Q. Code: 335932

Reg. No. | | | | | | | | | | | | | |

B.E. /B.TECH. DEGREE EXAMINATIONS, MAY 2024

Sixth Semester

IT18021 – MACHINE LEARNING

(Information Technology)

(Regulation 2018 / 2018 A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO1	Develop an appreciation for learning models from data and to formulate a machine learning problem.	**2**
CO2	Apply the algorithms to a real problem, evaluate and optimize the models learned.	**3**
CO3	Design experiments to evaluate and compare different machine learning techniques on real-world problems.	**3**
CO4	Understand the mathematical and statistical perspective of machine learning algorithms.	**2**
CO 5	Analyze and suggest appropriate machine learning approaches for various types of problems.	**4**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Define inductive bias with an example.	**1**	**1**
2.	Categorize the different types of machine learning algorithms with examples.	**1**	**2**
3.	How can a perceptron be utilized to replicate the functionality of an AND gate, effectively emulating its logical operation?	**2**	**3**
4.	Illustrate the various types of crossover operations employed within genetic algorithms.	**2**	**2**
5.	How the curse of dimensionality of KNN algorithm impacts the algorithm's performance?	**3**	**3**
6.	State Gibb's algorithm and its implications.	**3**	**2**
7.	State locally weighted regression with its implications.	**4**	**2**
8.	How the cover's theorem is used for understanding the relationship between data complexity and model performance.	**4**	**2**

9.	Assess the limitations of FOCL algorithm in advanced learning.	**5**		**4**
10.	Examine the key components involved in formulating the game of Tic-Tac-Toe as a reinforcement learning problem.	**5**		**4**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Apply the Candidate Elimination algorithm to the given sequence of training examples and identify the contents of sets S and G after each step of the algorithm.	**(14)**	**2**	**3**

Example	Size	Color	Shape	Class/Label
1	Big	Red	Circle	No
2	Small	Red	Triangle	No
3	Small	Red	Circle	Yes
4	Big	Blue	Circle	No
5	Small	Blue	Circle	Yes

(OR)

(b)	Consider a dataset containing information about customers and their purchasing habits. The target variable is "Will the customer buy the product?", and the predictor variables are "Age", "Income", and "Location". Construct the decision tree for the given dataset using attribute selection techniques.	**(14)**	**2**	**3**

S.No	Target variable	Predictor variable (Age)	Predictor variable (Income)	Predictor variable (Location)
1	Yes	35	High	Urban
2	No	25	Low	Rural
3	No	45	High	Urban
4	Yes	55	Low	Suburban
5	No	40	Middle	Urban
6	No	35	High	Rural
7	Yes	60	Low	Suburban
8	Yes	30	Middle	Urban
9	No	50	High	Suburban
10	Yes	35	Low	Rural
11	Yes	45	Middle	Urban
12	No	65	High	Suburban
13	No	30	Middle	Rural
14	No	50	Low	Urban
15	Yes	60	High	Rural

12. (a) What are the fundamental principles underlying genetic programming, and explain its ability to efficiently learn diverse sets of simple programs? **(14) 1 2**

(OR)

(b) How do the backpropagation algorithms enhance the efficiency of training MLP models within the realm of machine learning? Also, derive necessary equations to depict the back propagation error. **(14) 1 2**

13. (a) Demonstrate the application of an instance-based approach using symbolic representations and knowledge-based inference to address design problems. **(14) 3 3**

(OR)

(b) Derive the maximum likelihood hypotheses for predicting Probabilities using Bayes theorem. **(14) 3 3**

14. (a) Analyze how k-nearest neighbor (KNN) algorithm differs from other classification or regression techniques with a suitable example. Also, highlight the advantages and limitations of applying KNN in diverse real-world scenarios. **(14) 4 2**

(OR)

(b)	Examine how Gibbs sampling contributes to the process of generating samples from a probability distribution, and what are its applications in machine learning and statistical modeling.	**(14)**	**4**	**2**
15. (a)	Interpret the steps involved in Q-learning and how the maze problem can be tackled using Q-learning, a reinforcement technique.	**(14)**	**5**	**4**
	(OR)			
(b)	Discover the sequential procedures for acquiring sets of first-order rules in the context of machine learning.	**(14)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Suppose your friend has posed a challenge: estimate the bias of two coins in her possession. They might be fair coins, be more heavily weighted towards heads; you don't know. Here is the clue she has provided: a piece of paper with 5 records of an experiment where she has: Chosen one of the two coins at random. Flipped that same coin 10 times. How can you provide a reasonable estimate of each coin bias? Refer to these coins as coin A and coin B and their bias as θ_A and θ_B. Apply EM Algorithm to find the Maximum Likelihood Estimates.	**(14)**	**5**	**4**

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