ELEC ENG 2EI5
Lab 5

Lab 5 explores the amplification behavior of BJTs.

Objectives

1. Explore BJT amplifier circuits.
2. Identify how different circuit components (power supply, capacitors, resistors) affect the amplifier behavior.

Safety

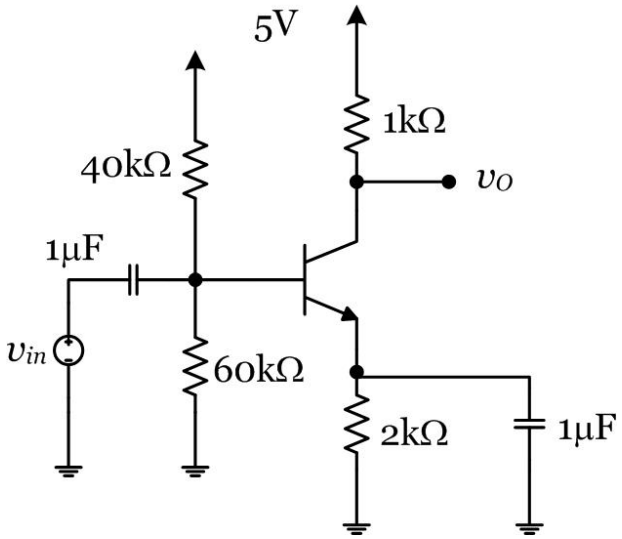
Be sure to check the ratings of any device before using it. Supplying current or applying voltage in excess of device ratings could destroy the device and/or cause minor burns if you touch a device that is "running hot."

Resources

- Under Content->Resources on Avenue you will find the old lab manual used in this course. It contains all the information you need regarding PSpice.

Lab Requirements

Construct the circuit shown here.



Set v_{in} to be a pure ac source with 10 mV <u>peak to peak</u> amplitude at 1 kHz and look at the output signal (v_O). Determine the gain of the circuit defined as $\frac{v_o}{v_{in}}$ (note the notation carefully!).

Explore (both in measurement and simulation) as many of the following questions as you would like (see below for marking):

1. What happens to the shape of the output voltage if the shape of the input voltage changes (sine wave, triangular wave, pulse, etc.)?
2. What is the effect of changing the frequency of the input?
    a. How far can you increase the frequency without seeing distortion at the output for any waveform?
    b. How far can you reduce the frequency without seeing distortion at the output for any waveform?
    c. How do the sizes of the capacitors change these frequency ranges?
3. How does the output change if you change the ac amplitude of the input? How does the output change if you change the DC bias of the input? Can you figure out the relationship between input amplitude, dc bias, and shape of output waveform?
4. How do the answers to the previous questions change if:
    a. You remove one or both capacitors?
    b. You change the values of the resistors?

Report Requirements

You are expected to make one submission per report in the Avenue Dropbox for Lab 1. Your submission has to be a single pdf file containing:

1. A photograph of your hardware setup.
2. Your measurement results
    a. This should include explanation of the specific steps you took in your measurements.
    b. This should include screen capture of graphs that were generated by your measurement software or graphs that you generated manually. **Use your judgment: we only need enough graphs to answer the questions you are supposed to investigate**.
3. Screen capture of your simulations:
    a. This should include circuit schematic, netlist, and simulation results.
4. A brief discussion of any discrepancies between measurement and simulation.
5. A brief discussion of any difficulties encountered in doing the lab and how you did troubleshooting.

I have not specified a particular page limit but you should make your report as brief as you can while meeting the above requirements. Excessive length will be penalized.

Marking

Your report will be marked on:

1. Experimental work
2. Simulation
3. Professional presentation and clarity

Discussion of theory is not required in this report. A detailed rubric will be posted prior to the deadline for submitting the report. The rubric will reflect the following:

1. The minimum requirement to get a mark greater than zero (i.e. Level 2) is to measure and simulate the gain.
2. Level 3 (for each of experimental and simulation) corresponds to good effort in exploring at least one of the four questions suggested.
3. Level 4 (for each of experimental and simulation) corresponds to good effort in exploring at least two of the four questions suggested.

Deadline

This lab is due Wednesday, March 25, 2015 at 5:00 p.m.