Sub Code: MCST 202 **ROLL NO……..……..**

II SEMESTER EXAMINATION, 2022 – 23

First Year, MTech – Computer Science & Engineering

Soft Computing

Duration: 3:00 hrs **Max Marks: 100**

Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.

Q 1.	Answer any four parts of the following. a) What is Soft Computing? How it is different with Hard Computing? b) Derive membership function for a fuzzy set called "Short men". Take your own values for different heights. c) How feedback Neural Network is useful to perform various tasks? Explain Hopfield Net. d) What do you understand by Optimization? Explain local and global optima with the help of schematic diagram. e) How array can be defined in MATLAB? Write a program to sort array in MATLAB. f) Prove that every fuzzy compliment has at most one equilibrium.	5x4=20
Q 2.	Answer any four parts of the following. a) What are the basic design issues and approaches to machine learning? b) What do you understand by 'Annealing Schedule' in simulated annealing? c) What will be the fitness function? Minimize $(x_1-2.5)^2+(x_2-5)^2$ such that $5.5x_1+2x_2^2-18<=0$, $0<=x_1$, $x_2<=5$. d) Why LMS algorithm is called as stochastic gradient descent method? e) What is Genetic Algorithm (GA)? What is the importance of hybrid Genetic Algorithms (GA)? f) List various activation functions used in ANN	5x4=20
Q 3.	Answer any two parts of the following. a) With the help of necessary block diagrams, compare Mamdani and Sugeno fuzzy inference systems. b) What is ANN? What are the different types of neural networks based on the architecture? Compare artificial neural network with biological neural network. c) Distinguish between MLP and RBF NN with their relative merits and demerits. Specify different Properties of NN.	10x2= 20
Q 4.	Answer any two parts of the following. a) Prove that the max-min composition on a binary fuzzy relation is associative. Obtain fuzzy relation T as a composition(Max-Min, Max-Product and Max-Average) between the two fuzzy relations given by:	10x2= 20

	$\underset{\sim}{R} = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{cc} y_1 & y_2 \end{array} \\ \begin{bmatrix} 0.6 & 0.3 \\ 0.2 & 0.9 \end{bmatrix} \end{array}$ and $\underset{\sim}{S} = \begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 1 & 0.5 & 0.3 \\ 0.8 & 0.4 & 0.7 \end{bmatrix} \end{array}$. b) With the help of a suitable example show how a MLP can be used to provide non-linear decision boundary in Pattern Classification. c) Explain Back propagation algorithm with flowchart. What is "Generalization" in back propagation training algorithm? What are training, validation and test sets? Describe at least one method for achieving Generalization.	
Q 5.	Answer any two parts of the following. a) Find the output of u from the network with input x=[-1,2]T w=[-1, 2] with activation function in hidden layer as: i) Unipolar activation function, ii) Bipolar sigmoidal function. b) State Charles Darwin's theory of evolution. Determine the maximum of function exp(5x) + sin(7π x) using Genetic Algorithm(GA). Given range = [0.002 0.6]; bits = 3; population = 14; generations = 36; mutation = 0.006; matenum = 0.3. c) What do you mean by Library Function in Python? Explain some commonly used libraries of python. What are the ways to insert python modules in a program?	10x2= 20

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