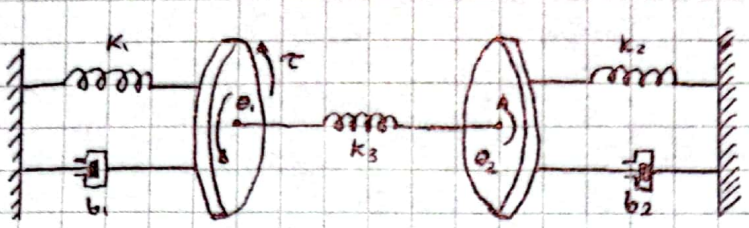
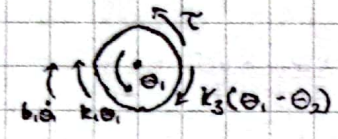
DD MM AA

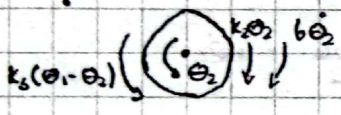




- $\Sigma F = I_1\ddot{\theta}_1$

$$\tau - k_1\theta_1 - b_1\dot{\theta}_1 - k_3(\theta_1-\theta_2) = I_1\ddot{\theta}_1$$

$$\ddot{\theta}_1 = \frac{\tau}{I_1} + \left(\frac{-k_1-k_3}{I_1}\right)\theta_1 - \frac{b_1}{I_1}\dot{\theta}_1 + \frac{k_3}{I_1}\theta_2$$



- $\Sigma F = I_2\ddot{\theta}_2$

$$k_3(\theta_1-\theta_2) - k_2\theta_2 - b_2\dot{\theta}_2 = I_2\ddot{\theta}_2$$

$$\ddot{\theta}_2 = \frac{k_3}{I_2}\theta_1 + \left(\frac{-k_3-k_2}{I_2}\right)\theta_2 - \frac{b_2}{I_2}\dot{\theta}_2$$

> Representación en variables de estado.

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ \frac{-k_1-k_3}{I_1} & \frac{-b_1}{I_1} & \frac{k_3}{I_1} & 0 \\ 0 & 0 & 0 & 1 \\ k_3/I_2 & 0 & \frac{-k_3-k_2}{I_2} & \frac{-b_2}{I_2} \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/I_1 \\ 0 \\ 0 \end{bmatrix} \tau$$

$$\begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + [0]\tau$$