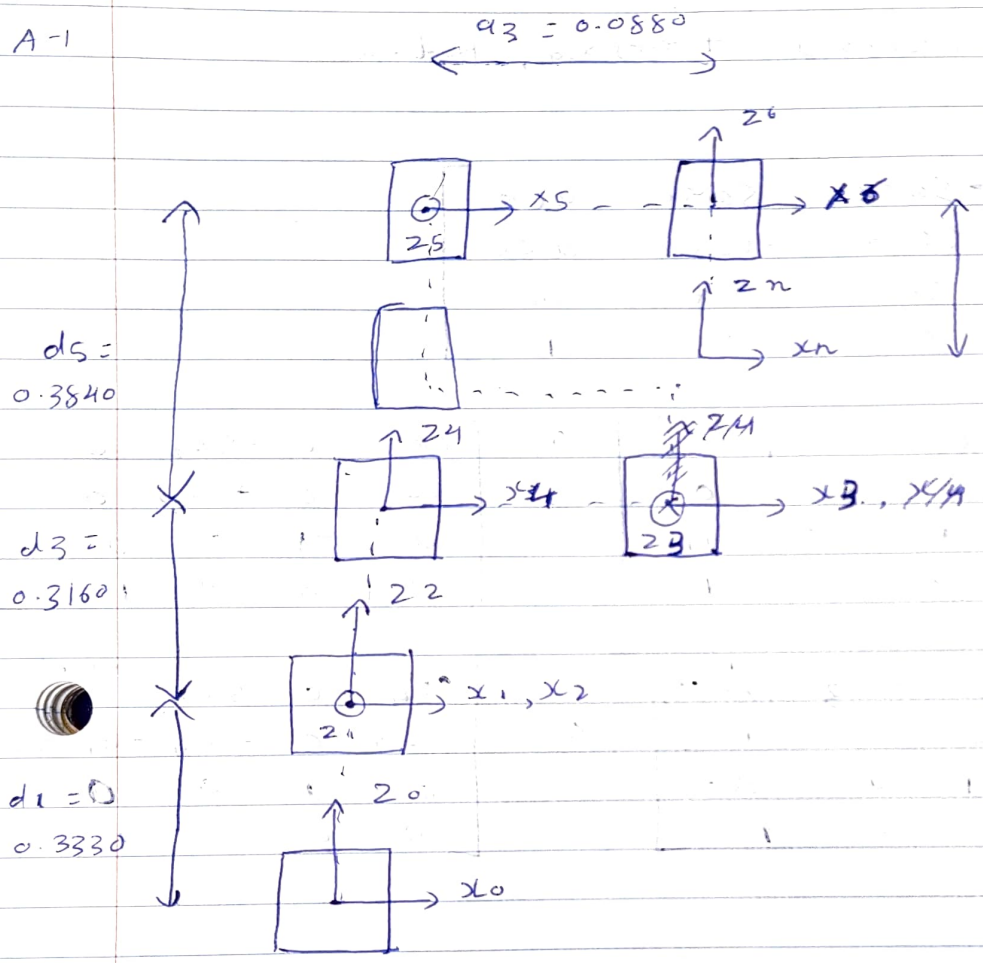
A-1



⊗ going in the plane

⊙ coming out of the plane.

DH Table

	a	α	d	θ
1	0	90	0.333	θ_1
2	0	-90	0	θ_2
3	0.08	-90	0.3160	θ_3
4	-0.08	+90	0	θ_4
5	+0.00	90	0.3840	θ_5
6	0.08	-90	0	θ_6
7	0	0	-0.107	θ_7

$A = Rot_{z,\theta} \cdot Trans_{z,d} \cdot Trans_{x,a} \cdot Rot_{x,\alpha}$

$$= \begin{bmatrix} c\theta & -s\theta c\alpha & s\theta s\alpha & a c\theta \\ s\theta & c\theta c\alpha & -c\theta s\alpha & a s\theta \\ 0 & s\alpha & c\alpha & d \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_1 = \begin{bmatrix} c\theta_1 & 0 & s\theta_1 & 0 \\ s\theta_1 & 0 & -c\theta_1 & 0 \\ 0 & 1 & 0 & d_1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad A_2 = \begin{bmatrix} c\theta_2 & 0 & -s\theta_2 & 0 \\ s\theta_2 & 0 & +c\theta_2 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & d & 1 \end{bmatrix}$$

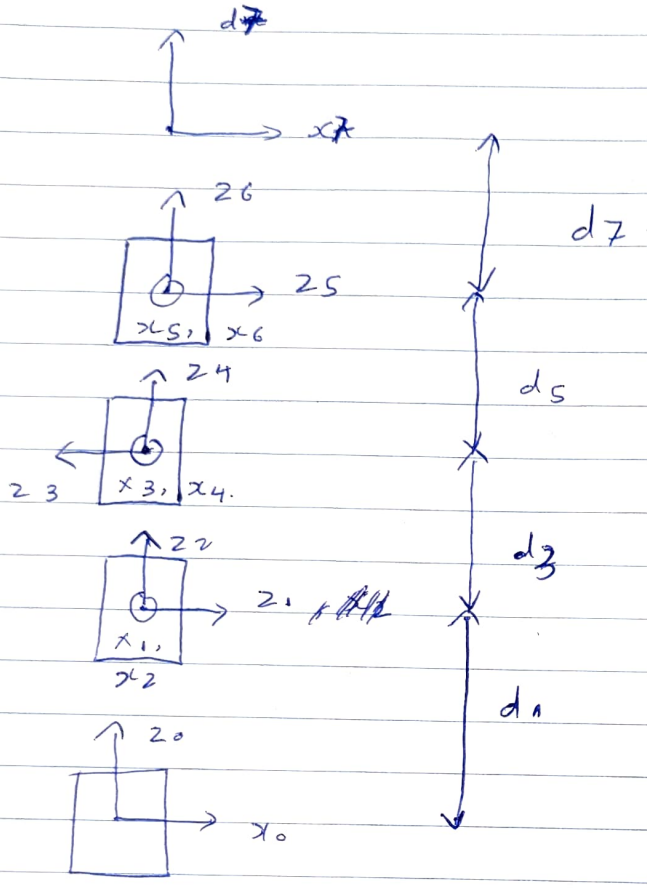
$$A_3 \begin{bmatrix} c\theta_3 & 0 & -s\theta_3 & a_1 \cdot c\theta_3 \\ s\theta_3 & 0 & c\theta_3 & a_1 s\theta_3 \\ 0 & -1 & 0 & d_3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad A_4 = \begin{bmatrix} c\theta_4 & 0 & s\theta_4 & -a_1 c\theta_4 \\ s\theta_4 & 0 & -c\theta_4 & -a_1 s\theta_4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & d & 1 \end{bmatrix}$$

$$A_5 = \begin{bmatrix} c\theta_5 & 0 & s\theta_5 & 0 \\ s\theta_5 & 0 & -c\theta_5 & 0 \\ 0 & 1 & 0 & d_5 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad A_6 = \begin{bmatrix} c\theta_6 & 0 & -s\theta_6 & a_1 c\theta_6 \\ s\theta_6 & 0 & c\theta_6 & a_1 s\theta_6 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_7 = \begin{bmatrix} c\theta_7 & -s\theta_7 & 0 & 0 \\ s\theta_7 & c\theta & 0 & 0 \\ 0 & 0 & 1 & -d_7 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$T_7^0 = A_1 \cdot A_2 \cdot A_3 \cdot A_4 \cdot A_5 \cdot A_6 \cdot A_7$

A-2



⊙ coming out of the plane.

D-H Table.

	α	d	θ
1	0	-90	d_1	θ_1
2	0	+90	0	θ_2
3	0	+90	d_3	θ_3
4	0	-90	0	θ_4
5	0	-90	d_5	θ_5
6	0	+90	0	θ_6
7	0	0	d_7	θ_7