

6E7102

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B.Tech. VI-Sem. (Main/Back) Examination, April/May - 2026

Artificial Intelligence and Data Science

6AID4-02 Machine Learning

CS, IT, AID, CAI, CDS, CCS, CIT, CSD, CSR

Time : 3 Hours

Maximum Marks : 70

**Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205).*

**PART - A****(Answer should be given up to 25 words only)****All questions are compulsory.****(10×2=20)**

1. Explain the role of labeled data in supervised learning.
2. How does K-Means assign a data point to a cluster?
3. Give one application of Apriori algorithm.
4. Compare wrapper and embedded methods
5. Mention one application of Singular Value Decomposition (SVD).
6. Why is margin maximization important in Support Vector Machine (SVM)?
7. Give an example of MDP in real life.
8. Why is Q-Learning considered model-free?
9. Explain the activation function in perceptron.
10. What is a neural network?

[Contd....]

## PART - B

(Analytical/Problem solving questions)

(5×4=20)

Attempt any Five questions.

1. Illustrate how Random Forest can be used for classification with a suitable example.
2. Compare FP-Growth with Apriori in terms of efficiency and memory usage.
3. Apply cross-validation techniques for selecting the best model.
4. Analyze the advantages and challenges of model-based Reinforcement Learning.
5. Describe the backpropagation algorithm used in training neural networks.
6. Explain the concept of Gaussian Mixture Models and probability distributions.
7. Explain the Bellman equation in the context of reinforcement learning.

$$V(s) = \max_a \left[ R(s, a) + \gamma \sum_{s'} P(s' | s, a) V(s') \right]$$

## PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions.

(3×10=30)

1. Explain the working principles of Naïve Bayes, Decision Tree, and K-Nearest Neighbour (KNN) algorithms with suitable diagrams.
  2. Analyze differences in cluster formation, scalability, and interpretability.
  3. Explain the concept of Singular Value Decomposition and its matrix factorization process.  
 $A = U \Sigma V^T$
  4. Compare convergence speed and computational complexity of policy iteration vs value iteration.
- Design an intelligent recommendation system combining content-based filtering with ANN.