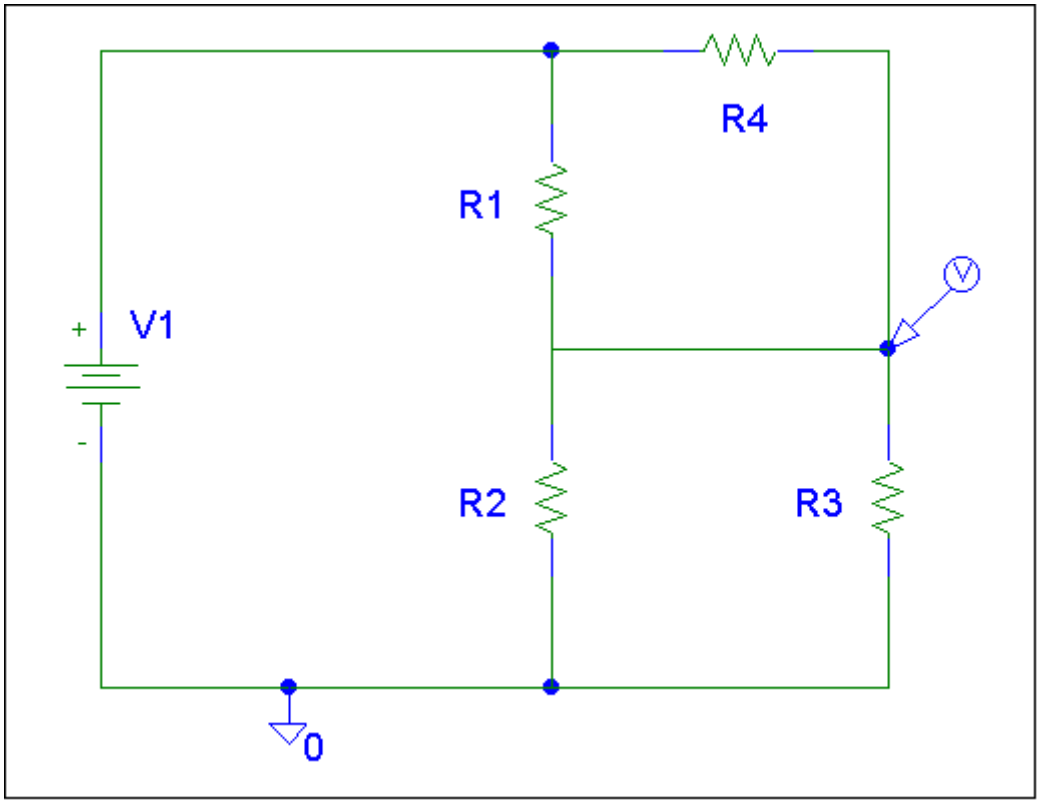
Electronics and Instrumentation

Name _____ ENGR-4220 Fall 1998 Section _____

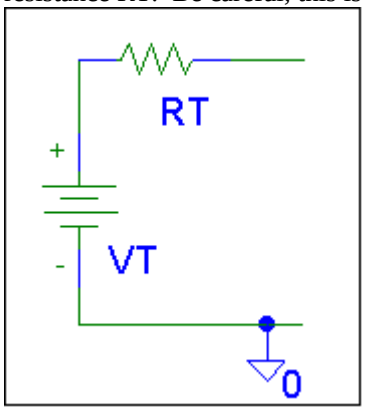
Quiz 1

1. Resistance Combinations



In the circuit above, V1 = 15 volts, R1 = R4 = 1k ohm, R2 = R3 = 2k ohm. Determine the voltage at the point marked with the arrow.

You have just found the Thevenin voltage for this configuration. Now find the Thevenin equivalent resistance RT. Be careful, this is not a bridge circuit, this is a voltage divider.



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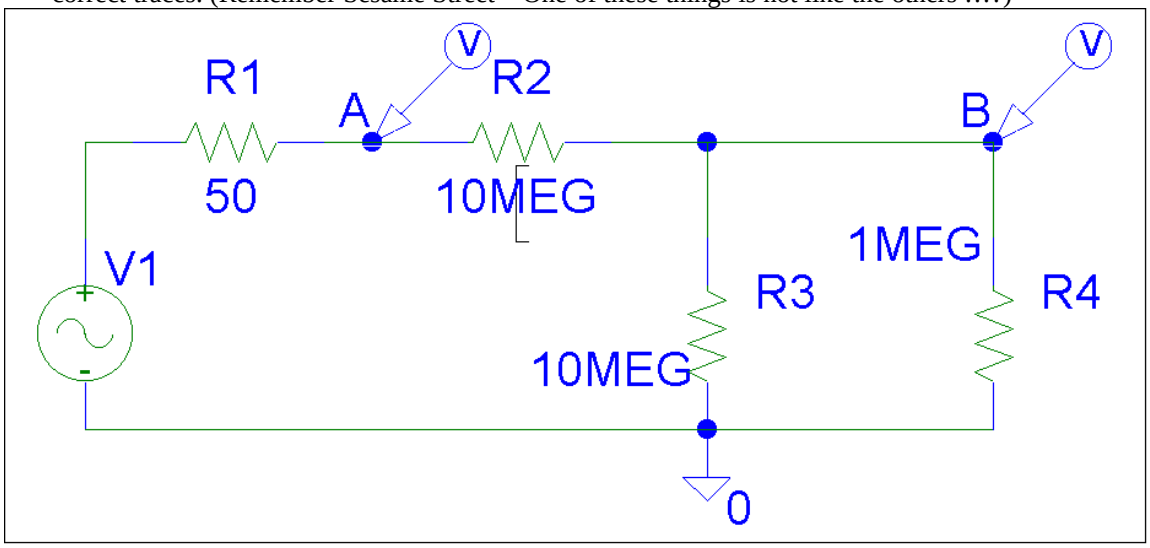
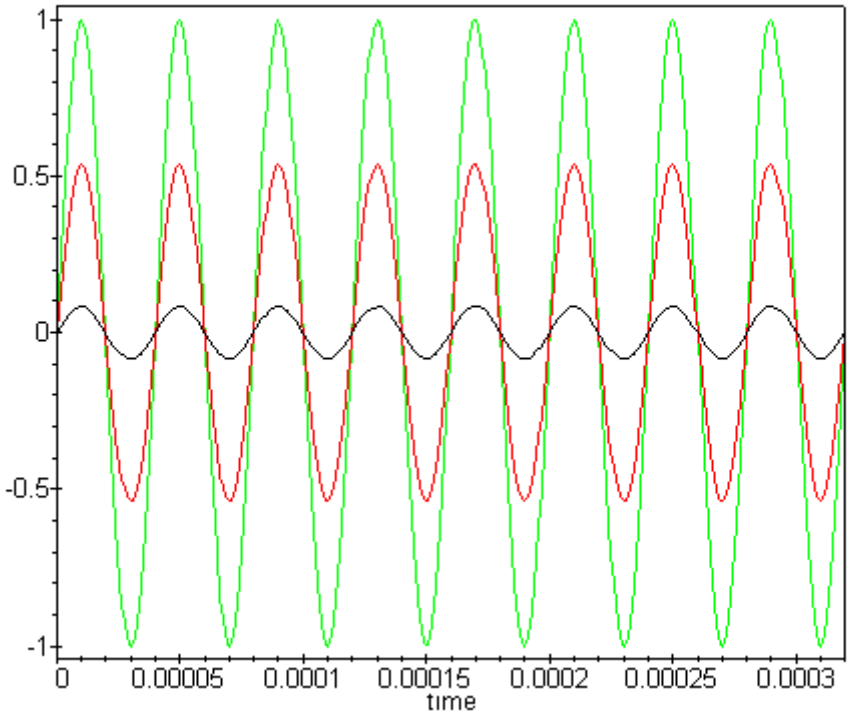
2. Simulation Results

a. For the given circuit, which of the traces on the following Probe-type plot is for the voltage at point A, which is for point B? Three traces are shown. One does not belong. Be sure you choose the two correct traces. (Remember Sesame Street – One of these things is not like the others …?)



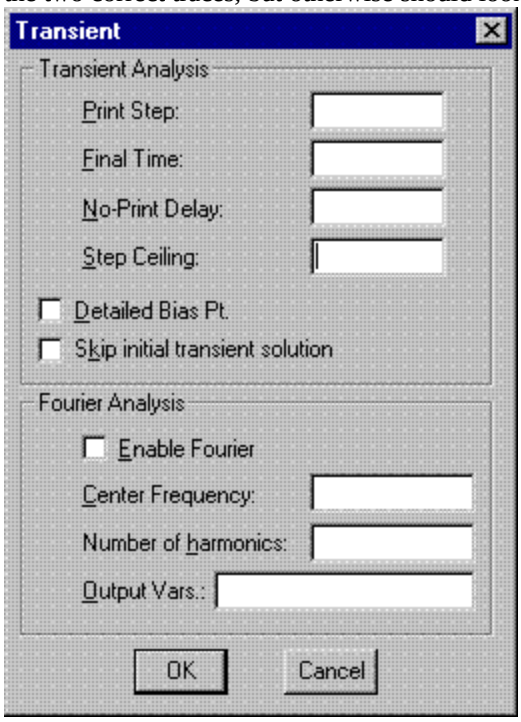


(Note: Maple was used to plot this, since it was not possible to obtain a black on white plot with PSpice. The horizontal scale is in seconds.)

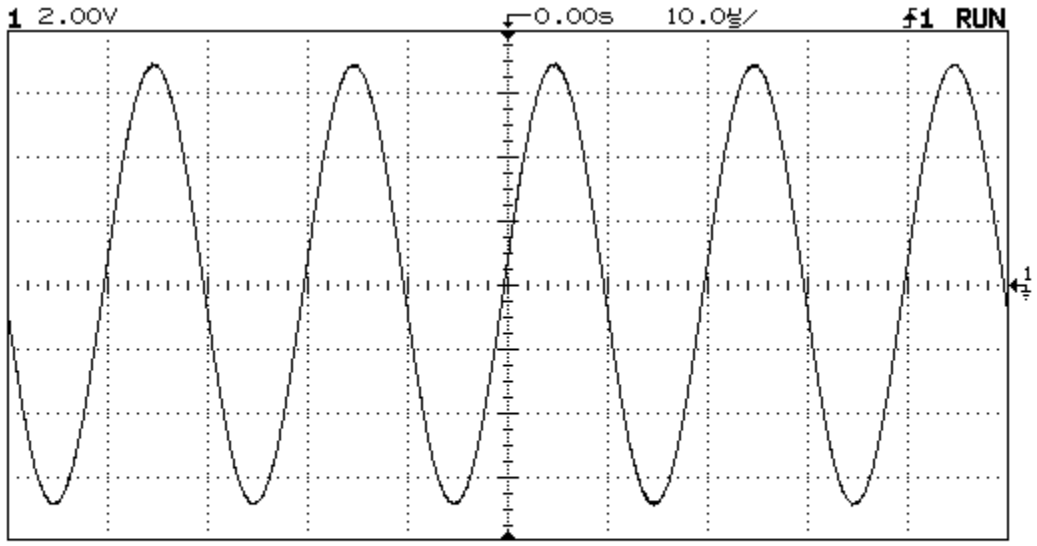
b. Write the mathematical expression for the voltage at point A. That is, write it in the form

$$V_A = V_o \sin(\omega t + \phi_o)$$

c. Shown below is the window we use for setting up the PSpice transient analysis. Put the appropriate numbers in the appropriate boxes to obtain plots like the ones above. Obviously, the result will only show the two correct traces, but otherwise should look essentially the same.



3. The figure below is a copy of the image that appears on one of the oscilloscopes in the studio. The function generator was used to generate the signal displayed. From this figure, determine the frequency and the peak-to-peak amplitude of the signal.



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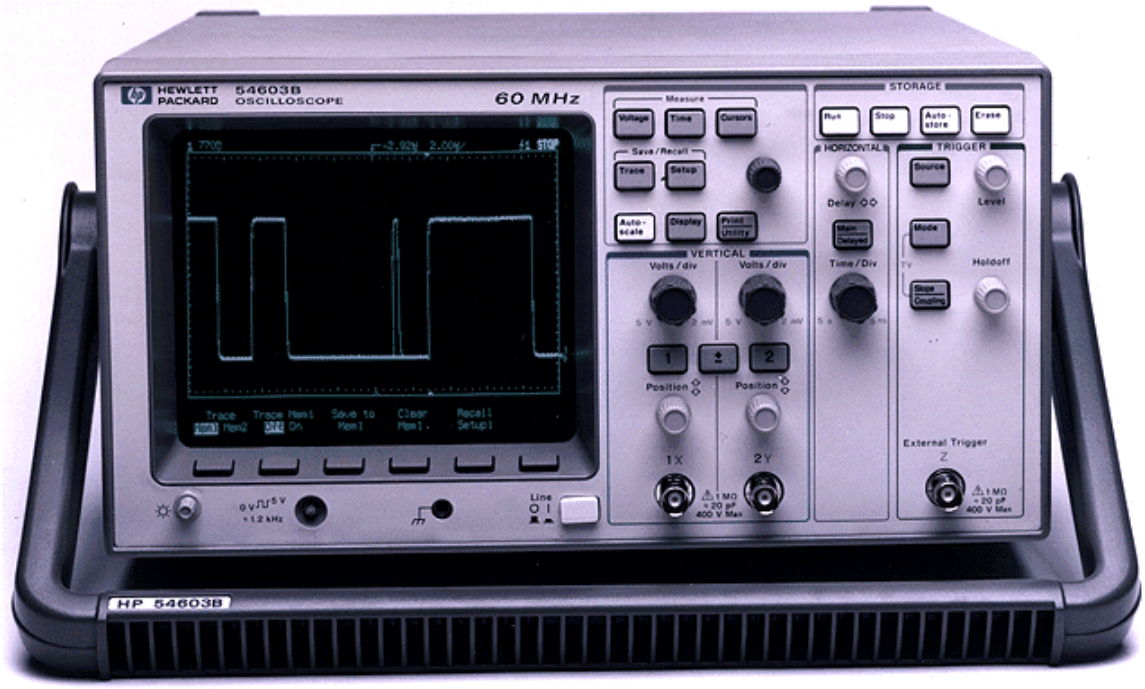

HP 54603B 2 Channel 60 MHz Oscilloscope

4. Shown above is an image of the oscilloscope we use in the studio.

a. Circle the button or knob we use to turn it on.

b. When you were observing the signal from the cantilever beam, you should have noticed that the sinusoidal signal you obtained decayed with time. This made it difficult to observe such things as the frequency, since the signal kept changing. Which button or know would you push or turn to make the display remain stationary? That is, which one would you push to display a snapshot of the signal?

c. Sometimes we observe two signals by connecting one to channel one and the other to channel two. Which button or know do we push or turn to display the difference between the two channels?

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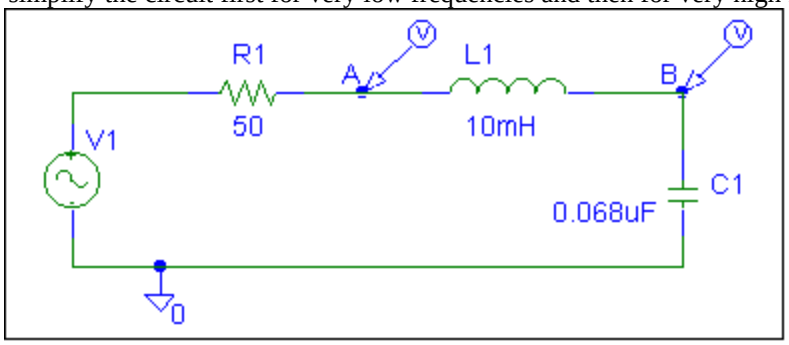
5. Given that you know inductors and capacitors can be short or open circuits at very low frequencies (at or very near to DC) and at very high frequencies, redraw the following circuits by replacing components that look like open circuits by open circuits and replacing components that look like short circuits by short circuits. That is, simplify the circuit first for very low frequencies and then for very high frequencies.



Label the points A and B on your simplified circuits.