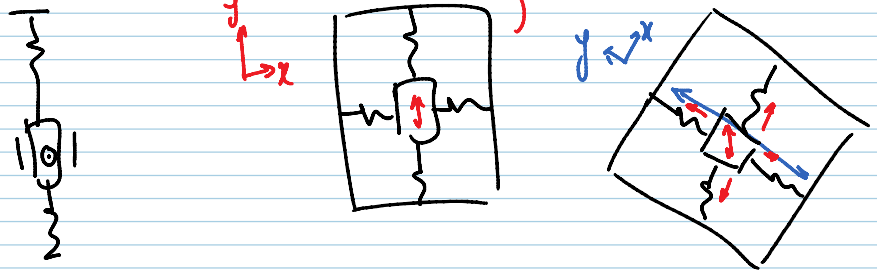
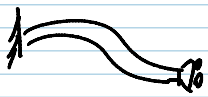
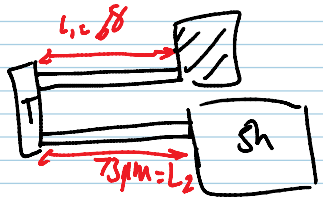
Dis 11, Mon Nov 26

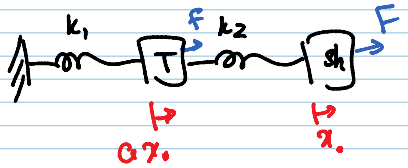
Monday, November 26, 2012
4:11 PM



$$M_{eff} = \int_0^L (\ )^2 dx$$







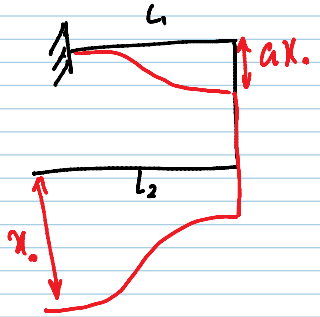
$$K = k_1 \| k_2$$

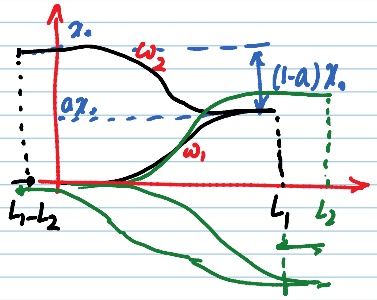
$$\alpha = \frac{k_2}{k_1 + k_2}$$

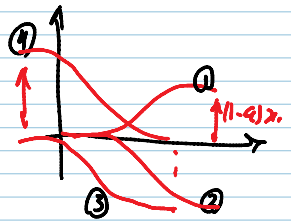
$$\left(\frac{1}{2}\right)^2 M_T$$

$$\alpha^2 M_T$$

$$F = x_0 (k_1 \| k_2) = \alpha x_0 k_1 \rightarrow \alpha = \frac{k_2}{k_1 + k_2}$$







$$w(x) = \delta \left[3\left(\frac{x}{L}\right)^2 - 2\left(\frac{x}{L}\right)^3\right]$$

$$w_1(x) = a x_0 \left[3\left(x/L_1\right)^2 - 2\left(x/L_1\right)^3 \right] \leftarrow \frac{x}{L_1} = t$$

$$w_2(x) = x_0 - (1-a)x_0 \left[3\left(\frac{x-(L_1-L_2)}{L_2}\right)^2 - 2\left(\frac{x-(L_1-L_2)}{L_2}\right)^3 \right]$$

" $\frac{x-(L_1-L_2)}{L_2} = z$ "

$$m_{eff,L_1} = \frac{\int_0^L w_1^2(x)\,dx/L}{x_0^2} m_1 = \frac{\int_0^1 \left(a x_0 (3t^2 - 2t^3)\right)^2 dt}{x_0^2} (m_1) = \left[a^2 \frac{13}{35}\right] m_1$$

$$m_{eff,L_2} = \frac{\int_{L_1-L_2}^{L_1} w_2^2(x)\,dx/L}{x_0^2} m_2 = \frac{\int_0^1 \left[x_0 - (1-a)x_0 \left(3z^2 - 2z^3\right)\right]^2 dz}{x_0^2} (m_2) = \left[a + \frac{13}{35}(1-a)^2\right] m_2$$

$$m_{eff,L_1} = \left[a^2 \frac{13}{35}\right] m_1$$

$$m_{eff,L_2} = \left[a + \frac{13}{35}(1-a)^2\right] m_2 \qquad a = \frac{k_2}{k_1 + k_2}$$

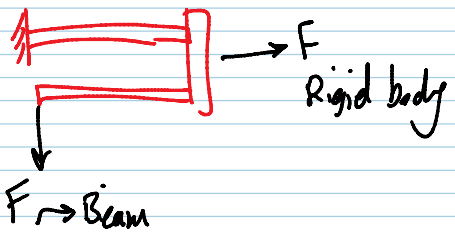
$$m_{eff,Truss} = a^2 m_T$$

If $k_1 = k_2$, $a = \frac{1}{2}$ and $m_{eff,L_1} = \frac{13}{140} m_1$

$$m_{eff,L_2} = \frac{53}{140} m_2$$

$$m_{eff,T} = \frac{1}{4} m_T$$

as we derived before.



all the fingers 41 μm long

overlap 35 μm

overlap 35 μm

$k_e = \frac{1}{2} V_p^2 \frac{d^2 C}{dx^2}$

Part 3 $V_{tune} = V_{tune}$ $V_p = 0$

Part 4 $\begin{cases} V_{tune} = 100\,V \\ V_{mos} = 20\,V \end{cases}$ $k_e = \frac{1}{2}(60-20)^2 \frac{d^2 C}{dx^2}$

effective mass ↓ m_x, k_x ← effective spring

m_y, k_y

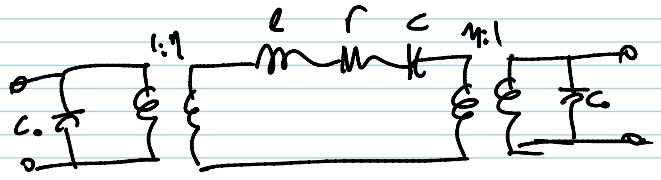
after Electrical Stiffness

$C_{eq,x} = \frac{m_x \omega_{0x}}{\omega_x} = \frac{1}{k_x \omega_x \omega_x}$ $k_x = k_m - k_e$

$C_{eq,y} =$

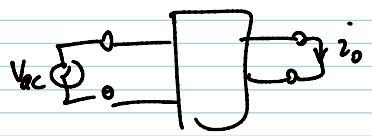
$\eta_x = V_p \frac{dC}{dx}$

$\eta_y = V_p \frac{dC}{dy}$



$L_x = m_x$ $C_x = \frac{1}{k_x}$ ← $k_x = k_m - k_e$

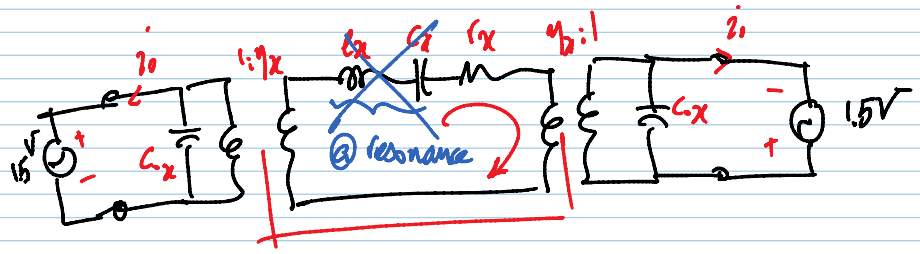
$r_x = C_{eq,x}$



SP analysis

S21 S12

Part 7)



eg. mass in sense mode

$$F = 2 * \dot{x}_d * m_s * \Omega$$

velocity drive mode