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Total Number of Pages : 02

M.Sc.I  
FMCE606

6<sup>th</sup> Semester Regular Examination 2017-18

FUZZY & ROUGH SET THEORY

BRANCH : M.Sc.I(MC)

Time : 3 Hours

Max Marks : 70

Q.CODE : C524

Answer Question No.1 which are compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Answer all parts of a question at a place.

Q1. Answer the following questions : (2 x 10)

- a) Explain the basic difference between Fuzzy Set and Crisp set theory.
- b) Fuzzy set  $A = \{(1, 0.5), (2, 0.6)\}$  and  $B = \{(1, 0.75), (2, 0.26)\}$  then find  $A \cap B$ .
- c) Define Extension Principle in fuzzy set.
- d) What is the generalized distance in fuzzy set?
- e) If  $A = \{(2, 0.15), (3, 0.6), (1, 0.25), (4, 0.16)\}$  then find the degree of A's non-member.
- f) Explain TRFN with example.
- g) What are Fuzzy Inference?
- h) Show that  $Z(P \rightarrow Q) = Z(P^c \cup Q)$ .
- i) What is Hamming distance?
- j) If A is in X then B is in Y. Write in form of relation if  $A \subset X$  and  $B \subset Y$ .

Q2. a) Derive a relation between T-norm and T-co-norm. (5)

- b) What is composition in fuzzy set? Find a composition mapping between two fuzzy sets X and Z where  $X \rightarrow Y$  and  $Y \rightarrow Z$  given below : (5)

X	Y <sub>1</sub>	Y <sub>2</sub>
X <sub>1</sub>	0.2	0.23
X <sub>2</sub>	0.35	0.45
X <sub>3</sub>	0.44	0.425

Y	Z <sub>1</sub>	Z <sub>2</sub>	Z <sub>3</sub>
Y <sub>1</sub>	0.65	0.45	0.23
Y <sub>2</sub>	0.214	0.213	0.22

Q3. a)  $A' = \{(-1, 1), (0, 0.4), (1, 0.02), (2, 0.5)\}$ ,  $B' = \{(-1, 0.5), (0, 0.08), (1, 1), (2, 0.5)\}$  (5)

and  $f(x_1, x_2) = x_1^2 + x_2^2$ . Then find  $\mu_{B'}(0)$  and  $\mu_{B'}(1)$ .

b) Let A' is define as smallest integers and B' define as integers close to 4 (5)

with the following data then find  $\mu_{A'}(3)$  where

$\mu_{A'}(3) = \{(u_1, \mu_{u_1}(3)), (u_2, \mu_{u_2}(3)), (u_3, \mu_{u_3}(3))\}$  and  $u_i$  and  $v_j$  given in the table below :

$u_i$	$\mu_{u_i}$	$v_j$	$\mu_{v_j}$
0.8	0.8	1	1
0.7	0.5	0.8	0.5
0.6	0.4	0.7	0.3

Q4. a) Explain fuzzy relations find fuzzy relations for (5)

$\bar{A} = \{0.2/x_1 + 0.5/x_2 + 1/x_3\}$  and  $\bar{B}$  given by  $\bar{B} = \{0.3/y_1 + 0.9/y_2\}$ .

b) Define different types of projections in fuzzy relations. (5)

**Q5. a)** Verify whether the relations given by matrix is equivalence or not **(5)**

X/X	x <sub>1</sub>	x <sub>2</sub>	x <sub>3</sub>	x <sub>4</sub>	x <sub>5</sub>
x <sub>1</sub>	1	0.8	0	0.1	0.5
x <sub>2</sub>	0.8	1	0.4	0	0.7
x <sub>3</sub>	0	0.4	1	0	0
x <sub>4</sub>	0.1	0	0	1	0.5
x <sub>5</sub>	0.2	0.9	0	0.5	1

**b)** If  $\bar{A} \equiv$  Capacity of ponds and  $\bar{B} \equiv$  Rain fall around given by **(5)**  
 $\bar{A} = \{0.2/p_1 + 0.6/p_2 + 0.5/p_3 + 0.9/p_4\}$  and  
 $\bar{B} = \{0.4/g_1 + 0.7/g_2 + 0.8/g_3\}$  then find a relation between  $\bar{A}$  and  $\bar{B}$ .

**Q6. a)** Explain  $\alpha$ -cut in fuzzy relation and show that  $R_\alpha$  is always crisp. **(5)**  
**b)** Draw the graph for the fuzzy relation given by the following matrix **(5)**

R	a	b	c	d
a	1	0.8	0.7	1
b	0.8	1	0.7	0.8
c	0.7	0.7	1	0.7
d	1	0.8	0.7	1

**Q7. a)** Write down the properties of membership function. **(5)**  
**b)** Explain basic de fuzzification techniques . **(5)**

**Q8. Short Notes (Any TWO)** **(5 x 2)**  
**a)** Weighted average method  
**b)** TFN  
**c)** Fuzzy integrations  
**d)** Mamdani Algorithm