Reg. No.															

Question Paper Code	13517

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Sixth Semester

Computer Science and Engineering

20ITEL806 - PATTERN RECOGNITION TECHNIQUES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	A discriminant function is used primarily for which of the following? (a) Feature extraction (b) Classification of data into different classes (c) Clustering of similar data (d)Generating synthetic data	1	K1	CO1
2.	Maximum–likelihood parameter estimation method is a (a) point estimation method (b) interval estimation method (c) both(a and b) (d) cannot be (a) and (b)	1	K1	CO1
3.	Which of the following clustering algorithm follows a top to bottom approach? (a) K-means (b) Divisible (c) Agglomerative (d) None	1	K1	CO2
4.	In DBSCAN, what does the epsilon (ε) parameter control? (a) The minimum number of points required to form a cluster (b) The maximum distance between two points for them to be considered part of the same cluster (c) The number of clusters that can be formed (d) The dimensionality of the data	1	K1	CO2
5.	What happens when you set the number of clusters K too high or too low in K-means? (a) The model will always converge quickly (b) The model will have better predictive accuracy (c) The clusters may become too small or too large, leading to poor results (d) The model will fail to converge	1	K1	CO3
6.	What happens when the learning rate is set too high in backpropagation? (a) The network will converge quickly but accurately (b) The network may oscillate and fail to converge (c) The weights will remain constant (d) The network will take longer to converge	1	K1	CO3
7.	What is the role of the "within-class variance" in measuring class separability? (a) To measure how distinct the class centers are from each other (b) To measure how dispersed the data points are within each class (c) To measure the distance between class centers (d) To measure how similar data points are to the center of the data	1	K1	CO4
8.	Which of the following regional features is most commonly used for texture analysis in images? (a) Gray Level Co-occurrence Matrix (GLCM) (b) SIFT (c) Histogram of Oriented Gradients (HOG) (d) Color Histograms	1	K1	CO4
9.	In SVM, what does the hyperplane represent? (a) A plane that separates data points into two classes (b) A plane that minimizes the classification error (c) A feature that separates data points in a non-linear fashion (d) A boundary that divides the input space into clusters	1	K1	CO5

10. What is the main disadvantage of fuzzy clustering? *1 K1 CO6*
(a) It is computationally simpler than traditional clustering
(b) It does not handle overlapping clusters effectively
(c) It can lead to higher computational costs and complex calculations
(d) It requires less data to create clusters compared to traditional methods

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Show the differences between statistical and structural approaches. *2 K2 CO1*
12. Define Bayes theorem. *2 K1 CO1*
13. What is divisive hierarchical clustering, and how does it differ from agglomerative clustering? *2 K1 CO2*
14. Compare Grid-based methods with Density-based methods. *2 K2 CO2*
15. When is Naive Bayes particularly useful, and what are its limitations? *2 K1 CO3*
16. List the purpose of the activation function in backpropagation. *2 K1 CO3*
17. What is feature selection and why is it important in pattern recognition? *2 K1 CO4*
18. Differentiate null hypothesis from an alternative hypothesis in the context of feature selection. *2 K2 CO4*
19. Define HMM and list the three problems addressed by it. *2 K1 CO5*
20. Compare SVM and RVM. *2 K2 CO5*
21. Let: A = 0.2/1 + 0.5/2 + 0.7/3 + 1/4 + 0.8/5 + 0.4/6 + 0.2/7. *2 K1 CO6*
Find the α-level set of A for α = 0.5 AND α = 0.8
22. State Hebbs rule. *2 K1 CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) Discuss the Components of a Pattern Recognition System. *11 K2 CO1*

OR

b) Illustrate Bayesian Belief Networks with an example. *11 K2 CO1*

24. a) Perform a single linkage hierarchical clustering of one dimensional set of points 1,4,9,16, 25, 36, 49, 64, 81 and show the dendogram. *11 K2 CO2*

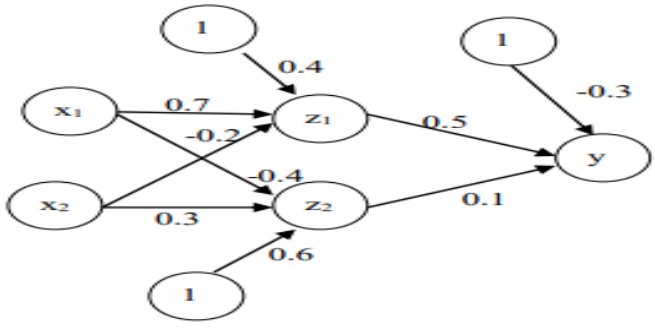
OR

b) Summarize how DBSCAN algorithm works . *11 K2 CO2*

25. a) Given 7 two dimensional patterns A=(2,2) , B=(4,4),C=(6,6), D=(0,4), E=(4,0), F=(5,5), G=(9,9). Using K-means algorithm, obtain 3 clusters. *11 K3 CO3*

OR

b) Solve for the new weight in the given neural network using the input pattern (0, 1), the target output 1. Use a learning rate α = 0.25 and the binary sigmoid activation function. *11 K3 CO3*

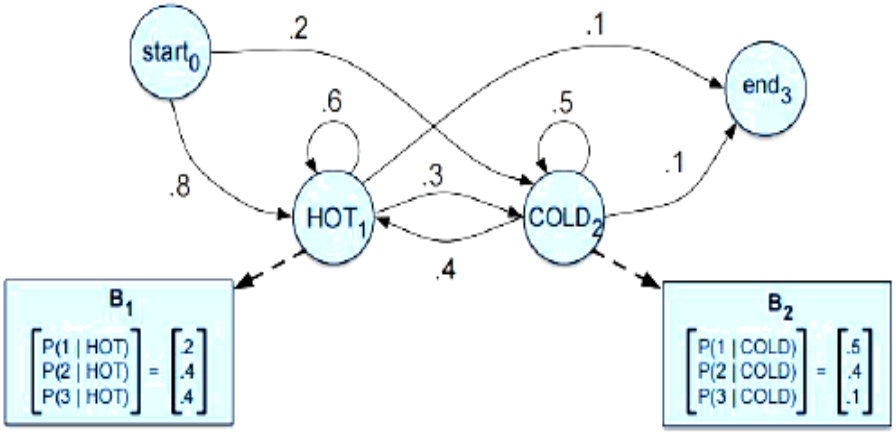


26. a) Explain the various types of Preprocessing techniques with an example. *11 K2 CO4*

OR

b) Illustrate various texture characterization techniques with an example. *11 K2 CO4*

27. a) Consider the hidden state Markov model which shows the behavior of student going to school with transition and emission probability. *11 K3 CO5*



Compute hidden state sequence for the given observation sequence '313'

OR

b) Make use of support vector machines for classification of following data and explain the not linearly separable. *11 K3 CO5*

X1	X2	Y
0	0	1
0	1	-1
1	0	-1
1	1	1

28. a) Explain the operations of union, intersection, and complement with suitable mathematical expressions and examples. *11 K2 CO6*

OR

b) Outline the structure and functions of an artificial neural network. Discuss the key components and applications in pattern recognition and classification. *11 K2 CO6*