Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 730803 **Date: 28-11-2013**

Subject Name: Soft Computing Methods

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)** What is soft computing? Discuss one application that shows the importance of soft computing. **07**

(b) Show the important features and properties of Neuro-fuzzy hybrid systems in comparisons with neural network and fuzzy systems. **07**

Q.2 **(a)** Sketch and explain the architecture of biological neuron. Discuss the single layer neural network perceptron model. **07**

(b) Design a perceptron for the OR function binary inputs and unipolar targets shown as **07**

x_1	x_2	T
0	0	0
0	1	1
1	0	1
1	1	1

The initial weights: $w_{01} = 0.1$ $w_{11} = 0.1$, $w_{21} = 0.2$.

The learning rate constant $\eta = 0.2$ and threshold = 0.5.

---------- **OR** ---------- **OR** ----------

(b) With suitable example explain Gauss elimination method. Preferably write MATLAB code for the same. **07**

Q.3 **(a)** Explain the various membership functions for crisp to fuzzy conversions. **07**

(b) Differentiate the working principle between Neuro-Fuzzy Systems and Fuzzy Neural Network. **07**

---------- **OR** ---------- **OR** ----------

Q.3 **(a)** Explain following terms with respect to Fuzzy systems **07**

(i) Fuzzification (iii) Defuzzification

(ii) Membership function (iv) Linguistic variables

(b) Consider two fuzzy sets $\tilde{A}$ and $\tilde{B}$ as shown **07**

$$\tilde{A} = \left\{ \frac{0}{1} + \frac{0.5}{2} + \frac{0.3}{3} + \frac{0.7}{4} + \frac{0.9}{5} \right\} \text{ and } \tilde{B} = \left\{ \frac{0.2}{1} + \frac{0.4}{2} + \frac{0.6}{3} + \frac{0.9}{4} + \frac{0.4}{8} \right\}$$

Find (i) $\tilde{A} \cup \tilde{B}$ (ii) $\tilde{A} \cap \tilde{B}$ (iii) $\overline{\tilde{A}}$ (iv) $\tilde{A} / \tilde{B}$ (v) $\tilde{A} \times \tilde{B}$ (vi) $\tilde{A} \square \tilde{B}$ (vii) $\tilde{A} \oplus \tilde{B}$

Q.4	**(a)**	State the comparison between pattern mode and batch mode of training.	**07**
	(b)	With respect to Game theory explain the negotiations method with suitable example.	**07**

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

Q.4	**(a)**	Define software agents and show their role in negotiations with suitable example.	**07**
	(b)	Explain the back-propagation training algorithm for the case when the activation function is an arctan function.	**07**
Q.5	**(a)**	With suitable example, explain the crossover and mutation techniques used in the genetic algorithm process.	**07**
	(b)	Solve the logical AND function using genetic algorithm by writing a program using a MATLAB code.	**07**

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

Q.5	**(a)**	State key features of genetic algorithm. Explain in detail any one application which can be effectively solved using genetic algorithm.	**07**
	(b)	Explain how Artificial neural network, Fuzzy logic and Genetic algorithm can be combined for certain applications.	**07**

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