

Indian Institute of Technology Delhi
Minor-II Exam
Fuzzy Sets & Applications: MTL 717

1. Let A, B be fuzzy sets on \mathbb{R} . The membership function for A is given as $\mu_A(x) = \begin{cases} x & x \in [0,1] \\ 2-x & x \in [1,2] \\ x-2 & x \in [2,3] \\ 4-x & x \in [3,4] \\ 0 & \text{otherwise} \end{cases}$

and B is given as $\mu_B(x) = \begin{cases} x & x \in [0,1] \\ \frac{4-x}{3} & x \in [1,4] \\ 0 & \text{otherwise} \end{cases}$.

- a. For which values of $\alpha \in [0,1]$, $(\alpha A) \cup (\alpha B)$ is discontinuous fuzzy set.
 b. For which values of $\alpha \in [0,1]$, $(\alpha A) \cup (\alpha B)$ is continuous fuzzy set.

[1.5+1.5=3]

2. Let $X = [-3, 5]$, $Y = [0, 50]$ and $f: X \rightarrow Y$ such that $f(x) = 2x^2$. Find $A = f^{-1}(B)$, where $B = [0 \ 32 \ 50]$ is a triangular fuzzy subset of Y .

[4]

3. Let $A = \left\{ \frac{0.3}{-1} + \frac{1}{0} + \frac{0.4}{1} \right\}$, $B = \left\{ \frac{0.5}{1} + \frac{0.4}{2} + \frac{1}{3} + \frac{0.6}{4} \right\}$ be fuzzy subsets of \mathbb{Z} and $f: \mathbb{Z} \times \mathbb{Z} \rightarrow \mathbb{Z}$ given by $f(x, y) = e^{x+y}$. Use extension principle to find $C = f(A, B)$

[4]

4. Let $A = [-5 \ -3 \ -1]$, $B = [-2 \ 1 \ 3]$ and $C = [-4 \ 0 \ 5]$ be triangular fuzzy numbers. Find a fuzzy set X such that $A \cdot X + B = C$

[4]

5. Consider the following decision table in which A and B are conditional variables and C, D are decision variables:

U	A	B	C	D
X1	L	H	1	0
X2	M	G	0	2
X3	M	H	2	0
X4	M	K	1	0
X5	L	G	1	0

Obtain consistent rules from the five rows w.r.t the Decision variables C & D taken together.

[5]