**Introduction:**

The objectives of this lab experiment were to to become familiar with the basic DC Current and Voltage measurements using Digital Multimeters (DMMs) - using the Fluke Model 8010A and the Agilent Model 34405A - as well as to become familiar with the sinusoidal AC waveform measurements using a Function Generator (FG) and a Digital-Storage-Oscilloscope (DSO).

The first half the of the experiment will be testing Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) laws by connecting an experimental resistor circuit to the Power Supply Panel (PSP) which delivers direct current (DC) to the circuit. This resistor circuit has a 10-turn variable potentiometer load resistance starting from 100 ohms and increasing approximately 20 ohms with each turn.

The second half of the experiment requires the experimental alternating current (AC) resistor-inductor-capacitor (RLC) to be connected to the FG and DSO to produce the appropriate signal waveform in order to calculate its corresponding amplitude ratios and phase shifts. The AC RLC experimental circuit also contains a 10-turn variable potentiometer load resistance similar to the DC experimental circuit.

**Procedure/Discussion:**

For the first half of the experiment, the values determined for the load resistance was 200 ohms at 4 turns of the potentiometer Vs and Is. It was then determined the current values of I1, I2, and I3 were 9.5 mA, 7.9 mA, and 1.7 mA respectively. For the voltage node values of VA, VE, and VC, they were determined to be 1.5 v, 5.4 v, and 1.05 v respectively.

For the second half of the experiment, the values of the R, L, and C values in the experimental AC RLC circuit were 100.4 ohms, 47.6 mH, and 21.9 nF respectively. This determined the nominal frequency (fn) to be 4999 Hz by way of the following formula:

**Conclusion/Results:**

The results for the first half of the experiment in proving KCL and KVL were successful as

I1 = I2 + I3 => 9.5 mA7.9 mA 1.7 mA.

and

VEF = VEA + VAC + VCD => 5.4 v3.9 v + 0.45 v + 1.05 v

The current source Is was determined to be 1.7105 mA and the total power dissipated and total power delivered were Pdiss= 0.0495 W and Pdel= 0.0513 W respectively. This can be attributed to the fact that in non-ideal situations, there is bound to be some energy loss to the components and/or environment.

The results for the second half of the experiment were as follows:

* The amplitude ratio (Av) for the waveform at a frequency of 4999 Hz was determined to be 11.46. The time difference between waveforms was determined to be 53 and thus its phase shift () was determined to be 95.38 degrees.
* The amplitude ratio (Av) for the waveform at a frequency of 7498.5 Hz was determined to be 0.787. The time difference between waveforms was determined to be 65 and thus its phase shift () was determined to be 175.46 degrees.

For the second half of the experiment, there was no experimental error to be really evaluated here since the frequencies were determined from a mathematical formula and the results thereafter were simply printed from the DSO. It was merely an exercise in using the instruments more than it was evaluating a proof.