Printed Page:- 04 **Subject Code**:- **ACSML0401N**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2023 - 2024)

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. What is the primary goal when designing a learning system? (CO1) 1

(a) Minimizing data collection

(b) Minimizing generalization error

(c) Maximizing model complexity

(d) Maximizing predictive accuracy

1-b. Which of the following is NOT an approach to machine learning? (CO1) 1

(a) Descriptive learning

(b) Supervised learning

(c) Unsupervised learning

(d) Reinforcement learning

1-c. Regression is a supervised learning task used for: (CO2) 1

(a) Categorizing data points into classes

(b) . Predicting numerical values

(c) Grouping data points into clusters

(d) None

1-d. The Apriori algorithm is commonly used for: (CO2) 1

(a) Classification tasks

(b) Regression analysis

(c) Market basket analysis

(d) Neural network training

1-e. In K-means clustering, how are clusters formed? (CO3) 1

(a) By iteratively selecting the nearest neighbors

(b) By randomly grouping data points

(c) By maximizing intra-cluster similarity and minimizing inter-cluster similarity

(d) By performing hierarchical merging of clusters

1-f. Partitional clustering algorithms, like K-means, aim to: (CO3) 1

(a) Form hierarchical clusters

(b) Partition data into subsets without a predefined number of clusters

(c) Merge existing clusters into larger ones

(d) Discover clusters of varying shapes

1-g. In the Naïve Bayes Classifier, why is it called "naïve"? (CO4) 1

(a) It is easy to implement

(b) It assumes feature independence

(c) It is a simple model

(d) It only works with categorical data

1-h. Random Forest is an ensemble method that: (CO4) 1

(a) Combines decision trees using boosting

(b) Combines decision trees using bagging

(c) Uses a single decision tree

(d) Combines decision trees using stacking

1-i. What is the core idea behind Q Learning in Reinforcement Learning? (CO5) 1

(a) It's a type of deep learning algorithm

(b) Learning to predict the expected cumulative reward for taking an action in a given state

(c) A supervised learning approach

(d) A clustering algorithm

1-j.	How is Reinforcement Learning different from traditional supervised learning? (CO5) (a) It doesn't involve learning from data (b) It focuses on learning patterns and associations (c) It learns from trial and error through interaction with an environment (d) It requires a fixed dataset for training	1

2. Attempt all parts:-

2.a.	What is the role of the Candidate Elimination Algorithm? (CO1)	2
2.b.	Explain the key differences between classification and regression tasks in machine learning. (CO2)	2
2.c.	What are some limitations of K-means clustering? (CO3)	2
2.d.	explain the process of bootstrapping. (CO4)	2
2.e.	Explain the Q Learning function in Reinforcement Learning (CO5)	2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a.	Define underfitting and overfitting in machine learning and how they relate to model generalization? (CO1)	6
3-b.	Explain the Find-S algorithm's role in concept learning with an illustrative example. (CO1)	6
3-c.	Explain the main differences between classification and regression problems in machine learning. Provide examples to illustrate each. (CO2)	6
3-d.	Describe the idea behind polynomial regression and when it is advantageous to use higher-degree polynomial terms in your model. Provide an example. (CO2)	6
3.e.	Compare and contrast the hierarchical clustering methods AGNES (Agglomerative Nesting) and DIANA (Divisive Analysis). (CO3)	6
3.f.	Describe the process of Bayesian learning and explain how it differs from other machine learning approaches. (CO4)	6
3.g.	Explain the importance of the Markov Decision Process (MDP) in Reinforcement Learning and how it models sequential decision-making problems. (CO5)	6

SECTION C **50**

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

4-a.	Explore different machine learning approaches, such as supervised, unsupervised, and reinforcement learning. Discuss their core principles and	10

applications. (CO1)

4-b. Write down components and steps in a concept learning task. Explain the Find-S algorithm with a real-world example. (CO1) 10

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

5-a. Describe the concept of overfitting in regression models and strategies to address it. (CO2) 10

5-b. What do mean by regression task in machine learning? Explain polynomial regression model. (CO2) 10

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

6-a. How do density-based clustering methods like DBSCAN work, and when are they helpful? (CO3) 10

6-b. Apply the DBSCAN algorithm to the given data points and create the clusters with minPts = 4 and epsilon (ε) = 1.9 (CO3) 10

Dataset:

P1: (3,7), P2: (4, 6), P3: (5,5), P4: (6,4), P5: (7, 3), P6: (6, 2), P7: (7,2), P8: (8,4), P9: (3, 3),

P10: (2,6)

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

7-a. How do Gradient Boosting Machines (GBM) work, and can you share real-world use cases? (CO4) 10

7-b. Explain the role of weak learners in Gradient Boosting Machines (GBM) and their contribution to creating strong learners.(CO4) 10

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

8-a. How does the Q Learning algorithm update Q-value in reinforcement learning? (CO5) 10

8-b. Discuss the various used components in reinforcement learning with the help of diagram. (CO5) 10