2017/EVEN/08/24/MCS–1002 (C)/ MS–402 (C)/574

PG Even Semester (CBCS) Exam., May—2017

COMPUTER SCIENCE

(10th Semester/4th Semester)

Course No. : MCS–1002 (C)/MS–402 (C)

(Fuzzy Set Theory and Applications)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Define interval-valued fuzzy set and model the following : 1+2+2=5

(i) Real numbers close to 10

(ii) x considerably larger than 100

(b) State and prove the first and second decomposition theorems. 5+5=10

2. Let A, B be two fuzzy numbers whose membership functions are given by

$$A(x)=\begin{cases} 0 & \text{for } x\le -1 \text{ and } x>3 \\ (x+1)/2 & \text{for } -1<x\le 1 \\ (3-x)/2 & \text{for } 1<x\le 3 \end{cases}$$

$$B(x)=\begin{cases} 0 & \text{for } x\le 1 \text{ and } x>5 \\ (x-1)/2 & \text{for } 1<x\le 3 \\ (5-x)/2 & \text{for } 3<x\le 5 \end{cases}$$

Calculate the fuzzy numbers $A+B$, $A-B$ and $A\cdot B$. 5×3=15

UNIT—II

3. Explain the following : 5×3=15

(a) Fuzzy complements

(b) Strong fuzzy homomorphism

(c) Fuzzy ordering relations

4. *(a)* Assuming that $x=y$, determine the max-min transitive closure for the relation defined by the following membership matrix : 9

$$R=\begin{bmatrix} \cdot 7 & \cdot 5 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & \cdot 4 & 0 & 0 \\ 0 & 0 & \cdot 8 & 0 \end{bmatrix}$$

(b) State the axiomatic skeleton for the following : 3×2=6

(i) Fuzzy *t*-norms

(ii) Fuzzy *t*-conorms

UNIT—III

5. (a) Explain the following : 3×3=9

(i) Belief measure

(ii) Plausibility measure

(iii) Fuzzy measure

(b) Explain the following with suitable examples : 3×2=6

(i) Fuzzy quantifiers

(ii) Linguistic hedges

6. (a) Discuss in detail the different types of fuzzy propositions. 12

(b) With suitable example, compare between the classical logic and the multivalued logic. 3

UNIT—IV

7. Write brief notes on the following : 7+4+4=15

(a) Fuzzy controllers

(b) QL implications

(c) S implications

8. (a) State and explain the basic features of a fuzzy expert system. 9

(b) Show that classical implication may result in several distinct classes of fuzzy implications. 6

UNIT—V

9. Write brief notes on the following : 5×3=15

(a) Fuzzy neural networks

(b) Fuzzy clustering

(c) Fuzzy automata

10. Explain how fuzzy set theory can be used in the following application areas : 7+8=15

(a) Image processing

(b) Pattern recognition

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