



45370

**BRAINWARE UNIVERSITY****Term End Examination 2025-2026****Programme – MCA-2025****Course Name – Machine Learning****Course Code - MCA27502 (T)****(Semester II)**

Library
Brainware University
398, Ramkrishnapur Road, Barasat,
Kolkata, West Bengal-700125

Full Marks : 40**Time : 2:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 10=10

1. *Choose the correct alternative from the following :*

- (i) Machine learning is primarily concerned with:
 - a) Writing fixed algorithms
 - b) Learning patterns from data
 - c) Designing hardware systems
 - d) Managing databases
- (ii) What is the process of predicting a continuous numerical value using machine learning called?
 - a) Classification
 - b) Regression
 - c) Clustering
 - d) Dimensionality Reduction
- (iii) Which of the following is an example of unsupervised learning?
 - a) Classification
 - b) Regression
 - c) Clustering
 - d) Prediction
- (iv) Information theory in machine learning is closely associated with:
 - a) Sorting complexity
 - b) Data compression
 - c) Entropy and information gain
 - d) Memory management
- (v) Gradient descent is an optimization technique used to:
 - a) Increase loss
 - b) Initialize weights
 - c) Minimize loss function
 - d) Normalize data
- (vi) Overfitting occurs when a model:
 - a) Performs well on training and test data
 - b) Performs poorly on training data
 - c) Learns noise in training data
 - d) Has too little data
- (vii) Why is gradient descent widely used in machine learning models?
 - a) It guarantees the global minimum
 - b) It efficiently reduces the loss iteratively
 - c) It eliminates overfitting
 - d) It avoids matrix operations
- (viii) The main purpose of a neural network activation function is to:
 - a) Introduce non-linearity
 - b) Initialize weights
 - c) Reduce overfitting
 - d) Perform normalization
- (ix) Transfer learning is most useful when:

- a) Data is limited
- b) Data is abundant
- c) Model is overfitting
- d) Dataset is synthetic
- (x) CNN models learn:
 - a) Sequential relationships
 - b) Hierarchical spatial features
 - c) Probabilities only
 - d) One-dimensional patterns

Group-B

(Short Answer Type Questions)

3 x 5=15

2. What is the primary distinction between supervised and unsupervised learning in machine learning? (3)
3. Name three common types of machine learning models and briefly state what each is used for (3)
4. Recall the definition of mean, median, and mode in statistics as applied to data analysis in ML. (3)
5. Analyze the differences between random forests (bagging-based ensemble) and gradient boosting (boosting-based ensemble) in terms of how they build and combine weak learners. (3)
6. Compare Support Vector Machines (SVM) with kernel trick to logistic regression in handling non-linearly separable data. Analyze the trade-offs in terms of interpretability, computational complexity, and generalization performance when choosing between these two algorithms for a medium-sized dataset (3)

OR

Examine how k-fold cross-validation combined with grid search is used for hyperparameter tuning and model selection. Analyze potential issues (e.g., computational cost, data leakage risk) and explain why stratified k-fold is often preferred over standard k-fold in classification problems with class imbalance. (3)

Group-C

(Long Answer Type Questions)

5 x 3=15

7. What is Information Gain? Describe how it is mathematically derived from entropy to assist in selecting features. (5)
8. Analyze how unsupervised learning can be applied to detect credit card fraud (5)
9. Explain the process of k-fold Cross-Validation for verifying model generalizability. (5)

OR

Compare the mathematical approaches of Bagging and Boosting. Analyze how Bagging reduces variance while Boosting focuses on reducing bias in a predictive model. (5)

Library
Brainware University
 398, Ramkrishnapur Road, Barasat
 Kolkata, West Bengal-700125