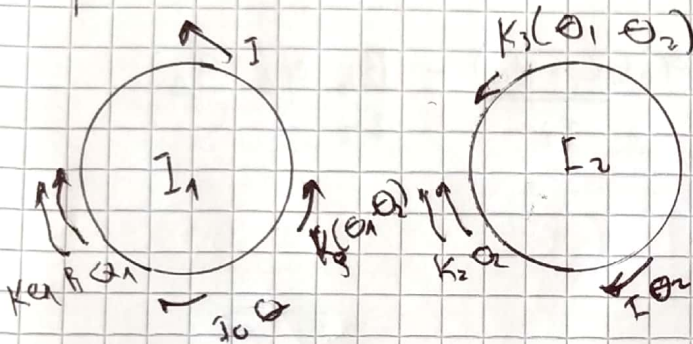
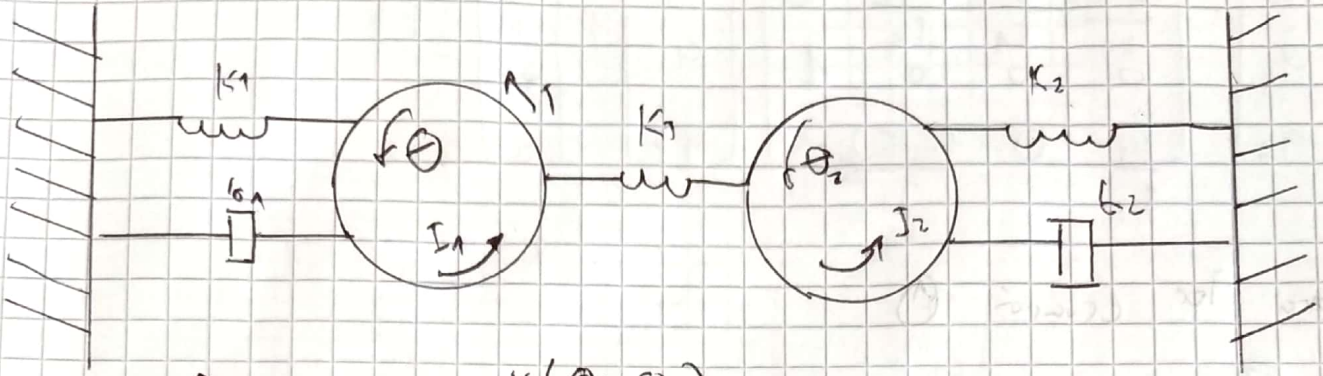


1 area 2
corte 2



$$I_1 \ddot{\theta}_1 + B_1 \dot{\theta}_1 + K_1 \theta_1 + K_2 (\theta_1 - \theta_2) = T$$

$$\ddot{\theta}_1 = \frac{-B_1}{I_1} \dot{\theta}_1 - \frac{K_1}{I_1} \theta_1 - \frac{K_2}{I_1} \theta_1 + \frac{K_2}{I_1} \theta_2 + \frac{T}{I_1}$$

$$K(\theta_1 - \theta_2) - K_2 \theta_2 - B_2 \dot{\theta}_2 - I_2 \ddot{\theta}_2 = 0$$

$$\frac{K_3}{I_2} (\theta_1) - \theta_2 \left(\frac{K_3 + K_2}{I_2} \right) - \frac{B_2}{I_2} \dot{\theta}_2 = \ddot{\theta}_2 \Rightarrow \text{E.C. (1)}$$

$$\ddot{\theta}_1 = -\frac{B_1}{I_1} \dot{\theta}_1 - \theta_1 \left(\frac{K_3 + K_1}{I_1} \right) + \frac{K_2 \theta_2}{I_1} + \frac{T}{I_1} \Rightarrow \text{E.C. (2)}$$

Para la ecuación (2)

$$q_1 = \theta_1$$

$$q_2 = \dot{q}_1 = \dot{\theta}_1 \quad \ddot{q}_2 = \frac{-B_1 q_2}{I_1} - q_1 \left(\frac{K_3 + K_1}{I_1} \right) + \frac{K_2 q_3}{I_1} + \frac{T}{I_1}$$

$$q_{1/1} = q_2 = \ddot{q}_1 = \ddot{\theta}_1$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ q_A \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ \frac{-(K_3+K_1)}{I_1} & \frac{-B}{I_1} & \frac{K_2}{I_1} & 0 \\ 0 & 0 & 0 & 1 \\ \frac{K_1}{I_2} & 0 & \frac{-(K_3+K_2)}{I_2} & \frac{-B_2}{I_2} \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_A \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{I_1} \\ 0 \\ 0 \end{bmatrix} [T]$$

Para la ecuación (1)

$$q_3 = \theta_2$$

$$q_A = \theta = q_3$$

$$q_1 = \dot{q}_1 = \dot{q}_3 = \dot{\theta}_2$$

$$\frac{K_3(q_1)}{I_2} - q_3 \frac{(K_3+K_2)}{I_2} - \frac{B_2}{I_2} q_A = \ddot{q}_A$$

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