

GUJARAT TECHNOLOGICAL UNIVERSITY**SEMESTER– 2 EXAMINATION – WINTER 2012****Subject code: 640009****Date: 11/01/2013****Subject Name: Soft Computing (SC)****Time: 10:30 – 13:00****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)** Answer the following questions:
- (i) What is artificial neural network? What are its characteristics? **02**
 - (ii) Define and differentiate weight and bias in neural network. **02**
 - (iii) Differentiate fuzzy logic and crisp logic? Define max-min composition in fuzzy. **03**
- (b)** Answer the following questions:
- (i) What is the necessity for activation function in neural network? **02**
 - (ii) What is the difference between inhibitory and excitatory weighted connections? **02**
 - (iii) Explain bit-wise operators in GA. **03**

- Q.2 (a)** Answer the following questions:
- (i) List commonly used activation functions in neural network. **03**
 - (ii) Differentiate feed-forward and feedback network. Construct a feed-forward network with five input nodes, three hidden nodes and four output nodes that has a lateral inhibition structure in the output layer. **04**
- (b)** Using Hebb rule, find the weights required to perform following classification. The vectors (1, -1, 1, -1) and (1, 1, 1, -1) belong to class (target value +1); vectors (-1, -1, 1, 1) and (1, 1, -1, -1) do not belong to class (target value -1). **07**

OR

- (b)** Explain the architecture of Back-propagation network with learning. **07**
- Q.3 (a)** Explain training algorithm in Perceptron network with its architecture and flowchart. **07**
- (b)** Construct a Maxnet with four neurons and inhibitory weight $w = 0.25$, given the initial activations (input signals) as follows: **07**

$$a_1(0) = 0.1 \quad a_2(0) = 0.3 \quad a_3(0) = 0.4 \quad a_4(0) = 0.7$$

OR

- Q.3 (a)** Construct a heteroassociative network to store and recognize the pattern given below: **07**

*	*	*	*	*	*
+	*	+	*	+	+
*	*	*	*	*	*

“I”

“C”

Target Value: (1, -1)

Target Value: (-1, 1)

- (b)** State various neural networks designed for typical applications. With an architectural diagram, explain the working principle of Boltzmann machine in different applications. **07**
- Q.4 (a)** Let $X = \{x_1, x_2, x_3\}$, $Y = \{y_1, y_2\}$, $Z = \{z_1, z_2, z_3\}$ and let R be a relation on $X \times Y$ and S be a relation on $Y \times Z$ defined as follows: **07**

$R = \begin{matrix} & y_1 & y_2 \\ x_1 & 0.5 & 0.1 \\ x_2 & 0.2 & 0.9 \\ x_3 & 0.8 & 0.6 \end{matrix}$	$T = \begin{matrix} & y_1 & y_2 \\ x_1 & 0.4 & 0.2 \\ x_2 & 0.3 & 0.7 \\ x_3 & 0.1 & 0.9 \end{matrix}$	$S = \begin{matrix} & z_1 & z_2 & z_3 \\ y_1 & 0.6 & 0.4 & 0.7 \\ y_2 & 0.5 & 0.8 & 0.9 \end{matrix}$
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Obtain $R \cup T$, $R \cap T$ and max-min composition $R \circ S$ of two fuzzy relations.

- (b) Explain fuzzy propositions and connectives with example. 07

OR

- Q.4 (a) What is the need of defuzzification? Explain various defuzzification methods with example. 07

- Q.4 (b) Explain the basic architecture of FLC and write steps involved in designing FLC. 07

- Q.5 (a) Why encoding is performed in genetic algorithm? Explain various encoding methods with example. 07

- (b) Explain Deletion and duplication, Deletion and Regeneration, Segregation and Cross-over with Inversion operators with example in genetic modeling. 07

OR

- Q.5 (a) What is the need for cross-over operator in genetic modeling? Explain two-site, multi-site and uniform cross-over with example. 07

- (b) State various reproduction methods used in genetic algorithm. Explain why roulette-wheel selection method is modified in rank selection. 07
