

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER- VII EXAMINATION – SUMMER 2026****Subject Code:3171715****Date:29-05-2026****Subject Name: Soft Computing Control****Time: 02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1** (a) Draw fuzzy system diagram. **03**
 (b) Write difference between classical set and fuzzy set theory. **04**
 (c) Discuss the fuzzy set operations with suitable diagram. **07**

- Q.2** (a) Define fuzzy relation and its cardinality. **03**
 (b) Explain the fuzzy relations operation. **04**
 (c) Discuss the properties of fuzzy sets with suitable fuzzy diagram. **07**

OR

- (c) Explain in detail Fuzzy Inference System with block diagram. **07**
Q.3 (a) Consider two fuzzy sets A and B find Complement, Union, Intersection. **03**

$$A = \frac{1}{2} + \frac{0.5}{3} + \frac{0.6}{4} + \frac{0.2}{5} + \frac{0.6}{6}, B = \frac{0.5}{2} + \frac{0.8}{3} + \frac{0.4}{4} + \frac{0.7}{5} + \frac{0.3}{6}$$

- (b) For a given below fuzzy set prove associativity property. **04**

$$A = \frac{1}{1.0} + \frac{0.65}{1.5} + \frac{0.4}{2.0} + \frac{0.53}{2.5} + \frac{0}{3.0}, B = \frac{0}{1.0} + \frac{0.25}{1.5} + \frac{0.6}{2.0} + \frac{0.25}{2.5} + \frac{1}{3.0},$$

$$C = \frac{0.5}{1.0} + \frac{0.25}{1.5} + \frac{0}{2.0} + \frac{0.25}{2.5} + \frac{0.5}{3.0}$$

- (c) Consider below fuzzy relations and find the relation $T = R \circ S$ using max-min and max-product composition. **07**

$$\underset{\sim}{R} = \begin{matrix} & y_1 & y_2 \\ \begin{matrix} x_1 \\ x_2 \end{matrix} & \begin{bmatrix} 0.7 & 0.6 \\ 0.8 & 0.3 \end{bmatrix} \end{matrix}, \quad \underset{\sim}{S} = \begin{matrix} & z_1 & z_2 & z_2 \\ \begin{matrix} y_1 \\ y_2 \end{matrix} & \begin{bmatrix} 0.8 & 0.5 & 0.4 \\ 0.1 & 0.6 & 0.7 \end{bmatrix} \end{matrix}.$$

OR

- Q.3** (a) Consider two fuzzy sets A and B find Difference, and De Morgan's law. **03**

$$A = \frac{1}{2} + \frac{0.5}{3} + \frac{0.6}{4} + \frac{0.2}{5} + \frac{0.6}{6}, B = \frac{0.5}{2} + \frac{0.8}{3} + \frac{0.4}{4} + \frac{0.7}{5} + \frac{0.3}{6}$$

- (b) For a given below fuzzy set prove distributivity property. **04**

$$A = \frac{1}{1.0} + \frac{0.65}{1.5} + \frac{0.4}{2.0} + \frac{0.53}{2.5} + \frac{0}{3.0}, B = \frac{0}{1.0} + \frac{0.25}{1.5} + \frac{0.6}{2.0} + \frac{0.25}{2.5} + \frac{1}{3.0},$$

$$C = \frac{0.5}{1.0} + \frac{0.25}{1.5} + \frac{0}{2.0} + \frac{0.25}{2.5} + \frac{0.5}{3.0}$$

- (c) List the various fuzzy membership functions. Discuss any two in detail with suitable figure. **07**

Q.4	(a) List fuzzy equivalence relation properties.	03
	(b) Compare PID control and fuzzy logic control.	04
	(c) List the method of assign the membership values. Explain any one in detail.	07
OR		
Q.4	(a) Define the terminology: (a)core, (b)support, (c) boundary	03
	(b) Write classification of fuzzy sets.	04
	(c) Write in detail about the Sugeno method adopted in fuzzy inference system.	07
Q.5	(a) Discuss about fuzzification and defuzzification.	03
	(b) Explain triangular membership function with example	04
	(c) Describe the neuro-fuzzy architecture.	07
OR		
Q.5	(a) List the advantages of Mamdani Method.	03
	(b) State the 4 properties of lamda cut sets.	04
	(c) Describe fuzzy control in plastic moulding machine.	07
