

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2023****Subject Code:3171613****Date:19-12-2023****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.

- Q.1** (a) Define pattern recognition. Describe any two real time applications of pattern recognition. **03**
- (b) Explain important tasks/steps in pattern recognition with suitable diagram. **04**
- (c) What is Bayes theorem? Describe its use in classification. **07**
- Q.2** (a) Differentiate Eigen values with Singular Values. **03**
- (b) Explain difference between supervised and unsupervised learning. **04**
- (c) Explain working of PCA as dimensionality reduction method. **07**
- OR**
- (c) Explain following terms with reference to Bayesian decision theory: Discriminant function, decision surface, minimum error rate classification. **07**
- Q.3** (a) What do you mean by pattern? Provide different examples where pattern is useful in discrimination process. **03**
- (b) Explain working of Hidden Markov Model. **04**
- (c) Explain maximum likelihood estimation. **07**
- OR**
- Q.3** (a) Why do we require to perform dimensionality reduction? Mention any three methods of dimensionality reduction. **03**
- (b) Elaborate working of K-means clustering method with suitable example. **04**
- (c) Explain Gaussian mixture model & Expectation maximization method for parameter estimation. **07**
- Q.4** (a) Define and differentiate correlation and autocorrelation. **03**
- (b) Explain working of K-nearest neighbor method. Why this method is called lazy learner? **04**
- (c) Explain factor analysis method for dimensionality reduction. **07**
- OR**
- Q.4** (a) Explain principle of gradient descent for linear discriminant functions. **03**
- (b) Draw a sample architecture of Multilayer feedforward network with suitable labels of all elements. Mention characteristics of this architecture. **04**
- (c) Explain following terms with reference to SVM: **07**
- (i) Maximum margin classification
- (ii) Kernel functions
- (iii) Soft margin classification
- (iv) Support vectors
- Q.5** (a) What is neural network? Mention any two real-time applications of neural network. **03**
- (b) Differentiate CNN and RNN. **04**
- (c) What is convolution operation in CNN? Describe the architecture of CNN with suitable diagram. **07**

OR

- Q.5** **(a)** Explain dictionary learning method in brief. **03**
 (b) What is deep neural network? Explain benefits of deep neural networks. **04**
 (c) How decision tree is useful in classification? Explain working of CART. **07**
