 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **MATHEMATICS**

FOURTH SEMESTER – **APRIL 2012**

# MT 4961 - THEORY OF FUZZY SUBSETS

Date : 25-04-2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**Answer all the questions. Each question carries 20 marks.**

1. **a)1)** Find the following index of fuzziness for the given fuzzy subsets

={(x1/0),(x2/0.3), (x3/0.7),(x4/1), (x5/0), (x6/0.2),(x7/0.6)} and

={(x1/0.3),(x2/1), (x3/0.5),(x4/0.8), (x5/1), (x6/0.5),(x7/0.6)}.

**OR**

**a)2)** Give the ordinary subset of level α for the fuzzy subset ={(x1/0.7),(x2/0.5), (x3/1),(x4/0.2), (x5/0.6)} i) α =0.1 ii) α=0.6 iii) α=0.8 iv) 0.9 (5)

**b)1)** State and prove decomposition theorem for fuzzy subsets. Decompose the fuzzy subset {(x1|0.3), (x2|0.7), (x3|0.5), (x 4|0.1), (x5|0.6)}.

**b)2)** Let = {(x1/0),(x2/0.3), (x3/0.7),(x4/1), (x5/0), (x6/0.2),(x7/0.6)}

= {(x1/0.3),(x2/1), (x3/0.5),(x4/0.8), (x5/1), (x6/0.5),(x7/0.6)} and

= {(x1/1),(x2/0.5), (x3/0.5),(x4/0.2), (x5/0), (x6/0.2),(x7/0.9)}.

Calculate  (6+9)

**OR**

**c)1)** Let  = {(x1|0.2), (x2|0.7), (x3|1), (x 4|0), (x5|0.5)} and = {(x1|0.5), (x2|0.7), (x3|0), (x 4|0.5), (x5|0.5)}.

Check whether?

**c)2)** List down all the ‘algebraic’ properties of fuzzy subsets. Explain in detail, giving the implications of those properties that make a difference between crisp sets and fuzzy subsets. (5+10)

**II**. **a)1)** Choosing a suitable example, explain fuzzy subsets induced by a mapping

**OR**

**a)2)** Choosing a suitable example, explain normal and global projections. (5)

**b)1)** Let then prove that ; where  is the strongest path existing from x to y of length k.

**b)2)** Define the algebraic product and sum of two fuzzy relations. Explain with examples. (5+10)

**OR**

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

**c)2)** For ,  and  as given below, verify the following conditions.

 (5+10)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |  |  | A | B | C | D | E |  |  | A | B | C | D | E |
| A | 0 | 1 | 1 | 1 | 1 |  | A | 1 | 0.5 | 0.5 | 1 | 0.7 |  | A | 0 | 0.3 | 1 | 0 | 0.5 |
| B | 0 | 0 | 0.9 | 0.7 | 0.3 |  | B | 0 | 1 | 0.7 | 0.7 | 0 |  | B | 0.3 | 0.2 | 0 | 0.8 | 0.1 |
| C | 0 | 0 | 0 | 0.7 | 0.3 |  | C | 0 | 1 | 1 | 0.7 | 0 |  | C | 1 | 0 | 0 | 0.2 | 1 |
| D | 0 | 0 | 0 | 0 | 0.3 |  | D | 0 | 0.3 | 0.3 | 0 | 0 |  | D | 0 | 0.8 | 0.2 | 1 | 0.4 |
| E | 0 | 0 | 0 | 0 | 0 |  | E | 1 | 0.5 | 0 | 0.5 | 1 |  | E | 0.5 | 0.1 | 1 | 0.4 | 0.4 |

1. **a)1)** Contrast fuzzy ordinal relation with fuzzy resemblance relation. Give an example.

**OR**

**a)2)** Consider the relation  given with the membership function

Is this relation a resemblance relation? (5)

**b)1)** Define anti symmetric and perfect anti symmetric fuzzy binary relations. Give examples. Is it true to say that any perfect anti symmetric relation is evidently anti symmetric?

**b)2)** Let  be a similitude relation. Let x, y, z be the elements of E. Put then prove that  (7+8)

**OR**

**b)3)** Explain the following in detail with examples: Relation of (i)preorder (ii) anti reflexive preorder (iii) similitude (iv)dissimilitude and (v)Resemblance. (15)

1. **a)1)** Explain the three fundamental problems in the process of pattern recognition.

**OR**

**a)2)** State the fuzzy c-means algorithm as given J. Bezdek. (5)

**b)1)** How will you justify that fuzzy applications will yield better results in the field of pattern recognition rather than any other traditional methods.

**b)2)** Explain how fuzzy clustering methods are based on fuzzy equivalence relation. Given any relation, how is it possible to apply this method. (7+8)

**OR**

**c)1)** Explain in detail with examples (i)the two fuzzy clustering methods and (ii) the two pattern recognition methods. (15)

**V. a)** Explain how fuzzy application could make a difference in the field of Economics **OR** Engineering. (5)

**b)** Explain in detail, with a suitable example, fuzzy application in the field of Medicine **OR** Robotics. (15)

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