Roll No. ....

W - 3205

Third Semester Examination 2021

M.Sc. (Mathematics)

Fuzzy Sets and their Application (I)

Paper - V

Time :- 3 Hrs. M.M. 80

SECTION - A (4x3=12)

Very short answer type questions.(maximum 3 lines)

Q.1 Define α-level sets ?

Q.2 If A and B are any two fuzzy numbers such that
$^{\alpha}A = [2\alpha - 1, 3 - 2\alpha]$ and $^{\alpha}B = [2\alpha + 1, 5 - 2\alpha]$
then find α(A-B)

Q.3 If R is a fuzzy partial ordering on a set X, then define the dominating class of x where $x \in X$.

Q.4 Define necessity measure.

SECTION - B

Short answer type questions with maximum word limit 150. (4x5=20)

Q.5 Prove that the law of contradictions is violated for fuzzy sets ?

OR

Define symmetric difference of fuzzy sets A and B of a universal set X and prove that $A\Delta(B \Delta C) = (A \Delta B)\Delta C$, where A, B and C are fuzzy sets on X.

Q.6 Let $f : X \rightarrow y$ be an arbitrary crisp function. Prove that
$^{\alpha+}[f(A)] = f(^{\alpha+}A)\ \forall A \in F(X),\ \alpha \in [0,1]$

P.T.O.

OR

Calculate [-4, 6]/[1, 2]

Q.7 For a given relation $R(X_1, X_2, ..., X_n)$, define $[R\downarrow Y]$ where $y = \{X_j \mid i \in J \subset \{1, 2, ..., n\}$

OR

Define composition of fuzzy relations ?

Q.8 Plausibility measure are subadditive. Justify

OR

For every $A \in P(X)$, prove that
$Nec(A) > 0 \Rightarrow Pos(A) = 1$.

SECTION - C

Long answer type questions with maximum word limit 500. (4x12=48)

Q.9 Prove that for all $a, b \in [0, 1]$,
$i_{min}(a,b) < i(a,b) < \min(a, b)$,
Where i_{min} denotes the drastic intersection.

OR

Given an involutive fuzzy complement C and an increasing generator g of c, prove that t-norm and t-conorm generated by g are dual with respect to C.

Q.10 Let A and B be fuzzy sets defined on the universal set X=Z whose membership functions are given by

$A(x) = .5/(-1)+1/0 + .5/1 + .3/2$

and $B(x) = .5/2 + 1/3 + .5/4 + .3/5$

Let a function $f : X \times X \rightarrow X$ be defined for all $x_1, x_2 \in X$ by $f(x_1, x_2) = x_1 . x_2$. Calculate f(A,B).

OR

If A and B are two fuzzy numbers defined as follows:

$$A(x) = \begin{cases} 0 & \text{for} \quad x < -1 \text{ and } x > 3 \\ (x+1)/2 & \text{for} \quad -1 < x < 1 \\ (3-x)/2 & \text{for} \quad 1 < x < 3 \end{cases}$$

$$\text{and } B(x) = \begin{cases} 0 & \text{for} \quad x < 1 \text{ and } x > 5 \\ (x-1)/2 & \text{for} \quad 1 < x < 3 \\ (5-x)/2 & \text{for} \quad 3 < x < 5, \end{cases}$$

then find $(A/B)(x)$.

Q.11 Explain min-max composition with suitable example.

OR

Explain fuzzy relation equation with suitable example.

Q.12 Let a given finite body of evidence <f,m> be nested. Then prove that the associated belief and plausibility measures have the following properties for all $A,B \in P(X)$:

(i) $Bel(A \cap B) = \min[Bel(A), Bel(B)]$;

(ii) $Pl(A \cup B) = \max[Bel(A), Bel(B)]$.

OR

Prove that a belief measure Bel on a finite power set P(X) is a probability measure iff the associated basic probability assignment function m is given by

$m(\{x\}) = Bel(\{x\})$ and $m(A) = 0$

for all subsets of X that are not singletons.

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