Correccion Parcial

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

asumiendo condiciones iniciales iguales a cero, se realiza la transformada de Laplace

$$s^3 X + s^2 X + 2s X + X = 2F(s)$$

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

asignando estados: $q_1 = x$, $q_2 = \dot{x} = \dot{q}_1$, $F(t) = U$, $q_3 = \dot{q}_2$

Representando en SS

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

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

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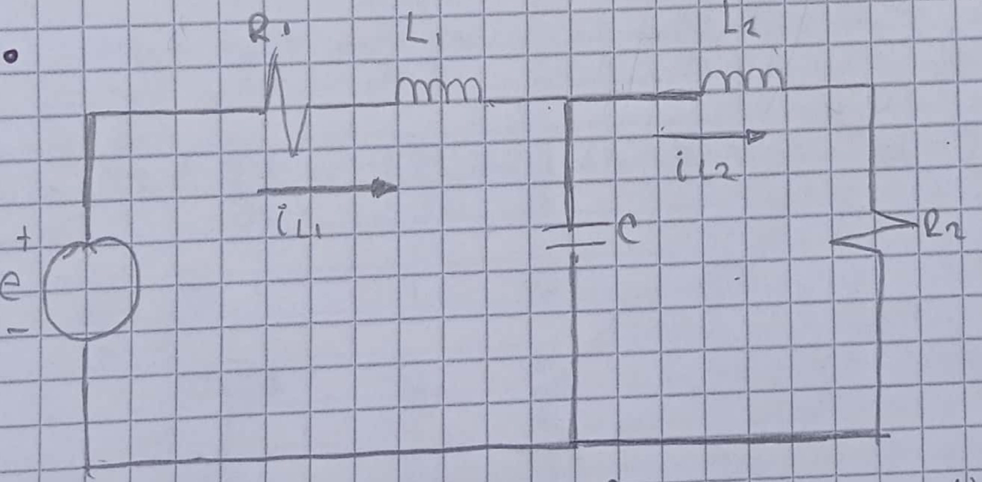


$U = e$ $\quad X_1 = i_{L_1}$ $\quad X_2 = i_{L_2}$

$X_3 = V_C$ $\quad U_0 = R_2 X_2$

$$U = R_1 X_1 + L_1 \dot{X}_1 + X_3$$

$$X_3 = L_2 \dot{X}_2 + R_2 X_2 \Rightarrow$$

$$X_1 = C\dot{X}_3 + X_2$$

$$\dot{X}_1 = -\frac{R_1 X_1}{L_1} - \frac{X_3}{L_1} + \frac{U}{L_1}$$

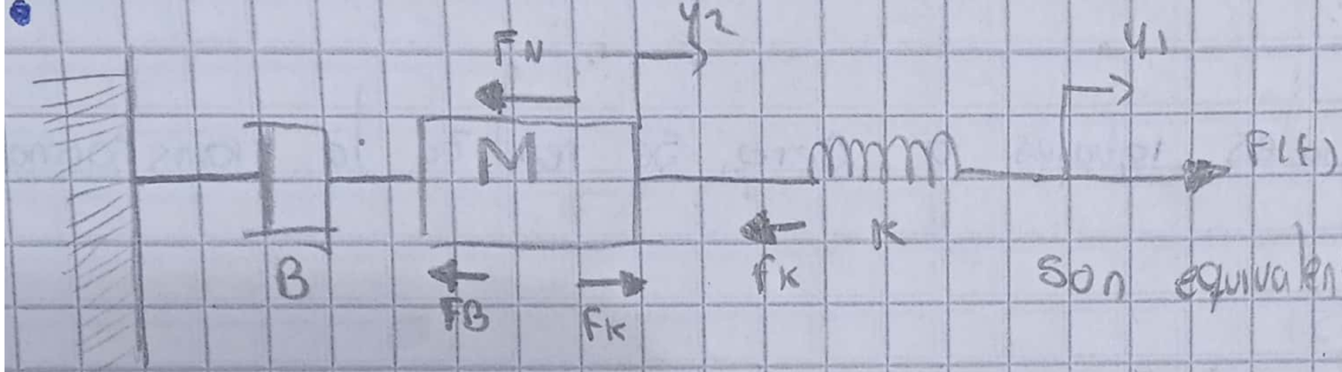
$$\dot{X}_2 = -\frac{R_2 X_2}{L_2} + \frac{X_3}{L_2}$$

$$\dot{X}_3 = \frac{X_1}{C} - \frac{X_2}{C}$$

La representacion en ss

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} -\frac{R_1}{L_1} & 0 & -1/L_1 \\ 0 & -R_2/L_2 & 1/L_2 \\ 1/C & -1/C & 0 \end{bmatrix}\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} \frac{1}{L_1} \\ 0 \\ 0 \end{bmatrix} U$$

$$y = \begin{bmatrix} 0 & R_2 & 0 \end{bmatrix}\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \bar{0}U$$



Son equivalentes

$F(t) = F$

$F = F_K$

$F_K = F_N + F_B$

$y_1 > y_2$

$x_1 = y_2$ $\quad x_2 = \dot{x}_1 = \dot{y}_2$ $\quad F = F_K = U = K(y_1 - x_2)$

$U = M\dot{x}_2 + Bx_2$ $\quad y_1 = x_1 + \frac{U}{K}$

$\dot{x}_2 = -\frac{B}{M}x_2 + \frac{U}{M}$

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

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} 1/K \\ 0 \end{bmatrix} U$$