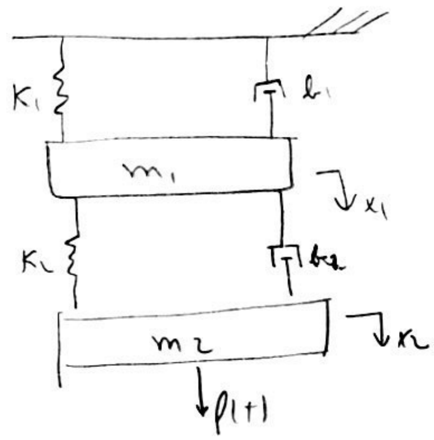
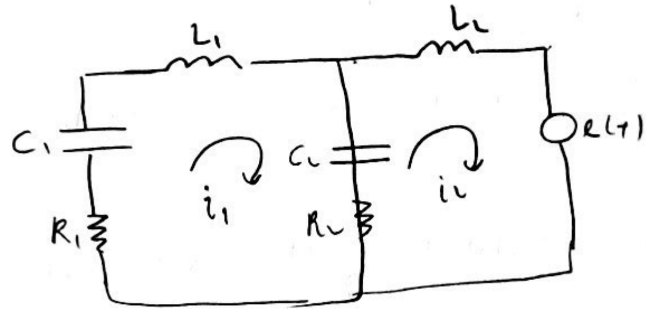
Lucas Nigro Matheo - 10772911   22/09/2020

PME 3380 - Exercício aula do dia 08/09/2020

Aula 8/9/2020

1



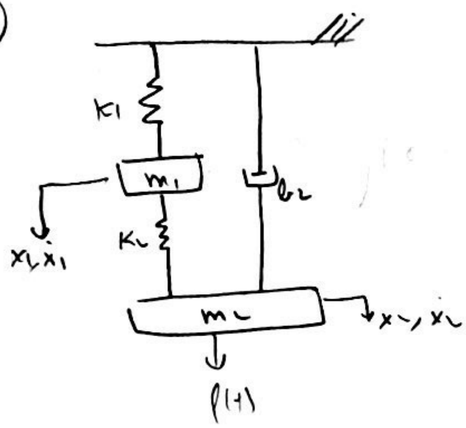


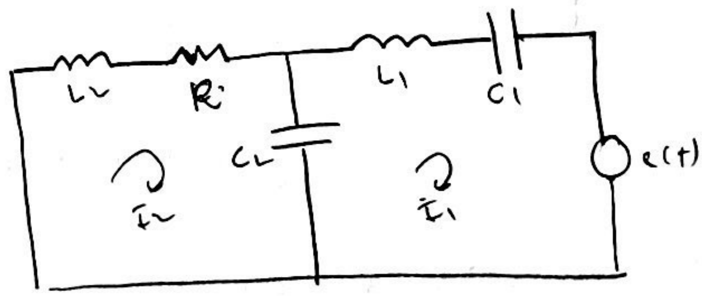
malla 1: $L_1 D i_1 + \frac{1}{C_1 D} i_1 + R_1 i_1 + \frac{1}{C_2 D}(i_1 - i_2) + R_2(i_1 - i_2) = 0$

malla 2: $L_2 D i_2 + \frac{1}{C_2 D}(i_2 - i_1) + R_2(i_2 - i_1) = e(t)$

$$\therefore \begin{cases} m_1 \ddot{x}_1 + K_1 x_1 + K_2(x_1 - x_2) + b_1 \dot{x}_1 + b_2(\dot{x}_1 - \dot{x}_2) = 0 \\ m_2 \ddot{x}_2 + K_2(x_2 - x_1) + b_2(\dot{x}_2 - \dot{x}_1) = f(t) \end{cases}$$

2





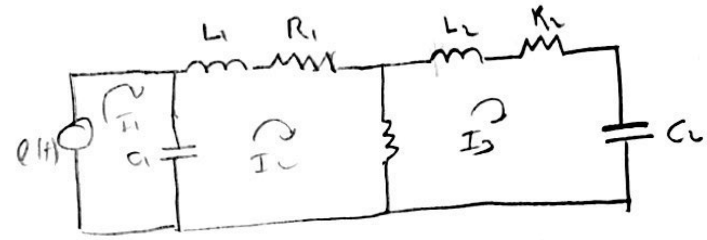
malla 1: $L_1 D i_1 + \frac{1}{C_1 D} i_1 + \frac{1}{C_2 D}(i_1 - i_2) = e(t)$

malla 2: $L_2 D i_2 + \frac{1}{C_2 D}(i_2 - i_1) + R i_2 = 0$

$$\Rightarrow \therefore \quad m_1 \ddot{x}_1 + K_1 x_1 + K_2(x_1 - x_2) = f(t)$$

$$m_2 \ddot{x}_2 + K_2(x_2 - x_1) + b\dot{x}_2 = 0$$

③



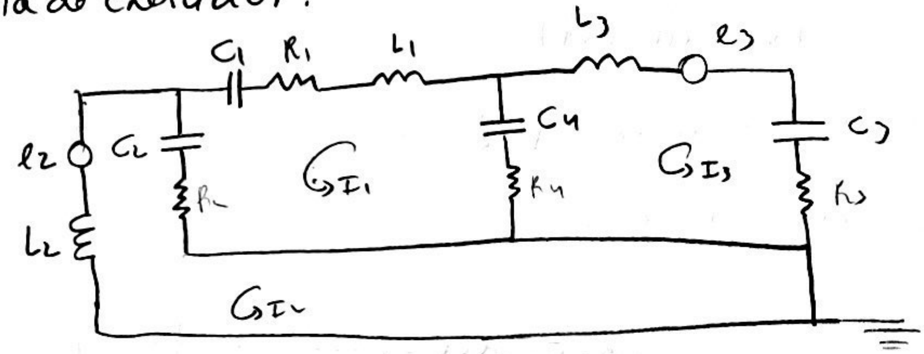
malha 1: $\frac{1}{C_1 D} i_1 = e(t)$; malha 2: $(L_1 D + R_1) i_2 + R_3 (i_2 - i_3) + \frac{1}{C_1 D}(i_2 - i_1) = 0$

malha 3: $(L_2 D + R_2) i_3 + \frac{1}{C_2 D} i_3 + (i_3 - i_2) R_3 = 0$

$$\therefore \begin{cases} K_1 \theta_1 = T(t) \\ J_1 \ddot{\theta}_2 + K_1(\theta_2 - \theta_1) + B_1 \dot{\theta}_2 + B_3(\dot{\theta}_2 - \dot{\theta}_3) = 0 \\ J_2 \ddot{\theta}_3 + K_2 \theta_3 + B_2 \dot{\theta}_3 + B_3(\theta_3 - \theta_2) = 0 \end{cases}$$

Lista de Exercícios:

③



malha 1: $\left(L_1 D + R_1 + \frac{1}{C_1 D}\right) i_1 + (i_1 - i_2)\left(R_2 + \frac{1}{C_2 D}\right) + (i_1 - i_3)\left(\frac{1}{C_4 D} + R_4\right) = 0$

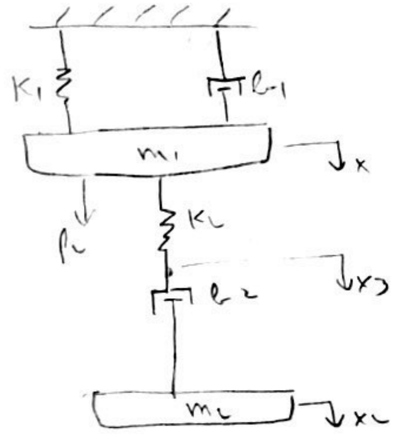
malha 2: $L_2 D i_2 + (i_2 - i_1)\left(R_2 + \frac{1}{C_1 D}\right) + (i_2 - i_3)\left(R_3 + \frac{1}{C_3 D}\right) = e_2$

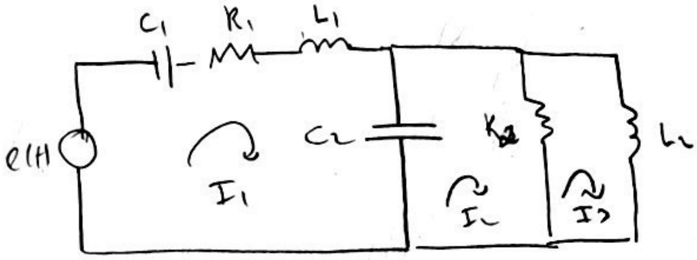
malha 3: $L_3 D i_3 + (i_1 - i_3)\left(R_4 + \frac{1}{C_4 D}\right) + (i_3 - i_2)\left(R_4 + \frac{1}{C_3 D}\right) = e_3$

a

$$\therefore \begin{cases} m_1 \ddot{x}_1 + x_1(K_1 + K_2 + K_4) + (b_1 + b_2 + b_4)\dot{x}_1 - K_2 x_2 - b_2 \dot{x}_2 - K_4 x_3 - b_4 \dot{x}_3 = 0 \\ m_2 \ddot{x}_2 + x_2(K_1 + K_2) + \dot{x}_2(b_1 + b_2) - K_3 x_3 - b_3 \dot{x}_3 - K_2 x_1 = f_2(t) \\ m_3 \ddot{x}_3 + (K_3 + K_4) x_3 + (b_3 + b_4)\dot{x}_3 - K_3 x_2 - b_3 \dot{x}_2 - K_4 x_1 - b_4 \dot{x}_1 = f_3(t) \end{cases}$$

6





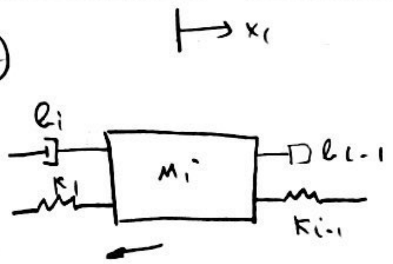
malha 1: $i_1 \frac{1}{C_1 D} + R_1 i_1 + L_1 D i_1 + \frac{1}{C_2 D}(i_1 - i_3) = e(t)$

malha 2: $L_2 D i_2 + R_2(i_2 - i_3) = 0$; malha 3: $\frac{1}{C_2 D}(i_3 - i_1) + R_2(i_3 - i_2) = 0$

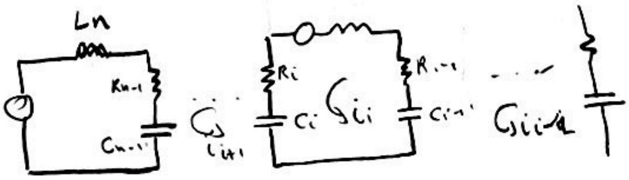
Aplicando a analogia:

$$\begin{cases} K_1 x_1 + \ell_1 \dot{x}_1 + m_1 \ddot{x}_1 + K_2(x_1 - x_3) = e(t) \\ m_2 \ddot{x}_2 + \ell_2(\dot{x}_2 - \dot{x}_3) = 0 \\ K_2(x_3 - x_1) + \ell_2(\dot{x}_3 - \dot{x}_2) = 0 \end{cases}$$

7



$mg\,sen\,\theta + K_i$



malha i $R_i(i_i - i_{i+1}) + \frac{1}{C_{i-1}D}(i_i - i_{i-1}) + \frac{1}{C_i D}(i_i - i_{i+1}) + R_{i-1}(i_i - i_{i-1}) + L_i D i = e_i(t)$

analogia:

$$K_T(x_i - x_{i+1}) + \ell_i(\dot{x}_i - \dot{x}_{i+1}) + K_{i-1}(x_i - x_{i-1}) + \ell_{i-1}(\dot{x}_i - \dot{x}_{i-1}) + m_i \ddot{x}_i =$$

$$= mg\,sen\,\theta_i - K_i$$

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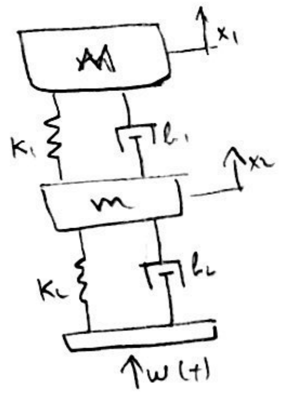
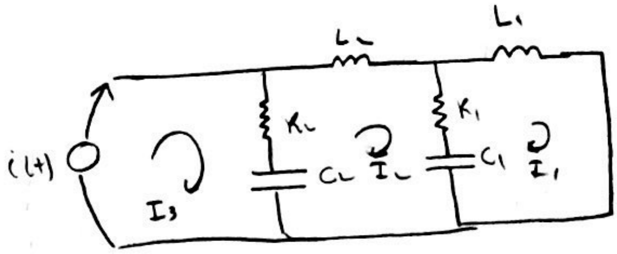
a) Supondo w deslocamento





$$L_1 D i_1 + (i_1 - i_2)\left(R_1 + \frac{1}{C_1 D}\right) = 0$$

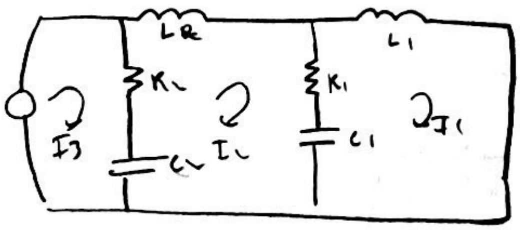
$$L_2 D i_2 + (i_2 - i_1)\left(R_1 + \frac{1}{C_1 D}\right) + (i_2 - i_1)\left(R_2 + \frac{1}{C_2 D}\right) = 0$$

Aplicando a analogia:

$$M\ddot{x}_1 + \ell_1\dot{x}_1 + K_1 x_1 - \ell_1\dot{x}_1 - K_1 x_2 = 0$$

$$m\ddot{x}_2 + (\ell_1 + \ell_2)\dot{x}_2 + (K_1 + K_2)x_2 - \ell_1\dot{x}_1 - K_1 x_1 - \ell_2\dot{w}(t) - K_2 w = 0$$

Supondo w(t) força



$$(i_3 - i_2)\left(R_2 + \frac{1}{C_2 D}\right) = e(t)$$

$$L_1 D i_1 + \left(R_1 + \frac{1}{C_1 D}\right)(i_1 - i_2) = 0$$

$$L_2 D i_2 + (i_2 - i_1)\left(R_1 + \frac{1}{C_1 D}\right) + (i_2 - i_3)\left(R_2 + \frac{1}{C_2 D}\right) = 0$$

$$M\ddot{x}_1 + \ell_1\dot{x}_1 + K_1 x_1 - \ell_1\dot{x}_2 - K_1 x_2 = 0$$

$$m\ddot{x}_2 + \ell_1\dot{x}_2 + K_1 x_2 - \ell_1\dot{x}_1 - K_1 x_1 = w(t)$$