Reg. No.					

MANIPAL INSTITUTE OF TECHNOLOGY

Manipal University

SECOND SEMESTER M.TECH DEGREE END SEMESTER EXAMINATION APRIL/MAY -2017

## SUBJECT: NEURAL NETWORK & FUZZY LOGIC (OPEN ELECTIVE-ECE-5248)

## TIME: 3 HOURS

## MAX. MARKS: 50

- Instructions to candidatesAnswer ALL questions.
  - Missing data may be suitably assumed.
- 1A. Consider a simple perceptron model with four inputs. Let the initial weight vector be  $[1 1 \ 0 \ 0.5 ]^{T}$ . Set of input training vectors are  $x1=[1 - 2 \ 1.5 \ 0]^{T}$ ,  $x2=[0 - 0.5 - 2 - 1.5]^{T}$  and  $x3=[0 \ 1 \ -1 \ 1.5]^{T}$ . Obtain the updated weights sign(x) function with learning constant c=1.
- 1B. Using the linear separable concept, obtain the response for OR function with bipolar inputs and bipolar targets.
- 1C. Briefly explain McCulloch\_Pitts neural network.

(5+3+2)

- 2A. What is a Adaptive Linear Neuron? With neat flow chart, explain the architecture of Delta rule for single output unit.
- 2B. What is supervised learning and how is it different from unsupervised learning? How does learning take place in supervised learning?
- 2C. With neat block diagram explain the concept of Reinforcement learning.

(5+3+2)

3A. Train the Hetero-associative memory network using outer product rule to store the input vector  $S = (S_1, S_2, S_3, S_4)$  to the output vector  $t = (t_1, t_2)$ . The vector pairs are given in the table.  $\varepsilon$ 

I/P target	$S_1$	$S_2$	<i>S</i> <sub>3</sub>	$S_4$	$t_1$	<i>t</i> <sub>2</sub>
$1^{st}$	1	0	1	0	1	0
$2^{nd}$	1	0	0	1	1	0
3 <sup>rd</sup>	1	1	0	0	0	1
4 <sup>th</sup>	0	0	1	1	0	1

3B. Construct a Maxnet with four neurons and inhibitory weight  $\varepsilon = 0.2$ , given the initial activation as follows:  $a_1(0) = 0.3$ ;  $a_2(0) = 0.5$ ;  $a_3(0) = 0.7$ ;  $a_4(0) = 0.9$ .

(5+5)

- 4A. Construct and test the Hamming network to cluster four vectors. Given the exemplar vectors, e(1)=[1 1 1 1]; e(2)=[-1 1 1 1] with the bipolar input vectors are  $x_1=[-1 1 1 1], x_2=[-1 1 1 1], x_3=[-1 1 1 1]$  and  $x_4=[1 1 1].$
- 4B. With neat block diagram, explain different types of fuzzy system. Mention the disadvantages.

(5+5)

- 5A. What is Fuzzification? What are the methods of membership value assignments? Briefly describe any three methods.
- 5B. For the following two fuzzy sets, perform union, intersection and difference operation.  $A = \left\{ \frac{1}{2} + \frac{0.3}{4} + \frac{0.5}{6} + \frac{0.2}{8} \right\} \quad B = \left\{ \frac{0.5}{2} + \frac{0.4}{4} + \frac{0.1}{6} + \frac{1}{8} \right\}$
- 5C. Mention the area of applications of fuzzy system. Briefly, explain any one application.

(5+3+2)