UG/PG ODD SEMESTER EXAMINATION, 2022

COMPUTER SCIENCE

7th Semester / 1st Semester

Course No. : MCS-504

(Fuzzy Set Theory and Applications)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer any five questions, taking one from each unit)

UNIT-I

1. (a) Define a fuzzy set and Type-2 fuzzy set. Illustrate with examples 6

   (b) Model the expression "real numbers considerably larger than 10" as a fuzzy set. Give the membership function. 8

2. (a) What is a membership function of a fuzzy set? Give Examples. 6

   (b) Define alpha cut, strong alpha cut and support of a given fuzzy set. 3

   (c) State and prove the first decomposition theorem. 5

UNIT-II

3. (a) Prove that a fuzzy set A on R is convex iff
$A(\lambda x_1 + (1-\lambda) x_2) > \min [A(x_1), A(x_2)]$ 6

(b) Let fuzzy sets A and B be given as
A = 0.5/3 + 1/5 + 0.6/7 + 0.8/8 and
B = 1/3 + 0.5/5 + 0.1/7 + 1/8, where X = {3, 5, 7, 8}. Obtain the following:
(i) A + B, the Algebraic Sum
(ii) A.B, the Algebraic Product 4+4=8

4. (a) Define the following:
(i) Fuzzy Complements
(ii) T-norms 4+4

(b) Prove that every fuzzy complement has at most one equilibrium. 6

UNIT-III

5. (a) Define the following:
(i) Fuzzy equivalence relation
(ii) A lattice 6

(b) Assume X=Y, Find the transitive max-min closure for the following membership matrix:

$$R = \begin{bmatrix} 1 & .2 & 0 & 0 \\ 0 & 0 & .4 & .3 \\ 1 & .2 & 0 & 0 \\ 0 & 0 & .4 & .3 \end{bmatrix}$$ 8

6. Define the following:
(i) Fuzzy compatibility relation
(ii) Fuzzy ordering relation
(iii) Fuzzy strong homomosphism 3+4+7=14

UNIT-IV

7. (a) With suitable example, compare between the classical logic and the multivalued logic.

(b) Write a note on Evidence Theory. 7+7=14

8. (a) Distinguish between absolute and relative Fuzzy quantifiers.

(b) What is a linguistic hedge? Why are linguistics hedges important in a fuzzy inference system?

(c) What is a fuzzy proposition? With suitable examples explain the different types of fuzzy propositions. 2+4+8

UNIT-V

9. Write a note on the following: 7+7=14
(a) Fuzzy Neural Networks
(b) Fuzzy Image Processing

10. What is fuzzy clustering?Explain in detail with the help of an example. 14

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