M.Sc. - I (Mathematics) First Semester Old

0167 - Optional - Fuzzy Mathematics-I Paper-VII

P. Pages : 2 **GUG/W/18/2185**

Time : Three Hours Max. Marks : 100

* 1 6 8 3 *

Notes : 1. Solve all the questions.
2. All questions carry equal marks.

UNIT - I

1. a) Show that a fuzzy set A on R is convex iff $A(\lambda x_1 + (1-\lambda) x_2) \geq \min [A(x_1), A(x_2)]$. **10**

b) Explain the four features that make the new paradigm superior to the classical paradigm. **10**

OR

c) Let A & B be fuzzy sets defined on a universal set X. Prove that $|A| + |B| = |A \cup B| + |A \cap B|$. **10**

d) Let $A, B \in \mathcal{I}(X)$ then for all $\alpha \in [0, 1]$ show that : **10**

i) $A \subseteq B$ iff $\alpha A \subseteq \alpha B$

$A \subseteq B$ iff $\alpha + A \subseteq \alpha + B$

ii) $A = B$ iff $\alpha A = \alpha B$

$A = B$ iff $\alpha^{+} A = \alpha^{+} B$

UNIT - II

2. a) Let $* \in \{+, -, \cdot, 1\}$ & A, B denote continuous fuzzy numbers then prove that fuzzy set $A * B$ defined by $(A * B)(z) = \sup_{z = x * y} \min [A(x), B(y)]$ is continuous fuzzy number. **10**

b) Explain the fuzzy equation A + X = B. **10**

OR

c) Prove that $0 \in A - A \;\&\; 1 \notin A / A$ where A is closed interval. Also find $[-4, 6] / [1, 2]$. **10**

d) Explain shortly the lattice of fuzzy numbers. **10**

UNIT - III

3. a) Show that for any fuzzy relation R on X^2 the fuzzy relation **10**

$$R_{T(i)} = \bigcup_{n=1}^{\infty} R^{(n)}$$

b) Prove that, if R be a reflexive relation on X^2 where $|X| = n \geq 2$ then $R_{T(i)} = R^{(n-1)}$. **10**

OR

c) Show that for any $a, a_j, b, d \in [0, 1]$ where j takes values from an index set J, operation w_i has the properties. **10**

i) $i(a, b) \leq d$ iff $w_i(a, d) \geq b$

ii) $w_i(i(a,b), d) = w_i(a, w_i(b, d))$

d) Explain shortly the fuzzy morphisms. **10**

UNIT - IV

4. a) If $S(Q, R) \neq \phi$ for $P \, o^i \, Q = R$ then show that $\hat{P} = (Q \, o^{w_i} \, R^{-1})^{-1}$ is the greatest member of S(Q, R). **10**

b) If $S(Q, R) \neq \phi$ then show that : **10**

i) $\hat{P} = R \, o^{w_i} \, \overline{Q}^{1}$ is the greatest member of S(Q, R)

ii) $\tilde{Q} = \overline{P}^{1} \, o^i \, R$ is the smallest member of S(P, R).

OR

c) Explain the use of the neural networks. **10**

d) Describe the solution method in brief. **10**

5. a) Which are the 3 basic methods by which sets can be defined within a given universal set X **5**

b) Explain shortly the linguistic variables. **5**

c) State the 5 properties satisfying by partial ordering. **5**

d) Explain the fuzzy relation equations based on sup-i compositions. **5**

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