ELCN8005-21F-Sec1-Electronics Design Principles

- **Experiment:** Scaled Adder

- **Submitted by:**

  - **Name:** Naren Subburaj

  - **Student number:** 8772452

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OBJECTIVE:

- Build a scaled adder that is inverting input with R1 will be amplified by 10 and the other R2 by 5.
- Use 10 K Ohm resister for the input resister (R1) and calculate Rf. Use the same Rf to calculate R2.
- Show your design in using Multi Sim 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.

EQUIPMENTS:

Hardware	Software
LM348 – 1	Multisim
Resistor – 100k,10k,20k	
Power supply – 5v	
Multimeter – 1	
Breadboard – 1	

SCHEMATIC IN MULTISIM:

OUTPUT:

Multimeter-XMM1 ✕

-1.997 V

| A | V | Ω | dB |

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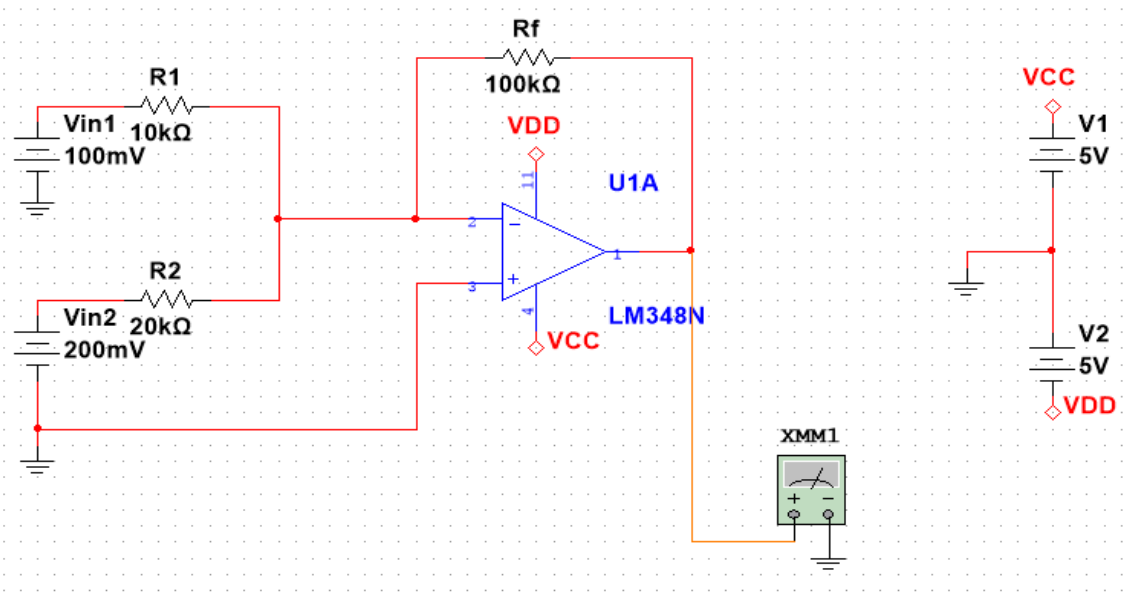
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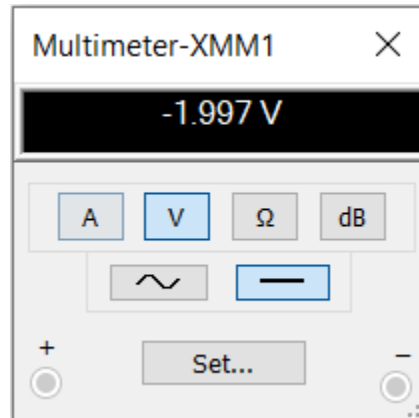
INPUT:

Resistor:

R1 – 10k

R2 – 20k

Rf – 100k

Input Voltage:

V1	V2
100mv	200mv
100mv	100mv
250mv	50v
50mv	50mv
300mv	200mv

CALCULATIONS:

R1 = 10k; A_{v1} = 10; A_{v2} = 5

R1 = -Rf / A_{v1}

10k = -Rf / 10

Rf = 100k

R2 = -Rf / A$_{v2}$

R2 = 100k / 5

R2 = 20K

$$V_{out} = - \left(\frac{R_f \cdot V_1}{R_{in1}} + \frac{R_f \cdot V_2}{R_{in2}} + ... \right)$$

Case 1:

Vout = -(100000*0.1/10000 + 100000*0.2/20000)

= -2v

Case 2:

Vout = -(100000*0.1/10000 + 100000*0.1/20000)

= -1.5v

Case 3:

Vout = -(100000*0.25/10000 + 100000*0.05/20000)

= -2.75v

Case 4:

Vout = -(100000*0.05/10000 + 100000*0.05/20000)

= -0.75v

Case :5

Vout = -(100000*0.3/10000 + 100000*0.2/20000)

= -4v

THEORY VS PRACTICAL:

Theory Vout	Practical Vout
-2v	-1.997v
-1.5v	-1.497v
-2.75v	-2.747v
-0.75v	-0.746v
-4v	-3.298v

CONCLUSION:

The summing amplifier can be used as adder, average and scaler. In this experiment we performed scaling adder. In scaling adder, the input voltage, input resistor and feed back resistor are different. In this circuit the input resistor R1 is 10k, R2 is 20k and feedback resistor is 100k by calculating using gain formula. The input voltage to the circuit is given as millivolt due the op amp configuration. The output voltage is negative because the input is given through the inverting pin. To get positive voltage unity amplifier most be used.

DISCUSSION:

From performing this experiment, I am able to build the scaling adder circuit in multi sim and breadboard. Understood the working principle of the scaled adder.

Reference: https://www.electronics-tutorials.ws/opamp/opamp_4.html