ITALO PAIVA - 10893370 - Aula 15/09.

(1)

$\frac{\omega_1}{\omega_2} = \frac{r_2}{r_1} = n$; $\frac{T_1}{r_1} = \frac{T_2}{r_2}$ ∴ $T_2 = T_1 n$ (I)

Tomando eixo 1: $J_1 \dot{\omega}_1 = T_m - T_1 - B_1 \omega_1$ (II)

Tomando eixo 2: $J_2 \dot{\omega}_2 + B_2 \omega_2 + T_c = T_2$ (III)

aplicando I em III e reescrevendo II

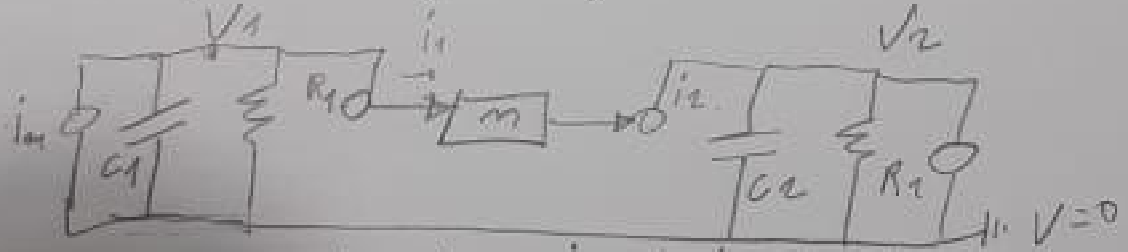
$J_2 \dot{\omega}_2 + B_2 \omega_2 + T_c = T_1 n$ (IV)

$T_1 = T_m - J_1 n \dot{\omega}_2 - B_1 n \omega_2$ (V) ; aplicando V em IV ;

$J_2 \dot{\omega}_2 + B_2 \omega_2 + T_c = T_m \cdot n - J_1 n^2 \dot{\omega}_2 - B_1 n^2 \omega_2$

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

solução por analogia Tipo 2 ;



$V_1 (C_1 D + \frac{1}{R_1}) = i_m - i_1$

$V_2 (C_2 D + \frac{1}{R_1}) = i_2 - i_c$

transformadores

$i_2 = n i_1$

$V_2 = V_1 / n$

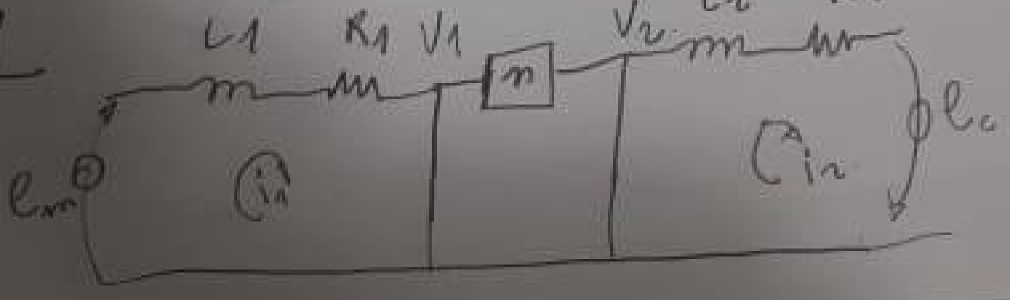
reescrevendo

$$\left. \begin{aligned} J_1 \dot{\omega}_1 + B_1 \omega_1 &= T_m - T_1 \\ J_2 \dot{\omega}_2 + B_2 \omega_2 &= T_2 - T_c \end{aligned} \right\}$$

$T_2 = n T_1$

$\omega_2 = \omega_1 / n$ item B

analogia 1



Lei das malhas em 1:

$L_1 D i_1 + R_1 i_1 = e_m - V_1$

malhas em 2.

$L_2 D i_2 + R i_2 = V_2 - e_c$

Relacionando por analogia

$J_1 \dot{w}_1 + B_1 w_1 = T_m - T_1$

$J_2 \dot{w}_2 + B_2 w_2 = T_2 - T_c$

com $T_2 = n T_1$

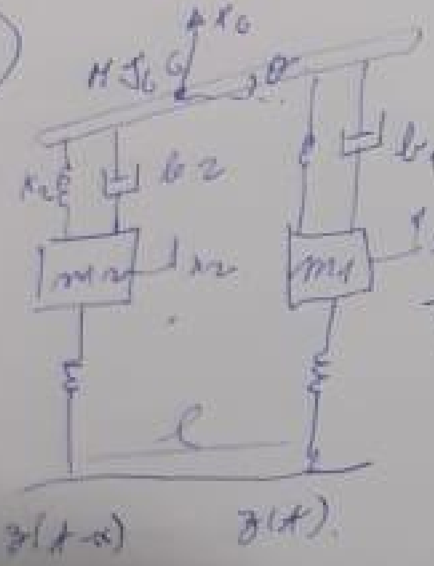
$W_2 = \frac{w_1}{n}$

transformadores

$V_2 = n V_1$

$i_2 = \frac{i_1}{n}$

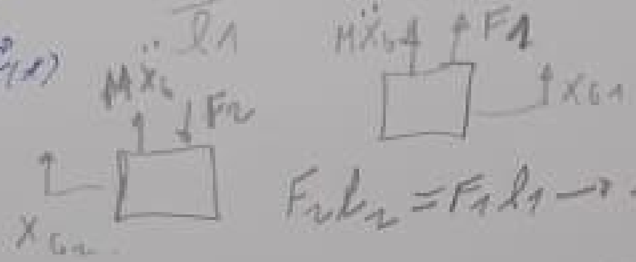
(2)



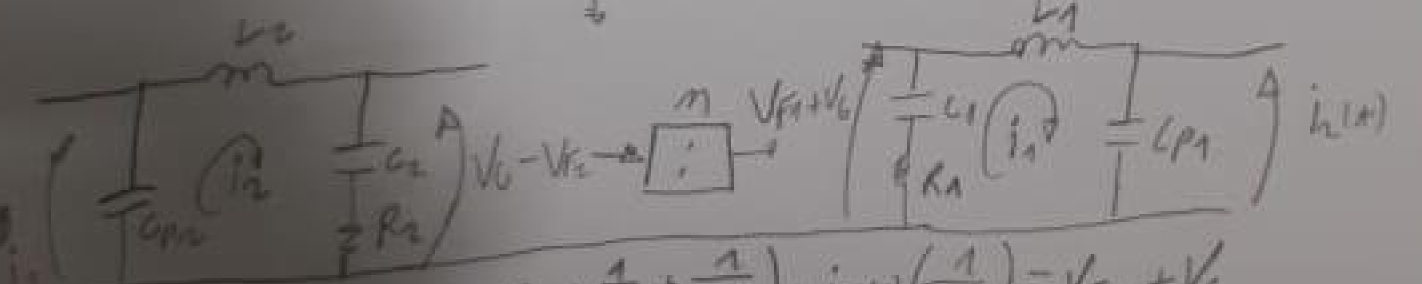
separar os 2 sistemas de 1/4 carro ligados por um transf que introduz o mov de arfagem.

$n = \frac{l_2}{l_1}$

DFCL:



$F_2 l_2 = F_1 l_1 \rightarrow n = F_1/F_2$



malha 1: $i_1 \left(L_1 D + R_1 + \frac{1}{C_1 D} + \frac{1}{C_{P1} D} \right) + i_{z(t)} \left(\frac{1}{C_{P1} D} \right) = V_{F1} + V_G$

malha 2: $i_2 \left(L_2 D + R_2 + \frac{1}{C_2 D} + \frac{1}{C_{P2} D} \right) - i_z(t-\alpha) \left(\frac{1}{C_{P2} D} \right) = V_G - V_{F2}$

fica: $m_1 \ddot{x}_1 + b_1 \dot{x}_1 + K_1 x_1 + K_{P1} x_1 - K_{P1} z(t) = F_1 + M\ddot{X}_G$

$m_2 \ddot{x}_2 + b_2 \dot{x}_2 + K_2 x_2 + K_{P2} x_2 - K_{P2} z(t-\alpha) = -F_2 + M\ddot{X}_G$

(3) $J_1 \dot{w}_1 + B_1 w_1 + T_1 = T_m$

$J_2 \dot{w}_2 + B_2 w_2 + T_L = T_2 = n T_1$.

$J_2 \dot{w}_2 + B_2 w_2 + T_L = n(T_m - J_1 \dot{w}_1 - B_1 w_1)$

$J_2 \dot{w}_2 + B_2 w_2 + T_L = n(T_m - J_1 n \dot{w}_2 - B_1 n w_2)$

$\dot{w}_2 (J_2 + n^2 J_1) + w_2 (B_2 + n^2 B_1) + T_L = n T_m$.

$J_{eq_2} \dot{w}_2 + B_{eq_2} w_2 + T_L = T_m n$

0.009