(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 2012-13

PATTERN RECOGNITION

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions.

1. Attempt any **four** of the following : **(4×5=20)**

   (a) What do you mean by learning and adaption ? Explain.

   (b) Explain Chi-Square test and discuss their significance in pattern recognition with suitable example.

   (c) Explain the following with example :

      (i) Pattern

      (ii) Classification

      (iii) Pattern recognition.

   (d) Explain design principles of pattern recognition system with an example.

   (e) What is normal distribution ? Explain.

   (f) Consider a two-class problem where the classes are labelled pen drive and laptop. Suggest a set of features that could be used to discriminate between these two classes of objects. What is the corresponding vector-space representation ?

2. Attempt any **four** of the following : **(4×5=20)**

(a) Explain the following :

(i) Bayes theorem

(ii) Law of Total Probability.

(b) Let blue, green and red be three classes of objects with prior probabilities given by P(blue) = 0.3, P(green) = 0.4, P(red) = 0.3. Let there be three types of objects : pencils, pens, and paper. Let the class-conditional probabilities of these objects be given as follows. ***Use Bayes classifier*** to classify pencil , pen and paper.

P(pencil|green) = 0.3 P(pen|green) = 0.5 P(paper|green) = 0.2

P(pencil|blue) = 0.5 P(pen|blue) = 0.2 P(paper|blue) = 0.3

P(pencil|red) = 0.2 P(pen|red) = 0.3 P(paper|red) = 0.5

(c) Explain *Naive Bayes classifier.*

(d) Assume your house has an *alarm system* against *burglary.* You live in the seismically active area and the alarm system can get occasionally set off by an *earthquake.* You have two neighbours, *Mary* and *John*, who do not know each other. If they hear the alarm they call the police. John always calls when he hears the alarm, but sometimes confuses the telephone ringing with the alarm. Mary does not always call because Mary like loud music. Draw the belief network.

(e) What is discriminant function ? Explain.

(f) Consider a two-class (Tasty or non Tasty) problem with the following training data. Use *Naive Bayes classifier* to classify the pattern :

"Cook = Asha, Health–Status = Bad, Cuisine = Continental"

Cook	*Health-Status*	*Cuisine*	*Tasty*
Asha	Bad	Indian	Yes
Asha	Good	Continental	Yes
Sita	Bad	Indian	No
Sita	Good	Indian	Yes
Usha	Bad	Indian	Yes
Usha	Bad	Continental	No
Sita	Bad	Continental	No
Sita	Good	Continental	Yes
Usha	Good	Indian	Yes
Usha	Good	Continental	No

3. Attempt any **two** of the following : **(2×10=20)**

(a) Write short notes on the following :

(i) Maximum likelihood estimation

(ii) Bayesian estimation.

(b) What is Hidden Markov Model (HMM) ? Explain following in HMM :

(i) Forward Algorithm

(ii) Backward Algorithm.

(c) What is Principle Component Analysis (PCA) ? Explain. Consider the two-dimensional patterns : (1, 1), (1, 2), (4, 4), (5, 4). Use the first principal component (PCA) to transform the pattern (1, 1). What is the vector obtained if we try to reproduce the original data ?

4. Attempt any **two** of the following : **(2×10=20)**

(a) Explain the following with example :

(i) Nearest Neighbour Classification algorithm

(ii) k-Nearest Neighbour (kNN) classification algorithm

(iii) Modified k-Nearest Neighbour (mkNN) classifier.

(b) What is Parzon Window ? Explain.

(c) Explain the following with suitable examples :

(i) Parametric pattern recognition methods and Non Parametric pattern recognition methods.

(ii) Fuzzy decision making and fuzzy classification.

5. Attempt any **two** of the following : **(2×10=20)**

(a) Write short notes on the following :

(i) Clustering vs classification

(ii) Cluster validation

(iii) Criteria function for clustering.

(b) Write K-means clustering algorithm. In which situation k means algorithm gives the globally optimal partition ? Illustrate K-means algorithm with the help of the three-dimensional data set of 10 points given below :

(1, 1, 1), (1, 1, 2), (1, 3, 2), (2, 1, 1), (6, 3, 1),

(6, 4, 1), (6, 6, 6), (6, 6, 7), (6, 7, 6), (7, 7, 7).

(c) Discuss hierarchical clustering.