B.E. COMPUTER SCIENCE AND ENGINEERING
FOURTH YEAR FIRST SEMESTER - 2018

SUBJECT
PATTERN RECOGNITION

Time : 3 hours Full marks : 100

Answer question no.1 and any four from the rest

All questions carry equal marks

1. Answer true or false stating reasons 2x10 = 20

(a) In case of pattern classification by distance functions, it is always possible to represent each pattern class by a single prototype.
(b) Kohonen self-organizing network can be used for data coding.
(c) Density- based clustering algorithms provide a natural protection against outliers.
(d) In case of pattern classification method using decision function, once a certain function or functions have been selected the only way to establish the effectiveness of the chosen decision functions is by direct trial.
(e) The measurement unit used cannot affect the clustering result of a given data set.
(f) DBSCAN algorithm cannot cluster data sets well with large differences in densities.
(g) Hierarchical clustering methods help in exploring data at different levels of granularity.
(h) A large part of the data will not be clustered if a high value of e is chosen in DBSCAN algorithm.
(i) Data mining engine acts as the domain knowledge that is used to guide the search or to evaluate the interestingness of resulting patterns.
(j) Hopfield network is usually employed for data clustering.

2. (a) Describe briefly how pattern classification can be implemented using decision function ? 4

(b) Assume any three disjoint pattern classes ω_1, ω_2 and ω_3 in $\Re^2$. Compute the decision boundaries and decision rules that are needed to successfully classify all the patterns from the said three classes for the following two cases : 6 + 6

1. Each class is separable from all other classes
2. Classes are pair-wise separable

(c) Describe briefly the factors that affect the success of such a pattern classification scheme. 4

3. What is partitional clustering? State and explain one such algorithm with example. Discuss the merits and demerits of the method. 2 + 12 + 6

4. (a) How are the features of a biological neurone imitated in an artificial neurone? 6

(b) Describe how can a single layer perceptron classify two linearly separable classes? Can such an ANN learn an XOR function? Justify your answer. 10 + 4

5. (a) What is data mining ? How is it different from a typical DBMS ? 3+5

(b) Discuss whether each of the following activities is a data mining task. 2 X 6

(i) Dividing the customers of a company according to their profitability.
(ii) Predicting the future stock price of a company using historical records.
(iii) Monitoring the heart rate of a patient for abnormalities.
(iv) Monitoring seismic waves for earthquake activities.
(v) Extracting the frequencies of a sound wave.
(vi) To detect a group of people who stage accidents to gain money from insurance companies.

6. (a) What are the expected features of a typical density-based clustering algorithm ?

(b) State and explain DBSCAN algorithm for clustering.

(c) Discuss how a user can assign the values of the parameters used in DBSCAN algorithm?

(d) What are the merits and demerits of the algorithm ? 2 + 10 + 4 + 4

7. Write short notes on any two of the following. 2 X 10

(a) Hyperplane properties
(b) Kohonen's Self Organizing Network
(c) Evaluation of clustering results