

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

First Semester, 2023-24

BITS F343 (Fuzzy Logic & Applications)

Mid-Semester Examination (Regular, Closed Book)

Max. Time: 90 minutes

Date & Time: Friday, October 13, 2023, 2:00-3:30 PM

Max. Marks: 70

Note: The notations have usual meaning as and when required. Use $A, \tilde{A}, \mu_{\tilde{A}}(x)$ for crisp set, fuzzy set and membership grade function respectively. Do all sub-parts together. Start new question from fresh page.

1. Let $\tilde{A} = \frac{0.4}{1} + \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.3}{4}$, $\tilde{B} = \frac{0.7}{1} + \frac{0.1}{2} + \frac{0.2}{3} + \frac{0.4}{4}$, $\tilde{C} = \frac{0.5}{1} + \frac{0.9}{2} + \frac{0.6}{3} + \frac{0.8}{4}$. Arrange \tilde{A}, \tilde{B} and \tilde{C} in descending order of fuzziness related to crisp set. (use formula that involves compliment)? 10
2. Let $\tilde{X} = \frac{0.5}{a} + \frac{0.6}{b} + \frac{0.8}{c} + \frac{0.4}{d}$, $\tilde{Y} = \frac{0.6}{a} + \frac{0}{b} + \frac{0.1}{c} + \frac{0.3}{d}$, $\tilde{Z} = \frac{0.7}{a} + \frac{0.1}{b} + \frac{0.8}{c} + \frac{1}{d}$. Find $Int[\{dil(\tilde{X}) \odot \tilde{Y}\} \ominus \{con(\tilde{Y}) \oplus \tilde{Z}\}]$. 10
3. Let $\tilde{C} = \frac{0.4}{-1} + \frac{0.5}{1} + \frac{0.7}{3}$ on U , $\tilde{D} = \frac{0.7}{-2} + \frac{0.1}{2} + \frac{0.2}{4}$ on V . Find \tilde{E} on $W = U \times V$ such that $w = f(u, v) = uv$. 10
4. Let $\tilde{M} = [-1, 1, 4]$ and $\tilde{N} = [-2, -1, 1]$. Find $\tilde{M} \odot \tilde{N}$. 10
5. Let $\tilde{P} = [-1, 1, 4, 7]$. Find $e^{\tilde{P}}$ and $\tilde{P}^{\frac{1}{3}}$. 10
6. Let $\tilde{R} = \frac{0.1}{a} + \frac{0.2}{b} + \frac{0.4}{c}$, $\tilde{S} = \frac{0.8}{a} + \frac{0.5}{b} + \frac{0.7}{c}$. Check, whether Yager class of union, intersection, and complementation for parameter 2 satisfy De Morgan's Law for union. 10
7. For $\tilde{W} = \frac{0.1}{a} + \frac{0.8}{b} + \frac{1}{c} + \frac{0.6}{d} + \frac{0.3}{e} + \frac{0}{f}$ and $\tilde{Z} = \frac{0.2}{a} + \frac{0.7}{b} + \frac{0.9}{c} + \frac{0.5}{d} + \frac{0.4}{e} + \frac{0.1}{f}$, determine 10
 - (i) Level set of \tilde{W}
 - (ii) Support of \tilde{W}
 - (iii) $0.4\tilde{Z}$
 - (iv) $FC(\tilde{W})$
 - (v) $\widetilde{and}(\tilde{W}, \tilde{Z})$ for parameter 0.8