LAB NOTE

Subject: Electronic Design Principles

Topic: Scale Adder

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1. Objectives

- Build a scaled adder that one inverting input with R1 will be amplified by 10 and the other R2 by 5.
- Use 10 kOhm resister for one of the input resisters, R1 and calculate Rf. Use the same Rf to calculate R2.
- 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

- A scaling adder has two or more inputs with each input having a different gain. The output represents the negative scaled sum of the inputs.

2.2 Design and Calculation

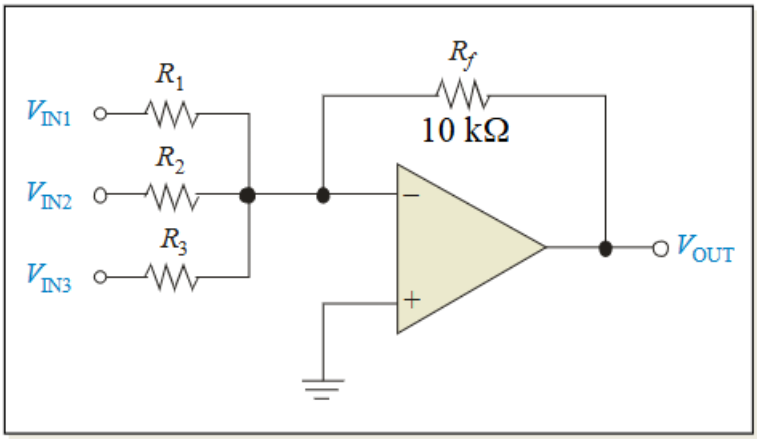

Figure 2-1: Scale Adder's design

For this design the following equipment are use:

- Resistor $10k\Omega$, Resistor $22k\Omega$ and Resistor $100k\Omega$
- IC LM348N
- Function Generator
- Power Supply

Formula to calculate gain:

$$A_i = -\frac{R_f}{R_i}$$

Formula to calculate V_{out}:

$$V_{out} = \sum_{i=1}^{\infty} A_i \times V_{in_i}$$

- **Calculation for R_f:**

The requirement stated that it need the gain of 10 for input 1 and gain 2 for input 2, with $R_1 = 10k\Omega$:

$$A_1 = -\frac{R_f}{R_1}$$

$$-10 = -\frac{R_f}{10k\Omega}$$

$$R_f = 100k\Omega$$

2. Theory and Calculation

- **Calculation for R_2:**

$$A_2 = -\frac{R_f}{R_2}$$

$$-5 = -\frac{100k\Omega}{R_1}$$

$$R_2 = 20k\Omega$$

Because the kit does not have a resistor with value $20k\Omega$, so instead will use $22k\Omega$ resistor.

- **Power supply:**

recommended operating conditions

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

Figure 2-2: 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.

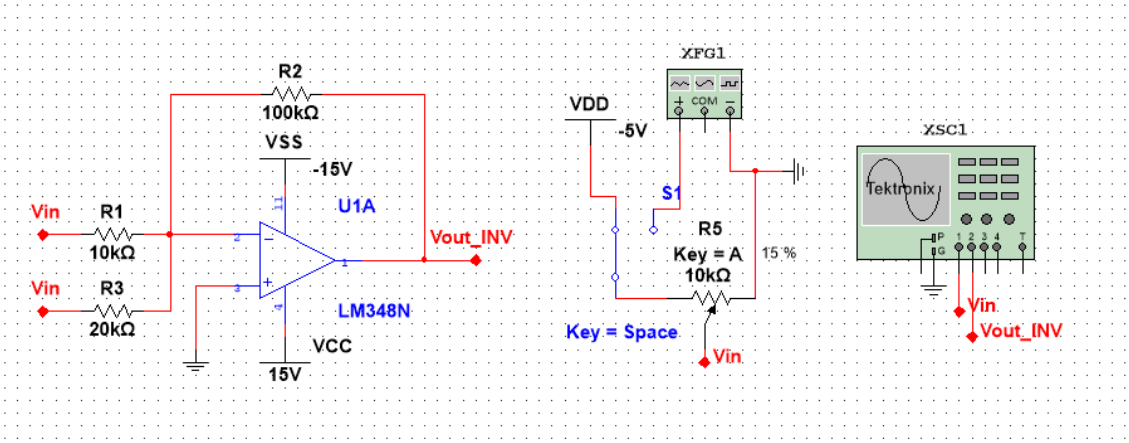

Figure 3-1: Multisim's design

3.2 Breadboard's design

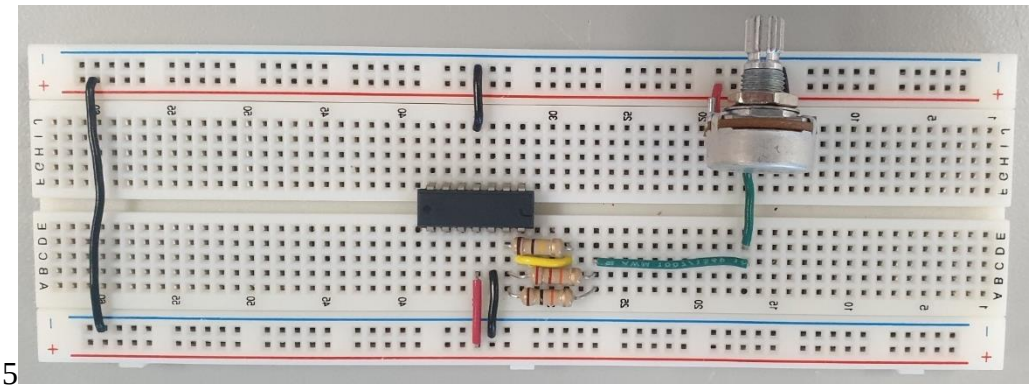

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Figure 3-2: Breadboard's design

3.3 Result

3.3.1 DC power

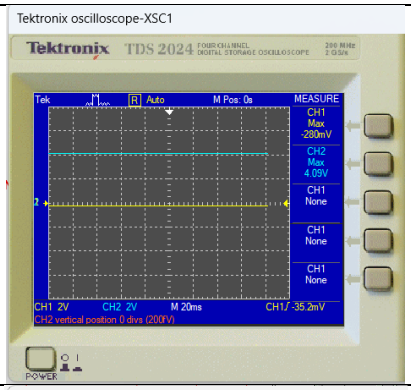
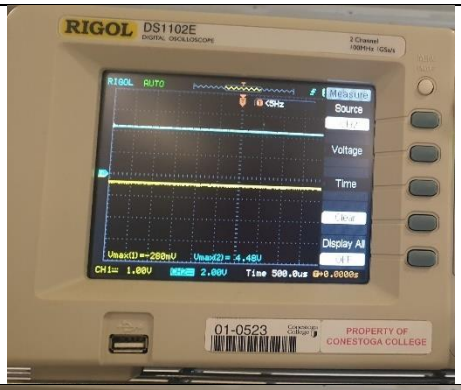
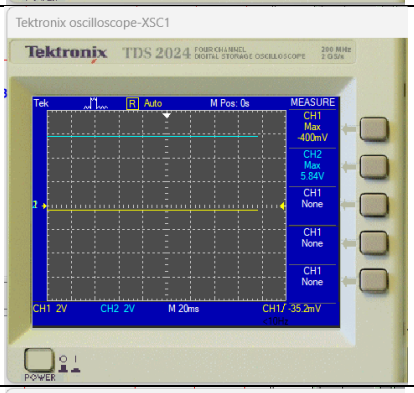
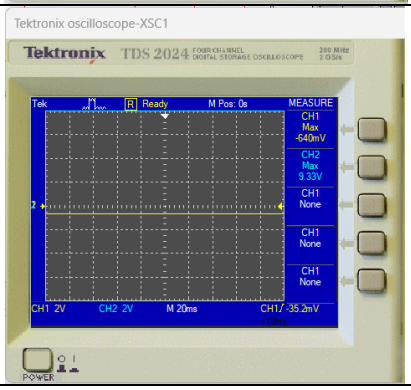
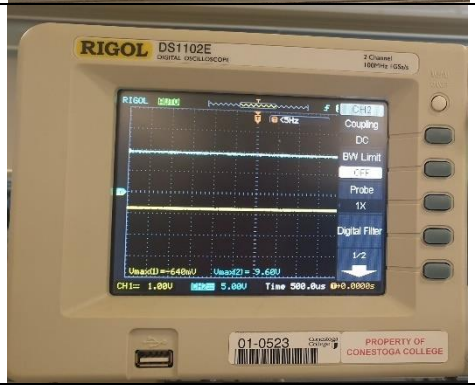
Input	Output		
	Theory	Multisim	Breadboard
-0.28	4.2		
-0.4	6		
-0.64	9.6		

Table 3-1: DC power for Scale Adder

3.3.2 AC power

- Inverting

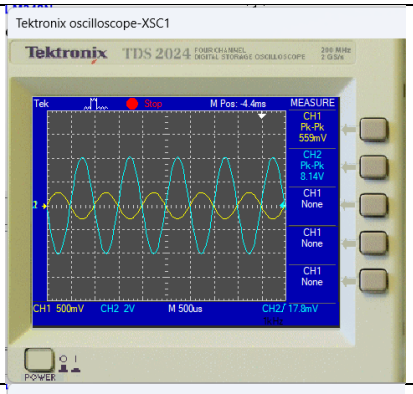
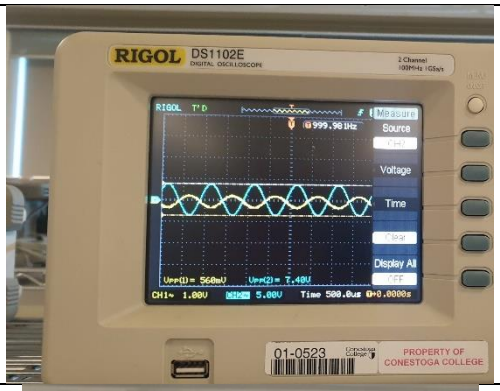
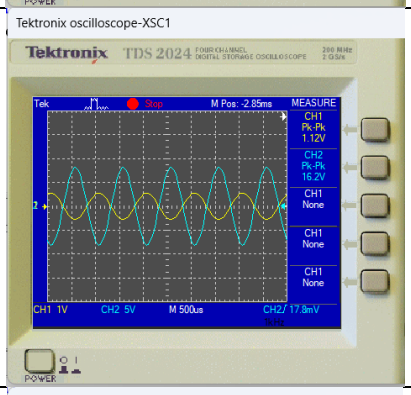
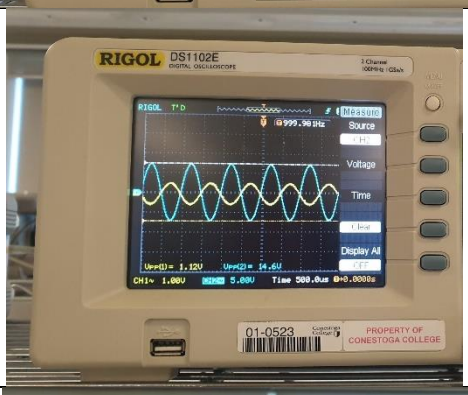
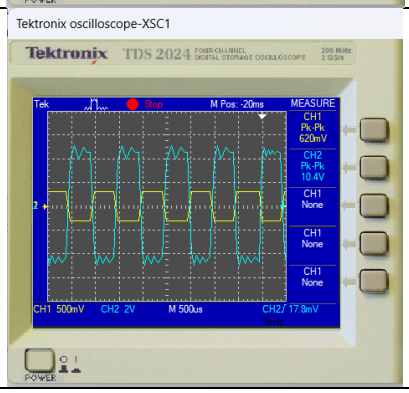
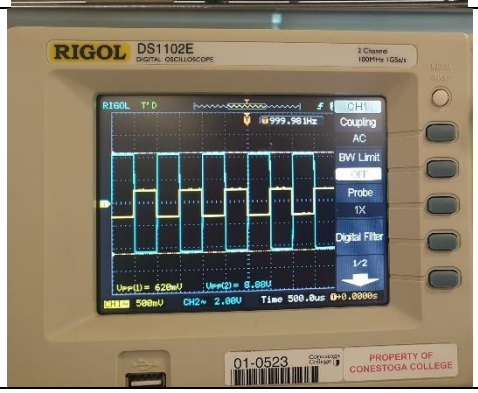
Input (Vpp)	Output		
	Theory	Multisim	Breadboard
0.56	7.4		
1.12	16.8		
0.62	9.3		

Table 3-2: AC power for Scale Adder

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