

# **INDIAN STATISTICAL INSTITUTE**

**(MS-QMS)\_2023**

## **FINAL-SEMESTER EXAMINATION**

### **(Pattern Recognition)**

**Duration: 180 minutes**

**Maximum Marks: 70**

### **Answer ANY SEVEN**

1. Formulate the Bayes decision rule with supporting descriptions of each parameters with examples? Describe advantages and challenges of this rule. [4+3+3]
2. [2+2+6]
  - a. Is the process of principal component analysis reversible? Provide the answer with supporting discussion.
  - b. What happens, if we standardize the data before PCA?
  - c. Describe the step by step operation for finding principal components with its significance.
3. Describe the significance and operational steps of semisupervised and Reinforcement learning. How it is different from supervised and unsupervised learning? [8+2]
4. What is Cross-entropy error minimization? Why it is preferred for logistic regression? Give the working steps and principles of Logistic regression for multiclass problem. [2+3+5]
5. Derive the parameter update equations for linear and logistic regressions using gradient descent algorithm. [4+6]
6.
  - a. How multilayer perceptron artificial neural network (MLPNN) differ (functionally and structurally) from functional link artificial neural network (FLANN)? [5]
  - b. What is the significance of hidden layer in MLPNN? [2]
  - c. How do you decide the number of nodes in different layers of MLPNN and FLANN? [3]
7. Describe the Branch and Bound Feature selection method with an example task of selecting TWO optimum features out of SIX features. [10]
8.
  - a. How do you find the true positive and true negative recognition rates of a model? [2+2]
  - b. Provide the complete interpretation of the ROC curve for a model. [6]
9. With supporting equations and illustrations, explain Binary and Grayscale morphological erosion, dilation, opening and closing and their multiscale versions [10]
10. With supporting equations and illustrations, explain Binary and Grayscale granulometries and their applications in pattern recognition and analysis. [10]
11. With supporting equations and illustrations, explain Binary and Grayscale morphological interpolations between the source and target sets (functions) [10]