Exercício 22/09 Modelagem.

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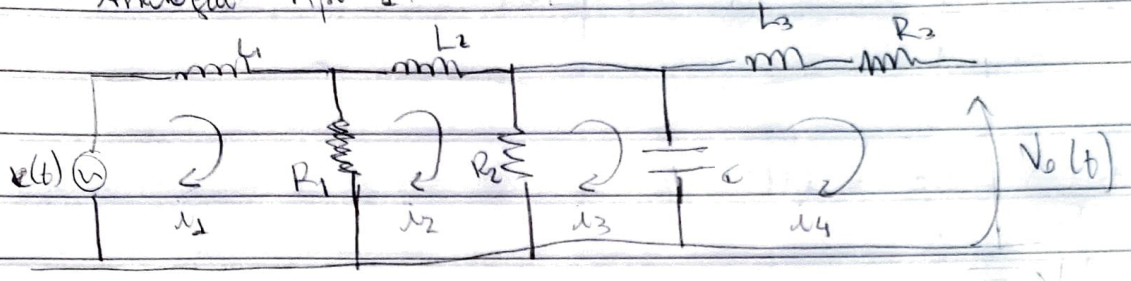
a) Analogia Tipo 1.



Malha 1: $i_1(L_1 D + R_1) - R_1 i_2 = e(t)$

Malha 2: $i_2(L_2 D + R_1 + R_2) - R_1 i_1 - R_2 i_3 = 0$

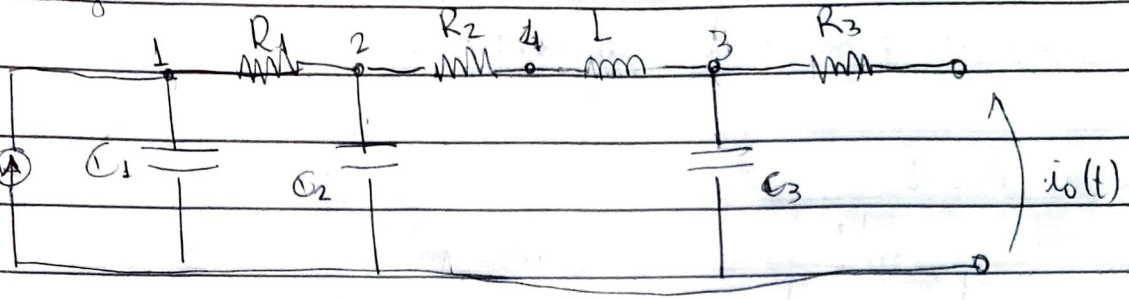
Malha 3: $i_3\left(R_2 + \frac{1}{CD}\right) - R_2 i_2 - \frac{1}{CD} i_4 = 0$

Malha 4: $i_4\left(L_3 D + R_3 + \frac{1}{CD}\right) - \frac{i_3}{CD} = V_o(t)$

Analogia: $V \to Q$; $C_f \to L$; $p \to i$; $L_f = C$; $R = \frac{1}{R_f}$

$$\begin{cases} A_1 \dot{h}_1 + \frac{h_1}{R_{f1}} - \frac{h_2}{R_{f2}} = Q(t) \\ A_2 \dot{h}_2 + \frac{h_2}{R_{f2}} - \frac{h_1}{R_{f1}} - \frac{h_4}{R_{f2}} + \frac{h_2}{R_{f1}} = 0 \\ A_3 \dot{h}_3 + \frac{h_3}{R_{f3}} + \frac{1}{L_f}\int (p_3 - p_4)\,dt = Q_o(t) \\ \frac{1}{R_{f2}}(h_2 - h_4) = \frac{1}{L_{f2}}\int (p_4 - p_3)\,dt \end{cases}$$

b) Analogia 2.



Nó 1

$$V_1\left(C_1D + \frac{1}{R_1}\right) - \frac{V_2}{R_1} = i(t)$$

Nó 2: $$V_2\left(C_2D + \frac{1}{R_1} + \frac{1}{R_2}\right) - \frac{V_1}{R_1} - \frac{V_3}{R_3} = 0$$

Nó 4 $$V_4\left(\frac{1}{R_2} + \frac{1}{LD}\right) - \frac{V_2}{R_2} - \frac{V_3}{LD} = 0$$

Nó 3 $$V_3\left(C_3D + \frac{1}{R_3} + \frac{1}{LD}\right) - \frac{V_4}{LD} = i_0(t)$$

$$\begin{cases} A_1\dot{h}_1 + \dfrac{h_1}{R_{f1}} - \dfrac{h_2}{R_{f2}} = Q_i(t) \\ A_2\dot{h}_2 + \dfrac{h_2}{R_{f2}} - \dfrac{h_1}{R_{f1}} - \dfrac{h_4}{R_{f2}} + \dfrac{h_2}{R_{f1}} = 0 \\ A_3\dot{h}_3 + \dfrac{h_3}{R_{f3}} + \dfrac{1}{L_f}\int(p_3 - p_4)\,dt = Q_0(t) \\ \dfrac{L}{L_f}\int(p_3 - p_4)\,dt = \dfrac{1}{R_f}(h_2 - h_4) \end{cases}$$