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B.TECH.
(SEM VIII) THEORY EXAMINATION 2018-19
PATTERN RECOGNITION

Time: 3 Hours *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. What is a prior probability?
b. What are the important components of Learning?
c. Consider a tetrahedral die and roll it twice. What is the probability that the number on the first roll is strictly higher than the number on the second roll?
Note: A tetrahedral die has only four sides(1,2,3 and 4).
d. What is the purpose of a goodness-of-fit test?
e. What do you mean by cluster analysis?
f. A roulette wheel has 38 slots-18 red,18 black, and 2 green. You play five games and always bet on red slots. What is the probability that you win all the five games?
g. What is machine Learning? Why do we need Machine Learning?
h. In case of equal discriminant function, pattern is assigned to which class? Also give the optimal discriminant function for two-class case.
i. What do you mean by defuzzification?
j. Define expectation and mean.

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a. What are the different clustering techniques? Explain. Also explain agglomerative clustering algorithm step by step.
b. What are dimension reduction methods? Explain Principle Component Analysis algorithm for dimension reduction. Also write its limitations.
c. Write an algorithm for k-nearest neighbor estimation. Explain.
d. Explain Supervised and unsupervised Learning algorithms using a block diagram. Is clustering considered an unsupervised learning? Justify.
e. What is Bayesian decision theory? Explain 2 category classification.

SECTION C

3. Attempt any *one* of the following: **10x1=10**

a. What do you mean by fuzzy decision making? Also discuss the fuzzy classification using suitable examples in detail.
b. Write short note on:
i)Reinforcement learning
ii)Expectation Maximization

4. Attempt any *one* of the following: **10x1=10**

a. Explain components of a typical pattern recognition system with a neat diagram.
b. Explain multivariate normal density using mathematical notations.

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5. Attempt any *one* of the following: 10x1=10

a. Explain Chi square test. How Chi-square test can be applied for testing null hypothesis?

The following table gives the number of suicides in Saskatchewan from 1978-1989:

Year	No of Suicides in Saskatchewan
1978	164
1979	142
1980	153
1981	171
1982	171
1983	148
1984	136
1985	133
1986	138
1987	132
1988	145
1989	124

Use the Chi square Test for goodness of fit to test the hypothesis that the number of suicides reported for each year from 1978-1989 does not differ significantly from an equal number of suicides in each year.

b. Explain iterative squared-error partitional clustering. Write its algorithm also.

6. Attempt any *one* of the following: 10x1=10

a. Explain Hidden Markov model. How Hidden Markov model is different from traditional markov model? Explain.

b. Explain the convergence of parzen window.

7. Attempt any *one* of the following: 10x1=10

a. Explain Naives Bayes classifier. Consider a fictional dataset that describes the weather conditions for playing a game of golf. Given the weather conditions, each tuple classifies the conditions as fit("Yes") or unfit("No") for playing golf.Here is a tabular representation of our dataset:

Outlook	Temperature	Humidity	Windy	Play Golf
Rainy	Hot	High	False	No
Rainy	Hot	High	True	No
Overcast	Hot	High	False	Yes
Sunny	Mild	High	False	Yes
Sunny	Cool	Normal	False	Yes
Sunny	Cool	Normal	True	No
Overcast	Cool	Normal	True	Yes
Rainy	Mild	High	False	No
Rainy	Cool	Normal	False	Yes
Sunny	Mild	Normal	False	Yes
Rainy	Mild	Normal	True	Yes
Overcast	Mild	High	True	Yes
Overcast	Hot	Normal	False	Yes
Sunny	Mild	High	True	No

Test it on a new set of features(Lets call the set of features today):
today=(Sunny,Hot,Normal,False) and determine whether the golf will be played or not.

b. Explain probabilistic neural network with its benefits.

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