Ex. Modelagem p/ 22/09

Analogia mecânica - elétrica tipo 1.

Ele. Mec - tipo 1

$L \rightarrow m$

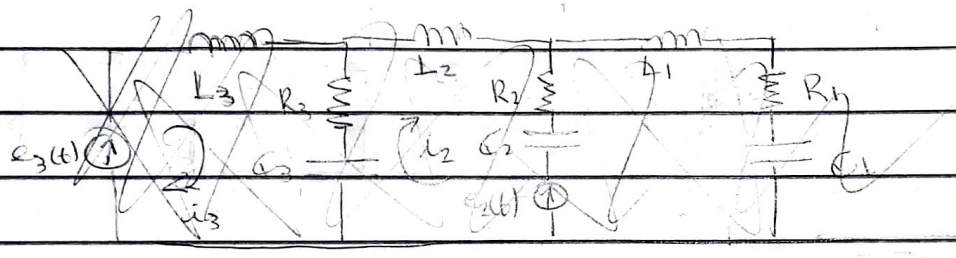
$\frac{1}{C} \rightarrow K$

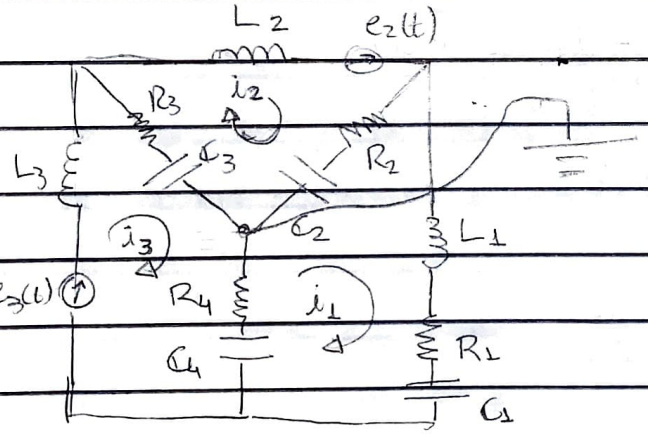
$R \rightarrow b$

$i(t) \rightarrow v(t)$

$v(t) \rightarrow F(t)$

3. Elétrica





Malha 1:

$$i_1\left(L_1D + R_1 + \frac{1}{C_1D} + R_4 + \frac{1}{C_4D} + R_2 + \frac{1}{C_2D}\right) - i_3\left(R_4 + \frac{1}{C_4D}\right) - i_2\left(R_2 + \frac{1}{C_2D}\right) = 0$$

Malha 2:

$$i_2\left(L_2D + R_2 + \frac{1}{C_2D} + R_3 + \frac{1}{C_3D}\right) - i_1\left(R_2 + \frac{1}{C_2D}\right) - i_3\left(R_3 + \frac{1}{C_3D}\right) = e_2(t)$$

Malha 3:

$$i_3\left(L_3D + R_3 + \frac{1}{C_3D} + R_4 + \frac{1}{C_4D}\right) - i_1\left(R_4 + \frac{1}{C_4D}\right) - i_2\left(R_3 + \frac{1}{C_3D}\right) = e_3(t)$$

/ /

Seg | Ter | Qua | Qui | Sex | Sáb | Dom

Analogia 1.

$$m_1\ddot{x}_1 + (b_1+b_2+b_4)\dot{x}_1 + (K_1+K_2+K_4)x_1 - b_2\dot{x}_2 - K_2x_2 - b_4\dot{x}_3 - K_4x_3 = 0$$

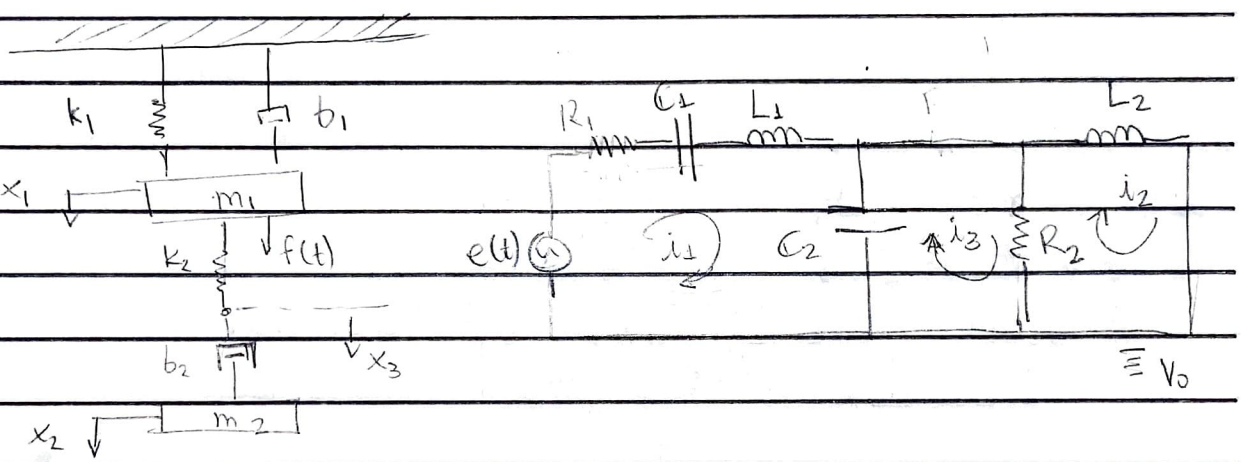
$$m_2\ddot{x}_2 + (b_2+b_3)\dot{x}_2 + (K_2+K_3)x_2 - b_2\dot{x}_1 - K_2x_1 - b_3\dot{x}_3 - K_3x_3 = f_2(t)$$

$$m_3\ddot{x}_3 + (b_3+b_4)\dot{x}_3 + (K_2+K_4)x_3 - b_4\dot{x}_1 - K_4x_1 - b_3\dot{x}_2 - K_3x_2 = f_3(t)$$

Os resultados são os mesmos da analogia 2 e dos obtidos por Lagrange.

Lista anterior.

6.



Malha 1: $i_1\left(L_1D + R_1 + \frac{1}{C_1D} + \frac{1}{C_2D}\right) - \frac{i_3}{C_2D} = e(t)$

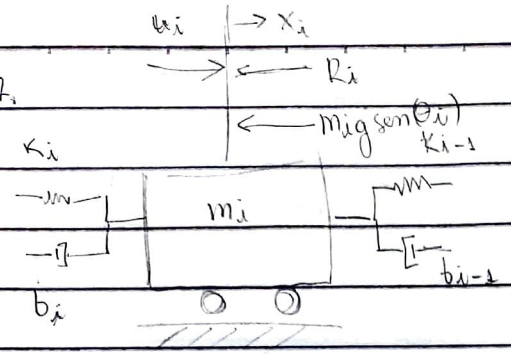
Malha 2: $i_2(L_2D + R_2) - i_3R_2 = 0$

Malha 3: $i_3\left(R_2 + \frac{1}{C_2D}\right) - i_2R_2 - \frac{i_1}{C_2D}$

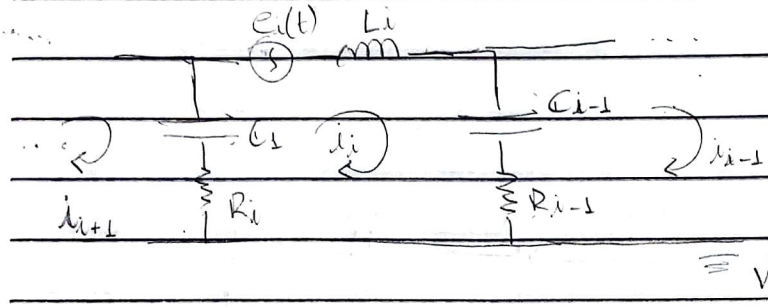
Analogia 1:

$$\begin{cases} m_1\ddot{x}_1 + b_1\dot{x}_1 + (K_1+K_2)\cdot x_1 - K_2\cdot x_3 = f(t) \\ m_2\ddot{x}_2 + b_2\dot{x}_2 - b_2\cdot\dot{x}_3 = 0 \\ b_2\cdot\dot{x}_3 + K_2\cdot x_3 - b_2\dot{x}_2 - K_2x_1 = 0 \end{cases}$$

7.



$$F_i = u_i - R_i - m_i g \operatorname{sen}(\theta_i)$$



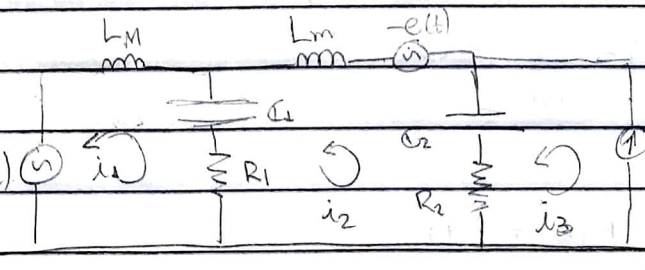
Malha ii:

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

Analogia 1:

$$m_i \ddot{x}_i + (b_i + b_{i-1})\dot{x}_i + (K_i + K_{i-1})x_i - b_{i-1}\dot{x}_{i-1} - K_{i-1}x_{i-1} - b_i \dot{x}_{i+1} - K_i x_{i+1} = u_i - R_i - m_i g \operatorname{sen}(\theta_i).$$

8



para b) → e(t) = w(t) (Força.)

$i(t) = \dot{w}(t)$ (Parte de tensão)

Vb

Malha 1: $i_1\left(L_M D + R_1 + \frac{1}{C_1 D}\right) - i_2\left(R_1 + \frac{1}{C_1 D}\right) = e(t)$

Malha 2: $i_2\left(L_m D + R_1 + R_2 + \frac{1}{C_1 D} + \frac{1}{C_2 D}\right) - i_1\left(R_1 + \frac{1}{C_1 D}\right) - i_3\left(R_2 + \frac{1}{C_2 D}\right) = -e(t)$

Malha 3: $i_3\left(R_2 + \frac{1}{C_2 D}\right) - i_2\left(R_2 + \frac{1}{C_2 D}\right) = 0$

/ /

Seg | Ter | Qua | Qui | Sex | Sáb | Dom

Analogia 1:

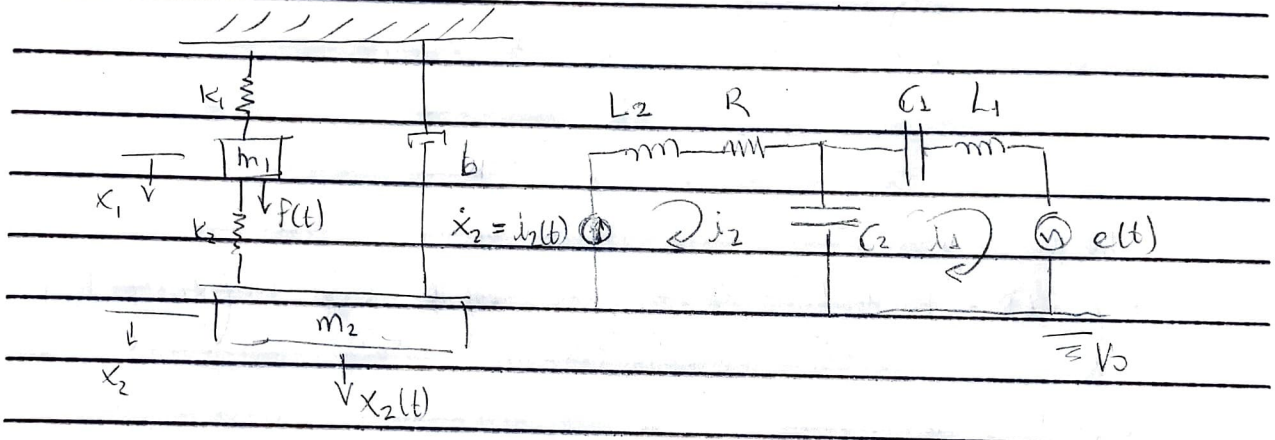
$M\ddot{x}_1 + b_1\dot{x}_1 + k_1x_1 - b_1\dot{x}_2 - k_1x_2 = u$

$m\ddot{x}_2 + (b_1+b_2)\dot{x}_2 + (k_1+k_2)x_2 - b_1\dot{x}_1 - k_1x_1 - b_2\dot{w} - k_2w = -u$

$b_2\dot{w} + k_2w - b_2\dot{x}_2 - k_2x_2 = 0$

Exercícios propostos em aula.

2.



Malha 1:

$$i_1\left(L_1D + \frac{1}{C_1D} + \frac{1}{C_2D}\right) - \frac{i_2}{C_2D} = e(t)$$

Malha 2:

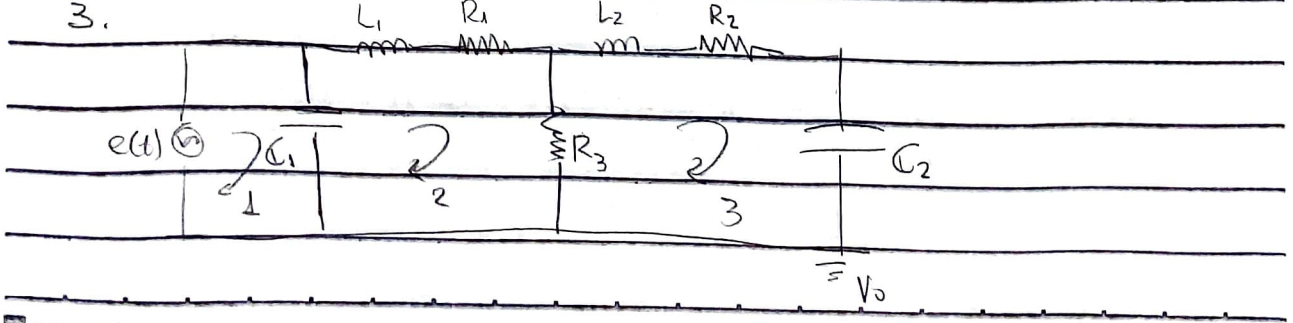
$$i_2\left(L_2D + R + \frac{1}{C_2D}\right) - \frac{i_1}{C_2D} = 0$$

Analogia 1.

$m_1\ddot{x}_1 + (k_1+k_2)x_1 - k_2x_2 = f(t)$

$m_2\ddot{x}_2 + b\dot{x}_2 + k_2x_2 - k_2x_1 = 0 \rightarrow x_2(t)$ dado.

3.



FORONI

Seg Ter Qua Qui Sex Sáb Dom

/ /

Malha 1:

$$\frac{i_1}{C_1 D} - \frac{i_2}{C_2 D} = e(t)$$

Malha 2:

$$i_2\left(L_1 D + R_1 + \frac{1}{C_1 D} + R_3\right) - \frac{i_1}{C_1 D} - i_3 R_3 = 0$$

Malha 3:

$$i_3\left(L_2 D + R_2 + \frac{1}{C_2 D} + R_3\right) - i_2 R_3 = 0$$

Analogia 1.

$$K_1 \theta_1 - K_2 \cdot \theta_2 = T$$

$$J_1 \ddot{\theta}_2 + (B_1 + B_3)\dot{\theta}_2 + K_1 \theta_2 - K_1 \theta_1 - B_3 \dot{\theta}_3 = 0$$

$$J_2 \ddot{\theta}_3 + (B_2 + B_3)\dot{\theta}_3 + K_2 \theta_3 - B_3 \dot{\theta}_2 = 0$$