

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) What is soft computing? Differentiate between soft computing and hard computing.
- b) Genetic algorithms (GA) are different from traditional optimization methods. Highlight the key features of GA.
- c) Explain Genetic Fuzzy Systems in brief.
- d) Briefly discuss Roulette wheel selection method in GA.
- e) Highlight some of the key characteristics of derivative free optimization
- f) What are various application areas of Adaptive Neuro-Fuzzy Inference Systems (ANFIS)?
- g) Define activation function and its types, applied for ANN problems.

(7x4)

2.

- a) Elaborate fuzzy filtered neural networks? What are its advantages of use? Explain its applications.
- b) Reinforcement learning is a popular method used in machine learning to produce intelligent programs. Justify the statement by giving a suitable example.
- c) Briefly discuss Hill Climbing search technique.

(6+6+6)

3.

- a) Simulated annealing (SA) is a probabilistic search technique. Briefly discuss SA. In order to apply the SA method to a specific problem, one must specify some parameters. Discuss those parameters in brief.
- b) Discuss supervised and unsupervised learning techniques with suitable example.

(12+6)

4.

- a) Considering a configuration of L-input neurons, m-hidden neurons, and n-output neurons, draw the architecture of Fuzzy Back Propagation System and discuss the computations carried out by each layer.
- b) In context of Genetic Algorithms discuss the crossover operator and its types with example.

(9+9)

5.

- a) Why Encoding for Genetic Algorithm based solution of a problem is required? Discuss Binary Encoding, Value Encoding, Permutation Encoding, and Tree Encoding with examples.
- b) Briefly discuss Neuro-Genetic Hybrid system and its limitations.

(12+6)

6.

- a) Discuss least square estimation technique and differentiate between linear and nonlinear least squares. Give appropriate example of each.
- b) Define a Neuro-fuzzy system and briefly discuss its properties.

(9+9)

7.

- a) Discuss the Adaptive Neuro Fuzzy Inference Systems (ANFIS) architecture.
- b) For the two fuzzy sets A and B, given below, compute: (i) $A \cup B$ (ii) $A \cap B$ and (iii) $A \cap \bar{A}$
 $A = \{0.1/0, 0.2/1, 0.4/2, 0.6/3, 1.0/4\}$, $B = \{1.0/0, 0.5/1, 0.7/2, 0.3/3, 0/4\}$

(12 +6)