

Indian Statistical Institute, Bangalore  
MS (QMS) First Year  
Second Semester - Pattern Recognition

Final Exam  
Maximum marks: 80

Date: April 29, 2019  
Duration: 3 hours

1. Describe the K-medoid and DBSCAN clustering algorithms. [5]
2. Differentiate between the principal component analysis (PCA) and linear discriminant analysis? Describe the step-wise process of finding the PCA of a data set. [6 + 4 = 10]
3. Describe with illustration, the Branch and Bound feature selection method with an example of selecting TWO optimum features out of FIVE features. [10]
4. (i) Describe with equations, the four learning laws: Hebb's, Delta and Widrow and Hoff. [3 + 3 + 3 = 9]  
(ii) Configure the NOR and NAND logic gates using MP neuron model with binary activation function. [4]
5. Differentiate between MLP, FLANN and RBF neural networks, based on their architectures and functionalities. [18]
6. Explain the following with the support of equations, algebraic properties and illustrations
  - a. Binary morphological erosion, dilation and their relationships with Minkowski subtraction and addition.
  - b. Grayscale erosion, dilation, opening and closing and their multiscale versions
  - c. Wighted Skeletonization by Influence Zones (WSKIZ) in Cartogram generation [3 + 4 + 5 = 12]
7. Explain the following with the support of equations, and illustrations. [7 + 5 = 12]
  - (a) Binary and grayscale granulometries and their applications in pattern recognition and analysis
  - (b) Binary (grayscale) morphological interpolations between the source and target sets (functions), and explain the difference between the morphological median and the dual morphological median.