

(Time: 3 Hours)

Total Marks: 80

N.B. (1) Question No 1 is compulsory

(2) Attempt any 3 Questions out of the remaining six questions

- Q1** (a) For following dataset, Class 'X' data points are P1(1,2), P2(1,1) and class 'O' data points are Q1(2,3), Q2(-1,1), Q3(3,2). Plot the points and determine that the given dataset is linearly separable or not. 5
- (b) State activation functions used in Neural network? Plot each of them with its equation. 5
- (c) State the differences between derivative based and derivative free optimization 5
- (d) Derive identity for unipolar continuous function : $f^*(net) = O(1-O)$ 5
- Q2** (a) What is Multi-Layer Perceptron? With the Block Diagram explain the algorithm used to adjust weights at each layer. Show it for two layers. 10
- (b) Use perceptron learning rule for computing weights after one iteration for the data given below: (use Binary Bipolar function.
 $X_1 = [1 \ -2 \ 0 \ -1]^T$; $X_2 = [0 \ 1.5 \ -0.5 \ -1]^T$; $X_3 = [-1 \ 1 \ 0.5 \ -1]^T$. Initial weight $W^1 = [1 \ -1 \ 0 \ 0.5]$. The learning constant is given by $c=0.1$. Desired output for X_1, X_2, X_3 are $[-1, -1 \ 1]$ respectively. 10
- Q3** (a) Design a Fuzzy system to predict price of the Resale cars. Assume Total Mileage and year of Manufacturing as input variables (attributes) and Sale price as an output variable. Assume 3 descriptors (values of variables) for each input attributes and 5 descriptors for output attributes.
1. Show clearly the units used for & universe of discourse of each attribute. 02
 2. Create Fuzzy Rulebase for Price prediction Problem. 03
 3. Define fuzzy membership functions for all Input and Output attributes 05
- (b) Explain Kohanan's Self Organizing Map w.r.t its architecture, Layers, How to determine no. of neurons in the layers (may give example), Neighborhood, Stopping conditions and applications. 10
- Q4** (a) For the given Fuzzy sets M (Medium) & H (High), Find fuzzy set 1. Very High 10
 2. Medium and High 3. Medium or High 4. $M_{\alpha=0.5}$ (Alpha level) 5. NOT High.
 $M = \{0.2/a + 0.4/b + 1/c + 0.8/d + 0/e\}$
 $H = \{0.1/a + 0.4/b + 0.3/c + 0.6/d + 0.8/e\}$
- (b) Design Mc- Culloch-Pitt's Neuron model to solve following functions 10

1.

X1	X2	D
0	0	0
0	1	0
1	0	1
1	1	1

2.

X1	X2	D
0	0	0
0	1	0
1	0	0
1	1	1

- Q5 (a) Explain Centre of Sums defuzzification techniques with suitable example. 04
(b) Determine the weights after two iterations for Hebbian learning of a single neuron network using Bipolar Binary activation function starting with initial weights $w = [-1, -1]$ and input patterns are $X1 = [1.3, -1]$, $X2 = [2.1, 3.2]$, $X3 = [-1.2, -1.8]$ and $c = 1$ 08
(c) Describe Roulette wheel and Tournament selection methods in Genetic Algorithms. 08
- Q6 (a) Differentiate Winner Take All and Learning Vector Quantization in terms of weight updation, Learning type, topological neighborhood, applications. 04
(b) Why we need Hybrid systems? Draw and explain architecture of ANFIS. 10
(c) State the differences between derivative based and derivative free optimization 06
