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EXPERIMENT NO: 06

TITLE OF EXPERIMENT: Simulate Inverting and Non-inverting amplifier using Op-amp.

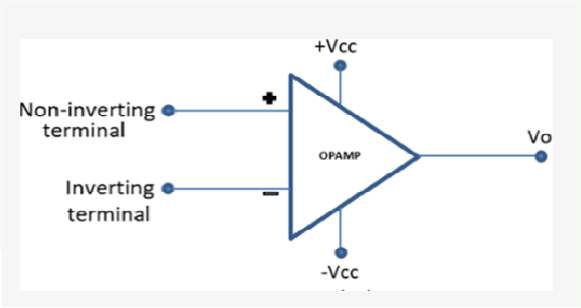
Aim: Simulate Inverting and Non-inverting amplifier using Op-amp.

Software: Multisim software

Theory:

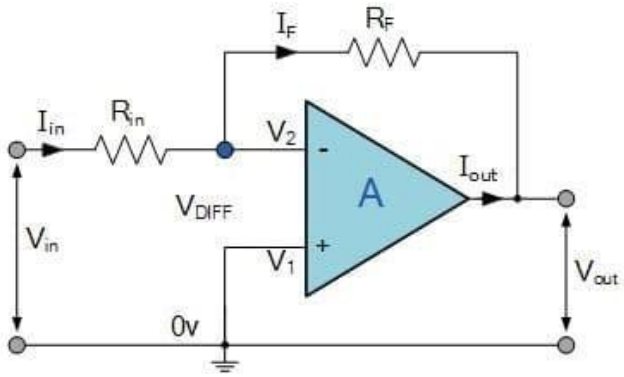
It is basic job of operational amplifier is to amplify the signal .Op-amp circuit is built using different capacitors and registers. Op-amp is able to perform different mathematical operations such as addition, subtraction, differentiation and integration. It amplifies the difference between two input signals. It is also called as differential amplifier.

Symbol of Op-amp



Circuit of Inverting amplifier:-

In an inverting amplifier circuit, the operational amplifier inverting input receives feedback from the output of the amplifier. Assuming the op-amp is ideal and applying the concept of virtual short at the input terminals of op-amp, the voltage at the inverting terminal is equal to non-inverting terminal. The non-inverting input of the operational amplifier is connected to ground. As the gain of the op amp itself is very high and the output from the amplifier is a matter of only a few volts, this means that the difference between the two input terminals is exceedingly small and can be ignored. As the non-inverting input of the operational amplifier is held at ground potential this means that the inverting input must be virtually at earth potential.

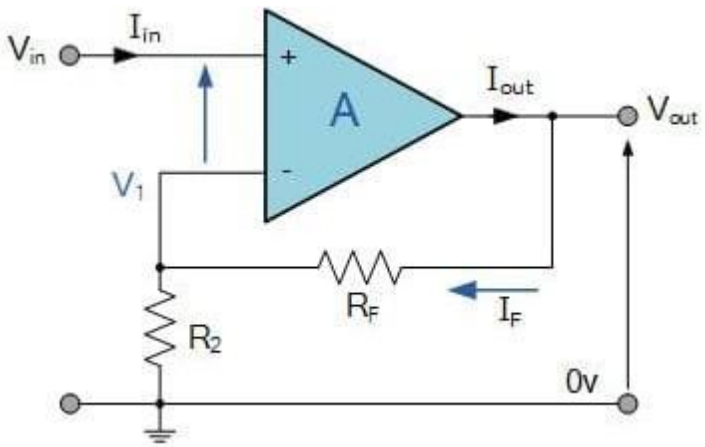


Applying KCL at inverting node we can calculate voltage gain,

$$\text{Voltage gain (A)} = V_{out}/ V_{in} = - R_f/R_{in}$$

Circuit of Non-inverting amplifier:-

The non-inverting amplifier is one in which the output is in phase with respect to the input. The feedback is applied at the inverting input. However, the input is now applied at the non-inverting input. The output is a non-Inverted (in terms of phase) amplified version of input. The gain of the non-inverting amplifier circuit for the operational amplifier is easy to determine.



The voltage gain can be calculated by applying KCL at the inverting node,

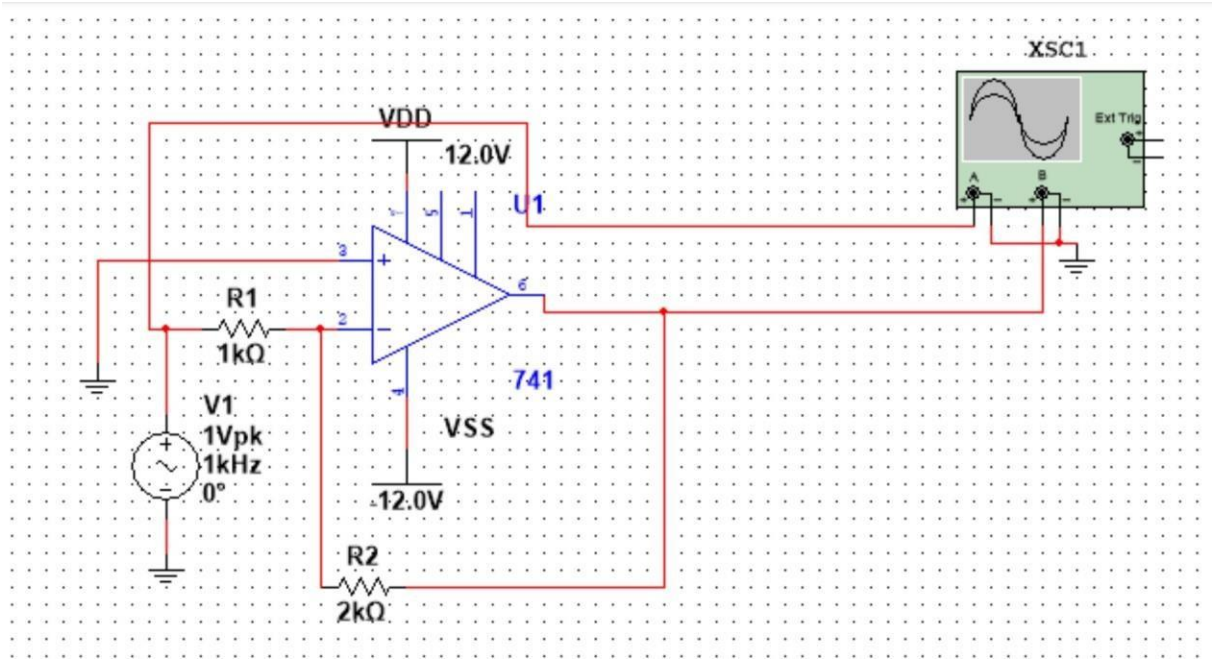
$$\text{Voltage gain (A)} = V_{out}/ V_{in} = 1 + (R_f / R_2)$$

Procedure

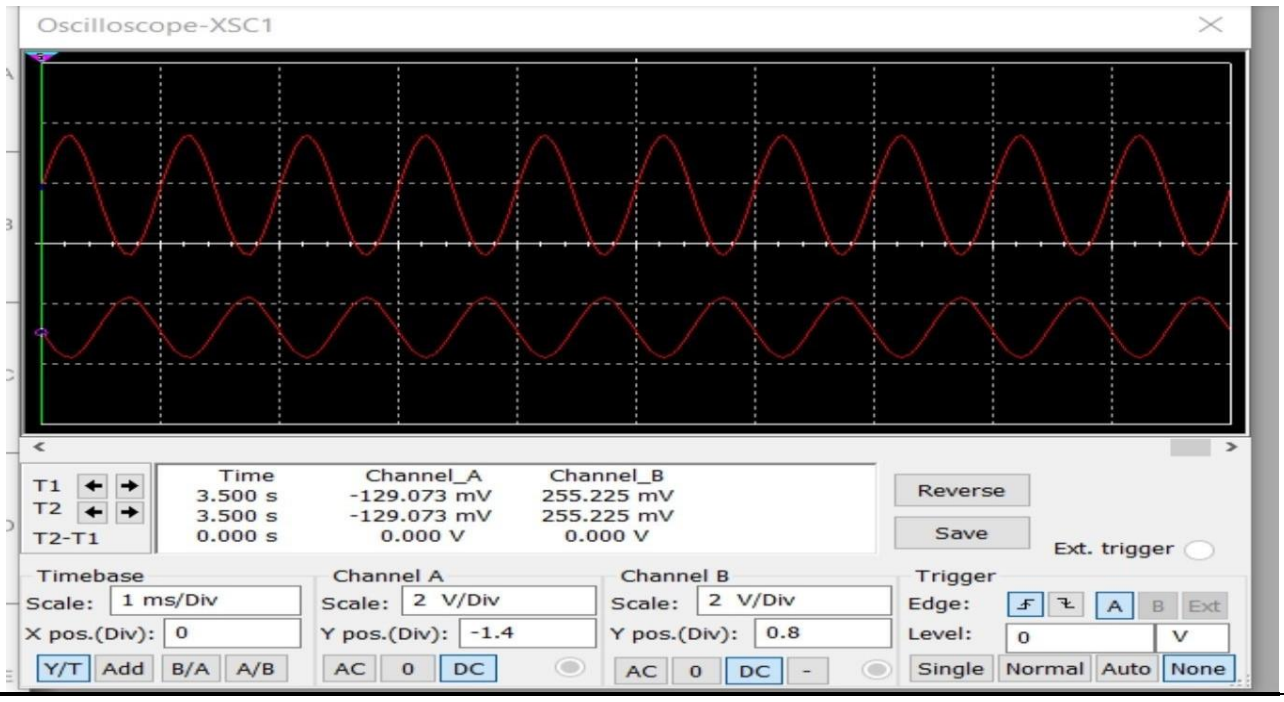
1. Draw the circuit of inverting and non-inverting amplifier in Multisim.
2. Find the output voltage, Vout,peak and the input voltage Vin,peak on CRO or by using interactive/transient analysis for both the circuits.
3. Calculate the practical and theoretical gain:

   Practical gain using formula Vout,peak / Vin,peak

Screenshot of inverting amplifier Circuit: (Must have title, your name, batch and roll no. written in the text box)



Screenshot of inverting amplifier input and output waveforms: (Peak output voltage must be visible)

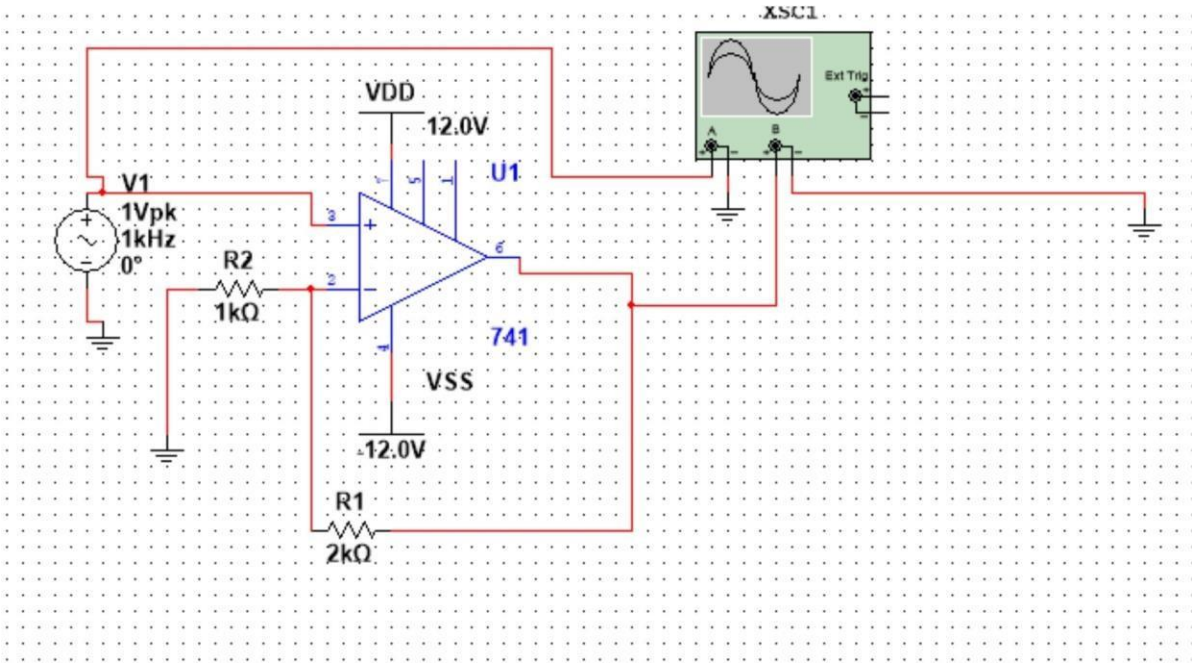


Observation Table:

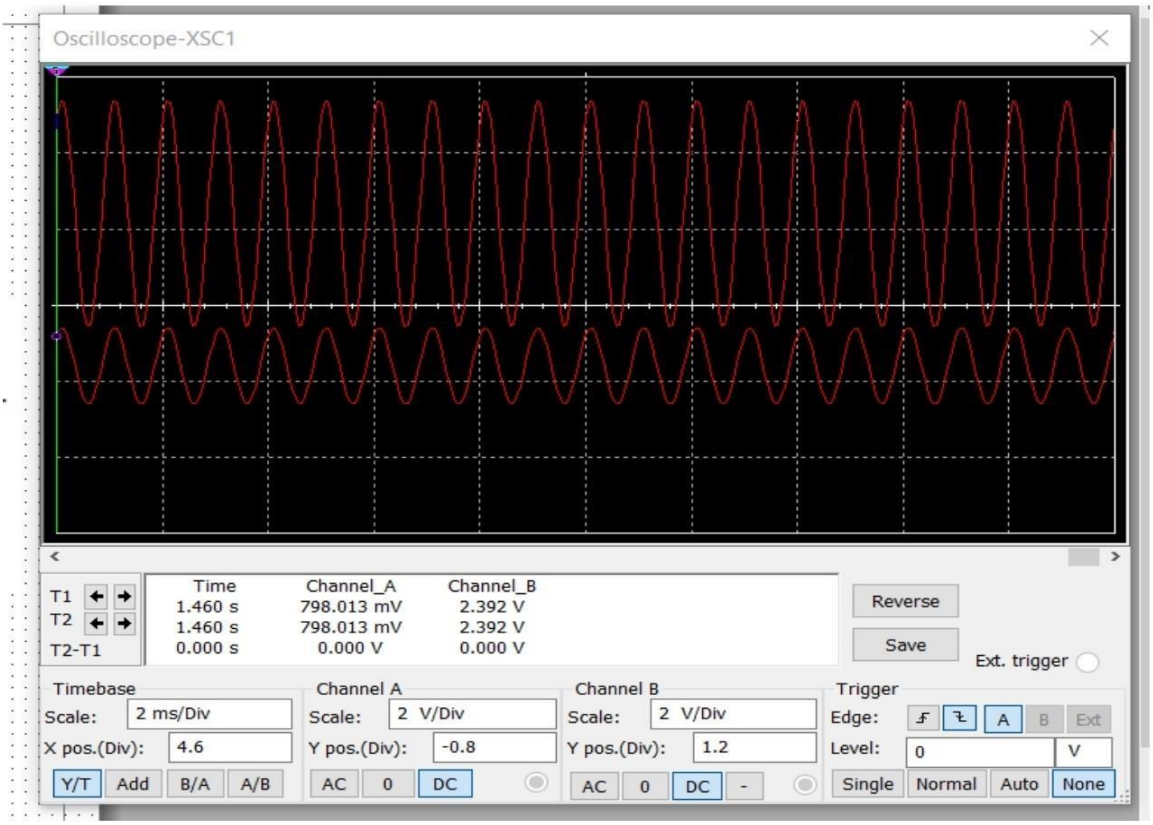
For Inverting Amplifier:

Vin, p	Vout, p	Practical gain A_v = Vout / Vin	Theoretical gain $A_v = -R_f / R_{in}$
1div*2v/div= 2V	2div*2v/div =4V	-4/2=-2	-2/1=-2

Screenshot of Non-inverting amplifier Circuit: (Must have title, your name, batch and roll no. written in the text box)



Screenshot of Non-inverting amplifier input and output waveforms: (Peak outputvoltage must be visible)



Observation Table:

For Non-inverting Amplifier:

Vin, p	**Vout, p**	**Practical gain** A_v **= Vout / Vin**	**Theoretical gain** $A_v = 1 + (R_f / R_2)$
1div*2v/div=2V	**2div*2vdiv=6V**	**6/2=3**	**1+2=3**

Conclusion:

1) Theoretical Voltage gain=Practical Voltage Gain for inverting and non invertingamplifiers.

2) Thus we have studied how to simulate Inverting and Non Inverting amplifiers usingOp-amp.