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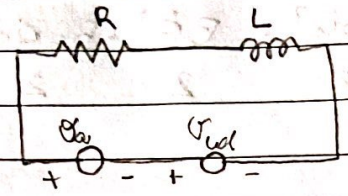
Exercício da aula 10/09/2020

1)



$$L = T - V = \frac{M\dot{x}^2}{2} - \frac{1}{2L}\lambda^2$$

$$R = \frac{1}{2R}\dot{\lambda}^2 + \frac{b\dot{x}^2}{2}$$

$\lambda \Rightarrow x$	$\frac{1}{L} \Rightarrow K$	$\frac{1}{R} \Rightarrow b$	$C \Rightarrow m$

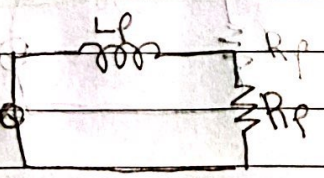
$$\rightarrow x: \frac{\partial L}{2\dot{x}} = M\dot{x} \Rightarrow \frac{d}{dt}\left(\frac{\partial L}{\partial \dot{x}}\right) = M\ddot{x} \quad , \frac{\partial L}{\partial x} = 0 \quad ; \frac{\partial R}{\partial \dot{x}} = b\dot{x}$$

$$\rightarrow \lambda: \frac{\partial L}{\partial \dot{\lambda}} = 0 \quad ; \frac{\partial L}{\partial \lambda} = -\frac{\lambda}{L} \quad , \frac{\partial R}{\partial \dot{\lambda}} = \frac{1}{R}\dot{\lambda}$$

$$\boxed{q = CV = C\dot{\lambda}} \qquad \boxed{\dot{q} = i = C\ddot{\lambda}}$$

$$\boxed{M\ddot{x} + b\dot{x} = F = \ell B i \quad e \quad \lambda/L + \dot{\lambda}/R = V_a/R + V_b/LD}$$

2) Eletroíma:



$$L = T - V = \frac{J\dot{\theta}^2}{2} + \frac{L_p\dot{q}^2}{2}$$

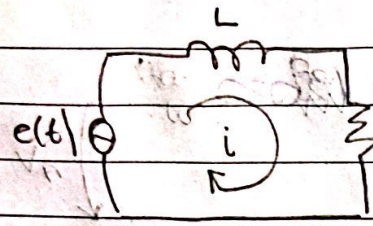
$$R = \frac{R_p^2\dot{q}^2}{2} + \frac{B\dot{\theta}^2}{2}$$

$$\rightarrow \theta: J\ddot{\theta} + B\dot{\theta} = T = K\dot{q}$$

$$\rightarrow q: L_p\ddot{q} + R_p\dot{q} = V_p \quad ; \text{Se } L_p = 0: \quad \dot{q} = V_p/R_p$$

$$\boxed{J\ddot{\theta} + B\dot{\theta} = K \cdot V_p/R_p}$$

• Imã constante:



$$L = T - V = \frac{Jw^2}{2} + \frac{Lai_a^2}{2} = \frac{J\dot{\theta}^2}{2} + \frac{La\dot{q}_a^2}{2}$$

$$R = \frac{Bw^2}{2} + \frac{Roi_a^2}{2} = \frac{B\dot{\theta}^2}{2} + \frac{Ra\dot{q}_a^2}{2}$$

$$e(t) = (LD + R)i$$

$\rightarrow \theta$: $J\ddot{\theta} + B\dot{\theta} = K\dot{q}_a$

$\rightarrow q_a$: $La\ddot{q}_a + Ra\dot{q}_a = e_a(t) - K_b(t).\dot{\theta}(t)$

Se $La = 0$: $\dot{q}_a = \frac{e_a - K_b\dot{\theta}}{Ra}$

$$J\ddot{\theta} + \left(B + \frac{Kb}{Ra}.K\right).\dot{\theta} = K\frac{e_a(t)}{Ra} \quad \div J$$

$$\boxed{\ddot{\theta} + \left(\frac{BRa + KbK}{JRa}\right).\dot{\theta} = \frac{Kea}{JRa}}$$