Correción parcial

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

$\xrightarrow{\mathcal{L}} s^3 + s^2 + 2s + 1 = 2f(s) \longrightarrow x(s)[s^3 + s^2 + 2s + 1] = 2f(s)$

$$\therefore G(s) = \frac{2}{s^3 + s^2 + 2s + 1}$$

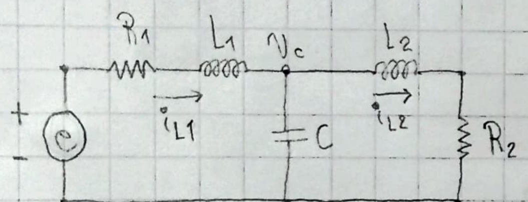
- Variables de estado:

$q_1 = x \; ; \; q_2 = \dot{q}_1 \; ; \; q_3 = \dot{q}_2 \; ; \; f(t) = u$

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

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

2.



$- \; x_1 = i_{L1}$

$x_2 = i_{L2}$

$x_3 = v_c$

$$\left.\begin{matrix} u = e \\ v_o = R_2 x_2 \end{matrix}\right\} u = R_1 x_1 + L_1 \dot{x}_1 + x_3$$

$\rightarrow \dot{x}_1 = -{}^{R_1}/_{L_1} \, x_1 + 0x_2 - {}^{x_3}/_{L_1} + {}^{u}/_{L_1}$

$x_3 = L_2 \dot{x}_2 + R_2 x_2 \longrightarrow \dot{x}_2 = 0R_1 - {}^{R_2}/_{L_2} \, x_2 + {}^{x_3}/_{L_2}$

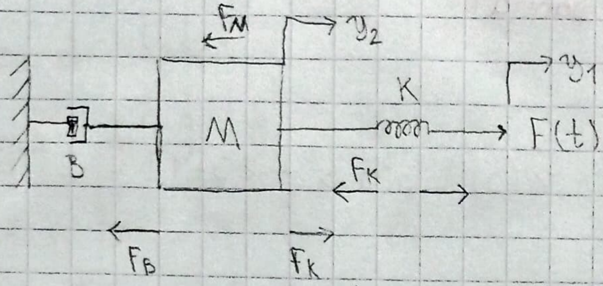
$x_1 = C\dot{x}_3 + x_2 \longrightarrow \dot{x}_3 = {}^{x_1}/_{C} - {}^{x_2}/_{C}$

- Variables de estado:

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

$$\therefore y = [0 \quad R_2 \quad 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + 0u$$

3.



¿ $y_1 > y_2$?

- $F = F_K$ y $F_K = F_N + F_B$

$\therefore$ $x_1 = y_2$; $x_2 = \dot{x}_1 = \dot{y}_1$; $u = f_K = K(y_1 - x_1)$

$y_1 = x_1 + u/K \rightarrow u = M\dot{x}_2 + Bx_2 \rightarrow \dot{x}_2 = -\frac{B}{M}x_2 + \frac{u}{M}$

- Variables de estado:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -B/M \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/M \end{bmatrix} u \quad y \quad \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} 1/K \\ 0 \end{bmatrix} 0$$