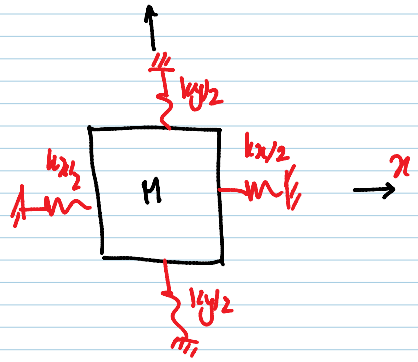
Dis 10, Mon Nov 19

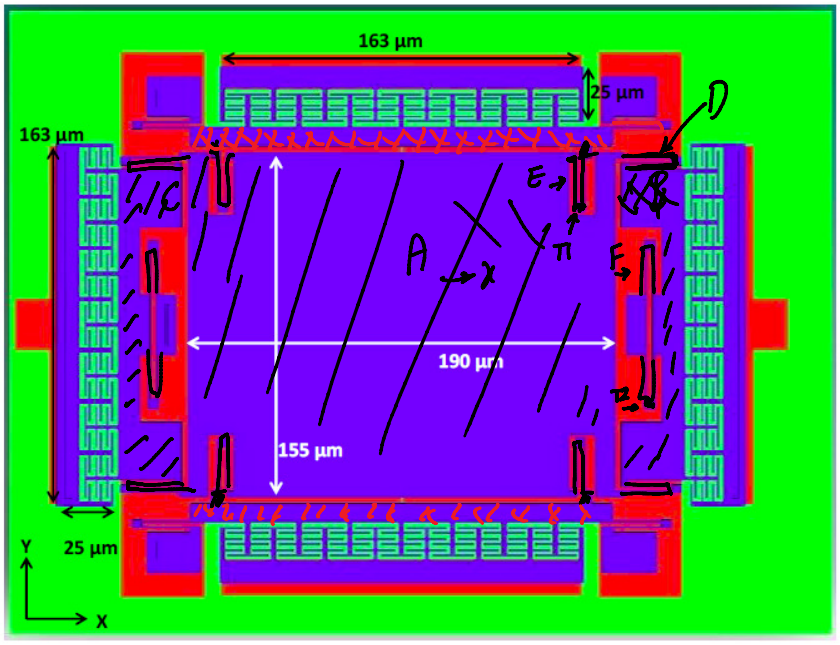
Monday, November 19, 2012
4:10 PM

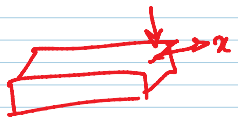


$\rightarrow k_x =$

$\rightarrow k_y =$

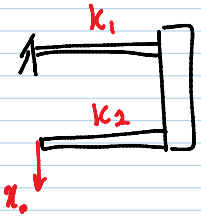
$\begin{cases} m_x = \\ m_y = \end{cases}$



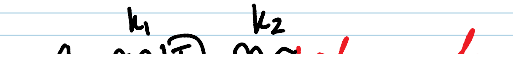


includes fingers

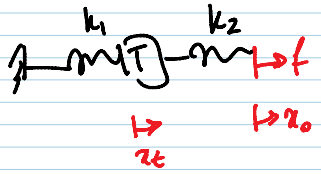
$m_x = m_A + m_B + m_C + \frac{1}{4} m_D + m_E + m_F + \left(m_{T1} + m_{T2}\right)\left(\frac{1}{2}\right)^2 + m_{eff,beam}$



$x_t - \frac{1}{2} x_0 = \frac{k_2}{k_1 + k_2} x_0$

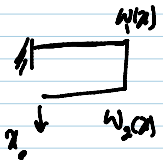


x_0



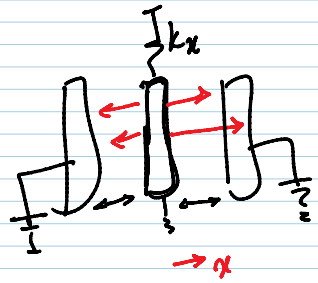
$F = x_0 (k_1 \| k_2) = x_t k_1$

$\frac{1}{2} x_0^2 \omega_0^2 m_{eff} = \frac{1}{2} \int$

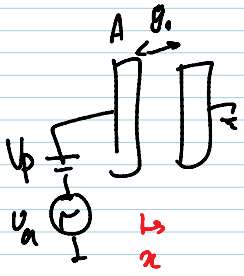


$m_{eff} = m_{str} \int \left[w(z/L) \right]^2 d(z/L)$

$\omega_{n,x} = \sqrt{\frac{k_x}{m_x}} =$



$F = \frac{1}{2} V^2 \frac{dc}{dx}$



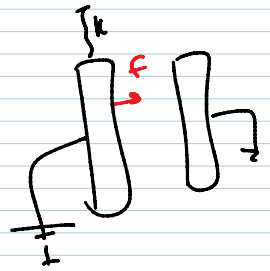
$C = \frac{\epsilon A}{g_0 - x} \qquad \frac{dc}{dx} = \frac{\epsilon A}{(g_0 - x)^2}$

$F = \frac{1}{2} (V_p + V_a)^2 \frac{\epsilon A}{(g_0 - x)^2} \rightarrow \frac{1}{g_0^2} (1 - x/g_0)^{-2}$

$$F = \frac{1}{2}\left(V_p^2 + 2V_p v_a + v_a^2\right)\frac{\epsilon A}{g_0^2}\left(1 + \frac{2x}{g_0} - \cdots\right)$$

$$F = \frac{1}{2}V_p^2\frac{\epsilon A}{g_0^2} + v_a V_p \frac{\epsilon A}{g_0^2} + \frac{1}{2}V_p^2\frac{\epsilon A}{g_0^3}2x + 2V_p v_a \frac{\epsilon A}{g_0^3}x$$

DC force — AC-term — Electrical stiffness



$g_0' = g_0 - \delta$

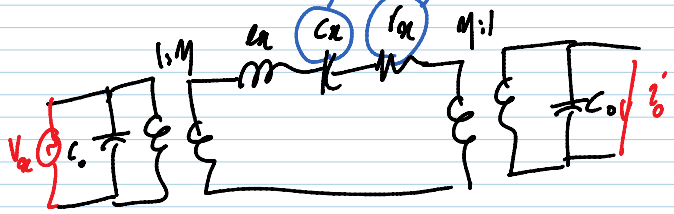
$\omega_n = \sqrt{\frac{k_x}{m_x}}$ $\omega_n' = \sqrt{\frac{k_x - k_{es}}{m_x}}$

changing with voltage

$m_x \rightarrow l_x$

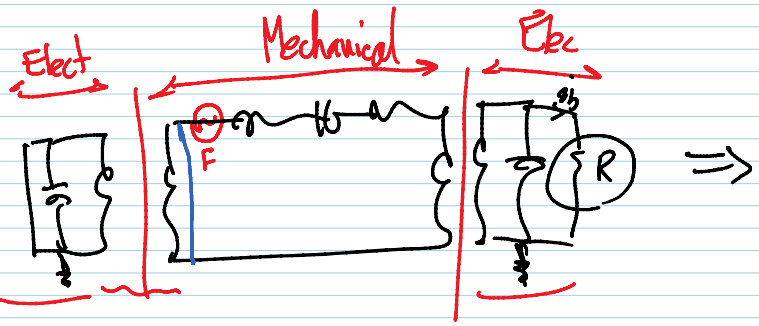
$k_x - k_{es} \rightarrow \frac{1}{C_x}$

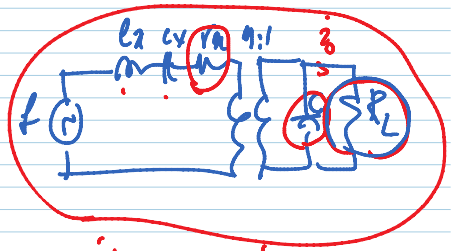
$C_{eq} \rightarrow r_x$



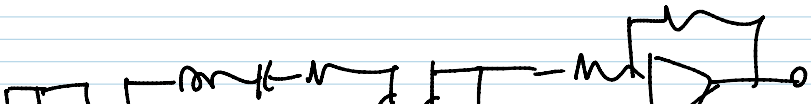
$$\frac{i_0}{v_{in}} = \text{---}$$

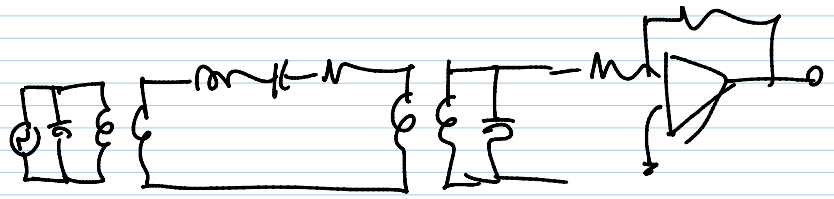
$$C_{eq} = \frac{m_x \omega_n}{Q}$$





$$\frac{i_0}{I_{in}}\bigg|_{\omega=0} = \frac{1}{\frac{r_x}{M^2} + R_L}$$





$$\frac{i_n^2}{\Delta f} = \left(\frac{1}{\frac{C_{gs}}{g_m}\omega R_L}\right)^2 S_{i_n}(\omega)$$

$$= \frac{1}{1-\left(\frac{\omega}{\omega_n}\right)^2 + \frac{j\omega}{Q\omega_n}}$$