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BTECH
(SEM VII) THEORY EXAMINATION 2024-25
MACHINE LEARNING

TIME: 3 HRS

M.MARKS: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

Q no.	Question	CO	Level
a.	Explain the terms Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning.	1	K1
b.	What are the three main types of machine learning? Explain each type with an example.	1	K1
c.	What is the implication of the use of a single learning rate (η) for all features (x_j) in gradient descent optimization?	2	K1
d.	Differentiate between training data and testing data in machine learning.	2	K1
e.	Describe dimension reduction in machine learning.	3	K1
f.	Define hierarchical clustering.	3	K1
g.	Explain the term 'loss function' in deep learning.	4	K1
h.	What is the meaning of Overfitting in Machine learning?	4	K1
i.	Use a genetic algorithm to optimize a scheduling problem and explain each step.	5	K1
j.	Define the term "kernel" in the context of Gaussian processes.	5	K1

SECTION B

2. Attempt any three of the following: 3 x 10 = 30

a.	Describe artificial intelligence (AI) and its potential impact on modern industries.	1	K2
b.	What is the purpose of support vector machines (SVM), and how do they work?	2	K2
c.	What is the expectation-maximization algorithm? Provide a brief overview.	3	K2
d.	Discuss the challenges and limitations of the Backpropagation algorithm in neural network training.	4	K2
e.	Define Hidden Markov Models (HMM) and their applications.	5	K2

SECTION C

3. Attempt any one part of the following: 1 x 10 = 10

a.	What are the essential steps involved in designing a learning system? Explain each step briefly.	1	K2
b.	Explain the applications of machine learning in mechanical engineering. Provide at least three use cases.	1	K2

4. Attempt any one part of the following: 1 x 10 = 10

a.	Explain Bayesian Decision Theory.	2	K2
b.	What are bias and variance in machine learning? How do they affect model performance?	2	K2



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5. Attempt any one part of the following:**1 x 10 = 10**

a.	Define Principal Component Analysis (PCA) and its role in dimensionality reduction.	3	K2
b.	What is clustering, and how does it differ from classification?	3	K2

6. Attempt any one part of the following:**1 x 10 = 10**

a.	Given stride S and kernel sizes for each layer of a (1-dimensional) CNN, create a function to compute the receptive field of a particular node in the network. This is just finding how many input nodes actually connect through to a neuron in a CNN.	4	K2
b.	Explain the concept of a kernel function in machine learning. How does it enable Support Vector Machines (SVM) to perform classification in higher-dimensional spaces? Provide examples of three commonly used kernel functions and their applications.	4	K2

7. Attempt any one part of the following:**1 x 10 = 10**

a.	Compare and contrast Bayesian estimation with Maximum Likelihood Estimation (MLE). Highlight their advantages and disadvantages in the context of machine learning models.	5	K2
b.	Discuss the differences between reinforcement learning and deep learning in the context of problem-solving.	5	K2