

**UNIVERSITY OF NEVADA LAS VEGAS, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING LABORATORIES.**

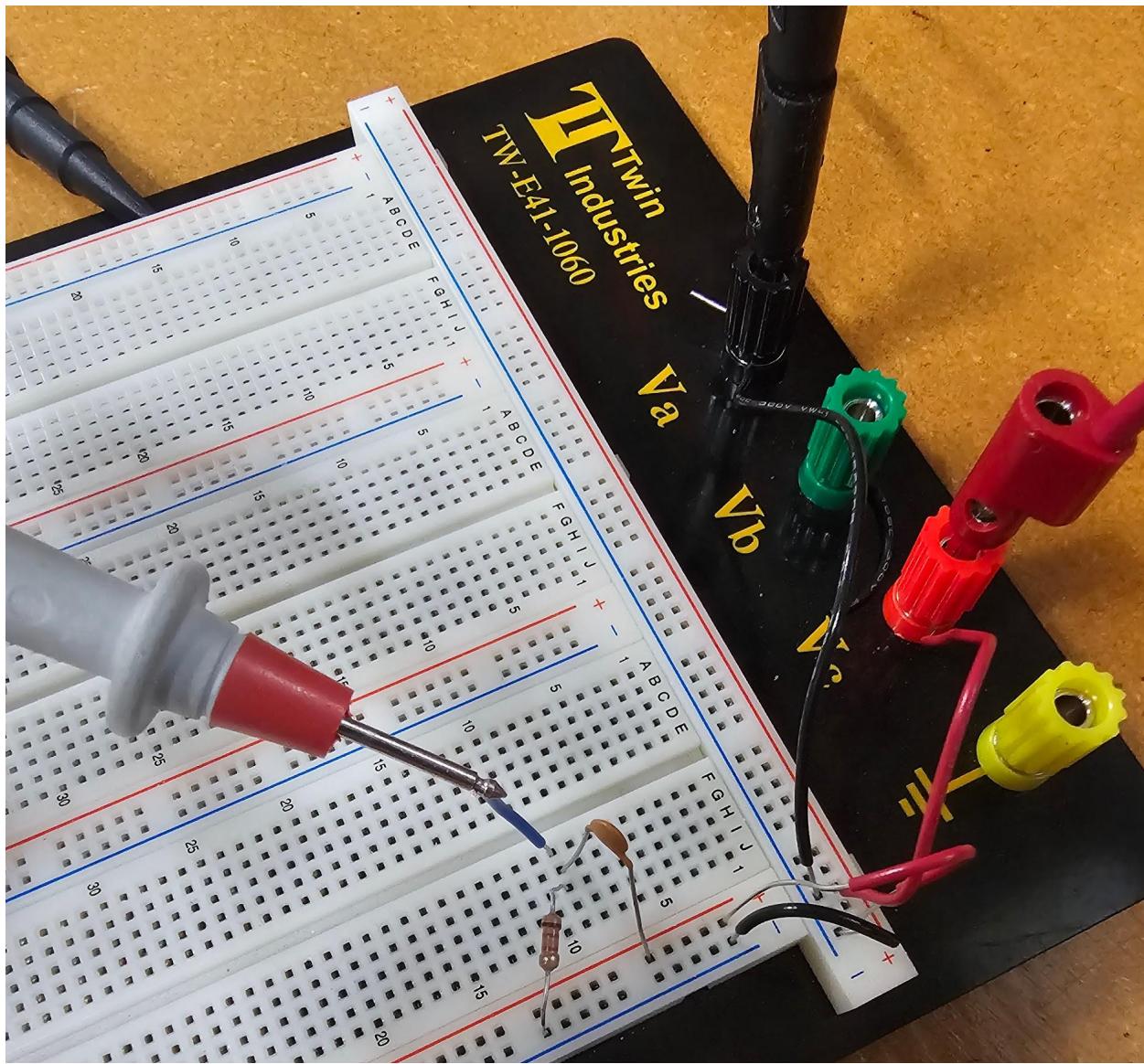
Class:	<b>EE221 Circuits II 1001</b>		Semester:	<b>Fall 2023</b>
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		Document topic:	<b>Postlab 3</b>	
Instructor's comments:				

### **1. Introduction / Theory of Operation**

The purpose of this lab was to implement real, practical DC and AC circuits on a physical breadboard using a power supply for the DC circuits and a function generator for the AC ones. We got to see the difference between the two types of circuits. We saw how measuring values on the two differed as well as how the actual results did as well, specifically at different tested frequencies for the AC circuits.

### **2. Description of Experiments**

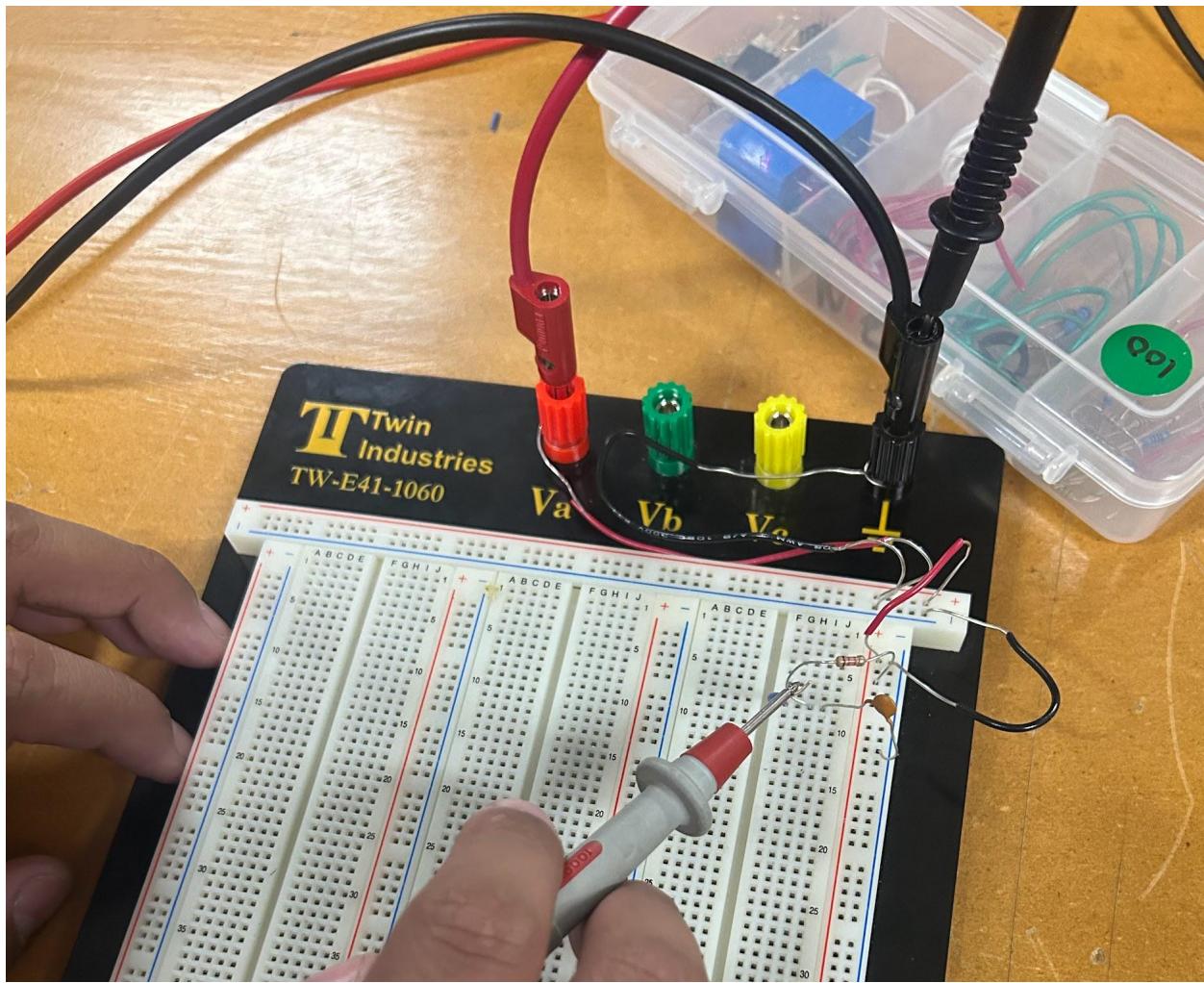
**DC Circuit for A.:**



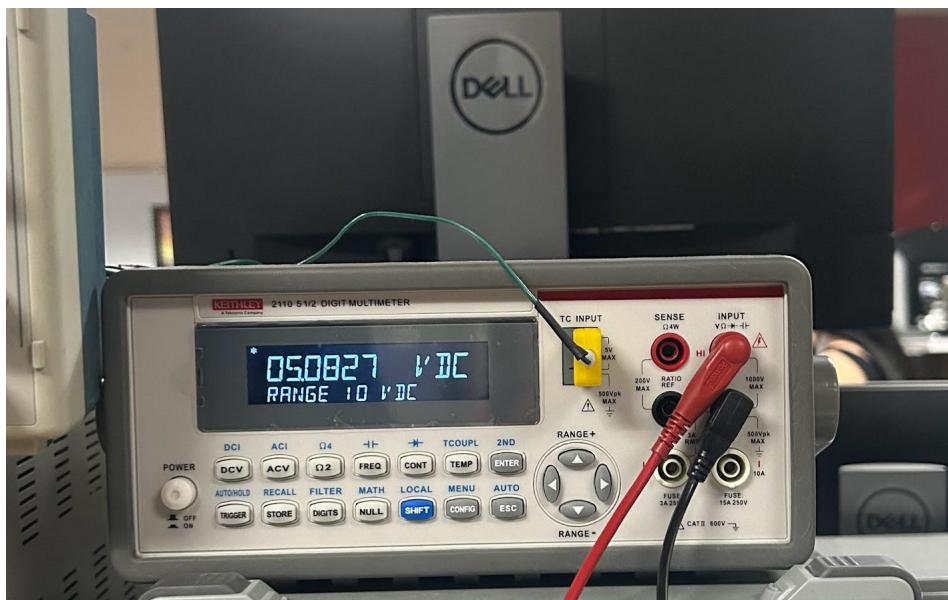
**DC Measurement for A.:**



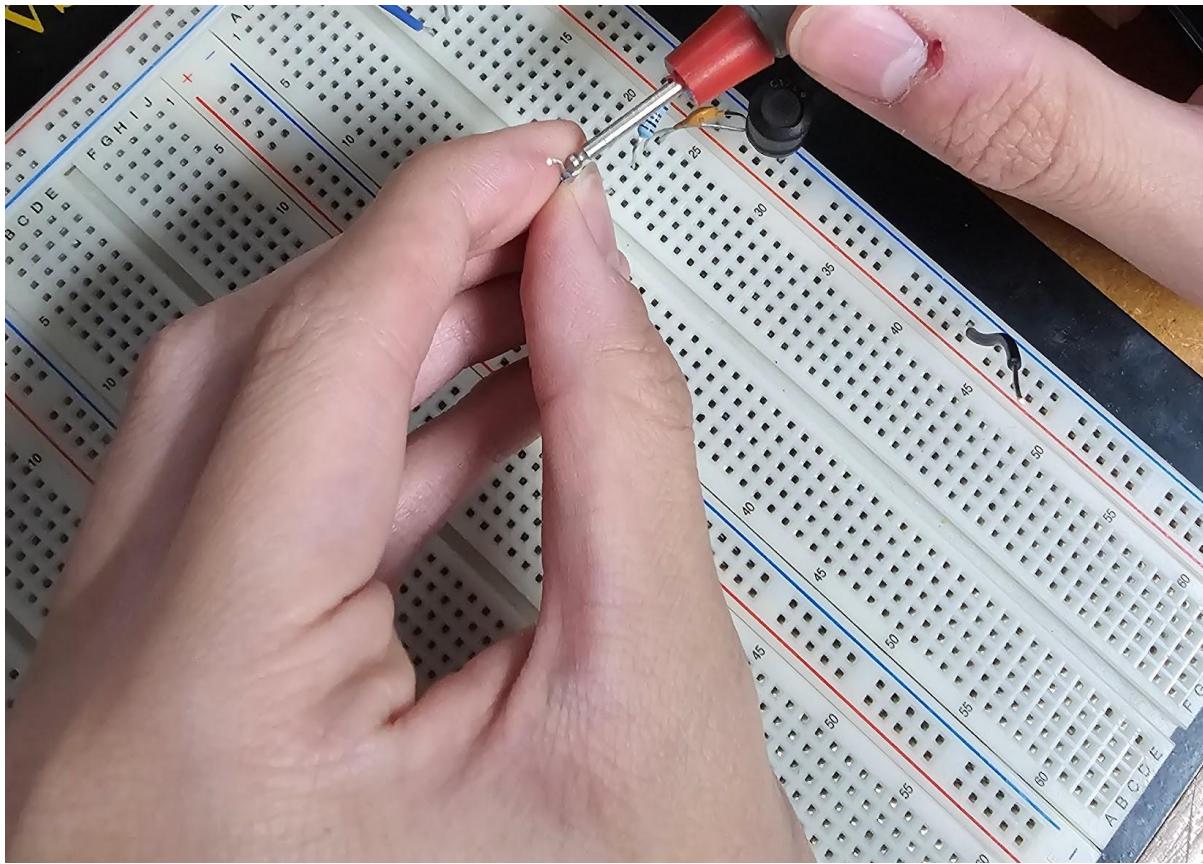
### DC Circuit for B.:



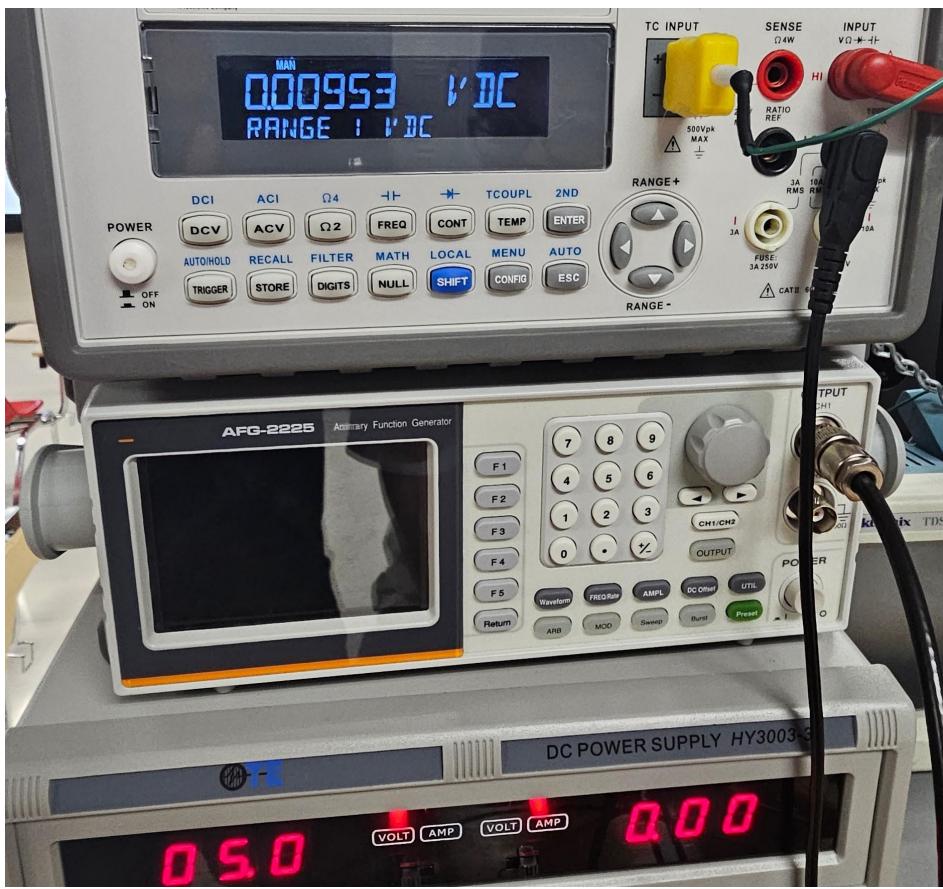
### DC Measurement for B.:



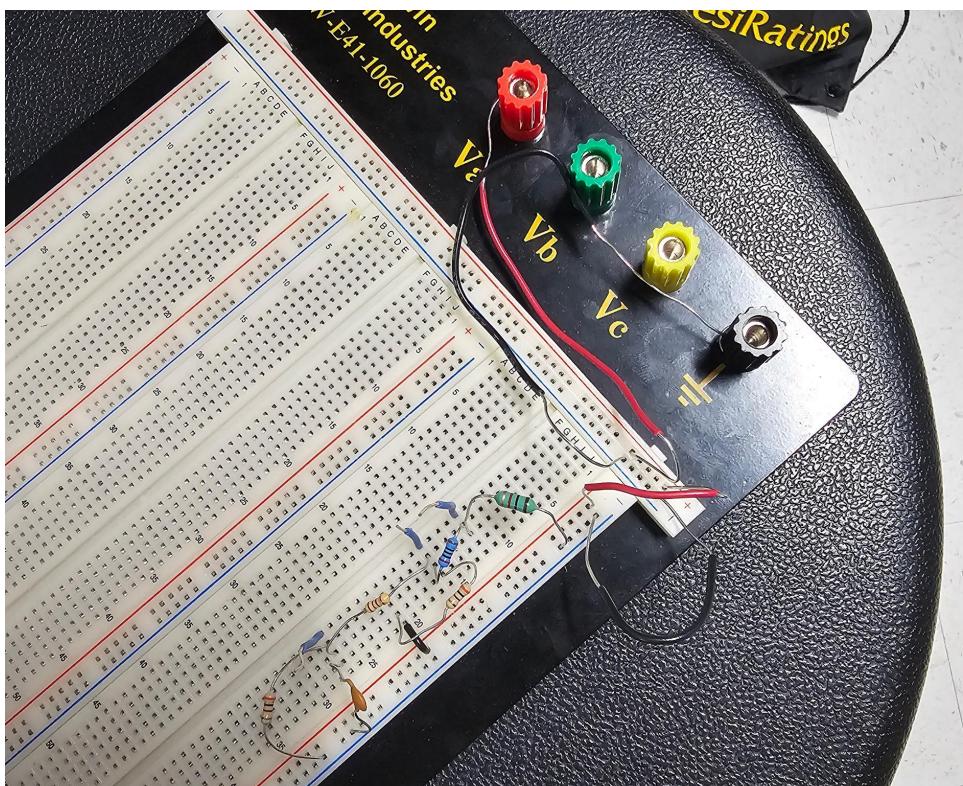
### DC Circuit for C.:



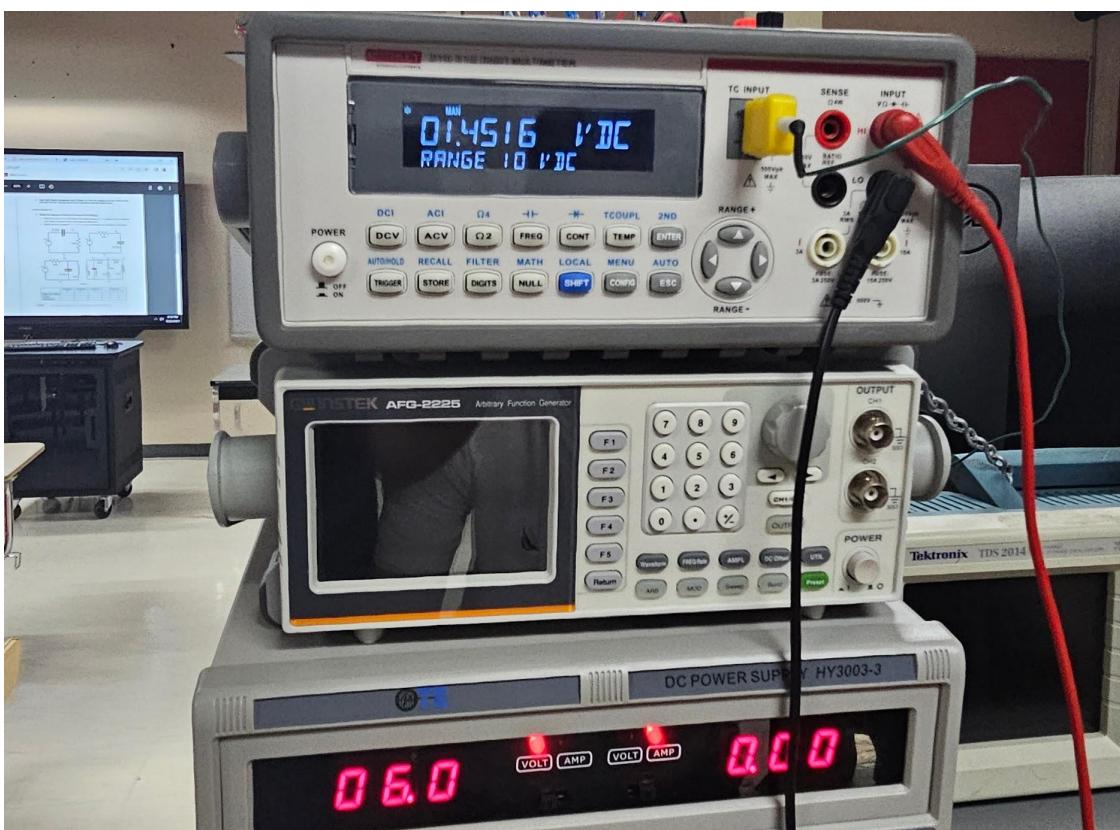
### DC Measurement for C.:



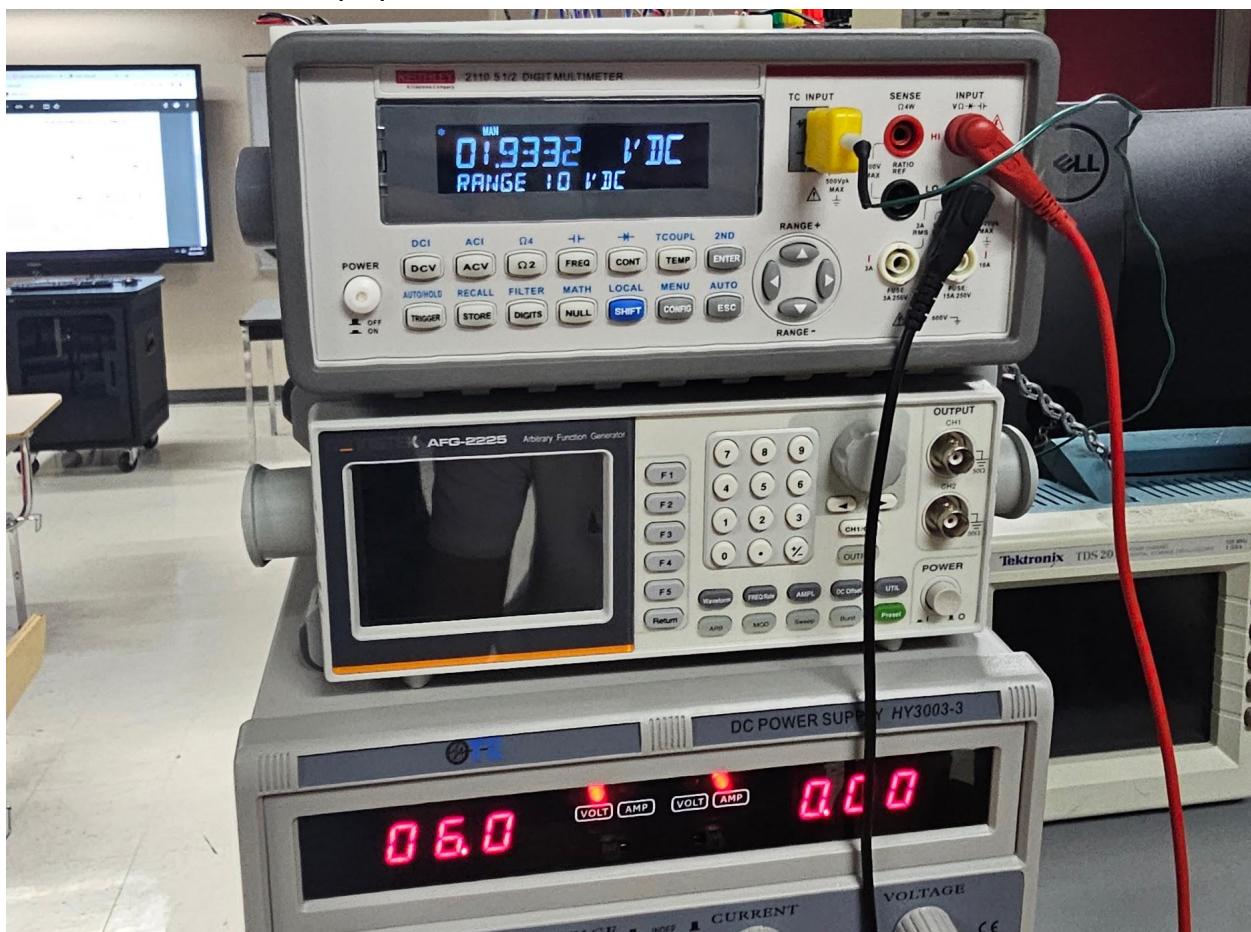
### DC Circuit for D.:



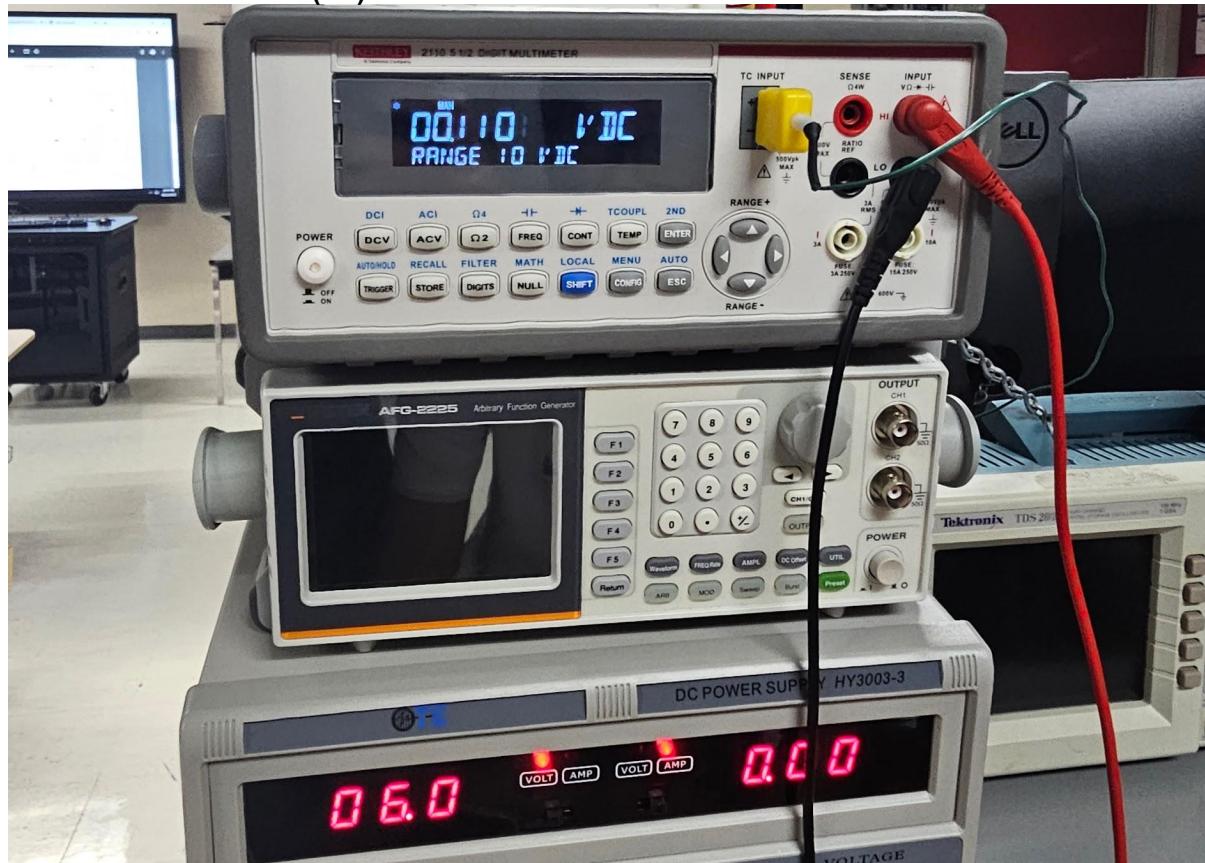
### DC Measurement for D. (V1):



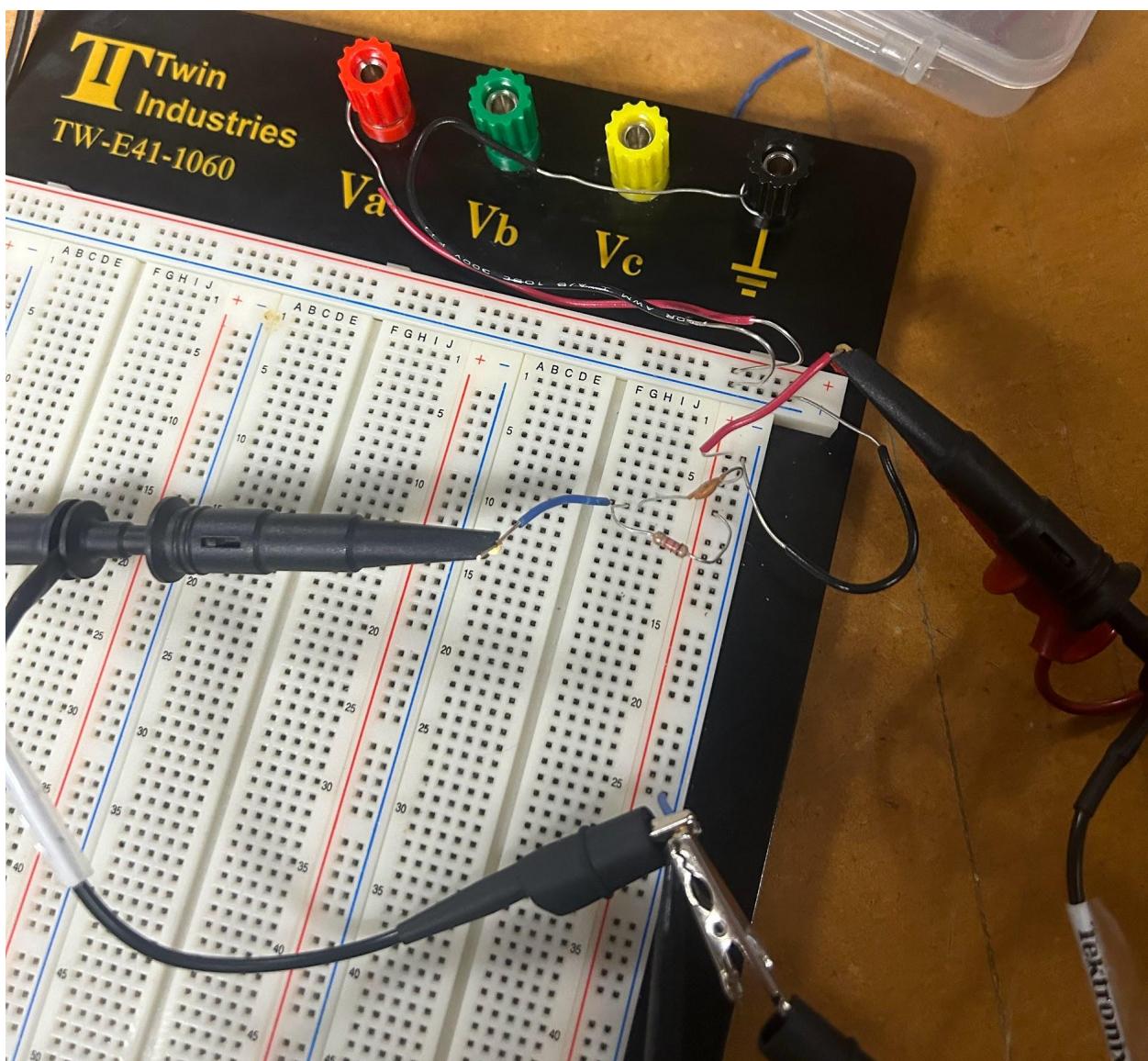
### DC Measurement for D. (V2):



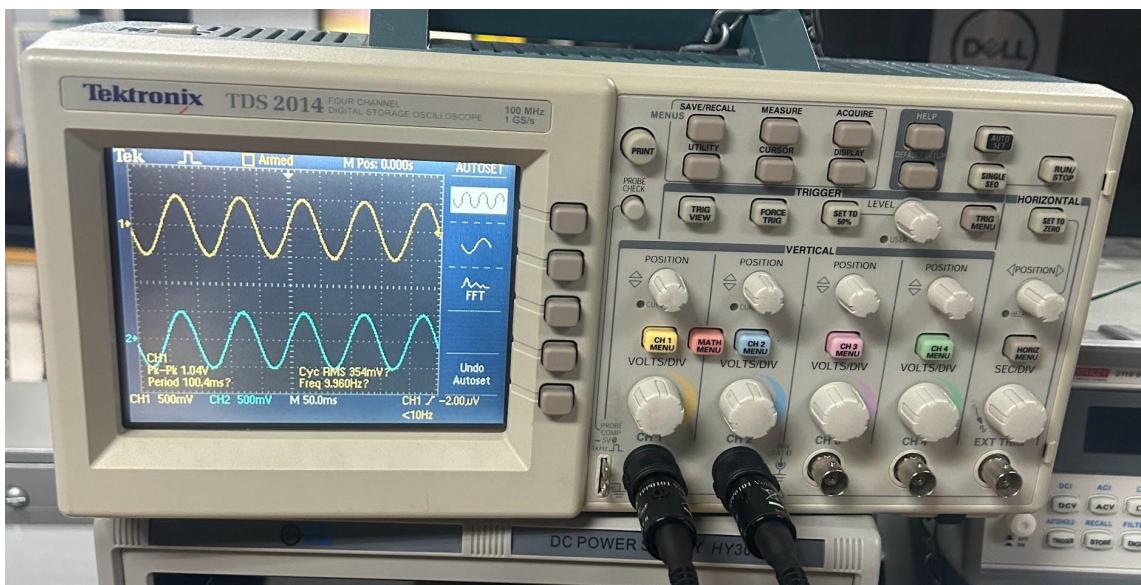
### DC Measurement for D. (V3):



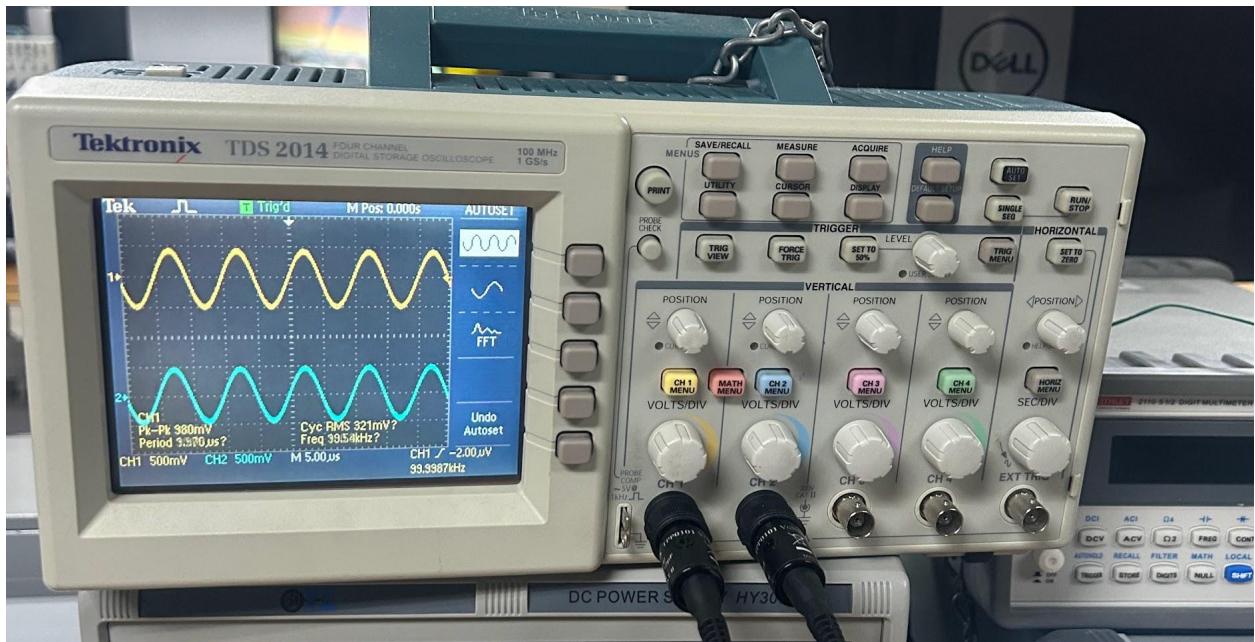
### AC Circuit for A.:



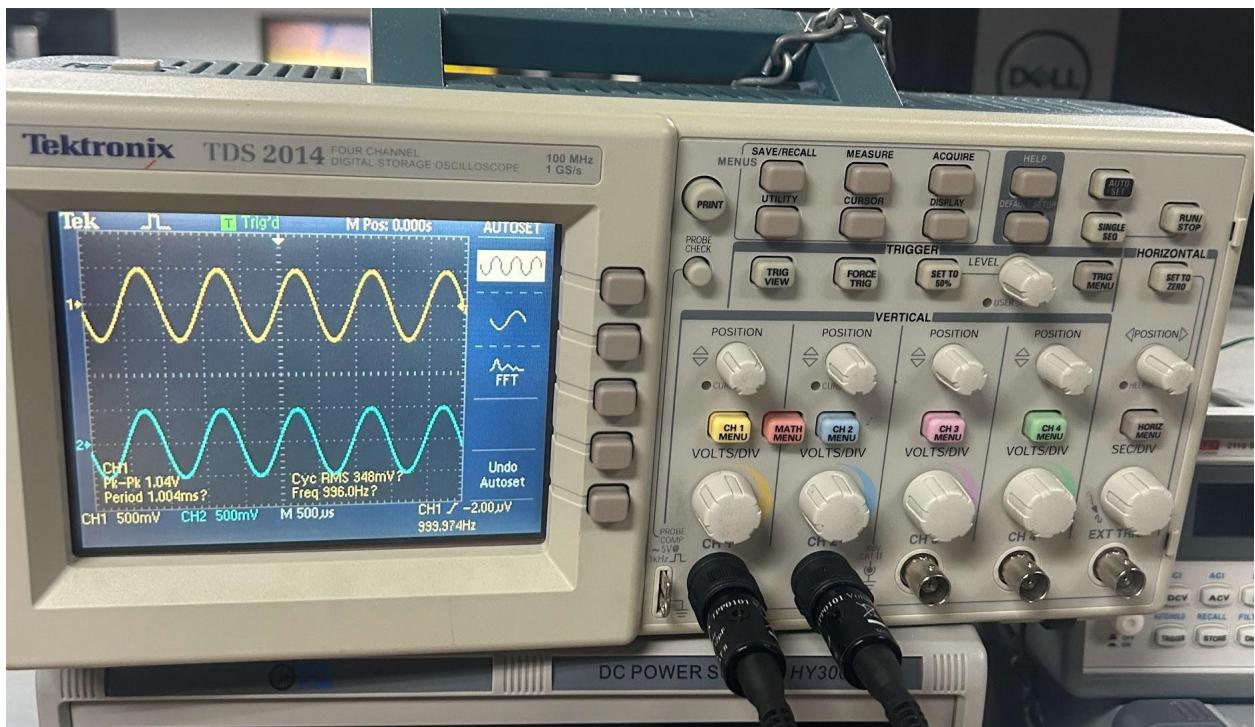
### AC Measurement for A (10 Hz):



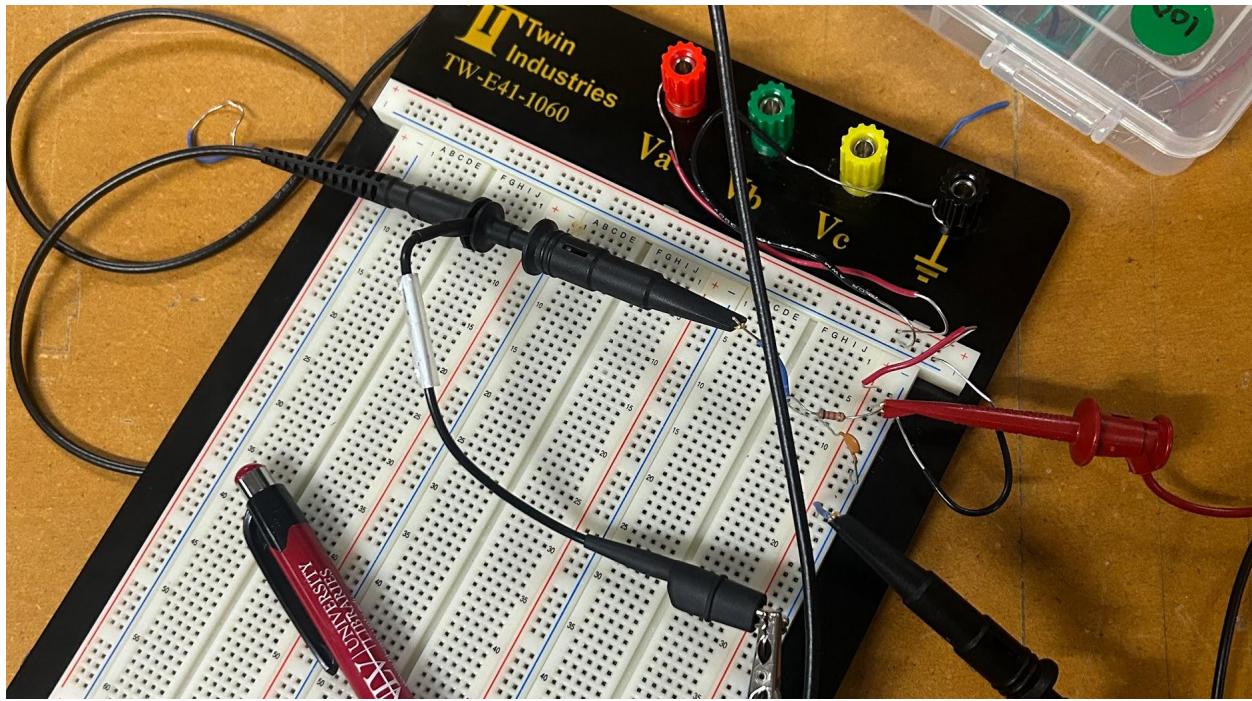
### AC Measurement for A (1 kHz):



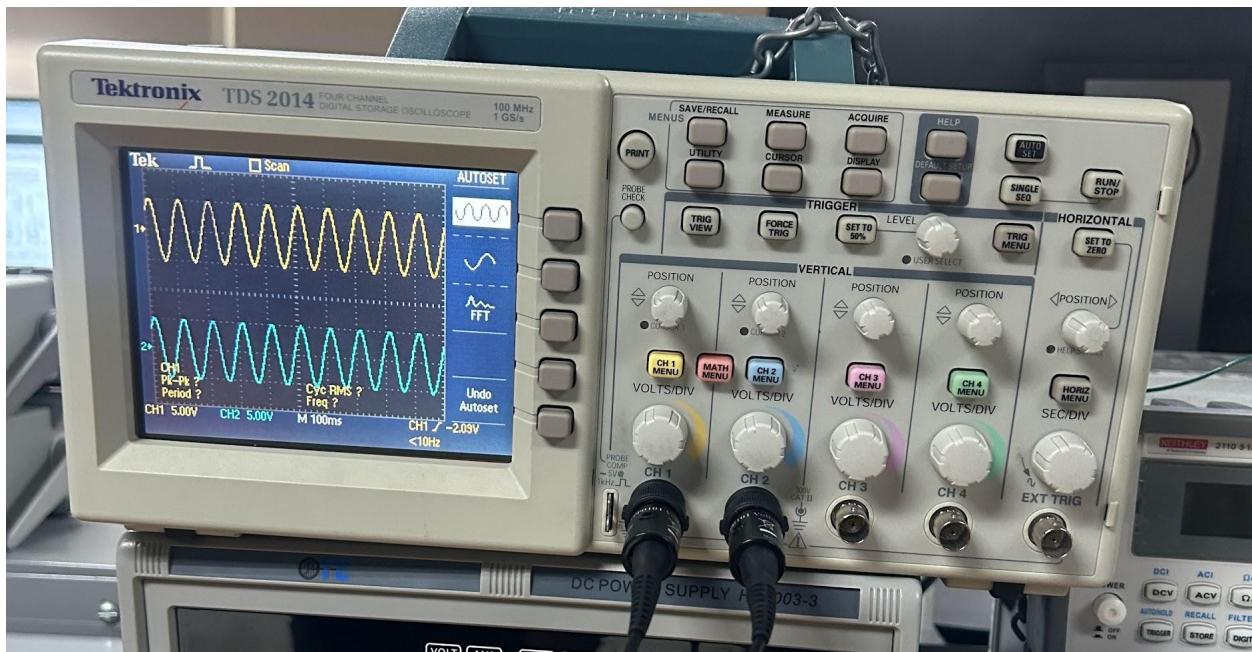
### AC Measurement for A (100 kHz):



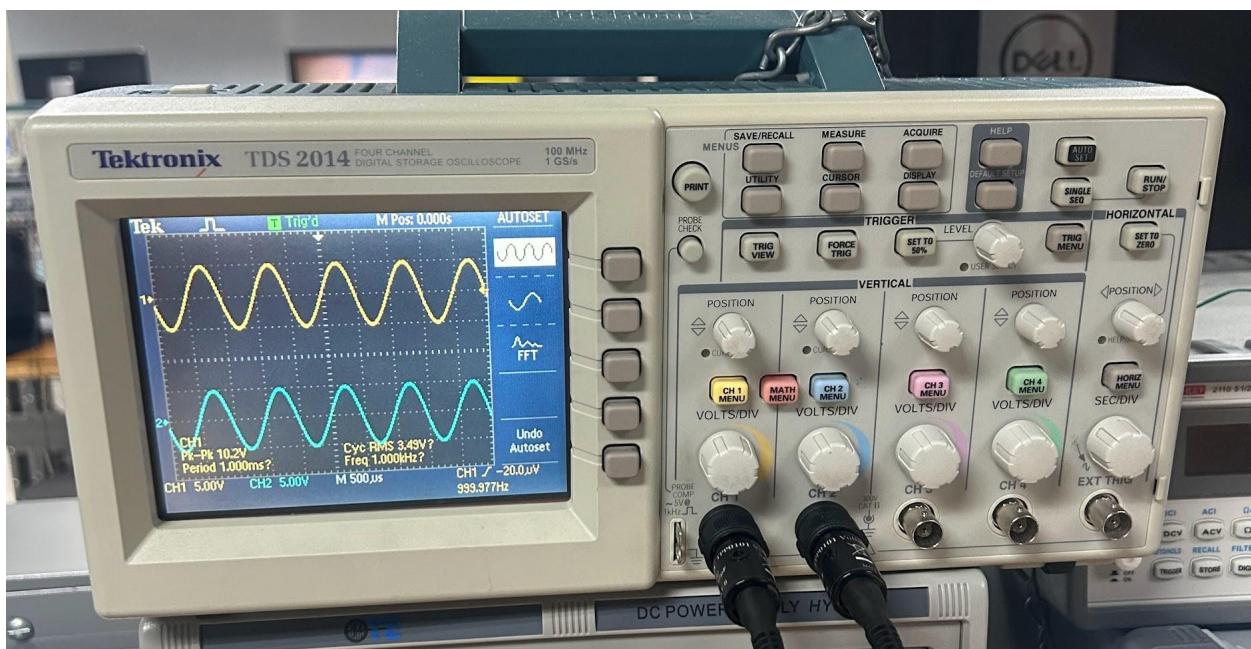
### AC Circuit for B.:



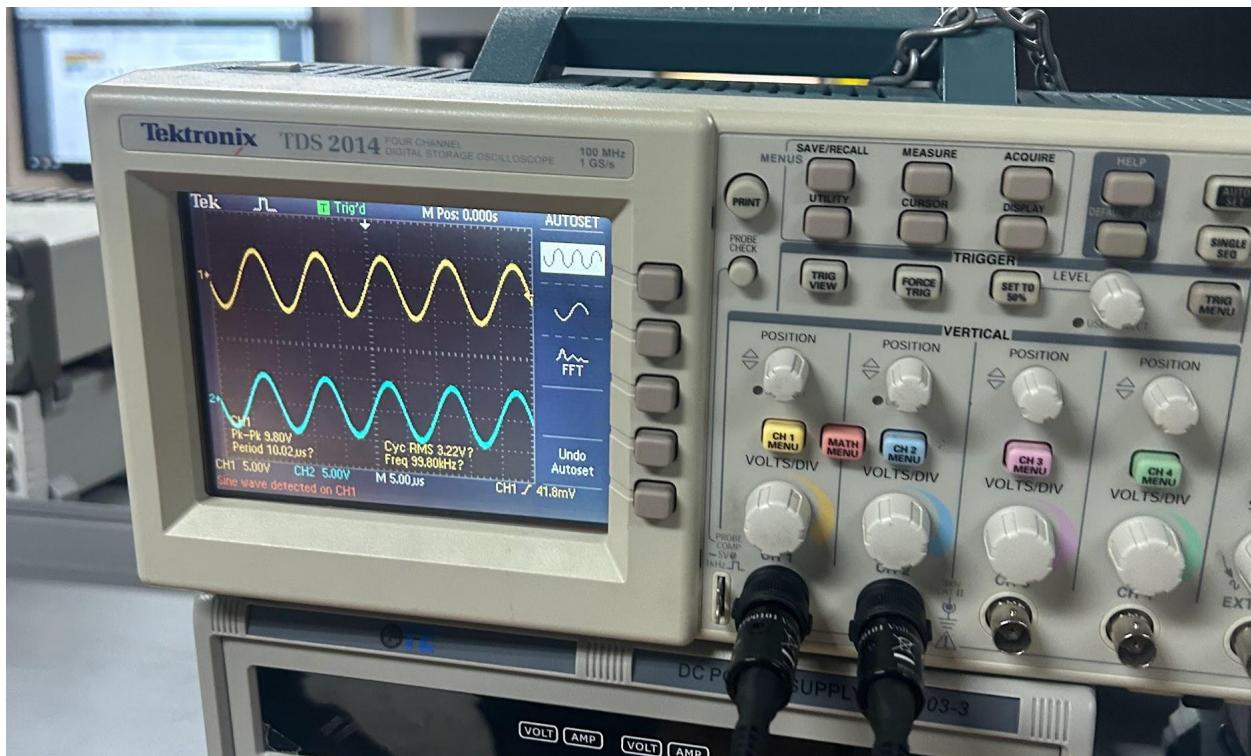
### AC Measurement for B (10 Hz):



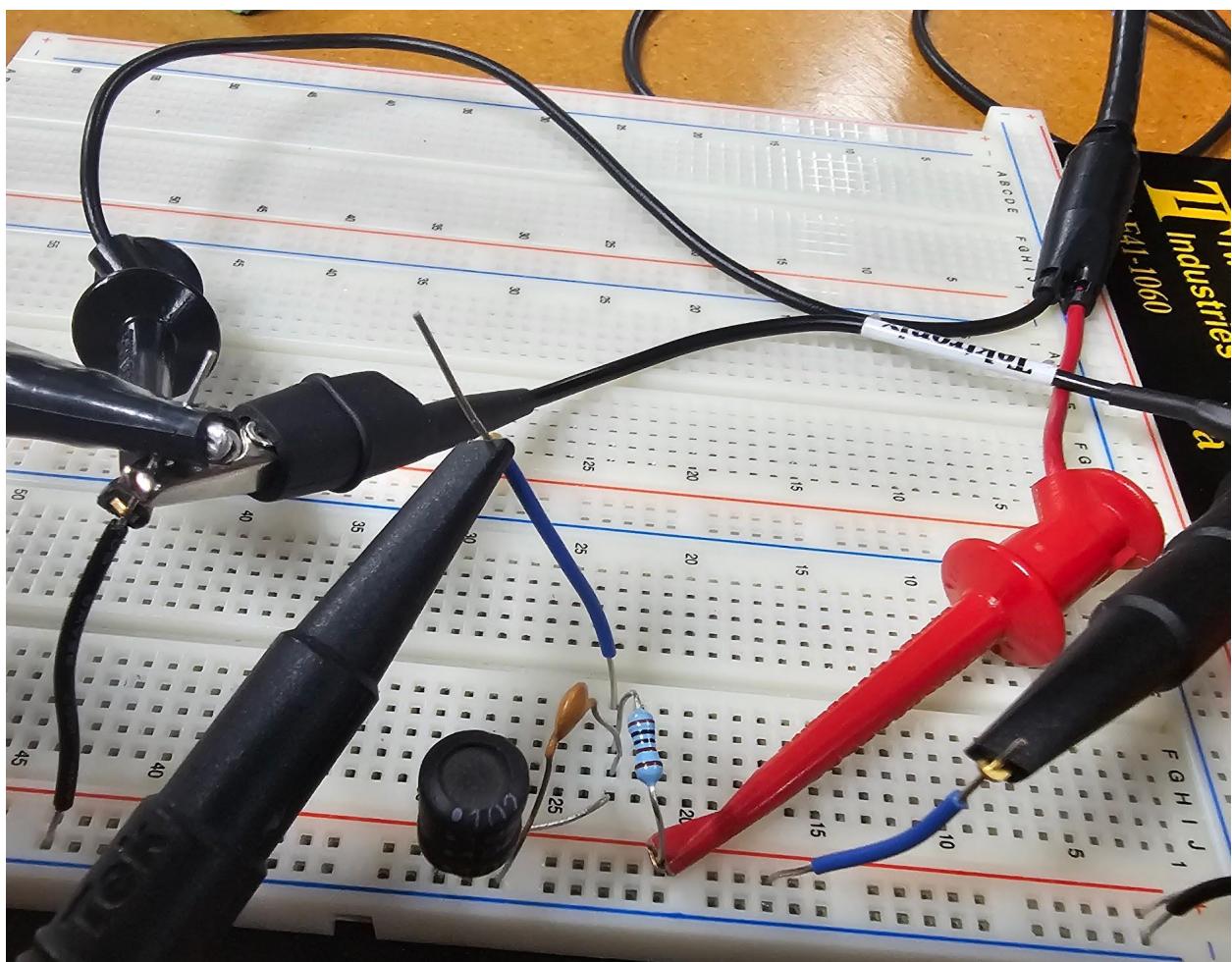
### AC Measurement for B (1 kHz):



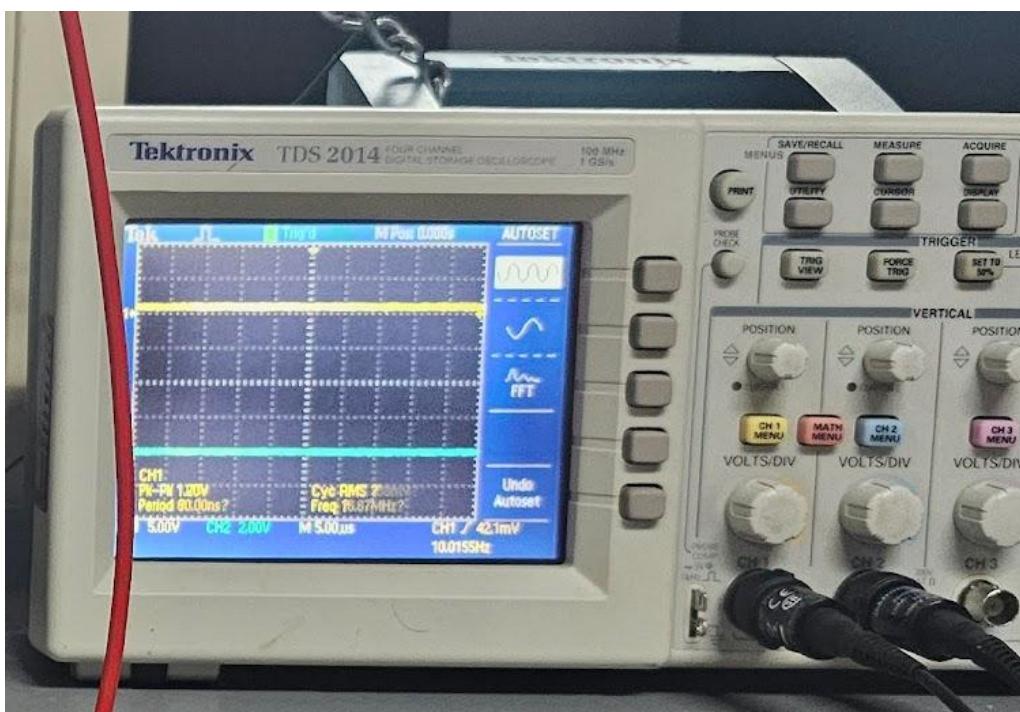
### **AC Measurement for B (100 kHz):**



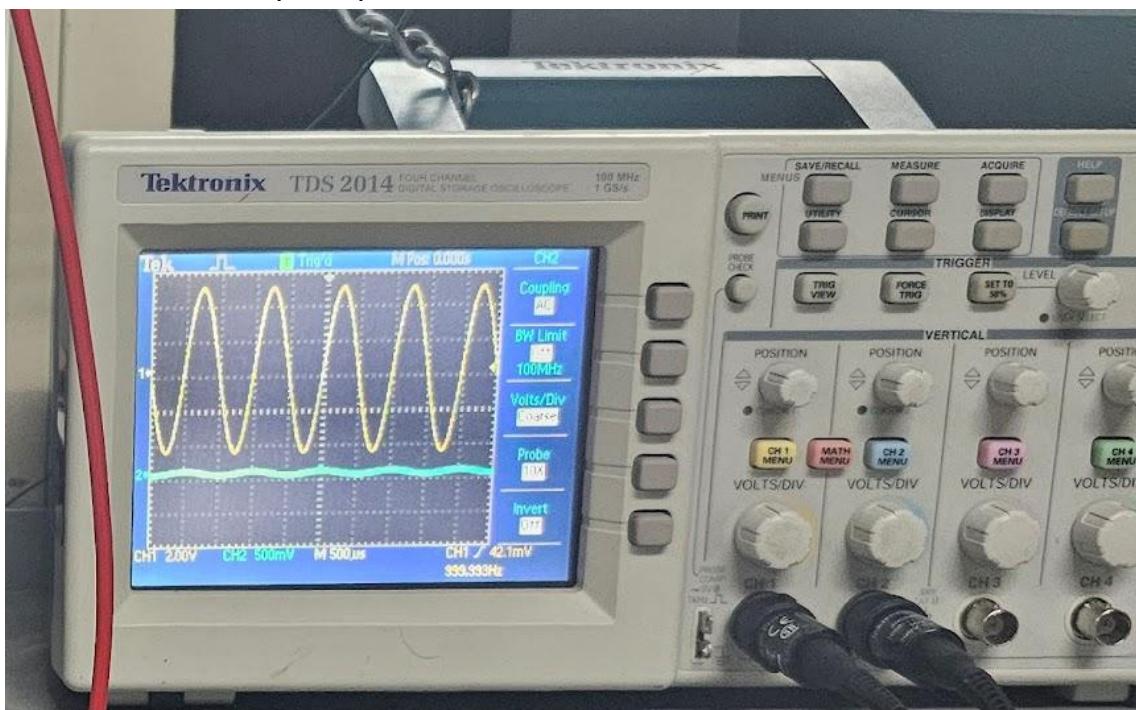
## AC Circuit for C.:



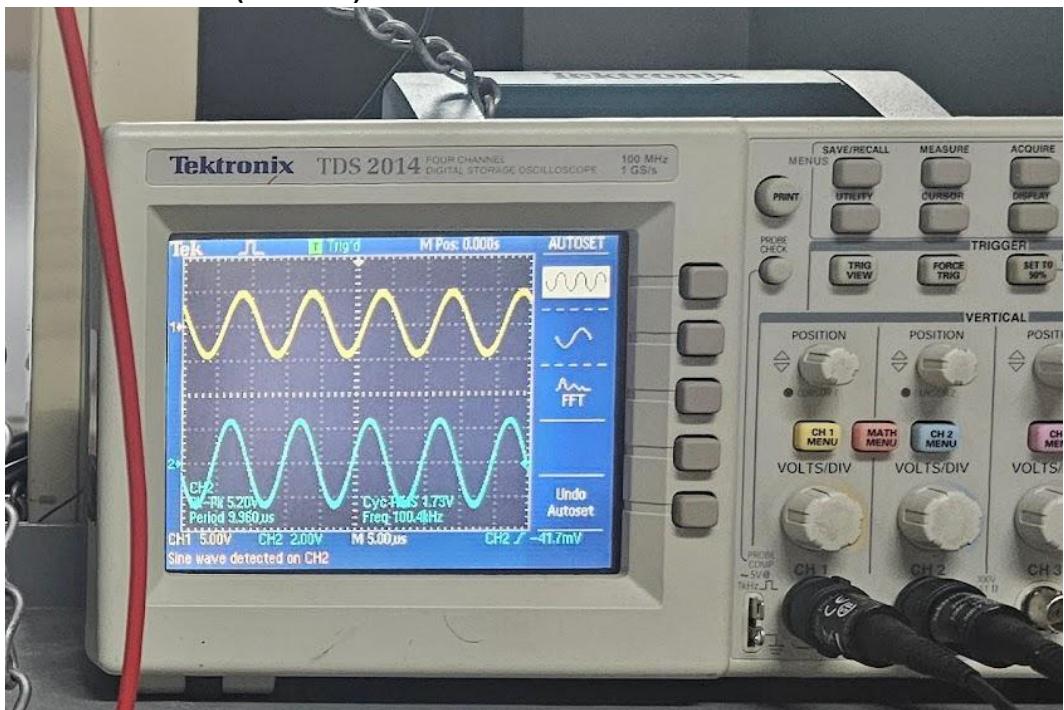
### AC Measurement for C (10 Hz):



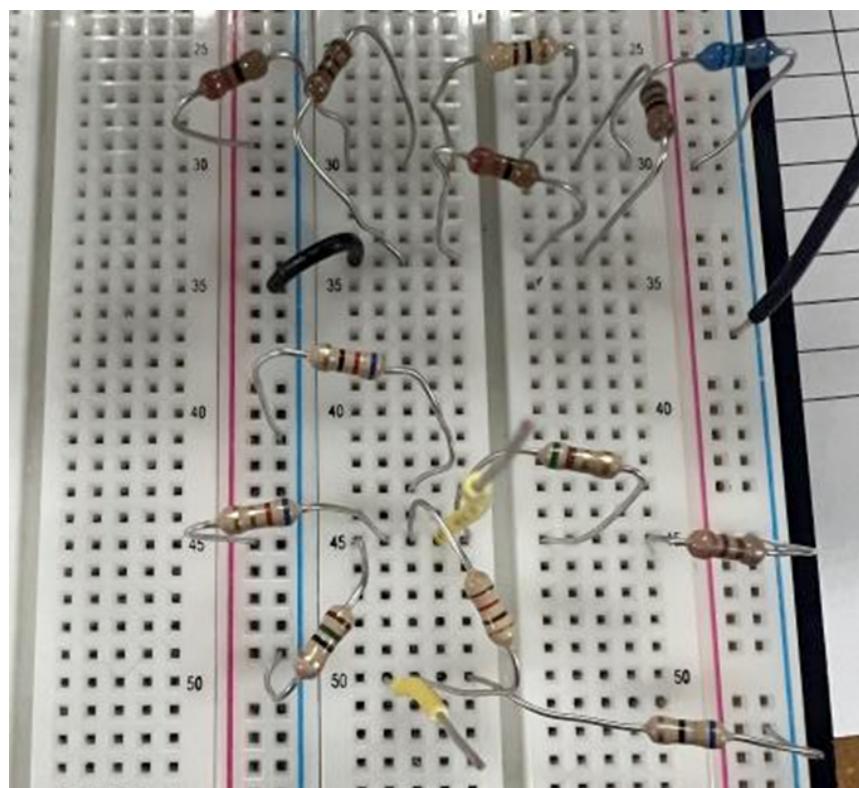
### AC Measurement for C (1 kHz):



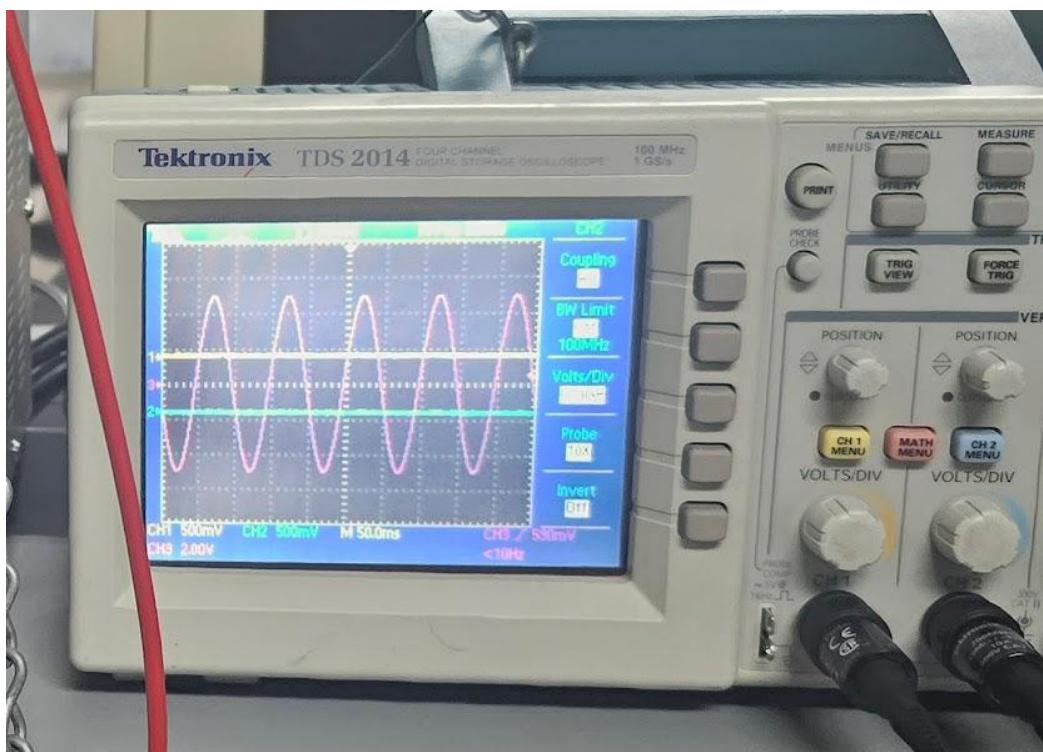
### AC Measurement for C (100 kHz):



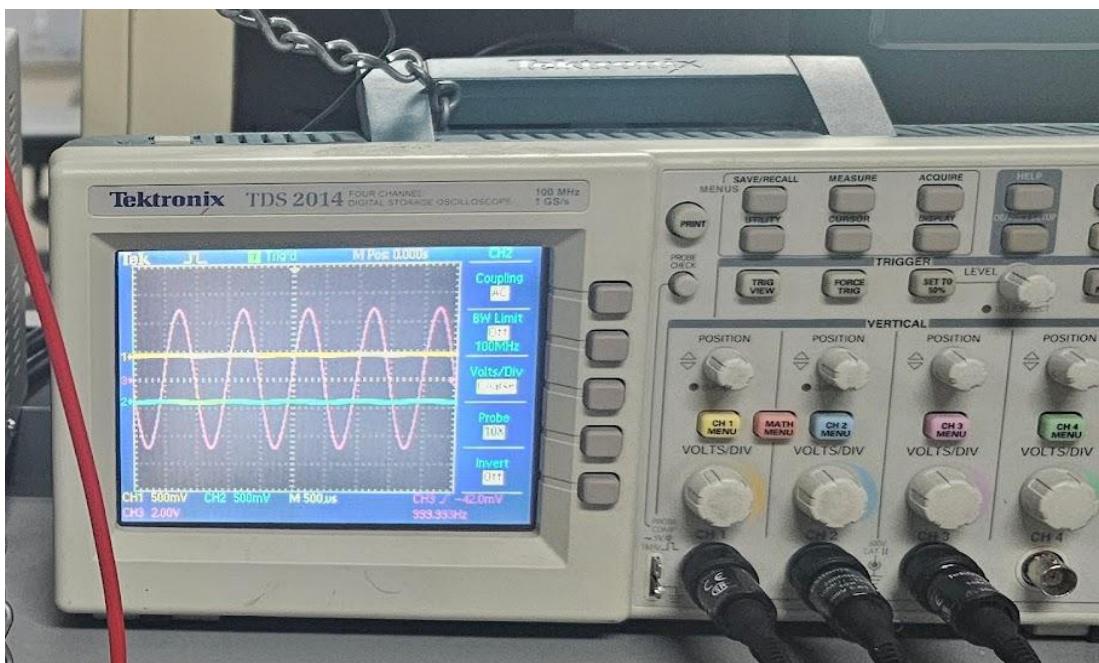
### AC Circuit for D.:



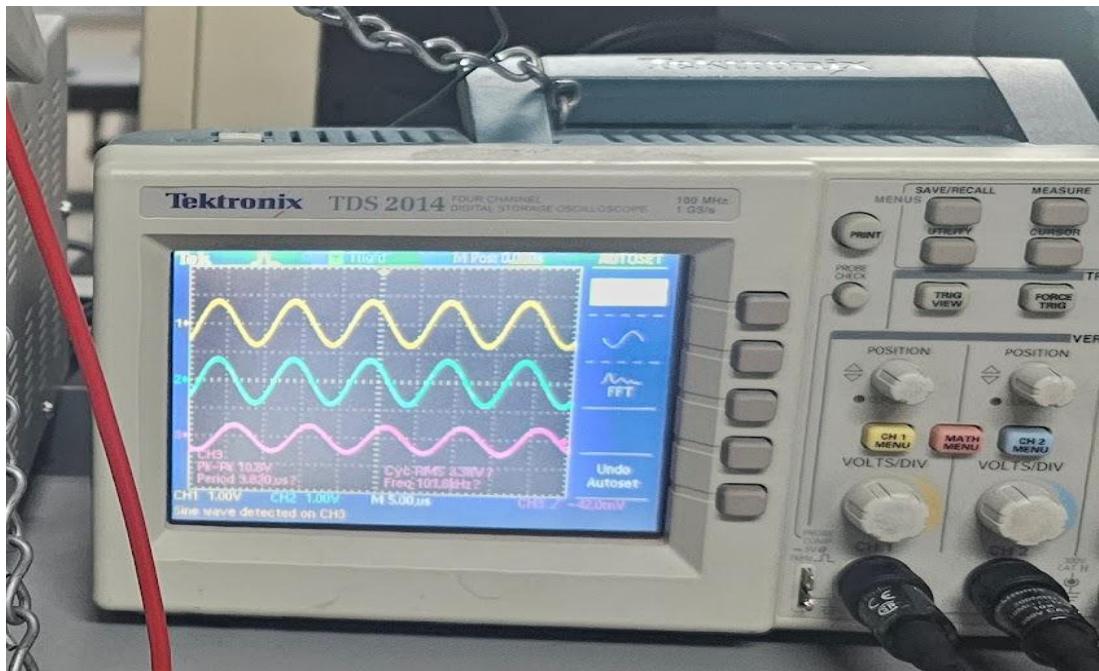
AC Measurement for D (10 Hz):



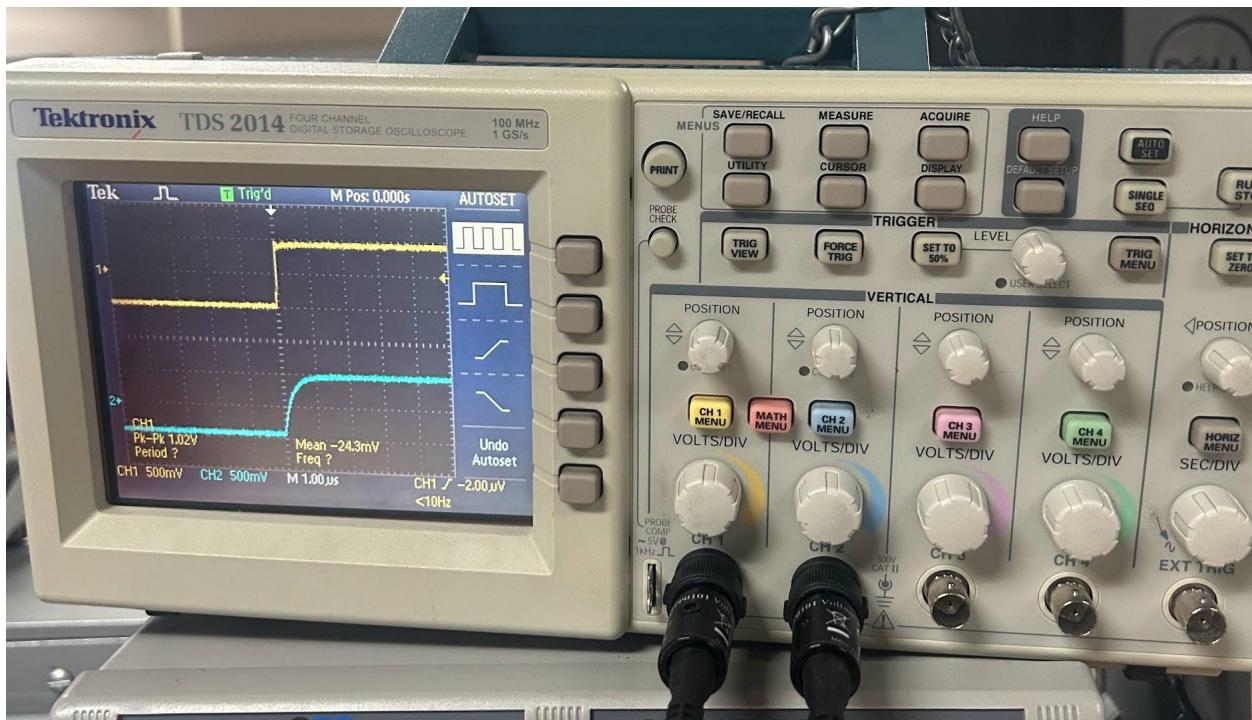
AC Measurement for D (1 kHz):



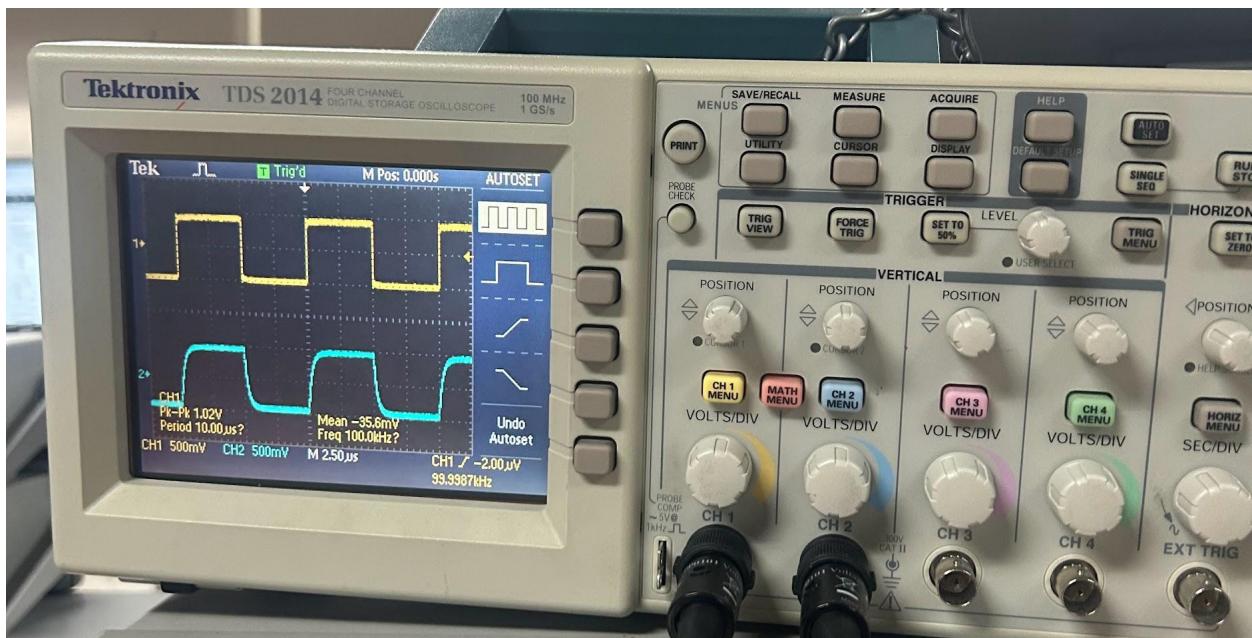
### AC Measurement for D (100 kHz):



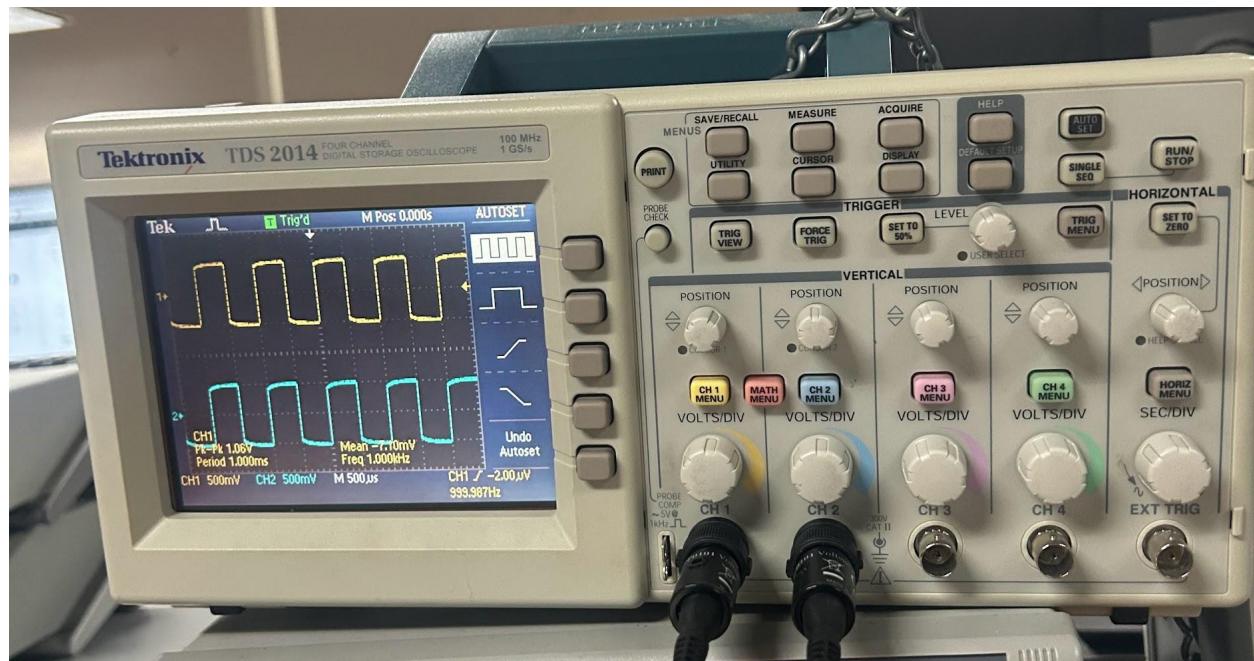
### Experiment 3 AC Square Waveform Measurement for B (10 Hz):



### Experiment 3 AC Square Waveform Measurement for B (1 kHz):



## **Experiment 3 AC Square Waveform Measurement for B (100 kHz):**



## DC Circuits

	Circuit (a)	Circuit (b)	Circuit (c)	Circuit (d)		
	V1	V1	V1	V1	V2	V3
Hand Calc. (Ideal)	0 V	5 V	5 V	1.38 V	1.84 V	0 V
LTspice	0 V	5 V	5 V	1.38 V	1.84 V	0 V
Measurement	0 V	5 V	0 V	1.45 V	1.93	0.11

## AC Circuits

10 Hz	Circuit (a)		Circuit (b)		Circuit (c)		Circuit (d)		
	V1	V2	V1	V2	V1	V2	V1	V2	V3

Hand Calc. (Ideal)	5 V	69.1 mV	5 V	5 V	5 V	0.31 mV	5 V	78.5 $\mu$ V	78.4 $\mu$ V
LTspice	5 V	69 mV	5 V	4.99 V	5 V	0.31 mV	5 V	78.4 $\mu$ V	78.4 $\mu$ V
Measurement	5 V	5 V	5 V	5 V	5 V	2 V	2 V	0.5 V	0.5 V

1k Hz	Circuit (a)		Circuit (b)		Circuit (c)		Circuit (d)		
	V1	V2	V1	V2	V1	V2	V1	V2	V3
Hand Calc. (Ideal)	5 V	4.05 V	5 V	2.87 V	5 V	32 V	5 V	7.92 mV	7.9 mV
LTspice	5 V	4.0 V	5 V	2.93 V	5 V	31.3 mV	5 V	7.83 mV	7.84 mV
Measurement	5 V	5 V	5 V	5 V	2 V	0.5 V	2 V	0.5 V	0.5 V

100k Hz	Circuit (a)		Circuit (b)		Circuit (c)		Circuit (d)		
	V1	V2	V1	V2	V1	V2	V1	V2	V3
Hand Calc. (Ideal)	5 V	5 V	5 V	36 mV	5 V	36.6 mV	5 V	15.6 mV	8.8 mV
LTspice	5 V	4.98 V	5 V	35.51 mV	5 V	35.73 mV	5 V	15.3 mV	8.87 mV
Measurement	5 V	5 V	5 V	5 V	5 V	2 V	1 V	42 mV	1 V

### **3. Encountered Problems**

The problems I encountered during the lab had to do with getting the AC circuits set up, more specifically getting all the correct equipment, plugging everything into the correct spots, and

being able to effectively measure the circuit voltage values. We also had an issue with some of our equipment being faulty as the oscilloscope at our station wasn't working properly.

#### **4. Questions and Answers**

**Experiment 1 Question 1 - Compare Circuit A, B, C Values of V1:** The results of my experiment for circuits A, B, and C were mostly consistent in comparison to my preliminary findings. Circuits A and B provided results that matched those found in the prelab. However, circuit C did not. This could be a result of a mistake I made in my prelab.

**Experiment 1 Question 2 - Compare Circuit D Values of V1, V2, and V3:** The results of all the measured voltages in circuit D were very close to my findings from the prelab, both my hand calculations and my LTspice simulations

**Experiment 2 Question 1 - VPP of Various Frequencies:** The VPP values are similar in some spots but vary in other nodes of the circuit where more impedances are introduced. Mathematically, this is due to Ohm's Laws. Voltage equals current multiplied by impedance.

**Experiment 3 Question 1 - Waveform Slopes/Sparks:** The values of the waveform transition from positive to negative voltages (and vice versa) far more abruptly than with the traditional sinusoidal waveform shape. This in turn also creates sharper slopes that are nearly vertical as well as longer, more easily-observable periods of voltages remaining the same.

#### **5. Conclusions**

I learned the primary differences between DC and AC circuits and how each functions and how AC circuits are built and measured differently. I learned what equipment is needed for AC circuit breadboard implementation. I also learned how to better understand and use the function generator and oscilloscope and how different aspects of each can be used in tandem for various measurables of AC circuits.