PAIE 3380 – Exercício Aula 15/09/2020

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1)

$$\frac{W_1}{W_2} = n \quad (EQ.3)$$

$$\begin{cases} J_1 \dot{W}_1 + B_1 W_1 + T_1 = T_m & (Eq\ 1) \\ J_2 \dot{W}_2 + B_2 W_2 + T_c = T_2 & (Eq.2) \end{cases}$$

• Sendo: $n = 1$ e $P_1 = P_2$, temos:

$$T_1 W_1 = T_2 W_2 \Rightarrow T_2 = \frac{T_1 W_1}{W_2} = T_1 \cdot n$$

Eq 2

$$\Rightarrow J_2 \dot{W}_2 + B_2 W_2 + T_c = T_1 \cdot n$$

Eq.1

$$\Longrightarrow J_2 \dot{W}_2 + B_2 W_2 + T_c = (T_m - J_1 \dot{W}_1 + B_1 W_1) \cdot n$$

Eq.3

$$\Longrightarrow J_2 \dot{W}_2 + B_2 W_2 + T_c = (T_m - J_1 \dot{W}_2 n - B_1 W_2 n)\, n \Rightarrow$$

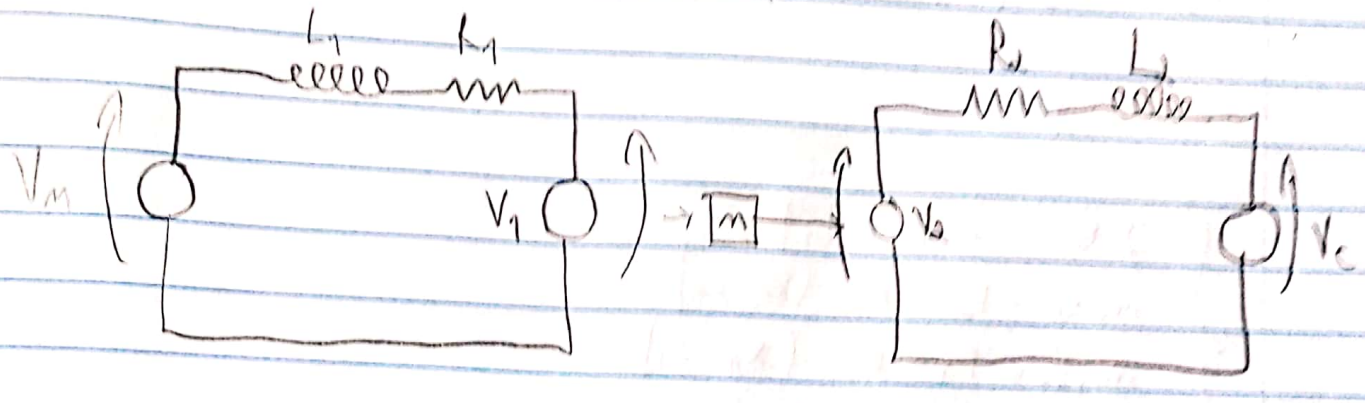
$$\Rightarrow T_m \cdot n = \dot{W}_2 \cdot \underbrace{(J_2 + J_1 n^2)}_{J_{EQ}} + W_2 \underbrace{(B_2 + B_1 n^2)}_{B_{EQ}} + T_c$$

$$J_{EQ} = J_2 + J_1 n^2 \quad ; \quad B_{EQ} = B_2 + B_1 \cdot n^2$$

$$J_{EQ} \cdot \dot{W}_2 + B_{EQ} \cdot W_2 + T_c = T_m \cdot n$$

2) Analogia:

→ Circuito Elétrico:

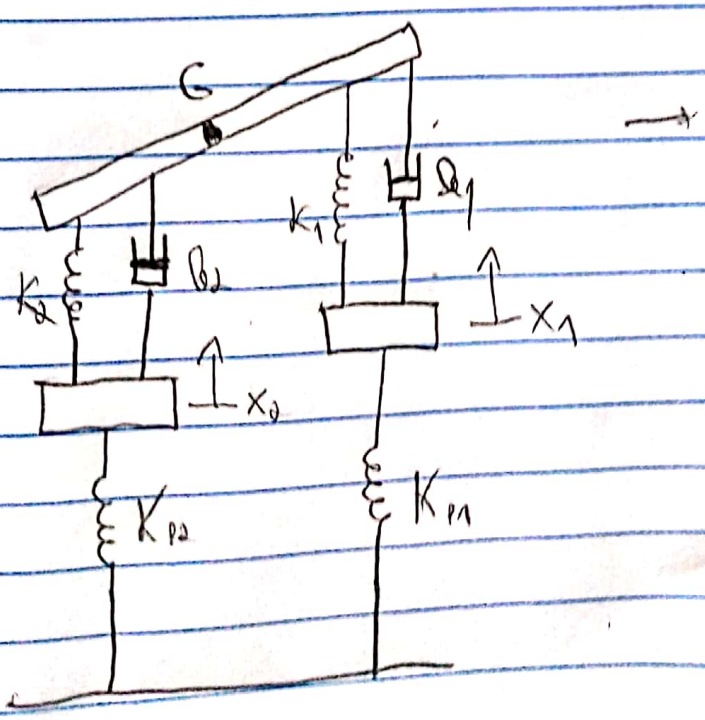


$$V_m - L_2 Di - R_1 i - V_1 = 0$$

$$V_2 - R_2 i - L_2 Di - V_c = 0$$

$$\begin{cases} T_m - J_1 \dot{w}_1 - B_1 w_1 - T_1 = 0 \\ T_2 - B_2 w_2 - J_2 \dot{w}_2 - T_c = 0 \end{cases} \Rightarrow \begin{cases} J_1 \dot{w}_1 + B_1 w_1 + T_1 = T_m \\ J_2 \dot{w}_2 + B_2 w_2 + T_c = T_2 \end{cases}$$

3-)



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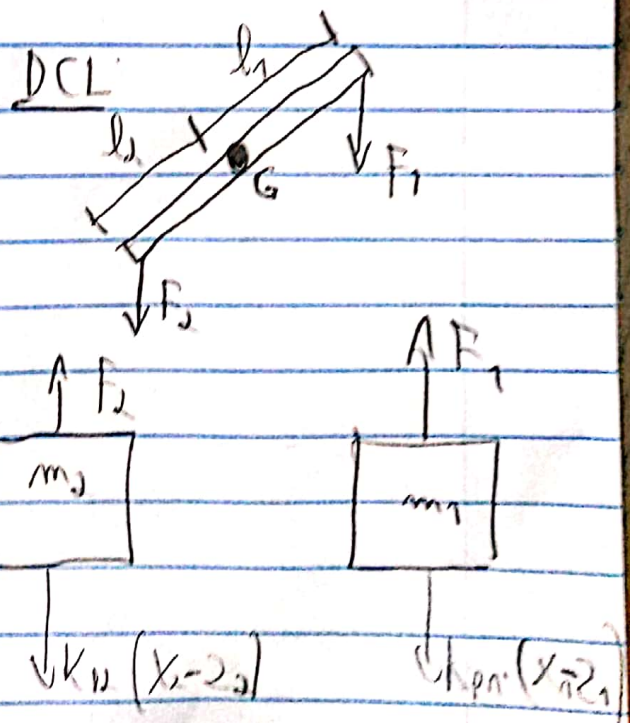

$$F_1 = k_1 (x_G + \theta l_1 - x_1) + b_1 (\dot{x}_G + \dot{\theta} l_1 - \dot{x}_1)$$

$$F_2 = k_2 (x_G - \theta l_2 - x_2) + b_2 (\dot{x}_G - \dot{\theta} l_2 - \dot{x}_2)$$

$$\begin{cases} J\ddot{\theta} = l_2 F_2 - l_1 F_1 \\ m_2 \ddot{x}_2 = F_2 - k_{p2} (x_2 - z_2) \\ m_1 \ddot{x}_1 = F_1 - k_{p1} \cdot (x_1 - z_1) \\ m_G \ddot{x}_G = -(F_1 + F_2) \end{cases}$$