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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 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 List out the steps in perceptron learning algorithm for single output classes. (3)

2 Using linear separability concept, obtain the response for NAND function. (take bipolar inputs and bipolar targets). (3)

3 Examine the various aspects of sigmoidal activation function. List the drawbacks. (3)

4 Compare supervised and unsupervised learning approaches in ANN. (3)

PART B

Answer any two full questions, each carries 9 marks.

5 a) Implement NAND function using McCulloch-Pitts neuron model. (Use binary data representation). (5)

b) Explain why Widrow-Hoff rule is adopted to minimize error in ANN learning. (4)

6 Explain the architecture and training algorithm of Back Propagation network. Describe the various terminologies used in the algorithm. (9)

7 Use Adaline network to train AND NOT function with bipolar inputs and targets. Calculate total mean error after 1 epoch of training. Initially the weights and bias have assumed a random value say 0.2. The learning rate is also set to 0.2. (9)

x1	x2	b	t
1	1	1	-1
1	-1	1	1
-1	1	1	-1
-1	-1	1	-1

PART C

Answer all questions, each carries 3 marks.

8 Using your own intuition and definition of universe of discourse, plot membership functions for liquid level in the tank. (empty, very less, less, full, very full) (3)

9 Using inference approach, find the membership values for each of the triangular shapes (I, R, IR, E, T) for a triangle with angles $120°, 50°, 10°$ (3)

10 Consider two fuzzy sets (3)

$$A = \{\frac{0.2}{0} + \frac{0.3}{1} + \frac{1}{2} + \frac{0.1}{3} + \frac{0.5}{4}\}$$

$$B = \{\frac{0.1}{0} + \frac{0.25}{1} + \frac{0.9}{2} + \frac{0.7}{3} + \frac{0.3}{4} + \frac{0.2}{5}\}$$

Find the following:

(a) Algebraic sum

(b) Bounded sum

(c)Bounded Difference

11 Represent the standard fuzzy set operations using Venn diagram. (3)

PART D

Answer any two full questions, each carries 9 marks.

12 Given two universes X={x1,x2,x3,x4,x5} and Y={y1,y2,y3,y4,y5},the fuzzy sets A defined on X and fuzzy set B defined on Y are given below.

i) Find the relation $R = A \times B$ (2)

$$A = \{\frac{0.4}{x1} + \frac{0.7}{x2} + \frac{1}{x3} + \frac{0.8}{x4} + \frac{0.6}{x5}\}$$

$$B = \{\frac{0.2}{y1} + \frac{0.6}{y2} + \frac{1}{y3} + \frac{0.9}{y4} + \frac{0.7}{y5}\}$$

Consider another fuzzy set C defined on the universe V ={v1,v2,v3} (2)

$$C = \{\frac{0.4}{v1} + \frac{1}{v2} + \frac{0.8}{v3}\}$$ (5)

ii) Find $P = B \times C$.

iii) Using max-min composition find RoP

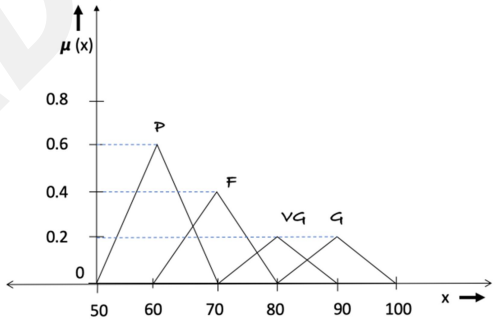
13 The following data was determined by the pairwise comparison of work preferences of 100 people: When it was compared with software (S), 40 persons polled preferred hardware (H), 38 of them preferred teaching (T), 48 of them preferred business (B) and 30 preferred textile (TX). On comparison with hardware (H), the preferences were 60 for S, 52 for T, 53 for B and 35 for TX. When compared with teaching, the preferences were 62 for S, 48 for H, 65 for B and 56 for TX. On comparison with business, the preferences were 52 for S, 47 for H, 35 for T, 60 for TX. When compared with textile, the preferences were 70 for S, 65 for H, 44 for T and 40 for B. Using rank ordering plot the membership function for the "most preferred work." (9)

14 a) Consider the fuzzy relation (4)

$$R = \begin{bmatrix} 1 & 0.8 & 0 & 0.1 & 0.2 \\ 0.8 & 1 & 0.4 & 0 & 0.9 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.5 \\ 0.2 & 0.9 & 0 & 0.5 & 1 \end{bmatrix}$$

Perform λ-cut operations for the values of $\lambda = 0.9, 0^+$

b) Let A be a fuzzy set that tells about a student as shown in figure below. Here, the linguistic variable P represents a Pass student, F stands for a Fair student, G represents a Good student and VG represents a Very Good student. Calculate the defuzzified value for the fuzzy set A with weighted average method and center of sums. (5)



PART E

Answer any four full questions, each carries 10 marks.

15 a) Differentiate between Mamdani FIS and Sugeno FIS. (5)

	b)	List the five functional blocks FIS is constructed on with a block diagram.	(5)
16	a)	Explain the methods used for decomposition of compound linguistic rules into simple canonical rules.	(6)
	b)	List the basic logic operations performed over the propositions.	(4)
17		What are the classifications of neuro-fuzzy hybrid systems? Discuss in detail.	(10)
18	a)	Compare and contrast traditional algorithm and genetic algorithm.	(5)
	b)	Explain various types of crossover techniques.	(5)
19	a)	Explain the Roulette wheel technique for traditional GA selection.	(5)
	b)	Describe the various stopping conditions for genetic algorithm flow.	(5)
20	a)	Give the advantages of Neuro-Genetic hybrids.	(5)
	b)	Explain the concepts of Genetic Fuzzy Systems.	(5)

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