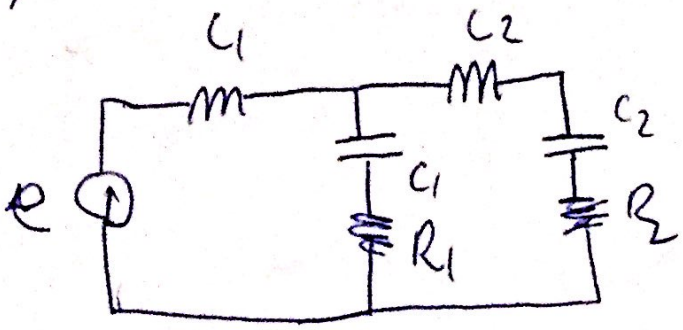
1)



Equações

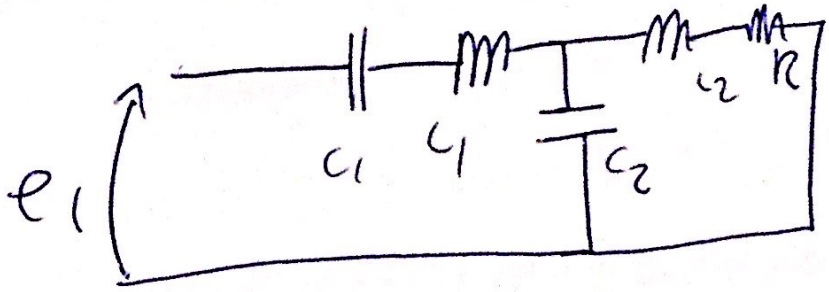
$$L_1 D i_1 + \frac{i_1 - i_2}{C_1 D} + R_1(i_1 - i_2) = e$$

$$L_2 D i_2 + \frac{i_2}{C_2 D} + R_2 i_2 + \frac{i_2 - i_1}{C_1 D} + R_1(i_2 - i_1) = 0$$

$$m_2 \ddot{x} + k_2(x_2 - x_1) + b_2(\dot{x}_2 - \dot{x}_1) = f(t)$$

$$m_1 \ddot{x}_1 + k_1 x_1 + b_1 \dot{x}_1 + k_2(x_1 - x_2) + b_2(\dot{x}_1 - \dot{x}_2) = 0$$

2)



Eqs.:

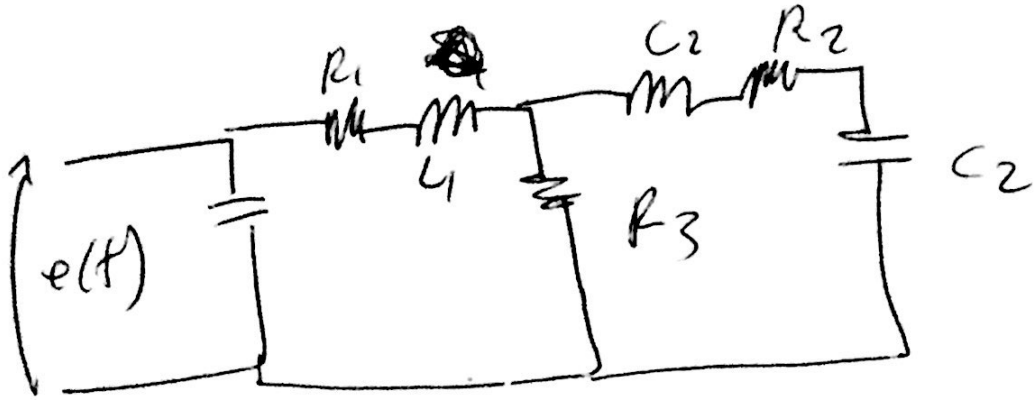
$$L_2 D i_2 + R_2 i_2 + \frac{1}{C_2 D}(i_2 - i_1) = 0;$$

$$L_1 D i_1 + \frac{i_1}{C_1 D} + \frac{1}{C_2 D}(i_1 - i_2) = e_1(t)$$

$$m_2 \ddot{x} + b\dot{x}_2 + k_2(x_2 - x_1) = 0$$

$$m_1 \ddot{x}_1 + k_1 x_1 + k_2(x_1 - x_2) = f_1(t)$$

3)



Equações

$$\frac{1}{C_1 D} \lambda_1 = e(t)$$

$$L_1 D\lambda_2 + R_2\lambda_2 + R_3(\lambda_2 - \lambda_3) + \frac{1}{C_1 D}(\lambda_2 - \lambda_3)$$

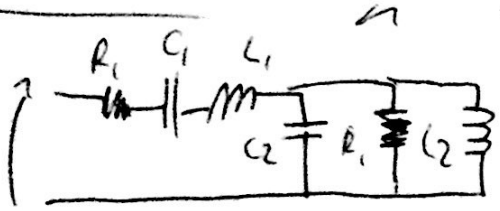
$$L_2 D\lambda_3 + R_2\lambda_3 + \frac{1}{C_2 D}\lambda_3 + (\lambda_3 - \lambda_2) R_3 = 0$$

Logo:

$$T = K_1\theta_1;\ J_1\ddot{\theta} + B_1\dot{\theta}_2 + B_3(\theta_2 - \theta_3) + k_2(\theta_2 - \theta_1) = 0$$

$$J_2\ddot{\theta}_3 + B_2\dot{\theta}_3 + B_3(\theta_3 - \theta_2) + K_2\theta_3 = 0$$

6)



$$L_1 D\lambda_1 + \frac{1}{C_1 D}\lambda_1 + R_1\lambda_1 + \frac{1}{C_2 D}(\lambda_2 - \lambda_3) = e$$

$$L_2 D\lambda_2 + R_2(\lambda_2 - \lambda_3) = 0$$

$$R_2(\lambda_3 - \lambda_2) + \frac{1}{C_2 D}(\lambda_3 - \lambda_1) = 0$$

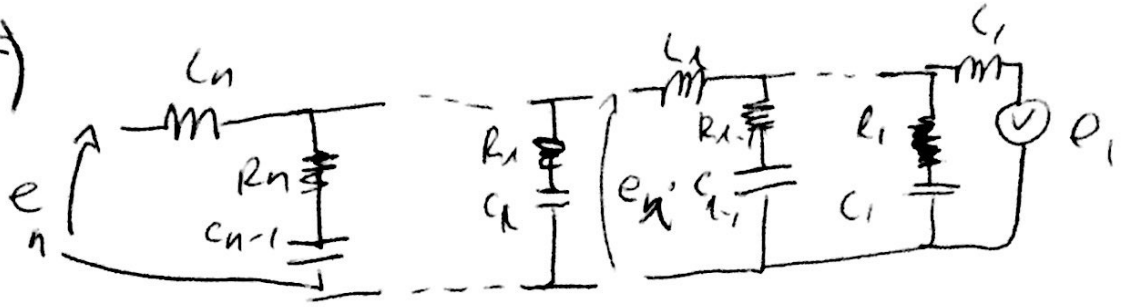
Logo:

$$m_1\ddot{x} + K_1 x_1 + b_1\dot{x}_1 + K_2(x_1 - x_4) = f(t)$$

$$m_2\ddot{x}_2 + b_2(\dot{x}_2 - \dot{x}_3) = 0$$

$$b_2(\dot{x}_3 - \dot{x}_2) + K_2(x_3 - x_1) = 0$$

7)



Para o vagão 1

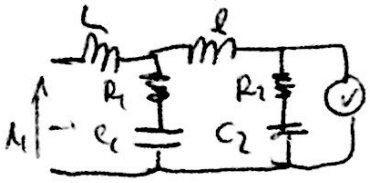
$$m_1\ddot{x}_1 + b_1\dot{x}_1 + k_1x_1 + b_1\dot{x}_2 - k_1x_2 = f(t)$$

Vag. n:

$$m_n\ddot{x}_n + b_{n-1}\dot{x}_n + k_{n-1}x_n - b_{n-1}\dot{x}_{n-1} - k_{n-1}x_{n-1} = f_n(t)$$

Vag i: $m_i\ddot{x}_i + (b_i + b_{i-1})\dot{x}_i + (k_i + k_{i-1})x_i - b_i\dot{x}_{i+1} - k_ix_{i+1} - b_{i-1}\dot{x}_{i-1} - k_{i-1}x_{i-1} = f_i(t)$

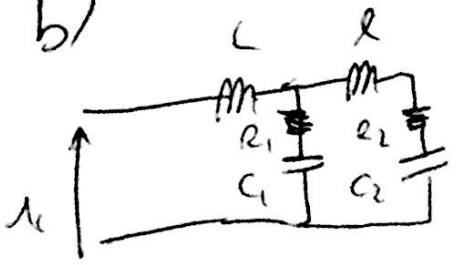
8) a)



$$M\ddot{x}_1 + b_1\dot{x}_1 - b_1\dot{x}_2 - k_2x_2 = 0$$

$$m\ddot{x}_2 + (b_1 + b_2)\dot{x}_2 + x_2(k_1 + k_2) - b_1\dot{x}_1 - k_1x_1 = b_2\dot{w}(t) + k_2w(t)$$

b)



$$m\ddot{x}_1 + b_1\dot{x}_1 + k_1x_1 - \dot{x}_2b_1 - k_2x_2 = 0$$

$$m\ddot{x}_2 + (b_1 + b_2)\dot{x}_2 + (k_1 + k_2)x_2 + b_1\dot{x}_2 - k_1\dot{x}_1 = w(t)$$