

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION MAY 2024
(Fourth Semester)

Branch – MATHEMATICS

FUZZY SET THEORY

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 1 = 5)

1. The set of elements that belong to the fuzzy set \tilde{A} at least to the degree α is called the _____ set if $A_\alpha = \{x \in X / \mu_{\tilde{A}}(x) \geq \alpha\}$.
(i) α -level (ii) α_1 -level (iii) $A\alpha$ -level (iv) $\tilde{A}\alpha$ -level
2. A _____ can be written as a set of ordered tuples.
(i) set (ii) function (iii) relation (iv) binary relation
3. For every $A \in P(X)$, $Nec(A) > 0$ implies $Pos(A) =$ _____.
(i) 0 (ii) 1 (iii) 2 (iv) -1
4. The probability of a fuzzy event $P(\tilde{A})$ is defined as _____.
(i) $\int_{R^n} \mu^A(x) dP$ (ii) $\int_{R^n} \mu^0(x) dP$ (iii) $\int_{R^A} \mu^A(x) dP$ (iv) $\int_{R^n} \mu^{1/x}(x) dP$
5. The vector-maximum problem is defined as _____.
(i) "minimum" $\{Z(x)/x \in X\}$ (ii) "maximum" $\{Z(x)/x \in X\}$
(iii) "minimum" $\{Z(x_0)/x \in X\}$ (iv) "maximum" $\{Z(x_0)/x \in X\}$

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

6. a) Explain the types of sets.
[OR]
b) Prove that (i) $\alpha^+ A \subseteq \alpha A$, and (ii) $\alpha(\tilde{A}) \subseteq (1-\alpha)^+(\tilde{A})$.
7. a) Discuss fuzzy relations with example.
[OR]
b) Explain fuzzy equivalence relations with suitable example.
8. a) Discuss fuzzy measure properties.
[OR]
b) Explain Plausibility measure with example.
9. a) Explain the causes uncertainty.
[OR]
b) Discuss probability of a fuzzy event as a scalar.
10. a) Describe symmetric fuzzy LP.
[OR]
b) Explain fuzzy LP with crisp objective function.

Cont...

SECTION -C (30 Marks)

Answer ALL questions
ALL questions carry EQUAL Marks

(5 x 6 = 30)

11. a) State and prove First Decomposition Theorem.
[OR]
- b) Let $f: X \rightarrow Y$ be an arbitrary crisp function. Then, prove that for any $A \in F(X)$, f fuzzified by the extension principle satisfies the equation $f(A) = \bigcup_{\alpha \in [0,1]} f(\alpha + A)$.
- 12.a) Discuss binary fuzzy relations with example.
[OR]
- b) Explain in detail about reflexive, irreflexive, symmetric, anti-symmetric and transitive relations.
- 13.a) Explain probability measure with example.
[OR]
- b) Distinguish between probability and possibility theory.
- 14.a) Explain the types of available information.
[OR]
- b) Explain possibility distribution with an example.
- 15.a) Solve $Max Z = 2x_1 + x_2$ subject to $x_1 \leq 3$; $x_1 + x_2 \leq 4$; $5x_1 + x_2 \leq 3$ and $x_1, x_2 \geq 0$.
[OR]
- b) Discuss fuzzy dynamic programming with crisp state.

Z-Z-Z

END