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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 $M_{\sim} = \left\{\frac{0}{x1} + \frac{0.8}{x2} + \frac{1}{x3} + \frac{0.8}{x4} + \frac{0}{x5}\right\}$ and $N_{\sim} = \left\{\frac{0}{y1} + \frac{0.2}{y2} + \frac{0.7}{y3} + \frac{1}{y4} + \frac{0.7}{y5} + \frac{0.2}{y6} + \frac{0}{y7}\right\}$. Construct a relation $R_{\sim} = M_{\sim} \times N_{\sim}$. (4)

b) Introduce another fuzzy set $M_{1\sim} = \left\{\frac{0}{x1} + \frac{0.8}{x2} + \frac{1}{x3} + \frac{0.6}{x4} + \frac{0}{x5}\right\}$. Find $M_{1\sim} \circ R_{\sim}$ using max-min composition. (5)

13 a) Consider the following two fuzzy sets: (4)

$A_{\sim} = \left\{\frac{0.2}{1} + \frac{0.3}{2} + \frac{0.4}{3} + \frac{0.5}{4}\right\}$

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

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; 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. (5)

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 λ-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)

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