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CS/B.TECH/CSE/SEM-8/CS-801B/2013

2013
SOFT COMPUTING

Time Allotted : 3 Hours *Full 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 answer for the following : $10 \times 1 = 10$

i) Perceptron in an example of

a) Artificial Neural Network

b) Genetic Algorithm

c) Expert System

d) Fuzzy Logic.

ii) Fuzzy set theory was introduced by

a) Zadeh b) Rosenblatt

c) Minsky d) Glover.

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

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

c) $0 < \mu A(x) < 1$ d) $0 \leq \mu A(x) \leq 1$.

iv) A fuzzy number is a fuzzy set with the property of

a) only normal

b) only convex

c) both normal and convex

d) normal but not convex.

v) Let A and B are two fuzzy sets with membership function μ. Then $(x)\ A \cup B\ \mu$ is equal to

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

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

vi) The Back Propagation learning rule is ..... type of learning.

a) Supervised b) Competitive

c) Boltzmann d) Reinforcement.

vii) X-OR problem can be solved by

a) single layer perceptron

b) Bayes' theorem

c) multi-layer peceptron

d) all of these.

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

a) gene b) genome

c) allele d) chromosome.

ix) Consider two strings A = 11011 and B = 00110. After one of the steps of Genetic Algorithm, the string has the values A = 11010 and B = 00111 then the step is

a) Mutation b) Reproduction

c) Crossover d) none of these.

x) The problem with simulated annealing is

a) It is approximate

b) It is a low rate convergence

c) It does not yield the desired output

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. If A and B are two fuzzy sets :

(i) $A = \{ (x_1, 0 \cdot 2), (x_2, 0 \cdot 7), (x_3 . 1), (x_4, 0) \}$

$B = \{ (x_1, 0 \cdot 5), (x_2, 0 \cdot 3), (x_3, 1), (x_4, 0 \cdot 1) \}$,

find the difference in fuzzy sets.

(ii) $A = \{ (x_1, 0 \cdot 4), (x_2, 0 \cdot 8), (x_3, 1), (x_4, 0) \}$

$B = \{ (x_1, 0 \cdot 4), (x_2, 0 \cdot 3), (x_3, 0), (x_4, 0) \}$,

find the distance in fuzzy sets. $2\frac{1}{2} + 2\frac{1}{2}$

3. a) What is the composition of fuzzy relation ?

b) If R and S are two fuzzy relations, then find out the composition of the following fuzzy relation :

R	a	B	c	D		S	α	β	γ
1	0·1	0·2	0·0	1·0		a	0·9	0·0	0·3
2	0·3	0·3	0·0	0·2		b	0·2	1·0	0·8
3	0·8	0·9	1·0	0·4		c	0·8	0·0	0·7
						d	0·4	0·2	0·3

$2 + 3$

4. What are meant by feed forward net, competitive net and sigmoidal function ?

5. Explain convex fuzzy set and magnitude fuzzy set with an example.

6. Given two fuzzy numbers "Approx 3" = $\left\{ \frac{0 \cdot 2}{2} + \frac{1 \cdot 0}{3} + \frac{0 \cdot 2}{4} \right\}$ and "Approx 2 " = $\left\{ \frac{0 \cdot 3}{1} + \frac{1 \cdot 0}{2} + \frac{0 \cdot 3}{3} \right\}$; find "Approx 6" using "Approx 6 " = " Approx 3" × " Approx 2 ".

GROUP – C

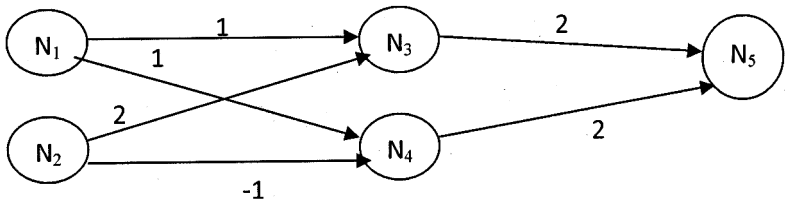
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Consider the neural network of McCulloch-Pitts neuron shown in fig. Each neuron (other than the input neuron N_1 and N_2) has a threshold 2.

   (i) Define the response of neuron N_5 at time t in terms of the activations of the input neuron, N_1 and N_2 at the appropriate time.

   (ii) Show that the activation of each neuron that results from an input signal of $N_1 = 1, N_2 = 0$ at $t = 0$;



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b) What is learning rule ? Describe Hebbian learning rule and Perceptron learning rule. 5

c) What is an activation function ? 2

8. a) Describe fuzzy homorphism with the following example where R and S are fuzzy relation. 5

R	a	b	C	d		S	α	β	γ
a	0·0	0·6	0·0	0·0		α	0·6	0·8	0·0
b	0·0	0·0	0·8	0·0		β	1·0	0·0	0·6
c	1·0	0·0	0·0	0·0		γ	0·6	0·0	0·0
d	0·0	0·6	0·0	0·0					

b) Explain trapezoidal fuzzy number.

If A = (1, 5, 6, 9) and B = (2, 2, 5, 8) are two trapezoidal fuzzy numbers, then find out their multiplication and addition. 2 + 4

c) Define the following : 4

(i) Core

(ii) Support

(iii) Boundary

(iv) λ-cut.

9. a) What is heteroassociative memory network ? 2

b) What is an algorithm of heteroassociative memory net ? 4

c) A heteroassociative net is trained by Hebb outer product rule for input row vectors $S = (x_1, x_2, x_3, x_4)$ to output row vectors $t = (t_1, t_2)$. Find the weigh matrix. 6

d) What is cylindrical extension ? 3

10. a) What are Ga's ? What are its benefits ? Explain with the help of a flowchart the working principle of Ga's.

1 + 2 + 3

b) Explain fitness proportionate selection. 3

c) What are the different types of crossover ? What happens when —

(i) Crossover rate is decreased

(ii) Mutation rate is increased. 2 + (2 × 2)

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

a) *S*-norm and *T*-norm

b) Fitness function

c) Boltzman machine

d) ANN architectures

e) Simulated annealing.