

ECE 317
Summer 2005
Lab Assignment #5

Active Filter Design

- 1) Design an active first order low-pass filter to meet the following specifications:
 - Half-power cutoff frequency of 30 kHz
 - Input impedance $Z_i \geq 22 \text{ k}\Omega$
 - DC gain of ± 3
 - A) Show how you designed the filter. Include the circuit schematic with all component values.
 - B) Use PSpice to verify your design by plotting the magnitude response (in dB) and phase response (in degrees) of the filter.
 - C) Find the magnitude response (in linear scale) and phase response (in degrees) at $f = 20 \text{ kHz}$.

- 2) Design an active third order Butterworth filter to meet the following specifications:
 - Pass the frequency band $0 \leq f \leq 6 \text{ kHz}$
 - Passband attenuation must not exceed 0.5 dB
 - Use only 22 nF capacitors
 - A) Determine an appropriate cutoff frequency. Explain how you found it.
 - B) Show how you designed the filter. Include the circuit schematic with all component values.
 - C) Use PSpice to verify your design by plotting the magnitude response (in dB) of the filter.

- 3) It is required to design a Butterworth low-pass filter to meet the following specifications:
 - $\alpha_p = 0.6 \text{ dB}$, $\alpha_s = 24 \text{ dB}$, $f_p = 15 \text{ kHz}$, and $f_s = 32 \text{ kHz}$
 - Use only 4.7 nF capacitors
 - A) Determine an appropriate order and cutoff frequency. Explain how you found them.
 - B) Show how you designed the filter. Include the circuit schematic with all component values.
 - C) Use PSpice to verify your design by plotting the magnitude response (in dB) of the filter.