Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

VI SEMESTER B.Tech.(BME) DEGREE END SEM EXAMINATIONS APR/MAY 2019
SUBJECT: ARTIFICIAL NEURAL NETWORKS (BME 4001)
Elective II
(REVISED CREDIT SYSTEM)
Tuesday, 30th April 2019: 2 pm to 5 pm

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to Candidates:

1. **Answer all the questions.**
2. **Draw labeled diagrams wherever necessary.**

1. (a) Characterize the processing capability of an artificial neuron with an activation set as sigmoidal. 03

(b) What is reinforcement learning? Explain. Differentiate it from the supervised learning? 03

(c) Realize the function $f = (A + B + C)$ using McCulloch-Pitt's neuron model. Test the network with a vector X = [0 1 1]^T. 04

2. (a) Construct a competitive net referred as MAXNET. Explain its training and the testing. 03

(b) Design a Hebbian network to classify the following two-dimensional input patterns 'L' and 'T'. The symbol '*' indicates data representation to be '1', '#' indicates data to be '0'. Consider the learning rate to be equal to 1. Test the network for one of the input "T". 03

$$L = \begin{matrix} * & \# & \# \\ * & \# & \# \\ * & * & * \end{matrix} \qquad T = \begin{matrix} * & * & * \\ \# & * & \# \\ \# & * & \# \end{matrix}$$

(c) Train and test Hetero-associative network to store the following inputs using Hebbian method: 04

- 1st input: [1 1 01] with target [1 0]
- 2nd input: [0 0 1 1] with target [0 1]

3. (a) Describe the concept of storage and retrieval of a pattern in a pattern association network. 04

(b) Illustrate the training algorithm of a single layer perceptron network with appropriate of weight updating rules. 03

(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 -0.1 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 0.4 -0.2] . Consider the learning rate as 0.7. Find the responses of a backpropagation net with the input pattern [-1, 1] and the target output is +1. Find the value of error term at output node of the network. 03

4. (a) Train the *auto-associative network* for input vector [-1 1 1 -1] and test whether the network is able to recognize: 04
   i. one missing entry at the MSB
   ii. one error entry in the 2nd bit position from MSB

(b) Explain the identification of cardiac heartbeats from digitized ECG signals to assist experts in the diagnosis of " bradycardia". 03

(c) Identify an unsupervised neural net. Explain its training and testing 03

5. (a) Discuss the significance of true positive rate and true negative rate of ANN based classifier. 03

(b) Why the design of neural network based application is considered as a cyclic approach? Discuss. 03

(c) Identify the major design cycle stages for differentiating two class problem using brain magnetic resonance image. List at least three features of corpus callosum. 04