Tarea 2

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Tarea 1.

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

$x = s^0 = x_1$

$\dot{x} = s^2 = \dot{x}_1 = x_2$

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

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

$V(s)[s^3+s^2+2s+1] = 2f(x)$

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

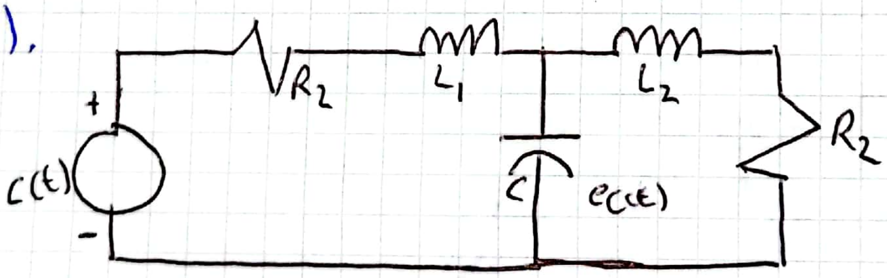
$\dot{x}_3 = 2U(2x_3 + x_2 + x_1)x - 1$

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

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

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} U$$

2).




$i_c = \frac{dV_c}{dt} C$

$V_c = L \frac{di_L}{dt}$

$i_1 + i_B + i_2$

$x_2 = Cx_1 + x_3$

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

$V_{R_2} + V_R = V_c$

$V_{R_2} = x_1 R_1\ x_3 V_c = \dot{x}_1$

$i_1 = x_2 \quad \dot{i}_1 = \dot{x}_2$

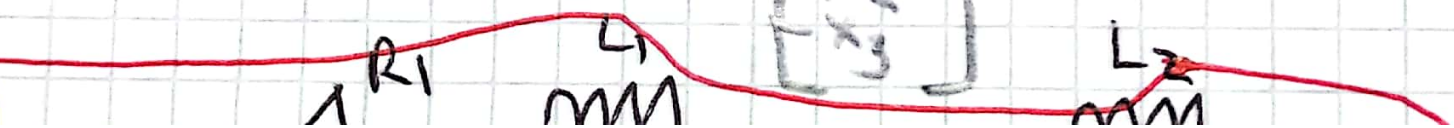
$i_2 = x_3 \quad \dot{i}_2 = \dot{x}_3$

$$V_{R_2} = I_2 R_2 = x_3 R_2$$

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

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

3)



3).

$m_1$ :

$$M\frac{d^2 y_2 t}{dt^2} = M\ddot{x}_1 \qquad y_2 = x_1$$

$$x_1 = q_1$$
$$\dot{x}_1 = q_2$$
$$\dot{x}_2 = q_2$$

$$B\frac{dy_2(t)}{dt} B\dot{x}_1$$

$$K(y_1 - Y_2) = K(X_2 - X_1)$$

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

$$K(y_1 = Y_2) = f(t) \longrightarrow K(x_2 - x_1) = f$$

$$KX_2 - KX_1 = f \longrightarrow X_2 = \frac{f + Kx_1}{K}$$

$$M\ddot{x}_1 + B\dot{x}_1 = \frac{Kf}{K} + Kx_1 - x_1$$

$$\ddot{x}_1 = (K x_1 - x_1 + f + B\dot{x}_1)\, 1/m$$

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