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Printed Page:-3 **Subject Code:- AMTAI0201**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: II - THEORY EXAMINATION (2025 - 2026)

Subject: Machine Learning

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

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 15

1. Attempt all parts:-

(1.1) Most general hypothesis : (CO1, K1) 1

(a) Covers all instances
(b) Covers none
(c) Covers some
(d) Covers random

(1.2) Which of the following is a disadvantage of decision trees (CO2, K1) 1

(a) Factor analysis
(b) Decision trees are robust to outliers
(c) Decision trees are prone to be overfit
(d) None of the above

(1.3) A test says you have the flu, but you really don't. This is an example of a…(CO3, K1) 1

(a) True Positive
(b) True negative
(c) False positive
(d) False negative

(1.4) Perceptron is used for: (CO4, K1) 1

(a) Clustering
(b) Linear classification
(c) Regression only
(d) Sorting

(1.5) Which component is essential in reinforcement learning? (CO5, K1) 1

(a) Agent
(b) Environment
(c) Rewards
(d) All of the above

2. Attempt all parts:-

(2.1) Explain the terms 2
A. Underfitting
B. Overfitting (CO1, K2)

(2.2) Discuss the assumptions of linear regression? (CO2, K2) 2

(2.3) Define hyperplane and criteria of choosing it. (CO3, K2) 2

(2.4) Differentiate between mutation and crossover. (CO4, K2) 2

(2.5) Explain Q value in Q learning? (CO5, K2) 2

SECTION-B 20

Answer any one of the following:-

(3.1) Explain general-to-specific ordering of hypotheses. (CO1, K2) 4

(3.2) Describe version space in concept learning. (CO1, K2) 4

Answer any one of the following:-

(3.3) Define K-Nearest neighbour. Also explain the steps involved in KNN algorithm. [CO2,K2] 4

(3.4) Explain the working of linear regression with an example. (CO2, K2) 4

Answer any one of the following:-

(3.5) Discuss the working of Naïve Bayes classifier. (CO3, K2) 4

(3.6) Explain conditional independence assumption in Bayesian models. (CO3, K2) 4

Answer any one of the following:-

(3.7) Discuss about the fully connected layers in detail (CO4, K2) 4

(3.8) Explain ReLU activation function with advantages. (CO4, K2) 4

Answer any one of the following:-

(3.9) State one practical example of reinforcement learning (CO5, K2) 4

(3.10) Explain elements of reinforcement learning. (CO5, K2) 4

SECTION-C 35

4. Answer any one of the following:-

(4.1) Discuss in detail the types of data and pre-processing in machine learning. (CO1, K2) 7

(4.2) Discuss the various tools used in machine learning and their applications. (CO1, K2) 7

5. Answer any one of the following:-

(5.1) Analyze instance-based learning in comparison to model-based learning. Discuss how the k-nearest neighbor (KNN) learning algorithm works. (CO2, K4) 7

(5.2)	Analyze the impact of feature selection in decision tree learning (CO2, K4)	7

6. Answer any one of the following:-

(6.1)	It is observed that 50% of mails are spam. There is a software that filters spam mail before reaching the inbox. It accuracy for detecting a spam mail is 99% and chances of tagging a non-spam mail as spam mail is 5%. If a certain mail is tagged as spam find the probability that it is not a spam mail. (CO3, K4)	7
(6.2)	In a test an examinee either guesses, copies or knows the answer to a multiple-choice question with four choices. The probability that he makes a guess is 1/3 and the probability that he copies the answer is 1/6. Given that the probability of his answer being correct when he copied it is 1/8, what is the probability that he actually knew the answer to the question, considering the probability that his answer is correct if he copied it? (CO3, K4)	7

7. Answer any one of the following:-

(7.1)	Illustrate the architecture of artificial neural network with a neat diagram and explain different types of artificial neural network (CO4, K2)	7
(7.2)	Discuss the back-propagation algorithm for MLP training. (CO4, K2)	7

8. Answer any one of the following:-

(8.1)	Analyze Genetic Algorithms and discuss how gene mutation works. (CO5, K2)	7
(8.2)	How would you build a recommendation engine to recommend news to users on Google? (CO5, K4)	7