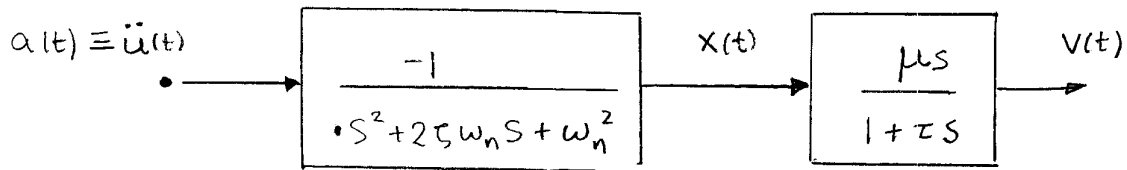
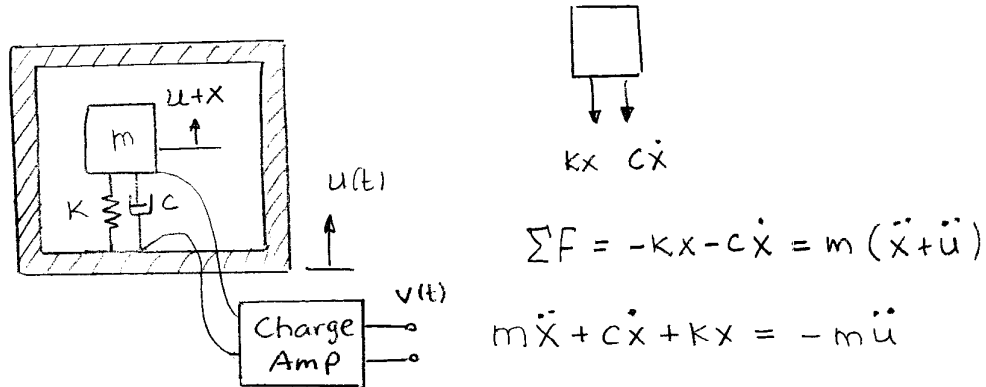
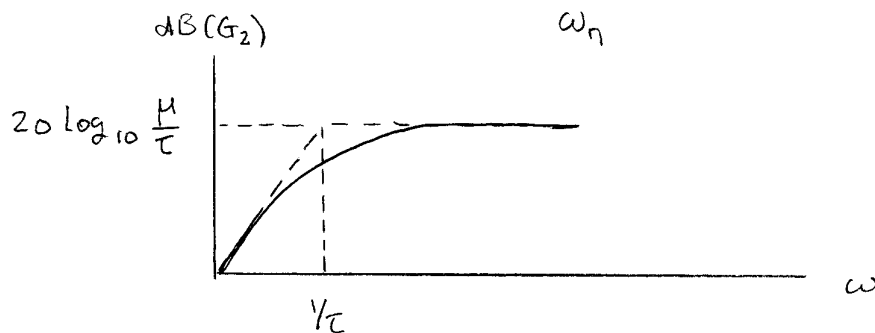
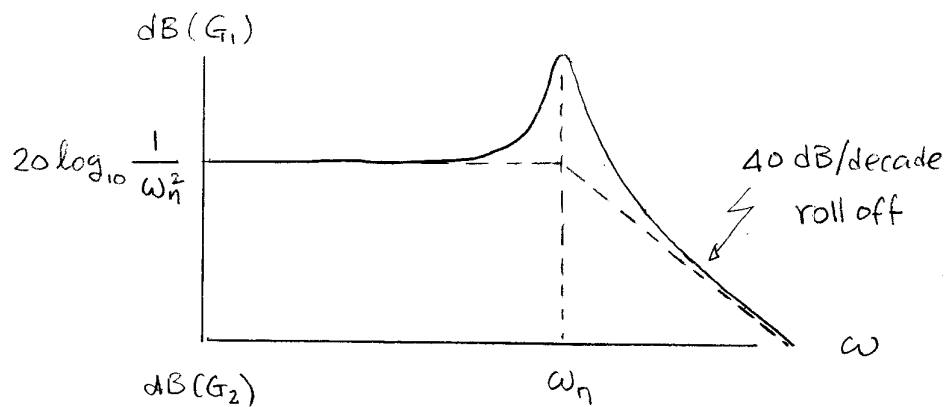


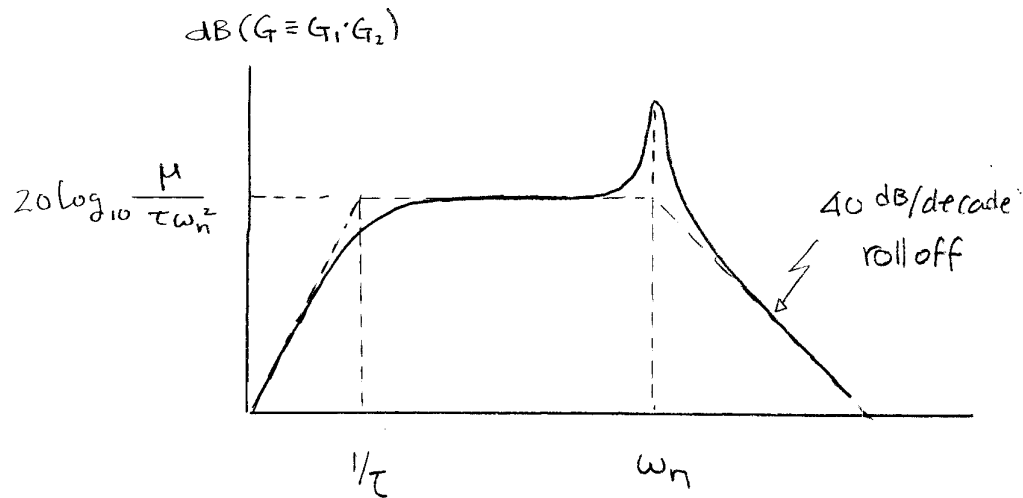
Piezoelectric Accelerometer



(a) Bode Plot (Magnitude)

$$G_1(\omega) \equiv \frac{-1}{(\omega_n^2 - \omega^2) + j(2\zeta\omega_n\omega)}, \quad G_2(\omega) = \frac{j\mu\omega}{1 + j\omega\tau}$$





(b) Bandwidth is from 10 Hz to 10,000 Hz

choose $\frac{1}{\tau} \ll 10 \text{ Hz} = 20\pi \Rightarrow \tau \gg \frac{1}{20\pi} = 0.0159 \text{ sec}$

choose $\omega_n \gg 10,000 \text{ Hz} = 20,000\pi = 62,832 \text{ rad/s}$

(c) If $\tau = 0.01$, $\omega_n = 10^5 \text{ rad/s}$

Sensitivity = $20 \log_{10} \frac{\mu}{\tau \omega_n^2} = -60 \text{ dB}$

$$20 \log_{10} \frac{\mu}{(0.01)(10^5)^2} = -60$$

$$\frac{\mu}{10^8} = \frac{1}{10^3} \Rightarrow \mu = 10^5$$