LAB NOTE

Subject: Electronic Design Principles

Topic: Instrumental Amplifier

Student: Minh Quan Tran

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1. Objectives

- Build an Instrumentation Amplifier with all 7 input resistor are the same
- Show your design in using Multisim in your pre-lab.
- Prepare a table for measurement in advance to prove that your circuit work by comparing your calculated values with the actual values.

2. Theory and Calculation

2.1 Theory

- An instrumentation amplifier (IA) amplifies the voltage difference between its terminals. It is optimized for small differential signals that may be riding on a large common mode voltages.

2.2 Design and Calculation

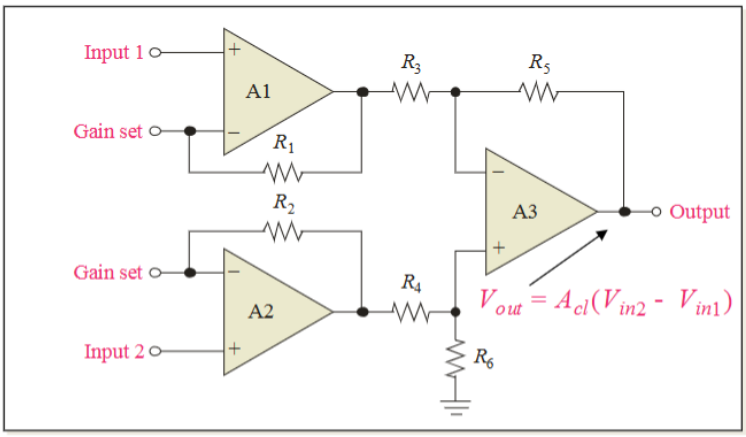


Figure 2-1: Instrumentation Amplifier's design

For this design the following equipment are use:

- 7 Resistors 10k
- IC LM348N
- Function Generator
- Power Supply

Formula to calculate V_{out}:

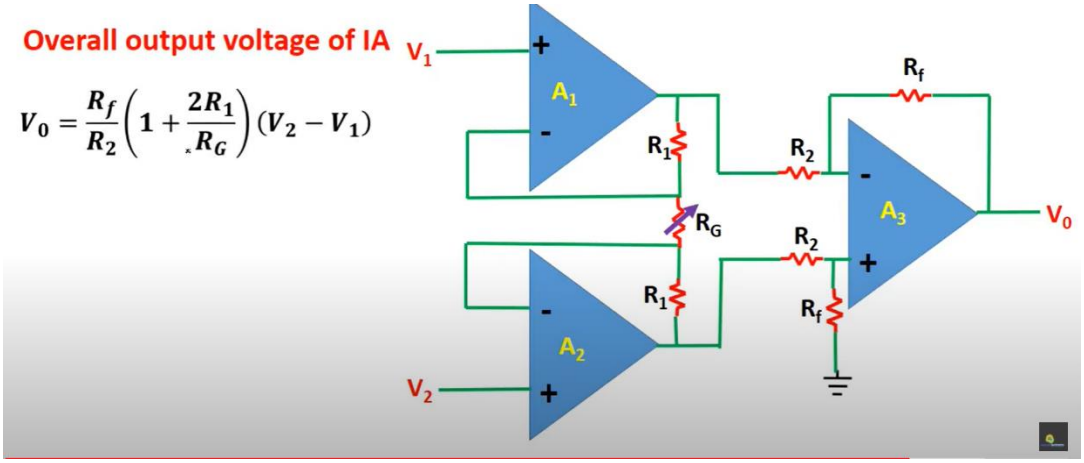


Figure 2-2: Formula to calculate V_{out}

So with all R are the same:

$$A = \frac{R}{R}\left(1 + \frac{2R}{R}\right)$$

$$A = 3$$

- **Power supply:**

recommended operating conditions

	MIN	MAX	UNIT
Supply voltage, V_{CC+}	4	18	V
Supply voltage, V_{CC-}	–4	–18	V

Figure 2-3: LM348N's datasheet

From the datasheet, it said that it recommended that the power supply of V_{cc+} should be in range from 4V to 18V, and for V_{cc-} should be from -4 to -18.

3. Design and Result

For this assignment, 6 cases will be tested, 3 will be with DC power and 3 will be from AC power.

3.1 Multisim's design.

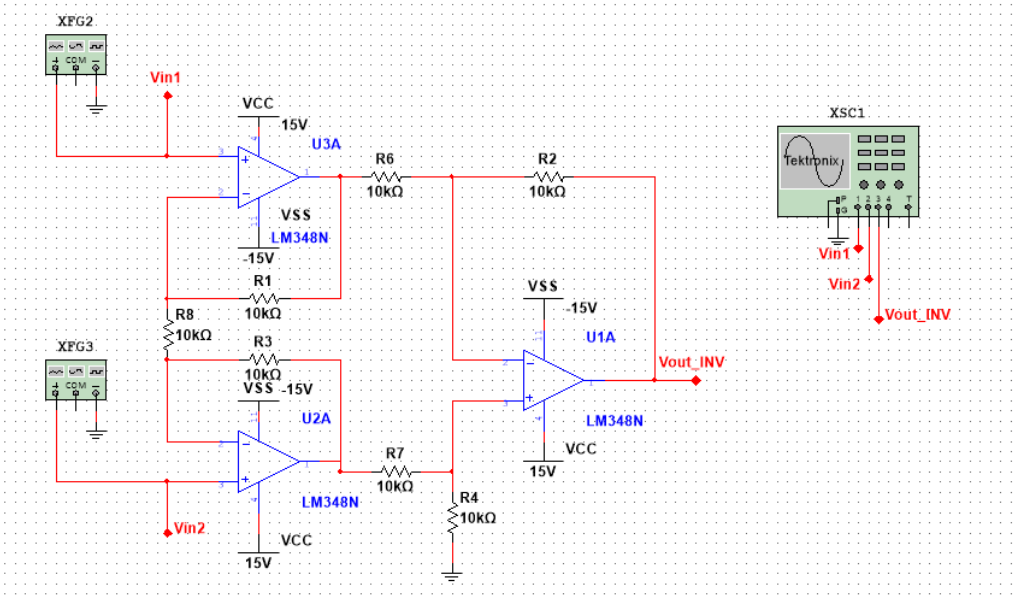


Figure 3-1: Multisim's design

3.2 Breadboard's design

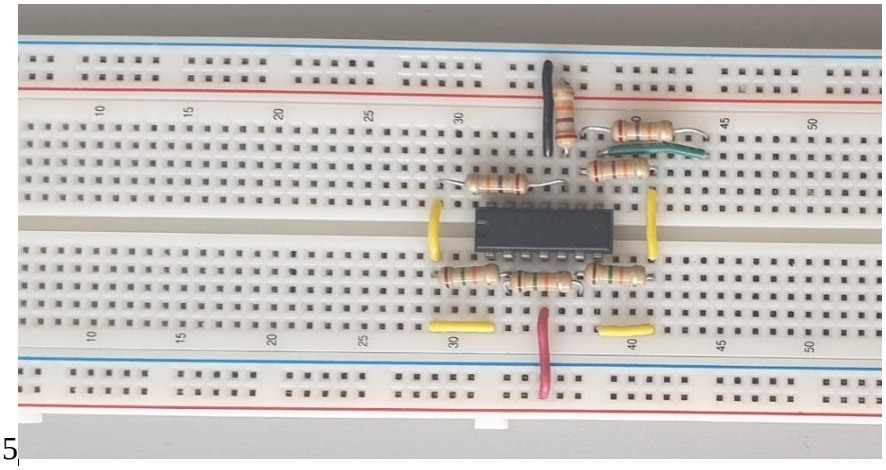
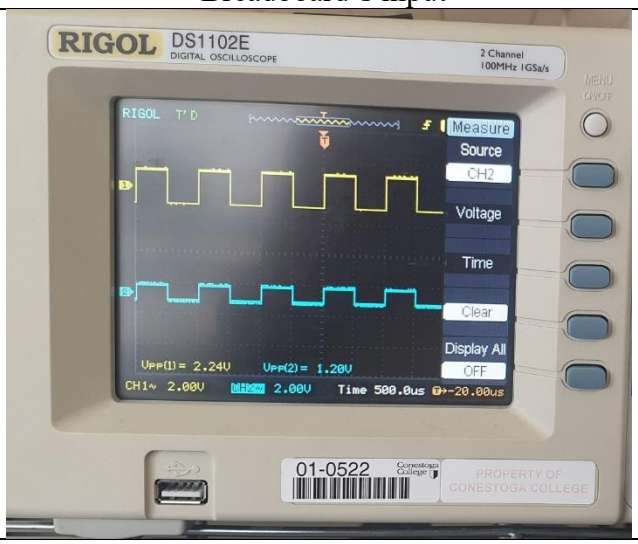
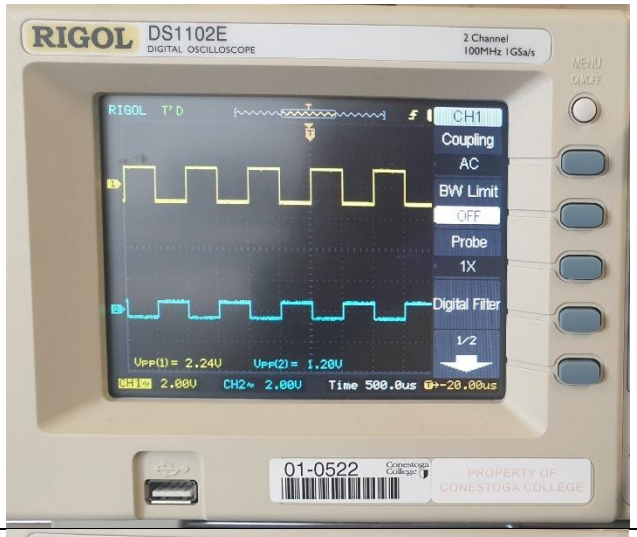
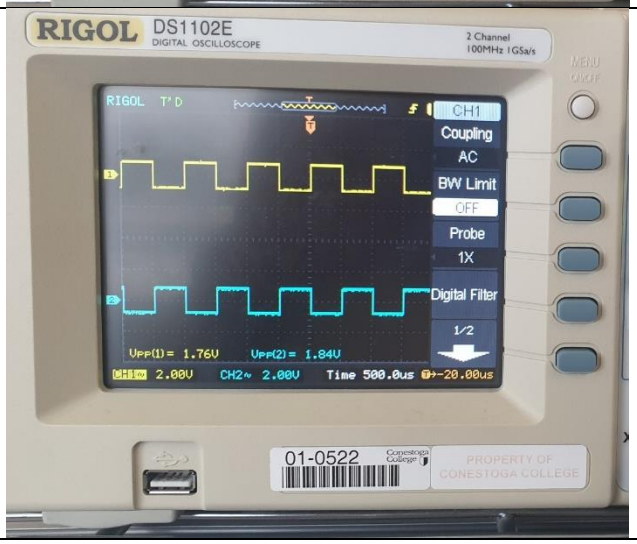


Figure 3-2: Breadboard's design

3.3 Result

- Input:

V_1	V_2	Breadboard's input
2.24	1.2	
-2.24	1.2	
-1.76	1.84	

3. Result

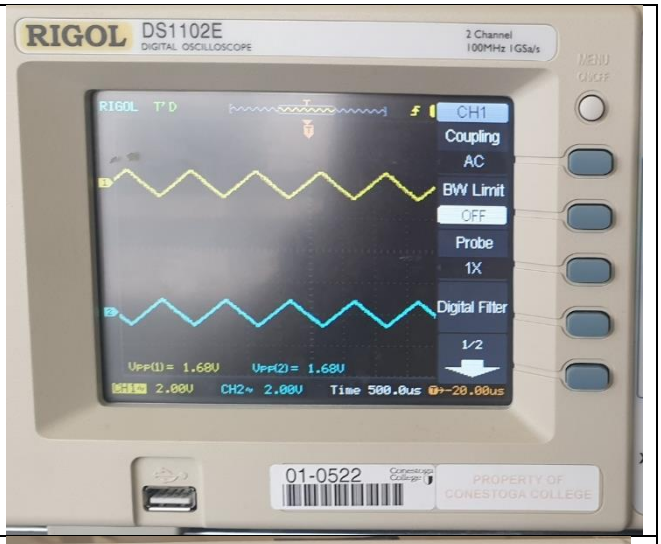
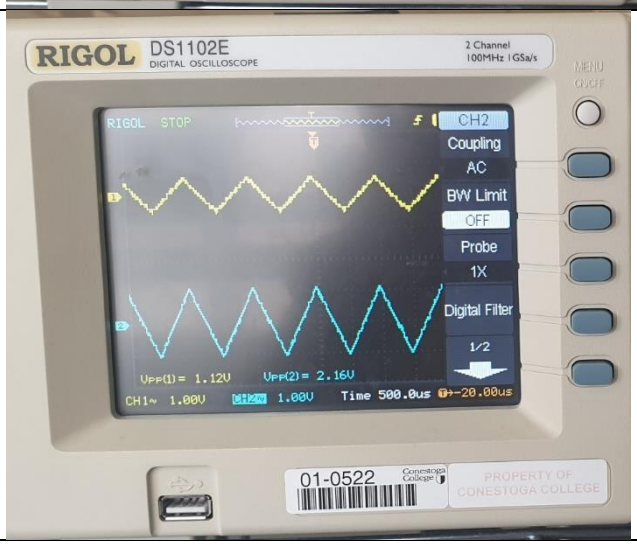
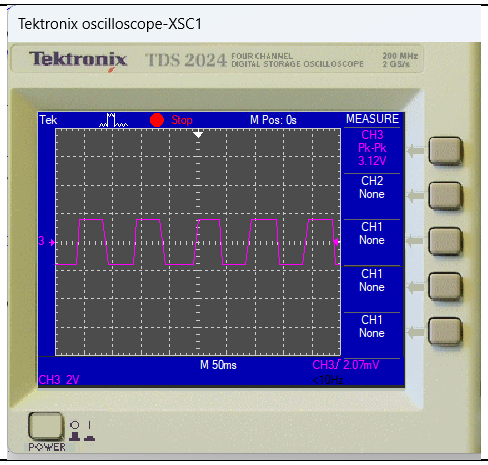
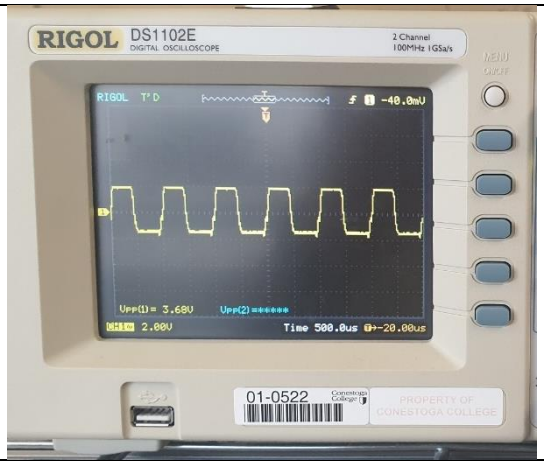
-1.68	1.68	
1.12	2.16	

Table 3-1: Input for Instrumentation Amplifier

- Output:

Input ($V_2 - V_1$)	Output		
	Theory	Multisim	Breadboard
1.04	3.12		

3. Result

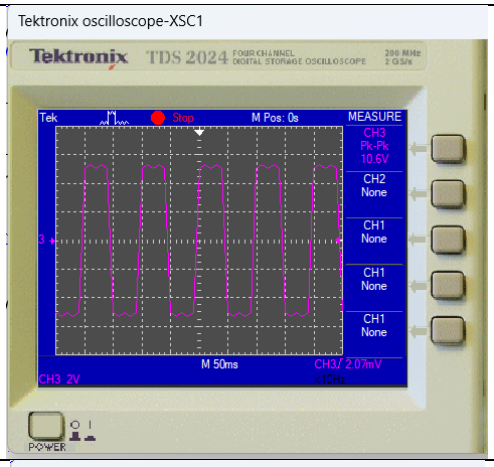
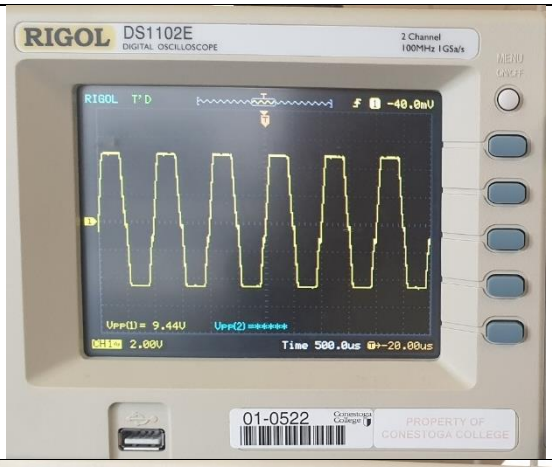
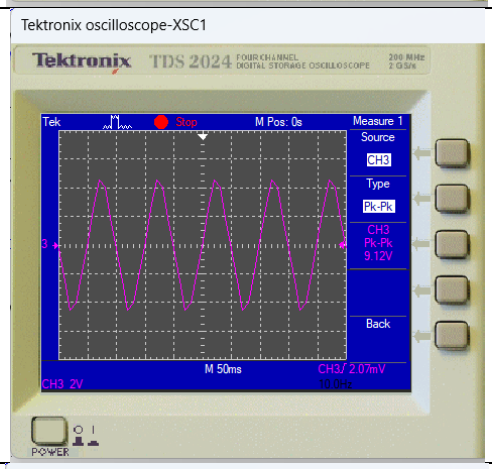
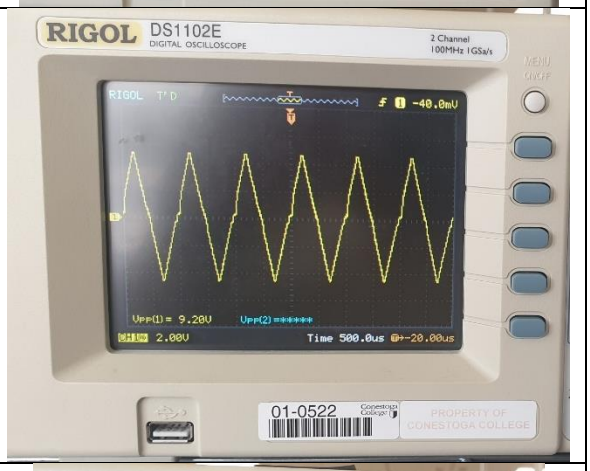
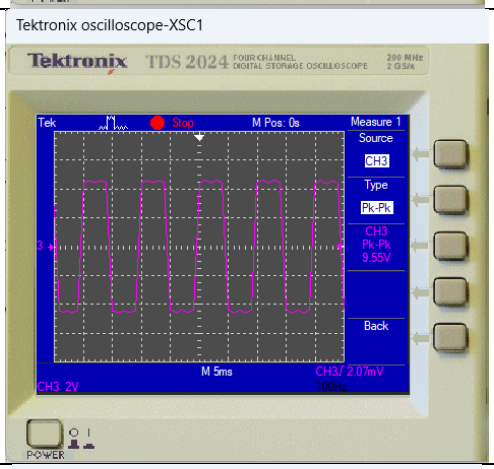
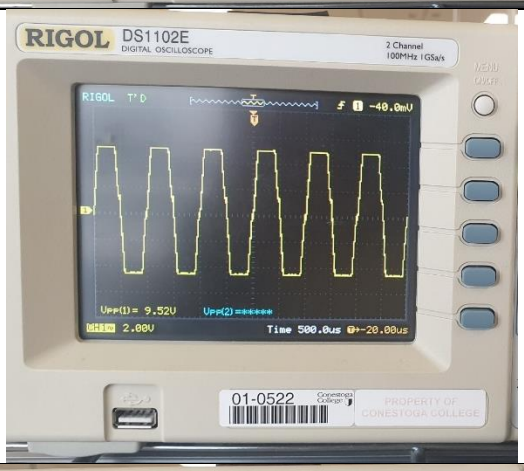
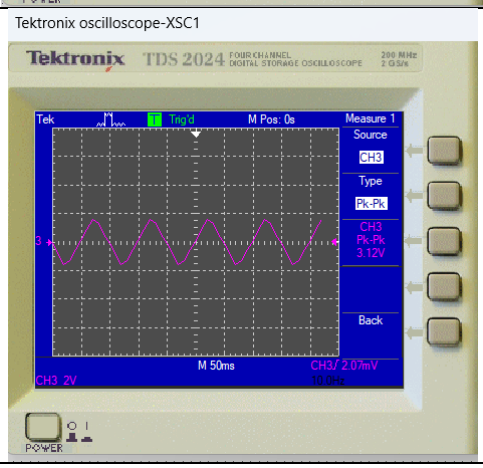
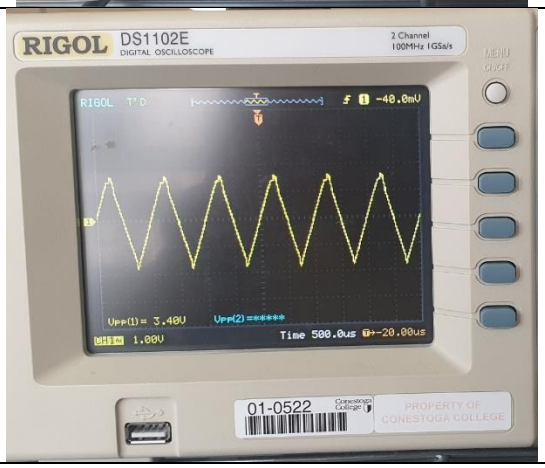
3.44	10.76		
3.2	9.6		
3.6	10.8		
1.04	3.12		

Table 3-2: Output for Instrumentation Amplifier

4. CONCLUSION

From the result of all cases:

- All cases have Theory's result, Multisim's result and Breadboard's result nearly the same.

REFERENCES