Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VI SEMESTER B.Tech (BME) DEGREE MAKE-UP EXAMINATIONS, JUNE 2017

SUBJECT: ARTIFICIAL NEURAL NETWORKS (BME4001) (Elective II)

(REVISED CREDIT SYSTEM)

Thursday, 22nd June 2017: 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) Design a McCulloch Pitt's neuron model to implement following function: $F = AB + AC$. 06

(b) What is *Unsupervised* learning? Explain how this learning is different from other learning methods. 06

(c) Design a Hebb's network to classify the following *two-dimensional* input patterns "*L*" and "*I*". The symbol '*' indicates data representation to be '+1', '#' indicates data to be '-1'. 08

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    * # #          * * *
L=  * # #     I =  # * #
    * * *          * * *
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2. (a) Describe the characteristics of associative networks. Draw the architecture of an auto-associative network and describe its training with no self-connection for an input vector $[1 \quad 1 \quad -1]$. Test whether the network is able to recognize : 10

(i) One missing entry at first bit position

(ii) One error in the first bit position

(b) Explain the training of a multilayer back propagation network with the details of error generation and error propagation. Describe the rules used for updating the weights. 10

3. (a) What are self-organising networks? Consider a Kohenen net with two cluster units and five input units. The weight vectors for the cluster units are given by :

$$W_{ij} = \begin{bmatrix} 0.3 & 0.2 & 0.1 & 0.8 & 0.4 \\ 0.5 & 0.6 & 0.7 & 0.9 & 0.2 \end{bmatrix}$$

Use square of Euclidean distance to find the winning cluster unit and its new weights, for the input pattern $x = [0.2 \quad 0.4]$ and the learning rate as 0.2. 10

(b) Explain neural network approach for the detection of class called "Normal" and "Demented" from MR images of the brain, with the help of at least five important features. 10

4. (a) Compare a biological neural network and an artificial neural network. 04

(b) What are activation functions? Explain its importance in association with an artificial neuron. Give two examples. 06

(b) Explain in detail the algorithm the algorithm used for storing the vector in a discrete Hopfield network. Design a Hopfield network to store a vector [-1 1 1 -1] and to test its recall capability with an error entry in the first component of the stored vector. 10

5. (a) Explain the role of sensitivity and specificity in deciding the performance of a classifier. 06

(b) Explain neural network based classification of Electrocardiograms, considering a two class problem. 06

(c) Design a three input perceptron network, for performing the OR gate function. 08