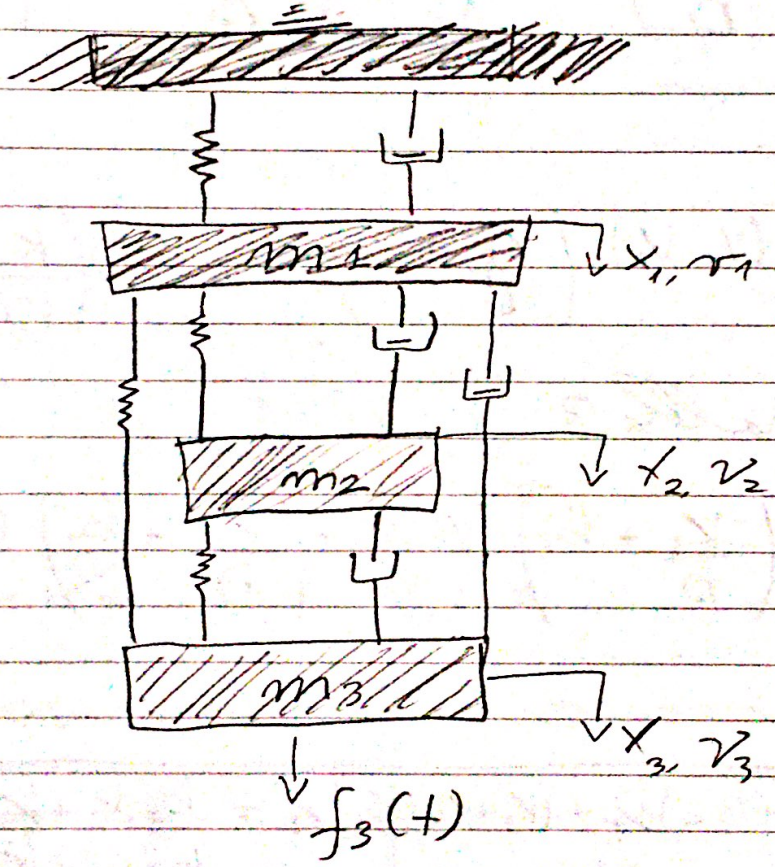
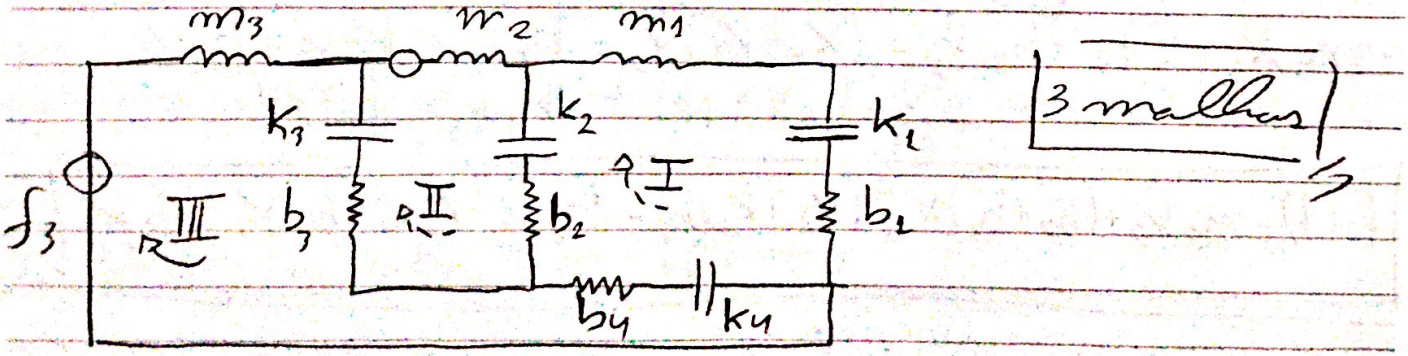
José Felipe Felix Rafael · 22/09/2020

PME 2371 - Modelagem e Sist. Dinâmicos

Ex 3



Circuito análogo



Analisando cada uma das malhas.

· malhas I:

$$0 = V_1 \cdot \left(m_1 D + b_1 + \frac{K_1}{D}\right) + (V_1 - V_2)\left(b_2 + \frac{K_2}{D}\right) + (V_1 - V_3)\left(b_4 + \frac{K_4}{D}\right)$$

P/ malha II:

$$f_2(t) = V_2 \cdot m_2 \cdot D + (V_2 - V_1) \cdot \left(\frac{K_2}{D} + b_2\right) + (V_2 - V_3) \cdot \left(\frac{K_3}{D} + b_3\right)$$

Por fim, p/a malha 3

$$f_3(t) = V_3 D m_3 + \left(\frac{K_3}{D} + b_3\right)(V_3 - V_2) + \left(\frac{K_4}{D} + b_4\right)(V_3 - V_1)$$

Dessa forma

$$\cdot\, m_1 \ddot{x}_1 + (b_1 + b_2 + b_4)\dot{x}_1 + (K_1 + K_2 + K_4)x_1 = b_2 \dot{x}_2 + K_2 x_2 + b_4 \dot{x}_3 + K_4 x_3$$

$$\cdot\, m_2 \ddot{x}_2 + (b_2 + b_3)\dot{x}_2 + (K_2 + K_3)x_2 = b_2 \dot{x}_1 + K_2 x_1 + b_3 \dot{x}_3 + K_3 x_3 + f_2(t)$$

$$f_2(t) = m_2 \ddot{x}_2 + (b_2 + b_3)\dot{x}_2 + (K_2 + K_3)x_2 - b_2 \dot{x}_1 - K_2 x_1 - b_3 \dot{x}_3 - K_3 x_3$$

$$\cdot\, f_3(t) = m_3 \ddot{x}_3 + (b_3 + b_4)\dot{x}_3 + (K_3 + K_4)x_3 - b_4 \dot{x}_1 - K_4 x_1 - b_3 \dot{x}_2 - K_3 x_2$$

fim do Ex. 3

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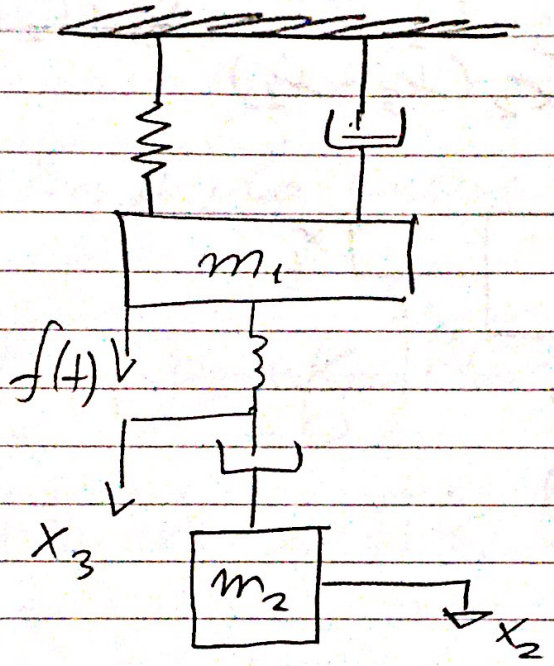
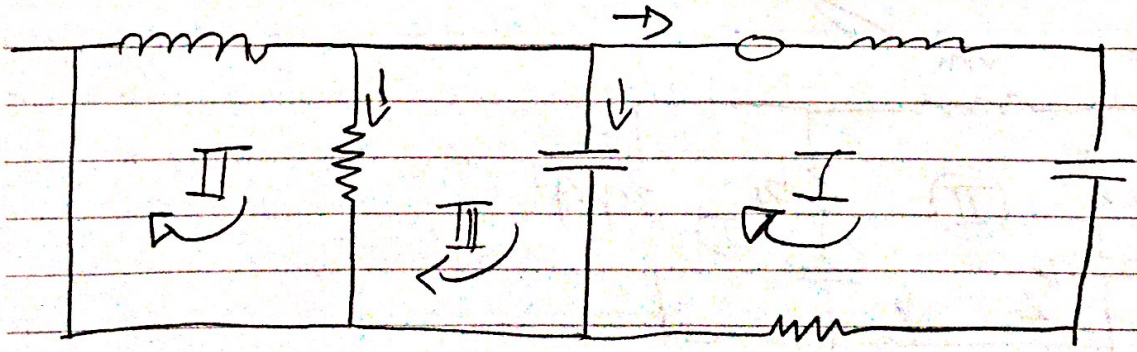
Ex 6



Circuito análogo



(I) $\left(m_1 D + b_1 + \frac{k_1}{D}\right) V_1 + (V_1 - V_3) \cdot \frac{k_2}{D} = f(t)$

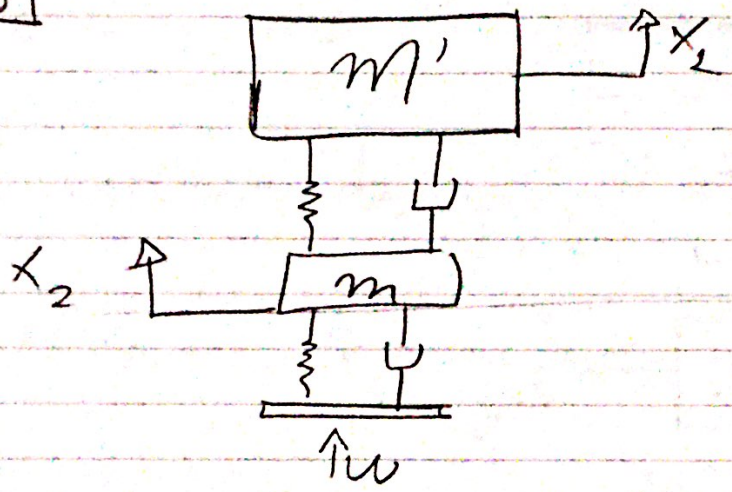
(II) $V_2 D m_2 + b_2 (V_2 - V_1) = 0$

(III) $(V_3 - V_1) \frac{k_2}{D} + b_2 (V_3 - V_2) = 0$

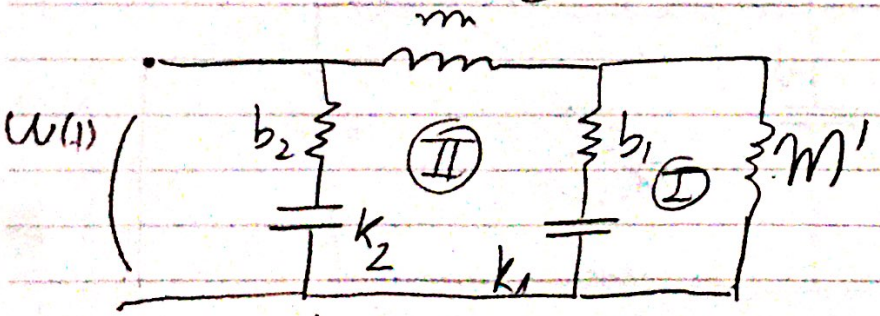
Com I, II e III

$$\begin{cases} f(t) = m_1 \ddot{x}_1 + b_1 \dot{x}_1 + (k_1 + k_2) x_1 - k_2 x_3 \\ 0 = m_2 \ddot{x}_2 + b_2 \dot{x}_2 - b_2 \dot{x}_1 = m_2 \ddot{x}_2 + b_2 (\dot{x}_2 - \dot{x}_1) \\ 0 = b_2 (\dot{x}_3 - \dot{x}_2) + k_2 (x_3 - x_1) \end{cases}$$

Ex 8



Circuito Analogo



Em (I) $m' D v_1 + \left(b_1 + \frac{k_1}{D}\right)(v_1 - v_2) = 0$

Em (II) $v_2 m D + (v_2 - v_1)\left(b_1 + \frac{k_1}{D}\right) + \left(\frac{k_2}{D} + b_2\right)(v_2 - v) = 0$

$$\begin{cases} m\ddot{x}_1 + b_2(\dot{x}_1 - \dot{x}_2) + k_1(x_1 - x_2) = 0 \\ m\ddot{x}_2 + (b_1+b_2)\dot{x}_2 + (k_1+k_2)x_2 = b_1\dot{x}_1 + k_1 x_1 \end{cases}$$

$b_2 w(t) + k_2 w(t)$

b)

Eq. I e Eq II do exercício anterior

III $w(t) = \left(b_2 + \frac{k_2}{b}\right)(v - v_2)$

$$\begin{cases} m\ddot{y}_1 + b_1(\dot{x}_1 - \dot{y}_2) + k_1(x_1 - y_2) \\ m\ddot{x}_2 + b_1\dot{x}_2 + k_1 x_2 = b_1\dot{x}_1 + k_1 x_1 + w(t) \end{cases}$$