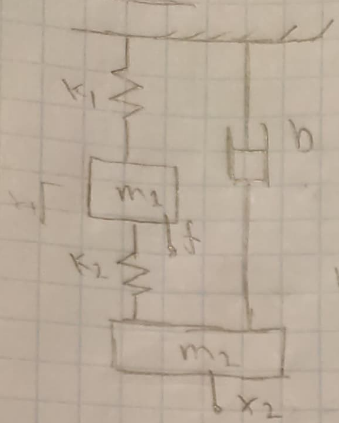
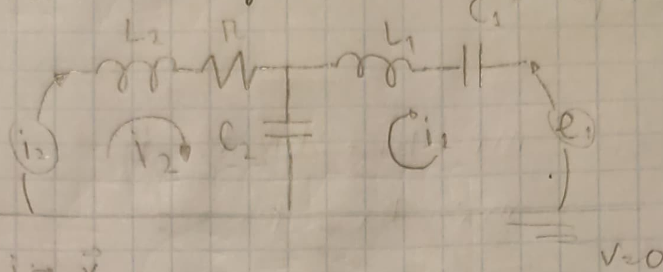
Ex 2 Enzo C Zuglioni - 10333741





$v \to f$, $i \to \vec{v}$

• Malha 2:

$L_2 D \cdot i_2 + R i_2 + (i_2 - i_1) \cdot \frac{1}{C_2 D} = 0 \Rightarrow$

$\Rightarrow m_2 D v_2 + b \cdot v_2 + (v_2 - v_1) \cdot \frac{K_2}{D} = 0 \Rightarrow$

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

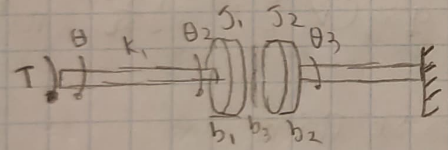
• Malha 1:

$(i_1 - i_2) \cdot \frac{1}{C_2 D} + L_1 D i_1 + i_1 \cdot \frac{1}{C_1 D} = e_1 \Rightarrow$

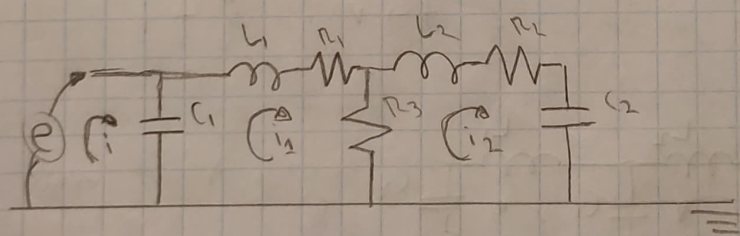
$\Rightarrow (v_1 - v_2) \cdot \frac{K_2}{D} + m_1 v_1 D + v_1 \cdot \frac{K_1}{D} = f \Rightarrow$

$\Rightarrow (x_1 - x_2) \cdot K_2 + m \ddot{x}_1 + x_1 K_1 = f$ /

Ex 3



$f \to v$; $\vec{v} \to i$



$x = \theta_1$
$x_1 = \theta_2$
$x_2 = \theta_3$ /

• Malha "i":

$e - (i - i_1) \frac{1}{C_1 D} = 0$

$\Rightarrow f - (v - v_1) \cdot \frac{K_1}{D} = 0 \Rightarrow (x - x_1) K_1 = f$ /

• Malha 1:

$(i_1 - i) \frac{1}{C_1 D} + L_1 D i_1 + R i_1 + (i_1 - i_2) \cdot R_3 = 0$

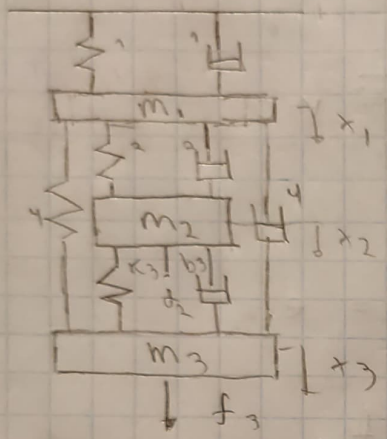
$\Rightarrow (v_1 - v) \cdot \frac{K_1}{D} + m_1 \cdot D \cdot v_1 + b_1 v_1 + (v_1 - v_2) \cdot b_3 = 0$

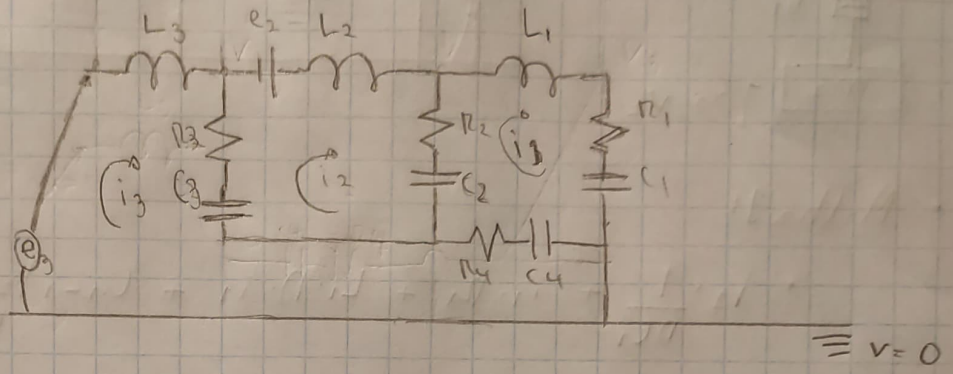
$\Rightarrow (x_1 - x) \cdot K_1 + m_1 \ddot{x}_1 + b_1 v_1 + (v_1 - v_2) \cdot b_3 = 0$ /

- Malha 2:
  - $(i_2 - i_1) \cdot R_3 + i_2 \cdot D \cdot L_2 + R_2 i_2 + \frac{1}{C_2 D} i_2 = 0$

$\Rightarrow (v_2 - v_1) \cdot b_3 + m_2 \cdot \ddot{x}_2 + b_2 \cdot v_2 + k_2 \cdot x_2 = 0$ //

- Ex "3"





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

$\Rightarrow m_1 \ddot{x}_1 + b_1 \cdot \dot{x}_1 + k_1 x_1 + (\dot{x}_1 - \dot{x}_3) b_4 + (x_1 - x_3) k_4 +$
$+ (\dot{x}_1 - \dot{x}_2) b_2 + (x_1 - x_2) k_2 = 0$ //

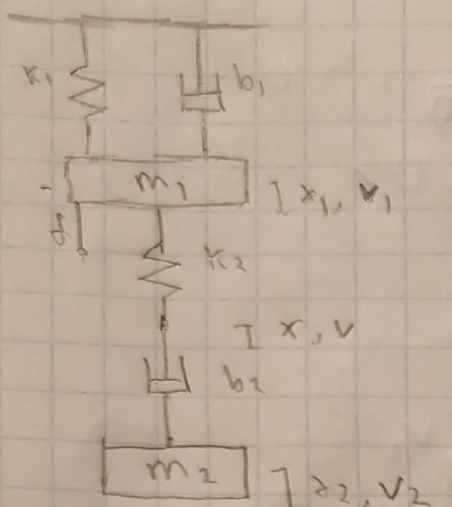
- Malha 2:
  - $L_2 D \cdot i_2 + (i_2 - i_1) \cdot (R_2 + \frac{1}{C_2 D}) + (i_2 - i_3) \cdot (R_3 + \frac{1}{C_3 D}) = e_2$

$\Rightarrow m_2 \ddot{x}_2 + (\dot{x}_2 - \dot{x}_1) \cdot b_2 + (x_2 - x_1) \cdot k_2 + (\dot{x}_2 - \dot{x}_3) b_3 + (x_2 - x_3) k_3 = f_2$ //

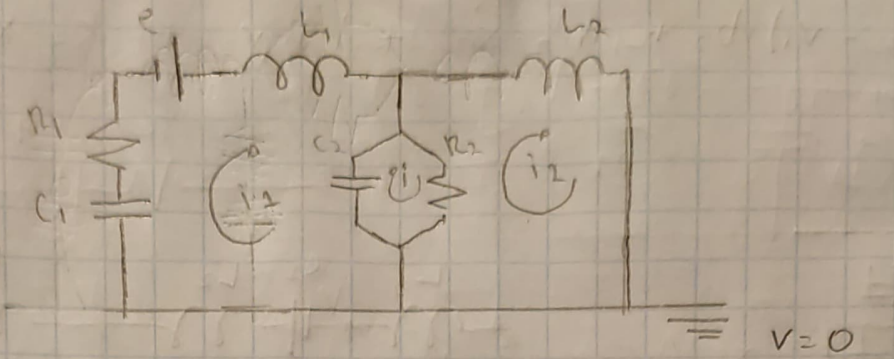
- Malha 3:
  - $L_3 \cdot D i_3 + (i_3 - i_2) \cdot (R_3 + \frac{1}{C_3 D}) + (i_3 - i_1)(R_4 + \frac{1}{C_4 D}) = e_3$

$\Rightarrow m_3 \ddot{x}_3 + (\dot{x}_3 - \dot{x}_2) b_3 + (x_3 - x_2) k_3 + (\dot{x}_3 - \dot{x}_2) b_4 + (x_3 - x_2) R_4 = f_3$ //

Ex 6



$f \rightarrow V, \quad \vec{v} \rightarrow i$



- Malha 1:

$$\cdot \; i_1 \cdot \frac{1}{DC_1} + i_1 \cdot R_1 + L_1 \cdot D \cdot i_1 + (i_1 - i) \cdot \frac{1}{C_2 D} = e$$

$$\Rightarrow \quad x_1 \cdot k_1 + \dot{x}_1 \cdot b_1 + m_1 \ddot{x}_1 + (x_1 - x) \cdot k_2 = f$$

- Malha 2:

$$\cdot \; i_2 \cdot L_2 \cdot D + (i_2 - i) \cdot R_2 = 0$$

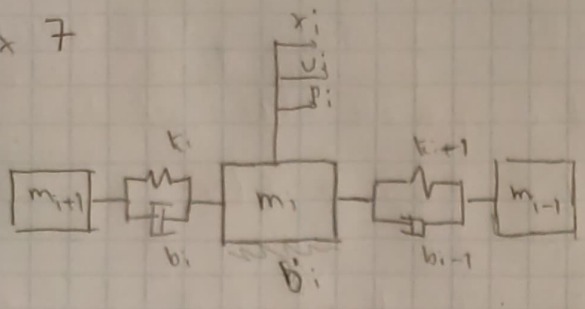
$$\Rightarrow \quad m_2 \cdot \ddot{x}_2 + (\dot{x}_2 - \dot{x}) \cdot b_2 = 0$$

- Malha "i"

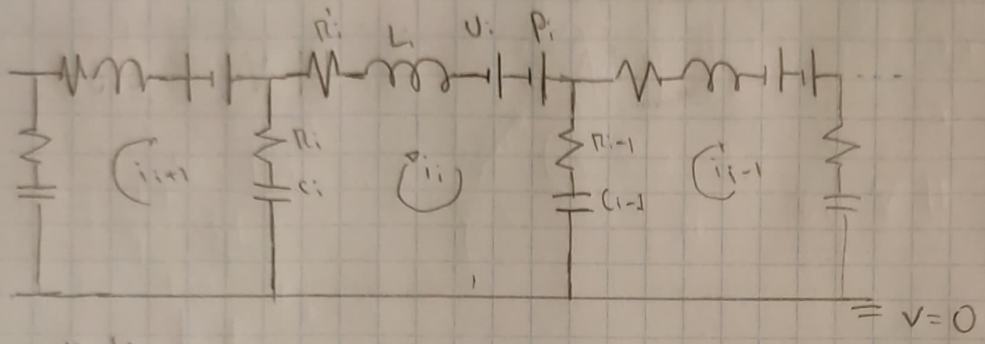
$$\cdot \; (i - i_2) R_2 + (i - i_1) \cdot \frac{1}{C_2 D} = 0$$

$$\Rightarrow \quad (\dot{x} - \dot{x}_2) b_2 + (x - x_1) \cdot k_2 = 0$$

Ex 7



· Circuito análogo:

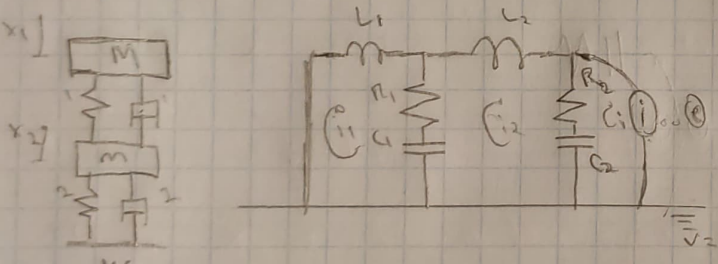


· Malha i_i:

$$\cdot\ i_i \cdot R_i' + L_i D i_i - v_i - P_i + (i_i - i_{i-1})\cdot\left(R_{i-1} + \frac{1}{C_{i-1}D}\right) + + (i_i - i_{i+1})\cdot\left(R_i + \frac{1}{C_i D}\right) = 0$$

$$\Rightarrow \dot{x}_i \cdot b_i' + m_i \ddot{x}_i + (\dot{x}_i - \dot{x}_{i-1}) b_{i-1} + + (x_i - x_{i-1})\cdot k_{i-1} + (\dot{x}_i - \dot{x}_{i+1}) b_i + (x_i - x_{i+1}) k_i = v_i + m_i g \operatorname{sen}\theta$$

Ex 8



$f \to v_i \quad \vec{v} \to i$

a) W deslocamento:

· Malha 1:

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

$$\Rightarrow m_1 \ddot{x}_1 + (\dot{x}_1 - \dot{x}_2) b_1 + (x_1 - x_2) k_1 = 0 \quad (I)$$

· Malha 2:

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

$$\Rightarrow m_1 \ddot{x}_1 + (\dot{x}_1 - \dot{w}) b_2 + (\dot{x} - w k_2 + (\dot{x}_2 - \dot{x}_1) b_1 + (x_2 - x_1) k_1 = 0$$

b) W fonte; Equação (I) é a mesma.

· Malha 2:

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

$$\Rightarrow m_2 \ddot{x}_2 + b_2 \dot{x}_2 + k_2 x_2 + (\dot{x}_2 - \dot{x}_1) b_1 + (x_2 - x_1) k_1 = w$$