Reg No.:_____　　　　　　　　　Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth Semester B.Tech Degree Supplementary Examination August 2024 (2019 Scheme)

Course Code: CST444

Course Name: SOFT COMPUTING

Max. Marks: 100　　　　　　　　　　　　　　　　　　　**Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks.　　　　　　　Marks

1	Given a neural network with a single neuron, the inputs x1 and x2 are provided as [0.3,0.4], and the corresponding weights w1 and w2 are [0.2,0.3] respectively, with a bias of 0.9. Calculate the output of the neuron using: a. Binary sigmoidal activation function. b. Bipolar sigmoid activation function.	(3)
2	Explain the architecture of a simple Artificial Neural Network. Compare it with a biological neuron.	(3)
3	Describe the role of bias in a perceptron model and demonstrate with an example how changing the bias value alters the final output.	(3)
4	Draw the architecture of the Adaline Network**.**	(3)
5	Using your intuition and definition of the universe of discourse, plot membership functions for temperature in a room. Define the fuzzy sets as cold, cool, warm, hot, and very hot.	(3)
6	Let A={(x1,0.7), (x2,0.3), (x3,0.9)}and B={(x1,0.6), (x2,0.4), (x3,0.8)}. Find intersection, union and complement of both the fuzzy sets	(3)
7	List the stopping condition for Genetic Algorithm Flow?	(3)
8	Illustrate the Mutation process in Genetic Algorithm?	(3)
9	Explain Pareto Optimality in Multi-Objective Optimization Problem.	(3)
10	How do you find a non-dominated set in multi-objective optimization?	(3)

PART B
Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	Implementing NAND Function Using M-P Neuron Model. Draw the architecture of the output network and threshold conditions.	(9)

b) Illustrate the five types of Neural Network Connections with suitable diagrams. (5)

OR

12 a) Implement OR function using bipolar inputs and targets using the Hebb rule. (9)

b) List any five activation functions with their equations and graphs. (5)

Module II

13 a) Design and implement OR function with bipolar inputs and targets using Adaline network? Find the total mean square error of 3 epochs. (8)

b) Find the weights required to perform the following classifications using a perceptron network: The vectors (2, 2, -2, -2) and (2, -2, 2, -2) belong to a class with a target value 1. The vectors (-2, -2, -2, 2) and (-2, -2, 2, 2) belong to a class with a target value -1. Assume a learning rate of 1 and initial weights of [0,0,0,0][0, 0, 0, 0][0,0,0,0]. (6)

OR

14 a) Explain the architecture and training algorithm of the Back Propagation Network. Describe the various terminologies used in the algorithm (9)

b) Explain the training and testing algorithm for an Adaptive Linear Neuron. (5)

Module III

15 a) Consider the following two fuzzy sets: A = {0.2/1,0.3/2,0.4/3,0.5/4} and B = {0.1/1,0.2/2,0.2/3,1/4}. Find the algebraic sum, algebraic product, bounded sum, and bounded difference for the given sets. (10)

b) Represent the standard fuzzy set operations using the Venn diagram. (4)

OR

16 a) Three fuzzy sets are defined as follows: (10)
A={(0.2/20),(0.3/50),(0.5/80),(0.7/110)}
B={(0.8/1),(0.5/2),(0.6/3),(0.4/4),(0.2/5),(0.1/6)}and
C={(0.4/100),(0.7/200),(0.9/300),(0.3/400)} Find: (i)$R = A \times B$ (ii) $S = B \times C$ (iii) $T = R$oS, using Max-Min composition (iv)$T = R$oS, using Max-Product composition.

b) State the conditions for fuzzy tolerance and fuzzy equivalence relations. (4)

Module IV

17 a) With the help of examples, explain the various crossover techniques employed in Genetic Algorithms. (10)

b) Illustrate the steps that Outline the Basic Genetic Algorithm. (4)

OR

18 a) With the help of necessary block diagrams, compare Mamdani and Sugeno Fuzzy Inference Systems. (10)

b) Explain different types of Encoding Techniques. (4)

Module V

19 a) Explain the concepts of dominance and Pareto-optimality in the context of multi-objective optimization. How can these concepts be used to identify optimal solutions in a multi-objective optimization problem? (10)

b) What are the properties of dominance relation? (4)

OR

20 a) Illustrate the different steps in genetic-neuro hybrid systems with the help of a neat block diagram, and list out its advantages also. (10)

b) Differentiate between Convex MOOP and nonConvex MOOP. (4)

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