5/26/2022

EXPERIMENT NO.6

EC111

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GROUP NO. 18

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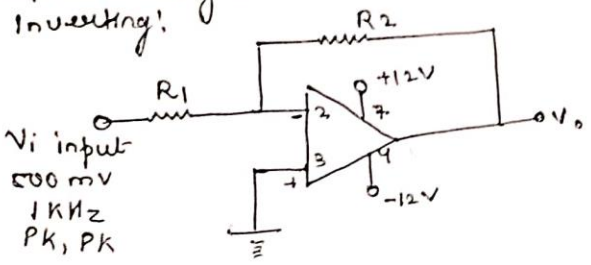
Experiment No: 6

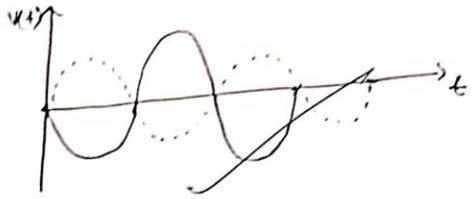
Aim: Design and observe the output of inverting and non-inverting op-Amp amplifier circuit.

Apparatus: Bread board, function generator, oscilloscope, DC power supply, resistor (1 KΩ, 10 KΩ), IC 741 (op-amp).

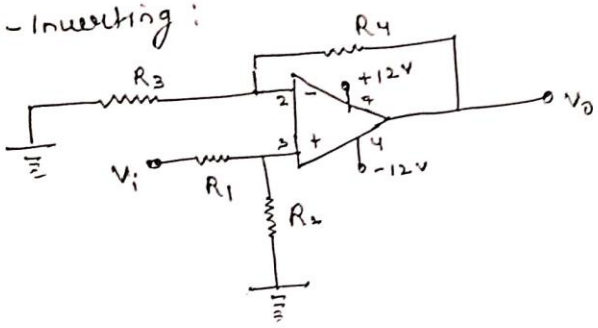
Circuit Diagram:

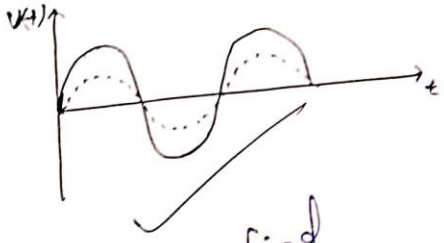
Inverting:





Non-Inverting:





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26/05/2022

Formulae used:

① Inverting:

∀ closed loop gain in inverting mode $= -\frac{R_2}{R_1}$ $\{R_1 = 1, R_2 = 10$

② Non inverting:

closed loop gain in non-inverting mode $= \left(1 + \left(\frac{R_4}{R_3}\right)\right) * V_p$

$\{ V_p = \left(\frac{V_i}{R_1 + R_2}\right) * R_2 \}$

$R_1 = 1$ KΩ
$R_2 = 10$ KΩ
$R_3 = 1$ KΩ
$R_4 = 10$ KΩ

EXPERIMENT NO. 6

TITLE: DESIGN OF OP-AMP AMPLIFIER CIRCUIT.

OBJECTIVE:

- To design an inverting amplifier circuit.
- To design a non-inverting amplifier circuit.

APPARATUS REQUIRED:

- Breadboard
- Connecting wires
- Resister of 1kohm and 10kohm
- Oscilloscope
- Function generator
- Power supply
- 741 IC(op-amp)

THOREY:

An operational Amplifier commonly known as Op-Amp is a linear electronic device having three terminals, two high impedance inputs, and one output terminal. Op-Amp can perform multiple functions when

attached to different feedback combinations like resistive, capacitive, or both. Generally, it is used as a voltage amplifier and the output voltage of the Op-Amp is the difference between the voltages at its two input terminals.

INVERTING OP-AMP:

The open-loop gain (A0) of the OP-AMP is very high which makes it very unstable, so to make it stable with a controllable gain, feedback is applied through some external resistor (Rf) from its output to inverting input terminal (i.e., also known as negative feedback) resulting in reduced gain (closed-loop gain, Av). So the voltage at inverting terminal is now the sum of the actual input and feedback voltages, and to separate both an input resistor (Ri) is introduced in the circuit. The noninverting terminal of the op-amp is grounded, and the inverting terminal behaves like a virtual ground as the junction of the input and feedback signal are at the same potential.

NON-INVERTING OP-AMP:

In this configuration of Op-amp the input signal is directly fed to the non-inverting terminal resulting in a positive gain and output voltage in phase with input as compared to inverting Op-amp where the gain is negative and the output voltage is out of phase with the input, and to stabilize the circuit negative feedback is applied through a resistor (Rf) and the inverting terminal is grounded with input resistor(R2). This inverting Op-Amp-like layout the at inverting terminal creates a virtual ground at the summing point making the Rf and R2 a potential divider across inverting terminal, Hence determining the gain of the circuit.

CIRCUIT DIAGRAM:

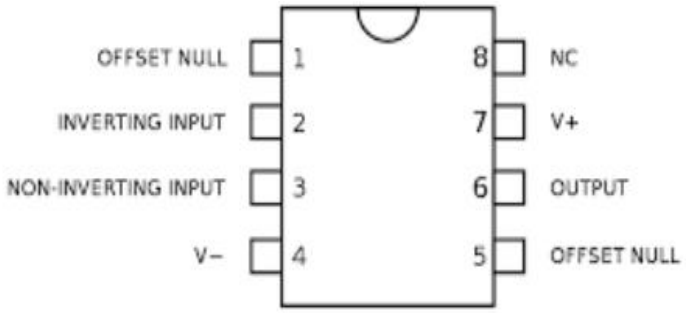


Fig 5.1: Pin diagram of LM741 Op-Amp IC

INVERTING OP-AMP:

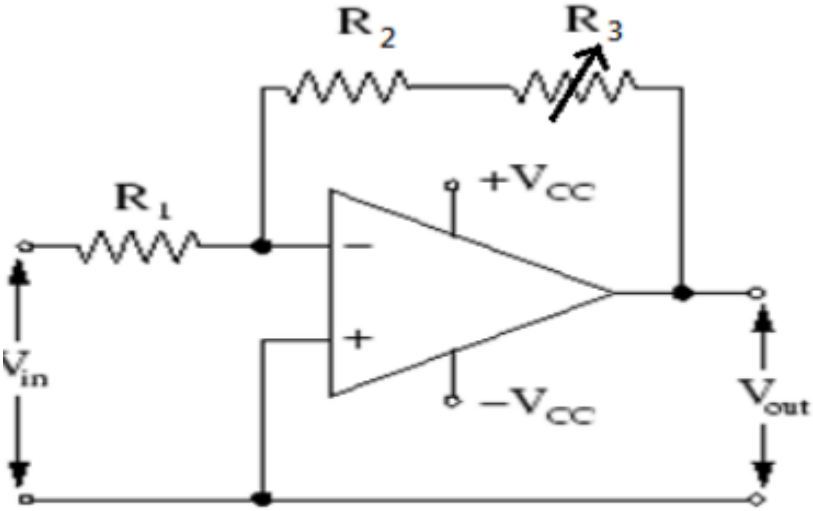


Fig 5.2: Inverting Amplifier circuit

Formula used:

The closed-loop gain in inverting mode Vout = − ($R2$+$R3$)/ $R1$

NON-INVERTING OP-AMP:

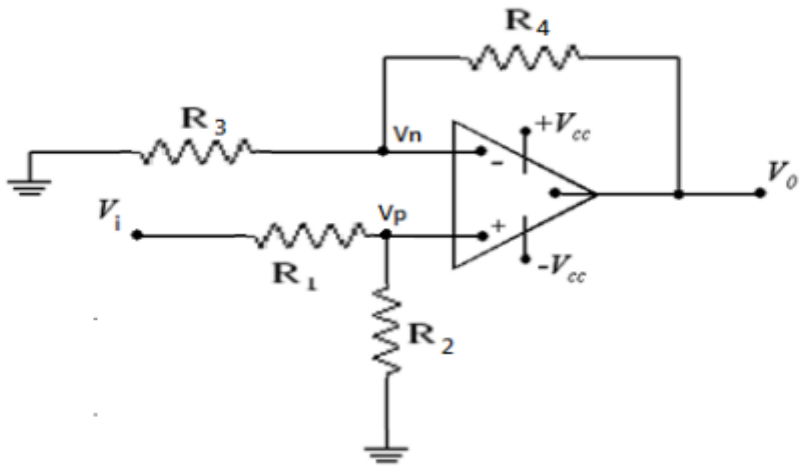


Fig 5.3: Non-Inverting Amplifier Circuit

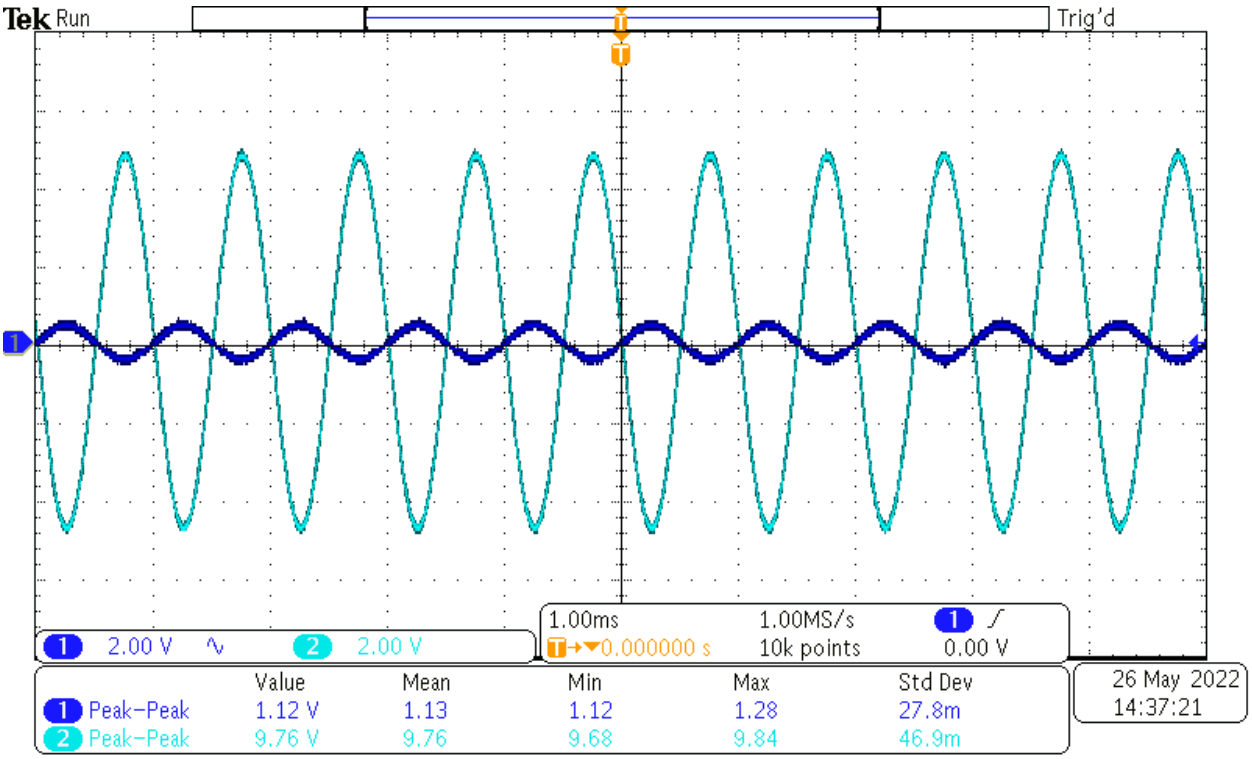
Formula used:

The closed-loop gain in the Non-Inverting mode

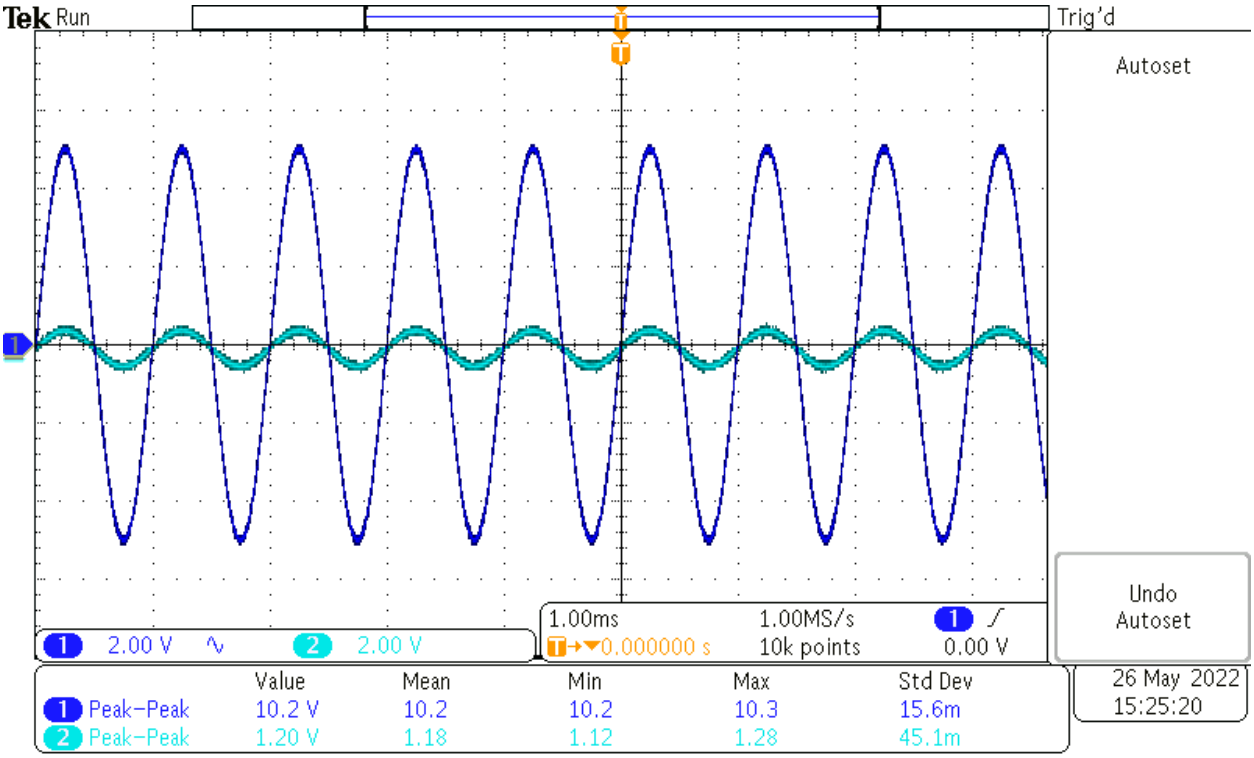
Vo = (1 + ($R4$ $R3$)) $*$ Vp VP = (Vi $R1$+$R2$) $*$ $R2$

OBSERVATION:

INVERTING OP-AMP:



NON-INVERTING OP-AMP:



RESULT:

- Successfully verified the functioning of inverting node of the op-amp.
- Successfully verified the functioning of the non-inverting node of the op-amp.

PRECAUTIONS:

- Connections should be made accordingly to the circuit diagram only.
- Do not be on the DC power supply for a long time otherwise diode may be burned.
- Wires should be tight and no short-circuiting should be there.
- Do not cross the maximum power rating.