

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Explain the classification of sensors with suitable examples. Discuss how different types of sensors are categorized based on their operating principles.	7	CO1	L2
	b)	Apply the concept of transfer function to analyze the performance of a sensor system. Illustrate with an example how input-output relationships are determined.	7	CO1	L3
		(OR)			
2.	a)	Describe the static characteristics of sensors such as accuracy, calibration, hysteresis, and resolution with neat explanations.	7	CO1	L2
	b)	Analyze the dynamic characteristics of a sensor system and demonstrate how response time and sensitivity affect measurement accuracy in practical applications.	7	CO1	L3
		<u>UNIT-II</u>			
3.	a)	Explain the working principle of LVDT and Hall effect sensors with suitable diagrams.	7	CO2	L2
	b)	Apply capacitive sensing principles to design a displacement measurement system and explain its operation.	7	CO2	L3
		(OR)			
4.	a)	Describe the operation of potentiometric used for position measurement.	7	CO2	L2
	b)	Analyze the working of radar sensors in level measurement and demonstrate their advantages in industrial applications.	7	CO2	L3
		<u>UNIT-III</u>			
5.	a)	Explain the characteristics of accelerometers and their significance in motion sensing applications.	7	CO3	L2
	b)	Apply the working principle of capacitive accelerometers to determine acceleration in a given system.	7	CO3	L3
		(OR)			
6.	a)	Describe the working of piezoelectric with suitable examples.	7	CO3	L2
	b)	Analyze how accelerometers are used to measure vibration in mechanical systems and interpret the output signals.	7	CO3	L3
		<u>UNIT-IV</u>			
7.	a)	Explain the characteristics of actuators and their importance in control systems.	7	CO4	L2
	b)	Apply the principles of pneumatic to illustrate actuator operation in industrial automation.	7	CO4	L3
		(OR)			
8.	a)	Describe the working of valves and rotary actuators with suitable diagrams.	7	CO4	L2
	b)	Analyze a mechanical actuation system and demonstrate how motion conversion is achieved.	7	CO4	L3
		<u>UNIT-V</u>			
9.	a)	Explain the working of thermal and electrical actuators with examples.	7	CO5	L2
	b)	Apply the concept of piezoelectric actuators in micro-positioning systems and explain their operation.	7	CO5	L3
		(OR)			
10.	a)	Describe micro actuators and their significance in MEMS applications.	7	CO5	L2
	b)	Analyze real-time applications of actuators in robotics and automation systems.	7	CO5	L3

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UNIT-I

- | | | Marks | CO | BTL |
|----|---|-------|----|-----|
| 1. | a) Elaborate on the different types of variables used in statistical modelling. | 7 | 1 | K2 |
| | b) Differentiate between Primary and Secondary data sources | 7 | 1 | K2 |

(OR)

- | | | | | |
|----|--|---|---|----|
| 2. | a) Distinguish between Descriptive and Inferential Statistics with appropriate scenarios | 7 | 1 | K2 |
| | b) Explain the classification of data based on the scale of measurement | 7 | 1 | K2 |

UNIT-II

- | | | | | |
|----|--|---|---|----|
| 3. | a) Explain how qualitative data can be organized and represented graphically | 7 | 2 | K2 |
| | b) Compare Histograms and Bar Charts | 7 | 2 | K2 |

(OR)

- | | | | | |
|----|---|---|---|----|
| 4. | a) Define Cumulative Frequency Distribution and explain its importance in data analysis | 7 | 2 | K2 |
| | b) Describe an Ogive? Explain its types and how they are used. | 7 | 2 | K2 |

UNIT-III

- | | | | | |
|----|--|---|---|----|
| 5. | a) The following frequency table gives the values obtained in 40 rolls of a die. | 7 | 3 | K3 |
|----|--|---|---|----|

Value	1	2	3	4	5	6
Frequency	9	8	5	5	6	7

Find the mean, median, and mode of the sample.

- | | | | | |
|----|--|---|---|----|
| b) | Find the coefficient of variation of 24, 26, 33, 37, 29, 31. | 7 | 3 | K3 |
|----|--|---|---|----|

(OR)

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|----|--|---|---|----|
| 6. | a) Describe the measures of central tendency | 7 | 3 | K2 |
| | b) Describe the construction and interpretation of a box-and-whisker plot. | 7 | 3 | K2 |

UNIT-IV

7. a) Random variable 'X' has the following probability function 7 4 K3

X	1	2	3	4	5	6	7
P(X)	k	2k	2k	3k	K^2	$2k^2$	$7k^2+k$

(i) Find the value of K (ii) Evaluate $P(X < 3)$

- b) In binomial distribution consisting of 5 independent trials, probabilities of 1 & 2 successes are 0.4096 & 0.2048 respectively. Find the probability of the parameter 'p' of the distribution 7 4 K3

(OR)

8. a) State and explain the addition and multiplication rules of probability. 7 4 K3
- b) Explain the Poisson distribution and its applications. 7 4 K3

UNIT-V

9. a) Define confidence interval and explain its meaning. 7 5 K3
- b) Describe one-sample z-test and t-test for mean. 7 5 K3

(OR)

10. a) A sample of 26 bulbs gives a mean life of 990 hours with standard deviation of 20 hours. The manufacturer claims that the mean life of bulbs is at least 1000 hours. Is the sample not up to the standard at level of significance 0.05. 7 5 K3
- b) In a random sample of 400 industrial accidents, it was found that 231 were due at least partially to unsafe working conditions. Construct 99% confidence interval for the true proportion using the large sample confidence interval formula. 7 5 K3

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Define categorical and numerical data. Explain univariate and bivariate analysis with examples.	7	1	L2
	b)	Calculate mean, median, and mode for a dataset and interpret the results.	7	1	L2
		(OR)			
2.	a)	Explain standard deviation with formula and significance.	7	1	L2
	b)	Describe Min-Max normalization and Z-score normalization with examples.	7	1	L3
		<u>UNIT-II</u>			
3.	a)	Explain different techniques for handling missing data. Illustrate any two methods with suitable examples and discuss their impact on model performance.	7	2	L3
	b)	Explain binning method with suitable example.	7	2	L2
		(OR)			
4.	a)	Explain dimensionality reduction and feature projection techniques.	7	2	L2
	b)	Compare Filter, Wrapper, and Embedded methods with suitable examples and identify the best method for a given dataset.	7	2	L3
		<u>UNIT-III</u>			
5.	a)	Explain K-Nearest Neighbor algorithm with working and limitations.	7	3	L2
	b)	Explain Naïve Bayes classifier and compute class probability for a small dataset.	7	3	L2
		(OR)			
6.	a)	Explain Decision Tree algorithm and construct a simple tree using a small dataset.	7	3	L2
	b)	Compare Linear Regression and Logistic Regression with equations and real-world applications.	7	3	L3
		<u>UNIT-IV</u>			
7.	a)	Explain K-means clustering and perform clustering for a small dataset with $k = 2$.	7	4	L2
	b)	Explain Hierarchical clustering and construct dendrogram for a sample dataset	7	4	L3
		(OR)			
8.	a)	Explain DBSCAN algorithm with suitable example and identify core, border, and noise points.	7	4	L3
	b)	Explain Association rule mining. Generate rules using support and confidence	7	4	L2
		<u>UNIT-V</u>			
9.	a)	Construct a confusion matrix for a classification problem and compute accuracy, precision, and recall.	7	5	L3
	b)	Explain F1-score and evaluate model performance using given values.	7	5	L2
		(OR)			
10.	a)	Plot ROC curve for a classifier and interpret AUC value.	7	5	L3
	b)	Explain K-fold cross validation and demonstrate its working with $k = 5$.	7	5	L2

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UNIT-I**Marks CO BTL**

- | | | | | | |
|----|----|--|----|-----|----|
| 1. | a) | Explain the evolution of EDA and the transition from manual design to automated synthesis and physical design. | 7M | CO1 | L2 |
| | b) | Compare Full-Custom vs. Semi-Custom design styles. In what scenarios is a Gate-Array style preferred over Standard-Cell? | 7M | CO1 | L3 |

(OR)

- | | | | | | |
|----|----|---|----|-----|----|
| 2. | a) | Elaborate on Algorithm Complexity (P vs NP) in VLSI. Why are most physical design problems considered NP-hard? | 7M | CO1 | L2 |
| | b) | Describe the general layout layers (Diffusion, Poly, Metal) and explain the importance of Design Rule Checks (DRC). | 7M | CO1 | L2 |

UNIT-II

- | | | | | | |
|----|----|--|----|-----|----|
| 3. | a) | Explain the Fiduccia-Mattheyses (FM) Algorithm. How does it improve upon the KL algorithm in terms of time complexity? | 7M | CO2 | L2 |
| | b) | Discuss the optimization goals of partitioning, such as minimizing "cut-set" and balancing "area" between blocks. | 7M | CO2 | L2 |

(OR)

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|----|----|--|----|-----|----|
| 4. | a) | Provide a detailed walkthrough of the Kernighan-Lin (KL) Algorithm focusing on the "Gain" calculation and "Node Swapping" process. | 7M | CO2 | L2 |
| | b) | Explain the concept of Multi-level Partitioning. Why is it necessary for modern SoC designs with millions of gates? | 7M | CO2 | L2 |

UNIT-III

5. a) Explain floorplan sizing and the cluster growth algorithm for generating initial floorplan solutions. 7M CO3 L2
- b) Explain the representation of a floorplan using constraint-graph pairs and sequence pairs. 7M CO3 L2

(OR)

6. a) Explain the difference between slicing and non-slicing floorplans. Use "Polish Expression" and "Slicing Tree" to illustrate. 7M CO3 L2
- b) Explain the Simulated Annealing (SA) process for floorplanning. How are "Moves" (swap, rotate, resize) executed? 7M CO3 L2

UNIT-IV

7. a) Contrast Planar Routing vs. Mesh Routing. Why has mesh routing become the industry standard for high-performance chips? 7M CO4 L2
- b) Discuss the impact of Package-to-Chip Power/Ground routing. Explain the role of C4 bumps and wire-bond pads. 7M CO4 L2

(OR)

8. a) Explain Electromigration (EM). How do Power/Ground routing rules mitigate the risk of EM in narrow metal wires? 7M CO4 L2
- b) Describe the process of Power-Ground distribution for Standard-Cell blocks. How are the "rails" and "straps" aligned? 7M CO4 L2

UNIT-V

9. a) Compare Min-Cut Placement with analytic placement. Which is better for spreading cells uniformly across the chip? 7M CO5 L2
- b) Define Static Timing Analysis (STA). Explain why STA is preferred over dynamic simulation for sign-off. 7M CO5 L2

(OR)

10. a) Solve a conceptual timing problem: Define setup time and hold time, and explain the "slack" calculation for a single flip-flop path. 7M CO5 L2
- b) Explain the optimization objectives in Placement, such as Total Wirelength (TWL) and Congestion. 7M CO5 L2

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		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Define Smart Energy and explain its key objectives.	7	1	2
	b) Explain the concept and components of a Smart Energy Management System.	7	1	2
(OR)				
2.	a) Discuss the important elements of a Smart Energy Management System in detail.	7	1	2
	b) Explain the concept of Energy Efficient Buildings and their features.	7	1	2
<u>UNIT-II</u>				
3.	a) Define Solar Energy and explain its role in Smart Cities.	7	2	2
	b) Explain the concept and development of Solar Cities.	7	2	2
(OR)				
4.	a) Discuss the working and applications of Solar Street Lights in Smart Cities.	7	2	2
	b) Explain the design and functioning of Solar Traffic Signal Boards.	7	2	2
<u>UNIT-III</u>				
5.	a) Define Smart Grid and explain its role in demand management.	7	3	3
	b) Explain the concept of Demand Management through Smart Grids.	7	3	3
(OR)				
6.	a) Discuss the need for Electric Vehicles (EVs) in modern society.	7	3	3
	b) Explain the components of EV ecosystem with emphasis on vehicles and batteries.	7	3	3
<u>UNIT-IV</u>				
7.	a) Define Smart Transport System and explain the need for urban smart transport.	7	4	2
	b) Explain the objectives of an Urban Smart Transport System.	7	4	2
(OR)				
8.	a) Discuss the components of an Urban Transport System.	7	4	2
	b) Explain various strategies used in Smart Transport Systems.	7	4	2
<u>UNIT-V</u>				
9.	a) Define ICT-supported Smart Transport System and explain its significance.	7	5	3
	b) Explain the concept and working of Real-Time Traffic Information System (RTIS).	7	5	3
(OR)				
10.	a) Discuss the Real-Time Traffic Monitoring System and its applications.	7	5	3
	b) Explain Automated Fare Collection (AFC) System with its components.	7	5	3

III B. Tech II Semester Regular Examinations, April, 2026
DESIGN, APPLICATIONS, AND CONTROL OF ROBOTICS
(Honors - Robotics)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

			Marks	CO	BTL
UNIT-I					
1.	a)	Explain robot-centered, in-line, and mobile robot cell layouts with neat sketches, and compare their suitability for different industrial applications.	9	CO1	K2
	b)	A robotic cell performs loading, transfer, positioning, and unloading in 5 s, 7 s, 4 s, and 3 s respectively. Determine the cycle time. Suggest two methods to reduce the cycle time without affecting safety.	5	CO1	K3
(OR)					
2.	a)	Discuss the important design considerations for multiple robot and machine interfaces to ensure smooth and safe operation.	7	CO1	K2
	b)	Explain sequence regulation, operator interface, safety monitoring, interlocks, and error recovery in a robotic work cell.	7	CO1	K2
UNIT-II					
3.	a)	A factory needs a robot for a repetitive material-handling task involving moderate payload, high repeatability, and limited floor space. Explain how you would select a suitable robot for this application.	7	CO2	K3
	b)	Discuss the structure, working principle, and applications of nanorobots in engineering and biomedical domains.	7	CO2	K2
(OR)					
4.	a)	Compare manufacturing and non-manufacturing applications of robots with suitable examples.	7	CO2	K2
	b)	Explain cognitive robots and medical robots, highlighting their features and real-world applications.	7	CO2	K2
UNIT-III					
5.	a)	Explain the role of mobile robots in delivery systems, mining automation, and underwater inspection.	7	CO3	K2
	b)	Compare mobile robots and stationary robots in terms of applications.	7	CO3	K3
(OR)					
6.	a)	Describe microbots and service robots with suitable examples and applications.	7	CO3	K2
	b)	Explain recent developments in robotics and discuss important safety considerations associated with modern robotic systems.	7	CO3	K2
UNIT-IV					
7.	a)	Explain different motion planning schemes in robotics and classify them based on static and dynamic environments.	7	CO4	K2
	b)	Explain how visibility graph and Voronoi diagram methods can be used for path planning, and state which method provides better obstacle clearance.	7	CO4	K3
(OR)					
8.	a)	Explain path-velocity decomposition and accessibility graph methods used in dynamic motion planning problems.	7	CO4	K2
	b)	Discuss artificial potential field approach and reactive control schemes for incremental motion planning with suitable examples.	7	CO4	K2
UNIT-V					
9.	a)	Explain how intelligent behavior can be implemented using a wheeled robot platform, mentioning sensing, control, and actuation aspects.	7	CO5	K2
	b)	Discuss the power consumption and dynamic balance issues involved in biped walking robots.	7	CO5	K2
(OR)					
10.	a)	Describe the major subsystems required for demonstrating a real biped robot and explain their functions.	7	CO5	K2
	b)	Compare wheeled robots and biped robots.	7	CO5	K2

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

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All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1	a) Define a sensor and classify sensors based on their principle of operation.	7M	CO1	K1
	b) Explain the static characteristics of sensors such as accuracy, calibration, hysteresis, and resolution with suitable examples.	7M	CO1	K2
	(OR)			
2	a) Describe the transfer function of a sensor and discuss its significance in measurement systems	7M	CO1	K2
	b) List and explain the dynamic characteristics of sensors.	7M	CO1	K1
	<u>UNIT-II</u>			
3	a) Explain the working principle and applications of potentiometric sensors and capacitive sensors used for position/displacement measurement.	7M	CO2	K2
	b) Discuss the construction and working of LVDT with a neat sketch.	7M	CO2	K2
	(OR)			
4	a) Explain the operation of optical sensors and radar sensors used for level sensing.	7M	CO2	K2
	b) Write short notes on Hall effect sensor and gravitational sensor.	7M	CO2	K1
	<u>UNIT-III</u>			
5	a) Define acceleration and list the important characteristics of accelerometers.	7M	CO3	K1
	b) Explain the working principle of capacitive accelerometers with differential capacitor arrangement.	7M	CO3	K2
	(OR)			
6	a) Explain the construction and operation of piezoelectric accelerometers.	7M	CO3	K2
	b) What are thermal accelerometers? Explain their principle of operation.	7M	CO3	K1
	<u>UNIT-IV</u>			
7	a) Explain the concept of pressure and describe the working of mercury pressure sensors.	7M	CO4	K2
	b) Write notes on piezoresistive pressure sensors.	7M	CO4	K1
	(OR)			
8	a) Explain the construction and working of optoelectronic pressure sensors.	7M	CO4	K2
	b) Discuss the working principles of ultrasonic sensors and thermal transport sensors used in flow measurement.	7M	CO4	K2
	<u>UNIT-V</u>			
9	a) Explain thermo resistive sensors and resistance temperature detectors (RTDs) with their applications.	7M	CO5	K2
	b) Describe the working of thermistors and compare them with RTDs.	7M	CO5	K2
	(OR)			
10	a) Explain the concept of humidity and discuss electrical conductivity sensors used for humidity measurement.	7M	CO5	K2
	b) Explain the construction and working of an optical hygrometer.	7M	CO5	K2

**BATTERY TECHNOLOGIES
(Honors – Electric Vehicles)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	BTL
1. a)	Compare reversible and irreversible cells in terms of thermodynamic efficiency, energy losses, and practical applications.	7	1	Analyze
b)	Explain the inter relationship of electrical energy and energy content in a cell.	7	1	Understand
	(OR)			
2. a)	Differentiate between primary and secondary battery technologies. Discuss their working, advantages, and limitations.	7	1	Understand
b)	Explain what are the different challenges in Energy storage Technologies.	7	1	Analyze
	<u>UNIT-II</u>			
3. a)	Explain the discharge characteristics of secondary batteries with the help of a typical discharge curve.	7	2	Understand
b)	Explain the chemical reactions of Lead acid Batteries.	7	2	Analyze
	(OR)			
4. a)	Define terminal voltage and plateau voltage in secondary batteries. Discuss their significance in battery operation.	7	2	Understand
b)	Explain the procedure for performance evaluation of Batteries.	7	2	Understand
	<u>UNIT-III</u>			
5.	Analyze the challenges associated with solid-state batteries and suggest how recent developments aim to overcome them.	14	3	Apply
	(OR)			
6. a)	Describe the role of cathode materials in lithium-ion batteries and discuss recent advancements in their composition.	7	3	Understand
b)	Explain the recent developments in electrode materials used in lithium-ion batteries.	7	3	Understand
	<u>UNIT-IV</u>			
7. a)	Explain the fundamental principles of supercapacitors and how they differ from conventional capacitors and batteries.	7	4	Understand
b)	Explain the fundamentals of thin film solid-state batteries and their working principle.	7	4	Understand
	(OR)			
8. a)	What are the advantages & disadvantages of Polymer solid electrolytes.	7	4	Remember
b)	Explain the concept of polymer solid electrolytes and their role in lithium-ion conduction.	7	4	Understand
	<u>UNIT-V</u>			
9. a)	Discuss the USABC and DOE targets for vehicular energy storage systems and their significance.	7	5	Understand
b)	Explain the concept of battery life modelling and factors affecting battery degradation.	7	5	Understand
	(OR)			
10. a)	Explain in detail the Environmental concern in battery production.	7	5	Understand
b)	Explain the degrees of vehicle electrification (HEV, PHEV, BEV, etc.) and their key characteristics.	7	5	Understand

**Predictive Analysis and Modeling
(Honors– Data Science)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Discuss the importance of classification algorithms in predictive analytics applications.	7	CO1	K2
	b)	Compare Logistic Regression and Support Vector Machines.	7	CO1	K2
		(OR)			
2.	a)	Explain the concept of Support Vector Machine (SVM) and the role of hyperplane and margin	7	CO1	K2
	b)	Explain how distance metrics influence the performance of KNN classifiers.	7	CO1	K2
		<u>UNIT-II</u>			
3.	a)	Explain the process of handling categorical variables in machine learning datasets	7	CO2	K2
	b)	Analyze the importance of dataset partitioning into training, validation, and testing sets	7	CO2	K2
		(OR)			
4.	a)	Explain the challenges associated with missing data in predictive modeling.	7	CO2	K2
	b)	Evaluate different strategies used to handle missing values in datasets.	7	CO2	K2
		<u>UNIT-III</u>			
5.	a)	Explain the role of hyperparameter tuning in improving machine learning models.	7	CO3	K2
	b)	Discuss the advantages of cross-validation techniques in model evaluation	7	CO3	K2
		(OR)			
6.	a)	Explain how ensemble learning improves predictive model stability.	7	CO3	K2
	b)	Evaluate the impact of class imbalance on predictive model performance.	7	CO3	K2
		<u>UNIT-IV</u>			
7.	a)	Explain the concept and importance of regression analysis in predictive analytics.	7	CO4	K2
	b)	Analyze different performance metrics used to evaluate regression models.	7	CO4	K2
		(OR)			
8.	a)	Explain the role of regression models in forecasting problems	7	CO4	K2
	b)	Evaluate the advantages of Random Forest Regression in complex prediction tasks.	7	CO4	K2
		<u>UNIT-V</u>			
9.	a)	Explain the learning process in Artificial Neural Networks.	7	CO5	K2
	b)	Analyze the differences between CNN and RNN architectures	7	CO5	K2
		(OR)			
10.	a)	Illustrate convolution and pooling operations in CNN with example	7	CO5	K2
	b)	A CNN receives an image of size 28×28 pixels. A convolution layer uses: Filter size = 3×3 Stride = 1 Padding = 0	7	CO5	K3
		i. Compute the output feature map size after convolution.			
		ii. If 8 filters are used, determine the final output dimension.			

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Define fraud risk indicators and list their types.	7	1	L1
	b)	Explain how anomalies differ from suspicious patterns in datasets.	7	1	L2
		(OR)			
2.	a)	Explain fraudulent data inclusions and deletions.	7	1	L3
	b)	Analyze the role of data analytical tools in detecting fraud patterns.	7	1	L3
		<u>UNIT-II</u>			
3.	a)	List the steps involved in data preparation for fraud detection.	7	2	L1
	b)	Explain the importance of descriptive statistics in fraud analytics.	7	2	L2
		(OR)			
4.	a)	Describe Audit and Investigative stage of data analysis.	7	2	L3
	b)	Explain how to determine the data requirements.	7	2	L3
		<u>UNIT-III</u>			
5.	a)	Define Z-score and list its applications.	7	3	L1
	b)	Explain the concept of Relative Size Factor (RSF) for fraud detection	7	3	L2
		(OR)			
6.	a)	Explain how multiple analytical tests help in detecting fraud.	7	3	L2
	b)	Explain how a Number Duplication Test helps in detecting errors or fraudulent activities in datasets.	7	3	L4
		<u>UNIT-IV</u>			
7.	a)	What is the purpose of GEL-1 and GEL-2 tests in data analysis, and how do they help in detecting anomalies or fraud?	7	4	L1
	b)	Describe how trend analysis and correlation are used to detect fraud patterns.	7	4	L2
		(OR)			
8.	a)	Analyze fraud schemes such as skimming using analytical methods.	7	4	L3
	b)	Describe how billing schemes can be identified using analytics.	7	4	L2
		<u>UNIT-V</u>			
9.	a)	List types of payroll fraud schemes.	7	5	L1
	b)	Explain how expense reimbursement fraud occurs.	7	5	L2
		(OR)			
10.	a)	Explain how data analytics helps in fraud prevention.	7	5	L2
	b)	Explain register disbursement fraud schemes.	7	5	L2

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Explain Support Vector Machines (SVM) with margin concept and kernel trick.	7	CO1	L2
	b)	Describe AdaBoost algorithm and explain how weak learners are combined.	7	CO1	L3
		(OR)			
2.	a)	Explain Linear Regression and its assumptions with mathematical formulation.	7	CO1	L1
	b)	Compare Bagging and Boosting techniques with suitable examples.	7	CO1	L2
		<u>UNIT-II</u>			
3.	a)	What is UMAP? Explain how it differs from t-SNE.	7	CO2	L2
	b)	Explain anomaly detection techniques with real-world applications.	7	CO2	L2
		(OR)			
4.	a)	Explain Gaussian Mixture Models (GMM) with probability density functions.	7	CO2	L1
	b)	Compare hierarchical clustering and K-means clustering.	7	CO2	L2
		<u>UNIT-III</u>			
5.	a)	Explain Bayesian Optimization for hyperparameter tuning.	7	CO3	L2
	b)	Explain ROC Curve and AUC with interpretation.	7	CO3	L2
		(OR)			
6.	a)	Explain Stratified K-Fold Cross Validation and its advantages.	7	CO3	L1
	b)	Discuss bias-variance tradeoff with graphical explanation.	7	CO3	L2
		<u>UNIT-IV</u>			
7.	a)	Explain policies and value functions in Reinforcement Learning.	7	CO4	L1
	b)	Describe Actor-Critic methods with architecture diagram.	7	CO4	L2
		(OR)			
8.	a)	Explain exploration vs exploitation tradeoff with examples.	7	CO4	L1
	b)	Describe SARSA algorithm with steps and equations.	7	CO4	L3
		<u>UNIT-V</u>			
9.	a)	Explain Transformer architecture with attention mechanism.	7	CO5	L2
	b)	Discuss transfer learning and fine-tuning in NLP models.	7	CO5	L2
		(OR)			
10.	a)	Explain sequence-to-sequence models with encoder-decoder architecture.	7	CO5	L1
	b)	Describe model monitoring techniques in deployed ML systems.	7	CO5	L1

**III B.Tech II Semester Regular Examinations, April-2026
ANALOG AND DIGITAL COMMUNICATIONS
(ELECTRONICS AND COMMUNICATION ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1. a)	Explain time domain description of AM with relevant waveforms.	7M	1	K2
b)	Develop the Power and Current relations in AM wave.	7M	1	K2
	(OR)			
2. a)	Compare AM,DSB-SC,SSB-SC Techniques in detail.	7M	1	K2
b)	Explain the principle of VSB modulation and mention its applications.	7M	1	K2
	<u>UNIT-II</u>			
3. a)	Draw and explain the sinusoidal FM wave.	7M	2	K2
b)	Explain the detection of FM using Phase Discriminator.	7M	2	K2
	(OR)			
4. a)	Explain how to generate FM through PM with help of block diagram.	7M	2	K2
b)	Compare narrowband FM and wideband FM.	7M	2	K2
	<u>UNIT-III</u>			
5. a)	Define PWM and explain the concept of pulse width modulation with neat wave forms.	7M	3	K2
b)	Explain the concept of Companding in PCM system.	7M	3	K2
	(OR)			
6. a)	What are the drawbacks of Delta Modulation and How these are eliminated by using Adaptive Delta Modulation?	7M	3	K2
b)	Explain PCM system with neat block diagram.	7M	3	K2
	<u>UNIT-IV</u>			
7. a)	Explain the generation of QPSK signals with neat diagrams.	7M	4	K2
b)	Draw and explain Coherent detection of ASK signals	7M	4	K2
	(OR)			
8. a)	Define different digital carrier modulations ASK, FSK, PSK and draw the waveforms for the binary data 101101011001.	7M	4	K2
b)	Draw and explain DPSK waveform for the binary data 110100011	7M	4	K2
	<u>UNIT-V</u>			
9. a)	Explain the operation of Tuned Radio Frequency receiver and mention its drawbacks.	7M	5	K2
b)	Draw and explain FM Radio Receiver block diagram.	7M	5	K2
	(OR)			
10. a)	What is Matched filter and derive its probability of bit error.	7M	5	K2
b)	Explain the different sources of noise in communication systems.	7M	5	K2

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u>UNIT-I</u>	Marks	CO	BTL
1.	What do you mean by Communication Skills? Describe the process of communication.		10	CO1	L2
	(OR)				
2.	Describe Hearing and Listening. Explain the types of Listening.		10	CO1	L2
	(OR)				
3.	Distinguish between Intrapersonal and Interpersonal skills. Explain the role of emotion in Interpersonal Skills.	<u>UNIT-II</u>	10	CO2	L4
	(OR)				
4.	Explain Social Exchange Theory. Describe various barriers of Intrapersonal skills.		10	CO2	L2
	(OR)				
5.	What do you mean by Nonverbal communication? Describe types of Nonverbal Communication.	<u>UNIT-III</u>	10	CO3	L2
	(OR)				
6.	Illustrate etiquette to be followed during business meetings.		10	CO3	L3
	(OR)				
7.	Draft a resume for the post of Software Developer in a Multi National Company.	<u>UNIT-IV</u>	10	CO4	L6
	(OR)				
8.	a You are Ravi/Rakshita, in-charge of purchase for Turbo Automobiles Ltd. Last week you made an order which is still pending. Write a letter to the manager of 'Tools & Spares' for the cancellation of the afore mentioned order in less than 150 words.		10	CO4	L6
	(OR)				
9.	Describe prerequisite of presentation skills. Summarize skills evaluated during the interview.	<u>UNIT-V</u>	10	CO5	L2
	(OR)				
10.	Illustrate types of Group Discussion and skills assessed in Group Discussion.		10	CO5	L3
	(OR)				
11.	Describe SMART goals.	<u>UNIT-VI</u>	10	CO6	L2
	(OR)				
12.	Explain abilities needed to form a team. Discuss Mission statement for your career as a graduate.		10	CO6	L2