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SIXTH SEMESTER **B. Tech.**

MID SEMESTER EXAMINATION ***March-2019***

CO324 PATTERN RECOGNITION

Time: 1:30 Hours *Max. Marks: 25*

Note: Answer ***ALL*** questions.
Assume suitable missing data, if any.
Use of scientific calculator is permitted.
USE ONLY OPTIMAL NUMBER OF WORDS FOR YOUR ANSWERS

1. Describe (briefly) major steps in the design of a pattern recognition system with help of neat diagram. Consider the example of face recognition system. **[2]**
2. Show that in two-class classification task, the Bayes decision rule minimizes the error probability. **[4]**
3. Given the set of data in Table-I of a distribution with two classes ω_1 and ω_2 both with prior probability of 0.5, find the discriminant functions and decision boundary. Assume distributions to be normal distribution, [Hint: Consider posterior probability to be a discriminant function and for calculation take precision up to two decimal points] **[4+3]**

Table-I

Sample	ω_1	ω_2
1	-5.20	-1.19
2	-5.01	1.00
3	1.20	-2.40
4	0.80	-2.10
5	-2.60	5.70
6	4.10	4.30
7	-2.50	3.50
8	-2.20	5.10
9	3.80	-1.40
10	1.02	-2.50

P.T.O.

4. In a two-class classification tasks, the feature vectors are generated by two-dimensional normal distributions having same covariance matrix given as [4+3]

$$\sum = \begin{bmatrix} 1.1 & 0.3 \\ 0.3 & 1.9 \end{bmatrix}$$

and the mean vectors are $\mu_1 = [0, 0]^T$, $\mu_2 = [3, 3]^T$, respectively.

a) Classify the vector $[1.0, 2.2]^T$ using the Bayesian classifier.

b) Compute the principal axes of distributions.

5. Suppose the data $\{x_1, x_2, \ldots, x_n\}$ is drawn from a normal distribution $N(\mu, \sigma^2)$, where μ and σ are unknown. Find the maximum likelihood estimate for the pair (μ, σ^2). [5]

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