LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2018**

16/17PMT3MC02 – FUZZY SETS AND APPLICATIONS

Date: 27-10-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

I. a)1) Check commutative property for difference between two fuzzy subsets. Justify your answer with an example.

OR

a)2) Define ordinary subset nearest to a fuzzy subset and using this principle find

$\mu_{\underset{\sim}{A}\cap\overline{\underset{\sim}{A}}}(x_i)$ for

$\underset{\sim}{A}$	x_1	x_2	x_3	x_4	x_5	x_6	x_7
	0.7	0.2	0.9	1	0	0.4	1

(5)

b) Define the following and find their values for the given fuzzy sets

(i) linear distance (ii) quadratic distance (iii) General relative Hamming distance and (iv) relative Euclidean distance

	x_1	x_2	x_3	x_4	x_5	x_6	x_7
$\underset{\sim}{A}$	0.7	0.2	0	0.6	0.5	1	0
$\underset{\sim}{B}$	0.2	0	0	0.6	0.8	0.4	1

(15)

OR

c)1) Find $\underset{\sim}{A}\oplus\underset{\sim}{B}$ for

	x_1	x_2	x_3	x_4	x_5	x_6	x_7
$\underset{\sim}{A}$	0.7	0.2	0	0.6	0.5	1	0
$\underset{\sim}{B}$	0.2	0	0	0.6	0.8	0.4	1

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) From the given relations tick the relations which are transitive.

	Fuzzy relation	YES	NO
1	Y is much larger than X		
2	A is closer to B		
3	Gmail is a distant relative of Hotmail		
4	Abi is a good friend of Binny		
5	Duplicate resembles the Original		

OR

a)2) Explain projection with an example and when does it become a normal projection? (5)

b)1) Explain in detail conditioned fuzzy subsets.

b)2) Define transitive closure of a fuzzy binary relation and prove the theorem," Let $\underset{\sim}{R}$ be any fuzzy binary relation. If for some k, one has $\underset{\sim}{R}^{k+1} = \underset{\sim}{R}^{k}$ then prove that $\underset{\sim}{R} = \underset{\sim}{R} \cup \underset{\sim}{R}^{2} \cup .... \cup \underset{\sim}{R}^{k}$ " Is the converse true? (6+9)

OR

c) Completely verify whether the given fuzzy relation $\underset{\sim}{R}$ is transitive or not? (15)

$\underset{\sim}{R}$	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) Contrast antisymmetry with prefect antisymmetry.

OR

a)2) If $\underset{\sim}{R}$ is a preorder relation then prove that $\underset{\sim}{R} = \underset{\sim}{R}^{2} = ... = \underset{\sim}{R}^{k} = ... = \underset{\sim}{R}$ (5)

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

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

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

b)2) Define fuzzy ordinal relation and given an example. (9+6)

OR

c) Define resemblance relation and dissemblance relation. Explain with an example. (15)

IV. a)1) Describe a few areas where computer based pattern recognition system are applied.

OR

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

b) Explain in detail the fuzzy clustering method based on equivalence relation with an example. (15)

OR

c) Using Clustering method based on fuzzy equivalence relations. Find the α- cut for the following problem

k	1	2	3	4	5
x_{k1}	0	1	2	3	4
x_{k2}	0	1	3	1	0

when $q = 2$ and $\delta = 0.25$. (15)

V. Explain in detail fuzzy application in the field of Medicine or Environmental issues. (20)

****