(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0935 Roll No. | | | | | | | | | | |

B. Tech.

(SEMESTER-III) THEORY EXAMINATION, 2012-13

INTRODUCTION TO SOFT COMPUTING (NEURAL NETWORKS, FUZZY LOGIC AND GENETIC ALGORITHM)

Time : 3 Hours] *[Total Marks : 100*

Section – A

1. Attempt **all** parts. **10 × 2 = 20**

(a) List the features of biological Neuron(s) and compare it with computer.

(b) What is the use of threshold value ?

(c) Why Sigmoid function is so important and popular activation function in neural networks ?

(d) A back-propagation network has 6 neurons in the input layer and 3 neurons in the output layer. What is the number of neurons in the hidden layer ?

(e) Let A and B be two fuzzy sets given by : A = ($x1$, 0.2), ($x2$, 0.5), ($x3$, 0.6)} B = {$x1$, 0.1), ($x2$, 0.4), ($x3$, 0.5)}. Find the membership value of $x2$ in (A–B).

(f) Draw fuzzy membership Function to describe cold, warm and hot water.

(g) Differentiate between fuzzy sets and crisp sets.

(h) Let A and B be two fuzzy sets with $\mu_A(x) = 0.2$ and $\mu_B(x) = 0.1$, for the rule : If A or B then C, what is fuzzy membership of C ?

(i) Briefly explain Roulette Wheel Selection in genetic algorithms.

(j) For what purpose genetic algorithms can be applied in telecommunication routing ?

Section – B

2. Attempt any **three** parts. **10 × 3 = 30**

(a) What are associative memories ? How an associative memory can be used to identify a noisy input pattern ?

(b) What is back propagation learning ? Explain forward pass and backward pass in conjunction with back propagation learning. Shall it be called unsupervised learning ? Why ?

(c) Suppose that 'abnormal marks out of ten' is defined as the fuzzy set: $F_{ABNORMAL}$ = {(0, 0.1), (1, 0.9), (2, 0.7), (3, 0.5), (4, 0.3), (5, 0.1), (6, 0.1), (7, 0.3), (8, 0.5), (9, 0.9), (10, 0.9)} and 'high marks out of ten' is defined as the fuzzy set: f_{HIGH} = {(0, 0), (1, 0), (2, 0), (3, 0.1), (4, 0.2), (5, 0.3), (6, 0.4), (7, 0.6), (8, 0.7), (9, 0.8), (10, 1.0)} Derive the composite function 'abnormally high marks out of ten'.

(d) Give fuzzy logic inference mechanism for the following rule under fuzzy logic. The rule : IF A THEN B ELSE C where A = very small, B = very large and C = NOT very large.

small and large are defined as under

small=1/1 + 0.8/2 + 0.4/3 + 0.2/4 + 0/5

large=0/1+0/2+0/4+0.8/4+1/5

If A has size = 4, then what would be the resultant inference

(e) Explain the effect of selection, crossover and mutation in evolutionary computation. How is the population affected by the use of each one of these operators ? What happens if you use a relatively high rate of mutation ?

Section – C

Attempt **all** parts. **10 × 5 = 50**

3. Attempt any **two** parts.

   (a) What are perceptions ? Describe how the gradient descent method is used in context of perceptions.

   (b) What is meant by activation function in ANN ? Describe the various activation functions that are employed and compare them.

   (c) Create an AND network with extra input neuron.

4. Attempt any **two** parts.

   (a) Whether momentum term is required for learning in a back-propagation network ? What is the effect of this term ?

   (b) How does learning rate play an important role in learning ? How can the training of neural network be improved ?

   (c) What is Back propagation error ? Mention the heuristics which will significantly improve the performance of Back Propagation algorithm.

5. Attempt any **two** parts.

   (a) Let A and B be two fuzzy sets given by A = $\{(x1, 0.2), (x2, 0.5), (x3, 0.6)\}$; B = $\{(x1, 0.1), (x2, 0.4), (x3, 0.5)\}$. Find $(A–B)^2$.

   (b) Define a membership function for old people and generate a fuzzy set using this function.

   (c) Explain fuzzy set theory in brief. Give fuzzy set representation of small integers.

6. Attempt any **two** parts :

   (a) Briefly explain the MAX-MIN, MAX-PRODUCT, AVERAGING and ROOT-SUM-SQUARE (RSS) methods of inferencing in fuzzy-logic.

   (b) Justify the use of fuzzy logic in AI. Give industrial examples where fuzzy logic concept and control is used.

   (c) Explain the following terms giving suitable examples : Fuzzyfications & Defuzzifications.

7. Attempt any **two** parts.

(a) How genetic algorithms perform better result as compared to traditional approaches ?

(b) How can Fitness functions be found for any optimization problem ? Explain, in detail, Fitness Function in Genetic algorithm.

(c) In a Genetic Algorithm, suppose that two potential parents are given by

1	1	0	0	1	1	0	1	1	1

0	0	1	1	1	0	1	0	0	1

Assuming the numbering goes from left to right and that $\xi 1 = 4$ and $\xi 2 = 8$, show the result of two-point crossover.