

Printed Pages : 4

EOE031

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

PAPER ID : 0935Roll No.

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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 : $A = (x_1, 0.2), (x_2, 0.5), (x_3, 0.6)$; $B = \{x_1, 0.1), (x_2, 0.4), (x_3, 0.5)\}$. Find the membership value of x_2 in $(A-B)$.
 - (f) Draw fuzzy membership Function to describe cold, warm and hot water.
 - (g) 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 ?

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

$$\text{small} = 1/1 + 0.8/2 + 0.4/3 + 0.2/4 + 0/5$$

$$\text{large} = 0/1 + 0/2 + 0/4 + 0.8/4 + 1/5$$

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 – CAttempt **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 $A = \{(x_1, 0.2), (x_2, 0.5), (x_3, 0.6)\}$; $B = \{(x_1, 0.1), (x_2, 0.4), (x_3, 0.5)\}$. Find $(A-B)^2$.
 - (b) 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
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0	0	1	1	1	0	1	0	0	1
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Assuming the numbering goes from left to right and that $\xi_1 = 4$ and $\xi_2 = 8$, show the result of two-point crossover.
