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Corrección parcial

1.

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

$$q_1 = x \qquad q_3 = \dot{q}_2 = \ddot{x}$$

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

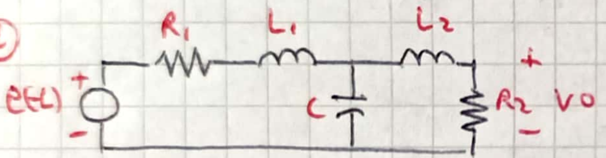
$$\dddot{x} = 2F(t) - \ddot{x} - 2\dot{x} - x$$

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

$$[X] = [1 \quad 0 \quad 0] \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$$

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

2.



$$q_1 = V_c \qquad \dot{q}_1 = \dot{V}_c$$

$$q_2 = i_{L2} \qquad \dot{q}_2 = \dot{i}_{L2}$$

$$q_3 = i_{L1} \qquad \dot{q}_3 = \dot{i}_{L1}$$

$$V_{L2} = L_2 \dot{i}_{L2} \qquad V_{L1} = L_1 \dot{i}_{L1} \qquad \dot{V}_c = \frac{i_c}{C} \qquad i_{L1} = i_{L2} + i_c$$

$$\dot{i}_{L2} = \frac{V_{L2}}{L_2} \qquad \dot{i}_{L1} = \frac{V_{L1}}{L_1} \qquad i_c = C\dot{V}_c \qquad i_c = i_{L1} - i_{L2}$$

$$\boxed{\dot{V}_c = \frac{i_{L1}}{C} - \frac{i_{L2}}{C}}$$

$$V_{L2} = V_c - V_{R2}$$

$$V_{L2} = V_c - R_2 i_{L2}$$

$$\dot{i}_{L2} L_2 = V_c - R_2 i_{L2}$$

$$\boxed{\dot{i}_{L2} = \frac{V_c}{L_2 + R_2}}$$

$$E = V_{R1} + V_{L1} + V_c$$

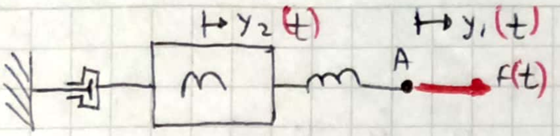
$$V_{L1} = E - i_{L1} R_1 - V_c$$

$$L_1 \dot{i}_{L1} = E - i_{L1} R_1 - V_c \Rightarrow \boxed{\dot{i}_{L1} = \frac{E}{L_1 + R_1} - \frac{V_c}{L_1 + R_1}}$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1/C & 1/C \\ \frac{1}{L_2 + R_2} & 0 & 0 \\ \frac{-1}{L_1 + R_1} & 0 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ \frac{1}{L_1 + R_1} \end{bmatrix} E$$

$$V_{R2} = [0 \quad R_2 \quad 0] \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$$

③



Masa m

$$m\ddot{y}_2 = k(y_1 - y_2) - b\dot{y}_2$$

$$\ddot{y}_2 = \frac{ky_1}{m} - \frac{ky_2}{m} - \frac{b\dot{y}_2}{m} \quad (1)$$

$q_1 = y_1$
$q_2 = y_2$
$q_3 = \dot{y}_2 = \dot{q}_2$
$\dot{q}_3 = \ddot{y}_2$

Punto A

$$f = k(y_1 - y_2) \qquad y_1 = \frac{f}{k} + \frac{ky_2}{k} = \frac{f}{k} + y_2 \quad (2)$$

$$f = ky_1 - ky_2$$

Reemplazando 2 en 1

$$\ddot{y}_2 = \frac{f}{m} + \frac{y_2 k}{m} - \frac{ky_2}{m} - \frac{b\dot{y}_2}{m} \qquad \ddot{y}_2 = \frac{f}{m} - \frac{b\dot{y}_2}{m}$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & -b/m \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1/m \end{bmatrix} f$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$$