Assignment (due Dec. 3)  

Project #3

1. Work through Example 15 on pages 91–95 of PSpice for Basic Circuit Analysis by Tront. Specifically:

   (a) Solve for the frequency response of the circuit in Fig. 88 assuming the voltage across $C_2$ is the output of the circuit. In MATLAB, plot the frequency response for frequency $f$ from 0 Hz to 1 kHz (note the units of frequency).

   (b) Draw the circuit of Fig. 88 in OrCAD Capture.

   (c) Run a frequency-analysis PSpice simulation (AC sweep) for $1 \text{ Hz} \leq f \leq 1 \text{ kHz}$. Note: PSpice is incapable of AC analysis for a frequency of 0, so we start the AC sweep at 1 Hz.

   (d) Produce output in the form of Fig. 90 showing the plot of the $C_2$ voltage for $1 \text{ Hz} \leq f \leq 1 \text{ kHz}$. Note: we use a source voltage of $1 \angle 0^\circ$, so the output voltage is equal to the frequency response.

   You are required to turn in your manual calculations of the frequency response, your MATLAB plot, and a printout of the result of step (d).

2. Consider the bandpass-filter circuit below.

   (a) Find the frequency response “by hand.” From this frequency response, find the center frequency, $f_0$, and bandwidth, $B$, both in Hz.

   (b) In MATLAB, plot the frequency response from (a) for $0 \leq f \leq 2 \text{ Hz}$.

   (c) Find the frequency response using OrCAD Capture plus PSpice simulation for $0.001 \text{ Hz} \leq f \leq 2 \text{ Hz}. \text{ Hint: Use the “E” PSpice device with a gain of } 10^6 \text{ as described on page 54 to model the ideal opamps. Be sure to see the polarity of the gain appropriate for the polarity of the opamp terminals.}

   You are required to turn in your manual calculations, your MATLAB plot, and a printout of the frequency response for $0.001 \text{ Hz} \leq f \leq 2 \text{ Hz}$ from OrCAD simulation