



Paper id: 250621

Roll No:

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BTECH
(SEM VI) THEORY EXAMINATION 2024-25
MACHINE LEARNING TECHNIQUES

TIME: 3 HRS

M.MARKS: 70

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

SECTION A

1. Attempt all questions in brief.

02 x 7 = 14

| Q no. | Question | CO | Level |
|-------|---|----|-------|
| a. | Define Machine Learning and its importance. | 1 | K1 |
| b. | What is the difference between linear and logistic regression? | 2 | K2 |
| c. | Define EM Algorithm in the context of Bayesian Learning. | 2 | K2 |
| d. | What is inductive bias in decision tree learning, and why is it necessary for generalization? | 3 | K1 |
| e. | What is the role of an activation function in neural networks? | 4 | K2 |
| f. | What is the purpose of pooling layers in CNN? | 4 | K2 |
| g. | Differentiate between crossover and mutation. | 5 | K2 |

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

| | | | |
|----|--|---|----|
| a. | Explain different types of Machine Learning with examples. | 1 | K2 |
| b. | Describe the working of the Naive Bayes classifier with a numerical example. | 2 | K3 |
| c. | Discuss the role of entropy and information gain in building decision trees. | 3 | K4 |
| d. | Explain the working principle of the Self-Organizing Map (SOM) algorithm. Describe how the neurons are organized, how the best matching unit (BMU) is identified, and how weights are updated. | 4 | K2 |
| e. | Define a Markov Decision Process (MDP) and explain its key components. How does the MDP framework support decision-making in reinforcement learning? | 5 | K2 |

SECTION C

3. Attempt any one part of the following:

07 x 1 = 07

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|----|---|---|----|
| a. | Discuss the components involved in designing a learning system. | 1 | K2 |
| b. | Compare various ML approaches such as ANN, SVM, and Decision Trees. | 1 | K4 |

4. Attempt any one part of the following:

07 x 1 = 07

| | | | |
|----|--|---|----|
| a. | Given the dataset: X: [1, 2, 3, 4, 5] Y: [2, 4, 5, 4, 5] Perform linear regression using the least squares method and find the regression coefficients. | 2 | K3 |
| b. | Given two classes: Class A: (1,2), (2,3), (3,3) Class B: (6,5), (7,8), (8,8) Using a linear kernel SVM, determine the separating hyperplane and calculate the margin. | 2 | K3 |



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5. Attempt any one part of the following:

07 x 1 = 07

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|----|--|---|----|
| a. | Classify the test point (3, 3) using k-NN (k=3) with training data: (1,1)-A, (2,2)-A, (3,4)-B, (5,5)-B | 3 | K3 |
| b. | Explain the ID3 algorithm in detail. Discuss how it uses entropy and information gain to construct a decision tree. Analyze the strengths and limitations of the ID3 algorithm in the context of decision tree learning. | 3 | K2 |

6. Attempt any one part of the following:

07 x 1 = 07

| | | | |
|----|--|---|----|
| a. | Discuss the derivation of the backpropagation algorithm. | 4 | K2 |
| b. | Explain the architecture and working principles of a Convolutional Neural Network (CNN). | 4 | K3 |

7. Attempt any one part of the following:

07 x 1 = 07

| | | | |
|----|--|---|----|
| a. | Describe the Q-learning algorithm with a step-by-step example. | 5 | K3 |
| b. | Explain the cycle of reproduction in Genetic Algorithms. | 5 | K3 |

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