Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(CSE)/SEM-3/MCSE-301B/2012-13

2012
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

(Objective Type Questions)

1. Answer the following in brief : 5 × 2 = 10

   i) Explain union and intersection operators of fuzzy set with examples.

   ii) What do you mean by recurrent network ?

   iii) What is the difference between single layer feed forward network and multilayer feed forward network ?

   iv) What do you mean by schema in genetic algorithm ?

   v) What is the significance of mutation operator in Genetic algorithm ?

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Find the cardinality of the given fuzzy set :

   $\tilde{A}$ = { (*a*, 0·5), (*b*, 0·7), (*c*, 0·3) } . Explain the relationship between A^{α} and $A^{\text{strong }\alpha}$. Explain the relationship between A^{α} and A^{β} where $\alpha \le \beta$. 2 + 3

3. Discuss defuzzification methods. Find all possible α-cut and strong α-cut for the given fuzzy set $\tilde{A}_1$ = { (*a*, 0·4), (*b*, 0·2), (*c*, 0·7), (*d*, 0·72) } where α = 0·3. 3 + 2

4. Discuss different types of crossover methods in Genetic Algorithm. 5

5. Explain a MADALINE network to solve the XOR problem. 5

6. Write a short note on single layer feed forward neural network. 5

GROUP – C

(Long Answer Type Questions)

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

7. a) Apply the fuzzy Modus Ponens rule to deduce Rotation is quite slow, given :

   (i) If the temperature is high then the rotation is slow

   (ii) The temperature is very high.

   For *X* = { 30, 40, 50, 60, 70, 80, 90, 100 }, the set of temperatures and *Y* = { 10, 20, 30, 40, 50, 60 } the set of rotations per minute.

   H (High), VH (Very High), S (Slow) and QS (Quite slow) indicate the associated Fuzzy sets as follows :

   H = { (70, 1), (80, 1), (90, 0·3) },*VH* = { (90, 0·9), (100, 1) }, *QS* = { (10, 1), (20, 0·8) }, *S* ={(30, 0·8), (40, 1), (50, 0·6) }.

b) Explain concentration and dilation operators of fuzzy set using examples.

c) Explain different learning methods in artificial neural network. 7 + 3 + 5

8. a) What is Kohonen's Self-organizing network ?

b) Explain Rosenblatt's perceptron model.

c) Consider the fuzzy sets $\tilde{A}_3$, $\tilde{A}_4$ defined on the interval X = [0, 5] of real numbers, by the membership grade functions $\mu_{\tilde{A}3(x)} = x / (x + 1)$, $\mu_{\tilde{A}4(x)} = 2^{-x}$. Determine the mathematical formulae and graphs of the membership grade functions of each of the following sets : (a) $\tilde{A}_3^c$, $\tilde{A}_4^c$, (b) $\tilde{A}_3$ union $\tilde{A}_4$, (c) $\tilde{A}_3$ intersection $\tilde{A}_4$, (d) $\tilde{A}_3 - \tilde{A}_4$. 3 + 3 + 9

9. What is ANN-Back-propagation learning ? Illustrate ANN-Back-propagation learning algorithm with the help of following example (Figure 1).

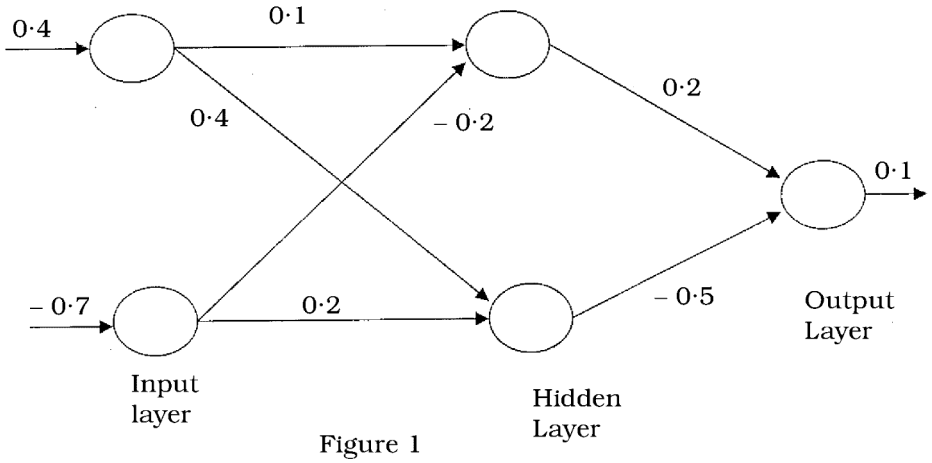

Figure 1

Consider Input = { 0·4, – 0·7 }, original output = { 0, 1 }, learning rate coefficient (λ) = 0·6 and the initial random weights as shown in Figure 1.

10. Explain the cycle of Genetic algorithm. What are the benefits of genetic algorithm ? Explain crossover rate, selection operator in genetic algorithm. Find different types of composition in fuzzy relation using the following relations.

R_1

	Y_1	Y_2
X_1	0.2	1
X_2	1	0.4
X_3	0.9	0.8

R_2

	Z_1	Z_2	Z_3
Y_1	0.7	0.6	0.5
Y_2	1	1	1

3 + 3 + 4 + 5