

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- VII EXAMINATION-SUMMER 2023****Subject Code: 3171613****Date: 19/06/2023****Subject Name: Pattern Recognition****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) How can you measure the performance of a pattern recognition model?	03
	(b) Explain the purpose of the following steps in pattern recognition: (i) pre-processing (ii) feature extraction	04
	(c) Define the term: “Pattern Recognition”. Discuss any two applications of Pattern Recognition in detail.	07
Q.2	(a) With the help of a neat diagram explain the working of a Perceptron.	03
	(b) Find the eigenvalues and corresponding eigenvectors for the matrix $A = \begin{bmatrix} -5 & 2 \\ -7 & 4 \end{bmatrix}$.	04
	(c) Explain the steps in “k-means clustering” using a suitable illustration. What are the limitations of this method?	07
	OR	
	(c) Discuss Bayes’ Decision Theory for the pattern classification problem with the help of a suitable example.	07
Q.3	(a) What is minimum error rate classification?	03
	(b) Enlist and explain any two criterion functions for clustering.	04
	(c) Explain in detail the “Principal Component Analysis” method for dimensionality reduction.	07
	OR	
Q.3	(a) Explain the concept of “Expectation Maximization” for parameter estimation in brief.	03
	(b) Explain the terms: (i) Autocorrelation (ii) Cross- correlation	04
	(c) Explain in detail the “Fisher Discriminant Analysis” method for dimensionality reduction.	07
Q.4	(a) Explain the main characteristics of Hidden Markov Model.	03

	(b)	Give differences between ‘supervised’ and ‘unsupervised’ learning.	04
	(c)	With the help of a neat diagram explain the topology and working of a multi-layer feedforward neural network.	07
	OR		
Q.4	(a)	What is “dictionary learning”?	03
	(b)	Give differences between ‘Convolutional Neural Networks’ and ‘Recurrent Neural Networks’.	04
	(c)	Explain the methods for Hierarchical clustering. What are the advantages of Hierarchical clustering?	07
Q.5	(a)	Explain the Gradient Descent procedure using a suitable analogy.	03
	(b)	With the help of a neat diagram explain the concept of “maximal margin hyperplane” in Support Vector Machine.	04
	(c)	Explain the CART algorithm for Decision Tree generation. Use a suitable example to illustrate your answer.	07
	OR		
Q.5	(a)	Enlist various applications of deep neural networks.	03
	(b)	Explain the problem of “overfitting” in decision tree. How can this problem be overcome?	04
	(c)	Explain K-Nearest Neighbor classification with the help of a suitable example.	07
