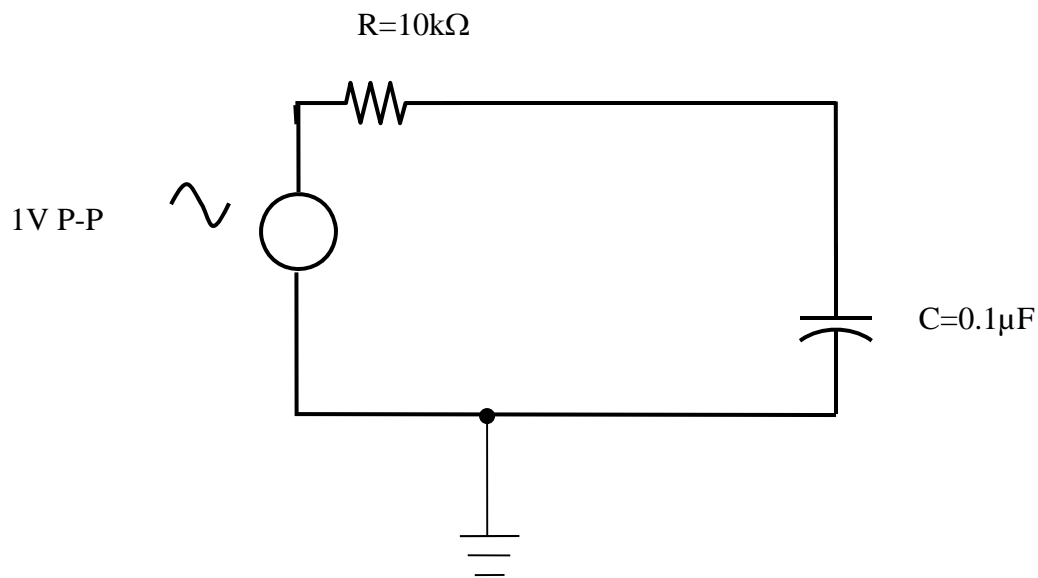


LAB 6: frequency Selective Circuits.

OBJECTIVE:

- In this lab will learn how to use oscilloscopes to measure complex voltages.
- Learn how to use the oscilloscope to calculate the phase difference between 2 voltages.

PRELAB



For this circuit shown

$$\text{Voltage gain} = \frac{V_o}{V_i} = \frac{1/j\omega C}{R + 1/j\omega C} = \frac{1}{1 + j\omega RC}$$

This is a complex quantity, meaning that it has a magnitude and a phase.

- Derive an equation for both magnitude and phase for the above circuit as a function of frequency
- What is the cut-off frequency (f_c) for the above filter?
- Draw the magnitude of gain vs. frequency from $0.01 f_c$ to $100 f_c$ on a log-log scale
- Draw the phase difference vs frequency for the same frequency range on a semi-log scale.
- Simulate the circuit using PSPICE and show the gain plot
- Repeat the above after replacing the capacitor by an inductor $L=10 \text{ mH}$.

LAB

Construct the above circuit in the lab

- Adjust the input frequency to be equal to the cut-off frequency of the filter.
- Display both input and output waveform on the scope – be sure to use the same scale (volts per division).
- What is the phase shift between these 2 waveforms?
- Change the frequency range as you did in the pre lab, measure the gain and phase shift.
- Plot the measured values on a loglog graph for gain and semilog graph for phase shift