Dr. A.P.J. Abdul Kalam Technical University (AKTU) · B.Tech Theory Examination

# Machine Learning Techniques

BCAI601 · May 2026

**Time: 3 Hours** **Max. Marks: 70**

Attempt all Sections. In case of any missing data; choose suitably.

## SECTION A

| | | | |
|---|---|---|---|
| **1(a)** | What is Machine Learning? | 2 | U1 |
| **1(b)** | What are well-defined learning problems? | 2 | U1 |
| **1(c)** | What is a Bayes Optimal Classifier? | 2 | U2 |
| **1(d)** | Explain Bayesian Belief Networks. | 2 | U2 |
| **1(e)** | What is Decision Tree Learning? | 2 | U3 |
| **1(f)** | What is a Perceptron? | 2 | U4 |
| **1(g)** | What is a Markov Decision Process (MDP)? | 2 | U5 |

## SECTION B

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|---|---|---|---|
| **2(a)** | Explain different types of learning in Machine Learning, such as supervised, unsupervised, and reinforcement learning. | 7 | U1 |
| **2(b)** | What is Linear Regression and Logistic Regression, and how do they differ in terms of output and application? | 7 | U2 |
| **2(c)** | What is information gain, and how does the ID3 algorithm use it to build a decision tree? | 7 | U3 |
| **2(d)** | Derive and explain the Backpropagation algorithm used in training Multilayer Neural Networks. | 7 | U4 |
| **2(e)** | Describe Q-Learning, including the Q-function and the steps involved in the Q-Learning algorithm. | 7 | U5 |

## SECTION C

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|---|---|---|---|
| **3(a)** | Differentiate between Data Science and Machine Learning in terms of scope, goals, and applications. | 7 | U1 |
| **3(b)** | Describe the design process of a Machine Learning system with suitable steps and examples. | 7 | U1 |
| **4(a)** | Describe the Naïve Bayes classifier and discuss its assumptions, advantages, and limitations. | 7 | U2 |
| **4(b)** | What is Support Vector Machine (SVM), and how does it construct a hyperplane (decision surface) for classification? | 7 | U2 |
| **5(a)** | What is Instance-Based Learning, and how does k-Nearest Neighbour (k-NN) algorithm work? | 7 | U3 |
| **5(b)** | Explain Locally Weighted Regression, Radial Basis Function Networks, and Case-Based Learning with suitable examples. | 7 | U3 |
| **6(a)** | What is a Self-Organizing Map (SOM), and how does it perform unsupervised learning? | 7 | U4 |
| **6(b)** | Explain the concept of Convolutional Neural Networks (CNN) and the roles of different layers such as convolutional, pooling, activation, and fully connected layers. | 7 | U4 |
| **7(a)** | Explain the structure of a Reinforcement Learning task with suitable examples from real-world applications. | 7 | U5 |
| **7(b)** | What are crossover and mutation in Genetic Algorithms, and how are they applied in Genetic Programming and real-world problems? | 7 | U5 |

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