MMSEC-1

Sl. No.

III Semester M.Sc. Degree Examination, October/November - 2025
MATHEMATICS
Fuzzy Mathematics
(CBCS SLM Scheme)

Time : 1½ Hours **Maximum Marks : 40**

Instructions to Candidates:

Compulsorily attend all the Sections.

SECTION - A

I. Answer any Five questions. **(5×2=10)**

1. Define α -Cut of a fuzzy set and give an example.

2. Define fuzzy intersection and fuzzy union.

3. Prove that $A \subseteq B$ if and only if $A \cap B = A$ where, $A, B \in F(X)$

4. If $A_i, \in F[x], i \in I$ where I is an index sets, then prove that $^{a+}\left(\cap A_i\right) \supseteq \bigcap_{i \in I}^{a+} A_i$

5. State Second decomposition theorem.

6. Define Psuedo-inverse of the increasing generator.

7. Define fuzzy number.

SECTION - B

II. Answer any Four questions. **(4×5=20)**

8. Prove that , for any fuzzy sets A and B defined on X, the following properties hold

i) $A \cup \left(A \cap B\right) = A$

ii) $A \cap \left(A \cup B\right) = A$

9. Prove that, $A \Delta B \Delta C = \left(\overline{A} \cap \overline{B} \cap C\right) \cup \left(\overline{A} \cap B \cap \overline{C}\right) \cup \left(A \cap \overline{B} \cap \overline{C}\right) \cup \left(A \cap B \cap C\right)$

10. Let $f : X \to Y$ be a Crisp function for $A_i \in F(X)$ and $B_i \in F(Y), i \in I$, the following properties hold

i) If $B_1 \subseteq B_2, then\ f^{-1}(B_1) \subseteq f^{-1}(B_2)$

ii) $\overline{f^{-1}(B)} = f^{-1}(\overline{B})$

[P.T.O.

11. Let $\tau(a,b)=ab$ and let $G(a)=\frac{1-a}{1-\lambda a}, \lambda \geq 0$ be the Sugeno's class of fuzzy complements obtain the t-conorum u such that $< i,u,c >$ is a dual triple

12. Explain arithmetic operations on intervals

13. Write a brief note on aggregation operation

SECTION - C

III. Answer any One question. **(1×10=10)**

14. If $A_i \in F(X), i \in I,$ where I is an index sets, then following properties holds:

i) $^{a}\left(\underset{i\in I}{\cup} A_i\right) \supseteq \underset{i\in I}{\cup}{}^{a} A_i$

ii) $^{a}\left(\underset{i\in I}{\cap} A_i\right) = \underset{i\in I}{\cap}{}^{a} A_i$

iii) $^{a+}\left(\underset{i\in I}{\cup} A_i\right) = \underset{i\in I}{\cup}{}^{a+} A_i$

iv) $^{a+}\left(\underset{i\in I}{\cap} A_i\right) \supseteq \underset{i\in I}{\cap}{}^{a+} A_i$

15. Let u_w denote the Yager's class of t-conorms defined by, $u_w(a,b)=\min(1,(a^w+b^w)^{1/w}), W>0$ Then prove that $\max(a,b) \leq u_w(a,b) \leq u_{\max}(a,b)$ Where, max is the standard fuzzy union and $u_{\max}$ is the drastic union t-conorm.
