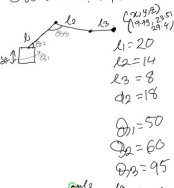


Question? Apply F.K



Find  $d_3$

$$d_3 = l_1, \theta_2, \theta_3$$

$$180 = 60 + 90 + \theta_x$$

$$\therefore \theta_x = 180 - (60 + 90) = 30$$

$$\sin \theta = \frac{\text{opposite}}{\text{Hypotenuse}}$$

$$\sin 60 = \frac{d_3}{20}$$

$$\therefore d_3 = 20 \times \sin 60 = 0.866 \times 20$$



Find  $d_6$

$$d_6, \theta_3 \rightarrow \theta_x(y), l_2$$

$$\theta_y(y)$$

$$\theta_3 = \theta_x + \theta_y$$

$$95 = 30 + \theta_y$$

$$\theta_y = 65$$



$$\cos \theta = \frac{A}{H}$$

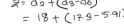
$$\cos 65 = \frac{d_6}{14}$$

$$14 \times \cos 65 = d_6$$

$$d_6 = 0.4226 \times 14 = 5.91$$

$z = ?$

Base to end effector



$$z = d_2 + (d_3 - d_6)$$

$$= 18 + (17.9 - 5.91)$$

$$= 29.9$$

$$(x, y, z) = (?, ?, 29.9)$$

$$(x, y)$$

Base to end effector?



$$d_1 = d_4 + d_5$$

Find  $d_4, \theta_2, l_1$

$$d_5, \theta_y, l_2$$

$d_4$

$$\cos \theta = \frac{A}{H}$$

$$\cos 60 = \frac{d_4}{20}$$

$$20 \times \cos 60 = d_4$$

$$d_4 = 0.5 \times 20 = 10$$

Find  $d_5$

$$\sin \theta = \frac{O}{H}$$

$$\sin 65 = \frac{d_5}{14}$$

$$d_5 = \sin 65 \times 14$$

$$= 0.9 \times 14$$

$$= 12.69$$

$$d_1 = d_4 + d_5$$

$$= 12.69 + 10 = 22.69$$

$$d_1 + l_3 = 8 + 22.69$$

$$= 30.69$$



we switch to top view



$$\theta_1 = 50^\circ$$

$$d_1 + l_3 = 30.69$$

$$\cos \theta \times (d_1 + l_3) = x$$

$$\sin \theta \times (d_1 + l_3) = y$$

$$x = \cos 50 \times 30.69 = 19.73$$

$$y = \sin 50 \times 30.69 = 23.51$$

$$(x, y, z)$$

Forward kinematics