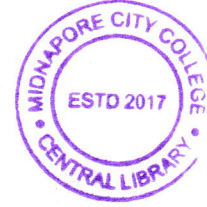


PG (CBCS)
M.SC. Semester- IV Examination, 2026
APPLIED MATHEMATICS
 PAPER: MTM 402A
(FUZZY MATHEMATICS)



Full Marks: 20

Time: 1 Hour

The figures in the right-hand margin indicate full marks.
 Candidates are required to give their answers in their own words as far as practicable.

GROUP-A1. Answer any **TWO** of the following questions:

2×2=4

- Find α -cut of triangular fuzzy number $\tilde{A} = (3, 7, 9)$ for $\alpha = 0.1$.
- Determine the height and support for each of the following fuzzy sets that have triangular membership functions. Draw the corresponding membership function for each case.
- Write two possible membership functions for the fuzzy number "close to 10".
- Define fuzzy measure with an example and then illustrating its application in decision-making contexts.

GROUP-B2. Answer any **TWO** of the following questions:

2×4=8

- Show that fuzzy sets do not satisfied laws of contradiction and excluded middle. Is every fuzzy set a fuzzy number? Justify your answer. 2+1+1
- Considering two triangular fuzzy numbers $\tilde{A}$ and $\tilde{B}$ with the following membership functions which one given by

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x \leq -9 \\ \frac{x+9}{4}, & -9 \leq x \leq -5 \\ -\frac{x}{5}, & -5 \leq x \leq 0 \\ 0, & 0 \leq x \end{cases} \quad \mu_{\tilde{B}}(x) = \begin{cases} 0, & x \leq -3 \\ \frac{x+3}{5}, & -3 \leq x \leq 2 \\ \frac{5-x}{3}, & 2 \leq x \leq 5 \\ 0, & x \geq 5 \end{cases}$$

Then determine the membership functions for fuzzy sets $\tilde{A} \cup \tilde{B}$ and $\tilde{A} \cap \tilde{B}$.

- Prove that distribution law for fuzzy sets is true.
- Consider the two fuzzy numbers $\tilde{A} = (5, 7, 10)$, $\tilde{B} = (0, 3, 9, 13)$. Using addition, subtraction and scalar multiplication rules for fuzzy numbers, determine the following: $2\tilde{A} + 3\tilde{B}$, $2\tilde{A} - 3\tilde{B}$, $\tilde{A} + \tilde{B}$, $\tilde{A} - \tilde{B}$. Give an example of fuzzy set which is not convex. Determine whether the statement is true or false: α -cut of fuzzy set is also a fuzzy set. 2+1+1

(P.T.O)

GROUP-C

3. Answer any **ONE** of the following questions:

2×8=16

- a) Using Addition rule for fuzzy numbers, prove that $[5, 7] + [6, 8] = [11, 15]$.
 Determine $20(5, 6, 3, 12) - 3(-1, 3, 4) + 5[-3, 2] - 10$. Let $f(x) = x^2 + 2$.
 Find $f(\tilde{A})$, where $\tilde{A} = \{(-3, 0.25), (-2, 0.5), (-1, 0.85), (1, 0.6), (2, 0.78), (4, 0.1)\}$.
 4+2+2

- b) Consider the fuzzy set $\tilde{A}$, with the following membership function is given by

$$\mu_A(x) = \begin{cases} \left| \frac{x-15}{3} \right|, & 12 \leq x \leq 18 \\ 0, & \text{otherwise} \end{cases}$$

- i) Find $\tilde{A}^c$, the complement of $\tilde{A}$. Also, sketch the membership function of $\tilde{A}^c$.
 ii) Find $\tilde{A}_{0.3}$, $\tilde{A}_{0.5}$ where $\tilde{A}_\alpha$ is the α -cut of the fuzzy set $\tilde{A}$.
 iii) Determine support and height for the fuzzy set $\tilde{A}$. Is it normal?
 iv) Is it convex? Justify your answer.

2+2+2+2

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