SIGNMENT-3

1. $\tilde{f}(x) = (f(x), s(x), t(x))$

$f(x) = x^2 \quad s(x) = \frac{x}{4} \quad t(x) = x/2$

$L(x) = \frac{1}{1+x^2} \qquad R(x) = \frac{1}{1+2|x|}$

$L(x)$ and $R(x)$ have no effect on value of integral of such fuzzy function.

$\int_1^4 \tilde{f}(x).dx = \quad \int_a^b f(x)\,dx = \int_1^4 x^2 dx = \frac{x^3}{3}\Big|_1^4 = 21$

$\int_a^b s(x)\,dx = \int_1^4 \frac{x}{4}\,dx = \frac{x^2}{8}\Big|_1^4 = 1.875$

$\int_a^b t(x)\,dx = \int_1^4 \frac{x}{2}\,dx = \frac{x^3}{6}\Big|_1^4 = 3.75$

Hence $\tilde{I}(a,b) = (21, 1.875, 3.75)_{LR}$

2. $\tilde{a} = \{(4,0.8), (5,1), (6,0.4)\} \quad \tilde{b} = \{(6,0.7), (7,1), (8,0.2)\}$

$f(x) = 2 \quad x \in [2,4]$

$[a,b]$	$\int_a^b f(x)\,dx = \int_a^b 2\,dx$	$\min(\mu_A(a), \mu_B(b))$
		0.7
$[4,6]$	4	
	6	0.8
$[4,7]$		

[4, 8]	8	0.2
[5, 6]	2	0.7
[5, 7]	4	1
[5, 8]	6	0.2
[6, 6]	0	0.4
[6, 7]	2	0.4
[6, 8]	4	0.2

$$\tilde{I}(A,B) = \{(0, 0.4), (2, 0.7), (4, 1), (6, 0.8), (8, 0.2)\}$$

3. $f(x) = 2x - 3 \qquad g(x) = 2x + 5$

$$\tilde{a} = \{(1, 0.8), (2, 1), (3, 0.4)\}$$

$$\tilde{b} = \{(3, 0.7), (4, 1), (5, 0.3)\}$$

$$f \circ g = 2(2x+5) - 3 = 4x + 10 - 3 = 4x + 7$$

$$g \circ f = 2(2x-3) + 5 = 4x - 6 + 5 = 4x - 1$$

(i)

$[a, b]$	$\int_a^b f(x)\,dx = \int_a^b 2x - 3 = x^2 - 3x\Big\vert_a^b$	$\min\{\mu_A(a), \mu_B(b)\}$
[1, 3]	2	0.7
[1, 4]	6	0.8
[1, 5]	12	0.3

[2, 3]	2	0.7
[2, 4]	6	1
[2, 5]	12	0.3
[3, 3]	0	0.4
[3, 4]	4	0.4
[3, 5]	10	0.3

$$\tilde{I}(A,B) = \{(0,0.4),(2,0.7),(6,1),(12,0.3),(4,0.4),(10,0.3)\}$$

(ii)

[a, b] &	$\int_a^b f(x)\,dx = \int_a^b 2x+5$ $= x^2+5x \Big|_a^b$	$\min\{\mu_A(a), \mu_B(b)\}$
[1, 3]	18	0.7
[1, 4]	30	0.8
[1, 5]	44	0.3
[2, 3]	10	0.7
[2, 4]	22	1
[2, 5]	36	0.3
[3, 3]	0	0.4
[3, 4]	12	0.4

[3, 5]	26	0.3

$\tilde{I}(A,B) = \{(0,0.4), (10,0.7), (12,0.4), (18,0.7), (22,1), (26,0.3), (30,0.8), (36,0.3), (44,0.3)\}$

(iii) & (iv)

$[a, b]$	$\int_a^b 4x+7 = 2x^2+7x \Big\vert_a^b$	$\int_a^b 4x-1 = 2x^2-x \Big\vert_a^b$	$\min\{\mu_A(a), \mu_B(b)\}$
[1, 3]	30	14	0.7
[1, 4]	51	27	0.8
[1, 5]	76	44	0.3
[2, 3]	17	9	0.7
[2, 4]	38	22	1
[2, 5]	63	39	0.3
[3, 3]	0	0	0.4
[3, 4]	21	13	0.4
[3, 5]	46	30	0.3

(iii) $\tilde{I}(A,B) = \{(0,0.4), (17,0.7), (21,0.4), (30,0.7), (38,1), (46,0.3), (51,0.8), (63,0.3), (76,0.3)\}$

(iv) $\tilde{I}(A,B) = \{(0,0.4), (9,0.7), (13,0.4), (14,0.7), (22,1), (30,0.3), (27,0.8), (39,0.3), (44,0.3)\}$

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4. $f(x) = x^3 \quad \tilde{x} = \{(-1, 0.4), (0, 1), (1, 0.6)\}$

$f'(x) = 3x^2$

using extension principle:-

$f'(\tilde{x}) = \{(0, 1), (3, 0.6)\}$

5. $f(x) = x^2+1, \; g(x) = 2-x$

$\tilde{a} = (1, 2, 3)$

$\tilde{b} = (3, 4, 5)$

6. $\tilde{x} = \{(-1, 0.4), (0, 0.1), (1, 0.6)\}$

$f(x) = x^3+2 \qquad g(x) = 2x+3$

$f'(x) = 3x^2 \qquad g'(x) = 2$

$f'(x) + g'(x) = 3x^2+2$

$f(x) + g(x) = x^3+2x+5$

$f'(\tilde{x}_0) = \{(3, 0.6), (0, 0.1)\}$

$g'(x) = \{(2, 0.6)\}$

$f'(x) + g'(x) = \{(5, 0.6), (2, 0.1)\}$

$(f'+g')(x) = \{(5, 0.6), (2, 0.1)\}$

Hence, $(f'+g')(\tilde{x}_0) = f'(\tilde{x}_0) + g'(\tilde{x}_0)$

Q. 7

ASSIGNMENT - 3.

$$f(x_0) = \{(-2+(-1-1), .5), (-1, .8), (2+(1-1), 1)$$
$$(16+(2-1), .8), (54+(3-1), .4)\}$$

$$= \{(-4, .5), (-1, .8), (2, 1), (17, .8), (56, .4)\}$$

$$g(x_0) = \{(-2, .5), (-1, .8), (0, 1), (13, .8), (50, .4)\}$$

$$LHS = \{(-6, .5), (-3, .5), (0, .5), (15, .5), (54, .4)$$
$$(-5, .5)\ (-2, .8)\ (1, .8)\ (16, .8), (55, .4),$$
$$(-4, .5), (-1, .8), (2, 1), (17, .8), (56, .4),$$
$$(9, .5), (12, .8), (15, .8), (30, .8), (69, .4),$$
$$(46, .4), (49, .4), (52, .4), (67, .4), (106, .4)$$

$$RHS = \{(-6, .5), (-2, .8), (2, 1), (30, .8), (106, .4)\}$$

Since RHS part of LHS hence Proved.

$\underline{S.8}$

$$f(x) = \begin{cases} 2x^2 - 3 & -2 \leq x \leq 2 \\ 5 & \text{else where} \end{cases}$$

$$\mu_{M(x)}(x) = \frac{f(x) - \inf(x)}{\sup(x) - \inf(x)}$$

$\sup(x) = 5$

$\inf(x) = -3$

So for

1) $2 \geq x \geq -2$

$$\mu_M(x) = \frac{2x^2 \cancel{-3} \cancel{+3}}{5-(-3)} = \frac{2x^2}{8} = \frac{x^2}{4}$$

2) else where

$$\mu_M(x) = \frac{5+3}{5+3} = 1$$

Q.9 $f(x) = \sin(\sin x)$, $x \in R$

$\sup(x) = \sin 1$

$\inf(x) = -\sin 1$

$$\mu_{max}(x) = \frac{f(x) - \inf(x)}{\sup(x) - \inf(x)}$$

$$= \frac{\sin(\sin x) + \sin 1}{2 \sin 1}$$

$\mu_{max}(0) = 1/2$

$\mu_{max}(\pi/2) = 1$

$\mu_{max}(-\pi/2) = 0$

10. (i) Yes

Classical functions can be defined as a fuzzy function mapping from crisp to crisp set with membership value '1'.

(ii) Yes

We can define fuzzy function, $f : X \to \tilde{P}(Y)$ where $\tilde{P}(Y)$ is fuzzy power set of Y and $\mu_{f(x)}(y) = \mu_R(x,y) \ \forall \ x, y \in X \times Y$ where R is a fuzzy relation.

(iv) Yes

If 'M' is the maximizing set of fuzzy function "f" then we say, we get maximum value of "f" at "x_0" if

(i) $\mu_m(x_0)$ is maximum

(ii) $\mu_D(x_0)$ is maximum

↳ denotes membership of x_0 in domain

(v) Yes

(vi) Yes

Integration of crisp function over fuzzy domain:

$$\int_{\tilde{a}}^{\tilde{b}} f(x)\,dx = F(\tilde{b}) - F(\tilde{a})$$

This subtraction is extended subtraction and done with conformation to extension principle.

Integration of fuzzy function over crisp domain:

$$\tilde{I}(a,b) = \left\{ \left(\int_a^b f_\alpha^-(x)\,dx + \int_a^b f_\alpha^+(x)\,dx \right) \right\}$$

where f_α^+ and f_α^- are α-level curves for fuzzy functions 'f'.

⇒ Since this is defined according to α-cuts, it is also in conformity with extension principle.

(vii) No

The condition holds only if $\int_a^b \tilde{f}(x)dx$ and $\int_a^b \tilde{g}(x)dx$ are commutative.

Generally,

$$\int_a^b (\tilde{f} \oplus \tilde{g})dx \supseteq \int_a^b \tilde{f}(x)dx \oplus \int_a^b \tilde{g}(x)dx$$ [fuzzy f^n over crisp domain]

(viii) No

The following condition is always there:

$$\int_{\tilde{a}}^{\tilde{b}} (f+g)x\,dx \subseteq \int_{\tilde{a}}^{\tilde{b}} f(x)dx + \int_{\tilde{a}}^{\tilde{b}} g(x)dx$$ [crisp f^n over fuzzy domain]

(ix) No

The given condition is true for fuzzy f^n over crisp domain but not for crisp f^n over fuzzy domain

$$\int_a^c \tilde{f}(x)dx = \int_a^b \tilde{f}(x)dx + \int_b^c \tilde{f}(x)dx$$

$$\int_{\tilde{a}}^{\tilde{c}} f(x)dx \subseteq \int_{\tilde{a}}^{\tilde{b}} f(x)dx + \int_{\tilde{b}}^{\tilde{c}} f(x)dx$$

(x) Yes

For question 6, condition was true.

For question 7, condition was not true.

11) $f(x) = x^4 + x^2 - 1$

$\{(1, 0.2), (2, 0.6), (3, 1), (4, 0.6), (5, 0.2)\}$

$f(\text{around } 3) = \{(f(1), 0.2), (f(2), 0.6), (f(3), 1), (f(4), 0.6), (f(5), 0.2)\}$

$= \{(1, 0.2), (19, 0.6), (89, 1), (271, 0.6), (649, 0.2)\}$

12) $P(\tilde{A})_{true} = \{(0.5, 0.6), (0.6, 0.7), (0.7, 0.8), (0.8, 0.9), (0.9, 1), (1, 1)\}$

$P(\tilde{B})_{true} = \{(0.2, 0.3), (0.3, 0.8), (0.5, 0.1), (0.7, 0.4), (0.8, 0.9), (0.9, 0.7)\}$

a) $P(\tilde{A})_{negation} = \{(0, 1), (0.1, 1), (0.2, 1), (0.3, 1), (0.4, 1), (0.5, 0.4), (0.6, 0.3), (0.7, 0.2), (0.8, 0.1)\}$

b) $P(\tilde{A})_{very\ true} = \{(0.5, 0.36), (0.6, 0.49), (0.7, 0.64), (0.8, 0.81), (0.9, 1), (1, 1)\}$

d) $P(\tilde{A})_{very\ very\ true} = \{(0.5, 0.216), (0.6, 0.343), (0.7, 0.324), (0.8, 0.729), (0.9, 1), (1, 1)\}$

e) $P(\tilde{A}) \wedge P(\tilde{B}) = \{(0.5, 0.1), (0.6, 0), (0.7, 0.4), (0.8, 0.9), (0.9, 0.7)\}$

f) $P(\tilde{A}) \vee P(\tilde{B}) = \{(0.2, 0.3), (0.3, 0.8), (0.5, 0.6), (0.6, 0.7), (0.7, 0.8), (0.8, 0.9), (0.9, 1), (1, 1)\}$

g) $P(\tilde{A}) \rightarrow P(\tilde{B}) = \{(0, 1), (0.1, 1), (0.2, 1), (0.3, 1), (0.4, 1), (0.5, 0.4), (0.6, 0.3), (0.7, 0.4), (0.8, 0.9), (0.9, 0.7)\}$

13) Using Lukasiewicz implication

$I(a,b) = \min(1, 1-a+b)$

$$\tilde{R} = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{cc} y_1 & y_2 \\ \multicolumn{2}{c}{\left[\begin{array}{cc} 1 & .9 \\ 1 & .4 \\ 1 & .8 \end{array}\right]} \end{array}$$

$B' = \{(y_1, .9), (y_2, .7)\}$

Using compositional rule of inference

$\mu_B(y_1) = \sup_{x \in X} \min[\mu_B(x), \mu_R(x, y_1)]$

$= \max(\min(.6, 1), (.9, 1), \min(.7, 1))$

$= 0.9.$

44. In this case,

$$\mu_{A'}(x_1) = \sup_{y \in Y} \min[\mu_B(y), \mu_R(x_1, y)] = \max\{\min(.9, 1), \min(.7, .9)\} = .9$$

$$\mu_{A'}(x_2) = \sup_{y \in Y} \min[\mu_B(y), \mu_R(x_2, y)] = .9$$

$$\mu_{A'}(x_3) = \sup_{y \in Y} \min[\mu_B(y), \mu_R(x_3, y)] = .9$$

Hence x is $\tilde{A}' = \{(x_1, .9), (x_2, .9), (x_3, .9)\}$

~~Now we consider generalized hypothetical syllogism,~~

~~Rule 1: [illegible]~~

~~Rule 2: [illegible]~~

~~For each conditional fuzzy proposition in (1) there is a fuzzy relation determined by $\tilde{R}(x,y) = \mathcal{J}[\tilde{A}(x), \tilde{B}(y)]$~~

15) $\tilde{A} = \{(x_1, 0.5), (x_2, 1), (x_3, 0.6)\}$

$\tilde{B} = \{(y_1, 0.1), (y_2, 0.4)\}$

$\tilde{C} = \{(z_1, 0.2), (z_2, 0.1)\}$

$$I(a,b) = \begin{cases} 1 & \text{if } a \leq b \\ b & \text{if } a > b \end{cases}$$

$\rightarrow$ $\tilde{R}_1 = \begin{array}{c|cc} & y_1 & y_2 \\ \hline x_1 & 1 & .4 \\ x_2 & 1 & .4 \\ x_3 & 1 & .4 \end{array}$ $\qquad \tilde{R}_2 = \begin{array}{c|cc} & z_1 & z_2 \\ \hline y_1 & .2 & 1 \\ y_2 & .2 & 1 \end{array}$

$\tilde{R}_3 = \begin{array}{c|cc} & z_1 & z_2 \\ \hline x_1 & 1 & .4 \\ x_2 & 1 & .4 \\ x_3 & 1 & .4 \end{array}$

$\tilde{R}_1 \circ \tilde{R}_2 = \begin{array}{c|cc} & z_1 & z_2 \\ \hline x_1 & 1 & .4 \\ x_2 & 1 & .4 \\ x_3 & 1 & .4 \end{array} = \tilde{R}_3$

Thus, generalised hypothetical syllogism holds.

17) i) $(a \wedge b) \Rightarrow c$

a	b	$a \wedge b$		c	$(a \wedge b) \Rightarrow c$
0	0	~~0~~	0	1	1
0	1/2	~~0~~	1/2	1	1
0	1	~~0~~	1	1	1
1/2	0	~~0~~	1/2	1/2	1
1/2	1/2	~~1/2~~	1/2	1/2	1
1/2	1	~~1/2~~	1	1/2	1/2
1	0	~~0~~	1	0	0
1	1/2	~~1/2~~	1	0	0
1	1	~~1~~	1	0	0

ii) $(a \vee b) \Leftrightarrow (a \wedge b)$

a	b	$\vee$	$\wedge$	$(a \vee b) \Leftrightarrow (a \wedge b)$
0	0	0	0	1
0	1/2	0	1/2	1/2
0	1	0	1	0
1/2	0	0	1/2	1/2
1/2	1/2	1/2	1/2	1
1/2	1	1/2	1	1/2
1	0	0	1	0
1	1/2	1/2	1	1/2
1	1	1	1	1

iii) $(a \Rightarrow b) \Rightarrow (a \Rightarrow b)$

a	b	$\Rightarrow$	$(a \Rightarrow b) \Rightarrow (a \Rightarrow b)$
0	0	1	1
0	1/2	1	1
0	1	1	1
1/2	0	1/2	1
1/2	1/2	1	1
1/2	1	1	1
1	0	0	1
1	1/2	1/2	1
1	1	1	1

(18) True $= \{(0.5, 0.3), (0.6, 0.6), (0.7, 0.8), (0.8, 0.9), (0.9, 0.9), (1, \cdot 1)\}$

False $= \{(0, 1), (0.1, 0.9), (0.2, 0.8), (0.3, 0.6), (0.4, 0.2), (0.5, 0.11)\}$

Not true $= \overline{\text{True}} = \{(0,1), (0.1 1), (0.2, 1), (0.3, 1), (0.4, 1), (0.5, 0.7), (0.6, 0.4), (0.7, 0.2), (0.8, 0.1), (0.9, 0.1), (1, 0.9)\}$

Neither True nor false $= (\overline{\text{True} \wedge \text{False}})$

True $\cup$ False $= \{(0, 1), (0.1, 0.9), (0.2, 0.8), (0.3, 0.6), (0.4, 0.2), (0.5, 0.3), (0.6, 0.6), (0.7, 0.8), (0.8, 0.9), (0.9, 0.9), (1, 0.1)\}$

Neither true nor false $= (\overline{\text{True} \cup \text{False}}) =$
$\{(0.1, 0.1), (0.2, 0.2), (0.3, 0.4), (0.4, 0.8), (0.5, 0.7), (0.6, 0.4), (0.7, 0.2), (0.8, 0.1), (0.9, 0.1), (1, 0.9)\}$

Very true = True - false = True ∧ False

False = {(0.1, 0.1), (0.2, 0.2), (0.3, 0.4), (0.4, 0.8),
(0.5, 0.9), (0.6, 1), (0.7, 1), (0.8, 1), (0.9, 1), (1, 1)}

Very True = True ∩ false

= {(0.5, 0.3), (0.6, 0.6), (0.7, 0.8), (0.8, 0.9),
(0.9, 0.9), (1, 0.1)}

Almost true not false = True ∪ false

= {(0.1, 0.1), (0.2, 0.2), (0.3, 0.4), (0.4, 0.5), (0.5, 0.9),
(0.6, 1), (0.7, 1), (0.8, 1), (0.9, 1), (1, 1)}

ANS 20

$$\mu_{RT(A'/A)}(.8) = \mu_A(x_1) = .9$$

$$\mu_{RT}(A'/A)(.6) = \mu_A(x_2) = .8$$

$$\mu_{RT}(A'/A)(.5) = \mu_A(x_3) = .5$$

$$\mu_{RT}(A'/A)(.4) = \mu_A(x_4) = .5$$

USING LUKASIEWIEZ FUZZY IMPLICATION

$$I(a,b) = \min(1, 1-a+b)$$

$$\mu_{RT}(B'/B)(b) = \max\{ \min(.9, S(I(.9,b))), \min(.8, S(I(.8,b))), \min(.5, S(I(.5,b))), \min(.5, S(I(.5,b))) \}.$$

$$\mu_B(y_1) = \mu_{RT}(B'/B)(\tilde{B}(y_1)) = \mu_{RT}(B'/B)(.2) = .5$$

$$\mu_B(y_2) = \mu_{RT}(B'/B)(\tilde{B}(y_2)) = \mu_{RT}(B'/B)(.5) = .7$$

$$\mu_B(y_3) = \mu_{RT}(B'/B)(\tilde{B}(y_3)) = \mu_{RT}(B'/B)(.6) = .8$$

$$B = \{(y_1, .5), (y_2, .7), (y_3, .8)\}.$$

1 point

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Que 21- $X = \{1, 2, 3, 4\}$; $\tilde{A} = \{(1,0), (2,.2), (3,.6), (4,1)\}$

$$\tilde{R} = \begin{array}{c c} & \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{bmatrix} 1 & .5 & 0 & 0 \\ .5 & 1 & .5 & 0 \\ 0 & .5 & 1 & .5 \\ 0 & 0 & .5 & 1 \end{bmatrix} \end{array}$$

$\Rightarrow \tilde{B} = \tilde{A} \circ \tilde{R}$

$$= \begin{array}{c c} & \begin{array}{cccc} y_1 & y_2 & y_3 & y_4 \end{array} \\ x_1 & \begin{bmatrix} 0 & .2 & .6 & 1 \end{bmatrix} \end{array} \circ \begin{array}{c c} & \begin{array}{cccc} z_1 & z_2 & z_3 & z_4 \end{array} \\ \begin{array}{c} y_1 \\ y_2 \\ y_3 \\ y_4 \end{array} & \begin{bmatrix} 1 & .5 & 0 & 0 \\ .5 & 1 & .5 & 0 \\ 0 & .5 & 1 & .5 \\ 0 & 0 & .5 & 1 \end{bmatrix} \end{array}$$

for $x = x_1$, $z = z_1$

$$\mu(x_1, z_1) = \max(\min(0,1), \min(.2,.5), \min(.6,0), \min(1,0))$$
$$= \max(0, .2, 0, 0) = .2$$

for $x = x_1$, $z = z_2$

$$\mu(x_1, z_2) = \max(\min(0,.5), \min(.2,1), \min(.6,.5), \min(1,0))$$
$$= \max(0, .2, .5, 0) = .5$$

for $x = x_1$, $z = z_3$

$$\mu(x_1, z_3) = \max(\min(0,0), \min(.2,.5), \min(.6,1), \min(1,.5))$$
$$= \max(0, .2, .6, .5) = .6$$

for $x = x_1$, $z = z_4$

$$\mu(x_1, z_4) = \max(\min(0,0), \min(.2,0), \min(.6,.5), \min(1,1))$$
$$= \max(0, 0, .5, 1) = 1$$

$\Rightarrow \tilde{B} = \{(1,.2), (2,.5), (3,.6), (4,1)\}$

Que22- $X=\{1,2,3,4,5\}$; $\tilde{A}=\{(1,1),(2,.5),(3,.4),(4,.2),(5,0)\}$

μ of $\tilde{A}\circ\tilde{R}$ be defined by $\tilde{B}$ matrix,

$$\tilde{B}=\tilde{A}\circ\tilde{R}$$

$$= \begin{array}{c|ccccc} & y_1 & y_2 & y_3 & y_4 & y_5 \\ x_1 & 1 & .5 & .4 & .2 & 0 \end{array} \circ \begin{array}{c|ccccc} & z_1 & z_2 & z_3 & z_4 & z_5 \\ y_1 & 1 & .8 & 0 & 0 & 0 \\ y_2 & .8 & 1 & .8 & 0 & 0 \\ y_3 & 0 & .8 & 1 & .8 & 0 \\ y_4 & 0 & 0 & .8 & 1 & .8 \\ y_5 & 0 & 0 & 0 & .8 & 1 \end{array}$$

for $x=x_1,\ z=z_1$

$$\mu(x_1,z_1)=\max(\min(1,1),\min(.5,.8),\min(.4,0),\min(.2,0),\min(0,0))$$
$$=\max(1,.5,0,0,0)=1$$

$$\mu(x_1,z_2)=\max(\min(1,.8),\min(.5,1),\min(.4,.8),\min(.2,0),\min(0,0))$$
$$=\max(.8,.5,.4,0,0)=.8$$

$$\mu(x_1,z_3)=\max(\min(1,0),\min(.5,.8),\min(.4,1),\min(.2,1),\min(0,.8))$$
$$=\max(0,.5,.4,.2,0)=.5$$

$$\mu(x_1,z_4)=\max(\min(1,0),\min(.5,0),\min(.4,.8),\min(.2,1),\min(0,.8))$$
$$=\max(0,0,.4,.2,0)=.4$$

$$\mu(x_1,z_5)=\max(\min(1,0),\min(.5,0),\min(.4,0),\min(.2,.8),\min(0,1))$$
$$=\max(0,0,0,.2,0)=.2$$

$$\Rightarrow \tilde{B}=\{(1,1),(2,.8),(3,.5),(4,.4),(5,.2)\}$$

Que-23

$$\tilde{A} = \{(100, .5), (120, .7), (140, .8), (160, 1)\}$$

$$\tilde{B} = \{(10, .6), (12, .8), (15, 1)\}$$

let index of attractive car for diff combinations of mileage and top speed is denoted by relation $\tilde{R}$.

$$\Rightarrow \cancel{\tilde{R} = \begin{array}{c} 100 \\ 120 \\ 140 \\ 160 \end{array} \begin{bmatrix} .5 \\ .7 \\ .8 \\ 1 \end{bmatrix}}$$

$$\Rightarrow \tilde{R} = \begin{array}{c} 10 \\ 12 \\ 15 \end{array} \begin{bmatrix} .6 \\ .8 \\ 1 \end{bmatrix} \circ \begin{array}{cccc} 100 & 120 & 140 & 160 \\ \end{array} \begin{bmatrix} .5 & .7 & .8 & 1 \end{bmatrix}$$

$$= \begin{array}{c|cccc} & 100 & 120 & 140 & 160 \\ \hline 10 & .5 & .6 & .6 & .6 \\ 12 & .5 & .7 & .8 & .8 \\ 15 & .5 & .7 & .8 & 1 \end{array}$$

Thus,

Mileage for most attractive car = 15 km/litre

Top speed for most attractive car = 160 km/hr

Que24-

$\tilde{A} = \{(1,0.7), (2,0.4), (3,0.6), (4,0.5), (5,0.8), (6,0.2)\}$

$\tilde{B} = \{(1,0.8), (2,0.5), (3,0.6), (4,0.6), (5,0.9), (6,0.1)\}$

① Zadeh's Maximum

$$t(x_i \text{ is } \tilde{A} \rightarrow y_j \text{ is } \tilde{B}) = (1 - \mu_A(x_i)) \vee (\mu_A(x_i) \wedge \mu_B(y_j))$$

$t =$

B

A	1	2	3	4	5	6
1	0.7	0.5	0.6	0.6	0.7	0.3
2	0.6	0.6	0.6	0.6	0.6	0.6
3	0.6	0.5	0.6	0.6	0.6	0.4
4	0.5	0.5	0.5	0.5	0.5	0.5
5	0.8	0.5	0.6	0.6	0.8	0.2
6	0.8	0.8	0.8	0.8	0.8	0.8

② Standard Sequence

$$t(x_i \text{ is } \tilde{A} \rightarrow y_j \text{ is } \tilde{B}) = \begin{cases} 1 & \mu_A(x_i) \le \mu_B(y_j) \\ 0 & \text{else} \end{cases}$$

$t =$

B

A	1	2	3	4	5	6
1	1	0	0	0	1	0
2	0	1	1	1	1	0
3	1	0	1	1	1	0
4	1	1	1	1	1	0
5	1	0	0	0	1	0
6	1	1	1	1	1	0

③ ~~Goo~~ Goguen's fuzzy Implication

$$t(x_i \text{ is } \tilde{A} \rightarrow y_j \text{ is } \tilde{B}) = \begin{cases} 1 & \mu_A(x_i) \le \mu_B(y_j) \\ \dfrac{\mu_B(y_j)}{\mu_A(x_i)} & \text{else} \end{cases}$$

t =

$$\begin{array}{c|c|c|c|c|c|c} & \multicolumn{6}{c}{B} \\ A & 1 & 2 & 3 & 4 & 5 & 6 \\ \hline 1 & 1 & 7/5 & 7/6 & 7/6 & 1 & 7 \\ 2 & 2 & 1 & 1 & 1 & 1 & 4 \\ 3 & 1 & 6/5 & 1 & 1 & 1 & 6 \\ 4 & 1 & 1 & 1 & 1 & 1 & 5 \\ 5 & 1 & 8/5 & 4/3 & 4/3 & 1 & 8 \\ 6 & 1 & 1 & 1 & 1 & 1 & 2 \end{array}$$

Conclusion is not same in all cases.