Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. COMPUTER SCIENCE AND ENGINEERING

END SEMESTER MAKEUP EXAMINATIONS, DECEMBER 2018

SUBJECT: SOFT COMPUTING PARADIGMS (CSE 4031)

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. With a neat diagram explain the non-linear model of a Neuron. Draw a graph showing affine transformation produced by the presence of a bias. Also explain Stochastic Model of a Neuron. **5M**

1B. What are the characteristics of a memory? Derive the mathematical equation for memorized matrix. Also show mathematically, how recall is addressed for patterns stored in memory. **5M**

2A. Write the pseudo code for Perceptron Convergence Algorithm. What are the conflicting requirements when a learning rate parameter is assigned into the range $0<\eta<=1$. **3M**

2B. The momentum constant α is normally assigned a positive value in the range $0< \alpha<1$. Investigate the difference that would be made in the behaviour for the following equation with respect to time t if α were assigned a negative value in the range $-1<= \alpha<0$. **2M**

$$\Delta wji(n) = -\eta \sum_{t=0}^{n} \alpha^{n-t} \frac{\partial E(t)}{\partial wji(t)}$$

2C. Classify the two dimensional input pattern shown in Figure 1 using perceptron network. The symbol "*" indicates the data representation to be +1 and "." indicates data to be -1. The patterns are I-F. For pattern I, the target is +1 and for F, the target is -1. The initial weights are all assumed to be zero and the learning rate parameter to be 1. The activation function is given by, **5M**

$$y = \begin{cases} 1 \text{ if } y > 0 \\ 0 \text{ if } -0 \leq y \leq 0 \\ -1 \text{ if } y < -0 \end{cases}$$

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* * *        * * *
. * .        * * *
* * *        * . .
 'I'          'F'
```

Figure 1

3A. Using back propagation network, find the new weights for the network shown in Figure 2. It is presented with the input pattern [0, 1] and the target output is 1. Use a learning rate parameter to be 0.25 and binary sigmoidal activation function. **5M**

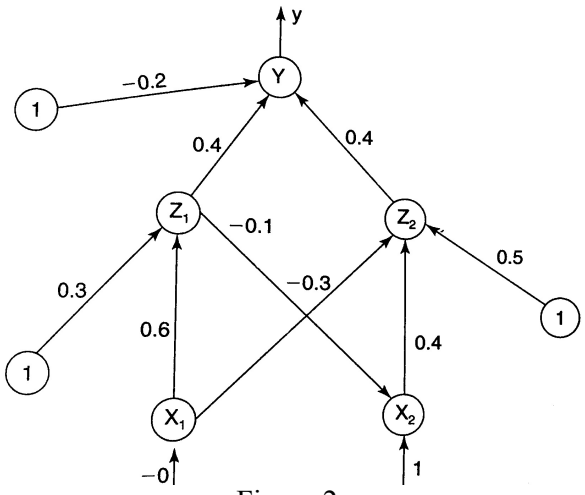

Figure 2

3B. Find the weight matrix for the BAM for the following binary input-output vector pairs: 5M
S(1) = (1,0,0,0), t(1) = (1,0) S(2) = (1,0,0,1), t(2) = (1,0)
S(3) = (0,1,0,0), t(3) = (0,1) S(4) = (0,1,1,0), t(4) = (0,1)
Using the unit step function (with threshold 0) as the output units activations functions, test the response of the network on each of the input patterns. Also test the response of the network on various combinations of input patterns with the following "mistakes" or "missing" data.
[1 0 -1 -1] ii) [-1 0 0 -1] iii) [-1 1 0 -1] iv) [1 1 -1 -1] v) [1 1]

4A. Draw a neat diagram for adaptive pattern classification, using self-organizing feature map and learning vector quantizer. Explain. **3M**

4B. Perform the following operations over the fuzzy sets given below: **4M**

$$P = \left\{\frac{0.1}{2} + \frac{0.3}{4} + \frac{0.7}{6} + \frac{0.4}{8} + \frac{0.2}{10}\right\}$$

$$Q = \left\{\frac{0.1}{0.1} + \frac{0.3}{0.2} + \frac{0.3}{0.3} + \frac{0.4}{0.4} + \frac{0.5}{0.5} + \frac{0.2}{0.6}\right\}$$

$$T = \left\{\frac{0.1}{0} + \frac{0.7}{0.5} + \frac{0.3}{1}\right\}$$

1. R = P * Q
2. S = Q * T
3. M = R o S
4. M = R o S

4C. Using the inference approach, obtain the membership values for the triangular shapes (I, R and T) for a triangle with angles 40, 60 and 80 (all the values are in degrees). **3M**

5A. How do you map values from fuzzy set to crisp set? Describe any four types of defuzzification methods **2M**

5B. Consider the two fuzzy sets and using Zadeh's notations, express the fuzzy sets into lambda cut sets for 0.4 and 0.7 for the following operations. **3M**

$$A = \left\{\frac{0}{0.2} + \frac{0.8}{0.4} + \frac{1}{0.6}\right\}$$

$$B = \left\{\frac{0.9}{0.2} + \frac{0.7}{0.4} + \frac{0.3}{0.6}\right\}$$

i. $\bar{A}$
ii. $\bar{B}$
iii. $A \cup B$
iv. $A \cap B$
v. $\bar{A} \cup \bar{B}$
vi. $\bar{A} \cap \bar{B}$

5C. What are Genetic Algorithm? Explain Mutation Operator and its techniques with example. **5M**