LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2019**

18PMT3MC02 – FUZZY SETS AND APPLICATIONS

Date: 31-10-2019   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

Answer ALL Questions

1. a) Define Fuzzy subsets and give an example.

   OR

   b) If the fuzzy subsets A and B represents real numbers very near to 5 and 10 respectively, find the fuzzy subset of real numbers very near to 5 and 10. **(5)**

   c) Find $R_2 \circ R_1$ using max-min composition.

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

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

   (15)

   OR

   d) Let $R \subset E \times E$ then prove that $\forall (x,y) \in E \times E; \mu_{R^k(x,y)=l_{k^*}(x,y)}$

   where $l_{k^*}(x,y)$ is the strongest path existing from x to y of length k. **(8)**

   e) Let $p_i, m_i, n_i \in R^+, i = 1,2 \ldots k$, then prove that $\sqrt{\sum_{i=1}^{k} p_i^2} \leq \sqrt{\sum_{i=1}^{k} m_i^2} + \sqrt{\sum_{i=1}^{k} n_i^2}$, where $p_i \leq m_i + n_i, i = 1,2 \ldots k.$ **(7)**

2. a) Explain in detail the concept of conditioned fuzzy subsets with an example.

   OR

   b) Explain normal projection with an example. **(5)**

   c) Find $A \oplus B$ for

	x_1	x_2	x_3	x_4	x_5	x_6	x_7
A	0.7	0.2	0	0.6	0.5	1	0
B	0.2	0	0	0.6	0.8	0.4	1

   (8)

d) When fuzzy relations are converted to crisp relations, what do you do with the boundary values?. Give an example. **(7)**

OR

e) Using suitable example, show that Max-Min composition is associative. **(7)**

f) Define algebraic product and algebraic sum of two fuzzy relations with an example.

(8)

3. a) Consider the relation $R_{0\!\!\!/}$ given with the resemblance function $\mu_{R_{0\!\!\!/}}(x,y) = \frac{1}{1+|x-y|}$, for all $x, y \in N$. Is

this relation a resemblance relation?.

OR

b) Define fuzzy ordinal relation and give an example. **(5)**

c) Explain the following fuzzy relation of (i) preorder (ii) semi-preorder (iii) perfect anti- symmetric and

(iv) similitude, each with an example. **(8)**

d) Define fuzzy equivalence relation and give an example with verification of properties.

(7)

OR

e) If $R_{0\!\!\!/}$ is a preorder relation then prove that $R_{0\!\!\!/}^{k} = R_{0\!\!\!/}$ for $k = 1,2, ...$ **(8)**

f) Prove that $\overline{\hat{R}}_{0\!\!\!/} \subset \hat{R}_{0\!\!\!/}$, where $R_{0\!\!\!/}$ is an resemblance relation. **(7)**

4. a) Explain the process of fuzzy c- mean algorithm.

OR

b) Explain sensing problem in pattern recognition. **(5)**

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

(7)

d) Explain how fuzzy clustering methods are based on fuzzy equivalence with an example.

(8)

OR

e) Explain fuzzy membership roaster method with an example. **(7)**

f) Give a detailed description of fuzzy image processing. **(8)**

5. a) Explain how one's face can could be verified using fuzzy tools.

OR

b) In any field of application, explain the concept of fuzzy degree of measure applied with an example.

(5)

c) Explain in detail fuzzy application in the field of medicine. **(15)**

OR

d) Explain in detail with suitable case studies, fuzzy applications in the field of engineering.

(15)

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