

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

**Course Code: CS361**

**Course Name: SOFT COMPUTING (CS)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | Explain the different learning mechanisms used in Artificial Neural Networks with the help of necessary diagrams.  | (3)   |
| 2 | With the help of an example, state the role of bias in determining the net output of an Artificial Neural Network. | (3)   |
| 3 | Illustrate the different steps involved in the training algorithm of Perceptrons.                                  | (3)   |
| 4 | State the concept of delta-rule used in Adaptive Linear Neurons.   | (3)   |

**PART B**

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

- |   |   |     |
|---|---|-----|
| 5 | Design a Hebb network to realize logical OR function.   | (9) |
| 6 | Implement AND logical function using Perceptrons.   | (9) |
| 7 | a) How is the training algorithm performed in back-propagation neural networks?                         | (5) |
|   | b) With graphical representations, explain the activation functions used in Artificial Neural Networks. | (4) |

**PART C**

*Answer all questions, each carries 3 marks.*

- |    |  |     |
|----|--|-----|
| 8  | List and explain the various operations that can be performed in fuzzy relations.  | (3) |
| 9  | Law of contradiction and law of excluded middle cannot be applied to fuzzy sets. Give proper justification to the statement. | (3) |
| 10 | With the help of a figure, explain the features of fuzzy membership functions.   | (3) |
| 11 | How can the role of lambda-cuts in defuzzification be justified? Give examples.  | (3) |

**PART D**

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

- |    |   |     |
|----|---|-----|
| 12 | a) Given two fuzzy sets, $M_{\sim}$ and $N_{\sim}$ , such that $M_{\sim} = \left\{ \frac{0}{x_1} + \frac{0.8}{x_2} + \frac{1}{x_3} + \frac{0.8}{x_4} + \frac{0}{x_5} \right\}$ and $N_{\sim} = \left\{ \frac{0}{y_1} + \frac{0.2}{y_2} + \frac{0.7}{y_3} + \frac{1}{y_4} + \frac{0.7}{y_5} + \frac{0.2}{y_6} + \frac{0}{y_7} \right\}$ . Construct a relation $R_{\sim} = M_{\sim} \times N_{\sim}$ . | (4) |
|    | b) Introduce another fuzzy set $M_{1\sim} = \left\{ \frac{0}{x_1} + \frac{0.8}{x_2} + \frac{1}{x_3} + \frac{0.6}{x_4} + \frac{0}{x_5} \right\}$ . Find $M_{1\sim} \circ R_{\sim}$ using max-min composition.  | (5) |
| 13 | a) Consider the following two fuzzy sets:<br>$A_{\sim} = \left\{ \frac{0.2}{1} + \frac{0.3}{2} + \frac{0.4}{3} + \frac{0.5}{4} \right\}$  | (4) |

$$B_{\sim} = \left\{ \frac{0.1}{1} + \frac{0.2}{2} + \frac{0.2}{3} + \frac{1}{4} \right\}$$

Find the algebraic sum, algebraic product, bounded sum, and bounded difference of the given sets.

- b) Using inference method, find the membership values of the triangular shapes; (5)  
 isosceles (I), right angled (R), isosceles and right angled (IR), equilateral (E), and other triangles (T); for a triangle with angles 60, 55, and 65.
- 14 a) Consider the following fuzzy relation,  $R_{\sim} =$  
$$\begin{bmatrix} 1 & 0.8 & 0 & 0.1 & 0.2 \\ 0.8 & 1 & 0.4 & 0 & 0.9 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.5 \\ 0.2 & 0.9 & 0 & 0.5 & 1 \end{bmatrix}$$
 (4.5)

Show that the above relation is a tolerance relation.

- b) Also, show that the  $\lambda$ -cut relation of the above relation results in a crisp tolerance relation. (4.5)

### PART E

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

- 15 a) "A compound rule may be decomposed and reduced into a number of simple canonical rule forms". Explain the different methods to do so. (6)  
 b) How can one perform the aggregation of fuzzy rules? (4)
- 16 With the help of necessary block diagrams, compare Mamdani and Sugeno Fuzzy Inference Systems. (10)
- 17 a) With the help of examples, explain the various fuzzy propositions. (6)  
 b) Explain the different methods for fuzzy approximate reasoning. (4)
- 18 a) Explain the different methods of encoding that are possible in genetic algorithm. (6)  
 b) "Termination criterion for a genetic algorithm brings the search to a halt". Explain the various termination techniques. (4)
- 19 With the help of examples, explain the various crossover techniques employed in genetic algorithms. (10)
- 20 a) Illustrate the different steps in genetic-neuro hybrid systems with the help of a neat block diagram. (6)  
 b) Distinguish between the processes of tuning and learning in genetic-fuzzy rule based systems. (4)

\*\*\*\*