Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CSE)/SEM-8/CS-801B/2012

2012

SOFT COMPUTING

Time Allotted : 3 Hours *Ful Marks* : 70

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) For a ne work with inputs $[x_1, x_2, x_3] = [0 \cdot 3,\ 0 \cdot 5,\ 0 \cdot 6]$ and weights $[w_1, w_2, w_3] = [0 \cdot 2,\ 0 \cdot 1,\ -0 \cdot 3]$, the net output to the output *M-P* neuron is

   a) 0·07 b) – 0·07

   c) 0·7 d) – 0·7.

ii) For a 3-input neuron representing a perceptron, where $[x_1, x_2, x_3] = [0 \cdot 8,\ 0 \cdot 6,\ 0 \cdot 4]$ and weights $[w_1, w_2, w_3] = [0 \cdot 1,\ 0 \cdot 3,\ -0 \cdot 2]$ and bias b = 0·35, the output of the neuron using bipolar sigmoid activation function is

a) 0·625 b) 0·764

c) 0·259 d) 0·346.

iii) The boundary of the fuzzy set A is defined by those elements x of the universe such that

a) $\mu A(x) = 1$ b) $0 < \mu A(x) < 1$

c) $\mu A(x) = 0$ d) $0 \le \mu A(x) \le 1$.

iv) The Hebbian rule is ..... type of learning.

a) supervised b) competitive

c) unsupervised d) reinforced.

v) Single layer perceptron is used for

a) linear separability b) error minimization

c) back propagation d) annealing.

vi) In fuzzy logic controller the rule base is updated by the help of

a) Fuzzy logic b) ANN and GA

c) Hebb's rule d) none of these.

vii) If a problem is linearly separable, then we can find the weight vector W_i, such that $W_i^T . X > 0$, for each X, with desired output '+1' and $W_i^T . X < 0$, for each X, with desired output '–1'.

a) True b) F lse

c) Can't say d) None of these.

viii) Combination of gen s for representing a particular property of an individual is known as

a) gene b) genome

c) allele d) chromosome.

ix) The size of each chromosome for the problem maximizing a function $f(x) = x^2$ in the interval $0 \leq x \leq 31$ is

a) 8 b) 5

c) 4 d) none of these.

x) Let A and B are two fuzzy sets with membership function μ, then $\mu_{A\cup B}(x)$ is equal to

a) $\mu_A(x)+\mu_B(x)$ b) $\mu_A(x)-\mu_B(x)$

c) $\text{MAX}\{\mu_A(x), \mu_B(x)\}$ d) $\text{MIN}\{\mu_A(x), \mu_B(x)\}$.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Compare between supervised learning and unsupervised learning with proper diagrams

3. Discuss about the different ctivation functions used of training artificial neural networks.

4. Indicate different p rameters of classical GA.

5. Define the s gnal layer perceptron net and its linear separ bility

6. Consider two fuzzy sets $\underset{\sim}{A} = \left\{\frac{0\cdot 2}{1}+\frac{0\cdot 3}{2}+\frac{0\cdot 4}{3}+\frac{0\cdot 5}{4}\right\}$ and $\underset{\sim}{B} = \left\{\frac{0\cdot 1}{1}+\frac{0\cdot 2}{2}+\frac{0\cdot 2}{3}+\frac{1}{4}\right\}$. Find the algebraic sum and algebraic product of the given fuzzy sets.

GROUP – C

(Long Answer Type Questions)

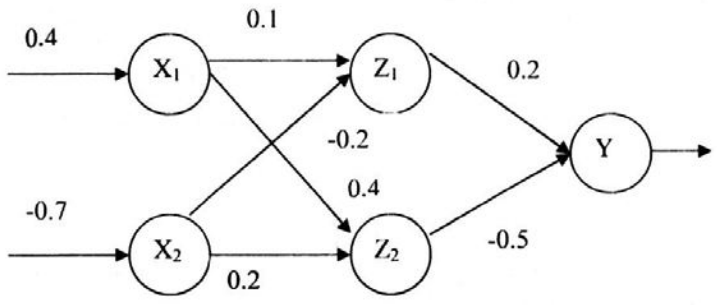
Answer any *three* of the following. $3 \times 15 = 45$

7. a) Using Hebb Network, implement AND function with bipolar inputs and targets.

   b) Write down the training algorithm and testing algorithm for the single layer perceptron network using perceptron learning rule.

   c) What is 'delta learning rule' ? 6 + 6 + 3

8. a) Find the new weights of he back propagation network after the first iteration of the following figure by using suitable activation function :



Assume with given vectors, Input pattern I = [0·4,– 0·7], Target t = [0·1], Weight vector from input layer to

hidden layer $V = \begin{bmatrix} 0\cdot1 & 0\cdot4 \\ -0\cdot2 & 0\cdot2 \end{bmatrix}$, Weight vector from hidden layer to output layer $W = \begin{bmatrix} 0\cdot2 \\ -0\cdot5 \end{bmatrix}$.

Show new weight vector W and V after first iteration. State the proposed scheme of convergence of the above net.

b) Using Perceptron Network, implement XOR function with bipolar inputs and targets.

c) What are the two algorithms used in a Madeline net ? Differentiate them. 7 + 4 + 4

9. a) Discuss about fuz y Cart sian product with example.

b) Two fuzzy relations are given by $\underset{\sim}{R} = \begin{matrix} \\ x_1 \\ x_2 \end{matrix} \begin{matrix} \begin{matrix} y_1 & y_2 \end{matrix} \\ \begin{bmatrix} 0\cdot6 & 0\cdot3 \\ 0\cdot2 & 0\cdot9 \end{bmatrix} \end{matrix}$ and

$\underset{\sim}{S} \begin{matrix} \\ y_1 \\ y_2 \end{matrix} \begin{matrix} \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{bmatrix} 1 & 0\cdot5 & 0\cdot3 \\ 0\cdot8 & 0\cdot4 & 0\cdot7 \end{bmatrix} \end{matrix}$. Obtain fuzzy relation $\underset{\sim}{T}$ as a composition between fuzzy relations.

c) Describe the importance of fuzzy sets. 5 + 6 + 4

10. a) Describe how genetic algorithms differ from other optimization and search procedures.

b) What is crossover rate and mutation rate ?

c) Use genetic algorithm to maximize the function $f(x) = x^2$ for $0 \leq x \leq 31$. The four initial population chromosome's size of 5 is selected as 01101, 11000, 01000, 10011. Show the first two iterations and justify the improvement of optimal solution of *x*. 5 + 4 + 6

11. Write short notes on any *three* of the following : 3 × 5

a) Biological neuron *vs* ANN

b) ART network

c) Defuzzification methods

d) Self organizing map

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