MMSEC-1

Sl.No. : **Total No. of Pages : 3**

III Semester M.Sc.Degree Examination, May/June - 2026
(SLM Scheme, CBCS)
MATHEMATICS
SEC-I:Fuzzy Mathematics

Time : 1½ Hours **Max. Marks : 40**

Instruction : Compulsorily attend all the sections.

SECTION - A

I. Answer any five questions. **[5×2=10]**

Q1) Define α-cut of a fuzzy set and give an example.

Q2) Prove that $A \subseteq B$ if and only if $A \cap B=A$ and $A \cup B=B$, where $A,B \in F(x)$.

Q3) Let $A,B \in F[x]$, then
Prove that $a+(A \cap B) = (a+A) \bigcap (a+B)$ for any $a \in [0,1]$

Q4) If $A_i \in F[x]$, $i \in I$ where I is an index sets, then prove that $a + (\cap A_i) \supseteq \bigcap_{i \in I} {}^{a+}A_i$

Q5) Let $x = \{x_1, x_2, x_3, x_4, x_5\}$ and let
$A \in F[x]$ be defined by
$A=\frac{0.2}{x_1}+\frac{0.4}{x_2}+\frac{0.6}{x_3}+\frac{0.8}{x_4}+\frac{1}{x_5}$, then express
A as a union of special Fuzzy sets and verify the decomposition theorem.

Q6) Define fuzzy number with an example.

Q7) Explain the arithmetic operations on intervals.

SECTION - B

II. Answer any four questions. **[4×5=20]**

Q8) Obtain a fuzzy set which represents the property

(i) Highly educated

(ii) Little educated

Q9) Let M be the fuzzy of middle aged persons defined by $M:X \to [0,1]$ where X={0,1,2,3.....100} and

$$M(x)=\begin{cases} 0, & if \quad x \le 20 \text{ or } x \ge 60 \\ \dfrac{x-20}{15} & if \quad 20 \le x \le 35 \\ \dfrac{60-x}{15} & if \quad 40 \le x \le 60 \\ 1 & if \quad 35 \le x \le 45 \end{cases}$$

then find ^{1}M, $^{0.5}M$ and $^{0.8}M$

Q10) If A and B are Fuzzy sets defined on X, then show that $|A|+|B|=|A \cup B|+|A \cap B|$.

Q11) State and prove first decomposition theorem.

Q12) Find the equilibrium point of a fuzzy complement defined by

$$C(\alpha)=\frac{1-\alpha}{1+\lambda\alpha}, \lambda \ge 0.$$

Q13) Show that $\left\langle ab, \dfrac{a+b}{ab+1}, \dfrac{1-a}{1+a} \right\rangle$ is a dual triple.

SECTION - C

III. Answer any one question. **[1×10=10]**

Q14) Show that a function g_p:[0,1]$\rightarrow$R defined by $g_p(a) = 1-(1-a)^p, \mathrm{P} > 0$ is an increasing generator. Find its psuedo inverse and obtain a class of t-conorms generated by g_p.

Q15) Show that a fuzzy set A on $\mathbb{R}$ is convex if and only if

$\mathrm{A}(\lambda x_1 + (1-\lambda)x_2) \geq \min\left(\mathrm{A}(x_1), \mathrm{A}(x_2)\right)$, for all $x_1, x_2 \in \mathbb{R}$.