EE393 BASIC ELECTRICAL ENGINEERING
LAB #3
April 8, 2003

Preliminary work:

1. Learn how an oscilloscope basically displays the signal (trigger modes, sweep types, input amplifiers display modes etc. -\ see course web-page.)
2. Assume you are given two signals;

   $v_1(t)=0.5\cos(6180t)$

   and

   $v_2(t)=3\cos(6180t-Pi/4)$.

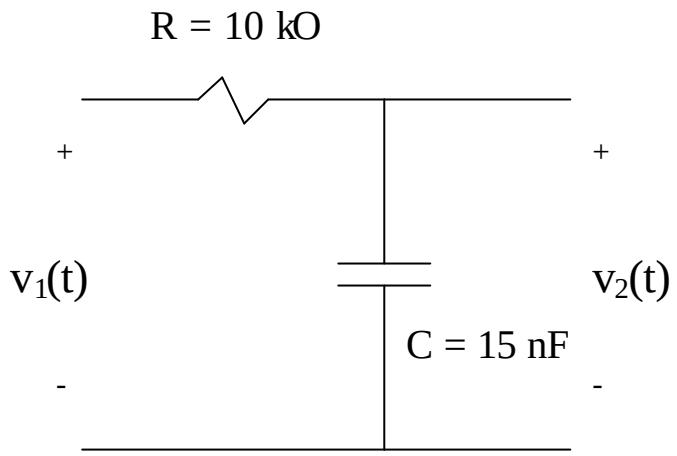
   State the phase difference between them and plot them (showing only critical timings is sufficient).
3. Plot the signals to create a Lissajous Figure by plotting $v_1(t)$ on the Y axis and $v_2(t)$ on the X axis. (-\ see course web-page.)

Lab work:

1. Demonstrate to yourself that an oscilloscope operates by triggering the trace at a given input level for a sinusoidal signal at 100 kHz $1V_{p-p}$.
   a. Use different triggering methods (normal, auto) and explain how they work.
   b. Apply a square-wave and try to see the details of leading and falling edges. (Trigger at the rising when measuring rise time; and trigger at the falling edge when measuring fall time)
   c. Measure the rise and fall times of the signal.
2. Adjust the sweep rate of oscilloscope to 0.5 sec/div and signal generator frequency to 1 Hz to see how the signal is traced.
3. Apply a sinusoidal signal at 100 Hz with 1 V_{p-p} amplitude again.
   a. Measure the rms amplitude using an oscilloscope.
   b. Measure the rms amplitude again using a voltmeter.
4. Comment on the results.

Notes: Rise Time: Time taken for a signal to rise from 10% to 90% of the signal amplitude.
Fall Time: Time taken for a signal to fall from 90% to 10% of the signal amplitude.
Signal generator gives twice the displayed value when loaded by high-impedance (much greater than 50 ohms).

5. Connect the circuit given below:



   a. Adjust and measure the i/p to $1V_{p-p}$ at 1 kHz.
   b. Measure the phase delay between v_1 and v_2 as follows:
      i. By using the time sweep mode of the scope (the usual mode).
      ii. By using the X-Y mode of the scope (Lissajous figure).

6. For the same circuit apply a square-wave at 100 Hz ($1V_{p-p}$.)
   a. Measure the natural response of the capacitor voltage.
   b. Comment on how the input voltage represent both the initial condition and the throwing of the switch..