

Course Code: 23AD6T01

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)

III - B.Tech II-Semester Regular Examinations (BR23), MAY - 2026

MACHINE LEARNING (CSE-AI&DS)

Time: 3 hours

Max. Marks: 70

Question Paper consists of Part-A and Part-B

Answer ALL the questions in Part-A and Part-B

PART-A (10X2 = 20M)

	Marks	CO	BL
1. a) List any four applications of Machine Learning in real world.	(2M)	CO1	BL1
b) Differentiate between supervised and unsupervised learning.	(2M)	CO1	BL2
c) Apply the Minkowski distance formula for $r=2$ to compute the distance between $A=(1,2)$ and $B=(4,6)$.	(2M)	CO2	BL3
d) What are Non-Metric Similarity Functions? Give an example.	(2M)	CO2	BL1
e) Explain the concept of Impurity Measures in decision trees.	(2M)	CO3	BL2
f) What is Bayes' Theorem? State its formula.	(2M)	CO3	BL1
g) What is meant by a linear SVM? State the decision boundary equation.	(2M)	CO4	BL1
h) What is a Perceptron? Describe its activation function.	(2M)	CO4	BL1
i) Define Clustering in Machine Learning. What is Partitioning of Data?	(2M)	CO5	BL1
j) List the limitations of the K-Means Clustering algorithm.	(2M)	CO5	BL1

PART-B (5X10 = 50M)

	Mark s	C O	B L
2 Describe the stages in a typical Machine Learning workflow including Data Acquisition, Feature Engineering, Model Selection, Training, Evaluation, and Prediction.	10(M)	C O1	B L2
(OR)			
3 Compare and contrast the three paradigms of Machine Learning: Supervised Learning, Unsupervised Learning, and Reinforcement Learning, with real-world examples for each.	10(M)	C O1	B L2

4a	Apply the K-Nearest Neighbour (KNN) algorithm to find the class label for a new customer with Annual Income=20k\$ and Spending Score=55 using k=3, from the dataset: (15,39,Low),(16,81,Med),(17,6,Low),(18,77,Med),(19,40,Low),(20,76,Med),(21,6,Low),(22,94,High),(23,3,Low),(24,72,Med).	5(M)	C	B	L3
b..	Explain KNN Regression method with a suitable example. How does it differ from KNN Classification?	5(M)	O2	B	L2
(OR)					
5	Describe different distance measures: Euclidean, Manhattan, Minkowski, and Cosine Distance with appropriate formulas and examples.	10(M)	O2	C	B L2
6a	Explain the concept of Random Forests in detail. How does it improve upon a single Decision Tree? Describe bagging and feature randomness.	5(M)	C	B	
b.	Explain the construction of a Decision Tree using the CART algorithm. Describe properties of Decision Trees.	5(M)	O3	B	L2
(OR)					
7a.	Explain the Naive Bayes Classifier with a suitable classification example. Discuss Class Conditional Independence and multi-class classification.	5(M)	C	B	
b.	Explain the Bayes Classifier and its optimality. What is the Bayes error rate?	5(M)	O3	B	L2
8	Explain the Non-Linear SVM with the kernel trick. Describe RBF, Polynomial, and Sigmoid kernels with suitable diagrams.	10(M)	O4	C	B L2
(OR)					
9a.	Explain the Multi-Layer Perceptron (MLP) model with Backpropagation. Derive the weight update equations for hidden and output layers.	5(M)	C	B	
b.	Explain Support Vector Machines for the linearly separable case. Define margin, support vectors, and the optimization objective.	5(M)	O4	B	L2
10	Explain Divisive and Agglomerative (Hierarchical) Clustering methods. Describe linkage criteria: single, complete, and average linkage with dendrograms.	10(M)	O5	C	B L2
(OR)					
11a.	Explain the K-Means Clustering algorithm with a step-by-step worked example. Discuss the effect of choosing different initial centroids.	5(M)	C	B	
b.	Describe Spectral Clustering and Rough K-Means Clustering Algorithm. How do they differ from traditional K-Means?	5(M)	O5	B	L2
