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B.Tech. Degree Examinations – April/May 2018

Sixth Semester

Computer Science Engineering

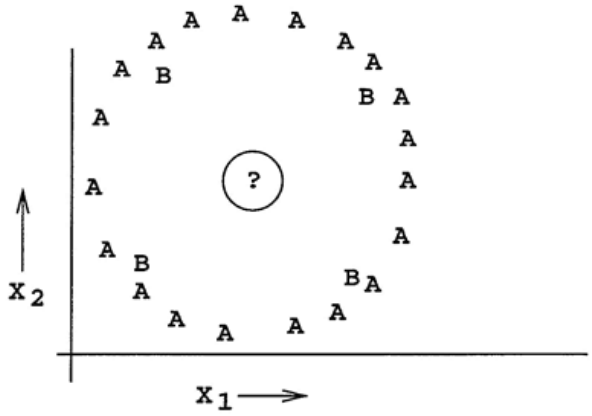
15CSE361 Pattern Recognition

[Time: Three hours Maximum: 100 Marks]

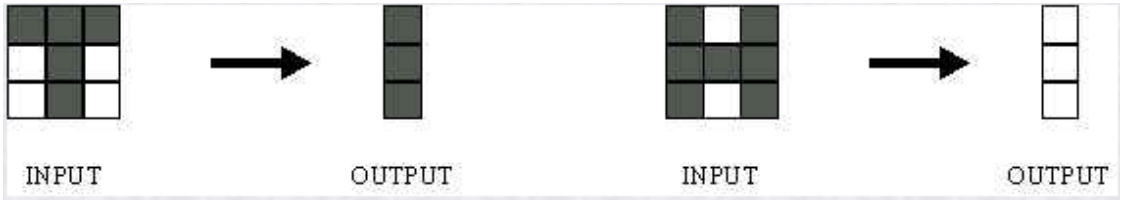
Answer all questions

PART A (10 x 3 =30 Marks)

1. Consider the following figure. If you train a new Bayes classifier on this data, what class would be predicted for the query location?



2. What are the assumptions in K Means algorithm?
3. List down some applications of intelligent robot using a single layer neural network?
4. What are the significances of dimensionality reduction in Pattern Recognition?
5. For example, a company that sells a variety of products may need to know about sale of all of their products, to check the most demanding and least demanding product Find which Pattern recognition system will work well for the above application. Justify your answer.
6. List down the advantages of using ROC curve.
7. How many parameters must be estimated to train a naive Bayes classifier?
8. What is the use of precision and recall?
9. Why KNN is called non parametric?
10. A neural network is trained to recognize alphabets T and H as shown below:



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If the following pattern is given what will be the output of the network?

PART B **(4 x 5 =20 Marks)**

11. Classify the sample with temperature=66 using Bayes theorem. Assume the Temperature data is normally distributed.

Temperature	Play Golf
85	N
80	N
83	Y
70	Y
68	Y
65	N
64	Y
72	N
69	Y
75	Y
75	Y
72	Y
81	Y
71	N

12. Use the following training set to classify the tuple {age =48, Loan=142,000} using KNN (Euclidean distance metric with K=3.)

Age	Loan	Class
25	40000	N
35	120000	N
40	62000	Y
60	100000	Y
33	150000	Y
48	220000	Y

13. Can you represent the following Boolean function with a single logistic threshold unit (i.e., a single unit from a neural network)? If yes, show the weights. If not, explain in few sentences.

A	B	f(A,B)
1	1	0
0	0	0
1	0	1
0	1	0

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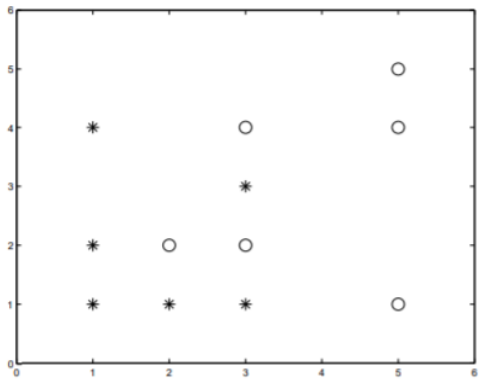
14. During a severe thunderstorm, any transmission line is damaged with probability 0.04, Independently of other transmission lines. A city with 75 transmission lines is hit by a severe thunderstorm. What is the probability that at least 5 of them get damaged?

PART C **(5 x 10 =50 Marks)**

15. Given the data set consisting of the scores of two variables on each of the seven individuals: Estimate the clusters with their centroids after 3 iterations using K means algorithm. Note: Assume the initial centroids are subjects 1 and 4.

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

16. Given the 2-d data representation for two classes: ω1 = [(1, 1),(1, 2),(1, 4),(2, 1),(3, 1),(3, 3)] and ω2 = [(2, 2),(3, 2),(3, 4),(5, 1),(5, 4),(5, 5)] as shown in the figure. Determine the optimal projection line in a single dimension.



17. You are given the following samples that belong to a single class:

x_1	9	9	11	9	7	7	13	7	14	14
x_2	0	6	0	6	2	4	0	6	4	2

Suppose there is a second class with mean m2 = [4, 11] and the same sample covariance matrix (S2 = S1), Given the point x = [8 6], to which class should x be classified? Assume both classes have equal prior probabilities.

18. Assume a perceptron with a unipolar step function has two inputs with weights w1= 0.5 and w2=−0.2, and a threshold θ = 0. 3 (θ can therefore be considered as a weight for an extra input which is always set to -1). For a given training example x= $[0,1]^T$, the desired output is 0 (zero).The perceptron is trained using the learning rule w=η(d−y)x, where x is the input vector, η is the learning rate, w is the weight vector, d is the desired output, and y is the actual output. What are the new values of the weights and threshold after one step of training with the input vector $x = [0 \quad 1]^T$, and desired output 1, using a learning rate of η= 0.5?

19. Feature x is normally distributed for class A with mean and standard deviation 0 and 1. For B it is normally distributed with mean and standard deviation 2 and 3. P (A) =1/4 and P (B) =3/4. Find the optimal decision regions.

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