Question Paper Code | 14079

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025
Sixth Semester

Electronics and Communication Engineering

20ECEL609 - MACHINE LEARNING TECHNIQUES

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K-Level	CO

1. Which technique is used in Unsupervised Learning to reduce dimensionality? — 1, K1, CO1
   (a) Linear Regression   (b) Clustering
   (c) Principal Component Analysis   (d) Decision trees

2. Which learning algorithm is more prone to under fitting? — 1, K1, CO1
   (a) Support Vector Machine   (b) K-means Clustering
   (c) Decision Trees   (d) Linear Regression

3. What is the primary goal of the Find-S algorithm? — 1, K1, CO2
   (a) To find the most specific hypothesis   (b) To find the most general hypothesis
   (c) To create a decision tree   (d) To optimize the hypothesis space

4. In the Candidate Elimination algorithm, the specific hypothesis S is initialized as: — 1, K1, CO2
   (a) The most specific hypothesis   (b) The most general hypothesis
   (c) A random hypothesis   (d) The first hypothesis in the hypothesis space

5. In the back propagation algorithm, what is the primary goal? — 1, K1, CO3
   (a) To increase the model's complexity
   (b) To minimize the loss function by adjusting weights
   (c) To prevent the model from generalizing
   (d) To increase the number of layers

6. In evolutionary models, which of the following is NOT typically a key process? — 1, K1, CO3
   (a) Selection   (b) Mutation   (c) Crossover   (d) Normalization

7. In concept learning, Bayes' theorem helps in — 1, K1, CO4
   (a) Identifying the most likely concept   (b) Predicting future outcomes
   (c) Estimating probabilities of observations   (d) Reducing the number of hypotheses

8. The Naïve Bayes classifier is called "naïve" because it assumes that — 1, K1, CO4
   (a) Features are dependent on the class label
   (b) Features are conditionally independent given the class label
   (c) Classes are independent of each other
   (d) All features are equally important in determining the class

9. The K-NN algorithm is classified under which type of learning? — 1, K1, CO5
   (a) Supervised learning   (b) Unsupervised learning
   (c) Reinforcement learning   (d) Deep learning

10. How does EBL handle new instances not covered by existing explanations? — 1, K1, CO6
    (a) It ignores new instances
    (b) It adapts existing explanations to fit new instances
    (c) It discards existing explanations
    (d) It relies on reinforcement learning

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

11. Classify positive and negative examples for the target concept. — 2, K2, CO1

12. Illustrate inductive Learning Hypothesis. — 2, K2, CO1

13. Classify the types of examples used by the Candidate Elimination algorithm to refine hypotheses. — 2, K2, CO2

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **14079**

14. Summarize the main steps involved in the Find-S algorithm.	2	K2	CO2
15. Illustrate a neural network and state its basic components.	2	K2	CO3
16. Define two common activation functions used in neural networks and their typical output ranges.	2	K2	CO3
17. Summarize the difference between prior and posterior probability in Bayes' theorem.	2	K2	CO4
18. Illustrate the advantage of using a finite hypothesis space over an infinite one in terms of learning efficiency.	2	K2	CO4
19. Summarize the primary factor used to assign weights in weighted regression.	2	K2	CO5
20. Enumerate two factors that impact the sample complexity of a learning algorithm.	2	K2	CO5
21. Differentiate first-order rule from propositional logic rules.	2	K2	CO6
22. Differentiate analytical learning and traditional inductive learning methods.	2	K2	CO6

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23. a) Summarize the steps involved in designing a program that learns to play checkers. — 11 K2 CO1

OR

b) Explain the role of inductive bias in the choice of learning algorithms. Discuss how different types of inductive biases (e.g., linearity, simplicity) affect the hypothesis space and illustrate with examples from decision trees and linear regression. — 11 K2 CO1

24. a) Solve the decision tree for the following set of training examples: — 11 K3 CO2

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
1	Sunny	Hot	High	Weak	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Weak	Yes
4	Rain	Mild	High	Weak	Yes
5	Rain	Cool	Normal	Weak	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Weak	No
9	Sunny	Cool	Normal	Weak	Yes
10	Rain	Mild	Normal	Weak	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Weak	Yes
14	Rain	Mild	High	Strong	No

OR

b) Analyze how the Candidate Elimination algorithm works with both positive and negative examples. Discuss how hypotheses are refined through the process and how inconsistencies in the data are handled. — 11 K3 CO2

25. a) Elaborate the architecture of a basic neural network. Explain how each layer (input, hidden, output) functions, and describe the role of weights and biases in the model's computations. — 11 K3 CO3

OR

b) Illustrate the key operations in a genetic algorithm, including selection, crossover, and mutation. Explain how these operations contribute to the evolution of solutions in the search space. — 11 K3 CO3

26. a) Illustrate how Minimum Description Length (MDL) Principle is applied in model selection.   *11*   *K3*   *CO4*

<div align="center">OR</div>

b) Solve using the Naïve Bayes Classifier to classify the given instance (OUTLOOK=SUNNY, TEMPERATURE= COOL, HUMIDITY= HIGH, WIND = STRONG)   *11*   *K3*   *CO4*

DAY	OUTLOOK	TEMPERATURE	HUMIDITY	WIND	PLAY TENNIS
D1	SUNNY	HOT	HIGH	WEAK	NO
D2	SUNNY	HOT	HIGH	STRONG	NO
D3	OVERCAST	HOT	HIGH	WEAK	YES
D4	RAIN	MILD	HIGH	WEAK	YES
D5	RAIN	COOL	NORMAL	WEAK	YES
D6	RAIN	COOL	NORMAL	STRONG	NO
D7	OVERCAST	COOL	NORMAL	STRONG	YES
D8	SUNNY	MILD	HIGH	WEAK	NO
D9	SUNNY	COOL	NORMAL	WEAK	YES
D10	RAIN	MILD	NORMAL	WEAK	YES
D11	SUNNY	MILD	NORMAL	STRONG	YES
D12	OVERCAST	MILD	HIGH	STRONG	YES
D13	OVERCAST	HOT	NORMAL	WEAK	YES
D14	RAIN	MILD	HIGH	STRONG	NO

27. a) Explain the K-Nearest Neighbor (K-NN) algorithm, including its working principles, advantages, and limitations.   *11*   *K2*   *CO5*

<div align="center">OR</div>

b) Examine the role of weight assignment in Weighted Regression models. How does the choice of weights affect the results of the model?   *11*   *K2*   *CO5*

28. a) Illustrate the Sequential Covering Algorithm and its significance in learning sets of rules. Evaluate its advantages and limitations in rule generation with an example.   *11*   *K3*   *CO6*

<div align="center">OR</div>

b) Enumerate the core components of a reinforcement learning task. Analyze how Q-Learning and Temporal Difference Learning differ in terms of learning strategies, and evaluate which approach is more effective for various types of problems.   *11*   *K3*   *CO6*