Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

VI SEMESTER B.TECH. (COMPUTER SCIENCE AND ENGINEERING)
MAKE-UP EXAMINATIONS, JUNE/JULY 2017
SUBJECT: **PE-III - MACHINE LEARNING (CSE 4010)**
REVISED CREDIT SYSTEM
(22/06/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Explain supervised, and unsupervised learning with respect to classification and clustering. 2

1B. Explain the steps involved in character recognition. 3

1C. Justifying the convergence condition of k-means clustering, explain the procedure of forming clusters 5

2A. Consider the belief network given in **Fig 2A**. Representing causal relationship of five random variables Burglary *(B)*, Earthquake *(E)*, Alarm *(A)*, John's Call *(J)*, and the Mary's call *(M)*. Given the conditional probability table

(i) Find the probability of John calls= yes.
(ii) find the probability that Burglary = yes given that John calls = yes.

{B_0 = no, B_1=yes}

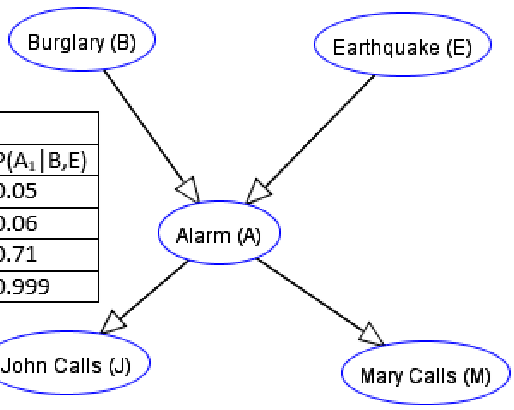
P(B)	
P(B_0)	**P(B_1)**
0.99	0.01

{E_0 = no, E_1=yes}

P(E)	
E_0	E_1
0.98	0.02

{A_0 = no, A_1=yes}

P(A|B, E)		
	P(A_0 | B, E)	P(A_1|B,E)
B_0, E_0	0.95	0.05
B_0, E_1	0.94	0.06
B_1, E_0	0.29	0.71
B_1,E_1	0.001	0.999



{J_0 = no, J_1=yes}

P(J|A)		
	J_o	J_1
A_0	0.9	0.1
A_1	0.05	0.95

{M_0 = no, M_1=yes}

P(M|A)		
	M_o	M_1
A_0	0.7	0.3
A_1	0.01	0.99

Fig 2A

3

2B. Explain zero-one loss function for classifying data into two classes. 3

2C. Derive the Fisher Linear Discriminant function for the two-class case. 4

3A. Perform K-NN classification of test data (-1.5,0.5), with K=4, using the training data, $X=\{x^t, r^t\}$ for $1 \le t \le 12$, in **Table 3A.** Use Euclidean distance measure.

x_1	x_2	R
3.15	-2.80	1
0.95	-1.88	1
3.31	-0.45	1
-3.78	-4.40	0
-0.25	-3.14	0
0.39	-1.04	0
-3.14	-2.93	0
1.23	-1.36	1
1.83	-2.0	0
-3.94	-0.51	1
0.91	-1.56	0
-1.55	-1.68	0

Table. 3A 3

3B. What are rough sets? Explain with an example. 3

3C. Consider a set $P=\{P_1, P_2, P_3, P_4\}$ of four varieties of paddy plants, set $D=\{D_1, D_2, D_3, D_4\}$ of the various disease affecting the plants and $S=\{S_1, S_2, S_3, S_4\}$ be the common symptoms of the disease. Let $\tilde{R}$ be the relation on P x D and $\tilde{S}$ be a relation on D x S For

$$\tilde{R} = \begin{array}{c} \\ P_1 \\ P_2 \\ P_3 \\ P_4 \end{array} \begin{array}{c} \begin{array}{cccc} D_1 & D_2 & D_3 & D_4 \end{array} \\ \begin{bmatrix} 0.6 & 0.6 & 0.9 & 0.8 \\ 0.1 & 0.2 & 0.9 & 0.8 \\ 0.9 & 0.3 & 0.4 & 0.8 \\ 0.9 & 0.8 & 0.1 & 0.2 \end{bmatrix} \end{array} \qquad \tilde{S} = \begin{array}{c} \\ D_1 \\ D_2 \\ D_3 \\ D_4 \end{array} \begin{array}{c} \begin{array}{cccc} S_1 & S_2 & S_3 & S_4 \end{array} \\ \begin{bmatrix} 0.1 & 0.2 & 0.7 & 0.9 \\ 1 & 1 & 0.4 & 0.6 \\ 0 & 0 & 0.5 & 0.9 \\ 0.9 & 1 & 0.8 & 0.2 \end{bmatrix} \end{array}$$

Obtain the association of the plants with the different symptoms of the diseases using max-min composition. 4

4A. Explain the concept of principal component analysis with a general example. 4

4B. Obtain the expression for change in weight of a neuron j in the output layer using back propagation algorithm. 4

4C. Explain Rosenblatt's model of perceptron with a neat diagram 2

5A. Explain Naïve Bayes classifier with a suitable example. 5

5B. Explain support vector machine for linearly separable case. 3

5C. Differentiate between Agglomerative and Divisive clustering 2