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

MBA

SEM: IV - THEORY EXAMINATION (2025 - 2026)

Subject: Machine Learning and Artificial Intelligence

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:-

- (1.1) Evolution of AI moved from rule-based systems to _____ (CO1-K2) 1
- (a) Static systems
- (b) Data-driven systems
- (c) Manual systems
- (d) Fixed systems
- (1.2) Symbolic AI represents knowledge using _____ (CO1-K2) 1
- (a) Numbers
- (b) Signals
- (c) Circuits
- (d) Symbols
- (1.3) A* search combines _____ for decision making (CO2-K1) 1
- (a) Only cost
- (b) Only heuristic
- (c) Random
- (d) Cost and heuristic
- (1.4) Memory-bounded search reduces memory usage by _____(CO2-K2) 1
- (a) Expanding all nodes
- (b) Ignoring heuristic function
- (c) Increasing search depth
- (d) Storing only limited nodes in memory
- (1.5) Supervised learning uses _____ for training (CO3-K2) 1

- (a) Unlabeled data
(b) Random data
(c) Labeled data
(d) No data
- (1.6) Confusion matrix is used for _____ (CO3-K2) 1
(a) Classification evaluation
(b) Data visualization
(c) Data compression
(d) Clustering evaluation
- (1.7) Logistic regression is used for _____ tasks (CO4-K1) 1
(a) Regression
(b) Clustering
(c) Classification
(d) Sorting
- (1.8) CART algorithm uses _____ for splitting (CO4-K2) 1
(a) Gini index
(b) Entropy
(c) Variance
(d) Mean
- (1.9) K-means clustering divides data into _____ (CO5-K2) 1
(a) Single group
(b) Two groups
(c) K groups
(d) No group
- (1.10) _____ distance is commonly used in K-means (CO5-K1) 1
(a) Manhattan
(b) Random
(c) Euclidean
(d) Binary

2. Attempt all parts:-

- (2.1) Define the role of robotics in integrating Artificial Intelligence with physical systems. (CO1-K1). 2
- (2.2) Define heuristic function with an example in search algorithms. (CO2-K1). 2
- (2.3) Define false positive and false negative with one example each. (CO3-K2). 2
- (2.4) Define slope and intercept in a linear regression equation. (CO4-K1). 2
- (2.5) State the purpose of normalization in clustering algorithms. (CO5-K2). 2

SECTION-B

30

Answer any one of the following:-

- (3.1) Explain the concept of Artificial Intelligence in detail and discuss its key characteristics that differentiate it from traditional computing systems (CO1-K2). 6

- (3.2) Discuss the integration of Artificial Intelligence with robotics and analyze its impact on automation (CO1-K2). 6

Answer any one of the following:-

- (3.3) Explain the concept of Depth-Limited Search and analyze its effectiveness in preventing infinite loops in search problems (CO2-K3). 6
- (3.4) Explain the A* search algorithm in detail and analyze its ability to provide optimal solutions using cost and heuristic functions (CO2-K3). 6

Answer any one of the following:-

- (3.5) Describe the different types of Machine Learning approaches and explain their characteristics with suitable examples (CO3-K2). 6
- (3.6) Discuss the concept of accuracy and analyze its limitations, especially in the context of imbalanced datasets (CO3-K2). 6

Answer any one of the following:-

- (3.7) Describe the role of the sigmoid function in logistic regression and analyze its impact on probability-based classification (CO4-K3). 6
- (3.8) Describe the concept of polynomial regression and analyze its ability to model non-linear relationships (CO4-K3). 6

Answer any one of the following:-

- (3.9) Explain the concept of clustering in detail and analyze its importance in discovering patterns within unlabeled data (CO5-K3). 6
- (3.10) Analyze the limitations of K-means clustering, including sensitivity to initial centroid selection and outliers (CO5-K3). 6

SECTION-C 50

4. Answer any one of the following:-

- (4.1) A university lecture discusses the contributions of Alan Turing in AI development. (a) Explain the significance of the Turing Test. (b) Evaluate its relevance in modern AI systems. (CO1-K2) 10
- (4.2) A startup is using deep learning for image classification. (a) Explain the concept of deep learning. (b) Discuss its advantages over traditional methods. (CO1-K2) 10

5. Answer any one of the following:-

- (5.1) A route-finding application uses estimated distances to guide search decisions. (a) Explain the concept of heuristic search. (b) Analyze how heuristics improve efficiency. (CO2-K3) 10
- (5.2) A search system must choose between optimality and speed. (a) Explain the trade-off between optimality and efficiency in search algorithms. (b) Analyze suitable strategies for different applications. (CO2-K3) 10

6. Answer any one of the following:-

- (6.1) A machine learning model shows high variance and unstable predictions across datasets. (a) Diagnose this issue by explaining variance in practical terms. (b) Propose strategies to reduce variance while maintaining performance. (CO3-K2) 10
- (6.2) A data scientist aims to balance model complexity and performance during model selection. (a) Explain the bias-variance tradeoff using a real modeling scenario. (b) Design an approach to achieve optimal balance in model performance. (CO3-K2) 10

7. Answer any one of the following:-

- (7.1) A dataset shows a linear relationship between advertising expenditure and sales. (a) 10
Explain the concept of simple linear regression. (b) Analyze how slope and
intercept influence predictions. (CO4-K3)
- (7.2) A dataset requires predicting continuous output values using a tree-based model. (a) 10
Explain the concept of regression trees. (b) Analyze their application in prediction
problems. (CO4-K3)

8. Answer any one of the following:-

- (8.1) A clustering algorithm updates cluster centers after assigning data points. (a) 10
Explain the role of centroids in K-means clustering. (b) Analyze how centroid
updates influence cluster quality. (CO5-K3)
- (8.2) A dataset is clustered using Euclidean distance. (a) Explain the concept of 10
Euclidean distance. (b) Analyze its effect on grouping data points. (CO5-K3)

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