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Question Paper Code: 59223

B.E./B.Tech. DEGREE EXAMINATION, NOV 2019

Elective

Computer Science and Engineering

15UCS923- FUZZY LOGIC

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The excluded middle axioms, extended for fuzzy sets are expressed as _____ CO1-U
(a) $AUA \neq X$ (b) $AU\bar{A} \neq X$ (c) $AU\bar{A} = X$ (d) $AUA = X$.
2. A relation R is defined on the set of positive integers as $x Ry$ if $2x + y \leq 5$. The relation R is CO2- U
(a) reflexive (b) transitive (c) symmetric (d) None of these
3. Fuzzification is the process of making a _____ CO3-R
(a) Crisp quantity (b) Fuzzy quantity (c) Crisp set (d) Fuzzy set
4. In a Fuzzy set a prototypical element has a value CO4-U
(a) 1 (b) 0 (c) infinite (d) Not defined
5. Which of the following cannot be stated using Fuzzy logic? CO5- R
(a) color of an apple (b) Height of a person
(c) Date of birth of a student (d) speed of a car

PART – B (5 x 3= 15 Marks)

6. List the Operations on classical sets with equations? CO1-U
7. For the given $A = \{1, 2\}$; $B = \{3, 4\}$ Prove the Cartesian product is not associative CO2-U
8. Determine the crisp λ -cut relations for $\lambda = 1, 0.9$ for the following fuzzy relation matrix R1? CO3-U

$$R_1 = \begin{bmatrix} 1 & 0.8 & 0 & 0.1 & 0.2 \\ 0.8 & 1 & 0.4 & 0 & 0.9 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.5 \\ 0.2 & 0.9 & 0 & 0.5 & 1 \end{bmatrix}$$

9. How multi-objective is used in decision making? CO4-U
10. Define fuzzy goal and fuzzy constraint CO5-U

PART – C (5 x 16= 80 Marks)

11. (a) Explain Classical sets and detail about to mapping classical set to function with example? CO1- U (16)

Or

- (b) Explain in detail about Fuzzy set and its properties with example? CO1-U (16)

12. (a) Explain in detail about CRISP Relations with example? CO2-U (16)

Or

- (b) (i) A certain type of virus attacks cells of the human body. The infected cells can be visualized using a special microscope. The microscope generates digital images that medical doctors can analyze and identify the infected cells. The virus causes the infected cells to have a black spot, within a darker gray region using two fuzzy set

$$P = \left\{ \frac{0.1}{C_1} + \frac{0.5}{C_2} + \frac{1.0}{C_3} \right\} \quad S = \left\{ \frac{0.3}{S_1} + \frac{0.8}{S_2} \right\}$$

- (ii) In the city of Calgary, Alberta, there are a significant number of neighborhood ponds that store overland flow from rainstorms and release the water downstream at a controlled rate to reduce or eliminate flooding in downstream areas. To illustrate a relation using the Cartesian product, let us compare the level in the neighborhood pond system based on a 1-in-100 year storm volume capacity with the closest three rain gauge stations that measure total rainfall.

$$A = \left\{ \frac{0.2}{p_1} + \frac{0.6}{p_2} + \frac{0.5}{p_3} + \frac{0.9}{p_4} \right\} \quad B = \left\{ \frac{0.4}{g_1} + \frac{0.7}{g_2} + \frac{0.8}{g_3} \right\}$$

13. (a) Explain defuzzification method in detail CO3-U (16)

Or

- (b) Explain the features of membership function CO3-U (16)

14. (a) Explain the following: CO4-U (16)
- (i) fuzzy Ordering
- (ii) Non-transitive Ranking

Or

(b) Explain multi-objective decision making with example CO4-U (16)

15. (a) Explain how fuzzy logic is used in activities. CO5-U (16)

Or

(b) Explain the applications of fuzzy logic in computer science and system science? CO5- App (16)

