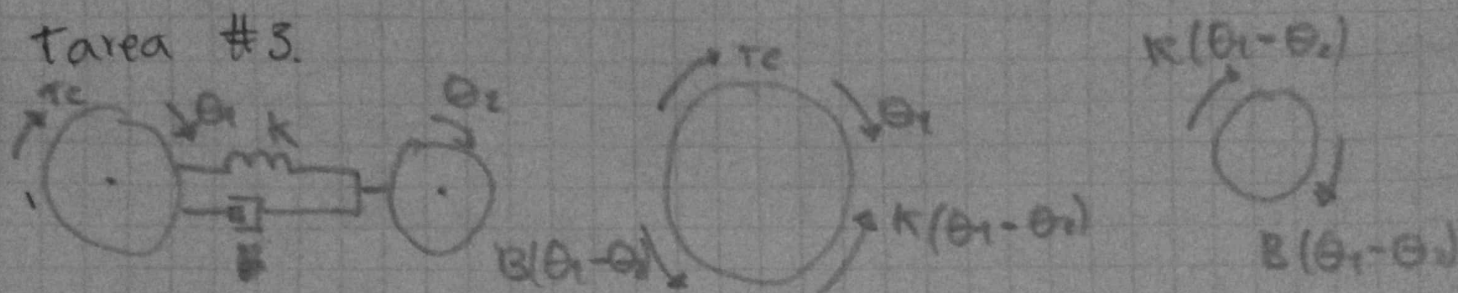


Tarea #3.



$$\textcircled{1} T_c - k(\theta_1 - \theta_2) - b(\dot{\theta}_1 - \dot{\theta}_2) = J_1 \ddot{\theta}_1$$

$$\textcircled{2} b(\dot{\theta}_1 - \dot{\theta}_2) + k(\theta_1 - \theta_2) = J_2 \ddot{\theta}_2$$

$$\textcircled{1} \ddot{\theta}_1 = \frac{T_c}{J_1} - \frac{k}{J_1} \theta_1 + \frac{k}{J_1} \theta_2 - \frac{b}{J_1} \dot{\theta}_1 + \frac{b}{J_1} \dot{\theta}_2$$

$$q_1 = \theta_1 ; q_2 = \dot{q}_1 = \dot{\theta}_1$$

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

$$\dot{q}_2 = \frac{T_c}{J_1} - \frac{k}{J_1} q_1 + \frac{k}{J_1} q_3 - \frac{b}{J_1} q_2 + \frac{b}{J_1} q_4$$

$$q_3 = \theta_2 ; q_4 = \dot{q}_3 = \dot{\theta}_2$$

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

$$\textcircled{2} \ddot{\theta}_2 = \frac{b}{J_2} \dot{\theta}_1 - \frac{b}{J_2} \dot{\theta}_2 + \frac{k}{J_2} \theta_1 - \frac{k}{J_2} \theta_2$$

$$\dot{q}_4 = \frac{b}{J_2} q_2 - \frac{b}{J_2} q_4 + \frac{k}{J_2} q_1 - \frac{k}{J_2} q_3$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ -\frac{k}{J_1} & -\frac{b}{J_1} & \frac{k}{J_1} & \frac{b}{J_1} \\ 0 & 0 & 0 & 1 \\ 0 & \frac{k+b}{J_2} & -\frac{k}{J_2} & -\frac{b}{J_2} \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{J_1} T_c \\ 0 \\ 0 \end{bmatrix}$$

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