# Lab Report

# Lab Session-4


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**Aim:**

To find out the voltage at the output pin of an op-amp (LM741) for different cases.

**Components used:**

Resistors, Function Generator, Oscilloscope, Breadboard, Wires, IC-LM741,DC-Power Source.

**Theory:**

An operational amplifier op-amp, for short, is fundamentally a voltage-amplifying device designed to be used with external feedback components such as resistors and capacitors between its output and input terminals. It is a three-terminal device with two inputs- an inverting (‘-‘) and a non-inverting input(‘+’). The magnitude of amplification can be decided by adjusting the ratio of the resistance values in a simple op-amp circuit. The output voltage Vout=Vin( 1 +$\frac{R2}{R1}$).The following is the pictorial description of the internal circuit in the IC (LM-741).

Pin 1,5-Offset Null

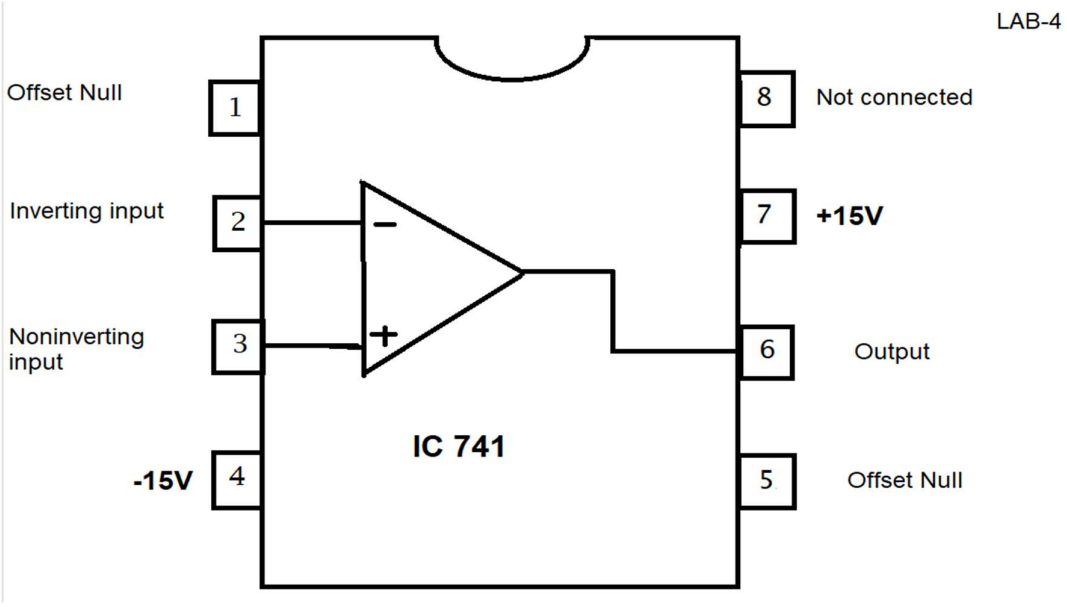
Pin 2 -Inverting input

Pin 3-Non-Inverting Input

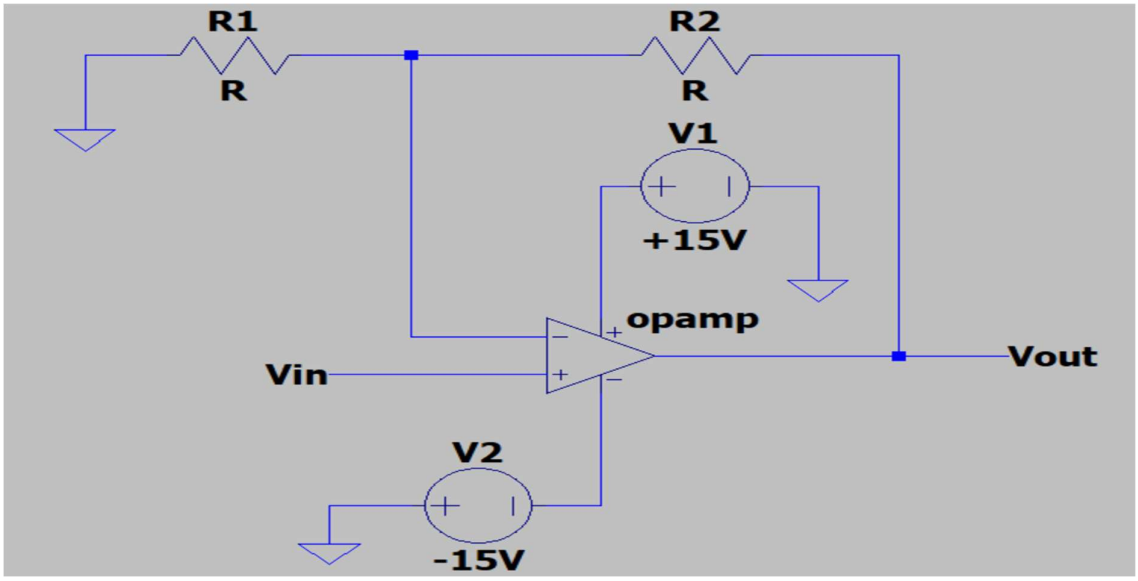
Pin 4,7 – DC power input

Pin 6 – Output pin

The op-amp is connected in negative feedback.




Below is the circuit diagram done in LTSpice.

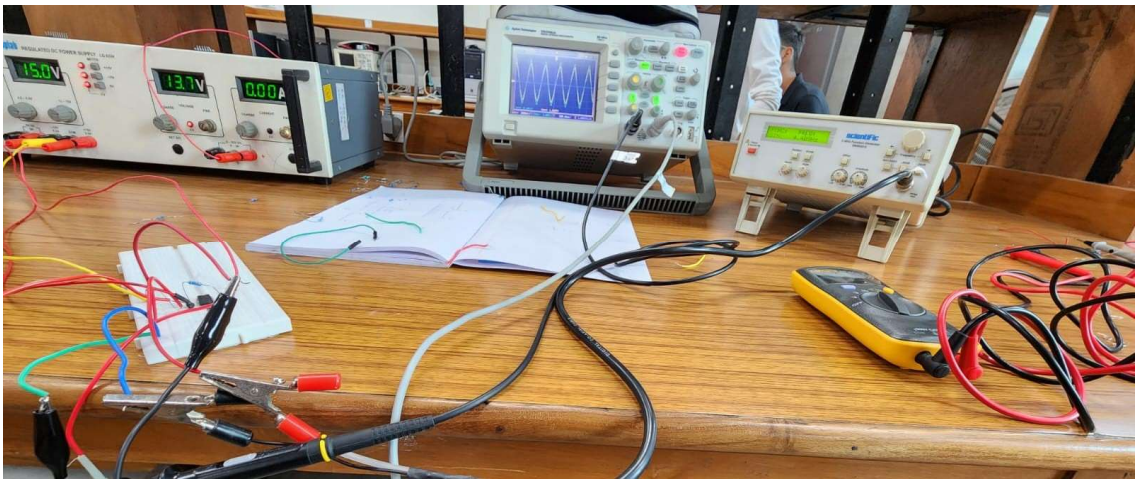


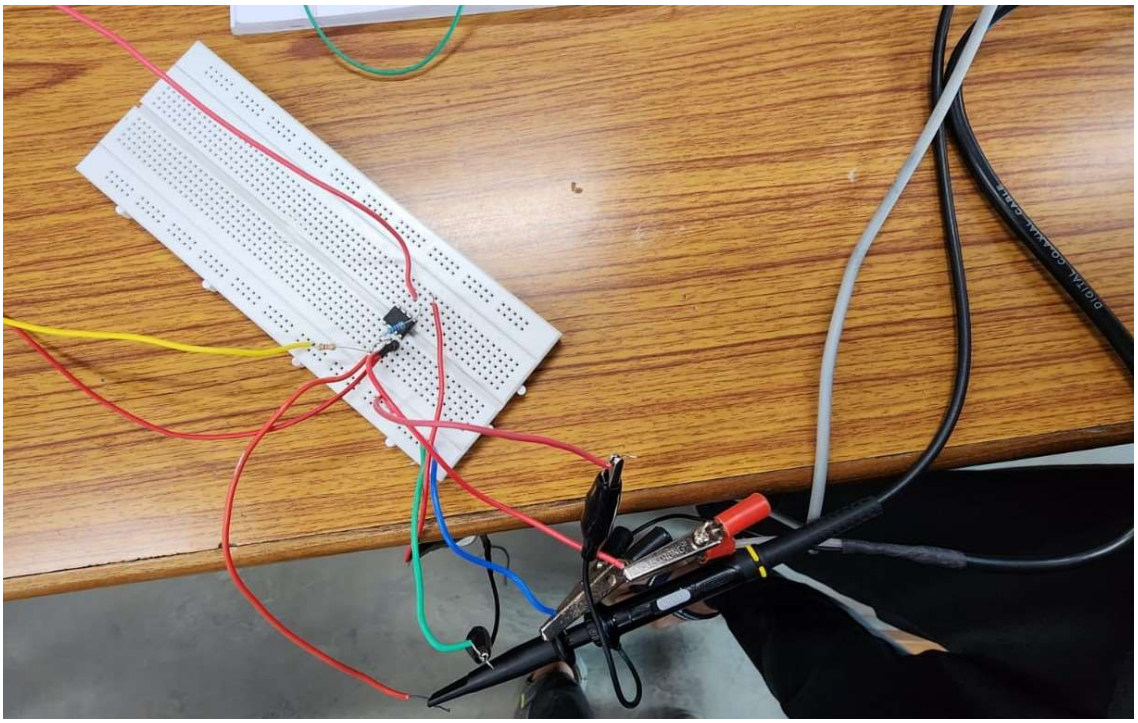

**Procedure:**

We set the circuit onto the breadboard by looking at the circuit diagram. We send an input sinusoidal voltage source using the function generator at pin number 3. We also set connect the DC power source at +/- 15V. We also set up a common ground for all the devices. Using the oscilloscope probes, we display the input and output voltages on the oscilloscope. We use different resistors to get different values of output voltage value ie different amplification values.

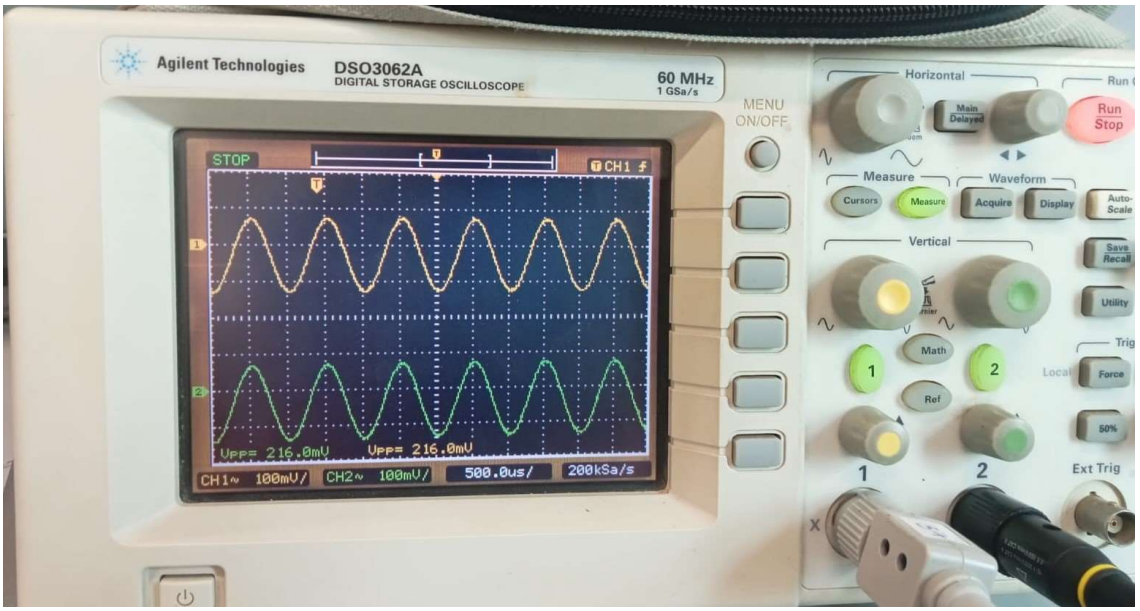
We display the Vpp input Vpp output values and compare them for three different cases.

The below is the pictures depicting the circuit diagram for this experiment.



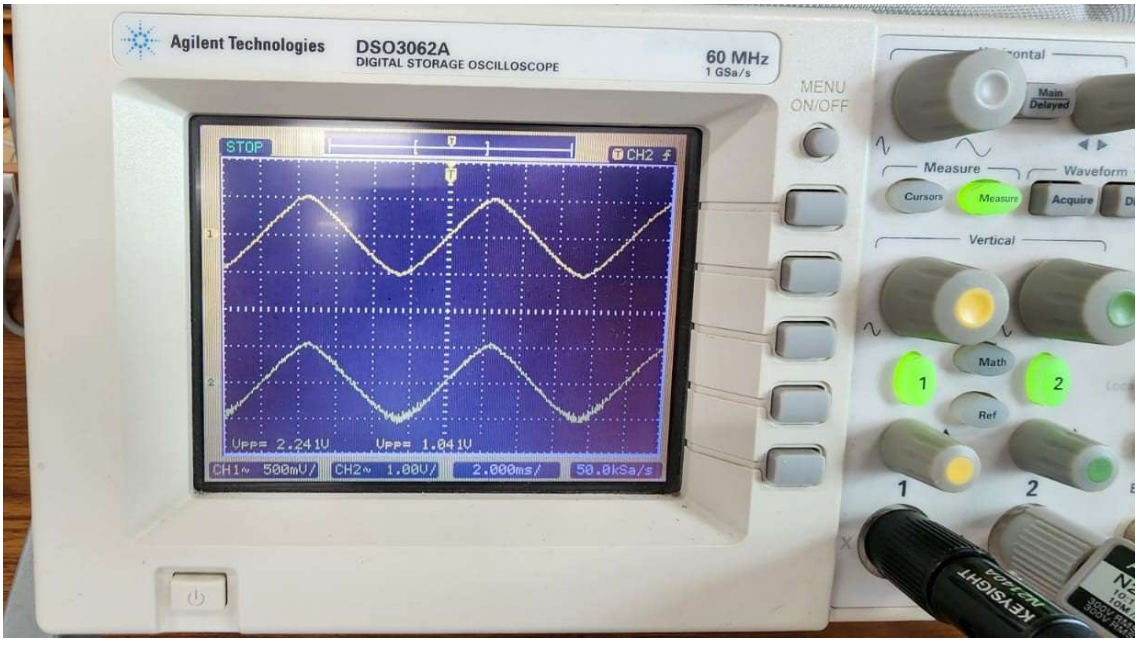



**CASE 1:**




Here Vin=Vout.We set R1 as infinite resistance and R2 as zero resistance.We do this by not connecting the R1 as it is infinite and no current will pass through and we replace resistor R2 with just a simple connecting wire which depicts close to zero resistance.So as R2/R1=0 , we get V2=V1.

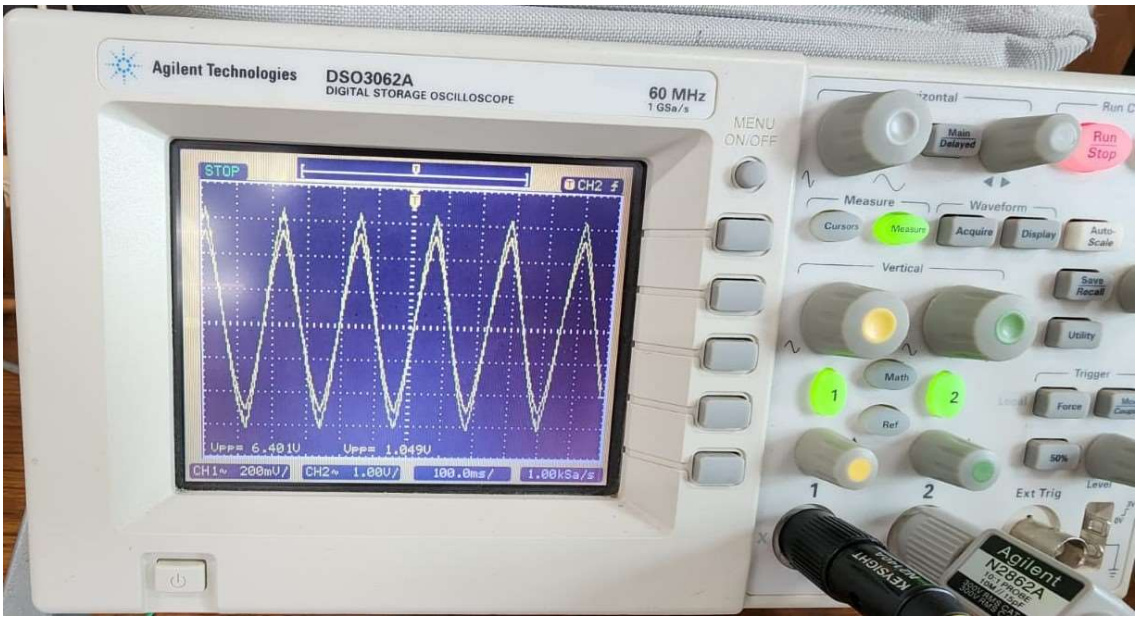
**CASE 2:**



Here we take R1=10k and R2=10k. Here R2/R1 comes out to be 1, and we get the output voltage as 2 times input voltage, ie Vout=2Vin.

Vout=Vin(1+R2/R1)=Vin(1+10k/10k)=2Vin.

**CASE 3:**




Here we take R1=10k and R2=50k. Here R2/R1 comes out to be 5, and we get the output voltage as 6 times input voltage, ie Vout=6Vin.

Vout= Vin(1+R2/R1)=Vin(1+50k/10k)=6Vin.