C9-R4:SOFT COMPUTING

NOTE :

1.	**Answer question 1 and any FOUR from questions 2 to 7.**
2.	**Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours   **Total Marks: 100**

1. (a) Compute the net input to the output neurons with bias 0.45. Given three input neurons and weight as follows:

$$[x1,x2,x3]=[0.3,0.5,0.6]$$
$$[w1,w2,w3]=[0.2,0.1,-0.3]$$

    (b) Explain Fuzzy Filtered Neural Network.
    (c) Illustrate how genetic algorithm is controlled by fuzzy logic.
    (d) Explain Hebb Network.
    (e) Enlighten the types of Neuro-Fuzzy Systems.
    (f) What is associative memory ? Explain its types.
    (g) State different de-fuzzification technique.

(7×4)

2. (a) Define the terms chromosome, fitness function, crossover and mutation as used in genetic algorithms. Write pseudocode of genetic algorithm.
    (b) Explain Fuzzy inference system in detail.

(9+9)

3. (a) Simulated annealing technique is useful in solving travelling salesman problem. Justify with detail explanation.
    (b) A genetic algorithm is to be used to evolve a binary string of length 'n' containing only 1s. The initial population is a randomly generated set of binary strings of length 'n'.

       (i) Give a suitable fitness function for this problem.
       (ii) Will the offspring of parents with a high fitness value generally also have a high fitness value, given your fitness function ? Explain your answer.
       (iii) If the population size in a genetic algorithm is restricted to 1, what search algorithm does it correspond to ? Explain your answer.

(10+[2+2+4])

4. (a) Explain derivative free optimization techniques. Illustrate hill climbing as a problem solving technique with flowchart.
    (b) Describe search optimization algorithm along with its types.

(10+8)

5. Explain the following multicriteria decision making with respect to fuzzy logic:

    (i)   Pareto-Optimal Decisions

    (ii)   Compromise Decisions

    (iii) Generalized Compromise Decisions

    (iv) Aggregation of Fuzzy Criteria

    (v)   Fuzzy Bayesian Decision Making

(3+3+4+4+4)

6. (a) Explain the crisp logic or sets. Illustrate the operations involved in classical set along with its properties with example.

    (b) Justify the following statement: "Partial membership is allowed in fuzzy sets." Discuss in detail the operations and properties of fuzzy sets.

(9+9)

7. (a) Consider two fuzzy sets:

$$\tilde{A}=\left\{\frac{0.2}{1}+\frac{0.3}{2}+\frac{0.4}{3}+\frac{0.5}{4}\right\}$$
$$\tilde{B}=\left\{\frac{0.1}{1}+\frac{0.2}{2}+\frac{0.2}{3}+\frac{1.0}{4}\right\}$$

Find the algebraic sum, algebraic product, bounded sum and bounded difference of the given fuzzy set.

    (b) Explain the following terms related to artificial neural network:

    (i)   Weights

    (ii)   Bias

    (iii) Perceptron

    (iv) Learning

(8+[2+2+2+4])

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