



ED-766

M.A./M.Sc. 4th Semester
Examination, May-June 2021

MATHEMATICS

Paper - III (C)

Fuzzy Set Theory and Its Applications-II

Time : Three Hours] [*Maximum Marks* : 80

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (a) Define fuzzy propositions with properties and examples.
- (b) Define fuzzy quantifiers with examples.
- (c) Write the method of inference from conditional and qualified propositions.

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(Turn Over)

(2)

Unit-II

2. (a) Let f be a function defined by $f(a) = e^a$ for all $a \in [0, 1]$. Find the fuzzy intersection, fuzzy union, fuzzy implication and fuzzy compliment generated by f .
- (b) Explain approximate reasoning and fuzzy language with one such example.
- (c) Write the interpolation method and show that $B_2^1 \subseteq B_4^1 \subseteq B_1^1 = B_3^1$.

Unit-III

3. (a) Write a short note on design of fuzzy controllers.
- (b) Discuss possible ways of fuzzyfying the general dynamic system.
- (c) Discuss the design of a air conditioner fuzzy controller.

Unit-IV

4. (a) Define defuzzification and write any two methods of defuzzification.

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(b) Aggregate graphically the fuzzy sets :

$$A_1 = \frac{0}{0}, \frac{.3}{1}, \frac{.3}{2}, \frac{.3}{3}, \frac{.3}{4}, \frac{0}{5}$$

$$A_2 = \frac{0}{3}, \frac{.5}{4}, \frac{.5}{5}, \frac{.5}{6}, \frac{0}{7}$$

$$A_3 = \frac{0}{5}, \frac{1}{6}, \frac{1}{7}, \frac{0}{8}$$

and solve it by the centroid method.

(c) Solve the following fuzzy linear programming problems

$$\text{Max. } z = 6x_1 + 5x_2$$

Subject to

$$(5, 3, 2)x_1 + (6, 4, 2)x_2 \leq (25, 6, 9)$$

$$(5, 2, 3)x_1 + (2, 1.5, 1)x_2 \leq (13, 7, 4)$$

$$x_1, x_2 > 0.$$

Unit-V

5. (a) Let each individual of four decision makers has a total preference ordering $P_i (i \in N)$ on a set of alternatives $X = \{a, b, c, d\}$ as

$$P_1 = (a, b, d, c) ; P_2 = (a, c, b, d) ;$$

$$P_3 = (b, a, c, d) ; P_4 = (a, d, b, c)$$

(4)

Find the fuzzy preference relation. Also find α -cuts of the fuzzy relation and group level of agreement concerning the social choice denoted by the total ordering (a, b, c, d) .

- (b) Explain individual and multiperson decision making in fuzzy environment.
- (c) Explain construction of an ordering of all given alternatives by Shimura method.