

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? Mention the application areas of soft computing.
- b) What is learning in neural network? Differentiate between supervised learning and unsupervised learning.
- c) Describe alpha cut set and cardinality of a Fuzzy set.
Find $[A]^\alpha$ for $X = \{-2, -1, 0, 1, 2, 3, 4\}$ and $A = 0.0/-2 + 0.3/-1 + 0.6/0 + 1.0/1 + 0.6/2 + 0.3/3 + 0.4/4$.
If $0 \leq \alpha \leq 0.3$ and $0.3 < \alpha \leq 0.6$ and $0.6 < \alpha \leq 1$.
- d) Draw the block diagram of a Fuzzy logic system.
- e) Compare soft computing and hard computing.
- f) Explain defuzzification and discuss the advantages of Fuzzy controller.
- g) Describe the main function of cross over operation in Genetic Algorithm.

(7x4)

2.

- a) What are the purposes of Fitness Function? Explain Fitness scaling, Fitness Windowing, Fitness ranking and fitness evaluation in detail.
- b) Explain McCulloch- Pitts model for an artificial neuron.
- c) Write Hebbian learning algorithm.

(6+6+6)

3.

- a) Explain back propagation multi layer perceptrons.
- b) Explain Fuzzy Inference Systems.
- c) How Fuzzy Filtered Neural Network works? Draw and explain the architecture of Fuzzy Filtered neural network.

(6+6+6)

4.

- a) How crossover is performed? Explain various crossover techniques of genetic algorithm with an example.
- b) Describe common characteristics which have been shared by derivative Free Optimization.
- c) Define System identification and list out different purposes of system identification. Give iterative algorithm for System identification.

(8+5+5)

5.

- a) List the different types of Neuro-Fuzzy System. Explain each with block diagram.
- b) What are the limitations of GA and when does one go for GA?
- c) Distinguish between forward mutations and reversions. Which forward mutation would be more likely to undergo a reversion, a transition or a transversion? Explain.

(8+5+5)

6.

- a) What are the objectives of fuzzy IF-THEN rules in combinatorial optimization problem? Write a basic genetic algorithm for selecting fuzzy IF- THEN rules.
- b) Define Objective function, Generating Function and Acceptance function. Describe the basic steps involved in a general Simulated Annealing method.
- c) Differentiate between Conventional System and Expert System

(8+5+5)

7.

- a) For the following Rule Set, draw the ANFIS Architecture. Explain the function performed in each layer.

Rule 1: If x is A_1 and y is B_1 , then $f_1 = p_1x + q_1y + r_1$;

Rule 2: If x is A_2 and y is B_2 , then $f_2 = p_2x + q_2y + r_2$;

- b) What is an evolution strategy? How is it implemented?
c) Explain Roulette wheel selection technique in detail.

(8+5+5)