LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FOURTHSEMESTER – APRIL 2018

MT 4817- FUZZY SETS AND ITS APPLICATIONS

Date: 09-05-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Answer all the questions. Each question carries 20 marks.

I. a)1) Contrast fuzzy subset with crisp set.

OR

a)2) Define ordinary subset nearest to a fuzzy subset Give examples. (5)

b)1) Draw for E= $\{x_1,x_2,x_3\}$ and M= $\{0, \frac{1}{2},1\}$, the Boolean lattice of ordinary sets and the vector lattice for fuzzy subsets.

b**)2)** If $a=\mu_{\underset{\sim}{A}}(x); b=\mu_{\underset{\sim}{B}}(x);\ c=\mu_{\underset{\sim}{C}}(x)$; verify whether associativity is true for algebraic sum and distributivity is true for product and algebraic sum. (7+8)

OR

c)1) Given

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
$\underset{\sim}{A}$	0	0.3	0.7	1	0	0.2	0.6
$\underset{\sim}{B}$	0.3	1	0.5	0.8	1	0.5	0.6
$\underset{\sim}{C}$	1	0.5	0.5	0.2	0	0.2	0.9

find $\underset{\sim}{A}\hat{+}\underset{\sim}{B}\hat{+}\underset{\sim}{C}$

c)2) *Prove : Let* $P_i, m_i, n_i \in R^+$, $i=1,2,3,...,k$ *then*

$$(P_i \le m_i + n_i, i=1,2,...,k) \Rightarrow \sqrt{\sum_{i=1}^{k} P_i^2} \le \sqrt{\sum_{i=1}^{k} m_i^2} + \sqrt{\sum_{i=1}^{k} n_i^2}$$ (8+7)

II a)1) Define fuzzy graph and give an example.

OR

a)2) Explain normal projection with an example (5)

b)1) Explain in detail fuzzy subset induced by a mapping.

b)2) Using a suitable example, explain the concept of conditional fuzzy subsets. (8+7)

OR

c)1) Checking out all the calculations, verify whether the given relation is transitive or not?

$\underset{\sim}{R}$	A	B	C	D
A	0.2	1	0.4	0.4
B	0	0.6	0.3	0
C	0	1	0.3	0
D	0.1	1	1	0.1

c)2) Consider $\underset{\sim}{R}_1$ *and* $\underset{\sim}{R}_2$ as given below. Find $\underset{\sim}{R}_2 \circ \underset{\sim}{R}_1$ where o represents max-min composition.

$\underset{\sim}{R}_1$	Y_1	Y_2	Y_3	Y_4	Y_5
X_1	0.1	0.2	0	1	0.7
X_2	0.3	0.5	0	0.2	1
X_3	0.8	0	1	0.4	0.3

$\underset{\sim}{R}_2$	Z_1	Z_2	Z_3	Z_4
Y_1	0.9	0	0.3	0.4
Y_2	0.2	1	0.8	0
Y_3	0.8	0	0.7	1
Y_4	0.4	0.2	0.3	0
Y_5	0	1	0	0.8

(8+7)

III.a)1) Define (i) fuzzy order relation and (ii) ordinal relation.

OR

a)2) If $\underset{\sim}{R}$ is a preorder relation then prove that $\underset{\sim}{R}^k = \underset{\sim}{R},\ k = 1, 2, 3, \ldots$ (3)

b)1) *Let* $\underset{\sim}{R} \subset E \times E$ *be a similitude relation. Let x, y, z be the elements of E. Put*

$$a = \mu_{\underset{\sim}{R}}(x, y) = \mu_{\underset{\sim}{R}}(y, x);\quad b = \mu_{\underset{\sim}{R}}(y, z) = \mu_{\underset{\sim}{R}}(z, y);\ c = \mu_{\underset{\sim}{R}}(z, x) = \mu_{\underset{\sim}{R}}(x, z);$$

then prove that $c \geq a = b$ *or* $a \geq b = c$ *or* $b \geq c = a$.

b)2) Explain the following notations: $\hat{\underset{\sim}{R}}, \bar{\underset{\sim}{R}}, \bar{\hat{\underset{\sim}{R}}}, \underset{\sim}{R}^{k}, \dot{\hat{\underset{\sim}{R}}}, \check{\underset{\sim}{R}}$ where $\underset{\sim}{R}$ is a fuzzy relation. (9+6)

OR.

c) Define the following and explain in detail with examples.
(i) Similitude (ii) dissimilitude (iii) resemblance and (iv) dissemblance relations (15)

IV) a)1) Briefly describe the two basic methods of fuzzy clustering

OR

a)2). Explain sensing problem in pattern recognition (5)

b)1) State the c-means clustering method.

b)2) Give a detailed description of fuzzy syntactic method. (5+10)

OR

c)1) Explain with an example fuzzy membership-roster method.

c)2) In finger print identification, which type of pattern recognition is used. Explain. (9+6)

V. Explain in detail fuzzy application in the field of medicine or industry. (20)

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