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

1. Attempt *all* questions in brief. **2 x 07 = 14**

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	K3

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):	3	K3

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?

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

Q no.	Question	CO	Level
a.	Derive the mathematical steps involved in backpropagation for training a neural network.	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