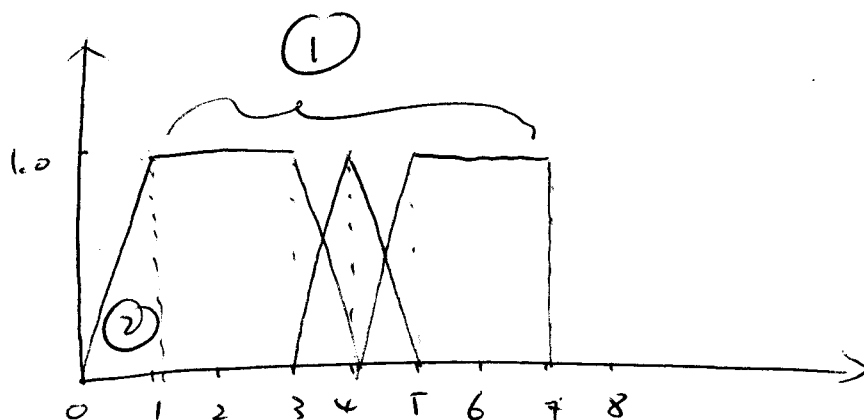


Tut 4 :

Q1:



$$z_1 = 4, \quad a_1 = 6 \times 1 - 1 \times 0.5 = 5.5$$

$$z_2 = \frac{2}{3}, \quad a_2 = \frac{1}{2}$$

$$\therefore z = \frac{z_1 a_1 + z_2 a_2}{a_1 + a_2} = \frac{4 \times 5.5 + \frac{2}{3} \times \frac{1}{2}}{5.5 + 0.5} = \frac{22.67}{6} = 3.61$$

Q2: (i). When  $x = -0.25$ ,  $y = 1$ , we have the following active rules.

$$R_1: A_1 = NS \text{ \& } B_1 = PS \rightarrow C_1 = Z$$

$$R_2: A_2 = Z \text{ \& } B_2 = PS \rightarrow C_2 = N$$

For  $R_1$ :  $\left. \begin{array}{l} \text{the degree of Compatibility of } A_1 \text{ is } w_1 = 0.5 \\ \text{the degree of Compatibility of } B_1 \text{ is } w_2 = 1 \end{array} \right\} \Rightarrow w = 0.5$

$$\therefore C_1' = w \wedge C_1 \Rightarrow \mu_{C_1'}(z) = w \wedge \mu_Z(z) = 0.5 \wedge \mu_Z(z)$$

For  $R_2$ :  $w = 0.5$ .

$$\therefore C_2' = 0.5 \wedge \mu_N(z) \wedge 0.5$$

$$\therefore C' = C_1' \cup C_2' = 0.5 \wedge [Z \cup N]$$

Q2. (ii) when  $x = 0.6$ ,  $y = 0.5$ .

we have 4 active rules. But all lead to  $C_i = N$ .

Since  $N$  is symmetric to  $u = -5$ , we know that

the crisp control output  $u = -5$  by COG defuzzification.

Q3. (i) when  $x = -0.25$ ,  $y = 1$ , the firing strength for both  $R_1$  and  $R_2$  is  $0.5 \times 1.0 = 0.5$

$\therefore$  The final output  $C' = 0.5 \wedge [Z \cup N]$

(ii) The crisp control output  $u = -5$  by COG defuzzification.

Q4: (i) yes.

(ii) we have four active rules. The firing strength of each rule is 0.5.

(iii) The fuzzy output is

$$C' = 0.5 \wedge [\text{neg small} \vee \text{neg large}]$$

$\therefore$  by COG, we have  $u = -15$ .