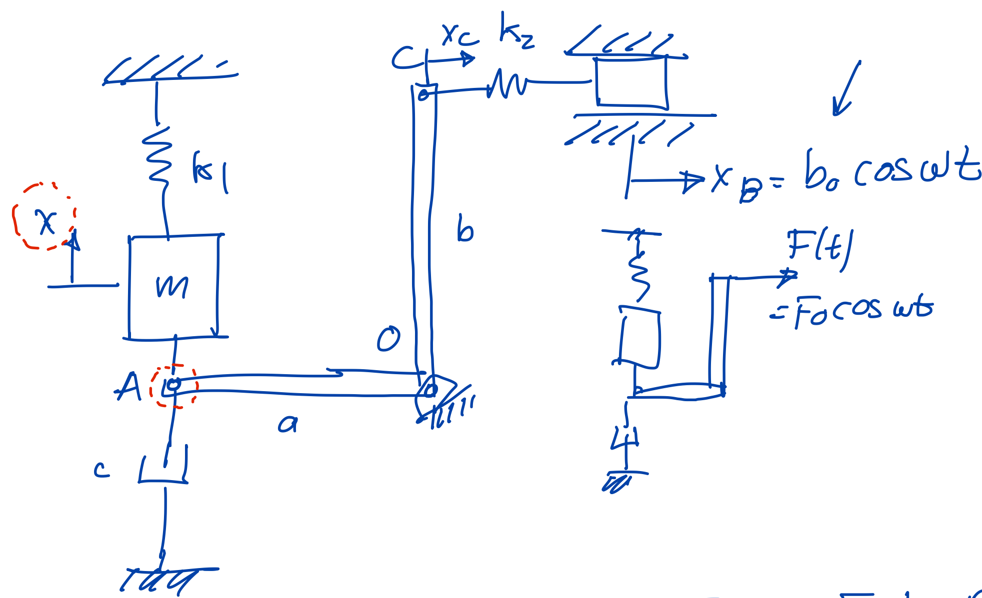
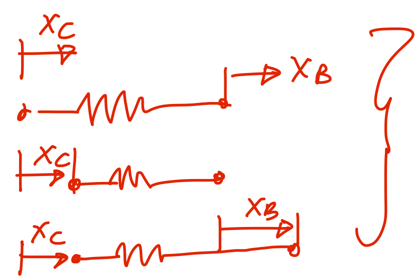
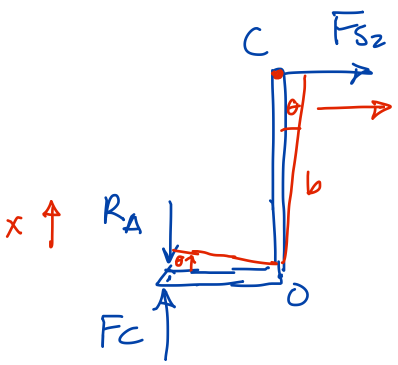
UBC-DYN-18-052



$F_S = -kx$

$= -k(x_C - x_B)$





$\Sigma M_O: -F_C a - F_{S_2} b + R_A a = 0$ ($I=0$, since $m=0$)

$F_C = -c\dot{x}$

$F_{S_2} = -k_2(x_C - x_B)$

$\dot{x} = \dot{\theta} a$

$x = \theta a$

$\theta = \dfrac{x}{a}$

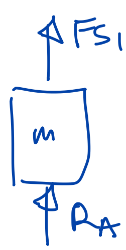
$x_C = \theta b$

$= \dfrac{x}{a} \cdot b$

$\Rightarrow$

$$a c \dot{x} + k_2\left(\frac{x}{a}\cdot b - x_B\right) b + R_A \cdot a = 0$$

$$\Rightarrow R_A = \frac{-1}{a}\left(a c \dot{x} + k_2\left(x \cdot \frac{b}{a} - x_B\right) b\right)$$



$\Sigma F_x: R_A + F_{S_1} = m\ddot{x}$

$$-\frac{1}{a}\left(a c \dot{x} + k_2\left(x \cdot \frac{b}{a} - x_B\right) b\right) - k_1 x = m\ddot{x}$$

$$-c\dot{x} - \frac{k_2}{a}\left(x \cdot \frac{b}{a}\right) b + \frac{k_2}{a} x_B b - k_1 x = m\ddot{x}$$

$$m\ddot{x} + c\dot{x} + \left(k_1 x + \frac{k_2}{a} \cdot \frac{b^2}{a} x\right) = k_2 \cdot \frac{b}{a} x_B$$

$$m\ddot{x} + c\dot{x} + \frac{k_1 a^2 + k_2 b^2}{a^2} x = k_2 \frac{b}{a} \cdot x_B$$