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B.E. (Computer Science & Engineering) Eighth Semester (C.B.S.)

Elective-III: Pattern Recognition

P. Pages: 2 NRJ/KW/17/4748 Time: Three Hours Max. Marks: 80

- Notes: 1. All questions carry marks as indicated.
 - Solve Question 1 OR Questions No. 2. 2.
 - 3. Solve Question 3 OR Questions No. 4.
 - 4. Solve Question 5 OR Questions No. 6.
 - 5. Solve Question 7 OR Questions No. 8.
 - Solve Question 9 OR Questions No. 10.
 - Solve Question 11 OR Questions No. 12.
 - Assume suitable data whenever necessary. 8.
 - 9. Illustrate your answers whenever necessary with the help of neat sketches.
 - 10. Use of non programmable calculator is permitted.
- 1. What is pattern recognition? Explain steps in pattern recognition system with example.
 - Explain the design cycle of pattern recognition system. B)

OR

- 2. Can the features vector (x, y) = (2, 3) (3, 5) (4, 2) (2, 7) from class A, be separated from A) four samples from class B located at (6, 2), (5, 4), (5, 6), (3, 7) by a linear decision boundary? If so give the equation of one such boundary and plot it. Draw scatter plot.
 - What is learning and adaptation? Explain different types of learning. B)
- 3. What is negative binomial distribution? A basket player is an 80 percent successful free throw shooter. To make 20 free throws, what is the probability that he or she will need to shoot exactly 25 times?
 - B) Explain following methods of estimation of parameters from samples. 6
 - The method of moments.
- Maximum Likelihood Estimes. ii)

- Find the expected value & variance of uniform random variable with range a to b. 4. A)
 - B) When does following equation hold? $P[(A \text{ and } B)|C] = P(A|C) \cdot P(B|C)$.
 - C) A fair coin is tossed 50 times. What is the probability that heads will appear exactly 25 3 times?
- Determine the optimal decision boundary between two simple bivariate normal classes when the features are independent within each class. Assume that the classes A and B are having equal prior probability. The parameter for class A are μ_x = 0, μ_v = 0, σ_x = 1, σ_v = 1, ρ_{xv} = 0 and the parameters for class B are

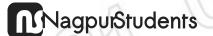
 μ_x = 2, μ_y = 0, σ_x = 1, σ_y = 2, ρ_{xy} = 0. Also draw the sketches for the same.

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B) Explain following three methods of error rates estimation.

i) Model based estimation

ii) Simple counting

iii) Fractional counting

OR

6. A) Explain leaving-One-Out & Leaving-Some-Out Technique in detail. What for it is used?

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B) Refer the following table and find confusion matrix in integer and fractional

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Sample	True Class	$\hat{P}(A x)$	$\hat{P}(B x)$	$\hat{P}(C x)$
1	A	0.3	0.4	0.3
2	A	0.5	0.1	0.4
3	В	0.5	0.3	0.2
4	С	0.1	0.1	0.8

7. A) Explain Fuzzy based classifier in detail.

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B) Write short notes on artificial neural network.

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OR

8. A) Explain support vector Machine. How SVM is trained and how X-OR operation is implemented?

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B) Explain Hidden Markov Model in detail.

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9. A) Explain following types of distances with their formulas and calculate those distance for two points A(1, 2) and B(3, 3)

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i) Euclidean distance.

ii) City block distance

iii) Maximum distance

B) What is histogram? Explain.

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OR

10. A) Explain Adaptive Decision boundary algorithm in detail.

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B) Explain k-nearest Neighbour classification technique.

A) Explain Ward's Method for clustering.

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B) Perform Partitional clustering using Forgy's algorithm for the following 5 samples.

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Samples	(1)	2	3	4	5
X	4	8	15	24	24
y	4	4	8	4	12

OR

12. A) Explain k-means algorithm in detail for performing clustering.

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B) Perform Hierarchical clustering of 5 samples using simple Linkage algorithm, on the data shown below. (4, 4), (8, 4), (15, 8), (24, 4), (24, 12)

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It's hard to beat a person who never gives up.

~ Babe Ruth

