

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME Semester –III Examination Dec. - 2011

Subject code: 730205

Date: 08/12/2011

Subject Name: Fuzzy Logic and Neural Networks

Time: 10.30 am – 01.00 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) Explain fuzzy (rule-based) systems in detail. **07**
(b) Explain any three defuzzification techniques. **07**

- Q.2** (a) Describe features of the membership function. **07**
(b) Explain the properties of Membership functions. **07**

OR

- (b) Explain fuzzy tolerance and equivalence relations. **07**

- Q.3** (a) Explain any two ways to develop the numerical values that characterize a relation: (Any Two) **07**
(i) Cartesian product
(ii) Closed-form expression
(iii) Lookup table
(iv) Linguistic rules of knowledge
(v) Classification
(vi) Automated methods from input/output data
(vii) Similarity methods in data manipulation

- (b) A rectangular sheet of perimeter $2L + 2h$ is to be rolled into a cylinder with height, h . Classify the cylinder as a function of the rectangular sheet as being a rod, cylinder, or disk by developing membership functions for these shapes. **07**

OR

- Q.3** (a) Describe the form of generalized learning rule. Differentiate between Hebbian learning rule and Delta learning rule. **07**
(b) Describe steps of perceptron learning algorithm. What can be the suitable termination criteria for this algorithm? How can you handle non numeric input with this algorithm? **07**

- Q.4** (a) Apply Hebbian learning rule for the network having one node with four inputs. The initial weight vector connecting all the inputs is $W = [1 \ -3 \ -1 \ 1]$. Consider input patterns to be $X_1 = [1 \ -2 \ 0 \ -1]$, $X_2 = [0 \ 1.5 \ -1 \ -1]$, $X_3 = [-1 \ 1 \ 0.5 \ -1]$. Display the updated weight vector after applying input training patterns. Consider bipolar activation function $f(\text{net}) = \text{sgn}(\text{net})$ for the calculation. **07**

- (b) Explain the working of Hopfield network in detail. Which kind of applications can be solved using Hopfield network. **07**

OR

- Q.4** (a) What is error back propagation? Explain error back propagation with necessary derivations. **07**

- (b) Explain the algorithm for multiple training encoding strategy. 07
- Q.5** (a) Differentiate hetero-correlation with auto-correlation. Explain storage and retrieval process of discrete bidirectional associative memory. 07
- (b) Describe the architecture of Radial Basis Function Network (RBF net). Explain the steps of forward and backward calculation to train RBF net. 07
- OR**
- Q.5** (a) What is swarm intelligence? How it is different from genetic algorithms? List swarm intelligence based algorithms. In which types of applications neural network is suitable, and in which types of applications swarm intelligence based algorithms are suitable? 07
- (b) Explain the principle behind topologically organized network. Describe the steps of completion, cooperation, and synaptic adaptation for self organizing maps. 07
