

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

06000CS361122001

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2020



Course Code: CS361

Course Name: SOFT COMPUTING

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | Compare hard computing and soft computing.   | (3)   |
| 2 | What is ADALINE? Why it is trained using least mean square rule? Write delta rule. | (3)   |
| 3 | With diagram explain about any three activation functions.                         | (3)   |
| 4 | Draw the architecture of perceptron network.                                       | (3)   |

**PART B**

*Answer any two full questions, each carries 9 marks.*

- |   |  |     |
|---|--|-----|
| 5 | Implement OR function using perceptron training algorithm with binary inputs and bipolar targets. (up to 2 epochs) | (9) |
| 6 | a) Draw the flowchart of Hebb training algorithm.  | (4) |
|   | b) Design a Hebb net to implement NOR function using with bipolar inputs and targets.                              | (5) |
| 7 | a) Draw the architecture of back propagation network and write training algorithm.                                 | (6) |
|   | b) Implement AND( $x_1, x_2$ ) where $x_1, x_2$ is an element of $\{0,1\}$ using MP neuron.                        | (3) |

**PART C**

*Answer all questions, each carries 3 marks.*

- |    |   |     |
|----|---|-----|
| 8  | Define (i) core (ii) support (iii) boundary of a fuzzy set.   | (3) |
| 9  | List the properties of fuzzy set.   | (3) |
| 10 | Differentiate between fuzzy tolerance and equivalence relation. How can we convert fuzzy tolerance relation to fuzzy equivalence relation?  | (3) |
| 11 | Using your own intuition and your own definitions of the universe of discourse, plot fuzzy membership functions for "Age of people":<br>(i) Very young (ii) Young (iii) Middle-aged (iv) Old (v) Very old | (3) |

## PART D

*Answer any two full questions, each carries 9 marks.*

- 12 a) Using inference method, find the membership values of the triangular shapes; (3)  
isosceles (I), right angled (R), isosceles and right angled (IR) for a triangle with angles 45, 75, and 60.

- b) (6)

$$\text{Given three fuzzy sets } D = \left\{ \frac{1}{0} + \frac{0.7}{1} + \frac{0.3}{2} \right\} \quad I_C = \left\{ \frac{0.5}{20} + \frac{1}{30} + \frac{0.6}{40} \right\}$$

$$I_M = \left\{ \frac{0.7}{20} + \frac{0.9}{30} + \frac{0.4}{40} \right\}$$

Find (i)  $R = I_C \times D$

- (ii) Max-min composition of  $I_M \circ R$  (iii) Max-product composition of  $I_M \circ R$

- 13 a)  $S_1 = \left\{ \frac{0}{0} + \frac{0.5}{20} + \frac{0.65}{40} + \frac{0.85}{60} + \frac{1.0}{80} + \frac{1.0}{100} \right\}$  (6)

$$S_2 = \left\{ \frac{0}{0} + \frac{0.45}{20} + \frac{0.6}{40} + \frac{0.8}{60} + \frac{0.95}{80} + \frac{1.0}{100} \right\}$$

- (i) Find  $S_1|S_2$  (ii) Verify DeMorgan's law (iii) Find  $S_2|S_1$ .

- b)  $A = \left\{ \frac{1}{a} + \frac{0.9}{b} + \frac{0.6}{c} + \frac{0.3}{d} + \frac{0.01}{e} + \frac{0}{f} \right\}$  (3)

Find  $\lambda$ -cut sets for the values of  $\lambda = 1, 0.9, 0.6, 0.3, 0+$ , and  $0$ .

- 14 a) With example, explain any four defuzzification methods. (6)

- b)  $A = \left\{ \frac{0.15}{50} + \frac{0.25}{100} + \frac{0.5}{150} + \frac{0.7}{200} \right\}$   $B = \left\{ \frac{0.2}{50} + \frac{0.3}{100} + \frac{0.6}{150} + \frac{0.65}{200} \right\}$  (3)

Find (i) Algebraic sum (ii) Bounded difference.

## PART E

*Answer any four full questions, each carries 10 marks.*

- 15 a) Explain about characteristics of neuro-fuzzy hybrid systems. (5)  
b) List the stopping criteria for genetic algorithm flow. (5)
- 16 a) Explain about Mamdani fuzzy inference system and Takagi Sugeno fuzzy inference system. (6)  
b) Explain any four selection methods. (4)
- 17 a) With suitable example, explain about aggregation of fuzzy rules. (4)  
b) With neat diagram, explain about Genetic-Fuzzy hybrid systems. (6)
- 18 a) Explain about crossover techniques in genetic algorithm. (5)  
b) With block diagram explain about Fuzzy Inference System. (5)

- 19 a) With suitable examples, explain about mutation. (5)  
b) Differentiate between fuzzy logic and classical logic. Prove that (5)  
 $(\bar{B} \wedge (A \rightarrow B)) \rightarrow \bar{A}$  is tautology.
- 20 a) With suitable example, explain about different methods of encoding that are (5)  
possible in genetic algorithm.  
b) Explain about Fuzzy rule based system. Write the canonical form for fuzzy rule (5)  
based system.

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