

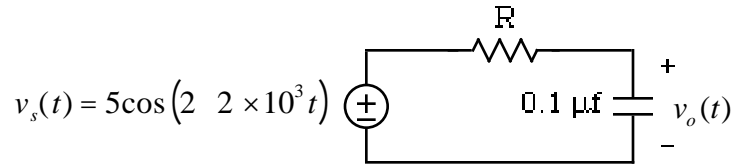
# ECE 209L - SINUSOIDAL STEADY STATE RESPONSES - LAB 1 FIRST ORDER RC CIRCUIT

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## OBJECTIVE

The objective of this lab is to first measure the sinusoidal steady state response of  $v_o(t)$  in the following first order RC circuit and then compare the results with calculated values



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

## LAB

1. **Prelab** - Obtain and measure your resistor and capacitor values. Then compare your nominal and measured values. Put your results in a Table
2. **Prelab** - Given the following sinusoid

$$v_s(t) = 5\cos(2 \cdot 10^3 t)$$

- a. What is the amplitude of  $v_s(t)$
  - b. What is the frequency of  $v_s(t)$  in Hz
  - c. What is the frequency of  $v_s(t)$  in radians/sec
3. Build the RC circuit above and then make use of what you see on the scope to sketch  $v_s(t)$  and  $v_o(t)$  on the same graph
  4. Measure the magnitude and phase of  $v_o(t)$ . Then use your results to write an equation for  $v_o(t)$
  5. **Prelab** - Obtain the differential equation for  $v_o(t)$  for your circuit element values. Then solve your differential equation for the sinusoidal steady state response (the forced response) by substituting in

$$v_f(t) = A \cos(2 \cdot 10^3 t + \theta)$$

and solving for A and  $\theta$ . The following trig identity should be helpful

$$B\cos(x) + C\sin(x) = \sqrt{B^2 + C^2} \cos(x - \tan^{-1} \frac{C}{B})$$

6. Compare your calculated and measured values for A and  $\theta$ . Put your results in a Table