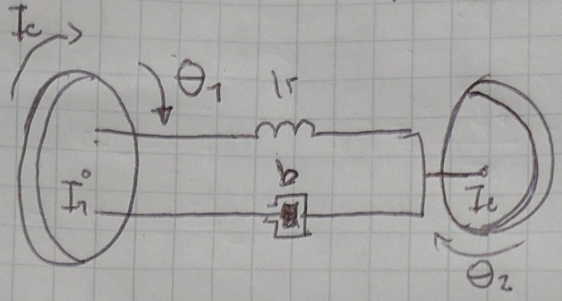
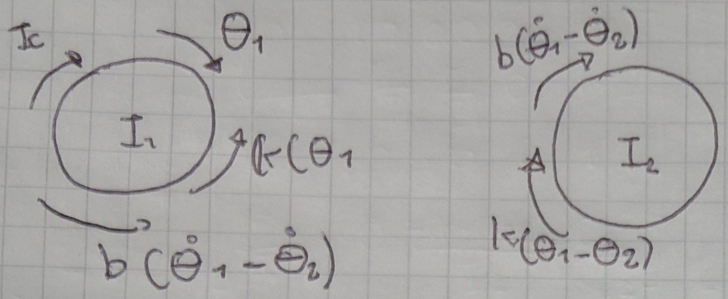
Tarea 3





$$\Rightarrow \boxed{T_c - k(\theta_1 - \theta_2) - b(\dot{\theta}_1 - \dot{\theta}_2) = I_1\ddot{\theta}_1} \quad (1)$$

$$\boxed{b(\dot{\theta}_1 - \dot{\theta}_2) + k(\theta_1 - \theta_2) = I_2\ddot{\theta}_2} \quad (2)$$

Para 1

$\Rightarrow$

$q_1 = \theta_1$

$q_2 = \dot{\theta}_1 = \dot{q}_1$

$\dot{q}_2 = \ddot{q}_1 = \ddot{\theta}_1$

Para 2

$q_3 = \theta_2$

$q_4 = \dot{q}_3 = \dot{\theta}_2$

$\dot{q}_4 = \ddot{q}_3 = \ddot{\theta}_2$

$$\Rightarrow \frac{T_c}{I_1} - \frac{k}{I_1}q_1 + \frac{k q_3}{I_1} - \frac{b q_2}{I_1} + \frac{b q_4}{I} = \dot{q}_2 \quad (1)$$

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

$$\Rightarrow \frac{b q_2}{I_2} - \frac{b q_4}{I_2} + \frac{k q_2}{I_2} - \frac{k q_3}{I_2} = \dot{q}_4 \quad (2)$$

$$\Rightarrow \begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ \frac{-r}{I_1} & \frac{-b}{I_1} & \frac{r}{I_1} & \frac{b}{I_1} \\ 0 & 0 & 0 & 1 \\ 0 & \frac{(r+b)}{I_2} & \frac{-r}{I_2} & \frac{-b}{I_2} \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{I_1} \\ 0 \\ 0 \end{bmatrix} [T_c]$$

$$\begin{bmatrix} \Theta_1 \\ \Theta_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix}$$