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

PAPER ID : 0935 Roll No.

B.Tech.

(SEMESTER-IV) 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) What is soft computing ? How is it different from conventional computing ?

(b) What is AI ? List any five applications of AI.

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

(d) What is the significance of Recurrent networks ?

(e) Let A and B be two fuzzy sets given by : A = $\{x_1, 0.2), (x_2, 0.5), (x_3, 0.6)\}$; B = $\{x_1, 0.1), (x_2, 0.4), (x_3, 0.5)\}$. Find the membership value of x_2 in (A–B).

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

(g) What is the significance of fuzzy quantifiers ?

(h) What are modifiers in linguistic hedges ?

(i) Differentiate between Conditional and Unconditional fuzzy proposition.

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

SECTION – B

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

(a) To which of the two paradigms – Supervised or Unsupervised learning does the following algorithm belong. Justify your answer.

(i) Hebbian

(ii) Competitive

(iii) Perceptron

(iv) Widrow Hoff

(b) Explain the selection criteria of various parameters in BPN.

(c) In a Jordan network with i input neurons, h hidden layer neurons, and o output neurons :

(a) How many neurons will there be in the state vector ? and

(b) If i = 4, h = 3, and o = 2, draw a diagram showing the connectivity of the network.

(d) Use GA to solve the following non-linear programming problem :

Minimize $(x_1 - 2.5)^2 + (z_2 - 5)^2$ subject to $5.5x_1 + 2x_2^2 - 18 <= 0 \quad 0 <= x_1, x_2 <= 5$

Give three and two decimal places of accuracy to variable x_1, x_2 respectively.

(i) How many bits are required for coding variable ?

(ii) Write down the fitness function which you would be using in reproduction.

(e) Discuss various reproduction operators. Find out the expected no. of copies of best string for the population and their fitness value given below. (Use tournament selection and Elitism reproduction method) :

String	Fitness
01101	5
11000	2
10110	1
00111	10
10101	3
00010	100

SECTION – C

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

3. Attempt any **two** parts.

   (a) Explain the different types of artificial neural networks.

   (b) Implement a MADALINE network to solve the XOR problem.

   (c) Discuss the relationship between Reinforcement and Supervised learning.

4. Attempt any **two** parts.

   (a) Explain the Multiple Training Encoding Strategy.

   (b) Explain the effect of tuning parameters of the Back-Propagation neural network.

   (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 $A = \{(x_1, 0.2), (x_2, 0.5), (x_3, 0.6)\}$; $B = \{(x_1, 0.1), (x_2, 0.4), (x_3, 0.5)\}$. Find $(A-B)^2$

   (b) Consider the fuzzy sets A' and B' defined on the interval X = [0, 5] of real numbers, by the membership grade functions.

   $\mu_{\tilde{A}}(x) = x / (x + 1)$, $\mu_{\tilde{B}}(x) = 2^{-x}$

   Determine the mathematical formulae and graphs of the membership grade function of each of the following sets :

   (i) A^c, B^c

   (ii) $A \cup B$

   (c) Differentiate between Roulette – wheel based on fitness and Roulette – wheel based on rank with a suitable example.

6. Attempt any **one** part.

   (a) Prove that the following rule is a Tautology

   $[(A \rightarrow B) \cap (B \rightarrow C)] \rightarrow (A \rightarrow C)]$

(b) Suppose we characterize parameter temperature in fuzzy linguistic terms as follows :

Low temp – 1/131 + 0.8/132 + 0.6/133 + 0.4/134 + 0.2/135 + 0/136

High temp = 0/134 + 0.2/135 + 0.4/136 + 0.6/137+ 0.8/138 + 1/139

Find the truth value for the following proposition :

(i) Temp not very low and not very high

(ii) Temperature fairly high

(iii) Temperature very very low

(iv) Temperature slightly high

7. Attempt any **two** parts.

(a) What are Genetic Algorithms ? Draw the general flow diagram of genetic algorithm.

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

(c) Explain Convergence of GA.