

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 2711**

Roll No.

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**B.Tech.**

(SEM. VII) ODD SEMESTER THEORY

EXAMINATION 2013-14

**PATTERN RECOGNITION**

*Time : 3 Hours*

*Total Marks : 100*

**Note :** (1) Attempt ALL questions.

(2) Make suitable assumption if required.

1. Attempt any **TWO** Parts :—

(a) What is Pattern Recognition ? Explain the difference between statistical and structural approaches to pattern recognition.

(b) (i) What is Pattern classification ? What are major paradigms of Machine Learning ?

(ii) Explain Learning and Adaptation. What are the components of a learning system ?

(c) (i) What do you mean by mean and covariance ?

(ii) What are random variables ? Explain chi-square test.

2. Attempt any **TWO** parts :—

(a) What is Bayes' theorem ? Explain. Also discuss Bayes' classifier using some example in detail.

- (b) (i) Consider the Bayesian classifier for the uniformly distributed classes, where :

$$P(x/w_1) = \begin{cases} \frac{1}{a_2 - a_1} & , x \in [a_1, a_2] \\ 0 & , \text{muullion} \end{cases}$$

$$P(x/w_2) = \begin{cases} \frac{1}{b_2 - b_1} & , x \in [b_1, b_2] \\ 0 & , \text{muullion} \end{cases}$$

Show the classification results for some values for a and b. (“muullion” means “otherwise”).

- (ii) Consider the classifier, where the risk is taken into account as follows :

$$\lambda_{11} = \lambda_{22} = 1 \quad \text{ja} \quad \lambda_{12} = \lambda_{21} = 2$$

construct the classifier (“ja” means “and”).

- (c) What is discriminant function ? Discuss it in detail using a formula of conditional risk :

$$R(\alpha_i | x) = \sum_{j=1}^n \lambda(\alpha_i | w_j) P(w_j | x)$$

derive the formula for the likelihood ratio.

3. Attempt any **TWO** Parts :—

- (a) Write a short note on Hidden Markov Model (HMM).

## | UPTU Notes |

- (b) Write short notes on the following :—
- (i) Gaussian mixture models
  - (ii) Fisher linear discriminant analysis.
- (c) Show that in the likelihood estimation (ML) the sample mean is equal to the mean of samples. Consider that  $S_i = \forall i$ .
4. Attempt any **TWO** Parts :—
- (a) Write an algorithm for K-Nearest neighbor estimation. Explain.
  - (b) Why use Fuzzy classes ? What is the Fuzzy classification process ?
  - (c) Write short notes on the following :—
    - (i) Perzen windows
    - (ii) Density Estimation.
5. Attempt any **TWO** parts :—
- (a) (i) Four samples are to be clustered into three clusters. Show all possible sets of clusters. How many sets there are ?
    - (ii) What do you mean by cluster validation ?
  - (b) What do you mean by supervised learning and unsupervised learning ? Explain. Discuss any unsupervised learning algorithm with some example.
  - (c) Write short notes on the following :—
    - (i) K-Means Partitional Algorithm
    - (ii) Hierarchical Clustering.