SCHOOL OF ELECTRONICS ENGINEERING

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)

VLSI LABORATORY REPORT

(EC-3095)

Submitted By

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Section: ETC - 06

Semester: 6 TH SEM

Experiment Number-9 (open ended -1)

AIM: Design and simulation of Operational Amplifier Circuit using TINA TI.

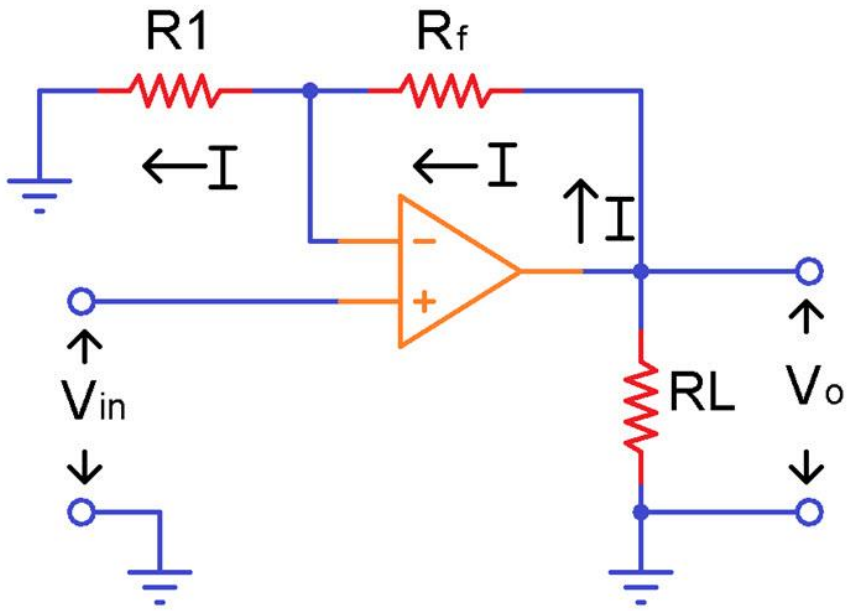
SOFTWARE REQUIRED:

TINA TI

THEORY:

A non-inverting amplifier is an op-amp circuit configuration that produces an amplified output signal. This output signal of the non-inverting op-amp is in-phase with the input signal applied. In other words, a non-inverting amplifier behaves like a voltage follower circuit.

The op amp has two input terminals (pins). One is inverting denoted with minus sign (-), and other is non-inverting denoted with a positive sign (+). When we apply any signal to the non – inverting input of, it does not change its polarity when it gets amplified at the output terminal. So, in that case, the gain of the amplifier is always positive.



Circuit diagram of non-inverting operational amplifier

From the circuit, it can be seen that the output voltage is potentially divided across resistors R1 (R1 in the above picture) and R2 (Rf in the above picture) before it is applied to the inverting input.

When the non-inverting input is connected to the ground, i.e., VIN = 0, the voltage at the inverting input terminal must also be at ground level; if not, any voltage difference between the input terminals would be amplified to move the inverting input terminal back to the ground level, because of the concept of virtual ground.

Since the inverting input terminal is at ground level, the junction of the resistors R1 and R2 must also be at ground level. This implies that the voltage drop across R2 will be zero. As a result, the current flowing through R1 and R2 must be zero. Thus, there are zero voltage drops across R1, and therefore the output voltage is equal to the input voltage, which is 0V.

When a positive-going input signal is applied to the non-inverting input terminal, the output voltage will shift to keep the inverting input terminal equal to that of the input voltage applied. Hence, there will be a feedback voltage developed across resistor R2,

$VR2 = VIN = I2R2$

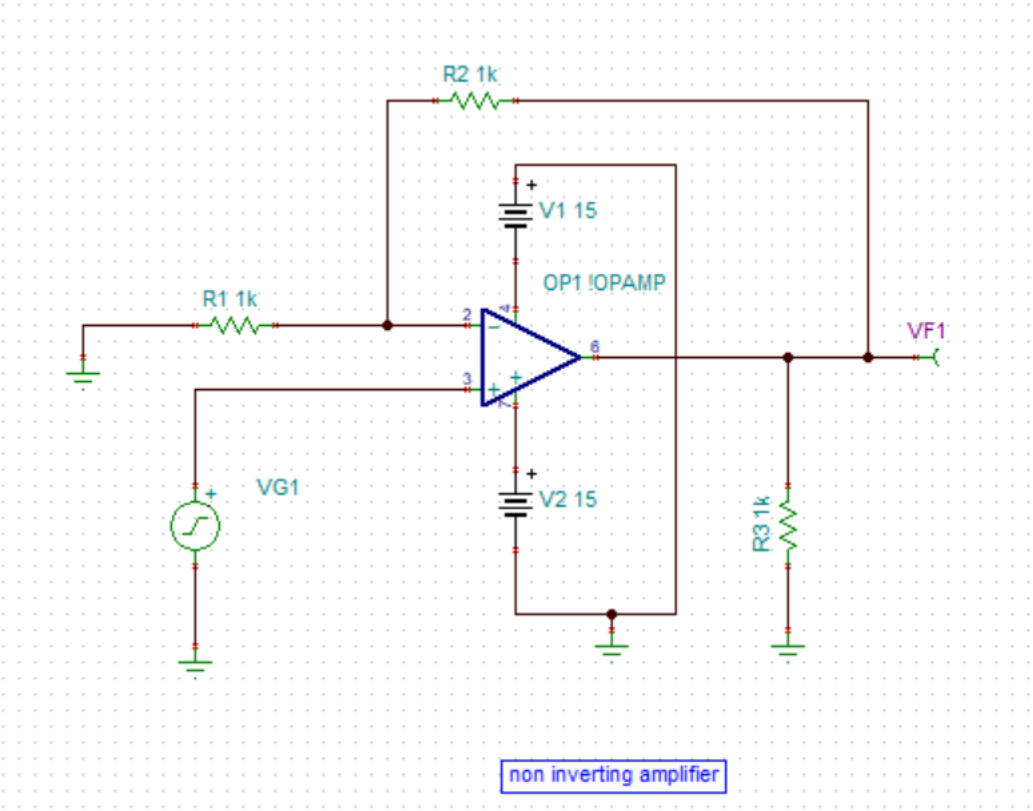
Where, I2 is the current flowing at the junction of resistors R1 and R2

$VOUT = I2 (R1 + R2)$

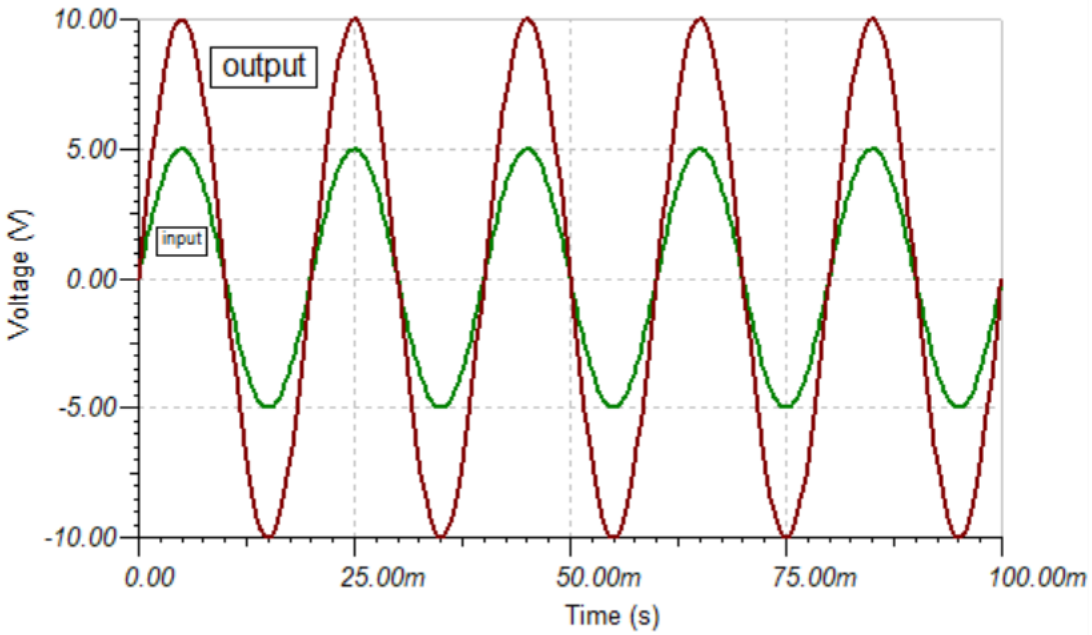
COMPONENTS USED :-

S.NO	Name of the Component	Quantity	Specifications
1.	Operational Amplifier	1	-
2.	Resistors	3	1k,1k,1k
3.	Battery	2	15 V
4.	Voltage Generator	1	5 v amplitude, 50 Hz frequency, Sinusoidal input
5.	Connecting wires	As per requirement	-
6.	Ground	4	-
7.	Voltage pin	1	To get the output graph

Circuit Diagram and output:



Circuit diagram of non-inverting amplifier using operational amplifier



Output waveform of non-inverting amplifier using operational amplifier

Discussion :

In this experiment we designed an operational amplifier circuit (non-inverting amplifier) using the components provided in the component list and after the circuit diagram was completed we clicked on analysis button followed by transient and obtained the output graph shown above. From the graph we can observe that the input given to the circuit was 5v, 50 Hz, sinusoidal wave and the output obtained is amplified with amplitude 10 v and it is in phase with the input wave .Thus, this circuit of operational amplifier (i.e., non inverting amplifier) gives correct results.

Conclusion:

In this experiment we successfully designed and simulated non inverting operational amplifier circuit using TINA TI software and obtained the required outputs.