ASC

Unit - 3

$A = \{ (a, 0.5)\ (b, 0.7)\ (c, 0.9) \}$

$B = \{ (a, 0.2)\ (b, 0.9) \}$

Fuzzy set

- $A \cup B = \{ (a, 0.5)\ (b, 0.9)\ (c, 0.9) \}$
- $A \cap B = \{ (a, 0.2)\ (b, 0.7) \}$
- $\bar{A} = \{ (a, 0.5)\ (b, 0.3)\ (c, 0.1) \}$
- $\bar{B} = \{ (a, 0.8)\ (b, 0.1) \}$

☆ De morgan's law

$$\boxed{\overline{A \cup B} = \bar{A} \cap \bar{B}}$$

Proof:-

$A = \{ (a, 0.6)\ (b, 0.9)\ (c, 0.1) \}$

$B = \{ (a, 0.2)\ (b, 0.4)\ (c, 0.7) \}$

$A \cup B = \{ (a, 0.6)\ (b, 0.9)\ (c, 0.7) \}$

$\overline{A \cup B} = \{ (a, 0.4)\ (b, 0.1)\ (c, 0.3) \}$ —— (1)

Similarly,

$\bar{A} = \{ (a, 0.4)\ (b, 0.1)\ (c, 0.9) \}$

$\bar{B} = \{ (a, 0.8)\ (b, 0.6)\ (c, 0.3) \}$

$\bar{A} \cap \bar{B} = \{ (a, 0.4)\ (b, 0.1)\ (c, 0.3) \}$ —— (2)

From eq (1) & (2),

$$\boxed{\overline{A \cup B} = \bar{A} \cap \bar{B}}$$

Hence Proved.

Demorgan's law for crisp set.

$$\boxed{\overline{A \cup B} = \bar{A} \cap \bar{B}}$$

Let $x \in \overline{A \cup B}$

$\Rightarrow x \notin A \cup B$

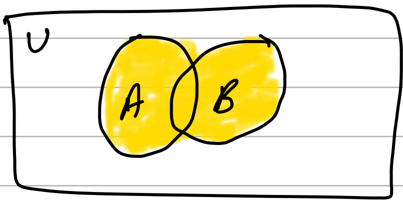
$\Rightarrow x \notin A$ and $x \in B$

$\Rightarrow x \in \bar{A}$ and $x \in \bar{B}$

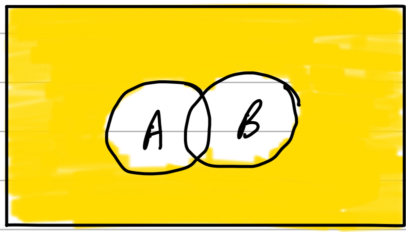
$\Rightarrow x \in \bar{A} \cap \bar{B}$

<u>Hence Proved</u>

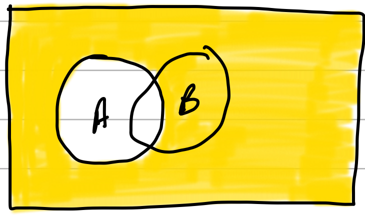
$A \cup B =$



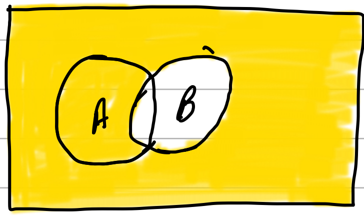
$\therefore \overline{A \cup B} =$



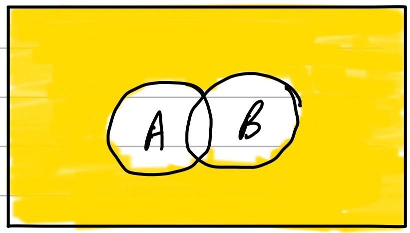
$\bar{A} =$



$\bar{B} =$



$\therefore \bar{A} \cap \bar{B} =$



Equal

<u>Hence Proved</u>

☆ Two Rules that are not followed by Fuzzy logics

① $A \cap \bar{A} = \phi$ Law of Contradiction.

Let, $A = \{(a, 0.2)\ (b, 0.4)\}$

$\therefore \bar{A} = \{(a, 0.8)\ (b, 0.6)\}$

$\therefore A \cap \bar{A} = \{(a, 0.2)\ (b, 0.4)\} \neq \phi$

② $A \cup \bar{A} = U$ Law of Excluded Middle.

☆ P.O.S | ROS.

$$R = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{cc} y_1 & y_2 \end{array} \\ \begin{bmatrix} 0.5 & 0.1 \\ 0.2 & 0.9 \\ 0.8 & 0.6 \end{bmatrix} \end{array} \qquad S = \begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.6 & 0.4 & 0.7 \\ 0.5 & 0.8 & 0.9 \end{bmatrix} \end{array}$$

$ROS = \max\{\min 1, \min 2, \ldots\}$

$x_1 z_1 = \max\{\min(0.5, 0.6), \min(0.1, 0.5)\} = \max\{0.5, 0.1\} = 0.5$

$\therefore$

$$\begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.5 & 0.4 & \\ & & \\ & & \end{bmatrix} \end{array}$$

$X_1 Z_1 = \max\{\min(0.5, 0.6), \min(0.1, 0.5)\}$

$X_1 Z_1 = \max\{0.5, 0.1\}$

$\therefore X_1 Z_1 = 0.5.$

$$\therefore ROS = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{bmatrix} 0.5 & & \\ & & \\ & & \end{bmatrix} \end{array}$$

Answer

Q. If X = Union set = $\{1, 2, 3, 4, 5, 6, 7\}$

$A = \{2, 4, 6\}$

$\therefore \quad \bar{A} = \{1, 3, 5, 7\}$.

$\therefore$ Cardinality of $\bar{A}$ = no. of elements in $\bar{A}$

$\Rightarrow \boxed{\text{cardinality} = 4}$