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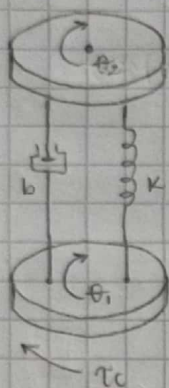
Código: 20211005107.

Sistemas Dinámicos br. 005-1

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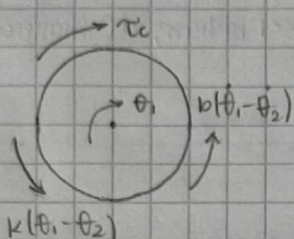
### Tarea Sistema rotacional de satélite.

Encontrar la representación en espacio de estados del siguiente sistema. Considerar  $\theta_1 \gg \theta_2$



\* Para el disco 1:

$$\sum F = I_1 \ddot{\theta}_1$$

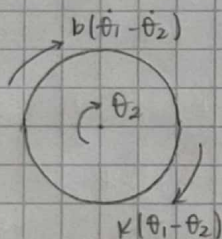


$$\tau_c + K(\theta_1 - \theta_2) - b(\dot{\theta}_1 - \dot{\theta}_2) = I_1 \ddot{\theta}_1$$

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

\* Para el disco 2:

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



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

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

\* Variables de estado:

$$q_1 = \theta_1$$

$$q_3 = \theta_2$$

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

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

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

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

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

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