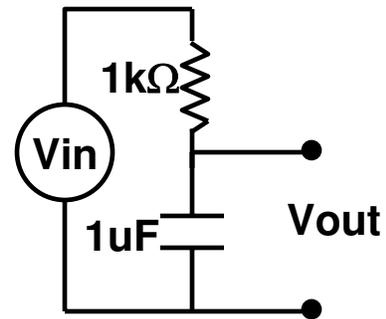


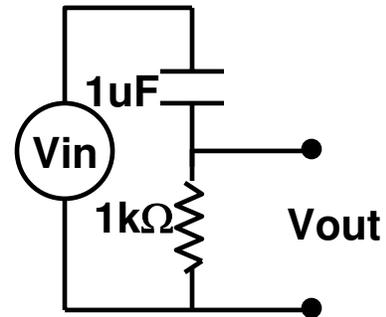
HW3, PHYSICS 127A

Additional Exercises are at end of chapter in Horowitz and Hill (HH) textbook.

1. For the low pass filter drawn on the right, (a) sketch the frequency response $|V_{out}/V_{in}|$, indicating the -3 dB ($1/2$ power) frequency, and (b) sketch the time response for a step-edge voltage pulse that changes from $V=0$ to $V=1$ volt at $t=0$.



2. For the high pass filter drawn on the right, (a) sketch the frequency response $|V_{out}/V_{in}|$, indicating the -3 dB ($1/2$ power) frequency, and (b) sketch the time response for a 1 volt step edge, as defined in problem 1.



3. HH Ad. Ex. Ch. 1, pblm. (6). (RC bandpass filter). Here you chain two separate RC filters, one LP and one HP. Choose a higher resistance of the 2nd filter so as to not load the first filter (see page 50 of the lab book). Design for audio frequency range $f_1 = 20$ Hz and $f_2 = 20$ kHz. Extra Credit: Which design is easier to build: LP then HP, or HP then LP?

4. The “AC-coupling” circuit on the right will be used in the next few weeks for transistors. (a) Is this a high-pass or low-pass filter? (b) What is the frequency response and -3 dB frequency (c) Plot $V_{out}(t)$ for an input $V(t)$ given by a 1 volt (peak to peak) sine wave at 1 Hz and 1 MHz, and a 1 volt step edge as defined in problem 1. (Hint: Besides using the Thevenin equivalent circuit for the resistors, look up the concept of “blocking capacitor” on page 59 of your lab book).

