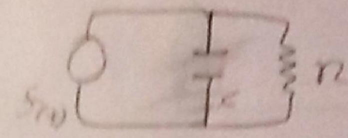
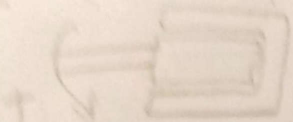
Ex 1:

$S_{(t)} = lB_i \implies$

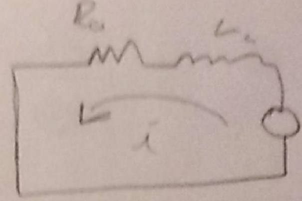


$S_{(t)} = \left(\frac{M}{R} + CD\right)V \implies M\ddot{x} + b\dot{x} = lBi$

Ex 2:



$\implies$



$\left(L_a D + R_a\right) i = e(t) \implies (JD + B)_w = T = K_i$

tal que: $J\ddot{\theta} + B\dot{\theta} = K_i$

$V = 0$

$T = \frac{J\dot{\theta}^2}{2} + \frac{\dot{q_a}^2 L_a}{2}$ $\qquad L = T - V$

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

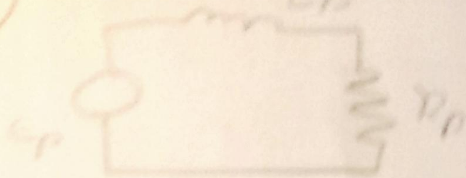
θ: $\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial \dot{\theta}}\right) = J\ddot{\theta}$; $\frac{\partial L}{\partial \theta} = 0$; $\frac{\partial R}{\partial \dot{\theta}} = B\dot{\theta}$

$\hookrightarrow \theta$: $J\ddot{\theta} + B\dot{\theta} - K\dot{q_a} = 0$

q_a: $\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial \dot{q_a}}\right) = L_a\ddot{q_a}$; $\frac{\partial L}{\partial q_a} = 0$; $\frac{\partial R}{\partial \dot{q_a}} = R\dot{q_a}$

$\hookrightarrow q_a$: $L_a\ddot{q_a} + R\dot{q_a} - e_a(t) - K_b(t)\cdot\dot{\theta}(t)$

b)



$V = 0$

$T = \frac{J\dot{\theta}^2}{2} + \frac{L_p \dot{\varphi}_p^2}{2}$

$\mathcal{R} = \frac{B\dot{\theta}^2}{2} + \frac{R_p \dot{\varphi}_p^2}{2}$

θ:

$\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{\theta}}\right) = J\ddot{\theta}$; $\frac{\partial L}{\partial \theta} = 0$; $\frac{\partial \mathcal{R}}{\partial \dot{\theta}} = B\dot{\theta}$

$\hookrightarrow \theta : J\ddot{\theta} + B\dot{\theta} = K\dot{\varphi}_p(t)$

$\Downarrow$

$J\ddot{\theta} + B\dot{\theta} - K\dot{\varphi}_p(t) = 0$

$\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{\varphi}_p}\right) = L_p \ddot{\varphi}_p$ $\quad \frac{\partial L}{\partial \varphi_p} = 0$ $\quad \frac{\partial \mathcal{R}}{\partial \dot{\varphi}_p} = R_p \dot{\varphi}_p$

$\hookrightarrow L_p \ddot{\varphi}_p + R_p \dot{\varphi}_p = e_p$

$\dot{\varphi}_p(L_p + R_p) - e_p = 0$