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Corrección parcial #1

1.

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

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

$q_1 = x$

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

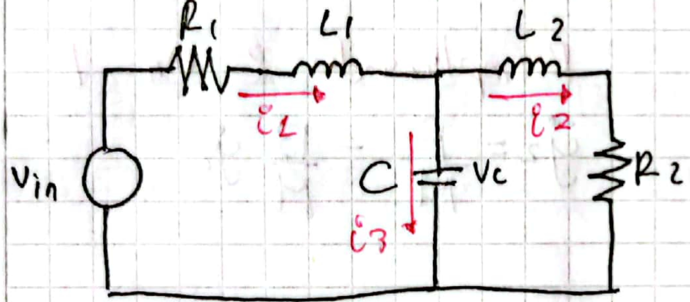
$q_3 = \dot{q}_2 = \ddot{x}$

$\dot{q}_3 = \ddot{q}_2 = \dddot{x}$

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

$$x = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$$

2.



$i_C = C\dfrac{dV_C}{dt}$ $V_L = L\dfrac{di_L}{dt}$

$V_C = X_1$ $i_1 = X_2$ $i_2 = X_3$

$\dot{V}_C = \dot{X}_1$ $\dot{i}_1 = \dot{X}_2$ $\dot{i}_2 = \dot{X}_3$

$i_1 = i_3 + i_2$

$X_2 = C\dot{X}_1 + X_3$

$\dot{X}_1 = \dfrac{X_2}{C} - \dfrac{X_3}{C}$

$V_{R2} + V_{L2} = V_C$

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

$V_{R2} = X_1 - L_2\dot{X}_3$

$V_C = V_{in} - V_{R1} - V_{L1}$

$X_1 = V_{in} - R_1 X_2 - L_1\dot{X}_2$

$\dot{X}_2 = \dfrac{V_{in}}{L_1} - \dfrac{R_1}{L_1}X_2 - \dfrac{X_1}{L_1}$

$i R_2 = X_1 - L_2\dot{X}_3$

$R_2 X_3 = X_1 - L_2\dot{X}_3$

$\dot{X}_3 = \dfrac{X_1}{L_2} - \dfrac{R_2}{L_2}X_3$

$V_{R2} = i_2 R_2$

$V_{R2} = X_3 R_2$

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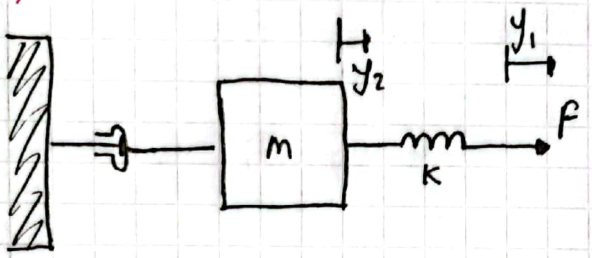
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & \frac{1}{C} & -\frac{1}{C} \\ -\frac{1}{L_1} & -\frac{R_1}{L_1} & 0 \\ \frac{1}{L_2} & 0 & -\frac{R_2}{L_2} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{L_1} \\ 0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

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

3)



$q_1 = y_1$ $\quad q_2 = y_2$

$\dot{q}_1 = \dot{y}_1$ $\quad \dot{q}_2 = \dot{y}_2 = q_3$

$\dot{q}_3 = \ddot{q}_2 = \ddot{y}_2$

masa $\quad \sum F = m\ddot{y}$

$$M\ddot{y}_2 + B\dot{y}_2 = K(y_1 - y_2)$$

$$M\ddot{y}_2 = Ky_1 - Ky_2 - B\dot{y}_2 \quad (1)$$

Reemplazando 2 en 1

$$\ddot{y}_2 = \frac{F}{M} - \frac{B}{M}\dot{y}_2$$

masa puntual

$$0 = -K(y_1 - y_2) + F$$

$$0 = -Ky_1 + Ky_2 + F$$

$$F = Ky_1 - Ky_2 \quad (2)$$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & -\frac{B}{M} \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ \frac{1}{M} \end{bmatrix} F$$

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