Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

VI SEMESTER B.TECH. (BME) DEGREE END SEMESTER EXAMINATIONS APRIL 2018

SUBJECT: ARTIFICIAL NEURAL NETWORKS (BME4001)

(REVISED CREDIT SYSTEM)

Tuesday, 24th April 2018: 2 to 5 PM

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

1. **Answer ALL questions.**
2. **Draw labeled diagram wherever necessary**

1.	(a)	Describe an iterative procedure for training Backpropagation network. State the significance of learning rate (α).	08
	(b)	Design a *McCulloch-Pitt's* neuron as a processing node for realising the following function: $f = \overline{(A+B)}$. Test the network with the test vector X = [0 1]^T.	06
	(c)	How is a recurrent network architecture different from a feed forward net? Explain.	06
2.	(a)	What is 'target vector' in a supervised learning? Explain its significance during training.	04
	(b)	Draw the basic architecture of a basic two input perceptron AND logic gate. Explain the training algorithm (consider bipolar type input) and find the node response for the following test inputs: (1,-1) and (1,1).	08
	(c)	Draw the architecture of a fixed weight competitive network. Describe Maxnet testing algorithm.	08
3.	(a)	What are associative networks? Explain.	04
	(b)	Draw the architecture of an associative network to store the following three vectors using *outer product rule*: S_1= [−1 1 1 −1], S_2= [−1 −1 −1 1], and S_3= [1 −1 −1 −1]. Verify the possibility of retrieving the stored vector 'S_2'.	08

(c) For a back-propagation network, the weights between input and hidden units are represented by V_{ij}, and the weights between hidden and output units are denoted by W_{jk}. The initial weights are: $[v_{11} \quad v_{21} \quad v_{01}]$ = [0.5 -0.2 0.3] ; $[v_{12} \quad v_{22} \quad v_{02}]$ = [-0.1 0.4 0.7], and $[w_1 \quad w_2 \quad w_0]$ = [0.3 0.2 -0.2] and the learning rate alpha 0.75.The network is presented with (0,1) and the target output is 1. Find the output response of the network. Find the value of error term at output node of the network. 08

4. (a) How is *winner takes all* rule adopted in case of Kohonen Self organizing network to find two groups of clusters? Explain. 08

(b) Express the Hebbian learning rule and train the neural net with the following inputs: '*I* ' and 'O'. The input bipolar representation is given in table 4 (b). Test the input "O" (use Hebbian rule).

Table 4(b)

Input	*Input in bipolar Representation*									*Bias*	*Target*
	x1	*x2*	*x3*	*x4*	*x5*	*x6*	*x7*	*x8*	*x9*		
I	1	1	1	-1	1	-1	1	1	1	1	1
O	1	1	1	1	-1	1	1	1	1	1	-1

08

(c) Explain the role of *sensitivity* and *specificity* in understanding a classifier performance? 04

5. (a) Why is the design of neural network based application considered as a cyclic approach? Describe different phases to be considered during the design of a neural network an *arrhythmia* classifier. 10

(b) Design the discrete Hopfield network with the input vector [1 1 1 −1]. Draw the labelled network diagram, and test it with a missing entry in the in the first and third components of the stored vector. 10