Correccion

① $\dddot{x} + \ddot{x} + 2x + x = 2\,f(x)$

$x = s^0 = x_1$

$\dot{x} = s^1 = \dot{x}_1 = x_2$

$\ddot{x} = s^2 = \dot{x}_2 = x_3$

$\dddot{x} = s^3 = \dot{x}_3$

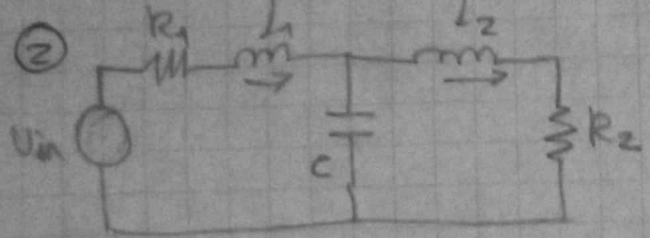
$V(s)\,(s^3 + s^2 + 2s + 1) = 2\,f(s)$

$$\frac{V(s)}{f(s)} = \frac{2}{s^3 + s^2 + 2s + 1}$$

$\dot{x}_3 = 2u - x_3 - 2x_2 - x_1$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u$$

②



$i_c = C\frac{dv_c}{dt}$; $v_c = L\frac{di_L}{dt}$

$i_1 + i_3 + i_2$; $V_{R2} + V_{L2} = V_c$

$V_{R2} = V_c - V_{L2}$ $\quad v_c = x_1$; $\dot{v}_c = \dot{x}_1$; $i_1 = x_2$ $\quad \dot{i}_1 = \dot{x}_2$

$x_2 = \frac{x_2}{C} - \frac{x_3}{C}$ $\quad i_2 = x_3$ $\quad \dot{i}_2 = \dot{x}_3$

$x_1 = V_{in} - R_1 x_2 - L_1 x_2$

$\dot{x}_2 = \frac{V_{in}}{L_1} - \frac{R_1 x_2}{L_1} - \frac{x_1}{L_1}$ $\quad \dot{x}_3 = \frac{x_1}{L_2} - \frac{R_2 x_3}{L_2}$

$\dot{x}_1 = \frac{x_2}{C} - \frac{x_3}{C}$

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

$$\begin{bmatrix} V_{R2} \end{bmatrix} = \begin{bmatrix} 0 & 0 & R_2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

③

$$M\frac{\partial^2 y_2}{\partial t^2} = M\ddot{x}_1 \qquad y_2 = x_1 \qquad x_1 = q_1 ;\ \dot{x}_1 = q_2 ;\ \ddot{x}_1 = \dot{q}_2$$

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

$$\frac{B\,\partial y_2(t)}{\partial t} = B\dot{x}_1$$

$$K(y_1 - y_2) = K(x_2 - x_1)$$

$$M\ddot{x}_1 + B\dot{x}_1 = K(x_2 - x_1)$$

Punto

$$K(y_1 - y_2) = f(t) \longrightarrow K(x_2 - x_1) = f$$

$$Kx_2 - Kx_1 = f \rightarrow x_2 = \frac{f + Kx_1}{K}$$

$$M\ddot{x}_1 + B\dot{x}_1 = K\left(\frac{f + Kx_1}{K}\right) - (x_1)$$

$$M\ddot{x}_1 + B\dot{x}_1 = f + Kx_1 - x_1$$

$$\ddot{x}_1 = \frac{(Kx_1 - x_1 + f + B\dot{x}_1)}{M}$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ \frac{K-1}{m} & \frac{B}{m} \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/m \end{bmatrix} f$$