

00703

**M.Sc. (MATHEMATICS WITH APPLICATIONS  
IN COMPUTER SCIENCE)  
M.Sc. (MACS)**

**Term-End Examination**

**June, 2011**

**MMTE-007 : SOFT COMPUTING AND ITS  
APPLICATIONS**

*Time : 2 hours*

*Maximum Marks : 50*

*Note : Attempt any four questions from Q. No. 1 to Q. No. 6.  
Q. No. 7 is compulsory.*

1. (a) Consider two universe of discourse 6  
described by.

$$x = \{1, 2, 3, 4\} \text{ and } y = \{1, 2, 3, 4, 5, 6\}$$

Let two fuzzy sets A and B be given by :

$$A = \frac{0.8}{2} + \frac{1}{3} + \frac{0.3}{4} \text{ and}$$

$$B = \frac{0.4}{2} + \frac{1}{3} + \frac{0.6}{4} + \frac{0.2}{5}, \text{ then find a}$$

fuzzy relation R corresponding to :

If A then B.

- (b) Define any two neural memory models. 4  
Also, give one example of each.

2. (a) Draw a figure of a single layer perception where, unit 1 receives inputs from units 2 and 3. Consider connection weights  $w_{12}=2$  and  $w_{13} = -3$  ; inputs  $I_2=0.5$  and  $I_3=0.5$  ; threshold  $\theta_1 = 1$  ; and learning rate  $\eta = 0.3$ . Calculate the output  $O_1$  for the desired output  $T_1=1$ . Also compute the modified weights. 6
- (b) Define the following terms for the genetic algorithms : giving an example of each. 4
- (i) Population.
  - (ii) Search space.
  - (iii) Chromosome.
  - (iv) Dominant Allele Set.

3. (a) Let two universe of discourse  $x_1$  and  $x_2$  be defined as. 5

$$x_1 = x_2 = \{1, 2, \dots, 30\},$$

Let two fuzzy sets be defined as

$$\text{"Approximately 3"} = \frac{0.5}{1} + \frac{1}{2} + \frac{0.8}{3} \text{ and}$$

$$\text{"Approximately 7"} = \frac{0.6}{3} + \frac{0.8}{4} + \frac{1}{5}. \text{ Find}$$

the fuzzy set for "Approximately 21".

- (b) Consider the QA technique for the following travelling salesman problem involving 9 cities with parent chromosomes as below : 5

|          |   |   |   |   |   |   |   |   |   |
|----------|---|---|---|---|---|---|---|---|---|
| Parent 1 | F | I | G | E | D | C | A | H | B |
| Parent 2 | C | B | G | I | H | F | D | E | A |

Determine the children solution using order crossover #3 assuming 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> positions as key positions.

4. (a) Explain the perception learning rule in detail. Also interpret its geometrical representation. 6
- (b) Consider the fuzzy sets A and B defined on the interval  $x = [0, 5]$  of real numbers, by the following membership functions : 4

$$\mu_A(x) = \frac{x}{x+1}, \mu_B(x) = 2^{-x}.$$

Determine the mathematical formulae and graphs of the membership functions of  $A^C$  and  $B^C$ .

5. (a) Let a two - input neuron with  $b = 1.5$ ,  $w = [2, 3]$  and  $x^t = [6 \ -5]$ . Calculate the neuron output for the following transfer function : 5
- (i) A linear transfer function.
- (ii) Tan sigmoid transfer function.
- (iii) Hard limit transfer function.
- (b) Explain all the steps of fuzzy C-mean algorithm with input and output. 5
6. (a) Explain the following operation for a genetic algorithm giving an example of each. 4
- (i) Reproduction. (ii) Elitism.

- (b) State Schema Theorem. 3
- (c) Consider the ADALINE filter with two neurons in the input layer having weights  $w_{11}=2$ ,  $w_{12}=3$  and the input sequence is {... 0, 0, 5, -4, 0, 0..}. What is the filter output from 0 to 5 ? 3
7. Which of the following statements are true or false ? Give reasons for your answer. 10
- (a) In a single layer neural network if  $\sum_{i=0}^n x_i w_i < 0$  then the output is 1 otherwise it is -1.
- (b) Hetero association is the phenomenon of association of an input vector with itself as the output.
- (c) If  $\mu_A(x)=0.6$  and  $\mu_B(x)=0.8$ , then  $\mu_{A \cap B}(x)=0.6$ .
- (d) Hopfield network is a multi-layer neural network.
- (e) If  $\alpha_1 < \alpha_2$ , then the subset relation is  $A_{\alpha_1} \supseteq A_{\alpha_2}$ .
-