Experiment No. 1

INVERTING AMPLIFIER

Aim: To design and setup an inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.

Objectives: After completion of this experiment, student will be able to design and setup an inverting amplifier using OP AMP. He/she will be able to design and implement OPAMP inverting amplifier circuit.

Equipments/Components:

Sl .No	Name and Specification	Quantity required
1	Dual power supply +/- 15V	1
2	Function generator (0 - 1MHz)	1
3	Oscilloscope	1
4	Bread board	1
5	IC 741C	1
6	Resistors	2
7	Probes and connecting wires	As required.

Theory

It is a closed loop mode application of opamp and employs negative feedback. The R_f and R_i are the feedback and input resistance of the circuit respectively. The input terminals of the opamp draws no current because of the large differential input impedance. The potential difference across the input terminals of an opamp is zero because of the large open loop gain. Due to these two conditions, the inverting terminal is at virtual ground potential. So the current flowing through Ri and Rf are the same.

$$I_i = I_f$$

That is $Vin/R_i = - Vo /R_f$

Therefore $V_o/V_{in} = A_v = - R_f/ R_i,$

Here the –Ve sign indicates that the output will be an amplified wave with 180^0 phase

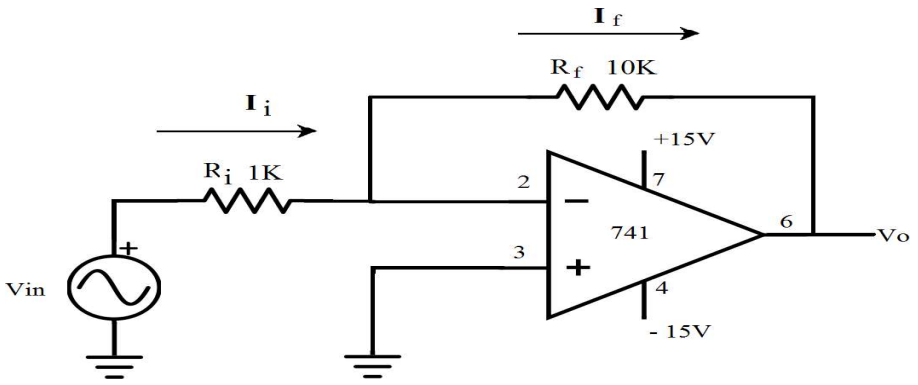
shift (inverted output). By varying the R_f or R_i, the gain of the amplifier can be varied to any desired value.

Procedure

1. Check the components.
2. Setup the circuit on the breadboard and check the connections.
3. Switch on the power supply.
4. Give 1 Vpp / 1 KHz sine wave as input.
5. Observe input and output on the two channels of the oscilloscope simultaneously.
6. Note down and draw the input and output waveforms on the graph.
7. Verify the input and output waveforms are out of phase.
8. Verify the obtained gain is same as designed value of gain.

Circuit

NON- INVERTING AMPLIFIER



Aim: To design and setup a non-inverting amplifier circuit with OPAMP IC 741C for a gain of 11, plot the waveform, observe the phase reversal, measure the gain.

Objectives: After completion of this experiment, student will be able to design and setup a non-inverting amplifier using OP AMP. He/she will acquire skill to design and implement OPAMP non-inverting amplifier circuit.

Equipments/Components:

Sl .No	Name and Specification	Quantity required
1	Dual power supply +/- 15V	1
2	Function generator (0 - 1MHz)	1

3	Oscilloscope	1
4	Bread board	1
5	IC 741C	1
6	Resistors	2
7	Probes and connecting wires	As required.

Theory

It is a linear closed loop mode application of op-amp and employs negative feedback. The R_f and R_i are the feedback and input resistance of the circuit respectively. There will be no phase difference between the output and input. Hence it is called non-inverting amplifier.

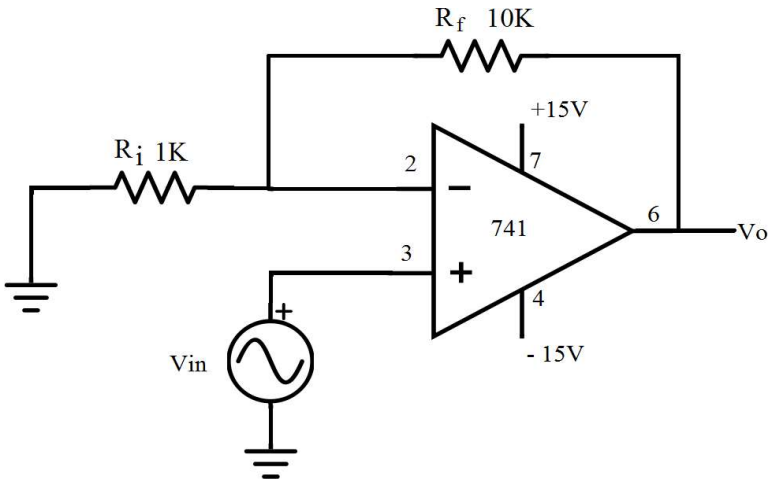
$$Av = V_o / V_{in} = 1 + R_f / R_i ,$$

Here the +Ve sign indicates that the output will be an amplified wave in phase with the input. By varying the R_f or R_i, the gain of the amplifier can be varied to any desired value.

Procedure

1. Check the components.
2. Setup the circuit on the breadboard and check the connections.
3. Switch on the power supply.
4. Give 1 Vpp / 1 KHz sine wave as input.
5. Observe input and output on the two channels of the CRO simultaneously.
6. Note down and draw the input and output waveforms on the graph.
7. Verify the input and output waveforms are in phase.
8. Verify the obtained gain is same as designed value.

Circuit Diagram



Design:

Gain of an inverting amplifier $Av = V_o/V_{in} = - R_f / R_i$

The required gain = 10,

That is $Av = - R_f/ R_i = 10$

Let $R_i = 1K\Omega$, Then $R_f = 10K\Omega$

Observations:

Vin = 1 Vpp

Vo=?

Gain, Av = Vo/Vin =?

Observed phase difference between the input and the output on the CRO =?

Graph

Design:

Gain of an inverting amplifier $Av=V_o/V_{in} = 1+R_f/ R_i$,

Let the required gain be 11,

Therefore $Av= 1+R_f/ R_i= 11$

$R_f/ R_i = 10$

Take $R_i= 1K\Omega$, Then $R_f = 10K\Omega$

Observations:

Vin = 1Vpp

Vo = ?

Gain Av = Vo/Vin =?

Observed phase difference between the input and the output on the CRO =?

Graph: