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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (2025 - 2026)

Subject: Machine Learning

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

(1.1) Which of the following is not a type of machine learning? (CO1, K1)

1

- (a) Supervised
- (b) Unsupervised
- (c) Reinforcement
- (d) Compiled

(1.2) In reinforcement learning, an agent learns by: (CO1,K1)

1

- (a) Using labels
- (b) Exploring rewards
- (c) Memorizing data
- (d) Clustering

(1.3) Classify the following as scalar or vector: $[2, -3, 5]$. (CO2,K2)

1

- (a) Scalar
- (b) Vector
- (c) Matrix
- (d) Tensor

(1.4) Compare L1 and L2 norms in terms of sensitivity to outliers. (CO2,K2)

1

- (a) Both are equally sensitive
- (b) L1 is more sensitive
- (c) L2 is more sensitive
- (d) Neither is sensitive

(1.5) Contrast regression and classification in terms of their output types.(CO3,K2)

1

- (a) Regression predicts labels, classification predicts values
 (b) Both output continuous values
 (c) Regression predicts values, classification predicts labels
 (d) Classification is always better
- (1.6) Extend decision tree models to handle missing values. (CO3,K2) 1
 (a) Drop missing values
 (b) Use mean imputation
 (c) Allow branching for missing values
 (d) Ignore missing values
- (1.7) Identify the algorithm based on the principle of Bayes' Theorem?(CO4, K1) 1
 (a) Naïve Bayes
 (b) K-means
 (c) SVM
 (d) Decision Tree
- (1.8) Apply your understanding to identify the 'K' in K-means clustering.(CO4, K1) 1
 (a) Number of clusters
 (b) Number of layers
 (c) Number of features
 (d) Learning rate
- (1.9) Which ML model is commonly used in predicting hospital readmission?(CO5,K1) 1
 (a) Logistic Regression
 (b) Linear Regression
 (c) Decision Tree
 (d) Naive Bayes
- (1.10) Which ML algorithm is often applied in detecting fraudulent credit card transactions? (CO5, K1) 1
 (a) KNN
 (b) SVM
 (c) Decision Tree
 (d) Gradient Boosting

2. Attempt all parts:-

- (2.1) What type of learning is commonly used in recommendation systems?(CO1,K1) 2
 (2.2) Compare L1 norm and L2 norm in the context of vector regularization.(CO2,K2) 2
 (2.3) Classify supervised and unsupervised learning with examples.(CO3,K2) 2
 (2.4) Identify scenarios where Support Vector Machines can be effectively applied. (CO4, K1) 2
 (2.5) How can ML be applied in medical image analysis?(CO5,K2) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) Discuss reinforcement learning? Explain its basic concept and components with an 6

	example.(CO1,K2)	
(3.2)	Define the term 'maximally specific hypothesis'. Why is it important in concept learning?(CO1,K1)	6
	Answer any one of the following:-	
(3.3)	Explain the concept of vector arithmetic with examples. How is it used in machine learning models? (CO2, K2)	6
(3.4)	Explain the concept of the inverse of a matrix. Under what conditions does a matrix not have an inverse? (CO2,K2)	6
	Answer any one of the following:-	
(3.5)	Classify the types of ensemble learning and explain how each improves model performance.(CO3,K2)	6
(3.6)	Outline the basic structure of a Recurrent Neural Network.(CO3,K2)	6
	Answer any one of the following:-	
(3.7)	Apply the Naïve Bayes algorithm to classify email spam and explain the result.(CO4,K3)	6
(3.8)	Apply a basic reinforcement learning agent for a tic-tac-toe game. (CO4,K3)	6
	Answer any one of the following:-	
(3.9)	Apply k-means clustering to categorize consumer behavior in retail business analytics. How does it help in marketing?(CO5,K3)	6
(3.10)	Implement an ML model to detect phishing websites. Describe the features used and accuracy improvement techniques.(CO5,K3)	6
	SECTION-C	50
	4. Answer any <u>one</u> of the following:-	
(4.1)	Describe with examples how classification differs from regression in supervised learning.(CO1,K2)	10
(4.2)	Discuss Candidate Elimination Algorithm with help of suitable Example. (CO1,K2)	10
	5. Answer any <u>one</u> of the following:-	
(5.1)	Explain the concept of vector arithmetic. How is it applied in machine learning? Given two datasets $X = [1, 2, 3, 4]$ and $Y = [2, 4, 6, 8]$, calculate the covariance between X and Y. (CO2, K3)	10
(5.2)	Interpret true positives, false positives, true negatives, and false negatives using a confusion matrix.(CO2,K2)	10
	6. Answer any <u>one</u> of the following:-	
(6.1)	Classify different types of neural networks and explain their suitable applications with examples.(CO3,K2)	10
(6.2)	Compare Decision Trees and Regression Trees by highlighting their structure, use-cases, and performance in modeling.(CO3,K2)	10
	7. Answer any <u>one</u> of the following:-	
(7.1)	Explain and draw convolutional neural network to classify image data.(CO4,K2)	10
(7.2)	Illustrate the steps involved in K-Mean Clustering, Give Advantages and Disadvantages of K-Mean Clustering. (CO4,K2)	10

8. Answer any one of the following:-

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| (8.1) | Apply the concept of supervised and unsupervised learning to solve a real-world environmental monitoring problem. Justify the choice of algorithms.(CO5,K3) | 10 |
| (8.2) | Apply ML techniques to develop an early diagnosis model for a chronic disease (e.g., diabetes or cancer). Discuss data handling and model validation. (CO5,K3) | 10 |

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