K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

APR 2025
(M. Tech.) Program: AI Scheme: II
Supp. Examination: FY Semester: I
Course Code: PCEC102 and Course Name: Machine Learning and Pattern Recognition
Date of Exam: 07/04/2025 Duration: 02.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	What do you mean by model visualization?Highlight how it is done?		CO1	U
b)	Compare Feature Selection vs. Feature Extraction		CO2	U
c)	How to Calculate Information Gain in a Decision Tree?		CO3	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Apply the Agglomerative Hierarchical clustering to the following data points to build a hierarchical clustering dendogram. 18,22,25,42,27,43		CO4	Ap
b)	What do you mean by ensemble learning?Explain voting and regressor ensemble learning methods		CO5	U
c)	What is the Difference Between Clustering and Classification Algorithms?		CO6	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Given the data in the table reduce its Dimension from 2 to 1 using LDA method. X1= (X1,X2) ={(4,1),(2,4),(2,3),(3,6),(4,4)} X1= (X1,X2)={(9,10),(6,8),(9,5),(8,7),(10,8)}		CO2	Ap

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b)

Instance	Classification	a1	a2
1	+	T	T
2	+	T	T
3	-	T	F
4	+	F	F
5	-	F	T
6	-	F	T

Draw a Decision Tree using ID3 Algorithm for ONE ITERATION only for the dataset given above

CO3 Ap

c)

CGPA	Interactive	Practical knowledge	Skills	Job Offer
>=9	Yes	Very good	Good	Yes
>=8	No	Good	Moderate	Yes
>=9	No	Average	Poor	No
<8	No	Average	Good	No
>=8	Yes	Good	Moderate	Yes
>=9	Yes	Good	Moderate	Yes
<8	Yes	Good	Poor	No
>=9	No	Very good	Good	Yes
>=8	Yes	Good	Good	Yes
>=8	Yes	Average	Good	Yes

CO3 Ap

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	Draw the Decision Tree using C4.5 algorithm for ONE ITERATION using the above dataset			
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Use Naive Bayes Classifier Technique for the following: Estimate conditional probabilities of each attribute{color,legs,height,smelly}for the species classes:{M,H}using the data given in the table.Using these probabilities estimate the probability values for the new instance-(Color = Green, legs = 2, Height = Tall, Smelly = No)		CO4	Ap
b)	A1(2,10),A2(2,5).A3(8,4),B1(5,8),B2(7,5),B3(6,4),C1(1,2),C2(4,9) Use K-means clustering algorithm to divide the data points into different clusters		CO4	Ap
c)	Explain the Random Forest Ensemble method and compare with other ML algorithms.		CO5	U

No	Color	Legs	Height	Smelly	Species
1	white	3	short	Yes	M
2	green	2	tall	No	M
3	green	3	short	Yes	M
4	white	3	short	Yes	M
5	green	2	short	No	H
6	white	2	tall	No	H
7	white	2	tall	No	H
8	white	2	short	Yes	H

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