

## ELG2331: Experiment 3

### AC Circuit Analysis

#### **Objective:**

To familiarize the students with AC circuit analysis and measurements including the applications of Kirchhoff's laws.

#### **Introduction:**

While analyzing an electric circuit having reactive components such as inductors and capacitors, the voltages, currents and branch impedance must be treated as complex quantities. These quantities may be expressed in rectangular form as a real part and imaginary part, or in polar form as a magnitude and a phase angle. The voltage magnitude is the quantity, which would be measured with ordinary AC voltmeter. Phase relationships may be measured with specialized equipment or may be calculated from measurements of DC resistance and of impedance, the impedance being the ratio of the applied AC voltage to the resulting AC current.

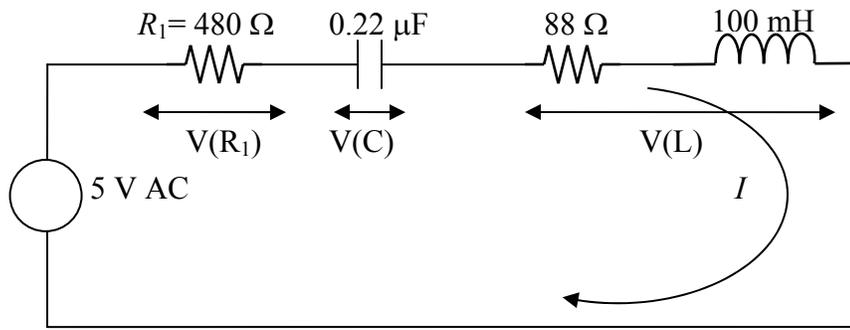
#### **Procedure:**

##### **Series AC Circuit:**

1. Connect the circuit shown in Figure 1
2. Fix the frequency of the function generator to 500 Hz and its output voltage to 5 V (rms)
3. Measure the AC voltage across each of the elements
4. Increase the frequency by 100 Hz until 1000 Hz is reached and readjusts the output voltage to maintain 5 V and repeat step 3.
5. Tabulate the results in Table 1.

##### **Parallel RLC Circuit:**

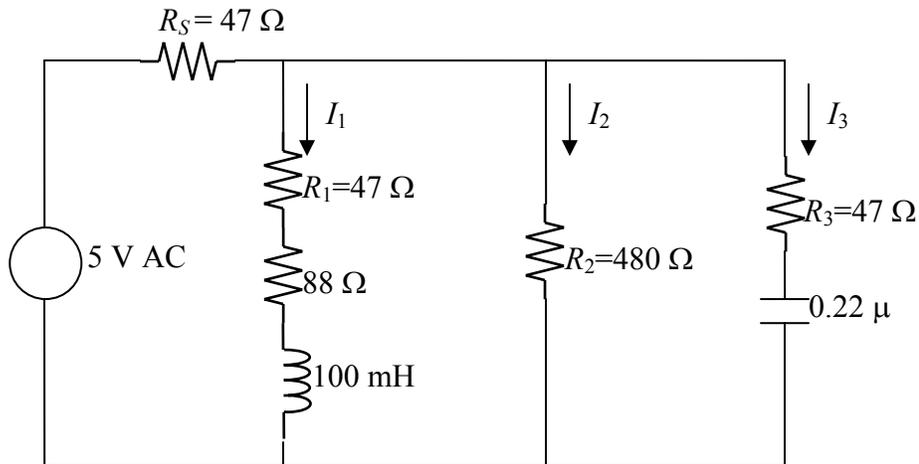
1. Measure the DC resistance for each resistor.
2. Measure the DC resistance of the inductor.
3. Connect the circuit as shown in Figure 2.
4. Fix the frequency to 500 Hz, and its output voltage magnitude to 5 V (rms).
5. Measure the magnitude of the AC voltage across  $R_S$ ,  $R_1$ ,  $R_2$ , and  $R_3$  and tabulate the values in Table 2.



**Figure 1** Series AC circuit.

**Table 1**

Frequency, Hz	V (C)	V (L)	V(R <sub>1</sub> )	I
500				
600				
700				
800				
900				
1000				



**Figure 2** Parallel AC circuit.

**Table 2**

Frequency, Hz	$I_1$	$I_2$	$I_3$
500			
600			
700			
800			
900			
1000			

**Report:**

1. Calculate the expected parameters values ( $I$ ,  $V (R_1)$ ,  $V (C)$ ,  $V (L)$ ) at the frequency 1000 Hz for the series  $RLC$  circuit in Figure 1.
2. Calculate the expected parameters values ( $I_1$ ,  $I_2$ , and  $I_3$ ) at the frequency 1000 Hz for the parallel  $RLC$  circuit in Figure 2.