M.Tech Odd Semester (CBCS) Exam., December—2016

COMPUTER SCIENCE AND ENGINEERING

(1st Semester)

Course No. : MCSEEL–09

(Pattern Recognition)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

The figures in the margin indicate full marks for the questions

Answer *any* **five** questions

1. In a three-class two-dimensional problem, the feature vectors in each class are normally distributed with covariance matrix

$$\begin{matrix} 1 & 2 & 0 & 4 \\ 0 & 4 & 1 & 8 \end{matrix}$$

The mean vectors for each class are $[0\ 1, 0\ 1]^T$, $[2\ 1, 1\ 9]^T$, $[\ 1\ 5, 2\ 0]^T$. Assuming that the classes are equiprobable, then classify the feature vector $[1\ 6, 1\ 5]^T$ according to the Bayes' minimum error probability classifier. 10

2. Show that if the likelihood function is Gaussian with unknowns, the mean as well as the covariance matrix , then the ML estimates are given by

$$\hat{} \quad \frac{1}{N} \sum_{k}^{N} x_k$$

$$\hat{} \quad \frac{1}{N} \sum_{k}^{N} (x_k \quad \hat{})(x_k \quad \hat{})^T$$ 10

3. Write a note on minimum error rate classification with example. 10

4. Write perceptron algorithm. Prove its convergence. 4+6=10

5. Explain K-mean clustering with example. 10

6. Obtain an expression for linear discriminate function for multicategory case. 10

7. Discuss Fisher linear discriminant. 10

8. Explain principal component analysis (PCA) with analytical treatment. 10

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