**LAB NOTE**

**Subject: Electronic Design Principles**

**Topic: Instrumental Amplifier**

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# 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.

# Theory and Calculation

## 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.

## Design and Calculation

A diagram of a circuit

Description automatically generated

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 Vout:

A diagram of a circuit

Description automatically generated

Figure 2‑2: Formula to calculate Vout

So with all R are the same:

* **Power supply:**

**A black and white line

Description automatically generated with medium confidence**

Figure 2‑3: LM348N's datasheet

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

# Design and Result

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

## Multisim’s design.

A diagram of a circuit

Description automatically generated

Figure 3‑1: Multisim's design

## Breadboard’s design

5 A white circuit board with black and red wires

Description automatically generated

Figure 3‑2: Breadboard’s design

## Result

* Input:

|  |  |  |
| --- | --- | --- |
| V1 | V2 | Breadboard’s input |
| 2.24 | 1.2 |  |
| -2.24 | 1.2 |  |
| -1.76 | 1.84 |  |
| -1.68 | 1.68 |  |
| 1.12 | 2.16 |  |

Table 3‑1: Input for Instrumentation Amplifier

* Output:

|  |  |  |  |
| --- | --- | --- | --- |
| Input  (V2 – V1) | Output | | |
| Theory | Multisim | Breadboard |
| 1.04 | 3.12 |  |  |
| 3.44 | 10.76 |  |  |
| 3.2 | 9.6 |  |  |
| 3.6 | 10.8 |  |  |
| 1.04 | 3.12 |  |  |

Table 3‑2: Output for Instrumentation Amplifier

# CONCLUSION

From the result of all cases:

* All cases have Theory’s result, Multisim’s result and Breadboard’s result nearly the same.

**REFERENCES**