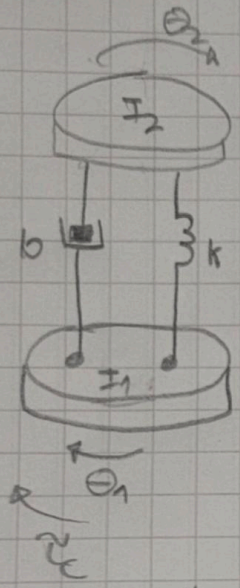
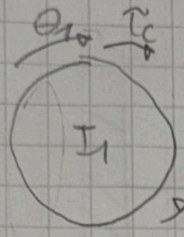
Juan Esteban Marino Gomez 2021005052

DD MM AA

Tarea 3



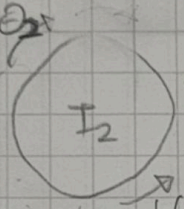
$\theta_1 >> \theta_2$



$$\Sigma F = I_1\ddot\theta_1$$

$$\tau_c - k(\theta_1-\theta_2) - b(\dot\theta_1-\dot\theta_2) = I_1\ddot\theta_1$$

$$\ddot\theta_1 = \frac{1}{I_1}(\tau_c - k_1\theta_1 - b\dot\theta_1 + k\theta_2 + b\dot\theta_2)$$



$$\Sigma F = I_2\ddot\theta_2$$

$$k(\theta_1-\theta_2) + b(\dot\theta_1-\dot\theta_2) = I_2\ddot\theta_2$$

$$\ddot\theta_2 = \frac{1}{I_2}(k\theta_1 + b\dot\theta_1 - k\theta_2 - b\dot\theta_2)$$

$\theta_1 \to y_1$

$$q_1 = \theta_1$$
$$q_2 = \dot q_1 = \dot\theta_1$$
$$\dot q_2 = \ddot q_1 = \ddot\theta_1$$

$\theta_2 \to y_2$

$$q_3 = \theta_2$$
$$q_4 = \dot q_3 = \dot\theta_2$$
$$\dot q_4 = \dot q_3 = \ddot q_2$$

$$\dot q_2 = \frac{1}{I_1}(\tau_c - k_1 q_1 - b q_2 + k q_3 + b q_4)$$

$$\dot q_4 = \frac{1}{I_2}(k q_1 + b q_2 - k q_3 - b q_4)$$

$$\begin{bmatrix}\dot q_1\\ \dot q_2\\ \dot q_3\\ \dot q_4\end{bmatrix} = \begin{bmatrix}0 & 1 & 0 & 0\\ \frac{-k}{I_1} & \frac{-b}{I_1} & \frac{k}{I_1} & \frac{b}{I_1}\\ 0 & 0 & 0 & 1\\ \frac{k}{I_2} & \frac{b}{I_2} & \frac{-K}{I_2} & \frac{-b}{I_2}\end{bmatrix}\begin{bmatrix}q_1\\ q_2\\ q_3\\ q_4\end{bmatrix} + \begin{bmatrix}0\\ \frac{1}{I_1}\\ 0\\ 0\end{bmatrix}[\tau_c] \qquad \begin{bmatrix}y_1\\ y_2\end{bmatrix} = \begin{bmatrix}1&0&0&0\\ 0&0&1&0\end{bmatrix}\begin{bmatrix}q_1\\ q_2\\ q_3\\ q_4\end{bmatrix} + \begin{bmatrix}0\\ 0\end{bmatrix}[\tau_c]$$