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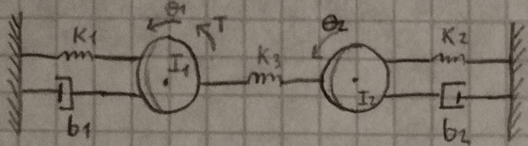
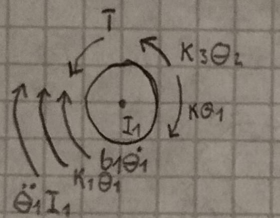
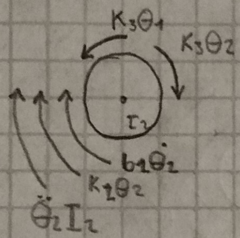
Ejercicio 1 de sistema mecanico rotacional



Diagramas





$$T = \ddot{\theta}_1 I_1 + b_1\dot{\theta}_1 + \theta_1(K_1+K_3) - \theta_2 K_3 \quad (1) \qquad \ddot{\theta}_2 I_2 + b_2\dot{\theta}_2 + \theta_2(K_3+K_2) - K_3\theta_1 = 0 \quad (2)$$

Teniendo en cuenta

$$q_1 = \theta_1 \qquad q_3 = \theta_2 \qquad y_1 = q_1 = \theta_1$$
$$q_2 = \dot{\theta}_1 = \dot{q}_1 \qquad q_4 = \dot{\theta}_2 = \dot{q}_3 \qquad y_2 = q_3 = \theta_2$$
$$\dot{q}_2 = \ddot{\theta}_1 \qquad \dot{q}_4 = \ddot{\theta}_2$$

Reemplazando

$$T = \dot{q}_2 I_1 + b_1 q_2 + q_1(K_1+K_3) - q_3 K_3 \qquad \dot{q}_2 = 1/I_1\left(T - b_1 q_2 - q_1(K_1+K_3) + q_3 K_3\right)$$

$$I_2\dot{q}_4 + b_2 q_4 + q_3(K_3+K_2) - q_1 K_3 = 0 \qquad \dot{q}_4 = 1/I_2\left(q_1 K_3 - q_3(K_3+K_2) - b_2 q_4\right)$$

Representación espacio de estados

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ \frac{-K_1-K_3}{I_1} & \frac{-b_1}{I_1} & \frac{K_3}{I_1} & 0 \\ 0 & 0 & 0 & 1 \\ \frac{K_3}{I_2} & 0 & \frac{-K_3-K_2}{I_2} & \frac{-b_2}{I_2} \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/I_1 \\ 0 \\ 0 \end{bmatrix} T$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix}$$