SOFT COMPUTING APPLICATION
(INFO 4282)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

   (i) Neural Networks are complex _____ with many parameters.
   (a) linear functions   (b) nonlinear functions
   (c) discrete functions   (d) exponential functions

   (ii) What are the advantages of neural networks over conventional computers?
   (x) They have the ability to learn by example
   (y) They are more fault tolerant
   (z) They are more suited for real time operation due to their high 'computational' rates
   (a) (x) and (y) are true   (b) (y) and (z) are true
   (c) (x) and (z) are true   (d) all of them are true.

   (iii) Which of the following selection techniques never selects the worst-fit chromosome of a population?
   (a) Roulette Wheel   (b) Rank selection
   (c) Tournament selection   (d) Both a & b.

   (iv) What kind of learning is back-propagation?
   (a) Supervised   (b) Unsupervised
   (c) Semi- supervised   (d) Reinforcement.

   (v) The order of schema H = *10*11*0* in genetic algorithm is _____.
   (a) 7   (b) 6   (c) 8   (d) 5.

   (vi) Which of the following genetic operator is based on the Darwinian principle of Survival of the fittest?
   (a) Selection   (b) Crossover
   (c) Mutation   (d) none of the above.

(vii) Classification is a _____ learning.
  (a) supervised   (b) unsupervised
  (c) semi -supervised   (d) reinforcement.

(viii) Which of the following is not a de-fuzzification method
  (a) Height method   (b) Centroid method
  (c) Weighted average method   (d) Resolution method.

(ix) In an Unsupervised learning _____.
  (a) specific output values are given
  (b) both inputs and outputs are given
  (c) no specific inputs are given
  (d) specific output values are not given.

(x) Clustering is a _____ learning.
  (a) supervised   (b) unsupervised
  (c) semi-supervised   (d) reinforcement.

Group - B

2. (a) Explain the basic steps of Genetic Algorithm.

   (b) State the advantages and disadvantages of Genetic Algorithm.

   6 + 6 = 12

3. (a) How is Genetic Algorithm different from traditional algorithms?

   (b) Explain the Schema theorem in details.

   (c) Which chromosome will be selected in the population for a random number 0.58 using Roulette-Wheel selection?

Chromosome no.	1	2	3	4	5
Fitness value	3.5	4.6	5	2.8	1.8

   3 + 4 + 5 = 12

Group - C

4. (a) Differentiate between fuzzy set and classical set with proper example.

   (b) What do you mean by fuzzification? Explain with suitable example.

   (c) Explain a fuzzification technique with suitable example.

   4 + 4 + 4 = 12

5. (a) Compare different defuzzification methods.

   (b) Let X = {0, 1, 2, ..., 6}, and let two fuzzy subsets, A and B, of X be defined by:

X	0	1	2	3	4	5	6
A	1	0.7	0	1	0.5	0	0.4
B	0.9	0.7	1	0.2	0.8	0.3	0

   Find : A ∩ B, A ∪ B, A' ∪ B' and A' ∩ B'

   4 + 8 = 12

Group - D

6. (a) Discuss the features of a membership function.

   (b) Name three strengths and three weaknesses of fuzzy expert systems.

   (c) Let A and B be fuzzy subsets of a universal set X. Show that
   $| A \cup B | = | A | + | B | + | A \cap B |$

   4 + 4 + 4 = 12

7. (a) Design a Hebb network to implement OR function using bipolar inputs and outputs.

   (b) Explain the principles of supervised and unsupervised learning in neural network.

   8 + 4 = 12

Group - E

8. (a) Using perceptron model of ANN design an OR gate.

   (b) What is the significance of initial weight and learning rate in training of ANN?

   8 + 4 = 12

9. (a) Implement AND gate using perceptron network for bipolar inputs and outputs.

   (b) Explain the back-propagation algorithm.

   6 + 6 = 12