

Experiment 4:

RC and RLC Circuits

Post-Lab Report

A. Phase Shift Measurements

- Fill the table below and then comment on the results

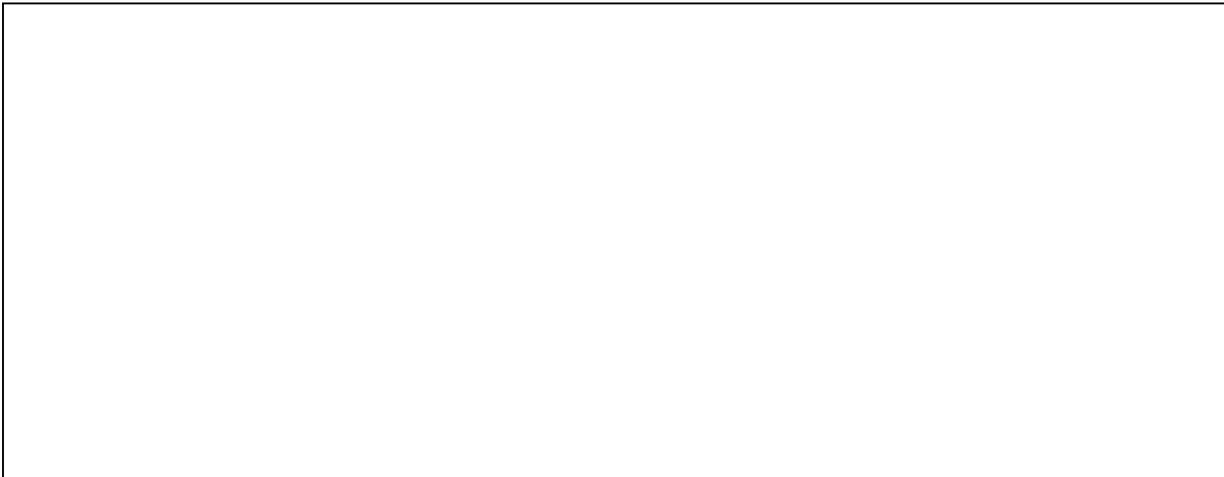
Phase Shift	
Calculated	
Y-T Format	
Lissajous Figure	

B. Lead and Lag Networks

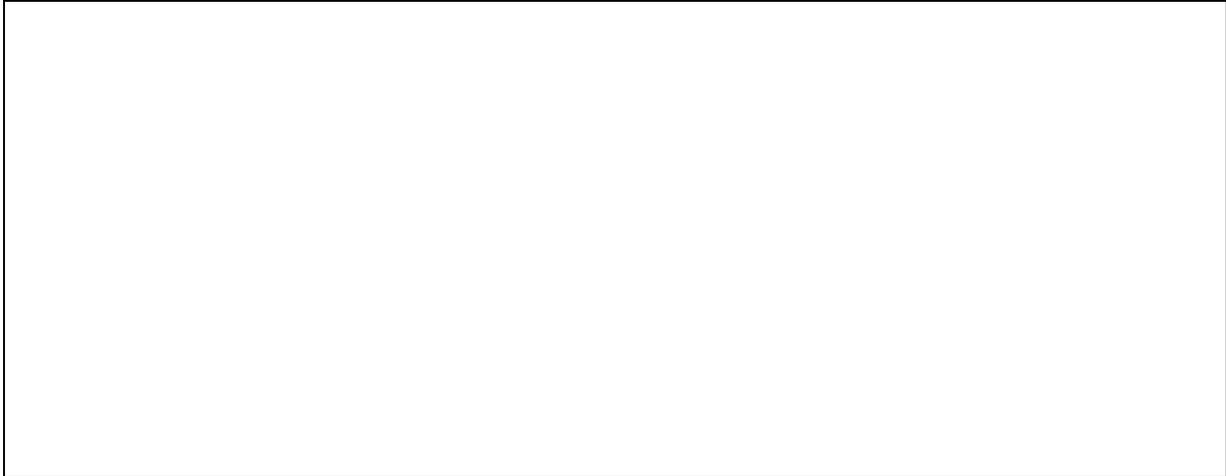
- Explain the shape of the output waveforms of the lag and lead networks to square wave inputs of various frequencies, with particular reference to the fundamental property of a capacitor not changing its voltage instantaneously.



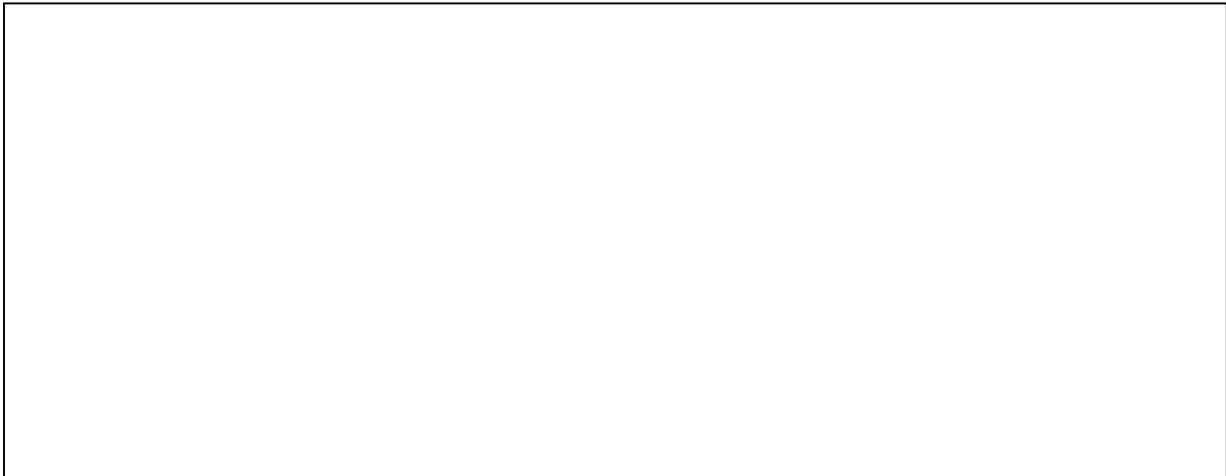
- What should be the relationship between the RC time constant and the frequency of the square wave so that:
 - The lag network does not appreciably distort the square wave.
 - The lag network acts as an integrator.
 - The lead network does not appreciably distort the square wave.
 - The lead-network acts as a differentiator.



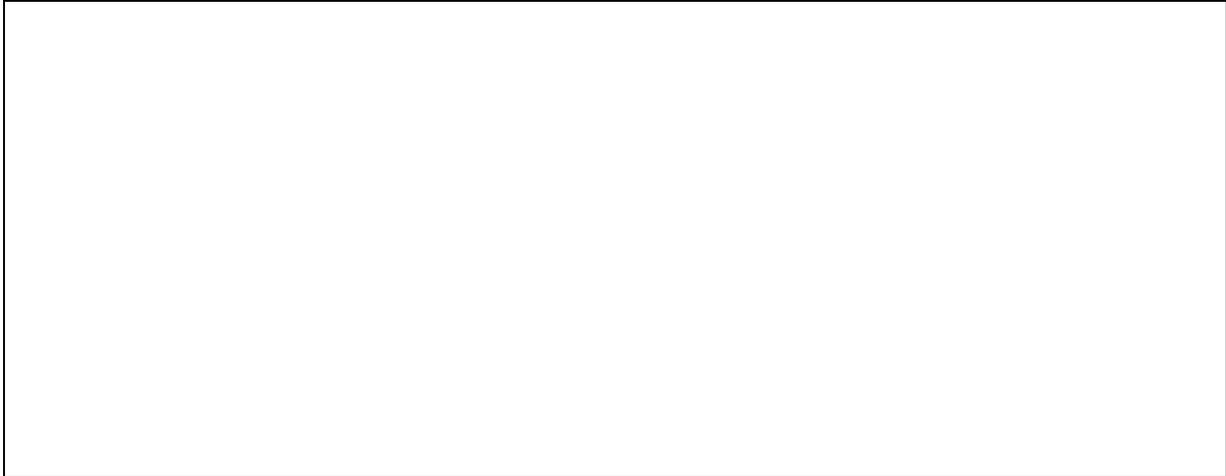
- What should be the relationship between the RC time constant and the frequency of the sinusoidal input so that:
 - The lag network does not introduce appreciable attenuation.
 - The lead network does not introduce appreciable attenuation.
 - How do these relationships compare with those for the square wave?
 - What is the relationship between a periodic waveform (such as the square wave) and sinusoids? (Refer to Fourier's Theorem).



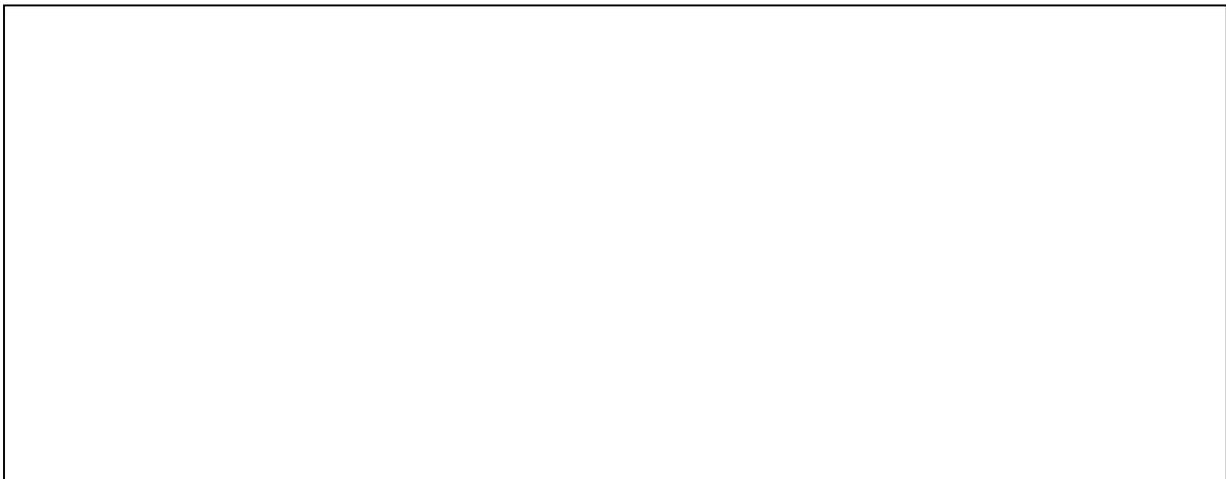
- The lag and lead networks are also referred to as Lowpass and Highpass filters respectively. Explain what these terms mean and indicate the cutoff frequency in each case. The cutoff frequency is defined as the frequency at which the output amplitude is 0.7071 of its maximum value



- Considering one of the RC elements to be a source impedance, and the other to be a load impedance, explain the integrating and differentiating action of these networks on the basis of the relationship between source and load impedances in the S domain.



- If the input voltage to either network has an average value of V_{DC} , what will be the average value of the voltage across the resistor and the capacitor? What will be the relationship between these three voltage values?



C. Series RLC circuits

- Comment on the results obtained and compare the measured resonant frequency to the calculated one.

