Corrección Parcial

• $\dddot{x} + \ddot{x} + 2\dot{x} + x = 2f(t)$

→ $\dfrac{X(s)}{F(s)} = \dfrac{2}{s^3+s^2+2s+1}$

→ Asignamos estados:

$q_1 = x \qquad f(t) = u$

$q_2 = \dot{x} = \dot{q}_1 \qquad q_3 = \dot{q}_2$

$\dot{q}_3 + q_3 + 2q_2 + q_1 = 2u$

$\dot{q}_3 = -q_1 - 2q_2 - q_3 + 2u$

→ Espacio de estados

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -1 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u$$

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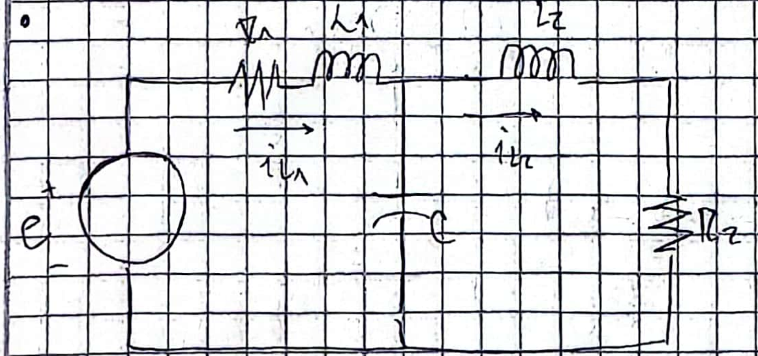


$u = e \; ; \; x_1 = i_{L_1}, \; x_2 = i_{L_2}$

$x_3 = v_C \; ; \; v_0 = R_2 x_2$

$u = R_1 x_1 + L_1 \dot{x}_1 + x_3$

$x_3 = L_2 \dot{x}_2 + R_2 x_2$

$x_1 = C\dot{x}_3 + x_2$

$\Rightarrow$

$\dot{x}_1 = -\dfrac{R_1}{L_1} x_1 - \dfrac{x_3}{L_1} + \dfrac{u}{L_1}$

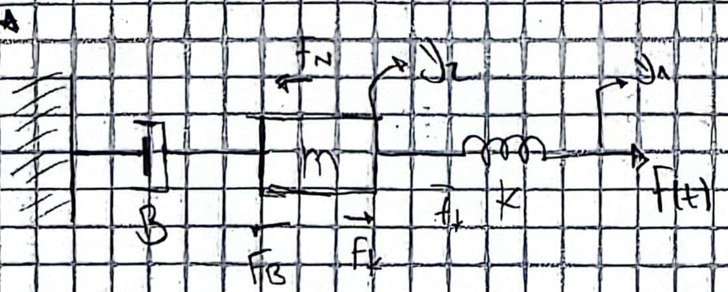
$\dot{x}_2 = -\dfrac{R_2}{L_2} x_2 + \dfrac{x_3}{L_2}$

$\dot{x}_3 = \dfrac{x_1}{C} - \dfrac{x_2}{C}$

→ Representación en espacio de estados

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}-\frac{R_1}{L_1} & 0 & -1/L_1\\ 0 & -R_2/L_2 & 1/L_2\\ 1/C & -1/C & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}1/L_1\\ 0\\ 0\end{bmatrix}u$$

$$y=\begin{bmatrix}0 & R_2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\bar{0}u$$



$F = F_k$ ①

$F_k = F_N + F_B$ ②

① y ② son equivalents

$y_1 > y_2$

$x_1 = y_2 \qquad x_2 = \dot{x}_1 = \dot{y}_2 \qquad F_k = u = k(y_1 - x_1)$

$u = f = f_k \qquad y_1 = x_1 + \frac{u}{k}$

$u = M\dot{x}_2 + Bx_2 \qquad \dot{x}_2 = \frac{-B}{M}x_2 + \frac{u}{M}$

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ 0 & -\frac{B}{M}\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ \frac{1}{M}\end{bmatrix}u$$

$$\begin{bmatrix}y_1\\ y_2\end{bmatrix}=\begin{bmatrix}1 & 0\\ 1 & 0\end{bmatrix}+\begin{bmatrix}1/k\\ 0\end{bmatrix}u$$