.

Printed Page:-4 **Subject Code:- AMICSML0701**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
M.Tech Integrated
SEM: VII - 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-a. Identify the function used in K-Means Clustering from the given options. (CO1, K1) 1

(a) k-means
(b) k-median
(c) heatmap
(d) none of the mentioned

1-b. the goal concept is accurately described by the CANDIDATE-ELIMINATION method when (CO1, K2) 1

(a) There are no errors in the training examples
(b) There is some hypothesis in H that correctly describes the target concept
(c) When sufficient training examples have been observed
(d) All of the above

1-c. Identify the type of Artificial Neural Network that allows loops: (CO2, K1) 1

(a) FeedForward ANN
(b) FeedBack ANN
(c) Both A and B
(d) None of the above

1-d. Choose the general limitations of the backpropagation rule among the following. (CO2, K2) 1

(a) Slow convergence
(b) Scaling

(c) Local minima problem

(d) All of the above

1-e. **Select the cases where K-Means clustering fails to provide accurate results: (CO3, K2)** 1

1. Data points with outliers
2. Data points with different densities
3. Data points with round shapes
4. Data points with non-convex shapes

(a) 1 and 2

(b) 2 and 3

(c) 2 and 4

(d) 1, 2 and 4

1-f. KNN is _____ algorithm. (CO3, K3) 1

(a) Non-parametric and Lazy Learning

(b) Parametric and Lazy Learning

(c) Parametric and Eager Learning

(d) Non-parametric and Eager Learning

1-g. Does gradient boosted trees generally perform better than random forest. (CO4, K2) 1

(a) Yes

(b) No

(c) Can not say

1-h. The benefit of Naïve Bayes: (CO4, K2) 1

(a) Naïve Bayes is one of the fast and easy ML algorithms to predict a class of datasets.

(b) It is the most popular choice for text classification problems.

(c) It can be used for Binary as well as Multi-class Classifications.

(d) All of the above

1-i. Real-Time decisions, Game AI, Learning Tasks, Skill Acquisition, and Robot Navigation are applications of which of the following (CO5, K2) 1

(a) Supervised Learning: Classification

(b) Reinforcement Learning

(c) Unsupervised Learning: Clustering

(d) Unsupervised Learning: Regression

1-j. Hidden Markov Model is used in. (CO5, K2) 1

(a) Supervised learning

(b) Unsupervised learning

(c) Reinforcement learning

(d) All of the above

2. Attempt all parts:-

2.a. Describe in brief: Version spaces and Candidate –Elimination Algorithm. (CO1, K2) 2

2.b.	Discuss issues in decision tree learning. (CO2, K2)	2
2.c.	Provide a brief description of the K-Nearest Neighbour (KNN) learning algorithm. (CO3, K2)	2
2.d.	Is Naive Bias a classification algorithm or regression algorithm. (CO4, K1)	2
2.e.	Compare Reinforced Learning and Supervised Learning. (CO5, K2)	2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Explain the Linear regression and logistic regression with example. (CO1, K2)	6
3.a.(ii)	Define Machine Learning. Discuss with examples why machine learning is important. (CO1, K2)	6

3.b. Answer any one of the following:-

3.b.(i)	Draw the model of a single artificial neuron and derive its output. (CO2, K3)	6
3.b.(ii)	Explain the CART algorithm in Machine Learning. (CO2,K2)	6

3.c. Answer any one of the following:-

3.c.(i)	Provide a detailed explanation of the AGNES (Agglomerative Nesting) algorithm, including its working and significance. (CO3, K3)	6
3.c.(ii)	Describe the step-by-step procedure of the K-Means Clustering Algorithm. (CO3, K2)	6

3.d. Answer any one of the following:-

3.d.(i)	Demonstrate the Naive Bayes Classifier with a suitable example. (CO4, K3)	6
3.d.(ii)	Explain random forest and also Write the application areas of Reinforcement Learning. (CO4, K3)	6

3.e. Answer any one of the following:-

3.e.(i)	Explain the Markov decision process with suitable diagram. (CO5, K3)	6
3.e.(ii)	Write Reinforcement learning problem characteristics.(CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Provide a detailed explanation of the Candidate Elimination Algorithm, supported by a proper example to illustrate its working. (CO1, K2)	10
4-b.	Analyze the concepts of underfitting and overfitting in machine learning. Evaluate the impact of bias and variance on model performance and suggest strategies to achieve an optimal balance. (CO1, K5)	10

5. Answer any one of the following:-

5-a.	Compare regression, classification and clustering in machine learning along with suitable real life examples. (CO2, K3)	10
5-b.	Explain the normal equation of Linear Regression and discuss the scenarios where it is preferred over the Gradient Descent method. (CO2, K2)	10

6. Answer any one of the following:-

6-a.	Discuss in detail hierarchical clustering techniques (AGNES and DIANA). Provide examples. (CO3, K3)	10

.

6-b. Apply the K-Nearest Neighbour (KNN) algorithm on the following dataset and predict the class of the point x (P1 = 4, P2 = 6) using k = 3. Show all steps including distance calculation, nearest neighbors selection, and final classification. (CO3, K3) 10

P1	P2	CLASS
7	7	FALSE
7	4	FALSE
3	4	TRUE
1	4	TRUE

7. Answer any <u>one</u> of the following:-

7-a. Explain various ensembles method and compare them. (CO4, K3) 10

7-b. **Define the following terms: (CO4, K2)** 10

1. Sample Space
2. Event
3. Random Variable
4. Conditional Probability
5. Marginal Probability

8. Answer any <u>one</u> of the following:-

8-a. Discuss the concept of reward shaping in reinforcement learning and provide an opinion on its ethical implications for teaching AI agents desirable behaviour. (CO5, K5) 10

8-b. Implement Q-learning with the help of real example. (CO5, K3) 10