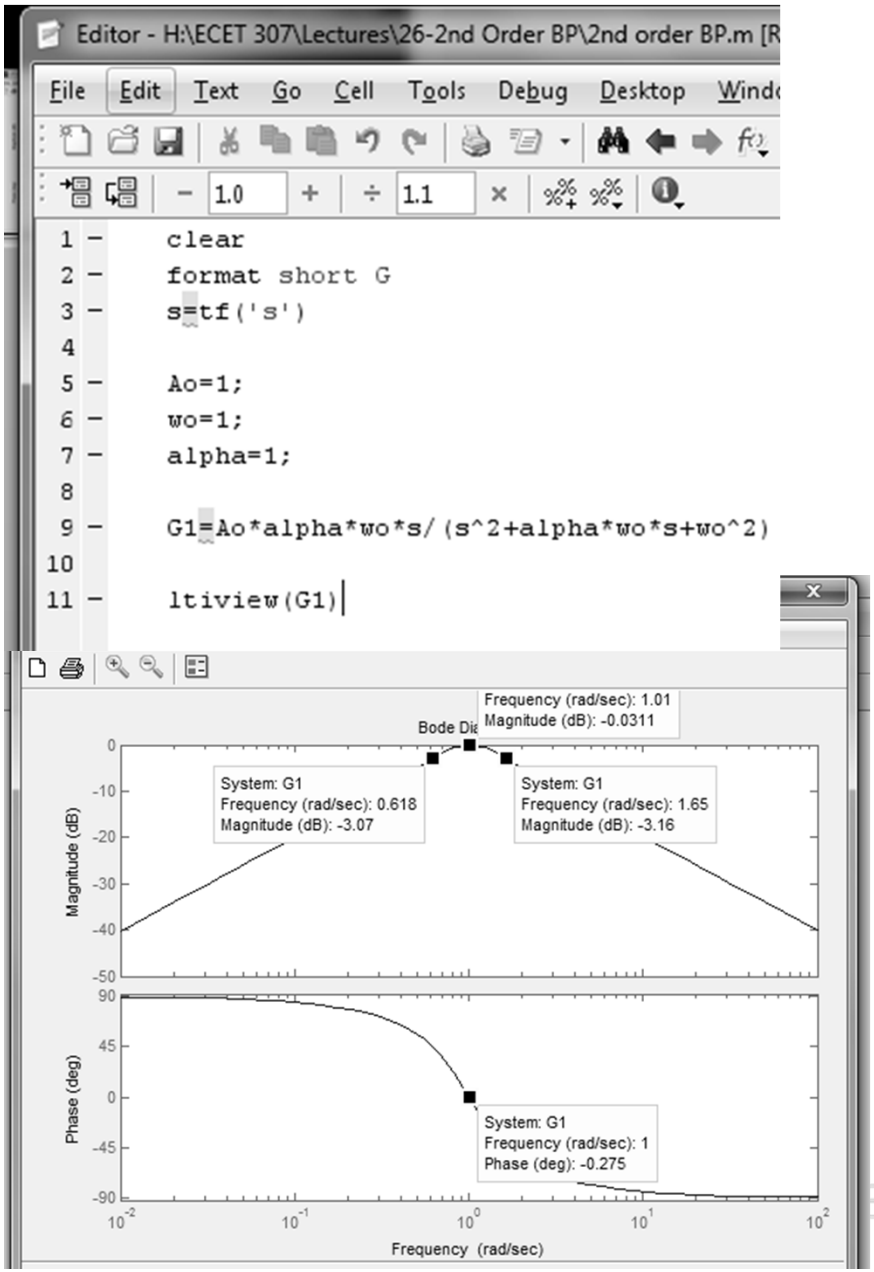
Second Order Bandpass Filters

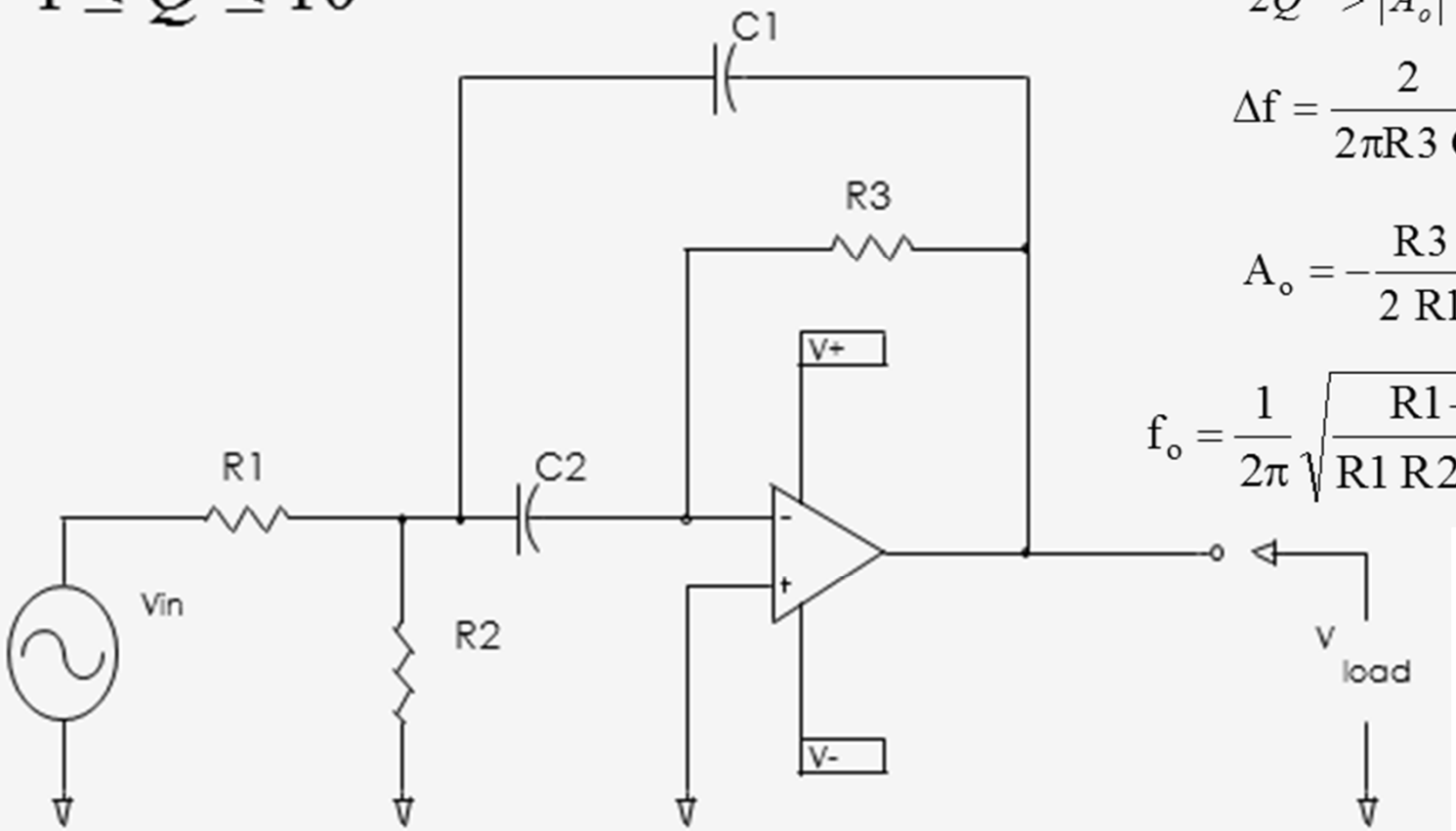


- $G = \dfrac{A_o \alpha \omega_o s}{s^2 + \alpha \omega_o s + {\omega_o}^2}$
- A_o
- f_o magnitude phase
- f_{high} f_{low} Δf
- $f_o =$ _____
- $Q =$ _____
- $\alpha =$ _____

Second Order Bandpass Multi-feedback

$$G = \frac{A_o \alpha \omega_o s}{s^2 + \alpha \omega_o s + {\omega_o}^2}$$

$$1 \le Q \le 10$$



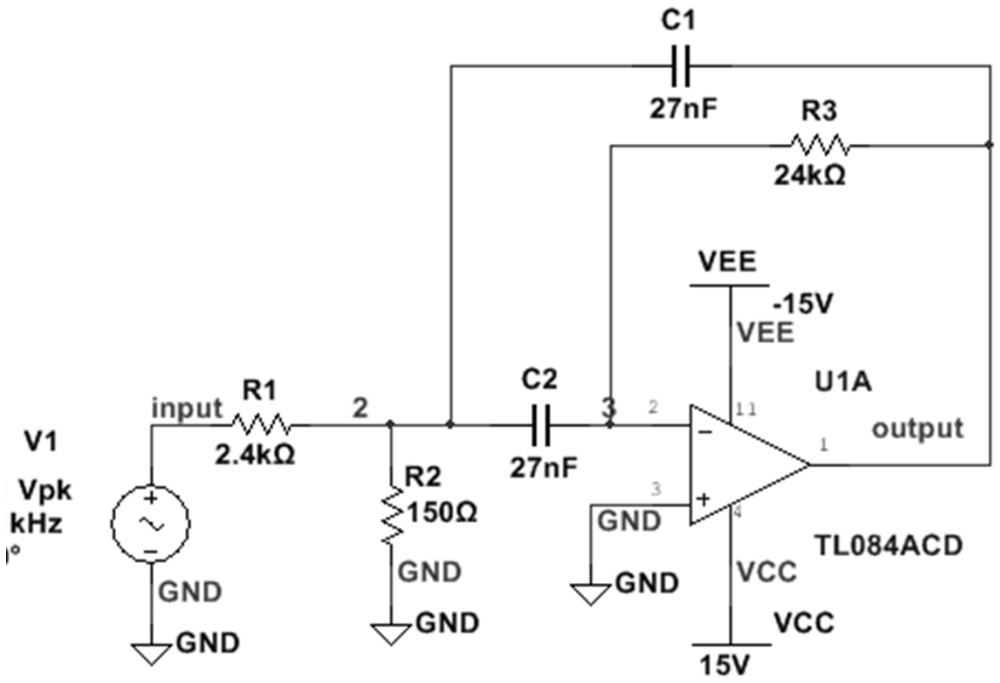
$$2Q^2 > |A_o|$$

$$\Delta f = \frac{2}{2\pi R3\ C}$$

$$A_o = -\frac{R3}{2\ R1}$$

$$f_o = \frac{1}{2\pi}\sqrt{\frac{R1 + R2}{R1\ R2\ R3\ C^2}}$$

Analysis Example



$$G = \frac{A_o \alpha \omega_o s}{s^2 + \alpha \omega_o s + {\omega_o}^2}$$

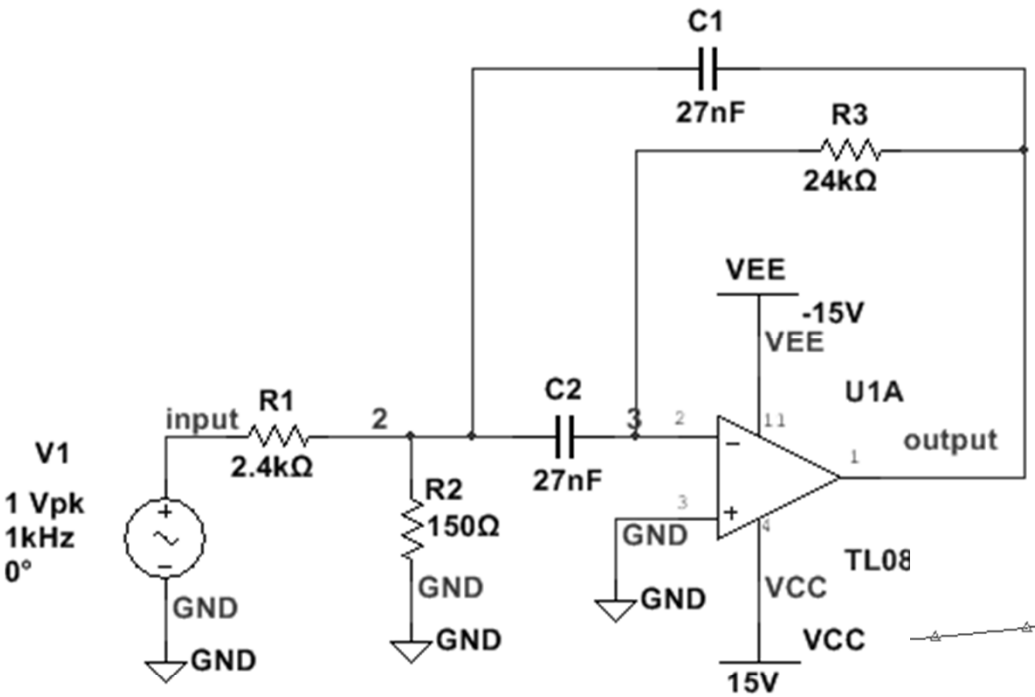
$$A_o =$$

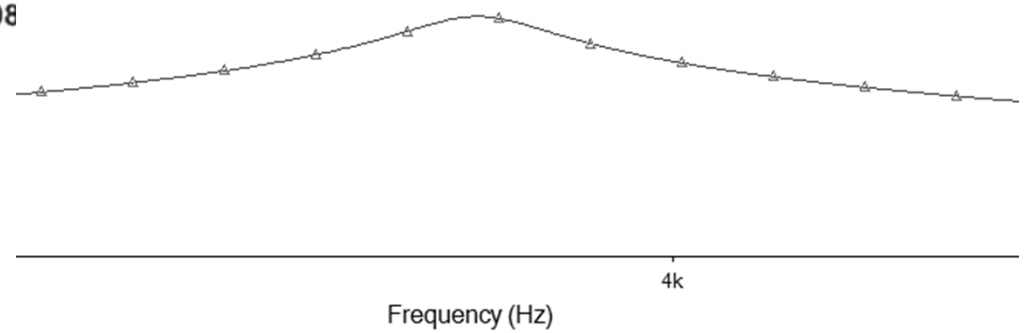
$$\omega_o =$$

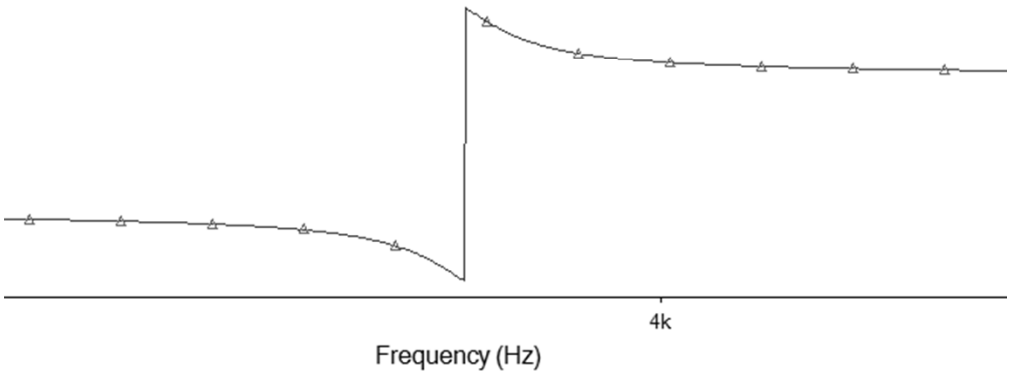
$$Q =$$

$$\alpha =$$

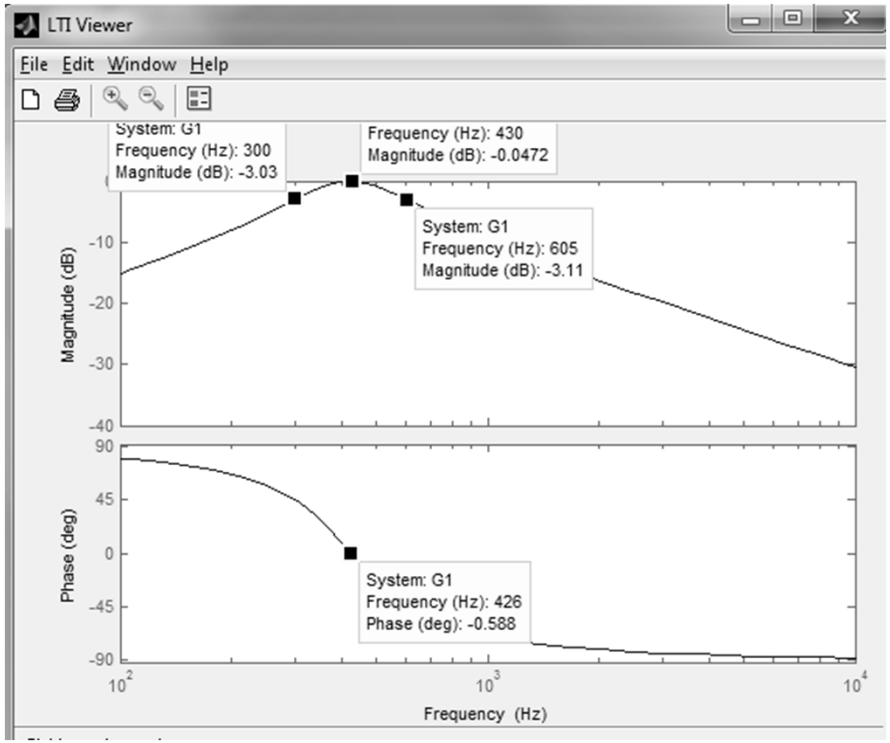
Analysis Example







Design Example - MATLAB Check



- $G = \dfrac{A_o \alpha \omega_o s}{s^2 + \alpha \omega_o s + {\omega_o}^2}$

f_{high} = 600 Hz

f_{low} = 300 Hz

A_o = 0dB = 1

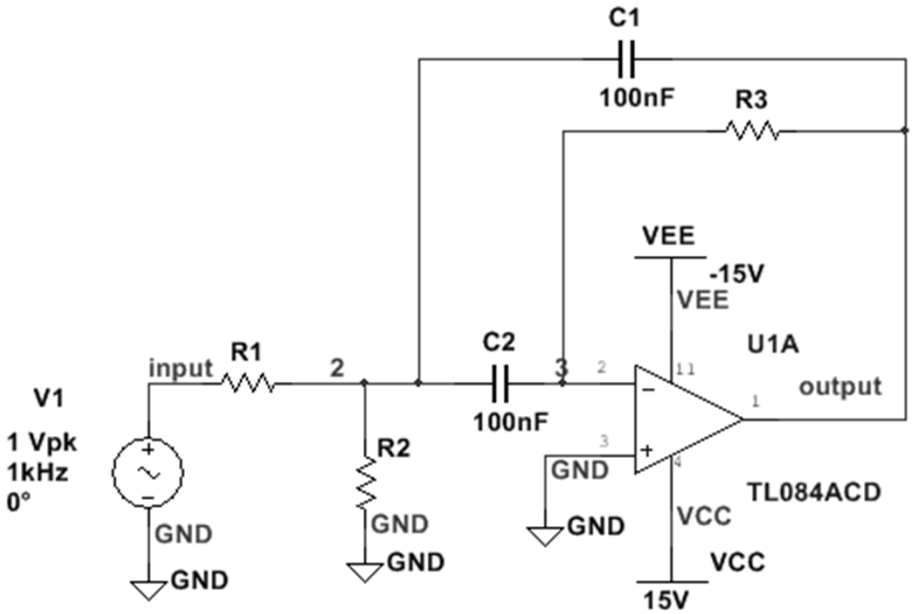
fo =_____

ω_o = _____

Q = _____

α = _____

Design Example



$\Delta f =$

$f_o =$

$A_o =$

$$\Delta f = \frac{2}{2\pi R_3 C}$$

Pick C = _____ (low audio)

$$R3 = \frac{2}{2\pi \Delta f C}$$

$$A_o = -\frac{R_3}{2R_1}$$

$R_1 =$

After some algebra

$$R_2 = \frac{R_1}{4\pi^2 R_1 R_3 f_o^2 C^2 - 1} =$$