Lista 3 - PME3380

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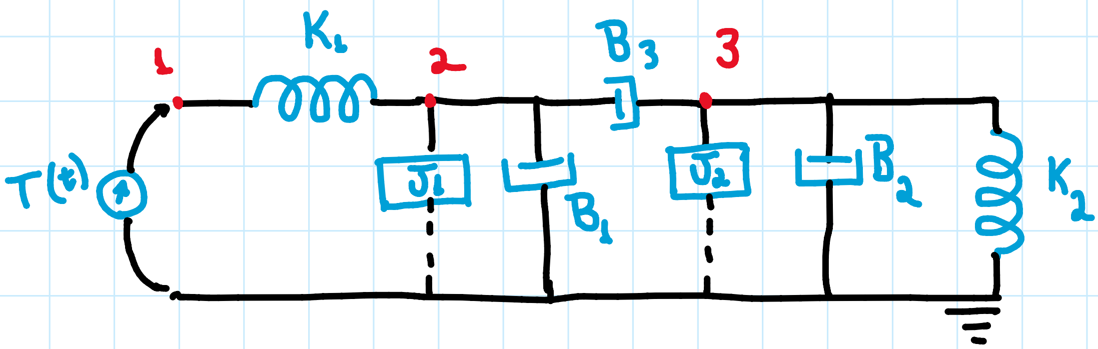
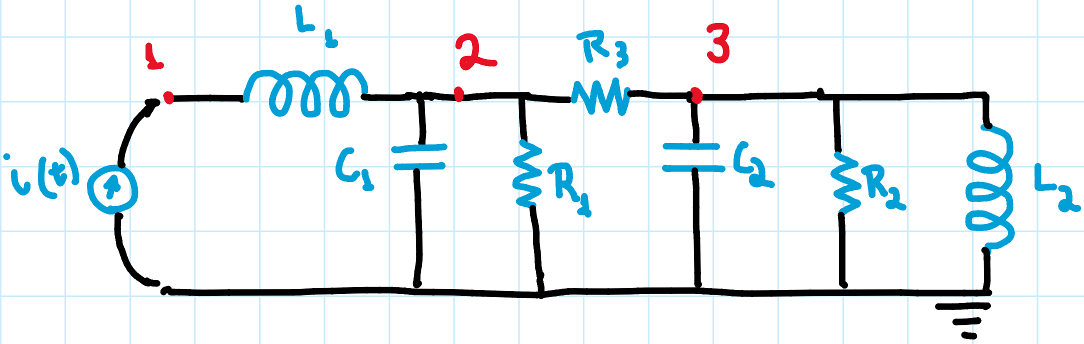
Ex.1) • Circuito mecânico:




• Circuito elétrico:




• Nó 1: $(V_1 - V_2)\cdot\frac{1}{L_1 D} = i(t) \quad (I)$

• Nó 2: $V_2\left[C_1 D + \frac{1}{R_1}\right] + (V_2 - V_3)\cdot\frac{1}{R_3} - (V_1 - V_2)\cdot\frac{1}{L_1 D} = 0 \Rightarrow$

$\Rightarrow \quad V_2\left[C_1 D + \frac{1}{R_1} + \frac{1}{R_3} + \frac{1}{L_1 D}\right] - V_1\cdot\frac{1}{L_1 D} - V_3\cdot\frac{1}{R_3} = 0 \quad (II)$

• Nó 3: $-(V_2 - V_3)\cdot\frac{1}{R_3} + V_3\cdot\left[C_2 D + \frac{1}{R_2} + \frac{1}{L_2 D}\right] = 0 \Rightarrow$

$$\Rightarrow \quad V_3\left[C_2 D + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{L_2 D}\right] - V_2 \cdot \frac{1}{R_3} = 0 \quad (\mathrm{III})$$

• De analogia do tipo 2: $V \to \omega \; (\to \dot{\theta})$; $i \to T$; $L \to \frac{1}{K}$; $C \to J$; $R \to \frac{1}{B}$

→ Eq(I): $(\omega_1 - \omega_2) \cdot \frac{1}{\frac{1}{K_1} D} = T(t) \Rightarrow \boxed{K_1 \cdot (\theta_1 - \theta_2) = T(t)}$

→ Eq. (II): $\omega_2 \cdot \left[J_1 D + \frac{1}{\frac{1}{B_1}} + \frac{1}{\frac{1}{B_3}} + \frac{1}{\frac{1}{K_1} D}\right] - \omega_1 \cdot \frac{1}{\frac{1}{K_1} D} - \omega_3 \frac{1}{\frac{1}{B_3}} = 0 \Rightarrow$

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

→ Eq. (III): $\omega_3 \cdot \left[J_2 D + \frac{1}{\frac{1}{B_2}} + \frac{1}{\frac{1}{B_3}} + \frac{1}{\frac{1}{K_2} D}\right] - \omega_2 \frac{1}{\frac{1}{B_3}} = 0 \Rightarrow$

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