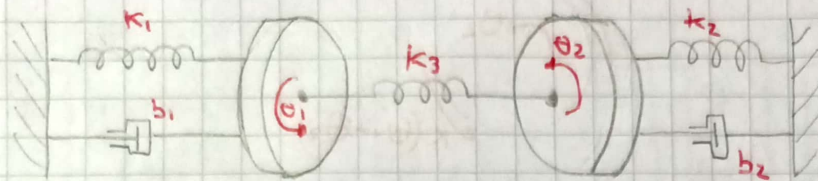
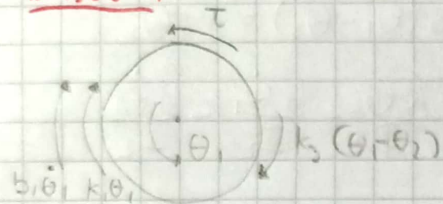


Santiago Andr  s Murcia Pu   2012005142

Espacios de estados sistema rotacional



Disco 1



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

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

$$q_1 = \theta_1$$

$$\dot{q}_1 = \dot{\theta}_1$$

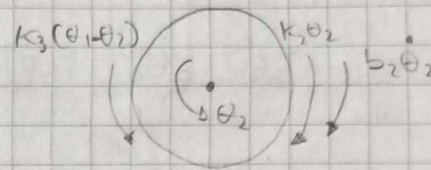
$$\ddot{q}_1 = \ddot{\theta}_1$$

$$q_3 = \theta_2$$

$$\dot{q}_3 = \dot{\theta}_2$$

$$\ddot{q}_3 = \ddot{\theta}_2$$

Disco 2



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

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

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

$$\begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix}$$