ASSIGNMENT-1

Fuzzy Sets And Fuzzy Logic

Q.1 Write the complement of the fuzzy set {(2,0.4), (4, 0.6), (5,0.7), (6,1), (7,1), (8,0.4), (9.02)} defined over the universe of discourse (i) x= {1,2, 3, ...,10} (ii) x= {2,4,5,6,7,8,9}

Q2. (a) Compute the cardinality and relative cardinality of the following fuzzy sets:

(i) $\tilde{A} = \frac{0.4}{1} + \frac{0.3}{3} + \frac{0.5}{4} + \frac{0.4}{7} + \frac{0.8}{8}$ defined on universe of discourse-

U={1,2,3,4,5,.......,10}

(ii) $\tilde{C} = \left\{ \{x, u_c(x)\}, u_c = 1-\frac{1}{10}, x \in \{0,1,2,........,10\} \right\}$

(b) Determine α-level and strong α-level set for the following fuzzy sets:

$$\tilde{C} = \left\{ (x, u_c(x)) . | x \in R \right\} \text{ where}$$

$$u_c(x) = \begin{cases} 0 & x \le 10 \\ \frac{1}{1+(x-10)^2} & x \ge 10 \end{cases}$$

for $\alpha = 0, 0.3, .5, 0.8, 1$

Q3. Let the fuzzy sets:

Fair: $\tilde{F} = \left\{ (2,0.3), (3,0.6),(4,0.9), (5,1),(6,0.9), (7,0.5),(8,0.1) \right\}$

Bad: $\tilde{B} = \left\{ (1,1), (2,0.7),(3,0.4), (4,0.1) \right\}$

be defined on the universe X={1,2,........,10}, construct membership functions for the following compound sets (i) Not Fair (ii) Not bad and (iii) Fair but not bad.

Q4. Consider the fuzzy sets $\tilde{A}$, $\tilde{B}$, $\tilde{C}$ defined on the universe [0,10] of real numbers by membership functions:

$$u_A(x) = \frac{x}{x+2}, \quad u_B(x) = 2^{-x}, \quad u_C(x) = \frac{1}{x+10((x-2)^2}$$

Determine the membership functions of : $C(\tilde{C})$, $\tilde{A} \cup \tilde{B}$, $\tilde{A} \cup C(\tilde{C})$, .C $\tilde{A} \cap \tilde{C}$,

Hence "C" is

Q5. Compute (i) $\tilde{A} + \tilde{B}$ and (ii) $\tilde{A} \times \tilde{C}$ where $\tilde{A}, \tilde{B}, \tilde{C}$ are triangular fuzzy numbers defined as:

$\tilde{A}=(2.5, 3, 3.5)$, $\tilde{B}=(3.5, 4, 4.5)$, $\tilde{C}= (1.5,2,2.5)$

Q6. Find $\tilde{x}$ such that $\tilde{A} \otimes \tilde{X}=\tilde{B}$, where $\tilde{A}=(1, 3, 4)$ and $\tilde{B}=(2, 12, 48)$

Q7. If $\tilde{A} \otimes \tilde{X}=\tilde{B}$. Find $\tilde{x}$, where $\tilde{A}=(1, 2, 4, 5)$ and $\tilde{B}=(2, 3, 5, 6)$

Q8. Find the best approximate real numbers x for the fuzzy equation:

$F(x)= (0, 2 ,3) + x = (5 ,6, 7)$

Q9. Prove that Multiplication and division of two trapezoidal fuzzy Numbers may not be trapezoidal Fuzzy Number. Discuss with example.

Q10. Prove that Multiplication and division of two triangular fuzzy Number may not be triangular fuzzy Number. Discuss with an example also.

Q11. Draw the graphs of Fuzzy sets whose membership functions are defined as follows:

(i) $\begin{cases} 0 & x \leq 1 \\ \frac{x-1}{3} & 1 \leq x \leq x \\ 1 & x \geq 4 \end{cases}$