

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024****Subject Code:3171613****Date:16-12-2024****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)** Find Eigen Values and Eigen vectors of the following**03**

$$A = \begin{bmatrix} -5 & 2 \\ -7 & 4 \end{bmatrix}$$

(b) A manufacturer has three machine operators A, B, and C. The first operator A produces 1% of defective items, whereas the other two operators B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the time, B on the job 30% of the time and C on the job for 20% of the time. All the items are put into one stockpile and then one item is chosen at random from his and is found to be defective. What is the probability that it was produces by A?

04

(c) What is pattern matching? Discuss any two application area of it in details.

07**Q.2 (a)** Describe linearly separable and linearly inseparable classification problems.**03**

(b) Explain why the maximum likelihood estimation is not working with uniformly distributed training sets.

04

(c) Discuss different cases of Bayesian parameter estimation.

07**OR**

(c) Discuss Non negative matrix factorization - a dictionary learning method.

07**Q.3 (a)** Differentiate between auto correlation and cross correlation.**03**

(b) Explain the nonparametric methods for density estimation.

04

(c) Prove that a Bayes classifier is equivalent to a minimum distance classifier, assuming that the feature vector is Gaussian.

07**OR****Q.3 (a)**

$$\begin{bmatrix} 3 & 3 & 2 \\ 2 & 3 & -2 \end{bmatrix}$$

03Find the SVD for the matrix $A =$

(b) What is the role of C in SVM? How does it affect the bias/variance trade-off?

04

(c) Apply K-means clustering algorithm on given data for K=3. Use C1(2), C2(16), C3(38) as initial cluster centres.

07

Data : 2,4,6,3,31,12,15,16,38,35,14,21,23,25,30.

Q.4 (a) Differentiate between single layer perceptron and multilayer perceptron.**03**

(b) Discuss different cluster validation methods.

04

(c) Explain Expectation-Maximization method.

07

OR

- Q.4** (a) A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. Find out the output. **03**
- (b) Differentiate between convolution neural networks and recurrent neural networks. **04**
- (c) Discuss the principle component analysis for dimensionality reduction. **07**

- Q.5** (a) What are the advantages of decision tree learning using CART ? **03**
- (b) Differentiate between discrete HMM and Continuous HMM. **04**
- (c) Discuss multilayer feed-forward neural networks with neat architecture diagram **07**

OR

- Q.5** (a) What is the significance of Hidden Markov Models in classifier design? **03**
- (b) What is pruning in decision tree construction? Explain its significance. **04**
- (c) Consider the two dimensional patterns (2, 1), (3, 5), (4, 3), (5, 6), (6, 7), (7, 8). Compute the principal component using PCA Algorithm. **07**
