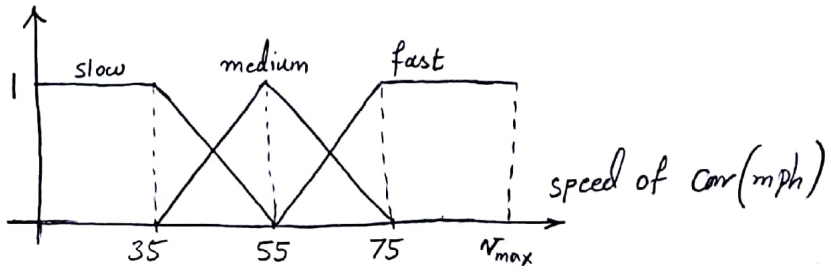
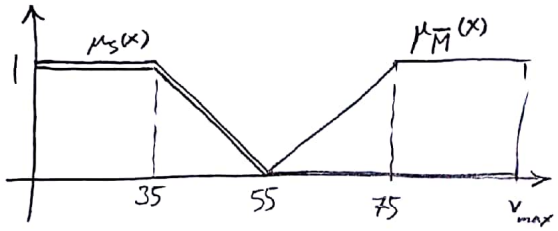
تمرین سری چهارم کنترل فازی

ارائه شنبه ۹۸/۱۰/۱۴

5.4) (5.12) x is S or x is not M

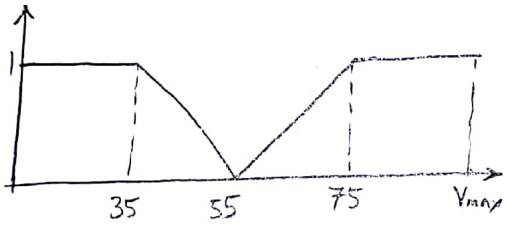


$$\mu_A(x) = \mu_{S\cup\bar{M}}(x) = \max\left[\mu_S(x), 1-\mu_M(x)\right]$$



Ans.

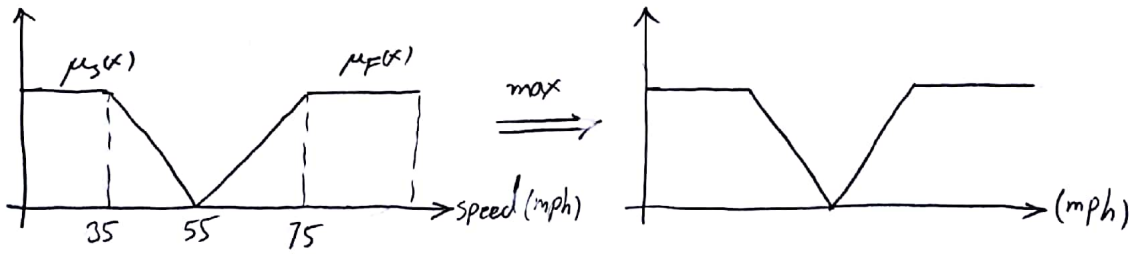
$\mu_{S\cup\bar{M}}(x) \Rightarrow$



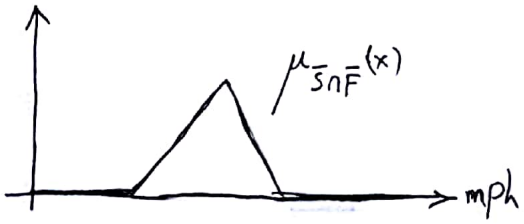
(5.13) x is not S and x is not F

$$\Rightarrow \mu_B(x) = \mu_{\bar{S}\cap\bar{F}}(x) = \mu_{\overline{S\cup F}}(x) = 1 - \mu_{S\cup F}(x)$$

$$= 1 - \max\left[\mu_S(x), \mu_F(x)\right]$$



Complement $\Rightarrow$

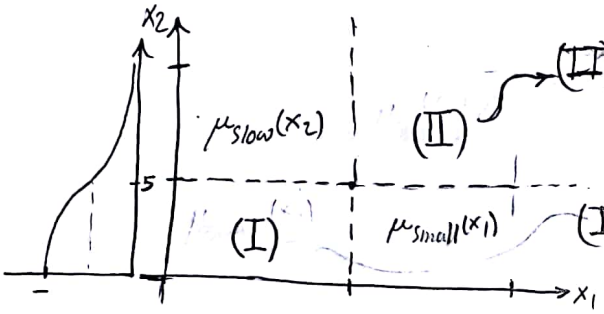


Ans.

5.5) IF x_1 is slow and x_2 is small, then y is Large.

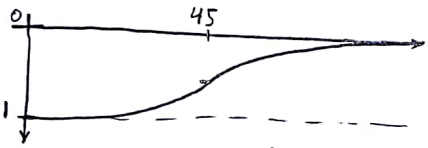
$$\mu_{slow}(x_1) = \frac{1}{1+\exp\left(\frac{x_1-45}{5}\right)}, \quad \mu_{small}(x_2) = \frac{1}{1+\exp\left(\frac{x_2-5}{2}\right)}, \quad \mu_{large}(y) = \frac{1}{1+\exp(2.5-2y)}$$

$$\mu_P(x) = \min\left[\mu_{slow}(x_1), \mu_{small}(x_2)\right]$$



(III) $\min_{x_1>45,\ x_2>5}\left\{\frac{1}{1+\exp\left(\frac{x_1-45}{5}\right)}, \frac{1}{1+\exp\left(\frac{x_2-5}{2}\right)}\right\} = f(x_1,x_2)$

(I) $\min_{x_1<45,\ x_2>5}\left\{\frac{1}{1+\exp\left(\frac{x_1-45}{5}\right)}, \frac{1}{1+\exp\left(\frac{x_2-5}{2}\right)}\right\} = g(x_1,x_2)$

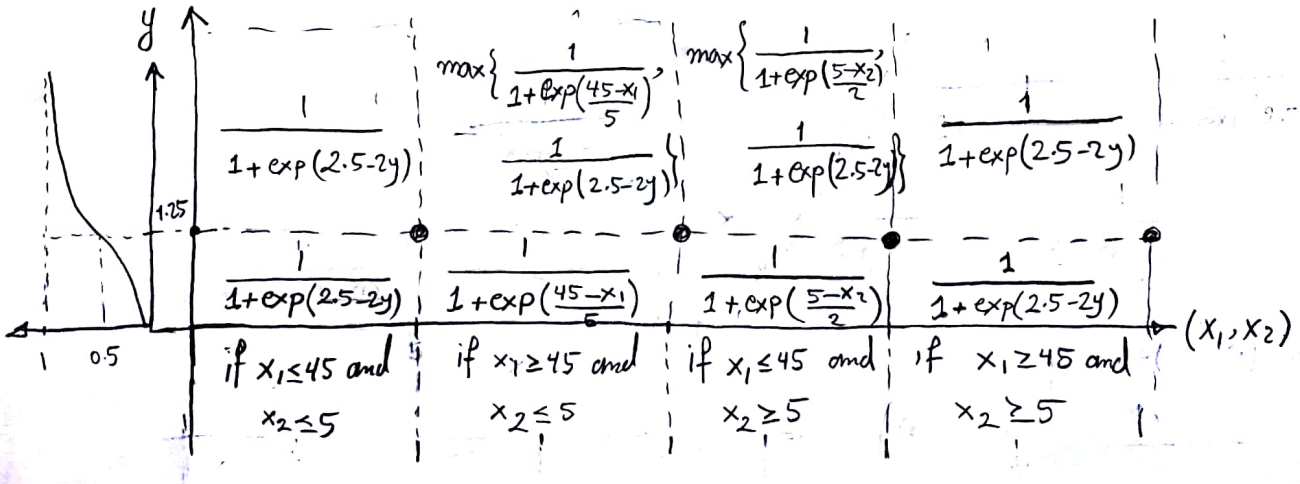


$$\Rightarrow \mu_{FP1}(x_1,x_2) = \begin{cases} f(x_1,x_2), & \text{if } x_1 \le 45 \text{ and } x_2 \le 5 \\ \frac{1}{1+\exp\left(\frac{x_1-45}{5}\right)}, & \text{if } x_2 \le 5 \text{ and } x_1 \ge 45 \\ \frac{1}{1+\exp\left(\frac{x_2-5}{2}\right)}, & \text{if } x_2 > 5 \text{ and } x_1 < 45 \\ g(x_1,x_2), & \text{if } x_1 > 45 \text{ and } x_2 > 5 \end{cases}$$

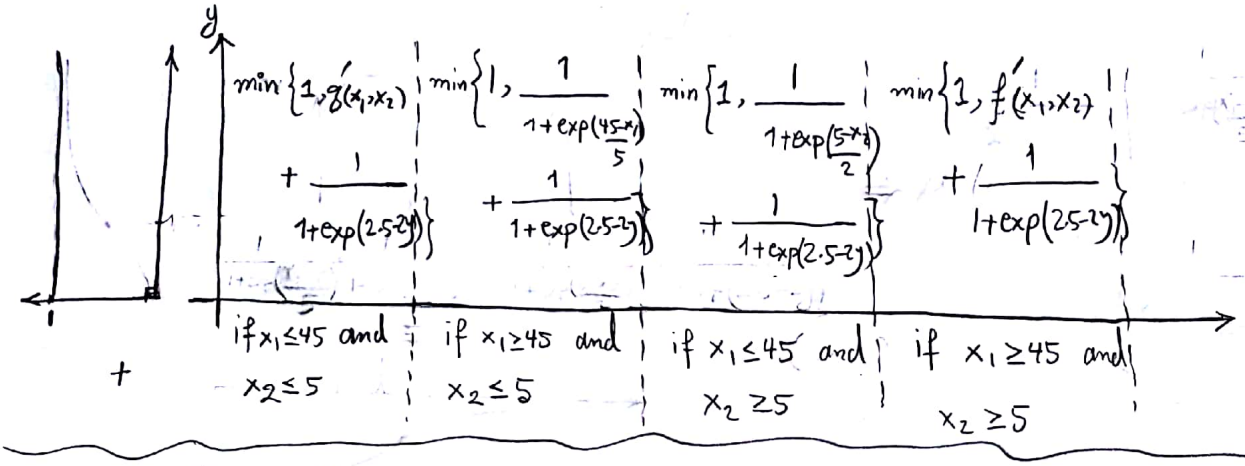
$$\Rightarrow \mu_{FP1}(x_1,x_2) = \begin{cases} 1 - f(x_1,x_2), & \text{if } x_1 \le 45 \text{ and } x_2 \le 5 \\ \frac{1}{1+\exp\left(\frac{45-x_1}{5}\right)}, & \text{if } x_2 \le 5 \text{ and } x_1 \ge 45 \\ \frac{1}{1+\exp\left(\frac{5-x_2}{2}\right)}, & \text{if } x_2 > 5 \text{ and } x_1 < 45 \\ 1 - g(x_1,x_2), & \text{if } x_1 > 45 \text{ and } x_2 > 5 \end{cases}$$

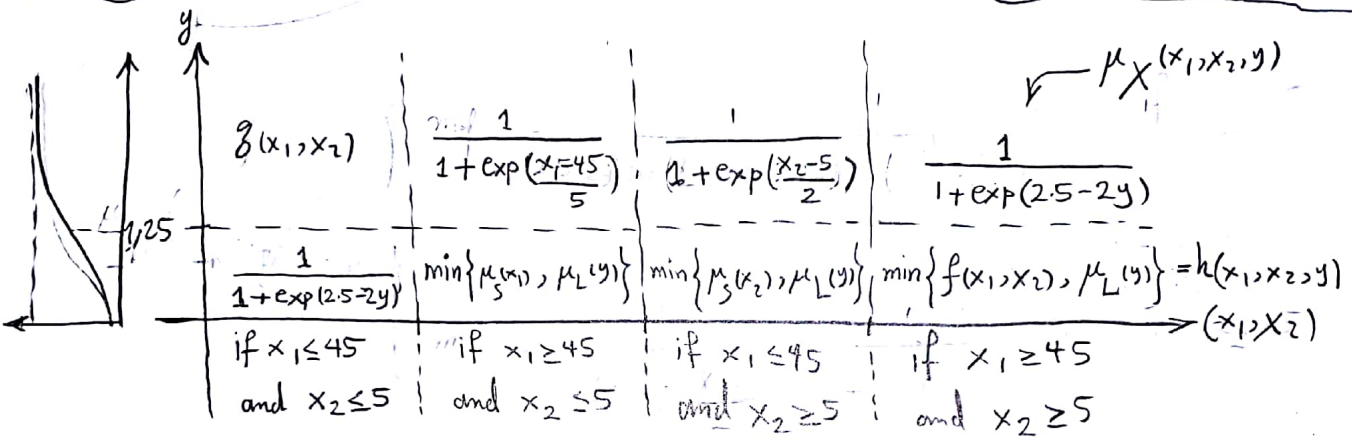
$\left(= \frac{1}{f(x_1,x_2)}\right)$ $\left(= g(x_1,x_2)\right)$

$$\mu_{QD}(x_1,x_2,y) = \mu_{PVQ}(x_1,x_2,y) = \max\left[\mu_{FP1}(x_1,x_2), \mu_{FP2}(y)\right]$$



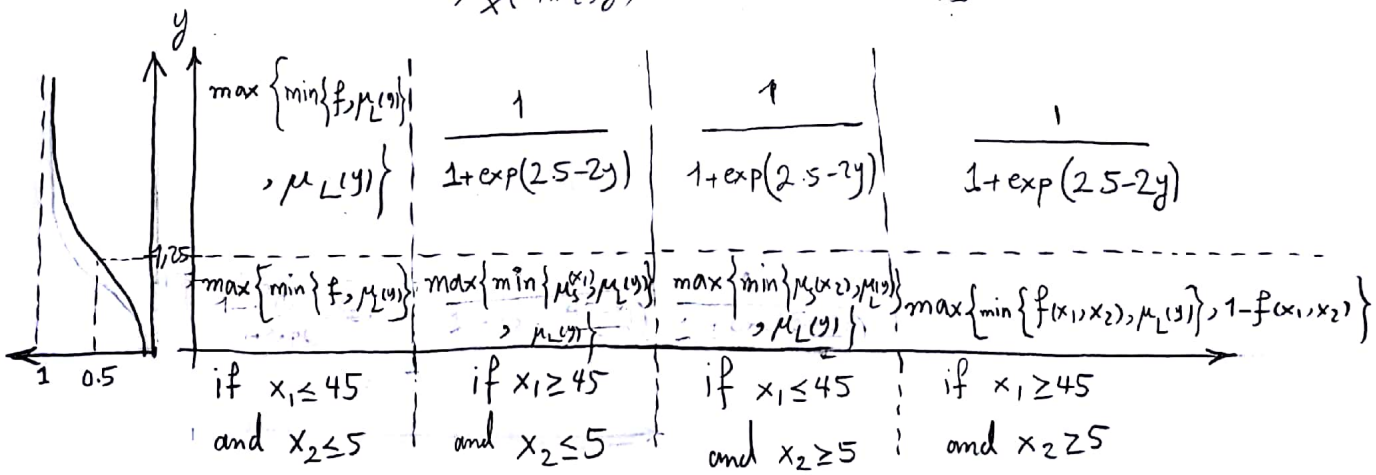
$$\mu_{Q_L}(x_1, x_2, y) = \min\left[1,\ 1 - \mu_{FP_1}^{(x_1,x_2)} + \mu_{FP_2}(y)\right]$$



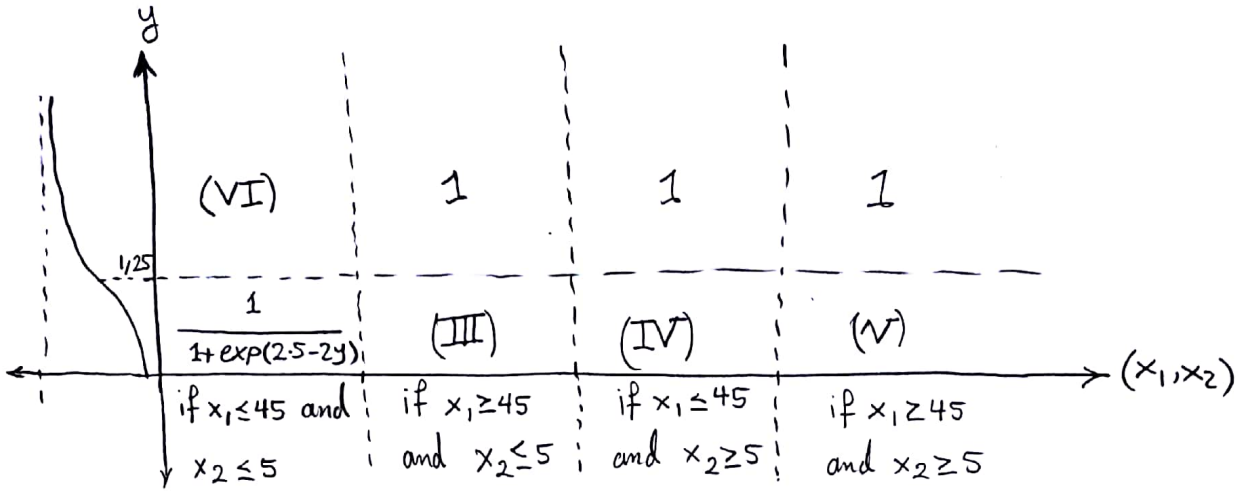


$\mu_X(x_1, x_2, y)$

$$\mu_{Q_2}(x_1, x_2, y) = \max\left[\underbrace{\min\left(\mu_{FP_1}(x_1,x_2), \mu_{FP_2}(y)\right)}_{\mu_X(x_1,x_2,y)},\ \underbrace{1 - \mu_{FP_1}(x_1, x_2)}_{\mu_{\overline{FP_1}}(x_1,x_2)}\right]$$



$$\mu_{Q_G}(x_1, x_2, y) = \begin{cases} 1 & \text{if } \mu_{FP_1}(x_1, x_2) \le \mu_{FP_2}(y) \\ \mu_{FP_2}(y) & \text{otherwise.} \end{cases}$$



(III) $\mu_{Q_G}(x_1, x_2, y) = \begin{cases} 1, & \text{if } \mu_{Small}(x_1) \le \mu_L(y) \\ \mu_L(y), & \text{otherwise.} \end{cases}$

$\{x_1 \le 45, x_2 \le 5, y \le 1{,}25\}$

(IV) $\mu_{Q_G}(x_1, x_2, y) = \begin{cases} 1, & \text{if } \mu_{Slow}(x_2) \le \mu_{Large}(y) \\ \mu_{Large}(y), & \text{otherwise.} \end{cases}$

$\{x_1 \le 45, x_2 \ge 5, y \le 1{,}25\}$

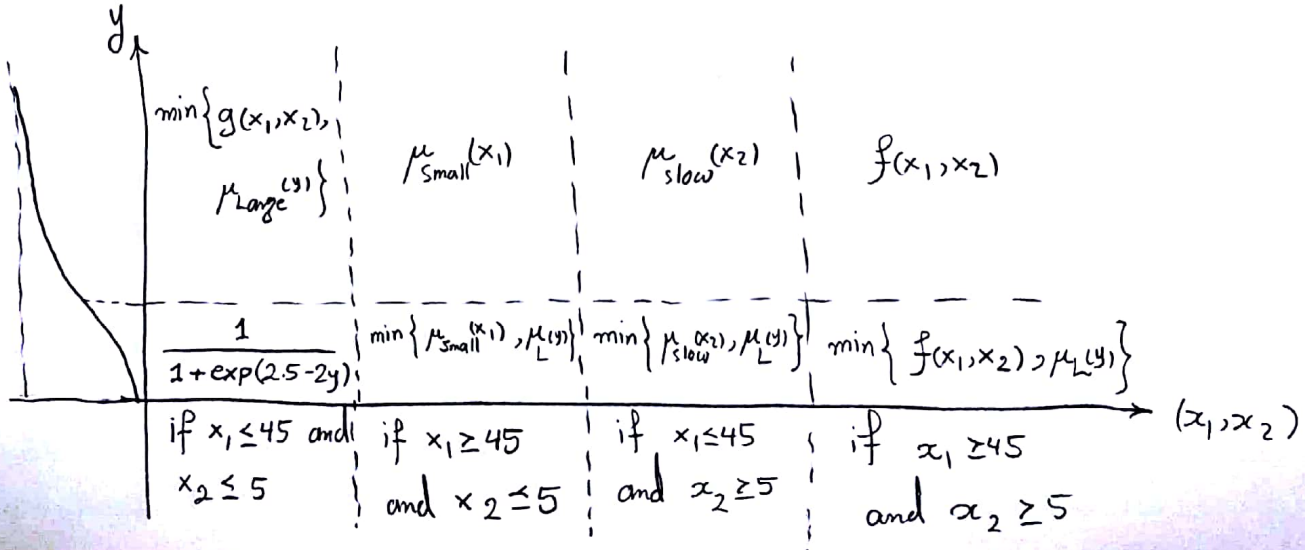
(V) $\mu_{Q_G}(x_1, x_2, y) = \begin{cases} 1, & \text{if } f(x_1, x_2) \le \mu_{Large}(y) \\ \mu_{Large}(y), & \text{otherwise.} \end{cases}$

$\{x_1 \ge 48, x_2 \ge 5, y \le 1{,}25\}$

(VI) $\mu_{Q_G}(x_1, x_2, y) = \begin{cases} 1, & \text{if } g(x_1, x_2) \le \mu_{Large}(y) \\ \mu_{Large}(y), & \text{otherwise.} \end{cases}$

$\{x_1 \le 45, x_2 \le 5, y \ge 1{,}25\}$

$$\mu_{Q_{MM}}(x_1, x_2, y) = \min\left[\mu_{FP1}(x_1, x_2), \mu_{FP2}(y)\right]$$



5.6) Q is called reflexive if $\mu_Q(u,u) = 1$ for all $u \in U$.

$$\mu_{Q\circ Q}(x,z) = \max_{y} t\left[\mu_Q(x,y), \mu_Q(y,z)\right]$$

$$= \max_{y \in U} \min\left[\mu_Q(x,y), \mu_Q(y,z)\right]$$

$$= \max \min\left[1, 1\right] = 1$$

So $Q \circ Q$ is reflexive.

$$\mu_Q(u,u) = \mu_{Q\circ Q}(u,u) = 1$$

$$\Rightarrow \mu_Q \leq \mu_{Q\circ Q} \Rightarrow \mu_Q \subseteq \mu_{Q\circ Q}$$

5.5 – nbl) $\mu_{Q_{MP}}(x_1, x_2, y) = \mu_{FP1}(x_1, x_2)\, \mu_{FP2}(y)$