LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – NOVEMBER 2016

MT 4817 - FUZZY SETS AND ITS APPLICATIONS

Date: 16-11-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

Answer all the questions.

I. a)1) Define ordinary subset nearest to a fuzzy subset.

OR

a)2) Define generalized relative hamming distance and Relative Euclidean distance. Give examples. **(3)**

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

$$(P_i \le m_i + n_i, i = 1,2,\ldots,k) \Rightarrow \sqrt{\sum_{i=1}^{k} P_i^2} \le \sqrt{\sum_{i=1}^{k} m_i^2} + \sqrt{\sum_{i=1}^{k} n_i^2}$$ **(8+9)**

OR

c)1) 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.

c)2) 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 $\underset{\sim}{A} \hat{+} \underset{\sim}{B} \hat{+} \underset{\sim}{C}$ **(8+9)**

II a)1) Explain normal projection with an example.

OR

a)2) Define support of a fuzzy relation and give an example. **(3)**

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

b)2) Consider $\underset{\sim}{R}_1$ *and* $\underset{\sim}{R}_2$ as given below. Verify with the given example that $\underset{\sim}{R}_2 \circ \underset{\sim}{R}_1 = \underset{\sim}{R} \Rightarrow R_2 \circ R_1 = R$ where o represents max-min composition. **(10+7)**

$\underset{\sim}{R}_1$	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

OR

c)1) Using a suitable example explain the concept of conditional fuzzy subsets.

c)2) 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

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

OR

a)2) Define fuzzy ordinal relation and give an example. **(3)**

b)1) Let $\underset{\sim}{R}$ be a resemblance relation. Then, with the usual notations, prove that $\overline{\underset{\sim}{\hat{R}}} \subset \dot{\underset{\sim}{\hat{R}}}$.

b)2) Define the following and give examples.

(i) Similitude (ii) dissimilitude (iii) resemblance and (iv) dissemblance relations

(5+12)

OR

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

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

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

c)2) What do these notations represent: $\hat{\underset{\sim}{R}}, \overline{\underset{\sim}{R}}, \overline{\hat{\underset{\sim}{R}}}, \underset{\sim}{R}^k, \dot{\hat{\underset{\sim}{R}}}, \overline{\overset{\vee}{\underset{\sim}{R}}}$ where $\underset{\sim}{R}$ is a fuzzy relation. **(11+6)**

IV) a)1) Explain sensing problem in pattern recognition

OR

a)2) Briefly describe the two basic methods of fuzzy clustering. **(3)**

b)1) Give a detailed demonstration of fuzzy c-means clustering method.

b)2) Suppose a serial theft is taking place in a repeated manner at a locality. Is it possible to study the case with fuzzy tools and which of the available fuzzy tools will you apply? Explain why?

(10+7)

OR

c)1) Give a detailed description of fuzzy syntactic method.

c)2) Explain with an example fuzzy membership-roster method**.** **(8+9)**

V. a)1) Write a short note on the possibilities for application of fuzzy concepts in the field of engineering.

OR

a)2) What are the compulsions in 'Economics' that requires analysis based on fuzzy concepts**.** **(3)**

b) Explain in detail with suitable example the place for fuzzy logic applications in the field of medicine.

OR

c) Explain in detail the possibilities for fuzzy logic applications in the field of Industry where more and more of automated machines replace human skills. **(17)**

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