Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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

Course Code: EC360
Course Name: SOFT COMPUTING

Max. Marks: 100 Duration: 3 Hours

PART A
Answer any two full questions, each carries 15 marks. Marks

1 a) Explain the terms Fuzzy Computing and Neural Computing. Mention some of the areas where you can apply them. (7)

b) For the fuzzy set A= 0.1/2 + 0.4/3 + 0.5/4 + 0.6/5 + 1/7 +1/8 + 0.5/9, find i) Height of A ii) Support of A. Also express A using resolution principle. (8)

2 a) Consider two fuzzy sets A and B as shown (8)

$$\mu_A(x) = \begin{cases} (x-1)/3 & 1 \le x \le 4 \\ (7-x)/3 & 4 < x \le 7 \end{cases}, \qquad \mu_B(x) = \begin{cases} (x-3)/3 & 3 \le x \le 6 \\ (9-x)/3 & 6 < x \le 9 \end{cases}$$

Determine $A \cup B$ and $A \cap B$

b) What are Fuzzy Relations? Draw and explain the bipartite and direct graph of fuzzy relation. (7)

3 a) What are Type-2 fuzzy sets? (3)

b) With an example prove Demorgan's Law. (5)

c) Given a fuzzy set A in X and a fuzzy relation R in X x Y as follows, (7)

$A = 0.2/x_1 + 0.8/x_2 + 1/x_3$

$$R = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{ccc} y_1 & y_2 & y_3 \\ \begin{pmatrix} 0.7 & 1 & 0.4 \\ 0.5 & 0.9 & 0.6 \\ 0.2 & 0.6 & 0.3 \end{pmatrix} \end{array}, \text{ Find } B=A \circ R \text{ using max-min composition}$$

PART B
Answer any two full questions, each carries 15 marks.

4 a) What are Linguistic variables and Hedges? (6)

b) With the help of a block diagram, explain a fuzzy rule based system. (9)

5 a) For a neural network the inputs given as $[x_1, x_2, x_3] = [0.7, 0.8, 0.3]$ and the weights are $[w_1, w_2, w_3] = [0.2, 0.4, -0.2]$ with bias 0.5. Draw the network and find the output for (i) sigmoidal and (ii) hyperbolic tangent activation functions. (8)

   b) Differentiate supervised learning with unsupervised learning. (7)

6 a) Draw and explain the basic structure of a biological neural network (7)

   b) Implement McCulloh Pits neuron for (i) NAND (ii) XOR functions. (8)

PART C
Answer any two full questions, each carries 20 marks.

7 a) What is linear separability? Explain with an example. (4)

   b) With a flowchart, explain the learning algorithm of perceptron network. (10)

   c) Illustrate perceptron network for OR and NAND functions (6)

8 a) Explain backpropagation algorithm for perceptron learning. (10)

   b) What is the significance of learning rate and momentum coefficient? (5)

   c) Implement XOR function using perceptron network(assume binary input). (5)

9 a) Explain the principle of a genetic algorithm. (10)

   b) Explain various selection methods? (5)

   c) Describe the concept of Mutation in genetic algorithm. (5)

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