



Galgotias College of Engineering and Technology, Greater Noida

Pre University Test (PUT) : Odd Semester 2024 -25

Course/Branch : B.Tech/ ECE
Subject Name : Machine Learning
Subject Code : KOE073

Semester : VIIth
Max. Marks : 100
Time : 180 min

CO-1 : Apply concept of machine learning

CO-2 : Analyze a wide variety of decision tree learning algorithms

CO-3 : Evaluate the hypotheses through various approaches

CO-4 : Analyze different instance-based learning algorithms

CO-5 : Analyze Genetic algorithms and Reinforcement learning

Section – A # 20 Marks (Short Answer Type Questions)

Attempt **ALL** the questions. Each Question is of 2 marks (10 x 2 = 20 marks)

Q. No.	COx	Question Description # Attempt ALL the questions. Each Question is of 2 marks
1	a	CO1 Write the TPE for Handwriting Recognition Problem. (BKL : K2 Level).
	b	CO1 Explain Version Spaces. (BKL : K2 Level).
	c	CO2 What is formula of Information Gain in Decision Tree Learning Algorithm?(BKL : K2 Level).
	d	CO2 What is the role of Activation Function in ANN ? (BKL : K1 Level).
	e	CO3 Write short on Sampling Theory. (BKL : K2 Level).
	f	CO3 Explain Bayes Classifier. (BKL : K2 Level).
	g	CO4 Define radial basis function. (BKL : K1 Level).
	h	CO4 Explain the principles of a Case-based learning.(BKL : K2 Level).
	i	CO5 What is reinforcement learning. (BKL : K1 Level).
	j	CO5 Define Genetic Programming.(BKL : K1 Level).

Section – B # 30 Marks (Long / Medium Answer Type Questions)

Attempt **ALL** the questions. Each Question is of 6 marks (5 x 6 = 30 marks)

Q.2 (CO-1) : What is Machine learning? Explain issues in Machine Learning. Differentiate between training and testing data.(K3)

OR

Explain the Candidate Elimination Algorithm with positive and negative examples. (K2)

Q.3 (CO-2) : Compare and contrast pre-pruning and post-pruning in decision tree construction. (K3)

OR

Explain the Gradient Descent and Delta Rule in brief. (K2)

Q.4 (CO-3) : Explain the steps involved in the EM algorithm, including the E-step and M-step. (K2)

OR

What is the assumption in Naïve Bayesian Algorithm that makes it different from Bayesian Theorem. (K2)

Q.5 (CO-4) : Differentiate Between Conventional Learning and Instance based Learning. (K3)

OR

Explain locally weighted regression with example? (K2)

Q.6 (CO-5) : What is Q-learning, and how does it work in the context of reinforcement learning? (K2)

OR

Differentiate between Genetic algorithm & traditional algorithm with suitable example.(K3)

Section – C # 50 Marks (Medium / Long Answer Type Questions)

Attempt ALL the questions. Each Question is of 10 marks.

Q.7 (CO-1) : Attempt any ONE question. Each question is of 10 marks.

- a. Suppose the hypothesis space H consists of 16 possible hypotheses ordered from most general to most specific. After observing 3 training examples, 6 hypotheses are consistent with the data. What percentage of the hypothesis space has been eliminated? (K5)
- b. Consider a training dataset with attributes (Color, Size, Shape). The possible values for each attribute are as follows: **Color:** {Red, Blue, Green}, **Size:** {Small, Medium, Large}, **Shape:** {Circle, Square, Triangle}

The training examples are:

Example	Color	Size	Shape	Label
1	Red	Small	Circle	Positive
2	Red	Medium	Circle	Positive
3	Blue	Small	Circle	Negative
4	Red	Small	Triangle	Positive

Using the **Find-S algorithm**, what is the final hypothesis? (K5)

Q.8 (CO-2) : Attempt any ONE question. Each question is of 10 marks.

- a. Consider the following dataset with 6 examples:

Example	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

Calculate the **information gain** for the attribute **Outlook** as the root node. (K5)

- b. Describe the steps involved in the backpropagation algorithm. (K2)

Q.9 (CO-3) : Attempt any ONE question. Each question is of 10 marks.

- a. Describe the role of EM algorithm to improve the Estimation Hypothesis accuracy in the presence of missing data.(K2)
- b. Compare Bayesian Belief Networks with other probabilistic models. (K3)

Q.10 (CO-4) : Attempt any ONE question. Each question is of 10 marks.

- a. Derive a generalized formula for the sample complexity of PAC (Probably Approximately Correct) learning in finite hypothesis spaces. (K4)
- b. Given a dataset of 5 points in a 2D space, with corresponding labels:

Point (x, y)	Label
(1, 2)	A
(2, 3)	A
(3, 1)	B
(4, 2)	B
(5, 4)	A

Use **k=3** for the k-NN classifier. Predict the label for a new point P(3,3). (K5)

Q.11 (CO-5) : Attempt any ONE question. Each question is of 10 marks.

- a. Discuss the key steps involved in learning first-order rules using sequential covering. (K2)
- b. Explore how the concept of evolutionary algorithms in machine learning can be extended to improve reinforcement learning algorithms. (K4)

