Reg. No.																

Question Paper Code	13014

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Electronics and Communication Engineering

20ECEL609 - MACHINE LEARNING TECHNIQUES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which method is primarily used in Unsupervised Learning? (a)Support Vector Machine (b) K-means Clustering (c) Decision Trees (d) Linear Regression	1	K1	CO1
2.	In supervised learning, the algorithm learns from a labelled _____ set. (a) testing (b)validation (c) training (d) evaluation	1	K1	CO1
3.	You are building a model to predict the number of customer purchases. What type of numerical data is this? (a) Continuous numerical (b) Discrete Numerical Data (c) Ordinal data (d) Nominal data	1	K1	CO1
4.	What is the primary goal of the Find-S algorithm? (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	1	K1	CO2
5.	Which of the following algorithms uses both positive and negative examples? (a) Find-S (b) Candidate Elimination (c) List-Then-Eliminate (d) Perceptron	1	K1	CO2
6.	The inductive bias of the Candidate Elimination algorithm assumes that: (a) The target concept is within the hypothesis space (b) The hypothesis space is infinite (c) Only positive examples define the target concept (d) The target concept is not in the hypothesis space	1	K1	CO2
7.	Which of the following best describes a perceptron? (a) A linear classifier used in supervised learning (b) A neural network with multiple hidden layers (c) An unsupervised learning algorithm (d) A genetic algorithm for optimization	1	K1	CO3
8.	Which of the following statements is true about genetic algorithms? (a) They rely on gradient-based optimization (b) They mimic natural selection and evolution (c) They are used only for classification tasks (d) They cannot be used for continuous data	1	K1	CO3
9.	What is the role of mutation in genetic algorithms? (a) To speed up convergence (b) To introduce diversity into the population (c) To minimize the fitness function (d) To reinforce the current solution	1	K1	CO3
10.	Bayes' theorem is used to calculate (a) Conditional probability (b) Marginal probability (c) Joint probability (d) All of the above	1	K1	CO4
11.	The Bayes optimal classifier is based on (a) A decision tree algorithm (b) A nearest-neighbor approach (c) The likelihood of different hypotheses (d) A probabilistic approach to classification	1	K1	CO4

12.	Gibbs sampling is used to (a) Estimate model parameters via sampling (b) Compute the Bayes optimal classifier (c) Find the most likely hypothesis in a Bayesian network (d) Generate random variables for the likelihood computation	*1*	*K1*	*CO4*
13.	The K-NN algorithm is classified under which type of learning? (a) Supervised learning (b) Unsupervised learning (c) Reinforcement learning (d) Deep learning	*1*	*K1*	*CO5*
14.	How does K-NN determine the class of a test instance? (a) By averaging all data points (b) By the majority class among the K-nearest neighbours (c) By selecting the first instance only (d) By randomly choosing a class	*1*	*K1*	*CO5*
15.	Which of the following metrics is commonly used in K-NN to measure similarity? (a) Manhattan distance (b) Euclidean distance (c) Jaccard index (d) Cross-entropy	*1*	*K1*	*CO5*
16.	In weighted regression, weights are applied to data points based on their _____. (a) Closeness to the origin (b) Importance or influence (c) Assigned class labels (d) Dimension values	*1*	*K1*	*CO5*
17.	Which type of logic is commonly used in first-order rule learning? (a) Predicate logic (b) Propositional logic (c) Linear logic (d) Fuzzy logic	*1*	*K1*	*CO6*
18.	First-order rules in machine learning involve: (a) Unary predicates (b) Quantifiers and variables (c) Only numerical variables (d) Binary relations	*1*	*K1*	*CO6*
19.	The Sequential Covering Algorithm is typically used for: (a) Classification tasks (b) Clustering tasks (c) Regression tasks (d) Anomaly detection tasks	*1*	*K1*	*CO6*
20.	The FOCL algorithm is associated with: (a) Learning from positive and negative examples (b) Combining logical reasoning with machine learning (c) Training neural networks for optimization (d) Genetic programming for rule generation	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	List the applications of machine learning.	*2*	*K1*	*CO1*
22.	Summarize the steps in designing a program to learn to play checkers.	*2*	*K2*	*CO1*
23.	Define deductive learning.	*2*	*K1*	*CO2*
24.	List the main steps involved in the Find-S algorithm.	*2*	*K1*	*CO2*
25.	Define a neural network and state its basic components.	*2*	*K1*	*CO3*
26.	Distinguish between crossover and mutation.	*2*	*K2*	*CO3*
27.	Identify the difference between prior and posterior probability in Bayes' theorem.	*2*	*K2*	*CO4*
28.	List the two main steps of the Expectation-Maximization (EM) algorithm.	*2*	*K1*	*CO4*
29.	Define K-Nearest Neighbor (K-NN) learning.	*2*	*K1*	*CO5*
30.	Differentiate between analytical learning and traditional inductive learning methods.	*2*	*K2*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Explain the steps involved in designing a program that learns to play checkers.	*10*	*K2*	*CO1*
		OR			
	b)	Explain in detail Supervised, Unsupervised and Reinforcement learning with example.	*10*	*K2*	*CO1*

32. a) Explain the Find-S algorithm in detail. Describe its steps, use cases, and limitations in machine learning. Provide an example to illustrate how it works. *10 K2 CO2*

OR

b) Draw and solve the decision trees for the following set of training examples *10 K2 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

33. a) Explain the working of the perceptron algorithm as a linear classifier with its limitations. *10 K2 CO3*

OR

b) Discuss evolutionary models and their application in machine learning. *10 K2 CO3*

34. a) Describe how Bayes Theorem can be used to update the probability of a hypothesis based on new evidence in a concept learning context. *10 K2 CO4*

OR

b) Describe the Gibbs Algorithm and its significance in relation to the Bayes Optimal Classifier. *10 K2 CO4*

35. a) Explain the K-Nearest Neighbor (K-NN) algorithm, including its working principles, advantages and limitations. *10 K2 CO5*

OR

b) Assess the detail about distance-weighted nearest neighbour algorithm. *10 K2 CO5*

36. a) Explain the Sequential Covering Algorithm and its significance in learning sets of rules. Evaluate its advantages and limitations in rule generation with an example. *10 K2 CO6*

OR

b) Explain the Explanation-Based Learning (EBL) approach and its role in optimizing the learning process. *10 K2 CO6*