Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 60033

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – FEB. 2025
First Semester
Information Technology
P23ITE04 – PATTERN RECOGNITION
(Regulation 2023)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	You are provided with a labeled dataset consisting of feature vectors and their corresponding class labels. The dataset is used to train a pattern classifier. Outline the key steps involved in training a supervised learning model for pattern classification.	2	K1	CO1
2.	You have come across some missing data in your dataset. How will you handle it?	2	K2	CO1
3.	What are the two methods of hierarchical clustering?	2	K2	CO2
4.	List two key differences between agglomerative and divisive hierarchical clustering?	2	K1	CO2
5.	Give two key differences between principal component analysis and independent component analysis?	2	K2	CO3
6.	How does Linear Discriminant Analysis calculate its maximum separation?	2	K2	CO3
7.	How do you generate text using a Hidden Markov Model (HMM) ?	2	K1	CO4
8.	Give the formulation of Hinge Loss in Support Vector Machine?	2	K2	CO4
9.	Compare single point and two point crossover using example.	2	K1	CO5
10.	What is mutation in a genetic algorithm?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain the concept of pattern classification using distance functions. Compare and contrast at least two different distance metrics (e.g., Euclidean distance vs. Mahalanobis distance) and discuss their impact on classification performance.	7+6	K4	CO1
		(OR)			
	b)	Consider a binary classification problem where each class is modeled with a Gaussian distribution. Let the prior probabilities for classes C_1 and C_2 be $P(C_1)$ and $P(C_2)$ respectively. Explain how Maximum Likelihood Estimation can be used to estimate the parameters (mean and covariance) of the Gaussian distributions for each class. What are the key assumptions made in MLE for this scenario?	7+6	K4	CO1
12.	a)	Explain the main steps in density based clustering.	13	K2	CO2
		(OR)			
	b)	Explain C Means algorithm.	13	K2	CO2
13.	a)	How is PCA used for dimensionality reduction?	13	K2	CO3
		(OR)			
	b)	Explain the main elements of formal grammars.	13	K3	CO3
14.	a)	Explain the structure and components of Hidden Markov Models (HMM). Discuss the forward and backward algorithms for computing the likelihood of a sequence given an HMM, and illustrate with a numerical example.	13	K2	CO4
		(OR)			
	b)	Describe Hard Margin Support vector Machine and Soft Margin Support vector Machine.	13	K3	CO4
15.	a)	What are the main steps in Genetic Algorithm?	13	K3	CO5
		(OR)			
	b)	How do you perform fuzzy classification.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Given the data in Table, reduce the dimension from 2 to 1 using the Principle Component Analysis (PCA) algorithm.	15	K5	CO3

Feature	Example 1	Example 2	Example 3	Example 4
X_1	4	8	13	7
X_2	11	4	5	14

(OR)

b)	Provide a case study of a machine learning project that utilizes sate machines, HMMs, or SVMs. Describe the problem statement, the data used, the methods applied, and the results obtained.	15	K3	CO4