PAPER ID-310309

Roll No:

BTECH
(SEM V) 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

2 x 07 = 14

1 **Attempt *all* questions in brief.**

Q no.	Question	CO	Level
a.	What constitutes a well-defined learning problem in machine learning? Give an example.	1	K1
b.	How does machine learning differ from data science, and how do they complement each other?	1	K2
c.	Explain the role of the sigmoid function in logistic regression.	2	K2
d.	What is the significance of the decision surface in Support Vector Machines (SVM)?	2	K2
e.	What is overfitting in decision tree learning, and how can it be avoided?	3	K1
f	Explain the role of the activation function in a perceptron.	4	K2
g.	Describe the role of the reward function in reinforcement learning.	5	K2

SECTION B

2 **Attempt any *three* of the following:**

07 x 3 = 07

Q no.	Question	CO	Level
a.	Describe the steps involved in designing a machine learning system. Illustrate each step with a real-world example.	1	K3
b.	Explore the difference between Simple Linear Regression and Multiple Linear Regression. How does the inclusion of multiple features affect the model?	2	K2
c.	Illustrate the steps of the ID3 algorithm, including how it selects attributes and constructs the tree.	3	K3
d.	Discuss the Self-Organizing Map (SOM) algorithm. How does SOM work for clustering and dimensionality reduction? Explain the differences between SOM and supervised learning models.	4	K2
e.	What is the role of the Q-learning function in reinforcement learning? Explain how it helps the agent learn optimal actions and policies.	5	

SECTION C

3 **Attempt any *one* part of the following:**

07 x 1 = 07

Q no	Question	CO	Level
a.	Discuss the history of machine learning. Highlight major milestones and advancements in the field.	1	K2
b.	Compare and contrast supervised, unsupervised, and reinforcement learning. Provide examples where each type is applicable.	1	K3

4 **Attempt any *one* part of the following:**

07 x 1 = 07

Q no	Question	CO	Level
a.	Consider the following weather data to determine whether or not a person will play tennis on a given day based on weather conditions.	2	K3

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		Day	Outlook	Temperature	Humidity	Wind	Play Tennis?		
		1	Sunny	Hot	High	Weak	No		
		2	Overcast	Hot	High	Weak	Yes		
		3	Rainy	Cool	Normal	Weak	No		
		4	Overcast	Cool	Normal	Strong	Yes		
		5	Rainy	Mild	Normal	Weak	Yes		
		6	Sunny	Mild	Normal	Strong	No		
		7	Overcast	Mild	High	Strong	Yes		
		8	Overcast	Hot	Normal	Weak	No		
	Apply Naïve Bayes Classifier to predict whether the person will play or not play tennis on given condition {Outlook = Sunny, Temperature = Cool, Humidity = High, Wind = Strong}								
b.	Fit a linear regression model for the dataset (x, y): (1, 1.5), (2, 3.0), (3, 4.5), (4, 6.0) and predict y for $x = 5$.							2	K3

5. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Describe the concept of locally weighted regression (LWR). How does it differ from traditional regression models, and what are its practical applications?	3	K3
b.	Given the following dataset with two attributes (A and B), and a target variable (T): A: 1, 2, 1, 2, 1, 2 B: 2, 3, 3, 2, 2, 3 T: Yes, No, Yes, No, Yes, No Calculate the entropy before the split and after the split on attribute A. Which attribute (A or B) gives the highest information gain?	3	K3

6 Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	backpropagation for training	4	K4
b	Explain the architecture and functioning of Convolutional Neural Networks (CNNs).	4	K4

7 Attempt any *one* part of the following: **07 x 1 = 07**

Q no	Question	CO	Level
a.	Explain the concept of Reinforcement Learning (RL). Discuss how it differs from supervised and unsupervised learning.	5	K3
b.	Explain the components of a genetic algorithm. Discuss the role of chromosomes, genes, and the population in the GA cycle.	5	K3

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