

Exercícios

$$\textcircled{1} \text{ Eixo 1: } J_1 \cdot \dot{\omega}_1 + B_1 \omega_1 + T_1 = T_M$$

$$\text{Eixo 2: } J_2 \cdot \dot{\omega}_2 + B_2 \omega_2 + T_c = T_2$$

$$J_2 \cdot \dot{\omega}_2 + B_2 \omega_2 + T_c = T_1 \cdot n$$

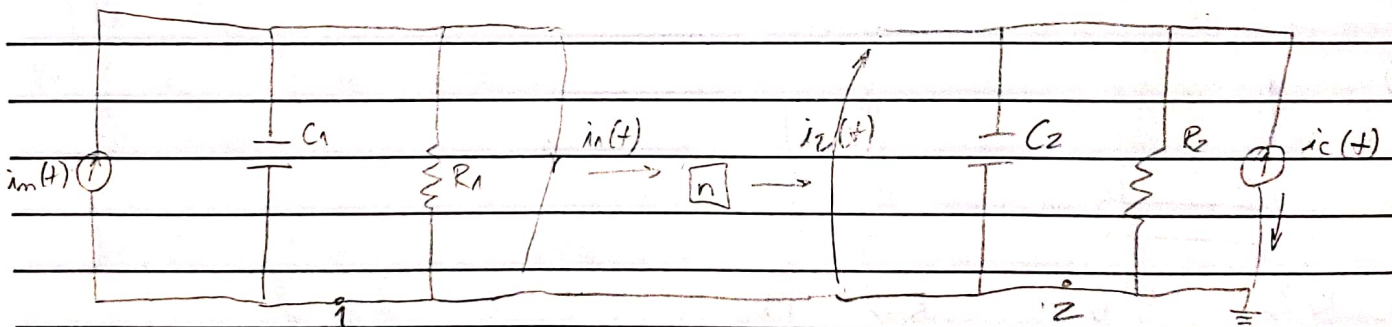
$$T_1 = -J_1 \cdot \dot{\omega}_1 - B_1 \omega_1 + T_M$$

$$T_1 = -J_1 \cdot n \dot{\omega}_2 - B_1 \cdot n \omega_2 + T_M$$

$$(J_2 + J_1 \cdot n^2) \dot{\omega}_2 + (B_2 + B_1 \cdot n^2) \omega_2 + (T_c + T_M) = 0$$

a)

Circuito elétrico:



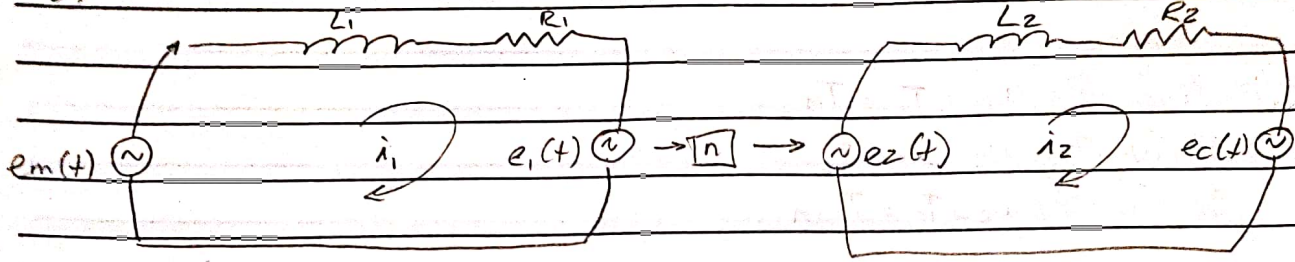
$$1: V_1 (C_1 D + 1/R_1) = i_m - i_1$$

$$2: V_2 (C_2 D + 1/R_2) = i_2 - i_c$$

$$\begin{cases} B_1 \cdot \dot{\theta}_1 + J_1 \cdot \ddot{\theta}_1 = T_M - T_1 \\ J_2 \cdot \ddot{\theta}_2 - B_2 \dot{\theta}_2 = T_2 - T_c \\ \dot{\theta}_2 \cdot n = \dot{\theta}_1 \end{cases}$$



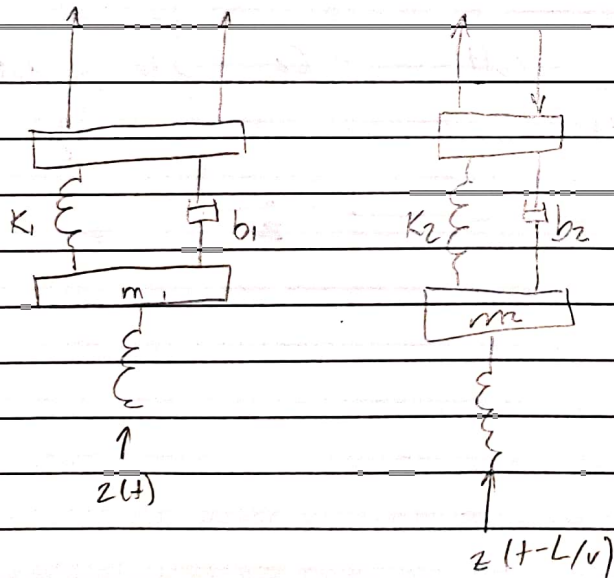
b)



$$\begin{aligned}
 e_2(t) &= n e_1(t) \\
 e_2(t) &= (L_2 D + R_2) i_2 + e_c(t) \\
 e_m(t) &= (L_1 D + R_1) i_1 + e_1(t)
 \end{aligned}
 \Rightarrow
 \begin{cases}
 T_M - T_n = J_1 \cdot D + B_1 \omega_1 \\
 T_2 - T_c = (J_2 D + B_2) \\
 T_2 = n T_1
 \end{cases}$$

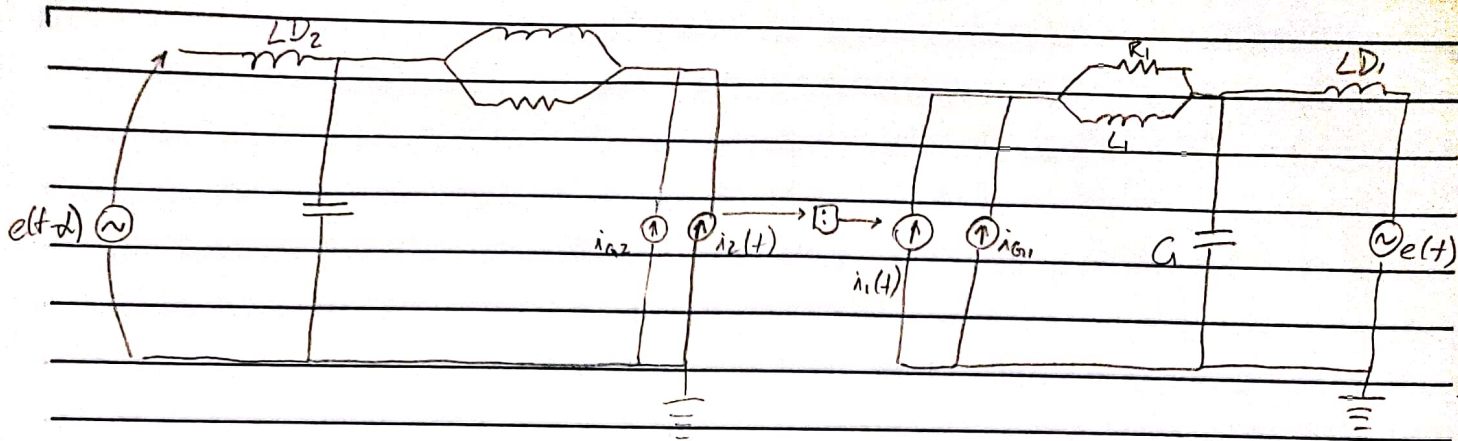
$$\Rightarrow
 \begin{cases}
 T_M - T_1 = J_1 \dot{\theta}_1 + B_1 \dot{\theta}_1 \\
 T_2 - T_c = J_2 \dot{\theta}_2 + B_2 \dot{\theta}_2 \\
 \dot{\theta}_2 \cdot n = \dot{\theta}_1
 \end{cases}$$

2)



$$\begin{aligned}
 f_1(t) &= l_1 (K_1 \theta + b_1 \dot{\theta}) \\
 f_2(t) &= l_2 (K_2 \theta + b_2 \dot{\theta}) \\
 f_{G1}(t) &= K_1 (x_G - x_1) + b_1 (\dot{x}_G - \dot{x}_1) \\
 f_{G2}(t) &= K_2 (x_G - x_2) + b_2 (\dot{x}_G - \dot{x}_2)
 \end{aligned}$$





$$V_1 \left(C_1 D + \frac{1}{R_1} + \frac{1}{L_1 D} + \frac{1}{L_{p1} D} \right) - V_3 \left(\frac{1}{R_1} + \frac{1}{L_1 D} \right) - e = 0$$

$$V_2 \left(C_2 D + \frac{1}{R_2} + \frac{1}{L_2 D} + \frac{1}{L_{p2} D} \right) - V_4 \left(\frac{1}{R_2} + \frac{1}{L_2 D} \right) - e(t-d) = 0$$

$$V_3 \left(\frac{1}{R_1} + \frac{1}{L_1 D} \right) = i_1(t) + i_{g1}(t)$$

$$V_4 \left(\frac{1}{R_2} + \frac{1}{L_2 D} \right) = i_2(t) + i_{g2}(t)$$

$$V_1 \left(C_1 D + \frac{1}{R_1} + \frac{1}{L_1 D} + \frac{1}{L_{p1} D} \right) = e(t) + i_1 + i_{g1}$$

$$V_2 \left(C_2 D + \frac{1}{R_2} + \frac{1}{L_2 D} + \frac{1}{L_{p2} D} \right) = e(t-d) - i_2 + i_{g2}$$

Sistema Mecânico

$$m_1 \ddot{x}_1 + b_1 \dot{x}_1 + (k_1 + k_{p1}) x_1 = k_{p1} z(t) + f_1(t) + f_{g1}(t)$$

$$m_2 \ddot{x}_2 + b_2 \dot{x}_2 + (k_2 + k_{p2}) x_2 = k_{p2} z(t-d) - f_2(t) + f_{g2}(t)$$

