NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - 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.*

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SECTION A   **20**

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1. Attempt all parts:-

1-a.   What is the purpose of a ROC curve in machine learning? (CO1)   1

(a) To evaluate classification models by measuring their precision

(b) To visualize the performance of a binary classifier

(c) To measure the computational complexity of a model

(d) To compare the runtime of different algorithms

1-b.   In the context of machine learning, what does "feature selection" refer to? (CO1)   1

(a) Selecting the best machine learning algorithm for a problem

(b) Selecting the most relevant features from the dataset to improve model performance

(c) Removing all features from the dataset

(d) Adding more features to the dataset

1-c.   Logistic regression is commonly used for: (CO2)   1

(a) Predicting numerical values

(b) Binary classification tasks

(c) Clustering data points

(d) Association

1-d. Support Vector Machines (SVM) are known for their effectiveness in finding: (CO2)   1

(a) Linear decision boundaries

(b) Complex decision boundaries

(c) Clustering patterns

(d) Hidden patterns in data

1-e. What is the primary objective of the Expectation Maximization (EM) algorithm in clustering? (CO3)   1

(a) Minimizing the number of clusters

(b) Maximizing the intra-cluster similarity

(c) Maximizing the likelihood of data given the cluster model

(d) Minimizing the cluster centroids' distances

1-f. Which of the following statements about K-Means clustering is true? (CO3)   1

(a) K-Means is a density-based clustering algorithm.

(b) K-Means is sensitive to the initial placement of cluster centroids.

(c) K-Means can handle categorical data effectively.

(d) K-Means forms hierarchical clusters.

1-g. In Bayesian Learning, what does the posterior probability represent? (CO4)   1

(a) The likelihood of the evidence given the hypothesis

(b) The prior probability of the hypothesis

(c) The likelihood of the hypothesis given the evidence

(d) The prior probability of the evidence

1-h. Which ensemble method combines multiple models by taking a weighted average of their predictions while giving more weight to better-performing models? (CO4)   1

(a) Random Forest

(b) AdaBoost

(c) Bagging

(d) XGBoost

1-i. What is the primary goal of an agent in Reinforcement Learning using a Markov Decision Process (MDP)? (CO5)   1

    (a) Minimize the state space

    (b) Maximize the reward over time by selecting optimal actions

    (c) Maximize the state space

    (d) Minimize the action space

1-j.	What is a practical example of a problem that can be solved using Reinforcement Learning and involves continuous action spaces? (CO5)	1

    (a) Solving the traveling salesman problem

    (b) Image classification

    (c) Autonomous drone navigation

    (d) Sentiment analysis

2. Attempt all parts:-

2.a.	What is machine learning? (CO1)	2
2.b.	How do decision tree algorithms work in decision making? (CO2)	2
2.c.	Discuss clustering algorithms and its various types. (CO3)	2
2.d.	How does Gradient Boosting Machines (GBM) combine weak learners to create a strong learner? (CO4)	2
2.e.	How does reinforcement learning use in real life? (CO5)	2

SECTION B   **30**

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

3-a.	Compare data science and machine learning, highlighting their similarities and differences in goals and methodologies. (CO1)	6
3-b.	Define supervised machine learning and discuss its various types.(CO1)	6
3-c.	How does ID3 algorithm differ from C4.5 algorithm in terms of their decision-making criteria? . (CO2)	6
3-d.	Describe the core concept behind a support vector machine (SVM) and its application in binary classification problems. Provide an intuitive example. (CO2)	6
3.e.	Define term K-means clustering. What are its various advantages and disadvantages? (CO3)	6
3.f.	Explain how gradient boosting machines (GBM) minimize errors iteratively? (CO4)	6
3.g.	Define reinforcement learning and its essential components (CO5)	6

SECTION C   **50**

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

4-a. Examine ethical considerations in machine learning, including privacy, transparency, and accountability issues. (CO1) 10

4-b. What do you mean by underfitting and overfitting in machine learning? When do they occur and how can both issues addressed? (CO1) 10

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

5-a. When and why is polynomial regression used in machine learning? What factors impact the choice of polynomial degree? (CO2) 10

5-b. Could you explain the concept of "support vectors" in the context of Support Vector Machines (SVM), and their role in creating decision boundaries? (CO2) 10

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

6-a. Explain the hierarchical clustering in detail. (CO3) 10

6-b. How does the choice of distance measure impact clustering results? (CO3) 10

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

7-a. How does the Naïve Bayes Classifier handle feature independence and data sparsity in text classification? (CO4) 10

7-b. State and prove Naive bayes theorem. (CO4) 10

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

8-a. How does reinforcement learning work in decision-making? (CO5) 10

8-b. What are the various methods used in reinforcement learning? Explain anyone method in detail. (CO5) 10