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

PAPER ID : 2711 Roll No. | | | | | | | | | | |

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 :

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

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

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 :

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

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).

(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.