular velocity, and write the relationship between transformation matrix and angular velocity. [4]
b) Explain the concept of manipulator Jacobian, Jacobian inverse in brief.[6]
c) Explain Jacobian matrix for prismatic and revolute joint. [8]

OR

- Q6)** a) Explain the trapezoidal velocity profile for robotic arm position control.[4]
b) Explain Resolved Motion Position Control (RMPC) with the help of a neat sketch. [6]
c) Explain the modelling of the D.C. motor with load with relevant equations and diagrams. [8]

- Q7)** a) Explain how robots are used in material handling, picking, and packaging. [3]
b) Explain the spray-painting robot in detail. [6]
c) Explain different fields of robot applications and explain in detail in case of Arc welding. [8]

OR

- Q8)** a) Explain the selection criteria of the robot for industrial applications. [3]
b) Explain how robots are used in home automation. [6]
c) Explain how robots are used in the defence and surveillance industry.[8]



Total No. of Questions : 8]

SEAT No. :

PD4605

[Total No. of Pages : 2

[6404]-110

B.E. (Electrical)

ALTERNATE ENERGY SYSTEM

(2019 Pattern) (Semester - VII) (Elective - IV) (403144 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Define : [10]

- i) Tip speed Ratio
- ii) Power coefficient
- iii) Cut in speed
- iv) Cut out speed
- v) Power contained in wind

b) What are the 2 types of wind turbine? Explain both of them briefly. List the factors affecting the design of wind turbine. [8]

OR

Q2) a) Explain power Vs speed and Torque Vs Speed characteristics for wind power generation with the help of appropriate curves. [10]

b) Write a short note on extraction of wind turbine power and wind energy. [8]

Q3) a) What is biomass conversion process? Explain any one process in detail. [8]

b) State the composition of biogas. Describe various factors affecting biogas generation. [9]

OR

Q4) a) What is biomass gasification? Explain any one gasifier with suitable diagram. [8]

b) Define : [9]

- i) Biomass
- ii) Biomass energy

State the classification of biomass resources with example.

P.T.O.

- Q5) a)** State the properties of Hydrogen. What are the possible areas of hydrogen use. [9]
- b) State the various methods of hydrogen production. Explain any one method in detail with suitable diagram. [9]

OR

- Q6) a)** State the methods of hydrogen storage. Explain the methods briefly. [9]
- b) What are the components of battery? Explain any two batteries with their application. [9]

- Q7) a)** Explain with example : [10]
- i) Time value of money
- ii) Internal rate of return
- b) Draw a neat diagram of solar PV source connected to the grid. List the parameters required for synchronization of PV source with grid. [8]

OR

- Q8) a)** Define with example : [10]
- i) Simple payback period
- ii) Life cycle cost
- b) A cogeneration sys. installation is expected to reduce the company's annual bill by Rs. 10 Lacs. If the capital cost of new cogen installation is Rs. 30 Lacs & annual O & M cost is Rs. 5 Lacs. [8]
- i) What will be payback period for the project?
- ii) What will be Return on Investment (ROI)?



Total No. of Questions : 8]

SEAT No. :

PD4606

[6404]-111

[Total No. of Pages : 2

B.E. (Electrical Engineering)
ELECTRICAL AND HYBRID VEHICLE
(2019 Pattern) (Semester - VII) (Elective - IV) (403144B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write a short note on electric bus with a suitable example. [5]
b) Write a short note on Battery swapping system. [6]
c) Explain any one energy management strategies for EV's. [7]

OR

- Q2)** a) Describe EV fleet management. [6]
b) Mention merits and demerits of fuel cell vehicle. [6]
c) Draw and explain Series hybrid configuration. [6]

- Q3)** a) Write a short note on vehicle dynamics. [5]
b) State different drive trains configuration in HEVs and explain anyone. [6]
c) Draw and explain HEV Subsystem. [6]

OR

- Q4)** a) How fuel efficiency analysis is carried for PHEV. [5]
b) Describe the HEV modelling considering forward approach and reverse approach. [6]
c) Explain any one power management strategy used for HEV. [6]

P.T.O.

- Q5)** a) Write a short note on electric vehicle network. [5]
b) Draw and explain PMSM motor control for an EV application. [7]
c) Describe important considerations for sizing of power converter. [6]

OR

- Q6)** a) Discuss selection parameters for an EV's battery. [5]
b) Which forces should be considered for EV design? State & explain it along with equations. [7]
c) How to select size of EV motor? Which are the factors considered for it? [6]

- Q7)** a) Write a short note on EV tariff. [5]
b) Explain in detail star labelling scheme for li-ion packs. [6]
c) Describe challenges for EV charging infrastructure as per revised guidelines. [6]

OR

- Q8)** a) Explain any one EV start up in detail. [5]
b) Discuss FAME-II policy. [6]
c) State revised guidelines mentioned for charging infrastructure? [6]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

PD4607

[6404]-113

B.E. (Electrical)

HVDC & FACTS

(2019 Pattern) (Semester - VII) (Elective - IV) (403144D)

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

Q1) a) Explain the Principle of operation, Control and Power transfer characteristics of VSC. **[9]**

b) How dc link voltage control is achieved in VSC based HVDC system?**[8]**

OR

Q2) a) Explain HVDC Light system. Also state applications of VSC based HVDC system. **[9]**

b) Discuss the structure of VSC link. Also explain how voltage control is achieved in VSC based system. **[8]**

Q3) a) Describe contractions and operation of AC Controllers. **[9]**

b) Define FACTS Controllers. Also state benefits of FACTS Controllers.**[9]**

OR

Q4) a) Discuss the static Power converter structures. **[9]**

b) Discuss the constructional feature with suitable diagram of back to back converters and also explain its operation. **[9]**

P.T.O.

Q5) a) Draw a practical structure of TCSC and Explain Principle of operation and different operating modes of TCSC. **[10]**

b) Explain TCR plus TSC operation and along with its V-I Characteristics. **[8]**

OR

Q6) a) With neat sketches explain construction and operation of SSSC. **[10]**

b) Discuss the applications of SVC. **[8]**

Q7) a) By using relevant diagrams explain different operating modes of UPFC controllers. **[9]**

b) With detailed diagram explain operation of UPFC. **[8]**

OR

Q8) a) What is the function of series controller of UPFC? With control of the same explain operation of the same. **[9]**

b) What are the constraints on the operation of UPFC? **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4608

[Total No. of Pages : 2

[6404]-114

B.E. (Electrical Engineering)
SWITCHGEAR AND PROTECTION
(2019 Pattern) (Semester - VIII) (403148)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain following ratings of circuit breaker. **[4]**

- i) Symmetrical Breaking Capacity
- ii) Rated Insulation Level

b) With neat diagram explain Vacuum circuit breaker. **[6]**

c) An 11 KV, 500 MVA, 3 sec circuit breaker suddenly closes on occurring of fault. **[8]**

Determine

- i) The symmetrical breaking current
- ii) The asymmetrical breaking current assuming 50% DC component
- iii) The peak making current
- iv) The short time current rating

OR

Q2) a) Explain following ratings of circuit breaker. **[4]**

- i) Making Capacity
- ii) Breaking Capacity

b) With neat diagram explain Air-Blast circuit breaker. **[6]**

c) A Vacuum circuit breaker is rated as 3 phase, 1600 A, 2000 MVA, 33 KV, 1 second. Determine **[8]**

- i) Breaking current
- ii) Making current
- iii) STC
- iv) Rated normal current

P.T.O.

- Q3)** a) Draw block diagram of Static Relay. [3]
b) Explain in short Phasor Measurement Unit (PMU). [6]
c) Compare Static Relay with Electromagnetic relay with respective, Construction, working Principle, advantage and limitations. [8]

OR

- Q4)** a) Discuss three merits of Static Relay. [3]
b) Explain anti-aliasing Filter. [6]
c) Explain with block diagram of Numerical relay. [8]

- Q5)** a) Explain current differential Relay. [4]
b) Explain Merz-price Protection of Transformers. [6]
c) Explain the magnetic inrush current phenomenon in transformer & how to overcome it. [8]

OR

- Q6)** a) Draw neat block diagram of Buchholz relay. [4]
b) State abnormal conditions occur in Induction motor. [6]
c) Explain protection against single phasing in 3 phase induction motor. [8]

- Q7)** a) Explain Mho Relay. [3]
b) Explain the effect of Arc resistance on. [6]
i) Distance relay
ii) MHO relay
c) Write a short note on Wide Area Measurement (WAM) System. [8]

OR

- Q8)** a) Draw flowchart of Numerical algorithm. [3]
b) Explain time graded system protection of three phase feeders using overcurrent relay. [6]
c) State four advantages and four disadvantages of PLCC. [8]



Total No. of Questions : 8]

SEAT No. :

PD4609

[Total No. of Pages : 2

[6404]-115

B.E (Electrical)

ADVANCED ELECTRICAL DRIVES AND CONTROL

(2019 Pattern) (Semester-VIII) (403149)

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 non-programmable calculator is allowed.*

- Q1)** a) Compare VSI and CSI speed control of 3- phase Induction motor. [4]
b) Explain regenerative braking and multi quadrant operation of Induction motor drives. [6]
c) Explain steady-state analysis of induction motor. [8]

OR

- Q2)** a) What are different failure modes of Drives? [4]
b) Draw and explain block diagram of Vector control of induction motor.[6]
c) A 3-Phase, Y-connected squirrel cage induction motor has the following ratings and parameters: 1370rpm, 400V, 50Hz, 4 pole, $R_s=2\Omega$, $R_r' = 3\Omega$, $X_s = X_r' = 3.5\Omega$ and $X_m = 33.2\Omega$. Motor is connected by a voltage source inverter V/f ratio. [8]

Calculate:

- i) Speed for frequency of 30Hz and 80% of full load torque.
- ii) Frequency for a speed of 1000rpm and full load torque.
- iii) Torque for a frequency of 40Hz, speed of 100rpm.

- Q3)** a) Draw construction and working of BLDC motor for motoring and regenerative braking. [9]
b) Explain vector control of BLDC drive and mention its importance in EV application. [9]

OR

P.T.O.

- Q4)** a) Explain variable DC link converter topology for BLDC motor half wave drives for motoring and regenerative braking. [9]
b) Draw and explain speed torque characteristics of BLDC motor. How it differs from PM synchronous motor. [9]
- Q5)** a) Describe closed loop control of PM synchronous motor. [8]
b) Describe the construction of synchronous reluctance motor. Also judge the suitability of this motor for EV applications. [8]

OR

- Q6)** a) Draw speed torque characteristics of PMSM. Explain application of synchronous reluctance motor in EV. [8]
b) Explain different topologies of rotor construction used in PMSM. Also state application of each. [8]
- Q7)** a) How motors are classified on the basis of duty and enclosure type. How these will help selecting motors? [9]
b) Explain requirements of motor drive requirements for traction application. Explain with neat sketch any one scheme. [9]

OR

- Q8)** a) Write short note on any two: [9]
i) Requirements of drive for Sugar industries.
ii) Requirements of drive for Solar and battery powered application.
iii) Requirements of drive for Machine tools.
b) Explain various requirements and choice of drive for EV applications. Also explain basic operations of drive. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4610

[6404]-116

[Total No. of Pages : 2

B.E. (Electrical)

DIGITAL CONTROL SYSTEM

(2019 Pattern) (Semester - VIII) (403150A) (Elective-V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the tests for determining controllability and observability of Discrete data control system. **[8]**

b) Give three different canonical state variable models corresponding to following Pulse transfer function. $G(z) = \frac{4z^3 - 12z^2 + 13z + 7}{(z-1)^2(z-2)}$ **[9]**

OR

Q2) a) Write a note on state regulator design. **[8]**

b) Design a full state observer for the system having. **[9]**

$$G = \begin{pmatrix} 0 & 20.6 \\ 1 & 0 \end{pmatrix}; H = \begin{pmatrix} 1 \\ 0 \end{pmatrix}; C = (0 \quad 1)$$

Desired Eigen values of observer matrix are $Z = -1.8 + j2.4$,
 $Z = -1.8 - j2.4$.

Q3) a) Summarize different methods for determination of observer feedback gain Matrix (k_e). **[8]**

b) Find the response of the system $y(k)$, if state equation of system is

$$x(k+1) = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k) \text{ and } x(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix} \quad u(k) = 1; k = 0, 1, 2, 3, \dots$$

[10]

OR

P.T.O.

- Q4)** a) Explain Compensator design by the separation principle. [9]
 b) Consider system defined by [9]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -0.5 & -0.2 & 1.1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

Determine state feedback gain k such that closed loop system will exhibit the deadbeat response.

- Q5)** a) Explain Euler's forward, backward method and trapezoidal method with Example. [8]

- b) Find Eigen Values and Eigen Vectors for $G = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}$. [9]

OR

- Q6)** Explain the following methods for discretizing analog controllers. [17]
 a) Euler's backward method
 b) Euler's forward method
 c) Trapezoidal method

- Q7)** Explain the following digital control system applications: [18]
 a) Digital temperature control
 b) Digital position control

OR

- Q8)** a) Explain stepper motor control with block diagram and algorithm. [9]
 b) Explain computer program structure for simulation for simulation of discrete time control of continuous time plant. [9]

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Total No. of Questions : 8]

SEAT No. :

PD4611

[6404]-117

[Total No. of Pages : 2

B.E. (Electrical)

RESTRUCTURING & DEREGULATION

(2019 Pattern) (Semester - VIII) (Elective - V) (403150B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the Electricity Act 2003. **[9]**

b) Explain in detail rate of return regulation & performance-based regulation. **[8]**

OR

Q2) a) What are the principles of Tariff setting? Explain in detail Phases of Tariff Determination. **[9]**

b) Explain in detail National Electricity policy. **[8]**

Q3) a) Explain models based on contractual arrangements? Explain any one in detail. **[9]**

b) What is the procedure adopted in energy exchanges ? Explain trading of Renewable energy credits. **[9]**

OR

Q4) a) Explain models based trading wholesale competition & retail competition. **[9]**

b) Explain DAM and TAM in detail. **[9]**

P.T.O.

- Q5) a)** Write a short note on: [9]
i) MCP
ii) HHI Index

- b) What are the various electricity markets? Explain future contracts and future markets in detail. [8]

OR

- Q6) a)** Explain the peculiarity of electricity as a commodity. [9]
b) Write a short note on : [8]
i) Entropy coefficient
ii) Lerner index

- Q7) a)** What are the reasons for congestion and explain congestion management methods? [9]
b) Write a short note on : [9]
i) Physical transmission rights,
ii) Open access

OR

- Q8) a)** What are the different Transmission pricing methods? Explain any two in detail. [9]
b) Write a short note on: [9]
i) LMR.
ii) ATC.
iii) FTR.

x x x

Total No. of Questions : 8]

SEAT No. :

PD4612

[Total No. of Pages : 2

[6404]-118

B.E. (Electrical Engineering)

SMART GRID

(2019 Pattern) (Semester - VIII) (403150C) (Elective-V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is GIS? Explain the components of GIS. [7]

b) Draw and explain the functional block diagram of smart substation. [10]

OR

Q2) a) Explain the need of GIS in smart grid. [7]

b) Draw and explain the functional block diagram of smart meter. [10]

Q3) a) Explain with help of neat diagram the interfacing of HAN and NAN in smart grid. [8]

b) Explain the Zigbee protocol architecture. [10]

OR

Q4) a) What is the need of cyber security and how it can be achieved in smart grid. [8]

b) Explain with the help of neat diagram WAMPC. [10]

P.T.O.

Q5) a) Discuss the various microgrid operation strategies with help of neat diagram. [7]

b) Explain with help of neat diagram centralized and decentralized control of microgrid. [10]

OR

Q6) a) Explain microgrid topology with storage technologies with the help of neat diagram. [7]

b) Explain micro grid architecture with help of neat diagram. [10]

Q7) a) Write a note on smart appliances. [8]

b) Discuss power quality issues of grid connected renewable energy sources. [10]

OR

Q8) a) Explain different types of Data Analytics in smart grid. [8]

b) Discuss the different principle areas of home Automation. [10]



Total No. of Questions : 8]

SEAT No. :

PD4613

[Total No. of Pages : 2

[6404]-119

B.E. (Electrical)

SENSOR TECHNOLOGY(Open Elective)

(2019 Pattern) (Semester -VIII) (Elective - V) (403150D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) With the help of neat diagram explain Near Infrared spectroscopy. **[9]**

b) With the help of neat diagram explain OPT3007 Light Sensor. **[9]**

OR

Q2) a) Write short on “Light and Image sensing devices”. **[9]**

b) With the help of neat diagram explain 3D Depth sensor. **[9]**

Q3) a) With the help of functional block diagram explain the HDC1080 humidity sensor. **[8]**

b) With the help of neat diagram Explain LM35 Temperature Sensor . **[9]**

OR

Q4) a) What is the principle of operation of INA240 current sense amplifier. **[8]**

b) Explain HDC2010 Humidity Sensor. **[9]**

P.T.O.

- Q5)** a) State and explain different position sensing methods for absolute and relative positions. [8]
- b) What are the different types of Proximity sensors? Explain any one in detail. [9]

OR

- Q6)** a) Write short note on AFE5805 Ultrasonic sensor. [8]
- b) Explain with neat diagram Linear Variable Differential Transducer. [9]
- Q7)** a) Explain in detailed the Bluetooth. [9]
- b) Explain Touch Screen sensors. [9]

OR

- Q8)** a) Explain laser sensors. [9]
- b) Write short note on “compass gyroscope inclinometer”. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4614

[6404]-120

[Total No. of Pages : 2

B.E. (Electrical Engineering)

EHV AC TRANSMISSION

(2019 Pattern) (Semester - VIII) (Elective - VI) (403151A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Compare line charge with point charge. [4]
b) Write the short notes on design of cylindrical cage for corona gradients.[6]
c) Explain the electrostatic field of a point charge & its Properties. [8]

OR

- Q2)** a) Write the short notes on inductance of multi conductor lines. [4]
b) Derive the maximum charge condition on three phase lines. [6]
c) Explain the importance of surface voltage gradient factors in Extra high voltage lines. [8]

- Q3)** a) Discuss effect of high electrostatic field on Humans. [3]
b) Derive the expression for electrostatic field of Double circuit 3 phase A.C line. [6]
c) Derive the expression for electrostatic induction on unenergized circuit of a double circuit line. [8]

OR

- Q4)** a) Discuss effect of high electrostatic field on Animals. [3]
b) Explain the terms in detail: [6]
i) Primary shock current
ii) Secondary shock current
c) Explain the concept of insulated ground wire and explain the purposes served by insulated ground wire. [8]

P.T.O.

- Q5)** a) State and explain at least 1 formulae for power loss due to corona. [4]
b) Explain formation of corona and define terms: [6]
i) Inception corona voltage
ii) Visual corona voltage
c) With a simple block diagram, explain the Audible noise measuring circuit in Extra high voltage ac lines. [8]

OR

- Q6)** a) Explain charge-voltage diagram. [4]
b) Discuss on [6]
i) AN Measurement
ii) Weighting Network
c) Explain the corona formation and methods to reduce the corona effects.[8]

- Q7)** a) State the Classification of Cable. [3]
b) Brief, the line insulation design based upon transient over voltages. [6]
c) Write note on various properties of XLPE used in EHV cables. [8]

OR

- Q8)** a) State the Properties of Cable. [3]
b) Define $\tan \delta$ loss factor and derive an expression for insulation resistance of a cable. [6]
c) State and explain at least four factors to be considered in the design of EHV lines based upon the steady state limits. Also state their limiting value. [8]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4615

[Total No. of Pages : 2

[6404]-121

B.E. (Electrical Engineering)

ILLUMINATION ENGINEERING

(2019 Pattern) (Semester - VIII) (Elective - VI) (403151 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 to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of non-programmable calculator is allowed.

- Q1) a)** Discuss the factors to be considered in Indoor lighting scheme. **[4]**
- b) Define and explain the following terms in concern with Illumination Engineering **[6]**
- i) Coefficient of utilization
 - ii) Beam Angle
 - iii) Polar diagram
- c) What are the different cavities to be considered in indoor illumination design? Explain each of them along with a diagram showing the three cavities. **[8]**

OR

- Q2) a)** Explain in brief about Lumen Method. **[4]**
- b) Discuss in brief about Room reflectance & Room Index. **[6]**
- c) Explain the terms: Light loss factor, Maintenance factor and acoustic ceiling. **[8]**
- Q3) a)** What is the measure of colour appearance of a lamp? Discuss it in brief. **[3]**
- b) What are the factors to be considered in Lighting design of an educational institute? Explain each in brief. **[6]**
- c) State the advantages of good illumination design. Discuss each in brief. **[8]**

OR

P.T.O.

- Q4)** a) What is contrast (in concern with lighting design)? [3]
b) Define and explain the following terms: Colour temperature & colour rendering index. [6]
c) What are the crucial factors in the design of a swimming pool. Discuss each in brief. [8]

- Q5)** a) What is the significance of good street lighting? [4]
b) Which are the lamps suitable for street lights? Explain one in brief. [6]
c) What are the important features needed in street light luminaires? [8]

OR

- Q6)** a) What is glare in street lighting? Explain each in brief. [4]
b) How to calculate the average illuminance on the road surface? [6]
c) What are the different types of pole arrangement? Also justify the suitability of each for a particular class of road. [8]

- Q7)** a) What are intelligent LED lighting systems and how do they work? [3]
b) Write a short note on Intelligent lighting. [6]
c) Compare LED and OLED? [8]

OR

- Q8)** a) Compare intelligent lighting for residential & commercial use [3]
b) What are the advantages & disadvantages of OLED? [6]
c) Write a short note on LASER & its applications. [8]

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Total No. of Questions : 8]

SEAT No. :

PD4616

[Total No. of Pages : 2

[6404]-122

B.E.(Electrical Engineering)

ELECTROMAGNETIC FIELDS

(2019 Pattern) (Semester - VIII) (403151 C) (Elective-VI)

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 non-programmable calculator is allowed.*

- Q1)** a) Explain about Electric dipole and flux lines. **[4]**
b) Derive the expression for Capacitors with multiple dielectrics. **[6]**
c) Derive the expression for Coaxial capacitor. **[8]**

OR

- Q2)** a) Write about Continuity equation for current. **[4]**
b) Derive the expression for Energy stored in terms of D and E. **[6]**
c) Derive the expression for Parallel plate capacitor. **[8]**

- Q3)** a) Explain the Scalar magnetic potential. **[3]**
b) Derivations of Ampere's law based on magnetic potential. **[6]**
c) Derive the Laplace's equations for Magnetostatic field. **[8]**

OR

- Q4)** a) Explain the Vector magnetic potential. **[3]**
b) Derive the expression Magnetic dipole. **[6]**
c) Derivations of Biot-Savart's law based on magnetic potential. **[8]**

P.T.O.

- Q5)** a) Explain the term Ohm's law employing mobility. [4]
b) Brief about Relaxation time. [6]
c) Explain the Dielectric boundary conditions. [8]

OR

- Q6)** a) Write the Free space boundary conditions. [4]
b) Explain the concept of uniform plane wave. [6]
c) Explain the Boundary conditions for Magnetostatic fields. [8]

- Q7)** a) Explain the terms: Time varying potentials, Time Harmonic Field. [3]
b) Brief about Polarization in Dielectrics. [6]
c) Write in detail about concept Poynting theorem. [8]

OR

- Q8)** a) Explain Faraday's law. [3]
b) Derive the expression for moving loop in time varying field. [6]
c) Derive the Maxwell's equations in point form and integral form for harmonic field. [8]



Total No. of Questions : 8]

SEAT No. :

PD4617

[Total No. of Pages : 2

[6404]-123

B.E.(Electrical)

**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(2019 Pattern) (Semester - VIII) (403151 D) (Open Elective)
(Elective-VI)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define propositional logic and explain its significance in building a knowledge base. **[4]**
b) Discuss the process of constructing a knowledge base using first-order logic. **[6]**
c) Explain the concept of probabilistic reasoning over time and its importance in modeling dynamic systems. **[8]**

OR

- Q2)** a) Provide an example of converting a natural language statement into a propositional logic representation. **[4]**
b) Discuss the limitations of first-order logic in representing uncertainty and incomplete information. **[6]**
c) Explain the concept of Hidden Markov Models (HMMs) and their application in modeling temporal uncertainty. **[8]**

- Q3)** a) Discuss the role of labeled training data in supervised learning and its significance. **[4]**
b) Define the VC dimension and its significance in the theory of supervised learning. **[6]**
c) Define the concept of Probably Approximately Correct (PAC) learning and its goals. **[7]**

OR

P.T.O.

- Q4)** a) Provide an example of a real-world application where learning a class from examples is used. [4]
b) Provide examples of hypothesis classes with low and high VC dimensions. [6]
c) Explain the importance of the sample size and the confidence parameter in PAC learning. [7]

- Q5)** a) Define linear regression and explain its basic principles in supervised learning. [4]
b) Describe the lasso regression method and its ability to perform variable selection. [6]
c) Explain the difference between linear regression and logistic regression. [8]

OR

- Q6)** a) Define shrinkage methods in the context of linear regression. [4]
b) Discuss the least angle regression (LARS) algorithm and its advantages over other methods. [6]
c) How does the concept of decision boundaries apply to logistic regression [8]

- Q7)** a) Explain the concept of association rules and their significance in market basket analysis. [4]
b) Explain the concept of temporal difference (TD) learning in reinforcement learning. [6]
c) Define cluster analysis and its purpose in unsupervised learning. [7]

OR

- Q8)** a) What is the Apriori algorithm and how does it help in generating association rules? [4]
b) Discuss the concept of centroid initialization and its impact on the K-means algorithm. [6]
c) Discuss the key components of a reinforcement learning problem. [7]



[6404]-124

B.E. (Electronics and Telecommunication)
RADIATION AND MICROWAVE THEORY
(2019 Pattern) (Semester - VII) (404181)

Time : 2½ Hours]

[Max. Marks : 70

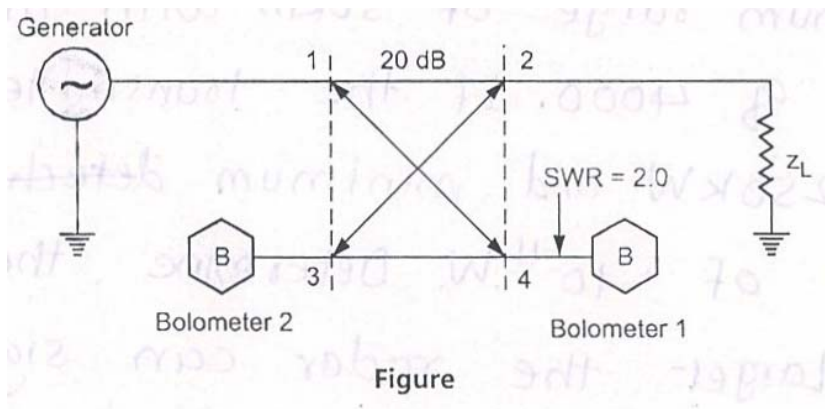
Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) 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 as a Mixer. [5]
- b) What are the different performance parameters of directional coupler. Explain the operation of two hole directional coupler. [6]
- c) Determine the [S] of a 3-port circulator. Given insertion loss of 0.5 dB, isolation of 20 dB and VSWR of 2. [6]

OR

- Q2)** a) Discuss 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 E-Plane Tee. [6]
- c) 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 arm4; bolometer 2 is matched to arm 3. If bolometer 1 reads 8mW and bolometer 2 reads 2 mW, find: i) the amount of power dissipated in the load Z_L ; ii) the VSWR on arm 2. [6]



P.T.O.

- Q3)** a) Distinguish between the Klystron tube and Travelling wave tube amplifier. [6]
b) With the help of Constructional Details explain the operating principle of Reflex Klystron. [6]
c) What is the slow wave structure? Explain how a helical TWT achieves amplification. [5]

OR

- Q4)** a) Explain the working principle of two cavity Klystron Amplifier. [6]
b) A reflex klystron operates at the peak mode of $n=2$ with $V_0 = 280\text{V}$, $I_0 = 22\text{mA}$ and signal voltage $V_1 = 30\text{V}$, Determine (i) the input power, (ii) the output power, and (iii) the efficiency. [6]
c) Explain the HF limitations of Conventional tube. [5]

- Q5)** a) What is parametric Amplifier? How it is different from a normal amplifier. [6]
b) Describe the several domain formation modes of a Gunn diode. [6]
c) With the help of circuit diagram explain the Schottky Barrier Diode. [6]

OR

- Q6)** a) Explain the operation of Varactor diode. Discuss its constructional details, equivalent circuit and figure of merit. Mention its applications. [6]
b) With the help of Energy band diagram explain how Tunnel diode exhibits negative resistance in the part of its forward characteristics. [6]
c) Discuss the application of PIN diode as a switch. [6]

- Q7)** a) A slotted line is used to measure the frequency and it was found that the distance between the nulls is 1.85 cm. Given guide dimensions are (3×1.5) cm. Calculate the value of frequency measured between twice minimum power points = 1 mm on a slotted line. [6]
b) Using suitable block diagram explain the operating principle of RADAR. Enlist the applications of RADAR. [6]
c) With the help of suitable block diagram explain the measurement of VSWR using double minima method. [6]

OR

- Q8)** a) Write a note on: Medical Application such as Microwave Diathermy. [6]
b) Write a note on radiation hazard levels for personnel. [6]
c) A marine radar operating at 10GHz has a maximum range of 50km with an antenna gain of 4000. If the transmitter has a power of 250 kW and minimum detectable signal of 10^{-11}W . Determine the cross section of the target the radar can sight. [6]



Total No. of Questions : 8]

SEAT No. :

PD4619

[Total No. of Pages : 2

[6404]-125

B.E. (Electronics & Telecommunication Engineering)

VLSI DESIGN & TECHNOLOGY

(2019 Pattern) (Semester - VII) (404182)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Compare CPLD with FPGA. [8]

b) Draw the block diagram of FPGA and explain it in brief. [9]

OR

Q2) a) Explain in brief PLD Design flow. [8]

b) Draw the block diagram of CPLD and explain it in brief. [9]

Q3) a) What is technology scaling? Explain any one type of scaling with its effect at least 4 parameters. [8]

b) Explain the working of a transmission gate and implement a circuit of 4:1 MUX using transmission gate. [10]

OR

Q4) a) Draw and explain CMOS inverter transfer characteristics. [6]

b) Explain : Channel Length Modulation, Body Effect, Velocity saturation. [12]

Q5) a) Explain ASIC Design flow. [6]

b) Explain DC and transient analysis using SPICE. [6]

c) Explain Antenna Effect in brief. [6]

OR

Q6) a) Explain LAMBDA rules used for CMOS layout design. [6]

b) Write short note on Cross talk. [6]

c) Write SPICE code for CMOS inverter for AC analysis. [6]

P.T.O.

- Q7)** a) What is DFT? Explain the need for DFT in brief. [7]
b) Explain the following terms with respect to testability: [10]
i) Fault coverage
ii) Fault Models
iii) Observability
iv) Controllability
v) Physical Defects

OR

- Q8)** a) What is need of BIST? Explain typical BIST in detail. [8]
b) Explain path sensitizing algorithm in detail. [9]



Total No. of Questions : 8]

SEAT No. :

PD4620

[Total No. of Pages : 2

[6404]-126

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

- Q1)** a) Explain full virtualization and para virtualization. [6]
b) Define virtualization? Explain the five stage virtualization process. [6]
c) Define Server virtualization and discuss its benefits and limitations. [6]

OR

- Q2)** a) Explain Hardware and Software virtualization with suitable diagram. [6]
b) Describe Hypervisors in detail. [6]
c) Explain resource partitioning and service partitioning. [6]

- Q3)** a) Explain cloud computing lifecycle management? [6]
b) Enlist the advantages and disadvantages of SOA. [6]
c) Write short note on: [5]
i) Data Security
ii) Host Security

OR

- Q4)** a) Draw & explain Cloud Architecture. State its importance. [6]
b) Describe the Security issues in Cloud service providers. [6]
c) Explain in detail design principles of COA. [5]

P.T.O.

- Q5)** a) Enlist the various advantages & disadvantages of Google App Engine.[6]
b) Draw and explain the architecture of Amazon Web Services. [6]
c) Explain the types of cloud platforms. [6]
i) Hadoop
ii) GAE

OR

- Q6)** a) Explain the Windows Azure Platform with Cost Model. [6]
b) Describe the application services of App Engine. [6]
c) Explain the steps for configuring a server for EC2. [6]
- Q7)** a) Write Short note on: [6]
i) RFID Tags
ii) Significance of GPS in IOT
b) Explain the following applications: [6]
i) Smart Traffic Management systems
ii) Smart Agriculture Systems
c) Define Distributed computing. Elaborate advantages of Distributed Computing. [5]

OR

- Q8)** a) Compare Cloud Computing and Distributed Computing. [6]
b) Describe any three IOT enabling Technologies. [6]
c) Enlist the benefits of Online Networking over Traditional Networking?[5]



Total No. of Questions : 8]

SEAT No. :

PD4621

[Total No. of Pages : 2

[6404]-127

B.E. (Electronics /E&TC)

SPEECH PROCESSING

(2019 Pattern) (Semester - VII) (404184-A) (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) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Make suitable assumptions wherever necessary.*
- 5) *Use of calculator is allowed.*

Q1) a) Explain Levinson-Durbin recursive algorithm for calculation of Predictor Coefficients? **[9]**

b) What is MFCC? Explain the method to calculate MFCC using block diagram? **[8]**

OR

Q2) a) Discuss covariance approach for finding LPC with mathematical Treatment. **[9]**

b) Explain Uniform and non uniform filter banks. **[4]**

c) Explain in detail estimation of formant using cepstrum. **[4]**

Q3) a) Explain forward and backward adaptive quantizer in detail. **[8]**

b) What is APCM? Compare APCM with companded PCM. Explain how companded PCM will improve the SNR of the signal? **[9]**

OR

Q4) a) With the help of block diagram explain homomorphic speech processing? **[8]**

b) Explain Linear Prediction Based Vocoders. **[9]**

Q5) a) Explain speech synthesis and Compare Speaker identification and Speaker verification. **[9]**

b) Draw a block diagram and explain the operation of Text-To-Speech (TTS) converter. **[9]**

OR

P.T.O.

- Q6) a)** What is prosody in speech production? What is the importance of prosody in speech? **[9]**
- b)** What is concatenative synthesis? State and explain sub types of concatenative synthesis. **[9]**

- Q7) a)** Explain the following performance parameters. **[8]**
- i) True Positives
 - ii) True negatives
 - iii) False Positives
 - iv) False negatives
- b)** Explain Recurrent Neural Network, State its advantages and disadvantages. **[10]**

OR

- Q8) a)** Explain the following performance parameters. **[8]**
- i) Sensitivity
 - ii) Specificity
 - iii) Area under curve
 - iv) Receiver Operating Characteristics.
- b)** Explain Text to speech synthesis using support vector machine. **[10]**



Total No. of Questions : 8]

SEAT No. :

PD4622

[Total No. of Pages : 2

[6404]-128

B.E. (E&TC)

PLC SCADA & AUTOMATION

(2019 Pattern) (Semester - VII) (404184B) (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) 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 concept of latching with the help of ladder diagram in PLC. [5]
b) With the help of ladder diagram & truth table, realize the 2 i/p Logic gates. [8]
 i) X-OR
 ii) X-NOR
c) Explain delay ON-TIMER in PLC with the help of an example in ladder logic. [5]

OR

- Q2)** a) Design- [8]
 i) 4 : 1 MUX
 ii) 1 : 4 DEMUX
 Using ladder logic
b) Write a ladder logic for the following event- [10]
 i) Fill the tank upto level L_u
 ii) Heat & stir the liquid for 30 min
 iii) Empty the tank upto level L_E
 iv) Repeat the process
 Use START push button is NO, STOP is NC, use Limit switches for level, sketch the diagram.

- Q3)** a) What is SCADA? Drawn & explain the architecture of SCADA. [7]
b) Explain the function of MTU & RTU in detail. [7]
c) Enlist the applications of SCADA in Industrial Automation. [4]

OR

- Q4)** a) Define the term SCADA & explain the components of SCADA system. [7]
b) Explain an application of SCADA system in industrial automation. [7]
c) What is HMI? Explain HMI interface in SCADA. [4]

P.T.O.

- Q5)** a) What is DCS? Explain architecture of DCS. [7]
b) Explain in detail the application of water treatment plant as DCS. [7]
c) What are types of DCS. [4]

OR

- Q6)** a) Explain the basic concept of DCS system? Explain the components of DCS. [6]
b) What are the advantages of DCS system state applications of DCS. [6]
c) Compare PLC, DCS, & SCADA. [6]

- Q7)** a) What is CNC? Explain with block diagram. [8]
b) State the advantages & applications of CNC m/c in manufacturing. [8]

OR

Q8) Write short notes on [16]

- a) Foundation field Bus
- b) Ethernet
- c) MODBUS
- d) TCP/IP



Total No. of Questions : 8]

SEAT No. :

PD4623

[Total No. of Pages : 2

[6404]-129

B.E. (E&TC) (Electronics)

JAVA SCRIPT

(2019 Pattern) (Semester - VII) (404184C) (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 right indicate full marks.
- 4) Assume suitable data for writing program, if necessary.

- Q1)** a) Explain the Mask out with respect to Functions in Java Script. [6]
b) Explain how function is used as object in Java Script? [6]
c) How Arrays can be used as Stacks and Queues in Java Script? [6]

OR

- Q2)** a) What is Anonymous Function ? Explain with example. [6]
b) Explain different types of Objects. [6]
c) List the various methods of Math object. Explain any one with Example.[6]

- Q3)** a) What are Common character classes in Regular Expressions? [6]
b) Write a short note on Advanced Regular Expressions. [6]
c) List String Methods for Regular Expressions and explain any one of them. [5]

OR

- Q4)** a) List the 6 Repetition Quantifiers with their meaning. Explain any 2 with example. [6]
b) Explain Static Properties of the RegExp Class Object. [6]
c) Describe Limitations of Regular Expressions. [5]

- Q5)** a) List different DOM methods used for accessing elements. Explain any two with suitable example. [6]
b) Explain in detail Netscape 4 event model. [6]
c) Describe how to create, insert and append nodes in DOM. [6]

OR

P.T.O.

- Q6)** a) Describe the terms DOM and HTML elements. [6]
b) Explain event and event handler with an example. [6]
c) Describe different event model issues. [6]

- Q7)** a) Explain Browser Object Model with suitable diagram. [6]
b) What is frame and explain the HTML tags to create frames and how to change the properties of the frame. [6]
c) Create a student information Form to accept information like Name Address, City, State, Gender, Mobile Number and email id. [5]

OR

- Q8)** a) Describe the term controlling window. Enlist different window methods with use. [6]
b) Write a Java Script code for a simple calculator using Java script for operations like addition, multiplication, subtraction, division, square of a number etc. [6]
c) List and explain different properties and methods used in location object. [5]



Total No. of Questions : 8]

SEAT No. :

PD4624

[Total No. of Pages : 2

[6404]-130

**B.E. (Electronics & Telecommunication Engineering)
EMBEDDED SYSTEM & RTOS
(2019 Pattern) (Semester - VII) (404184(D)) (Elective - III)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) 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: OSMBBoxPost() and OSMBBoxPend(). [8]
c) Explain with state diagram the states of a task in RTOS. [6]

OR

- Q2)** a) Explain the following μ C/OS- II functions. [4]
i) OSInit()
ii) OSStart()
b) What are different task management functions? Explain following functions with reference to μ COS- II. [8]
i) OSTaskCreate ()
ii) OSTaskDel ()
iii) OSTaskSuspend ()
c) Define clock tick in RTOS. Explain with functions any two time management services in μ COS- II. [6]

- Q3)** a) Differentiate between BIOS and Boot-loader. [4]
b) Draw a typical embedded Linux development set up and explain how it works. [8]
c) Explain the various binary utilities in tool chain. [5]

OR

P.T.O.

- Q4)** a) Explain the storage considerations in Embedded Linux. [6]
b) Explain typical set up for embedded Linux application development.[7]
c) Explain in detail the role of GNU debugger. [4]

- Q5)** a) What is Linux kernel configuration? Explain the steps in Linux kernel configuration. [6]
b) Explain the file structure used in Embedded Linux. [6]
c) Explain with diagram the architecture of Linux kernel. [6]

OR

- Q6)** a) With diagram, explain the functional blocks of Universal Boot-loader.[6]
b) What are the various boot-loader challenges? Explain briefly. [6]
c) Which are different types of device driver? Explain the loadable kernel modules. [6]

- Q7)** a) Explain the development platform of Arduino Uno with reference to IDE, Board details and application. [9]
b) Explain the embedded software development process and tool chain.[8]

OR

- Q8)** a) Explain the development platform of Raspberry Pi with reference to IDE, Board details and application. [9]
b) How the testing and debugging is done using tools like Simulator, Emulator and Logic analyzer? [8]



Total No. of Questions : 8]

SEAT No. :

PD4625

[Total No. of Pages : 2

[6404]-131

B.E. (Electronics & Telecommunication Engineering)

MODERNIZED IOT

(2019 Pattern) (Semester - VII) (404184-E) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe in detail the HTTP and MQTT session layer Protocol in IoT?[9]

b) Write a short note on IPv4 and IPv6 protocol. [8]

OR

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

i) Z Wave

ii) Bluetooth Low Energy

b) Compare TCP and UDP transport layer protocol? [8]

Q3) a) Differentiate between Raspberry Pi and Arduino Board. [9]

b) Explain the connection of microcontrollers with mobile devices through Bluetooth. [8]

OR

Q4) a) Explain the DHT interfacing deployment in ESP8266. [9]

b) List out and explain any 8 Arduino functions in detail. [8]

Q5) a) Draw and explain the Architecture of IIoT. [9]

b) Explain in detail about the Industrial Internet Architecture Framework (IIAF). [9]

OR

Q6) a) Briefly explain application of IIoT in: [9]

i) Healthcare

ii) Logistics

b) What is IIoT and How is it different from IoT? [9]

P.T.O.

- Q7)** a) Explain in detail the Air Pollution monitoring system. **[9]**
b) Describe the Sportsmen care application for vital signs monitoring in high-performance centers and fields. **[9]**

OR

- Q8)** a) Describe Photovoltaic Installation -Monitoring and optimization of performance in solar energy plants. **[9]**
b) Write a short note on: **[9]**
i) Smart Grid
ii) Smart Parking



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 1

PD4626

[6404]-132

B.E. (E & TC)

DATAMINING

(2019 Pattern) (Semester - VII) (404185 A) (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 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) Give in detail the steps and algorithm of FP growth algorithm. [9]
b) Describe the different steps in Pattern Evaluation Method. [9]

OR

- Q2)** a) What are the differences between Bayes Classification Methods, Rule-Based Classification? [9]
b) Explain Decision Tree Induction methods. [9]

- Q3)** a) Detail different attribute selection measures. [9]
b) Give the steps involved in CART algorithm. [9]

OR

- Q4)** a) Describe in detail the general approach to solving a classification problem. [9]
b) Write short notes on Support Vector Machines. [9]

- Q5)** a) Discuss the different types of outliers that occur in a dataset. [9]
b) With the help of suitable example, explain k-medoids algorithm. [8]

OR

- Q6)** a) Detail BDSCAN clustering algorithm with an example. [9]
b) Differentiate between classification and clustering. [8]

- Q7)** a) Write in detail on mining stream data. [9]
b) Discuss the steps involved in HITS algorithm. [8]

OR

- Q8)** a) Differentiate between Web usage mining and Web Structure mining. [9]
b) Write short notes on Web log structure and issues regarding web logs. [8]



Total No. of Questions : 8]

SEAT No. :

PD4627

[Total No. of Pages : 2

[6404]-133

B.E. (E & TC)

ELECTRONIC PRODUCT DEVELOPMENT

(2019 Pattern) (Semester - VII) (Elective - IV) (404185 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the software life cycle and various types of softwares. **[9]**

b) Write short note on the concept of the failure and risk abatement. **[8]**

OR

Q2) a) How real time software is embedded in electronic product development stages. **[9]**

b) What are the different types debugging practices observed in software development of electronic products. **[8]**

Q3) a) Write short note of routing topology in PCB layout designing. **[9]**

b) State and explain fan cooling and force cooling technique in electronic product systems. **[9]**

OR

Q4) a) Explain the grounding & shielding techniques in PCB design. Also explain guard band technique in PCB. **[9]**

b) Explain the role of different types of softwares in PCB designing process. **[9]**

Q5) a) Write short note on “Good Programming Practices.” **[9]**

b) Explain the digital to analog conversion techniques. **[9]**

OR

P.T.O.

- Q6)** a) Compare the conducted EMI and Radiated EMI with example. [9]
b) Explain EMI and EMC issues in details. [9]

- Q7)** a) Explain the need and various methods of documentation. [9]
b) Explain the effective bill of material with suitable example. Also explain the need of bills of materials. [8]

OR

- Q8)** a) What are various visual techniques of documentation. [9]
b) Explain the accountability and liability related to records of documentation. [8]



Total No. of Questions : 8]

SEAT No. :

PD4628

[Total No. of Pages : 2

[6404]-134

B.E. (E & TC)

DEEP LEARNING

(2019 Pattern) (Semester - VII) (404185 C) (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 to be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What is activation function? Explain any two types of activation functions used in deep learning. [6]
- b) Define width and depth of neural networks. Explain the architecture of Neural Network. [6]
- c) Write short notes on Dropout & Overfitting with respect to neural network. [6]

OR

- Q2)** a) What is batch normalization used in neural network? Explain its working. [6]
- b) What is regularization? Explain Lasso (L1) Regularization. [6]
- c) Explain with neat diagram of Restricted Boltzmann Machines (RBM). [6]

- Q3)** a) Explain convolutional operation of CNN with example. [6]
- b) Explain pooling layer of CNN. [6]
- c) Explain the terms padding & striding. [5]

OR

- Q4)** a) Explain the terms weight initialization and hyper parameter training with respect to training of CNN. [6]
- b) Explain the function of fully connected layer of CNN [6]
- c) Write a short note on deep CNN architecture: AlexNet. [5]

P.T.O.

- Q5)** a) What is A Recurrent Neural Network (RNN)? How it is used in NLP? [6]
b) Explain RNN Vs. Feed-Forward Neural Networks. [6]
c) Write a short note on Generative Adversarial Network. [6]

OR

- Q6)** a) Explain the term long short term memory (LSTM) used in RNN. [6]
b) Write a short note on Back Propagation Through Time (BPTT). [6]
c) Explain the working of sequence to sequence model. [6]

- Q7)** a) Explain in detail the structure of an image classification using deep learning. [9]
b) How NLP is used for text preprocessing? Explain in detail. [8]

OR

- Q8)** a) Explain spam mail classification applications using NLP. [9]
b) Explain sentiment analysis used for any social media application. [8]



Total No. of Questions : 8]

SEAT No. :

PD4629

[Total No. of Pages : 2

[6404]-135

B.E. (Electronics /E & TC Engineering)

LOW POWER CMOS

(2019 Pattern) (Semester - VII) (Elective - IV) (404185 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No. 1 or 2, Q. No. 3 or 4, Q5 or Q6, Q7 or Q8.*
- 2) Neat diagrams to be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data if necessary.*

- Q1)** a) What are the challenges and considerations in balancing the performance and power consumption when sizing an inverter chain for dynamic power reduction? **[8]**
- b) Combinational flip-flops and double-edge-triggered flip-flops are used in modern circuits for better timing and efficiency. Compare and contrast these two types of flip-flops, highlighting their respective advantages and disadvantages in terms of power consumption and performance. **[9]**

OR

- Q2)** a) Describe the impact of transistor sizing on leakage power. How can transistor sizing be used to reduce leakage power in CMOS circuits? Provide specific strategies and the underlying principles. **[9]**
- b) Explain the variety of Boolean functions that can be implemented in a low-power digital cell library. How does optimizing Boolean functions contribute to power reduction? **[8]**
- Q3)** a) Explain the importance of power estimation at the circuit level in VLSI design. Discuss the methods used for accurate power estimation at the transistor level. **[9]**
- b) Estimate the power dissipation in Domino logic circuits. Explain how charge sharing, node capacitances, and clocking events contribute to the power consumption of Domino circuits. **[9]**

OR

P.T.O.

- Q4)** a) Explain the concept of sensitivity analysis in power estimation. How can sensitivity analysis be used to identify critical components that affect power dissipation and optimize them for low-power design? [9]
- b) Explain the concept of signal modeling in digital circuits. Discuss the different types of signals that are typically modeled in VLSI systems and their relevance in power estimation. [9]

- Q5)** a) Discuss the primary sources of software power dissipation in embedded systems. How do software operations such as memory access, computation, and control flow contribute to power consumption? [8]
- b) Explain the concept of architecture-level power estimation in software systems. How does this method provide insights into power consumption of different components like ALUs, registers, and buses in a processor? [10]

OR

- Q6)** a) Discuss the role of minimizing memory access costs in reducing software power consumption. What techniques can be employed to reduce power dissipation due to memory operations? [8]
- b) Describe the concept of automated low power code generation. How do compilers and code generators assist in automatically optimizing code for power efficiency? [10]

- Q7)** a) Explain the concept of adiabatic switching in digital circuits. How does it differ from traditional switching in terms of energy dissipation? [9]
- b) Define battery-aware synthesis and explain its importance in low-power system design, especially in portable and battery-powered devices. [8]

OR

- Q8)** a) Explain the concept of process variations and how they affect the performance and power consumption of digital circuits. Provide examples of such variations. [9]
- b) Discuss the key features of low-power synthesis tools. How do these tools assist in power optimization at different levels of design, such as logic synthesis, placement, and routing? [8]



Total No. of Questions : 8]

SEAT No. :

PD4630

[Total No. of Pages : 2

[6404]-136

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

- Q1)** a) What is the basic working principle of Smart Antennas? Write the types of smart antenna along with their advantage. [6]
- b) Explain the terms Beam Steering and Degree of Freedom for smart antennas. [6]
- c) Explain mutual coupling effect in a smart antenna array? How directivity can be improved under influence of mutual coupling? [6]

OR

- Q2)** a) Explain the architecture of a smart antenna system with suitable diagram. [6]
- b) Differentiate between switched beam and adaptive antenna beam method. [6]
- c) How does beam steering contribute to the effectiveness of smart antennas, and what key factors for implementing beam steering antenna. [6]

- Q3)** a) Explain the working principle of Root MUSIC and Cyclic MUSIC algorithms used in the beamforming of smart antennas. [7]
- b) Describe the working of the ESPRIT algorithm. [5]
- c) Explain in detail Maximum likelihood method for DOA estimation. [5]

OR

- Q4)** a) What are various Eigen structure methods, explain the significance of Eigen structure for antenna design. [7]
- b) What is a MUSIC algorithm? Compare root music and cyclic music algorithm. [5]
- c) Explain in detail the linear prediction method for spectral estimation. [5]

P.T.O.

- Q5)** a) Write short note on Beam Forming also explain the concept of classical Beam former. [6]
- b) How to achieve Minimum Mean Square Error (MMSE) using beamforming algorithms? [6]
- c) What is Linearly Constrained Minimum Variance (LCMV) and how does LCMV help in enhancing the quality of a signal in the presence of interference? [6]

OR

- Q6)** a) Explain Adaptive Algorithms for Beam forming with its advantage. [6]
- b) Explain the Statistically Optimum Beam-forming Weight Vector. [6]
- c) Explain the concept of Direct Matrix Inversion (DMI) in the context of smart antenna. [6]

- Q7)** a) Compare SISO, SIMO, MISO, MIMO systems with respect to data throughput, link range, bandwidth, and transmit power. [6]
- b) What is the principle of MIMO systems and its advantage? Draw block diagram of MIMO System design. [6]
- c) List out & explain the challenges associated with implementation of MIMO in smart antennas? [5]

OR

- Q8)** a) What is the concept of MIMO? Write its applications. [6]
- b) Explain hybrid antenna array, what are key challenges for implementing hybrid antenna array. [6]
- c) What do you mean by massive MIMO, mention its applications in wireless communication. [5]



Total No. of Questions : 8]

SEAT No. :

PD4631

[Total No. of Pages : 3

[6404]-137

B.E. (E&TC)

**FIBER OPTIC COMMUNICATION
(2019 Pattern) (Semester - VIII) (404190)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) A given silicon APD has a quantum efficiency of 65% at a wavelength of 900 nm. Suppose 0.5 μW of optical power produces a multiplied photocurrent of 10 μA . Find multiplication factor. **[5]**
- b) Compare pin diode and APD w.r.t. following. **[6]**
- i) Response time
 - ii) Bias
 - iii) Output current
 - iv) Internal gain
 - v) Cost
 - vi) Complexity
- c) What are the different noise sources in photo detectors? Explain the following. **[7]**
- i) Quantum noise
 - ii) Dark noise
 - iii) Thermal noise

OR

- Q2)** a) Define & explain the following terms w.r.t. optical detector. **[6]**
- i) Quantum Efficiency
 - ii) Responsivity
 - iii) Long cut off wavelength
- b) When 3×10^{11} photons each with a wavelength of 0.85 μm are incident on a photodiode, on average 1.2×10^{11} electrons are collected at the terminals of the device. Determine the quantum efficiency and the responsivity of the photodiode at 0.85 μm . **[6]**
- c) Explain performance and compatibility requirements for photodectors. **[6]**

P.T.O.

- Q3)** a) Enlist various types of optical amplifiers and explain SOA in detail. [6]
b) Draw the block diagram of a point to point optical fiber link and explain the function of blocks needed in it. [6]
c) An optical fiber transmission system is to be designed to operate on 8km length without repeaters. The rise time of the chosen components are source LED : 8ns, Fiber cable: intermodal :5ns/km, Intramodal: 1ns/km, Detector PIN :6ns Estimate maximum bit rate that may be achieved on the link when using NRZ and RZ formats. [6]

OR

- Q4)** a) Explain the working principle of Fiber Bragg Grating. Enlist applications of FBG. [6]
b) Write short notes on. [6]
i) Optical Isolator
ii) Optical Circulator
iii) Optical Add/Drop Multiplexers:
c) A 2 X 2 biconical tapered fiber coupler has an input optical power level of $P_0 = 200$ mW. The output powers at the other three ports are $P_1 = 90$ mW, $P_2 = 85$ mW, and $P_3 = 6.3$ nW. What are the coupling ratio, excess loss, insertion losses, and return loss for this coupler? [6]
- Q5)** a) Compare synchronous and asynchronous optical network. Explain SONET with respect to structure and elements. [6]
b) With suitable diagram explain Gigabit Passive Optical Network (GPON). [6]
c) Define Optical Network .Explain the term optical node and light path with suitable diagram. [5]

OR

- Q6)** a) Define network topology. State and explain types of network topologies with suitable diagram. [6]
b) What is FTTX what are the different categories of FTTX Explain FTTX with respect to architecture, advantages. [6]
c) Compare active optical network (AON) and passive optical network (PON).Explain concept of PON with the help of diagram. [5]

- Q7) a)** With suitable diagram explain signal attenuation in an optical fiber by cutback technique. **[6]**
- b)** An engineer wants to find the attenuation at 1310 nm of a 4.95-km long fiber. The only available instrument is a photo detector, which gives an output reading in volts. Using this device in a cutback attenuation setup, the engineer measures an output of 6.58 V from the photodiode at the far end of the fiber. After cutting the fiber 2 m from the source, the output voltage from the photo detector now reads 2.21V. What is the attenuation of the fiber in dB/km? **[5]**
- c)** What are the different methods for measurement of Numerical Aperture of a fiber? Explain trigonometric method with suitable diagram. **[6]**

OR

- Q8) a)** What are the different methods for measurement of fiber attenuation? With the help of neat diagram explain insertion loss technique. **[6]**
- b)** The insertion-loss technique also can be used for measuring the loss through an optical device that has fiber fly leads attached. Consider the case when the power at the photo detector prior to inserting the filter is $P_1 = 0.51 \text{ mW}$ and the power level with the optical filter in the link is $P_2 = 0.43 \text{ mW}$. What is the insertion loss of the device? **[5]**
- c)** Enlist different measurement techniques for fiber dispersion Describe frequency domain dispersion measurement with the suitable diagram. **[6]**



Total No. of Questions : 8]

SEAT No. :

PD4632

[Total No. of Pages : 2

[6404]-138

B.E. (E&TC)

BIOMEDICAL SIGNAL PROCESSING

(2019 Pattern) (Semester-VIII) (Elective-V) (404191A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Draw a schematic anatomy of the brain with the major functional components. Articulate the functions of the brain. **[8]**

b) Which are the Sources of noise in EEG signal recordings? State the main frequency components of Typical EEG and Explain Frequency-Domain Analysis of EEG signal. **[10]**

OR

Q2) a) Which are the internationally accepted methods of testing the brain activity that are commonly applied in clinical measurements. Explain EVOKED POTENTIALS recordings in short. **[8]**

b) State the significance of EEG in clinical diagnostics of neurological disorders. Which are the diseases of central nervous system diagnosed by an EEG? Explain epilepsy and its related brain waveforms. **[10]**

Q3) a) Which are the general methods for acquiring EMG signal? Illustrate the different phases for electrode placements in EMG. **[7]**

b) Enlist the neuro muscular diseases? Which neuro muscular diseases are diagnosed by processing of EMG signal? Explain some of the other applications of EMG. **[10]**

OR

P.T.O.

- Q4) a)** Write short note on feature extraction of ECG & its time domain Analysis & Frequency domain Analysis. **[8]**
- b)** Which are the sources of noise in EMG signal? Explain frequency domain analysis of an EMG signal. **[9]**

- Q5) a)** Define the term, 'Blood Pressure'; State its types also illustrate the instrument used to measure Blood Pressure? **[8]**
- b)** What do you mean by the respiratory signals? State the significance of respiratory signal measurement. Which instruments are used to measure respiratory signal? Draw Airflow signal. **[10]**

OR

- Q6) a)** What is the significance of Electro-oculogram? Comment on the measurement of EOG. Draw Detecting vertical and horizontal motion of the eyes using EOG. Also state the main application of EOG. **[10]**
- b)** What do you mean by MEG? Compare MEG over EEG? What are the advantages and limitations of MEG over EEG? **[8]**

- Q7) a)** Which are the biomedical sensors? State its significance by considering type of signal, frequency band, and amplitude. **[8]**
- b)** Write the selection criteria for the filter to remove the Artifacts from the Biomedical signal. Explain in detail how adaptive filters are used for noise cancellation in the biomedical signal. **[9]**

OR

- Q8) a)** Enlist the digital filters used to remove the noise from biomedical signals. Paraphrase the type of noise in biomedical signals in detail. **[9]**
- b)** Write short note on **[8]**
- Optimal and adaptive filters,
 - Wiener filters.

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Total No. of Questions : 8]

SEAT No. :

PD4633

[Total No. of Pages : 2

[6404]-139

B.E. (E & TC)

INDUSTRIAL DRIVES AND AUTOMATION

(2019 Pattern) (Semester - VIII) (Elective-V) (404191B)

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

- Q1) a)** What is the role of feedback in a closed-loop DC motor drive system?[3]
What is Speed Sensing of DC Motor? [3]
What feedback options are available in DC drives? [3]
- b) Why PID is better than PI Controller? [3]
What is converter-fed DC drive? [3]
What is the principle of chopper fed DC drive? [3]

OR

- Q2) a)** What is the function of separately excited DC motor? [3]
What is the transfer function of a DC motor? [3]
What are the three types of self-excited DC motors? [3]
- b) What are the different response types of PID? [3]
Why is PI controller preferred? [3]
What is the disadvantage of PI controller? [3]

- Q3) a)** What is PWM in Induction Motor? [3]
Explain “The Pulse Width Modulation and its Use in Induction Motor Speed Control”? [6]
- b) What Is Power Factor In Induction Motor? [4]
What are the Power Factor Improvement Devices Used For Induction Motors. [4]

OR

P.T.O.

- Q4) a)** Explain Stator voltage control using AC Voltage controller induction motor. **[8]**
b) Enlist different speed control methods for induction motor. Explain why variable frequency control method by constant v/f is popular and widely used. **[9]**

- Q5) a)** What is the torque equation of a synchronous motor? **[3]**
What is the breakdown torque of a synchronous motor? **[3]**
What is pull in torque and pull out torque in synchronous motor. **[3]**
b) What is the formula of motor synchronous?
What is Power factor? What are methods to improve Power factor. **[8]**

OR

- Q6) a)** Explain adjustable frequency operation synchronous operation? **[8]**
b) Explain voltage source inverter drive with open loop Control? **[9]**

- Q7) a)** What are the types of stepper motor? **[3]**
Explain operation of any one type of stepper? **[3]**
Why do stepper motors have high torque? **[3]**
b) Explain Static and dynamic characteristics of Stepper motor. **[6]**
Which torque is maximum in stepper motor? **[3]**

OR

- Q8) a)** What is the permanent magnet stepper motor? **[3]**
Explain Permanent Magnet Stepper Motor with neat construction diagram. **[3]**
What uses permanent magnet motors? **[3]**
b) Explain with circuit diagram working of microprocessor based stepper motor control and state its advantages. **[5]**
State advantages and applications of Stepper Motors. **[4]**

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Total No. of Questions : 8]

SEAT No. :

PD4634

[6404]-140

[Total No. of Pages : 2

B.E. (Electronics & Telecommunication) (Electronics)
ANDROID DEVELOPMENT
(2019 Pattern) (Semester - VIII) (Elective - V) (404191C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Figures to the right indicate full marks.

Q1) a) Explain about [8]

- i) Data Picker
- ii) Time Picker
- iii) ListView view
- iv) Spinner View

b) What is android? Explain their versions and applications? [9]

OR

Q2) a) Explain the procedure steps of Installing Android SDK Tools. [8]

b) Briefly discuss about Linking Activities and fragments. [9]

Q3) What is DVM? Explain the compiling and packaging process from the source file with diagram. [17]

OR

Q4) a) Explain the Components for Communication. [7]

b) What is a Content Provider? How does it work? [10]

P.T.O.

- Q5)** a) How the communication was establishing between a service & activity. **[9]**
- b) Explain the three animation systems used in Android applications. **[9]**

OR

- Q6)** a) Define about binding activities to services. **[9]**
- b) Briefly discuss about deploying APK Files. **[9]**

- Q7)** a) Write a note on using SQLite databases for developing android applications. **[8]**
- b) Explain JSON Parsing and JSON web service. **[10]**

OR

- Q8)** a) Explain widgets, its types and list them. **[6]**
- b) What is the meaning of location based services? Explain the methods of Location Objects. **[12]**

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Total No. of Questions : 8]

SEAT No. :

PD4635

[6404]-141

[Total No. of Pages : 2

B.E. (Electronics & Telecommunication)

EMBEDDED SYSTEM DESIGN

(2019 Pattern) (Semester - VIII) (Elective - V) (404191(D))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe the classification of API? **[9]**

b) Summarize the use of HAL library for SPI, 12C and CAN module. **[8]**

OR

Q2) a) Elaborate USB Modules in the STM 32F4 Microcontroller. **[8]**

b) Describe Hardware Abstraction Layer (HAL) drivers. **[9]**

Q3) a) Describe cross development compilation in detail. **[9]**

b) What is FreeRTOS? How FreeRTOS is configured using STM32CubeMX? **[9]**

OR

Q4) a) Identify in detail the role of GNU debugger. **[9]**

b) Describe ChibiOS and Contiki OS. **[9]**

P.T.O.

- Q5)** a) Elaborate how to Install Touch GFX for Graphical User Interface (GUI).[9]
- b) Design an embedded system for Image transfer between PC and STM32F4. [8]

OR

- Q6)** a) Illustrate procedure of GUI Formation with TouchGFX for any two applications. [8]
- b) Summarize how to Interface of SPI based graphical LCD with STM32F4.[9]

- Q7)** a) Describe Loading and interfacing methods in Embedded Android. [9]
- b) Describe Linux Kernel. [9]

OR

- Q8)** a) Classify different android platforms used in embedded system in detail.[9]
- b) Articulate requirments of android. [9]

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Total No. of Questions : 8]

SEAT No. :

PD4636

[6404]-142

[Total No. of Pages : 2

B.E. (Electronics & Telecommunication)

MOBILE COMPUTING

(2019 Pattern) (Semester - VIII) (Elective - V) (404191(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) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Compare proactive routing protocols with reactive routing protocols.[6]
b) Explain DHCP protocol with suitable diagram. [6]
c) What is hybrid routing? Explain zone routing protocol (ZRP) with suitable diagram. [6]

OR

- Q2)** a) Explain with suitable data flow diagram, client initialization via DHCP.[6]
b) Compare MANET and VANET. [6]
c) What is Reactive Routing Protocol in MANET? Describe DSR and AODV Routing Protocols. [6]

- Q3)** a) Explain the principle of operation of Indirect TCP. State its advantages and disadvantages. [9]
b) Why and when encapsulation is needed? List different methods of encapsulation and explain any one of them. [8]

OR

- Q4)** a) Explain snooping TCP with proper diagram. List its advantages and disadvantages. [9]
b) Write short note on mobile-TCP. List its advantages and disadvantages.[8]

P.T.O.

- Q5)** a) Compare wideband and narrowband channels. [6]
b) State and Explain the Types of fading channels. [6]
c) Write a note on Rician fading. [6]

OR

- Q6)** a) Explain the Effect of fading in communication systems. [6]
b) State and explain various methods of improving BER. [6]
c) State and explain the properties of Rayleigh distribution. [6]

- Q7)** a) State the features required for mobile devices to enable mobile commerce. Compare features of windows mobile OS, Android OS. [9]
b) Define SDK. Write short note on Windows phone SDK, Android SDK, iOS SDK. [8]

OR

- Q8)** a) With neat diagram explain the structure of mobile commerce. List the pros and cons of M-commerce. [9]
b) Explain in brief design issues of mobile OS. [8]

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Total No. of Questions : 8]

SEAT No. :

PD4637

[Total No. of Pages : 2

[6404]-143
B.E. (E & TC)
SYSTEM ON CHIP
(2019 Pattern) (Semester - VIII) (Elective - VI) (404192 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are different modeling styles supported by Verilog? Explain with suitable examples. [6]
- b) Explain Task and Functions with suitable examples. [5]
- c) Write Verilog code for full adder using half adders. [7]

OR

- Q2)** a) Write Verilog Code for Half adder using primitive gates. [4]
- b) Write Verilog code for 4 bit asynchronous counter. [8]
- c) Explain blocking and non-blocking statements supported by Verilog. [6]

- Q3)** a) Explain floor planning and its techniques. [9]
- b) Write the need of partitioning and its methods. [8]

OR

- Q4)** a) Write short note on placement. Mention any 2 differences between placement and floor planning. [9]
- b) Write short note on Routing. Explain fixed and variable die-routing. [8]

P.T.O.

- Q5)** a) Explain in brief what is [9]
i) Scalar processor
ii) Superscalar processor
iii) VLIW Processor
b) Write short note on Vector Processors [5]
c) Explain in brief soft processors along with their need. [4]

OR

- Q6)** a) Explain any 3 Branch management techniques. [9]
b) Explain the role of buffers in minimizing pipeline delays. [9]

- Q7)** a) Explain any 2 cache organization in brief. [8]
b) Write short note on write policies of cache. [5]
c) Mention common types of caches and its uses. [4]

OR

- Q8)** a) Explain the important parameters which decide suitable interconnect architecture for SoC. [6]
b) Write short note on Advanced Microcontroller Bus Architecture. [6]
c) Write full form of : [5]
i) AHB
ii) DMA
iii) APB
iv) AHB
v) ARM

* * *

Total No. of Questions : 8]

SEAT No. :

PD4638

[Total No. of Pages : 1

[6404]-144
B.E.(E & TC)
NANO ELECTRONICS
(2019 Pattern) (Semester - VIII) (Elective-VI) (404192 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain Structure of CNT & Carbon nano tubes. [8]
b) Explain Nano material and its types. [8]
OR
- Q2)** a) Explain properties of CNT. [8]
b) Explain Method to Stabilize Nano particles. [8]
- Q3)** a) Explain Optical lithography process in detail. [9]
b) Explain Electron Beam Lithography with neat Diagram. [9]
OR
- Q4)** a) Explain Nano electronics for communication. [9]
b) Explain Atomic Lithography with neat diagram. [9]
- Q5)** a) What are molecular switch? Explain Ph switch. [9]
b) Explain MEMS. [9]
OR
- Q6)** a) Explain Nano tubes Actuators. [9]
b) Explain types of Super molecular Switches. [9]
- Q7)** a) Explain Piezo-Electric Biosensor. [9]
b) Which are types of Nano Sensor? Explain Nano biosensor. [9]
OR
- Q8)** a) What is use of Nano technology in Electronics? [9]
b) Explain Transformation. [9]



Total No. of Questions : 8]

SEAT No. :

PD4639

[Total No. of Pages : 2

[6404]-145

B.E.(E & TC) (Electronics)

REMOTE SENSING

(2019 Pattern) (Semester - VIII) (404192 C) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Write a short note on **[8]**
- i) False color composite
 - ii) True color composite
- b)** Enlist the difference between raster data and vector data. **[8]**

OR

- Q2) a)** Explain various band combinations and color composites used in satellite image processing with suitable examples of LANDSAT 8 bands. **[8]**
- b)** Compare supervised and unsupervised classification. **[8]**
- Q3) a)** Differentiate between active and passive microwave remote sensing. **[8]**
- b)** Explain concept of SAR and SLAR with suitable diagram & Brief about the characteristics and interpretation of SAR & SLAR data. **[10]**

OR

- Q4) a)** Explain LIOAR concept, its types, characteristics with applications. **[10]**
- b)** Explain RADAR equation and determine ground based resolution and azimuth resolution of SLAR with suitable illustrations. **[8]**
- Q5) a)** Explain GNSS technology and signal structure with suitable diagram. **[8]**
- b)** Explain various segments of GNSS technology. **[10]**

OR

P.T.O.

- Q6)** a) Explain space based augmentation system GAGAN. [10]
b) Explain different tools for GNSS data processing. [8]
- Q7)** a) Brief the application of remote sensing in coastal side with use cases and methodology. [10]
b) Brief the application of remote sensing in agriculture with use cases and methodology. [8]

OR

- Q8)** a) Brief the application of remote sensing in urban sprawl planning and management with use cases and methodology. [10]
b) Brief the application of remote sensing in water resource management with use cases and methodology. [8]



Total No. of Questions : 8]

SEAT No. :

PD4640

[Total No. of Pages : 2

[6404]-146

B.E. (Electronics/E & TC)

DIGITAL MARKETING

(2019 Pattern) (Semester - VIII) (Elective - VI) (404192 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) Figures to the right indicate full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Explain keyword planner. List out benefits of it. **[9]**

b) Explain methods of mobile advertising. **[8]**

OR

Q2) a) Explain different types of search engine marketing tools used by business organization. **[9]**

b) Explain the importance of Adwords and Google Ads in SEM and how they enable businesses to reach their target audience effectively. **[8]**

Q3) a) Explain B to C perspective and B to B perspective. **[8]**

b) Which are the different requirements to start monetizing youtube videos? **[9]**

OR

Q4) a) Explain different social media platforms for marketing and the development data driven audience and campaign insights. **[9]**

b) List out the benefits of social media marketing. **[8]**

P.T.O.

- Q5) a)** Write in detail about- **[9]**
i) Responder Tracker
ii) Lead generation
b) Detail about the steps for email campaigning through HTML. **[9]**

OR

- Q6) a)** Elaborate the steps involved in planning email marketing campaign. **[9]**
b) List out different types of Linked In advertising techniques and explain in detail. **[9]**

- Q7) a)** Describe detail about online reviews. Why are online reviews important for customers and businesses? **[9]**
b) Write short notes on **[9]**
i) No click searches
ii) Voice search

OR

- Q8) a)** Discuss about OTT Platforms. Explain its advantages and disadvantages. **[9]**
b) Discuss about affiliate marketing with respect to ethical considerations and potential challenges. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4641

[Total No. of Pages : 2

[6404]-147

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

Q1) a) Draw and explain the operation of 6T CMOS SRAM cell with neat waveforms through read and write operations. **[8]**

b) Write short on: **[9]**

- i) Overview of memory architecture.
- ii) Classification of memories.

OR

Q2) a) Compare SRAM cell with DRAM cell. **[4]**

b) Draw and explain the schematic of 1 T DRAM cell read-write cycles with the help of timing diagram. **[8]**

c) Explain the working of sense amplifier used with SRAM cell. **[5]**

Q3) a) Write Short note on floor planning methods. **[9]**

b) Explain clock distribution and power optimization in details. **[8]**

OR

Q4) a) What is Global Routing. Explain clock skew in detail. **[9]**

b) Explain in detail power distribution and signal integrity issues. **[8]**

P.T.O.

- Q5) a)** Explain in brief CLB 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]**

OR

- Q6) a)** Write short note on dedicated multiplier and memories in FPGA. **[8]**
- b)** What is need of boundary scan? Explain boundary scan techniques in detail. **[10]**

- Q7) a)** Define scaling. Explain the any one scaling technique in detail. **[9]**
- b)** Draw Stick Diagram for a 2input NAND gate. 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 CMOS. **[9]**
- b)** Explain MOS layers, stick diagram and layout diagrams in CMOS circuit design processes. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4642

[Total No. of Pages : 2

[6404]-148

**B.E. (Electronics Engineering)
ADVANCED POWER ELECTRONICS
(2019 Pattern) (Semester - VII) (404202)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain Dynamic and regenerative braking of DC motors. [8]
b) Give Comparison of converter fed drive & chopper fed drive [9]

OR

- Q2)** a) Elaborate 3 ϕ converter drives for separately excited DC motors for continuous & discontinuous operations. [8]
b) Explain Basic characteristics of DC motors, Operating modes, and Motor performance parameters. [9]

- Q3)** a) Elaborate Variable frequency CSI Drives with suitable waveforms. [9]
b) Explain Variable frequency SPWM VSI Drives with suitable waveforms. [9]

OR

- Q4)** a) Explain Induction motor Characteristics in details. [9]
b) Write short note on Breaking of induction motor. [9]

- Q5)** a) Explain Switched reluctance motor drive with suitable diagrams. Give its advantages and disadvantages. [8]
b) Write a short note on Servo motor drive. [9]

OR

- Q6)** a) Explain Brushless DC drives. Give its advantages and disadvantages. [8]
b) Explain different types of Stepper motor drives in details. Give its advantages and disadvantages. [9]

P.T.O.

- Q7)** a) Elaborate working of solar power system. Explain different types of photovoltaic system. **[9]**
- b) Explain a Case study to implement solar power system: Selection of Solar panel, inverter, battery, charge controller, Metering of 'solar based system. **[9]**

OR

- Q8)** a) Explain Working of wind power system. Elaborate Standalone wind energy systems and Grid connected wind energy systems. **[9]**
- b) Explain different types of wind generator Control of wind turbines. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4643

[Total No. of Pages : 2

[6404]-149

B.E. (Electronics Engineering)
ELECTRONIC 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 and Q.7 or Q.8.*
- 2) Figures to the right side indicate full marks.*
- 3) Assume suitable data if necessary.*

- Q1)** a) Explain interfacing of LED with microcontroller. [6]
b) Compare SPI & I2C bus. [6]
c) Write short note on: [8]
i) LIN Bus
ii) CAN Bus

OR

- Q2)** a) Explain the selection criteria of microcontroller for particular DAS application. [6]
b) Explain interfacing of temperature sensor with microcontroller. [6]
c) Write short note on: [8]
i) LIN Bus
ii) FlexRay Bus

- Q3)** a) With the help of neat diagram, explain different phases of software design. [8]
b) What are features of high level & low level languages? [8]

OR

- Q4)** a) What are the features of simulators, what is the role of documentation in product design & development? [8]
b) What are the features of assemblers & compiler? [8]

P.T.O.

- Q5) a)** Explain rules of PCB Design for mixed signal circuits. [8]
- b) What is need of conducting compliance test? Explain different EMI/EMC standards related to conducted and radiated emissions. [8]

OR

- Q6) a)** Explain the following phenomenon in high speed PCB design & how it can be prevented. [8]
- i) Crosstalk
- ii) Reflection
- b) Explain in details: Shielding & Guarding in precision circuits. [8]

- Q7) a)** What is need of environmental testing? Explain vibration and shock test with suitable example. [9]
- b) Explain the importance of AC and DC analysis with example. [9]

OR

- Q8) a)** List different features of MSO. Draw and explain it with the help of block diagram. [9]
- b) Define the term DSO. Explain the terms & their significance in DSO: Band width, Sampling rate, probe impedance, memory depth. [9]



Total No. of Questions : 8]

SEAT No. :

PD4644

[Total No. of Pages : 2

[6404]-150

B.E. (Electronics Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester-VII) (404204 A) (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 and Q.7 or Q.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) What is WSN? State the characteristics of WSN. [6]
- b) What is full form of IaaS? Explain what is IaaS?. What are merits and demerits of IaaS. [6]
- c) With help of neat diagram explain how WSN can be used in Healthcare system. [8]

OR

- Q2)** a) What are challenges of cloud computing? Explain each challenge in brief. [6]
- b) State the difference between PaaS and SaaS. [6]
- c) List out the various development environment (IoT platforms) for service development. Elaborate features and services provided by any one platform in detail. [8]
- Q3)** a) Draw the interfacing diagram of DC motor with Arduino Board. Also write the program for same. Mention any one application for the same. [8]
- b) What is Arduino? What do you mean by open source hardware and software? State the features of Arduino because of which it is widely preferred. [8]

OR

P.T.O.

Q4) a) Draw the interfacing diagram of LED with Raspberry Pi. Also write the program for blinking LED with a delay of one second and draw its flowchart. [8]

b) Draw the interfacing diagram of LM35 with Arduino Board. Also write the program to read temperature and display on serial monitor screen. Also draw its flowchart. [8]

Q5) a) What are different types of data analytics? Explain each type by giving appropriate example. [8]

b) What are the characteristics of Big data? List out the components of Big data solution and explain each component in detail. [8]

OR

Q6) a) Why is Hadoop used for big data analysis? Explain different features of Hadoop technology. [8]

b) Explain the following terms: [8]

i) Analysis of Variance

ii) Data Dispersion

Q7) a) Explain how wearable technologies are partnering with smart cities to address social issues. [6]

b) Write short note on IoT for Smart Agricultural Monitoring. [6]

c) Explain Smart Health care monitoring system using IoT. [6]

OR

Q8) a) Write short note on IoT for Industrial standards. [6]

b) Draw and explain Air pollution Monitoring system using IoT. [6]

c) Draw and explain Greenhouse monitoring system using IoT. [6]



Total No. of Questions : 8]

SEAT No. :

PD4645

[Total No. of Pages : 2

[6404]-151

B.E. (Electronics Engineering)

SOFTWARE DEFINED RADIO

(2019 Pattern) (Semester-VII) (404204 B) (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 and Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain frequency offset estimation and correction in signal processing. [9]
b) Explain the role of : [9]
i) DSP techniques in SDR,
ii) OFDM in SDR

OR

- Q2)** a) What is Multi Rate DSP? Explain Multi Rate Algorithm in detail. [9]
b) What do you mean by Channel Estimation? Explain any one channel estimation technique. [9]

- Q3)** a) Explain the term with diagram: [9]
i) Cognitive Cycle
ii) Cognitive Radio
iii) White space in spectrum
b) What is spectrum sensing? Explain with the block diagram energy detection method in CR? [9]

OR

- Q4)** a) Explain Spectrum Management and its significance in CR? [9]
b) Briefly explain the significance of IEEE 1900.x standards in Cognitive Radio standardization. How do these standards contribute to in the field of Cognitive Radio? [9]

P.T.O.

- Q5) a)** Explain in detail Cognitive Radio network architecture with suitable diagram. [9]
- b) What is Cross-layer design for cognitive radio networks? [9]

OR

- Q6) a)** What is Spectrum Brokering? Explain Spectrum Brokering Services Information Modeling. [9]
- b) Explain Topology Aware CRN Architectures. Also explain Statistical Characterization of Node Locations. [9]

- Q7) a)** Write short notes on: [8]
- i) System Spectral Efficiency
- ii) Anti-jamming
- b) What is Commercial Wireless Communication Networks and what is its Requirements in recent world? [8]

OR

- Q8) a)** Explain the Benefits of Cognitive Radio. Also explain any two applications of CR. [8]
- b) Explain Public Safety Communication, TETRA and C2000. [8]



Total No. of Questions : 8]

SEAT No. :

PD4646

[Total No. of Pages : 1

[6404]-152

B.E. (Electronics)

**TESTING & VERIFICATION FOR SOC DESIGN
(2019 Pattern) (Semester - VII) (404204C) (Elective - III)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in brief statistical models used for fault simulation. [9]
b) What is the need of Testability measures? Explain in detail. [9]

OR

- Q2)** a) Explain Testing techniques with respect to test equipment. [9]
b) Write a short note on Observability and Controllability. [9]

- Q3)** a) Write a short note on the “Techniques of Memory Testing”. [8]
b) Explain the Simulation for design verification with diagram. [9]

OR

- Q4)** a) Explain Logic and Switch Level Modelling for Fault simulation. [8]
b) What is Simulation-Based Sequential Circuit ATPG? Explain in detail. [9]

- Q5)** 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. [9]

OR

- Q6)** a) Give different Description languages for boundary scan. [9]
b) Explain system level DFT approach. [9]

- Q7)** a) Elaborate briefly redundancy identification for combinational circuit. [8]
b) Write a short note on Boundary Scan Description Language. [9]

OR

- Q8)** a) How to configure a system for BIST? [8]
b) Write a short note on System Configuration with Boundary Scan. [9]



Total No. of Questions : 8]

SEAT No. :

PD4647

[Total No. of Pages : 2

[6404]-153

B.E. (Electronics Engineering)

MOBILE COMMUNICATION

(2019 Pattern) (Semester - VII) (Elective - IV) (404205 A)

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) With neat diagram explain the working of Linear Transversal equalizer structure. [6]

b) Explain with neat diagram the working of QPSK Transmitter and Receiver. [6]

c) With neat diagram explain the operation of RAKE receiver. [8]

OR

Q2) a) List the Space Diversity Methods and Explain any two in short. [6]

b) Explain in details with neat diagram BPSK receiver. [6]

c) What is mean by diversity technique? Explain in any two space diversity methods. [8]

Q3) a) Explain in details AMPS radio interface with diagram. [8]

b) Explain various logical channel used in radio transmission in details. [8]

OR

Q4) a) Draw and explain GSM Architecture in details. [8]

b) Explain in details Call processing of Mobile terminated call in AMPS. [8]

P.T.O.

- Q5)** a) Explain the concept packet data transport process flow. Explain with diagram Mobile IP. [8]
- b) Write short note on EVDO. [8]

OR

- Q6)** a) Explain different radio network components use in CDMA 2000. [8]
- b) Explain in details Interference-Mitigation Techniques of radio network. [8]

- Q7)** a) With neat diagram explain network architecture for UMTS. [6]
- b) Compare wireless network & fixed telephone network. [6]
- c) Explain packet reservation multiple access protocol (PRMA) for Network Access. [6]

OR

- Q8)** a) Explain with diagram cellular packet-switched architecture. [6]
- b) Write note on development in wireless network. [6]
- c) Draw and explain the Distributed Central Switching Office for CCS. [6]



Total No. of Questions : 8]

SEAT No. :

PD4648

[Total No. of Pages : 2

[6404]-154

B.E. (Electronics Engineering)

EMBEDDED SYSTEMS

(2019 Pattern) (Semester - VII) (Elective - IV) (404205 B)

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

- Q1)** a) Draw & explain kernel architecture. [6]
- b) Explain foreground & background systems in RTOS. [6]
- c) What is critical session. Explain with example. [6]

OR

- Q2)** a) Describe task with example. Why task scheduler is important in RTOS? [6]
- b) Compare pre-emptive & non-preemptive scheduling. [6]
- c) Describe intertask communication mechanism. [6]

- Q3)** a) Compare operating system with RTOS. [6]
- b) Describe the considerations in selecting RTOS for any application. [6]
- c) Explain the features of Vx works & Micro RTOS. [5]

OR

- Q4)** a) Write advantages & disadvantages of QNX neutrino RTOS. [5]
- b) Write & explain any two types of RTOS. [6]
- c) Compare QNX neutrino & Vxworks RTOS. [6]

P.T.O.

- Q5)** a) Describe design issues in embedded system development. [6]
b) Describe the design cycle of embedded system. [6]
c) Describe the incircuit emulator in detail. [5]

OR

- Q6)** a) Describe the significance of logic analyzer in embedded system. [5]
b) Explain the process of embedded system project management in detail. [6]
c) List & explain any two software tools used for the development of embedded system. [6]

- Q7)** a) Draw & describe the process of automatic chocolate Vending machine. [6]
b) How TCP/IP Network for stream transmission works using RTOS. [6]
c) Describe the features of RTOS adapted in Adaptive cruise control system. [6]

OR

- Q8)** a) Describe RTOS for smot card system. [6]
b) Describe adaptive cruise control system with RTOS. [6]
c) What are the essential coding steps required in TCP/IP network with RTOS implementation. [6]



Total No. of Questions : 8]

SEAT No. :

PD4649

[Total No. of Pages : 2

[6404]-155

B.E. (Electronics)

OPTIMIZATION TECHNIQUES

(2019 Pattern) (Semester - VII) (404205 C) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Maximize $z = 200x_1 + 400x_2$ [9]

Subject to : $x_1 + 3x_2 \leq 400$

$x_1 + 2x_2 \leq 350$

$x_1 + x_2 \geq 200$

$x_1 \geq 0, x_2 \geq 0$

b) Solve the following Linear Programming Problem graphically : [9]

Maximize : $Z = 3x_1 + 2x_2$

Subject to : $x_1 + x_2 \leq 4$

$2x_1 + x_2 \leq 5$

$x_1 \geq 0, x_2 \geq 0$

OR

Q2) a) Explain the standard form of a linear programming problem and provide a step-by-step method to solve a system of linear equations using Gaussian elimination. Additionally, discuss the simplex Algorithm for identifying an optimal point and improving a non-optimal basic feasible solution. [9]

b) State the fundamental theorem of linear programming, explain the pivotal reduction of a general system of linear equations, and outline the procedure of the simplex algorithm for improving a non-optimal basic feasible solution. [9]

Q3) a) Use the Dichotomous search method to minimize the function $f(x) = x^2 + 4x + 4$ in the interval $[0, 5]$ with a tolerance of 0.01. [10]

b) Compare and contrast elimination methods and interpolation methods in one-dimensional minimization. [7]

OR

P.T.O.

- Q4)** a) Use Quadratic Interpolation to find the minimum of the function $f(x) = x^2 - 4x + 3$ using the points $(1, f(1))$, $(2, f(2))$ and $(3, f(3))$. [10]
b) Explain the convergence characteristics of direct root methods in one-dimensional minimization. [7]

- Q5)** a) Differentiate between direct search methods and indirect search methods in unconstrained optimization. [9]
b) Explain the Conjugate Gradient Method and its advantages over the Steepest Descent Method. [9]

OR

- Q6)** a) Minimize the function $f(x, y) = x^2 + y^2 + 4x - 6y + 13$ using the steepest descent method starting from the initial point $(x_0, y_0) = (0, 0)$. Perform two iterations with a step size of 0.1. [9]
b) Use Powell's method to minimize the function $f(x, y) = (x-1)^2 + (y-2)^2$, starting from the initial point $(x_0, y_0) = (0, 0)$. Perform one complete cycle of optimization along the coordinate directions. [9]

- Q7)** a) Explain the Karush-Kuhn-Tucker (KKT) conditions and their significance in constrained optimization. [9]
b) Discuss the key components and applications of Quadratic Programming (QP) in constrained optimization. [8]

OR

- Q8)** a) What is the Generalized Reduced Gradient (GRG) Method? Explain its steps and relevance in solving nonlinear programming problems. [9]
b) Compare the necessary and sufficient conditions for constrained and unconstrained optimization. [8]



Total No. of Questions : 8]

SEAT No. :

PD4650

[Total No. of Pages : 2

[6404]-156

**B.E. (Electronics Engineering)
PROCESS INSTRUMENTATION
(2019 Pattern) (Semester - VIII) (404210)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 calculator is allowed.

- Q1)** a) Explain OP-AMP realization of proportional plus integral (P+I) controller with the help of neat circuit diagram and output voltage expression. [6]
b) Explain process reaction method of controller tuning. Draw process reaction graph and state the formulae for P, P+I and PID controller settings. [6]
c) In an application of the Ziegler-Nichols method, a process begins oscillation with a 30% proportional band in an 11.5-min period. Find the nominal three-mode controller settings. [6]

OR

- Q2)** a) Describe an op amp circuit that will implement the proportional-derivative control mode. [6]
b) Explain the concept of relay based tuning. State the advantages of relay based tuning. [6]
c) Design a proportional-integral controller with a proportional band of 30% and an integration gain of 0.1%/(%-s). The 4- to 20-mA input converts to a 0.4- to 2-V signal, and the output is to be 0–10 V. Calculate values of G_p , G_I , R_2 , R_1 , and C, respectively. [6]

- Q3)** a) Explain with the help of neat block diagrams the concept of feedback control and feed-forward control. [6]
b) Explain cascade control system with the help of suitable example. [6]
c) Explain auctioneering control scheme for tubular catalytic reactor. [6]

OR

- Q4)** a) Explain ratio control for a chemical reactor when the ratio of two reactants must be controlled. [6]
b) Explain selective control scheme to protect process equipment. [6]
c) Explain split range control scheme with suitable example. [6]

P.T.O.

- Q5) a)** What is Adaptive Control? Why do we need adaptive control? Explain Programmed or Scheduled Adaptive Control System. **[9]**
- b)** Explain with the help of neat block diagram Model Reference Adaptive Control (MRAC). **[8]**

OR

- Q6) a)** Explain the concept Model Predictive Control (MPC) with the help of neat block diagram. **[9]**
- b)** Explain Internal Model Control (IMC) for a First Order with Dead Time process. **[8]**

- Q7) a)** Explain following safety layers employed to ensure safety in chemical process plants. **[9]**
- i) Basic Process Control System (BPCS)
 - ii) Alarms
 - iii) Safety Interlock System (SIS)
 - iv) Safety relief valves
 - v) Containment
- b)** Explain how plant performance is monitored in a typical process industry. **[8]**

OR

- Q8) a)** Explain the hierarchy of control structure. **[9]**
- b)** Explain the following design considerations for final control elements. **[8]**
- i) capacity
 - ii) precision
 - iii) dynamics
 - iv) failure position



Total No. of Questions : 8]

SEAT No. :

PD4651

[6404]-157

[Total No. of Pages : 2

**B.E. (Electronics Engineering)
BIOMEDICAL ELECTRONICS**

(2019 Pattern) (Semester - VIII) (404211(A)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the Components of EEG machine and explain in brief with neat schematic application of medical use of EEG. **[8]**

b) What are the different components of central nervous system? Explain in detail. **[8]**

OR

Q2) a) Draw and explain 10-20 electrode system for EEG recording. State the importance of 10-20 system for EEG measurement. **[8]**

b) List various EEG waves with their frequency. **[8]**

Q3) a) Explain the key components of an ECG acquisition system and state the role of the instrumentation amplifier in ECG systems. **[9]**

b) Draw and explain the functional block diagram central monitoring system. **[9]**

OR

Q4) a) Write short note on finger plethysmography and echocardiography. **[9]**

b) Explain in detail life saving device Ventilator and pacemaker. **[9]**

P.T.O.

- Q5)** a) Explain the principle used in an automated blood cell counter with main parameters measured in a complete blood count (CBC). [9]
- b) Explain the need of grounding and risks in improper grounding in medical instruments? How does shielding help reduce electromagnetic interference. [9]

OR

- Q6)** a) Draw and explain the principle, essential components and application of colorimeter. [9]
- b) Write a note on Blood Gas Analyzer for measurement of pH, pO_2 & pCO_2 . [9]
- Q7)** a) Explain with neat block diagram working principle of an X-ray machine and state its advantages, disadvantages and application. [9]
- b) Write a note on [9]
- i) PET (Positron Emission Tomography)
 - ii) Ultrasonic Doppler Machine

OR

- Q8)** a) With neat block diagram explain any 2 Laser Applications in Biomedical. [9]
- b) Write a note on : [9]
- i) MRI Machine
 - ii) Biotelemetry system

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Total No. of Questions : 8]

SEAT No. :

PD4652

[Total No. of Pages : 2

[6404]-158

B.E. (Electronics)

ARTIFICIAL INTELLIGENCE AND NEURAL NETWORK

(2019 Pattern) (Semester - VIII) (404211(B)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Use of non-programmable scientific calculator is allowed.*

- Q1)** a) Explain Parameters affecting Deep Learning? [5]
b) Explain Batch Normalization and Weight normalization? [6]
c) Draw and explain Architecture of Back Propagation Networks? [6]

OR

- Q2)** a) Explain Training of Neural Network? [5]
b) Explain the term Overfitting and Underfitting and write the various techniques to reduce it? [6]
c) With the help of neat diagram describe Multilayer neural Network? [6]

- Q3)** a) Explain Architecture of Convolution Neural Network in details? [6]
b) What is Padding and Pooling in Convolution Neural Network? [6]
c) Explain Advantages and Disadvantages of Convolution Neural Network?[6]

OR

- Q4)** a) Explain application of Convolutional Neural Network in detail? [6]
b) Describe Convolution layer and Strides in Convolution Neural Network?[6]
c) Explain components of Convolutional Neural Network? [6]

P.T.O.

- Q5) a)** Describe different Recurrent neural network architecture in details? **[9]**
- b) Explain Forward propagation and back propagation in Recurrent Neural Network? **[8]**

OR

- Q6) a)** Explain Application, Advantages and disadvantages of Recurrent Neural Network? **[9]**
- b) Explain Two issues of Standard Recurrent Neural Network with Diagram?**[8]**

- Q7) a)** Explain Natural Language processing using deep learning? **[6]**
- b) Explain Speech recognition using deep learning? **[6]**
- c) Describe Handwritten Digit Recognition using CNN? **[6]**

OR

- Q8) a)** Describe Image classification using deep learning? **[6]**
- b) Explain Various Applications Areas of Deep Learning? **[6]**
- c) Explain in details different Phases of NLP? **[6]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4653

[6404]-159

[Total No. of Pages : 2

**B.E. (Electronics Engineering)
AUDIO VIDEO ENGINEERING**

(2019 Pattern) (Semester - VIII) (404211(C)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write a short note on Video Intercom systems and video projectors. **[8]**
b) Draw and explain block diagram of smart TV. **[9]**

OR

- Q2)** a) Discuss in brief Wi-Fi TV with diagram. **[8]**
b) Explain the working of IP TV with its architecture. **[9]**

- Q3)** a) Explain with block diagram of digital TV receiver. **[6]**
b) Write a short note on video streaming. **[6]**
c) Compare EDTV, SDTV, HDTV. **[6]**

OR

- Q4)** a) Draw and explain block diagram of Direct To Home (DTH). **[6]**
b) Write a short note on CAS (Conditional Access System). **[6]**
c) What is MAC signal? What are various types of MAC? Draw D2 MAC signal. **[6]**

P.T.O.

- Q5) a)** Draw and explain the cordless microphone system. **[8]**
- b)** Draw and explain the block diagram of PA system. **[9]**

OR

- Q6) a)** What are requirements for good auditorium? Give salient features of acoustic design for an auditorium. **[8]**
- b)** Discuss in any two types of microphone. **[9]**

- Q7) a)** Compare CD, DVD and Blue Ray DVD. **[6]**
- b)** Explain in detail Dolby/Multichannel 5.1 sound system and also state its advantage. **[6]**
- c)** Write a short note on Mp3 Player **[6]**

OR

- Q8) a)** State the important specification of a Blue Ray DVD? Draw and explain working of Blue Ray DVD Player. **[9]**
- b)** Explain the variable area method of recording of sound on films. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PD4654

[Total No. of Pages : 2

[6404]-160

B.E. (Electronics)

AUTOMOTIVE ELECTRONICS

(2019 Pattern) (Semester-VIII) (Elective-V) (404211D)

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) *Assume suitable data if necessary.*

Q1) a) Draw and explain diagram for the engine crankshaft angular position measurement. **[10]**

b) State the advantages and limitations of multicore architecture in ECUs. **[8]**

OR

Q2) a) Enlist automotive grade processor. How microcontrollers differ from a microprocessor? **[10]**

b) Explain the process of engine calibration in detail. **[8]**

Q3) a) Outline & explain components of an electronically controlled engine with suitable diagram. **[10]**

b) Write a note on CAN. Compare CAN and Flexray. **[8]**

OR

Q4) a) What do you mean by error handling and protocol extension in CAN.? **[10]**

b) Explain Common Methods for Interfacing Automotive Applications. **[8]**

P.T.O.

Q5) a) Explain electronic steering control system and automatic rain operated wiper control. **[10]**

b) Discuss superset of variables sensed in engine control system. **[8]**

OR

Q6) a) What is Model based Development? Explain the role of Model based development in Automotive embedded systems development. **[10]**

b) Differentiate analog & digital cruise control system. **[8]**

Q7) a) With neat sketch explain electric window control circuit & door lock circuit. **[8]**

b) Discuss off-board diagnostic and its operation cycles. **[8]**

OR

Q8) a) State various driver assistance systems and explain any two in detail. **[8]**

b) What is on-board Diagnostics? Explain operation cycles in on-board diagnostics. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PD4655

[Total No. of Pages : 2

[6404]-161

B.E. (Electronics Engineering)

RENEWABLE ENERGY SYSTEM & DSM

(2019 Pattern) (Semester - VIII) (Elective-VI) (404212 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.

- Q1) a)** Explain the function of wind generators in converting mechanical energy from wind turbines into electrical energy. Discuss the components and working principles of wind generator systems, including generators, converters, and control systems. **[8]**
- b)** Describe different wind generator drive systems used in wind turbines, such as direct-drive and gearbox-driven configurations. Discuss the advantages and limitations of each drive system in terms of efficiency, reliability, and maintenance requirements. **[9]**

OR

- Q2) a)** Describe different wind generator drive systems used in wind turbines, such as direct-drive and gearbox-driven configurations. Discuss the advantages and limitations of each drive system in terms of efficiency, reliability, and maintenance requirements. **[9]**
- b)** Compare and contrast stand-alone and grid-connected wind power systems. Discuss the differences in system design, operation, and integration with the electrical grid, as well as their respective advantages and limitations. **[8]**
- Q3) a)** Classify biomass based on its source and characteristics. Discuss the main categories of biomass, including agricultural residues, forestry residues, energy crops, organic waste, and animal byproducts. **[9]**
- b)** Explore biomass resources and their energy potential. Compare and contrast different biomass feedstocks in terms of availability, energy content and suitability for various conversion technologies. **[9]**

OR

P.T.O.

- Q4)** a) Discuss ethanol fermentation as a biomass conversion process. Explain how carbohydrates from biomass feedstocks are converted into ethanol through fermentation using yeast or bacteria. [9]
- b) Describe biomass gasification as a thermochemical conversion technology. Discuss the Principles of biomass gasification and the types of gasifiers used, including fixed-bed, fluidized-bed, and entrained-flow gasifiers. [9]
- Q5)** a) Analyze methods for harnessing energy from ocean waves. Discuss various wave energy conversion technologies, such as point absorbers, oscillating water columns, and attenuators, and compare their advantages, limitations, and deployment challenges. [9]
- b) Explain geothermal energy and the structure of the Earth's interior. Discuss the heat sources within the Earth, including radioactive decay, residual heat from planetary formation, and heat flow from the Earth's core. [8]

OR

- Q6)** a) Discuss the gradient of geothermal resources and how it affects the feasibility of power generation. Explain how temperature gradients in the Earth's crust determine the heat flux available for geothermal energy extraction. [9]
- b) Describe geothermal resources in India and their utilization for power generation. Discuss the distribution of geothermal sites in India, the technologies used for harnessing geothermal energy, and the potential for expanding geothermal power capacity. [8]
- Q7)** a) Define Demand Response (DR) and classify various DR options based on their characteristics and applications. Discuss DR strategies such as peak shaving, load shifting, price-based incentives, and voluntary curtailment programs. [9]
- b) Describe the architecture for implementing Demand Response (DR) programs. Discuss the role of advanced metering infrastructure (AMI), communication networks, and control systems in enabling real-time monitoring, control, and coordination of DR activities. [9]

OR

- Q8)** a) Explain the concept of an Energy Management System (EMS) and its role in Demand Response (DR). Discuss how EMS platforms integrate with building automation systems, smart appliances, and renewable energy resources to optimize energy consumption and participate in DR Programs. [9]
- b) Discuss Demand Response strategies for various load categories, including residential, commercial, and industrial sectors. Describe how DR programs can be tailored to the specific needs and characteristics of different types of energy consumers. [9]



Total No. of Questions : 8]

SEAT No. :

PD4656

[Total No. of Pages : 2

[6404]-162

B.E.(Electronics Engineering)

WIRELESS SENSOR NETWORK

(2019 Pattern) (Semester - VIII) (404212 B) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain 6LOWPAN Protocol. [6]
b) Explain the structure of Z-wave Protocol stack. [6]
c) Compare wireless HART and ISA 100.11a Protocol. [8]

OR

- Q2)** a) Explain cross layer protocol stack architecture. [6]
b) Explain the structure of wireless sensor network protocol stack. [6]
c) Compare Zigbee and Bluetooth protocol. [8]

- Q3)** a) Define localization in wireless sensor network. Explain types of location information in WSN. Explain proximity Schemes for localization in WSN. [8]
b) Explain single hop and multi hop wireless sensor networks with the help of diagram. [8]

OR

- Q4)** a) Explain routing in wireless sensor network. Explain need of routing in wireless sensor networks. Explain various metrics for routing protocol in WSN. [8]
b) With the help of flow diagram explain geographic/location-based routing algorithm. [8]

P.T.O.

- Q5)** a) Explain the following types of clustering in WSN [8]
i) Random Clustering in WSN
ii) Nearest Sink Clustering in WSN
b) What is compression process in WSN? Explain Huffman codes compression. [8]

OR

- Q6)** a) List different attacks in WSN. Explain defensive measures for attacks in WSN. [8]
b) Explain goal oriented attacks and layer oriented attacks in wireless sensor network. [8]

- Q7)** a) What is deployment in wireless sensor network. Explain early WSN deployment with example. [6]
b) Explain node problems and global problems in deployments of wireless sensor network. [6]
c) Explain link/path problems and topology problems in deployments of wireless sensor network. [6]

OR

- Q8)** a) Explain early WSN deployments in brief. Explain the requirement analysis in WSN. [6]
b) Explain the Top-down design process of deployment of WSN. [6]
c) Explain link/path problems and topology problems in deployments of wireless sensor networks. [6]



Total No. of Questions : 8]

SEAT No. :

PD4657

[Total No. of Pages : 2

[6404]-163

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) Define and explain the following terms. **[6]**

- i) MRR
- ii) NDCG

b) Calculate the precision and recall scores for the search, using the given data. **[6]**

A database contains 80 records on a particular topic and a search was conducted on that topic and 60 records were retrieved. Out of 60 records retrieved, 45 were relevant.

c) Define and explain the following terms. **[6]**

- i) Precision
- ii) Recall

OR

Q2) a) What are User oriented measures used in performance evaluation of IR systems. **[6]**

b) Explain DCG and F-Score measures used in performance evaluation of IR system. **[6]**

c) What are the various techniques used to specify query in information visualization? **[6]**

Q3) a) What is data modelling in multimedia IR? Explain it in detail? **[9]**

b) Describe Multimedia data support in Commercial DBMS? **[8]**

OR

P.T.O.

- Q4)** a) What is multimedia IR? Explain GEMINI approach of Multimedia IR. [9]
b) Explain in detail Multimedia Office Server (MULTOS). [8]

- Q5)** a) Explain search engine mechanism with a neat diagram. [6]
b) What is ranking? Explain importance of ranking in detail. [6]
c) Write a note on request module and beautiful soup library. [6]

OR

- Q6)** a) Write a short note on Web Scraping. [6]
b) Explain Crawler-Indexer Architecture with neat diagram. [6]
c) Discuss the challenges faced in web searching. [6]

- Q7)** a) Define Recommender system? Explain in brief Content based recommendation. [9]
b) Explain Vector Space Model for XML Retrieval. [8]

OR

- Q8)** a) Explain in detail Content Based Recommendation of Documents. [9]
b) Differentiate between Collaborative filtering system and content based filtering system. [8]

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Total No. of Questions : 8]

SEAT No. :

PD4658

[Total No. of Pages : 2

[6404]-164

**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 diagram must be drawn wherever necessary.
- 3) Figure 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

- Q6)** a) Explain Oldham-Hackman job characteristic model. [9]
b) Explain five fundamental stages of development. [9]

PTO.

- 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 Borad? 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. :

PD4659

[Total No. of Pages : 2

[6404]-165

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

Q1) a) Explain various types of Recurrent Neural Networks with architecture diagram and applications. [9]

b) Differentiate between RNN and FFNN. [9]

OR

Q2) a) Explain Recursive Neural Networks with diagram and applications. [9]

b) Explain Long Short-Term Memory Network with suitable architectural diagram and application areas. [9]

Q3) a) What are encoders? Explain undercomplete auto encoder. [8]

b) What is regularized auto encoder? Where are they used? [9]

OR

Q4) a) Write a short note on-Stochastic autoencoders and decoders. [8]

b) Differentiate between denoising auto encoder and contractive auto encoder. [9]

Q5) a) Write a short note on - DenseNet [9]

b) What is domain adaption? Explain with suitable example. [9]

OR

P.T.O.

- Q6)** a) What is transfer learning? Explain with suitable example. [9]
b) What is greedy layer-wise pre-training network? [9]

- Q7)** a) Explain how deep learning is used in recommender systems? [8]
b) Explain deep learning-based framework for NLP. [9]

OR

- Q8)** a) Explain the role of CNNs as an image classifier. [8]
b) How deep learning is used in social network analysis? [9]



Total No. of Questions : 8]

SEAT No. :

PD4660

[Total No. of Pages : 2

[6404]-166

B.E. (Information Technology)

MOBILE COMPUTING

(2019 Pattern) (Semester-VII) (414444 A) (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 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain difference between 2G, 3G, 4G. [9]
b) Explain the First Generation of wireless communication with its standards. [9]

OR

- Q2)** a) Write a note on Third Generation Wireless Networks (3G). [9]
b) Explain the different technologies under 5G. [9]

- Q3)** a) What is Mobile IP and Explain its entities and terminology. [8]
b) Write a short note on: DHCP protocol mechanism. [9]

OR

- Q4)** a) Explain Encapsulation Process and its types protocol are specified for Mobile IP. [8]
b) Describe DSDV and DSR routing algorithms for adhoc networks? [9]

- Q5)** a) Explain Traditional TCP in detail? [9]
b) Explain the Mobile WWW System Architecture in brief. [9]

OR

P.T.O.

- Q6)** a) Explain Slow start, Fast retransmit/fast recovery in regard with TCP.[9]
b) Explain briefly WAP model architecture. [9]

- Q7)** a) Write short notes on: [9]
i) Symbian OS
ii) Android
b) Discuss the Mobile Payment System. [8]

OR

- Q8)** a) Give the list of Mobile Operating System and Explain its components.[9]
b) Write a note on Software Development Kit-iOS SDK and Android SDK? [8]



Total No. of Questions : 8]

SEAT No. :

PD4661

[Total No. of Pages : 2

[6404]-167

B.E. (Information Technology)

HIGH PERFORMANCE COMPUTING

(2019 Pattern) (Semester-VII) (414444 B) (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 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain in detail Blocking and Non-Blocking communication using MPI. [5]
- b) Describe the circular q-shift operation. [5]
- c) Explain All-to-All broadcast on an eight node ring topology (show first 2 steps and last communication step). Also, provide the cost analysis of All-to-All broadcast. [8]

OR

- Q2)** a) Explain scatter and gather communication operations with a suitable diagram. [5]
- b) How can the speed of communication operations be improved by relaxing the assumption that “original messages cannot be divided into smaller parts”? [5]
- c) Explain with a diagram One-to-All broadcast on an eight-node (three-dimensional) hypercube with node 0 as the source. Also, provide the cost analysis of One-to-All broadcast and All-to-One reduction. [8]

- Q3)** a) Explain Amdahl’s law and Gustafson’s law. [5]
- b) Discuss the concept of scalability in parallel systems and the methods used to measure it. [5]
- c) Show the effect of granularity on performance for the problem of adding n numbers on p processing elements. [7]

OR

P.T.O.

- Q4)** a) Explain different performance metrics for parallel systems. [5]
b) What is the minimum execution time and minimum cost-optimal execution time? Explain in detail. [5]
c) Explain sources of overhead in parallel programs with an example. [7]

- Q5)** a) Write the advantages and limitations of CUDA. [5]
b) Explain key differences between CUDA and OpenMP. [5]
c) Describe the processing flow of a CUDA-C program with a diagram. [7]

OR

- Q6)** a) Describe the role of synchronization in CUDA. How does synchronization between threads within a block differ from synchronization across blocks? [5]
b) What is memory contention in CUDA, and how can it affect the performance of a parallel program? [5]
c) List and explain key components of CUDA architecture in details. [7]

- Q7)** a) Explain with a suitable example the parallel formulation of odd-even transposition sort. [5]
b) Write a short note on parallel quick sort. [5]
c) How can Depth First Search (DFS) be adapted for parallel execution, and what is the complexity of the modified approach? [8]

OR

- Q8)** a) Explain the parallel algorithm for matrix-vector multiplication. [5]
b) Comment on the parallel formulation of Dijkstra's All-Pairs Shortest Paths problem. [5]
c) Explain the parallel Best-First Search algorithm with a suitable example. [8]



Total No. of Questions : 8]

SEAT No. :

PD4662

[Total No. of Pages : 2

[6404]-168

B.E. (Information Technology)

MULTIMEDIA TECHNOLOGY

(2019 Pattern) (Semester-VII) (414444 C) (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 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is the nature of sound waves, and what are the key characteristics that define them? Additionally, provide an overview of the AIFF and VOC audio file formats, highlighting their respective features and common use cases. **[8]**

b) What is the need of Audio compression? Explain DM, ADPCM and MPEG compression techniques. **[9]**

OR

Q2) a) Explain the different Video transmission standards. **[8]**

b) Explain the video compression techniques H.261 and H.263 and provide a detailed explanation of one of them along with a relevant example to illustrate its application. **[9]**

Q3) a) What is Animation and how it is different from a video? Explain the key principles of animation? **[8]**

b) Describe how animation is utilized on websites and provide a relevant example to illustrate its role. **[9]**

OR

Q4) a) What is 2D and 3D animation? Explain 3D animation by a relevant example. **[8]**

b) Compare and contrast common animation file formats, their characteristics, and best-use scenarios. **[9]**

P.T.O.

- Q5)** a) Describe the concept of Virtual Reality. Provide a historical overview of its development. How has the idea of VR evolved over time. [9]
- b) What are the different types of VR systems and highlight the distinctions between them. [9]

OR

- Q6)** a) How is Virtual Reality (VR) applied within the healthcare industry, and can you provide a detailed illustration of its usage through a relevant scenario? [9]
- b) What are the various types of VR devices, and how do they contribute to enhancing the immersive experience in virtual reality environments? [9]

- Q7)** a) Explain the architecture of the Android Multimedia Framework with suitable diagram. [9]
- b) Describe the software development life cycle for multimedia applications. Discuss the stages involved. [9]

OR

- Q8)** a) What is Visual effect and why to use VFX? Describe anyone VFX software in detail. [9]
- b) What are the application areas in which VFX can be used and how? [9]



Total No. of Questions : 8]

SEAT No. :

PD4663

[Total No. of Pages : 2

[6404]-169

B.E. (Information Technology)

SMART COMPUTING

(2019 Pattern) (Semester-VII) (414444 D) (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 and 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) Discuss five properties of ubiquitous computing systems which were proposed by Weiser with neat diagram? [9]

b) Explain different degrees of Human computer Interaction with neat diagram? Differentiate between iHCI and eHCI? [9]

OR

Q2) a) Draw neat diagram of smart DEI model and explain in detail? [9]

b) Discuss different types of Smart Environment Devices Interactions? [9]

Q3) a) Explain three important characteristics of smart devices in ubiquitous computing? Explain how system complexity is reduced using abstraction. [9]

b) Explain different architecture of Client-server model with neat diagram? [8]

OR

Q4) a) Draw neat diagram of Service provision life cycle and explain in detail? [7]

b) Write short note on: [10]

- i) Service Oriented Architecture
- ii) Mobile OS

P.T.O.

- Q5) a)** What are the main component of a sensors? Explain with neat diagram?
Discuss any one applications of ubiquitous system using Sensors. [10]
- b) Discuss the significance of MEMS systems? [8]

OR

- Q6) a)** Explain the significance of real time system? Differentiate hard and soft real time system? [8]
- b) Write short note on: [10]
- i) Micro-sensors
 - ii) Nano-computing

- Q7) a)** What are the different components of IoT? Explain with neat diagram?[8]
- b) Describe different Characteristics of Smart Home? Which are different communication technologies used for Smart Homes. [9]

OR

- Q8) a)** Write short note on Smart Agricultural System. [8]
- b) What are different layers of the IoT protocol stack? [9]



Total No. of Questions : 8]

SEAT No. :

PD4664

[Total No. of Pages : 2

[6404]-170

B.E. (IT)

BIOINFORMATICS

(2019 Pattern) (Semester - VII) (414445 A) (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) Figures to the right indicate full marks.
- 3) Assume suitable data wherever necessary.
- 4) Neat labelled diagrams must be drawn wherever necessary.

- Q1)** a) Discuss various techniques and tools used for sequence visualization. Explain the importance of sequence maps and structure visualization in understanding biological sequences and their structural properties. [8]
- b) Compare and contrast local alignment and global alignment techniques in sequence alignments. Discuss their respective uses and advantages in different biological scenarios. [9]

OR

- Q2)** a) Explain the concept of substitution scores in PAM and BLOSUM matrices. Discuss how these scores are determined and their significance in evaluating the likelihood of substitutions between amino acids in sequence alignments. [8]
- b) Explain the statistical concepts used in analyzing microarray data. Discuss the principles of normalization, statistical significance testing, and gene expression analysis in the context of microarray experiments? [9]

- Q3)** a) Explain the concept of classification algorithms and their role in predicting and classifying biological data. Provide examples of classification algorithms commonly used in bioinformatics. [9]
- b) Discuss the BLAST algorithm and its significance in bioinformatics. Compare and contrast the FASTA and BLAST algorithms in terms of their features and performance. [9]

OR

- Q4)** a) Define Biological algorithm vs. Computer algorithms. [4]
- b) Explain FASTA in detail with neat diagrams. [7]
- c) Explain the concept of Hidden Markov Models (HMMs) in bioinformatics. Discuss their applications in sequence analysis and prediction. [7]

P.T.O.

- Q5)** a) What are the applications of bioinformatics in the drug discovery process? Provide examples of how bioinformatics tools and techniques are utilized to analyze biological data and facilitate drug discovery. [8]
- b) Describe the process of modeling and simulation in drug discovery. Discuss how computational methods and simulations contribute to the understanding of drug behavior and efficacy. [9]

OR

- Q6)** a) Describe the hierarchical organization of protein structure, and provide an example illustrating each level of organization. [8]
- b) Explain the concept of drugs and the drug discovery process. Discuss the key steps involved in discovering and developing new drugs. [9]

- Q7)** a) Describe the process of genetic engineering and its applications in agriculture. Discuss the potential benefits and concerns associated with genetically modified organisms (GMOs). [9]
- b) What is the role of biotechnology in environment? [9]

OR

- Q8)** a) Discuss the emerging trends and advancements in medical technology that are shaping the future of medicine. Include topics such as precision medicine, personalized therapies, and the integration of artificial intelligence in healthcare. [9]
- b) What are some everyday applications of nanotechnology in various aspects of our lives? [9]



Total No. of Questions : 8]

SEAT No. :

PD4665

[Total No. of Pages : 2

[6404]-171

B.E. (Information Technology)

INTRODUCTION TO DEVOPS

(2019 Pattern) (Semester - VII) (414445 B) (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 the right indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) What is continuous integration and does it have any impact on quality of product elaborate? [6]
- b) List down different continuous delivery strategies and its benefits. [6]
- c) Discuss the steps of build in CI/CD system from initiation to release of Project. [6]

OR

- Q2)** a) Explain what technology changes are required in the development tool chain to enable DevOps? [6]
- b) How the use of DevOps pipeline phases does improve performance? [6]
- c) What is a continuous integration and delivery in pipeline? Does it pay off? [6]

- Q3)** a) Differentiate between Continuous Delivery and Continuous Deployment. [5]
- b) Elaborate in details what are the steps involved in managing defect backlog? [4]
- c) What are different type of test in continuous deployment and how do we implement testing strategy for it? [8]

OR

- Q4)** a) Discuss tradeoffs in deployment pipeline. [5]
- b) How many stages do we have in deployment pipeline? Explain. [4]
- c) Write a Short note on : [8]
- i) Automated Acceptance Test Gate
 - ii) Integration Testing

P.T.O.

- Q5)** a) Write down the factors involved in monitoring systems. Why monitoring is important explain? [6]
b) Who is SRE? What are the common tools used by SRE? [6]
c) Write a short note on behavior driven monitoring. [6]

OR

- Q6)** a) Elaborate the steps involved in logging and creation of the dashboard. [6]
b) Write a short note on: [6]
i) White box monitoring
ii) Black-box monitoring
c) Write about building monitoring system and monitoring infrastructure. [6]

- Q7)** a) What is a Docker? Why should we use Docker? What does it offer? [6]
b) Explain various tools for bug tracking and why do we use them? [6]
c) Which tool is mostly used in DevOps? Write a Short note about one tool. [5]

OR

- Q8)** a) Illustrate the use of containers while creating container-based application design. Explain various containers used in relation with DevOps. [6]
b) List various version control tools and write their comparison. [6]
c) Explain continuous testing and tools used for it. [5]



Total No. of Questions : 8]

SEAT No. :

PD4666

[Total No. of Pages : 1

[6404]-172

B.E. (Information Technology)

COMPUTER VISION

(2019 Pattern) (Semester - VII) (414445 C) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Edge detection. [9]

b) Describe Feature matching. [9]

OR

Q2) a) Explain Vanishing points. [9]

b) Describe Edge linking in detail. [9]

Q3) a) What is Hough Transform (HT) for line detection? [9]

b) Describe ellipse detection. [8]

OR

Q4) a) What is Generalized Hough Transform (GHT)? [9]

b) Explain Graph-Theoretic Approach to Object Location. [8]

Q5) a) Explain projection schemes. [9]

b) Describe point-based representation. [9]

OR

Q6) a) Explain parametric motion in detail. [9]

b) Explain Optical flow layered motion. [9]

Q7) a) Explain Eigenfaces in detail. [9]

b) Describe Chamfer matching and occlusion. [8]

OR

Q8) a) Describe Human Gait Analysis. [9]

b) Explain foreground-background separation. [8]



Total No. of Questions : 8]

SEAT No. :

PD4667

[Total No. of Pages : 2

[6404]-173

B.E. (Information Technology)

WIRELESS COMMUNICATIONS

(2019 Pattern) (Semester - VII) (414445 D) (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 the right indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) What is OFDM technique? Also, explain OFDMA transmitter and receiver. **[9]**

b) Explain the Principal of TDMA. What are different features of TDMA? **[9]**

OR

Q2) a) What is MIMO? Explain two formats of MIMO. **[9]**

b) How Code Division Multiple Access Technique is implanted while accessing a channel for multiple users? Support your theory answer with example. **[9]**

Q3) a) What are the different challenges in WAP? Also, write down the advantages and disadvantages of WAP. **[9]**

b) Explain SigFox protocol in details. **[8]**

OR

Q4) a) What is NFC? What are the different characteristics of NFC? **[9]**

b) What is Li-Fi? Explain the working principle of Li-Fi technology. **[8]**

Q5) a) What is post-quantum cryptography? Explain in details. **[9]**

b) What is security? What are the different security issues in 1G, 2G, 3G, and 4G? **[9]**

OR

P.T.O.

- Q6)** a) Explain Bluetooth Security Architecture in detail. [9]
b) What are Wireless Security tools? Explain URH and Kismet in details. [9]

- Q7)** a) What is quantum Technology? Explain quantum Technology for a 5G/6G wireless network. [9]
b) State and explain various applications of wireless technology. [8]

OR

- Q8)** a) Explain how 5G NR (New Radio) working along with its benefits. [9]
b) Explain Simultaneous Transmission and Reflection (STAR) for 360° coverage in details. [8]



Total No. of Questions : 8]

SEAT No. :

PD4668

[Total No. of Pages : 2

[6404]-174

B.E. (Information Technology)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - VIII) (414450)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Discuss the problem of clock synchronization in distributed operating systems. Illustrate the Berkeley's clock synchronization algorithm with neat diagram and the drawback of Network Time Protocol (NTP). [8]
- b) What is the purpose of Message Passing Interface? Illustrate the architectural model for MPI using send and receive primitives. [9]

OR

- Q2)** a) Define External Data Representation, Marshalling and Unmarshalling. Discuss the three alternative approaches to XDR and marshalling. [8]
- b) Explain the goal of an Election algorithm. Illustrate the bully algorithm using appropriate diagrams. [9]

- Q3)** a) Discuss the two important reasons for wanting to replicate data and how does replication relate to scalability. [9]
- b) What is a primary-based protocol in a consistency protocol? Explain the working of replicated write protocols with active replication. [9]

OR

- Q4)** a) What is checkpointing in a distributed system? Explain the working of Coordinated checkpointing recovery mechanism. [9]
- b) Define data-centric consistency model. Explain the causal consistency model with suitable example using distributed shared database. [9]

- Q5)** a) What is a Directory Service? What is the difference between DNS and x500? Describe in detail the components of X.500 service architecture.[8]
- b) Describe the Sun Network File System architecture in details. [9]

OR

P.T.O.

- Q6)** a) Describe the design of a peer-to-peer file sharing application designed to support very large multimedia files. How does the BitTorrent protocol operate? **[8]**
- b) What are web services? Describe with a suitable diagram the general organization of the Apache web server. **[9]**

- Q7)** a) Explain the following in brief: **[9]**
- i) Wearable devices
 - ii) PVM
 - iii) JINI
- b) Explain in brief, the key features of Prometheus including data model, query language, or alerting rules. **[9]**

OR

- Q8)** a) Explain in brief, the following Distributed System monitoring tools: **[9]**
- i) Nagios
 - ii) Zabbix
- b) Explain in brief following Microkernels. **[9]**
- i) CHORUS
 - ii) Mach



Total No. of Questions : 8]

SEAT No. :

PD4669

[6404]-175

[Total No. of Pages : 2

B.E. (Information Technology)
SOFTWARE DEFINED NETWORKS
(2019 Pattern) (Semester - VIII) (414451A) (Elective-V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Define Design goals of Network Virtualization. **[9]**

b) Describe Benefits & Challenges for Network Function Virtualization. **[9]**

OR

Q2) a) Enlist and explain various Virtual Network Applications in Cloud Computing. **[9]**

b) Describe Various Services of Cloud using SDN. **[9]**

Q3) a) Define Data center Network & explain goals of Data center Design. **[9]**

b) Describe Taxonomy of DCN topology & Explain Fat-Tree topology in detail. **[9]**

OR

Q4) a) Write Short note on Failure recovery and Multi Tenancy issues in Data Centers. **[9]**

b) Enlist various Programmable languages of SDN in detail. **[9]**

P.T.O.

Q5) a) What are applications of Software Defined Network Security (SDN) Security? **[9]**

b) Explain Security Analysis and Potential attacks in SDN in detail? **[9]**

OR

Q6) a) Demonstrate the Network Security enhancement using the SDN Framework. **[9]**

b) What are the Solutions to the security issues in SDN. **[9]**

Q7) a) Differentiate Reactive versus Proactive Applications of SDN applications. **[8]**

b) Write a short note on Traffic Engineering for Service Providers. **[8]**

OR

Q8) a) Describe Traffic Engineering in Mobile Networks with neat diagram. **[8]**

b) Draw & Explain application of Open Daylight Controller. **[8]**

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Total No. of Questions : 8]

SEAT No. :

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[Total No. of Pages : 2

[6404]-176

B.E. (IT)

SOCIAL COMPUTING

(2019 Pattern) (Semester - VIII) (414451B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is clustering? Explain any clustering algorithm with example. **[8]**

b) What is Keyword Search? Explain Query Semantics and Answer Ranking.**[9]**

OR

Q2) a) Explain Motivations for Data Mining in Social Media. **[9]**

b) What is data mining? Explain Data Mining Methods for Social Media.**[8]**

Q3) a) What is Influence and how to Measure Influence? **[9]**

b) Explain Randomization Test with example. **[9]**

OR

Q4) a) Explain Shuffle Test and Edge-reversal test. **[9]**

b) What is Homophily? How to measure Homophily. **[9]**

P.T.O.

Q5) a) What is Individual Behavior? Explain individual online behaviour three categories. **[8]**

b) What is Collective Behavior Analysis? Explain User Migration in social media. **[9]**

OR

Q6) a) Which are the major components of Behaviour Analysis Methodology?**[8]**

b) What is Individual Behavior Modelling? Explain Social Community Structure. **[9]**

Q7) a) Write a Note on Exploring Google +API. **[9]**

b) What is TF-IDF? Explain Query human Language Data with TF-IDF.**[9]**

OR

Q8) a) Write a short note on Note on **[9]**

i) Scraping

ii) Parsing

iii) Crawling the web

b) Explain Quality of Analysis for Processing Human Language Data. **[9]**

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Total No. of Questions : 8]

SEAT No. :

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[6404]-177

[Total No. of Pages : 2

B.E. (Information Technology)
NATURAL LANGUAGE PROCESSING
(2019 Pattern) (Semester - VIII) (414451C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain WSD in NLP. **[6]**
b) Explain the difference of discourse structure from other reference mechanisms. **[6]**
c) Write a short note on Semantic Analysis. **[6]**

OR

- Q2)** a) What are the different types of ambiguity? Provide an example of each. **[6]**
b) How do anaphora and cataphora affect cohesion in discourse processing? **[6]**
c) Explain the concept of compositional meaning and its role in meaning representation. **[6]**

- Q3)** a) Explain with example two major approaches for relation extraction. **[6]**
b) Describe the patterns used to extract relationship between two entity with a given sentence. **[6]**
c) Explain the journey of text processing from word Sequences to dependency Paths. **[6]**

OR

- Q4)** a) Write short note on the following : **[10]**
i) In fact System Overview
ii) Global Security.org
b) Write a note on “frame Semantics & Semantic role labelling”. **[8]**

P.T.O.

- Q5) a)** How pages are classified for trainable document separation. **[9]**
- b)** What is probabilistic model? Give examples of probabilistic models and explain any one in detail. **[9]**

OR

- Q6) a)** What is sequence mapping problem ? How it affects the document separation? **[9]**
- b)** Write a note on various approaches to analysing texts. **[9]**

- Q7) a)** Write a short note on **[9]**
- i) Word Net
 - ii) Frame Net
 - iii) Stemmers
- b)** Explain non - classical Information Retrieval Model. **[7]**

OR

- Q8) a)** With a suitable example explain cluster based IR modeling. **[9]**
- b)** Explain design feature of IR with a neat diagram. **[7]**

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Total No. of Questions : 8]

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[6404]-178

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B.E. (Information Technology)

SOFT COMPUTING

(2019 Pattern) (Semester - VIII) (Elective-V) (414451D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 different operation in fuzzy relation data model with example. **[9]**

b) Draw and explain the block diagram of a Fuzzy logic system. **[8]**

OR

Q2) a) Explain fuzzy set and crisp set with eg. How they are different? **[8]**

b) Explain the concept of fuzzy propositions with example. **[9]**

Q3) a) What is Genetic Algorithm? Explain working principle of GA. **[9]**

b) Compare and contrast traditional algorithm and genetic algorithm. **[8]**

OR

Q4) a) Explore the use of mutation operator in GA with eg. **[8]**

b) Explain how genetic algorithms are different than evolutionary programming. **[9]**

P.T.O.

- Q5) a)** Explain features and applications of Neuro Fuzzy systems. **[9]**
- b)** What are Fuzzy Genetics Algorithm systems? Explain its applications. **[9]**

OR

- Q6) a)** What is hybrid soft computing? Explain Fuzzy - Backpropagation system. **[9]**
- b)** Explain in what ways is a genetic algorithm utilized to obtain weight values for a neural network? **[9]**
- Q7) a)** Explain use of Soft Computing in mobile ad-hoc networks using suitable application. **[9]**
- b)** Explain various applications of fuzzy systems with suitable cases studies. **[9]**

OR

- Q8)** Write short notes on [Any 3] **[18]**
- Ant colony optimization (ACO)
 - Fuzzy ARTMAP
 - GA based clustering
 - Sugeno Fuzzy Models

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Total No. of Questions : 8]

SEAT No. :

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[6404]-179

[Total No. of Pages : 2

B.E. (Information Technology)

GAME ENGINEERING

(2019 Pattern) (Semester - VIII) (414451E) (Elective-V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are the four objectives to accomplish onboarding? [6]
b) What is “Reclaiming Opposition” in the context of digital culture, and why is it important? [6]
c) What is “affective modulation,” and how does it relate to the design of digital products and services? [6]

OR

- Q2)** a) Describe pattern recognition and collecting game mechanics can be useful for gamified system. [6]
b) Explain any four mechanics which can be used in any gamified system designed for solving any social problems. [6]
c) Explain how social engagement loop motivating emotion leads to player reengagement. [6]

- Q3)** a) How does “Utility-based Resource Allocation” impact gameplay in network games? [6]
b) What are “Positive and Negative Externalities” in network effects and how do they affect games played over networks? [5]
c) What is “Selfish Routing” and how does it relate to network games? [6]

OR

P.T.O.

- Q4)** a) What are the “Three Levels” of rules in game design and how do they relate to gameplay? [6]
- b) How does “Strategic Network Formation’ impact the design and outcomes of network games? [5]
- c) How do “Wardrop and Nash Equilibrium” affect the design and play of network games? [6]

- Q5)** a) What are some key features of Construct 2, and how they have contributed to its popularity among game developers? [6]
- b) List and explain the features of any gamification server. [6]
- c) What are some popular game engines/frameworks, and what are their strengths and weaknesses? [6]

OR

- Q6)** a) Discuss BigDoor platform? Explain any one usage of it? [6]
- b) What are the advantages and disadvantages of using LOVE 2D for game development, compared to other frameworks? [6]
- c) How does Unity differ from other game engines, and what types of games is it best suited for?. [6]

- Q7)** a) How is game engineering used in esports, and what are some examples of successful esports games? [9]
- b) What are some key features of PUBG New State that distinguish it from other battle royale games? [8]

OR

- Q8)** a) How is game engineering being used in the healthcare industry, and what are some examples of successful healthcare games? [9]
- b) What are some of the unique challenges faced by game developers when designing and engineering blockchain-based games? [8]

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Total No. of Questions : 8]

SEAT No. :

PD4674

[6404]-180

[Total No. of Pages : 2

B.E. (Information Technology)

ETHICAL HACKING AND SECURITY

(2019 Pattern) (Semester - VIII) (414452A) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is Metasploit? Explain Reconnaissance with Metasploit. [6]
b) Explain Browser Exploitation with an example. [6]
c) Explain Password Cracking Websites and Tools. [6]

OR

- Q2)** a) Explain Port Scanning with Metasploit. [6]
b) Explain PDF Hacking with an example. [6]
c) Explain Spyware in detail. [6]

- Q3)** a) Differentiate between Horizontal vs. Vertical Privilege Escalation. [6]
b) Explain Privilege Escalation on Windows with Examples. [6]
c) What is Authentication Bypass? Give an example. [6]

OR

- Q4)** a) Differentiate between Vulnerabilities and Exploits. [6]
b) Give short notes on Malware and Social Engineering. [6]
c) Explain Linux Privilege Escalation with an example. [6]

P.T.O.

- Q5)** a) What is Hacking? Explain any two Website Hacking Applications. [6]
b) Explain Cross-Site Request Forgery (CSRF). [6]
c) Explain the Denial of Service (DoS) attack. [5]

OR

- Q6)** a) Explain SQL Injection & Code Injection. [6]
b) Explain any two Applications used for Securing Modern Websites. [6]
c) Explain any three Web Application Security Risks. [5]

- Q7)** a) What is Wireless Security? Explain the working of Wireless Security. [6]
b) Explain Wired Equivalent Privacy (WEP) Protocol. [6]
c) Explain Threats to Wi-Fi Security. [5]

OR

- Q8)** a) What is Wi-Fi Hacking? Explain Essential Tools for Hacking Wireless Networks. [6]
b) What is Network Sniffing? Explain Types of Network Sniffers. [6]
c) Explain the Evil Twin attack. [5]

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Total No. of Questions : 8]

SEAT No. :

PD4675

[6404]-181

[Total No. of Pages : 2

B.E. (Information Technology)

AUGMENTED AND VIRTUAL REALITY

(2019 Pattern) (Semester - VIII) (414452B) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Perception of colors in detail. **[9]**

b) Explain concept of Visual Rendering in detail. **[9]**

OR

Q2) a) Explain concept of Motion in Real and Virtual Worlds in detail. **[9]**

b) Explain Three categories of tracking in VR systems. **[9]**

Q3) a) How does Augmented Reality Work? Explain with suitable example. **[9]**

b) Describe any two applications of Augmented Reality. **[8]**

OR

Q4) a) Define Augmented Reality? Explain History of Augmented Reality. **[8]**

b) Explain Ingredients of an Augmented Reality Experience. **[9]**

P.T.O.

Q5) a) What is hybrid tracking? Explain with suitable examples. **[9]**

b) What is role of sensor in tracking? Explain in detail. **[9]**

OR

Q6) a) Describe different types of AR devices. **[9]**

b) Describe sensor fusion with example. **[9]**

Q7) a) What is natural-feature tracking? Describe with any one application. **[9]**

b) What is simultaneous localization and mapping in AR? **[8]**

OR

Q8) a) What are the major software components in augmented reality? **[9]**

b) What is marker tracking in AR? Explain in detail. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PD4676

[6404]-182

[Total No. of Pages : 2

B.E. (Information Technology)

BUSINESS ANALYTICS AND INTELLIGENCE

(2019 Pattern) (Semester - VIII) (Elective - VI) (414452C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Explore the diverse types of dashboards available, supported by relevant examples to illustrate their functionality and utility. **[8]**
- b) Discuss use of Tableau BI as a Business Intelligence (BI) tool. **[5]**
- c) What is KPI? Explain the types of KPIs. **[5]**

OR

- Q2)** a) Write a note on Business Performance Management. **[6]**
- b) Write a note on Dashboard design. Also explain the common characteristics of Dashboard. **[6]**
- c) Discuss the use of Power BI as a Business Intelligence (BI) tool. **[6]**

- Q3)** a) Write short note on: **[9]**
- i) Certainty
 - ii) Uncertainty
 - iii) Risk
- b) What is predictive analytics? Explain the importance of predictive analytics with the help of an example. **[5]**
- c) Discuss the various Components of Decision Support Mathematical Models. **[4]**

OR

P.T.O.

- Q4)** a) Discuss Mathematical Programming Optimization with an example. [5]
b) Enlist the benefits of Decision Modeling with Spreadsheets. [4]
c) Write short note on: [9]
i) Decision analysis with decision tables
ii) Decision analysis with decision trees
iii) What-If Analysis, and Goal Seeking

- Q5)** a) Enlist the advantages of using Business Intelligence in Banking Sector.[4]
b) With the help of a real time case study explain the applications of Business Intelligence in Marketing. [7]
c) Explain the importance of Business Intelligence in Telecommunication domain with respect to any real time case study. [6]

OR

- Q6)** a) Discuss the real time Applications of BI in Customer Relationship Management with appropriate case study. [6]
b) Discuss the Applications of BI in Logistics and Production with the help of real time case study. [5]
c) Discuss role of visual analytics and business analytics in Business Intelligence. [6]

- Q7)** a) What are rich reports? How are rich reports helping organizations to have a competitive advantage over their competitors. [6]
b) Write a note on “Predicting the Future with the help of Data Analytics”. [5]
c) Write short note on: Location based analytics for organizations. [6]

OR

- Q8)** a) Write short note on: Cloud Computing and Business Intelligence. [6]
b) Discuss the impacts of Analytics in Organizations with respect to Business Intelligence. [5]
c) Explain with the help of appropriate steps BI Search and Text Analytics.[6]

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Total No. of Questions : 8]

SEAT No. :

PD4677

[6404]-183

[Total No. of Pages : 2

**B.E. (Information Technology)
BLOCKCHAIN TECHNOLOGY**

(2019 Pattern) (Semester - VIII) (Elective - VI) (414452D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 components of Ethereum Ecosystem. **[6]**

b) Write a note on Ethereum programming languages. **[6]**

c) Explain Blockchain platform with blocks & blockchain. **[6]**

OR

Q2) a) What is Ethereum? Explain Features of Ethereum. **[9]**

b) What is Smart contract? How smart contract work? **[9]**

Q3) a) What is Hyper ledger and how does it work? **[6]**

b) State and explain the benefits of Hyper ledger fabric. **[6]**

c) Draw and Explain the architecture of Hyper ledger fabric system. **[6]**

OR

Q4) a) What is Hyper ledger? Explain Features of hyper ledger blockchain? **[9]**

b) Explain the differences between Ethereum and Hyper ledger blockchain. **[9]**

P.T.O.

- Q5)** a) What is Tokenization? Explain the technology behind Tokenization. [6]
b) How blockchain tokenization can help in enterprise systems? Elaborate.[6]
c) Describe the Consensus mechanism in brief. [5]

OR

- Q6)** a) State and explain different types of Consensus algorithm. [6]
b) Write a short note on: [6]
i) Tokenizing Shares and Fund Raising
ii) Challenges to Tokenization.
c) What is Tokenization? Explain its benefits? [5]

- Q7)** a) Discuss any two applications of Blockchain. [5]
b) Explain merits and demerits of Blockchain. [6]
c) Write use case of Blockchain for Health Insurance. [6]

OR

- Q8)** a) Explain the risk and limitations of blockchain: Privacy & Security Risks.[5]
b) Explain the benefits of blockchain in various scenarios. [6]
c) Write use case of Blockchain for Supply chain Financing. [6]

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[6404]-184

B.E.(Instrumentation & Control)
PROCESS CONTROL TECHNIQUES
(2019 Pattern) (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 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) Design and tune a PI Controller using Zeigler-Nichols closed loop tuning method for the following transfer function. [9]

$$G_p(s) = \frac{1}{s^3 + 5s^2 + 7s + 3}$$

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: **[10]**

$$G_p(s) = \begin{bmatrix} \frac{-2e^{-s}}{10s+1} & \frac{1.5e^{-s}}{s+1} \\ \frac{1.5e^{-s}}{s+1} & \frac{2e^{-s}}{10s+1} \end{bmatrix}$$

- b) Discuss decoupling control approach to multivariable control with neat sketch. **[7]**

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 **[10]**

and pairing. $G_p(s) = \begin{bmatrix} \frac{12.8e^{-s}}{16.7s+1} & \frac{-18.9e^{-3s}}{21s+1} \\ \frac{6.6e^{-7s}}{10.9s+1} & \frac{-19.4e^{-3s}}{14.4s+1} \end{bmatrix}$ **[10]**

- b) Analyze the direct and indirect effect of interaction with help of 2×2 systems. **[7]**

- Q7) a)** Give different methods for determination of PID controller settings. Determine PID structure and its settings for FOPDT model using direct synthesis method in detail. **[10]**

- b) Discuss PID controller design for the FOPDT model using IMC method. **[8]**

OR

- Q8) a)** With neat block diagram discuss model predictive controller and give its advantages. **[10]**

- b) Explain Smith Predictor technique for compensation of delay time. **[8]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4679

[Total No. of Pages : 2

[6404]-185

B.E. (Instrumentation & Control)
PROJECT ENGINEERING & MANAGEMENT
(2019 Pattern) (Semester - VII) (406262)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn whenever necessary.
- 3) Figure 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 Tendering process with appropriate example and comment on tendering evaluation process. **[9]**
- b) Suggest suitable tool for conduct of procurement process ,enlist various Procurement activities and the evaluation process. **[8]**

OR

- Q2) a)** Illustrate the significance of purchase order with appropriate example and comment on content of Purchase order. **[9]**
- b) Evaluate the Process of Vendor registration and vendor evaluation for the purchase of the equipment. **[8]**

- Q3) a)** Develop piping and Instrumentation diagram for typical temperature control loop. **[9]**
- b) State the significance of control room layout drawing with suitable example. **[9]**

OR

- Q4) a)** State the importance of loop wiring diagram and prepare the loop wiring diagram according to ISA S-5.4 for flow loop control. **[9]**
- b) Develop the loop wiring diagram for a loop having following instruments. **[9]**
- 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

P.T.O.

- Q5)** a) Illustrate the importance of loop wiring diagram prepare the loop wiring diagram according to ISA S-5.4 for flow loop control. **[9]**
b) Elaborate in detail Cable identification schemes and Cable trays used in detail engineering design. **[8]**

OR

- Q6)** a) Develop loop wiring diagram for any typical process. **[9]**
b) Prepare Manufacturing bill of material(MBOM) for any one application.**[8]**

- Q7)** a) Illustrate the installation and commissioning activities of the plant and documents required at this stage. **[9]**
b) State the significance of Customer Acceptance Test (CAT) with suitable example. **[9]**

OR

- Q8)** a) Draw hook up diagram for the installation sketches of DP type flow transmitter. **[9]**
b) State the importance cold commissioning and hot commissioning during the project development. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4680

[Total No. of Pages : 2

[6404]-186

B.E. (Instrumentation & Control)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester-VII) (406263 A) (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 and Q.7 or Q.8.*
- 2) Neat diagrams must be drawn whenever necessary.*
- 3) Use of Non- programmable Calculator is allowed.*
- 4) Assume suitable data if necessary.*

Q1) a) Explain the image enhancement. **[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. :

PD4681

[Total No. of Pages : 2

[6404]-187

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

- Q1)** a) 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. :

PD4682

[Total No. of Pages : 2

[6404]-188

B.E. (Instrumentation & Control)

WIRELESS SENSOR NETWORKS

(2019 Pattern) (Semester-VII) (406263 C) (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 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Elaborate flooding traffic implosion problem in routing protocol. [9]
- b) Suggest suitable routing algorithm designed to collect and deliver data to the data sink (Base station). Justify it. [9]

OR

- Q2)** a) Elaborate Power-Efficient Gathering in Sensor Information Systems (PEGSIS) in WSN? [9]
- b) Analyze the performance requirements for MAC protocol with respect to energy efficiency, scalability, adaptability, latency and predictability. [9]

- Q3)** a) Suggest with neat sketch suitable connection oriented and connectionless TCP protocol. [9]

- b) Summarize the following terms with respect to TCP protocol: [8]
- ACK
 - Packet transmission
 - Delivery ACK
 - Retransmission of packets
 - Order delivery
 - Congestion control

OR

P.T.O.

- Q4)** a) What are the design issues in TCP protocol? [9]
b) Compare TCP & UDP protocol. [8]

- Q5)** a) Analyze the existing Middleware protocol with respect to IrisNet. [9]
b) Justify the IrisNet is a two-tier architecture. [9]

OR

- Q6)** a) Summarize following terms w.r.t. middleware protocol: [9]
i) Remote Procedure Call (RPC)
ii) Object-Oriented Middleware (OOM)
iii) Message-Oriented Middleware (MOM)
iv) Event-Based Middleware
b) Analyze Wireless sensor networks middleware principle with neat sketch. [9]

- Q7)** a) Suggest suitable possible solution for jamming. Justify with neat sketch. [9]
b) Summarize following terms with respect to sensor network security: [8]
i) Hello flooding attack
ii) Wormhole
iii) Black hole
iv) Sinkhole

OR

- Q8)** a) Analyze the Challenges and issues in security provisioning network. [9]
b) Elaborate design issues and challenges in Ad-Hoc network. [8]



Total No. of Questions : 8]

SEAT No. :

PD4683

[Total No. of Pages : 2

[6404]-189

B.E. (Instrumentation & Control)

PROCESS MODELLING AND OPTIMIZATION

(2019 Pattern) (Semester-VII) (406263 D) (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 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, electronic pocket calculator etc is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) For a experimentation following data is obtain **[9]**

X	0	10	20	30	40	50	60	70	80	90	100
Y	100	103	106.1	110	112.4	116	120	124	128	133	138

Identify the curve fitting equation will give best fit. Obtain the values coefficient of equation

b) Explain prediction error methods for identification. **[8]**

OR

Q2) a) Explain ATV identification method. **[9]**

b) Explain relationship between time, Laplace and frequency domain. **[8]**

Q3) a) Determine the stability of a 2×2 process with a diagonal feedback controller given as: **[9]**

$$G_m = \begin{bmatrix} 5 & 2 \\ 4 & 4 \end{bmatrix} \text{ and } B_s = \begin{bmatrix} 4 & 12 \\ 2 & 5 \end{bmatrix}$$

b) Explain Nyquist and loci plot for analysis of multivariable system. **[9]**

OR

P.T.O.

- Q4)** a) Explain Inverse Nyquist Array and its application in analysis of multivariable system. [9]
 b) For the system given Find NI for this comment on stability also find proper pairing of control and manipulated variables [9]

$$\begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} 10 \frac{e^{-2s}}{(2s+1)} & 15 \frac{e^{-s}}{(5s+1)} \\ 6 \frac{e^{-5s}}{(5s+1)} & 8 \frac{e^{-2s}}{(2s+1)} \end{bmatrix} \begin{bmatrix} P \\ Q \end{bmatrix}$$

- Q5)** a) Explain extremum of objective function. [9]
 b) Explain optimization component of optimization statement with suitable example. [8]

OR

- Q6)** a) Explain Convex and Concave functions with proper example and its roll in optimization [8]
 b) For the functions given below, analyze the concavity and convexity in each case. [9]

i) $f(x_1, x_2) = (x_1 - x_2)^2 + x_2$

ii) $f(x) = x_1^2 + 4x_1x_2 + x_1 + x_2 + 3$

iii) $f(x) = 5x + 3x^2 + 4x^3$

- Q7)** a) Determine the optimum values of x_1 & x_2 for the function [9]

$$y = \frac{x_1^2}{3} + \frac{6}{x_1x_2} + 2x_2$$

and state whether point is minimum or maximum

- b) Explain Quasi Newton method for optimization. [9]

OR

- Q8)** a) Explain region elimination method. [9]
 b) Explain simplex method of optimization. [9]



Total No. of Questions : 8]

SEAT No. :

PD5293

[Total No. of Pages : 2

[6404]-190R

B.E. (Instrumentation & Control Engineering)

CLOUD COMPUTING

(2019 Pattern) (Semester - VII) (406264 A) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Analyze the architecture of Virtual Machine with its brief operations. [9]
b) How virtualization can be implemented in the multi-core processors. [9]

OR

- Q2)** a) Justify “Virtualization is the wave of the future”. Explicate the process of CPU, memory and I/O device virtualization in data center. [9]
b) Analyze the standards used by application developers in detail. [9]

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) Smart building is one of the major application of IoT and cloud computing. Elaborate with suitable diagram and examples. [9]

OR

P.T.O.

- Q6)** a) Comment on Ubiquitous system challenges and outlook. [9]
b) Elaborate the cyber physical system (CPS) and their components. [9]

- Q7)** a) Elaborate the docker deployment workflow with diagram. [9]
b) Comment on : [8]
i) Mobile Cloud Computing
ii) Jungle Computing

OR

- Q8)** a) Comment on : [9]
i) Location aware applications.
ii) Energy aware cloud computing
iii) Intelligent fabrics and paints.
b) Sketch the architecture of mobile cloud computing. [8]



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B.E. (Instrumentation and Control)

SOFT COMPUTING

(2019 Pattern) (Semester - VII) (406264 B) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Difference between Crisp Set and Fuzzy Set. [8]

b) For the following fuzzy sets, find Union, Intersection and Complement operation. [9]

$$A = \{ (x_1, 0.6) (x_2, 0.2) (x_3, 1) (x_4, 0.4) \}$$

$$B = \{ (x_1, 0.3) (x_2, 0.8) (x_3, 0.4) (x_4, 0.9) \}$$

OR

Q2) a) What is Fuzzy Logic? State the Characteristics of Fuzzy Logic [8]

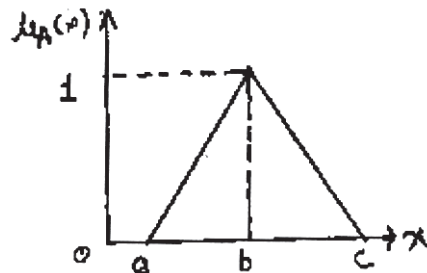
b) Explain the following properties in Fuzzy Sets. [9]

- i) Commutativity
- ii) Distributivity
- iii) Demorgan's Law

Q3) a) Explain the Fuzzy Inference system with a labeled block diagram. [8]

b) What is membership Function?

For given values, $a = 2$, $b = 6$ and $c = 10$, compute the fuzzy value corresponding to $x = 7$. [9]



OR

Q4) a) What is the purpose of Defuzzification? Explain any one method of Defuzzification. [9]

b) What is fuzzy inference system? Explain Mamdani FIS. [8]

Q5) a) Explain a Fuzzy Logic Control System with an example. [9]

b) Appraise the fuzzy system for speed control in Smart Car. [9]

OR

Q6) a) Discuss on the static and dynamic properties of Fuzzy Controller. [9]

b) Construct a Fuzzy Controller with a suitable block diagram for a washing machine application. [9]

Q7) a) Elaborate the Neuro Fuzzy method to learn Fuzzy classification rules from data. [9]

b) Explain the architecture of Neuro Fuzzy system with a labeled diagram. [9]

OR

Q8) 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 CMAC Based Self Learning controllers. [9]



Total No. of Questions : 8]

SEAT No. :

PD4686

[Total No. of Pages : 2

[6404]-192

B.E. (Instrumentation & Control)

AUTOMOTIVE INSTRUMENTATION

(2019 Pattern) (Semester - VII) (406264 C) (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 the right indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) List active safety systems. Explain any one active safety system with neat diagram. [9]

b) Draw and explain the block diagram of mechanism to open the air bags. [9]

OR

Q2) a) Classify active and passive safety systems. Explain any two passive safety system. [9]

b) Explain lane departure alert system in vehicle with neat diagram. [9]

Q3) a) Explain in detail the architecture of local interconnect network in vehicle. [8]

b) State the role of protocols in vehicles. Explain FlexRay communication protocol. [9]

OR

Q4) a) Why communication protocols are important in vehicles? Explain Media Oriented Systems Transport protocol. [9]

b) Explain the CAN-FD communication protocol. [8]

Q5) a) Explain the basic instrumentation and infrastructure required in EV maintenance. [9]

b) Explain the construction and working of axial flux motor with neat diagram. [9]

OR

P.T.O.

Q6) a) Explain following terms. (Each 2 marks) **[9]**

- i) Electromobility
- ii) Chassis
- iii) Battery charging
- iv) Driving cycle

b) Explain DC converter and Inverter in detail. Draw circuit diagrams also. **[5+4]**

Q7) a) State the advantages of IoT in automotive. Explain Vehicle to network (V2N) communication network in vehicles. **[9]**

b) Describe Vehicle to infrastructure (V2I) communication network in detail. **[8]**

OR

Q8) a) Describe Vehicle to pedestrians (V2P) communication network in detail. **[9]**

b) Explain Vehicle to network (V2N) communication network in detail. **[8]**



[6404]-193

B.E. (Instrumentation & Control)
ADVANCED CONTROL SYSTEM
(2019 Pattern) (Semester - VII) (406264 D) (Elective - IV)

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 side indicate full marks.
- 4) Use of Logarithmic tables, electronic Pocket calculator and steam table is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) Find the diagonal canonical form of following system. [9]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -72 & -54 & -13 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u(k)$$

$$y(k) = [2 \ 0 \ 1]x(k)$$

b) Convert the pulse transfer function to controllable canonical form and Jordan Canonical form. [8]

$$\frac{Y(z)}{X(z)} = \frac{(z+1)}{(z+2)(z+3)(z+5)}$$

OR

Q2) a) Find the state transition matrix for following system [9]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -12 & -8 & -5 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

$$y(k) = [1 \ 1 \ 1]x(k)$$

b) Find the pulse transfer function of following system. [8]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -30 & -31 & -10 \end{bmatrix} x(k) + \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} u(k)$$

$$y(k) = [1 \ 1 \ 1]x(k) + 4u$$

P.T.O.

Q3) a) Investigate controllability and observability of following system [6]

$$x(k+1) = \begin{bmatrix} 1 & 4 & 2 \\ -3 & 5 & 6 \\ 10 & 1 & 5 \end{bmatrix} x(k) + \begin{bmatrix} 2 \\ 4 \\ 0 \end{bmatrix} u(k)$$

$$y = [1 \ 3 \ 5]x(k) + 6u(k)$$

b) Find the feedback gain matrix for following system. [12]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -120 & -74 & -15 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

$$y = [2 \ 4 \ 7] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + 6u$$

So that desired poles can be placed at $-1, -3, -4$

OR

Q4) a) Investigate controllability and observability of following system [6]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -4 & -2 \end{bmatrix} x(k) + \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix} u(k) \text{ and } y(k) = [1 \ 2 \ 3]x(k)$$

b) Design a full order observer for following system. [12]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -6 & -7 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

$$y(k) = [4 \ 2 \ 3]x(k)$$

So that poles of close loop system will placed at $-2, -5, -7$.

- Q5) a)** Determine whether following system is positive definite, positive semidefinite, negative definite, negative semi definite system or indefinite. [8]

$$P = \begin{bmatrix} 1 & 3 & 5 \\ 4 & 6 & 4 \\ 1 & 7 & 9 \end{bmatrix}$$

$$P = \begin{bmatrix} -1 & 7 & 3 \\ -4 & 0 & 4 \\ 2 & 2 & 1 \end{bmatrix}$$

- b) Find stability of equilibrium point using Lyapunov stability. [9]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -30 & -31 & -10 \end{bmatrix} x(k)$$

OR

- Q6) a)** Determine whether following system is stable in sense of Lyapunov or not. [8]

$$x_1(k+1) = 3x_1(k)$$

$$x_2(k+1) = -4x_1(k) - 7x_2(k)$$

If energy function is given by $v(x_1, x_2) = x_1^2 - x_2^2$.

- b) Determine whether following system is stable or not [9]

$$x_1(k+1) = 3x_1(k)$$

$$x_2(k+1) = -2x_1(k) - 4x_2(k) + 6u(k)$$

- Q7) a)** Explain construction of phase plane method. [9]

- b) Explain stability analysis of nonlinear system. [9]

OR

- Q8) a)** List various nonlinearities and explain any three. [9]

- b) Find the describing function of ideal relay. [9]



Total No. of Questions : 8]

SEAT No. :

PD4688

[Total No. of Pages : 2

[6404]-194

**B.E. (Instrumentation & Control)
PROCESS INSTRUMENTATION
(2019 Pattern) (Semester - VIII) (406268)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Develop suitable feedback control strategy for bottoms composition in a column. [7]

b) Develop inferential control for composition control of distillate. [10]

OR

Q2) a) Identify process variables, control variables and manipulated variables in Distillation column. [7]

b) Develop suitable control strategy for distillation column level control.[10]

Q3) a) Develop feedback control strategy for rotary dryer. [7]

b) Develop feedback control strategy for double drum dryers. [10]

OR

Q4) a) Develop feedback control strategy for multi effect evaporators. [7]

b) Develop suitable selective control strategy for multi-effect evaporators. [10]

Q5) a) Develop time sequence diagram for batch reactor control. [8]

b) Develop end point detection control in batch reactors. [10]

OR

Q6) a) Comment on recipe building in batch reactor control. [8]

b) Develop temperature on pressure cascade control strategy for exothermic reactors. [10]

P.T.O.

- Q7)** a) Discuss in brief start/stop sequence in pumps. [8]
b) Develop on-off pressure control for parallel pumps. [10]

OR

- Q8)** a) Develop control logic for on-off control of a standalone compressor.[8]
b) Develop anti-surge control system for compressors. [10]



Total No. of Questions : 8]

SEAT No. :

PD4689

[Total No. of Pages : 2

[6404]-195

**B.E. (Instrumentation and Control)
ADVANCED EMBEDDED SYSTEMS
(2019 Pattern) (Semester-VIII) (406269)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw a neat block diagram of SPI and elaborate its operation in brief. **[9]**
b) Describe on chip ADC configuration processor. **[8]**

OR

- Q2)** a) Write a short note on fast GPIO lines of ARM-7 processors. **[9]**
b) Draw and explain block diagram of LPC2148. **[8]**

- Q3)** a) Elaborate on AMBA bus protocol. **[9]**
b) Draw the neat interfacing diagram and elaborate the operation of stepper motor interfacing with LPC2148. **[9]**

OR

- Q4)** a) Draw a neat block diagram and describe Standard Interrupt Controller (SIC). **[9]**
b) Draw the neat interfacing diagram and elaborate the operation of SPDT relay interfacing with LPC2148. **[9]**

- Q5)** a) Describe the function of DCB, DCW, CODE32 and DATA assembler directives. **[8]**
b) How to ARM and THUMB programming differ? **[9]**

OR

P.T.O.

- Q6)** a) How is Embedded C used in ARM programming? [9]
b) Elaborate on ARM assembly module. [8]

Q7) Develop an IoT based health monitoring system using LPC2148 and WiFi. [18]

OR

Q8) It is decided to design home automation system. Identify different parameters for smart home system. Develop the system using LPC2148 ARM-7 microcontroller to display the parameters on LCD display. Provide the facility to communicate the information through SMS. For this system,

- a) Identify different parameters for health monitoring system. [3]
b) Enlist selected sensors. [3]
c) Develop block diagram. [4]
d) Elaborate the operation of the system with respect to block diagram. [4]
e) Develop the algorithm for the system. [4]

* * *

Total No. of Questions : 8]

SEAT No. :

PD-4690

[Total No. of Pages : 2

[6404]-196

B.E. (Instrumentation & Control)

ELECTRIC VEHICLES

(406270 A) (2019 Pattern) (Semester - VIII)(Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw the configuration and control of Induction Motor drives and brief.[9]
b) Describe the configuration and control of Permanent Magnet Motor drives. [9]

OR

- Q2)** a) List electric components used in hybrid and electric vehicles. [9]
b) Draw & explain Configuration and control of DC Motor drives. [9]

- Q3)** a) Elaborate Hybridization of different energy storage devices. [9]
b) Explain components of EV with respect to Sizing: Propulsion motor.[9]

OR

- Q4)** a) Explain following components with respect to Sizing: Power electronics. [9]
b) Explain following components with respect to Sizing: Selecting the energy storage technology. [9]

- Q5)** a) Write a short note on: Case study of 4 wheeler vehicles in EVs. [9]
b) Write a short note on : Hybrid (ICE & others). [9]

P.T.O.

OR

- Q6)** a) Write a short note on: Case study of 3 wheeler in EV. [9]
b) Write a short note on: Solar Powered Vehicles. [9]

- Q7)** a) Examine the energy management strategies used in hybrid and electric vehicles. [8]
b) Classify different energy management strategies. [8]

OR

- Q8)** a) List & explain the various charging techniques. [8]
b) Analyze implementation issues of energy management strategies. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4691

[Total No. of Pages :2

[6404]-197

B.E. (Instrumentation & Control)

SAFETY INSTRUMENTATION SYSTEM

(406270 B) (2019 Pattern) (Semester - VIII) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Examine the different types of protection layers and how do they differ in terms of their design and functionality? **[9]**
- b) Discuss the common challenges and limitations associated with developing and implementing SRSs for protection layers? **[9]**

OR

- Q2)** a) Differentiate between a safety requirement and a functional requirement, and elaborate how are they related in the context of protection layers? **[9]**
- b) Describe the Mitigation layer of risk. **[9]**

- Q3)** a) Discuss the issues of LOPA in detail. **[9]**
- b) How is SIL determined for a safety instrumented function (SIF) and what factors are considered in this determination? **[9]**

OR

- Q4)** a) What are some common challenges and limitations associated with determining and verifying SIL levels in practice? **[9]**
- b) Elaborate the process steps of As Low As Reasonably Practical (ALARP). **[9]**

P.T.O.

- Q5)** a) What are failure modes and how are they classified in terms of their impact on safety and reliability? [8]
b) Discuss the Life expectancy of equipment. [9]

OR

- Q6)** a) What is Mean Time Between Failures (MTBF) and how is it related to failure rate and the overall reliability of an SIS? [8]
b) Discuss the Consequence Analysis of hazardous incidents. [9]

- Q7)** a) What are the key components and functions of a furnace/fired heater safety shutdown system and how are these components integrated to ensure safe and reliable operation? [8]
b) Elaborate the Scope of Analysis of safety life cycle. [9]

OR

- Q8)** a) What are some common hazards and failure modes associated with furnace/fired heater operation and how is the SIS designed to mitigate these hazards and failure modes? [8]
b) Elaborate the Operation and Maintenance Procedures for safe operation. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4692

[Total No. of Pages : 2

[6404]-198

B.E. (Instrumentation and Control)

Renewable Energy System

(2019 Pattern) (Semester - VIII) (406270 C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1) a)** Elaborate on the applications of energy storage system in renewable system
Elaborate the working of fuel Cells with neat diagram. **[10]**
- b) Elaborate the working of Pb-acid Rechargeable battery with neat diagram. **[7]**

OR

- Q2) a)** State the significance of batteries in Renewable System. Elaborate on the charging technique for batteries with neat diagram. **[10]**
- b) Elaborate the working of Fly-Wheels with neat diagram. **[7]**
- Q3) a)** State the significance of energy estimation and its importance in renewable energy system. Elaborate on the design on solar panel for various loads with diagram. **[10]**
- b) Draw and explain the working of Solar Panel mounting and Tracking. **[8]**

OR

P.T.O.

- Q4) a)** State the significance of power converters in solar photovoltaic system. Elaborate on the working of any one type of power converter used in renewable system with neat diagram. **[10]**
- b)** With a block diagram, explain the working of MPPT. **[8]**

- Q5) a)** State the significance of Renewable Energy. Explain the working of Solar power generation plant with neat diagram. **[10]**
- b)** Elaborate on the working of solar water pump with neat diagram. **[7]**

OR

- Q6) a)** State the significance of solar power generation. Elaborate on the working of Solar electric Vehicles and charger with neat diagram. **[10]**
- b)** Elaborate on the working of solar street lamps with neat diagram. **[7]**

- Q7) a)** State the significance of wind energy. Describe the wind energy conversion technology with neat diagram. **[10]**
- b)** Elaborate the concept of Wind farm with neat diagram. **[8]**

OR

- Q8) a)** State the significance of hybrid wind energy system. Draw and explain the working of wind + photo voltaic wind energy system. **[10]**
- b)** Elaborate on the various models to predict wind pattern and their analysis. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD5336

[6404]-200R

[Total No. of Pages : 2

B.E. (Instrumentation & Control Engineering)

CYBER SECURITY

(2019 Pattern) (Semester - VIII) (Elective - VI) (406271A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) How can the Diffie-Hellman key exchange algorithm help two parties establish a shared secret key over an unsecured channel? **[8]**

b) Explain the mathematical foundations underlying the RSA public-key cryptography algorithm. **[9]**

OR

Q2) a) Compare and contrast the security characteristics and cryptographic vulnerabilities of the MD4 and MD5 message digest algorithms. **[8]**

b) Describe the SHA-I cryptographic hash function and its flaws, which include collision attacks. **[9]**

Q3) a) How does PKI provide secure communication by issuing and managing digital certificates? **[8]**

b) Explain the message exchange mechanism and the security features of the Needham-Schroeder authentication protocol. **[9]**

OR

Q4) a) Describe the features and benefits of using IPSec to secure IP connections. **[8]**

b) How do PGP and S/MIME protocols protect the confidentiality and integrity of email messages? **[9]**

P.T.O.

Q5) a) What is the importance of risk management in information security and also how are threats identified in terms of information security? **[9]**

b) What are the main strategies used to manage and reduce risks in information security? Explain the process of assessing and prioritizing risks in information security? **[9]**

OR

Q6) a) How can software programs and sensitive data be protected against unwanted access and manipulation? **[9]**

b) Describe how cybercrimes are classified and the most typical types of cyber attacks. What are the security challenges of cloud computing in regard to cybercrime? **[9]**

Q7) a) How do digital forensics professionals use Windows artifacts such as system time, user activity, registry entries, and memory dumps to recreate digital crime scenes? **[9]**

b) How do investigators collect and analyze data from mobile devices, such as call records, messages, browser history, and loaded applications, to gather evidence of cybercrime? **[9]**

OR

Q8) a) What approaches are used to study network traffic, communication protocols, and devices in order to detect suspicious activity and security breaches? **[9]**

b) What approaches and tools are used to examine the structure, metadata, and embedded objects of PDFs and MS Office documents for forensic purposes? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PD4695

[Total No. of Pages : 2

[6404]-201

B.E. (Instrumentation & Control)
AUTOMATION IN AGRICULTURE
(2019 Pattern) (Semester - VIII) (Elective-VI) (406271B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the selection and types of irrigation system used in agricultural field. **[9]**

b) State the importance of monitoring and control systems used in Greenhouse. **[8]**

OR

Q2) a) Explain the types of ventilation in green house. Give the importance of automation in agriculture. **[9]**

b) State different automation scheme used in green house and benefits of green house. **[8]**

Q3) a) Explain the instrumentation of sugar cane weighing mechanism used in sugar Industry. **[9]**

b) Explain the batch process of sugar cane juice handling and automation in it. **[9]**

OR

Q4) a) Explain the pasteurisation process and the instrumentation associated with it in milk plant. **[9]**

b) Elaborate the different components of steam economy devices. **[9]**

P.T.O.

Q5) a) Explain the design consideration of cold storage and give it importance in agriculture. **[9]**

b) Elaborate International code on hygiene for various products in food processing. **[8]**

OR

Q6) a) State the importance of different food preservation techniques. **[9]**

b) What is biosensor? Explain the biosensors used in food processing and its importance. **[8]**

Q7) a) Illustrate with suitable example the role of PLC and SCADA in food packing Industry. **[9]**

b) Explain the flow diagram of milk processing plant. **[9]**

OR

Q8) a) Explain various methods of soil moisture measurements and give its importance agriculture. **[9]**

b) State the importance of creating and maintaining controlled atmosphere in food processing Industry. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4696

[Total No. of Pages : 2

[6404]-202

B.E. (Instrumentation and Control)
ENVIRONMENTAL INSTRUMENTATION
(2019 Pattern) (Semester - VIII) (Elective-VI) (406271C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) List the different level measurement technique in waste water treatment. Justify differential pressure sensors. **[10]**

b) Suggest proper instrumentation for laboratory analysis of ground water samples. Justify with neat sketch. **[7]**

OR

Q2) a) Suggest proper analyzer in which mobile gas phase and the stationary phase are used. Justify with neat sketch. **[10]**

b) Suggest proper instrumentation in ground water monitoring. Justify with neat sketch. **[7]**

Q3) a) Examine latest methods of waste water treatment plants. **[10]**

b) Compare Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD) along with the applications. **[8]**

OR

Q4) a) Examine selection criteria for waste water sampling location. **[10]**

b) Compare open channel and non-open channel flow measurement. **[8]**

P.T.O.

Q5) a) Suggest suitable sound pollution method which is helpful for environment.
List out effect of sound pollution on environment. **[10]**

b) Suggest suitable environmental laws which is used for protection of forest. **[7]**

OR

Q6) a) Suggest suitable air sampling method in which activated charcoal is use
as agent. **[10]**

b) Justify why sampling train is suitable for stack sampling. **[7]**

Q7) a) Elaborate Rain gauge weather instrument. **[10]**

b) Compare Aneroid Barometer and Mercury Barometer. **[8]**

OR

Q8) a) Suggest suitable weather instrument in which humidity, pressure,
temperature, wind speeds, and ultraviolet radiation is measure. **[10]**

b) Elaborate Ceilometer for weather station. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4697

[Total No. of Pages : 4

[6404]-203

B.E.(Mechanical Engineering)

**HEATING VENTILATION AIR-CONDITIONING AND
REFRIGERATION**

(2019 Pattern) (Semester - VII) (402041)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Discuss any one method of capacity controls of centrifugal compressor. **[6]**

b) Explain with neat sketch thermostatic expansion valve. **[6]**

c) Explain oil pressure failure control. **[5]**

OR

Q2) a) Explain with neat sketch evaporative condenser. **[6]**

b) Explain with neat sketch low temperature control. **[6]**

c) Explain with neat sketch transcritical cycle. **[5]**

Q3) a) Discuss the various types of indoor air contaminants. **[8]**

b) Air at 25°C and 60% RH is supplied to the drug formulation unit. It is conditioned to this state, first by cooling and dehumidification and then by reheating it. Cooling coil surface temperature is 13°C and ambient conditions are at 32°C DBT & 65% RH. if the supply air rate is 15,000 m³/hr, determine: **[10]**

- i) Cooling coil capacity in TR
- ii) BPF of coil
- iii) Heating capacity in kW
- iv) Heating coil surface temperature if BPF is 0.3
- v) Mass of water removed

OR

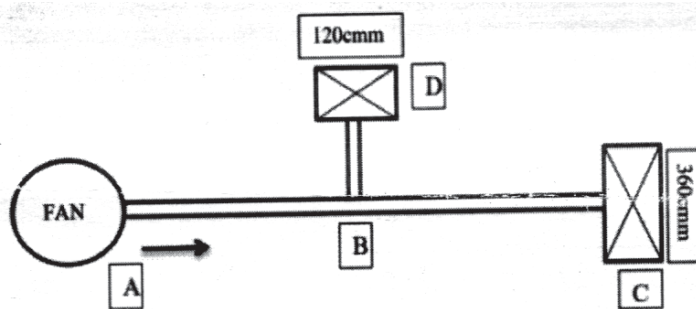
P.T.O.

- Q4) a)** What is CLTD method? How it connects with time lag and decrement factor. **[8]**
- b)** Outside design conditions are 40°C and 30% RH. Room design conditions are 25°C and 50% RH. Room sensible heat is 50 kW and room latent heat is 10 kW. If the outside air quantity is 50m³/min and assuming by pass factor of cooling coil is 0.1. Find: GSHF and ESHF. **[10]**

- Q5) a)** Explain selection and location of supply outlets. **[8]**
- b)** A circular duct of 40 cm is selected to carry air at velocity 440 meter per minute if duct is replaced by rectangular duct of aspect ratio 1.5. Find the size of a rectangular duct for equal friction when;
- Velocity in two duct is same.
 - Discharge in two duct is same.
- If $f = 0.015$. Find the pressure loss per 100 m length of duct. Take density of air = 1.15 kg/m³.

OR

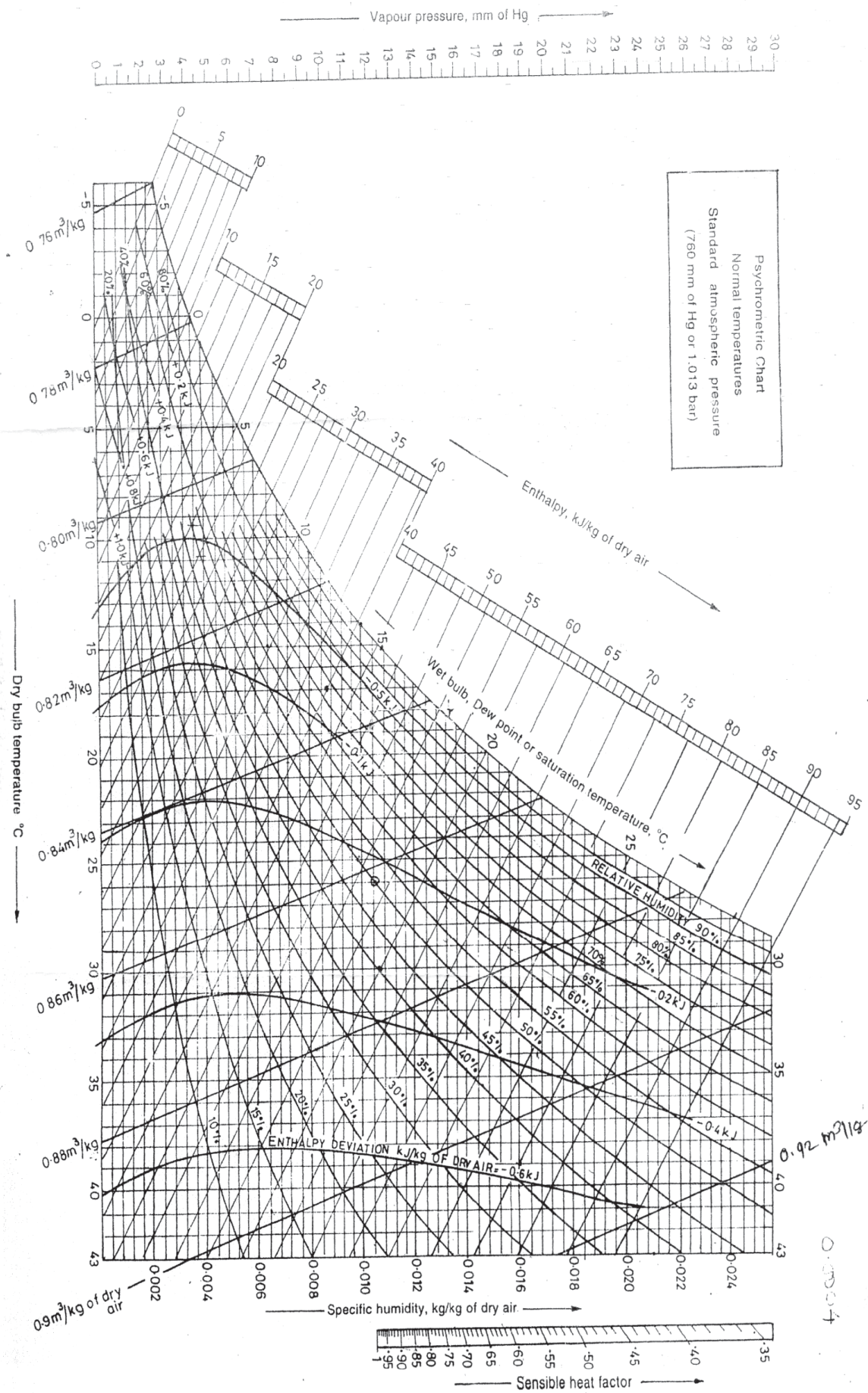
- Q6) a)** Explain Natural & Mechanical ventilation. **[8]**
- b)** Using Equal friction method, determine the duct diameter and velocity for section AB, BD and BC. Assume velocity in the main duct AB = 600 m/min. Also Calculate maximum pressure drop in the duct system. Distance AB = 30m, Distance BC = 30m and Distance BD = 10m. Refer the figure as given below. **[10]**

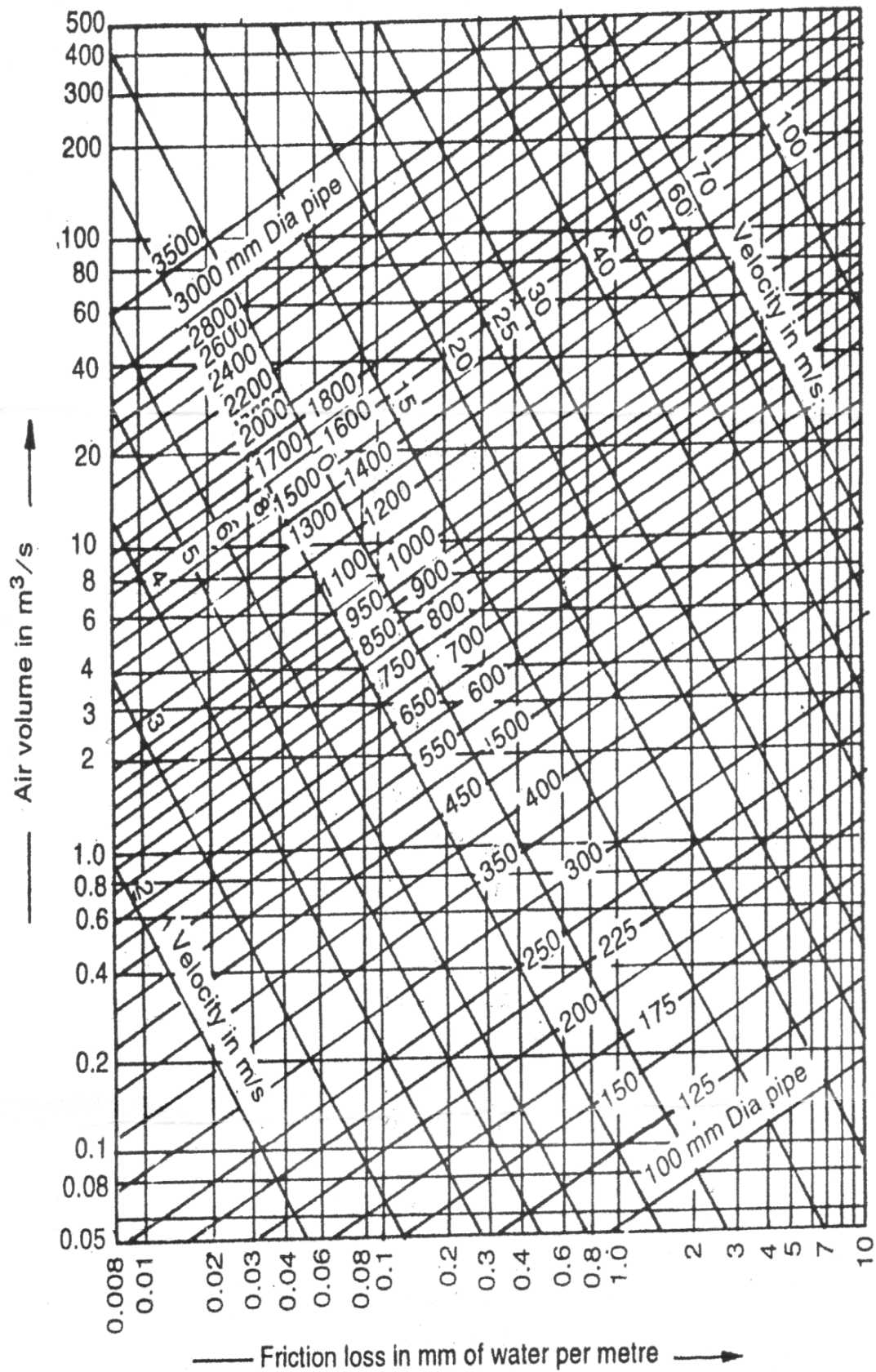


- Q7) a)** Draw neat sketch and explain all year round AC system. **[6]**
- b)** Draw neat sketch and explain solid desiccant air conditioning system. **[6]**
- c)** Explain evaporative cooling air conditioning systems. **[5]**

OR

- Q8) a)** Explain with neat sketch all-water system. **[6]**
- b)** Explain with neat sketch solid packed tower. **[6]**
- c)** Explain clean room air conditioning system. **[5]**





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Total No. of Questions : 8]

SEAT No. :

PD4698

[Total No. of Pages : 2

[6404]-204

B.E. (Mechanical)

DYNAMICS OF MACHINERY

(2019 Pattern) (Semester - VII) (402042)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** A 5 kg of mass is attached to lower end of spring, whose upper end is fixed and vibrates with a natural period of 0.45 Sec. Calculate value of K. The same spring having stiffness of K is cut into two halves, and two springs are used to support mass of 2.5 kg. Calculate natural period in sec for new system when two springs are used in parallel and series. **[10]**
- b) Discuss the elements of a vibratory system and explain with neat diagram mathematical modeling of a bicycle. **[7]**

OR

- Q2) a)** Define the term damping factor and explain with neat sketches, underdamped, overdamped and critically damped systems. **[8]**
- b) An under-damped shock absorber is to be designed for a motorcycle of mass 200 kg such that during a road bump, the damped period of vibration is limited to 2 seconds and amplitude of vibration should reduce to one-sixteenth in one cycle. Find the spring stiffness and the damping coefficient of shock absorber. **[9]**

- Q3) a)** Derive an expression for the amplitude of vibration for a system having rotating or reciprocating unbalance. **[8]**
- b) A machine part of mass 4 kg vibrates in a viscous fluid. Determine the damping coefficient when a harmonic exciting force of 50 N results in resonant amplitude of 250 mm with a period of 0.4 second. If the excitation frequency is 2 Hz, find the percentage increase in the amplitude of forced vibration when damper is removed. **[10]**

OR

- Q4) a)** A radio set of 20 kg mass has to be isolated from a machine vibrating with an amplitude of 0.05 mm at a speed of 500 cpm. The set is mounted on four isolators, each having a spring scale of 31400 N/m and damping coefficient of 392 N-s/m. Determine: **[10]**
- i) Amplitude of vibration of radio set
 - ii) Dynamic load on each isolator due to vibration.
- b) Derive an expression for deflection of vertical shaft with a single rotor without damping. **[8]**

P.T.O.

- Q5) a)** Explain the concept of torsionally equivalent shaft and derive equation for its equivalent length. [7]
- b)** Determine the natural frequency and corresponding mode shapes of given system shown in Fig. 5b when $K = 40 \text{ N/m}$ and $m = 10 \text{ kg}$. [10]

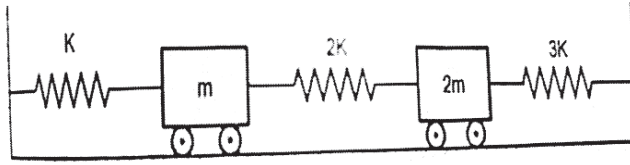


Fig. 5b

OR

- Q6) a)** Explain the torsional vibrations of geared system neglecting inertia of gears. [7]
- b)** For a spring-mass system shown in Fig. 6b, find Eigen values and Eigen vectors by matrix method. [10]

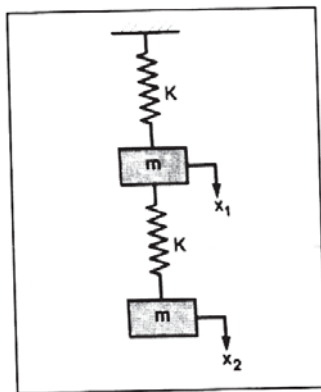


Fig. 6b

- Q7) a)** Explain Piezoelectric accelerometer with neat sketch. [6]
- b)** What is FFT Analyzer ? Explain how frequency spectrum can be used to detect vibration related problems in mechanical systems. [6]
- c)** Write short note on Seismic instruments. [6]

OR

- Q8) a)** What are different methods of vibration control? Explain any one in detail. [6]
- b)** Explain with neat sketch the working of sound level meter. [6]
- c)** Explain anechoic chamber and reverberant chamber. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4699

[Total No. of Pages : 3

[6404]-205

B.E. (Mechanical Engineering)

TURBO MACHINERY

(2019 Pattern) (Semester-VII) (402043)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

Q1) a) Compare Francis Turbine with Kaplan Turbine. **[6]**

b) A Pelton wheel is to be designed for the following specifications. **[8]**

Power developed = 9650 kW, Head = 350 m, Speed = 750 rpm,
Speed ratio = 0.45, Jet diameter not to exceed 1/6 th of the wheel diameter.
Overall efficiency = 85%.

Determine the following.

- i) The wheel diameter
- ii) Diameter of the jet
- iii) No. of jets required.

Take $C_v = 0.985$

OR

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

- i) Casing of Pelton wheel
- ii) Notch of bucket
- iii) Governing mechanism

P.T.O.

- b) The external and internal diameters of an inward flow reaction turbine are 2m and 1m respectively. The head on the turbine is 60 m. The width of the vane at inlet and outlet are the same and equal to 0.25 m. The runner vanes are radial at inlet and discharge is radial at outlet. The speed is 200 rpm and the discharge is $6 \text{ m}^3/\text{sec}$. Determine (i) The vane angle at outlet of the runner and guide blade angle at inlet. (ii) The hydraulic efficiency. [8]

- Q3)** a) Explain in brief different losses in steam turbine. [4]
 b) Steam enters an impulse wheel having a nozzle angle of 20° at a velocity of 450 m/s. The exit angle of moving blades is 20° and relative velocity of steam may be assumed to remain constant over the moving blades. If the blade speed is 180 m/s. determine: [8]
 i) blade angle at inlet,
 ii) work done/kg of steam,
 iii) power developed when the turbine is supplied with 1.8 kg/s of steam
 iv) Diagram efficiency

OR

- Q4)** a) Explain nozzle governing with sketch. [4]
 b) In a single stage impulse turbine the mean diameter of the blade ring is 1m and the rotational speed is 3000 rpm. The steam issued from the nozzle at 300 m/sec and nozzle angle is 20° . The blades are equiangular. If the friction loss in the blade channel is 19% of the kinetic energy corresponds to relative velocity at the inlet to the blades. What is the power developed in the blading when the axial thrust on the blades is 98 N. Solve the problem graphically or analytically. [8]
- Q5)** a) What do you mean by cavitation? Explain the phenomenon of cavitation in centrifugal pumps. [6]
 b) A Centrifugal pump having outer diameter equal to two times inner diameter and running at 1200 rpm works against a total head of 75m. The velocity of flow through the impeller is constant and is equal to 3 m/s. The vanes are set back at width at an angle of 30° is at the outlet. If the outer diameter of the impeller is 600 mm and width at outlet is 50 mm. [6]
 Determine:
 i) Vane angle at inlet
 ii) Work done per second by impeller
 iii) Manometric efficiency

OR

- Q6)** a) Explain different types of impellers used for centrifugal pumps. [6]
b) A Centrifugal pump running at 900 rpm is working against a head 20m. The external diameter of the impeller is 460 mm and outlet width is 50 mm. If the vane angle at outlet is 40° and manometric efficiency is 70 %. Determine the following [6]
i) Flow velocity at outlet
ii) Angle made by the absolute at outlet with the direction of motion at outlet

- Q7)** a) Explain construction and working of Axial flow Compressor with a neat diagram. [6]
b) A centrifugal compressor running at 9000 rpm delivers $600 \text{ m}^3/\text{min}$ of free air. The air is compressed from 1 bar and 20°C to a pressure ratio of 4 with isentropic efficiency of 82 %. [6]
Calculate
i) Final temperature of air
ii) Theoretical power

OR

- Q8)** a) Explain surging and choking phenomenon in centrifugal compressors with neat diagram. [6]
b) The impeller of the centrifugal compressor has the inlet and outlet diameter of 0.3 and 0.6 m respectively. The intake is from the atmosphere at 100 kPa and 300 K, without any whirl component. The outlet blade speed is 10000 rpm and velocity of flow is constant at 120 m/s. If the blade width at inlet is 6 cm outlet Blade Angle = 75° [6]
Calculate
i) Specific work
ii) Exit pressure



Total No. of Questions : 8]

SEAT No. :

PD4700

[Total No. of Pages : 2

[6404]-206

B.E. (Mechanical Engineering)
Elective - III: AUTOMOBILE DESIGN
(2019 Pattern) (Semester - VII) (402044A)

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)** A propeller shaft is required to transmit 45 kW power at 500 rpm. It is a hollow shaft, having an inside diameter 0.6 times of outside diameter. It is made of plain carbon steel and the permissible shear stress is 84 N/mm². Calculate the inside and outside diameters of the shaft. **[9]**
- b) Explain the construction and working of a rack and pinion type steering gear. **[9]**

OR

- Q2) a)** Differentiate between semi floating and full floating axle. **[8]**
- b) A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameters of the pinion and gear are 80 mm and 100 mm respectively. The tooth profiles of the gears are of $14\frac{1}{2}^\circ$ composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmits 2.75 kW at 1100 r.p.m., find the module and number of teeth on each gear from the standpoint of strength and check the design from the standpoint of wear. Take surface endurance limit as 630 MPa and modulus of elasticity for cast iron as 84 kN/mm². **[10]**

- Q3) a)** What is ABS? Explain with neat sketch working of ABS. **[9]**
- b) What is the angle of banking necessary for a curved road of 50 m radius for safe driving at 54 km/h? If the road is not banked, what is the coefficient of friction necessary between the road surface and tyres for safe driving at this speed? **[8]**

OR

- Q4) a)** Write a short note on **[10]**
- i) Classification of pressed steel disc wheel
 - ii) Factors affecting tyre life
- b) Compare radial ply tyre over the cross ply tyre. **[7]**

P.T.O.

- Q5) a)** Explain with neat sketch MacPherson strut front independent suspension system. State its advantages. [9]
- b)** A helical compression spring is used to absorb the shock. The initial compression of the spring is 30 mm and it is further compressed by 50 mm while absorbing the shock. The spring is to absorb 250 J of energy during the process. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire with an ultimate tensile strength of 1500 N/mm² and modulus of rigidity of 81 370 N/mm². The permissible shear stress for the spring wire should be taken as 30% of the ultimate tensile strength. [9]
- Calculate:
- i) wire diameter;
 - ii) mean coil diameter;
 - iii) number of active turns

OR

- Q6) a)** Explain with neat sketch hydro gas suspension system. State its advantages. [9]
- b)** 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. [9]
- i) the width and thickness of the leaves;
 - ii) the initial nip; and
 - iii) the initial pre-load required to close the gap C between extra full length leaves and graduated-length leaves.

- Q7) a)** Explain the following [10]
- i) Mechanical packaging
 - ii) Automotive industry packaging
- b)** Discuss steps involved in driver package development. [7]

OR

- Q8) a)** Explain with suitable examples anthropometry in automobile. [9]
- b)** Write a note on applications of biomechanics in vehicle. [8]



Total No. of Questions : 8]

SEAT No. :

PD4701

[Total No. of Pages : 2

[6404]-207

B.E. (Mechanical Engineering)

**Elective - III: DESIGN OF HEAT TRANSFER EQUIPMENTS
(2019 Pattern) (Semester - VII) (402044B)**

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 of each question indicate full marks.*
- 4) *Assume suitable data wherever necessary and mention the same clearly.*
- 5) *Use of steam tables, mollier chart and calculator is allowed.*

- Q1)** a) Discuss the Bell-Delaware Method for evaluation of shell-side heat transfer coefficient. **[9]**
- b) Elaborate the parameters for selection criteria of a shell and tube heat exchanger. Discuss the assumptions considered in the process of design of a heat exchanger. **[9]**

OR

- Q2)** a) Explain the method for calculation of Shell side pressure drop and Tube side pressure drop of STHE. **[9]**
- b) Discuss the basic design procedure of a shell and tube heat exchanger in brief. **[9]**

OR

- Q3)** a) Elaborate design and operational considerations considered during selection of condensers. **[9]**
- b) What different types are of evaporators used in refrigeration and air conditioning applications? Discuss anyone with diagram, working, merits, demerits. **[8]**

OR

- Q4)** a) Discuss Evaporative condenser with diagram, working, merits, demerits and applications. **[9]**
- b) Elaborate the design considerations of heat exchangers for a air conditioning application. **[8]**

- Q5)** a) Explain mini and micro channel heat exchangers with diagram, working, merits, demerits and applications. **[9]**
- b) Discuss thermal design process of plate fin heat exchanger. **[8]**

P.T.O.

- Q6)** a) Explain Tube fin heat exchanger with diagram, working, merits, demerits and applications. [9]
b) What are factors affecting design of heat exchanger? Explain in brief.[8]

- Q7)** a) Elaborate Classification of cooling towers. Discuss construction and working of forced draft cooling tower with diagram. [9]
b) Elaborate design methodology for a counter flow direct contact heat exchanger. [9]

OR

- Q8)** a) Explain different performance indicative parameters of cooling towers.[9]
b) Discuss Heat Balance of cooling tower and Determination of the number of diffusion units. [9]



Total No. of Questions : 8]

SEAT No. :

PD4702

[Total No. of Pages : 2

[6404]-208

B.E. (Mechanical Engineering)

MODERN MACHINING PROCESSES

(2019 Pattern) (Semester - VII) (Elective - III) (402044C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Describe the Photochemical machining process with principle, construction, working process parameters and applications. [8]
b) Explain in detail with suitable sketch of electro chemical machining (ECM). Also discuss the effect of process parameters, merits, demerits and applications. [9]

OR

- Q2)** a) Explain chemical machining (CHM) process with principle, construction, working process parameters. [8]
b) Write in brief about electrolytes used in ECM process. [5]
c) Compare electro chemical machining (CHM) and electro chemical grinding (ECG). [4]

- Q3)** a) Illustrate the suitable properties of followings in case of Spark erosion machining. [9]
i) Tool material
ii) Dielectric fluid
iii) Work material
b) Explain electric Discharge Diamond Grinding with principle, construction, working process parameters and applications. [9]

OR

- Q4)** a) Elucidate with neat sketch Wire Electric Discharge Machining (WEDM) procedure, encompassing its fundamental principles, structural components, operational mechanisms, and diverse applications. [9]
b) Draw R-C circuit. Explain with neat graph the effect of following parameters on MRR in EDM? [9]
i) Resistance
ii) Mean current
iii) Capacitance
iv) Spark gap

P.T.O.

- Q5)** a) Explain micro turning with suitable sketch. Also discuss the advantages, disadvantages and applications. [9]
b) Explain micro drilling with principle, construction, working process parameters and applications. [8]

OR

- Q6)** a) Elaborate on the material removal mechanism inherent in diamond turn machining. [8]
b) Explain micro engraving process with suitable sketch. [5]
c) Elucidate the advanced methodology employed in the manufacturing of micro Electrical Discharge Machining (EDM) tools. [4]
- Q7)** a) Explain the photolithography process with principle, construction, working process parameters and applications. [9]
b) Describe Magnetorheological Finishing with principle, construction, working process parameters and applications. [9]

OR

- Q8)** a) Clarify wet and dry etching process with suitable sketch. [8]
b) Compare MAP and AFF. [6]
c) Write a note on MEMS in brief. [4]



Total No. of Questions : 8]

SEAT No. :

PD4703

[Total No. of Pages : 2

[6404]-209

B.E. (Mechanical)

INDUSTRIAL ENGINEERING

(2019 Pattern) (Semester - VII) (Elective - III) (402044 D)

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) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is the relationship between Plant Layout and Material Handling equipment. **[7]**

b) Explain the selection criterion for material handling. Explain in detail factors affecting selection of location for the industrial plant. **[10]**

OR

Q2) a) Write short note on- **[9]**

- i) Line Layout
- ii) Travel chart
- iii) Functional Layout

b) Define material handling. List Material Handling equipment and describe any of them. **[8]**

Q3) a) Explain in brief various functions of production planning and control. **[8]**

b) Explain Moving Average Method for Demand forecasting. What is Line of balancing? Explain Assembly line balancing in detail. **[10]**

OR

Q4) a) What is Master Production Schedule (MPS)? Discuss objective and importance of MPS. **[9]**

P.T.O.

- b) Historical data on the sale of Laxmi Pumps for the last 12 years is given below. By the method of three yearly moving average establish the trend values and forecast demand for 13th year. If actual demand for 13th year is 520 nos. What shall be the forecast for 14th year? [9]

Year	1	2	3	4	5	6	7	8	9	10	11	12
Sales No.	332	344	328	336	370	408	420	432	428	450	498	540

- Q5) a)** Define Enterprise resource planning. Explain functions of Enterprise resource Planning system. [8]
- b) What do you understand by term Cost Reduction & Value Improvement. Explain with example. What is Sampling Method. In detailed Acceptance Sampling and Inspection. [10]

OR

- Q6) a)** What is Inventory Control and Objectives of Inventory Control. [9]
- b) Maxell manufacture has to supply his customers 3600 units of his products per year. Shortage is not permitted. Inventory carrying cost amounts Rs 1.2 per unit per annum. The setup per run is Rs. 80 Find. [9]
- Economic order quantity (EOQ)
 - Optimum number of orders per annum
 - Average annual inventory cost (minimum)

- Q7) a)** Explain the terms Rapid Upper Limb Assessment (RULA) and Rapid EntireBody Assessment (REBA). [6]
- b) What is Performance Appraisal? Explain the types of Performance Appraisal methods. [6]
- c) Explain basic principles of Ergonomics. [5]

OR

- Q8) a)** What is Merit Rating? Enlist and explain the methods of Merit Rating in Performance appraisal. [9]
- b) What is value Engineering. Write Principles and benefits of value engineering in industry. [8]

* * *

Total No. of Questions : 8]

SEAT No. :

PD4704

[Total No. of Pages : 2

[6404]-210

B.E. (Mechanical Engineering)

COMPUTATIONAL FLUID DYNAMICS

(2019 Pattern) (Semester - VII) (Elective - III) (402044 F)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Derive two dimensional steady heat convection-diffusion equation. **[10]**
b) Compare Implicit versus Explicit finite volume method for CFD modelling. **[8]**

OR

- Q2) a)** Explain 2D unsteady heat convection-diffusion equation for slug flow using finite volume method. **[10]**
b) What is Peclet number? State its' Significance. **[8]**

- Q3) a)** Derive solution of Navier-Stoke' equation for incompressible flow. **[9]**
b) Explain and illustrate the use of SIMPLE algorithm for solution of 2-D Navier Stokes equations. **[8]**

OR

- Q4) a)** Discuss the challenges in solving Navier-Stokes Equations numerically? Suggest two remedies to overcome these challenges. **[9]**
b) Explain and illustrate the development of an algorithm to solve problem of incompressible flow over an airfoil. **[8]**

- Q5) a)** Derive One equation model for Turbulent Flow Modeling. **[10]**
b) What is turbulence modeling? What is Scales of turbulence? Explain in details. **[8]**

OR

P.T.O.

- Q6)** a) Why turbulence modeling is required? Explain any one “two-equation” turbulence model. **[10]**
- b) Explain the Direct Numerical Simulation (DNS) and its applications. **[8]**

- Q7)** a) Explain and illustrate Eulerian description along with its advantages and limitations. **[9]**
- b) Explain and illustrate mechanical forces and equilibrium for FSI formulation. **[8]**

OR

- Q8)** a) What is continuum mechanics of fluid and solid with respect to Fluid-Structure Interaction formulation? **[9]**
- b) Explain types of Fluid-Solid Couplings in details. **[8]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4705

[6404]-211

[Total No. of Pages : 2

B.E. (Mechanical Engineering)

PRODUCT DESIGN AND DEVELOPMENT

(2019 Pattern) (Semester - VII) (402045A) (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 the procedure for product tear down in detail. [7]
- b) Explain Pugh's chart. [6]
- c) Explain brain storming with suitable example. [4]

OR

- Q2)** a) Explain subtract and operate procedure. [7]
- b) Explain SWOT analysis for a selection of profitable product. [6]
- c) Explain benchmarking with suitable example. [4]

- Q3)** a) What is design for assembly? Explain the principles of DFA. [7]
- b) Explain the term 'Product architecture'. [6]
- c) Define Limit, Tolerance and Fit. [4]

OR

P.T.O.

- Q4)** a) What is design for manufacturing? Explain the principles of DFM. [7]
b) What is Geometric Tolerances? List down various geometric tolerances with symbols. [6]
c) What are the various elements of production drawing? [4]

- Q5)** a) Explain Simulation driven design. List down various simulation driven design types. [8]
b) What is Rapid prototyping? Explain 3D printing in detail with suitable sketch. [6]
c) What is production capacity planning? [4]

OR

- Q6)** a) What is PPAP? Explain elements of PPAP. [8]
b) Explain Make Vs Buy Decision. [6]
c) Differentiate product testing and product validation. [4]

- Q7)** a) Discuss design for robustness in detail. [8]
b) Describe in detail 'Process Flow Chart'. [6]
c) Differentiate value analysis and value engineering. [4]

OR

- Q8)** a) Define APQP and Explain APQP phases. [8]
b) Write a short note on product data management. [6]
c) Differentiate DFMEA and PFMEA. [4]



Total No. of Questions : 8]

SEAT No. :

PD4706

[6404]-212

[Total No. of Pages : 2

B.E. (Mechanical)

EXPERIMENTAL METHODS IN THERMAL ENGINEERING

(2019 Pattern) (Semester - VII) (402045B) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 4 questions Q1 or Q2, Q3 or Q4, Q 5 or Q6, .Q7 or Q8 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 do you mean by RTD? Discuss different methods of construction of RTD with diagram. Explain merits and demerits of use of RTD. [9]
- b) What is Thermocouple? Explain the type of thermocouple with significance applications? [8]

OR

- Q2)** a) Write short notes on : [9]
- i) Thermistor
 - ii) Thermopile
 - iii) Liquid crystal thermography
- b) What is an Optical Pyrometer? Explain its Construction, Working & Its Applications. [8]

- Q3)** a) Write a short note on [10]
- i) McLeod gauge
 - ii) Pirani gauge and
 - iii) Ionization gauge
- b) Write the types of sensors used in pressure measurement with its applications. [8]

OR

P.T.O.

- Q4)** a) Difference between high pressure measurement and low-pressure measurement? How to measure the pressure in combustion? [10]
- b) Describe transient response of pressure transducers in detail. [8]

- Q5)** a) State the main objectives of flow visualization. Explain interferometer with neat sketch. [8]
- b) Discuss Magnetic flow meter with following points : [10]
- i) Working Principle with neat diagram
 - ii) Advantages and Disadvantages
 - iii) Applications

OR

- Q6)** a) Explain the flow obstruction methods? How to measure the flow in micro channel? [8]
- b) 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) What do you mean by statistical Correlation? Explain the types of Correlation with examples. [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. :

PD4707

[6404]-213

[Total No. of Pages : 2

B.E. (Mechanical)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VII) (402045C) (Elective - IV) (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) *Figures to the right indicate full marks*
- 4) *Assume suitable data wherever necessary.*

Q1) a) Explain process Direct Ink Writing (DIW) and Robocasting with suitable sketch. **[9]**

b) Explain process Direct Metal Deposition (DMD) with suitable sketch. **[9]**

OR

Q2) a) Explain process TIG deposition in additive manufacturing. List its Benefits, Limitations and Applications. **[9]**

b) Write short notes on Extrusion. Give its advantages and disadvantages. **[9]**

Q3) a) Explain different quality considerations in A.M. **[9]**

b) Explain Robocasting and Bio printing with suitable example. **[8]**

OR

Q4) a) Explain use of Metals in Additive Manufacturing with important process parameters, benefits, drawbacks, Limitations and appropriate applications. **[9]**

b) What are the different types of post processing techniques in AM? Why post processing is necessary in additive manufacturing? **[8]**

P.T.O.

- Q5) a)** Explain the process and mechanism used in Multi-Jet Modeling (MJM).[9]
- b) Explain the design considerations of different types of nozzles used in Polymer based 3D Printers. [8]

OR

- Q6) a)** What is calibration of 3D Printer and Explain raw material manipulation in details with suitable examples. [9]
- b) What are the bio active materials in additive manufacturing state its application. [8]

- Q7) a)** Write short notes on Mass Customization and Future trends in additive manufacturing. [9]
- b) Explain application of AM in Food-Processing, Food & Consumer Applications with suitable case study. [9]

OR

- Q8) a)** Explain application of AM in Personalized Surgery, Bio-medical Applications with suitable case study. [9]
- b) Explain with the example of case studies additive manufacturing in aerospace and machine tools. [9]



Total No. of Questions : 8]

SEAT No. :

PD4708

[6404]-214

[Total No. of Pages : 6

B.E. (Mechanical)

OPERATIONS RESEARCH

(2019 Pattern) (Semester - VII) (Elective - IV) (402045D)

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) *Answers in One answer Books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary*

Q1) a) A manufacturer of furniture makes two products - chairs and tables. Processing of this product is done on two machines A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A and no time on machine B. There are 16 hours of time per day available on machine A and 30 hours on machine B. Profit gained by the manufacturer from a chair and a table is Rs 2 and Rs 10 respectively. What should be the daily production of each of two products? **[12]**

b) Explain with the help of an example general syntax of LPP. **[6]**

OR

Q2) a) Use two-phase simplex method to solve **[12]**

Maximize $Z = 5X_1 + 3X_2$

Subject to Constraints

$$2X_1 + X_2 \leq 1;$$

$$X_1 + 4X_2 \geq 6;$$

$$X_1, X_2 \geq 0;$$

b) Discuss the following **[6]**

i) Objective function

ii) Constraints

iii) Feasible and infeasible solution set

P.T.O.

- Q3) a)** Consider a problem of assigning four clerks to five tasks. The time (hrs) required to complete the task is given below. Clerks II cannot be assigned to task C and Clerk 3 cannot be assigned to task A. Find the optimum schedule. **[10]**

		Tasks				
		A	B	C	D	E
Clerks	I	9	11	15	10	11
	II	12	9	----	10	9
	III	----	11	14	11	7
	IV	14	8	12	7	8

- b)** Find out the initial feasible solution for the transportation problem given below. Using **[8]**

- i) North- west corner rule
- ii) VAM method
- iii) Least cost method

		Destinations				
Plants		1	2	3	4	Supply
1		2	3	11	7	6
2		1	0	6	1	1
3		5	8	15	9	10
Requirement		7	5	3	2	

OR

Q4) a) What do you mean by balancing an assignment problem? What steps you take to solve maximization case in assignment problem? Explain. [6]

b) A manager has 4 jobs on hand to be assigned to 3 of his clerical staff. Clerical staff differs in efficiency. The efficiency is a measure of time taken by them to do various jobs. manager wants to assign the duty to his staff, so that the total time taken by the staff should be minimum. The matrix given below shows the time taken by each person to do a particular job. Help the manager in assigning he jobs to the personnel. [12]

Jobs.	Men (time taken to do job in hours)		
	X	Y	Z
A	10	27	16
B	14	28	7
C	36	21	16
D	19	31	21

Q5) a) The following mortality rates have been observed for a certain type of fuse. [12]

Week	1	2	3	4	5
% failing by the End of Week	5	15	35	75	100

There are 1000 fuses in use and it costs Rs 5 to replace an individual fuse. If all fuses were replaced simultaneously it would cost Rs 1.25 per fuse. It is proposed to replace all fuses at fixed intervals of time, whether or not they have burnt out and to continue replacing burnt out fuses as they fail. At what intervals the group replacement should be made? Also prove that this optimal policy is superior to the straight forward policy of replacing each fuse only when it fails.

b) Differentiate between CPM and PERT analysis of project network. [5]

OR

Q6) a) A project has the following data.

[12]

Task	1-2	1-3	1-4	2-5	2-6	3-6	4-7	5-7	6-7
Optimistic Time	5	18	26	16	15	6	7	7	3
Pessimistic time	10	22	40	20	25	12	12	9	5
Most likely time	8	20	33	18	20	9	10	8	4

Determine the following:

- Construct the network and find out the \Expected task time and their variance.
- The earliest and the latest expected completion times of each event.
- The critical path.
- The probability of an event occurring at the expected completion date if the original scheduled time of completing the project is 41.5 weeks.
- The duration of the project that will have 95 % chance of being completed. Use following table

Probability	0.3085	0.3050	0.3015	0.2981	0.95
Normal distribution constant (Z)	-0.50	-0.51	-0.52	-0.53	1.64

- Explain what you mean by crashing of the network and various flaws in the network construction. **[5]**

Q7) a) Explain various steps involved in the simulation process. **[5]**

- b) Due to the new technology up gradation done on the plant of the auto component manufacturing firm. It has come up with a need of training its workforce in the different trainings. It thus contracted about four different training firms for providing the training in technical domain. The results for all the trainings was compiled for knowledge enhancement on a scale of 100 as follows: **[12]**

Number of Courses	Firm 1	Firm 2	Firm 3	Firm 4
0	0	0	0	0
1	25	20	40	10
2	50	70	60	20
3	60	90	80	30
4	80	100	100	40
5	100	100	100	50
6	100	100	100	60
≥ 7	100	100	100	70

How many courses should be allocated to each firm in order to maximize knowledge?

OR

Q8) a) Explain the characteristics of dynamic programming in brief. **[5]**

b) Students arrive at the head office of www.gunjan.com. According to the following arrival and service time probability distributions are as follows: **[12]**

Inter-arrival time (min)	Frequency	Service time (min)	Frequency
1	1	1	1
2	4	2	4
3	7	3	7
4	17	4	17
5	31	5	31
6	23	6	23
7	7	7	7
8	5	8	5
9	3	9	3
10	2	10	2

Use Monto Carlo Simulation and determine the following

- The average waiting time before service.
- The average time a student spends in a system.

Use following random numbers : 17,86,84,79,33,55,6,42,93,38



Total No. of Questions : 8]

SEAT No. :

PD4709

[6404]-215

[Total No. of Pages : 2

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 Q.1 or Q. 2, Q.3 or Q. 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 static and dynamic features, Physical constraints, Level of detail, surface attributes, and acoustics. **[10]**

b) Describe the particle systems used as a powerful technique for modelling natural phenomena such as water, rain, fire, grass and trees. **[8]**

OR

Q2) a) Explain any five types of sensors used in VR input/output devices for movement capture. **[10]**

b) Explain and illustrate simple rolling/rotation of wheel used in physical simulations. **[8]**

Q3) a) Describe the core components of Augmented Reality (AR). **[8]**

b) Explain following Augmented Reality (AR) displays: **[9]**

- i) Head attached displays,
- ii) Handheld displays, and
- iii) Spatial displays.

OR

P.T.O.

- Q4)** a) Compare Marker versus Markerless -based Augmented Reality (AR). [10]
b) Write a short note on types of Augmenting Reality (AR). [7]

- Q5)** a) Explain the five features of modeling toolkits. [10]
b) Explain physical simulation with respect to the following: Rigid bodies, Mass, Forces due to fields, Forces due to direct intervention, Forces due to collisions, Dead reckoning, Collision detection, The physics library. [8]

OR

- Q6)** a) Explain the following range of dynamic features that mimic the dynamics of objects in the real world as a part of VR system and software: Gravity, Fuel, Climbing, Falling, Friction, Restitution, Driving velocity, External velocity, Maximum velocity, Angular velocity, and Pushable. [12]
b) Describe types of tactile receptors of human body which detects the sensations of touch, pressure and vibration. [6]

- Q7)** a) Explain how VR can be used in human factors modelling. [8]
b) How to simulate the combined augmented and virtual reality application in science domain. [9]

OR

- Q8)** a) Explain how AR can be used in Public Safety, The Military, and The Law. [9]
b) Explain how VR can be subjected to Finite Element Analysis (FEA) techniques to identify areas of stress. [8]



Total No. of Questions : 8]

SEAT No. :

PD4710

[6404]-216

[Total No. of Pages : 2

B.E. (Mechanical Engineering)

COMPUTER INTEGRATED MANUFACTURING

(2019 Pattern) (Semester - VIII) (402048)

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 & Explain the components of CNC Machine Tool. [9]

b) Write a CNC turning program for following component shown in Figure 1b. Assume suitable data. [9]

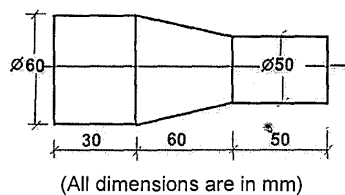


Fig. 1b

OR

Q2) a) Explain Tool length and cutter radius compensation with suitable G-codes. [9]

b) Write a complete part program for 10mm drilling operation at four location on milling machine on a work piece shown in Figure 2b. Assume suitable speed and feed for machining. [9]

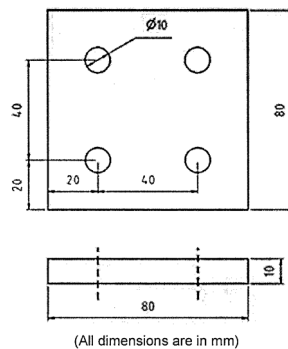


Fig. 2b

P.T.O.

- Q3)** a) Describes the different approaches to Computer Aided Process Planning (CAPP). [9]
- b) Explain in brief : (i) Capacity planning, (ii) Enterprise Resource Planning (ERP). [8]

OR

- Q4)** a) Explain Logical steps in Computer Aided Process Planning (CAPP). [8]
- b) Describe the Manufacturing Resource Planning (MRP-II) with input, working, outputs and benefits. [9]

- Q5)** a) Explain any three Flexible Manufacturing Systems (FMS) based on layout with suitable sketches. [9]
- b) Explain Optiz parts coding system with suitable example. [9]

OR

- Q6)** a) Describe Rank order Clustering (ROC) algorithm with suitable example. [9]
- b) Explain cellular manufacturing and types of machine cell design with layouts. [9]

- Q7)** a) Explain the classification of components of Industry 4.0. [9]
- b) Explain Big-Data and Cloud Computing used for IoT along with its benefits and limitations. [8]

OR

- Q8)** a) Explain the use of IoT for Smart Manufacturing, Predictive.Maintenance and Supply-Chain & Logistics applications. [9]
- b) Explain with an example, How Digital Twin is implemented for Smart Manufacturing? [8]



Total No. of Questions : 8]

SEAT No. :

PD4711

[Total No. of Pages : 3

[6404]-217
B.E (Mechanical)
ENERGY ENGINEERING
(2019 Pattern) (Semester-VIII) (402049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and calculator is allowed.

- Q1) a)** Describe with simple diagram Boiling Water Reactor (BWR). Also write its advantages. **[6]**
- b) Discuss in brief factors should be considered while selecting a site for a diesel power plant. What are applications of diesel power plant? **[6]**
- c) The runoff data of one river at a particular site is as below. **[6]**

Sr No.	Month	Discharge in million of Cu m per month	Sr No	Month	Discharge in Millions of Cu m per month
1.	Jan	80	7.	July	150
2.	Feb	40	8.	August	250
3.	March	50	9.	Sept	200
4.	April	0	10.	Oct	120
5.	May	20	11.	Nov	80
6.	June	100	12.	Dec	100

From above data

- i) Determine Mean Flow
- ii) Draw Flow Duration Curve

OR

P.T.O.

- Q2)** a) Describe construction and operation of different components of medium head hydro-electric power plant with neat diagram. [6]
- b) List the essential components of a diesel power plant and explain them briefly. [6]
- c) Write short note on: Waste disposal of nuclear power plant. [6]
- Q3)** a) Air enters the compressor of a gas-turbine power plant having capacity 10 MW at 1 bar and 27 degrees Celsius. The maximum cycle temperature, pressure is 577° C, 6.5 bar respectively. The two stage compression with perfect inter cooling arrangement is incorporated in the plant. The compression in both stages and expansion in turbine are isentropic. Take adiabatic index, specific heat for both air and gas as 1.4, 1 KJ/Kg-K respectively. Assume calorific value of fuel as 45 MJ/Kg. Draw cycle arrangement and T-s diagram and determine [9]
- i) The thermal efficiency of cycle with considering effect mass flow rate of fuel on air.
- ii) Fuel consumption on per hour basis (with inter cooling arrangement)
- b) What do you mean by Cogeneration. Describe a need of Cogeneration in gas power cycle. Explain Cogeneration in gas power cycle with suitable block diagram. [8]

OR

- Q4)** a) The air enters the compressor of gas-turbine power plant at 1 bar, 27° C. The pressure ratio is 6:1. The air after compression is passed through heat exchanger with effectiveness 0.65. Then air is passed to combustion chamber and heated to 870°C. Then gases are expanded up to 1 bar in turbine then to heat exchanger and finally to the exhaust. The isentropic efficiency of compressor, gas turbine is 80%,85% respectively. Take adiabatic index for air gas as 1.4. Take specific heat for air, gas as 1 KJ/Kg-K. Neglect mass flow rate of fuel and air mass as 5kg/sec. Draw cycle arrangement and T-s diagram and determine. [9]
- i) The thermal efficiency of cycle
- ii) Heat carried away by exhaust gases on per minute basis
- b) Explain the gas and steam combined cycle plant with cycle arrangement, T-s diagram, advantages and limitations. [8]

- Q5) a)** A 100 MW thermal power plant has peak load of 65MW. The power station supplies load to four town having their maximum demand of 20MW, 15MW, 10MW and 30 MW. The Annual load factor is 65%. Find: [6]
- i) Average load on the plant
 - ii) Energy Supplied per year
 - iii) Diversity factor
 - iv) Demand factor
 - v) Plant capacity factor
- b) Enlist the protective equipments and explain the working of switch gear in power plant. [6]
- c) Write note on: Energy demand estimation. [5]

OR

- Q6) a)** A steam power station has an installed capacity of 120 MW and maximum demand of 100 MW. The coal consumption is 0.4 kg per kWh and cost of coal is Rs. 80 per ton. The annual expenses on salary bill of staff and other overhead charges excluding cost of coal are $\text{Rs. } 50 \times 10^5$. The power station works at a load factor of 0.5 and the capital cost of the power station is $\text{Rs. } 4 \times 10^5$. If the rate of interest and depreciation is 10%. Determine total annual energy generation and the cost of generating per kWh. [6]
- b) State the function of relay system. How the relays classified? Explain working of any one relay with diagram. [6]
- c) Explain anyone method of thermal energy storage with simple diagram. [5]
- Q7) a)** Explain working principle of fuel cell. What are different types of fuel cells? [6]
- b) Explain superheated steam system geothermal energy system with diagram and disadvantages. [6]
- c) Describe the principle, advantages and applications of Solar Photovoltaic System. [6]

OR

- Q8) a)** Describe Anderson's Ocean Thermal Energy system with diagram. [6]
- b) Write note on-biomass gasifier. [6]
- c) Discuss Low temperature flat plate collector solar power plant with a suitable sketch. And also write their advantages. [6]



Total No. of Questions : 8]

SEAT No. :

PD4712

[6404]-218

[Total No. of Pages : 3

B.E. (Mechanical Engineering)

QUALITY AND RELIABILITY ENGINEERING

(2019 Pattern) (Semester - VIII) (402050A) (Elective-V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Draw suitable neat diagrams, whenever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Assume suitable data if required.*

Q1) a) Differentiate between Quality & Reliability. **[6]**

- b) The failure of ten vehicle brakes are observed to be 43500, 52000, 72000, 84500, 93500, 101000, 111500, 116000 & 123500 miles of operations. Plot the probability density, probability distribution, reliability and the hazard function of the failure time to brakes. **[12]**

OR

Q2) a) Define failure with it's classification and modes of failure in detail. **[9]**

- b) Explain in detail the term Probability Density Function (PDF) & Cumulative Distribution Function (CDF). **[9]**

Q3) a) Explain with illustration reliability analysis of series, parallel & mixed configuration systems. **[8]**

- b) The three main units connected in series together make an assembly of machine which requires reliability of 0.65. The individual reliabilities of units are 0.70, 0.80 & 0.90 respectively. Explain and find how the reliability of machine should be apportioned among these units with minimum effort technique. **[9]**

OR

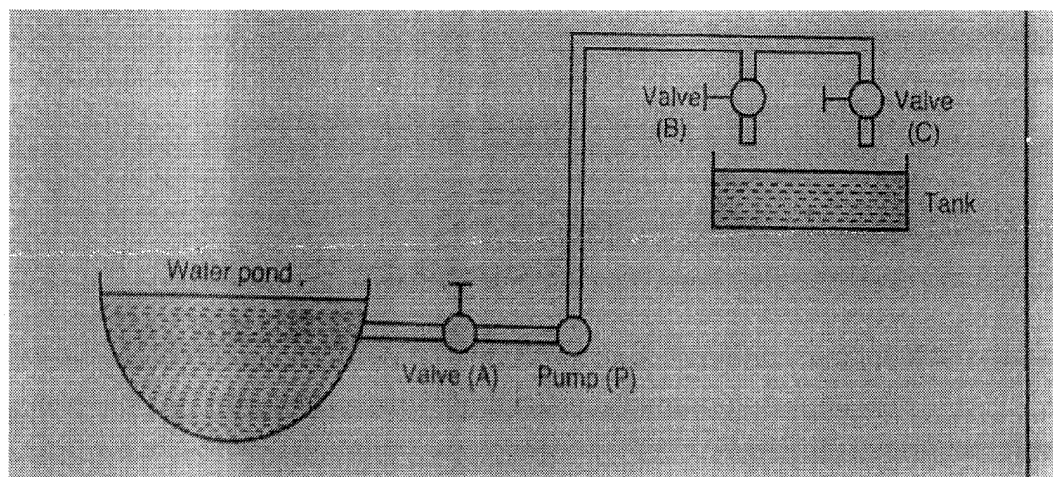
P.T.O.

Q4) a) Explain in detail about Cold, Warm & Hot Standby Redundancy. [8]

- b) A system have three elements 1, 2 and 3 connected in series with their failure rates of $\lambda_1 = 0.006$, $\lambda_2 = 0.004$, $\lambda_3 = 0.001$ per hour respectively Assuming mission time of 20 hours and system reliability of 0.92, find the reliability of each subsystem to achieve the desired reliability goal.[9]

Q5) a) What is fault tree analysis (FTA)? Give four basic symbols used in FTA. Explain four points of differences between FTA and failure mode and effects analysis (FMEA) approach. [9]

- b) Figure shows three valves A, B and C, a pump (P), a pipeline and a tank to collect water pumped from the pond. Construct the fault tree corresponding to the top event no flow of water into the tank. [9]



OR

Q6) a) What is FMECA? Give the procedure of FMECA. State importance of RPN in FMECA with example. [9]

- b) Draw and explain any five symbols used in fault tree construction. [9]

Q7) a) Write a note on : **[9]**

- i) Markov model
 - ii) MTBF
 - iii) Reliability Centered Maintenance (RCM)
- b) Define preventive, predictive and corrective types of maintenance. State the benefits of each type of maintenance with suitable examples. **[8]**

OR

Q8) a) Define maintainability and state the factors which affect maintainability. Also, compare the inherent, achieved and operational availability. **[8]**

- b) A beam is subjected to mean stress 180 N/mm^2 and standard deviation 20 N/mm^2 the mean strength of beam material is 280 N/mm^2 and standard deviation 40 N/mm^2 . **[9]**

Determine:

- i) Reliability of the Beam
- ii) Minimum Factor of Safety
- iii) Average factor of safety



Total No. of Questions : 8]

SEAT No. :

PD4713

[6404]-219

[Total No. of Pages : 2

B.E. (Mechanical)

ENERGY AUDIT AND MANAGEMENT

(2019 Pattern) (Semester - VIII) (402050B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) An industry intends to invest INR. 5,00,000 in a new energy-saving project. The cash flows expected are: Year 1: Rs.2,00,000 Year 2: Rs.3,00,000 Year 3: Rs.2,00,000 The expected return is 10%. Evaluate the Net Present Value and comment on the feasibility of the project. [7]

b) Perform detailed analysis of the cost calculation of coal, natural gas, steam and electricity. [10]

OR

Q2) a) Explain various methods of financial analysis techniques used for proposal appraisal. [10]

b) Explain the 'Simple Payback Period' method of financial analysis with its advantages and limitations. [7]

Q3) a) How the performance of the cooling tower is specified? Discuss factors affecting the performance of cooling towers. [10]

b) The pump is used in HVAC applications with a rated power absorbing capacity of 200 KW and delivers 0.20 m³/sec. The suction and delivery head is 80 m and motor efficiency is 85%. Calculate pump efficiency assuming standard water density. [8]

OR

P.T.O.

- Q4) a)** Enlist the types of steam traps and explain any two with a neat sketch.[10]
- b) Explain the energy-saving opportunities in the compressed air system.[8]

- Q5) a)** Discuss essential components of electric tariffs and explain any two tariff methods. [10]
- b) Discuss causes of transmission and distribution losses in electric power transmission and suggest methods to eliminate them. [7]

OR

- Q6) a)** Discuss factors influencing the selection of induction motor. [10]
- b) The showroom of two-wheeler utilizes, 15 bulbs each of 60W and 10 fluorescent tubes of 40W each, and a refrigerator of 500W. It is decided to replace bulbs and tubes with 15 CFL with 35 W each and an efficient refrigerator with power 200 W. Find savings in KWh and amount of rupee saved if the showroom runs 10 hours per day and an electric tariff of 8 INR is applicable. [7]

- Q7) a)** Write a short note on Trigenation and write its advantages. [10]
- b) What is the need of cogeneration? Explain cogeneration in detail with suitable examples. [8]

OR

- Q8) a)** Explain carbon credit calculation for thermal power plant. [10]
- b) Explain the Waste Heat Recovery (WHR) in the industry and write its direct and indirect benefits. [8]



Total No. of Questions : 8]

SEAT No. :

PD4714

[6404]-220

[Total No. of Pages : 2

B.E. (Mechanical)

MANUFACTURING SYSTEMS AND SIMULATION
(2019 Pattern) (Semester - VIII) (402050C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q. 2, Q. 3 or Q. 4, Q.5 or Q. 6, Q. 7 or Q. 8.*
- 2) Draw suitable neat diagrams, whenever necessary.*
- 3) Figure to the right indicate full marks.*
- 4) Assume suitable data if required.*

Q1) a) How is a Discrete-Event Simulation Carried Out? Explain in details. **[9]**

b) What is the difference between System dynamics (SD) and Agent-based modelling (ABM)? **[8]**

OR

Q2) a) Explain different steps in simulation study. **[8]**

b) Explain Manufacturing simulation with its advantages, disadvantages, Applications. **[9]**

Q3) a) Explain following Input data in details : **[8]**

- i) Deterministic input data
- ii) Probabilistic input data
- iii) Discrete input data
- iv) Continuous input data

b) What are different Sources of collecting input data? Explain in details. **[10]**

OR

P.T.O.

- Q4)** a) What are different Tools for Developing the Problem Statement? [10]
b) Explain phases of input modelling for simulation. [8]

- Q5)** a) Explain in details Face Validity. [9]
b) Explain the Iterative process of calibrating a model. [8]

OR

- Q6)** a) Explain the purpose of model verification in operational model. [9]
b) Explain possible validation techniques in order of increasing cost-to-value ratios. [8]

- Q7)** a) Explain role of robotics in Discrete Event Simulation. [8]
b) Explain Cellular manufacturing system selection with multi-lean criteria and simulation. [10]

OR

- Q8)** a) Explain role of PLCs in Discrete Event Simulation. [8]
b) How Material Handling Equipment's helps to improve manufacturing simulation? [10]



Total No. of Questions : 8]

SEAT No. :

PD4715

[Total No. of Pages : 3

[6404]-221

B.E. (Mechanical)

ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT
(2019 Pattern) (Semester - VIII) (402050D) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of an electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is a Profit and Loss (P&L) Statement? Explain its concepts in detail. **[6]**

- b) From the following given the trial balance of Vishal Ltd. Prepare the Balance Sheet of the company as of 31st March 2015 as per Schedule III of the Companies Act. **[12]**

Trial Balance as on 31 st March 2015			
Debit	Rs.	Credit	Rs.
Advances to employees	3,00,000	Equity Share Capital	52,00,000
Cash at Bank	3,14,320	Capital Reserve	60,000
Furniture & Fixture	7,50,000	Loan from SBI	8,00,000
Premises	41,09,940	Provision for Employees	
Patents	10,00,000	Welfare Fund	6,00,000
Discount on issue of		Proposed Dividend	1,64,000
shares (unwritten off)	25,000	Short term loan from bank	4,90,200
Trade Receivables	3,66,240	Unpaid dividend	64,800
Advance Tax	50,000	Profit & Loss A/c	42,980
8% Govt. Bonds	3,36,000	Bills Payable	85,100
Stock in trade	3,55,600	Sundry Creditors	1,00,020
	<u>76,07,100</u>		<u>76,07,100</u>

OR

P.T.O.

- Q2) a)** Difference between cost accounting and management accounting. [6]
- b) From the following Ledger balances of Varun LTD., prepare the Balance Sheet of the company as of 31st March 2014 as per Schedule III of the Companies Act. [12]

Particulars	Rs.	Particulars	Rs.
Plant & machinery	6,00,000	Immovable property	10,00,000
8% Debentures	8,00,000	Public deposit	5,00,000
Employee's provident Fund	1,30,000	Provision for taxation	1,80,000
Securities premium	80,000	Drafts on hand	5,00,000
Cash at bank	34,000	Bills Receivable	2,40,000
24,000 fully paid Equity shares of Rs. 100 each		Brokerage on issue of shares	1,10,000
Rs. 50 called up	12,00,000	Bank overdraft	1,50,000
Sundry Creditors	1,16,000	Security Deposit	1,24,000
Loan to Manager	70,000	Trade marks	1,80,000
Deposits with ICICI			
Bank (5 years)	1,98,000		
Prepaid insurance	1,00,000		

- Q3) a)** What is the budget and steps in budgeting? [9]
- b) Give classification of budgets based on time, condition, function and flexibility. [8]

OR

- Q4)** a) What are the effects of inflation on budgeting and budgetary control?[9]
b) What is zero-base budgeting? State its advantages and disadvantages.[8]

- Q5)** a) What are government fiscal and exchange rate policies? [9]
b) What is Gresham's law and state its limitations? [8]

OR

- Q6)** a) Define international trade and reasons for international trade. [9]
b) Explain the significance of foreign trade policy. [8]

- Q7)** a) Write a short note on: [10]
i) Entrepreneurship
ii) Incubators
iii) Crowdfunding
iv) Deal Sourcing
v) Term Sheet
b) What is Pre-Money and Post-Money Valuation? Explain in detail. [8]

OR

- Q8)** a) Explain the Factors affecting investment decisions for startups. [10]
b) State and explain Entrepreneurial Finance and Corporate Finance. [8]



Total No. of Questions : 8]

SEAT No. :

PD4716

[Total No. of Pages : 2

[6404]-222

B.E. (Mechanical)

ORGANIZATIONAL INFORMATICS

(2019 Pattern) (Semester - VIII) (402050E) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What are key management issues surrounding product data and product workflow integration. **[10]**

b) Discuss the key elements of a product information data model and its role in facilitating effective PLM. **[8]**

OR

Q2) a) What are the primary reasons for deploying PLM systems in modern industries, and how do they address organizational needs? **[10]**

b) Define Product Data Management (PDM) and its significance in modern industries. **[8]**

Q3) a) Differentiate between Business Blueprint and Business Process Reengineering (BPR) methodologies in the context of ERP implementation. **[9]**

b) Explain the principles underlying ERP systems and outline the components of the ERP framework. **[8]**

OR

P.T.O.

- Q4) a)** How do ERP systems facilitate manufacturing database integration, particularly in lean manufacturing and Industry 5.0 environments? [9]
- b) Explain the concept of customization in ERP systems and its significance for meeting unique business requirement. [8]

- Q5) a)** Compare the features and functionalities of different MOM software solutions available in the market. [9]
- b) Outline the advantages of MOM systems across different functional areas such as production inventory management, and quality control. [8]

OR

- Q6) a)** Explain the importance of plant dashboards in MOM systems and how they aid in real-time monitoring and control. [9]
- b) How does workflow management contribute to efficiency and agility in manufacturing operations within MOM systems? [8]

- Q7) a)** Explore the challenges and considerations involved in maintaining the privacy and confidentiality of information within Information Systems.[10]
- b) Discuss the significance of intranets and extranets in facilitating internal and external communication within digital organizations. [8]

OR

- Q8) a)** Explore the challenges and opportunities in implementing Knowledge Management Systems within organizations. [10]
- b) What are the key features and benefits of cloud computing within Information Systems? [8]



Total No. of Questions : 8]

SEAT No. :

PD4717

[Total No. of Pages : 2

[6404]-223

B. E. (Mechanical Engineering)

COMPUTATIONAL MULTI BODY DYNAMICS

(2019 Pattern) (Semester - VIII) (402050F) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What are the types of MBD formulations? Explain any four. **[10]**

b) Explain the derivation of equations of motion using Principle of virtual work. **[8]**

OR

Q2) a) Explain the derivation of equations of motion using Lagrange's method. **[6]**

b) What is Lagrange's equation and formulation? Explain with respect to requirements, advantages, limitations and applicability to the MBD system simulations. **[12]**

Q3) a) How to model revolute, prismatic, cam pairs joint constraints for Planar Kinematic Analysis? **[9]**

b) How to assemble systems of equations for acceleration analysis for Planar Kinematic Analysis? **[8]**

OR

Q4) a) What is Iterative solution for Planar Kinematic Analysis? Explain "How to generate/model Iterative solution of systems of linear equations?" **[10]**

b) Explain the computation of planar generalized forces for external forces and actuator element forces. **[7]**

P.T.O.

- Q5)** a) Explain Euler angles and Euler parameters for Rigid bodies in Space. [8]
b) How the equations of motion are generated for closed-chain constrained spatial systems? [10]

OR

- Q6)** a) Explain and derive the relationship between the Angular Velocity Vector and the time derivatives of Euler parameters for of Rigid bodies in Space. [10]
b) What are the basic kinematic constraints in Spatial Systems? [8]
- Q7)** a) What is Forward and Inverse Recursive Inverse Dynamics? Compare it. [8]
b) Explain in detail the dynamic analysis of spatial systems? [9]

OR

- Q8)** a) How to do computation of reaction forces using Lagrange's multipliers for spatial system? [9]
b) What are the domain specific applications of Multibody Dynamics Simulation software? [8]



Total No. of Questions : 8]

SEAT No. :

PD4718

[Total No. of Pages : 2

[6404]-224

B.E. (Mechanical Engineering)
PROCESS EQUIPMENT DESIGN
(2019 Pattern) (Semester - VIII) (Elective-VI) (402051A)

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 design of thick cylinders subjected to internal pressure based on maximum principal stress theory and derive the equation to find thickness of cylinder wall. **[9]**
- b) Explain the purpose of pre-stressing of cylinders. Explain any one method in detail with neat labeled sketch. **[9]**

OR

- Q2) a)** A long thick steel tube of inner diameter 150 mm is subjected to an internal pressure of 20 N/mm². The allowable compressive and tensile stresses for the tube are 160 N/mm² and 100 N/mm² respectively. Determine the outer diameter of the using: **[10]**
- i) Maximum principal stress theory
- ii) Maximum shear stress theory
- Derive the expression you use.
- b) Explain the design of openings in pressure vessel by area compensation method. **[8]**

- Q3) a)** Explain the three types of floating roofs used in floating roof type tank with sketches. **[9]**
- b) Explain the pump selection procedure for pump used in process industry. **[8]**

OR

- Q4) a)** Explain shell and tube type of heat exchanger with neat labeled sketch. **[8]**
- b) List the different types of valves used on pipe line. Explain any two types of valves with neat sketch. **[9]**

P.T.O.

- Q5) a)** List the different pressure measuring instruments and explain principal, construction and working of Bourdon tube with neat labeled sketch. **[9]**
- b)** Discuss with neat labeled sketch, any type of flow meter used to measure flow of highly corrosive liquids involving measurement of erosive slurries. **[9]**

OR

- Q6) a)** Explain functions of controller. **[4]**
- b)** Explain PID controller with block diagram. **[6]**
- c)** Describe with neat sketches, principal, construction and working of LVDT. **[8]**
- Q7) a)** What is purpose of using protective coating on metal? Write note on metallic coating and inorganic coating. **[8]**
- b)** List NDT methods used for surface defects. Discuss any two methods used for detection of surface defects. **[9]**

OR

- Q8) a)** What is the purpose of lining for chemical plant and equipments? Explain the different types of lining used in chemical plant. **[8]**
- b)** Differentiate between destructive and Non-destructive testing. Explain Radiographic testing used for detection of internal defects. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4719

[Total No. of Pages : 3

[6404]-225

B.E. (Mechanical Engineering)

RENEWABLE ENERGY TECHNOLOGIES

(2019 Pattern) (Semester - VIII) (Elective -VI) (402051B)

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 the following solar cells with neat sketch. **[6]**

- i) Single Crystalline -
- ii) Poly Crystalline

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

- i) Payback Time and
- ii) Levelized Energy Cost for solar energy generation

c) List out and explain the various PV components used in designing PV system. **[6]**

OR

Q2) a) Write a short note on. **[8]**

- i) Factors affecting electricity generated by a solar cell and
- ii) Solar Cell Equation

b) Design a standalone PV system for the load specified in the table. **[10]**

Load	Number	Power Rating (Watt)	Usage Hr/day
T.V	1	100	2
Refrigerator	2	50	8
Computer	3	18	5

Find:

- i) Energy supplied (Wh) by the battery to inverter input considering inverter efficiency = 85 %.
- ii) Considering Depth of Discharge (DOD) of 50 %, calculate the required charge capacity of battery (24V).
- iii) Considering two days of autonomy, calculate battery charge capacity.
- iv) Calculate no. of batteries needed for 24 V system voltage if the available battery configuration is 12 V and 100 Ah.
- v) Calculate the number of panels of 60 W_p for the above case considering 6 sunshine hours of 1000 W/m²-day.

Assume battery efficiency = 80 %, Assume controller circuit efficiency = 100%.

P.T.O.

- Q3) a)** Write a short note on. **[6]**
- i) Betz coefficient and
 - ii) Tip Speed Ratio
- b) Explain the Horizontal and Vertical axis wind turbines with neat sketch. **[6]**
- c) With neat sketch, explain the concept of Upwind and Downwind rotor position for wind turbines. **[6]**

OR

- Q4) a)** List out and explain the components of wind turbine with neat sketch. **[8]**
- b) Wind at 1 standard atmospheric pressure and 15°C temperature has a velocity of 10 m/s. The turbine has a diameter of 120 m and its operating speed is 40 rev/min at maximum efficiency. Calculate. **[10]**
- i) Total power density in the wind stream
 - ii) Maximum obtainable power density assuming, $\eta = 40\%$,
 - iii) Total power produced in kW and
 - iv) Torque and axial thrust. Assume air density as $\rho = 1.226 \text{ kg/m}^3$

- Q5) a)** Write a short note on. **[6]**
- i) Yaw control mechanism used in wind turbine
 - ii) Solar PV tracking
- b) Write a short note on. **[6]**
- i) Site selection for wind farm
 - ii) ICT based monitoring and control of wind farm
- c) Write a short note on effect of dust on PV and suggest few remedies for it. **[5]**

OR

- Q6) a)** Explain off shore and on shore wind farms providing their advantages and disadvantages. **[6]**
- b) List out and explain various components of solar photovoltaic system. **[6]**
- c) Explain Pitch controlled and Stall controlled power control for wind turbines. **[5]**

- Q7)** a) Explain Biogas Digester with neat sketch. [6]
b) Explain following characteristics of biomass: [6]
i) Ultimate analysis
ii) Proximate analysis and
iii) Thermo- gravimetric analysis
c) Differentiate between Aerobic and Anaerobic digestion. [5]

OR

- Q8)** a) Write a short note on Bio-Diesel. [6]
b) List out and explain various type of biomass. [5]
c) A biomass gasifier is used to run a compression ignition engine. The engine operates in the dual fuel mode with 75 % diesel replacement. The biomass feeding rate for the gasifier is 170 kg/hr. Calculate the power produced by the engine, if the engine efficiency is 28 % and calorific value of biomass is 15500 k.J/kg. Consider efficiency of the gasifier is 0.70. [6]



Total No. of Questions : 8]

SEAT No. :

PD4720

[Total No. of Pages : 2

[6404]-230

**B.E. (Mechanical Engineering)
AUTOMATION AND ROBOTICS**

(2019 Pattern) (Semester - VIII) (Elective-VI) (402051C)

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 labeled diagrams 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 the motion conversion and determination of power of motor in robotic devices. **[9]**

b) Explain the various drive system used in an industrial robot with their selection criteria and compare their features, merits and demerits. **[9]**

OR

Q2) a) Write a note on (i) Cycloidal Gearbox and (ii) Harmonic Gearbox. **[10]**

b) Explain the micro actuators. **[8]**

Q3) a) What are the tooling used in Robotic applications? Explain their types, classification, significance and applications used in Robotics. **[9]**

b) Describe the construction, working, selection and design Considerations of encoders used in various Robotic applications. **[8]**

OR

Q4) a) What is compliance? Explain active, passive and Remote center compliance. **[9]**

b) Describe the construction, working, selection and design considerations of range sensors and machine vision system used in various Robotic applications. **[8]**

P.T.O.

Q5) a) Explain DH parameters of any one type of basic Robot. **[10]**

b) Explain and illustrate Newtonian and Eulerian approach for formulation of equations of motion of planar two joints/link RP manipulator. **[8]**

OR

Q6) a) Compare and illustrate Lagrangian-Eulerian and newtonian Eulerian approaches for formulation of equations of motion of planar manipulator. **[9]**

b) Explain the differences between Kinematic and Dynamic formulation of any one robotic task. **[9]**

Q7) a) Write a note on functional safety in Robotic applications. **[8]**

b) Explain Robot cell design considerations and selection of robot. **[9]**

OR

Q8) a) Explain the applications of field and service Robotics. **[9]**

b) Compare Wheeled, Legged, Tracked and Hybrid Terrestrial mobile robots. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4721

[Total No. of Pages : 2

[6404]-231

B.E. (Mechanical)

**INDUSTRIAL PSYCHOLOGY AND ORGANIZATIONAL BEHAVIOR
(2019 Pattern) (Semester - VIII) (Elective-VI) (402051D)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Define Performance Management and explain process of performance management. **[10]**

b) Explain concept of performance management and state objectives of performance management. **[7]**

OR

Q2) a) Write short note on i) Recruitment ii) Time management **[10]**

b) Explain job satisfaction. Explain the factors influencing job satisfaction. **[7]**

Q3) a) What are the different types of organizational theories? Explain classic theory. **[10]**

b) Explain factors affecting organizational behavior. **[8]**

OR

Q4) a) Explain importance of ethics in an organization. **[10]**

b) What are the different theories of learning? Explain social learning theory in detail. **[8]**

P.T.O.

Q5) a) Explain different stages in group development. **[10]**

b) Define a group and explain its types. **[7]**

OR

Q6) a) Define leadership and its various functions. **[10]**

b) List down the characteristics of good leadership. **[7]**

Q7) a) Define and explain organizational culture. Describe the characteristics of Dominant culture. **[10]**

b) State and explain which forces are responsible for organizational change. **[8]**

OR

Q8) a) Explain the process of organizational development. **[10]**

b) Describe the following: **[8]**

i) Open-system Theory.

ii) Classical organizational theory.



Total No. of Questions : 8]

SEAT No. :

PD4722

[Total No. of Pages : 2

[6404]-232

B.E. (Mechanical Engineering)
ELECTRICAL AND HYBRID VEHICLE
(2019 Pattern) (Semester - VIII) (Elective-VI) (402051E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe and illustrate the structural configuration of motor layout. **[6]**

b) Write a short note on (i) battery cooling, (ii) thermal control and protection, (iii) battery safety and maintenance. **[12]**

OR

Q2) a) Describe and illustrate the motors (prime mover) classification, construction working, and control. **[10]**

b) Describe and illustrate the energy storage system classification-types and packs. **[8]**

Q3) a) Explain power flow control in electric drive-train topologies. **[9]**

b) Explain the power train components and sizing calculation. **[8]**

OR

Q4) a) Explain with suitable equations rolling resistance, aerodynamic drag/lift, grading resistance, road resistance, acceleration resistance, total driving resistance. **[9]**

b) Differentiate between mechanical differential and electric differential. **[8]**

P.T.O.

Q5) a) What are the national/international testing/regulation/licensing/approval organizations and agencies? **[9]**

b) Describe and illustrate the Front/Rear Suspension systems design for varieties of electric vehicle configuration. **[9]**

OR

Q6) a) Describe and illustrate the body loads based on varieties of electric vehicle configurations. **[9]**

b) What is Retrofitting? Describe and illustrate the retrofitting of Two-wheeler vehicles. **[9]**

Q7) a) Describe and illustrate a typical structure of battery management system. **[9]**

b) What are the Requirements for Charging System? **[8]**

OR

Q8) a) Explain the Level 1, Level 2 and Level 3 chargers of electric vehicles. **[9]**

b) Explain grid voltages, frequencies, wiring, real power, apparent power, and power factor. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4723

[Total No. of Pages : 2

[6404]-233

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) State few applications of Solar PV system with neat sketch. **[8]**

b) Write short notes on wind mills. **[9]**

OR

Q2) a) How the hydrothermal resources are classified? Explain any one. **[8]**

b) With a neat sketch explain a typical geothermal field. **[9]**

Q3) a) Describe energy and environment. **[9]**

b) List and describe all the requirements of energy action planning? **[9]**

OR

Q4) a) Discuss different aspects of Energy Policy and strategy in Energy conservation systems. **[9]**

b) What are the principles of energy management and need of managerial skills in energy management? **[9]**

Q5) a) What are the different types of energy audit? Discuss the scope of preliminary energy audit. **[8]**

b) Explain stepwise procedure to carry out detailed energy audit. **[9]**

OR

P.T.O.

- Q6)** a) Write short notes on Current energy conservation act and electricity act. **[8]**
b) Give a typical energy audit reporting format. **[9]**

- Q7)** a) With neat sketch of each differentiate between load curve and load duration curve. **[9]**
b) Short note: **[9]**
i) CDM projects
ii) Carbon credit calculation

OR

- Q8)** a) Write short notes on types of tariffs for electrical energy. **[9]**
b) Define waste heat recovery. Describe its benefits and potentials of savings in industry. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4724

[Total No. of Pages : 2

[6404]-234

B.E. (Mechanical Sandwich)

INDUSTRIAL ENGINEERING & ORGANIZATIONAL

MANAGEMENT (Self-Study-IV)

(2019 Pattern) (Semester - VII) (402065)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1) a)** What is dynamic plant layout? **[4]**
- b) Explain Relationship between layout and Material handling with suitable examples. **[8]**
- c) What are analytical tools of plant layout? Explain with neat sketch layout of manufacturing shop floor. **[8]**

OR

- Q2) a)** Explain Multi-facility location. **[4]**
- b) Explain Layout planning. List out Quantitative methods of Plant layout and relationship diagrams. **[8]**
- c) Explain Layout of **[8]**
- i) Repair shop
 - ii) Process plant

- Q3) a)** Explain the following. (any two) **[8]**
- i) Enterprise Resource Planning (ERP)
 - ii) Just-in-Time system (JIT)
 - iii) Supply Chain Management (SCM)
- b) Explain the concept of Inventory control based on its classification and objectives. **[8]**

OR

P.T.O.

- Q4) a)** Explain the Production Planning Control with the stepwise terminologies involved in it. **[8]**
- b)** Explain the following. (any two) **[8]**
- i) Causal and time series models
 - ii) Moving average and Exponential smoothing
 - iii) Trend and Seasonality

- Q5) a)** What is line balancing? Explain with different methods and applications. **[8]**
- b)** Explain the procedure for Process Planning Process selection with suitable example. **[8]**

OR

- Q6) a)** What is Group Technology? Explain with advantages, disadvantages and applications. **[8]**
- b)** Differentiate critical path method and Program Evaluation Review Technique based on its advantage, limitations and applications. **[8]**

- Q7) a)** Explain Value engineering with its concepts, Principles, Methodologies and standards. **[10]**
- b)** Define and explain Rapid Upper Limb Assessment (RULA) and Rapid Entire Body Assessment (REBA). **[8]**

OR

- Q8) a)** Explain methods of merit rating for Performance appraisal along with wage and wage incentive plans. **[10]**
- b)** Explain industrial legislation with its advantages, disadvantages and applications. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4725

[Total No. of Pages : 3

[6404]-235

B.E. (Mechanical Sandwich)

DESIGN OF TRANSMISSION ELEMENTS

(2019 Pattern) (Semester - VII) (402066)

Time 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Discuss in brief the selection of roller contact bearing from manufacturer's Catalogue. [6]

- b) A 30 HP (22.065 KW) electric motor is directly coupled to a shaft of 25mm diameter, which is supported by two cylindrical roller bearing. The shaft transmits power to another shaft through a flat pulley of 300mm diameter which is placed mid way between the two bearings. The coefficient of friction between the belt and pulley is 0.3 , while angle of lap is 180 degree. The belt is horizontal. The load factor is 1.5 and the expected life of the bearing is 50,000 hrs, Apply the concept of design and select the suitable bearing from manufacturer's catalog. Use following table [12]

Bearing No	NU2205	NU2305
Basic dynamic capacity (C) in KN	15.99	31.39

Explain how the bearing are designated and what NU2205 bearing means.

OR

Q2) a) A single row deep groove ball bearing is subjected to the following work cycle [12]

Sr No	Radial load (Fr) in KN	Thrust load (Fa) in KN	Radial factor (X)	Thrust factor (Y)	Race rotating	Service factor	Speed (rpm)	Fraction of cycle
1	1.5	0.25	1.0	0.0	Inner	1.2	400	1/10
2	1.0	0.75	0.56	2.0	Outer	1.8	500	1/5
3	5.0	1.1	0.56	2.0	Inner	1.5	600	3/5
4	1.0	----	1.0	0.0	Outer	2.0	800	Remaining

Apply the concept of design and select the suitable bearing: The rated life of the bearing is 15000 hrs. Use following data

P.T.O.

Bearing number	6011	6211	6311	6411
Dynamic capacity 'C' KN	28.1	43.6	71.5	99.5

- b) Derive the Stribeck's equation to find out the static capacity of the rolling contact bearing. [6]

Q3) a) Apply the knowledge and derive the expression for braking acting on the brake drum in the following situation. [12]

- i) Line of action of braking force passes through the fulcrum of the lever.
 - ii) Line of action of braking force is offset by distance 'c' from the fulcrum of the lever and is between the fulcrum and centre of brake drum.
 - iii) Line of action of braking force is offset by distance 'c' from the fulcrum of the lever and is on one side of the fulcrum as well as centre of brake drum.
 - iv) Also explain the concept of self locking in brakes.
- b) Explain with the help of neat sketch construction and working of centrifugal clutch. [5]

OR

Q4) a) Derive the expression for torque transmission capacity of plate clutch using uniform pressure theory and uniform wear theory. [5]

- b) A single plate clutch consisting of two pairs of contacting surfaces is used to connect an electric motor running at 1500 rpm with a machine. The machine is equivalent to a rotor of mass 200 kg and a radius of gyration 300mm. The inner and outer diameter of the contacting surfaces is 150mm and 250 mm respectively. The coefficient of friction is 0.2 and the intensity of pressure is limited to 0.3 N/mm². The clutch is engaged suddenly so as to connect the stationary machine with the electric motor. Assuming the clutch as brand new. [12]

- i) Calculate the power transmitting capacity of the clutch.
- ii) Calculate the time required by machine to attain its full speed.
- iii) Calculate the amount of heat generated during the engagement.

- Q5) a)** A multi speed gear box is to be designed for a small-size , general purpose machine tool for spindle speeds varying between 200 r.p.m. minimum and 1200 r.p.m. maximum speeds. If the recommended geometric progression ratio is as per R_4 series. The gear box is driven by the motor of 8KW power. Calculate [12]
- i) Range ratio
 - ii) Geometric progression ratio
 - iii) Number of stages
 - iv) Find out various spindles speeds
 - v) Draw Structure diagram
 - vi) Draw speed diagram
 - vii) Draw kinematic (Gearing) diagram for a given gear box
- b) What do you understand from the Structure diagram and speed diagram? [6]

OR

- Q6) a)** Draw speed ray diagram, layout for six speed gear box and calculate Input shaft speed for a multi speed gear box having any one of the following structural formula: [12]
- i) 2 (3) 3(1)
 - ii) 2 (1) 3(2)
- The output speeds are 160 r.p.m. minimum and 100 r.p.m. maximum speeds. The motor shaft speed is 1440 r.p.m.
- b) Justify why in multi speed gear box the value of GP is in the range 1 to 2. [6]

- Q7) a)** Explain with the help of neat sketch construction (layout), working, advantages and limitation of battery operated electric vehicle. [10]
- b) Discuss Basic elements and working of Series hybrid vehicle. [7]

OR

- Q8) a)** Discuss the following characteristics of hybrid electric vehicle components. [10]
- i) Traction force Vs Vehicle speed
 - ii) Battery power Vs Scale of Charge
- b) Discuss power management in hybrid electric vehicle. [7]



[6404]-236

B.E (Mechanical Sandwich)

MACHINE DYNAMICS AND VIBRATION

(2019 Pattern) (Semester-VIII) (402067)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** With neat diagram distinguish between the longitudinal, transverse and torsional vibration. [6]
- b) A vertically suspended spring-mass system has mass of 10kg and static deflection of spring 20mm. Determine the stiffness and natural frequency in Hz of the system. [6]
- c) For the system of springs and mass shown in the figure, determine time period of free vibration of the mass m . Take $m = 10\text{kg}$, $k_1 = 300\text{N/m}$, $k_2 = 200\text{ N/m}$, $k_3 = k_4 = 400\text{N/m}$. [5]

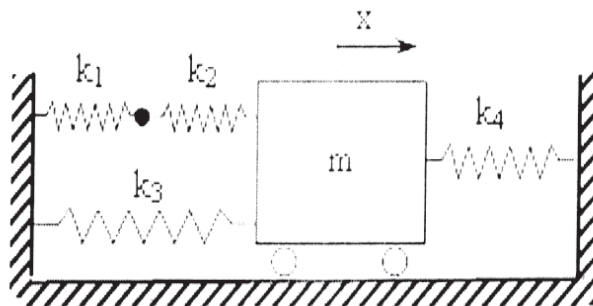


Figure: Q1 c)

OR

P.T.O.

- Q2) a)** Draw the neat labeled time-displacement graph of free vibration of 1-dof viscously damped system for different damping conditions- [6]
- i) zero damping,
 - ii) under damping
 - iii) critical damping and
 - iv) over damping
- b) Write a short note on the free vibration of a single DOF spring mass system with Coulomb damping with reference to the following points-[6]
- i) time-displacement graph
 - ii) loss of amplitude per cycle
 - iii) frequency of free vibration.
- c) Derive an expression for the natural frequency of a simple spring-mass system in terms of static deflection of spring. [5]

- Q3) a)** Explain with neat sketch the transient state and steady state of vibration related to forced vibration. [6]
- b) A single DOF mass-spring-damper oscillator is excited by a harmonic force $f(t) = 10\sin(20 t)$ N. The oscillator has a mass of 10kg, stiffness 1000N/m and damping coefficient 50 N-s/m. Determine [11]
- i) Steady state amplitude and
 - ii) Maximum acceleration of vibration of mass
 - iii) Quality factor of the system
 - iv) Maximum force transmitted to the support

OR

- Q4) a)** Define the following terms in relation to forced vibration- [6]
- i) Magnification factor and Quality factor
 - ii) Force transmissibility and Motion transmissibility
- b) A rotor of 10 kg mass is mounted midway on a horizontal shaft of diameter 3 cm which is simply supported with a span of 1.2m in bearings at both the ends. The center of gravity of the rotor is 0.2 mm offset from its axis of rotation. The modulus of elasticity of shaft material is 200 GPa. Determine - [11]
- i) Static deflection of rotor
 - ii) Critical speed of shaft in rpm
 - iii) Amplitude of steady state lateral vibrations of rotor and
 - iv) Dynamic load on each bearing at a speed of 3000rpm.

- Q5) a)** Explain the matrix method (eigen value problem) to determine natural frequencies and mode shapes of a multi-dof (2-dof) system. **[6]**
- b)** For the system of spring and masses shown in the figure- **[12]**
- Derive differential equations of motion in terms of displacement x_1 and x_2 of masses
 - Determine natural frequencies and corresponding mode shapes by solving the differential equations
 - Describe the mode shapes graphically

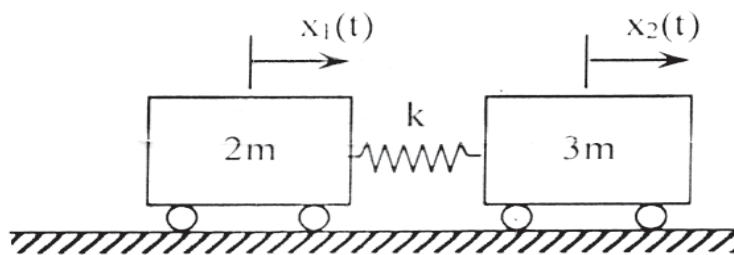


Figure: Q 5 b)

OR

- Q6) a)** Explain the significance of natural frequency and mode shape of a two degree of freedom system with suitable example. **[4]**
- b)** Two equal masses of magnitude ' m ' are attached to a light string of length $3L$ which is stretched with static tension ' T ' between two supports as shown in figure. Assuming that the static tension ' T ' is so high that the dynamic change in it is negligible due to small vertical displacements of masses. Derive differential equations of motion for small vertical displacements x_1 and x_2 of masses and determine natural frequencies and mode shapes. Describe the mode shapes graphically. **[14]**

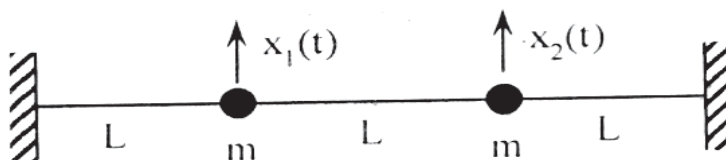


Figure: Q No 6 b)

- Q7)** a) Explain in brief various methods and techniques for vibration control. **[6]**
- b) Explain with neat sketches the working principle of seismic sensor for vibration measurement. **[6]**
- c) Write a short note on Vibration Isolators. Explain any 4 isolating material along with their industrial applications. **[6]**

OR

- Q8)** a) Explain with neat labeled sketches a typical arrangement of vibration measurement system. **[6]**
- b) What is Dynamic vibration absorber? Explain working principle of undamped dynamic vibration absorber. **[6]**
- c) Explain the method of vibration based condition monitoring of machines. **[6]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD-4727

[Total No. of Pages : 3

[6404]-237

B.E. (Mechanical Sandwich)

ARTIFICIAL INTELLIGENCE IN MECHANICAL
ENGINEERING

(2019 Pattern) (Semester - VIII) (402068)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 decision tree terminology. [6]
b) Explain Logistic Regression. [6]
c) Enlist and explain steps involved in development of regression model. [5]

OR

- Q2) a) What is Support Vector Machine? How does the SVM work. [6]
b) Explain following terms in decision tree : [6]
i) Entropy
ii) Information gain
iii) Gini index
c) What are the various applications of machine learning in mechanical engineering? [5]

- Q3) a) Write a short notes on : [8]
i) Regression,
ii) Ranking.
b) Calculate [10]
i) Accuracy ii) Precision
iii) Recall iv) F1 Score

		Actual Values	
Predicted values		1	0
	1	560	60
	0	50	330

P.T.O.

OR

Q4) a) Write a short notes on **[8]**

i) Classification algorithm in ML

ii) Clustering algorithm in ML

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

i) Accuracy

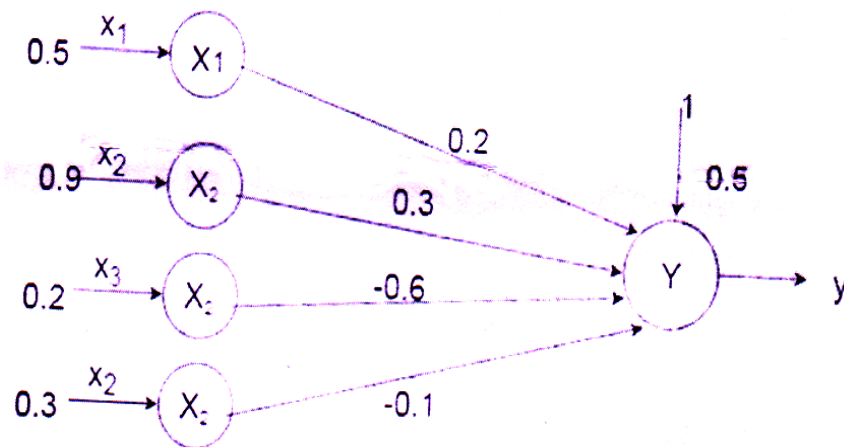
ii) Precision

iii) Recall

iv) F1 Score

Q5) a) What is the Bellman Equation? How is it helpful in RL? **[8]**

b) Compute the output of the following neuron if the activation function is hyperbolic. **[10]**



OR

Q6) a) Explain elements of reinforcement learning. **[8]**

b) Explain in Detail Markov Decision Process. **[10]**

- Q7)** a) Write short note on use of AIML in Material inspection [5]
b) Explain in details different applications of AIML. [6]
c) Make a list of maintenance and explain in brief. Discuss the scope of AIML. [6]

OR

- Q8)** a) What are different types of sensors used in human Machine Interactions [5]
b) What are the advantages of using Fault detection in Automobile cars?[6]
c) Explain fault diagnosis (of any suitable machine element) using ML. [6]



Total No. of Questions : 8]

SEAT No. :

PD4728

[6404]-238

[Total No. of Pages : 2

B.E. (Mechanical Sandwich)
AUTOMOBILE ENGINEERING
(2019 Pattern) (Semester - VIII) (402069A) (Elective-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of electronic calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain with neat sketch Pneumatic brake system. **[6]**
b) What are the requirements of good wheel? Demonstrate with neat sketch construction of disc. wheel. **[6]**
c) What are various components of specification of tyre? Explain them with suitable example. **[5]**

OR

- Q2)** a) Describe with neat sketch Principal and working of Hydraulic brake system. **[8]**
b) Explain various tyre trade patterns. List the advantages of each. **[5]**
c) What do you mean by tyre inflation? What are its effects? Explain. **[4]**

- Q3)** a) Explain with neat sketch charging system of automobile. **[8]**
b) Classify different types of batteries used in automobile. Explain what are tests carried out to check battery performance? **[10]**

OR

- Q4)** a) Describe with neat sketch working principle of the following. **[8]**
i) Temperature indicator
ii) Wiper mechanism
b) Write short note on the following. **[10]**
i) Starter switches.
ii) Negative earth system.

P.T.O.

- Q5) a)** Prepare a schedule for daily, weekly, periodical and breakdown maintenance of LMV. **[8]**
- b)** Describe with neat sketch construction and working of catalytic convertor. **[10]**

OR

- Q6) a)** Prepare table indicating nature of complaint, Causes and remedies for trouble shooting for the following. **[8]**
- i) Steering gear box
- ii) Brake system
- b)** Explain various Euro emission norms in detail. **[10]**

- Q7) a)** Describe with neat sketch lay out of Electric Vehicle. Explain various components of it. **[9]**
- b)** Explain role of artificial intelligence in engine management system. **[8]**

OR

- Q8) a)** Write short note on battery for electric vehicle. **[8]**
- b)** Write short note on the following. **[9]**
- i) Performance of EV
- ii) Complete vehicle control system

x x x

Total No. of Questions : 8]

SEAT No. :

PD4729

[6404]-239

[Total No. of Pages : 2

B.E. (Mechanical Sandwich)

REFRIGERATION AND AIR-CONDITIONING

(2019 Pattern) (Semester - VIII) (402069B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What do mean by compound or multi stage vapour compression system?
List its advantages. **[9]**

b) What are the limitations of VCC system in the field of low temperature refrigeration? **[8]**

OR

Q2) a) How does Claude cycle is differ from Linde cycle in the context of liquefaction of air? **[8]**

b) State the role of liquid intercooler, water intercooler and liquid subcooler in a multi stage vapour compression system. **[9]**

Q3) a) Draw neat sketch of sling psychrometer and explain its principal of working for measurement of temperatures. **[9]**

b) What do mean by alignment circle'? Mention its utility in Psychrometry?**[9]**

OR

Q4) a) Describe briefly the physical hazards occurs due to extreme cold and hot on human body. **[9]**

b) Explain with neat sketch the process of Chemical dehumidification. **[9]**

P.T.O.

- Q5)** a) Define air conditioning and show relationship between the refrigeration and Air Conditioning. [9]
- b) Which are the main factors affecting human comfort and how can these be categorized? [9]

OR

- Q6)** a) Explain charging process of refrigerant in refrigeration system with neat sketch. [9]
- b) Explain with neat sketch flooded type evaporator. [9]
- Q7)** a) With neat sketch explain working of AHU. [9]
- b) Draw and Explain use of Friction chart. [8]

OR

- Q8)** a) Explain static regain method of duct design. [9]
- b) Explain types of Fans used in ducting system. [8]



Total No. of Questions : 8]

SEAT No. :

PD4730

[6404]-240

[Total No. of Pages : 3

B.E. (Mechanical Sandwich)

FLUID POWER CONTROL

(2019 Pattern) (Semester - VIII) (402069C) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.No.1 or Q. No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Use of calculator is allowed.*
- 4) *Figure to the right indicates full marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Draw a simple sketch and ISO symbol of a pressure relief valve, and explain its working. State its importance in hydraulic systems. **[8]**

b) Draw ISO symbols for the following Hydraulic and Pneumatic Components. **[9]**

- i) 4×2 pneumatically Pilot operated spring offset DCV
- ii) Spring loaded accumulator
- iii) Quick Exhaust Valve

OR

Q2) a) Draw neat sketch and explain the following with their applications in circuit. **[8]**

- i) Three Way, Two Position Direction Control Valve.
- ii) Four Way, Three Position Direction Control Valve (Closed Centre).
- b)** Explain shuttle valve with a neat sketch. State its application with a typical circuit. **[9]**

P.T.O.

Q3) a) Explain with neat sketch, meter-out speed control methods in hydraulics System and also mention 3 differences between meter-in & meter-out circuit? [9]

b) Explain counterbalance valve circuit with neat sketch. [9]

OR

Q4) a) Differentiate between meter in circuit and meter out circuit. [9]

b) Draw a neat sketch of Pump unloading circuit. State function of unloading valve. [9]

Q5) a) Draw a typical symbol of FRL unit and explain the working principle of lubricator. [9]

b) Draw circuit for : [9]

i) Pneumatic motor actuation circuit

ii) Pneumatic circuit equivalent to AND gate

OR

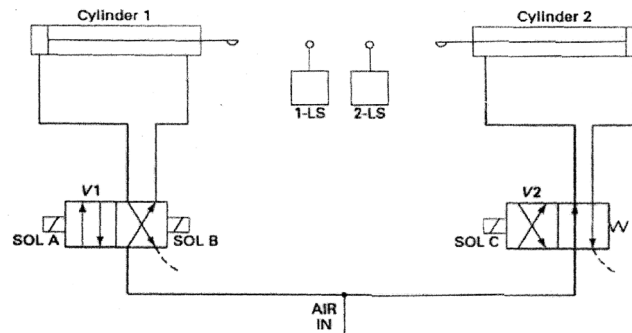
Q6) a) Explain with neat sketch working of “AND” valve and with the help of circuit diagram explain any one typical application of it. [9]

b) Explain with neat sketch typical compressed air generation and distribution system. [9]

Q7) a) Explain in short: [8]

- i) How does a limit switch differ from a push-button switch?
- ii) What is an electrical relay? How does it work?

b) Explain the complete operation of the system shown in fig. [9]

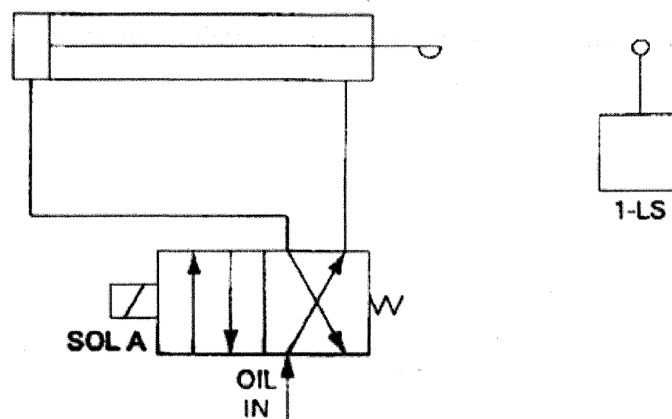


OR

Q8) a) What is a programmable logic controller? State the main function of each of the following elements of a PLC: [8]

- i) CPU
- ii) Programmer/monitor
- iii) I/O module

b) Explain the complete operation of the system shown in fig. [9]



Total No. of Questions : 8]

SEAT No. :

PD-5309

[Total No. of Pages : 2

[6404]-241

B.E. (Mechanical Sandwich)

ADDITIVE MANUFACTURING

(2019 Pattern) (Elective - I) (Semester - VIII) (402045C)

Time : 2½ Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) With a neat sketch explain Direct metal deposition. List its benefits and limitations. **[9]**

b) Explain the working principle of fused deposition modelling with a neat sketch. Discuss the possible defects in this method. **[9]**

OR

Q2) a) Explain the process of polyjet printing. Also write the applications, merits and demerits. **[9]**

b) Explain the construction and working principle of direct ink writing with a neat sketch. Also write merits, demerits and applications. **[9]**

Q3) a) Explain with an example how the material and the additive manufacturing method can be selected for various applications. **[9]**

b) Explain phase transformation in additive manufacturing. **[8]**

OR

Q4) a) Explain the various design considerations/rules involved in additive manufacturing with the help suitable sketch. **[9]**

P.T.O.

- b) Discuss the various techniques used to enhance the surface properties of additively manufactured parts. [8]

- Q5)** a) Explain the construction details of 3D printers. [9]
b) Define slicing and their types. Explain the various infill strategies used for area filling the sliced model. [9]

OR

- Q6)** a) Explain the steps followed while slicing a CAD model in slicing software. Explain the construction of extrusion based printers. [9]
b) Write note on : [9]
i) Cooling system of 3D printer
ii) Print bed of 3D printer
iii) 3 D printer frame

- Q7)** a) How additive manufacturing can influence the mass customization? Explain in detail mentioning its future trends. [9]
b) Discuss a case study on how the performance of automobile parts can be improved by adopting additive manufacturing. [8]

OR

- Q8)** a) Discuss the application of 3D printing in the art, fashion and jewellery industry. [9]
b) Discuss the reasons on how additive manufacturing influenced the growth in the production of stents used in biomedical applications. [8]



Total No. of Questions : 8]

SEAT No. :

PD4731

[6404]-242

[Total No. of Pages : 2

B.E. (Mechanical S/W)

AUTOMATION AND ROBOTICS

(2019 Pattern) (Semester - VIII) (402051C) (Elective-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) 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 Stepper Motors with neat sketch. [7]
- b) Write the short note on Motion Conversion apply for robots. [5]
- c) State the Salient Features and application BLDC. [6]

OR

- Q2)** a) Explain Motion Transmission Systems for Robot. [6]
- b) What are Cycloidal Gearbox and How Does it Works? [8]
- c) State the Salient Features of D.C. Servo Motors [4]

- Q3)** a) Explain Eddy Current Sensor with neat sketch. [7]
- b) Explain the Three-Jaw Gripper with neat sketch. [6]
- c) What are Resolver? [4]

OR

P.T.O.

- Q4)** a) Discuss various type of End-Effectors used in robotics. [5]
 b) Explain the Vacuum Cup Gripper with neat sketch. [6]
 c) Write a short note on incremental encoders and state it application. [6]

- Q5)** a) With the help of suitable illustration explain the significance of Jacobian Transformation. [7]
 b) The coordinate of point $P_{abc} = (5, 4, 3)^T$ in the body coordinate frame OABC is rotated 300 about O axis. Determine the coordinated of vector P_{xyz} with respect to base reference frame. [6]
 c) Write notes on Inverse Kinematics of two joints. [4]

OR

- Q6)** a) Derive an equation Newton-Euler Formulation of Equations of Motion. [6]
 b) Explain Composite Rotation matrix. [5]
 c) Write the short notes on Direct Kinematics. [6]

- Q7)** a) Explain Robot-based Manufacturing System with suitable illustration. [8]
 b) Write a short notes on: [10]
 i) Industry 4.0
 ii) Social Aspects of Robotics.

OR

- Q8)** a) Write the different between Simulation and Off-line Programming. [6]
 b) Write a short notes on : [12]
 i) Hybrid Terrestrial Mobile Robots
 ii) Robot Economics.
 iii) Unmanned Aerial Vehicle (UAV)



Total No. of Questions : 8]

SEAT No. :

PD4732

[Total No. of Pages : 2

[6404]-243

**B.E. (Mechanical Sandwich)
Product Design and Development
(2019 Pattern) (Semester - VIII) (Elective-II) (402045A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non-programmable electronic calculator is permitted.
- 5) Assume suitable data, if necessary.

Q1) a) Describe in detail reverse engineering. State an example. **[8]**

b) Explain the operational, durability and Aesthetic characteristics of a product. **[9]**

OR

Q2) a) Explain how you will carry out the analysis of gathered information. How it is useful for new product development. **[8]**

b) Write a short note on SWOT analysis for a selection of a profitable product. Explain with an example. **[9]**

Q3) a) Explain the principles and significance of Solid modeling in part and assembly design, highlighting its role in enhancing product development. Provide examples to support your analysis. **[9]**

b) What is ergonomics in design? Explain types of ergonomics with example. **[9]**

OR

Q4) a) Explain BOM with example. **[9]**

b) What is product architecture? Explain types of product architecture. **[9]**

Q5) a) List down different design simulation techniques and explain any one. **[8]**

b) Write a short note on additive manufacturing. **[9]**

OR

P.T.O.

- Q6)** a) Differentiate product testing and product validation. [8]
b) Discuss the role of letter of intent, Purchase order and product costing in vendor development. [9]

- Q7)** a) Discuss the role and significance of advanced product Quality planning (APQP) in new product development. What is its effectiveness in ensuring robust design and development on product quality and customer satisfaction. [9]
b) Discuss in detail manufacturing cost analysis. [9]

OR

- Q8)** a) What are guidelines for design for robustness? Discuss. [9]
b) Explain the elements of PLM in detail. [9]



Total No. of Questions : 8]

SEAT No. :

PD4733

[Total No. of Pages : 5

[6404]-244

B.E. (Mechanical Sandwich)

OPERATIONS RESEARCH

(2019 Pattern) (Semester - VIII) (402045D) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) 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]**

Maximize $Z = 1170X_1 + 1110X_2$

Subject to Constraints

$$9X_1 + 5X_2 \geq 500$$

$$7X_1 + 9X_2 \geq 300$$

$$5X_1 + 3X_2 \leq 1500$$

$$7X_1 + 9X_2 \leq 1900$$

$$2X_1 + 4X_2 \leq 1000$$

$$X_1, X_2 \geq 0$$

b) Explain in brief. **[7]**

- i) Objective function
- ii) Constraint surface
- iii) Feasible and infeasible points
- iv) Optimum solution

OR

Q2) a) Use Simplex method to solve the following LPP **[10]**

Maximize $Z = 80X_1 + 55X_2$

Subject to Constraints

$$4X_1 + 2X_2 \leq 40$$

$$2X_1 + 4X_2 \leq 32$$

$$X_1, X_2 \geq 0$$

b) Explain in brief. **[3]**

- i) Limitations of graphical method **[3]**
- ii) Conversion of Primal to Dual in LPP problem **[4]**

P.T.O.

Q3) a) Discuss in brief the methodology used in Hungarian method to solve the any assignment problems for getting optimum solution. **[8]**

b) Find out the initial feasible solution by North West corner method. **[10]**

From	To					Supply
	2	11	10	3	7	4
	1	4	7	2	1	8
	3	1	4	8	12	9
Demand	3	3	4	5	6	

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 wit “X”. **[12]**

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?

b) Differentiate between 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. **[12]**

i) and ending

ii) node numbers

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

a) Draw the network diagram of the activities in the projects.

b) Find expected duration and variance for each activity. What is the expected project length?

c) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed.

i) At least 4 weeks earlier than expected time.

ii) No more than 4 weeks later than expected time.

Given

Z (0-Z)	1.33
Probability	0.4082

b) Explain 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: **[12]**

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. 6,000 *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.

b) Differentiate between CPM and PERT. **[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: [12]

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 up	15	0.20

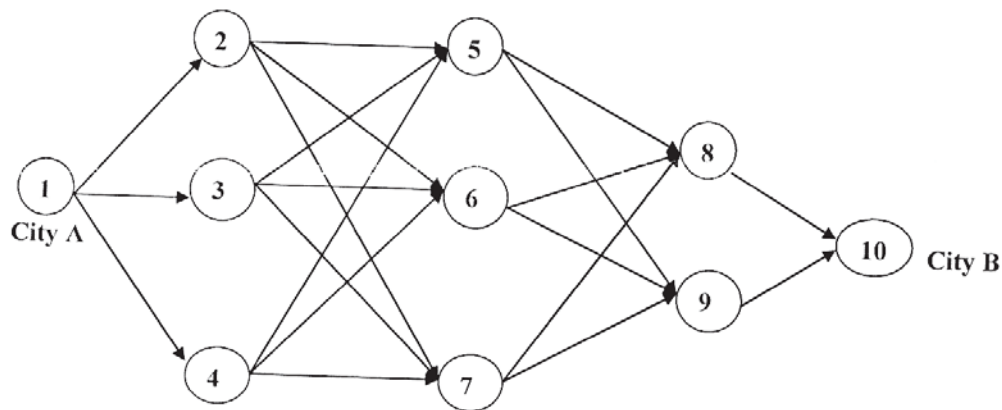
Simulate the dentist's clinic for four hours and determine the average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8:00 a.m. Use the following sequence of random numbers to simulate the above problem.

Random Numbers: 40 , 82, 11, 34, 25, 66, 17,79

- 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. :

PD4734

[Total No. of Pages : 3

[6404]-245

B.E. (Mechanical Sandwich)

QUALITY AND RELIABILITY ENGINEERING

(2019 Pattern) (Semester - VIII) (Elective-II) (402050A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a) Explain 'Bath Tube Curve' with neat sketch. [5]
b) Explain Mutually Exclusive events. Give two examples of mutually exclusive event. [5]
c) An urban Electric company buys its requirement of energy meters from four different manufactures. Manufacturer E_1 supplies 40% of energy meters. Each of the other manufacturer E_2 , E_3 & E_4 supplies 20% of the requirements. The meters from the E_1 pass the acceptance test 95% of the times whereas the meters supplied by others pass the acceptance test 90% of times. If in a given installation, an energy meter is found to be defective, What are the probabilities that the meter supplied by E_1 , E_2 , E_3 or E_4 . [8]

OR

- Q2) a) What is reliability? Distinguish between reliability and Quality of a product. [5]
b) Explain Baye's theorem. Give two engineering applications of Baye's Theorem. [5]
c) A scooter manufacturer buys 500 spark plugs from three suppliers every month, Supplier X supplies 200 spark plug, Y supplies 175 and Z supplies 125. Among the individual supplies, the probability that a spark plug being supplied by X is defective by 0.05, that supplied by Y is defective by 0.06 and by Z is 0.008. What is the probability that a plug is defective and supplied by supplier Y. Use Baye's Theorem. [8]
- Q3) a) Express the reliability of series system in terms of its component reliabilities. [5]
b) Explain Active, passive and Standby redundancies. [5]
c) Three units are connected in series with reliabilities $R_1 = 0.85$, $R_2 = 0.9$ & $R_3 = 0.8$. Calculate the system reliability. If the reliability is to be increased to a value of 0.65. How should this be apportioned among the three units according to minimum effort method. [7]

OR

P.T.O.

- Q4)** a) Express the reliability of a parallel system in terms of its component reliabilities. [5]
 b) Explain Minimum Effort Method of Reliability Allocation. [5]
 c) Determine the system reliability of the system shown in fig 1. [7]

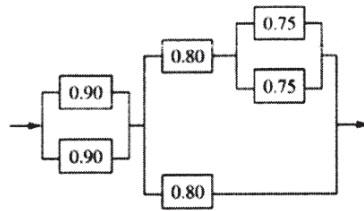


Fig.1

- Q5)** a) Explain the significance of Risk Priority Number in FMECA? [5]
 b) Draw and explain any five symbols used in fault tree construction. [5]
 c) In the block diagram shown in fig 2. Let I and O be the input and output terminals. There are two sub-systems P and Q that are connected in series, The system fails when either of these two sub-systems fails. Draw the fault Tree diagram. [8]

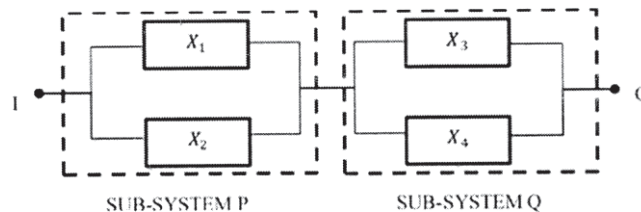


Fig 2

OR

- Q6)** a) Explain Ishikawa diagram for Failure representation with suitable example. [5]
 b) Explain four points of differences between Fault Tree Analysis(FTA) and Failure Mode and Effects Analysis (FMEA) approach. [5]
 c) The logic gate diagram for FMEA study has been shown in fig 3. The basic failure modes of A, B and C have failure rates 0.002, 0.003 and 0.004 per hour respectively. Find the failure rate of T_0 . Assume a mission time of 100 hrs. [8]

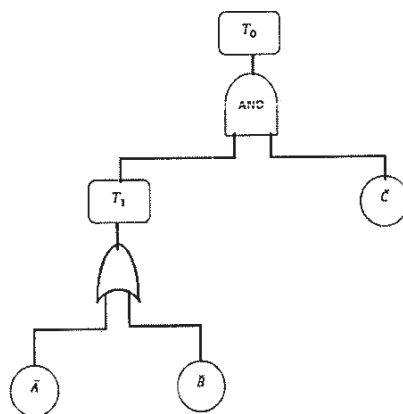


Fig 3.

- Q7)** a) Explain the term Availability and Maintainability with the help of suitable example. [5]
- b) Explain in brief the reliability test conducted at various stages of life cycle. [5]
- c) Distinguish between Highly Accelerated Life Test (HALT) and Accelerated Life Testing (ALT). [7]

OR

- Q8)** a) Explain the preventive maintenance and corrective maintenance. [5]
- b) Explain the term Margin of Safety & Factor of safety. [5]
- c) Write short note on. (Any Two) [7]
- i) MTTR and MTBF
 - ii) Human Reliability
 - iii) Reliability Growth Testing
 - iv) Reliability Centered Maintenance



Total No. of Questions : 8]

SEAT No. :

PD4735

[Total No. of Pages : 2

[6404]-246

B.E. (Mechanical Sandwich)

ELECTRICAL AND HYBRID VEHICLE

(2019 Pattern) (Semester - VIII) (Elective-II) (402051E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions from the following.*
- 2) *Draw Neat labeled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable electronic calculator is allowed.*
- 5) *Assume suitable/standard data, if necessary.*

Q1) a) Explain the application of motors and their design with examples. **[8]**

b) Describe energy storage system? Write its advantages. **[9]**

OR

Q2) a) Write detail note on: **[8]**

- i) Pumped Hydro Energy storage system
- ii) Battery Energy storage system

b) Describe and illustrate the motors (prime mover) classification, construction, working. **[9]**

Q3) a) Differentiate between mechanical differential and electric differential. **[8]**

b) Explain rolling, pitching and its effects. **[9]**

OR

Q4) a) Describe 3 wheeler and 4- wheeler EV steering. **[8]**

b) Explain power flow control in electric drive-train topologies. **[9]**

Q5) a) State and explain the different types of frames used in electric vehicle and the associated chassis/frame building problems. **[9]**

b) What is the Homologation of vehicles? **[9]**

OR

P.T.O.

- Q6)** a) Describe and illustrate the Front/Rear suspension systems design for varieties of Electric vehicle Configuration. [9]
b) What is Retrofitting? Describe and illustrate the retrofitting of Two-wheeler vehicles. [9]

- Q7)** a) What are the charging methods and the charging standards? [9]
b) Describe and illustrate charger architectures. [9]

OR

- Q8)** a) Write a note on: [9]
i) AIS charging standards,
ii) BIS charging standards,
iii) Charging Infrastructure for Electric Vehicles-EVCI guidelines.
b) Explain following: grid voltages, frequencies and wiring, real power, apparent power and power factor. [9]



Total No. of Questions : 8]

SEAT No. :

PD4736

[Total No. of Pages : 2

[6404]-247

B.E. (Printing Technology)

GRAVURE PRINTING TECHNIQUES

(2019 Pattern) (Semester - VII) (408283)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe different Types of Inks and Solvents used for Gravure. **[12]**

b) Explain Compatibility of Resin with Solvents. **[5]**

OR

Q2) a) Explain gravure process in detail with diagram. **[8]**

b) Purpose of slow drying and fast-drying solvents **[5]**

c) Define Ink Transfer in Sheet fed Gravure. **[4]**

Q3) a) What is Viscosity and how to affect print quality? **[5]**

b) Explain Flammability of solvents. **[12]**

OR

Q4) a) Define dryer and its Types. Need of Dryers used on a gravure press. **[12]**

b) Define OSHA (Occupational Safety and Health Association) Standards. **[5]**

Q5) a) What is Impression Cylinder and affect print quality due to pressure. **[13]**

b) Explain specifications for impression rollers. **[5]**

OR

P.T.O.

- Q6)** a) Explain ESA and Effect of ESA on Print Quality. [8]
b) Effect of ESA parameters on ink transfer [5]
c) Describe effect of ESA parameters on ink transfer. [5]

Q7) Write a note on:

- a) Web Viewing System [6]
b) Electronic Line Shaft [6]
c) Gravure Troubleshooting [6]

OR

Q8) Write a note on:

- a) 3" and 6" air expandable shafts [6]
b) Web aligner [6]
c) Mounting Techniques of Web Aligner System [6]



Total No. of Questions : 8]

SEAT No. :

PD4737

[Total No. of Pages : 2

[6404]-248

**B.E. (Printing Technology)
DIGITAL PRINTING TECHNIQUES
(2019 Pattern) (Semester - VII) (408284)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are the fundamental steps in Digital Image Processing? **[10]**
b) What are the functions of digital image processing? **[8]**

OR

- Q2)** a) Explain scientific proof method with process control parameters. **[10]**
b) Explain Electrophotography proofing. **[8]**

- Q3)** a) Explain various attributes of Digital Camera – Dynamic Range, White balance, Black Point, White Point. **[10]**
b) Explain 3 main attributes of Digital Camera – Shutter Speed, ISO and Aperture. **[7]**

OR

- Q4)** a) Explain Barcode and QR code scanning techniques. **[10]**
b) Explain the concept of Input resolution. **[7]**

- Q5)** Explain Lossy and lossless file formats. And compare the same. **[18]**

OR

- Q6)** Explain analog to digital conversion techniques and vice versa. **[18]**

P.T.O.

- Q7)** a) Explain job flow of Visiting cards using variable data printing. [10]
b) Explain any 2 inline finishing operations. [7]

OR

- Q8)** a) Explain the concept of Automation in Print industry and necessity of a software based ERP system. [10]
b) Explain Print on Demand with diagram. [7]



Total No. of Questions : 8]

SEAT No. :

PD-5276

[Total No. of Pages : 2

[6404]-249R

B.E. (Printing Technology)

Paper Board and Corrugation Package Technology

(Elective - III) (2019 Pattern) (Semester - VII) (408281 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

Q1) a) Explain in detail the process of manufacturing paper bags and multiwall sacks along with its applications. **[10]**

b) Explain “Stretch sleeve labels” with applications and diagram. **[7]**

OR

Q2) a) Explain in detail the process of manufacturing liquidfilled cartons along with its applications. **[10]**

b) Explain “Wrap around labels” with applications and diagram. **[7]**

Q3) Explain in detail the manufacturing of punching die with complete automated system along with neat diagrams. **[18]**

OR

Q4) a) Explain the use of corking in die making along with neat diagram. **[9]**

b) Draw a neat diagram of RSC 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 wall 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 facer corrugated board, label the diagram and explain the applications of the same. **[7]**

Q7) Explain the FCT in detail along with diagram and its application. **[18]**

OR

Q8) a) Write a short note on ECT **[9]**

b) Write a short note on RCT **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4739

[Total No. of Pages : 2

[6404]-250

**B.E. (Printing Technology)
Elective - III: POLYMER SCIENCE
(2019 Pattern) (Semester - VII) (408281B)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss heat fusion and explain heat fusion in amorphous polymers. [6]
b) Interpret the impact strength of a materials and explain the method to measure it. [6]
c) Discuss the surface energy of a polymer and calculate it by considering one polymer. [6]

OR

- Q2)** a) Illustrate thermal expansion coefficient and relate the reason for higher thermal expansion coefficient in polymers than metals. [6]
b) Describe blocking of polymers thin films and explain the method to control it. [6]
c) Demonstrate the method of evaluating the gloss of different polymers. [6]

- Q3)** a) Analyzed different types of additives are used during compounding to enhance polymer properties. [6]
b) Illustrate UV stabilizers protect polymers from degradation. [6]
c) Discuss the role of heat stabilizers play in preventing thermal degradation of polymers. [5]

OR

- Q4)** a) Describe the dispersive and distributive mixing of additives. [6]
b) Summarized the role of fillers in polymeric materials with two examples. [6]
c) Discuss factors influence the effectiveness of stabilizers in various applications. [5]

- Q5)** a) Illustrate the fluorination, Bromination, chlorination and sulfonation in the chemical modification for surface of polymers. [12]
b) Describe the Crosslinking of polymer films in mechanical modification. [6]

OR

P.T.O.

- Q6)** a) Describe the plasma treatment and its importance and advantages for polymer substrate. [6]
b) Interpret the thermal stability in mechanical modification of polymer films. [6]
c) Summarized the most common surface modification techniques for improving the adhesion properties of polymer films. [6]
- Q7)** a) Illustrate the effect of humidity on the properties of polymers. [6]
b) Justify solubility and explain the Henry law of solubility. [6]
c) Distinguish difference between 'sorption' and 'migration'. [5]

OR

- Q8)** a) Discuss the Fick's law of diffusion with first and second law of diffusion. [5]
b) Interpret 'permeation' in Polymeric Packaging and factors affect the permeant molecule. [6]
c) The oxygen permeability of amorphous PET at 25°C has been found to be 14 cc mil/d 100 in 2 atm. Calculate the value of P at 50°C? $E_p = 38 \text{ KJ/mol}$. [6]



Total No. of Questions : 8]

SEAT No. :

PD4740

[6404]-251

[Total No. of Pages : 2

B.E. (Printing)

MULTIMEDIA ADVERTISING

(2019 Pattern) (Semester - VII) (408282A) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*

Q1) What are the advantages of Print media over digital media? Explain any case where print media is preferred over digital media for the said advantages. **[18]**

OR

Q2) What is function of following bodies and what inputs advertising can extract from these organizations: **[18]**

- a) TRP
- b) NRS
- c) ABC

Q3) What is the difference between Product and Brand? Why in the market, brands are promoted instead of a product, explain in greater details. **[17]**

OR

Q4) How are the campaigns planned? State the process with proper case study. **[17]**

P.T.O.

Q5) a) Explain any 3 methods of advertising budgeting. **[9]**

b) With any suitable print advertisement, explain the construction and all elements of advertising and relation between them if any. **[9]**

OR

Q6) “Art Director is the key personnel in an advertising agency”, justify this statement with respect to construction of an advertisement. **[18]**

Q7) What is the difference between traditional and digital marketing? **[17]**

OR

Q8) What is content marketing, which different ways of content marketing are practiced today and what are their salient features, explain in greater detail. **[17]**



Total No. of Questions : 8]

SEAT No. :

PD4741

[6404]-252

[Total No. of Pages : 2

B.E. (Printing Technology)

**PROCESS OPTIMIZATION AND TOTAL QUALITY
MANAGEMENT IN PRINTING**

(2019 Pattern) (Semester - VII) (408282B) (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.*
- 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. :

PD-5280

[Total No. of Pages : 2

[6404]-253R
B.E. (Printing Engineering)
OPERATIONS MANAGEMENT IN PRINTING AND
PACKAGING
(2019 Pattern) (Semester - VIII) (408290)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) Find an optimal sequence for following sequencing problem. Also find total elapsed time. **[18]**

Job :	1	2	3	4
Machine M1	6	5	4	7
Machine M2	4	5	3	2
Machine M3	1	3	4	2
Machine M4	2	4	5	1
Machine M5	8	9	7	5

OR

Q2) Find the optimal sequence for following sequencing problem of 4 jobs on 5 machines, when passing is not allowed. Its processing time (in hours) is given below. **[18]**

Job :	Machine				
	M1	M2	M3	M4	M5
A	7	5	2	3	9
B	6	6	4	5	10
C	5	4	5	6	8
D	8	3	3	2	6

P.T.O.

Q3) What are functions of production planning and control, explain with suitable case study. **[17]**

OR

Q4) What are stages of production planning and control, explain in greater details.**[17]**

Q5) What is product life cycle, what is its impact on production planning and control. **[18]**

OR

Q6) State about Batch and mass production systems their features, advantages, limitations if any. **[18]**

Q7) State Continuous or flow production system its features, advantages, limitations if any. **[17]**

OR

Q8) Compare and contrast between product breakdown structure and work breakdown structure. **[17]**



Total No. of Questions : 8]

SEAT No. :

PD4743

[Total No. of Pages : 2

[6404]-254

B.E. (Printing Technology)

ADHESIVES AND COATINGS IN PACKAGING

(2019 Pattern) (Semester - VIII) (408291)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe the different types of adhesives used for flexible packaging and explain their functions. **[9]**

b) How do hotmelt adhesives compare to other types of adhesives in packaging applications? Discuss their advantages and limitations. **[8]**

OR

Q2) a) Explain the process and benefits of using hot seal adhesives in packaging applications. What are the challenges associated with their use? **[10]**

b) Discuss the role of pressure-sensitive adhesives in product labeling and packaging, highlighting their key characteristics. **[7]**

Q3) a) Discuss the role of polymers in coating formulations, with particular reference to their application in food packaging. **[9]**

b) Explain how coating pigment affects the color and lightfastness of packaging materials. What is its significance in product presentation? **[9]**

OR

Q4) a) What are the key factors to consider in selecting coatings for food-grade packaging? Discuss the properties required for safe and effective packaging. **[10]**

b) Describe the types of coatings used for paper and board packaging materials. What are the primary benefits of using PE and wax coatings? **[8]**

Q5) a) Describe the process of gravure coating and its application in the packaging industry. What are the benefits of using gravure for high-quality finishes? **[9]**

b) Explain the concept of porous roll coating and its role in producing coated flexible films. **[8]**

OR

P.T.O.

- Q6) a)** Discuss the evaluation of coated paper, including the tests used to assess its durability and resistance to various environmental factors. **[10]**
- b) What is the significance of the drying process in coating applications, and what types of dryers are used in the industry? **[7]**

- Q7) a)** What are the different types of coating tests conducted to ensure the quality of coatings in food packaging? Discuss their importance. **[9]**
- b) Explain the process testing and finish product testing in the coating industry. Why are these tests crucial for ensuring quality packaging materials? **[9]**

OR

- Q8) a)** What are the regulations surrounding coatings used in food packaging? How do they impact the development and production of coated packaging materials? **[9]**
- b) Explain how the scratch resistance and product resistance tests are conducted on coated materials and their relevance in packaging performance. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD4744

[Total No. of Pages : 2

[6404]-255

B.E. (Printing Technology)

FOOD & PHARMACEUTICAL PACKAGING

(2019 Pattern) (Semester - VIII) (408288A) (Elective-V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain coating technology with examples. **[9]**

b) Write Down Different Types of Extrusion technology with diagram. **[9]**

OR

Q2) a) Explain extrusion coating and lamination process. **[9]**

b) Explain Metallization process and its benefits. **[9]**

Q3) a) Explain how filling system works for food and pharmaceutical packaging. **[8]**

b) Explain Induction Sealing process with the composition of CAP. **[9]**

OR

Q4) a) Explain the workflow Horizontal Form Fill Seal Machine (HFFS) with applications. **[8]**

b) What is WADS or liners explain with diagram and its uses. **[9]**

Q5) a) Explain the structure of Pouch Making process with diagram. **[9]**

b) Explain types of Blister packaging with applications. **[9]**

OR

Q6) a) What type of packaging is called as Sachets explain the procedure of making sachets? **[9]**

b) What is Retort Packaging and its benefits. **[9]**

P.T.O.

- Q7)** a) What is the Need and Regulations for Pharmaceutical Materials? [8]
b) What are the Legislative and Safety Aspects for Food and Pharmaceuticals? [9]

OR

- Q8)** a) What are the Regularity Aspects of Pharmaceutical Packaging. [8]
b) Which Quality Specifications given by World Health Organization (WHO). [9]



Total No. of Questions : 8]

SEAT No. :

PD4745

[Total No. of Pages : 2

[6404]-257

**B.E.(Printing Engineering)
SUSTAINABLE PACKAGING**

(2019 Pattern) (Semester - VIII) (408289 A) (Elective-VI)

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) *Use of electronic pocket calculator is allowed.*

Q1) a) What is Effective Packaging and what are the Bio-Based and Biodegradable Food Packaging material. **[9]**

b) Explain the concept of Renewable Packaging materials. **[9]**

OR

Q2) a) Explain Design Considerations and Material Alternatives. **[9]**

b) Explain the impact of material selection on packaging. **[9]**

Q3) a) Explain the Industry 4.0 and Circular Economy. **[8]**

b) Explain key concepts and terminology of Circular Economy. **[9]**

OR

Q4) a) Explain 3R's of Circular Economy and Negative Impacts of Plastics disposals. **[9]**

b) Explain the concept of Waste Management and Plastics in Circular Economy. **[8]**

Q5) a) Explain the Functions of LCA and Types of Packaging for LCA. **[8]**

b) What are the Phases and Processes in LCA and explain Levels of LCA. **[9]**

OR

P.T.O.

- Q6)** a) Explain the Marine Pollution issues and Life Cycle Assessment for Packaging Materials and Food Packaging. [9]
b) Explain the effect of Green House Gas Emissions. [8]

- Q7)** a) Explain Ethical sourcing and Impacts of Efficiency of transportation and Impact of Package size on supply chain. [9]
b) Explain the Brand Positioning and Marketing Strategy. [9]

OR

- Q8)** a) Explain the Regulatory and Supply Chain management. [9]
b) Explain the Understanding of global regulatory landscapes for sustainable Packaging. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4746

[Total No. of Pages : 2

[6404]-259

B.E. (Production)

AUTOMATION AND CONTROL ENGINEERING

(2019 Pattern) (Semester - VII) (411081A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Neat diagrams must be drawn whenever necessary.*
- 2) *Use of electronic pocket calculator is allowed.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Explain with neat sketch construction and working of reciprocating type pneumatic pump. **[8]**

b) Explain with neat sketch FRL unit used in pneumatic circuit. **[10]**

OR

Q2) a) Draw the pneumatic circuit for AND-function. Label the components. **[8]**

b) Draw neat sketch of Pneumatic system and explain functions of each components. **[10]**

Q3) a) Write short notes on Flip-Flop and Register in microprocessor. **[8]**

b) Explain with neat sketch internal architecture of 8085 microprocessor. **[10]**

OR

Q4) a) Draw pin diagram of 8085 microprocessor and explain functions of any four pins. **[10]**

b) Explain in detail factors to be considered in selection of Microcontroller. **[8]**

Q5) a) Explain in detail the basic functions of relay and contactor. **[7]**

b) Explain with block diagram Programmable Logic Controller(PLC). **[10]**

OR

Q6) a) What are types of control systems? Explain with suitable example PID controller. **[10]**

b) Draw the ladder logic for basic gates like AND and OR with truth. **[7]**

P.T.O.

- Q7)** a) Discuss in detail benefits of Neural Networks. [8]
b) Write short notes on Remote Terminal Unit (RTU) &HMI. [9]
OR

- Q8)** a) List the functions of SCADA. Explain any two. [8]
b) Write short notes on Single-Layer and Multi Layer Feedforward Networks. [9]



Total No. of Questions : 8]

SEAT No. :

PD-5262

[Total No. of Pages : 3

[6404]-260R
B.E. (Production Engineering)
OPERATIONS RESEARCH
(2019 Pattern) (Semester - VII) (411082)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q.6 and 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 distinguishing characteristics of dynamic programming. [9]
b) Describe algorithm of dynamic programming. [8]

OR

- Q2)** a) Describe Computational procedure in dynamic programming. [7]
b) Explain the following with suitable example [10]
i) Branch & Bound method
ii) Cutting Plane method

- Q3)** a) Describe the replacement model in which maintenance cost and value of money changes with time [5]
b) A fleet owner finds from his past records that the cost per year of running a vehicle whose purchase price is Rs. 50000/- are as under : [12]

Year:	1	2	3	4	5	6	7
Running cost in Rs. :	5000	6000	7000	9000	21500	16000	18000
Resale value in Rs.	30000	15000	7500	3750	2000	2000	2000

Thereafter running cost increases by Rs.2000/- per year but resale value remains constant at Rs. 2000/- At what stage the replacement is to be done?

P.T.O.

OR

- Q4) a)** Machine A costs Rs. 45,000/- and the operating costs are estimated at Rs. 1000/- for the first year, increasing by Rs. 10,000/ per year in the second and subsequent years. Machine B costs Rs, 50000/- and operating costs are Rs. 2000/- for the first year, increasing by Rs 4000/- in the second and subsequent years, If we now have a machine of type A, should we replace it by B? If so when? Assume both machines have no resale value and future costs are not discounted. [12]
- b) Describe the group replacement model with suitable illustration. [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) Maxi Max criteria or criteria of optimism
- ii) MaxiMin criteria or criteria of Pessimistic(Wald Criteria]
- iii) MiniMax Regret criteria

	Status of Nature (Product Demand)			
Strategy	High	Moderate	Low	Nil
Expand	5	25	-25	-45
Construct	7	3	-4	-8
subcontract	3	15	-1	-1

- b) Describe the following with suitable Illustration [6]
- i) Savage Criteria
 - ii) 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 [alfa = 0.8]
- ii) Laplace criteria or Criteria of Rationality

	Status of Nature (Product Demand)			
Strategy	High	Moderate	Low	Nil
Expand	5	25	-25	-45
Construct	7	3	-4	-8
Subcontract	3	15	-1	-1

- 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	2	1	2	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

- Q7) a)** Describe various arrangements of service facilities (structure of the service system) **[6]**

- b) In a bank 11 customers arrives on an average after every 5 minutes for withdrawing the cash. On an average the cashier at the payment counter takes 3 minutes to serve 12 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)** Write note on Monte Carlo Simulation. **[8]**

- b) Discuss Assumptions and limitations of queuing theory. **[10]**



Total No. of Questions : 8]

SEAT No. :

PD4748

[Total No. of Pages : 2

[6404]-261

B.E. (Production Engineering)

SIMULATION, MODELING & DIGITAL TWIN

(2019 Pattern) (Semester - VII) (Elective - III) (411083A)

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) *Assume suitable data, if necessary.*
- 4) *Use of Non-programmable scientific calculators is allowed.*
- 5) *Figures to the right side indicate full marks.*

Q1) a) Write down the importance of simulation models? How they are designed? **[8]**

b) Write short note on Elimination of initial bias. **[9]**

OR

Q2) a) Write short note on Replication of runs in a simulation system. **[8]**

b) Write a short note on calibration and validation of the models. Give appropriate example. **[9]**

Q3) a) Explain the importance and application of digital twin in process industry. **[9]**

b) How the digital twin can be implemented in service sector? Elaborate with suitable example. **[9]**

OR

Q4) a) Explain the role of DTT in the industry innovation. **[9]**

b) Discuss Digital Twin. Briefly explain history of Digital Twin and also importance of it in today's era. **[9]**

Q5) a) What are the threads in process industry? Explain it's impact in implementing digital twin. **[8]**

b) What is process safety? Explain it's resemblance with digital twin. **[9]**

OR

P.T.O.

Q6) a) What do you mean by a process industry? Explain the working and trends in the process industry. **[8]**

b) Write short note on automation simulation of a plant. **[9]**

Q7) a) Explain the role of digital twin in identification of bottlenecks and improvement in efficiency. **[9]**

b) Product quality can be improved by implementing digital twin. Discuss. **[9]**

OR

Q8) a) How we can achieve the flexibility in production by application of digital twin? **[9]**

b) Describe how the use of digital twins enhance process safety. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4749

[Total No. of Pages : 1

[6404]-262

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 side indicate full marks.
- 4) Use of calculators is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Discuss code of conduct for Benchmarking. **[9]**

b) Explain Ishikawa Fishbone diagram with suitable sketch. **[9]**

OR

Q2) a) Discuss Stages of FMEA in detail. **[9]**

b) Explain Ishikawa's Seven Quality Tools in detail. **[9]**

Q3) a) Describe concept of MTBF and MTTF in reliability. **[9]**

b) Discuss concept of reliability and components in reliability. **[8]**

OR

Q4) a) Describe the concept of maintainability and availability in detail. **[9]**

b) What are the types of failures? **[8]**

Q5) a) How to organize for quality implementation? **[9]**

b) Discuss various teams used for TQM. **[9]**

OR

Q6) a) What are the requirements for quality coordination of quality activities? **[9]**

b) How to evaluate an organization for quality? **[9]**

Q7) a) Discuss the benefits of EMS. **[9]**

b) What are the major elements of ISO 9001:2000? **[8]**

OR

Q8) a) What are the requirements of ISO14001? **[8]**

b) Discuss ISO documentation. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD4750

[Total No. of Pages : 2

[6404]-263

B.E. (Production Engineering)

ARTIFICIAL INTELLIGENCE IN MANUFACTURING

(2019 Pattern) (Semester - VII) (Elective - III) (411083C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) The performance of GA depends on the balance between selection pressure and population diversity – justify the statement. [6]
b) State the advantages and disadvantages of GA. [6]
c) Differentiate traditional algorithm and GA. [5]

OR

- Q2)** a) Explain the elitist strategy used in GA. [6]
b) Why do we use high value of crossover probability and low value of mutation probability in GA-applications? [6]
c) Describe the flowchart of GA. [5]

- Q3)** a) How Backpropagation Algorithm Works? [6]
b) Which are the applications of Adaptive Resonance theory? [6]
c) How to improve Associative Memory? [5]

OR

- Q4)** a) What are the major limitations of back propagation algorithm? [6]
b) Which are the characteristics of Boltzmann machine in neural network? [6]
c) What is associative memory and which are its types? [5]

- Q5)** a) Describe Online process monitoring in additive manufacturing. [6]
b) Discuss AI and the future of Manufacturing. [6]
c) What is Industrial Machine Vision. Which are its benefits? [6]

OR

- Q6)** a) Explain ultrasonic process monitoring in additive manufacturing. [6]
b) How predictive maintenance is performed using Machine Vision? [6]
c) Describe Product and Component Assembly using machine vision. [6]

P.T.O.

- Q7)** a) What are the common AI use cases in manufacturing? [6]
b) What is autonomous aircraft? Which are its benefits? [6]
c) Why a warehouse needs Artificial Intelligence? [6]

OR

- Q8)** a) What are the benefits of AI in manufacturing? [6]
b) Which methods of Artificial Intelligence is used for changing Warehouse Operations? [6]
c) Discuss the application of AI in process planning. [6]



Total No. of Questions : 8]

SEAT No. :

PD4751

[Total No. of Pages : 1

[6404]-264

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]

- 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. :

PD4752

[6404]-265

[Total No. of Pages : 2

B.E. (Production Engineering)

**PLANT MAINTENANCE AND INDUSTRIAL SAFETY
(2019 Pattern) (Semester - VII) (411084(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) 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) What are the benefits of condition monitoring? [5]
- b) Discuss the temperature monitoring methods. [6]
- c) Describe the on-load and off-load testing. [6]

OR

- Q2)** a) How system approach to condition monitoring can be useful? [7]
- b) Explain vibration monitoring and corrosion monitoring methods. [10]

- Q3)** a) Safety at work increase Productivity of Industry: Justify. [8]
- b) Describe roll of management in Industrial safety. [10]

OR

- Q4)** a) Explain safety committees and its structure. [8]
- b) Explain the History and development of Industrial safety. [10]

P.T.O.

- Q5) a)** Explain following terms: [7]
- i) Housekeeping
 - ii) First AID
- b) Explain various factors affecting the selection of plant location. [10]

OR

- Q6) a)** List the personal protective equipments for following human body parts: [7]
- i) Head,
 - ii) Ear,
 - iii) Face,
 - iv) Eye,
 - v) Overall body,
 - vi) Foot and leg,
 - vii) Fingers and hands
- b) Explain the different types of industrial accidents and general steps to be taken for preventing the accidents in any industry. [10]

- Q7) a)** Define the following as per stipulated of the Workmen's compensation Act, 1923. [8]
- i) Dependent
 - ii) Partial disablement
 - iii) Total disablement
- b) Describe the Engineering methods of controlling chemical hazards. [10]

OR

- Q8) a)** Explain the codes and regulations for workers safety and health. [8]
- b) Explain the Indian Boilers Act-1923. [10]



Total No. of Questions : 8]

SEAT No. :

PD4753

[6404]-266

[Total No. of Pages : 2

B.E. (Production Engineering)

SURFACE ENGINEERING

(2019 Pattern) (Semester - VII) (411084(B)) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.
- 2) Figures to the right indicate full marks.

Q1) a) Explain any one organic coating process. **[10]**

b) Describe the galvanizing process. **[8]**

OR

Q2) a) Discuss cyaniding process with its applications. **[10]**

b) Explain the anodizing process. **[8]**

Q3) a) Describe the scope of surface engineering in augmentation of surface properties. **[10]**

b) Which are surface engineering problems related to substrate characteristics. **[8]**

OR

Q4) a) Differentiate between ion implantation and diffusion process. **[10]**

b) Describe Diamond-Like Carbon (DLC) Coatings with its Classification, Properties and Applications. **[8]**

P.T.O.

- Q5)** a) Describe Laser-Based Approach of surface roughness measurement. [10]
- b) Describe measurement of Thickness of Coatings and Films by ultrasonic testing. [7]

OR

- Q6)** a) Explain peel test of adhesion measurement. [10]
- b) Describe hardness testing method. [7]

- Q7)** a) Describe the use of Laser in Surface Engineering. [10]
- b) Write note on simulation of actual application environment in tribometer. [7]

OR

- Q8)** a) What type of coating is most resistant to high heat? Discuss. [10]
- b) Which are the different methods of measurement of nano materials? Explain dynamic light scattering. [7]



Total No. of Questions : 8]

SEAT No. :

PD-4754

[Total No. of Pages : 2

[6404]-267

B.E. (Production Engineering)
REVERSE ENGINEERING (Theory)
(2019 Pattern) (Semester - VII) (411084 C) (Elective - IV)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Discuss the contact method used to acquire data during reverse engineering, including its benefits and drawbacks. [8]

b) Discuss in brief the four stages of the RE data processing chain and the RE operations at each stage. [9]

OR

Q2) a) Write short note on destructive method in reverse engineering. [8]

b) Write short notes on

i) Point and images phase

ii) Curve phase [9]

Q3) a) Discuss the selection procedure for a reverse engineering system briefly using an example. [9]

b) Describe stereoscopic imaging systems and structured-light systems. [9]

OR

Q4) a) Write short note on: [9]

i) Internal Measurement Systems

ii) X-ray Tomography

b) Describe the idea of post processing of collected data in RE with an appropriate example. [9]

P.T.O.

- Q5)** a) Write a brief remark on data processing in reverse engineering. [8]
b) How the initial point is determined to start the construction of first segment? [9]

OR

- Q6)** a) Briefly explain how the adaptive layer thickness is determined? [8]
b) Explain the idea of first line segment building using an appropriate example. [9]
- Q7)** a) With typical block diagram, explain the workflow for automotive body design. [9]
b) Write short notes on applications of
i) Aerospace industries
ii) Medical device industries [9]

OR

- Q8)** a) Explain briefly, using suitable examples, how reverse engineering is used in the automobile industry. [9]
b) What are the obstacles to implementing reverse engineering? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4755

[Total No. of Pages : 2

[6404]-268

B.E. (Production Engineering)

ENTREPRENEURSHIP AND INNOVATIONS

(2019 Pattern) (Semester - VII) (411084 D) (Elective - IV)

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) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 4) *Use of electronic pocket Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) What is Family Business? Explain types of Family Business with advantages and disadvantages. **[9]**

b) Which characteristics of small enterprises enable them to contribute to the economic development process in a developing country like India? Discuss. **[9]**

OR

Q2) a) Write in brief about Importance and need for entrepreneurship development. **[9]**

b) What are the strategies for entrepreneurship development? **[9]**

Q3) a) What is involved in project accounting? **[8]**

b) What are the three processes performed in project accounting? **[9]**

OR

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

P.T.O.

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) Interest coverage ratio
 - ii) Debtors Turnover Ratio
 - iii) Gross profit ratio
- b) What are the different sources from which a project idea can be generated? [8]
- Q5) a) What are the five stages of project control? [8]**
b) What are the 7 C's of project management? [9]
- OR
- Q6) a) Why are planning performance and control important in the execution of projects? [8]**
b) What is the relationship between project planning and project control? [9]
- Q7) a) What are the legal issues related to product development and entrepreneurship? [9]**
b) What are the characteristics elements of partnership? [9]
- OR
- Q8) a) What are the stages of partnership? [9]**
b) What are the keys to successful partnerships? [9]



[6404]-269

B.E. (Production Engg.)

**COMPUTER INTEGRATED DESIGN AND
MANUFACTURING**

(2019 Pattern) (Semester-VIII) (411088-A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What is MRP-I? Explain different input and out put reports of MRP-I. [9]
b) Explain with neat sketch Laminated object RP method with its highlights. [8]

OR

- Q2)** a) Write short note on : [9]
i) CIM data files,
ii) Benefits of MRP
b) Explain with neat sketch selective laser sintering RP method. [8]
- Q3)** a) Explain PTP and continuous path NC machine with neat sketch . [6]
b) Write a CNC program in G and M code for a part as shown in fig No. 1. Also write a remark for each block. [12]

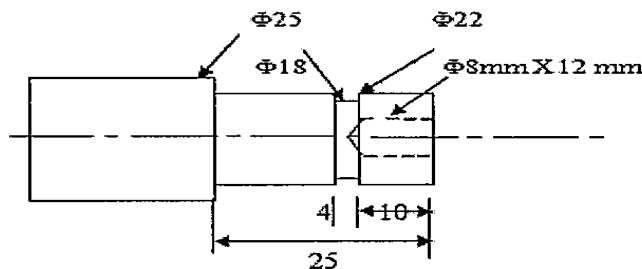


Fig. No. 1 (All dimension are in MM)

P.T.O.

OR

Q4) a) Write the meaning of following G and M code- [6]

G0

1, G02, G91, M00, M03, M30

b) Write a CNC program in G and M code for a part as shown in fig No.2. Also write a remark for each block. [12]

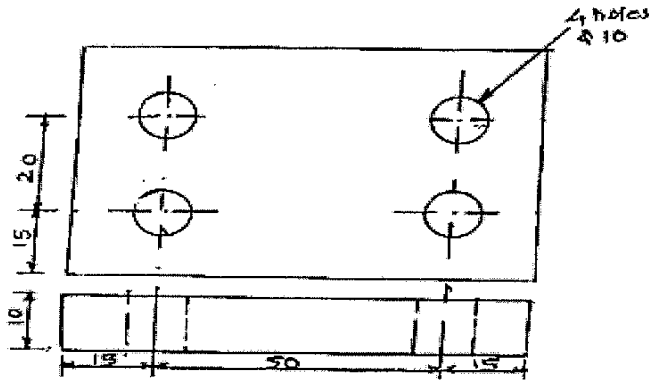


Fig. No. 2(All dimension are in MM)

Q5) a) Fig 3 shows three springs, having stiffness 15, 25 and 40 N/mm, connected in parallel. One end of the assembly is fixed, and a force of 600 N is applied at the other end. Determine the deflections of individual spring. [12]

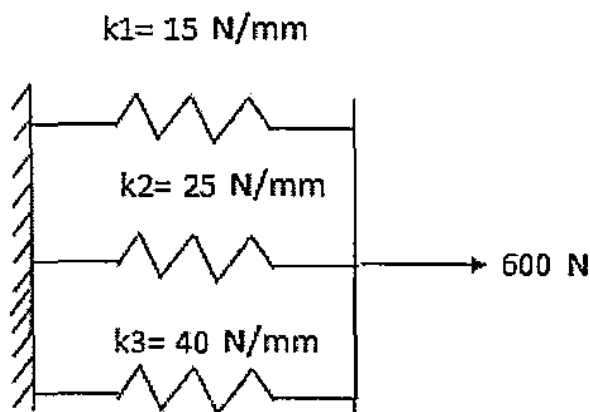


Fig. No. 3

b) With neat sketch write Matrix analysis for force, load and displacement of 1 -dimensional single rod element. [6]

OR

- Q6) a)** Consider the bar as shown in fig.4. An axial load $F=20\text{KN}$ is applied as shown, determine nodal displacement and reaction at fixed ends [12]

$$A_1 = 2400 \text{ mm}^2, E_1 = 70 \times 10^3 \text{ N/mm}^2,$$

$$A_2 = 600 \text{ mm}^2, E_2 = 200 \times 10^3 \text{ N/mm}^2$$

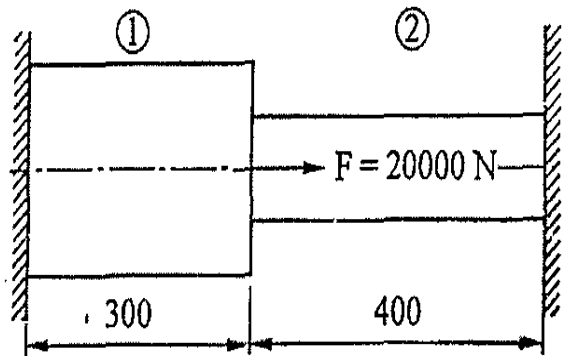


Fig. No. 4

- b) Write properties of global stiffness matrix. [6]

- Q7) a)** Explain with suitable example how production flow analysis helps in cell formation in grouping of parts. [8]

- b) Consider a CNC machining center processing raw parts one at a time in M/M/1 fashion. Let parts arrive at a rate of 15 parts/hour and service rate of 25 parts/hour. Find machine utilization, mean number of parts in system and in queue, mean waiting time in system and in queue. [9]

OR

- Q8) a)** Determine the most logical sequence of machine for data, according To/From ratio-Construct the flow diagram for the data, develop the flexible layout plan for the machine, Show where the parts enter the cell and exit the cell on low diagram and how many parts in each place. [9]

From	TO				
	1	2	3	4	5
1	0	20	75	0	0
2	0	0	0	90	0
3	0	0	0	0	0
4	60	0	30	0	0
5	0	70	0	30	0

- b) Explain monocode and ploy code system for coding the parts in GT.[8]

Total No. of Questions : 8]

SEAT No. :

PD4757

[Total No. of Pages : 2

[6404]-270

B.E. (Production Engineering)

INDUSTRIAL ROBOTICS

(2019 Pattern) (Semester-VIII) (411089)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

- Q1) a) Explain the link inertia tensor for rectangular body. [9]
b) Explain the concept of kinetic and potential energy in case of manipulator dynamics. [9]

OR

- Q2) a) Explain the link inertia tensor for circular body. [9]
b) Explain the generalized forces considered in manipulator dynamics. [9]

- Q3) a) What is function of encoder? Explain the principle of operation of Absolute encoder. [8]
b) How digital image is represented for robotic vision? The 8×8 array of pixels indicating each element as the gray level of pixel is given below. [9]
i) Construct the histogram and find threshold value
ii) Convert it into black and white image
iii) Perform shape analysis (first and second order moments, centroids, run length encoding, principal angle)
The 8×8 array of pixels indicating each element as the gray level of pixel is given below.
i) Construct the histogram and find threshold value.
ii) Convert it into black and white image
iii) perform shape analysis (first and second order moments, centroids, run length encoding, principal angle)

7	12	12	13	15	11	13	13
10	13	10	15	15	15	14	15
9	13	14	16	16	17	15	17
8	13	10	16	15	16	14	11
10	12	15	15	15	15	15	14
7	12	14	16	16	16	11	11
8	7	6	11	12	10	8	8
6	9	8	9	10	11	11	14

OR

P.T.O.

Q4) a) What is function of encoder? Explain the principle of operation of incremental encoder. [8]

b) How digital image is represented for machine vision? [9]

The 8×8 array of pixels indicating each element as the gray level of pixel is given below.

i) Construct the histogram and find threshold value.

ii) Convert it into black and white image.

iii) Perform shape analysis (first and second order moments, centroids, run length encoding, principal angle)

The 8×8 array of pixels indicating each element as the gray level of pixel is given below.

i) Construct the histogram and find threshold value.

ii) Convert it into black and white image

iii) Perform shape analysis (first and second order moments, centroids, run length encoding, principal angle)

12	7	12	13	15	11	13	13
10	13	10	15	15	15	14	15
9	10	14	16	16	17	15	17
8	13	10	10	15	16	14	11
10	12	15	15	15	15	15	14
7	12	14	16	14	16	14	10
8	7	6	11	12	10	8	8
6	9	8	9	10	11	11	14

Q5) a) Describe online programming with suitable example. [8]

b) Explain robot programming steps for pick and place operation. [9]

OR

Q6) a) Describe offline programming with suitable example. [8]

b) Write a program for palletizing operation for robot using BRANCHING. Use WAIT, SIGNAL and DELAY commands. [9]

Q7) Write short note on [18]

a) Robot programming

b) Role of AI in robotics

c) Welding robots

d) ANN

OR

Q8) Write short note on [18]

a) Robotic machining center

b) FMS

c) Walking robots

d) AI & Robotics

Total No. of Questions : 8]

SEAT No. :

PD4758

[6404]-271

[Total No. of Pages : 2

**B.E. (Production Engineering)
E-MOBILITY IN AUTOMOBILE**

(2019 Pattern) (Semester - VIII) (Elective - V) (411090 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figure to the right indicates full marks.*
- 3) *Neat Diagram must be drawn wherever necessary.*
- 4) *Assume Suitable data if necessary.*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

Q1) a) Enlist requirements of EV System installation. **[9]**

b) Explain construction and working of electric drive train system. **[8]**

OR

Q2) a) Discuss applications of EV Drives. Explain any four applications in detail. **[9]**

b) Write short notes on the following. (any two) **[8]**

i) Applications of EV Drives.

ii) BLDC Motor and PMSM motor

iii) Industrial Motors

Q3) a) Enlist various criteria's for EVs charging station. **[9]**

b) Brief on Solar Power Electric Vehicle. **[8]**

OR

Q4) a) Classify energy sources used in EVs and HEVs. **[9]**

b) Write a note on Wireless power transfer system. **[8]**

P.T.O.

- Q5)** a) Explain configuration of any one EV System. [9]
b) Brief on converted and built EVs. [9]

OR

- Q6)** a) Discuss various methods for EV Communication. [9]
b) Differentiate between V2V and V2G. [9]

- Q7)** a) Describe various Government Norms for EVs. [9]
b) Elaborate concept of power electronics. [9]

OR

- Q8)** a) Explain briefly fuel cell vehicles. [9]
b) Why study of E-Mobility in automobile is essential? Elaborate it. [9]

x x x

Total No. of Questions : 8]

SEAT No. :

PD-4759

[Total No. of Pages : 2

[6404]-272

B.E. (Production Engineering)

SMART MANUFACTURING

(2019 Pattern) (Semester - VIII) (411090(B)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figure to the right indicates full marks.

- Q1)** a) Explain the role of sensors in smart manufacturing. [6]
b) What is basic operation of manufacturing equipment in smart manufacturing? [6]
c) Which are the challenges that can be addressed by effective data analysis? [5]

OR

- Q2)** a) What is software connectivity in smart manufacturing? [6]
b) What is data contextualization in smart manufacturing? [6]
c) Explain Condition-based and predictive asset management in smart manufacturing. [5]

- Q3)** a) Explain data-based models. [6]
b) Which are the four enabling technologies for industry 4.0? [6]
c) Which are the challenges of Industrial AI and predictive analytics for smart manufacturing systems? [5]

OR

- Q4)** a) What are the data requirements of From data and model to value? [6]
b) Explain model reduction in process modeling. [6]
c) Explain Analytics technologies of industry 4.0 [5]

P.T.O.

- Q5)** a) Explain the Optimization methods for complex optimization systems. **[6]**
b) Explain PAROC in smart manufacturing. **[6]**
c) Explain High-fidelity dynamic modeling and model approximation. **[6]**

OR

- Q6)** a) Which are the multidisciplinary system design optimization approaches? **[6]**
b) What is Asset autonomy in smart manufacturing? **[6]**
c) Write note on Smart manufacturing concepts. **[6]**

- Q7)** a) Describe variations to PCA/PLS. **[6]**
b) Which are the characteristics of process data? Explain in brief. **[6]**
c) Explain Inferential control and state estimation-based approaches. **[6]**

OR

- Q8)** a) Describe use of Artificial neural networks for soft sensor building. **[6]**
b) Explain Smart Manufacturing as data-enabled sustainable manufacturing. **[6]**
c) Describe Support vector machines as data driven sensor. **[5]**



Total No. of Questions : 8]

SEAT No. :

PD-4760

[Total No. of Pages :2

[6404]-273

B.E. (Production Engineering)

MANUFACTURING SYSTEM DESIGN (Elective - V)

(411090 C) (2019 Pattern) (Semester - VIII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Write short note on fixturing. [8]
b) Write factor which considered in Station Level Design. [8]
c) Brief shortly about Hybrid Manufacturing System. [3]

OR

- Q2)** a) Write short note on: Manufacturing system design Configuration. [8]
b) What are different steps followed in Task Allocation and Sequencing?[8]
c) What is a Need of Manufacturing System? [3]

- Q3)** a) Explain Different type of codes in Design and Manufacturing Attributes.[8]
b) What is Part Family? What are Benefits of part Families. [8]
c) Write advantages and limitation of Group Technology. [3]

OR

- Q4)** a) Write Production Flow Analysis (PFA) in details. [8]
b) Write short note on Group technology. [8]
c) Mentioned Methods for Part Family Formation. [3]

- Q5)** a) What is Opportunity cost? Explain [8]
b) Write short note on: [8]
i) Value stream Mapping
ii) JIT

OR

P.T.O.

- Q6)** a) Write Short note on Zero Inventory. [8]
b) What are principles of Lean Production. [8]

- Q7)** a) What are different steps in Process planing? [8]
b) Write short note on MRP (Material Requirement Schedule) [8]

OR

- Q8)** a) What are material selection parameter in process planning. [8]
b) What do you mean by CAPP. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4761

[Total No. of Pages : 2

[6404]-274

B.E. (Production Engineering)

Ergonomics and Work Management

(2019 Pattern) (Semester - VIII) (411090 D) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is anthropometry? Give the principles for design of product using anthropometry. [9]

b) What is design of work surface? Explain with example. [8]

OR

Q2) a) List and discuss the displays for static and dynamic information. [9]

b) Discuss the effect of following on human performance in work: [8]

i) Noise/vibration

ii) Heat.

Q3) a) Define productivity. Enumerate the factors which affecting productivity. [9]

b) Explain the procedure of work study in detail. [9]

OR

P.T.O.

Q4) a) Why work study is valuable? **[9]**

b) Explain the techniques to reduce work content. **[9]**

Q5) a) What are different types of charts in method study? Explain any one individual case study. **[9]**

b) What are different criteria in selecting the work to be studied. **[8]**

OR

Q6) a) Discuss Critical examination and questioning technique. How it helps in conducting method study? **[9]**

b) Define Method study. Explain procedure of method study. **[8]**

Q7) a) Discuss the purpose of work measurement. Also explain it's use. **[9]**

b) What are different allowances and their types? Why it is useful? **[9]**

OR

Q8) a) Elaborate equipment and forms used for time study. How it is useful? **[9]**

b) Discuss various types of incentive plans. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4762

[Total No. of Pages : 2

[6404]-275

B.E. (Production)

FACILITY PLANNING

(2019 Pattern) (Semester - VIII) (411091 - A) (Elective - VI)

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 with sketch different warehouses at raw material and product manufacturing Stages. [8]
- b) Explain different layouts in FMS. [9]

OR

- Q2)** a) Explain the Features of warehouse management systems. [9]
- b) Discuss the facility provided for reduction in WIP. [8]

- Q3)** a) Discuss the several common sanitation challenges that modern manufacturers face. [9]
- b) Explain maintenance of Heating, Ventilation and Air Conditioning (HVAC) facilities. [9]

OR

- Q4)** a) What is OSHA? Highlights its characteristics. [10]
- b) Discuss different factors considered by facility planner for better Structural System Performance. [8]

P.T.O.

Q5) a) Explain with suitable data grouping of machine for higher productivity. [9]

- b) A firm produces three components. Components 1 and 2 have the same size and weight and are equivalent with respect to movement. Component 3 is almost twice as large and moving two units of either component 1 or 2 is equivalent to moving 1 unit of component 3. The departments included in the facility are A,B, C, D and E the overall flow path is A-B-C-D-E. By From - to analysis. The quantities to be produced and the component routings are as follows: [9]

Component	Production Quantities (per day)	Routing
1	30	A-C-B-D-E
2	12	A-B-D-E
3	07	A-C-D-B-E

OR

Q6) a) Explain briefly the qualitative layout evaluation technique. [9]

- b) Explain with suitable example FCFS and LCFS Waiting Line Models. [9]

Q7) a) What are facilities planning audit? Explain different area considered for it. [8]

- b) Describe specific situations where block templates or models should be used instead of contour templates and models and vice versa. [9]

OR

Q8) a) Describe weighted factor method for facility planning. [9]

- b) How could computer-aided layout techniques be used to study flow patterns outside facility? [8]



Total No. of Questions : 8]

SEAT No. :

PD-5310

[Total No. of Pages : 2

[6404]-276R

B.E. (Production Engineering)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VIII) (411091 B) (Elective - VI)

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 working and features of Stereolithography. **[9]**

b) Discuss working, advantages and disadvantages of Cubital's Solid Curing Ground curing (SGC). **[9]**

OR

Q2) a) Describe with sketch working and applications of D-MEC's Solid Creation System (SCS). **[9]**

b) What is need of Rapid Freeze Prototyping and Microfabrication? **[9]**

Q3) a) Explain working, principle and application of Fused Deposition Modeling. **[9]**

b) What are advantages, disadvantages and application of Cubic Technologies Laminated Object Manufacturing (LOM)? **[8]**

OR

Q4) a) Describe working with neat sketch of Kira's Paper Lamination Technology. **[9]**

b) Discuss Beijing Yinhua,s Slicing Solid Manufacturing (SSM) in detail.[8]

P.T.O.

- Q5) a)** Explain Principles and working of Selective Laser Sintering (SLS) process. **[9]**
- b)** What is Electron Beam Melting? Explain it in detail. **[9]**

OR

- Q6) a)** Discuss principle, process, advantages and applications of Three Dimensional Printing. **[9]**
- b)** Explain powder based additive manufacturing systems with examples. **[9]**

- Q7) a)** Write note on Computer Aided Tissue Engineering (CATE). **[9]**
- b)** Describe application of Additive Manufacturing in Cancerous Brain Tumor Surgery. **[8]**

OR

- Q8) a)** Discuss Customized Tracheobronchial Stents. **[9]**
- b)** What do you understand from Medical and Bio-Additive Manufacturing? **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4764

[Total No. of Pages : 2

[6404]-278

B.E. (Production Engineering)

DATA ANALYTICS

(2019 Pattern) (Semester - VIII) (411091D) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q. 4, Q.5 or Q. 6. & Q.7 or Q.8.*
- 2) *Assume suitable data, if necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is predictive analysis? Explain Multiple regression in detail. **[9]**

b) Explain Neural network in detail. **[9]**

OR

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

i) Conjoint Analysis

ii) Applications of data analysis.

b) Explain Data mining and its need. **[9]**

Q3) a) Write a short note on : **[8]**

i) Linear Classifier

ii) Quadratic Classifier

b) Explain support vector machine with example. **[9]**

OR

P.T.O.

- Q4)** a) Explain random forest in detail. [8]
b) Explain liner regression with example. [9]

- Q5)** a) What is prescriptive analysis ? Explain Decision tree with example. [8]
b) Explain expert system in detail. [9]

OR

- Q6)** a) Explain principal component analysis in detail. [8]
b) Explain genetic algorithm in detail. [9]

- Q7)** a) Write a short note on :
i) Markov Chain analysis.
ii) Classification based ML model. [10]
b) Explain monte carlo simulation in detail. [8]

OR

- Q8)** a) Explain Q learning and its application. [8]
b) Write a short note on : [10]
i) Reinforcement learning
ii) SARSA Learning



Total No. of Questions : 8]

SEAT No. :

PD-5260

[Total No. of Pages : 2

[6404]-279R

**B.E. (Production Engineering) (Sandwich)
MANUFACTURING AUTOMATION
(2019 Pattern) (Semester - VII) (411121)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the function of Valve draw labelled diagram **[8]**

- i) Shuttle valve
- ii) Twin Pressure valve

b) Explain speed control methods in pneumatic system. **[9]**

OR

Q2) a) Design and Testing of pneumatic components circuit in the sequence of $A^+ B^+ B^- A^-$ **[8]**

b) List and draw the seven basic electrical devices used in fluid power systems. **[9]**

Q3) Explain Regarding 8051 microcontroller. **[17]**

- a) Program memory & Data memory
- b) Data bus, address bus, and control bus
- c) Function blocks in details
- d) Alternate function of Part 3 of 8051

OR

Q4) Explain in detail of 8051 microcontroller following **[17]**

- a) Interrupt enabling and disabling of 8051
- b) Format of PSW register of 8051
- c) Von-Neumann and Harward Architecture

P.T.O.

- Q5) a)** Explain Automated Production Line following : **[9]**
i) In line type configuration
ii) Rotary type Indexing type configuration system
b) Classify and explain methods of transporting workpiece on flow lines. **[9]**

OR

- Q6) a)** Explain following transfer mechanism. & draw sketch. **[9]**
i) Geneva Mechanism
ii) CAM Mechanism
b) Draw pneumatic circuit for 3/2 push button DC valve by using single acting cylinder. **[9]**

- Q7) a)** Difference between SCADA & HMI. **[9]**
b) Define HCI, Explain Guidelines in HCI, and areas **[9]**

OR

- Q8) a)** Explain RTU, benefits, advantage and disadvantage. **[9]**
b) Explain Machine learning in ANN. Also Explain Learning Strategies. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4766

[Total No. of Pages : 3

[6404]-280

B.E. (Production Sandwich Engg.)

OPERATIONS RESEARCH

(2019 Pattern) (Semester - VII) (411122)

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 Calculators is allowed.*
- 4) *Assume Suitable data if necessary.*
- 5) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*

Q1) a) Explain in brief Goal Programming. State its assumptions. **[8]**

b) What are the essential characteristics of Dynamic Programming. **[9]**

OR

Q2) a) Describe Branch & Bound Method for the solution of Integer programming problem. **[8]**

b) State the applications of Non linear programming. **[9]**

Q3) a) Machine A costs Rs. 45,000/- and the operating costs are estimated at Rs. 1000/- for the first year, increasing by Rs. 10,000/- per year in the second and subsequent years. Machine B costs Rs.50000/- and operating costs are Rs. 2000/- for the first year, increasing by Rs. 4000/- in the second and subsequent years. If we now have a machine of type A, should we replace it by B? If so when? Assume both machines have no resale value and future costs are not discounted. **[10]**

P.T.O.

- b) A firm is considering replacement of a machine, whose cost is Rs 12,200 and the scrap value is Rs 200. The Maintenance Cost in various years are as given below:

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced? [8]

OR

- Q4) 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:

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? [10]

- b) Discuss the various types of replacement situations. [8]

- Q5) a)** Solve the following game by dominance and find the game value. [10]

		Player B			
Player A		I	II	III	IV
	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

- b) Explain the following terms with reference to game theory. [8]

- Value of the game
- Strategy
- Saddle point
- Two person zero sum game

OR

- Q6) a)** Solve following 2 x m game theory problem using by graphical method. **[10]**

		Player B			
Player A		B1	B2	B3	B4
	A1	2	1	0	-2
	A2	1	0	3	2

- b) Discuss different types of Decision making enviroments. **[8]**

- Q7) a)** On an average 96 patients per 24-hour day require the service of an emergency clinic. Also on an average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minutes of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from one and one-third patients to half patient. **[10]**

- b) Define Simulation. Explain Why is simulation used? **[7]**

OR

- Q8) a)** Explain the steps involved in Monte Carlo Simulation. **[7]**

- 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 : **[10]**

Production per day	146	147	148	149	150	151	152	153	154
Probability	0.04	0.09	0.12	0.14	0.11	0.10	0.20	0.12	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:

- What will be the average number of scooters waiting in the factory?
- What will be the average number of empty space on the lorry?



Total No. of Questions : 8]

SEAT No. :

PD4767

[Total No. of Pages : 2

[6404]-281

B.E. (Production Sandwich)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VII) (411123A) (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 indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) What is Stereolithography Apparatus (SLA)? Write down its Principle, process, advantages and applications. **[9]**

b) What is Solid Ground Curing (SGC) Process? Explain in detail: **[8]**

OR

Q2) a) What are the steps in Additive Manufacturing? Explain each step. **[9]**

b) What are the basic microfabrication techniques? What is the difference of microfabrication and nanotechnology? **[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 Fused Deposition Modelling (FDM)? Write down its Principle, process, advantages and applications. **[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) Categorize the applications of Additive Manufacturing in the areas of customized implants and prosthesis. [9]
- b) What is cranial implant? Explain in detail. [9]

OR

- Q8)** a) Discuss with a cases study how design and production of medical devices are done by Additive Manufacturing. [9]
- b) Write Short notes on Computer Aided Tissue Engineering (CATE). [9]



Total No. of Questions : 8]

SEAT No. :

PD4768

[Total No. of Pages : 2

[6404]-282

B.E. (Production Sandwich)

INDUSTRIAL ROBOTICS

(2019 Pattern) (Semester - VII) (Elective - III) (411123B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Differentiate between sensor & transducer with example and explain the role of sensors in robots. **[9]**

b) Explain the working of Tactile Array Sensor with application. **[9]**

OR

Q2) a) With neat sketch explain the working of following sensors in robots: **-[9]**

- i) Slip Sensor
- ii) LVDT
- iii) Potentiometer

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]**

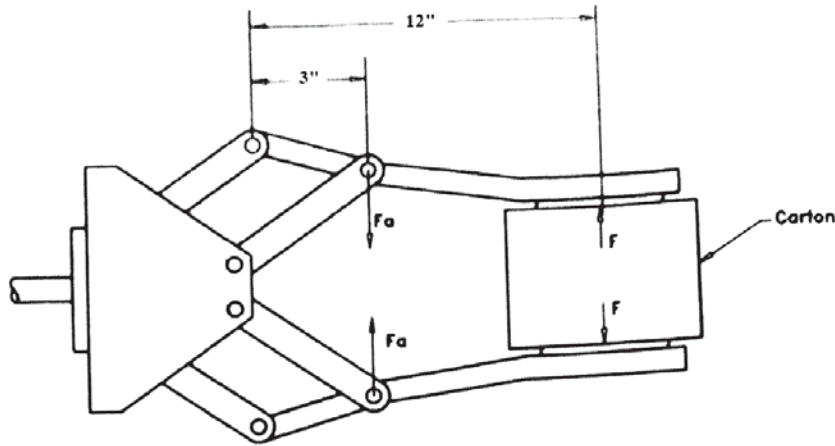
- i) Determine required gripping force
- ii) If safety factor is 1.5 calculate gripping force

b) A vacuum gripper is used to lift flat steel plates whose dimension are $0.25 \times 24 \times 36$ inches. The gripper will use two cups, 5.0 inches in diameter each & they will be located at 18 inches apart for stability. As safety factor of 2 should be used to allow for acceleration of the plate determine the negative pressure required to be lift the plates if the density of steel is 0.28 lb/in^3 . **[10]**

OR

P.T.O.

- Q4) a)** An angular movement gripper is used for holding the cardboard carton, the gripper force is 60lb. The gripper is to be activated by piston device to apply an actuating force F_a . Determine the piston device force F_a to close the gripper. [7]



- 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 the medical applications of robots. [8]

- b) Explain any three processing operations performed by robots. [9]

OR

- Q8) a)** What is Artificial Intelligence & explain role of Artificial Intelligence in robotics. [8]

- b) Write a note on: - [9]

- Pick & Place Robots
- Welding Robots
- Climbing Robots



[6404]-283

B.E. (Production Sandwich)
RELIABILITY ENGINEERING

(2019 Pattern) (Semester - VII) (411123C) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

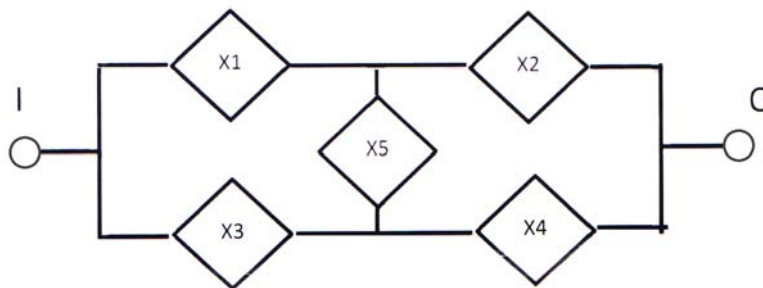
Instructions to the candidates:

- 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) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic table, slide rule or electronic pocket calculator is allowed.

- Q1) a)** Explain the concept of mean time between failures (MTBF) and mean time to repair (MTTR) in repairable system analysis. Discuss how MTBF and MTTR metrics are calculated, interpreted, and used to assess system reliability and maintainability. [9]
- b)** Suppose we have a system consisting of 10 identical components. The components operate independently, and each component has an average time between failures of 200 hours. Calculate the MTTF for the entire system. [8]

OR

- Q2) a)** Describe the key steps involved in conducting failure data analysis for repairable systems. Discuss how data collection, preprocessing, modeling, and interpretation contribute to improving system reliability and performance. [9]
- b)** Explain MTTF for series and parallel system. [8]
- Q3) a)** Explain the concept of Fault Tree Analysis (FTA) and its role in system safety and reliability engineering. Discuss how FTA helps identify potential system failures, analyze their causes, and assess the overall system risk. [9]
- b)** For a logic diagram shown in figure. Construct fault tree. [9]



OR

P.T.O.

Q4) a) A fire broke out at unit 1 of XYZ cable manufacturing company despite the safety system in place. The General Manager was very concerned about the accident and requested the Safety Officer in charge to evaluate the system. However, as part of the initial analysis of the existing system, the safety team used FTA to identify the different causes of the accident. Draw the fault tree diagram for the system. **[9]**

b) Explain in brief Fault Tree Analysis (FTA). **[9]**

Q5) a) Compare Normal Distribution and Uniform Distribution. **[9]**

b) What are the characteristics of Weibull Distribution. **[8]**

OR

Q6) a) Discuss the challenges associated with reliability estimation in complex systems. Explain how factors such as component interactions, environmental conditions, and usage patterns impact reliability estimation and require careful consideration during analysis. **[9]**

b) Describe difference between reliability prediction and reliability estimation. **[8]**

Q7) a) Discuss the challenges and trade-offs involved in reliability optimization. **[9]**

b) Explain Beta distribution with suitable example. **[9]**

OR

Q8) a) Explain imperfect switching in redundancy. **[9]**

b) Discuss the role of reliability-centered design in reliability optimization. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD5281

[Total No. of Pages : 2

[6404]-284R

B.E. (Production Sandwich)

MICRO-ELECTROMECHANICAL SYSTEMS

(2019 Pattern) (Semester - VII) (411123D) (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) Assume suitable data, if necessary.

- Q1)** a) Discuss the concept of static bending of thin plates. **[8]**
b) What do you understand by Finite Element Analysis? Discuss the concept with an example. **[9]**

OR

- Q2)** a) Explain the concept of Thermo Mechanics. How is it related with FEM?**[9]**
b) What do you mean by Thin Film Mechanics in MEMS? Discuss its importance with MEMS. **[8]**

- Q3)** a) Discuss the concept of Scaling laws in Miniaturization in brief. **[9]**
b) How is Rigid Body-Dynamics associated in Scaling laws for Miniaturization. **[9]**

OR

- Q4)** a) Write a short note on Scaling in Heat Transfer. **[9]**
b) What do you understand by Electrostatic Forces in MEMS? Discuss in relation with Scaling. **[9]**

- Q5)** a) What are significant issues related with Surface Micro-Machining. **[8]**
b) Write a note on LIGA process of Micromachining. **[9]**

OR

P.T.O.

- Q6)** a) Discuss any 2 types of Micro Machining processes in brief. [9]
b) Describe in brief advantages and limitations of Micromachining processes. [8]

- Q7)** a) What are Sensors? Explain in brief the Mechanism of Sensing used in MEMS. [9]
b) Write a short note on Principle of Sensing with a suitable example. [9]

OR

- Q8)** a) What are the different types of Membrane Transducer Materials Used?[9]
b) Discuss any 2 of following. [9]
i) CLOC
ii) E Nose
iii) Chemotransistors
iv) Mass sensitive Chemosensors



Total No. of Questions : 8]

SEAT No. :

PD-4771

[Total No. of Pages : 2

[6404]-285

B.E. (Production Sandwich Engineering)

CREATIVE PRODUCT DESIGN

(2019 Pattern) (Semester - VII) (Elective - IV) (411124 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of a programmable calculator is not allowed.*
- 4) *Write all necessary steps.*

Q1) a) What are the key points of Traditional Brainstorming. **[10]**

b) Write short note on FAST **[7]**

OR

Q2) a) Explain the process of executing Morphological analysis. **[10]**

b) Give summary of 6-3-5 Method **[7]**

Q3) a) Discuss the Steps in Product Teardown **[10]**

b) What is Product Portfolio Architecture. Discuss with example. **[8]**

OR

Q4) Write short notes on following Benchmarking Process tools

[3 × 6 = 18]

- a) Trend Analysis
- b) Function-Form Diagrams
- c) Thoughts on Benchmarking the Competition

P.T.O.

- Q5)** a) Discuss Global, Regional and Local Issues related to Environment [10]
b) What are the objectives of Design for Environment. [7]

OR

- Q6)** a) What is your understanding about the term 'Theoretical Minimum number of parts' Discuss with the help of example. [10]
b) Mention Product Structure Guidelines and reasons in DFE. [7]

- Q7)** a) Explain the various stages of Product Life Cycle with the help of Diagram. [8]
b) Discuss the Key Areas of Product Lifecycle Management. [6]
c) Define Product Lifecycle Management (PLM) & Product Lifecycle Management System (PLM System) [4]

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 lifecycle data
b) Discuss PLM Vs PLCM [6]



Total No. of Questions : 8]

SEAT No. :

PD-5264

[Total No. of Pages : 2

[6404]-286R

B.E. (Production Sandwich)

MECHATRONICS

(2019 Pattern) (Semester - VII) (411124 B) (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) Use of scientific calculator is allowed.
- 3) Figures to the right side indicate full marks.

- Q1)** a) Develop a simple PLC program for controlling a conveyor system that includes latching and sequencing. Explain the logic functions involved and how they are represented in the ladder diagram? [9]
- b) Explain how timers and internal relays are used in PLC programming. Write a program that uses a timer to delay the start of a motor and stops it after a set period? [9]

OR

- Q2)** a) Define synchronous communication and explain its function in data transmission. How would you write an assembly program to facilitate synchronous communication between two microcontrollers? [9]
- b) What are semiconductor sensors and micro-chemical devices? Discuss their applications and advantages in modern sensing technologies? [9]
- Q3)** a) Explain the process of modeling a mechanical system using differential equations. Provide an example of a simple mass-spring-damper system and derive its governing equations? [9]
- b) Describe how thermal systems are modeled using the principles of energy balance. Provide an example of a thermal system and explain how heat transfer affects its behavior? [8]

OR

P.T.O.

- Q4)** a) Explain the significance of poles and zeros in the transfer function of a system. How do their locations affect the system's transient and steady-state response? [9]
- b) Compare the differences between time domain and frequency domain analyses. What are the advantages and limitations of each approach in the context of system performance analysis? [8]
- Q5)** a) Define a servo system and explain its role in mechatronics. How do open-loop and closed-loop control systems differ, and what are the advantages and disadvantages of each type? [9]
- b) Describe the construction, working, and applications of a Linear Variable Differential Transducer (LVDT). Explain its principle of operation and why it is used for displacement measurements? [8]

OR

- Q6)** a) Compare the principles, specifications, and typical applications of capacitive and inductive proximity sensors. What are the benefits and limitations of each type? [9]
- b) Discuss the operation of rotary encoders and their use in measuring angular position and velocity. Compare incremental and absolute rotary encoders in terms of working principle and applications. [8]
- Q7)** a) Explain the concept of latching and sequencing in PLC programming. Develop a ladder logic program that demonstrates a latching circuit for controlling a motor? [9]
- b) Explain the working principles of sensors used for measuring velocity and motion. Provide examples of sensors suitable for these measurements and describe their applications? [9]

OR

- Q8)** a) Describe the types of sensors used for measuring force, fluid pressure and liquid flow. Discuss their working principles and how they are integrated into industrial control systems? [9]
- b) List and Describe the type of Sensors commonly used for measuring displacement position, and proximity. Discuss their performance characteristics and typical applications? [8]



Total No. of Questions : 8]

SEAT No. :

PD-5292

[Total No. of Pages : 2

[6404]-287R

B.E. (Production Sandwich Engineering)

CAD/CAM

(2019 Pattern) (Semester - VII) (411124C) (Elective - IV)

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) *Use of Non-programmable scientific calculators is not allowed.*
- 4) *Write all necessary steps.*

Q1) a) Explain CAD and Data exchange format & data format details. [9]

b) Discuss part Slicing and Orientation and its importance. [9]

OR

Q2) a) Discuss important features of Rapid Prototyping & applications. [9]

b) Discuss classification of Rapid Prototyping -FDM, LOM, SLA, SLS.[9]

Q3) a) Discuss The Siemens Model of CIM & IBM concept of CIM. [9]

b) Discuss steps in developing CNC part program in detail. [8]

OR

Q4) a) Explain Computer integrated production management system & enterprise resource planning. [9]

b) Discuss working principles of CNC Turning center and Milling center. [8]

Q5) a) Explain manufacturing resource planning & enterprise resource planning. [9]

b) Discuss Computer application in manufacturing & inspection and quality control. [9]

OR

P.T.O.

- Q6)** a) Discuss Computer Aided process Planning. [9]
b) Computer integrated production management system, inventory material requirement planning. [9]

- Q7)** a) Explain Part Families, part classification and coding. [9]
b) Explain production flow analysis & Rank Order Clustering Algorithm. [8]

OR

- Q8)** a) Discuss the elements of Product Life Cycle. [9]
b) Discuss machine cell design and Cellular manufacturing. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4774

[Total No. of Pages : 3

[6404]-288

B.E. (Production Sandwich)

DATA ANALYTICS

(2019 Pattern) (Semester - VII) (411124(D)) (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) *Figure to the right indicates full marks.*
- 3) *Neat Diagram must be drawn wherever necessary.*
- 4) *Assume Suitable data if necessary.*

Q1) 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. **[9]**

- 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.

b) Discuss the following : **[9]**

- i) Expert system
- ii) Principal component analysis
- iii) Genetic algorithm

OR

Q2) 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

P.T.O.

Q3) Discuss the following :

[16]

- a) Markov chain analysis
- b) Monte carlo simulation
- c) Q Learning
- d) SARSA

OR

Q4) a) 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]**

b) 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. **[10]**

- 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?

Q5) a) What is predictive analysis? Discuss with at least five real-time applications. **[9]**

b) What is univariate, 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. **[12]**

- 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?

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 are 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	April	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) a)** 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]**
- b) 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?



Total No. of Questions : 8]

SEAT No. :

PD-4775

[Total No. of Pages : 2

[6404]-289

B.E. (Production Sandwich Engineering)

SUPPLY CHAIN MANAGEMENT

(2019 Pattern) (Semester - VIII) (411134(A)) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What are the important measures to build strategic frame work for establishing textile business? **[9]**

b) Explain how safety inventory can be estimated in D-Mart chain. **[8]**

OR

Q2) a) Elaborate cycles & push-pull boundary in supply chain when you are purchasing smartphone. **[9]**

b) Analyse different instances of Product Substitution? Discuss with suitable example. **[8]**

Q3) a) Describe modes of transportation popularly used in supply chain decisions in online product selling. **[9]**

b) How Changing the distribution network affects the supply chain logistics in automobile sector (consider one product) **[8]**

OR

Q4) a) Explain role of information technology in transportation. **[9]**

b) Explain in brief factors influencing network design decisions. **[8]**

Q5) a) Explain the supply chain macro processes in computer supply industry. **[9]**

b) What are the different effect seen in demand fluctuations in Supply Chain Management in medical sector? **[9]**

P.T.O.

OR

Q6) a) What actions should be taken by management for achieving less delay in supply chain? [9]

b) Discuss the impact of E-Business on customer service in toys industry. [9]

Q7) a) Explain the role of warehouse networking in pricing final product. [9]

b) Brief the steps to evaluate network design decisions using decisions trees in stationary supply chain. [9]

OR

Q8) a) What are the different non-financial factors which Influences Supply Chain Decisions? [9]

b) Explain the role of revenue management in supply Chain Management.[9]



Total No. of Questions : 8]

SEAT No. :

PD-4776

[Total No. of Pages :2

[6404]-290

B.E. (Production Sandwich Engineering)
PLANT ENGINEERING AND MAINTENANCE
(411134 B) (2019 Pattern) (Semester - VIII) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Use of logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*
- 5) *Figures to the right indicates full marks.*

Q1) a) What is preventive maintenance? Explain importance of preventive maintenance? **[8]**

b) Discuss role of periodic maintenance in any engineering company. **[9]**

OR

Q2) a) Discuss predictive preventive maintenance in detail. **[8]**

b) Explain MICLASS for Material Classification. **[9]**

Q3) a) Explain scheduling maintenance in manufacturing industries. **[8]**

b) Explain Mathematical model for calculating life cycle cost. **[9]**

OR

Q4) a) What is reliability? Explain relationship with maintenance. **[8]**

b) Explain various models for calculating life cycle costs. **[9]**

Q5) a) Discuss-safety against chemical hazards. **[9]**

b) Explain various accident prevention practices and codes. **[9]**

OR

P.T.O.

- Q6)** a) Explain in short various fire prevention practices? [9]
b) Write a short note on Energy conservation, management and audit. [9]

- Q7)** a) What is ferrography? How is it used in oil analysis? [9]
b) What is Total Productive Maintenance? State merits and demerits of Total Productive Maintenance. [9]

OR

- Q8)** a) Discuss various diagnostic techniques used in maintenance activity. [9]
b) Explain Reliability Centered Maintenance (RCM). [9]



Total No. of Questions : 8]

SEAT No. :

PD-4777

[Total No. of Pages : 2

[6404]-291

**B.E. (Production Engineering) (Sandwich)
Industrial Relations & Human Resource Management
(2019 Pattern) (Semester - VIII) (411134 C) (Elective - V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

Q1) a) What are the Objectives Estimating man power requirement? **[8]**

b) What Recruitment and selection process follow in Manufacturing Industry? **[9]**

OR

Q2) a) Enlist and brief Main resources of recruitment. **[8]**

b) What are the Assessment Devices follow in IT Industry? **[9]**

Q3) a) What parameters involved in Training Process? **[9]**

b) Explain Methodology follow in Training Process. **[9]**

OR

Q4) a) Explain the Need and objectives of training process. **[9]**

b) Describe Methods of Training. **[9]**

P.T.O.

Q5) a) Why it is necessary to follow Ethics in appraisal system? **[9]**

b) Explain in brief Concepts of Performance Management. **[9]**

OR

Q6) a) What are the Different methods of Performance Appraisal? **[9]**

b) What is Rating Errors? Brief with example. **[9]**

Q7) a) What are the main reasons of Dismissal? What measures Industry has to follow to avoid dismissal? **[9]**

b) What are the main aspects responsible for Suspension? What will be the solution to overcome this issue? **[8]**

OR

Q8) a) Write note on Industrial Democracy and Industrial Peace. **[9]**

b) What is the Role of HRD in developing Industrial Relations? **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4778

[Total No. of Pages : 2

[6404]-292

B.E. (Production Sandwich Engineering)

MARKETING MANAGEMENT

(2019 Pattern) (Semester - VIII) (411134D) (Elective - V-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 indicates full marks.
- 4) Assume suitable data, if necessary and mention it clearly.
- 5) Use of non-programmable calculator is allowed.

Q1) a) What is the process of gathering information about the market? **[8]**

b) What are the 4 types of market segmentation? What is target market segmentation and positioning model? **[9]**

OR

Q2) a) What is the formation of a marketing strategy? **[9]**

b) What is marketing plan and program? **[8]**

Q3) a) What new products are in development? What are the 7 steps to developing a product? **[8]**

b) What are the 4 types of marketing intermediaries? **[9]**

OR

Q4) a) What are the 4 stages of marketing logistics planning? **[8]**

b) What are the theories of pricing? **[9]**

Q5) a) What is territory management in Salesforce? What are different sales territories? **[9]**

b) What are the 7 P's of service marketing? Why is service marketing important? **[9]**

P.T.O.

OR

Q6) a) What are new innovations in marketing? What is technological innovation in marketing? What are examples of marketing innovations? [9]

b) What are the recent innovation in modern marketing? What is marketing innovation with example?

[9]

Q7) a) What is the importance of marketing information and research? [9]

b) What is the scope of marketing research? What are the 7 types of marketing research? [9]

OR

Q8) a) What is the role of quantitative research in your research? [9]

b) What is the role of Role of quantitative tools in marketing research. What is the use of quantitative tools? [9]



Total No. of Questions : 8]

SEAT No. :

PD-5258

[Total No. of Pages : 2

[6404]-293

**B.E. (Artificial Intelligence & Machine Learning)
INFORMATION RETRIEVAL IN AI
(2019 Pattern) (Semester - VII) (418541)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 various techniques used to specify query in information visualization. **[9]**
- b) Explain averaging techniques contribute to the performance evaluation of algorithms. **[9]**

OR

- Q2) a)** Discuss in details Precision & recall with example. **[9]**
- b) Short Note on query specification in IR in detail with examples. **[9]**

- Q3) a)** Explain in detail Generic Multimedia indexing Approach and Automatic Feature Extraction with example. **[8]**
- b) Explain the significance of automated methods for extracting features from multimedia content, and discuss how these extracted features enhance the efficiency and effectiveness of multimedia search and retrieval systems. **[9]**

OR

- Q4) a)** Explain One-Dimensional Time Series & Two-Dimensional color Images. **[8]**
- b) Short Note on : **[9]**
- i) Collection Partitioning
 - ii) Query Processing

P.T.O.

- Q5) a)** How does web crawling play a crucial role in the functioning of search engines? Describe the key processes involved in web crawling. **[9]**
- b)** What is hyperlink-based searching in Information Retrieval (IR)? Explain how hyperlinks are used to enhance search effectiveness, and mention any two popular algorithms that utilize hyperlink structure. **[9]**

OR

- Q6) a)** Explain the Terms of Search Engines : **[9]**
- i) Ranking
 - ii) Crawling
 - iii) Indices
- b)** Explain in detail **[9]**
- i) Centralized Architecture
 - ii) Distributed Architecture

- Q7) a)** Describe Need and Significance of Metasearch in Information Retrieval for AI. **[9]**
- b)** Write Note on : **[8]**
- i) Need of Metasearch
 - ii) Basics working of metasearch

OR

- Q8) a)** Explain in detail Real Life Examples of metasearch engines. **[9]**
- b)** How a metasearch engine works? Explain in detail about the Metasearch along with its advantages and disadvantages. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4779

[Total No. of Pages : 2

[6404]-294
B.E. (AI & ML)
CLOUD COMPUTING
(2019 Pattern) (Semester - VII) (418542)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Explain Infrastructure As A Service with diagram. [6]
b) Explain steps to launch an EC2 instance in AWS Cloud. [6]
c) Write Note on Amazon Simple DB and Elastic Block Store. [6]

OR

- Q2)** a) Describe the components of Microsoft Azure along with Microsoft services. [6]
b) What is VMware Acquisition in the Cloud? And Explore Amazon S3 Service in the cloud. [6]
c) Explain salesforce.com CRM. [6]

- Q3)** a) Discuss the terms: Big Table and HBase cloud data stores in cloud computing. [6]
b) Describe virtual storage containers. [6]
c) Describe the challenges in data storage on cloud. [5]

OR

- Q4)** a) Draw and explain the General Architecture of the Hadoop Distributed File System (HDFS). [6]
b) Explain GFS Cloud File system with a diagram. [6]
c) Write a Note on: i) Simple DB ii) Dynamo Cloud data stores. [5]

- Q5)** a) Describe Digital Signature and Public Key Infrastructure (PKI) in cloud based system. [6]
b) Explain any four cloud security policies in detail. [6]
c) Describe different risks in cloud computing and how to manage them? [6]

P.T.O.

OR

- Q6)** a) Write notes on Identity access management (IAM) and Single-Sign On (SSO). [6]
b) Define Encryption and discuss in detail with diagram. [6]
c) Write notes on i) Integrity ii) Threat iii) Availability. [6]

- Q7)** a) Explain open cloud consortium (OCC). [6]
b) Describe Docker workflow with suitable examples. [6]
c) Explain standards for cloud application developers. [5]

OR

- Q8)** a) Explain Open Virtualization Format (OVF). [6]
b) Explain common standards for security in cloud computing. [6]
c) Write short note on SMTP and POP protocols. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4780

[Total No. of Pages : 2

[6404]-295
B.E. (A.I & M.L)
DEEP LEARNING FOR AI
(2019 Pattern) (Semester - VII) (418543)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) Explain working of LSTM in detail. **[10]**

b) What are the applications of a Recurrent Neural Network. **[8]**
(RNN)? Also explain which type of RNN it belongs to.

OR

Q2) a) Compare the Difference Between a Feedforward Neural Network and Recurrent Neural Network? **[6]**

b) Explain Vanishing Gradient Descent problem for RNN. **[6]**

c) Interpret how LSTM proves efficient over RNN? **[6]**

Q3) a) What are the applications of autoencoders? **[10]**

b) Explain Undercomplete autoencoders. **[7]**

OR

Q4) a) What is a hyperparameter? Explain different hyperparameters that must be set before training. **[8]**

b) Explain denoising autoencoders in detail. **[9]**

Q5) a) When will you use transfer learning? Explain with examples. **[6]**

b) Draw Densenet architecture. **[6]**

c) Explain distributed representation? **[6]**

OR

P.T.O.

- Q6)** a) Explain domain adaptation. [6]
b) What are the advantages of Densenet? [6]
c) Why is the network called a Greedy Layer wise pretraining network? [6]

- Q7)** a) Explain Overview GAN structure. [10]
b) Explain GAN variants. [7]

OR

- Q8)** a) What are the advantages and disadvantages of the GAN model? [10]
b) How does Dall-E work? [7]



Total No. of Questions : 8]

SEAT No. :

PD4781

[Total No. of Pages : 2

[6404]-297

B.E. (Artificial Intelligence & Machine Learning)

BLOCKCHAIN TECHNOLOGY

(2019 Pattern) (Semester - VII) (Elective - III) (418544B)

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) Discuss the Ethereum ecosystem, supporting the development of decentralized applications (DApps). [9]
- b) How does Metamask act as a bridge between traditional web applications and the Ethereum blockchain, enabling seamless user interactions with DApps? [9]

OR

- Q2)** a) Reveal the role of the Truffle framework and Ganache in Ethereum smart contract development and testing. [9]
- b) Organise elements of Ethereum tool stack as per their application. [9]

- Q3)** a) How does the modular architecture of Hyperledger Fabric contribute to its scalability and flexibility? [8]
- b) Analyse the architecture of Hyperledger Fabric, comparing it with other blockchain frameworks such as Ethereum, and discuss its suitability for implementing enterprise-level use cases like car ownership tracking. [9]

OR

- Q4)** a) Set up a fabric network with two organizations. [8]
- b) Describe the transaction flow in Hyperledger Fabric, detailing how transactions are proposed, endorsed, ordered, and validated within the network. [9]

- Q5)** a) What is token? What are the pros and cons of tokenizing shares? [5]
- b) What advantages does Blockchain provide during tokenization? [7]
- c) Discuss following consensus algorithms: [6]
- i) Proof of work
 - ii) Proof of activity

OR

P.T.O.

- Q6)** a) Write difference between: [6]
i) Fungible Token vs. Non-Fungible Token
ii) Cardano (ADA) vs. Riiple (XRP)
b) What are the challenges to tokenization in Blockchain? Explain in brief.[7]
c) What are the benefits of tokenization for businesses and users? [5]

- Q7)** a) What are the benefits of Blockchain in supply chain financing scenarios. [6]
b) Explain role of Blockchain in Healthcare Insurance application. [6]
c) Explain the role Blockchain in IoT. [5]

OR

- Q8)** a) What determines the adoption rate of a specific Blockchain technology?[6]
b) Explain risks and limitations of Blockchain in healthcare. [6]
c) Explain different aspects of Risks and Limitations of Blockchain. [5]



Total No. of Questions : 8]

SEAT No. :

PD4782

[Total No. of Pages : 2

[6404]-298

B.E. (Artificial Intelligence & Machine Learning)

AI IN DRONES

(2019 Pattern) (Semester - VII) (Elective - III) (418544C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the Payload types? [6]
b) Explain various types of non-dispensable Payload? [6]
c) What is Concept of kinematics and dynamics? [6]

OR

- Q2)** a) Explain Communication media detail. [6]
b) What is the Radio Communication? [6]
c) Explain Antenna types. [6]

- Q3)** a) Explain Global Positioning System in detail. [6]
b) Explain Control station composition in detail. [6]
c) Explain algorithm Waypoint navigation. [5]

OR

- Q4)** a) Explain Inertial Navigation. [6]
b) Determine Path planning algorithm Waypoint navigation with real life example. [5]
c) Explain Radio Tracking. [6]

- Q5)** a) What is Radio Control? [6]
b) Discuss in brief Flight Controller examples. [6]
c) Explain Transmitter in Flight Control. [6]

OR

P.T.O.

- Q6)** a) Explain Receivers in Flight Control. [6]
b) What is the ESC (Electronic Speed Controller)? [6]
c) What are Flight Control? Explain with an example. [6]

- Q7)** a) What are Beneficial Drones? [6]
b) What is Aerial Photography? [6]
c) What is difference between Search and Rescue? [5]

OR

- Q8)** a) What is Infrastructure Inspection? [6]
b) What is Precision Agriculture? [5]
c) Write short note on SURVEILLANCE and Delivery Drones. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4783

[Total No. of Pages : 2

[6404]-299

**B.E. (Artificial Intelligence and Machine Learning)
ETHICAL HACKING AND CYBER FORENSICS
(418545A) (2019 Pattern) (Semester - VII) (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) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume Suitable data, if necessary.*

Q1) a) Define Metasploit. Explain Port Scanning with metasploit. **[9]**

b) How to Crack a password using Password Tracking Tool with example?
[9]

OR

Q2) a) What are Client Side Exploitation methods? Explain any two methods in detail? **[9]**

b) Describe the types of Backdoors Attack. How to Prevent a backdoor Attack? **[9]**

Q3) a) What is Web application penetration testing? Enlist the methodologies and tools used in this testing. **[9]**

b) Describe the common attacks occurred in wireless networks. **[8]**

OR

P.T.O.

- Q4)** a) Define Encryption. Explain any one encryption algorithm and protocol in detail. [9]
- b) Write a short note on OWASP. [8]

- Q5)** a) What is Digital Forensics? Explain file system and disk Imaging. [9]
- b) How to analyze the data and extract the data from mobile device. [9]

OR

- Q6)** a) Describe network based Attacks and intrusions in Network forensics.[9]
- b) How to Investigate mobile device security incidents. [9]

- Q7)** a) How the collaboration is done between digital forensics and cyber security. [9]
- b) Describe legal requirement Reporting and Documentation. [8]

OR

- Q8)** a) What are different cloud computing digital Forensic challenges. [9]
- b) Explain in detail Social Media forensics with example [8]



Total No. of Questions : 8]

SEAT No. :

PD-5294

[Total No. of Pages : 2

[6404]-300

B.E. (Artificial Intelligence and Machine Learning)

AUGMENTED AND VIRTUAL REALITY

(2019 Pattern) (Semester-VII) (418545 B) (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 side indicate full marks.*
- 4) Assume suitable data if necessary.*

Q1) a) Explain Perception of Motion in detail. **[9]**

b) Explain the process for Combining Sources of Information for visual rendering in AR and VR. **[8]**

OR

Q2) a) Explain how representation of Motion in Real and virtual worlds differs. **[8]**

b) Explain with eg. and relevant diagram concept of Shading Models. **[9]**

Q3) a) Define Augmented Reality. Explain the real-world applications of Augmented Reality. **[8]**

b) Explain the system structure of Augmented Reality with suitable applicable diagram. **[9]**

OR

P.T.O.

- Q4)** a) Describe with diagram developmental phases of Augmented Reality. [8]
b) What is Mobile Augmented Reality? Write down different advantages and disadvantages of Mobile Augmented Reality. [9]

- Q5)** a) Explain various displays used in Augmented Reality Hardware. [9]
b) Explain the requirements and characteristics for Sensory and spatial display models. [9]

OR

- Q6)** a) Enlist and explain types of AR devices. [9]
b) Explain the process of calibration and registration. In what aspects both of them are different? [9]

- Q7)** a) Explain various SDKs and Frameworks for AR App development. [9]
b) Explain applications of VR in Gaming and Entertainment. [9]

OR

- Q8)** Write short notes on [Any 3] [18]
a) AR application development using Unity.
b) AR application development using ARCore and Vuforia
c) Sensor Fusion
d) Applications of AR and VR in Defense and Aerospace



Total No. of Questions : 8]

SEAT No. :

PD-5295

[Total No. of Pages : 2

[6404]-301

**B.E. (Artificial Intelligence and Machine Learning)
DevOps in Machine Learning
(2019 Pattern) (Semester - VII) (418545C) (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 the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1) a) i)** What is TDD? Explain in brief: [6]
- ii) Differentiate between Continues Integration & Continues Delivery? [6]
- b)** What is continuous Integration? Explain with suitable diagram of CI chain. [6]

OR

- Q2) a) i)** Explain Various SDLC for Designing CI & CD system. [6]
- ii) Benefits of Continues Integration & Continues Delivery. [6]
- b)** Explain CI & CD Pipeline. [6]

- Q3) a)** What is Continues Delivery and continues Deployment? [5]
- b) i)** Compare Performance testing & non-performance testing. [6]
- ii) Draw & explain basic deployment pipeline cycle. [6]

OR

- Q4) a) i)** What is difference between agile and DevOps? [5]
- ii) Why Automated Testing is Essential for CI/CD? [6]
- b)** Explain different types of testing strategy. [6]

P.T.O.

- Q5) a) i) What is MLOps and How it is Important? [6]**
ii) Explain Different Roles and Responsibilities in MLOps. [6]
b) Explain Machine Learning Lifecycle. [6]

OR

- Q6) a) Explain Various Components of MLOps. [6]**
b) i) Differentiate between MLOps and DevOps. [6]
ii) Draw an Architecture of ML pipeline. [6]

- Q7) a) Explain any one Tools to create ML pipelines. [6]**
b) Write and explain Model Retraining. [5]
c) Explain the concept of Data Quality and Integrity in ML pipeline. [6]

OR

- Q8) a) Explain in detail Monitoring and Logging process in ML Model Deployment. [6]**
b) Write and explain the concept of Model replacement. [5]
c) Describe the concept of Model Versioning with example. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4784

[Total No. of Pages : 2

[6404]-302

B.E. (Artificial Intelligence and Machine Learning)
NATURAL LANGUAGE PROCESSING
(2019 Pattern) (Semester - VIII) (418550)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 generative models of language. [6]
b) Explain with an example "Evaluating Language Models". [6]
c) Given a document-term matrix with the following counts: [6]

	Document 1	Document 2	Document 3
Term 1	10	5	0
Term 2	2	0	8
Term 3	1	3	6

Compute TF-IDF Score of "Term 1" in "Document 1".

OR

- Q2)** a) Explain the Latent Dirichlet Allocation (LDA) algorithm and its application in topic modeling. [9]
b) Describe the process of building a simple Markov model for predicting the next word in a sentence with the help of an example. [9]

- Q3)** a) Explain Vector Space Model. [6]
b) Illustrate coreference resolution with example. [6]
c) Discuss Cross lingual information Retrieval. [5]

OR

- Q4)** a) Describe Information Retrieval system in Natural Language Processing. [9]
b) Describe entity extraction and relation extraction with the help of examples. [8]

P.T.O.

- Q5)** a) List the tools available for the development of NLP applications? Write features NLTK and TextBlob? [6]
b) Describe linguistic resources. [6]
c) Explain WordNet [6]

OR

- Q6)** a) Discuss types of tasks are performed by the Gensim library with suitable example. [9]
b) Explain Lesk algorithm for word sense disambiguation. [9]
- Q7)** a) Explain Sentiment Analysis. [6]
b) Describe various Machine Translation Approaches. [6]
c) Explain Discourse processing. [5]
- Q8)** a) Explain Statistical Machine Translation (SMT) with suitable diagrams and example. [9]
b) Explain Natural Language Generation with reference architecture. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4785

[Total No. of Pages : 2

[6404]-303

B.E. (Artificial Intelligence & Machine Learning)

DISTRIBUTED SYSTEM

(2019 Pattern) (Semester - VIII) (418551 A) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is MPI? Describe how does MPI communicate between processes? **[9]**

b) What is Network Virtualization? Describe the reasons for adopting network virtualization. Explain different applications of network virtualization. **[9]**

OR

Q2) a) What is IPC? Explain with the example of communication between processes using the Message passing. **[9]**

b) What are election algorithms in distributed system? Describe the bully algorithm step-by-step. **[9]**

Q3) a) What is Replication in Distributed system? Why do we require replication? Discuss the key issues of replication. **[9]**

b) What is checkpointing in a distributed system? Explain the working of Coordinated checkpointing recovery mechanism. **[8]**

OR

Q4) a) What is fault tolerance in a distributed system? Explain the principle of fault tolerance? **[9]**

b) What is the distribution commit problem? Discuss how this problem is solved using the two-phase commit protocol with suitable diagram. **[8]**

P.T.O.

- Q5)** a) What is Distributed File System? Describe the architecture of Distributed File System in detail. [9]
- b) What are web services? Describe with a suitable diagram the general organization of the Apache web server. [9]

OR

- Q6)** a) What are the key design issues for distributed file systems? Describe the requirements for distributed file system. [9]
- b) What is the architecture of traditional web-based system? Explain in detail how does the Web Request Work? [9]
- Q7)** a) What is Service Oriented Architecture (SOA)? Explain the various SOA components. How does it differ from traditional software architecture? [8]
- b) Explain the following in brief: [9]
- i) Wearable devices
 - ii) PVM
 - iii) JINI

OR

- Q8)** a) What are the different Wearable devices available in market? Explain the key challenges of Wearables. [9]
- b) Explain in brief, the key features of Nagios. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4786

[Total No. of Pages : 2

[6404]-304

**B.E. (Artificial Intelligence and Machine Learning)
Software Project and Management
(2019 Pattern) (Semester - VIII) (418551 B) (Elective - V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss the significance of Sequence diagrams in the context of Software Project Management. **[8]**
- b) What is project evaluation and why is it important in Software Project Management? **[6]**
- c) What is the GQM Paradigm and how does it aid in process measurement? **[4]**

OR

- Q2)** a) What is risk management and why is it important in SPM? **[8]**
- b) Explain how Cost Benefit Evaluation techniques can be utilized to justify project investments. **[6]**
- c) What is Process analysis. Discuss the techniques used for Process analysis. **[4]**

- Q3)** a) What is Software Configuration Management. Describe the components of a typical software configuration management system. **[7]**
- b) What are the different types of contracts in software project management and What are the benefits of each? **[6]**
- c) What are four features of a good status report and how do they contribute to project management? **[4]**

OR

P.T.O.

- Q4)** a) Discuss the role of Earned Value Management (EVM) in project tracking and control within software projects. [7]
- b) How do tools like Git, Team Foundation Server and Ansible support software configuration management? [6]
- c) Define Cost Management. Explain four steps of Project Cost Management. [4]
- Q5)** a) What is the Oldham-Hackman Job Characteristics Model and how does it apply to software project management? [8]
- b) What are the key strategies for managing stress in the workplace to maintain high levels of employee health? [6]
- c) What are considered the best methods for staff selection and how do they impact organizational performance? [4]

OR

- Q6)** a) What are the unique challenges and benefits of managing dispersed and virtual teams? [8]
- b) How does the organizational structure impact communication and decision-making processes in software projects? [6]
- c) How do different organizational structures affect decision-making processes within a company? [4]
- Q7)** a) Discuss the tools and features in Azure DevOps that support visibility and collaboration among project teams. [7]
- b) What are the main differences between Microsoft Team Foundation Server (TFS) and Azure DevOps? [6]
- c) What role do metrics play in Agile practices and how are they implemented? [4]

OR

- Q8)** a) What are the key features of Application Lifecycle Management (ALM) in Azure DevOps? [7]
- b) What features does TFS offer for managing Agile projects and how do they compare to those in Azure DevOps? [6]
- c) How can Azure DevOps be integrated with other tools and systems to enhance project management? [4]



Total No. of Questions : 8]

SEAT No. :

PD-4787

[Total No. of Pages : 2

[6404]-305
B.E. (AI & ML)
Computer Vision
(2019 Pattern) (Semester - VIII) (418551C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3, or Q.4. Q.5 or Q.6. Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and assume suitable data wherever necessary.*

Q1) a) Define feature detection and explain its importance in computer vision. **[9]**

b) Describe how vanishing points are used to understand scene geometry and camera orientation. **[9]**

OR

Q2) a) Discuss how points and patches are used in augmented reality and virtual reality applications. **[9]**

b) Compare the strengths and limitations of different edge detection methods. **[9]**

Q3) a) Compare the foot-of-normal method with the Hough Transform for line detection. **[9]**

b) Discuss the challenge of detecting circles with unknown radii using the Hough Transform. **[8]**

OR

Q4) a) Explain how Hough-based schemes can be adapted to detect ellipses in images. **[9]**

b) Discuss various strategies for saving computation in line and circle detection. **[8]**

P.T.O.

- Q5)** a) Describe how projective geometry is applied in computer vision to simulate 3D perspectives. [9]
- b) Describe the shape from focus method for 3D depth estimation. How does it utilize variations in focus? [9]

OR

- Q6)** a) Discuss the role of the assumption of surface smoothness in 3D vision. How does it impact different shape estimation techniques? [9]
- b) Discuss different 3D reconstruction methods such as voxel-based, mesh-based and point-based approaches. [9]

- Q7)** a) Discuss category recognition in photo albums and its importance in managing personal photo collections. [9]
- b) Discuss the importance of image search in personal photo collections and how it can be improved using computer vision. [8]

OR

- Q8)** a) Explain different methods for foreground-background separation and their impact on surveillance accuracy. [9]
- b) Compare different object detection algorithms such as YOLO, SSD, and Faster R-CNN and discuss their impact on photo album organization. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4788

[Total No. of Pages : 2

[6404]-306

B.E. (Artificial Intelligence and Machine Learning)

REINFORCEMENT LEARNING

(2019 Pattern) (Semester - VIII) (418552A) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the policy evaluation related to Monte-Carlo method. [6]
b) What is Temporal Difference Learning? Explain Optimality of TD(0). [6]
c) How to choose values of Gamma and Lambda in generalized temporal differencing algorithms? [6]

OR

- Q2)** a) Explain in short R-learning, off policy learning. [6]
b) Explain in detail roll out in Monte-Carlo method. [6]
c) Explain the difference between on policy and off policy learning. [6]

- Q3)** a) Explain what is forward and backward views related to Eligibility traces in detail. [6]
b) What do you mean by SARSA(lambda). [6]
c) Explain n-step TD prediction in detail. [5]

OR

P.T.O.

- Q4)** a) Write a note on $Q(\lambda)$. [6]
b) Write a note on accumulating traces. [6]
c) What is TD (λ) related to Eligibility traces in detail. [5]

- Q5)** a) Explain approximate policy gradient algorithm in detail. [5]
b) What is function approximation? Explain linear function approximation. [6]
c) Explain the concepts of REINFORCE algorithm. [6]

OR

- Q6)** a) Explain use of Policy Gradient methods in non-associative learning in detail. [6]
b) Explain gradient descent method in Function Approximation. [6]
c) Explain any one algorithm used for value prediction. [5]

- Q7)** a) Explain in detail MAXQ framework related Hierarchical RL. [6]
b) Write a note on Computational Neuroscience. [6]
c) Explain Case study on Elevator dispatching in detail. [6]

OR

- Q8)** a) Write a note on : [6]
i) Ham framework
ii) Options framework.
b) Write a note on Option discovery algorithms. [6]
c) Explain Case study on Helicopter piloting in detail. [6]



Total No. of Questions : 8]

SEAT No. :

PD-5311

[Total No. of Pages : 2

[6404]-307

B.E. (Artificial Intelligence & Machine Learning)

BIG DATA ANALYTICS

(2019 Pattern) (Semester - VIII) (418552B) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** What are the key stages involved in the execution of a MapReduce job? **[6]**
- b) How does MongoDB differ from traditional relational databases? **[6]**
- c) Explain the role of TaskTracker in task execution. **[6]**

OR

- Q2) a)** Explain the main components of the MapReduce framework and how do they interact with each other? **[6]**
- b) Explain the lifecycle of a MapReduce job from job submission to completion. **[6]**
- c) How does Hadoop handle task-level failures during a MapReduce job? **[6]**

- Q3) a)** Explain how partitioning and bucketing work in Hive tables. **[6]**
- b) What is Grunt in Apache Pig? Explain how is Pig different from traditional RDBMS? **[6]**
- c) What is IBM Big SQL and how does it fit into the big data ecosystem? **[5]**

OR

P.T.O.

- Q4)** a) Compare HBase with RDBMS in terms of data model, schema and scalability. [6]
b) What is Pig Latin? How does Pig Latin handle data transformation, filtering and aggregation operations? [6]
c) Explain the key features and characteristics of HBase that differentiate it from traditional relational databases. [5]

- Q5)** a) Explain the common functions in R used for Exploratory Data Analysis. [6]
b) Differentiate between simple linear regression and multiple regression in R? [6]
c) Write R code to create a boxplot, histogram, scatter plot and bar chart. [6]

OR

- Q6)** a) Explain the concept of statistical modelling in R, including linear regression, logistic regression and other commonly used techniques. [6]
b) Explain the following terms with example : [6]
i) Scatter Plot
ii) Histogram
iii) Pie Chart
c) What is the role of graphical data analysis in the data science workflow and its importance for communicating insights to stakeholders. [6]

- Q7)** a) What tools and techniques would you use to extract, clean and analyze dark data for customer sentiment analysis? [6]
b) What is Apache Cassandra and what makes it suitable for big data workloads? [6]
c) Explain the main components of Spark architecture. [5]

OR

- Q8)** a) What is dark data? Why is it significant in big data analytics? [6]
b) What is Xplenty and explain the role of Xplenty in data integration? [6]
c) What is the significance of rise of AI-powered big data analytics in data-driven decision-making and business intelligence. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4789

[Total No. of Pages : 2

[6404]-308

B.E. (Artificial Intelligence and Machine Learning)

**ARTIFICIAL INTELLIGENCE USING R
PROGRAMMING**

(2019 Pattern) (Semester - VIII) (418552C) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What is a numeric variable, and how is it different from a categorical variable? [6]
- b) How would you display the frequency distribution of a categorical variable? [6]
- c) Write a note on : [6]
- i) Mean
 - ii) Median
 - iii) Mode

OR

- Q2)** a) What types of graphs can be used to represent univariate data? [6]
- b) Define variance and standard deviation. Why is the standard deviation more commonly used than variance in summarizing data spread? [6]
- c) Explain the Terms [6]
- i) Quantiles and
 - ii) Percentiles

P.T.O.

- Q3)** a) What are the advantages and disadvantages of using barplots versus pie charts for categorical data visualization? [6]
b) Define a histogram and explain how it differs from a barplot. [6]
c) Explain with example how to read Box and Whisker plot. [5]

OR

- Q4)** a) Discuss the significance of bin width in histograms. [6]
b) How does classical probability differ from empirical probability? [6]
c) How to make a Side by Side Boxplot in R? [5]

- Q5)** a) Differentiate between confidence intervals and prediction intervals in the context of regression analysis. [6]
b) Define interpolation and extrapolation in the context of using a regression model. [6]
c) How to create a column with binary variable based on a condition of other variable in an R data frame? [6]

OR

- Q6)** a) What is a linear regression model and how is it used in statistical analysis? [6]
b) Discuss the implications of treating a categorical variable as a numeric variable in regression analysis. [6]
c) What is coefficient of significance? How to know if coefficients are significant? [6]

- Q7)** a) Explain what the Omnibus F-test evaluates in a multiple linear regression model. [6]
b) Explain the process and purpose of K-means clustering in R. [6]
c) Explain how stepwise regression is implemented in R and its purpose. [5]

OR

- Q8)** a) Describe how to build and interpret a decision tree using R. [6]
b) Discuss how AdaBoost improves model performance. [5]
c) What are the advantages of using random forests over simple decision trees, and how are they implemented in R? [6]



[6404]-309

B.E. (Automation and Robotics Engg.)
INDUSTRIAL AUTOMATION AND CONTROL SYSTEMS
(2019 Pattern) (Semester - VII) (402541)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume Suitable/Standard data if necessary.

Q1) a) Draw a neat sketch indicating the construction of pneumatic system and explain the functions of various components involved in it. [8]

b) Explain the use of “AND” logic gates in pneumatics with a neat sketch. Explain the function of Proportional-Derivative (PD) controller with neat sketch. [10]

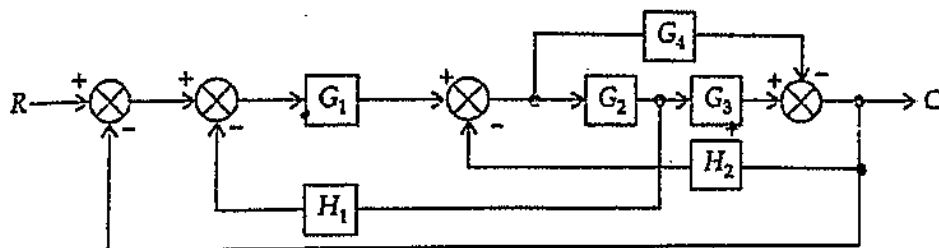
OR

Q2) a) Explain the use of “OR” logic gates in pneumatics with a neat sketch. Explain the function of Proportional-Integral (PI) controller with neat sketch. [10]

b) Explain the construction and working of sequencing pneumatic circuit with a neat sketch. [8]

Q3) a) Describe the open loop and closed loop control systems with the help of real time applications. [10]

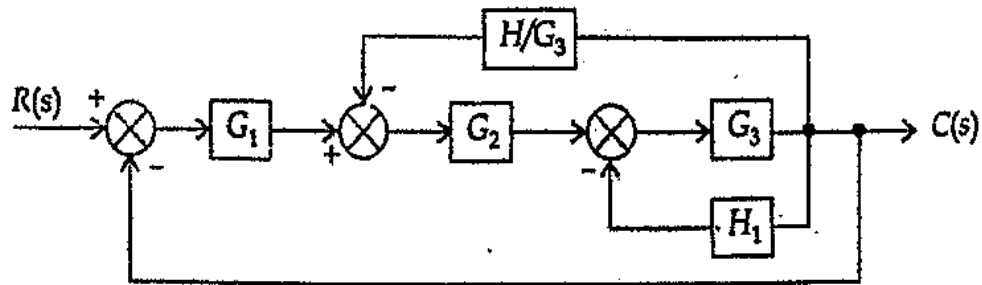
b) Draw the signal flow graph and determine C/R for the block diagram shown in Fig. [7]



P.T.O.

OR

- Q4) a)** Simplify the block diagram using block diagram reduction rules and calculate the transfer function. [7]



- b) Explain the various components used in control system. Describe how these components are necessary in a robot control systems. [10]
- Q5) a)** Derive the relation of deadzone function for stability analysis in non-linear systems. [9]
- b) Describe the functions of following non-linearities : relay, deadzone and saturation. [9]

OR

- Q6) a)** Derive the relation of relay function for stability analysis in non-linear systems. [10]
- b) Explain the singular points and give their classification. [8]
- Q7) a)** Explain the various types of HMI. List their advantages. [9]
- b) Explain Digital Communication Unit. Give the differences between SCADA and HMI. [8]

OR

- Q8) a)** Explain the functions of HMI. Explain how the automation is beneficial in large scale control system. [8]
- b) Explain SCADA with neat block diagram and define each level involved in it. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4791

[Total No. of Pages : 2

[6404]-310

B.E. (Automation & Robotics Engineering)

ROBOTICS PROCESS AUTOMATION AND DEVELOPMENT

(2019 Pattern) (Semester - VII) (402542)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer four questions from the following.*
- 2) Draw neat labeled diagrams wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of non-programmable electronic calculator is permitted.*
- 5) Assume Suitable/Standard data if necessary.*

Q1) a) What are some common data manipulation activities that RPA bots can perform in business automation? **[8]**

b) Explain the concept of data scraping in RPA. What types of data sources can be scraped? **[9]**

OR

Q2) a) What are the key advantages of using RPA for data manipulation tasks compared to manual methods? **[8]**

b) Distinguish between Desktop and Web Recording. **[9]**

Q3) a) What are Citrix recording methods in RPA, and when would you use each of them? **[9]**

b) Explain the concept of “Anchors” in the context of data extraction. How are they used in RPA processes? **[9]**

OR

Q4) a) Write a sequence of a project for extracting input data from a excel sheet which needs to be filled on a web portal of a company. **[9]**

b) What are the primary benefits of incorporating AI and ML capabilities into RPA workflows? **[9]**

P.T.O.

Q5) a) Explain the different types of bots used in Robotic Process Automation (RPA). Provide a brief description of each type and highlight their specific functions and applications. **[8]**

b) Define the terms “image trigger” and “element trigger” in the context of RPA. Explain how they differ and provide a real-world scenario where each type of trigger might be preferred over the other? **[9]**

OR

Q6) a) Outline the best practices for effectively utilizing debugging tools to streamline RPA development processes? **[8]**

b) “Exceptions are a critical aspect of Robotic Process Automation (RPA) development. Discuss the role of exceptions in RPA, and provide examples of common exceptions that RPA developers encounter. **[9]**

Q7) a) Explain the steps involved in deploying RPA bots within an organization. Discuss how these steps ensure a smooth integration with existing systems and processes. **[9]**

b) Explain the concept of “Bot Orchestration” and how it impacts the deployment of RPA bots in an enterprise. **[9]**

OR

Q8) a) What are the scalability challenges in RPA? How can an organization effectively scale its RPA bot deployment? **[9]**

b) What emerging technologies or trends are likely to impact the deployment and maintenance of RPA bots in the near future? Provide examples and potential implications. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4792

[Total No. of Pages : 2

[6404]-311

B.E. (Automation and Robotics)

**402543: Artificial Neural Networks and Deep Learning
(2019 course) (Semester - VII)**

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidate:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) Elaborate on the different activation functions employed within neural networks. **[8]**
- b) Compose a comparison between Binary Neural Networks (BNN) and Artificial Neural Networks (ANN). **[8]**

OR

- Q2)** a) What is the definition of a neural network? How many layers are required for it to be referred to as a deep neural network. **[8]**
- b) Which deep learning model employs the back-propagation method, and what are the learning techniques linked to back propagation. **[8]**
- Q3)** a) Explain the structure and functioning of Hopfield networks and what are the limitations of Hopfield networks. **[8]**
- b) What is Adaptive Resonance Theory (ART) Network and how do they differ from traditional Competitive Learning (CL) network, in terms of learning and adaptability. **[9]**

OR

P.T.O.

- Q4)** a) How is error performance measured in Hopfield networks, and what factors influence their ability to recall stored patterns accurately. **[8]**
- b) What are the key properties of a feature map in the context of Self-Organization Maps (SOM), and how do they contribute to the organization of input data. **[9]**
- Q5)** a) Describe the typical architecture of a CNN, including the arrangement of convolution, pooling, and fully connected layers. **[8]**
- b) How Artificial Neural Networks (ANN) are utilized in texture classification and segmentation tasks. What are the challenges in these tasks. **[9]**

OR

- Q6)** a) What are the fundamental building blocks of a Convolutional Neural Network (CNN), and how do they contribute to its architecture. **[8]**
- b) How can Artificial Neural Networks (ANN) be applied to recognize Olympic Games symbols? Explain the key components of such a system. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4793

[Total No. of Pages : 2

[6404]-312

B.E. (Automation & Robotics)

ROBOTICS-COGNITIVE & MEDICAL

(2019 Pattern) (Semester - VII) (402544A) (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) Assume suitable data if necessary
- 4) Use of Non-programmable scientific calculator is allowed.
- 5) Figures to the right indicate full marks.

- Q1)** a) What is the difference between laparoscopic and endoscopic surgery with regard to robotic systems? **[9]**
- b) What are the primary types of robotic systems used in surgery? **[8]**

OR

- Q2)** a) Explain the differences in application between physically assistive and socially assistive robots in medical care. **[9]**
- b) List and briefly explain the key characteristics of medical robots. **[8]**

OR

- Q4)** a) How does robot design for MIS differ from design for other types of surgeries? **[9]**
- b) Identify the key principles involved in cooperative manipulation during surgery. **[9]**

P.T.O.

- Q5) a)** What are the primary functions of assistive controllers in wearable robotic systems? **[9]**
- b)** List the key components of a framework for neuro-rehabilitation robotics. **[8]**

OR

- Q6) a)** Identify common sensors used in prosthetic robots for neuro-rehabilitation. **[9]**
- b)** List examples of software platforms used to integrate robots and virtual environments for neuro-rehabilitation. **[8]**
- Q7) a)** Describe the primary function of neural engineering in rehabilitation. **[9]**
- b)** How do biologically inspired robots enhance biomedical engineering applications? **[9]**

OR

- Q8) a)** Identify the key clinical applications of biomedical engineering in gynaecology. **[9]**
- b)** How do biologically inspired robots differ from traditional robots in terms of functionality and design? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4794

[Total No. of Pages : 2

[6404]-313

B.E. (Automation & Robotics)

**MICROPROCESSORS AND MICROCONTROLLERS
(2019 Pattern) (Semester - VII) (402544B) (Elective - III)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) Draw and explain interfacing of DMA controller 8237A with the 8085.[8]
b) Draw and explain main types of 8085 interrupts and respective vector locations. [9]

OR

- Q2)** a) Draw and explain DMA controller 8237A with internal Registers. [8]
b) Explain the Multiple Interrupts and Priority Encoder with neat Diagram.[9]

- Q3)** a) Describe how a microprocessor 8085 can be utilized to manage traffic lights efficiently. Draw a diagram that outlines the traffic light sequencing logic and a schematic diagram illustrating the connections between the microprocessor 8085 and the traffic lights. [9]
b) Design a multiplexed seven-segment LED display system schematic using the 8085 Microprocessor along with the 8255 Programmable Peripheral Interface (PPI). Provide a detailed explanation of the circuit diagram and components used. [9]

OR

- Q4)** a) Write a program to display the message μp -rdy (microprocessor-ready) using 8255 PPI and MPU and describe it. [9]
b) Explain the basic principles of stepper motor control using a microprocessor 8085. Provide a block diagram that demonstrates the interfacing of a microprocessor 8085 with a stepper motor driver for precise control. Also draw a flowchart for the movement of the stepper motor. [9]

P.T.O.

- Q5) a)** Provide a labeled diagram of the pin configuration for an 8051 Microcontroller. Explain the functions of at least five essential pins. **[8]**
- b)** Provide an overview of the instruction set of the 8051 Microcontroller. How do instructions differ in terms of their functionality? **[9]**

OR

- Q6) a)** Write at least 8 differences between a microprocessor and a microcontroller. **[8]**
- b)** Draw and explain 8051 Block diagram. Also write features of 8051 Microcontroller. **[9]**
- Q7) a)** Explore the various modes of operation for the parallel port in the 8051 Microcontroller. How do these modes allow the Microcontroller to interact with external devices? **[9]**
- b)** Explain the role of the “IE’ (Interrupt Enable) and “IP” (Interrupt Priority) registers in the 8051. **[9]**

OR

- Q8) a)** Discuss the functions of the SBUF and SCON registers in serial communication. **[9]**
- b)** Write in detail about the interfacing of LCD with 8051 Microcontroller and draw its neat connection diagram. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4795

[Total No. of Pages : 2

[6404]-314

B.E. (Automation & Robotics)

MODERN MACHINING PROCESSES

(2019 Pattern) (Semester-VII) (402544 C) (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) Assume suitable data if necessary*
- 4) Use of Non-programmable scientific calculators is allowed.*
- 5) Figures to the right indicate full marks.*

- Q1)** a) Explain Photochemical Machining. [5]
b) Explain working principle of Electrochemical Machining. [6]
c) Explain various parts involved in an electrochemical grinding setup with neat sketch. [6]

OR

- Q2)** a) Explain Construction of Chemical Machining. [5]
b) Explain advantages, disadvantages and applications of electro stream drilling. [6]
c) Explain maskant technique in Chemical Machining. [6]

- Q3)** a) Write short note on Dielectric Fluid used in EDM Machining. [7]
b) Write short note on Wire EDM Machines. [5]
c) Explain the advantage, disadvantages and applications of wire EDM. [6]

OR

P.T.O.

- Q4)** a) Explain Electrochemical discharge machining and its working principle. [5]
b) Write applications of Electric Discharge Diamond Grinding. [6]
c) Explain the Components of EDM and their functions. [7]

- Q5)** a) Explain Diamond turn machining and its material removal mechanism with neat sketch. [5]
b) Explain the effect of process parameters and materials processed in Micro Electro Discharge Machining. [6]
c) Explain the applications of micro engraving. [6]

OR

- Q6)** a) Explain Micro turning, its Working Principle and material removal mechanism. [6]
b) Explain the applications of Micro Electro Discharge Machining. [5]
c) Write a short note on Economics of Machining: [6]

- Q7)** a) Write short note on Microsystems. [6]
b) Write short note on LIGA process [6]
c) Explain the working principle and material removal mechanism of Magnetic Abrasives Finishing (MAF) [6]

OR

- Q8)** a) Explain the working principle and material removal mechanism of Abrasive Flow Finishing (AFF). [6]
b) Explain the Magnetorheological Finishing (MRF) and its working principle [6]
c) Explain the Rotational Magnetorheological Abrasive Flow Finishing (R-MRAFF) and its working principle. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4796

[Total No. of Pages : 2

[6404]-315

B.E. (Automation and Robotics Engineering)

INDUSTRIAL ENGINEERING

(Elective - III) (2019 Pattern) (Semester-VII) (402544 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain 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 equipment. [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. [9]

Year	1995	1996	1997	1998	1999
Sale Rs. ($\times 10^5$)	180	168	159	170	188
Forecast ($\times 10^5$)	160				

- b) Explain the functions of production planning and control. [8]

OR

- Q4) a)** What do you mean by aggregate planning? Explain. [8]

- b) Give the objectives of Production Planning and control. [9]

- Q5) a)** Define inventory and its importance. Enlist different types of inventories. [9]

- b) Discuss MRP-I and MRP-II in detail. [8]

OR

- Q6) a)** Explain SCM with flow diagram? Discuss its importance in industry? [8]

- b) What is ABC analysis? Explain in detail with procedure for making ABC analysis. [9]

- 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”? [6]

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? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4797

[Total No. of Pages : 2

[6404]-316

B.E. (Automation & Robotics)

COMPUTATIONAL FLUID DYNAMICS

(2019 Pattern) (Semester - VII) (402544 E) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non-programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1) a)** What are the primary differences in the solution approach for steady vs unsteady convection-diffusion problems in two dimensions. **[8]**
- b)** What specific boundary conditions are typically applied in one-dimensional transient convection-diffusion problems, and how do they affect the solution. **[9]**

OR

- Q2) a)** How does one verify and validate numerical results for convection-diffusion equations in the context of real-world applications. **[8]**
- b)** Why is the peclt number an important parameter in choosing suitable numerical schemes for convection-diffusion problems? **[9]**
- Q3) a)** Why is the SIMPLE algorithm preferred for steady-state simulations, and how does it perform in unsteady or transient flow problems. **[9]**
- b)** How does mesh refinement impact the accuracy of solutions in the lid-driven cavity problem, especially near the walls. **[9]**

OR

- Q4) a)** How can mesh generation and refinement around the cylinder affect the quality of simulation results, particularly in capturing flow separation. **[9]**
- b)** How does the angle of attack affect the lift and drag characteristics of an airfoil, and what role does the Reynolds number play. **[9]**

P.T.O.

- Q5) a)** Explain Reynold's time averaging concept of turbulence. Derive RANS equation. **[8]**
b) Explain the difference turbulence models namely standard $k-\epsilon$, and standard $k-\omega$, SST $k-\omega$, and RSM models. **[9]**

OR

- Q6) a)** What is turbulence motion and how it could be captured with DNS, LES and RANS models. **[8]**
b) How does the computational grid and time step size need to be adjusted for DNS, LES, and RANS to accurately capture turbulent flow features. **[9]**

- Q7) a)** In what scenarios are loosely coupled versus fully coupled fluid-solid simulations preferred. **[9]**
b) How is fluid-solid coupling used to analyze the performance and safety of structures like bridges, buildings, and aircraft under wind loading. **[9]**

OR

- Q8) a)** In what types of applications is Arbitrary Lagrangian-Eulerian (ALE) particularly beneficial, such as biomechanics, aerodynamics, or fluid-structure interactions in flexible structures. **[9]**
b) How are coupled fluid-structure equations validated to ensure realistic simulation results. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4798

[Total No. of Pages :2

[6404]-317

B.E. (Automation & Robotics Engineering)

LEAN MANUFACTURING

(Elective - IV) (402545 A) (2019 Pattern) (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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of Non-programmable scientific calculator is allowed.*
- 5) *Figures to the right indicate full marks.*

- Q1)** a) Briefly discuss Total Productive Maintenance along with its components. **[8]**
b) Explain Poka-Yoke. How it can be used for mistake proofing? **[9]**

OR

- Q2)** a) Define KAIZEN. Briefly explain principles of kaizen. **[8]**
b) Write a short note on creating a culture of continuous improvement. **[9]**

- Q3)** a) Write short note on cellular manufacturing. Briefly discuss benefits and characteristics of cellular manufacturing. **[9]**
b) Write a short note on Lean principles in logistics and distribution. **[9]**

OR

- Q4)** a) Discuss basics of lean supply chain management. **[9]**
b) How DMAIC methodology in lean Six Sigma projects? Discuss with example. **[9]**

- Q5)** a) Briefly explain the role of leaders in lean organizations. **[8]**
b) Write a short note on Lean scorecards and visual management. **[9]**

P.T.O.

OR

- Q6)** a) Explain with a suitable example how do you create cross-functional teams for lean projects. [8]
b) Explain Key performance indicators (KPIs) in lean manufacturing. [9]

- Q7)** a) Write a short note on Change management in lean transformation. [9]
b) Briefly explain the application of lean principles to real-world scenarios. Give suitable example. [9]

OR

- Q8)** a) Briefly explain any one case study of lean implementation in manufacturing. [9]
b) Discuss lessons learned from lean case studies in actual implementation. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4799

[Total No. of Pages : 2

[6404]-318

B.E. (Automation & Robotics)

PROJECT MANAGEMENT

(2019 Pattern) (Semester - VII) (402545 B) (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) Assume suitable data if necessary.
- 4) Use of Non-programmable scientific calculators is allowed.
- 5) Figures to the right indicate full marks.

Q1) a) Discuss the purpose of network techniques like PERT and CPM in project management. **[9]**

b) State the principles of quality management in project environments. **[8]**

OR

Q2) a) Explain the significance of performance measurement and reporting in project management. **[9]**

b) Compare and contrast PERT and CPM models in terms of their applications and assumptions. **[8]**

Q3) a) Identify the tools used in project cost estimation techniques. **[9]**

b) State the benefits of activity-based costing in project management. **[9]**

OR

Q4) a) Explain the importance of legal and ethical aspects in project management. **[9]**

b) Summarize the relationship between project financial management and cash flow forecasting. **[9]**

Q5) a) Explain the significance of project closure in the overall project lifecycle. **[9]**

b) What are the different techniques used in project evaluation? **[8]**

OR

P.T.O.

- Q6)** a) Describe the process of conducting project audits and reviews. [9]
b) Discuss the key components of a project closeout report. [8]

- Q7)** a) State the principles of sustainability and green project management. [9]
b) Identify the challenges of project risk management in uncertain environments. [9]

OR

- Q8)** a) Explain the role of digital tools in modern project management. [9]
b) Describe how Agile project management differs from traditional project management. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4800

[Total No. of Pages : 2

[6404]-319

B.E. (Automation & Robotics)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VII) (402545 C) (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) *Assume Suitable data if necessary.*

Q1) a) Explain the working principle of fused deposition modelling with neat sketch. Discuss the possible defects in this method. [9]

b) Explain the printing mechanism involved in direct ink writing with neat sketch. Give the advantages and applications. [9]

OR

Q2) a) Explain Direct metal deposition. List its Benefits and Limitations. [9]

b) Explain the process polyjet printing. Also write the applications, merits and demerits. [9]

Q3) a) Explain phase transformation in additive manufacturing. [9]

b) Explain with an example how the material and the additive manufacturing method can be selected for various applications. [8]

OR

Q4) a) Discuss the various techniques used to enhance the surface properties of additively manufactured parts. [8]

b) Explain the various design considerations/rules involved in additive manufacturing with the help suitable sketch. [9]

P.T.O.

- Q5)** a) Define slicing and their types. Explain the various infill strategies used for area filling the sliced model. [9]
- b) Explain the construction details of 3D printers. Also explain the significance of nozzle in 3D printer. [9]

OR

- Q6)** a) Write note on i) cooling system of 3D printer ii) print bed of 3D printer iii) 3 D printer frame. [9]
- b) Explain the steps followed while slicing a CAD model in slicing software along software integration. [9]
- Q7)** a) Discuss the benefits of additive manufacturing in the research and development sector. [9]
- b) Discuss a case study on how the performance of automobile parts can be improved by adopting additive manufacturing. [8]

OR

- Q8)** a) How additive manufacturing can influence the mass customization? Explain in detail mentioning its future trends. [9]
- b) Discuss the application of 3D printing in art, fashion and jewelry industry. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4801

[Total No. of Pages :2

[6404]-321

B.E. (Automation & Robotics)

**AUGMENTED REALITY AND VIRTUAL REALITY
(402545 E) (2019 Pattern) (Semester - VII) (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 scientific calculators is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Why do DC magnetic trackers suffer less from metal interference than ACones? [6]
- b) What is a Boom 3D display and how does it work? What advantages does it have compared to an HMD? [6]
- c) What is the mathematical description for object position/orientation in virtual environments? How can invariants be used? [5]

OR

- Q2)** a) How does a wireless tracking suit work? Give examples. [6]
- b) Draw and explain the architecture of the CAVE. [6]
- c) How does the CyberGlove work? [5]

- Q3)** a) What are the functionalities of AR? [6]
- b) How AR is used to enhance human computer interaction? [6]
- c) Which are the evaluation methods of AR? [5]

OR

- Q4)** a) What is interactivity in AR? [6]
- b) What's the difference between AR and VR? [6]
- c) How do augmented reality applications enhance the real world? [5]

P.T.O.

- Q5)** a) What is the function of the special senses eyes and ears in VR? [6]
b) Which tools and software are used in virtual reality? [6]
c) Explain VRTK toolkit in VR. [6]

OR

- Q6)** a) Explain the 'Unity' popular tool for VR development? [6]
b) What is a head coupled display in virtual reality? [6]
c) What is virtual acoustics in VR? [6]

- Q7)** a) What advantages does VR offer for rehabilitation, particularly for post-stroke patients? Give examples. [6]
b) Why is ADHD assessment in a virtual classroom more realistic than current questionnaire-based methods? [6]
c) What is the Visible Human database and how was it created? Describe some of its applications. [6]

OR

- Q8)** a) How is VR used for patients with fear of flying? What is the system architecture and study outcomes? [6]
b) What is the Digital Anatomist project and why is it increasing access for students? [6]
c) Give types of PC video games. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4802

[Total No. of Pages : 2

[6404]-322

B.E. (Automation & Robotics)

EMBEDDED SYSTEMS IN ROBOTS

(2019 Pattern) (Semester - VIII) (402549) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume suitable/standard data, if necessary.*

Q1) a) Write short note on: [10]

- i) I2C Serial communication Protocol
- ii) SPI Serial communication Protocol

b) Write short note on :

- i) Compare between Simplex, Half Duplex & Full Duplex communication modes. [5]
- ii) What do you mean by Synchronous and Asynchronous Communication? [3]

OR

Q2) a) Explain the TCP/IP model neat diagram. [8]

b) Write short note on: [10]

- i) RS232 Serial Communication Standard
- ii) Bluetooth (Advanced Serial Protocol)

Q3) a) Explain ATmega 8 AVR microcontroller architecture with proper diagram. [10]

b) What is MSP430 Microcontroller? Mention any 5 features & application of MSP 430 Microcontroller. [7]

OR

P.T.O.

- Q4)** a) Describe the functions of each pins of ATmega 8 AVR microcontroller. **[10]**
- b) Write short note on : **[7]**
- i) Write any 5 differences between RISC & CISC processors.
- ii) Write any 5 differences between Microprocessor & Microcontroller.

- Q5)** a) Explain the basic architecture of arduino board with proper functional block diagram. **[10]**
- b) What is a GPIO? What are the modes of GPIO? Explain the modes. **[8]**

OR

- Q6)** a) Discuss the difference between Arduino Uno, Arduino Mega, and Arduino Nano boards in terms of specifications and capabilities with proper application example. **[10]**
- b) What are the advantages and disadvantages of using an Arduino board compared to other microcontroller platforms? **[8]**
- Q7)** a) Write the arduino program code for interfacing of IR sensor with arduino & draw the interfacing circuit. **[8]**
- b) Write the arduino uno program code for interfacing of RF Tx/Rf Rx with Arduino. **[9]**

OR

- Q8)** a) Write the arduino program code for interfacing of Motor Driver L293D with arduino. **[9]**
- b) Draw Interfacing diagram of Atmega 328 based Arduino board with LED & write the program to blink the LED in every 3 secs. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD4803

[Total No. of Pages : 2

[6404]-323

B.E. (Automation and Robotics)

FUNDAMENTALS OF AUTONOMOUS SYSTEMS

(2019 Pattern) (Semester-VIII) (402550)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following.*
- 2) Draw neat labeled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of non programmable electronic calculator is permitted.*
- 5) Assume suitable/standard data if necessary.*

Q1) a) What is path planning in autonomous systems, and how do algorithms create optimal routes while accounting for environmental constraints and system goals? **[10]**

b) Provide examples of real-world applications where decision-making algorithms play a critical role in autonomous systems, such as self-driving cars, drones, or robotic systems. **[8]**

OR

Q2) a) What is the function of collision detection systems in autonomous vehicles, and how do they leverage sensor data to detect potential collisions and minimize risks? **[8]**

b) How do uncertainty in sensor data and changes in environmental conditions affect decision-making in autonomous systems? What strategies can be used to reduce the impact of such uncertainties? **[10]**

Q3) a) Explain the role of feedback control in maintaining stability in autonomous systems. How does it contribute to overall system performance? **[10]**

b) What challenges and limitations arise when incorporating machine learning techniques into autonomous systems, and how can these challenges be effectively addressed? **[7]**

OR

P.T.O.

- Q4) a)** Compare and contrast traditional control methods with machine learning-based approaches in terms of their adaptability and performance in autonomous systems. **[10]**
- b)** In what ways do feedback control systems and machine learning work together to improve the overall performance and capabilities of autonomous systems. **[7]**

- Q5) a)** Provide examples of distributed system architectures used in coordinating multiple autonomous systems, such as swarms of drones or fleets of autonomous vehicles. How do these architectures enable collaboration and scalability? **[10]**
- b)** How can advances in communication, simulation, and human-robot interaction contribute to the future evolution of autonomous systems? **[8]**

OR

- Q6) a)** Describe the importance of network security in autonomous systems. What measures should be implemented to safeguard communication channels and prevent cyber attacks? **[9]**
- b)** Outline the principles of human-robot interaction in autonomous systems. How do these principles guide the design of interfaces and interaction mechanisms? **[9]**

- Q7) a)** What are the potential economic impacts of autonomous systems on different industries and sectors, and how can organizations harness autonomy to foster innovation and enhance competitiveness? **[8]**
- b)** Explain the importance of fail-safe mechanisms and redundancy in ensuring the reliability of autonomous systems. How do these mechanism prevent system failures and accidents? **[9]**

OR

- Q8) a)** What is the role of regulatory frameworks and standards in overseeing the development and deployment of autonomous systems, and how do these regulations ensure adherence to safety, ethical, and privacy requirements? **[9]**
- b)** Discuss the autonomy levels achieved in different types of autonomous vehicles, including land, aerial, and maritime vehicles. How do these vehicles navigate and operate autonomously in their respective environments? **[8]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD-5232

[Total No. of Pages : 2

[6404]-324

**B.E. (Automation and Robotics Engineering)
Industrial Robotics & Material Handling Systems
(2019 Pattern) (Semester - VIII) (402551 A) (Elective - V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) Answer four questions from the following.*
- 2) Draw neat labeled diagrams wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of non programmable electronic calculator is permitted.*
- 5) Assume Suitable/Starndard data if necessary.*

- Q1)** a) Explain how the classification of grippers influences their selection for specific tasks in robotics. **[10]**
- b) Discuss the role of material properties like thermal conductivity and corrosion resistance in the selection of materials for robotic grippers.**[8]**

OR

- Q2)** a) What are the key factors that influence the selection of a robot for a specific industrial application. **[8]**
- b) Explain the working principles of pneumatic grippers and how they differ from hydraulic and electric motor-driven grippers. **[10]**
- Q3)** a) Explain the differences between gray scale, RGB, and HSV color models. How does the choice of color model affect the performance of image processing algorithms in robotic vision applications. **[10]**
- b) Describe how pixel-based image representation works. What is the significance of resolution, bit depth and image size in robotic vision?**[7]**

OR

P.T.O.

Q4) a) Describe various feature extraction techniques (e.g., edges, corners, blobs) used in robotic vision. How are these features matched between frames or templates and what role do they play in tasks like object tracking and mapping? **[10]**

b) Explore the role of machine learning and deep learning in improving object recognition and visual perception in robots. **[7]**

Q5) a) Explain how robotic systems equipped with vision and sensory technology can perform both assembly and quality inspections. **[10]**

b) Explain how robotics contribute to increased efficiency and reduced errors in manufacturing operations. **[8]**

OR

Q6) a) Discuss the advantages of using robots for continuous arc welding as compared to traditional manual methods? **[9]**

b) Explain the role of robotic systems in underwater exploration, maintenance, and construction, such as oil rig inspection or shipwreck exploration. **[9]**

Q7) a) Define collaborative robots (cobots). How do they ensure safe human-robot interaction in shared workspaces and where are they most commonly used? **[8]**

b) Explain the role of mobile robots and autonomous systems in industrial logistics and material handling. What technologies enable their navigation and obstacle avoidance? **[9]**

OR

Q8) a) Explain how machine learning algorithms improve object recognition and adaptive behavior in industrial robots. **[9]**

b) Why is cybersecurity important in robotic systems? Mention common threats and describe methods to secure industrial robots and their networks. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-5332

[Total No. of Pages : 3

[6404]-325

B.E. (Automation and Robotics)

SUPPLY CHAIN MANAGEMENT

(2019 Pattern) (Semester-VIII) (402551B) (Elective- V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain the concept of Electronic Data Interchange (EDI). Discuss its advantages and applications in business transaction. [6]
- b) Differentiate between Intranet and Extranet. How do these technologies support organizational communication and collaboration? [6]
- c) Explain how ERP systems support and enhance Supply Chain Management. [5]

OR

- Q2)** a) What is Data Mining? How is it different from Data Warehousing? Explain the role of Data Marts in decision-making. [6]
- b) Define E-Commerce. Explain different types of E-Commerce models with suitable examples. [6]
- c) Describe different types of ERP models. What are the common perceptions and challenges faced during ERP implementation? [5]
- Q3)** a) Explain the importance of modeling in Supply Chain Management. How does it help in improving supply chain efficiency? [6]
- b) What are the important factors to consider while modeling a Supply Chain Management system? Explain with examples. [6]
- c) What are the different types of models used in SCM? Explain with suitable examples. [5]

P.T.O.

OR

- Q4)** a) Define the concept of modeling in the context of SCM. What are the key features and benefits of using models in decision-making? [6]
- b) Describe the process of structuring a logistic chain. What are the key components involved and how do they contribute to the overall supply chain? [6]
- c) Discuss the major challenges faced during the modelling of supply chains. How can these challenges be overcome? [5]
- Q5)** a) Define Reverse Supply Chain. How does it differ from traditional supply chain management? [6]
- b) What are the different types of reverse flows in a supply chain? Explain their significance with examples. [6]
- c) What is a Collaborative Supply Chain? Explain its significance in modern supply chain management. [6]

OR

- Q6)** a) Differentiate between Forward Supply Chain and Reverse Supply Chain with appropriate examples. [6]
- b) What are the different types of reverse flows in a supply chain? Explain their significance with examples. [6]
- c) What are the key imperatives for building a successful integrative supply chain? Discuss with examples. [6]
- Q7)** a) What is an Agile Supply Chain? Explain its importance in today's dynamic business environment. [6]
- b) Describe the supply chain of a newspaper. What makes it unique compared to other supply chains? [6]
- c) Analyze the Mumbai Dabbawala supply chain. What makes it an exemplary case of operational efficiency? [6]

OR

- Q8)** a) What are the major sources of variability in a supply chain? How do they affect supply chain performance? [6]
- b) Explain the key stages involved in the supply chain of book publishing. What challenges are commonly faced? [6]
- c) Describe the supply chain of organic food products. How is it different from the conventional food supply chain? [6]



Total No. of Questions : 8]

SEAT No. :

PD-4804

[Total No. of Pages : 2

[6404]-326

**B.E. (Automation & Robotics Engineering)
PRODUCT DESIGN AND DEVELOPMENT
(2019 Pattern) (Semester - VIII) (402045 A) (Elective - V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 Or Q.2, Q.3, or Q.4, Q.5 or Q.6,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) Describe Product Policy of an organization. List down various Product Policies. [7]

b) Describe in detail Reverse Engineering in Idea generation. [6]

c) Explain Marketing Aspect in concept analysis. [4]

OR

Q2) a) Explain Product Characteristics.. [7]

b) Describe in detail Concept Selection Process. [6]

c) Write note on Alternate thinking in idea generation approach. [4]

Q3) a) What is the need for Engineering Drawing? Classify engineering drawing. [7]

b) Explain Design for Assembly and Design for manufacturing. [6]

c) Explain Value Analysis in detail. [4]

OR

Q4) a) Explain BOM with example. [7]

b) Describe in detail Design review/part Print Analysis. [6]

c) What are the various elements of Production Drawing? [4]

P.T.O.

- Q5)** a) List down types of FMEA and explain steps of FMEA. [8]
b) What is the importance of PLM and PDM for a Designer? [6]
c) Enlist Industrial Safety to be consider in Product Design. [4]

OR

- Q6)** a) What is PLM? What are the phases involved in it? [8]
b) Explain Aesthetic and aesthetics consideration in product design. [6]
c) What are guidelines for Design for Robustness? Discuss. [4]

- Q7)** a) Describe in detail Legal Product of Design Patents. [8]
b) Define Purchase Order and Product Costing in vendor development.[6]
c) Explain Drawing Office procedure in detail. [4]

OR

- Q8)** a) Explain Production Part Approval Process Tools in detail. [8]
b) Explain Product Testing and its Validation. [6]
c) Describe Organization Structure in detail. [4]



Total No. of Questions : 8]

SEAT No. :

PD-4805

[Total No. of Pages : 2

[6404]-329

B.E. (Automation & Robotics)

DATA SCIENCE

(2019 Pattern) (Semester - VIII) (402552 A) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume suitable / standard data, if necessary.*

- Q1)** a) Why is effective communication of results important in data analytics?[8]
b) Why data preparation is considered a critical step in the data analytic lifecycle? [9]

OR

- Q2)** a) What is the primary goal of the discovery phase in data analytics? [8]
b) What does it mean to operationalize findings in the context of the data analytic lifecycle? [9]

- Q3)** a) What are Scikit-learn, how do you handle datasets in Scikit-learn, and why is this important for machine learning? [9]
b) When should logistic regression be used instead of linear regression?[9]

OR

- Q4)** a) How do you swap variables in a dataset, and why is this step important during data preprocessing? [9]
b) Discuss the Naive Bayes categorization technique, considering the assumptions it relies on. [9]

P.T.O.

- Q5)** a) Exactly what is the significance of an elbow plot in clustering, and how is it created? **[8]**
- b) Explain the role of sklearn metrics in evaluating machine learning models and how is a confusion matrix used to assess classifier performance?**[9]**

OR

- Q6)** a) What data does an AUC-ROC curve comprise, and how do you understand it? **[8]**
- b) Illustrate the K-Means clustering approach and its processes, as well as the benefits and drawbacks of using it. **[9]**

- Q7)** a) Provide an overview of the Hadoop ecosystem and its components.**[9]**
- b) Discuss the objective of a line chart in data visualization and give an example of how it can effectively represent patterns or trends in data.**[9]**

OR

- Q8)** a) Analyze the advantages of combining line charts, plots of scatter, histograms, density charts, and box plots in a holistic data visualization technique. **[9]**
- b) Explain the term histogram and clarify why it is useful for showing the typical distribution of numerical information. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-5338

[Total No. of Pages : 2

[6404]-332R

B.E. (Mechanical Sandwich) (Automation & Robotics Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester - VIII) (Elective - VI) (402044E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the Motion Sensor interfacing with any board. [7]
b) What are the main design principles and needed capabilities in IoT? [7]
c) Explain the IoT Input-Output Interface. [4]

OR

- Q2)** a) Describe three types of Serial Communication protocols supported by Arduino family communication peripherals. [10]
b) Describe Arduino Software with respect to Source Code, Compile Code and Upload Machine Code. [8]
- Q3)** a) Explain in detail IoT Communication APIs and their types. [7]
b) What are the popular communication technologies? Explain any four.[10]

OR

- Q4)** a) Explain Cloud Storage models and Communication. [8]
b) Explain and illustrate mapping of OSI model on TCP/IP. [9]

P.T.O.

- Q5)** a) Explain Real Time Location Sensing (RTLS) communication. [9]
b) Describe three parts of Message Queueing Telemetry (MQTT) protocol. [8]

OR

- Q6)** a) Explain SQL Back-end Application. [8]
b) Describe and illustrate the structure of Hyper Text Transport Protocol (HTTP). [9]

- Q7)** a) Explain IoT in Environmental Protection Modern Day IoT Applications. [10]
b) What are the legal challenges in implementing IoT applications. [8]

OR

- Q8)** a) Explain IoT applications for Health, Lifestyle and Connected Vehicles. [10]
b) Explain the future IoT ecosystem. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4806

[Total No. of Pages : 2

[6404]-334

B.E. (Robotics and Automation)

MACHINE VISION SYSTEM

(2019 Pattern) (Semester - VII) (411501)

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 in detail arithmetic mean filters with relevant mathematical equations. **[8]**

b) For the below given 5×4 image find out following : **[10]**

Image:

1 4 5 1 6

6 5 7 0 1

2 0 1 5 1

2 0 1 0 6

- i) Probability Density Function (PDF) of each pixel value.
- ii) Huffman's Code for each pixel value.
- iii) What is the Huffman's code length for highest & lowest probability for pixel and why? Justify your answer.

OR

Q2) a) Why it is important to know compression ratio & signal to noise ratio in any compression technique? Justify your answers? **[5]**

b) Draw & explain degradation model in image compression. **[5]**

P.T.O.

- c) Below is the 5×3 binary image. [8]

Image:

0 0 1 1 1

1 1 1 0 0

0 0 1 1 1

For the given image calculate following:

- i) Total number of Run length vectors.
- ii) Compression ratio.
- iii) Predict if data is compressed? Justify your answer.

- Q3)** a) How the image is segmented with technique-based approach? And explain Hybrid technique in detail. [9]
b) Write a short note on region-based segmentation technique in detail. [9]

OR

- Q4)** a) Explain approach-based segmentation in image segmentation. [9]
b) What do you understand by term clustering in image segmentation? Explain in detail with considering examples. [9]

- Q5)** a) Explain Fourier based alignment in motion estimation & how it is different from hierarchical motion estimation? [9]
b) Write a note on windowed correlation motion estimation technique. (expression is mandatory). [8]

OR

- Q6)** a) Write a note on rotation and scale motion estimation techniques with relevant example. [9]
b) Write a note on parametric motion estimation techniques. [8]

- Q7)** a) What do you understand by Principle Component Analysis (PCA)? Explain in detail. [8]
b) What are deep neural networks and how it can be implemented in humanoid robots? [9]

OR

- Q8)** a) What are convolutional neural networks explain how it is feasible to use in robotics applications. [8]
b) Explain in detail unsupervised learning and explain in detail. [9]

Total No. of Questions : 8]

SEAT No. :

PD-4807

[Total No. of Pages : 4

[6404]-335

B.E. (Robotics & Automation)

**ROBOT SYSTEM RELIABILITY AND SAFETY
(2019 Pattern) (Semester - VII) (411502)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2; Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8*
- 2) *Figure to the right indicates full marks*
- 3) *Neat Diagram must be drawn wherever necessary*
- 4) *Assume Suitable data if necessary*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed*

- Q1) a)** In the design of a space station, four major subsystems have been identified, each having a Weibull failure distribution with parameter values as given here:

Subsystem	Scale parameter, θ in yr	Shape parameter, β
Computer	3.5	0.91
Avionics	4.0	0.80
Structures	5.0	1.80
Life support	6.0	1.00

On the basis of the current average failure rate of each subsystem over the first year of the space station, apply the ARINC method to determine an average failure rate goal for each subsystem. If the reliability of the station must be 0.995 at the end of the first year. Determine the reliability for each of the major subsystems needed in order to reach the system goal. Also, prove that the goal is satisfied. **[9]**

- b) Explain the concept of redundancy. Explain any two methods of redundancy. Also, find reliabilities of these methods **[8]**

OR

P.T.O.

- Q2) a)** Allocate the reliability of electronic system used in a robotic system which has number of items in subsystem assemblies is 19 and with a goal of reliability for 95%, using AGREE Method of Reliability Allocation. If the given data for the mission is : **[9]**

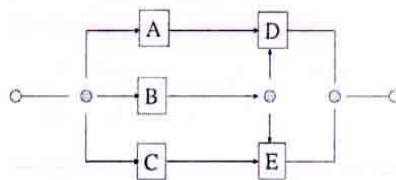
System Level 1 Subassemblies	Number of Items in Subassembly	Importance Factor	Mission Time of Subassembly
A	4	1	300
B	8	0.8	100
C	1	1	300
D	6	0.9	100

The input data of this electronic system is as follows :

Module	Number of components	Importance Factor
1	4	1
2	8	0.8
3	1	1
4	6	0.9

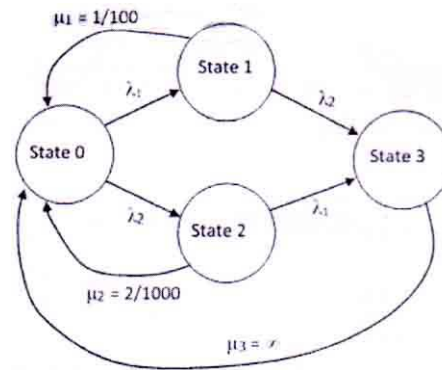
Also, find the allocated mean time between failures of each subsystem assemblies.

- b)** Consider below system. Use inspection technique and find an equation for the reliability of the system if all chunks are identical and independent.



Find the reliability of the following system if the probability of success of each component is 0.8. **[8]**

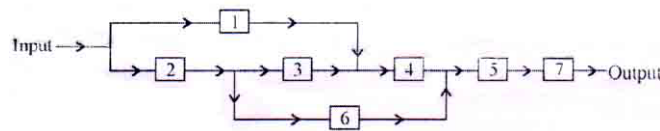
- Q3) a)** Explain the Minimum Effort method of Reliability Allocation. [9]
- b)** A two - element system model is subjected Markov Analysis having the block diagram given below :



Derive an expression of reliability for this system assuming the elements are independent and are parallel. Also, find the reliability if $\lambda_1 = 50E - 06$ failures per hour, $\lambda_2 = 20E - 06$ failures per hour, $\mu_1 = 0.001$ repairs per hour, and $\mu_2 = 2/1000$ repairs per hour. Consider the steady state transition throughout the system. [9]

OR

- Q4) a)** Evaluate the reliability of the system using the decomposition method for a mission of 1 year as shown in the reliability block diagram in the figure below : [9]



Assume that the reliability of each component is 0.90 and all components are independent of each other.

- b)** Optimize and allocate the reliability of a robot motors for 4 axis articulated robot using Minimum Effort Method, if cost of all motors should not exceed € 8000 : [9]

Joint	Component Feasibility	Initial Reliability	Minimum Reliability	Maximum Reliability	Per Unit Cost
J_i	f_i	R_i	$R_{i,min}$	$R_{i,max}$	C_i
1	0.68	0.985	0.9	0.999	30
2	0.66	0.985	0.9	0.999	30
3	0.66	0.985	0.9	0.999	40
4	0.64	0.98	0.9	0.999	40

- Q5) a)** Explain the functions of OSHA. How it affects the decisions of any organizations? **[9]**
- b)** Explain RULA and REBA to evaluate musculoskeletal disorder. **[9]**

OR

- Q6) a)** Explain in detail about ISO45001: 2018. **[9]**
- b)** Explain in detail about Electrical Hazards. **[9]**

- Q7) a)** Differentiate between Unsafe Condition and Unsafe Act with relevant examples and case study. **[8]**
- b)** Explain the code of practice in IS 15656:2006. **[9]**

OR

- Q8) a)** What are various methods to avoid, control and measure hazards? Explain with relevant case study. **[8]**
- b)** Explain various provisions of Factory Act 1948. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-5279

[Total No. of Pages : 2

[6404]-337R

B.E. (Robotics & Automation Engineering)

WIRELESS SENSOR NETWORK

(2019 Pattern) (Semester - VII) (411503 B) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What is mean by wireless standards? Why do we need wireless standard in wireless sensor network? Explain any 2 in wireless standards in detail. **[9]**

b) Explain cross layer wireless protocol stack in detail along with diagram. **[9]**

OR

Q2) a) Explain IEEE802.15.4 low rate wpan in detail with suitable diagram. **[9]**

b) What is zigbee? Why we need it? Explain zigbee architecture in detail. **[9]**

Q3) a) What is the concept of localization in wsn? Explain various challenges and properties of localization. **[9]**

b) Explain range based localization in detail along with diagram. **[9]**

OR

Q4) a) Explain the following terms in detail : **[9]**

- i) Received Signal Strength Indicator (RSSI)
- ii) Time of Flight (ToF)
- iii) Time Difference of Arrival (TDoA)
- iv) Multilateration

b) Explain range free localization in detail along with diagram. **[9]**

P.T.O.

- Q5) a)** What is the need of data aggregation and security in WSN? Explain clustering techniques in detail. **[8]**
- b)** Explain different security issues present in WSN. **[9]**
- OR**
- Q6) a)** Which are the different attacks that we face in WSN while data aggregation. **[8]**
- b)** Explain the terms data Confidentiality, data Integrity, data Authentication, data Availability with respect to WSN security. **[9]**
- Q7) a)** Explain various stages involved while designing and deploying WSN applications. **[8]**
- b)** Explain the terms unit testing, system testing, and performance testing, Security testing in detail with reference to general testing and validation process for WSN applications. **[9]**
- OR**
- Q8) a)** Explain the terms Reliability and Stability Testing, Acceptance Testing, Documentation and Reporting, Maintenance and Continuous Improvement in detail with reference to general testing and validation process for WSN applications. **[8]**
- b)** Explain Bottom-up implementation process in detail along with diagram. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4809

[Total No. of Pages : 2

[6404]-338

B.E. (Robotics & Automation Engineering)

MICROPROCESSOR AND MICROCONTROLLER

(2019 Pattern) (Semester - VII) (411503 C) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Discuss the significance of following signals of 8085 in detail: HOLD, READY, ALE, HLDA. **[8]**

b) Illustrate the addressing modes of 8051 microcontroller. Support your answer with suitable examples. **[9]**

OR

Q2) a) Analyze the architecture of 8051 microcontroller along-with a suitable block diagram. **[8]**

b) Analyze the PSW of 8051 and also explain the relevant flag bits. **[9]**

Q3) a) Analyze the architecture of PIC18FXX microcontroller along- with a suitable block diagram. **[9]**

b) Explain **[8]**

i) Watch Dog Timers

ii) Power down modes

OR

Q4) a) Comparison of the PIC family. **[8]**

b) Illustrate the Instruction set of PIC18FXX microcontroller. Support your answer with suitable examples. **[9]**

P.T.O.

- Q5) a)** Draw the interfacing diagram of Seven segment LED with Cortex M4 based microcontroller. Also write basic algorithm used for this interfacing. **[9]**
b) Write down concept of GPIO programming. **[9]**

OR

- Q6) a)** Draw the interfacing diagram of LDR and MQ3 with STM32F4xx based microcontroller and explain it. **[9]**
b) Explain STM32F4xx: Timers and counters **[9]**

- Q7) a)** Write down short note on Unmanned Vehicle Design Using Microcontroller. **[9]**
b) Explain in details Mobile Robot Analysis and control for Pipe Line Inspection. **[9]**

OR

- Q8) a)** What is interrupt driven data transfer? Is it a form of programmed data transfer or not? While writing an interrupt service subroutine, what special features are usually incorporated extra in comparison to a normal subroutine? Justify. What is the difference in execution of RET and IRET instructions? **[9]**
b) Give the Bus Cycle timing diagrams for IN and OUT instructions. How are they different from comparable MOV instructions? Can MOV instruction be ever used for I/O operation? If yes, what the I/O type is then called? If no, why not? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4810

[Total No. of Pages : 2

[6404]-339

**B.E. (Robotics and Automation Engineering)
ERGONOMICS AND WORK MANAGEMENT
(2019 Pattern) (Semester - VII) (411503 D) (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) *Assume suitable data if necessary.*
- 4) *Use of Non-programmable scientific calculators is allowed*
- 5) *Figures to the right indicate full mark.*

- Q1)** a) Explain the principles for design of product using anthropometry. [9]
b) Discuss the design of work surface. [8]

OR

- Q2)** a) Explain in detail static information displays. [9]
b) Discuss the effect of noise, heat and dust on human performance in work. [8]

- Q3)** a) What are the stages of design research? [9]
b) What is Model-based systems engineering? Explain in detail. [9]

OR

- Q4)** a) Write the significance of product life cycle in consumer product design. [9]
b) What is innovation in consumer product design. [9]

- Q5)** a) Discuss in detail micro-motion study. [9]
b) Why KANBAN system is implemented in industries? [8]

P.T.O.

OR

Q6) a) Productivity is responsible for improvement of life style of consumer. Justify. [9]

b) Discuss MTM and MOST. [8]

Q7) a) How to implement Occupational safety at work? [9]

b) List and explain occupational diseases. [9]

OR

Q8) a) Explain in detail housekeeping in industries. [9]

b) How to develop industrial psychology for accident prevention in industries? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4811

[Total No. of Pages : 2

[6404]-340

B.E. (Robotics and Automation)

COMPUTATIONAL FLUID DYNAMICS

(2019 Pattern) (Semester - VII) (Elective - IV) (411504(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Use of scientific calculator is allowed.*
- 3) *Figures to the right side indicate full marks.*

- Q1)** a) Explain the basic concepts of the Finite Volume Method (FVM) and its advantages over other numerical methods such as the Finite Difference Method (FDM)? **[9]**
- b) Discuss the role of boundary conditions in solving a 1-D steady-state diffusion problem using the Finite Volume Method. How would improper handling of boundary conditions affect the solution? **[9]**

OR

- Q2)** a) Illustrate the process of setting up the Finite Volume Method for a 2-D steady-state diffusion problem. Include a discussion on how the fluxes across control volume faces are treated in the formulation? **[9]**
- b) Analyze the challenges faced when applying higher-order advection schemes in FVM. Such as the QUICK scheme, in terms of implementation complexity and numerical stability? **[9]**
- Q3)** a) Explain the process of discretizing the momentum equation in the context of the Finite Volume Method. Discuss the significance of integrating the equation over control volumes and handling convective and diffusive fluxes. **[9]**
- b) Compare the Primitive Variable approach with the Stream Function-Vorticity approach for solving fluid flow problems. Discuss the circumstances under which each method is more appropriate? **[8]**

OR

P.T.O.

- Q4)** a) Describe the Stream Function-Vorticity approach for solving incompressible flow problems. Highlight the advantages and limitations of using this approach compared to other methods [9]
- b) What is the SIMPLEC (SIMPLE Consistent) algorithm, and how does it differ from the standard SIMPLE algorithm? Discuss its benefits in terms of convergence speed and accuracy? [8]
- Q5)** a) Define a computational grid in the context of CFD and explain its role in the numerical solution of fluid flow and heat transfer problems. Why is grid quality important for accurate simulations? [9]
- b) Explain the process of geometric modeling and surface grid generation. Why is this step crucial before generating a volume grid in CFD simulations? [8]

OR

- Q6)** a) Compare and contrast structured and unstructured grids in CFD. Include their respective advantages, disadvantages, and applications in different types of flow problems. [9]
- b) Explain the concept of a multi-block grid system. How does it help in managing complex geometries and ensuring grid quality in CFD simulations? [8]
- Q7)** a) Explain the application of CFD in battery simulation for electric vehicles and energy storage systems. What specific parameters and challenges are addressed through CFD analysis in battery performance and thermal management? [9]
- b) Describe how CFD is applied for heat transfer and thermal management simulations. Discuss its importance in designing systems with efficient cooling and heating mechanisms, providing examples of relevant applications? [9]

OR

- Q8)** a) What are the current limitations of CFD in terms of simulation accuracy and computational cost? Discuss potential future developments that may help overcome these limitations and improve CFD's effectiveness in engineering analysis? [9]
- b) Discuss recent trends in Computational Fluid Dynamics (CFD). Including advancements in algorithms, computational power, and the integration of Artificial Intelligence (AI) and Machine Learning (ML) in simulation? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4812

[Total No. of Pages : 2

[6404]-341

B.E. (Robotics & Automation)

**INTERNET OF THINGS & MACHINE LEARNING
(2019 Pattern) (Semester - VII) (411504 B)(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) Assume suitable data, if necessary.
- 3) Figures to the right side indicates full marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of calculator is allowed.

- Q1)** a) What are cloud storage use cases? [6]
b) Which are the Advantages and benefits of data cleaning? [6]
c) What is an API? How it works? [5]

OR

- Q2)** a) What are Pros and cons of cloud storage? [6]
b) What are the difficulties of medium access in wireless networks? [6]
c) How to use Python to analyze data? [5]

- Q3)** a) How Machine Learning Works? [6]
b) What Is Artificial Intelligence? [6]
c) What is Overfitting in Machine Learning? [5]

OR

- Q4)** a) What is Machine Learning? [6]
b) What is data collection and preprocessing? [6]
c) What is Underfitting in Machine Learning? [5]

- Q5)** a) How to install and configure a web server? [6]
b) Give the Specifications of ESP8266 Wi-Fi Module. [6]
c) Explain Dynamic vs. static web servers. [6]

OR

- Q6)** a) How to connect ESP8266 with web server? [6]
b) How to send sensor data to web server? [6]
c) What is the ESP8266 Wi-Fi Module? [6]

P.T.O.

- Q7)** a) How IoT is used in healthcare system? [6]
b) What is smart crop monitoring system using IoT? [6]
c) What kind of challenges can you face while implementing IoT? [6]
- OR
- Q8)** a) What are IoT healthcare devices? [6]
b) What is Autonomous vehicle? State six levels of autonomy. [6]
c) What is the role of IoT in smart cities? [6]



Total No. of Questions : 8]

SEAT No. :

PD-4813

[Total No. of Pages : 2

[6404]-342

B.E. (Robotics and Automation)

**ARTIFICIAL NEURAL NETWORKS AND FUZZY
SYSTEMS**

(2019 Pattern) (Semester - VII) (411504 C) (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,orQ.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Describe the convergence rule in neural network training. Why is it important? [9]

b) Explain the detailed architecture of a neural network. [8]

OR

Q2) a) How do neurons in a single-layer Artificial Neural Network (ANN) process input signals? [9]

b) Discuss on auto-associative and hetro-associative network. [8]

Q3) a) Explain the concept of partial truth in fuzzy logic. How does it handle uncertainty? [9]

b) Discuss Fuzzy set theory with its operations. [8]

OR

Q4) a) What is a membership function in a fuzzy set? Provide an example.[9]

b) Enlist properties of fuzzy sets. [8]

P.T.O.

Q5) a) Which are the various applications of fuzzy logic. Explain any one in detail. [9]

b) What is Fuzzyfications & Defuzzificataion concept. [9]

OR

Q6) a) Describe the characteristics of different types of membership functions, such as triangular, trapezoidal, and Gaussian. [9]

b) How do you handle overlapping membership functions in a flizzy system? [9]

Q7) a) How is fuzzy logic used in control systems like home appliances, automotive, and robotics? [9]

b) What is fuzzy interference system. [9]

OR

Q8) a) How does the max-min composition work in fuzzy relations? [9]

b) Brief of industrial case study on fuzzy logic. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4814

[Total No. of Pages : 2

[6404]-343

B.E. (Robotics & Automation Engineering)

POWER ELECTRONICS AND DRIVES

(Elective - IV) (2019 Pattern) (Semester - VII) (411504 D) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** With the help of neat circuit diagram and associated waveforms discuss the operation of a Buck converter. **[9]**
- b)** A Step Down dc chopper has a resistive load of $R=15\Omega$ and Input voltage $E_{dc} = 200V$. When the chopper remains ON, its voltage drop is 2.5V. The chopper frequency is 1kHz. If the duty cycle is 50%, determine: **[9]**
- i) Average Output Voltage
 - ii) RMS Output Voltage
 - iii) Chopper Frequency

OR

- Q2) a)** With the help of a neat circuit diagram and associated waveforms, discuss the operation of Buck-Boost converter. List the advantages and disadvantages of this type of converter. **[9]**
- b)** Describe the voltage commutated chopper with associated voltage and current waveforms as a function of time. **[9]**
- Q3) a)** With the help of neat circuit diagram and waveforms, explain the operation of thyristorised three-phase bridge inverter with resistive load in 120° Conduction mode. **[9]**
- b)** Why Voltage control is needed in inverter circuits? State the various methods of voltage control in inverter circuits and explain each of them briefly. **[8]**

P.T.O.

OR

- Q4) a)** Compare between Voltage Source Inverter & Current Source Inverter. [9]
b) With the help of neat circuit diagram and associated waveforms, explain the operation of single phase half bridge Voltage Source Inverter with (i) Resistive Load and (ii) Inductive Load. [8]

- Q5) a)** Discuss the working of delta connected three phase A.C. regulator with suitable power diagram. Also, draw the various waveforms for $\alpha = 120^\circ$. [9]
b) Give the various configuration of three-phase A.C. regulators. List the important points of comparison between these circuits. [9]

OR

- Q6) a)** Describe the operation of single phase to single phase step Down cycloconverter with neat power-diagram and voltage and current waveforms. [9]
b) Describe the operation of single-phase Full-wave A.C. voltage regulator with the help of voltage and current waveforms. Also derive the expression for average value of output voltage. [9]

- Q7) a)** Draw and explain the operation of four-quadrant A.C. voltage controller. [8]
b) Draw & explain the power circuit of semiconverter feeding a separately excited D.C. motor. Explain with typical voltage and current waveforms. [9]

OR

- Q8) a)** Draw & Explain the operation of single-phase, half- wave converter drive. Also, draw the voltage and current waveforms. [9]
b) State & discuss the various methods of speed control of induction motor. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4815

[Total No. of Pages : 2

[6404]-344

B.E. (Robotics and Automation)

Field and Service Robots

(2019 Pattern) (Semester - VIII) (411508)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Discuss the concept of a lightweight autonomous climbing robot designed to assist elderly and disabled individuals. Provide a detailed explanation of its functionality and benefits. **[9]**
- b) Provide a brief overview of the importance of planning under uncertainty and how it enhances the reliability of robotics in healthcare. **[9]**

OR

- Q2)** a) Briefly explain how the development of a personal service robot with user-friendly interfaces improve the user experience. **[9]**
- b) Explain in detail the concept of an advanced robotic library system designed for managing an off-site shelving facility. **[9]**

- Q3)** a) Briefly describe how the use of robot and sensor teams for distributed search and rescue operations improve efficiency in emergency situations. **[9]**
- b) Explain in detail the concept of developing a pneumatically controlled expandable arm designed for searching in confined or restricted-access environments. Also, describe the main features and functions of the Distal Expandable Tube. **[9]**

OR

P.T.O.

- Q4)** a) Provide a detailed description of the concept behind developing mobile robots specifically designed for search and rescue operations. [9]
- b) Discuss how the use of spraying robots in grape production supports sustainable agriculture practices. Include an analysis of the environmental and economic benefits these robots offer compared to traditional spraying techniques. [9]
- Q5)** a) Briefly explain why real-time navigation, guidance, and control are essential for UAVs. Outline the methods used to achieve these real-time capabilities with low-cost sensors, and discuss how they impact UAV performance. [9]
- b) Discuss the significance of compact millimetre-wave radar sensors for UAVs. Provide a brief overview of their features and practical applications, emphasizing how they improve UAV operational capabilities. [8]

OR

- Q6)** a) Describe the process of obtaining helicopter control knowledge from human pilots to enable autonomous flight. Highlight the main experimental methods used in this research area and summarize the key findings these methods have produced. [9]
- b) Examine the challenges faced in achieving autonomous helicopter landings on moving targets. Provide a brief overview of the strategies used to address these difficulties and assess their effectiveness. [8]
- Q7)** a) Explain the importance of creating a multi-purpose eight-legged robot for testing neural interfaces. Give a concise overview of its design and capabilities, and assess how it could be applied to advance neural interface technology evaluations. [9]
- b) Explain the significance of effective human-robot interaction in completing skilled tasks with an interactively operated service robot. Discuss the main challenges faced in achieving smooth collaboration between humans and robots in skilled work settings, along with potential solutions to improve this cooperation. [8]

OR

- Q8)** a) Briefly explain the concept of real-time interactive presence and its role in enhancing human-robot interaction. Describe the techniques used to create online presence and examine their impact on the design of immersive virtual environments. [9]
- b) Briefly discuss how integrating road scene monitoring with vehicle control systems improves road safety. Highlight the key technologies and methodologies used in this integration. [8]



Total No. of Questions : 8]

SEAT No. :

PD4816

[Total No. of Pages : 2

[6404]-345

**B.E. (Robotics & Automation Engineering)
PLC AND SCADA PROGRAMMING
(2019 Pattern) (Semester-VIII) (411509)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the rules for PLC Ladder Diagram Programming, memory mapping and Input/output addressing. **[8]**

b) Write a program using NO-NC & Counter for any application of PLC. **[9]**

OR

Q2) a) Write Short Notes on, **[8]**
i) Ladder logic

ii) Functional block diagram

b) Explain modes of operation and concepts of Timer, Latching and Interlocking with diagram. **[9]**

Q3) a) What is DCS? How is it used in industry? Also State Advantages and Disadvantages of DCS. **[8]**

b) Explain the networking Protocols- **[9]**

i) Ethernet

ii) CAN open

iii) HART

OR

Q4) a) By using SCADA and DCS in Industry 4.0 compare its advancements to conventional systems. **[8]**

b) State the applications in industry where Field bus, Process bus & Modbus are used. **[9]**

P.T.O.

- Q5) a)** What are components of SCADA? Explain any three in short. **[9]**
- b)** How SCADA can be implemented to monitor the Railways, Traffic signals, Thermal Power Station? **[9]**

OR

- Q6) a)** What is SCADA? Explain issues faced by SCADA in the industry. **[9]**
- b)** What is wireless SCADA? Explain its basic components. **[9]**
- Q7) a)** Explain various Inputs and Outputs that can be used in PLC for industrial applications. **[9]**
- b)** Explain the Following: **[9]**
- i) Mechanically operated Switch
 - ii) Encoder and Decoder
 - iii) Contactors

OR

- Q8) a)** Design the Ladder logic, for the example of boxes counting control System and explain each Rung. **[9]**
- b)** Using Ladder Logic design Sequential switching of motors and Motor interlocking. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PD-4817

[Total No. of Pages : 2

[6404]-346

B.E. (Robotics and Automation)

REVERSE ENGINEERING

(2019 Pattern) (Semester - VIII) (411510 A) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Solve Q.1 Or Q.2,Q.3, or Q.4, Q.5 or Q.6,Q.7,orQ.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Use of Logarithmic Table, Slide rule or Electronic pocket calculator is allowed.*
- 5) *Figures to the right indicates full marks.*

Q1) a) Explain single and double camera triangulation non-contact type methods. [9]

b) Explain contact type methods in reverse engineering with its advantages and disadvantages. [9]

OR

Q2) a) Classify reverse engineering software based on application. [9]

b) Explain the working principle of CT Scanner. [9]

Q3) a) Explain touch trigger probe and continuous analogue scanning probe. [9]

b) Explain the concept of detailed vendor assessment and benchmarking in selection process of reverse engineering. [8]

OR

Q4) a) With neat sketch explain the concept of X-ray tomography. [8]

b) Write a note on tracking system in reverse engineering. [9]

P.T.O.

- Q5)** a) Write a short note on data processing in rapid prototyping. [9]
b) With neat sketch explain Adaptive Slicing Approach for Cloud Data Modeling. [9]

OR

- Q6)** a) Explain Modeling of Cloud Data in Reverse Engineering. [9]
b) Explain the Integration of Reverse Engineering and Rapid Prototyping for Layer-based Model Generation. [9]

- Q7)** a) Explain the legal aspects of reverse engineering. [8]
b) Explain with neat sketch application of Reverse engineering in automotive industry. [9]

OR

- Q8)** a) Explain the barriers in adopting reverse engineering. [8]
b) Explain the application of Reverse engineering in Knee replacement. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4818

[Total No. of Pages : 5

[6404]-347

B.E. (Robotics and Automation)

DATA ANALYTICS

(2019 Pattern) (Semester - VIII) (411510 B) (Elective V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory i.e. Solve Q.1 Or Q.2,Q.3, or Q.4, Q.5 or Q.6,Q.7,orQ.8.*
- 2) *Assume Suitable data if necessary.*
- 3) *Use of Electronic pocket calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) A study was conducted to evaluate consumer preferences for personal robotic assistants based on specific attributes and levels: **[9]**

Attributes	Level 1	Level 2	Level 3
Mobility Type	Wheeled	Legged	Flying
Task Capability	Household Tasks	Companion/Social Tasks	Advanced Technical Tasks
Size (cm)	Small (30 cm)	Medium (50 cm)	Large (80 cm)
Battery Life (hours)	4 hours	8 hours	12 hours
Price (in USD)	\$200	\$500	\$800

After analyzing the data and conducting regression analysis, the following utility equation was derived to predict consumer preference (U) based on these attributes:

$$U = 15 + (5 \times \text{Legged Mobility}) + (8 \times \text{Flying Mobility}) + (6 \times \text{Companion/Social Tasks}) + (10 \times \text{Advanced Technical Tasks}) + (4 \times \text{Medium Size}) + (7 \times \text{Large Size}) + (2 \times 8 \text{ hour Battery Life}) + (3 \times 12 \text{ hour Battery Life}) - (0.5 \times \$500 \text{ Price}) - (0.8 \times \$800 \text{ Price})$$

P.T.O.

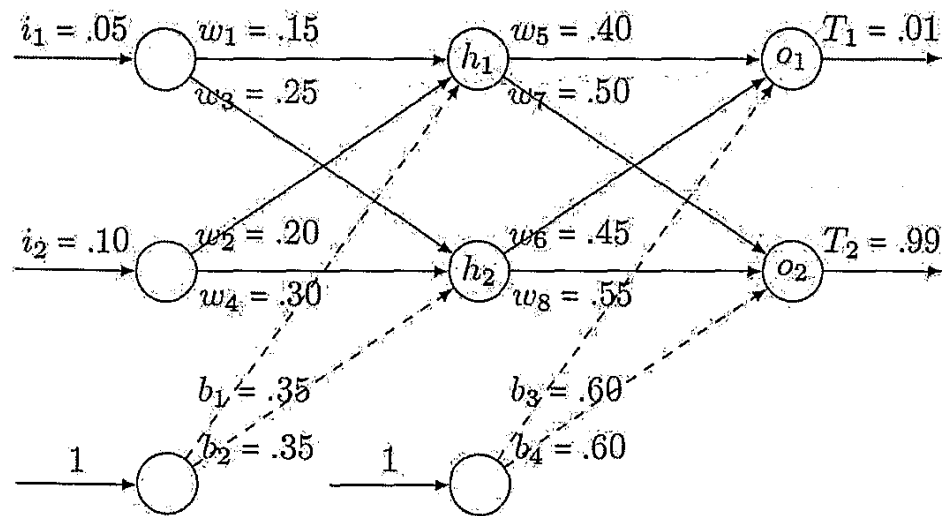
- i) Calculate the part-worth utility score for each level of every attribute.
 - ii) Determine the importance of each attribute.
 - iii) Calculate the predicted utility (U) for a personal robotic assistant with the following attributes: Mobility Type: Legged, Task Capability: Advanced Technical Tasks, Size: Large (80 cm), Battery Life: 12 hours, Price: \$500
 - iv) How much more valuable (in dollars) is a Flying robot compared to a Legged robot.
- b) In a robotics project, aim is to predict the energy consumption (in watt-hours) of a robot based on two independent variables: distance traveled (in meters) and payload weight (in kilograms). The dataset collected from various robot runs is as follows: [9]

Run	Distance (meters)	Payload(kg)	Energy Consumption (watt-hours)
1	5	2	300
2	8	3	420
3	3	2	250
4	10	4	500
5	6	2.5	350

- i) Write down the general equation for the multi linear regression model to predict energy consumption (Y) based on distance traveled (X1) and payload weight X2).
- ii) Compute the coefficients (intercept and slopes) of the regression model using the given data.
- iii) Suppose a robot travels a distance of 7 meters with a payload weight of 3.5 kg. Use your regression model to predict its energy consumption.

OR

- Q2) a)** Given the following network, compute the outputs from o_1 and o_2 (assume that the activation function is the sigmoid function). Also calculate Mean Squared Error (MSE). [9]



- b) You are working with a dataset representing feature vectors extracted from objects detected by a robot's sensors. The dataset consists of 6 feature vectors:
 $\{(0.5, 0.8), (1.2, 1.5), (2.0, 2.5), (3.2, 3.3), (4.0, 4.5), (5.0, 5.5)\}$ Use $k=2$
 Choose initial cluster centroids: $C1=(1,1)$, $C2=(4,4)$
 Apply k-means algorithm to assign feature vectors to clusters and update the centroids. [9]

- Q3) a)** Explain Logistic Regression in detail with example. [8]
 b) Suppose a robot is using a camera to classify objects as either "plants" or "machines." Here are the results for 10 observations: [9]

Observation	Expected	Predicted
1	Plant	Machine
2	Machine	Machine
3	Plant	Plant
4	Plant	Plant
5	Machine	Plant
6	Machine	Machine
7	Plant	Plant
8	Plant	Plant
9	Machine	Machine
10	Plant	Plant

- i) Compute the confusion matrix for the data.
 ii) Compute the accuracy, precision, recall, sensitivity and specificity of the data.

OR

- Q4)** a) Explain random forest in detail with example. [8]
b) Use a support vector machine to classify the following training set:[9]

X1	X2	Class
1	1	+
2	2	+
2	0	+
0	0	-
1	0	-
0	1	-

- i) Determine the vector w and intercept b .
ii) Plot Decision boundary with training points on an X_1 - X_2 axis.
iii) Find the class of point (0,2)

- Q5)** a) Explain the Expert system with an example? [8]
b) Use PCA to reduce the dimension from 2 to 1 from given data: [9]

Feature	Example 1	Example 2	Example 3	Example4
X1	4	8	13	7
X2	11	4	5	14

OR

- Q6)** a) Explain the Decision tree with an example? [8]
b) Consider the following set of training examples: [9]

Instance	Classification	a_1	a_2
1	+	T	T
2	+	T	T
3	-	T	F
4	+	F	F
5	-	F	T
6	-	F	T

- i) What is the entropy of this collection of training examples with respect to the target function “classification”?
ii) What is the information gain of a_1 and a_2 relative to these training examples?

Q7) a) Write a short note on :

i) Reinforcement learning

ii) SARSA Learning [10]

b) Explain Monte Carlo simulation in detail. [8]

OR

Q8) a) Write a short note on :

i) Markov Chain analysis

ii) Regression based ML model [10]

b) Explain Q learning and its application [8]



Total No. of Questions : 8]

SEAT No. :

PD-4819

[Total No. of Pages : 3

[6404]-348

B.E. (Robotics and Automation)

**ENTREPRENEURSHIP AND INNOVATIONS
(2019 Pattern) (Semester - VIII) (411510 C) (Elective V)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicates full marks.*
- 2) *Assume Suitable data if necessary.*
- 3) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Solve Q.1 Or Q.2,Q.3, or Q.4, Q.5 or Q.6,Q.7,orQ.8.*

Q1) a) Critically assess government policies that support entrepreneurship. How do they impact the startup ecosystem? [8]

b) How does innovation contribute to the growth and sustainability of entrepreneurial ventures, and could you highlight some innovative startups as case studies? [9]

OR

Q2) a) What role does entrepreneurship play in fostering job growth and driving economic progress within developing nations? [8]

b) How do government policies aimed at supporting entrepreneurship influence the dynamics of the startup ecosystem, and what are their potential strengths and weaknesses? [9]

Q3) a) How do entrepreneurs incorporate financial forecasting into project formulation? Can you give an example from a successful Indian venture? [9]

b) What is the importance of conducting thorough project evaluation before committing resources? [9]

OR

P.T.O.

Q4) a) What approaches do companies utilize to conduct field-studies and gather information essential for project identification within the context of accountancy? [9]

b) What role does balance sheet preparation play in aiding entrepreneurs' project identification efforts, emphasizing the importance of financial analysis? [9]

Q5) a) Define the concept of cost of capital and outline its importance in Financial decision-making. [4]

b) Total debt = ₹ 50,00,000 [4]

Interest expense = ₹ 3,00,000

Equity = ₹1,20,00,000

Beta coefficient = 1.2

Risk-free rate = 5%

Market return = 15%

Expected dividend per share next year = ₹ 5

Current market price per share = ₹ 100

Growth rate of dividends = 8%

Calculate:

i) The cost of debt (r_D).

ii) The cost of equity (r_E) using both the Capital Asset Pricing

iii) Model (CAPM) and the Dividend Discount Model (DDM).

The Weighted Average Cost of Capital (WACC) assuming the weights of debt and equity are 40% and 60%, respectively.

c) How does cost-volume-profit analysis contribute to profit planning strategies? [9]

OR

- Q6)** a) Identify and describe three key financial functions integral to product planning and control. [4]
- b) Total debt = ₹ 70,00,000 [4]
Interest expense = ₹ 3,50,000
Equity = ₹ 1,50,00,000
Beta coefficient = 1.3
Risk-free rate = 5.5%
Market return = 14%
Expected dividend per share next year = ₹ 6
Current market price per share = ₹120
Growth rate of dividends = 7% Calculate:
- i) The cost of debt (r_D).
- ii) The cost of equity (r_E) using both the Capital Asset Pricing Model (CAPM) and the Dividend Discount Model (DDM).
- iii) The Weighted Average Cost of Capital (WACC) assuming the weights of debt and equity are 45% and 55%, respectively.
- c) What are the key policies guiding public enterprises in India, and why are they important for the country's economic development? [9]

- Q7)** a) Analyze the impact of international taxation on Indian businesses with global operations. How do cross-border tax norms influence the strategies of Indian Multi National Corporations (MNCs)? [9]
- b) What challenges do entrepreneurs face regarding Indian laws? Give examples. [9]

OR

- Q8)** a) Explain the importance of fair competition regulations for startups. [9]
- b) What challenges do businesses face in complying with taxation laws in India, especially with frequent regulatory changes? How can they mitigate risks related to tax audits and disputes? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4820

[Total No. of Pages : 2

[6404]-350

B.E. (Robotics and Automation)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VIII) (411511 A) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *All questions are compulsory. Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8*
- 2) *Assume suitable data jf necessary*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain Fused Filament Fabrication (FFF) process with suitable sketch. List its Benefits, Limitations & Applications **[8]**
- b) Explain Bio-printing process in detail. **[5]**
- c) Explain Direct Ink Writing (DIW) process in detail. **[5]**

OR

- Q2)** a) Explain Plasma deposition process with suitable sketch. List its Benefits, Limitations & Applications. **[9]**
- b) Explain Polyjet Printing What are the advantages and limitations of Polyjet Printing. **[9]**
- Q3)** a) Explain DFAM. What are the rules and recommendations for DFAM. **[9]**
- b) Explain Surface enhancement Techniques used in additive manufacturing based products. **[9]**

OR

P.T.O.

- Q4)** a) Explain error sources in Additive Manufacturing. [8]
b) Write short note on 4D printing. [5]
c) Write short note on Biomimetic materials [5]

- Q5)** a) Explain the functions of Powder Handling System and Laser controller in additive manufacturing machine. [8]
b) Explain the classification of Equipment Topology/Layout Frame Designs used in 3D Printers with illustrations. [9]

OR

- Q6)** a) Explain function of Cooling system and Gas Recirculation System in AM [8]
b) What are the different types of In-fill pattern? Describe in details [9]
- Q7)** a) Explain the applications of AM in Health care industry, Food-Processing and consumer application industry with suitable case study [8]
b) Write a short note on Bio-materials and its applications [9]

OR

- Q8)** a) Explain how additive manufacturing is used in Automotive Industries. Also write merits, demerits and practical feasible applications with illustrations [8]
b) Write a short note on Bio-printing and its applications [9]



Total No. of Questions : 8]

SEAT No. :

PD-4821

[Total No. of Pages : 2

[6404]-351

B.E. (Robotics & Automation)

INDUSTRY 4.0

(2019 Pattern) (Semester - VIII) (411511(B)) (Elective - VI)

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) Figures to the right indicate full marks.*
- 5) Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

- Q1) a)** What do you mean by Process Automation and Optimization? **[8]**
b) What is mean by Predictive maintenance and Anomaly Detection in Industry? **[10]**

OR

- Q2) a)** What is Cyber Physical System? **[8]**
b) Explain term : **[10]**
i) Digital Twin
ii) Process Automation and Robotization

- Q3) a)** What is Mean by Cloud Programming? **[9]**
b) Draw and Explain Architecture of cloud applications? **[9]**

OR

- Q4) a)** Explain Different Cloud deployment Techniques? **[9]**
b) Explain Fog Computing in detail. **[9]**

P.T.O.

- Q5) a)** Write short note on : **[8]**
- i) Digital Forensics
 - ii) Cyber defense
- b) Explain terms Data Communication and Networking with its characteristics. **[9]**

OR

- Q6) a)** What is Security system and its function. **[8]**
- b) Explain Cyber Laws and cyber policies in Industry 4.0? **[9]**

- Q7) a)** Write note on IoT And IIoT case Studies. **[8]**
- b) What is AI, explain in details. **[9]**

OR

- Q8) a)** Explain IIoT with its benefits and Disadvantages. **[9]**
- b) Explain the term Industry 4.0 laboratories. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4822

[Total No. of Pages :2

[6404]-352

B.E. (Robotics & Automation Engineering)

VLSI DESIGN FOR ROBOTICS

(Elective - VI)(411511 C) (2019 Pattern) (Semester - VIII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Write about the FGPA Architecture along with its Features, Specifications and Applications. **[8]**

- b) Write Short note on: **[9]**
- i) Clock management techniques
 - ii) Simulation Tools
 - iii) Synthesis Tools

OR

Q2) a) Describe the Design Flow for PLD Architectures and give its applications. **[8]**

- b) Write about the CPLD Architecture along with its Features, Specifications and Applications. **[9]**

Q3) a) Describe the Hot electron effect and Velocity saturation. Give proper example with diagram. **[8]**

- b) Describe the terms N-MOS, P-MOS and CMOS with suitable circuit diagrams. **[9]**

OR

P.T.O.

- Q4)** a) Differentiate between P-MOS and N-MOS systems. [8]
b) What is Technology scaling? Also explain Channel length modulation with neat circuit diagram. [9]

- Q5)** a) Explain Design Flow and Cell design specifications for IC's with circuit diagram. [9]
b) What is AC and DC analysis? Write about Transfer Characteristics and its Transient responses. [9]

OR

- Q6)** a) Give detail explanation of Library cell designing for NAND & NOR with proper circuit diagram. [9]
b) Explain the following: [9]
i) Noise analysis
ii) Lambda rules
iii) Design Rule Check
- Q7)** a) Write in short about the VLSI Testing and Analysis along with its applications. [9]
b) Explain the Following for VLSI Testing: [9]
i) Types of fault
ii) Need of Design for Testability (DFT)
iii) DFT Guideline

OR

- Q8)** a) Describe the Test pattern generation, Sequential circuit test and Built In Self Test for VLSI circuit. [9]
b) What is a Built In Self Test, JTAG & Boundary scan? Explain with neat diagram. [9]



Total No. of Questions : 8]

SEAT No. :

PD-5337

[Total No. of Pages : 2

[6404]-353R

B.E. (Robotics and Automation)

INTELLIGENT ROBOTICS SYSTEMS

(2019 Pattern) (Semester - VIII) (411511 D) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Elaborate role of micro grippers in microrobotics. **[9]**

b) Explain working of Walking MEMS Robot. **[8]**

OR

Q2) a) Discuss in detail elements in micro robot communication system. **[9]**

b) Brief on Micro robot powering system in detail. **[8]**

Q3) a) Define neurorobotics and explain how it integrates principles from neuroscience and robotics. **[9]**

b) Write in brief cerebral models in robotics. **[8]**

OR

Q4) a) Elaborate optic flow in robots. **[9]**

b) Why speech recognition is important in neuro robots? Explain it. **[8]**

P.T.O.

- Q5) a)** Define cloud robotics and explain how it differs from traditional robotic systems. **[9]**
- b) Discuss how to build a networked telerobotic system. **[9]**

OR

- Q6) a)** Brief on Autonomous mobile robot on the web. **[9]**
- b) Explain Web software architecture in detail. **[9]**
- Q7) a)** Discuss the key differences between traditional industrial robots and collaborative robots. What are the main advantages of collaborative robots in terms of safety and flexibility? **[9]**
- b) Discuss challenges and considerations in designing collaborative robot interfaces for diverse user groups, including operators with varying levels of technical expertise. **[9]**

OR

- Q8) a)** Explore various industrial applications of collaborative robots, such as assembly tasks, material handling, quality inspection, and human-robot teamwork in manufacturing processes. **[9]**
- b) Discuss design and deployment of robots. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4824

[Total No. of Pages : 2

[6404]-354

B.E. (Electronics & Computer Engineering)

DATA SCIENCE & VISUALIZATION

(2019 Pattern) (Semester - VII) (410341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What are the Association rules .Explain Apriori Algorithm in detail with suitable example. **[8]**

b) Explain K-means algorithm in detail. And compare it with DBSCAN. **[9]**

OR

Q2) a) What is classification. Explain the Naïve Bayes classifier with example.**[8]**

b) What is regression. Compare simple and multiple Linear regression. **[9]**

Q3) a) Explain following : **[8]**

- i) Perception
- ii) Feed-Forward Neural Networks
- iii) Back propagation

b) What is Decision Tree. Construct Decision Tree with suitable example.**[9]**

OR

Q4) a) Write a short note on : **[8]**

- i) Random Forest
- ii) Map Reduce

b) What is CAPTCHA and its importance. Explain CAPTCHA Defeat in details. **[9]**

P.T.O.

- Q5) a)** What is Heatmap. Explain its uses and compare it with correlation and covariance. **[9]**
- b)** Explain Box plot in details and how it is used in outliers detection and removal with suitable example. **[9]**

OR

- Q6) a)** Explain different libraries in Python for plotting a Graph with their feature. Compare matplotlib and Seaborn library. **[9]**
- b)** Explain Need of Dashboards and designing principles of dashboards. **[9]**
- Q7) a)** Explain following Multi-dimensional Data Modelling Techniques: permutation matrix, survey plot, scatter plot matrix, Tree Map, Parallel Co-ordinates. **[9]**
- b)** Explain Sammon's mapping and compare it with Principle Component analysis. **[9]**

OR

- Q8) a)** Explain Data Modelling Process. What is Multi-Dimensional Data Model. advantages and disadvantages of Multi-Dimensional data modeling. **[9]**
- b)** Write a short note on : **[9]**
- i) Sammon's mapping
 - ii) Self-Organizing Maps



Total No. of Questions : 8]

SEAT No. :

PD-4825

[Total No. of Pages : 2

[6404]-355

B.E. (Electronics and Computer Engineering)

WEB TECHNOLOGY

(2019 Pattern) (Semester-VII) (410342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What are the various JavaScript objects? Explain anyone with an example. [8]

b) Explain the features javascript and explain how to call JavaScript function from HTML page. [9]

OR

Q2) a) Explain features of Java script. How to create array and read elements in Java script. [9]

b) What are different data types available in javascript? [8]

Q3) a) Explain various JSP scripting elements, actions and Templates in JSP [9]

b) Define JSP. List advantages of java servlet over JSP. [8]

OR

Q4) a) Explain the Strut architecture with neat diagram and also explain the benefits of Strut. [9]

b) Compare doGet and doPost methods in servlet. [8]

P.T.O.

- Q5) a)** What is Associate arrays in PHP? Explain it with simple PHP code. [9]
b) What is Angular JS? List and explain various directives in Angular JS? [9]

OR

- Q6) a)** What is purpose of AJAX? Explain with relevant example? [9]
b) Explain in detail WAP Architecture & WML. [9]
- Q7) a)** What are the different types of EJB? Identify and explain situations about when to use session beans. [9]
b) What is use of JSF? Write differences between SOAP and REST in detail? [9]

OR

- Q8) a)** List the difference between entity bean and session bean? Explain the callback method? [9]
b) Write brief note on following : [9]
i) Word press
ii) Spring



Total No. of Questions : 8]

SEAT No. :

PD-4826

[Total No. of Pages : 2

[6404]-356

B.E. (Electronics & Computer Engineering)

Internet of Things

(2019 course) (Semester - VII) (410343)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Explain Wireless Sensor Network with diagram? Explain the basic components of Wireless Sensor Network. **[6]**
- b) With the help of diagram explain how Wireless Sensor Network is used for health care monitoring. **[6]**
- c) Explain Platform as a Service (PaaS) with neat diagram. Write advantages of PaaS. Compare PaaS and SaaS. **[8]**

OR

- Q2)** a) Explain the features and services provided by Microsoft Azure IoT Cloud Platform **[6]**
- b) Describe hybrid cloud in detail with diagram. State its advantages **[6]**
- c) Why Cloud Computing is needed? Draw and explain components of cloud computing architecture. **[8]**
- Q3)** a) What is PIR sensor? Draw interfacing of PIR sensor with Arduino UNO. Write program to detect the motion and to turn ON/OFF buzzer accordingly. **[8]**
- b) What is Arduino? Describe features of Arduino UNO board. Interface temperature sensor LM 35 to Arduino UNO and write a program to read and display temperature on serial monitor. **[8]**

P.T.O.

OR

- Q4)** a) Explain working of ultrasonic sensor with suitable diagram. Draw interfacing of ultrasonic sensor to Raspberry Pi and write a program to measure the distance from obstacle. [8]
- b) What is Raspberry Pi? Why it is called Raspberry Pi? How powerful is Raspberry Pi? What is SoC available for it? [8]
- Q5)** a) What are the characteristics of big data? Draw and explain basic architecture of big data solution. [8]
- b) Explain different features of Hadoop. Draw and explain architecture of Hadoop. [8]

OR

- Q6)** a) What is big data analytics? Explain Prescriptive, Diagnostic and Predictive data analytics in detail. [8]
- b) Explain in detail the steps in collecting, analyzing and visualization of data using Thingspeak or any other cloud platform. [8]
- Q7)** a) Explain the following with help of neat diagram [9]
- i) Smart Home Automation by using IoT.
- ii) Air Pollution Monitoring using IoT
- b) List and explain in brief different IoT use cases in agriculture. With the help of neat diagram explain smart agriculture monitoring system using IoT. [9]

OR

- Q8)** a) What is wearable technology? Elaborate different modern trends in wearable technology in detail. [9]
- b) Explain the following with help of neat diagram [9]
- i) Greenhouse Monitoring using IoT.
- ii) Smart Car Parking System using IoT.



Total No. of Questions : 8]

SEAT No. :

PD-4827

[Total No. of Pages : 2

[6404]-357

B.E. (Electronics & Computer Engineering)
BIG DATA & ANALYTICS
(Elective - III) (2019 Pattern) (Semester - VII) (410344A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain Google File system and its advantages. [8]
b) Explain Map Reduce with proper diagram for word count example. [9]

OR

- Q2)** a) Explain Big data Ecosystem with suitable diagram. [8]
b) Explain anatomy of File read and write in HDFS. Write two Hadoop shell file management command. [9]

- Q3)** a) Explain different kinds of Big Data Analysis. [8]
b) What is the need of big data analysis? Explain the different types of analysis techniques. [9]

OR

- Q4)** a) Explain the terms data cleaning and data transformation with the help of example. [8]
b) How data can be ingested in python. Write syntax in python same. [9]

- Q5)** a) Explain different tools for data visualization. Write two data visualization functions from seaborn. [9]
b) How data visualization help Big data Analytics. Explain Data Visualization with Tableau. [9]

P.T.O.

OR

Q6) a) Explain challenges in Big data visualization. Write two data visualization functions from matplotlib. [9]

b) Explain data visualization with the help of example? What are the advantages of data visualization? [9]

Q7) a) What is text mining? Draw and explain text mining architecture and its use. [9]

b) How mobile analytics is different than social media analytics. Explain with suitable example. [9]

OR

Q8) a) Explain Big Data Analytics Challenges in brief. [9]

b) Explain Data Scientist role and responsibilities with suitable diagram.[9]



Total No. of Questions : 8]

SEAT No. :

PD-4828

[Total No. of Pages : 2

[6404]-358

B.E. (Electronics and Computer Engineering)

MOBILE APPLICATION DEVELOPMENT

(2019 Pattern) (Semester - VII) (410344B) (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) Assume suitable data, if necessary.*
- 4) Figures to the right indicate full marks.*

Q1) a) Discuss the role of animation in enhancing user experience in Android applications. Provide examples of different types of animations and when they are best utilized. **[9]**

b) Explain the concept of responsive design in the context of Android user interface development. How can developers ensure their UI designs adapt well to various screen sizes and orientations? **[8]**

OR

Q2) a) What are some best practices for improving the accessibility of Android user interfaces? How can developers ensure their applications are usable by individuals with disabilities? **[9]**

b) Explain the importance of designing user interfaces with layouts in Android development. Describe at least three different types of layouts and when they are typically used. **[8]**

Q3) a) What are the different types of resources available in Android applications? Provide examples of each type and describe when they are typically used. **[9]**

b) Explain the process of working with string resources in Android development. How can developers benefit from using string resources instead of hardcoding strings directly in the application code? **[9]**

P.T.O.

OR

- Q4) a)** Discuss the importance of resource localization in Android application development. What are the steps involved in supporting multiple languages and cultures in an Android app? **[9]**
- b)** Compare and contrast the use of different resource qualifiers such as screen size, orientation, and density in Android development. Provide examples of scenarios where each qualifier would be useful. **[9]**
- Q5) a)** What are Android Telephony APIs, and how are they used in Android development? Provide examples of how developers can leverage Telephony Manager and other telephony-related APIs to interact with device telephony features. **[9]**
- b)** Explain the process of deploying an Android application to the world. Discuss the steps involved in preparing an app for release, signing the APK, and publishing it on the Google Play Store. **[8]**

OR

- Q6) a)** Discuss the best practices for data storage and management in Android applications. How can developers ensure data integrity, security, and efficiency when working with data storage APIs? **[9]**
- b)** Describe the role of permissions in accessing sensitive data and features in Android applications. How can developers implement proper permission handling to ensure app security and user privacy? **[8]**
- Q7) a)** Discuss the methods for retrieving location data in an Android application. How can developers use location providers such as GPS, network, or fused location provider to obtain the device's current location? **[9]**
- b)** Discuss the methods for displaying a map in an Android application. How can developers use MapView or MapFragment to embed Google Maps in their app's user interface? **[9]**

OR

- Q8) a)** Describe how to Implement zoom control functionality for a map in an Android application. What options are available for users to zoom in and out of the map view? **[9]**
- b)** Explain the Android security model and its key components. What are the security features and mechanisms in place to protect Android applications and user data from various threats? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4829

[Total No. of Pages : 2

[6404]-359

B.E. (Electronics and Computer Engineering)

INFORMATION AND CYBER SECURITY

(2019 Pattern) (Semester - VII) (410344C) (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 indicate full marks
- 4) Assume suitable data, if necessary.

Q1) a) Explain with Diagram functioning of SHA- 1 algorithm. [8]

b) Explain ElGamal encryption algorithm with example. [6]

c) Determine value of X using Chinese remainder theorem. [4]

$$X = 1 \pmod{5} \quad X = 6 \pmod{7} \quad X = 8 \pmod{11}$$

OR

Q2) a) What is digital signature? Which security goals are met by signing a document using digital signature? [8]

b) Perform encryption and decryption using RSA algorithm for following values $p = 17$, $q = 11$, $e = 17$, $M = 8$. [6]

c) What is Chinese remainder theorem? Explain with example. [4]

Q3) a) Define Cyber security and information security with example. [7]

b) Explain Social Engineering attacks. [6]

c) Differentiate Risk Management vs. Risk Assessment. [4]

OR

P.T.O.

- Q4)** a) Write a short note on Indian legal perspective. [7]
b) Explain Qualitative Risk Analysis. [6]
c) Differentiate between Law and Ethics. [4]

- Q5)** a) List the benefits of IPSec. Distinguish between tunnel and transport mode in IPSec. [8]
b) Explain X.509 standard for Digital Certificate. [6]
c) Differentiate between SSL and IPSec. [4]

OR

- Q6)** a) What problem was Kerberos designed to address? Describe Kerberos realm. [8]
b) Explain Authentication Header with Diagram. [6]
c) Write short note on Web Security. [4]

- Q7)** a) What is DoS and DDoS attacks? Explain with suitable example. [7]
b) Define and differentiate virus and worms. [6]
c) Write short note on phishing attack. [4]

OR

- Q8)** a) Explain Intrusion Detection System with Diagram. [7]
b) Write short note on keyloggers and spywares. [6]
c) Write short note on different ways of password cracking. [4]



Total No. of Questions : 8]

SEAT No. :

PD-4830

[Total No. of Pages : 2

[6404]-360

B.E. (Electronics and Computer Engineering)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester - VII) (410344D) (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 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

- Q1)** a) Differentiate between Lossless and Lossy compression? [6]
b) Write a short note on Video compression? [5]
c) What is data redundancy. Explain any two redundancies in detail. [6]

OR

- Q2)** a) Explain Runlength coding with suitable example. [6]
b) Explain Wavelet base compression in detail. [6]
c) Explain image compression using JPEG with suitable block diagram. [5]

- Q3)** a) What is Hough transform? How it is used for edge linking? [9]
b) Explain the following edge extraction operators [9]
i) Sobel Edge detector
ii) Prewitt Edge detector
iii) DoG

OR

- Q4)** a) Explain Laplacian Edge detector? Why LOG mask preferred over Laplacian for edge detection? [6]
b) Explain Morphological Operations: Dilation, Erosion, Opening. [6]
c) Explain Image Segmentation using [6]
i) Image Region Splitting
ii) Region Merging

P.T.O.

- Q5)** a) Explain in detail Optimum Notch Filtering for image restoration. [6]
b) Write short note on Polygonal approximation. [6]
c) Explain any three types of noise models. [6]

OR

- Q6)** a) Draw and explain Image Degradation Model? [6]
b) Explain following filter [6]
i) Adaptive filter
ii) Inverse Filtering
c) Explain in detail Representation, Chain codes and Signatures. [6]

- Q7)** a) Explain Remote Sensing application of Image processing. [6]
b) Explain Bayes classifier image classification algorithm. [6]
c) Write a short note on image processing application as Biometric Authentication? [5]

OR

- Q8)** a) Explain Character Recognition application of Image processing. [6]
b) Explain Medical application of Image processing. [6]
c) What is Image classification? Explain Correlation based classifier. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4831

[Total No. of Pages :2

[6404]-361

B.E. (Electronics & Computer Engineering)

ROBOTICS & AUTOMATION

(410345 A) (2019 Pattern) (Semester - VII) (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 side indicate full marks.*
- 4) *Use of scientific calculators is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explain the significance of Denavit-Hartenberg (D-H) parameters in the kinematic modeling of robotic manipulators. [6]
- b) Explain the process of obtaining the forward kinematics solution for a PUMA robot. [6]
- c) Discuss the key components and mathematical steps involved in deriving the transformation matrix from the base frame to the end-effector frame. [8]

OR

- Q2)** a) Define the key terms involved, including joint variables, end-effector position, and orientation. [6]
- b) Discuss the conventions and considerations involved in assigning coordinate frames to the joints and links. [6]
- c) Provide a numerical example to demonstrate the application of the forward kinematics equations for a specific configuration of a PUMA robot with given joint angles and link lengths. [8]

- Q3)** a) State & explain the general properties of inverse solutions in Inverse Kinematics, specifically addressing the existence and uniqueness of solutions. [8]
- b) Explain the geometric approach in Inverse Kinematics and how it is utilized to determine joint angles in a robotic system. Define key terms such as end-effector pose, kinematic constraints. [8]

OR

P.T.O.

- Q4)** a) Discuss the formulation and application of Lagrange's Equation to derive the equations of motion for a robotic system. [8]
b) Provide examples to illustrate scenarios where inverse solutions may or may not exist, and where solutions may or may not be unique. [8]

- Q5)** a) How does the Jacobian matrix differ when considering manipulators with prismatic joints? [4]
b) How can the angular velocity be expressed or derived from the transformation matrix, and what role does it play in describing the rotational motion of a rigid body? [6]
c) Identify & explain a limitation of proportional control in regulating the joint position. [6]

OR

- Q6)** a) Write the significance of including both the motor and load dynamics in the control of the robot arm. [4]
b) How is the error signal used in proportional control to adjust the joint position? [6]
c) Explore how RMPC and RMRC can be integrated to enhance the overall performance of a robotic manipulator. [6]

- Q7)** a) Write short note on welding types of robotics in details. [9]
i) Automated Welding
ii) Arc Welding
iii) Spot Welding
b) What are the roles and advantages of Resolver, Rotary shaft encoders, Potentiometers, Tacho-generators in servo control system. [9]

OR

- Q8)** a) Explain selection criteria for stepper motor and D.C. servo motor in electric drive technology. [9]
b) What are the different sensors used in servo control system? Explain any two sensors in details. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4832

[Total No. of Pages : 2

[6404]-362

B.E. (Electronics & Computer Engineering)
HUMAN COMPUTER INTERFACE (Elective - IV)
(410345 B) (2019 Pattern) (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.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) Describe WIMP Interface in detail. [7]
b) What is Context of interaction? Explain with example. [5]
c) Explain Models of interaction. [5]

OR

- Q2)** a) Describe Paradigms of Interactions. [7]
b) Elaborate Ergonomics in understanding the interaction. [5]
c) Explain different Interaction styles. [5]

- Q3)** a) What is interaction design? Explain software design process. [7]
b) Describe Navigation Design. [5]
c) Explain the UI Layer and Its Execution Framework. [5]

OR

- Q4)** a) What is interaction design? Explain screen design process. [7]
b) Elaborate Model-View-Controller (MVC) Framework. [5]
c) Explain Prototyping techniques. [5]

- Q5)** a) Elaborate User interface management system (UIMS) in detail. [8]
b) Write short note on - Golden rules and heuristics. [5]
c) Explain evaluation through expert analysis. [5]

P.T.O.

OR

- Q6)** a) Explain the design standards and design Guidelines in HCI. [8]
b) Explain evaluation through user participation. [5]
c) Write a note on - Evaluation Criteria. [5]

- Q7)** a) Describe Physical and device models with examples. [8]
b) Explain Cognitive architectures. [5]
c) How to find things on the web Future of HCI? [5]

OR

- Q8)** a) Describe a linguistic model in detail. [8]
b) Elaborate Hierarchical task analysis (HTA). [5]
c) Write a note on Ubiquitous Computing. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4833

[Total No. of Pages :2

[6404]-363

B.E. (Electronics & Computer Engineering)

DIGITAL SYSTEM DESIGN

(410345 C) (2019 Pattern) (Semester - VII) (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) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagram must be drawn wherever necessary.*

- Q1)** a) Sketch Y-Chart representation of Verilog construct supporting synthesis activity. Explain the logical synthesis in detail. **[9]**
- b) Explain the synthesis of Static loops without embedded timing controls and with embedded timing controls. **[8]**

OR

- Q2)** a) Explain in details basic rules used to anticipating the results of synthesis. **[9]**
- b) Explain with suitable example about Registered logic. **[8]**

OR

- Q3)** a) Sketch the state machine controllers for a datapath. Explain in detail about partitioning sequential machines into a datapath. **[9]**
- b) Explain in detail about RISC SPM Instruction Set. **[8]**
- Q4)** a) Explain in detail about UART Transmitter and Receiver. **[9]**
- b) Sketch architecture and state transition graph of a synchronous 4-bit binary counter with proper explanation. **[8]**

P.T.O.

- Q5)** a) Explain in detail about various storage devices used in Programmable logic devices. [9]
- b) Sketch and explain Carry look-ahead adder circuit. [9]

OR

- Q6)** a) Sketch the circuit diagram and explain the operation of Programmable Logic Array (PLA). [9]
- b) Explain in detail about Programmable ROM. Compare the various types of ROMs. [9]

- Q7)** a) Explain in detail about Postsynthesis Design Validation with example. [10]
- b) Explain the boundary scan and JTAG ports. Also explain the operation of JTAG modes of operation. [8]

OR

- Q8)** a) Describe fault simulation. Explain different approaches of Fault simulations. [10]
- b) Explain the different option available for elimination of ASIC timing violation. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4834

[Total No. of Pages :2

[6404]-364

B.E. (Electronics & Computer Engineering)
AUGMENTED AND VIRTUAL REALITY (Elective - IV)
(410345 D) (2019 Pattern) (Semester - VII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Compare Visual Representation, Aural Representation and Haptic Representation in Virtual Reality. **[9]**
- b) Explain any two methods visual Rendering methods used in computer graphics and compare them. **[9]**

OR

- Q2)** a) Explain the Haptic Rendering Techniques and state how Haptic rendering plays a crucial role in applications related to virtual reality. **[9]**
- b) Describe Visual Representation in Virtual Reality, explain the how the various components contribute to creating a visually virtual world with its importance. **[9]**

- Q3)** a) Explain the significance of translation, rotation, and scaling as manipulation operations in virtual reality. **[9]**
- b) Compare the classes of travel methods in Virtual reality. **[9]**

OR

- Q4)** a) How does shared experience contribute in virtual reality and in In what situations is collaborative interaction beneficial in virtual reality applications. **[9]**
- b) How do user interface metaphors contribute in virtual environments for users and give examples of user interface metaphors. **[9]**

P.T.O.

- Q5)** a) With reference to computer graphics. state how does dimensionality play important role in representing virtual environments. **[9]**
- b) With the help of an application Explain the hardware components with their functions in augmented reality. **[9]**

OR

- Q6)** a) What types of digital content are typically part of an augmented reality experience? How do users interact with augmented reality content? **[9]**
- b) Explain the working of Augmented reality and also explain how is it different from virtual reality. **[9]**

- Q7)** a) Explain the essential software components in an Augmented Reality system and its contribution towards creation of real-world environment in Augmented reality. **[8]**
- b) Explain the common software tools used for creating content in Augmented Reality and its importance in design and development of augmented reality. **[8]**

OR

- Q8)** a) Describe the working of marker-based tracking in Augmented Reality and state its advantages. **[8]**
- b) Explain how mobile augmented reality differs from Augmented Reality experiences and what are challenges with mobile augmented reality platform. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4835

[Total No. of Pages :2

[6404]-365

B.E. (Electronics & Computer Engineering)
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(410350) (2019 Pattern) (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.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) Explain Forward Changing and backward changing algorithm with the help of example. [6]
- b) Describe different approaches to knowledge representation. [6]
- c) Explain WUMPUS World Environmental giving it space description explain how percept sequences generated. [8]

OR

- Q2)** a) Explain the Bayesian Networks. [6]
- b) Explain modus ponens with suitable example. [6]
- c) Distinguish between propositional logic and first order predicate logic knowledge representation mechanism. [8]

- Q3)** a) Compare Machine Learning with traditional programming. Discuss types of Machine Learning with suitable examples. [8]
- b) What are various Statistical Learning Approaches. [8]

OR

- Q4)** a) Explain different data formats used in Machine Learning. [8]
- b) What is Machine Learning? Explain applications of Machine Learning in data science. [8]

P.T.O.

- Q5)** a) What is decision trees. Explain in detail? [8]
b) Differentiate between overfitting and underfitting. [8]

OR

- Q6)** a) Write a detail note naive Bayes linear models? [8]
b) What is support vector machine. Discuss in detail? [8]

- Q7)** a) Explain artificial neural network based on perception concept with diagram. [9]
b) Describe mutli-layer neural network. Explain why back propagation algorithm is required. [9]

OR

- Q8)** a) What is Functional Link Artificial Neural Network (FLANN)? Explain its merits over other ANNs. [9]
b) Explain Single Layer Neural Network and What is Activation Function? Explain with a suitable example. [9]



Total No. of Questions : 8]

SEAT No. :

PD4836

[Total No. of Pages : 2

[6404]-366

B.E. (Electronics and Computer Engineering)

VLSI DESIGN AND TECHNOLOGY

(2019 Pattern) (Semester-VIII) (410351)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Explain the memory array organization in semiconductor memories. **[8]**
- b) Differentiate between static RAM and dynamic RAM. Enlist the different DRAM cells. **[9]**

OR

- Q2) a)** Explain the refresh circuit. Also explain the timings. **[8]**
- b) Explain in brief the sense amplifier. **[9]**

- Q3) a)** Explain the interconnect properties. Also explain the wiring plans. **[8]**
- b) Explain the power distribution and clock distribution. **[9]**

OR

- Q4) a)** Explain the global routing and switchbox routing. **[8]**
- b) Explain in brief the different floor planning methods. **[9]**

P.T.O.

- Q5)** a) Explain the JTAG. Also explain the boundary scan. [9]
b) Explain in brief the carry chains in FPGA. [9]

OR

- Q6)** a) Explain in brief the TAP controller. [9]
b) Explain with suitable example how to use the Shannon's decomposition to implement function. [9]

- Q7)** a) Explain the working of CMOS inverter with the help of Voltage Transfer curve. [9]
b) Draw CMOS logic for 2 input NOR gate. Explain its working and draw its stick diagram. [9]

OR

- Q8)** a) Explain the layout design rules. Also explain the scaling issues in the design of CMOS circuit. [9]
b) Discuss need for transmission gate. Draw 4:1 Mux using TG. [9]

* * *

Total No. of Questions : 8]

SEAT No. :

PD-4837

[Total No. of Pages : 2

[6404]-367

B.E. (Electronics & Computer Engg.)

CLOUD COMPUTING

(2019 Pattern) (Semester - VIII) (410352 A) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the features Ajax standard with its security aspect [8]
b) Write short note on - [8]
Google AppEngine
Microsoft Azure

OR

- Q2)** a) Explain the architecture of Google App Engine and its components. [8]
b) Explain Solution Stacks and standards for security in cloud computing. [8]

- Q3)** a) Explain the features and architecture of HBase. [9]
b) What is cloud storage? How does it work- reference to cloud providers. [9]

OR

- Q4)** a) Explain Bigdata architecture with suitable diagram. [9]
b) Draw and explain Cloud file system GFS/HDFS. [9]

- Q5)** a) Describe the advantages, disadvantages and performance of distributed system. [9]
b) With neat suitable conceptual diagram explain the Cyber-Physical System application of IoT. [9]

P.T.O.

OR

Q6) a) Write a note on - [9]

- i) Smart Buildings
- ii) Retailing and Supply-Chain Management

b) Write a note on Online Social and Professional Networking. [9]

Q7) a) Write short note on : [9]

- i) Mobile Cloud Computing.
- ii) Jungle Computing

b) What is Docker? Explain Docker Workflow with diagram. [9]

OR

Q8) Write a short note on : [18]

- a) Future of Cloud-Based Smart Devices.
- b) Mobile Cloud.
- c) Energy Aware Cloud Computing.



Total No. of Questions : 8]

SEAT No. :

PD-4838

[Total No. of Pages : 2

[6404]-368

B.E. (Electronics & Computer Engg.)

**EMBEDDED SYSTEM AND REAL TIME OPERATING
SYSTEMS**

(2019 Pattern) (Semester - VIII) (410352 B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write features of ucos II RTOS. [6]
b) Describe advantages of embedded linux OS. [5]
c) Explain memory selection criteria of embedded system. [6]

OR

- Q2)** a) Explain intertask communication in μ cos II. [6]
b) Explain task management service of μ cos II OS. [5]
c) Explain the working of message Queue, Mailbox. [6]

- Q3)** a) Write the features of embedded Linux. [5]
b) Describe Embedded development environment in detail. [6]
c) Explain cross development tools in embedded system with example.[6]

OR

- Q4)** a) Explain any two tools of embedded systesm development. [6]
b) Write the need of embedded Linux O.S. [5]
c) Write short Note :
Embedded Linux set up & storage considerations. [6]

P.T.O.

- Q5)** a) Explain Kernel configurations: BIOS & Bootloader. [6]
b) What is module utility & Linux file system in embedded Linux. [6]
c) Explain background of Linux Kernel development. [6]

OR

- Q6)** a) What is device driver? Explain driver method. [6]
b) Describe the role of boot loader in Linux Kernel. [6]
c) Write short Note : [6]
i) U-Boot porting &
ii) Driver methods in Linux OS.

- Q7)** a) Draw & explain the structure of Arduino board. [6]
b) Which I/O pins are available in ATmega 328P processor. Explain the functions. [6]
c) Write case study of embedded system using ultrasonic sensor & PIR sensor. [6]

OR

- Q8)** a) Write case study of embedded system for the measurement of distance using ultrasonic sensor. [6]
b) Describe the process followed to get the software in target system. [6]
c) Short Notes : [6]
i) Linking & loading software.
ii) Software development tools.



Total No. of Questions : 8]

SEAT No. :

PD-4839

[Total No. of Pages : 2

[6404]-369

B.E. (Electronics & Computer Engg.)
SOFTWARE TESTING AND QUALITY ASSURANCE
(2019 Pattern) (Semester - VIII) (410352 C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is Test Automation and Terms used in Automation? [5]
b) Explain the Design and Architecture of Automation? [6]
c) What is the Generic requirement for the Test Tool? [6]

OR

- Q2)** a) Explain the Process model for Automation and Selecting the Test Tool?[5]
b) What is Automation for XP/Agile model? [6]
c) Explain the challenges in Automation and Data Driven Testing. [6]

- Q3)** a) What is Selenium and what is its primary purpose in software testing?[5]
b) Describe Selenium's tool suite? [6]
c) Explain the Test Design Considerations. [6]

OR

- Q4)** a) Describe a scenario where Selenium Grid would be particularly useful in a testing environment. [5]
b) Draw and Explain Selenium Architecture. [6]
c) Explain. [6]
i) Selenium RC
ii) Selenium Web-driver

P.T.O.

- Q5)** a) What is software quality and why is it important in software development? [9]
- b) Explain the concept of Six Sigma in the context of Software Engineering. How does it apply to software quality improvement? [9]

OR

- Q6)** a) What are the main elements of Software Quality Assurance (SQA) and also write SQA Tasks and Goals? [9]
- b) What are ISO 9000 Quality Standards and how do they relate to Software Quality Assurance (SQA)? [9]
- Q7)** a) Explain Total Quality Management approach of software testing. [6]
- b) Compare Product Quality Metrics and process Quality Metrics? [6]
- c) Describe the role of software maintenance in ensuring product quality.[6]

OR

- Q8)** a) Explain the Pareto diagram and Histogram use in quality management.[9]
- b) What are Ishikawa's 7 basic tools for quality improvement? Provide a brief overview of each tool and its application. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4840

[Total No. of Pages : 2

[6404]-370

B.E. (Electronic & Computer Engg)

ARTIFICIAL NEURAL NETWORK

(2019 Pattern) (Semester - VIII) (410352D) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw architecture of artificial neural network and explain the various layers used in architecture. How to train artificial neural network? **[8]**
- b) What is activation function? Explain Sigmoid, Tanh, ReLU and Leaky ReLU activation function in detail. **[9]**

OR

- Q2)** a) What is multi-layer artificial neural network? Explain feedforward artificial neural network and feedback artificial neural network. **[8]**
- b) Describe the role of regularization techniques in preventing overfitting in deep learning. Compare and contrast L1 and L2 regularization methods and explain how they are applied in neural networks. **[9]**

- Q3)** a) Explain the process of designing a Convolutional Neural Network architecture for image classification. Describe the choices for the number of convolutional layers, pooling layers, and fully connected layers. **[8]**
- b) Describe the pooling layers in Convolutional Neural Networks. What is the purpose of pooling, and how does it help in reducing the dimensionality of the feature maps? Compare and contrast different pooling techniques, such as max pooling and average pooling. **[9]**

OR

- Q4)** a) Describe the architecture of the VGG Convolutional Neural Network. How does the VGG architecture differ from other CNN architectures, and what are its main characteristics? **[8]**

P.T.O.

- b) Describe the concept of the kernel (filter) in the convolutional layer of a Convolutional Neural Network. How does the kernel contribute to the process of feature extraction? Discuss the impact of the size and type of the kernel on the performance of the CNN. [9]

- Q5)** a) Draw architecture of Recurrent Neural Networks and explain the main components of RNN. State the advantages of RNN. [9]
b) Discuss the limitations of traditional feedforward neural networks in handling sequential data. How does the RNN architecture overcome these limitations? Explain how the RNN's is suitable for processing sequential data. [9]

OR

- Q6)** a) Draw and explain the architecture of Bidirectional Recurrent Neural Networks (BRNN). Discuss the advantages of BRNNs over unidirectional RNNs. [9]
b) Describe the Long Short-Term Memory architecture in Recurrent Neural Networks. Discuss the components and functionalities of LSTM units, and how they address the vanishing gradient problem. Compare and contrast LSTMs with traditional RNN's. [9]

- Q7)** a) What are the applications of deep learning in natural language processing? Explain any one application. What are the advantages and disadvantages of using deep learning for natural language processing? [9]
b) Describe the process of building a Convolutional Neural Network in Python using Tensor Flow/Keras. What are the key components involved in constructing a CNN architecture? Explain how to define the architecture, including convolutional layers, pooling layers, and fully connected layers. [9]

OR

- Q8)** a) Explain the pros of training a Deep Learning model for object/image classification. What are the key steps involved in training a model for classification tasks using deep learning techniques? Discuss the challenges and solutions specific to object/image classification. [9]
b) Explain the applications of Recurrent Neural Networks in crop yield prediction. How are RNN's utilized in predicting crop yields? Discuss the architecture and functioning of RNN's in this agricultural application. [9]



[6404]-371

B.E. (Electronics and Computer Engineering)
DATA MINING AND WAREHOUSING
(2019 Pattern) (Semester - VIII) (410353 A) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain data matrix, data dissimilarity matrix and binary attributes with example. [9]

- b) Define cosine similarity using cosine similarity find similarity between two vectors.

X and Y, $X=\{3,2,0,5\}$, $Y=\{1,0,0\}$ [8]

OR

Q2) a) What is Jaccard.Similarity? Find the Jaccard Similarity Coefficient between the two sets $A = \{0,1,2,5,6\}$ $B = \{0,2,3,4,5,7,9\}$ [9]

- b) Find Simple Matching coefficient and Jaccard Coefficient of $x = \{1,1,0,0,1,1,0\}$ and $Y = \{1,0,0,1,1,0,0\}$ [8]

Q3) a) Explain FP-Growth algorithm. Compare and contrast FP-Growth algorithm with Apriori algorithm. [9]

- b) Consider an example of the following set of transactions in Market Analysis. Assuming minimum support of 50% and minimum confidence of 80%. Find: [8]

- i) All frequent itemset using a-priori algorithm.
- ii) All association rules using a-priori algorithm

TransactionID	Items Brought
T1	M,A,B,D
T2	A,D,C,B,F
T3	A,C,B,F
T4	A,B,D

P.T.O.

OR

- Q4)** a) Explain Apriori algorithm. How do you find frequent itemsets on Transactional Data. Explain with one example. [9]
b) Briefly with an example explain the following : [8]
i) Frequent itemset
ii) Closed frequent Itemset

- Q5)** a) What is Bayesian Belief Network, Elaborate the training process of a Bayesian Belief Network with suitable example. [9]
b) Write short note on: [9]
i) frequent pattern classification
ii) case based reasoning Classifier

OR

- Q6)** a) Explain the following with example: [9]
i) Entropy
ii) Gini Index
iii) Information Gain
iv) Gain Ratio
b) Define Lazy learners with an example. Explain the IF-THEN rules for classification? [9]

- Q7)** a) How the performance of Classifiers algorithms is evaluated. Explain following with example [9]
i) Accuracy
ii) Error Rate
b) Define systematic Learning. Discuss Reinforcement learning relevance and its applications in real time environment. [9]

OR

- Q8)** a) Explain in detail following techniques to evaluate the accuracy of a Classifier. [9]
i) Random subsampling
ii) Cross validation
b) Explain Systematic learning. Differentiate between Wholistic learning and Multi perspective learning. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4842

[Total No. of Pages : 2

[6404]-372

B.E. (Electronics and Computer Engineering)
ELECTRIC VEHICLE TECHNOLOGY
(2019 Pattern) (Semester - VIII) (410353 B) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the function of controllers in electric vehicle drives. How do controllers contribute to optimizing performance, efficiency and safety in EVs? **[9]**

b) Describe the types of sensors commonly used in electric vehicles and their respective functions. Discuss how sensors contribute to real-time monitoring, control and safety in EVs. **[8]**

OR

Q2) a) Define the concept of drive trains in the context of energy consumption. How does the architecture of electric drive trains differ from traditional internal combustion engine drive trains? **[9]**

b) Compare and contrast the working principles of DC motors, induction motors and BLDC motors used in EVs. **[8]**

Q3) a) Explain the hybridization of different energy storage devices in electric vehicles. Discuss the advantages and challenges of combining multiple energy storage technologies, such as batteries and supercapacitors, to enhance overall performance and efficiency. **[9]**

b) Discuss the function of batteries in electric vehicles and the role of a Vehicle Battery Management System (BMS). Provide a block diagram illustrating the components and functionalities of a BMS and explain why it is essential for the safe and efficient operation of EV batteries. **[9]**

OR

P.T.O.

- Q4)** a) Compare different types of batteries used in electric vehicles and discuss the scope of development in battery technology for EVs. [9]
- b) Provide an introduction to energy storage requirements in electric vehicles. Why is energy storage critical for EVs and what are the key performance criteria that influence the selection of energy storage solutions? [9]

- Q5)** a) Compare and contrast battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), plug-in hybrid vehicles (PHEVs) and fuel cell electric vehicles (FCEVs). [9]
- b) Define the levels of electrification and discuss how they impact vehicle performance, fuel efficiency and emissions. [8]

OR

- Q6)** a) Explain the importance of electrical protection and system requirements in electric vehicles (EVs). Discuss key considerations for ensuring safety, reliability and efficiency in EV electrical systems. [9]
- b) Describe the design of photovoltaic solar-based electric vehicles. How do solar panels integrate into the vehicle's structure and what role do they play in extending range and reducing reliance on grid charging? [8]

- Q7)** a) Explain the process of selecting and sizing a charging station for a specific application. Consider factors such as available power supply, charging requirements, anticipated usage patterns and compatibility with EV models. [9]
- b) Discuss the selection of power semiconductors for EV charging and infrastructure applications. Explain the importance of reliability, efficiency and thermal management in choosing suitable semiconductor devices for high-power applications. [9]

OR

- Q8)** a) Discuss the different types of charging stations for electric vehicles (EVs), including Level 1, Level 2 and Level 3 (DC fast charging). Compare and contrast their charging speeds, power outputs and suitability for various EV applications. [9]
- b) Identify and describe the components of a typical charging station. Discuss the roles of components such as power converters, connectors, communication modules, safety features and billing systems. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4843

[Total No. of Pages : 2

[6404]-373

B.E. (Electronics & Computer Engineering)

SOFTWARE DEFINED RADIO

(2019 Pattern) (Semester - VIII) (410353 C) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are the challenges of multirate DSP in Software Defined Radio. [6]
b) Write advantages of multirate DSP. [6]
c) Draw & explain blockdiagram of OFDM Transmitter in SDR communication. [6]

OR

- Q2)** a) Explain frequency offset & its correction techniques in SDR. [6]
b) What is channel estimation? Explain any one channel estimation technique in detail. [6]
c) Describe decimation & interpolation in multirate DSP. [6]
- Q3)** a) Define Cognitive Radio. write a brief history of CR. [6]
b) Explain spectrum management in cognitive Radio. [6]
c) Explain Cognitive Radio Network. [6]

OR

- Q4)** a) Explain cognitive capability, operation frequency & Reconfiguration terms in cognitive Radio. [6]
b) What is the concept of spectrum sharing? How it can be achieved with CRN. [6]
c) Explain the Cognitive Radio related standardization efforts in IEEE standards. [6]

P.T.O.

- Q5)** a) Draw & explain architecture of Cognitive Radio. [6]
b) Explain spectrum sensing & techniques used in spectrum sensing by Cognitive Radio. [6]
c) Compare communication in Cognitive Radio with traditional communication system. [5]

OR

- Q6)** a) Explain Cognitive Radio Network topology & architecture. [6]
b) Describe characteristics of Cognitive Radio Network. [5]
c) What is the contribution of policy support in CR. [6]

- Q7)** a) Explain the case study of Role of SDR in advance communication system. [6]
b) What are the challenges & issues in implementation of communication using CR. [5]
c) What is parameter estimation? How it is used for implementation of CR based communication system. [6]

OR

- Q8)** a) Case study: CR for public safety an example of application. Explain.[6]
b) Explain Beagle board based SDR. [5]
c) Write in detail : [6]
i) Vertical handoff and
ii) Network Interoperability



Total No. of Questions : 8]

SEAT No. :

PD-4844

[Total No. of Pages : 2

[6404]-374

B.E. (Electronics & Computer Engineering)

WIRELESS SENSOR NETWORKS

(2019 Pattern) (Semester - VIII) (410353 D) (Elective-VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Draw and explain the architecture of Wireless HART Protocol. [6]
b) Explain in detail protocol stack of WSNs along with its diagram. [6]
c) What is MAC protocol. Explain S-MAC and B-MAC protocol in detail. [8]

OR

- Q2)** a) Explain in detail BLE protocol standard along with its architecture.[6]
b) Write short note on Zigbee protocol. [6]
c) Write a short note on IEEE802.15.3. Also state the features of same.[8]

- Q3)** a) Explain the proximity schemes and ranging schemes for localization in Wireless Sensor Networks. [8]
b) What are the issues in designing a routing protocol. Also explain classification of routing protocols. [8]

OR

- Q4)** a) Explain the following: [8]
i) Collection Tree Protocol
ii) Localization in WSN
b) Draw and explain multi-hop Wireless Sensor Network architecture. State the advantages and disadvantages of multi-hop Wireless Sensor Networks. [8]

P.T.O.

- Q5) a)** Explain the following algorithms: [8]
- i) Event-to-Sink Directed Clustering algorithm
 - ii) K-means algorithm in detail.
- b) Explain in detail various types of attacks in WSN. Also elaborate possible solutions for attacks in WSN. [8]

OR

- Q6) a)** Explain the following algorithms: [8]
- i) Adaptive Distributed Clustering Algorithm
 - ii) Low Energy Adaptive Clustering
- b) Explain different security issues and challenges in Wireless Sensor Networks. [8]
- Q7) a)** Explain the requirement analysis in WSN. Also explain issues and challenges in providing QoS. [9]
- b) Explain WSN application of weather sensing and monitoring along with block diagram. [9]

OR

- Q8) a)** Explain general problems in deployments of Wireless Sensor Networks. Also explain in detail general testing and validation process. [9]
- b) Along with block diagram explain smart home application of WSN. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4845

[Total No. of Pages : 2

[6404]-375
B.E. (AI & DS)
MACHINE LEARNING
(2019 Pattern) (Semester - VII) (417521)

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 indicates full Marks.

Q1) a) Consider the following three-class confusion matrix. Calculate precision and recall per class. Also calculate overall Precision and recall. **[12]**

		Predicted		
		Class 1	Class 2	Class 3
Actual	Class 1	15	2	3
	Class 2	7	15	8
	Class 3	2	3	45

- b) Explain construction of multi-class classifiers, **[6]**
- i) One Vs All approach
 - ii) One Vs. One approach

OR

Q2) a) Apply K-Nearest Neighbor Algorithm (KNN) on following data. Predict the student result for values physics = 6 marks, Chemistry = 8 marks. Consider number of neighbours K = 3 and Euclidean Distance as distance measure. **[12]**

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

- b) Differentiate between balanced and imbalanced classification. **[6]**

P.T.O.

Q3) a) Explain Agglomerative Hierarchical Clustering (AHC) and What is the role of dendrograms in choosing number clusters in hierarchical clustering? [9]

b) Explain DBSCAN algorithm with an example. [8]

OR

Q4) a) Explain K-Means clustering algorithm and how the elbow method is used to decide the value of cluster k. [9]

b) Explain Gaussian mixture model. [8]

Q5) a) Differentiate the Bagging and Boosting approach of ensemble learning. [6]

b) Explain different types of voting mechanisms in ensemble learning. [6]

c) Explain Gradient Boosting in detail. [6]

OR

Q6) a) Compare Homogeneous and Heterogeneous ensemble methods. [6]

b) Explain AdaBoost algorithm in detail. [6]

c) Explain random forest ensembles with an example. [6]

Q7) a) Explain elements of Reinforcement learning. [8]

b) Explain Q-Learning algorithm with an example. [9]

OR

Q8) a) Explain following terms : [8]

- Markov Property
- Bellman Equation
- Markov Reward Process
- Markov Chain

b) How does the Markov property relate to Reinforcement Learning? Why is it important? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4846

[Total No. of Pages : 2

[6404]-376
B.E. (AI & DS)
DATA MODELING AND VISUALIZATION
(2019 Pattern) (Semester - VII) (417522)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in detail Higher-dimensional Displays and Special Structures.[8]
b) Explain the critical role of data handling in both data modeling and visualization. [9]

OR

- Q2)** a) Explain the different types of Data Visualization. [8]
b) Explain why graphics and computing are crucial for data visualization, highlighting the importance of exploratory graphics in enhancing visualization effectiveness. [9]

- Q3)** a) Explain the Force-directed Techniques and Multidimensional Scaling in detail. [9]
b) Explain Graph Layout Techniques in detail. [8]

OR

- Q4)** a) Write a short note on Pulling Under Constraints Model. [8]
b) Explain the process of data wrangling in detail. [9]

- Q5)** a) Write a short note on : [9]
i) Pivot tables
ii) Cross tabulation 67 Time Series
b) Explain Data aggregation in detail. [9]

P.T.O.

OR

Q6) a) Explain Group by Mechanics technique in data modeling and visualization. **[9]**

b) Write a short note on : **[9]**

i) Moving Window Functions

ii) Periods and Periods Arithmetic

Q7) a) Write a short note on : **[9]**

i) PET Images

ii) Analysis of Medical Images

b) Explain the various data reconstruction techniques used to assist data modeling and visualization. **[9]**

OR

Q8) a) Write Short note on : **[9]**

i) ER/Studio and its Application

ii) Erwin data modeler

b) Explain in details ultrasound images and its applications in data modeling and visualization. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-5288

[Total No. of Pages : 2

[6404]-377

B.E. (Artificial Intelligence and Data Science)

QUANTUM ARTIFICIAL INTELLIGENCE

(Elective III) (2019 Pattern) (Semester-VII) (417523(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve questions Q.1 or Q2, Q3 or Q4. 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 detail if necessary.*

- Q1)** a) Discuss factoring integers with example. [6]
b) Describe Simon's algorithm with example [6]
c) Compare Deutsch algorithm and Deutsch. -Jozsa algorithm. [6]

OR

- Q2)** a) Discuss the working of Shor's algorithm with its significance in breaking classical cryptosystems. [6]
b) Describe Grover's algorithm with example. [6]
c) Compare Probabilistic vs Quantum algorithms. [6]

- Q3)** a) Write a short note on Quantum Boosting [6]
b) Compare clustering vs. classification [6]
c) Discuss the role of quantum super vector machine and quantum neural network in quantum enhanced machine learning [6]

OR

P.T.O.

- Q4)** a) Describe quantum machine learning classification with appropriate example. [6]
b) Discuss quantum algorithm for linear algebra. [6]
c) Discuss nearest neighbour search with example. [6]

- Q5)** a) Discuss the concept of quantum teleportation and its significance in quantum communication. [6]
b) Describe with appropriate steps quantum key distribution process. [6]
c) Write a note on classical three bit code. [5]

OR

- Q6)** a) How does quantum dense coding works? And how it is related with quantum information theory. [6]
b) Discuss in detail quantum cryptography. [6]
c) Write a note on error recovery. [5]

- Q7)** a) Elaborate the concept of quantum computing for Data Science. [6]
b) Describe heuristic search with example. [6]
c) Write a note on Quantum walk-random insect. [5]

OR

- Q8)** a) Discuss penny lane a cross platform python library. [6]
b) Write a note on Quantum search. [5]
c) Elaborate tarrataca's quantum production system. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4847

[Total No. of Pages : 2

[6404]-378

B.E. (Artificial Intelligence and Data Science)

INDUSTRIAL INTERNET OF THINGS

(2019 Pattern) (Semester - VII) (417523B) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What are the primary components of an industrial IoT system? Explain each in details. **[6]**
b) Explain the Industrial Internet Architecture Framework (IIAF). **[6]**
c) What are different types Industrial IoT- Layers? Explain in details each layer. **[6]**

OR

- Q2)** a) What are the key components and Design consideration of a typical WSN used in industrial IoT? **[6]**
b) Explain the Business Model Architecture of industrial IoT. **[6]**
c) Explain the difference between edge computing and cloud computing in industrial IoT. **[6]**

- Q3)** a) Explain the concept of Cloud of Things (CoT) and its significance in the context of Industrial IoT. **[6]**
b) What is the role of data analytics in Industrial IoT? Explain Any one Example. **[6]**
c) What is need of Digital Twin for industrial IoT? Explain Elements of Digital Twin in Industrial IoT. **[6]**

OR

- Q4)** a) Explain the SaaS PaaS and IaaS with examples. **[6]**
b) Explain the importance of data visualization techniques in presenting complex Industrial IoT data. **[6]**
c) Provide examples of how digital twin technology is transforming industries and driving digital transformation. **[6]**

P.T.O.

- Q5) a)** What are the key challenges and security considerations when implementing the industrial IoT in industrial environments? **[6]**
- b) What is the concept of threat analysis in the context of Industrial IoT? Explain the industrial IoT threat analysis in smart manufacturing plant. **[6]**
- c) Explain the Network security techniques in industrial IoT. **[5]**

OR

- Q6) a)** Explain the Conventional web technology and relationship with industrial IoT. **[6]**
- b) What is importance of access control in industrial IoT? Explain the methodologies for access control. **[6]**
- c) Explain Management aspects of cyber security in industrial IoT. **[5]**

- Q7) a)** Explain the concept of smart factories and how they differ from traditional manufacturing facilities. **[6]**
- b) How does industry 4.0 benefits the industrial IoT in manufacturing process? **[6]**
- c) What is industry 5.0 with example? **[5]**

OR

- Q8) a)** Explain the health care application in industrial IoT. **[6]**
- b) Describe the advantages and challenges of implementing smart logistics in supply chain management. **[6]**
- c) What are Key characteristics of industry 4.0? **[5]**



Total No. of Questions : 8]

SEAT No. :

PD-4848

[Total No. of Pages : 2

[6404]-379

B.E. (Artificial Intelligence and Data Science)

ENTERPRISE ARCHITECTURE AND COMPONENTS

(2019 Pattern) (Semester - VII) (417523(C)) (Elective-III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) How to plan successfully your enterprise architecture. What is the role of baseline and target architectures for an enterprise? **[9]**

b) What is the baseline architecture? Explain the best practices of Architecture implementation. **[8]**

OR

Q2) a) Define the term is architecture governance? Explain the key components of architecture governance? **[8]**

b) Explain Architecture design principles. **[9]**

Q3) a) What is the role of enterprise information architecture? List and Explain Component Model of the Enterprise Information Architecture. **[9]**

b) Explain the benefits of enterprise information architecture? How does enterprise information architecture differ from traditional IT architecture? **[8]**

OR

P.T.O.

Q4) a) What is a component model? What is the purpose of a component interaction diagram? [8]

b) What is the purpose of using an operational model relationship diagram framework? List out the different tools used to create component diagram. [9]

Q5) a) What are the popular interoperability standards and protocols for metadata and master data exchange? Explain the challenges that organizations face when implementing interoperability standards for data exchange? [9]

b) What are the key features of Metadata? Enlist and describe metadata management tools? [9]

OR

Q6) a) Difference between master data management and metadata. What are the five core functions of master data management? [9]

b) Enlist and Explain the three types of master data? Explain cross domain metadata. [9]

Q7) a) What is the role of enterprise architecture in digital transformation? How does enterprise architecture support IT strategy? [9]

b) Why enterprise architecture governance is important? Mention the steps for establishing an Enterprise Architecture Governance Framework. [9]

OR

Q8) a) How can Enterprise Architecture Tools and Technologies help organizations to achieve their strategic goals? [9]

b) Explain different Guiding principles of EA governance? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4849

[Total No. of Pages : 2

[6404]-380

B.E. (Artificial Intelligence and Data Science)

BIOINFORMATICS

(2019 Pattern) (Semester-VII) (417523D) (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 indicate full marks.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Describe the key steps involved in a molecular docking simulation, including ligand conformational sampling and scoring functions. [9]
- b) Describe the application of data science techniques in medical image analysis. [9]

OR

- Q2)** a) Discuss the advantages and limitations of threading as a protein structure prediction method. [9]
- b) Define computer-aided drug design (CADD) and its role in the drug discovery process. [9]

- Q3)** a) Define Metabolic Network and explain its fundamental principles. [9]
- b) Discuss the importance of network analysis and visualization tools in systems biology. [9]

OR

P.T.O.

- Q4)** a) Provide an example of how network analysis and visualization tools have been applied to gain insights into a specific biological process or disease. [9]
- b) Provide an example of a specific regulatory network and its role in a biological system. [9]

- Q5)** a) Explain the concept of feature selection and dimensionality reduction in machine learning. [9]
- b) Explain the primary objectives of dimensionality reduction in data analysis. [8]

OR

- Q6)** a) Explain the importance of clustering in pattern recognition and data analysis [9]
- b) Provide an example of a specific gene network analysis task where machine learning, deep learning, or CNNs have provided valuable insights. [8]

- Q7)** a) Discuss the role of biotechnology in crop improvement, pest control, and soil remediation. [9]
- b) Describe the current trends and emerging research areas in the field of biotechnology and life sciences. [8]

OR

- Q8)** a) Provide an example of a biotechnological solution that has positively impacted agriculture or environmental conservation. [9]
- b) Provide an example of a cutting-edge research project or discovery that has the potential to transform the field of biotechnology. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4850

[Total No. of Pages :2

[6404]-381

B.E. (AI & DS)

GPU PROGRAMMING AND ARCHITECTURE

(417524 A) (2019 Pattern) (Semester - VII)(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) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary.

- Q1)** a) Discuss different commonly used CUDA error handling APIs? [6]
b) Describe Synchronization issues in detail? [6]
c) Identify different tools and techniques that are used for finding and Avoiding CUDA errors? [6]

OR

- Q2)** a) Describe working of Image feature extraction algorithm based on CUDA Architecture? [6]
b) Identify different common problems faced by CUDA programmers?[6]
c) Explain parallel programming issue: Race Hazard? [6]

- Q3)** a) Describe how the interaction between Kernels and Host Device takes place? [9]
b) What are the different alternatives to OpenCL for GPU Programming? Explain it? [8]

OR

- Q4)** a) Draw & Explain OpenCL Execution Model? [9]
b) What is OpenCL? Explain Key features and components of the OpenCL standard? [8]

P.T.O.

- Q5)** a) Explain Sparse Matrix Multiplication on a GPU? [6]
b) Define Parallelism? Explain Task based parallelism and data-based parallelism? [6]
c) Explain Parallel Prefix Sum algorithms with suitable example? [6]

OR

- Q6)** a) Discuss convolution parallel algorithm in detail with suitable example?[6]
b) Explain Common parallel Patterns: Loop-based and fork/join Pattern?[6]
c) Describe the working of Heterogeneous Cluster? [6]

- Q7)** a) Draw & Explain Transport Triggered Architecture (TTA)? [9]
b) Draw & Explain OpenCL Memory Model? [8]

OR

- Q8)** a) Describe Heterogeneous computing with OpenCL? [9]
b) Describe the Application Specific Processors (ASP)? [8]



Total No. of Questions : 8]

SEAT No. :

PD-4851

[Total No. of Pages : 2

[6404]-382
B.E. (AI&DS)
INFORMATION RETRIEVAL
(2019 Pattern) (Semester - VII) (417524 B) (Elective - IV)

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) Define and explain Probabilistic Retrieval. [4]
b) Define the following with respect to Information Retrieval: [6]
i) Vector Space Model
ii) Term Frequency
iii) Inverse Document Frequency
c) What is the binary independent retrieval model? [6]

OR

- Q2)** a) List the problems associated with n-gram. Explain how these problems are handled. [6]
b) List and explain the challenges in Natural language processing. [4]
c) Explain with suitable example different levels of NLP. [6]

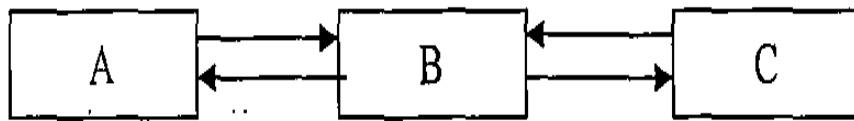
- Q3)** a) What is the difference between clustering and classification? Can clustering be used for classification purposes? [6]
b) What are different types of clustering algorithm? Explain any one of them. [6]
c) Explain in detail about naïve Bayes algorithm and its application in text classification. [6]

OR

P.T.O.

- Q4)** a) Write partitioning algorithm for clustering. [10]
b) Solve Agglomerative hierarchical clustering for single link with example. [8]

- Q5)** a) Discuss the factors that influence a webpage's PageRank score. Discuss the challenges involve in web search engine. [8]
b) What is page ranking? Calculate page rank of following web pages. Assume damping factor 0.7 [10]



OR

- Q6)** a) Define Python library is used for web crawling? [6]
b) What are the Main challenges posed by Web? [6]
c) Explain the components of focused web crawlers? [6]

- Q7)** a) Outline the steps to build a recommender system with an example. [10]
b) What are the four phases of recommender system? . [8]

OR

- Q8)** a) Multimedia Information Retrieval. [8]
b) What are the different evaluation metric for Recommender system. [10]



Total No. of Questions : 8]

SEAT No. :

PD-4852

[Total No. of Pages :2

[6404]-383

B.E. (AI & DS)

UI / UX DESIGN (Elective - IV)

(417524 C) (2019 Pattern) (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.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Make suitable assumption whenever necessary.*

- Q1)** a) Explain different human considerations in design. [6]
b) Explain golden rules of Interface design. [6]
c) How to evaluate Interface design? [6]

OR

- Q2)** a) Explain with an example Usability testing. [6]
b) How do you approach designing for mobile applications? [6]
c) What is information architecture and its importance in UI design? [6]

- Q3)** a) Differentiate between direct manipulation and indirect manipulation. [6]
b) Write a short note on - Phrasing the Menu. [6]
c) Differentiate between menu bar and toolbar. [5]

OR

- Q4)** a) Write a short note on - Interaction with natural language. [6]
b) Enlist different interaction styles. [6]
c) Explain WIMP in detail. [5]

P.T.O.

- Q5)** a) Write a short note on - Selection of Controls. [6]
b) Explain drop down and pop up list boxes. [6]
c) Explain operable controls in detail. [6]

OR

- Q6)** a) What is presentation control? [6]
b) Explain individual windows design and multiple windows design. [6]
c) Explain command menus in detail. [6]

- Q7)** a) What is usability testing? [6]
b) Explain Cognitive walkthrough in detail. [6]
c) Explain different challenges for information visualization. [5]

OR

- Q8)** a) Differentiate between usability testing and user testing. [6]
b) Write a sort note on Eye tracking and A/B testing. [6]
c) Explain Think Aloud protocol in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4853

[Total No. of Pages : 3

[6404]-384

B.E. (Artificial Intelligence and Data Science)

OPTIMIZATION ALGORITHMS

(2019 Pattern) (Semester - VII) (Elective - IV) (417524(D))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Write down all KKT conditions necessary for non linear programming and explain them in details. **[8]**

b) Consider a geometric programming problem with the following objective function and constraints: Objective Function : **[10]**

$$\text{minimize } f(x) = x_1 + x_2 * x_3$$

Subject to :

$$\frac{x_1 * x_2}{x_3} = 10$$

$$\frac{x_1}{x_3} \geq 4$$

$$x_1, x_2, x_3 \geq 0$$

- Formulate the problem as a geometric programming problem and discuss the properties of the objective function and constraints.
- Describe how to transform this geometric program into a convex optimization problem.
- Solve the problem using appropriate methods and interpret the results

OR

P.T.O.

- Q2) a)** Prove that knapsack problem can solved with principle of optimality with mathematically. **[10]**
- b)** Finding a hyperplane in support vector machine for classification activity for a balanced dataset, use quadratic programming to find the optimal hyperplane that maximizes the margin between available classes **[8]**

- Q3) a)** A genetic algorithm is applied to solve a system of linear equations. The system of equations is represented as follows : **[9]**

$$5x + 2y - 4z = 15$$

$$2x - 2y + 5z = 3$$

$$11x + 2y + 4z = 28$$

evaluate the fitness of candidate solutions and produce a step-by-step explanation of how the genetic algorithm would be applied to find a solution for system of linear equations

- b)** For a NP problem like traveling salesman, how simulated annealing can be used to find the optimal tour of minimum cost **[8]**

OR

- Q4) a)** Explain the role of Boltzmann distribution in simulated annealing with example. **[9]**
- b)** Explain the concept stochastic tunneling for global optimization with respect to annealing. **[8]**

- Q5) a)** Consider a neural network with four input vectors and three class distribution. While training the neural network we set the parameters to be achieved at highest level like accuracy, tuning hyper parameters and reducing error rate. Think of these parameters as multi objectives and apply multi objective optimization-Pareto and brief the process **[10]**
- b)** Consider the following minimization problem : **[8]**

$$\text{Minimize } f(x) = x^5$$

where $-2 \leq x \leq 10$. Describe the conditions under which the Differential Evolution algorithm can be terminated. What defines the stopping criteria for the optimization process?

OR

- Q6) a)** Consider the following minimization problem: Minimize the Rosenbrock function: **[10]**

$$f(x, y) = (1 - x)^2 + 100*(y - x^2)^2$$

where $-5 \leq x \leq 5$ and $-5 \leq y \leq 5$ Discuss a real-world scenario or problem where APSO can be applied. Explain how APSO's acceleration coefficients and updates can be adapted to address specific optimization challenges.

- b) Explain the convergence analysis of particle swarm optimization in detail **[8]**

- Q7) a)** What are different steps taken to control Randomization Variants of the Firefly Algorithm, explain them in details **[9]**

- b) Explain the process Echolocation of Bats while optimizing and self tuning the distance parameter **[8]**

OR

- Q8) a)** Explain the behavior of firefly algorithm in self tuning. **[9]**

- b) Write down the application areas where Bat algorithm can be used. Explain one application in detail. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4854

[Total No. of Pages : 2

[6404]-385

B.E. (Artificial Intelligence and Data Science)

COMPUTATIONAL INTELLIGENCE

(417530) (2019 Pattern) (Semester - VIII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

Q1) a) Define Swarm Intelligence and Explain Ant Colony Optimization algorithm. **[8]**

- b) Write short note on: **[10]**
- i) Evolutionary Computation versus Classical Optimization
 - ii) Ant Colony Optimization algorithm

OR

Q2) a) Write short note on: **[10]**

- i) Tournament selection method
- ii) Constraint Handling

b) What are genetic operators and what is their role in evolutionary algorithms? **[8]**

Q3) a) Explain following Terminologies of Genetic Algorithm: **[10]**

- a) Search space
- b) Genes
- c) Allele
- d) Trait
- e) Genotype and Phenotype

P.T.O.

- b) Write short note on : [7]
a) Selection operator in Genetic Algorithm.
b) Stopping conditions used in genetic algorithms

OR

- Q4)** a) What are types of mutation and cross over techniques? Explain in brief. [6]
b) Explain Messy Genetic Algorithms. [6]
c) Explain - Binary Representations, Floating Point Representations used in Genetic Algorithms. [5]

- Q5)** a) Explain following Word embedding Techniques: [8]
i) Bag of Words
ii) TF-IDF
iii) Word2Vec
iv) GloVe
b) Explain the process of Neural Style Transfer and discuss its applications. [5]
c) Discuss the significance of pre-trained NLP BERT models and provide examples of their applications. [5]

OR

- Q6)** a) Describe the architecture of a Neural Machine Translation (NMT) model and discuss the role of Seq2Seq in NMT. [9]
b) Define BLEU Score and BERT Score as metrics for evaluating machine translation. Compare traditional metrics with neural metrics in machine translation evaluation. [9]
Q7) a) Describe the Network Theory Model in artificial immune systems. [6]
b) Describe the working of the Artificial Immune System Algorithm. [5]
c) Explain the concept of danger theory in the context of artificial immune systems. [6]

OR

- Q8)** a) Explain how the Clonal Selection Theory Model contributes to the development of artificial immune systems? [6]
b) Explain the concept of the natural immune system. Compare it with artificial immune models. [5]
c) Discuss the role of dendritic cells in the artificial immune system. How are dendritic cell-based models utilized in problem-solving and optimization tasks? [6]



Total No. of Questions : 8]

SEAT No. :

PD-4855

[Total No. of Pages : 2

[6404]-386

B.E. (Artificial Intelligence & Data Science)

DISTRIBUTED COMPUTING

(2019 Pattern) (Semester - VIII) (417531)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*

- Q1)** a) Explain the key differences between Centralized and Distributed Load Balancing Techniques. **[6]**
- b) Describe what Consensus algorithms are and explain how one specific algorithm works. **[6]**
- c) Compare and contrast how Weighted Round Robin and Least Connection load balancing algorithms would perform in a system with varying server capacities and network loads. **[6]**

OR

- Q2)** a) Describe one variant of Paxos and explain how it differs from the original Paxos algorithm. **[6]**
- b) Describe how Genetic Algorithms can be used for task scheduling and explain their benefits in this context. **[6]**
- c) Apply load balancing and resource allocation strategies to optimize performance in a cloud computing environment. How would you implement these strategies to handle varying workloads? **[6]**

P.T.O.

- Q3)** a) Explain Elastic Averaging SGD. [9]
b) Explain Systems and Architectures for Distributed Machine Learning. [8]

OR

- Q4)** a) What is Apache Spark? Explain the working of Apache Spark. [9]
b) Explain i) Federated Learning.
ii) Elastic Averaging SGD. [8]

- Q5)** a) How would you apply Secure Multi-Party Computation (SMPC) to protect sensitive data in a collaborative machine learning task? [6]
b) What are the key differences between SIMD and MIMD? [6]
c) Describe the concepts of Threat Hunting and Visualization and explain how they are used in cybersecurity. [6]

OR

- Q6)** a) Summarise the AI-based Intrusion Detection and Threat Mitigation Techniques. [6]
b) Explain Anomaly as well as Behavior AI-based Intrusion Detection & Threat Mitigation Techniques [6]
c) Discuss about various types of real-time analytics used in distributed computing systems. [6]
- Q7)** a) Explain how reinforcement learning can be applied to load balancing in distributed systems, highlighting its potential advantages. [9]
b) Apply different Big Data processing frameworks in a distributed computing environment to solve a specific data analysis problem. How would you choose and implement the appropriate framework? [8]

OR

- Q8)** a) Describe the different types of data ingestion and explain how each type is used in data processing workflows. [9]
b) Describe AI-based intrusion detection and threat mitigation techniques and explain how they help enhance network security. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4856

[Total No. of Pages : 2

[6404]-387

**B.E. (Artificial Intelligence and Data Science)
VIRTUAL REALITY AND GAME DEVELOPMENT
(2019 Pattern) (Semester - VIII) (Elective - V) (417532A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is Virtual Reality? Explain Methodology used in various VR tools For Data Collection and Analysis. **[9]**

b) Explain how various Human Factors are used in VR Evaluations using applicable diagram and steps. **[8]**

OR

Q2) a) Explain how VR is applied in various Health and Safety Issues using eg.? **[9]**

b) Enlist various VR Tools. State comparison between Unity and Unreal Engine. **[8]**

Q3) a) Enlist and explain various player modes. How they are impacting the gaming experience. **[9]**

b) Explain the MDA framework used in game design with suitable diagram. **[9]**

OR

Q4) a) Explain the role of story and character development in video games. How do narrative elements and character arcs impact player engagement and immersion in the game world? **[9]**

b) Discuss the key principles of level design in video games. Explain with suitable eg. how these principles are considered in Guiding the Player in interactive gaming? **[9]**

P.T.O.

- Q5)** a) Enlist and explain various ways for manipulating 2D objects in Blender with suitable case study. [9]
b) Describe the process of texturing and shading 2D images in Blender.[9]

OR

- Q6)** a) Discuss the role of the Timeline and Keyframes in Blender for animating objects in VR game development. [9]
b) Provide an overview of the basic 3D modeling techniques used in Blender for VR development. [9]

- Q7)** a) Explain the key features of Virtual Reality (VR) in gaming. How does VR technology enhance the immersive experience for players? [9]
b) What is the role of Artificial Intelligence (AI) in Virtual Reality (VR) gaming? Explain how AI can be used to enhance VR game environments. [8]

OR

- Q8)** a) Discuss the difference between heuristic and non-heuristic methods in AI. How are these methods used in solving problems within video games? [9]
b) Explain the concept of Game AI and its importance in creating interactive and engaging gameplay. Provide examples of Game AI models used in modern video games. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4857

[Total No. of Pages : 2

[6404]-388

B.E. (Artificial Intelligence and Data Science)

BIG DATA ANALYTICS

(2019 Pattern) (Semester - VIII) (417532 B) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the steps involved in performing the linear regression analysis using R programming. **[6]**
- b) Write a short note on model planning and model building in data analytics lifecycle. **[6]**
- c) Explain the steps involved in data preparation for data analysis. **[6]**

OR

- Q2)** a) Explain dirty data in R Programming with suitable example. **[6]**
- b) With the help of neat diagram explain the phases of Data Analytics Life Cycle. **[6]**
- c) Explain the concept of MapReduce with diagram. **[6]**

- Q3)** a) Explain Exploratory Data Analytics in the data analysis process. **[6]**
- b) Explain random subsampling method of dataset Partitioning. **[6]**
- c) How does the utilization of confusion matrix aid in the evaluation and selection of models. **[6]**

OR

P.T.O.

- Q4)** a) Explain the working of random forest algorithm. [6]
b) Explain the following terms with respect to Exploratory Data Analysis. [6]
i) Univariate Analysis
ii) Data Cleaning
c) Write a short note on Boosting and AdaBoost ensemble techniques. [6]

- Q5)** a) Discuss various techniques for visual data representation. [6]
b) Write a short note on : [6]
i) Candela
ii) D3.js
c) Explain the importance of Tableau in data visualization. [5]

OR

- Q6)** a) Explain various types of data visualization techniques available to data analysts. [6]
b) Explain the key challenges of big data visualization. [6]
c) Explain the key features and functionalities of the Google Chart API. [5]

- Q7)** a) How does Apache HBase contribute to efficient data storage and retrieval in big data environments? [6]
b) Write a short note on data collection tools : [6]
i) Semantria tool
ii) Sentiment Analysis tool
c) Explain Scraper data extraction tool in big data analytics. [5]

OR

- Q8)** a) Discuss the applications of Big Data Analytics in the Retail Analytics. [6]
b) Write a short note on data storage tools : [6]
i) Apache HBase
ii) CouchDB
c) Explain Mozenda data extraction tool in big data analytics. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4858

[Total No. of Pages : 2

[6404]-389

B.E. (Artificial Intelligence and Data Science)

SOFTWARE DEVELOPMENT FOR PORTABLE DEVICES

(2019 Pattern) (Semester - VIII) (417532 C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the concept of Location-Based Services in Android. What are the main components required to implement LBS in an application? **[9]**
- b) Explain hardware support and devices Using the Camera for Taking Pictures and Camera Properties. **[9]**

OR

- Q2)** a) Explain how to use the Sensor Manager to access and manage sensors on an Android device. Provide an example of how to monitor a device's accelerometer. **[9]**
- b) Write short note on : **[9]**
- i) Forward Geocoding
 - ii) Reverse Geocoding

- Q3)** a) What are the steps for pairing and enabling developer mode of wear devices? **[9]**
- b) Write short note on Google Services and Google Play Services. **[8]**

OR

P.T.O.

- Q4)** a) What are the interfaces and classes of the wearable package of Android Wear API's? [9]
b) Explain any notification control setting of the device. [8]

- Q5)** a) What is Google Fit and explain various applications of Google Fit. [9]
b) Explain Google Permission Groups and Fitness Scopes? [9]

OR

- Q6)** a) Explain different Storage Options available in Android. [9]
b) Explain various Content Providers with example. [9]

- Q7)** a) Write short note on : [8]
i) Home Automation with portable devices
ii) Industrial safety using portable devices
b) Explain the concept of Real-world Application for Fitness, Health, and Medical with an example. [9]

OR

- Q8)** a) Write short note on : [9]
i) Wearables at workplaces
ii) Remote medical diagnostics
b) Explain different Predictive Consumer Health Applications as a real application of portable device. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4859

[Total No. of Pages : 3

[6404]-390

B.E. (AI & DS)

DEEP LEARNING

(2019 Pattern) (Semester - VIII) (417532D) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the basic architecture of a Convolutional Neural Network (CNN) and describe the role of each key component within the architecture.[9]
- b) Define padding and strides in CNNs, and explain their impact on the output size of feature maps in convolutional layers. [8]

OR

- Q2)** a) Discuss the role of the ReLU layer in CNNs. How does ReLU differ from other activation functions, and why is it preferred in convolutional layers? [9]
- b) Describe the concept of pooling in CNNs and explain how it contributes to spatial dimensionality reduction. What are some common pooling methods, and how do they differ? [8]

- Q3)** a) Explain the structure of Recurrent Neural Networks (RNNs) and the concept of unfolding computational graphs. How do RNNs handle sequential data, and what challenges arise with long-term dependencies?[9]
- b) Discuss the Bidirectional RNN and Encoder-Decoder Sequence-to-Sequence Architecture. How do these architectures enhance the ability of RNNs to handle complex sequential tasks? [9]

OR

P.T.O.

- Q4) a)** Outline practical methodologies for evaluating the performance of recurrent neural networks (RNNs). Describe commonly used performance metrics, baseline models, and strategies for selecting hyperparameters in RNN-based models. **[9]**
- b)** Describe the role of Long Short-Term Memory (LSTM) networks and other gated RNNs in addressing the limitations of standard RNNs. How do LSTM networks manage long-term dependencies, and what are some alternative strategies for handling multiple time scales? **[9]**

- Q5) a)** What is a deep generative model, and how does it differ from discriminative models? Provide examples of deep generative models and their applications. **[9]**
- b)** Describe the structure and functioning of a Boltzmann Machine (BM). What is the concept of energy in a Boltzmann Machine, and how does it guide the learning **[8]**

OR

- Q6) a)** What is a Generative Adversarial Network (GAN), and how do the generator and discriminator networks interact in the GAN framework? Describe their roles and training process. **[9]**
- b)** Discuss the various types of GAN architectures and provide examples of applications where GANs have proven effective. **[8]**

- Q7) a)** What is deep reinforcement learning, and how does it extend traditional reinforcement learning techniques? Discuss its significance in AI and real-world applications. **[6]**
- b)** Explain the concept of a Markov Decision Process (MDP) and describe its components. How does an MDP serve as a foundation for reinforcement learning? **[6]**
- c)** Describe the basic framework of reinforcement learning, including key concepts such as agents, environments, actions, states, rewards, and policies. **[6]**

OR

- Q8)** a) What are the main challenges faced in reinforcement learning, and what techniques are commonly used to address them? **[6]**
- b) Explain Q-Learning and how Deep Q-Networks (DQN) improve upon traditional Q-Learning for complex environments. **[6]**
- c) How can reinforcement learning be applied to solve a simple game like Tic-Tac-Toe? Describe the learning process and strategy. **[6]**



Total No. of Questions : 8]

SEAT No. :

PD-4860

[Total No. of Pages : 2

[6404]-391

B.E. (Artificial Intelligence and Data Science)

AUGMENTED REALITY

(2019 Pattern) (Semester - VIII) (Elective - VI) (417533A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) How is computer vision used in augmented reality? Explain in detail Marker Tracking and Multiple-Camera Infrared Tracking. **[9]**

b) List and explain the different Major Software Components for Augmented Reality Systems. **[9]**

OR

Q2) a) Explain Natural Feature Tracking and its types. **[9]**

b) Explain in detail which kind of Software used to Create Content for the Augmented Reality Application. **[9]**

Q3) a) Explain Different Augmented Reality Techniques in detail. **[9]**

b) Explain different Marker types with detail description of 2D barcode markers. **[8]**

OR

Q4) a) Explain Augmented Reality System, And Threats of Augmented Reality. **[9]**

b) Explain different Tracking methods with detailed explanation of hybrid tracking. **[8]**

P.T.O.

- Q5) a)** Explain Augmented Reality Components in details. **[9]**
- b) Explain in detail Scene Generator. Difference between Tracking system and monitoring system. **[9]**

OR

- Q6) a)** Explain Augmented Reality Devices in details. **[9]**
- b) What is the difference between video see through and optical see through? Explain in detail key characteristics of projection displays. **[9]**

- Q7) a)** Explain in detail Cloud services AR Applications **[9]**
- i) Business applications,
- ii) Weather prediction,
- iii) Market prediction
- b) Explain the smart cities AR application for Civil Engineering, Architecture, Archaeology, Crime and Security. **[8]**

OR

- Q8) a)** Explain in detail different Tools available for Augmented Reality and Recognition. **[9]**
- b) Explain the following Points in detail **[8]**
- i) Healthcare sector,
- ii) Education,
- iii) Agriculture
- iv) IoT



Total No. of Questions : 8]

SEAT No. :

PD-4861

[Total No. of Pages : 2

[6404]-392

B.E. (Artificial Intelligence and Data Science)

BUSINESS INTELLIGENCE

(2019 Pattern) (Semester - VIII) (Elective - VI) (417533(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) *Make suitable assumptions in necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) a) Define Data Warehouse and explain any one schemas of data warehouse. **[6]**

b) Develop a plan for Data Quality assessment and profiling in the context of a specific business dataset. **[6]**

c) Create a visual representation (e.g., diagram or flowchart) of the Data Provision in process, highlighting key stages and components. **[6]**

OR

Q2) a) Differentiate between Initial and Incremental Loading in ETL processes. **[6]**

b) Create a simplified data mart and explain its purpose in a BI system. **[6]**

c) Compare and contrast the data provisioning methods of different BI tools such as Tableau, Power BI, and Dundas BI. **[6]**

Q3) a) Describe the significance of Data Reduction in the context of large datasets, and explain the methods of Sampling. **[6]**

b) Analyze the impact of incomplete data on data Analysis and explain any the strategy for handling such data. **[5]**

c) Propose a feature extraction method suitable for a specific domain and explain its potential benefits. **[6]**

P.T.O.

OR

- Q4)** a) Write short not on Feature Selection and Principal Component Analysis (PCA) [6]
b) Evaluate the effectiveness of different methods of Data Discretization in improving the interpretability of data. [5]
c) Evaluate the strengths and weaknesses of measures of correlation for numerical attributes in multivariate analysis. [6]
- Q5)** a) Analyze the strengths and limitations of Linear Regression in different scenarios. [6]
b) Discuss the principles underlying the Apriori Algorithm for association rule mining. [6]
c) Design a regression model for a complex problem, considering relevant variables and data. [6]

OR

- Q6)** a) Critically analyze the outcomes of clustering models based on partition and hierarchical methods. [6]
b) Evaluate the trade-off's between Bayesian methods and Logistic Regression in classification problems. [6]
c) Propose a clustering strategy for a large dataset and justify your approach. [6]
- Q7)** a) Explain how Logistics and Supply Chain Management benefit from Business Intelligence applications. [5]
b) Develop a Customer Relationship Management strategy that incorporates Business Intelligence tools and analytics. [6]
c) Compare the advantages and disadvantages of Mobile Business Intelligence with traditional BI approaches. [6]

OR

- Q8)** a) Identify and analyze key issues related to analytics, such as data privacy and security concerns. [5]
b) Evaluate the Benefits and challenges of integrating cloud computing with business intelligence. [6]
c) Evaluate the potential future impacts of Location-based Analytics on organizational decision-making. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4862

[Total No. of Pages : 2

[6404]-393

**B.E. (Artificial Intelligence and Data Science)
INFORMATION SYSTEMS MANAGEMENT (Theory)
(2019 Pattern) (Semester - VIII) (Elective - VI) (417533C)**

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) *Draw neat figures wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

Q1) a) What are the major types of knowledge management systems explain in brief? **[9]**

b) What is Decision making System? What are types of Decision? **[9]**

OR

Q2) a) List and explain the analytic functionalities provided by BI systems. **[9]**

b) Explain : **[9]**

- i) Business Value of Improve decision Making
- ii) High Velocity Automated Decision Making

Q3) a) Explain Project Software tools like JIRA and SCRUM. **[9]**

b) Write short Note on:Modelling and Design System **[8]**

OR

Q4) a) Explain contrast Structured and Object-Oriented Methodologies for modelling and designing systems. **[9]**

b) Evaluate the multifaceted purposes of the System Development Process cycle. **[8]**

P.T.O.

- Q5)** a) List and describe the challenges posed by enterprise applications. [9]
b) Illustrate how enterprise systems provide value for a business. [9]

OR

- Q6)** a) What is CRM (Customer Relationship Management)? Explain operational and analytical CRM. [9]
b) Explain push-based and a pull-based model of supply chain Management. [9]

- Q7)** a) List and explain any three options for building and hosting e-commerce Web sites. [9]
b) List and describe the Unique features of e-commerce. [8]

OR

- Q8)** a) Explain in Detail What is E commerce, its types and Models? [9]
b) Explain other mobile commerce services and its beneflts (Any 4) [8]



Total No. of Questions : 8]

SEAT No. :

PD-4863

[Total No. of Pages : 2

[6404]-394

B.E. (Artificial Intelligence and Data Science)

REINFORCEMENT LEARNING

(2019 Pattern) (Semester - VIII) (417533D) (Elective - VI)

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 dynamic programming for the Markov decision process and define formulation of planning in MDPs. [6]
- b) List and Explain the principles of optimality. [5]
- c) Elaborate Iterative policy evaluation and policy iteration. [6]

OR

- Q2)** a) Elaborate proof of contraction mapping property of Bellman expectation and optimality operators. [7]
- b) Discuss Banach fixed point theorem. [5]
- c) Explain a proof of convergence of policy evaluation and value iteration algorithms. [5]

- Q3)** a) Discuss the role of Monte Carlo methods for model-free Reinforcement Learning and Monte Carlo control. [8]
- b) Explain on-policy and off-policy learning techniques. [4]
- c) Elaborate first visit and every visit to Monte Carlo in Reinforcement Learning. [6]

OR

- Q4)** a) Discuss Discounting-aware Importance Sampling and Per-decision Importance Sampling with examples. [12]
- b) Elaborate Monte Carlo tree search along with examples. [6]

P.T.O.

- Q5)** a) Elaborate Deep Q-networks with convolution neural networks and single-layer neural networks. [12]
b) Compare Model based learning and model-free learning with applications. [6]

OR

- Q6)** a) Elaborate Temporal difference learning technique. [6]
b) Explain the Separate target network and discuss the role of the Separate target network in computing the target Q-values. [6]
c) Elaborate Double DQN and Dueling DQN in reinforcement learning. [6]
- Q7)** a) Elaborate Multi-agent Reinforcement Learning with Rollout and Policy Iteration. [6]
b) Discuss Trajectory Sampling and Real-time Dynamic Programming with respect to learning. [6]
c) Comment on Planning at Decision Time along with its importance. [5]

OR

- Q8)** a) Elaborate Heuristic Search and Rollout Algorithms in reinforcement learning. [6]
b) Discuss Integrated Planning, Acting and Learning in Planning and Learning. [6]
c) Explain Trajectory Sampling, and Real-time Dynamic Programming. [5]



Total No. of Questions : 8]

SEAT No. :

PD-5259

[Total No. of Pages : 2

[6404]-395

B.E. (Mechatronics Engineering)

ROBOT OPERATING SYSTEM

(2019 Pattern) (Semester-VIII) (417541)

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) Use of non-programmable calculator is allowed.*
- 4) Assume suitable data if necessary.*

- Q1)** a) Write a short note on Robot welding application using VAL program. [9]
- b) Explain in brief the palletizing applications using VAL. [8]

OR

- Q2)** a) Explain in brief the basic command used in VAL-II programming. [9]
- b) Explain any one application using conditional statements. [8]

- Q3)** a) Write a short note on Pick and place operation using Industrial robot. [9]
- b) Explain the concept of Move master command language. [9]

OR

- Q4)** a) Explain in detail the subroutine command based programming language. [9]
- b) Differentiate between the manual mode and the automatic mode. [9]

P.T.O.

- Q5)** a) Explain in brief the Robotic Process Automation in detail. [9]
b) Write a short note on machine Interference Process chart. [8]

OR

- Q6)** a) Explain in brief the VR in Robotics. [9]
b) Explain in detail the computer vision system used in industrial robots. [8]

- Q7)** a) Explain in brief the experimental nature of simulation. [9]
b) Write a short note on interfacing of software with robots. Explain with an example. [9]

OR

- Q8)** a) In detail give the Comparison between simulation packages and programming languages. [9]
b) Write a short note on classification of simulation software. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4864

[Total No. of Pages : 2

[6404]-396

B.E. (Mechatronics Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - VII) (417542)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q. 6. and Q.7 or Q.8.*
- 2) *Assume suitable data, if necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Define Modulation index. Explain the frequency spectrum for FM wave. **[8]**

b) Explain in details Transistor phase modulator and Noise Triangle. **[9]**

OR

Q2) a) Compare Wide band FM with Narrow band FM. **[8]**

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

- i) Frequency Deviation
- ii) Deviation Ratio
- iii) Percentage modulation for FM

Q3) a) Explain the following modulation Techniques : **[8]**

- i) BFSK
- ii) M-ARY PSK

b) Explain in details Differentially Encoded BPSK and DQPSK. **[9]**

OR

P.T.O.

- Q4) a)** Explain the following modulation Techniques : **[8]**
- i) BASK
 - ii) M-ARY FSK
- b) Explain in details Pulse Desperation, Coherent and non-coherent. **[9]**

- Q5) a)** Define Wave Propagation. Explain its various types. **[9]**
- b) Write short note on : **[9]**
- i) Effective Length
 - ii) Helical Antenna

OR

- Q6) a)** Explain the relation from small loops and its radiation resistance. **[9]**
- b) Explain half wave dipole and folded wave dipole with their advantages, disadvantages and applications. **[9]**
- Q7) a)** Write a short note on multipath effect in Mobile Communications also state the parameters for the same. **[9]**
- b) Explain the following systems with their advantages, disadvantages and applications : **[9]**
- i) 2G
 - ii) 2.5G

OR

- Q8) a)** With the help of suitable diagram explain WLAN state its type. **[9]**
- b) Explain the concept of Frequency Reuse and Adjacent Channel Interference. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-5265

[Total No. of Pages : 2

[6404]-397

B.E. (Mechatronics Engineering)

MICRO ELECTRO MECHANICAL SYSTEMS

(2019 Pattern) (Semester - VII) (417543)

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) *Use of Non-programmable Calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

- Q1) a)** Describe the key properties required of materials used in MEMS and Microsystems. Why are these properties important? **[9]**
- b)** Write a short note on Photolithography. Draw neat diagram. **[8]**

OR

- Q2) a)** Explain why silicon is the most widely used material in MEMS. What are its advantages and limitations in this context? **[9]**
- b)** Discuss the role of polymers in MEMS applications. How do they compare with traditional materials like silicon and metals? **[8]**
- Q3) a)** Write a short note on scaling in geometry in MEMS. **[9]**
- b)** Explain the concept of scaling laws in the context of miniaturization of MEMS devices. Why are they important in microsystem design? **[9]**

OR

- Q4) a)** Discuss how thermal conduction and heat dissipation are affected by scaling down physical dimensions in MEMS devices. **[9]**
- b)** Describe how capacitance and inductance scale with size in MEMS. How does this affect the design of electrostatic actuators and sensors? **[9]**

P.T.O.

- Q5) a)** Explain in detail the Micro- Scopy with some example. **[9]**
b) Describe how interferometry is used in MEMS to obtain surface and depth information. What are its advantages and limitations? **[9]**

OR

- Q6) a)** Describe the working principle of Scanning Tunneling Microscopy (STM). How does it provide topographical information at the atomic scale? **[9]**
b) Explain in detail the different Topography methods with suitable diagram. **[9]**

- Q7) a)** Describe the key applications of carbon nanotubes in electronics, sensing, and energy storage. How do their unique properties make them suitable for each application? **[9]**
b) Discuss the use of CNTs in biomedical applications such as drug delivery or biosensing. What are the potential benefits and risks? **[8]**

OR

- Q8) a)** Describe the mechanical properties of carbon nanotubes. Why are they considered among the strongest known materials? **[9]**
b) Write a short- note on Nano- tribolog. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-5285

[Total No. of Pages : 2

[6404]-398

B.E. (Mechatronics Engineering)

IMAGE PROCESSING & COMPUTER VISION

(2019 Pattern) (Semester - VII) (417544A) (Eletive - 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 indicates full marks.*
- 4) Use of Calculator is allowed.*
- 5) Assume Suitable data if necessary*

Q1) a) What is texture Descriptor? Explain Local Binary Pattern (LBP) in detail. **[8]**

b) Explain Histogram of oriented Gradients with the help of proper example. **[10]**

OR

Q2) a) Explain in detail Interest or Corner Point Detectors with example. **[9]**

b) Explain Scale Invariant Feature Transform in detail. **[9]**

Q3) a) What is a Pattern Recognition System? What are components of pattern recognition System. **[5]**

b) Explain Object Detection in Computer Vision. **[5]**

c) What are different parameter Estimation Techniques? Explain Maximum Likelihood Estimation in detail. **[7]**

OR

P.T.O.

- Q4)** a) What is Learning and Adaptation in Machine Learning? [4]
b) What is Dimension Reduction? [5]
c) Explain Linear Discriminant Analysis in detail. [8]

- Q5)** a) Give Opencv code for following operation : [6]
i) Accessing and modifying pixel values of an image
ii) Accessing Image properties
b) Give opencv code for following shape drawing functions : [6]
i) Circle
ii) Rectangle
c) Explain Image Blurring Technique. Give advantages of Image Blurring. [5]

OR

- Q6)** a) What are Image Contours? Write steps for finding and drawing contours using opencv. [6]
b) What are different Arithmetic Operations on Image? Explain Addition of image. [6]
c) Explain Image Thresholding Technique with syntax and syntax explanation. [5]

- Q7)** a) What is Artificial neural network for pattern Classification? [6]
b) What is Convolution Neural Networks (CNNs)? [6]
c) What are Autoencoders? [6]

OR

- Q8)** a) Give a brief on application of computer vision-Motion Estimation. [9]
b) Explain Object Tracking in computer vision in detail. [9]

Total No. of Questions : 8]

SEAT No. :

PD-4865

[Total No. of Pages : 2

[6404]-399

B.E. (Mechatronics Engineering)

MEDICAL MECHATRONICS

(2019 Pattern) (Semester - VII) (417544 B) (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) *Assume suitable data, if necessary.*
- 3) *Figures to the right side indicates full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of calculator is allowed.*

Q1) a) State the significance of Hearing Aids. Describe the working principle of audiometer with the neat diagram. **[10]**

b) With the help of neat diagram, Explain the working of cardiac output measurement with the help of neat diagram. **[7]**

OR

Q2) a) Define Blood flow. Draw and Discuss the working principle of any one type of Blood flow meter with the help of neat diagram. **[10]**

b) Explain the working of oximeter with the help of neat diagram. **[7]**

Q3) a) State the role of Defibrillator in the body. With the help of neat diagram, Explain the working of Defibrillator with the help of neat diagram. **[10]**

b) With the help of neat diagram, explain the working of Hemodialysis machine with the help of neat diagram. **[8]**

OR

Q4) a) State the role of Pacemaker in the body. With the help of neat diagram, Explain the working of Pacemaker with the help of neat diagram. **[10]**

b) With the help of neat diagram, explain the working of Infant Incubator system. **[8]**

P.T.O.

- Q5) a)** State the advantages of Magnetic Resonance effect in the body. With the help of neat diagram, Explain the working of Magnetic Resonance Imaging with the help of neat diagram. **[10]**
- b)** With the help of neat diagram, Explain the working of Endoscopy with the help of neat diagram. **[7]**

OR

- Q6) a)** State the advantages of X-Rays in the body. With the help of neat diagram, Explain the working of Computer Tomography with the help of neat diagram. **[10]**
- b)** With the help of neat diagram, Explain the working of Microwave Hermography with the help of neat diagram. **[7]**
- Q7) a)** State the concept of Electrical Safety. With the help of neat diagram, Explain the concept of EMI/RFI Interference. **[10]**
- b)** With the help of neat diagram, Explain the working of HIS System with the help of neat diagram. **[8]**

OR

- Q8) a)** State the role of database in HIS. With the help of neat diagram, Explain the working of HIS System with the help of neat diagram. **[10]**
- b)** Elaborate the concept of Biomedical Telemetry with the help of neat diagram. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD-4866

[Total No. of Pages : 2

[6404]-403

B.E. (Mechatronics Engineering)

Industry 4.0

(2019 Pattern) (Semester - VII) (Elective - IV) (417545 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Explain the Availability and Usability of EVs. [6]
b) Explain in brief Pumped Hydro Storage [6]
c) Explain Variable Renewable Electricity Sources [6]

OR

- Q2)** a) Discuss the potential of Sodium-Sulphur Battery Energy Storage to Enable Integration of Wind [6]
b) Explain in brief Compressed Air Energy Storage [6]
c) Write a note on Zinc-Bromine Batteries [6]
- Q3)** a) Differentiate between Conventional Grid and Smart Grid [6]
b) Explain concept of Self-Healing Grid [6]
c) What are different Stages of Evolution of Smart Grid [6]

OR

P.T.O.

- Q4)** a) Explain the Challenges faced by Smart Grid Technology [6]
b) Explain in brief different Smart Grid Solutions [6]
c) What are Security challenges faced in smart grid and Industry 4.0 integration [6]

- Q5)** a) Write a note on Google's Self-Driving Car [6]
b) Distinguish between Automatic car and smart car [6]
c) Explain in brief different Levels of Automation in Self Driving Car [5]

OR

- Q6)** a) Describe the concept of Smart Entertainment [6]
b) Explain the Pros and Cons of Self Driving Cars [6]
c) Write a note on Bluetooth and Bluetooth Smart [5]

- Q7)** a) What are the different sensors used in IoT? Explain in brief [6]
b) How the concept of IOT evolved? Explain. [6]
c) Write a note on Raspberry Pi. [5]

OR

- Q8)** a) What are General Opportunities and Challenges faced in Industry 4.0. [6]
b) Explain with neat diagram architecture of Industrial Internet of Things. [6]
c) Define IIOT. Explain about Arduino used in IoT. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4867

[Total No. of Pages : 2

[6404]-404
B.E. (Mechatronics Engineering)
INTERNET OF THINGS
(2019 Pattern) (Semester - VIII) (417548)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** What are the functions of the IOT platform? **[9]**
b) How can Arduino be integrated with sensors and actuators and give types of sensors & actuators? **[8]**

OR

- Q2) a)** Define IOT Platform. How does an IOT platform Work? **[9]**
b) State and explain different Types of platform. **[8]**

- Q3) a)** Explain HPC for cloud computing. **[9]**
b) Explain IOT Service Models: Software as a service. **[9]**

OR

- Q4) a)** Explain Cloud Computing Architecture and its characteristics. **[6]**
b) Explain different deployment cloud models. **[6]**
c) Explain IOT Service Models: Infrastructure as a service. **[6]**

- Q5) a)** Explain challenges of Network layer & Transport layer. **[5]**
b) Explain Bootstrapping and Authentication in IOT. **[6]**
c) Explain A lightweight cryptography (LWC) framework to secure IOT. **[6]**

OR

- Q6) a)** Explain different security issues in IOT. **[6]**
b) Explain the use of IOT gateways in Security. **[6]**
c) Explain Authorization Mechanisms IOT. **[5]**

P.T.O.

- Q7)** a) Explain in detail-Smart grid & cloud. [6]
b) Explain in detail-Cloud services in Health Care Sector. [6]
c) Explain in detail-Smart home. [6]

OR

- Q8)** a) Explain in detail-Smart Grid. [6]
b) Explain in detail-Smart Health Care System. [6]
c) Explain-Cloud and Big Data Analytics in the Health Care Sector. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4868

[Total No. of Pages :3

[6404]-405

B.E. (Mechatronics Engineering)
VIBRATION ANALYSIS AND CONTROL
(417549) (2019 Pattern) (Semester -VIII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 drawing instruments, electronic pocket calculators are allowed.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explain transverse vibrations with neat diagram: [7]
- b) A body of mass 5kg is supported on a spring of stiffness 1960N/m and has dashpot connected to it which produces a resistance of 1.96 n at a velocity of 1m/s. In what ratio will the amplitude of vibration be reduced after 5 cycles? [4]
- c) Define the term critical damping coefficient related to vibrations. [7]

OR

- Q2)** a) In a single degree freedom viscously damped vibrating system the suspended mass of 20kg makes 50 oscillations in 20 seconds. The amplitude of natural vibrations decreases to one fourth of the initial value after 4 oscillations. [6]

Determine :

- i) The logarithmic decrement
 - ii) Damping factor:
 - iii) Damping coefficient:
- b) A 500kg vehicle is mounted on springs such that its static deflection is 1.5mm. What is the damping coefficient of viscous damper to be added to the system in parallel with the springs that the system is critically damped? [6]

P.T.O.

- c) A mass of 2kg is supported on a spring of 3kN/m and has a dashpot having damping coefficient of 5Ns/m. If the initial displacement of 8mm is given find: [6]

- i) The damped natural frequency
- ii) The logarithmic decrement
- iii) The amplitude after 3 cycles

- Q3)** a) Explain transmissibility versus frequency ratio curve for different amount of damping. [8]

- b) Write a short note on: forced vibrations due to reciprocating unbalance. [10]

OR

- Q4)** a) Discuss the effect of shaft speed when shaft speed is less than critical speed, shaft speed is equal to critical speed, shaft speed is greater than critical speed. [8]

- b) A machine having a mass of 100kg is running at a speed of 1500rpm. It is mounted on a spring of stiffness 10^6 N/m and damper having damping factor 0.3. A 3 kg piston within the machine has a reciprocating motion with a stroke of 100mm. Determine: [10]

- i) The amplitude of vibrations of the machine
- ii) The force transmitted to the foundation

- Q5)** a) Explain degenerate system with any two examples. [6]

- b) Define the following terms: i) Zero frequency ii) Node point [5]

- c) Explain two degree of freedom system with any two practical examples. [6]

OR

- Q6)** a) Explain the concept of torsionally equivalent shaft and derive the equation for its equivalent length. [8]

- b) The flywheel of an engine driving a dynamo has mass of 200kg and has a radius of gyration of 300mm. The shaft at the flywheel end has an effective length of 250mm and is 50mm diameter. The armature mass is 225kg and has a radius of gyration of 255mm. The dynamo shaft has a diameter of 43.75mm and a length of 200mm. Neglecting the inertia of the shaft and coupling, calculate the frequency of the torsional vibrations and position of node, take the modulus of rigidity for shaft material as 80GPa. [9]

- Q7)** a) A device used to measure torsional acceleration consists of a ring having a moment of inertia of 0.049 kgm^2 connected to a shaft spring having a scale of 0.98 Nm/rad and a viscous damper having a constant of 0.11 Nm.s/rad . When the shaft vibrates with a frequency of 15 cpm , the relative amplitude between the ring and shaft is found to be 2° . What is the maximum acceleration of the shaft. **[9]**
- b) Explain the general vibration measurement process with neat sketch. **[8]**

OR

- Q8)** a) Explain four methods of vibration control. **[8]**
- b) A vibration measuring device is used to find the displacement, velocity and acceleration of a machine running at 120 rpm . If the natural frequency of the instrument is 5 Hz and it shows 0.04 mm . What are the 3 readings? Assume no damping. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4869

[Total No. of Pages : 2

[6404]-406

B.E. (Mechatronics Engineering)

APP DEVELOPMENT

(2019 Pattern) (Semester - VIII) (417550 A) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, 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 neatly about Absolute and Relative Layouts. **[6]**
- b) Explain the activity life cycle. **[6]**
- c) List all attributes to develop a simple button and Write the syntax for Intent-Filter tag. **[6]**

OR

- Q2) a)** Write the Syntax and output for : **[10]**
- i) Rating Bar
 - ii) Toast
 - iii) Switch button
 - iv) Image Button
 - v) Check Box
- b) Explain different layout managers with its uses in Android. **[8]**

- Q3) a)** Describe the significance of SQLite database in Android. **[6]**
- b) Write a program to capture an image using a camera and display it. **[6]**
- c) List sensors in Android and explain any one in detail. **[5]**

OR

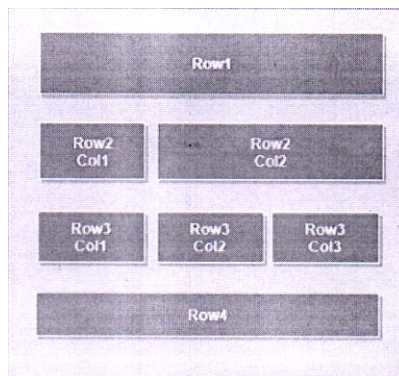
P.T.O.

- Q4)** a) Define content provider and explain fragments. [6]
 b) How can you create and use databases. [6]
 c) What are the methods for converting text to speech in android. [5]

- Q5)** a) Discuss the need of permissions in Android. Describe the permissions to set system functionalities like bluetooth, camera. [9]
 b) Develop a program to send an email. [9]

OR

- Q6)** a) Write a program to display following output using suitable layout. [10]



- b) Develop a simple calculator using table layout. [8]
- Q7)** a) Describe the procedure to connect our device to internet resources. [6]
 b) Explain Web servers and web browsers with examples. [6]
 c) Explain HTML & its roots. [5]

OR

- Q8)** a) Explain different approaches to web application development. [9]
 b) Explain dynamic web application and its applications. [8]



Total No. of Questions : 8]

SEAT No. :

PD-4870

[Total No. of Pages : 3

[6404]-408

B.E. (Mechatronics Engineering)

ADVANCED CONTROL SYSTEM

(2019 Pattern) (Semester - VIII) (417550-C) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, 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 equation for the solution of the state space. **[8]**

b) Find the state model for the given transfer function using direct programming. Draw the state diagram also. **[10]**

$$\frac{Y(z)}{R(z)} = \frac{z + 5}{z^2 + 15z + 35}$$

OR

Q2) a) For a system with the state equation, **[8]**

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} \text{ and } x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Find the state transition matrix.

b) For a system with the state equation, $x(k+1) = Gx(k) + Hu(k)$ and $y(k) = cx(k)$, where **[10]**

$$G = \begin{bmatrix} 1 & 0 & 0 \\ -3 & 1 & 2 \\ 1 & 1 & 4 \end{bmatrix}, H = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \text{ and } C = [0 \ 0 \ 1]$$

Find the pulse transfer function.

P.T.O.

Q3) a) Explain the following terms : **[8]**

- 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]**

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ 30 & 16 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$$
$$y(k) = \begin{bmatrix} 1 & 0 \end{bmatrix} x(k)$$

OR

Q4) a) Explain the duality property of the controllability and observability. **[5]**

- b) Find the state feedback gain matrix for the system, $x(k+1) = Gx(k) + Hu(k)$ and $y(k) = cx(k)$, with **[12]**

$$G = \begin{bmatrix} 0 & 0 & -6 \\ 1 & 0 & -11 \\ 0 & 1 & -6 \end{bmatrix}, H = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \text{ and } C = [0 \ 0 \ 1]$$

the system is placed at the desired pole locations at, $-0.5 \pm j 0.5$, 2

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]**

$$\dot{x} = \begin{bmatrix} -9 & 0 \\ -0 & -9 \end{bmatrix} x(t)$$

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]**

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+2) \end{bmatrix} = \begin{bmatrix} -1 & 2 \\ -6 & -5 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$

Q7) a) Explain the characteristics of non-linear systems. **[9]**

b) Explain the concept of singular points and their types. **[9]**

OR

Q8) a) Explain the method for construction of phase trajectory with example. **[9]**

b) Write a short note on phase plane analysis. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4871

[Total No. of Pages : 2

[6404]-410

B.E. (Mechatronics Engineering)

HUMAN MACHINE INTERFACE

(2019 Pattern) (Semester - VIII) (417551-B) (Elective - VI)

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

- Q1) a)** What are the graphical design concepts in HMI. Explain in brief. **[9]**
b) Explain the concept of visible languages in HMI. **[8]**

OR

- Q2) a)** Explain the beyond screen design in HMI. **[10]**
b) Write a short note on graphical design by grids. **[7]**

- Q3) a)** Explain in brief the device-based controls in HMI. **[8]**
b) Explain in detail overcoming the Obstacle of Animism. **[9]**

OR

- Q4) a)** Write a short note on interaction styles in HMI. **[8]**
b) Explain how the communication is establish in HMI with example. **[9]**

- Q5) a)** Explain the process-oriented standards in detail with example. **[9]**
b) Explain the principles to support usability in HMI. **[9]**

OR

- Q6) a)** Write a short note on Human Computer Interaction (HCI) patterns in HMI. **[9]**
b) Explain the project-oriented standards in detail. **[9]**

P.T.O.

- Q7)** a) Explain the design of HMI for Process control application. [9]
b) Write a short note on HMI in flight control. [9]

OR

- Q8)** a) Explain the role of HMI in smart phones. [9]
b) Explain the smart welding using HMI. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4872

[Total No. of Pages : 2

[6404]-411

B.E. (Mechatronics Engineering)

ELECTRIC VEHICLES

(2019 Pattern) (Semester - VIII) (417551 C) (Elective - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Describe Construction and Working of the Motors used in Electric Vehicles. [6]
- b) Write a note on Battery Energy Storage systems. [6]
- c) Find out battery rating considering the given data : [6]
- Speed = 25 Km/hrs. max,
Motor rating = 250 Watts, 24 Volts,
Motor efficiency = 85%, to cover distance of 100 km.
Assume suitable data, if necessary.

OR

- Q2) a)** Describe and Illustrate the BCU their types. [6]
- b) A rickshaw has following specifications [6]
- Gross curb weight (GCW) = 600 Kg,
Road Friction, $R_r = 0.015$
Coefficient of Drag, $C_d = 0.45$
Density of Air, $\rho = 1.2 \text{ kg/m}^3$
Front Area of Vehicle, $A = 1.6 \text{ m}^2$
Wheel Radius = 0.2 m
Maximum speed of the vehicle = 30 kmph
Working Voltage of Motor = 24 Volts
For attaining the speed range of 90 km per charge, suggest the type and capacity of battery pack required. Assume suitable data, if necessary
- c) Describe the components of Flywheel system with neat diagram. [6]

P.T.O.

- Q3)** a) Describe and Illustrate the Effect of Rolling and Pitch on velocity and movements. [6]
b) Describe and Illustrate the Dynamic equation related to mechanics of vehicle movement. [6]
c) Differentiate between mechanical differential and electric differential. [5]

OR

- Q4)** a) Explain power flow control in electric drive-train topologies. [6]
b) Describe and illustrate the brake system and its types. [6]
c) Explain Fuel Efficiency Analysis. [5]

- Q5)** a) State and explain the different types of frames used in electric vehicle. [6]
b) What is the Homologation of Vehicles? [6]
c) Describe and illustrate the Driving dynamics and Comfort of Car Package. [6]

OR

- Q6)** a) Describe and illustrate the body loads based on varieties of Electric Vehicle Configurations. [6]
b) Explain Need of vehicle Testing. [6]
c) Explain about the different National/International Testing / Regulation / Licensing/ Approval Organizations and Agencies? [6]

- Q7)** a) Describe and illustrate Charger Architectures. [6]
b) Explain the Boost Converter for Power Factor Correction with Examples. [6]
c) Write a note on AIS Charging Standards. [5]

OR

- Q8)** a) Describe with neat diagram Typical Structure of Battery Management Systems (BMS). [6]
b) Explain the electric vehicle chargers (Level 1, Level 2 and Level 3). [6]
c) Write a note on BIS Charging Standards. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4873

[Total No. of Pages : 2

[6404]-412

B.E. (Computer Science & Design)

COMPUTER VISION

(2019 Pattern) (Semester - VII) (418241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What is Clustering-based segmentation, explain K-means Clustering-based algorithm with example. **[9]**

b) Explain Region-based segmentation with following types of segmentation. **[9]**

- i) Region growing
- ii) Region splitting
- iii) Region merging

OR

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

- i) contour-based shape representation.
- ii) region-based shape representation.

b) What is feature? State different feature extraction techniques. Explain any two in detail. **[9]**

Q3) a) What is difference between hierarchical and non-hierarchical approach in object recognition? **[8]**

b) Explain KNN classifier with suitable example. **[9]**

OR

Q4) a) What is knowledge representation and how it is used in object recognition? **[8]**

b) What is syntactic clustering, how does syntactic clustering handled ambiguity and uncertainty? **[9]**

Q5) a) What is 3D vision and how does it differ from 2D vision? **[8]**

b) List and explain different projection schemes in 3D vision? **[9]**

P.T.O.

OR

- Q6) a)** Write short note on following : **[8]**
i) Surface representations
ii) Volumetric representations
b) How do you represent 3D object with respect to meshes, point clouds and voxels. **[9]**

- Q7) a)** Explain how trajectory detection performs in motion analysis. **[9]**
b) Explain how does motion vectors estimating using sequential search algorithm. **[9]**

OR

- Q8) a)** What is motion analysis, List and explain different motion analysis methods? **[9]**
b) Write short note on the following : **[9]**
i) Logarithmic search algorithm
ii) Kalman filters



Total No. of Questions : 8]

SEAT No. :

PD-4874

[Total No. of Pages : 2

[6404]-413

B.E. (Computer Science and Design Engineering)

DEEP LEARNING

(2019 Pattern) (Semester - VII) (418242)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Draw and explain CNN (Convolution Neural Network) architecture in detail. **[6]**
- b) What is Padding? Enlist and explain types of Padding. **[6]**
- c) Explain Local response normalization and need of it. **[6]**

OR

- Q2) a)** Explain ReLU Layer and its advantages. **[6]**
- b) Explain Pooling layers and its types with examples. **[6]**
- c) What is Strides in CNN? Explain in brief **[6]**

- Q3) a)** What is RNN? What is need of RNN? Explain in brief about working of RNN (Recurrent Neural Network). **[6]**
- b) Explain in brief Encoder Decoder architecture. **[6]**
- c) Explain Unfolding computational graphs with example. **[5]**

OR

- Q4) a)** Draw and explain architecture for Long Short-Term Memory (LSTM). **[6]**
- b) Write Short Note on Performance Matrices. **[6]**
- c) Differentiate between Recurrent and Recursive Neural Network. **[5]**

P.T.O.

- Q5)** a) Explain GAN (Generative Adversarial Network) architecture with an example. [6]
b) Explain Deep generative model with example. [6]
c) What is Boltzmann machine? Explain its objectives. [6]

OR

- Q6)** a) Differentiate generative and discriminative models in GAN. (Generative Adversarial Network). [6]
b) List the applications of GAN network with description. [6]
c) Write Short Note on Deep generative model and Deep Belief Networks. [6]
- Q7)** a) Explain dynamic programming algorithms for reinforcement learning. [6]
b) Explain Markov decision process. [6]
c) Compare Active and Passive Reinforcement Learning. [5]

OR

- Q8)** a) Write Short Note on Q Learning and Deep Q-Networks. [6]
b) What are different characteristics of Reinforcement Learning? [6]
c) Explain Simple reinforcement learning for Tic-Tac-Toe [5]



Total No. of Questions : 8]

SEAT No. :

PD-4875

[Total No. of Pages : 2

[6404]-414

B.E. (Computer Science & Design)
GAME DESIGN AND DEVELOPMENT
(2019 Pattern) (Semester - VII) (418243)

Time : 2½ Hours]

[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) Draw neat & clean diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) What are the key differences between game development and game design, and how do they work together to create a successful game?" [6]
- b) Explain following with suitable example [6]
- i) Traditional Game Loop ii) Multithreaded game loop
- c) Explain the difference between real time and game time in the context of game development. Provide examples of scenarios where these two concepts diverge. [5]

OR

- Q2)** a) Explain delta time concept. How do you calculate what the delta time should be every frame? [6]
- b) What are the different types of scrolling methods used in game design? Explain how each method works and provide examples of games that utilize these techniques effectively. [6]
- c) Explain different types of game objects with examples. [5]

- Q3)** a) What is the difference between a digital and an analog device? Give an example of each. [6]
- b) What advantages does an event-based input system have over a polling system. [6]
- c) Describe the Doppler effect with example. [6]

OR

P.T.O.

- Q4)** a) What is the most commonly used plane equation in games, and what does each variable in the equation represent? [6]
b) Describe different camera types. [6]
c) Explain camera collision algorithm with suitable diagram. [6]

- Q5)** a) Explain how you can be a great playtester for other people. [6]
b) Describe Usability testing. [6]
c) Explain the concept of automated testing (AT) in game development what are the benefits and challenges of implementing such testing?" [5]

OR

- Q6)** a) Explain following beta tests Closed ,open and Limited. [6]
b) Explain the concept of formal individual testing in game design. What types of data should be recorded during this process, and how can the synchronization of these data streams help designers understand a player's experience in greater detail? [6]
c) How Formal Group Testing is done? [5]

- Q7)** a) Explain the phases and associated components in the game development cycle? [6]
b) What are some effective ways to lead and manage game development teams? [6]
c) What are the different types of documentation used in game development? [6]

OR

- Q8)** a) Explain with diagram the three-stage iterative game development process. [6]
b) List a few guidelines for effective management: [6]
c) Explain the purpose of concept document and it's several components. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4876

[Total No. of Pages : 2

[6404]-416

**B.E. (Computer Science & Design Engineering)
SOFTWARE TESTING & QUALITY ASSURANCE
(2019 Pattern) (Semester - VII) (418244 B) (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 and 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 the Test Case design techniques with example. [6]
b) Explain Unit Testing in detail. [6]
c) State in your own words why Regression Testing is important. [6]

OR

- Q2)** a) Write a short note on Integration Testing. [6]
b) What are differences between Inspection & Walkthrough? [6]
c) Explain Ad-hoc testing in detail. [6]

- Q3)** a) Which are the different phase of software development process? [6]
b) What is the ISO 9001 standard? Explain with their principles. [6]
c) List and explain important aspects of Quality Management. [5]

OR

- Q4)** a) What happens at different level of CMM? [6]
b) Why there is need to measure customer satisfaction? [6]
c) What are Ishikawa's 7 basic tools of Quality Control? [5]

- Q5)** a) What is SoapUI? Explain in details with advantages. [6]
b) Explain Robotic Process Automation (RPA) in detail. [6]
c) How would you explain selenium IDE explain in detail? [6]

P.T.O.

OR

- Q6)** a) How to choose an Automation tool? Explain in briefly. [6]
b) Write a short note on Selenium's Grid. [6]
c) Identify different benefits of Automation testing. [6]

- Q7)** a) What parameters required for achieving good software quality? [6]
b) What is Six Sigma? Explain in details. [6]
c) Which are different elements in SQA? [5]

OR

- Q8)** a) What is in Product Quality metrics? [6]
b) Explain in details software Quality Dilemma? [6]
c) Write a short note on Total Quality Management? [5]



Total No. of Questions : 8]

SEAT No. :

PD-4877

[Total No. of Pages : 2

[6404]-417

B.E. (Computer Science and Design Engineering)

BLOCKCHAIN TECHNOLOGY

(2019 Pattern) (Semester - VII) (418244C) (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 indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain in detail Markel Trees? [5]
b) Differentiate between Symmetric Key Cryptography and Asymmetric Key Cryptography. [6]
c) Explain in detail Digital Signature Algorithm. [5]

OR

- Q2)** a) Explain the Layered Architecture of Blockchain. [5]
b) Write a short note on Blockchain adaptation so far. [5]
c) Explain in detail how the decentralization is achieved through Blockchain. [6]

- Q3)** a) Explain the Byzantine General Problem in the context of blockchain consensus. [5]
b) Discuss the difference between Bitcoin and Ethereum. [5]
c) Discuss following consensus algorithms used in blockchain technology. [8]

- i) Proof of work
- ii) Proof of Activity
- iii) Proof of Burn
- iv) Proof of Stake

P.T.O.

OR

- Q4)** a) List & explain types of crypto currency. [6]
b) Differentiate between coinbase & Binance. [6]
c) Differentiate between metmask and coinbase wallet. [6]

- Q5)** a) What is ethereum? What are the types of ethereum? [6]
b) Explain SWARM (Decentralized storage platform) in detail. [6]
c) Explain solidity in detail. [6]

OR

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

- 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. [6]

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. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4878

[Total No. of Pages : 2

[6404]-419

B.E. (Computer Science & Design)

NATURAL LANGUAGE PROCESSING

(2019 Pattern) (Semester - VII) (418245 A) (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 and Q.7 or Q.8.
- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

Q1) a) Write a short note on Graph-based Model. **[8]**

b) Explain Latent Semantic Analysis in detail. **[9]**

OR

Q2) a) Explain Markov model in detail. **[9]**

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

Q3) a) Define Information Retrieval. Explain in detail. **[9]**

b) What is Vector Space Model? Explain in detail. **[9]**

OR

Q4) a) Write a short note on Cross Lingual Information Retrieval. **[8]**

b) Define and Explain: **[10]**

i) Relation Extraction

ii) Reference Resolution

Q5) a) Explain Lesk Algorithm & Wallker's algorithm. **[9]**

b) Explain WordNets for Word Sense Disambiguation. **[9]**

OR

Q6) a) What are various Prominent NLP Libraries? Explain. **[10]**

b) Explain Lexical Knowledge Network in detail. **[8]**

P.T.O.

- Q7)** a) Enlist various applications of NLP? Explain. [9]
b) Explain Statistical Machine Translation (SMT) [8]
- OR
- Q8)** a) Explain Machine Translation: Rule based techniques. [8]
b) Explain Text Entailment and Discourse Processing. [9]



Total No. of Questions : 8]

SEAT No. :

PD-5296

[Total No. of Pages : 2

[6404]-423

B.E. (Computer Science & Design)

INFORMATION AND CYBER SECURITY

(2019 Pattern) (Semester-VIII) (418250)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain RSA Algorithm with suitable example. **[8]**

b) Explain Diffie-Hellman Key exchange algorithm with example. **[10]**

OR

Q2) a) Explain the following terms: Cryptography, Cryptanalysis, Plain text, Cipher text, Private Key, Public Key. **[10]**

b) Discuss Elliptic Curve Cryptography. **[8]**

Q3) a) What are the steps involved in SET transaction? Explain the features of SET. **[10]**

b) Comparison between IPv4 and IPv6. **[8]**

OR

Q4) a) What is use of MIME? Explain MIME header in detail? **[8]**

b) Explain IPsec Protocol in detail? Describe "SSL/TLS" and its role in network security. **[10]**

P.T.O.

- Q5)** a) Explain need and challenges of IDS. Define signature based IDS? [8]
b) Explain anomaly based intrusion detection system and their operations. [9]

OR

- Q6)** a) Explain types of IDS. Differentiate between NIDS and HIDS. [8]
b) Explain Firewall with its type. State the Limitations of firewall. [9]
- Q7)** a) What is cybercrime and enlist and explain types of cybercrime. [8]
b) Explain security life cycle with suitable diagram. [9]

OR

- Q8)** a) What is cyber stalking? How to identify and detect cyber stalking. [8]
b) Explain the term: Proxy server, Phishing. [9]



Total No. of Questions : 8]

SEAT No. :

PD-5266

[Total No. of Pages : 2

[6404]-424

B.E. (Computer Science and Design Engineering)

Generative AI

(418251) (2019 Pattern) (Semester - VIII)

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) Describe the architecture and key components of a Generative Adversarial Network (GAN). [6]
- b) Explain the difference between Autoregressive and Autoencoding generative models. [6]
- c) Describe any one real-world application of GANs with its workflow.[6]

OR

- Q2)** a) What is a latent space in the context of VAEs and GANs? [6]
- b) Discuss the significance and limitations of PixelCNN. [6]
- c) Explain the main difference in the learning objectives of VAEs and GANs. [6]

- Q3)** a) What is the role of positional encoding in Transformer models? [6]
- b) Discuss top-k and nucleus (top-p) sampling methods in probabilistic text generation. [6]
- c) Explain how GPT-4 differs from earlier versions in terms of architecture and training. [6]

OR

P.T.O.

- Q4)** a) Describe the significance of vector representations in large-scale text generation. [6]
b) Compare the architecture of LLaMA and GPT models. [6]
c) What is beam search and how does it affect the quality of generated text? [6]

- Q5)** a) Explain how contextual language models differ from statistical language models. [9]
b) Describe how transformer models improve NLP tasks like text classification or summarization. [8]

OR

- Q6)** a) Discuss different types of NLP tasks where transformer models outperform traditional approaches. [9]
b) Explain the evolution of language models from n-grams to Transformers. [8]

- Q7)** a) Explain template-based prompt generation with suitable examples. [6]
b) How are vector databases integrated with prompt engineering workflows? [6]
c) What is the Chain-of-Verification (CoVe) prompting technique? [5]

OR

- Q8)** a) Describe the concept of Chain-of-Code (CoC) and Graph-of-Thoughts (GoT) in prompt engineering. [6]
b) What factors influence the cost and efficiency of prompts when using LLM APIs? [6]
c) Give examples of prompt engineering use cases in sentiment analysis and QA systems. [5]



Total No. of Questions : 8]

SEAT No. :

PD-5267

[Total No. of Pages : 3

[6404]-428

B.E. (Computer Science & Design)

DevOps

(2019 Pattern) (Semester - VIII) (418252 D) (Elective - V)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the concept of Continuous Integration (CI). Why is it important in modern software development? **[6]**
- b) What is meant by Continuous Database Integration? Explain its importance in a CI/CD environment. **[6]**
- c) Discuss the challenges associated with releasing builds in large-scale software projects. How can these be managed effectively? **[6]**

OR

- Q2)** a) Define 'Time to Market' and explain how CI helps in reducing it. **[6]**
- b) Explain any three strategies used for implementing Continuous Delivery in software projects. **[6]**
- c) Describe how a Continuous Delivery pipeline differs from a Continuous Integration pipeline with respect to process and output. **[6]**

P.T.O.

- Q3)** a) Explain the role of the Commit Stage in a deployment pipeline. What activities typically occur in this stage? [6]
- b) Describe the key practices to be followed while implementing a deployment pipeline. [6]
- c) Discuss how preparing to release in a deployment pipeline differs from traditional release cycles. What are the advantages and limitations? [6]

OR

- Q4)** a) What is integration testing? Why is it important in a CI/CD environment [6]
- b) What is a defect backlog? How is it managed during the integration testing process? [6]
- c) Discuss how test strategies can be integrated into a deployment pipeline to ensure continuous delivery and deployment readiness. [6]
- Q5)** a) What is a monitoring system? Why is it important in modern IT infrastructure? [6]
- b) Explain the process of collecting monitoring data and logs from an application. How is this data used? [6]
- c) List and explain common tools used by SREs. How do these tools help automate monitoring and incident response? [5]

OR

- Q6)** a) Differentiate between white-box monitoring and black-box monitoring with examples. [6]
- b) What is Site Reliability Engineering (SRE)? How does it relate to DevOps? [6]
- c) Compare and contrast the goals of SRE and DevOps. How do they complement each other in a CI/CD environment? [5]

- Q7)** a) What is version control? Explain the role of Git in continuous development. [6]
- b) Explain how Jenkins supports both Continuous Integration and Continuous Delivery in a CI/CD pipeline. [6]
- c) Describe how Selenium is used for continuous testing. What are its advantages in automated test pipelines? [5]

OR

- Q8)** a) What is Docker? How does it support containerization in modern application deployment? [6]
- b) What is Kubernetes? How does it enable serverless orchestration in cloud environments? [6]
- c) How is Jira used for bug tracking and project management in a DevOps setup? [5]



Total No. of Questions : 8]

SEAT No. :

PD-5268

[Total No. of Pages :2

[6404]-429

B.E. (Computer Science and Design Engineering)

DATA VISUALIZATION (Elective - VI)

(418253 (A) (2019 Pattern) (Semester - VIII)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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) *Make suitable assumptions if necessary.*

Q1) a) Define Spatio-Temporal Visualization. How does it help in analyzing complex datasets? **[9]**

b) What are the key differences between graph visualization and tree visualization? **[8]**

OR

Q2) a) Describe any two techniques used in Time Series Data Visualization. **[9]**

b) Discuss various methods used for Text Data Visualization. How does it aid in Natural Language Proecessing (NLP). **[8]**

Q3) a) Explain how Map Color and Other Channels can be used to manipulate the view in a data visualization interface. **[9]**

b) Describe the various techniques for visualizing hierarchical and relational structures using networks and trees. **[8]**

OR

Q4) a) Define Tree Map and explain its usefulness in hierarchical data representation. **[9]**

b) Differentiate between Networks and Trees with suitable examples. **[8]**

P.T.O.

- Q5)** a) Explain icon-based techniques used for visualizing multivariate data. Discuss any two common types and their advantages. **[9]**
- b) What are hierarchical techniques in multivariate data visualization? Illustrate how they are useful for structured or nested datasets. **[9]**

OR

- Q6)** a) What is a scatterplot matrix, and how does it help in visualizing relationships among multiple variables? Explain with a suitable example. **[9]**
- b) What are geometric projection techniques in multivariate data visualization, and how do they help in understanding high-dimensional data? Give examples. **[9]**
- Q7)** a) Explain the use of marks and channels in Tableau. How do they help enhance data visualization? **[9]**
- b) Write about the importance of interactive dashboards in Tableau and how they are used in various domains. **[9]**

OR

- Q8)** a) What are common mistakes in dashboard design? How can they be avoided? **[9]**
- b) Differentiate between Worksheets, Workbooks, and Dashboards in Tableau. How can workbook performance be optimized? **[9]**



Total No. of Questions : 10]

SEAT No. :

[Total No. of Pages : 1

PD4879

[6404]-433

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) 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 diagram must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Your answer will be valued as a whole.*
- 5) Use electronic pocket calculator is allowed.*
- 6) Assume suitable data if necessary.*

Q1) Explain in details Erection of hard barricades and utility trenching, diversion of underground utilities. **[14]**

OR

Q2) Explain General Safety measures while excavation. **[14]**

Q3) Explain in brief Roles & Responsibility, Project In charge, Site Engineer for Pile Foundation. **[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]**

Q7) Explain Sequence of Work for construction of Concourse Pier arm Platform Pier arm with 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. :

PD4880

[Total No. of Pages : 2

[6404]-436

B.E. (Civil) (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) Attempt Q.1 or Q. 2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and clearly state.
- 5) Use of electronic pocket calculator is allowed.

- Q1)** a) Explain parking requirements. [6]
b) Describe in detail the Stopping Sight Distance with formula. [6]
c) Explain road hierarchy. [5]

OR

- Q2)** a) List out geometric design elements and explain anyone. [6]
b) Describe in detail the Overtaking Sight Distance with formula. [6]
c) Explain the design considerations for cycle tracks in India. [5]

- Q3)** a) Explain types of intersection. [6]
b) Explain road safety measures. [6]
c) Explain rotary intersection in detail. [5]

OR

- Q4)** a) What are types of passenger terminals? Explain layout and facilities of it. [6]
b) Explain at grade and grade separated intersections. [6]
c) What is the aim to provide road safety information to road users? Also enlist the various activities conducted by Government of India for road safety. [5]

P.T.O.

- Q5)** a) Explain Lowry model of transport land use pattern. [6]
b) Explain 20 yr Bombay plan. [6]
c) Explain urban spatial structure. [6]

OR

- Q6)** a) Explain 20 yr Nagpur plan. [6]
b) Explain Lowry & Grain model of transport land use pattern. [6]
c) Explain urban spatial location theory. [6]

- Q7)** a) Describe urban transport problems in India. [6]
b) Write a note on “Transportation System Management”. [6]
c) Explain BRTS system of public transport. [6]

OR

- Q8)** a) Explain urban growth mechanism, development and planning policy. [6]
b) Which data is required to plan the city bus transportation in urban area? [6]
c) Explain the concept of Mass transport. [6]



Total No. of Questions : 8]

SEAT No. :

PD4881

[Total No. of Pages : 2

[6404]-437

B.E. (Mechanical) (3D Printing Honors)
ADDITIVE MANUFACTURING SYSTEM DESIGN
(2019 Pattern) (Semester - VII) (402014MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Draw suitable neat diagrams, whenever necessary.
- 3) Figure to the right indicate full marks.
- 4) Assume suitable data if required.

- Q1)** a) Explain Gravity-based and Fluidized bed with it's schematic figure and working & advantages. [10]
b) Differentiate Lateral Powder Delivery System Vs. Coaxial Powder Delivery System. [8]

OR

- Q2)** a) What is Atomization? Types of Atomization & Explain Centrifugal Atomization with neat sketch. [10]
b) Explain Melt spinning process with its figure, working and benefits. [8]

- Q3)** a) Explain Arm-Spring Vibration Dampers and Belt Tension Mechanisms. [10]
b) Explain the Bed Movement System of 3D printing machine. [7]

OR

- Q4)** a) Write in detail about Powder delivery nozzles and its types with diagram. [10]
b) Explain: [7]
i) Inert gas cooling system
ii) Gas recirculating system

- Q5)** a) Explain: [10]
i) X-axis calibration
ii) Y-axis calibration
iii) Z-axis calibration
b) What are the filament settings? How to determine the correct temperature of filament? [8]

OR

P.T.O.

- Q6)** a) Explain in detail Preparation and setup of 3D printer before calibration. [10]
b) Differentiate between: Single printing and Multi-printing mode. [8]

- Q7)** a) What are the common faults and trouble shooting in 3D Printing system? [10]
b) What are different ASM/ASTM Standards for Additive Manufacturing system and explain its significance. [7]

OR

- Q8)** a) Explain quality monitoring and inspection in Additive manufacturing system. [10]
b) What is the Sensor? Explain the types of Sensors used in 3D Printer. [7]



Total No. of Questions : 8]

SEAT No. :

PD4882

[Total No. of Pages : 2

[6404]-438

B.E. (Mechanical) (Honors)

ELECTRICAL ENERGY SYSTEMS

(2019 Pattern) (Semester - VII) (402024MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1. or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right of each question indicate full marks.*
- 4) *Assume suitable data wherever necessary and mention the same clearly.*

- Q1)** a) Discuss energy efficiency opportunities in compressed air system. [10]
b) Explain Positive Displacement Compressor and Dynamic Compressor with examples and schematic diagrams. [8]

OR

- Q2)** a) Explain compressed air system with its components and their functions. [10]
b) Explain the procedure for quantification of compressed air leakages. [8]

- Q3)** a) Explain the working of heat pump with schematic diagram. List applications of the heat pump. [10]
b) Discuss the function of cooling tower. Explain different performance parameters of cooling tower. [7]

OR

- Q4)** a) Discuss following air-conditioning process with hand drawn psychometric chart [10]
i) Cooling with dehumidification
ii) Heating with humidification
b) Explain the working of Li-Br vapour absorption system with a neat sketch? [7]

- Q5)** a) Discuss energy saving opportunities in a fans and blowers. [10]
b) Discuss the parameters affecting pump system curves. [8]

OR

P.T.O.

Q6) a) What are types of fans? Discuss the factors that affect the fan performance? [10]

b) Explain Municipal water pumping system. [8]

Q7) a) Discuss following terms used in lighting system. [10]

i) Luminous flux

ii) Illuminance

iii) Lux

iv) Luminous efficacy

v) Color Rendering Index

b) What are Advantage and limitations of adopting diesel power plant? [7]

OR

Q8) a) Explain the principal of operation and features of LED Lamps. [10]

b) Discuss energy conservation measures possible in lighting system. [7]



Total No. of Questions : 8]

SEAT No. :

PD4883

[Total No. of Pages : 2

[6404]-439

B.E. (Mechanical/Automobile) (EV-Honors)
MODELLING AND SIMULATION OF EHV
(2019 Pattern) (Semester - VII) (302034MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw 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? [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]

- 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

P.T.O.

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 of Loads on the Chassis frame? [8]

Q7) a) Explain Vehicle Structure design against Noise and Vibration exposure with suitable sketches? [10]

b) Explain the phases involved in Crashworthiness Design along with its important features? [8]

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. :

PD4884

[Total No. of Pages : 2

[6404]-440

B.E. (Mechanical Engineering)

HONORS IN SYSTEM MODELLING AND SIMULATION

(2019 Pattern) (Semester - VII) (302044 MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Discuss the importance of causality in bond graph modeling and its implications for system analysis. **[9]**

b) Evaluate the challenges and strategies in assigning causality to basic 2-port elements in bond graphs. **[9]**

OR

Q2) a) Describe the procedure for determining causality in 3-port junction elements and its impact on system modeling. **[9]**

b) Discuss how integrating basic 1-port, 2-port, and 3-port elements facilitates the modeling of complex systems. Provide an example. **[9]**

Q3) a) Explain the process of modeling electrical systems using differential equations. Provide an example involving a simple RLC circuit. **[9]**

b) Discuss the concept of transfer function in electrical system modeling and its importance. **[8]**

OR

Q4) a) Describe the principles of hydraulic system modeling and the analogy to electrical circuits. **[8]**

b) Analyze the dynamic behavior of an acoustic circuit using wave equations. **[9]**

P.T.O.

- Q5)** a) Discuss the differences between linear and nonlinear systems in the context of dynamic modeling. Provide examples of each. [9]
- b) Describe common methods for modeling nonlinear systems and the challenges involved [9]

OR

- Q6)** a) Explain the significance of nonlinearities in real-world systems and how they affect system performance and stability. [9]
- b) Discuss the role of automated simulation in dynamic system modeling. How does it enhance the modeling process? [9]
- Q7)** a) Explain the method of solving ordinary differential equations (ODEs) using the characteristic equation. Provide an example with a second-order linear ODE. [8]
- b) Define the free response of a linear system. How are eigenvalues related to the stability of the system? Provide an example. [9]

OR

- Q8)** a) Evaluate the impact of control system design on the performance and stability of engineering systems. Provide examples. [8]
- b) Discuss the basic principles of automatic control and the role of feedback in control systems. [9]



Total No. of Questions : 8]

SEAT No. :

PD4885

[Total No. of Pages : 2

[6404]-441

B.E. (Electronics and Telecommunication)
HONORS IN ROBOTICS
Industrial Robotics and Automation
(2019 Pattern) (Semester - VII) (404181HR)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define pneumatic actuators, how they are classified? Explain Rotary actuators with neat diagram. [9]
- b) Explain air treatment stages and pressure regulation method with neat diagram. [8]

OR

- Q2)** a) How pneumatic compressors are classified? Explain positive displacement compressors with neat diagram. [9]
- b) Explain basic components of pneumatic system with neat diagram. [8]
- Q3)** a) How to perform the analysis of an assembly? Explain with a suitable example. [8]
- b) Write steps to design of parts for high speed feeding and orienting. State different feeding difficulties. [9]

OR

- Q4)** a) State design features of CNC systems. Explain drive system for CNC machine tools. [8]
- b) Explain in detail how high speed automation insertion is possible in robotic assembly. State general rules for product design and automation. [9]

P.T.O.

- Q5) a)** What are the stages in mechatronics design? Explain different phases of mechatronics design process. [9]
- b)** Write a case study on Engine management system. Compare traditional and mechatronics design. [9]

OR

- Q6) a)** Prepare a detailed case studies on a pick and place robot. Write algorithm for a pick and place robot. [9]
- b)** Define mechatronics. Explain basic elements of mechatronics system with neat sketches. [9]

- Q7) a)** Compare Electrical, Mechanical and Hydraulic transmission systems. [6]
- b)** What is back pressure? When it arise and how to avoid it? [6]
- c)** Draw neat diagram to achieve forward and reverse stroke using cylinder and piston mechanism. [6]

OR

- Q8) a)** Give classification of hydraulic pumps. Explain positive displacement pumps and its characteristics. [6]
- b)** Give comparison between hydraulic and pneumatic system. What are the applications of hydraulic systems? [6]
- c)** Draw and explain basic components of hydraulic system. [6]



Total No. of Questions : 8]

SEAT No. :

PD4886

[Total No. of Pages : 2

[6404]-442

B.E. (E & TC)

HONOR'S IN BLOCK CHAIN TECHNOLOGY

Smart Contracts & Cryptocurrency

(2019 Pattern) (Semester - VII) (404181HBCT)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain following terms : **[8]**

i) Sidechain

ii) Namecoin

b) Explain in brief history of distributed ledger technology. **[9]**

OR

Q2) a) Explain Life Cycle of Smart Contract. **[8]**

b) What is a DAO? How do DAOs work? **[9]**

Q3) a) Discuss Applications of Cryptocurrency for IoT **[9]**

b) Explain need of crypto exchange. Give example of any crypto exchange. **[9]**

OR

Q4) a) Compare digital currency and cryptocurrency **[9]**

b) Explain what is bitcoin its working and limitations in detail. **[9]**

P.T.O.

- Q5)** a) Discuss the detailed Roots of Bitcoin along with Legal Aspects of Cryptocurrency Exchange. [8]
- b) List and explain types of bitcoin wallets. [9]

OR

- Q6)** a) Write note on following : [8]
- i) Bitcoins Network
- ii) Bitcoin Payments
- b) Write a short Note on following terms : [9]
- i) Digital Signature
- ii) Digital Keys
- iii) Private Keys

- Q7)** a) Discuss Block chain use cases in Healthcare. [9]
- b) Discuss Use cases for blockchain and AI together in various domains [9]

OR

- Q8)** a) Discuss different investment management platforms of blockchain in detail. [9]
- b) Discuss IBM Block chain. [9]



Total No. of Questions : 8]

SEAT No. :

PD-5233

[Total No. of Pages : 2

[6404]-443

**B.E. Honors in (Advanced Packaging Technology)
(Printing Technology)**

SUSTAINABLE PACKAGING

(2019 Pattern) (Semester - VII) (408214)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) What are design packaging considerations? **[10]**

b) What is supply chain management. **[7]**

OR

Q2) a) Explain in details compostable packaging. **[10]**

b) What is sustainable food packaging. **[7]**

Q3) a) What is the Need and functions of LCA. **[9]**

b) What is the circular economy? Explain its principles with relevant examples that show how it differs from traditional economic models. **[9]**

OR

Q4) a) What is Life Cycle Analyses? **[9]**

b) Explain the 3Rs–Reduce, Reuse and Recycle–as pillars of the circular economy. How do these strategies contribute to sustainable resource management? **[9]**

P.T.O.

- Q5) a)** What are the Phases and Processes of LCA. **[8]**
b) Discuss the environmental and health impacts of plastic usage throughout its life cycle. Why is plastic considered a major challenge for sustainability?**[9]**

OR

- Q6) a)** Compare different types of packaging materials based on their life cycle environmental impact. How does packaging type influence the outcome of an LCA? **[10]**
b) Discuss the different levels of LCA. When and why is each level used?**[7]**

- Q7) a)** How can businesses effectively engage consumers in sustainability? Analyze strategies for building consumer trust and promoting sustainable behaviors through marketing. **[9]**
b) What are environmental claims and why must they be carefully managed? Discuss the risks of greenwashing and how organizations can ensure their claims are verifiable. **[9]**

OR

- Q8) a)** Explain the purpose and structure of ISO 14040. How does it support the development and application of Life Cycle Assessment in sustainability practices? **[9]**
b) Discuss the challenges and best practices for communicating sustainability messages. How can companies ensure transparency and credibility in their communication? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4887

[Total No. of Pages : 2

[6404]-444
B.E. (AI & ML)
HONORS IN MACHINE LEARNING
(2019 Pattern) (Semester - VII) (410301)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 Tree based method? Describe following tree based methods. **[9]**

- i) Regression Trees
- ii) Classification Trees

b) Explain SVM as a Penalization Method in detail. **[8]**

OR

Q2) a) Elaborate out of Bag Samples, Variable Importance, Proximity Plots w.r.t random forest in detail. **[9]**

b) Define SVM. Explain in detail Support Vector Machines for Regression. **[8]**

Q3) a) Write a short note on : **[9]**

- i) Recurrent Networks
- ii) Regularization in Neural Networks

b) What is learning time? Explain Time Delay Neural Networks and Recurrent Networks in detail. **[9]**

OR

P.T.O.

- Q4) a)** Explain following backpropagation algorithm in multilayer perceptron in detail. [9]
- i) Two-Class Discrimination
 - ii) Multiclass Discrimination
- b)** Why Tuning the Network Size required in multilayer perceptron? How it done? [9]

- Q5) a)** Explain in detail Gaussian Mixtures as Soft K-means Clustering. [9]
- b)** Consider the market basket transaction shown below. [8]

Transaction ID	Item Bought
T1	Mango, Apple, Banana, Dates
T2	Apple, Dates, Coconut, Banana, Fig
T3	Apple, Coconut, Banana, Fig
T4	Apple, Banana, Dates

Assuming the support of 50% and confidence of 80%

- i) Find all frequent itemsets using Apriori algorithm
- ii) Find all association rules using Apriori algorithm

OR

- Q6) a)** Explain with suitable example k-medoids algorithm. [8]
- b)** Write short note on : [9]
- i) Market Basket Analysis
 - ii) Vector Quantization

- Q7) a)** Write short note on : [9]
- i) Markov Random Fields
 - ii) Learning the Structure of a Graphical Model
- b)** Explain Model Selection in HMM in detail. [9]

OR

- Q8) a)** Explain how to find state sequence and model parameters in HMM in detail. [9]
- b)** What do you mean by linear regression? Explain it with suitable example. State which applications are best modeled by liner regression. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4888

[Total No. of Pages : 2

[6404]-445

B.E. (Computer) (Honors)

CYBER SECURITY

Internet of Things & Embedded Security

(2019 Pattern) (Semester - VII) (Elective - VI) (410401)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe IoT security CONOPS document, Network and security integration? **[8]**

b) Explain data purging in detail. **[9]**

OR

Q2) a) Explain the following : **[8]**

- i) Incident management
- ii) Compliance monitoring

b) Describe attribute-based access control mechanism for IoT? **[9]**

Q3) a) What is Digital signature? Explain the steps involved in creating a Digital signature? **[9]**

b) Enlist and explain the phases of cryptographic key management fundamentals. **[9]**

OR

Q4) a) Describe cryptographic control in Zigbee protocol. **[9]**

b) Explain cryptographic control for IoT protocols? **[9]**

P.T.O.

- Q5)** a) Explain holistic IAM program for IoT? [9]
b) Explain IEEE 1609.2? [8]

OR

- Q6)** a) Discuss authorization & access control for IoT? [9]
b) Explain identity management & access management for the IoT? [8]

- Q7)** a) Explain the following identity management model [9]
i) Local Identity
ii) Federated identity
b) Explain user-centric identity management. [9]

OR

- Q8)** a) Explain the following identity management models [9]
i) Network identity
ii) Global web identity
b) Describe Identity Portrayal? [9]



Total No. of Questions : 8]

SEAT No. :

PD-4889

[Total No. of Pages : 2

[6404]-446

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) For what type of data Density-Based Spatial Clustering is suitable? Which parameters are required by DBSCAN algorithm. **[9]**

b) Explain KNN algorithm with example. **[8]**

OR

Q2) a) What are the types of hierarchical clustering methods? Explain. **[9]**

b) Explain K-Means algorithm with an example. **[8]**

Q3) a) How does the learning rate affect the training of the Neural Network? What do you mean by Hyperparameters? **[6]**

b) What is the use of Artificial Neural Network? How is ANN useful in making a machine intelligent? **[6]**

c) Explain back propagation algorithm. **[6]**

OR

Q4) a) Explain a biological neuron along with its parts. **[6]**

b) Explain Generalized Delta Learning Rule. **[6]**

c) What are the various components of a Neural Network? **[6]**

P.T.O.

- Q5)** a) Explain the terms "Valid Padding" and "Same Padding" in CNN. List down the hyperparameters of a Pooling Layer. [6]
b) Explain the applications where CNNs are used extensively? [6]
c) What are the best practices that need to be followed when designing a CNN? [6]

OR

- Q6)** a) Explain CNN Architecture along with diagram. [6]
b) Enlist various types of CNN models. Explain any two of them. [6]
c) What is the use of the convolution layer in CNN? [6]

- Q7)** a) What are various text similarity measures? Explain any two of them. [8]
b) Write short note on : [9]
i) Stemming
ii) Lemmatization
iii) topic modeling

OR

- Q8)** a) Explain the process of text processing. [8]
b) Write short note on : [9]
i) features selection
ii) tokenization
iii) document representation



Total No. of Questions : 8]

SEAT No. :

PD-4890

[Total No. of Pages : 2

[6404]-447

B.E. (Computer Engineering)

HONOURS IN INTERNET OF THINGS

MACHINE LEARNING FOR INTERNET OF THINGS

(2019 Pattern) (Semester - VII) (410601)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) Explain K-means algorithm with an example. [6]
b) What is CNN? Explain in detail. [6]
c) What is ensemble learning? Explain various simple ensemble techniques? [6]

OR

- Q2)** Write short note on following : [18]

- a) Recurrent Neural Network
- b) Principal Component Analysis
- c) Decision Trees

- Q3)** a) Explain Hardware implementation of Least-Squares-Solver for Shallow Neural Network. [6]
b) What is the need of Machine learning accelerators? List and explain different ML accelerators. [6]
c) What is edge computing on IOT devices? What are the benefits of it [6]

P.T.O.

OR

Q4) Write note on following : **[18]**

- a) IOT based smart buildings
- b) Least-Squares-Solver for Shallow Neural Network
- c) Machine Learning accelerators

Q5) a) How deep learning is used in IOT? Explain with example. **[6]**

b) What is embedded deep learning? Explain in brief with benefits of it. **[5]**

c) Explain various deep learning models for sensor data. **[6]**

OR

Q6) Write notes on following with reference to deep learning for IOT **[17]**

- a) Embedded deep learning
- b) Real time IOT imaging with deep neural network
- c) Deep learning models for sensor data

Q7) a) How IOT is useful in Agriculture? Explain with example. **[6]**

b) Enlist applications of IOT. Explain any two applications in detail. **[6]**

c) How machine learning is useful in IOT security? Explain with example. **[5]**

OR

Q8) Write short notes on **[17]**

- a) IOT and smart cities
- b) Smart transportation
- c) Application of IOT in Agriculture



Total No. of Questions : 8]

SEAT No. :

PD-4891

[Total No. of Pages : 2

[6404]-448

B.E. (Honours) (Computer Engineering)
VIRTUAL REALITY AND GAME DEVELOPMENT
(2019 Pattern) (Semester - VII) (410701)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) How do we create content in Virtual Reality? [6]
b) What are different technical skills required for VR? [6]
c) Describe Expert Evaluations method used in learn stage. [6]

OR

- Q2)** a) Explain Define stage in Iterative design. [6]
b) Mention different characteristics of input devices considered when choosing hardware and designing interactions. [6]
c) Explain Interaction Pattern Design with an example. [6]

- Q3)** a) Differentiate between Animations in Unreal Engine Vs Unity Engine [8]
b) What are Fundamentals of sprite animation? [9]

OR

- Q4)** a) How to create and script enemy in Unity? [8]
b) Explain step to develop town view using unity. [9]

- Q5)** a) How to create a battle system in VR environment. [9]
b) Explain all hardware challenges involved in Virtual Reality game development? [9]

P.T.O.

OR

- Q6)** a) State different pre-processor directives that Unity recognizes. [9]
b) Illustrate the overall design process of the Battle System in Unity. [9]

- Q7)** a) Explain a unified model of motion perception and motion sickness? [8]
b) Explain system delays in VR systems with diagram. [9]

OR

- Q8)** a) State different examples of reducing adverse effects. [8]
b) Explain adverse health effects caused by Non-moving visual stimuli. [9]



Total No. of Questions : 8]

SEAT No. :

PD-4892

[Total No. of Pages : 2

[6404]-449
B.E. (Civil)
Tunnel Engineering
(Honors in Metro Construction)
(2019 Pattern) (Semester - VIII) (401303)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidate:

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

- Q1)** a) What are some of the advantages of road headers [6]
- b) Explain about the shield tunneling [6]
- c) Explain the factors affecting selection of a shield. [6]

OR

- Q2)** a) Write about benefits of a TBM drive in contrast to traditional tunneling methods. [6]
- b) Explain about earth pressure balance shield method in tunneling [6]
- c) Explain about the advantages of TBM [6]
- Q3)** a) Write about sources of dust and heat in underground space [6]
- b) Explain about mechanical ventilation in tunneling [6]
- c) Explain about health effects of the harmful gasses due to increased concentration level. [5]

OR

P.T.O.

- Q4)** a) Write about physiological effects of heat and humidity [6]
b) Explain about analysis of air in the tunnel. [6]
c) Explain about Blowing Ventilation Systems in Tunnel. [5]

- Q5)** a) Explain tunnel lighting system [6]
b) Explain about roof and wall supports in tunneling [6]
c) Explain the smooth blasting techniques of tunneling. [6]

OR

- Q6)** a) Write about lighting requirements for access zones of tunnel lighting [6]
b) Explain the cushion blasting techniques of tunneling [6]
c) Explain about problems of drilling and blasting for large tunnels [6]

- Q7)** a) Write about hazard identification & risk assessment (HIRA) [6]
b) What are the benefits of doing a Job Safety Analysis [6]
c) Explain in detail about the evolution of modern safety concepts [5]

OR

- Q8)** a) Explain about fire prevention and protection. [6]
b) Explain safety audit methodology [6]
c) Explain about job safety analysis. [5]



Total No. of Questions : 8]

SEAT No. :

PD-4893

[Total No. of Pages : 2

[6404]-450
B.E. (Civil) (Honors)
ARCHITECTURE AND TOWN PLANNING
Land Use & Land Cover
(2019 Pattern) (Semester - VIII) (401403)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Define survey and what is the significance in the field of urban planning. **[6]**

b) How to used GIS and RS for development of any area? **[6]**

c) What will be the impact of smart cities, green cities and sustainable cities on development towards sustainability. **[5]**

OR

Q2) a) Explain the importance of new techniques such as GIS and Remote sensing in design of town area. **[6]**

b) What planning parameters play important role while preparation of smart, green and sustainable cities. **[6]**

c) Before starting of any project explain how survey plays important role for planning. **[5]**

Q3) a) Elaborate the demand and supply relationship of land. **[6]**

b) What is the benefit of afforestation in environment and public health? **[6]**

c) While planning of land use which norms and environmental aspects taking into consideration. **[5]**

OR

P.T.O.

- Q4)** a) Enlist different types of land use structure and explain any one in detail. [6]
b) What are the design criteria and requirement of residential zone? [6]
c) Explain different Traffic and Transportation system in town planning and its impact on urban area. [5]

- Q5)** a) How town planning principles changed the land development? [6]
b) Elaborate how URDPFI Guidelines is benefitted. [6]
c) How land development affect on environmental features? [6]

OR

- Q6)** a) How UDCPR guideline make changes in new era development? [6]
b) What are the different URDPFI guidelines used for land use and infrastructure development. [6]
c) How to solve the current development of area regarding demand and supply of land. [6]

- Q7)** a) Write a short note on : Development Plan [12]
Neighborhood Plan
Town Planning Scheme
b) Explain in detail "National Land Utilization Policy". [6]

OR

- Q8)** a) How Maharashtra Land Revenue Code 1966 useful for development of land? [6]
b) What is mean by Urban Renewal Strategy? [6]
c) What are the policy norms used for design of small and medium town. [6]



Total No. of Questions : 8]

SEAT No. :

PD-4894

[Total No. of Pages : 2

[6404]-451

B.E. (Automobile and Mechanical Engineering) (Honors)
3D PRINTING APPLICATION & ENTREPRENEURSHIP
(2019 Pattern) (Semester - VIII) (402016MJ)

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 sketches/diagrams must be drawn wherever necessary*
- 3) *Figures to the right indicate full marks for the sub-questions.*
- 4) *Assume suitable data if necessary and state them in your answer clearly.*
- 5) *Use non-programmable pocket size electronic calculator is allowed.*

- Q1)** a) What is Principle of Social Manufacturing and Give examples of 3D printing applications in Home and Office utilities, Lighting Utilities? **[9]**
- b) Explain the following terms in terms of additive manufacturing (Any Two). **[8]**
- i) Ergonomics Design Considerations
 - ii) Design Flexibility
 - iii) Operational Productivity.

OR

- Q2)** a) What is Functionally graded material (FGMs) and its applications? **[9]**
- b) Give examples with application of custom made body parts and implants in 3D printing. **[8]**
- Q3)** a) Differentiate between Manufacturer-centric Vs. Consumer-centric Business models **[9]**
- b) What is entrepreneurship and, Current Approach of Manufacturing Enterprises? **[9]**

OR

- Q4)** a) What are the functional and manufacturing requirement of different types of jewelry with respect to additive manufacturing? **[9]**
- b) Give examples of the application of 3D printing in consumer products and explain in details how 3D printing is useful in daily utilities? **[9]**

P.T.O.

- Q5) a)** What are the applications of 3D printing in Art, History, Archeology, Architecture and Landscaping field like Home utilities. **[9]**
- b)** What are the advantages, limitation and challenges in AM in biomedical and health care application? Also highlight the post processing in AM. **[8]**

OR

- Q6) a)** Write short note on Functional CAD modeling and customized Creative Art Expressions. **[9]**
- b)** Explain the following terms : **[8]**
- i) Internal Bench-marking
 - ii) Competitive Bench-marking

- Q7) a)** Compare Manufacturer-centric & Consumer-centric Business models. Explain current approach of Manufacturing Enterprises. **[9]**
- b)** What are Advantages, Disadvantages, Limitations and Challenges of additive manufacturing in Creative Art Expressions? **[9]**

OR

- Q8) a)** How additive manufacturing play vital role in creative arts? Also highlight challenges, advantages and limitation. **[9]**
- b)** Give short note on Lost wax Casting & Mold Making. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4895

[Total No. of Pages : 2

[6404]-452

B.E. (Mechanical)

Honors in Energy Management in Utility Systems
SUSTAINABLE ENERGY CONVERSION SYSTEMS
(2019 Pattern) (Semester - VIII) (402026 MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Define Hybrid wind energy system? Explain any one. [5]
b) Explain in details of procedure generation of electricity through wind power. [6]
c) Difference between Vertical Axis and Horizontal Axis Wind turbine. [6]

OR

- Q2)** a) How does a wind turbine produce electricity? [5]
b) Difference between Up Wind and Down Wind Process. [6]
c) Define Wind Energy? Explain its Parameters. [6]

- Q3)** a) Write a short notes on Sources of energy generation. [5]
b) Define Biogas production? Explain any one. [6]
c) What is Gasification? Types of gasifiers, Explain any one. [7]

OR

- Q4)** a) Briefly explain Industrial waste and agro residues. [5]
b) Write down any Five Utilization and advantages of briquetting. [6]
c) Write Environment benefits of biochemical and thermo-chemical conversion. [7]

P.T.O.

- Q5) a)** What are the Various forms of Energy Storage, explain any one in details? [5]
b) Difference Between Conventional and Nonconventional Energy System. [6]
c) Briefly explain Techno Commercial Analysis. [6]

OR

- Q6) a)** Briefly Explain Conventional Energy System. [5]
b) Explain the importance of Electrical and Nuclear Energy Storage. [6]
c) What are the different Types of Nonconventional Energy System. Explain any one. [6]

- Q7) a)** Write a short note on Occupancy sensor. [5]
b) Write short note on Energy saving potential of each technology. [6]
c) Short note on : [7]
i) Electronic ballast
ii) Energy efficient lighting controls

OR

- Q8) a)** Write a short note on controllers? [5]
b) Explain IOT and its application for chiller system. [6]
c) Explain the variables of Automatic power factor controllers. [7]



Total No. of Questions : 8]

SEAT No. :

PD-4896

[Total No. of Pages : 2

[6404]-453
B.E. (Mechanical)
(Honors in Electric Vehicles)
E-VEHICLE STANDARDS, CHARGING AND SAFETY
(2019 Pattern) (Semester - VIII) (302036MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Explain Role of EV aggregators in EVGI framework. **[9]**
- b) Write a note on Electric Vehicle Charging and grid integration standards. **[8]**

OR

- Q2) a)** Explain Control and communication infrastructure in EV charging? **[9]**
- b) Discuss the potential challenges and opportunities associated with widespread adoption of electric vehicles in the context of grid integration. **[8]**

- Q3) a)** Describe Testing procedures for EV batteries in brief. **[9]**
- b) Explain the role of regulatory standards in establishing safety requirements for function batteries in electric vehicles. **[9]**

OR

- Q4) a)** Explain specific Requirements for L and N Category Electric Power Train Vehicles. **[9]**
- b) What is the blunt indentation test and how does it contribute to the evaluation of battery safety? **[9]**

P.T.O.

- Q5) a)** What are the key parameters measured during electrochemical and thermal characterization of batteries? **[9]**
- b)** Explain : **[8]**
- i)** Battery Aging in an Electric Vehicle (EV)
 - ii)** Calorimetry

OR

- Q6) a)** List and explain several reasons for Lithium-ion battery failure. **[9]**
- b)** Explain the role of regulatory standards and industry guidelines in ensuring the safety of battery technology in electric vehicles. **[8]**
- Q7) a)** Explain in detail about EV charging infrastructures. Also explain categories of charging stations. **[9]**
- b)** How does location planning and land allocation impact the accessibility and efficiency of EV charging networks? **[9]**

OR

- Q8) a)** Explain Charging Methods & Power Ratings of Electric Vehicle. **[9]**
- b)** How does EV charging infrastructure contribute to energy diversification and efficiency within the power sector? **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-4897

[Total No. of Pages : 2

[6404]-454
B.E. (Mechanical) (honors)
SYSTEM ENGINEERING
System Engineering Management
(2019 Pattern) (Semester - VIII) (302046MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Describe the key processes in information management. **[6]**
b) Why is treat risk important? **[6]**
c) How do you monitor risk factors? **[4]**

OR

- Q2)** a) What are the steps of risk profile? **[6]**
b) Describe risk monitoring with suitable example? **[6]**
c) Write a note on 5 stages of information management? **[4]**

- Q3)** a) What is Configuration Management in Project Management? **[6]**
b) What are the activities in configuration identification? **[6]**
c) What are the four process of project evaluation? **[6]**

OR

- Q4)** a) What is control activities in project management? **[6]**
b) What is a configuration management plan? **[6]**
c) What is configuration management in change management? **[6]**

P.T.O.

- Q5)** a) What is the measurement plan in project development process? [6]
b) Explain the importance of project management measurement? [6]
c) Explain the parameters to measure project performance? [6]

OR

- Q6)** a) How to do modeling measurements? [6]
b) Explain the ways to measure progress of activities in a project? [6]
c) Why is project management measurement important? [6]

- Q7)** a) Explain the threat and incident management? [6]
b) What are the quality engineering activities and process? [6]
c) Why is quality assurance important? [6]

OR

- Q8)** a) How to do an evaluation of an activity? [6]
b) Explain the process to maintain records and reports in project management? [6]
c) What are the elements of quality assurance system? [6]



Total No. of Questions : 8]

SEAT No. :

PD4898

[6404]-455

[Total No. of Pages : 2

B.E. (E & TC Engineering)

HONORS IN ROBOTICS

Artificial Intelligence in Robotics

(2019 Pattern) (Semester - VIII) (404183 HR)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are the Characteristics of uninformed search algorithms in AI? [6]
b) Explain Hill Climbing Search algorithm? [6]
c) Explain Ant Colony Optimization Technique? [6]

OR

- Q2)** a) What are Characteristics of informed search algorithms in AI? [6]
b) What are Metaheuristics algorithms in AI (list only)? What are its Characteristics? [6]
c) How TABU search optimization algorithm works? [6]

- Q3)** a) What is Concept of Machine Vision? How it is useful in Robotics? [6]
b) How Image processing is useful in Machine Vision and robotics? [6]
c) Explain imaging based automatic sorting and inspection used in Machine Vision? [5]

OR

- Q4)** a) What are Machine Vision algorithms? List out algorithms used in Artificial Intelligence? [6]
b) What are types of Machine Vision techniques for robotics applications?[6]
c) Write a Short note on “Imaging based robot guidance”. [5]

P.T.O.

- Q5)** a) What are the AI tools/techniques used Intelligent robotics systems? [6]
b) What is Task Based Hybrid Closure Grasping Optimization for Autonomous Robot Hand? Explain. [6]
c) Explain accurate Motion Control in Fast Mobile Robots? [5]

OR

- Q6)** a) What are the applications of intelligent systems for mobile Robot Motion Planning? [6]
b) Explain intelligent robotic system for obstacle avoidance? [6]
c) Explain operation of Path Planning Robot Control in Dynamic Environment? [5]

- Q7)** a) How can you correlate AI with Flexible automation? (Any 3 Points). [6]
b) What are advantages of flexible automation? [6]
c) What are applications of FMS? [6]

OR

- Q8)** a) What is process planning in Artificial Intelligence in Flexible Automation systems? [6]
b) What is flexible automation? What are benefits of flexible automation?[6]
c) What is Route optimization for Automated Storage and Retrieval (AS/RS) systems? [6]

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Total No. of Questions : 8]

SEAT No. :

PD-5341

[Total No. of Pages : 2

[6404]-456
B.E. (Honors)
HBCT : BLOCKCHAIN SOLUTIONS
(2019 Pattern) (Semester - VIII) (404183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** What is Block Chain Construction? Explain in brief the element of Naive Blockchain construction. **[6]**
- b) Describe Memory Hard algorithm to implement Hashcash in Block Chain Technology. **[6]**
- c) What is Direct Acyclic Graph (DAG) in Block Chain Technology? Explain the following components of Direct Acyclic Graph (DAG). **[6]**
- | | |
|----------------------|---------------|
| i) Nodes | ii) Edges |
| iii) Directed Graphs | iv) Colliders |
| v) Path | vi) Tree |

OR

- Q2) a)** Explain in brief, working operation of Smart Contract Construction in Blockchain Technology. **[6]**
- b) Write a short note on how to develop toy application using Blockchain Technology. **[6]**
- c) Describe in brief following : **[6]**
- i) Go-ethereum
 - ii) To build Mining puzzles

P.T.O.

- Q3)** a) Compare Pseudo-anonymity vs. Anonymity in Blockchain Security. [6]
b) List out following aspects of anonymity in Block Chain Technology. [6]
i) Transparency vs Privacy
ii) Privacy coins and technologies
c) Write a short note on different attacks on Block chains. [5]

OR

- Q4)** a) Explain step by step, Sharding based Consensus Algorithms to prevent the attacks in Blockchain Technology. [6]
b) Elaborate Zk-SNARKS for anonymity preservation in Block Chain Security. [6]
c) Explain the working operation of Sybil attack in Blockchain Technology. [5]

- Q5)** a) Describe in brief, how Blockchain security can help in building tamper-proof systems for e-governance, such as land record / digital identity. [6]
b) How does Blockchain ensure the Confidentiality, Integrity and Availability of medical records in Medical Record Management System? [6]
c) Evaluate the benefits and challenges of integrating Blockchain with IoT in environmental applications. [5]

OR

- Q6)** a) In what ways is Blockchain transforming established financial systems, such as asset management, payments, and banking? [6]
b) Explain with example, how Blockchain enhances trust, security and automation in IoT environments. [6]
c) How does blockchain, provide a secure framework for data integrity and tamper-proof records? [5]

- Q7)** a) Justify the myth, Blockchain can replace existing Data Management Technologies. [6]
b) List and brief Limitations of blockchain Technology. [6]
c) List out with brief explanation, various common blockchain myths. [6]

OR

- Q8)** a) Compare Myths vs Reality of blockchain technology. [6]
b) Justify the Myth, Blockchains are inherently more secured. [6]
c) Explain three common myths and their corresponding realities before adopting blockchain. [6]



Total No. of Questions : 8]

SEAT No. :

PD4899

[6404]-457

[Total No. of Pages : 2

B.E. (Printing Engineering) (Honors)
BRAND & PACKAGING MANAGEMENT
(2019 Pattern) (Semester - VIII) (408216)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Outline the process of creating signature design elements within a visual language. **[10]**
- b) Describe the fundamental design principles that should be adhered to when developing a visual language for a brand. How do these principles ensure consistency and coherence in brand communication? **[7]**

OR

- Q2)** a) Discuss the role of visual language in creating a memorable brand identity. Provide examples of brands that have effectively used visual language to establish themselves in the market. **[10]**
- b) How does a deep understanding of consumer behaviour contribute to the development of a successful visual language for a brand? Illustrate your answer with relevant theories and case studies. **[7]**

- Q3)** a) Describe the typical deliverables expected in a packaging design project. Include tangible items like design mockups, prototypes, and production-ready files, as well as any documentation or reports. **[9]**
- b) Summarize the difference between demographics and psychographics when considering the audience for a packaging design. Provide examples of how each aspect can impact packaging design choices and branding strategies differently. **[9]**

OR

P.T.O.

Q4) a) Evaluate the importance of conducting a competitor analysis in the context of packaging design. **[9]**

b) Assess the potential consequences of neglecting to define the scope of a packaging design project thoroughly. Discuss how unclear project scopes can lead to miscommunication, scope creep, and ultimately, project delays and dissatisfaction. **[9]**

Q5) a) Discuss the Ideation stage. How can designers facilitate a brainstorming session to generate innovative ideas. **[9]**

b) Discuss the significance of prototyping in the Design Thinking process and how it aids in refining and validating design concepts. **[8]**

OR

Q6) a) Explain the significance of empathy in the design thinking process and its impact on the creation of successful products or services. **[9]**

b) Discuss the importance of encouraging creativity during the Ideation stage. **[8]**

Q7) a) Explain the statement “Ensuring high visibility on the shelf contribute to the impact of a product.” **[9]**

b) Discuss the ways to use consumer feedback to improve the persuasive quality of a product’s packaging. **[9]**

OR

Q8) a) Explain the role of sustainability in the effectiveness of packaging design in today’s consumer landscape. **[9]**

b) Discuss the key elements that make a product’s packaging relevant to its target audience. Provide example of successful brand message or points-of-difference communicated through packaging. **[9]**

x x x

Total No. of Questions : 8]

SEAT No. :

PD4900

[6404]-458

[Total No. of Pages : 2

B.E. (Computer) (Artificial Intelligence and Machine Learning)
HONORS IN SOFT COMPUTING AND DEEP LEARNING
(2019 Pattern) (Semester - VIII) (410303)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain how genetic algorithm are different from evolutionary programming? [6]
- b) What are operators in genetic algorithm? List and explain GA operators in brief. [6]
- c) Explain Vncoding methods. [6]

OR

- Q2)** a) What are types of crossover and mutation techniques? [6]
- b) Mention application area of genetic algorithm. [6]
- c) What is difference between genetic algorithm and genetic programming?[6]

- Q3)** a) List out the strength and weakness of artificial neural network. [6]
- b) Explain in brief architecture of multilayer feed-forward neural network?[6]
- c) Explain how weights are updated in perceptron network? [5]

OR

- Q4)** a) Explain Types of Artificial Neural Network (ANN). [6]
- b) Explain Single layer and multilayer Perceptrons. [6]
- c) Explain Self-Organizing Map in neural network? [5]

P.T.O.

- Q5)** a) Explain why to use deep learning? [6]
b) Explain in brief architecture of deep network. [6]
c) Explain different Deep Learning libraries? [6]

OR

- Q6)** a) Explain Restricted Boltzman Machines in details? [6]
b) Explain different Deep Learning platform. [6]
c) Explain any one Use Cases of Deep Learning? [6]

- Q7)** a) Explain in detail Convolution Neural Network(CNN)? [6]
b) Explain different Properties of CNN representations? [6]
c) List and explain different Applications of CNN. [5]

OR

- Q8)** a) Explain in details Recurrent Neural Network (RNN)? [6]
b) Explain Sequential processing LSTM model in details? [6]
c) Explain difference between CNN and RNN? [5]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4901

[6404]-459

[Total No. of Pages : 2

B.E. (Honors in Cyber Security)
INFORMATION SYSTEM MANAGEMENT
(2019 Pattern) (Semester - VIII) (410403)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Elaborate Levels of IT Infrastructure. [6]
b) Describe the components of edge computing. [6]
c) Elaborate cloud computing essential characteristics. [5]

OR

- Q2)** a) Explain what type of services provided by Cloud Computing. [6]
b) What is Virtualization? List it's type and explain any four. [6]
c) What are the advantages and disadvantages of Grid computing. [5]

- Q3)** a) Explore types of knowledge management systems. [6]
b) Define Knowledge and Explore Important Dimensions of Knowledge. [6]
c) Distinguish between and structured and unstructured decision. [6]

OR

- Q4)** a) Explain the categories of Enterprise-Wide Knowledge Management Systems. [6]
b) How Case base System work Explain with neat Diagram. [6]
c) Describe the elements of a business intelligence environment. [6]

P.T.O.

- Q5)** a) Describe Steps in Prototyping with its Advantages. [6]
b) Explore Strategies to overcome user resistance. [6]
c) Identify & discuss what are the Consequences of Poor Project Management. [5]

OR

- Q6)** a) List and describe the business process management Steps. [6]
b) What are Dimensions of Project Risk. [6]
c) List tangible and intangible benefits of Information System. [5]

- Q7)** a) What are the tools of information security Explain any 4 in details. [8]
b) What is Mobile Security? Explain Components of Mobile Security.[10]

OR

- Q8)** a) List and explore any 4 issues related to managing passwords. [10]
b) What is block chain? Explain key elements of block chain? [8]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4902

[6404]-460

[Total No. of Pages : 2

**B.E. (Computer Engineering)
HONORS IN DATA SCIENCE**

**Artificial Intelligence for Big Data Analytics
(2019 Pattern) (Semester - VIII) (410503)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 artificial neural networks and state its applications? [6]
b) Explain how to avoid overfitting in Neural Networks. [6]
c) What is a recurrent neural network and how it differs from feed forward neural networks? [8]

OR

- Q2)** a) Explain features of back propagation. [6]
b) What is gradient descent and explain its types? [6]
c) What is perceptron and explain Components of a Perceptron. [8]

- Q3)** a) What are the main components of Hadoop? [4]
b) Explain types of nodes in Hadoop. [6]
c) What are the features of HDFS explain in detail? [8]

OR

- Q4)** a) What are the challenges of Map Reduce. [4]
b) What is of Map Reduce? What are the steps in Map Reduce? [6]
c) What is Hadoop Streaming and explain how it works. [8]

P.T.O.

- Q5)** a) What are the key components of data warehouse? [6]
b) What is data ingestion and explain its types. [6]
c) Write a short note on: Data mining. [4]

OR

- Q6)** a) Explain Scalable Machine Learning on Big Data using Spark. [6]
b) Explain the benefits of data ingestion in detail. [6]
c) What is Hive and why do we need it? [4]

- Q7)** a) What are the applications of NLP? [6]
b) What is pre-processing in computer vision? [6]
c) Explain feature extraction in NLP. [4]

OR

- Q8)** a) Explain in details Text pre-processing in NLP. [6]
b) How to Apply NLP Techniques? [6]
c) What are the applications of computer vision? [4]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4903

[Total No. of Pages : 2

[6404]-461

B.E. (Honors)

**INTERNET OF THINGS SECURITY
(2019 Pattern) (Semester - VIII) (410603)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in detail - Digital Signature with example. [6]
b) Explain different Privacy Preservation Techniques in IoT security. [5]
c) What is Identity Based Authentication? Explain with a suitable example.[6]

OR

- Q2)** a) What is Public Key Based Authentication? Explain with a suitable example.[6]
b) Explain - Existing Security Schemes for IoT. [5]
c) What is Lightweight Cryptography? Explain with an example. [6]

- Q3)** a) What are the Threats Caused in Maintenance of IoT? [6]
b) Explain Cloud Security for IoT, with a suitable example. [6]
c) How to provide IoT Security to machine learning applications? Explain with an example. [6]

OR

- Q4)** a) How can security be provided in the Network Layer IoT Architecture?[6]
b) Explain - the data life cycle in IoT, with suitable example. [6]
c) How can security be provided in the Application Interface Layer of IoT Architecture? [6]

P.T.O.

- Q5)** a) What are the security concerns in social IoT? [6]
b) List and explain the main potential attacks in 6LoWPAN. Discuss security protocols and privacy issues in 6LoWPAN. [6]
c) How to maintain confidentiality and security for IoT-based healthcare applications? [6]

OR

- Q6)** a) How to provide Security in Identification and Tracking Technologies? Explain with a suitable example. [6]
b) Using which security schemes information in Wireless Sensor Networks (WSNs) can be protected? [6]
c) What are the threats and challenges to achieving security in the - identification and tracking technologies of the IoT Environment [6]

- Q7)** a) How can security be provided in Smart Cities? [6]
b) How can security be provided to Connected Cars? [5]
c) How can Blockchain Technology be used in the Security and Privacy of IoT? [6]

OR

Q8) Write Short Notes on the following :

- a) Blockchain-enabled food supply system. [6]
b) Blockchain in IoT. [5]
c) Smart Home [6]

x x x

Total No. of Questions : 8]

SEAT No. :

PD4904

[6404]-462

[Total No. of Pages : 2

B.E. (Computer Engineering) (Honours)

VIRTUAL REALITY AND AUGMENTED REALITY

**Application Development Using Augmented Reality and Virtual Reality
(2019 Pattern) (Semester - VIII) (410703)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is ARCore? Explain the features of ARCore. [6]
b) What is Vuforia? Explain the features of Vuforia. [6]
c) Explain anatomy of SLAM algorithm. [5]

OR

- Q2)** a) What considerations should developers keep in mind during the integration of Vuforia into their applications? [6]
b) Explain the terms: [6]
i) Environmental Detection
ii) Occlusion
c) Give a detailed overview of the key components involved in the structure of a SLAM algorithm. [5]

- Q3)** a) Explain the significance of User Experience (UX) in AR and VR applications, and discuss how programming languages can play a role in improving UX. [6]
b) Identify some of the most widely used technologies for Augmented Reality (AR) and Virtual Reality (VR) development. [6]
c) Describe the fundamental Object-Oriented Programming (OOP) principles in C# and explain how they are implemented in Unity development. [6]

OR

P.T.O.

- Q4)** a) How can Visual Studio be set up for C# development in Unity? [6]
b) What is the role of C# in AR and VR development with Unity? [6]
c) How does C# manage and control 3D models in Unity? [6]

- Q5)** a) What is the structure and working principle of the HTC Vive VR device?[6]
b) Compare the Oculus Rift and HTC Vive in terms of structure, functionality, features, and pros and cons. [6]
c) What is the purpose of an AR tracking system in AR technology? [5]

OR

- Q6)** a) What is the role of a tracking system in AR, and how does it enhance the AR experience? [10]
b) What are the main advantages and disadvantages of AR and VR, and how do these affect their use across industries? [7]

- Q7)** a) Why are human factors important in designing AR and VR experiences?[6]
b) How does the widespread use of AR and VR influence social interactions and societal norms? [6]
c) What are the applications of AR and VR in healthcare, and what are the benefits for patients and professionals? [6]

OR

- Q8)** a) How are AR and VR used in science and engineering for simulations, training, and collaborative research? [6]
b) What are the applications of AR and VR in the aerospace and defense sectors? [6]
c) How do AR and VR impact the gaming and entertainment industry, and what advancements enhance user experiences? [6]

x x x

Total No. of Questions : 8]

SEAT No. :

PD5313

[Total No. of Pages : 3

[6404]-1506

B.E. (Mechanical Engineering)
HYDRAULICS AND PNEUMATICS
(2015 Pattern) (Semester - VII) (402041)

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) *Figures to the right indicate full marks.*
- 3) *Use of non-programmable scientific calculator is allowed.*
- 4) *Draw neat diagram wherever necessary.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of steam table is permitted.*

- Q1)** a) Explain in brief different applications of hydraulic systems. **[4]**
- b) What is a rod less cylinder and tandem cylinder? State their applications. **[8]**
- c) Explain with neat sketch the working of a counter balance valve with a typical circuit showing its application. **[8]**

OR

- Q2)** a) What are the desirable properties of hydraulic fluids? Explain in breif. **[4]**
- b) Classify different hydraulic actuators. What are their typical applications? **[6]**
- c) Compare the advantages and disadvantages of three types of flow control methods. **[10]**
- Q3)** a) With the help of a suitable hydraulic circuit, explain the working of sequencing circuit. **[8]**
- b) Explain with neat sketch hydraulic circuit for clamping component on drilling machine. **[8]**

OR

P.T.O.

- Q4) a)** Sketch and discuss the hydraulic circuit for synchronization of two cylinders. [10]
b) Define different filter ratings. Explain in short their significance. [6]

- Q5) a)** Explain following components with applications. [9]
 i) Pneumatic/vacuum clamp
 ii) Shuttle valve
 iii) Twin pressure valve
b) Draw and explain a typical compressed air generation and distribution system. [8]

OR

- Q6) a)** What is purpose of quick exhaust valve in a pneumatic system? Explain with neat sketch of it, with a typical application. [8]
b) Write a note on selection criteria of compressor for pneumatic systems. [4]
c) What is the purpose of providing 'Regulator' in pneumatic circuits? [5]

- Q7) a)** A high-low circuit with an unloading valve is employed for press application. This operation requires flow rate of 200 lit/min for high speed opening and closing of the dies at maximum pressure of 30 bar. The work stroke needs a maximum pressure of 400 bar. Assuming equal power requirement in both process, determine the suitable delivery of both pumps. [10]
b) Analyze the circuit shown in Fig 7 (b) [7]

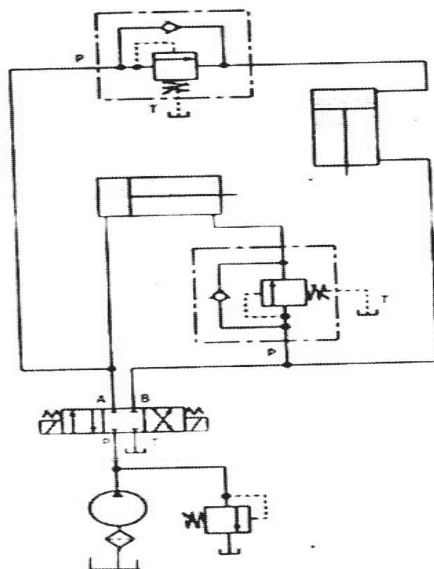


Fig. 7 (b)

OR

Q8) a) In a meter-in circuit, a cylinder with 100 mm bore diameter and 70 mm rod diameter is used to exert a forward thrust of 100 kN, with velocity of 0.5 m/min. Neglecting the pressure drop through the piping valves. If the pump flow is 20 lit/min. find the following: **[10]**

- i) Pressure required at the pump during extension
- ii) Flow through the flow control valve
- iii) Relief valve setting
- iv) Flow out of the pressure relief valve
- v) System efficiency during extension.

b) Analyze the circuit shown in Fig 8 (b) **[7]**

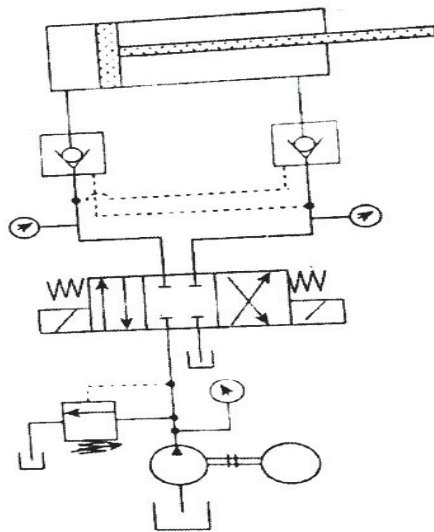


Fig. 8 (b)

* * *

[6404]-1507

B.E. (Mechanical)

REFRIGERATION AND AIR CONDITIONING
(2015 Pattern) (Semester - VII) (302049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Draw neat diagram wherever necessary.
- 3) Use of scientific calculator, psychrometric chart is allowed.
- 4) Assume suitable data, if necessary.
- 5) Figures to the right indicate full marks.

Q1) a) With a neat sketch explain the working of Evaporative cooler. **[4]**

b) State desirable properties of refrigerants. **[6]**

OR

Q2) a) What is the significance of environment friendly refrigerant. **[4]**

b) A simple saturated vapour compression refrigeration system has a condensing temperature of 50°C and evaporating temperature of 0°C. The refrigeration capacity is 7 TP. The liquid leaving the condenser is saturated liquid and compression is isentropic. Determine. **[6]**

- i) The mass of refrigerant in kg/s
- ii) Compressor power in kW
- iii) Heat rejected from the system and
- iv) COP of the system

Take enthalpy at the end of isentropic compression as 210 kJ/kg & properties of Refrigerant is listed in the following table:

T °C	P bar	h_f kJ/kg	h_g kJ/kg	s_{fg} kJ/kgK	s_g kJ/kgK
50	12.199	84.868	206.298	0.3034	0.6792
0	3.086	36.022	187.397	0.1418	0.6960

P.T.O.

- Q3)** a) Explain the concept of Carnot COP? [4]
b) Explain refrigeration system with flash gas removal. [6]

OR

- Q4)** a) Explain Multi evaporator vapour compression refrigeration system. [4]
b) State various applications of cryogenics. [6]

- Q5)** a) Explain the ASHRAE comfort chart showing the comfort zone for winter and summer season. [6]
b) Explain the significance of various psychometric processes by drawing it on psychomotor chart. [10]

OR

- Q6)** a) Define RSHF, GSHF & ESHF. [6]
b) Explain different methods of duct design. [10]

- Q7)** a) Explain the working of Automatic Expansion Valve with a neat sketch. [8]
b) Explain the working of different components used in air conditioning system. [8]

OR

- Q8)** a) Explain the working of Thermostatic Expansion Valve with a neat sketch. [8]
b) Explain the concept of All-Air system with neat sketch. Also state the application of same. [8]

- Q9)** a) Explain the concept of Humidity and Smoke sensors. [8]
b) What are the different pressure losses in the duct. Explain. [10]

OR

- Q10)** a) Classify the ducts on the basis of pressure and velocity of air in the duct. Also state any four factors which should be considered during design of duct. [8]
b) Classify fans used in air conditioning system. Explain any one fan in detail. [10]

* * *

[6404]-1508

B.E. (Mechanical Engineering)

FINITE ELEMENT ANALYSIS

(2015 Pattern) (Semester - VII) (Elective - I) (402044 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

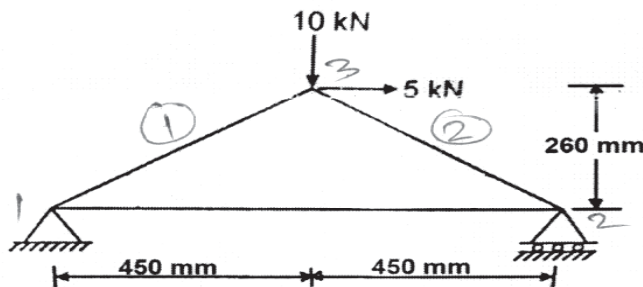
- 1) Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.

Q1) a) Explain principle of minimum potential energy to formulate FEM Equation. [6]

b) Explain shape function for two noded 1D element. [4]

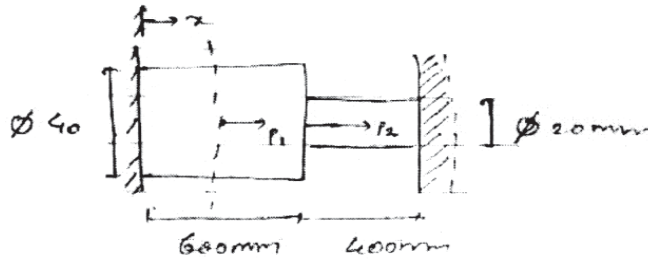
OR

Q2) For a truss shown in figure. Determine the displacement of nodes and stresses in members. Cross-section area of all members is 400mm^2 and $E = 2 \times 10^5$ MPa. Determine [10]



P.T.O.

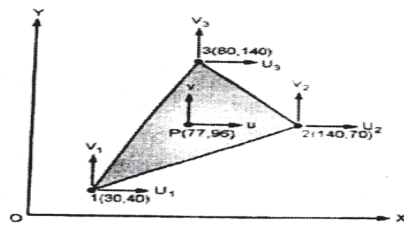
- Q3) a)** Figure shows one dimensional step bar fixed at each end subjected to load P_1 and P_2 . Determine nodal displacement at each element.
 $E = 200 \text{ GPa}$, $P_1 = 50 \text{ kN}$, $P_2 = 20 \text{ kN}$. [6]



- b) Explain in brief types of elements used in FEM along with their characteristics. [4]

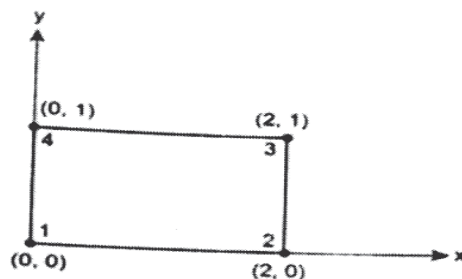
OR

- Q4) a)** In a triangular element, the nodes 1, 2 and 3 have cartesian coordinates: (30,40), (140,70) and (80,140) respectively. The point P within the element has cartesian coordinates (77,96). For point P, determine [6]
- the natural coordinates and
 - shape functions



- b) Explain plane stress formulation and its importance. [4]

- Q5) a)** Derive Jacobian matrix for three noded triangular (CST) element. [8]
- b) A four noded rectangular element is shown in fig. Take $\zeta = 0$ and $\eta = 0$. Determine [8]
- Jacobian matrix
 - strain displacement matrix



OR

Q6) a) Explain the terms isoparametric, subparametric and superparametric elements. [8]

b) Evaluate $I = \left(\int_{y=-2}^{y=2} \int_{x=-1}^{x=1} (x^2 + 2xy + y^2) dx dy \right)$ using Gauss quadrature method. [8]

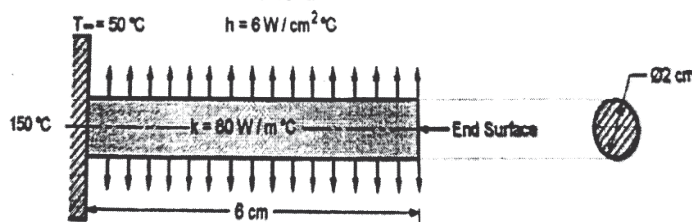
Q7) a) Write down governing of steady-state heat transfer. Also write elemental stiffness matrix and compare it with bar element. [8]

b) The brick wall has a thickness of 0.6 m and $K=0.8 \text{ W/m}^\circ \text{K}$. The inner surface is at 28°C and the outer surface is exposed to cold air at -10°C . The heat transfer coefficient associated with the outside surface is $40 \text{ W/m}^\circ\text{K}$. Determine the steady-state temperature distribution within the wall and also the heat flux through the wall using two elements. [10]

OR

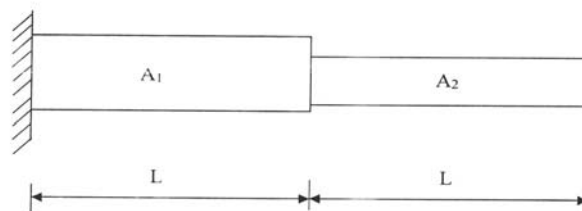
Q8) a) Write short note on heat transfer through fin-pin. Explain with appropriate governing equation. [8]

b) Find the temperature distribution in the one-dimensional rod as shown in figure. [10]



Q9) a) Explain difference between consistent and lumped mass matrix technique for modal analysis of structure. [6]

b) Find the natural frequencies of longitudinal vibration of stepped shaft using consistent mass matrix having cross sectional areas $A_1 = 2500 \text{ mm}^2$ and $A_2 = 1200 \text{ mm}^2$. The shaft is constrained at one end as shown in figure. [10]



OR

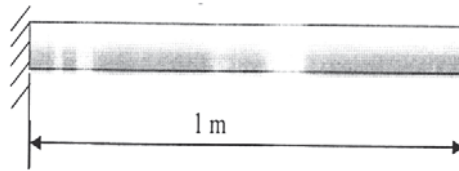
Q10)a) Write down consistent and lumped mass matrices for following elements.[6]

i) Bar element

ii) Plane truss element

iii) Beam element

- b) Estimate the natural frequencies of axial vibrations of bar shown in figure using lumped mass matrix. The bar is having uniform cross-section with cross-sectional area $A = 50 \times 10^{-6} \text{ m}^2$. Length $L = 1 \text{ m}$. modulus of elasticity $E = 2 \times 10^{11} \text{ N/m}^2$ and density $\rho = 7800 \text{ kg/m}^3$. Model the bar by using two elements. **[10]**



* * *

Total No. of Questions : 10]

SEAT No. :

PD5316

[Total No. of Pages : 3

[6404]-1509
B.E.(Mechanical)
TRIBOLOGY
(2015 Pattern) (Semester - VIII) (402049 A) (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) *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 importance of Tribology in Industry. **[6]**

b) Explain the physical and chemical properties of lubricants. **[4]**

OR

Q2) a) Write note on Stick-slip phenomenon in friction. **[4]**

b) Explain the following terms in short: **[6]**

- i) Extreme Pressure Additives
- ii) Recycling of used oil

Q3) a) Write short note on **[6]**

- i) Gaskets
- ii) Oil seals

b) Explain the effect of temperature and pressure on viscosity. **[4]**

OR

P.T.O.

Q4) The following data is given for 360° hydrodynamic bearing

[10]

Journal speed = 1500 rpm

Journal diameter = 100mm

Bearing length = 50mm

Minimum oil film thickness 0.015 mm

Viscosity of lubricant = 30cP

The fit between journal and bearing is H7/e7 for which

Hole diameter = mm

Shaft diameter = mm

Specify the load carrying capacity of given hydrodynamic bearing.

	S	f		
0.1	0.0313	1.6	5.69	0.939
0.2	0.0923	3.26	5.41	0.874
0.4	0.319	8.10	4.85	0.730
0.6	0.779	17.00	4.29	0.552
0.8	2.03	40.9	3.27	0.310

Q5) a) What is squeeze film lubrication? State applications of squeeze film lubrication. **[10]**

b) Differentiate hydrostatic bearing and hydrodynamic bearing on the basis of **[8]**

- i) Friction between shaft and bearing at starting and running condition
- ii) Power losses
- iii) Load carrying capacity
- iv) Operating speed

- Q6)** a) Derive an expression for flow rate of fluid through rectangular slot. State the assumptions while deriving the expression. [8]
b) The following data is given for hydrostatic thrust bearing [10]
Supply pressure = 2.5 MPa,
Shaft speed = 720 rpm
Shaft diameter = 400mm,
Recess diameter = 250mm
Film thickness = 0.15mm
Viscosity of lubricant = 30cP
Calculate
i) Load carrying capacity of bearing
ii) Total flow rate of lubricant
iii) Frictional power loss
Pumping power loss

- Q7)** a) How Elasto-hydrodynamic lubrication differs from hydrodynamic lubrication? Also explain the Ertel-Grubin equation with its limitation in brief. [8]
b) State the merits and demerits and four application of gas lubricated bearing. [8]

OR

- Q8)** a) Explain Hertz theory of contact stress with example. Explain in brief contact stresses between two cylinders. [8]
b) Compare the gas lubricated bearings with oil lubricated bearings based on following parameters. [8]
i) Load carrying capacity
ii) Overall coefficient of friction
iii) Viscosity of lubricant
iv) Operating speed

- Q9)** a) Explain with neat sketches any two methods used for corrosion resistance. [8]
b) Write a note on Lubrication system in I.C. engine. [8]

OR

- Q10)** a) Classify surface engineering processes. [8]
b) Write short notes on [8]
i) Hot dip coating
ii) Flame spraying



Total No. of Questions : 10]

SEAT No. :

PD-5331

[Total No. of Pages : 2

[6404]-1510

B.E. (Electronics and Telecommunication Engineering)

MOBILE COMMUNICATION

(2015 Pattern) (Semester - VIII) (404189) (Open Elective)

Time : 2½ Hours]

[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, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Compare Circuit switching. Message switching and Packet switching techniques. **[6]**

b) Explain the term Progressive grading & Homogeneous grading. **[4]**

OR

Q2) a) Describe the operation of packet switching techniques for data transmission. **[6]**

b) Write short note on CCITT signaling. **[4]**

Q3) a) With the help of neat block diagram, explain input controlled time division space switching. **[6]**

b) Compare voice traffic & data traffic on the basis of following parameters; **[4]**

i) Type of signal

ii) Bandwidth

iii) Losses

iv) Line utilization

OR

Q4) a) With neat diagram explain two stage networks operation for voice transmission. **[6]**

b) Write short note on cell splitting. **[4]**

P.T.O.

- Q5) a)** With the help of neat block diagram explain GSM architecture. **[8]**
b) Explain with neat diagram Intra-BSC and Inter-BSC hand over in GSM. **[8]**

OR

- Q6) a)** Draw & explain various interfaces used in GSM system. **[8]**
b) Explain various radio transmission parameters used in GSM. **[8]**
- Q7) a)** With neat diagram explain hand over mechanism in GSM. **[8]**
b) Explain HSCSD Architecture for enhancement of GSM circuit switched data transmission. **[9]**

OR

- Q8) a)** Explain in brief GSM burst structures. **[9]**
b) Compare TDMA, CDMA and OF DMA multiple access techniques for GSM. **[8]**
- Q9) a)** Draw LTE frame structure and list out LTE design parameters. **[8]**
b) List out & explain various challenges and requirements for 5G service. **[9]**

OR

- Q10)a)** Compare following points from 1G to 5G. **[8]**
i) Standards
ii) Multiple access
iii) Data rate
iv) Services
b) Explain with neat diagram open wireless Architecture of 5G system. **[9]**



Total No. of Questions : 8]

SEAT No. :

PD-5333

[Total No. of Pages : 2

[6404]-1511

**B.E. (Electronics and E & TC Engineering)
BROADBAND COMMUNICATION SYSTEMS
(2015 Pattern) (Semester - VIII) (404190)**

Time : 2½ Hours]

[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 and waveforms must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of non-programmable calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain how light propagates inside optical fiber with diagram. Define Numerical aperture (NA). Write expression for NA. **[10]**

b) Explain WDM with basic principle and block diagram. State and explain types of WDM. **[10]**

OR

Q2) a) Explain scattering loss and dispersion loss in detail. **[10]**

b) What is optical amplifier. State its types. Explain any one type of optical amplifier with neat diagram. **[10]**

Q3) a) What are different launch vehicles of satellite. State steps of launching satellite. **[8]**

b) With neat equations explain azimuth and elevation angles for satellite communication. **[9]**

OR

Q4) a) Explain LEO, MEO and GEO. **[9]**

b) Write a short note on orbital effects on communication systems. **[8]**

P.T.O.

- Q5) a)** Write a short note on satellite reliability with bath tub curve. **[8]**
b) With block diagram explain Telemetry Tracking Command and Monitoring (TTC & M). **[9]**

OR

- Q6) a)** Explain different antennas used for satellite communication systems. **[9]**
b) Write short note on Attitude and Orbital Control System (AOCS). **[8]**

- Q7) a)** Draw and explain block diagram of transponder for 6/4 GHz band. **[8]**
b) Explain the terms path loss, EIRP, CNR. **[8]**

OR

- Q8) a)** Explain different steps required for satellite downlink design. **[8]**
b) Explain the terms G/T ratio and C/I ratio. **[8]**



Total No. of Questions : 8]

SEAT No. :

PD5317

[Total No. of Pages : 2

[6404]-1516

B.E. (Electronics and Telecommunication Engineering)

MACHINE LEARNING

(2015 Pattern) (Semester - VIII) (404191 A)

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) *Figures to the right indicate full marks.*
- 3) *Draw neat figures wherever necessary.*
- 4) *Assume any missing data, if necessary.*

- Q1) a)** Explain Supervised and Unsupervised classification? Compare Supervised and Unsupervised classification. **[6]**
- b)** Justify “Increasing data size (number of samples) helps in reducing overfitting”. **[6]**
- c)** With reference to support vector machines (SVM), elaborate the following terms with suitable diagram. **[6]**
- i) Support Vector
 - ii) Margin
 - iii) Decision Boundary

OR

- Q2) a)** State any six applications where machine learning is used? **[8]**
- b)** What are basis functions? Give any four examples of basis functions. **[6]**
- c)** What are the applications of K means clustering algorithm? **[4]**
- Q3) a)** State any explain the resemblance (similarity) of ANN to biological neural network. **[6]**
- b)** Compare perceptron with McCulloch-Pitts (M.P.) neuron **[6]**
- c)** What is the significance of bias in perceptron networks? Explain with suitable example. **[6]**

OR

P.T.O.

- Q4)** a) Describe with the help of suitable example, the delta learning rule (chain rule with sigmoid activation). [8]
b) Describe with help of suitable example, algorithm for Hebbian learning rule. [6]
c) State any four activation functions used in ANN. [4]

- Q5)** a) Describe the Back propagation algorithm with the help of suitable example. [8]
b) State and prove the Covers theorem using suitable example. [8]

OR

- Q6)** a) State the architecture of Radial basis function networks. [8]
b) What is Learning vector Quantizer (LVQ)? How target values in the data are used while training in LVQ? How code vectors are obtained in LVQ? [8]

- Q7)** a) Explain function of in respect of CNN. [9]
i) Convolution layer
ii) Pooling
iii) Relu Function
b) What is vanishing gradient algorithm in multilayered neural networks? Explain how the saturation in activation affects the gradients? [9]

OR

- Q8)** a) What are the challenges in conventional machine learning? How they are overcome in deep machine learning techniques? [9]
b) Why pooling layer is used in CNN architecture? Explain with suitable example, [9]
i) Max
ii) Min and
iii) Average pooling technique.

* * *

Total No. of Questions : 10]

SEAT No. :

PD5318

[Total No. of Pages : 2

[6404]-1517

B.E. (Electronics & Telecommunication)

AUDIO VIDEO ENGINEERING

(2015 Pattern) (Semester - VIII) (Elective - III) (404191E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8. Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Define [5]

- i) Hue
- ii) Saturation
- iii) Luminance

b) Draw a neat block diagram of color TV receiver and explain function of each block. [5]

OR

Q2) a) Explain the PAL and NTSC analog TV standards with advantages and disadvantages. [5]

b) Discuss the interlaced and progressive scanning with suitable diagram.[5]

Q3) a) With a block diagram explain the component encoded advanced DTV transmitter. [5]

b) State the operating principles of DIGICAM. [5]

OR

Q4) a) With suitable diagram explain CATV system. [5]

b) Draw and explain direct to home T.V. System (DTH). Also enlist the advantages for the same. [5]

P.T.O.

- Q5)** a) What are the features of IPTV? Explain the architecture of IPTV. [8]
b) What is mobile TV? What are its challenges and the hardware requirements? [8]

OR

- Q6)** a) Explain Wi-Fi TV with relevant block diagram in detail. [8]
b) Explain the concept of IP audio and video. [8]

- Q7)** a) Compare CD, DVD and Blue ray DVD. Draw the block diagram of CD recording and explain. [10]
b) Explain the different methods of sound recording and reproduction. [8]

OR

- Q8)** a) Write a short note on : Variable density method of optical recording. [10]
b) Write short note on MP3 player. Explain the need of Audio compression. [8]

- Q9)** a) Define reverberation time? Explain the importance if reverberation. What are the factors on which reverberation time depends? [8]
b) State the various types of loudspeakers. Explain any one loudspeaker with construction details, working, specifications and applications. [8]

OR

- Q10)a)** Enlist the basic requirements of PA system. Draw the block diagram of typical cordless PA system. Explain it in detail. [8]
b) Discuss the technology of satellite radio reception with necessary block diagram. [8]

* * *

Total No. of Questions : 8]

SEAT No. :

PD5319

[Total No. of Pages : 2

[6404]-1518

B.E.(E & TC)

WIRELESS SENSOR NETWORKS

(2015 Pattern) (Semester - VIII) (Elective-IV) (404192C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Define Wiretess sensor Network and explain types of sensor network.[7]

b) Write a note on memory management and its implementation in sensor node operating system. [8]

c) Draw & explain protocol stack in WSN. [5]

OR

Q2) a) Explain hardware components of sensor node. [7]

b) Explain cross-layer protocol in WSN. [6]

c) Write a note on following w.r. to operating system. (Any one) [7]

i) Interrupts

ii) Tasks, Threads, Events

Q3) a) Explain Direct Diffusion routing. [9]

b) Explain backward Error control and forward error control with example.[9]

OR

Q4) a) What are design crieteria of link estimation protocol. [9]

b) Write the performance metric of MAC and explain any two design criteria of MCA. [9]

P.T.O.

- Q5)** a) Write a short note on compressive sampling. [8]
b) Explain security protocols in sensor Network.(Any two protocols) [8]

OR

- Q6)** a) Write short note on : [8]
i) Data aggregation
ii) In-network processing
b) Explain a threat model in WSN. [8]

- Q7)** a) Explain Design & Deployment steps in WSN application. [8]
b) Write a short note on early deployment. [8]

OR

- Q8)** a) Explain Bottom up design approach in WSN. [8]
b) Explain testing & validation in WSN. [8]



Total No. of Questions : 8]

SEAT No. :

PD-5342

[Total No. of Pages : 3

[6404]-1519

B.E. (E& TC)

RENEWABLE ENERGY SYSTEMS

(Elective - IV) (2015 Pattern) (Semester-VIII) (404192(D))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What is nuclear energy? Explain with the help of diagram nuclear fission reaction to generate nuclear energy. [8]
- b) Calculate the angle made by beam radiation with normal to flat plate collector on May 1, at 0900 h (LAT). The collector is located in New Delhi ($28^{\circ} 35'$, $77^{\circ} 12' E$). It is tilted at an angle of 36° with the horizontal and is pointing due south. [6]
- c) Write short note with suitable diagram on. [6]
- i) On Grid Solar PV system
 - ii) Off Grid Solar PV system

OR

- Q2)** a) What are the different renewable and conventional forms of energy? Explain their merits and demerits. [8]
- b) Define the following terms. [6]
- i) Solar constant
 - ii) Hour angle
 - iii) Zenith angle
- c) What is solar cell? Define efficiency of solar cell and explain limits to cell efficiency. [6]

P.T.O.

- Q3)** a) Explain with the help of neat sketch different types of wind turbines used to extract wind energy. [8]
- b) Describe the main considerations in electing the main site for wind generator. [6]
- c) What are the advantages and disadvantages of wind energy systems?[4]

OR

- Q4)** a) Describe with neat sketch the working of Wind Energy Converter System (WECS) with main components. [8]
- b) Define the following with respect to Wind turbines. [6]
- i) Nacelle
 - ii) Hub
 - iii) Yaw control
 - iv) Cut-in-speed
 - v) Cut-out-Speed
 - vi) Rated Speed
- c) Wind at one standard atmospheric pressure and 15°C has a speed of 10 m/s. A 10-m diameter wind turbine is operating at 5 rpm with maximum efficiency of 40%. Calculate [4]
- i) the total power density in wind stream,
 - ii) the maximum power density,
 - iii) the actual power density.

- Q5)** a) What is geothermal energy? What is plate tectonic theory and how it is related to geothermal energy? [8]
- b) List the different types of tidal power plants and explain any two in detail. [8]

OR

- Q6)** a) What are the advantages and environmental impacts of geothermal energy? Explain in detail. [8]
- b) What do you mean by tidal energy? Explain tidal characteristics which help to generate tide energy. [8]

- Q7)** a) List the different types of fuel cells and explain alkaline fuel cell with neat diagram. [8]
- b) Draw and explain operating characteristics of fuel cell. [8]

OR

- Q8)** a) Define fuel cell. Explain the Phosphoric Acid Fuel Cell (PAFC) with neat diagram. [8]
- b) Compare acidic and alkaline hydrogen-Oxygen fuel cell. [8]



Total No. of Questions : 8]

SEAT No. :

PD5320

[Total No. of Pages : 2

[6404]-1520

**B.E.(Electronics Engineering)
COMPUTER NETWORKS & SECURITY
(2015 Pattern) (Semester - VIII) (404209)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the 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 pocket calculator is allowed.*

- Q1)** a) Draw OSI Reference model. List & explain functions of Each Layer. **[6]**
b) Explain the term network architecture with suitable example. **[6]**
c) Explain various connecting devices-Hub, Router, Bridges & Gateways. **[8]**

OR

- Q2)** a) State & explain four basic network topologies and write advantages of each type. **[6]**
b) Explain in brief physical address, network address & port number. **[6]**
c) Compare circuit switching Vs packet switching. **[8]**

- Q3)** a) Explain different QOS parameters in brief. **[6]**
b) What is routing? Explain shortest path routing algorithm. **[6]**
c) Compare IPv4 Vs IPv6. **[4]**

OR

- Q4)** a) What are various Network layer design issues? **[6]**
b) What is traffic shaping? Explain leaky bucket algorithm? **[6]**
c) Explain the Address Resolution protocol. **[4]**

P.T.O.

Q5) a) Explain telnet & FTP in detail with respect to client server communication. **[10]**

b) List the advantages & disadvantages of HTML. **[8]**

OR

Q6) Write short notes

a) SMTP **[6]**

b) DNS **[6]**

c) FTP **[6]**

Q7) a) Compare public key & private key security algorithm. Explain RSA algorithm in detail. **[10]**

b) Explain the various network security attacks. **[6]**

OR

Q8) a) What is symmetric key cryptography? Explain the substitution cipher. **[10]**

b) Explain UTP cabling for PC to PC communication. **[6]**



Total No. of Questions : 8]

SEAT No. :

PD5321

[Total No. of Pages : 2

[6404]-1521

B.E. (Electronics Engineering)

OPTICAL AND MICROWAVE COMMUNICATION

(2015 Pattern) (Semester - VIII) (Elective-III) (404211C)

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

- Q1)** a) Compare step index fiber and Graded index fiber. [6]
b) List out the factors that causes loss in optical fiber. [6]
c) Draw and explain the primary building blocks of a fiber optic system. [8]

OR

- Q2)** a) What are different types of fibers and write their characteristics. [6]
b) Explain NA of the fiber and acceptance angle of fiber. [6]
c) A multimode step index fiber having the core refractive index of 1.5 and cladding refractive index of 1.38, core radius of 25μm operates at the wavelength of 1300 nanometer. Calculate [8]
i) Numerical Aperature
ii) Normalized Frequency
iii) Solid Acceptance angle
iv) Total number of modes entering the fiber

- Q3)** a) Compare between spontaneous emission and stimulated emission. [8]
b) A rectangular waveguide has dimension of 6cm×4cm in dominant mode. It propagates a signal at 3GHz. Compute [10]
i) Cut off frequency
ii) Guide wavelength
iii) Phase constant
iv) Phase velocity
v) Group velocity

OR

P.T.O.

- Q4)** a) What is photo detector? Explain with diagram PIN diode. [4]
b) Draw and explain working principle of EDFA optical amplifier. [10]
c) State four application of optical fiber. [4]

- Q5)** a) Write short note on optical isolator and circulator. [6]
b) Explain 2×2 fiber coupler with performance parameters. [4]
c) How mode jumping is avoided in magnetron. [6]

OR

- Q6)** a) Draw the neat diagram of WDM system containing various type of optical amplifiers and explain. [10]
b) State and explain application of Magic Tee. [6]

- Q7)** a) Explain the construction and working of Travelling wave tube. [8]
b) Explain the construction and working of microwave BJT. [8]

OR

- Q8)** a) Explain the construction and working of Gunn diode. [8]
b) Explain the construction and working of Tunnel diode. [8]

* * *

Total No. of Questions : 10]

SEAT No. :

PD-5343

[Total No. of Pages : 2

[6404]-1522

B.E. (Instrumentation & Control)

BUILDING AUTOMATION

(2015 Pattern) (Semester - VIII) (406270(A)) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Why Are Building Automation systems Useful? **[5]**

b) Draw and explain Block diagram of BMS Architecture. **[5]**

OR

Q2) a) Describe the DDC Controllers? **[5]**

b) What is the BAC net Protocol? **[5]**

Q3) a) Define BTU? What is the purpose of BTU? **[5]**

b) What is Humidity? What is Relativity Humidity? What are temperature and humidity sensors? **[5]**

OR

Q4) a) Explain the NDIR sensor for CO₂ measurement in BAS. **[5]**

b) List out the four comfort factors? How can you improve and control thermal comfort in buildings? **[5]**

Q5) a) Describe Run Around coil and Thermal wheel in AHU. **[8]**

b) Draw simplified diagram of AHU and describe various measurements and justify each? **[8]**

OR

Q6) a) Differentiate between Constant and variable Air Volume systems in Air conditioning systems. **[8]**

b) Compare AHUs based on 100% outdoor air and mixed air type. **[8]**

P.T.O.

Q7) a) Distinguished water-cooled chiller vs Air cooled chiller in HVAC system. **[10]**

b) Describe concept of heat pump with respect to geothermal energy. **[8]**

OR

Q8) a) Enlist the parts of fire tube boiler and explain its working? What is the advantage of fire tube boiler? **[10]**

b) Discuss class A and Class B wiring in FAS. **[8]**

Q9) a) Explain the conventional (non-addressable) and addressable Types of Fire Alarm Systems. **[8]**

b) What is the fire alarm? Why do we need NFPA 72 compliance? **[8]**

OR

Q10)a) What is the difference between a Video server and NVR and a DVR?**[8]**

b) Discuss block diagram of access control system. **[8]**



Total No. of Questions : 10]

SEAT No. :

PD5322

[Total No. of Pages : 2

[6404]-1523

B.E. (Computer Engineering)

EMBEDDED & REAL TIME OPERATING SYSTEMS

(2015 Pattern) (Semester - VIII) (410252 C)(Elective -III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Draw neat diagram whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain in detail different characteristics of embedded systems. [5]
b) Draw the block diagram of an embedded system and describe the hardware units of an embedded system. [5]

OR

- Q2)** a) Explain types of serial communication with examples. [5]
b) Write a short note on ARM bus. [5]

- Q3)** a) What are the main features of CAN2.0 Bus standards? [5]
b) Describe the parallel protocols PCI, PCI-X. [5]

OR

- Q4)** a) Describe and compare RS232C and SDIO Devices. [5]
b) Name and Explain Power Management modes of Bluetooth. [5]

- Q5)** a) How the Precedence constraint and data dependency decides in real time task? [7]
b) Explain Earliest Deadline first and Rate Monotonic Algorithm in detail.[9]

OR

P.T.O.

- Q6) a)** Use EDF Scheduler for scheduling following periodic task T1 and T2. Perform schedulability check and comment on whether given task is schedulable and schedule produced is feasible. **[9]**

Task	Burst Time	Deadline	Period
T1	3	7	20
T2	2	4	5
T3	2	8	10

- b) Differentiate hard versus soft real time system and their time constraints. **[7]**
- Q7) a)** What is Priority Inversion? What is deadlock? With appropriate example prove that priority ceiling algorithm avoids deadlock. **[9]**
- b) What is Semaphore? How does it help in resource sharing in RTOS kernel? **[7]**

OR

- Q8) a)** What is shared data problem? Explain any two methods to avoid it. **[9]**
- b) Explain with example Resource conflicts and blocking. **[7]**
- Q9) a)** Explain in detail software development process in Embedded System. **[9]**
- b) Describe in details the features of QNX Neutrino. **[9]**

OR

- Q10)a)** Explain with example Validation and debugging in an embedded system. **[9]**
- b) Write in detail resource access control and synchronization in Real-time Operating system. **[9]**

* * *

Total No. of Questions : 10]

SEAT No. :

PD5323

[Total No. of Pages : 2

[6404]-1524

B.E. (Information Technology)

SOFTWARE TESTING AND QUALITY ASSURANCE

(2015 Pattern) (Semester - VII) (414457 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain software testing life cycle phases. [6]
b) Describe testing as an engineering process. [4]

OR

- Q2)** a) What is difference between Debugging and Testing? [6]
b) Explain V model of testing. [4]

- Q3)** a) Describe TQM for inventory management. [6]
b) Suppose you are a member of a team that was designing a defect repository. What information do you think should be associated with each defect? Why is this information useful and who would use it? [4]

OR

- Q4)** a) Draw a control flow graph for the following code and clearly label each node so that it is linked to its corresponding statement. [6]

```
int evensum (int i)
{
    int sum = 0; [6]
    while (i <= 10)
    {
        if (i/2 == 0)
            sum = sum + i; i ++;
    }
    return sum;
}
```

- b) Explain Design & Architecture of Automation. [4]

P.T.O.

Q5) a) Define software quality assurance. List various objectives of Software Quality Assurance (SQA) [8]

b) Explain planning for software quality assurance w.r.t. to your final year project. [8]

OR

Q6) a) In what respect does QC vary from QA. [8]

b) Explain 7 basic Tools of software quality. [8]

Q7) a) Draw and explain CMMI levels. [8]

b) What is TMM? Explain various levels & benefits of TMM. [8]

OR

Q8) a) What is an “Ishikawa” diagram? When should it be used? [8]

b) Explain the model for process management. What are its uses? [8]

Q9) a) Consider online banking system, state and inject 5 defect in the system which will cause flaw in the system and suggest it's preventive measures. [10]

b) Describe the levels of PSP. [8]

OR

Q10)a) Explain code Review Techniques. [8]

b) Write a note on internal Auditing and assessment. [10]

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