

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

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|---|--|-----|
| 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.*

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|---|--|-----|
| 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.*

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|----|---|-----|
| 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":
(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)
$$\underline{D} = \left\{ \frac{1}{0} + \frac{0.7}{1} + \frac{0.3}{2} \right\} \quad \underline{I}_C = \left\{ \frac{0.5}{20} + \frac{1}{30} + \frac{0.6}{40} \right\} \quad (6)$$

Given three fuzzy sets

$$\underline{I}_M = \left\{ \frac{0.7}{20} + \frac{0.9}{30} + \frac{0.4}{40} \right\}$$

Find (i) $\underline{R} = \underline{I}_C \times \underline{D}$

(ii) Max-min composition of $\underline{I}_M \circ \underline{R}$ (iii) Max-product composition of $\underline{I}_M \circ \underline{R}$

13 a)
$$\underline{S}_1 = \left\{ \frac{0}{0} + \frac{0.5}{20} + \frac{0.65}{40} + \frac{0.85}{60} + \frac{1.0}{80} + \frac{1.0}{100} \right\} \quad (6)$$

$$\underline{S}_2 = \left\{ \frac{0}{0} + \frac{0.45}{20} + \frac{0.6}{40} + \frac{0.8}{60} + \frac{0.95}{80} + \frac{1.0}{100} \right\}$$

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

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

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

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.
