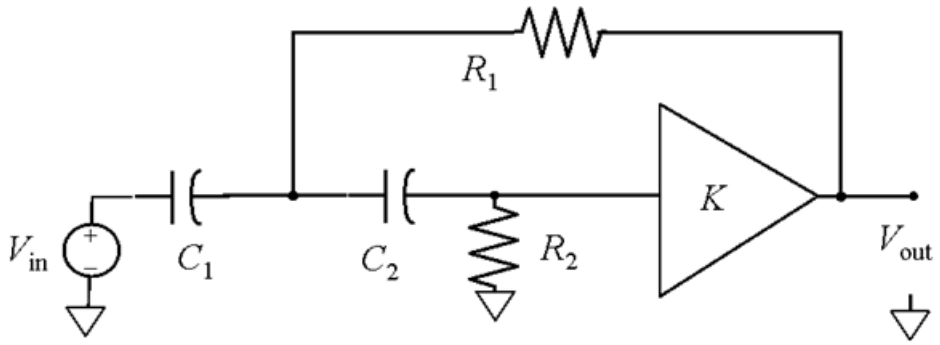
Signals and Systems ECE 202
Assignment 12

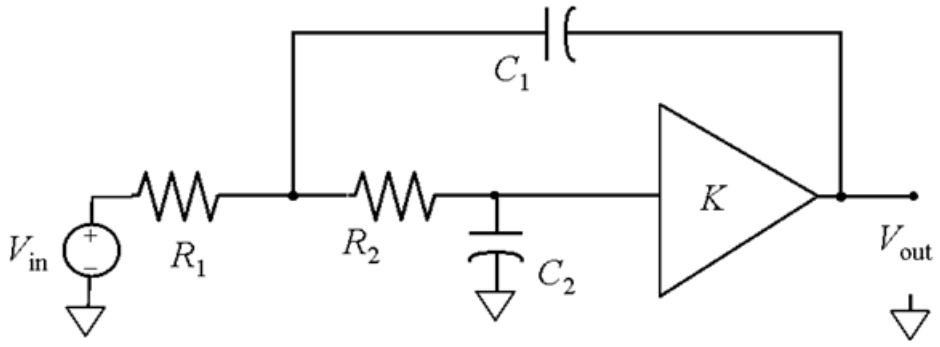
Document and submit your analytic results. Also generate and publish a MATLAB document, where appropriate, for the following exercises. Submit your MATLAB html folder and original MATLAB code (m files).

1. Find the transfer functions $H(f) = V_{\text{out}}(f)/V_{\text{in}}(f)$ of these active filters and identify them as lowpass, highpass, bandpass, or bandstop.

(a)



(b)



2. Using MATLAB, find the transfer function of an eighth-order lowpass Butterworh filter with corner frequency $\omega_c = 1$ and unity gain at zero frequency. List the b and a coefficients (in MATLAB polynomial order) and plot the magnitude vs frequency. Mark the corner frequency response with dashed lines.

3. Find the transfer functions of these Butterworth filters. List the b and a coefficients (in MATLAB polynomial order) and plot the magnitude vs frequency. Mark the design band edge(s) with dashed lines.

   (a) Second-order highpass with corner frequency of 20 kHz and a passband gain of 5.

   (b) Fourth-order bandstop with center frequency of 10 MHz, a -3 dB bandwidth of 50 kHz and a passband gain of 1.

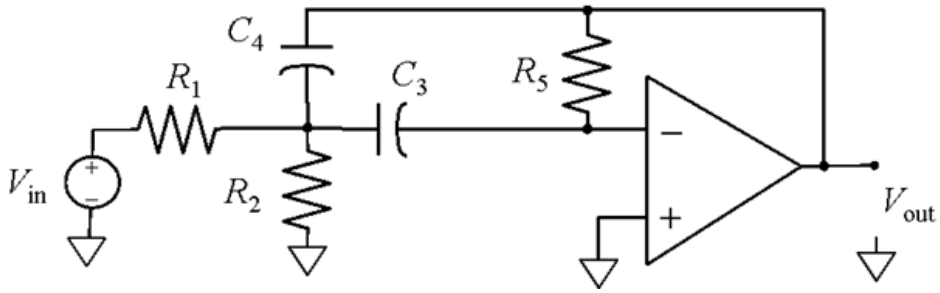
4. Find the db (power) level corresponding to a passband magnitude response of 0.995. Find the db level corresponding to a stopband magnitude response of 0.005.

5. Design a fourth-order Chebyshev II bandpass filter with center frequency of 1336 Hz, bandwidth of 20 Hz, and stopband ripple of -60 dB. Plot the dB frequency response vs frequency. Superimpose dotted lines showing the passband edges and stopband limits.

6. Repeat the previous design, relaxing the bandwidth to 100 Hz. Determine whether this resulted in an improved filter (sharper edges).

7. Find the transfer functions $H(f) = V_{\text{out}}(f)/V_{\text{in}}(f)$ of these active filters and identify them as lowpass, highpass, bandpass, or bandstop.

(a)



(b)