# GREEN UNIVERSITY OF BANGLADESH

## Department of Computer Science & Engineering

Course Code: EEE-204

Course Title: Electronics lab

Experiment Number : 01
Experiment Name : Study of Diode I-V Characteristic

Date of Performance : 17.02.2021
Date of Submission : 05.04.2021

| Submitted to: | Submitted by: |
|---|---|
| Name : Sakib Abdul Ahad | Name : Jakirul Islam |
| Designation : Lecture | ID : 193002101 |
| Dept : EEE | Dept. : CSE |

Remark

Experiment no: 01

Experiment name: study of Diode I-V characteristic.

Objectives:

1. To study the diode I-V characteristics
2. To observe the output of a simple with a diode using AC input.

Instrument Required:

| Serial | Name | Rating | Quantity |
|---|---|---|---|
| 1 | Project Board | | 1 Piece |
| 2 | Diode | | 4 piece |
| 3 | Resistor | | 1 piece |
| 4 | multimeter | | 1 unit |
| 5 | Signal generator | | 1 piece |
| 6 | oscilloscope | | 1 unit |
| 7 | chords and wire | | lot. |

## Circuit Diagram:

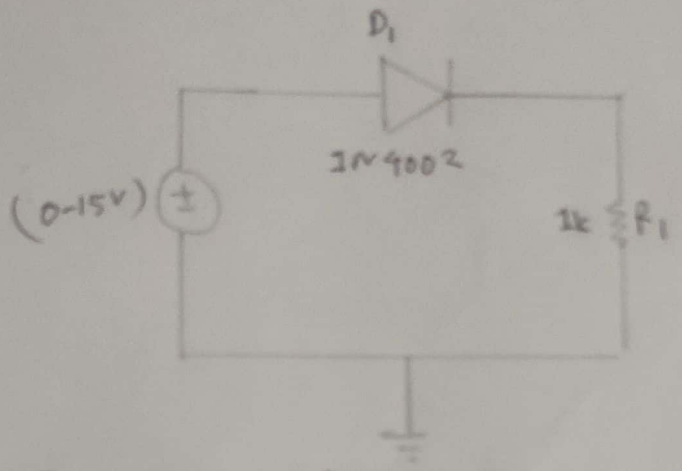



Fig: 1(a): PN forward bias circuit

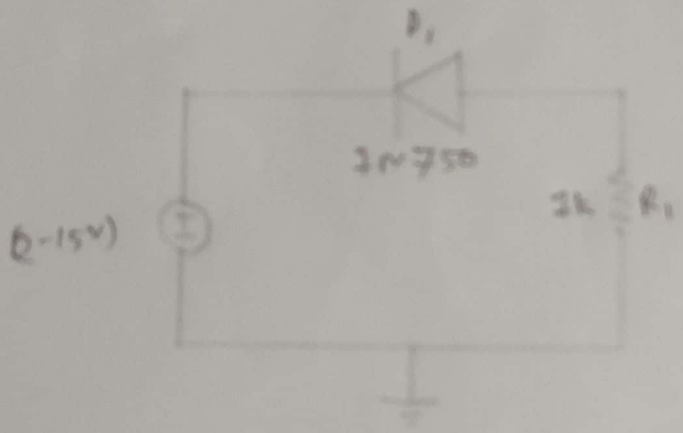



Fig: 1(b): PN reverse bias circuit.

Description:-

A p-n junction diode is a two-terminal device that acts as a one way conductor. that means its permits the passage of electrical current in only one way and prevents. if the current is passed from the other terminal. A diode can be connected in a circuit in two configurations.

1. forward Biased configuration
2. Reverse Biased configuration

forward Bias, when the voltage at the p-side of a p-n diode is higher than that of its n-side. then the diode is called forward Biased.

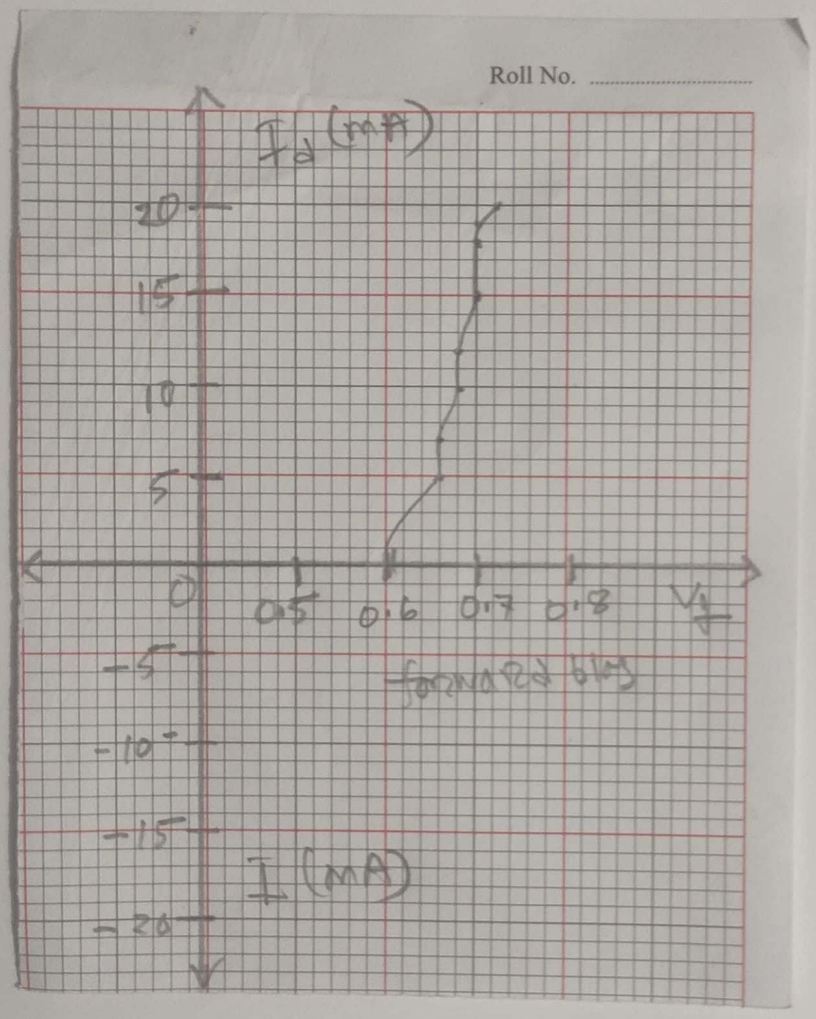
Reverse Bias, when a diode gets negative voltage across it then it is in Reverse Biased

Breakdown voltage, when the voltage caused the burn is called Breakdown voltage. there will be a rush of current of that time and that current is called Avalanch current

## Experimental Data table:

| Serial | Vin (v) | $V_d$ (v) | $I_d$ (mA) |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2 | 0.2 | 0.57 | 0 |
| 3 | 0.5 | 0.60 | 0 |
| 4 | 0.7 | 0.61 | 0 |
| 5 | 1 | 0.62 | 0 |
| 6 | 1.2 | 0.63 | 0 |
| 7 | 1.5 | 0.65 | 5 |
| 8 | 1.7 | 0.66 | 7 |
| 9 | 2 | 0.68 | 10 |
| 10 | 2.2 | 0.688 | 12 |
| 11 | 2.5 | 0.696 | 15 |
| 12 | 2.7 | 0.699 | 16 |
| 13 | 3 | 0.703 | 17 |
| 14 | 3.2 | 0.709 | 18 |
| 15 | 3.5 | 0.715 | 20 |

Graph :-



Result:

Discussions:

The diode should not be short circuited. that will allow the flow of huge current which might destroy the diode.

If we just reverse the diode to measure the I-v characteristics. the sudden change might destroy the diode.

current must not pass through it for a very long time. It will then increase the depletion region and develop a fluctuating resistance.

# GREEN UNIVERSITY OF BANGLADESH

## Department of Computer Science & Engineering

Course Code: EEE-204

Course Title: Electronics lab

Experiment Number : 02
Experiment Name : Study of Diode Rectifier Circuits

Date of Performance : 23.02.2021
Date of Submission : 05.04.2021

| Submitted to: | |
|---|---|
| Name | : Sakib Abdul Ahad |
| Designation | : Lecture |
| Dept | : EEE |

| Submitted by: | |
|---|---|
| Name | : Jakirul Islam |
| ID | : 193002101 |
| Dept. | : CSE |

| Remark |
|---|
| |

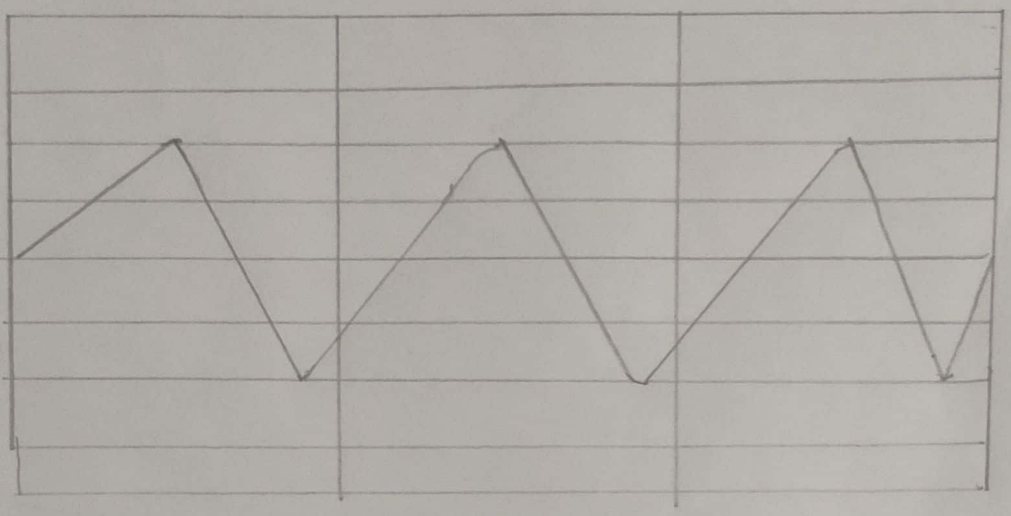
## Objectives:

1. To understand Principle of diode in converting Ac into ~~de~~ DC.
2. To study different diode rectifiers circuits.

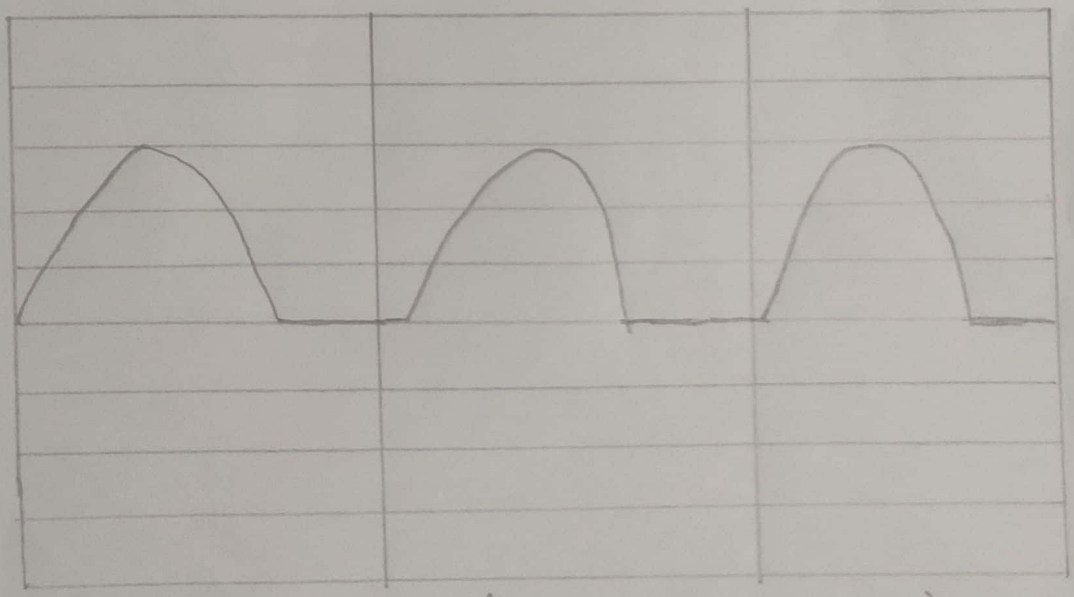
## Instruments Required:

| Serial | Name | Ratings | Quantity |
|---|---|---|---|
| 1 | Project Board | | 1 pieces |
| 2 | p-n junction Diode | | 4 pieces |
| 3 | Resistor | | 1 piece |
| 4 | Zener Diode | | 1 piece |
| 5 | Capacitor | | 1 piece |
| 6 | Multimeter | | 1 unit |
| 7 | Signal generator | | 1 piece |
| 8 | Oscilloscope | | 1 unit |
| 9 | chords and wire | | lot |

Circait diagnam:



input voltage



output voltage (without capacitor)

figure2.1: Half wave Rectifiers Input and output

## Circuit Diagram:

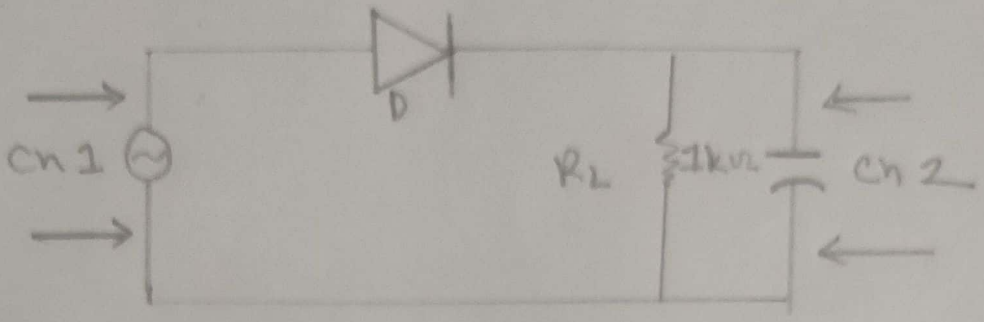



Figure: 2.3 Half wave rectifier

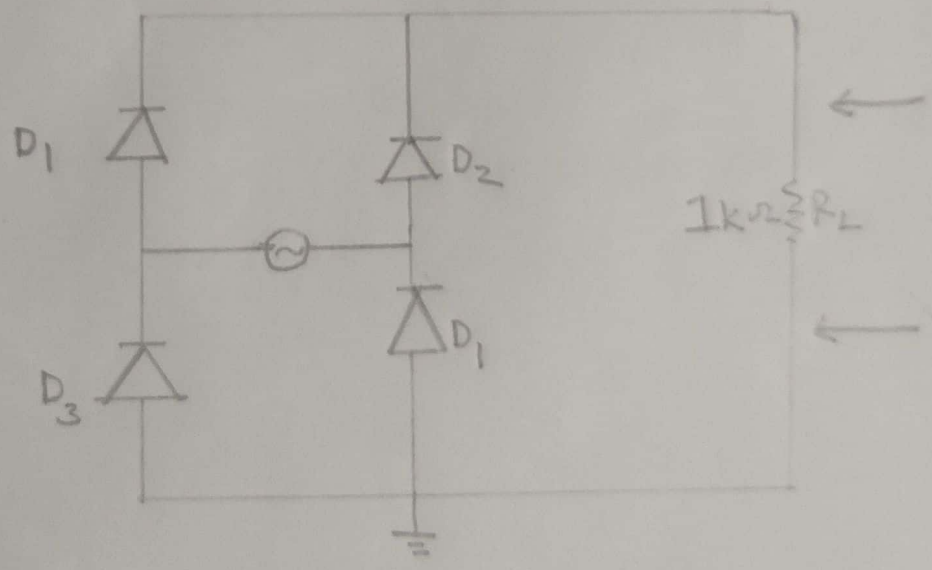



Figure: 2.4: Full wave rectifier

Description:

In electrical systems AC to DC conversion is one of the most essential factors. the Process of converting an AC voltage to DC voltage is called rectification.

there are two types of rectifiers

Half wave rectifier, which is a type of rectifier that allows only one half cycle of an AC voltage wave form to pass while blocking the other half cycle.

Full wave rectifier, which is a type of rectifier that converts alternating current into continous current and that utilizes both halves of each cycle of the alternating current.

use of the capacitor:

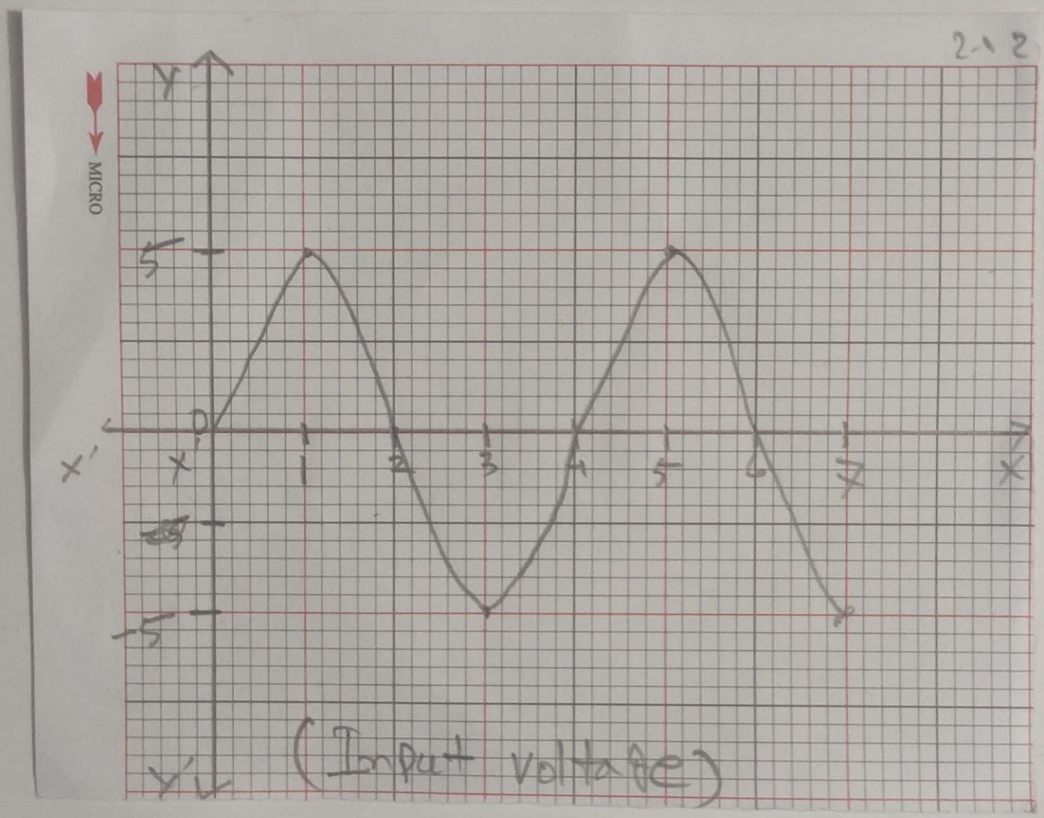
the output voltage without the capacitor hay not attained a DC shape. Instead it is an AC without its negative cycle. Now the way to achieve a DC voltage is to add a capacitor in Parallel with lowere resistance, before catching the next peak it will get discharged. So, a capacitor with higher capacitance is incumbent.

## Experimental Data and Table

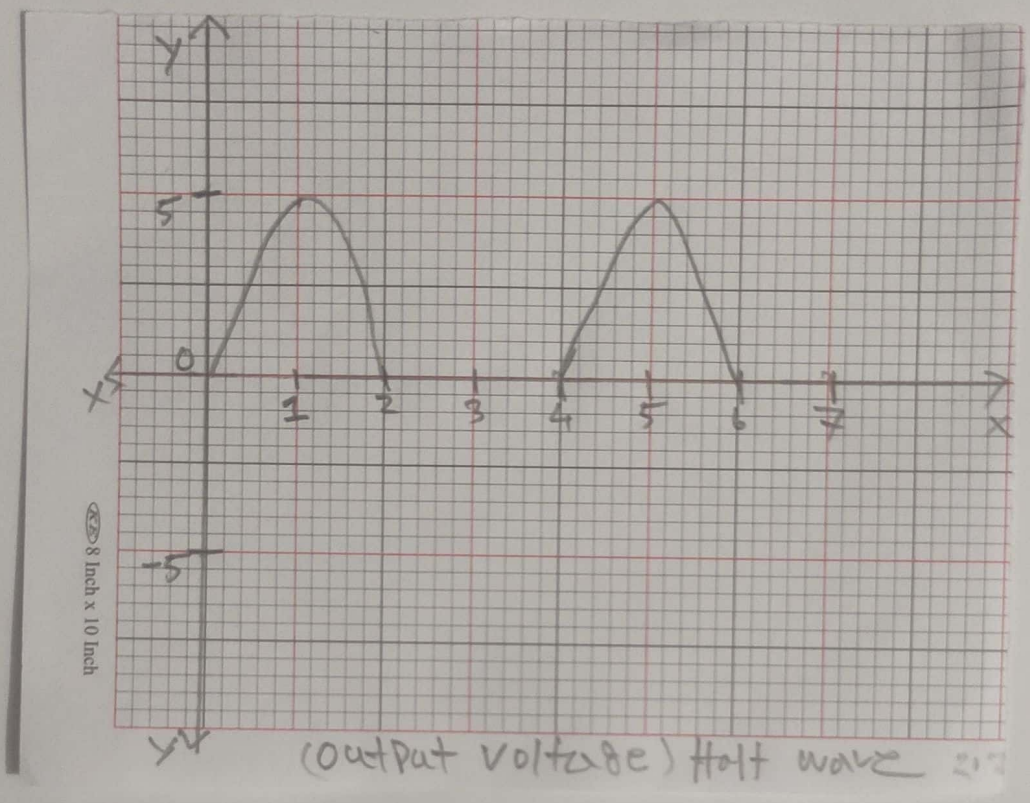
| Rectifier | output voltage | Theoretical value | Experiment value | | |
|---|---|---|---|---|---|
| | | | without capacitor | | |
| Half wave Rectifier | Average measured by multi-meter DC mode) | | | | |
| Full wave rectifier | (Average) measured by multi-meter in DC mode | | | | |

table 2.1 output voltage measurement.

Graph:

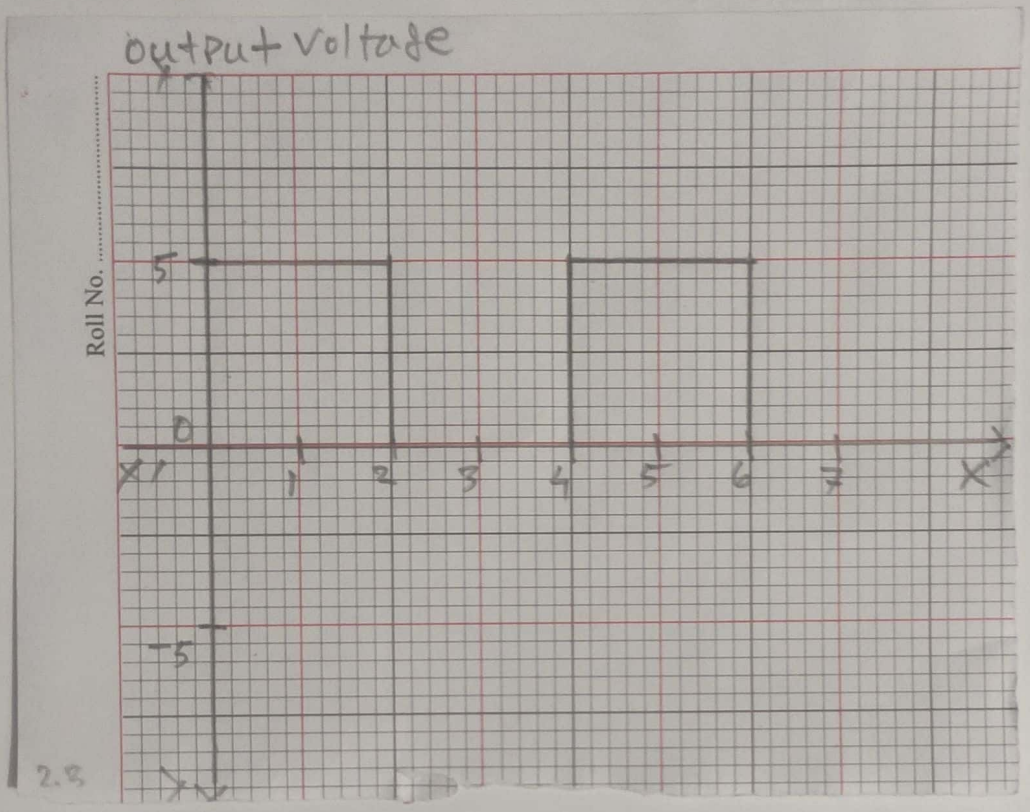


Graph: 2.2

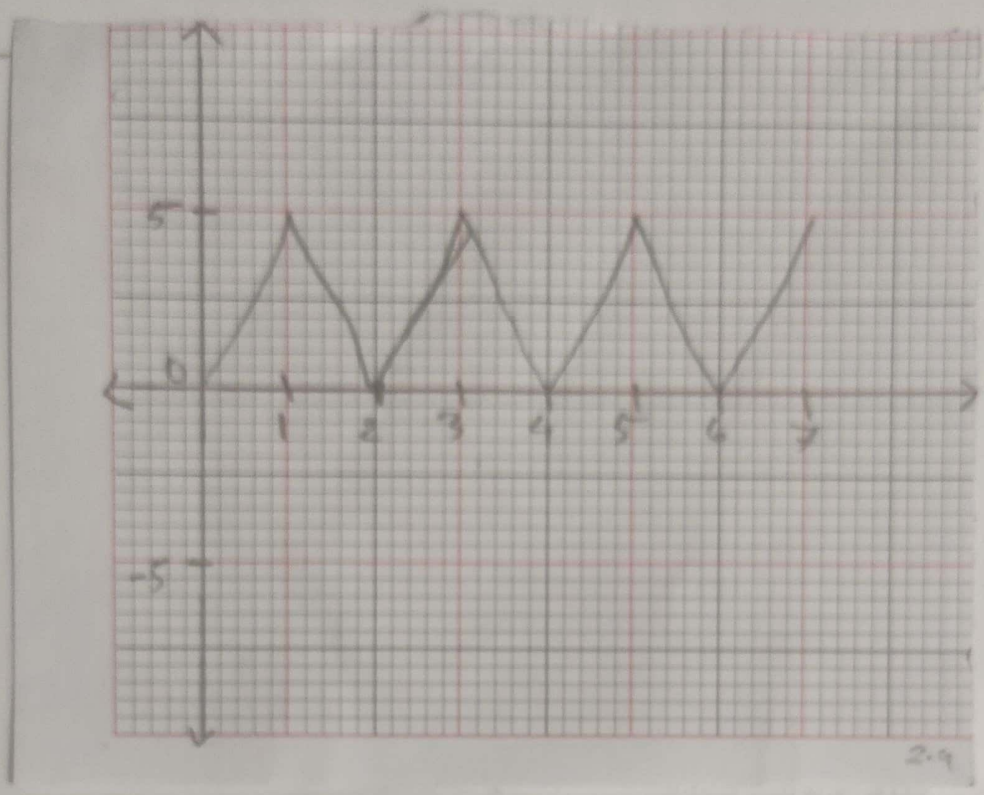



output voltage (Holt wave Rectifier

Graph: 2.3




output voltage with capacitor (Half wave Rectifier.)

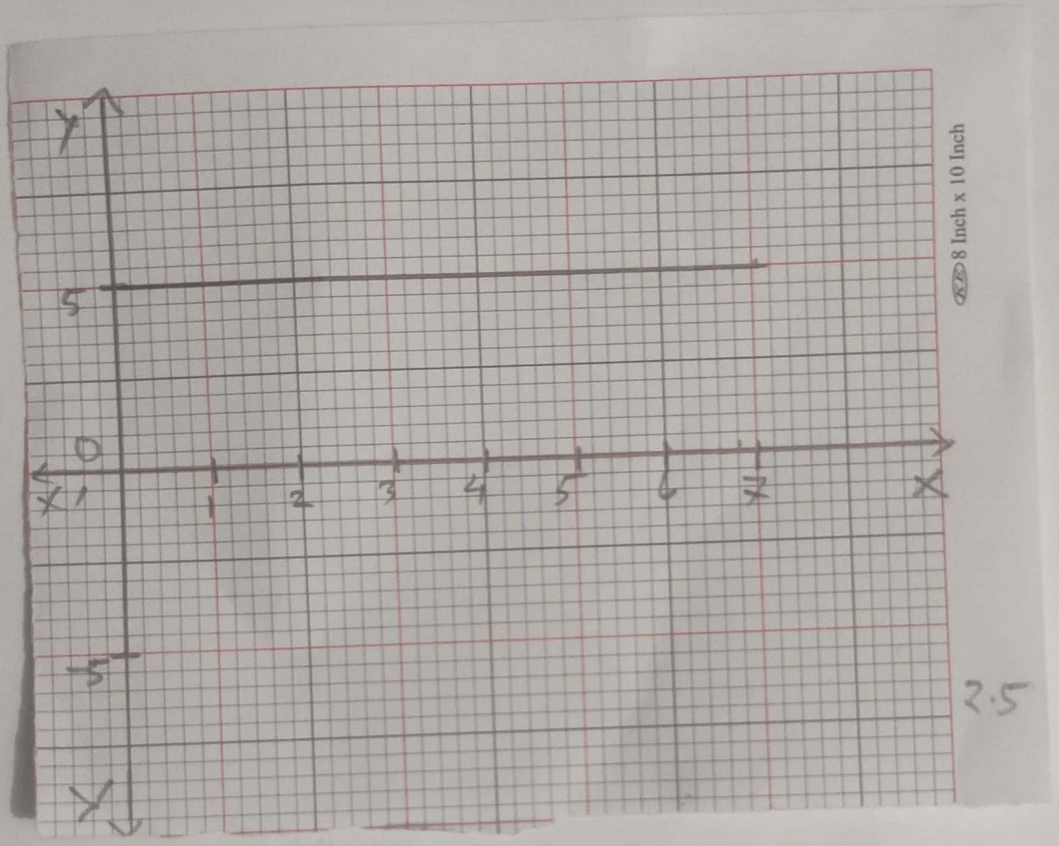



Graph : 2.4 Output voltage (Full wave rectifier)

150

~~Calculation~~:

Graph: 2.5




Graph: 2.5 output voltage with capacitor (full wave Rectifier)

Result:

Discussion:

All the connections should be verified. The resistance should be chosen within the range of kohm. Best performance is being obtained within 50 Hz to 7 Mhz.

# GREEN UNIVERSITY OF BANGLADESH

## Department of Computer Science & Engineering

Course Code: EEE-204

Course Title: Electronics lab

Experiment Number : 03
Experiment Name : Study of Operational Amplifier as Zero Crossing & Voltage Level Detectors

Date of Performance : 02.03.2021
Date of Submission : 05.04.2021

| Submitted to: | |
|---|---|
| Name | : Sakib Abdul Ahad |
| Designation | : Lecture |
| Dept | : EEE |

| Submitted by: | |
|---|---|
| Name | : Jakirul Islam |
| ID | : 193002101 |
| Dept. | : CSE |

| Remark |
|---|
| |

## Objectives:

1. To get familiarized with operational Amplifier
2. To study OP-Amp as a Comparator.

## Instruments Required:

| Serial | Name | Ratings | Quantity |
|---|---|---|---|
| 1 | Project Board | | 1 Piece |
| 2 | OP-AMP | | 1 Piece |
| 3 | Resistor | | 1 Piece |
| 4 | Signal Generator | | 1 unit |
| 5 | Oscilloscope | | 1 unit |
| 6 | Analog Trainer Board | | 1 unit |
| 7 | Chords and wire | | lot |

## Circuit Diagram:

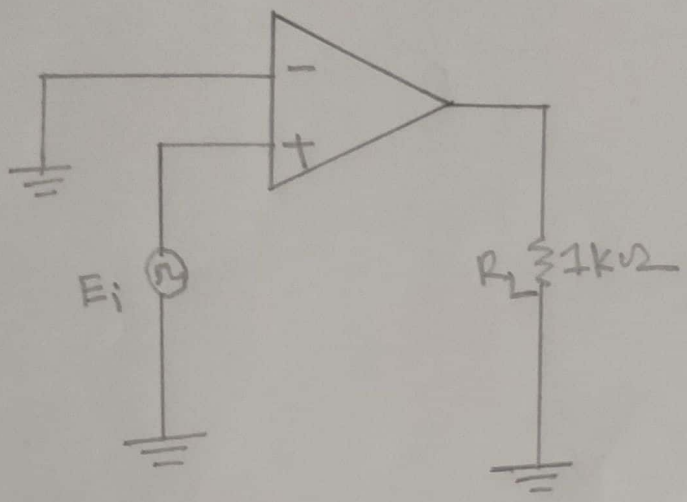



Figure: circuit diagram 1: non-inverting

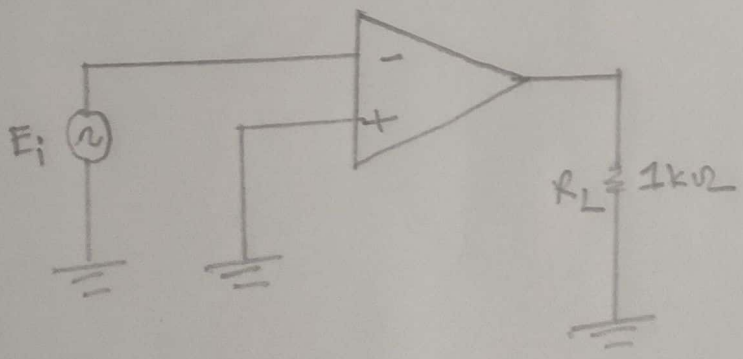



Figure: circuit diagram 2: inverting

## Description:

In open loop connection there is no feedback between the output and input terminal. The OP-AMP in this experiment will be operated as a comparator.

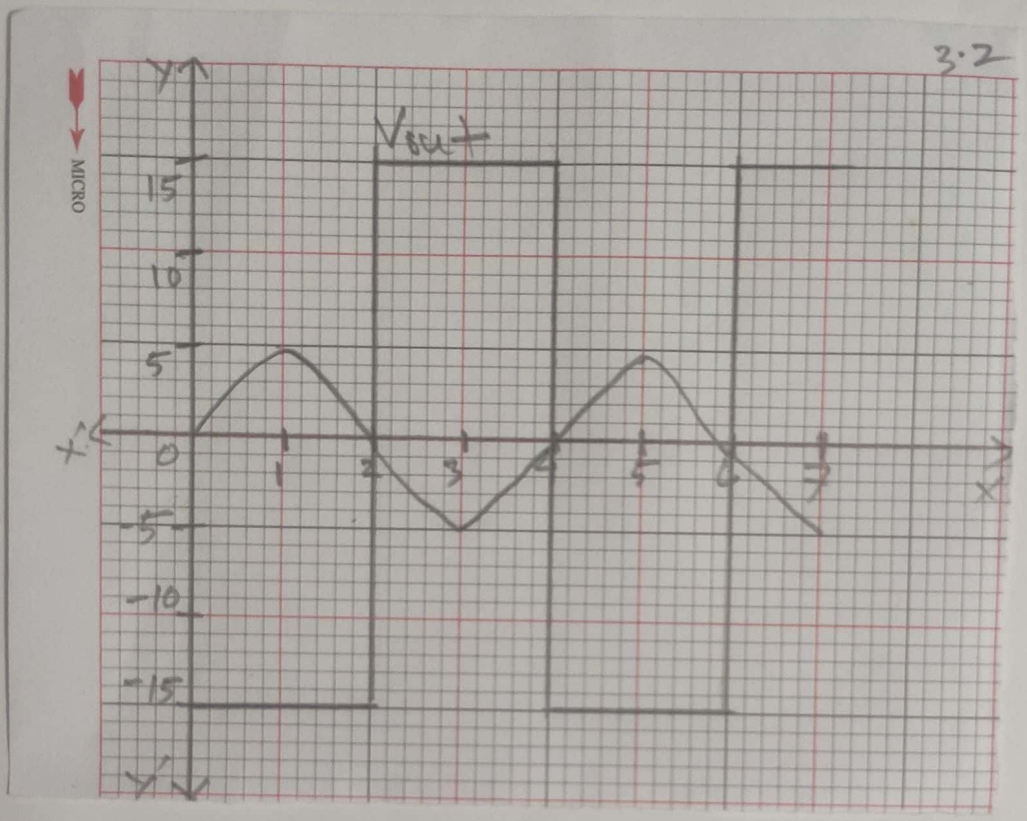
If the voltage of non-inverting input terminal it is $E^+$ and the voltage of the inverting input terminal is $E^-$, then,

the output, $V_o = +V_{sat}$, when $E^+ > E^-$

And $V_o = -V_{sat}$, when $E^+ < E^-$

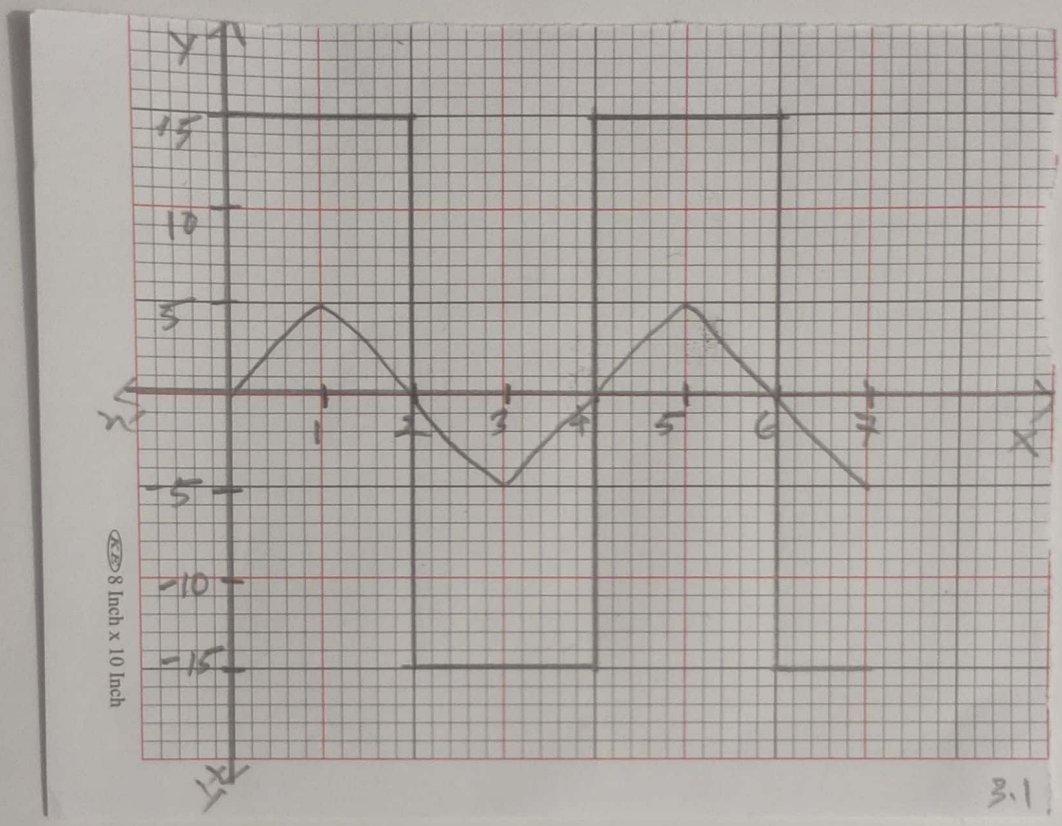
Using this concept we can use it to detect any zero crossing voltage or to identify any voltage level.

Graph




Graph 31 : Vin and Vout for non-inverting zero crossing detector.

Graph:




Graph 3.2: Vin and Vout for Inverting zero Crossing Deteerton.

Discussion:

After completing this experiment we learn

1. After About the basic characteristics of an OP-Amp
2. We also understand the use of OP Amp as a comparator.

# GREEN UNIVERSITY OF BANGLADESH

## Department of Computer Science & Engineering

Course Code: EEE-204

Course Title: Electronics lab

Experiment Number : 04
Experiment Name : Study of Operational Amplifier as an Amplifier

Date of Performance : 30.03.2021
Date of Submission : 05.04.2021

| Submitted to: | |
|---|---|
| Name | : Sakib Abdul Ahad |
| Designation | : Lecture |
| Dept | : EEE |

| Submitted by: | |
|---|---|
| Name | : Jakirul Islam |
| ID | : 193002101 |
| Dept. | : CSE |

| Remark |
|---|
| |

## Objectives:

1. To get familiarized with the use of OPAMP as amplifiers.
2. To study the behaviour of inverting and non-inverting amplifiers.

## Instruments Required:

| Serial | Name | Ratings | Quantity |
|---|---|---|---|
| 1 | Project Board | | 1 piece |
| 2 | OP-Amp | | 1 piece |
| 3 | Resistor | | 1 piece |
| 4 | Signal Generator | | 1 unit |
| 5 | Oscilloscope | | 1 unit |
| 6 | DC Power Supply | | 1 unit |
| 7 | Multimeter | | 1 unit |
| 8 | Chords and wire | | lot |

## Circuit Diagram:

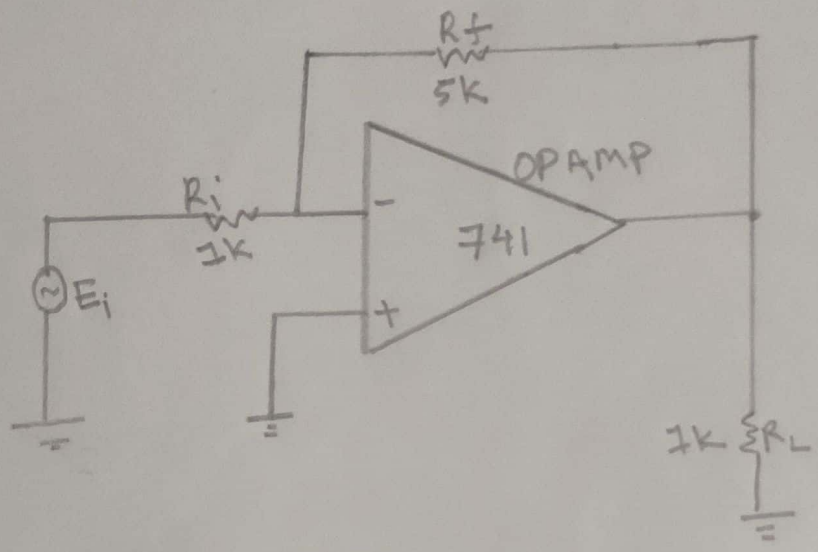



Figure: Circuit Diagram 1

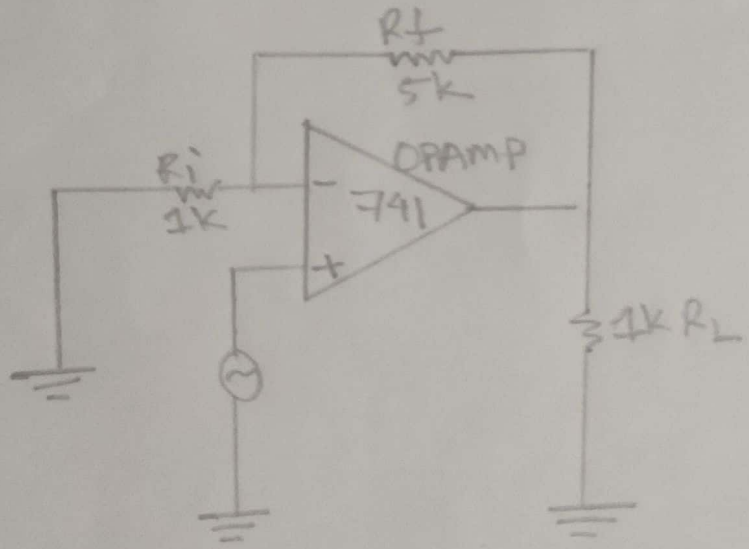



Figure: Circuit Diagram 2

Description:

The two widely used closed loop amplifiers using OPAMP are-

1. Inverting Amplifiers
2. Non-inverting Amplifiers

In both the cases the closed loop gain of the Amplifiers is determined by the input resistance Ri and the feedback resistance Rf

Inverting Amplifiers: In an inverting amplifier the input is applied at the inverting input pin. the output obtained here is inverting. the close loop gain for this type of amplifiers is given by

$$A_{CL} = -R_f / R_i$$

non inverting Amplifiers: In this type of amplifier the input is applied at the non-inverting input whereas the output is not inverting. the close loop gain for this type of amplifiers is given by

$$A_{CL} = (1 + R_f / R_i)$$

Experimental Data Table:

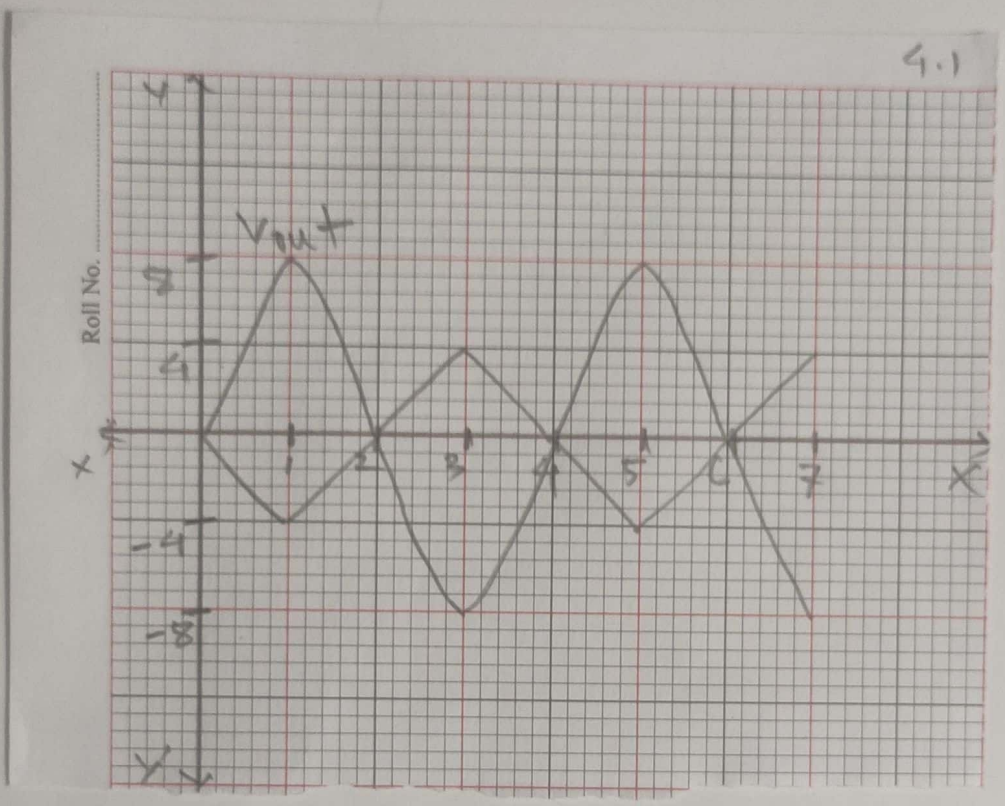
Table 4.1 : Inverting Amplifier

| $R_i$ | $R_f$ | $A_{CL} = -R_f/R_i$ | $E_i$ | $V_o$ | Gain $= \frac{V_o}{E_i}$ |
|---|---|---|---|---|---|
| 1 kΩ | 2 kΩ | −2 | 4 V | 8 V | 2 |

Table : 4.2 : Non-Inverting Amplifier

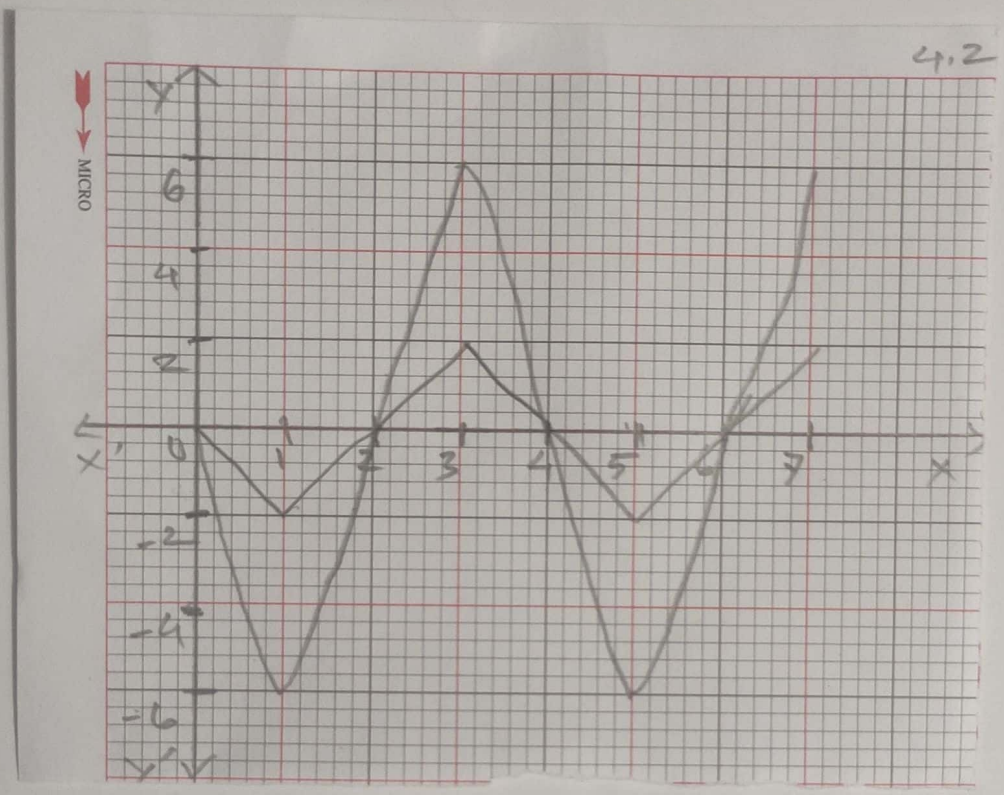
| $R_i$ | $R_f$ | $A_{CL} = (1 + \frac{R_f}{R_i})$ | $E_i$ | $V_o$ | Gain $= \frac{V_o}{E_i}$ |
|---|---|---|---|---|---|
| 1 kΩ | 2 kΩ | 3 | 2 V | 6 V | 3 |

Graph




Graph: 4.1 : Vin and Vout for Inverting Amplifier

Graph




Graph: 4:2: $V_{in}$ and $V_{out}$ for non-inverting Amplifier

Discussion:

After completing this experiment we learn-

a) About the operational of op amp as an amplifier.

b) we also point out the difference of behavior of the inverting and non-inverting amplifier.

# GREEN UNIVERSITY OF BANGLADESH

## Department of Computer Science & Engineering

# Lab report-9b

Course Code: EEE204
Course Title: Electronics Lab

Experiment name: Study of Mathematical Operations Using Op Amp

Submitted to:
Name : Sakib Abdul Ahad
Designation : Lecture
Dept : CSE
Green University Of Bangladesh

Submitted by:
Name : Jakirul islam
ID : 193002101
Section : 193
Dept. : CSE

Objective:

1. To study the use of operational Amplifiers in different mathmatical operations.
2. To study the behavior of inverting adder, differentiator and integrator.

Instrument Required:

| Serial | Name | Ratings | Quantity |
|---|---|---|---|
| 1 | Project Board | | 1 Piece |
| 2 | OP-AMP | 741 | 1 Piece |
| 3 | Resistor | 10kΩ | 4 Piece |
| 4 | Resistor | 20kΩ, 50kΩ | 1 Piece |
| 5 | Capacitor | 0.01 μF | 1 Piece |
| 6 | Signal Generator | | 1 unit |
| 7 | Oscilloscope | | 1 unit |
| 8 | DC Power Supply | | 1 unit |
| 9 | multimeter | | 1 unit |
| 10 | Chords and wire | | lot |

Circuit Diagram:

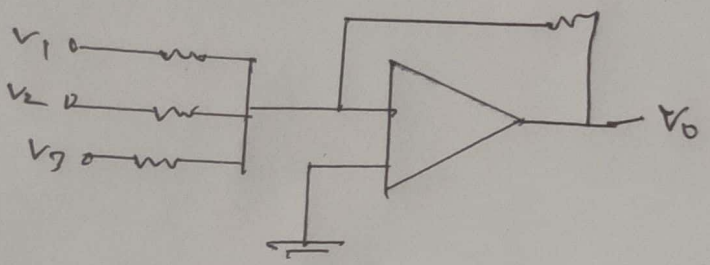



Fig: 5.1 Inverting adder

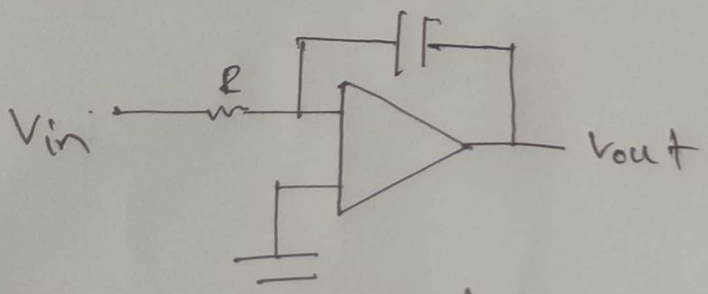



Fig: 5.2 Integrator

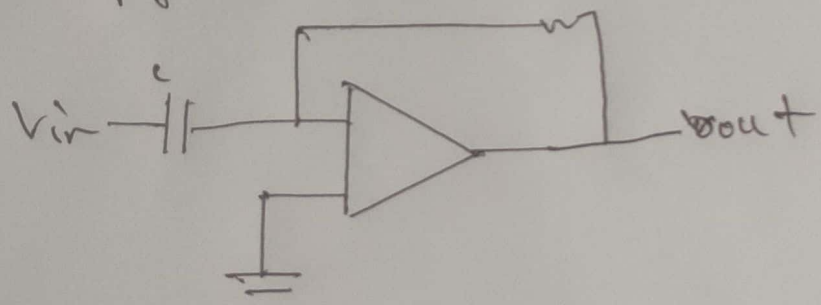



figure: 5.3 · Differentiator

Discription:

The property of infinite impedance and infinite gain of an operational amplifier results in a situation of zero voltage between the two input terminals. Due to this effect, the OP-AMP can be used to perform some mathematical operations use OP-AMPs in different mathematical operations. Implement OP-AMP circuits in diverse systems to serve different purposes. Using the concept of inverting Amplifier, the OP-Amp can be used as an adder cactually inverting adder to sum up same input signals.

Discussion:

Aftere completing this experiment we learn-

a) About the use of op-Amp in different mathematical operations.

b) we also learn about the Implementation of op-Amp circuits in diverse systems to serve different purpose.