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OR

Solve the fuzzy relation equation using max-min composition.

$$\begin{bmatrix} .5 & .7 & 0 & .2 \\ .4 & .6 & 1 & 0 \\ .2 & .4 & .5 & .6 \\ 0 & .2 & 0 & .8 \end{bmatrix} = [.5 \quad .5 \quad .4 \quad .2]$$

Unit - IV

Q.4 A. Define focal element and total ignorance. **(2)**

Q.4 B. Define plausibility measure. **(2)**

Q.4 C. Let a given finite body of evidence (ξM) be nested then for all $A, B \in P(x)$ following properties hold

1) $bel(A \cap B) = \min[bel(A), bel(B)]$

2) **(4)**

OR

Every possibility measure '*pos*' on a finite power set is uniquely determined by a possibility distribution function via the formula $pos(A) = \max_{x \in A} r(x)$ for each $A \in P(x)$

Q.4 D. Define Belief measure, write its properties and prove that $bel(A) + bel(\overline{A}) \leq 1$ **(12)**

OR

Compare possibility theory with probability theory.

---x---

Roll No.....

Total No. of Units : 04

Total No. of Printed Pages : 04

Code No. : 03/503

Third Semester Examination, Dec. 2018

M.Sc. MATHEMATICS

Paper - V

FUZZY SETS AND THEIR APPLICATIONS (I)

Time : 3 Hrs. **Max. Marks : 80**

- Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences.
  Part C (Short answer type).
  Part D (Long answer type).

Unit - I

Q.1 A. Define convex fuzzy set. **(2)**

Q.1 B. Explain membership function with an example. **(2)**

Q.1 C. Let [illegible] be two fuzzy sets defined on universal set *X*, then prove that: **(4)**

OR

Prove that standard fuzzy intersection is only idempotent *t*-norm.

Q.1 D. State and prove first characterization theorem of fuzzy complements. **(12)**

OR

Define extension principle with an example. Also show that be an arbitrary crisp function. Then for any and for all $\alpha \in [01]$, the following properties of 'f' fuzzified by extension principle hold

1) $\alpha + [f(A)] = f(\alpha +_A)$

2) $\alpha[f(A)] \supseteq f(\alpha_A)$

Unit - II

Q.2 A. Define union and intersection of two fuzzy relation. **(2)**

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Q.2 B. Define fuzzy graph. **(2)**

Q.2 C. Let A & B be two numbers whose functions are given by **(4)**

$$B(x) = \begin{cases} \frac{x-2}{2}, & 2 < x \le 4 \\ \frac{6-x}{2}, & 0 < x \le 6 \\ 0, & \text{otherwise} \end{cases}$$

Find the fuzzy number $(A+B),(A-B),(A\cdot B),(A/B)$

OR

Let $R = \begin{bmatrix} 1 & 0 & .7 \\ .3 & .2 & 0 \\ 0 & .5 & 1 \end{bmatrix}$ find domain, range, height and inverse of R.

Q.2 D. Let *MIN* & *MAX* be binary operation on R. Then for the following properties hold : **(12)**

1)

2)

3) $MIN\left[A\ MAX(B,C)\right] = MAX\left[MIN(AB), MIN(AC)\right]$

OR

Can we solve fuzzy equation ?

Let A and B be two fuzzy numbers such that

$$B = \frac{.1}{[0\ 1)} + \frac{.2}{[1\ 2)} + \frac{.6}{[2\ 3)} + \frac{.7}{[3\ 4)} + \frac{.8}{[4\ 5)} + \frac{.9}{[5\ 6)} + \frac{1}{6} + \frac{.5}{(6\ 7]} + \frac{.4}{(7\ 8]} + \frac{.2}{(8\ 9]} + \frac{.1}{(9\ 10]}$$

Then find the solution of equation $A + X = B$.

Unit - III

Q.3 A. Define fuzzy compatibility relation. **(2)**

Q.3 B. Define max-min composition of two fuzzy relation. **(2)**

Q.3 C. If R is symmetric, then show that each power of R is symmetric. **(4)**

$$R = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{array} \begin{array}{c} \begin{array}{cccccc} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 \end{array} \\ \begin{bmatrix} 1 & .3 & .6 & .6 & .2 & .6 \\ .3 & 1 & .6 & .2 & .8 & .2 \\ .6 & .6 & 1 & .2 & .2 & .6 \\ .6 & .2 & .2 & 1 & .2 & .8 \\ .2 & .8 & .2 & .2 & 1 & .2 \\ .6 & .2 & .6 & .8 & .2 & 1 \end{bmatrix} \end{array}$$

OR

Define fuzzy partial ordering relation and write its properties.

Q.3 D. Express the following matrix relation as similar or equivalence relation. **(12)**

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