ECE 209L - FIRST ORDER CIRCUITS - LAB 7
FREQUENCY RESPONSES OF FIRST ORDER RC CIRCUITS

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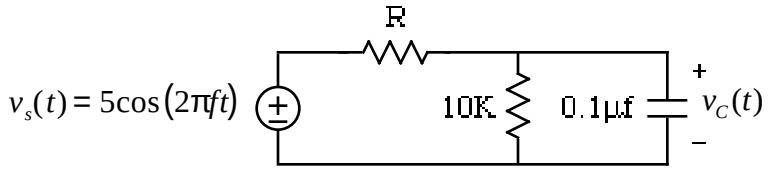
OBJECTIVE

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

LAB

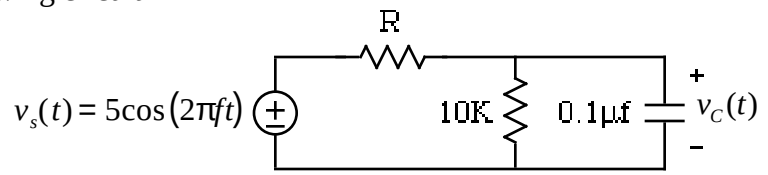
1. Given the following circuit



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. Build the circuit and then describe what happens to the magnitude of the sinusoidal steady state voltage $v_C(t)$ as you increase the frequency of the input $v_S(t)$. Illustrate with graphs of $v_C(t)$
c. Explain why the amplitude of the sinusoidal steady state response of $v_C(t)$ 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. Build the circuit and then measure the amplitude of the sinusoidal steady state response response of $v_C(t)$ at the frequencies f = 0, 500 Hz, 1KHz, 2KHz and 3KHz. 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 results in part (b) to calculate $|G(j2\pi f)| = |V_C(j2\pi f)/V_S|$ at the corresponding frequencies. As usual put your results in a Table
d. **Prelab** - Draw the phasor circuit with your measured values and then analyze it to obtain $G(j\omega) = V_C(j\omega)/V_S$
e. Make use of your transfer function from part (d) to calculate $|G(j2\pi f)|$ | at the frequencies in part (b)
f. Compare your measured and calculated values of $|G(j2\pi f)|$ in parts (c) and (e)
g. What causes the amplitude of $v_S(t)$ to decrease at least some as f increases