For MSc(5yr) **CA Test 2**

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

Department of Applied Mathematics and Computational Sciences

M. Sc TCS- Semester 5

CONTINUOUS ASSESSMENT TEST 1I Date: 29/10/2025

20XT53 - Machine Learning

Time: 1 Hour 30 min. **Maximum Marks: 40**

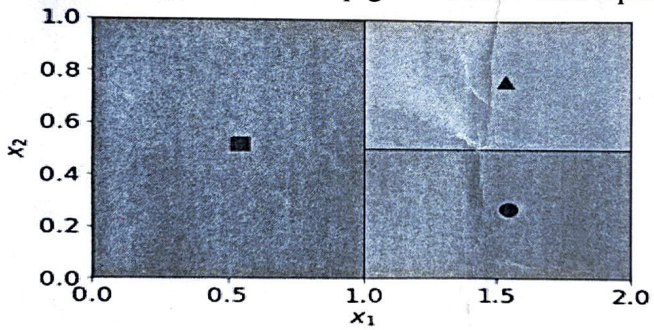
INSTRUCTIONS:

1. Answer **ALL** questions. Each question carries 20 Marks.
2. Subdivisions (a)(i) and (a)(ii) carries 2 marks each, subdivision (b) carries 6 marks each and subdivision (c) carries 10 marks each.
3. Subdivisions (a) and (b) will be with no choice and Subdivision (c) may be with choice but not in more than 1 question.
4. _____ Data book / _____ table(s) may be permitted.
5. Course Outcome Table :

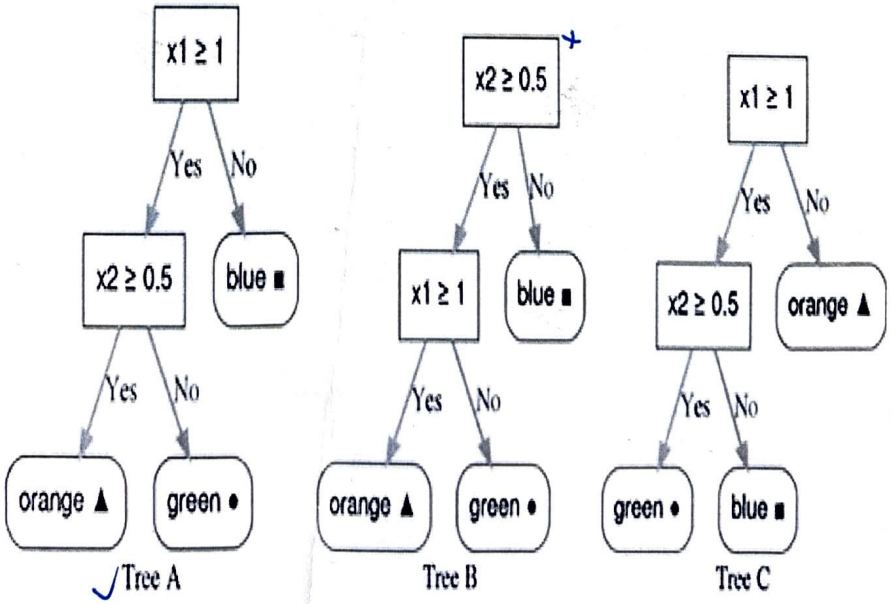
Qn.4	CO5

1a(i) When learning the tree, we chose a feature to test at each step by maximizing the expected information gain. Does this approach allow us to generate the optimal decision tree? Why or why not? L2

(II) Consider the prediction map given below with square, triangle and circle data L3



Which of the following decision trees match the prediction map?



B(i) Describe in detail about SVM in classification and its loss function. Why is the SVM distance between two hyper plane margins equal to $\frac{2}{\|w\|}$ L3

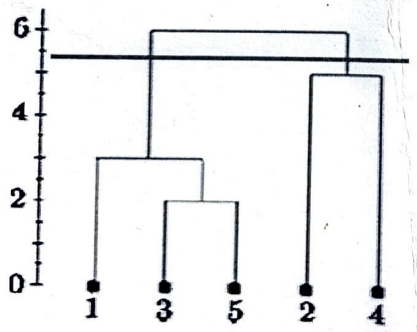
c Describe in detail about decision tree in classification and how prunning methods is used to improve tree performance. For the given data calculate the Gini Index with the following - L5

- Gini Index for past trend
- Gini Index for open interest

Past Trend	Open Interest	Trading Volume	Return
Positive	Low	High	Up
Negative	High	Low	Down
Positive	Low	High	Up
Positive	High	High	Up
Negative	Low	High	Down
Positive	Low	Low	Down
Negative	High	High	Down
Negative	Low	High	Down
Positive	Low	Low	Down
Positive	High	High	Up

2a(i) How can you choose the optimal value for 'k' in K-Means? L2

2a(ii) What is the purpose of dendrogram diagram for representing clustering? Consider the following dendrogram diagram and if we cut the single linkage tree at the point shown below, how many clusters will be formed?



b Describe in detail about the agglomerative hierarchical clustering and use single link of hierarchical clustering L3

	P1	P2	P3	P4	P5
P1	0.00	0.10	0.41	0.55	0.35
P2	0.10	0.00	0.64	0.47	0.98
P3	0.41	0.64	0.00	0.44	0.85
P4	0.55	0.47	0.44	0.00	0.76
P5	0.35	0.98	0.85	0.76	0.00

c Describe in detail about spectral clustering and give the comparison of K-means, Spectral Clustering and Hierarchical Clustering methods L4