Roll No. ..... Total No. of Sections : 4

Total No. of Printed Pages : 6

Code No. : B03/503

III Semester Examination

M.Sc.

MATHEMATICS

Paper V

[Fuzzy Sets and Thier Application]

Time : Three Hours] [Maximum Marks : 80

[Minimum Passing Marks : 16

Note : *Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences. Part C (Short answer type) of each question will be answered 200-250 words. Part D (Long answer type) of each question should be answered within the word limit 400-450.*

Unit–I

1. (A) State second decomposition theorem. **2**

(B) Define t-conorm. **2**

(C) Can we satisfy law of contradiction for : **4**

$$u\,(a,\ b) = \min\,(1,\ a + b)$$

$$i\,(a,\ b) = \max\,(0,\ a + b - 1)$$

$$c\,(a) = 1 - a$$

P. T. O.

Or

Is $g(a) = \begin{cases} a, & \text{for } 0 \le a \le \frac{1}{2} \\ \frac{1}{2}a + \frac{1}{4}, & \text{for } \frac{1}{2} < a \le 1 \end{cases}$

a decreasing generator ?

(D) State and prove characterization theorem of t-conorms. **12**

Or

Show that if C is a continuous fuzzy complement, then it has at most equilibrium and also it is unique.

Unit–II

2. (A) Define fuzzy partial ordering. **2**

(B) For $A(x) = \frac{x}{x+1}$ **2**

$$x \in \{0,\ 1,\ 2,\ 3,\ ....,\ 10\} = X$$

Calculate fuzzy cardinality of X.

(D) If $R = \begin{array}{c} \\ a \\ b \\ c \\ d \\ e \end{array} \begin{bmatrix} a & b & c & d & e \\ 1 & 0.7 & 0 & 1 & 0.7 \\ 0 & 1 & 0 & 0.9 & 0 \\ 0.5 & 0.7 & 1 & 1 & 0.8 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0.1 & 0 & 0.9 & 1 \end{bmatrix}$ **12**

Find the set of all distinct crisp orderings for all values of α.

Or

Solve the equation

$$P \overset{i}{o} \begin{bmatrix} 0.1 & 0.3 \\ 0.2 & 0.4 \end{bmatrix} = [0.5 \quad 0.6]$$

where $\overset{i}{o}$ is algebraic product.

Unit–IV

4. (A) Define fuzzy measure. **2**

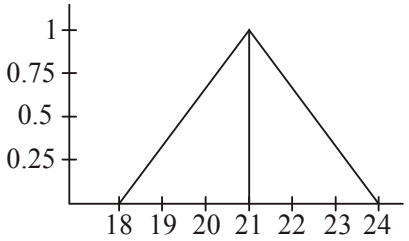
(B) Give formula for combined evidence. **2**

(C) If X = {*a*, *b*, *c*, *d*}, *m* {*a*, *b*, *c*} = 0.4, *m* {*a*, *b*, *d*} = 0.3, *m* {*a*, *b*} = 0.2, *m* (*x*) = 0.3 determine corresponding belief measures. **4**

Or

Show that Bel (A ∩ B) = min [Bel A, Bel B] where A, B are fuzzy sets.

(D)



If A_1 = {21}, A_2 = {20, 21, 22}, A_3 = {19, 20, 21, 22, 23}, find, Pos (A_1) Pos (A_2) Pos (A_3) and Nec (A_1) Nec (A_2) Nec (A_3). **12**

Or

If $F = \frac{0.4}{1} + \frac{0.7}{2} + \frac{0.1}{3} + \frac{0.8}{4} + \frac{0.5}{5}$ determine Nec A and Pos A.

(C) $$A(x) = \begin{cases} \sin x, & \text{for } 0 \le x \le \pi \\ 0\ , & \text{otherwise} \end{cases}$$ **4**

is it a fuzzy number ? Explain.

Or

$$A(x) = \begin{cases} \dfrac{x-2}{2}, & \text{for } 2 < x \le 4 \\ \dfrac{6-x}{2}, & \text{for } 4 < x \le 6 \\ 0\ , & \text{otherwise} \end{cases}$$

and $$B(x) = \begin{cases} \dfrac{x-6}{2}, & \text{for } 6 < x \le 8 \\ \dfrac{10-x}{2}, & \text{for } 8 < x \le 10 \\ 0\ , & \text{otherwise} \end{cases}$$

Find A – B.

(D) Show that, **12**

$$A(x) = \begin{cases} 1\ , & \text{for} \quad x \in [a, b] \\ l(x), & \text{for} \quad x \in (-\infty, 9) \\ r(x), & \text{for} \quad x \in (b, \infty) \end{cases}$$

where $l : (-\infty, a) \to [0, 1]$ is monotonic

increasing function s.t. $l(x) = 0$ for $(-\infty, w_1)$ and $r : (b, \infty) \to [0, 1]$ is monotonic decreasing function s.t. $r(x) = 0$ for (w_2, ∞) is a fuzzy number.

Or

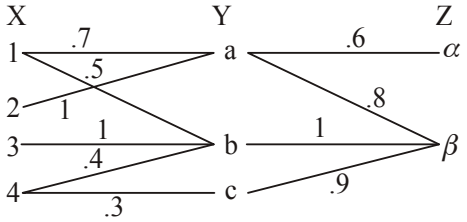
Write a short note on Projections and cylindric extensions.

Unit–III

3. (A) Define supremum of a set. **2**

(B) Who is the founder of fuzzy set theory. **2**

(C) Find min-max composition. **4**



Or

Show that if $S(Q, R) \neq \phi$, then $\hat{P} = R \overset{wi}{o} Q^{-1}$ is the greatest member of S(Q, R).