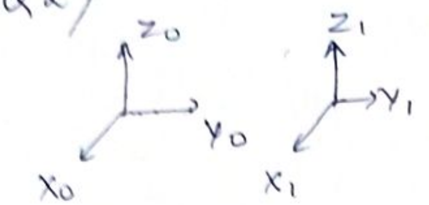
HOMOGENEOUS → MATRICES TRANSFORMATION

- i) CONSIDERING frame 0 & frame 1

Q2)



$$T = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Using

$$^{A}T_{B} = \begin{bmatrix} ^{A}R_{B} & ^{A}d_{B} \\ 0 & 1 \end{bmatrix}$$

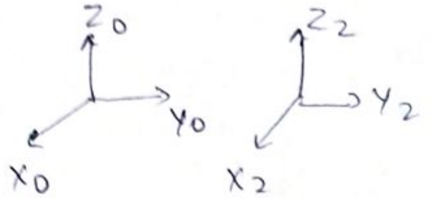
frame 0 → $O_0 x_0 y_0 z_0$

frame 1 → $O_1 x_1 y_1 z_1$

frame 2 → $O_2 x_2 y_2 z_2$

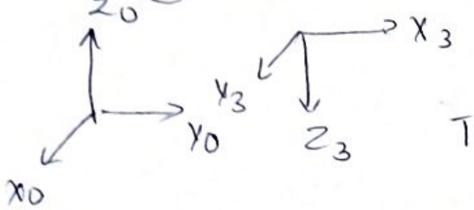
frame 3 → $O_3 x_3 y_3 z_3$

(ii) frame 0 & frame 2



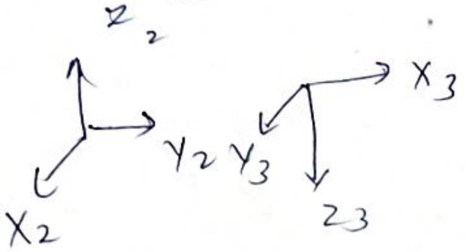
$$T = \begin{bmatrix} 1 & 0 & 0 & -0.5 \\ 0 & 1 & 0 & 1.5 \\ 0 & 0 & 1 & 1.1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

(iii) frame 0 & frame 3



$$T = \begin{bmatrix} 0 & 1 & 0 & -0.5 \\ 1 & 0 & 0 & 1.5 \\ 0 & 0 & -1 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

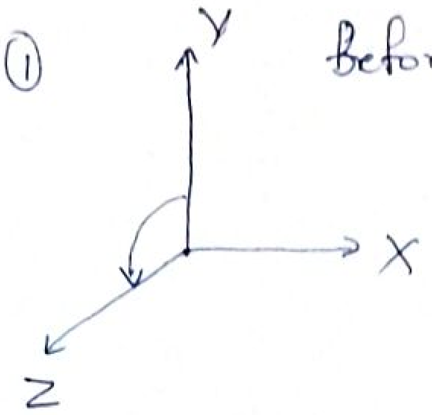
(iv) frame 2 & frame 3



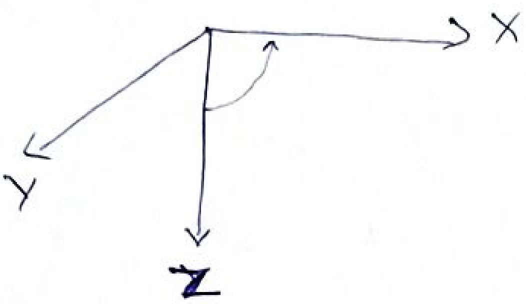
$$T = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & [illegible] \\ 0 & 0 & -1 & 1.9 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Q1)

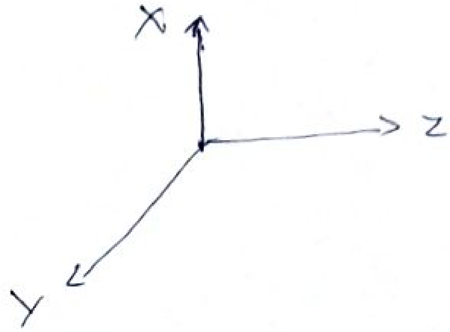
① Before Rotation



② After $\pi/2$ rotation about X-AXIS



③ $\pi/2$ Rotation about the fixed Y-axis



first Rotation Matrix

$$R_1 = \begin{array}{c|ccc} & & \text{New} & \\ & x & y & z \\ \hline \text{old } x & 1 & 0 & 0 \\ y & 0 & 0 & -1 \\ z & 0 & 1 & 0 \end{array}$$

Second Rotation Matrix

$$R_2 = \begin{array}{c|ccc} & & \text{New} & \\ & x & y & z \\ \hline \text{old } x & 0 & 0 & 1 \\ y & 0 & 1 & 0 \\ z & -1 & 0 & 0 \end{array}$$

$$^0R_2 = {}^0R_1 \, {}^1R_2$$

(for Composite Transformation) Rotation Matrix =

$$\begin{array}{c|ccc} & & \text{New} & \\ & x & y & z \\ \hline \text{old } x & 0 & 0 & 1 \\ y & 1 & 0 & 0 \\ z & 0 & 1 & 0 \end{array}$$