

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth Semester B.Tech Degree (R, S) Examination May 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 | What is the role of activation function in Artificial Neural Network (ANN)?
Write and explain any two activation functions of ANN. | (3) |
| 2 | Compare and contrast biological neuron and artificial neuron | (3) |
| 3 | Explain the training algorithm of Perceptron Network. | (3) |
| 4 | Explain the architecture and the delta rule used for weight updation in Adaline network | (3) |
| 5 | Using your own intuition, plot the Fuzzy membership function for the “Age of people”? | (3) |
| 6 | What are the three basic features involved in characterizing a fuzzy membership function? Explain. | (3) |
| 7 | Explain any 3 mutation techniques with proper examples | (3) |
| 8 | Describe the various stopping conditions for genetic algorithm flow? | (3) |
| 9 | Explain Dominance in Multi Objective Optimization Problem? | (3) |
| 10 | What are the characteristics of Neuro Fuzzy Hybrid systems? | (3) |

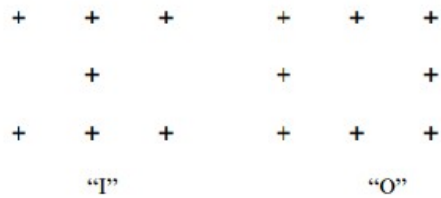
PART B*Answer any one full question from each module, each carries 14 marks.***Module I**

- | | | |
|----|---|-----|
| 11 | a) Explain linear separability with an example of AND logic implementation using Hebb network. | (6) |
| | b) Implement AND NOT function using Mc-Culloch Pitts Neuron. Draw the architecture and threshold conditions | (8) |

OR

- | | | |
|----|--|-----|
| 12 | a) Using the Hebb rule, find the weights required to perform the following classifications of the given input patterns shown in figure. The “+” symbols represent the value “1” and empty space indicate “-1”. Consider “I” belongs to | (8) |
|----|--|-----|

the members of class (so has target value 1) and “O” does not belong to the members of class (so has target value -1). Perform testing of these samples also.



- b) Design a two input single output biased artificial neural network for the input (6)
 X1, value 0.7 and X2, value 0.8 with weight values 0.2 and 0.3 respectively.
 The weight value associated with bias input is 0.9. Find the output Y for binary
 sigmoidal and bipolar sigmoidal activation functions.

Module II

- 13 a) State the significance of error portions δ_k , δ_j and how they are calculated in (8)
 BPN algorithm. Explain the architecture of BPN with proper labelling
 b) Implement the logic function OR with binary inputs and bipolar targets using (6)
 Perceptron network up to two epochs.

OR

- 14 a) Explain the Adaline training algorithm for single output class (6)
 b) Implement one epoch of Adaline algorithm for AND logic function with binary (8)
 inputs and bipolar outputs. Initial weights are $w_1=0.2$, $w_2=0.1$ and learning rate
 parameter $\eta=0.2$.

Module III

- 15 a) Given two fuzzy sets A and B, compute the following set operations on A (6)
 and B:
 a) Algebraic sum b) Algebraic product c) Bounded sum d) Bounded
 difference

$$A = \left\{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \right\}$$

$$B = \left\{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \right\}$$

- b) What is defuzzification? Explain different defuzzification methods with (8)
 examples.

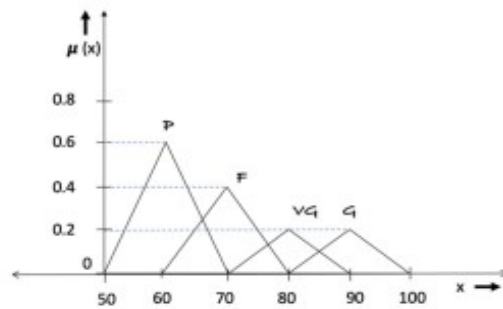
OR

- 16 a) Consider the fuzzy relation (5)

$$R = \begin{bmatrix} 1 & 0.8 & 0 & 0.1 & 0.2 \\ 0.8 & 1 & 0.4 & 0 & 0.9 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.5 \\ 0.2 & 0.9 & 0 & 0.5 & 1 \end{bmatrix}$$

Perform λ -cut operations for the values of $\lambda = 0.9, 0.7$

- b) Let A be a fuzzy set that tells about a student as shown in figure below. Here, (9)
the linguistic variable P represents a Pass student, F stands for a Fair student, G represents a Good student and VG represents a Very Good student. Calculate the defuzzified value for the fuzzy set A with weighted average method and center of sums.



Module IV

- 17 a) What is the Fuzzy Inference System (FIS)? Illustrate Mamdani and Sugeno FIS with examples (8)
b) Explain any three selection techniques in genetic algorithm (6)

OR

- 18 a) Explain i) uniform crossover ii) Three parent crossover iii) shuffle crossover, (8)
iv) Precedence Preservative crossover of genetic algorithm with proper examples.
b) Explain the various encoding schemes used in genetic algorithm (6)

Module V

- 19 a) Explain convex and non-convex Multi Objective Optimization Problem. How to find a non-dominated set? (6)
b) Explain Genetic neuro Hybrid system in detail? (8)
- OR
- 20 a) What are the classifications of neuro-fuzzy hybrid systems? Discuss in detail (8)
b) What is pareto optimality. (6)
