

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019****Subject Code: 2172009****Date: 30/11/2019****Subject Name: Soft Computing Applications****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Do as directed. 03

(i) State the difference between soft computing and hard computing with reference to its problem solving capabilities.

(ii) With the suitable example define & explain the supervised and unsupervised learning method.

(b) Identify the basic traits of soft computing as computational process and briefly explain how any one of these traits help us in problem solving of engineering sector. 04**(c) Explain the basic membership functions of fuzzy sets with a suitable example. 07****Q.2 (a) Consider two fuzzy sets \tilde{A} and \tilde{B} as shown 03**

$$\tilde{A} = \left\{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \right\} \text{ and } \tilde{B} = \left\{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \right\}$$

Calculate several operation on the fuzzy set (i) $\tilde{A} \cup \tilde{B}$ (ii) $\tilde{A} \cap \tilde{B}$ (iii) $\bar{\tilde{A}}$ (iv) $\bar{\tilde{B}}$ (v) cardinality and relative cardinality of fuzzy sets \tilde{A} and \tilde{B} **(b) For the fuzzy sets given in Q.2(a) find out 04**(i) Algebraic product (ii) Bounded sum (iii) Bounded difference
(iv) Algebraic sum**(c) Consider two fuzzy relations R1 and R2 on $X \times Y$ and $Y \times Z$ respectively, where $X = \{a, b, c\}$, $Y = \{1, 2, 3, 4\}$ and $Z = \{\alpha, \beta\}$. Assume R1 and R2 can be expressed as the following relation 07**

$$\tilde{R}_1 = \begin{bmatrix} 0.2 & 0.6 & 0.8 & 0.9 \\ 0.5 & 0.1 & 0.6 & 0.4 \\ 0.7 & 0.3 & 0.2 & 0.7 \end{bmatrix} \text{ and } R_2 = \begin{bmatrix} 0.6 & 0.2 \\ 0.3 & 0.7 \\ 0.4 & 0.9 \\ 0.8 & 0.5 \end{bmatrix}$$

Calculate the fuzzy *max-min*, and *max-prod* composition between two fuzzy relations.**OR****(c) Let $F = \left\{ \frac{0.6}{a} + \frac{0.2}{b} + \frac{0.3}{c} + \frac{0.9}{d} \right\}$ be a fuzzy set. Find a set of α -cut such that 07** $F = \bigcup_{\alpha} \alpha F_{\alpha}$. How many such sets of α -cuts are there? Justify your answer.

- Q.3 (a)** With suitable diagram explain the law of Excluded Middle and the law of Contradiction. **03**
- (b)** Define defuzzification and compare first of maxima and last of maxima method. **04**
- (c)** For the logical union of the membership functions shown below Figure (a) and (b), find the defuzzified value x^* using centroid and weighted average method. **07**

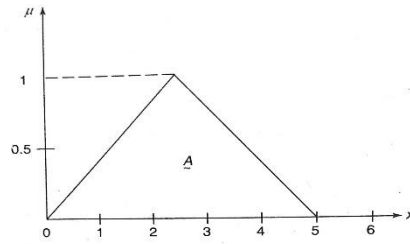


Figure (a)

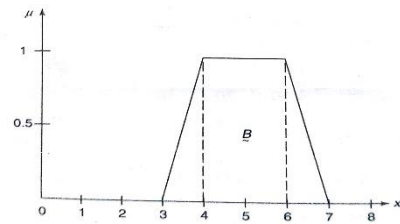
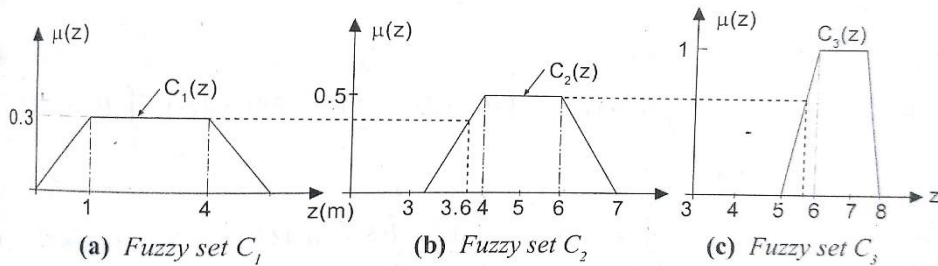


Figure (b)

OR

- Q.3 (a)** What is fuzzy equivalence relation? **03**
- (b)** Define: reflexive and irreflexive properties of fuzzy relation. **04**
- (c)** Figure shows three implication process results \tilde{C}_1, \tilde{C}_2 and \tilde{C}_3 . Find the aggregated output and the defuzzified output using centroid method. **07**



- Q.4 (a)** What is activation function? Explain the different types of activation functions used in ANN's. **03**
- (b)** Sketch the Hebb network and show the steps of training algorithm for the same. **04**
- (c)** Realize the Mc-Culloch-Pitts neuron model for AND gate (take binary data). **07**

OR

- Q.4 (a)** Using McCulloch-Pitts neuron structure implement XOR function. (Consider binary data). **03**
- (b)** Explain the training algorithm of the Perceptron network. **04**
- (c)** Classify the two-dimensional input pattern shown in figure using Perceptron network. The symbol “*” indicates the data representation to be +1 and “#” indicates data to be -1. For the pattern I, the target is +1 and for the pattern H, the target is -1. **07**

*	*	*	*	#	*
#	*	#	*	*	*
*	*	*	*	#	*

Pattern – I Pattern – H

- Q.5 (a)** With the help of ADALINE network architecture, draw the flow diagram for the step of learning in ADALINE network. **03**

- (b) Write a short note on Adaptive Resonance Theory. **04**
- (c) With the help of block diagram and explain the application of neural network in machine vision. **07**

OR

- Q.5** (a) State the merits and demerits of Kohonen Self-organizing feature maps. **03**
- (b) Write a short note on Learning Vector Quantization network. **04**
- (c) With the help of block diagram and flow chart, explain the application of fuzzy logic in water level control. **07**
