

Course Name:	Analog Integrated Circuits and Applications	Semester:	VI
Date of Performance:	Jan 15, 2024	Batch No:	A2
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Faculty Sign & Date:		Grade/Marks:	/25

Experiment No: 2

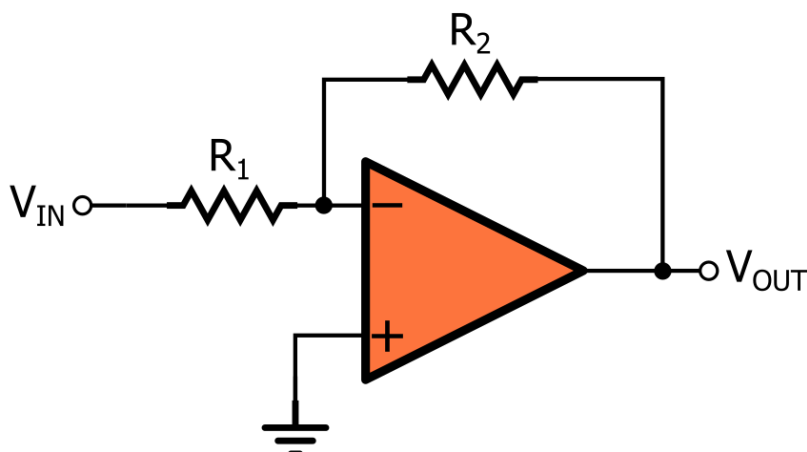
Title: To study Inverting and Non Inverting Amplifier using Op-amp

Aim and Objective of the Experiment:
To study Inverting and Non-Inverting Amplifier using op-amp 741

COs to be achieved:
CO2: Design circuits using op-amps as linear applications.

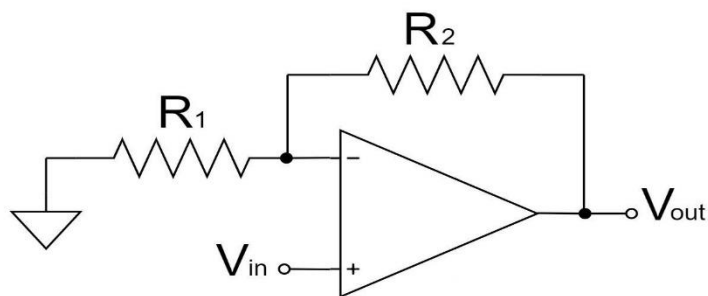
Theory:
<p>The op amp used is high performance monolithic one constructed using the fair child planar epitaxial process. It is intended for wide range of analog applications. High common mode voltage & absence of latch up tendencies make 741 ideal for use as a Voltage follower.</p> <p>Important features are:</p> <ol style="list-style-type: none"> 1. No frequency compensation required 2. No short circuit protection 3. Offset voltage nullifying capability 4. No latch up problem 5. Large common mode & differential gain

Circuit Diagram:
A) Inverting Amplifier:



B) Non- Inverting Amplifier:

Non-Inverting Amplifier Circuit



Stepwise-Procedure:

A. Inverting and Non-inverting amplifier

- 1) Connect the circuit for Inverting configuration.
- 2) Apply sine wave input of 1V_{p-p}, 1kHz and measure output voltage.
- 3) Draw the input and output waveforms Vs time.
- 4) Increase input voltage from zero to maximum such that output goes in to saturation.
- 5) Measure V_{OH} and V_{OL} and draw transfer characteristic.
- 6) Repeat steps 2 to 5 for Non Inverting Amplifier

Observation Table:

A) Inverting amplifier:

For Vin sine wave 1kHz

Sr. No.	Vin volts(p-p)	Vout volts(p-p)	Gain (Vo/Vin)
1.	1	10	10
2.	2	17.5	8.75
3.	1.5	14	9.3

Find out maximum peak to peak voltage (Vin) such that no clipping is observed. Increase input voltage to observe clipping and measure V_{OH} and V_{OL}

B) Non-inverting amplifier:

For Vin sine wave 1kHz

Sr. No.	Vin volts(p-p)	Vout volts(p-p)	Gain (Vo/Vin)
1.	1	10	10
2.	1.5	15	10
3.	2	17	8.2

Calculation:

Design:-

$$V_{out} = \left(\left(\frac{R_F}{R_2} * V_a \right) - \left(\frac{R_3}{R_1} * V_b \right) \right) \dots \dots \dots (1)$$

1) To design Subtractor,

$$R_1 = R_2 = R_3 = R_F$$

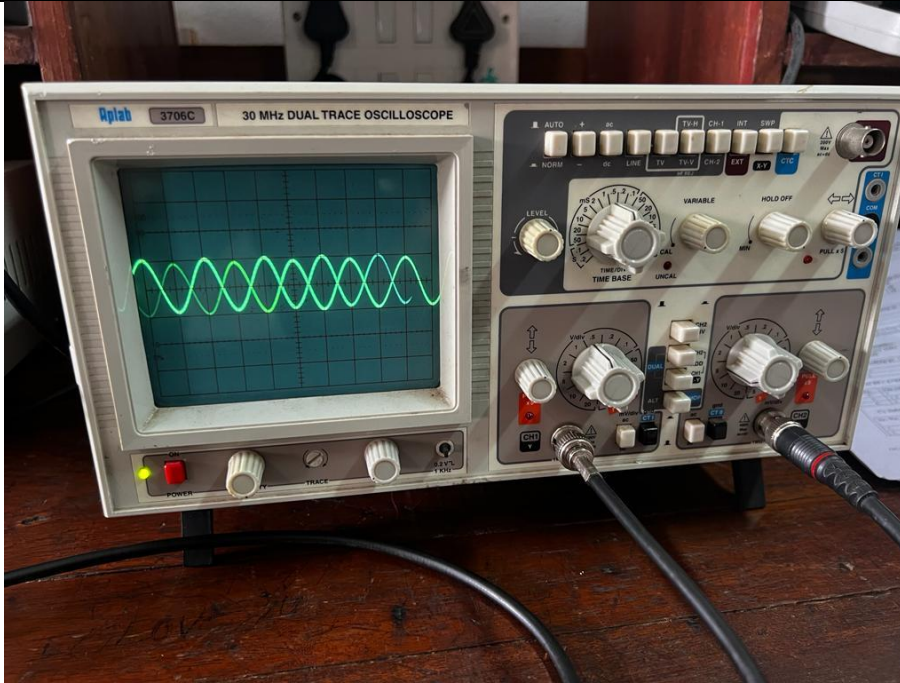
So that equation 1 becomes

$$V_{out} = (V_a - V_b)$$

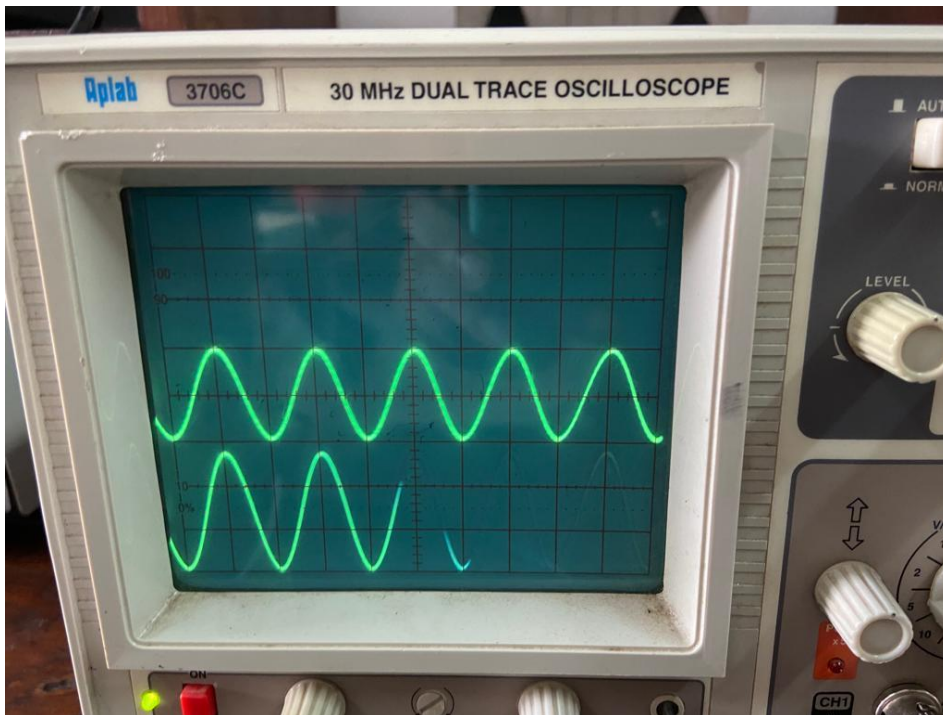
Assume, $R_1 = R_2 = R_3 = R_F = 10K\Omega$

Results:

Inverting:



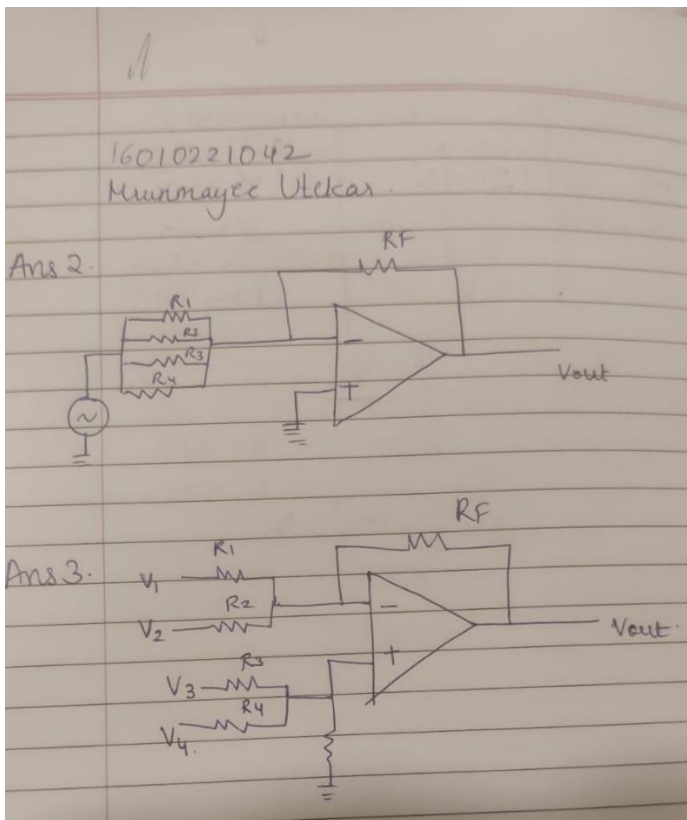
Non-Inverting:



Post Lab Questions:

1. List all linear applications of op-amp.
Voltage follower (Unity gain amplifier)
Inverting amplifier
Non-inverting amplifier
Summing amplifier
Difference amplifier
Integrator
Differentiator
Instrumentation amplifier
Active filters
2. Design averaging circuit for four DC inputs.
3. Design Adder-Subtractor circuit using opamp.

$$V_{out} = (V3 + V4) - (V1 + V2)$$



Conclusion:

In conclusion, the experiment aimed at implementing inverting and non-inverting amplifiers using



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the IC 741 operational amplifier was successfully conducted. The key characteristics of operational amplifiers, such as high open-loop gain, differential inputs, and single-ended output, were demonstrated in both configurations

Signature of faculty in-charge with Date: