



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – MATHEMATICS

THIRD SEMESTER – APRIL 2018

16PMT3MC02- FUZZY SETS AND APPLICATIONS

Date: 26-04-2018
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

Answer ALL the questions. Each question carries 20 marks.

I. a) 1) Define fuzzy subsets and give an example

OR

a) 2) Define Relative Hamming distance and choosing a suitable example find Relative hamming distance. (5)

b) 1) Given a fuzzy subset $\{(x_1/0), (x_2/0.5), (x_3/0.2), (x_4/0.7), (x_5/0.6), (x_6/0.9), (x_7/0.1)\}$, calculate the ordinary subset of level α at i) $\alpha = 0.1$ ii) $\alpha = 0.6$ iii) $\alpha = 0.8$ iv) 0.9

b) 2) Draw the vector lattice of fuzzy subsets for $E = \{x_1, x_2, x_3\}$ and $M = \{0, \frac{1}{2}, 1\}$ (6+9)

OR

b) 3) 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 .

b) 4) Let $p_i, m_i, n_i \in \mathbb{R}^+, i = 1, 2, 3, \dots, k$. Then prove that $(p_i \leq m_i + n_i, i = 1, 2, 3, \dots, k) \Rightarrow \sqrt{\sum_{i=1}^k p_i^2} \leq \sqrt{\sum_{i=1}^k m_i^2} + \sqrt{\sum_{i=1}^k n_i^2}$ (7+8)

II. a) 1) Define perfect anti symmetric fuzzy binary relations. Is it true to say that any perfect anti symmetric relation is evidently anti symmetric? Justify your claim.

OR

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

b) 1) Prove that the transitive closure of any fuzzy binary relation is transitive binary relation.

b) 2) Let \underline{R} be any fuzzy binary relation. If for some k , one has $\underline{R}^{k+1} = \underline{R}^k$ then prove that $\underline{R} = \underline{R} \cup \underline{R}^2 \cup \dots \cup \underline{R}^k$. Is the converse true? (7+8)

OR

b) 3) Define algebraic product and algebraic sum of two fuzzy relations. Give an example.

b) 4) State and prove the decomposition theorem for fuzzy relations. (8+7)

III. a) 1) Define fuzzy preorder and anti reflexive preorder. Give examples.

OR

a) 2) Prove that if \underline{R} is transitive and reflexive then $\underline{R}^k = \underline{R}$, $k = 1, 2, 3, \dots$ (5)

b) 1) Let $\underline{R} \subset E \times E$ be a similitude relation. Let x, y, z be the elements of E . Put $a = \mu_{\underline{R}}(x, y) = \mu_{\underline{R}}(y, x)$; $b = \mu_{\underline{R}}(y, z) = \mu_{\underline{R}}(z, y)$; $c = \mu_{\underline{R}}(z, x) = \mu_{\underline{R}}(x, z)$; then prove that $c \geq a = b$ or $a \geq b = c$ or $b \geq c = a$.

b) 2) Contrast fuzzy ordinal relation with fuzzy resemblance relation. Give an example. (8+7)

OR

b) 3) Explain the following with examples: Relation of (i) similitude (ii) dissimilitude and (iii) Dissemblance. (15)

IV) a)1)How could one use pattern recognition to identify signature of a person.

OR

a)2) Explain the three fundamental problems in the process of pattern recognition. (5)

b)1) Explain in detail with examples, the two fuzzy pattern recognition methods. State their advantages and disadvantages. (15)

OR

b)2) Explain how fuzzy clustering methods are based on fuzzy equivalence relation. Given any relation, how is it possible to apply this method.

b)3) Explain fuzzy c-means algorithm. (8+7)

V) a) Explain the need for fuzzy notion in the field of Economics **OR** Engineering. (5)

b) Explain in detail the fuzzy application in the field of Robotics used in Industry **OR** Medicine. (15)
