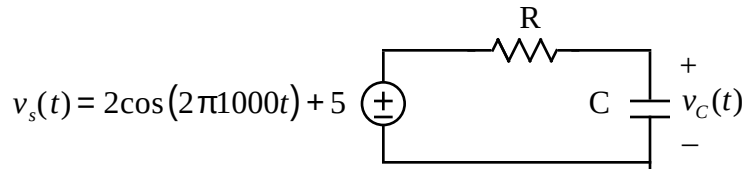
ECE 209L - INTRODUCTION TO FILTERS - LAB 15
FIRST ORDER LOWPASS RC FILTERS

FALL 2003 **A.P. FELZER**

OBJECTIVE

The objective of this lab is to make use of superposition to find the steady state response of the following lowpass filter.



PARTNER 1: C = 0.1 µf PARTNER 2: C = 0.2 µf

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** - What will happen to $v_C(t)$ in this circuit as R increases. Why

3. **Prelab** - Choose a value for f_{3dB} so that $v_C(t) \approx 5$ volts. Then make use of your f_{3dB} to sketch a graph of the magnitude of the frequency response $G(j2\pi f) = V_C(j2\pi f)/V_S$

4. **Prelab** - Make use of your value of f_{3dB} and the fact that the transfer function of our first order RC circuit is given by $G(j2\pi f) = \dfrac{f_{3dB}}{jf + f_{3dB}}$ to find G(j2πf)

5. **Prelab** - Make use of your transfer function in Problem (4) to find and sketch $v_C(t)$

6. **Prelab** - Make use of the fact that in our circuit $f_{3dB} = \dfrac{1}{2\pi RC}$ to find R for your f_{3dB} in Problem (3)

7. Build your filter and then make use of a scope to sketch and obtain an equation for $v_C(t)$

8. Compare DC offsets and amplitudes of the sinusoids of your calculated and measured $v_C(t)'s$

9. **Prelab** - Choose a value for f_{3dB} so that $v_C(t) \approx 5$ volts + 2 cos (2π1000t). Then find and sketch a graph of the magnitude of the corresponding transfer function G(j2πf)

10. **Prelab** - Make use of your transfer function to calculate and sketch $v_C(t)$ for your filter

11. **Prelab** - Calculate the value of R for your filter

12. Build your filter and then sketch and write an equation for $v_C(t)$

13. Compare your calculated and measured $v_C(t)'s$