

Electrical & Electronics Engineering

EEE Lab Report

Course: Electronic Devices and Circuits & Pulse Techniques Lab

Course Code: EEE 204

Experiment No: 06

Experiment Name: Difference Amplifier

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Signature and Date

Mr. Md. Sharif Nafis Mahmood

Lecturer

Department of EEE

Green University of Bangladesh

Experiment No: 06

Experiment Name: Difference Amplifier

Aim: To design and setup a difference amplifier circuit - with OP AMP 741C for a gain of 2 and verify the output.

Objectives: After completion of this experiment, we will be able to design and setup a difference amplifier using OP AMP.

Equipments/Components:

SL. No.	Name and Specification	Quantity required
01.	Dual power supply $\pm 15V$	1
02.	DC power source 1.5 V	1
03.	Function generator (0-1MHz)	1
04.	Oscilloscope	1
05.	Bread board	1
06.	IC 741C	1
07.	Resistor	3
08.	Probes and connecting wires	As required

Principle: A difference amplifier is a circuit that gives the amplified version of the difference of the two inputs, $V_o = A(V_1 - V_2)$, where V_1 and V_2 are the inputs and A is the voltage gain. Here input voltage V_1 is connected to non-inverting terminal and V_2 to the inverting terminal. This is also called

as differential amplifier. Output of a differential amplifier can be determined using super position theorem. When $V_1 = 0$, the circuit becomes an inverting amplifier with input V_2 and the resulting output is $V_{02} = -R_f/R_i (V_2)$. When $V_2 = 0$, the circuit become a non-inverting amplifier with input V_1 and the resulting output is $V_{01} = R_f/R_i (V_1)$. Therefore the resulting output according to super position theorem is

$$\begin{aligned} V_0 &= V_{01} + V_{02} \\ &= \frac{R_f}{R_i} (V_1 - V_2) \end{aligned}$$

Procedure:

01. Check the components.

02. Setup the circuit on the breadboard and check the connections.
03. Switch on the power supply.
04. Give $V_2 = +1.5V$ DC - with Polarity as shown.
05. Give $V_1 = 1V_{pp}/1KHz$ sine - wave.
06. Make sure that the oscilloscope coupling selector in the D.C. position.
07. Observe input and output on oscilloscope simultaneously.
08. Note down and draw the input and output waveforms on the graph.

Circuit Diagram:

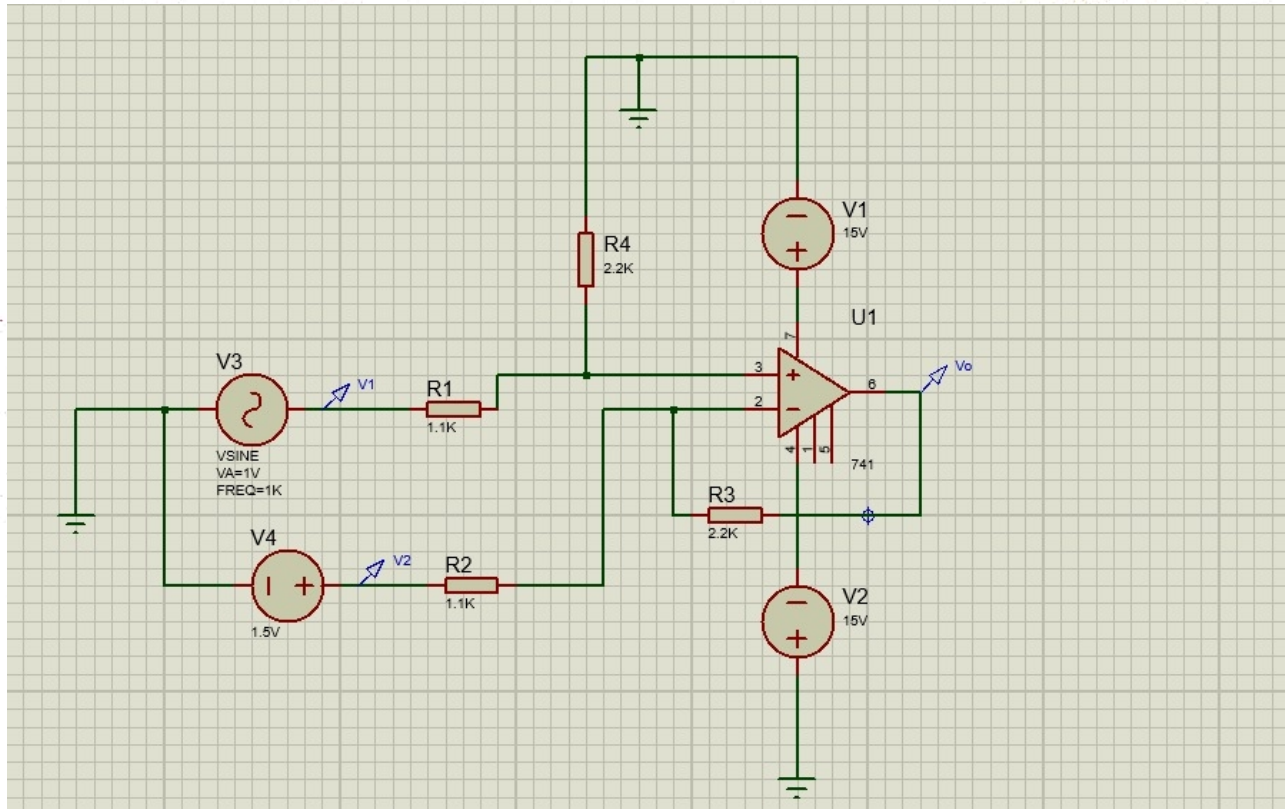


Figure: Difference Amplifier (Proteus)

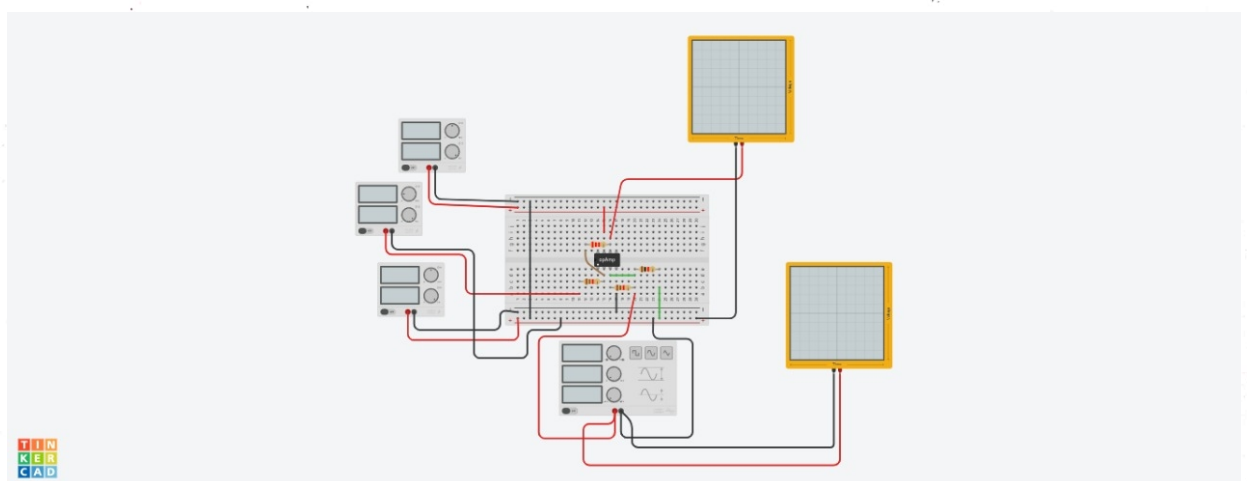
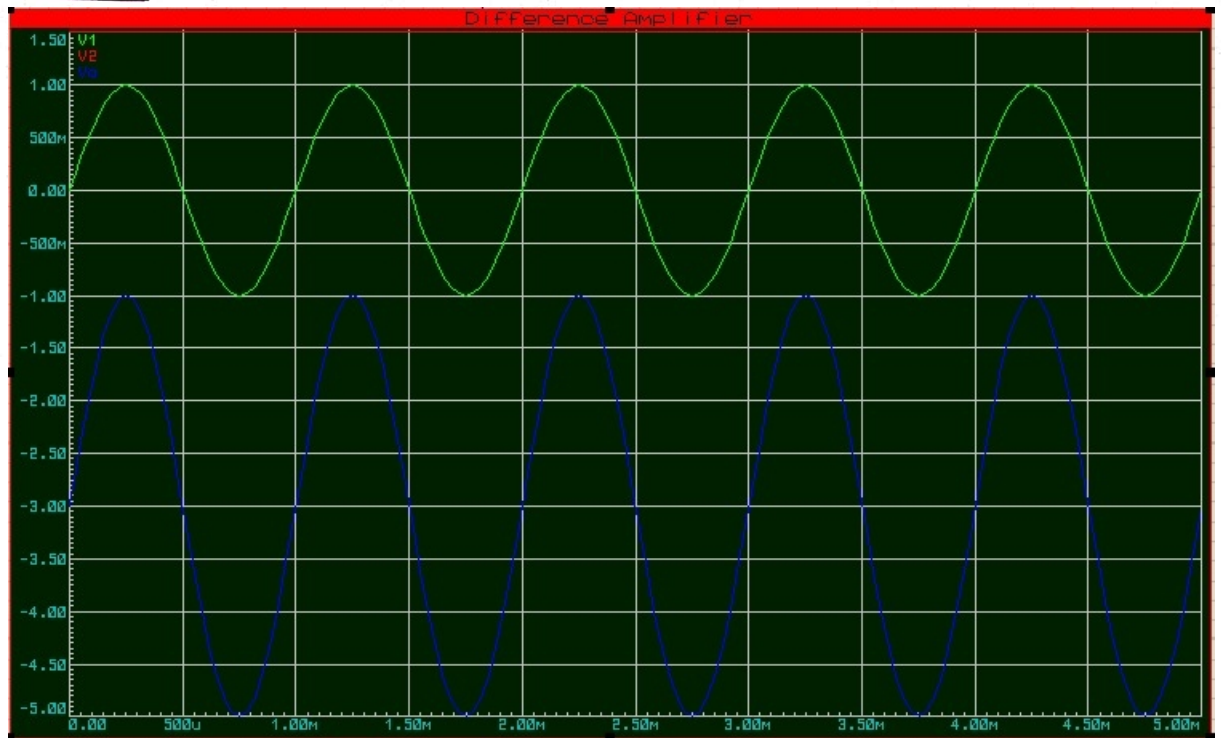


Figure: Difference Amplifier (TinkerCAD)

Graph:

Graph: Difference Amplifier

Result:

We know that,
Gain of a difference amplifier is given
by,

$$V_o = V_{o1} + V_{o2}$$

$$= \frac{R_f}{R_i} (V_1 - V_2).$$

Here,
we let,

$$R_f = 2.2 \text{ K}\Omega \text{ and } R_i = 1.1 \text{ K}\Omega$$

Therefore, $V_o = \frac{2.2}{1.1} (V_1 - V_2)$
 $= 2 (V_1 - V_2)$.

If we use $V_2 = 1.5 \text{ V}$ then,

$$V_o = 2 (V_1 - 1.5)$$
$$= 2V_1 - 3 \text{ [for that, the output graph will start from } -3]$$

Discussion:

The difference amplifier is a amplifier which amplifies the voltage difference present on its inverting and non-inverting inputs.

From this experiment, we can design an OP amp which can produce single output as a weighted difference of

input signals. By this experiment, we learned that difference amplifier is basically an op amp is a subtractor based circuit which produces an output equal to the difference of the input voltages.

Finally - we can say that, this experiment is more effective to gain knowledge about a difference amplifier and from this experiment we can realize that, how difference amplifier works. So at last we can say that, this experiment is more effective for us.

References:

- [1] Lab Manual for EEE 204 Course
[Made & Edited by Mr. Md.]

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