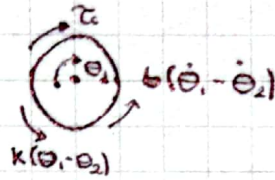


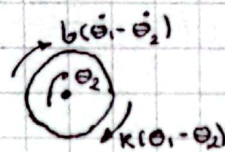
* Diagrama



$$\sum F = I \ddot{\theta}_1$$

$$\tau_c - k(\theta_1 - \theta_2) - b(\dot{\theta}_1 - \dot{\theta}_2) = I_1 \ddot{\theta}_1$$

$$\ddot{\theta}_1 = \frac{\tau_c}{I_1} - \frac{k\theta_1}{I_1} + \frac{k\theta_2}{I_1} - \frac{b\dot{\theta}_1}{I_1} + \frac{b\dot{\theta}_2}{I_1}$$



$$\sum F = I_2 \ddot{\theta}_2$$

$$k(\theta_1 - \theta_2) + b(\dot{\theta}_1 - \dot{\theta}_2) = I_2 \ddot{\theta}_2$$

$$\ddot{\theta}_2 = \frac{k\theta_1}{I_2} - \frac{k\theta_2}{I_2} + \frac{b\dot{\theta}_1}{I_2} - \frac{b\dot{\theta}_2}{I_2}$$

> Representación en variables de estado.

$$\begin{aligned} q_1 &= \theta_1 & q_3 &= \theta_2 \\ q_2 &= \dot{q}_1 & q_4 &= \dot{q}_3 \\ q_2 &= \dot{q}_1 = \dot{\theta}_1 & q_4 &= \dot{q}_3 = \dot{\theta}_2 \end{aligned}$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ -\frac{k}{I_1} & -\frac{b}{I_1} & \frac{k}{I_1} & \frac{b}{I_1} \\ 0 & 0 & 0 & 1 \\ \frac{k}{I_2} & \frac{b}{I_2} & -\frac{k}{I_2} & -\frac{b}{I_2} \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/I_1 \\ 0 \\ 0 \end{bmatrix} \tau_c$$

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