

Time : Three Hours]

[Maximum Marks : 80

[Minimum Pass Marks :

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

Q 1. Answer the following questions

2x5

- Define Fuzzy measure.
- What are the various types of Fuzzy quantifiers.
- Define fuzzy implication.
- Define multivalued logics.
- What do you mean by fuzzy decision making?

Q 2. Answer the following questions

2x5

- For the function $f(a) = \log(1+a)$, $a \in [0,1]$, find the fuzzy component.
- Explain fuzzy ranking method.
- Write the reasonable axioms of fuzzy implications.
- Explain Evidence theory.
- Define lukasiewicz implication.

Section-B

Answer any five of the following questions.

12x5

- (a) A belief measure bel on finite power set $p(x)$ is a probability measure if and only if the associated basic probability assignment function μ is given by $\mu(A) = 0$ for all subset S of X that are not singletons.
(b) Explain in Belief measure.
- (a) Let a given finite body of evidence (F,m) be nested. Then prove that

$$Nec(A \cap B) \geq \min[Nec(A), Nec(B)]$$

$$Pos(A \cup B) = \max[Pos(A), Pos(B)]$$
 (b) Show that every measure 'POS' on a finite power set $p(x)$ is uniquely determined by a possibility distribution function $r \rightarrow [0,1]$ via the formula.
- (a) prove that $B_2' \leq B_4' \leq B_1' \leq B_3'$.
(b) Explain linguistic Hedges with example.
- Explain fuzzy logic control of air conditioner controller.
- Discuss the axioms of fuzzy implication prove a function $j: [0,1]^2 \rightarrow [0,1]$ satisfying all the axiom of fuzzy implication for fuzzy complement C if and only if there exist a strictly increasing continuous function $f: [0,1] \rightarrow [0, \infty]$ such that $f(0,0)=0, \sup (a, h) f^{(-1)}[f(1)-f(a)ef(b)], \forall a, b \in [0,1]$ and $C(a) = f^{-1}(f(1)-f(a))$.
- Solve the following fuzzy linear programming problem

$$\text{Max } Z = 5x_1 + 4x_2$$

$$\text{s.t. } (4,2,1)x_1 + (5,3,1)x_2 \leq (24,5,8)$$

$$(4,2,1)x_1 + (1,5,1)x_2 \leq (12,6,3),$$

$$x_1, x_2 \geq 0$$

9. Let us assume that each individual of a group of eight decision makers has total preference ordering $P_i (i \in N)$ on a set alternative $X = \{w, x, y, z\}$ as follows.

$$P_1 = \{w, x, y, z, \}$$

$$P_2 = P_5 = \{z, y, x, w\}$$

$$P_3 = P_7 = \{x, w, y, z, \}$$

$$P_4 = P_8 = \{w, z, x, y, \}$$

$$P_6 = \{z, w, x, y, \}$$

Using the membership function $s(x_i x_j) = \frac{N(x_i x_j)}{n}$, for the fuzzy group performance find the fuzzy performance relation. Also find α - cuts of this fuzzy relations and group user of agreement concaring the social choice by total ordering (w, x, y, z).

10. Discuss various defuzzification methods used in fuzzy control.

11. (a) Discuss the fuzzy expert system.

- (b) Write short note on centre of maxima method.