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) Describe the search space, where breadth first search tree works worse than depth first search.
b) List any four comparisons between Neural Network and Von-Neuman computer.
c) Differentiate between Unipolar Neuron, Bipolar Neuron and Multipolar Neuron.
d) Write Perceptron Learning Algorithm.
e) List different properties of Hopefield Network.
f) Explain the application of genetic algorithm in the area of machine learning and image processing.
g) Explain uniform crossover technique.

(7x4)

2.

a) For a 2-1 neural network using sigmoid activation function and with weights (no bias) $w_{11} = 0.5$, $w_{21} = 0.75$ and n = 0.2
   i) Draw a carefully labeled network diagram.
   ii) Calculate output value of network for the inputs $in_1 = 0.65$ and $in_2 = 0.85$.
b) List any 6 components of Genetic algorithm and explain them in detail.
c) Suppose you have a variable 'x', which can range over numbers 1 to 20 and a variable 'y' which can range over the numbers 5 to 20.
   i) Express this constraint on 'x' formally for : 9 <= x <= 17.
   ii) How does this alter the domain of 'x'?

(6+6+6)

3.

a) With the help of suitable diagram, explain different transfer functions that are used in Neural Network.
b) With the help of appropriate block diagram explain the concept of supervised learning.
c) Consider two fuzzy sets defined by "approximately 2" = 0.5/1 + ½ + 0.5/3 and "approximately 4 " = 0. 8/1 + 0.9/3 + ¼. Find the value of "approximately 8 ".

(6+6+6)

4.

a) Make the block diagram of fuzzy controller and explain its various components.
b) Explain the concept and application of following transfer functions with suitable diagram.
c) Explain Fuzzy Inference System.

(6+6+6)

5.

a) Explain the concept of mutation and write its algorithm.
b) Differentiate between direct constraint handling and indirect constraint handling.
c) Find the rate of change of function $f(x) = x^2 - 7x + 1$. Elaborate the steps the Genetic Algorithm will apply for this computation.

(6+6+6)

6.

a) Explain Counter Propagation Network and its network structure.

b) Differentiate between supervised and unsupervised learning.

c) Consider two parent strings:

P_1 = 10010110
P_2 = 10111000

Find the two off spring produced when crossover points i=5 is selected.

d) Elaborate various applications of Genetic Algorithm.

(4+4+5+5)

7.

a) Design a Hopfield network to recognize between bananas and pineapple where $p_1 = \begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix}$ (Banana) and $p_2 \begin{bmatrix} -1 \\ -1 \\ 1 \end{bmatrix}$ (Pineapple).

b) Calculate Euclidean distance from P[1 1 1] ^{T} to each prototype vector.

(9+9)