

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

**PAPER ID : 0935**

Roll No.

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**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  $5.5x_1 + 2x_2^2 - 18 \leq 0$   $0 \leq x_1, x_2 \leq 5$

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

$$\text{Low temp} = 1/131 + 0.8/132 + 0.6/133 + 0.4/134 + 0.2/135 + 0/136$$

$$\text{High temp} = 0/134 + 0.2/135 + 0.4/136 + 0.6/137 + 0.8/138 + 1/139$$

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.