Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II– EXAMINATION – WINTER - 2016

Subject Code: 2722710 **Date: 21/11/ 2016**

Subject Name: Neuro Computing and Applications

Time: 2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks**

Q.1 (a) There are two ways to interpret the role of the brain while considering the human body as a computational agent. One of them is to view the entire brain as a single unit that acts as the CPU for the whole body. The other is to consider the brain as a huge network of billions of processing units called neurons. Compare and contrast between these two views from computational perspective. **07**

(b) With the neat architecture, explain the training algorithm of heteroassociative network. **07**

Q.2 (a) Implement XOR function using McCulloch-Pitts neuron. (Consider binary data). **07**

(b) Using the Hebb rule, find the weights required to perform classification of the given input pattern shown in figure. The symbol "*" indicates the data representation to be +1 and "#" indicates data to be -1. Consider the pattern I belongs to the member of class (the target is +1) and for the pattern O does not belong to the member of class (the target is -1). **07**

```
* * *     * * *
# * #     * # *
* * *     * * *
Pattern – I   Pattern – O
```

---------- OR ---------- OR ----------

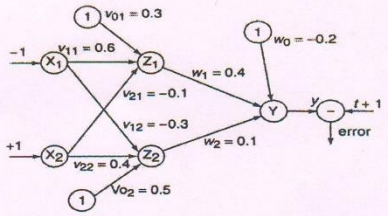
(b) Design a Hebb net to implement logical NOR function with **07**

(a) bipolar inputs and binary targets

(b) bipolar inputs and targets

Q.3 (a) With architecture explain the principle of back-propagation network. Derive the back-propagation algorithm for weight updation between the output layer and hidden layer. **07**

(b) Using back-propagation network, find the new weights for the network shown in figure. The network is presented with the input pattern [-1, 1] and the target output is +1. Use learning rate of $\alpha = 0.25$ and bipolar sigmoidal activation function. **07**



---------- OR ---------- OR ----------

Q.3 **(a)** Draw the architecture of ADALINE and MADALINE net. Differentiate two training algorithms for MADALINE, *viz.*, MR-I and MR-II. **07**

(b) Implement OR function with bipolar inputs and targets using ADALINE net. Consider the initial weights are $b = w_1 = w_2 = 0.1$, and the learning rate is set to $\eta = 0.1$. Show the performance (i.e. MSE) of the ADALINE net at least for two epochs of learning. **07**

Q.4 **(a)** With neat architecture, explain the training algorithm of Kohonen self-organizing feature maps. **07**

(b) Construct and test an Learning Vector Quantization (LVQ) net with five vectors assigned to two classes. The given vectors along with the classes are as shown in table. **07**

Vector	Class
[0 0 1 1]	1
[1 0 0 0]	2
[0 0 0 1]	2
[1 1 0 0]	1
[0 1 1 0]	1

---------- OR ---------- OR ----------

Q.4 **(a)** What is the basic concept behind Adaptive Resonance Theory (ART)? Sketch the architecture of ART 1 network and discuss its training algorithm. **07**

(b) With neat architecture, explain each step of flowchart for training algorithm of Radial Basis Function (RBF) network. Further, list out major differences between RBF and back-propagation multi-layer network. **07**

Q.5 **(a)** Discuss how a Support Vector Machine (SVM) can be used to solve an M-ary pattern classification problem, where M=2. **07**

(b) Write notes on application of neural networks in pattern recognition. **07**

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Q.5 **(a)** Briefly explain NARX model for recurrent network architecture. **07**

(b) Discuss application of neural networks in robotics. **07**

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