

# ECE 209L - FIRST ORDER CIRCUITS - LAB 8

## FREQUENCY RESPONSES OF FIRST ORDER RL CIRCUITS

FALL 2003

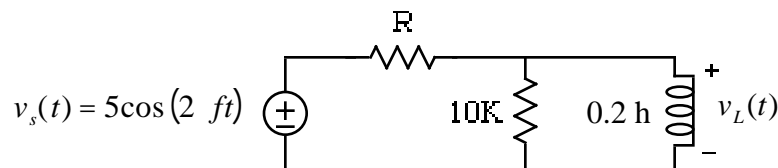
A.P. FELZER

### OBJECTIVE

The objective of this lab is to see how the magnitudes of the sinusoidal steady state responses of first order RL circuits vary as a function of frequency

### LAB

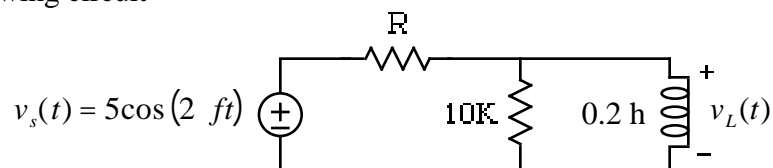
1. Given the following circuit



PARTNER 1: R = 4.7K      PARTNER 2: R = 10K

- a. **Prelab** - Obtain and measure your resistor and capacitor values. Then compare your nominal and measured values. Put your results in a Table
- b. Describe what happens to the amplitude of the sinusoidal steady state voltage  $v_L(t)$  as you increase the frequency of the input  $v_s(t)$ . Illustrate with graphs of  $v_L(t)$
- c. Explain why the amplitude of the sinusoidal steady state response of  $v_L(t)$  behaves the way it does as you increase the frequency

2. Given the following circuit



PARTNER 1: R = 1K      PARTNER 2: R = 2K

- a. **Prelab** - Obtain and measure your resistor and capacitor values. Then compare your nominal and measured values. Put your results in a Table
- b. Measure the amplitude of the sinusoidal steady state response response of  $v_L(t)$  at the frequencies  $f = 0, 500 \text{ Hz}, 1\text{KHz}, 2\text{KHz}$  and  $3\text{KHz}$ . Be sure to monitor the amplitude of  $v_s(t)$  every time you take a measurement at a new frequency to make sure it's still 5 volts
- c. Make use of your measured values in part (b) to calculate  $|G(j2 f)| = |V_L(j2 f) / V_s|$  at the corresponding values of  $f$ . As usual . . .
- d. **Prelab** - Draw the phasor circuit with your measured circuit values and then analyze it for  $G(j\omega) = V_L(j\omega) / V_s$
- e. Make use of your transfer function from part (d) to calculate  $|G(j2 f)|$  at the frequencies in part (b)
- f. Compare your measured and calculated values of  $|G(j2 f)|$  in parts (c) and (e)