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

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Artificial Intelligence and 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.　　Which of the following best defines an intelligent agent? (CO1,K1)　　1

　　(a)　A device that only acts on pre-defined instructions

　　(b)　A system that perceives its environment and takes actions to maximize its success

　　(c)　A program that collects and stores user data

　　(d)　A system that reacts randomly to the environment

1-b.　　What is the primary limitation of the Greedy Best-First Search algorithm? (CO1,K1)　　1

　　(a)　It is memory-intensive

　　(b)　It is not complete

　　(c)　It may not find an optimal solution

　　(d)　Both b and c

1-c.　　Identify the learning method where an agent interacts with its environment.(CO2,K1)　　1

　　(a)　Supervised Learning

　　(b)　Reinforcement Learning

　　(c)　Unsupervised Learning

　　(d)　Clustering

1-d.　　Distinguish between discrete and continuous features.(CO2,K1)　　1

　　(a)　Both are categorical features

(b)  Both are numerical features

(c)  Discrete has specific values, continuous varies

(d)  Continuous is categorical

1-e.  In multivariate regression, target prediction involves (CO3,K1)  1

(a)  A single target and multiple features

(b)  Multiple targets and one feature

(c)  Multiple targets and multiple features

(d)  A single target and one feature

1-f.  ID3 algorithm splits nodes based on (CO3,K1)  1

(a)  Gini index

(b)  Information gain

(c)  Variance reduction

(d)  Root mean square error

1-g.  Unsupervised learning methods are typically used for: (CO4,K1)  1

(a)  Clustering

(b)  Regression

(c)  Classification

(d)  Prediction

1-h.  DIANA algorithm starts clustering with: (CO4,K1)  1

(a)  A single large cluster

(b)  Individual data points

(c)  Predefined groups

(d)  Random assignments

1-i.  Which of the following is not a supervised machine learning algorithm? (CO5,K1)  1

(a)  Decision tree

(b)   SVM for classification problems

(c)  Naïve Bayes

(d)  K-means

1-j.  Identify the parametric machine learning algorithm. (CO5,K1)  1

(a)  CNN (Convolutional neural network)

(b)  KNN (K-Nearest Neighbours)

(c)  Naïve Bayes

(d)  SVM (Support vector machines)

2. Attempt all parts:-

2.a.  List two characteristics of a rational agent.(CO1,K2)  2

2.b.  Define machine learning. (CO2,K1)  2

2.c.  What is the primary goal of linear regression? (CO3,K1)  2

| 2.d. | Mention any two real-world applications of clustering.(CO4,K2) | 2 |
| 2.e. | Define what is the objective of a reinforcement learning agent? (CO5,K2) | 2 |

**SECTION-B** 30

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

| 3-a. | Describe the components of an Intelligent Agent with an example for each. (CO1,K2) | 6 |
| 3-b. | Compare the performance of Breadth-First Search (BFS) and Depth-First Search (DFS) in terms of completeness, optimality, and time complexity. (CO1,K3) | 6 |
| 3-c. | Explain the main purpose of machine learning in predictive modeling. (CO2,K2) | 6 |
| 3-d. | Discuss the working of Principal Component Analysis in reducing dimensionality. (CO2,K3) | 6 |
| 3.e. | Explain the four possible combination of bias and variance with diagram. (CO3,K3) | 6 |
| 3.f. | Discuss the various types of unsupervised machine learning models with real world applications. (CO4,K3) | 6 |
| 3.g. | Define reinforcement learning with four real life applications. Explain its key characteristics. (CO5,K3) | 6 |

**SECTION-C** 50

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

| 4-a. | Discuss the role and components of an Intelligent Agent with examples. Compare goal-based agents and utility-based agents in real-world applications. (CO1,K4) | 10 |
| 4-b. | Analyze the role of machine learning and reasoning in advancing AI, providing examples of their integration in real-world systems. (CO1,K3) | 10 |

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

| 5-a. | Discuss the steps to build a machine learning model, starting from data collection to evaluation.(CO2,K4) | 10 |
| 5-b. | Describe the differences between various types of machine learning algorithms, providing examples for each type.(CO2,K4) | 10 |

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

| 6-a. | Explain linear regression in brief. Apply linear regression of given below dataset and predict value for X=5. (CO3,K4) | 10 |

| X | Y |
|---|---|
| 4 | 6 |
| 7 | 5 |
| 3 | 8 |
| 1 | 3 |

| 6-b. | Describe the working of the K-Nearest Neighbors (KNN) algorithm. Apply KNN on given dataset for K=3 and classify label good or bad for X1=3 and X2=7. (CO3,K4) | 10 |

| X1 | X2 | Classify |
|----|----|----------|
| 7 | 7 | Bad |
| 7 | 4 | Bad |
| 3 | 4 | Good |
| 1 | 4 | Good |
| 3 | 7 | ? |

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

7-a. Explain the significance of the parameters eps ($\varepsilon$), minimum points, core points and noise points in DBSCAN. How do they influence the clustering results? (CO4,K3)     10

7-b. Explain K-Means clustering in brief. Apply K-means clustering for K=2 on given dataset {2,3,4,10,11,12,20,25,30}. (CO4, K4)     10

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

8-a. State and prove Bayes' theorem and explain each term used in Bayes theorem. (CO5,K3)     10

8-b. Explain the various components of reinforcement learning in detail. Discuss the significance of Q factor. (CO5, K4)     10