PRACTICE FILE

ELECTRONIC

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INDEX

BECC 0800: ELECTRONICS LAB-I

Semester I

List of Experiments

S NO.	AIM
1	Identification of various electronics, electrical components and study of measuring instruments and sources used in electronic circuits. (i) Multi-meters (ii) CRO (iii)Function Generator (iv)DC Supply
2	To determine the V-I characteristics of a semi-conductor diode.
3	To study the working of a Half-Wave & Full Wave (Bridge type) rectifier.
4	To study application of diode as clipper circuit and clamper circuit.
5	Principal's Report
6	To study various logic gates such as OR, AND, NOT, NAND, NOR.

EXPERIMENT NO. 1

OBJECTIVE:

Identification of various electronics, electrical components and study of measuring instruments and sources used in electronic circuits. (i) CRO (ii) Function Generator (iii) Multi-meter (iv) DC Supply

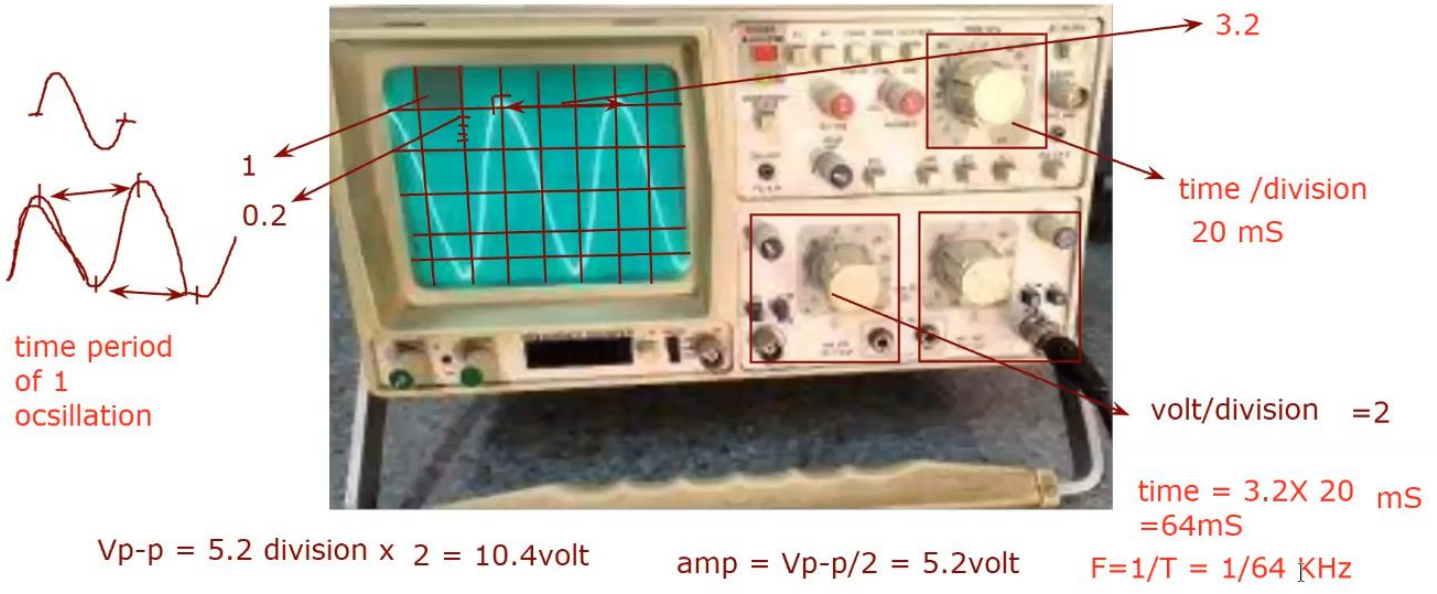
APPARATUS & MATERIAL REQUIRED: -

Cathode-ray Oscilloscope, Function Generator, BNC to BNC co-axial cable, CRO Probes, multi-meter and dc power supply.

THEORY:

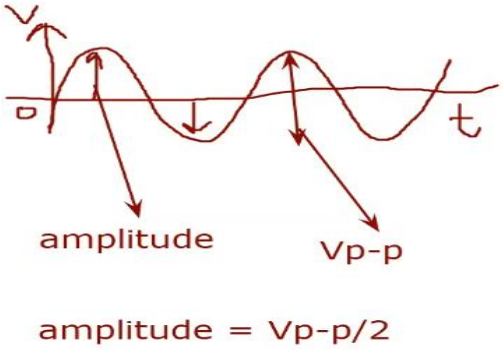
Cathode-Ray Oscilloscope:

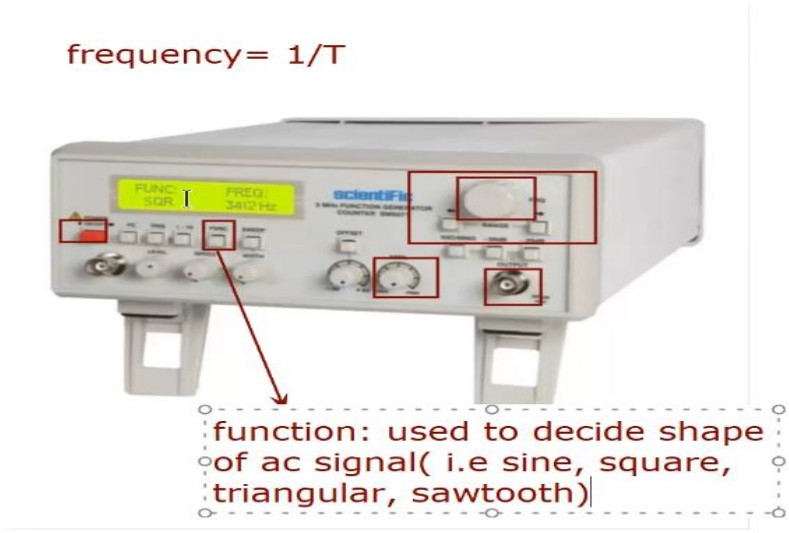
The cathode-ray oscilloscope (CRO) is a common laboratory instrument that provides accurate time and amplitude measurements of voltage signals over a wide range of frequencies. Its reliability, stability, and ease of operation make it suitable as a general purpose laboratory instrument. The heart of the CRO is a cathode-ray tube



FUNCTION GENERATOR

A function generator is a piece of electronic test equipment or software used to generate electrical waveforms. These waveforms can be either repetitive, or single-shot in which case some kind of triggering source is required (internal or external).



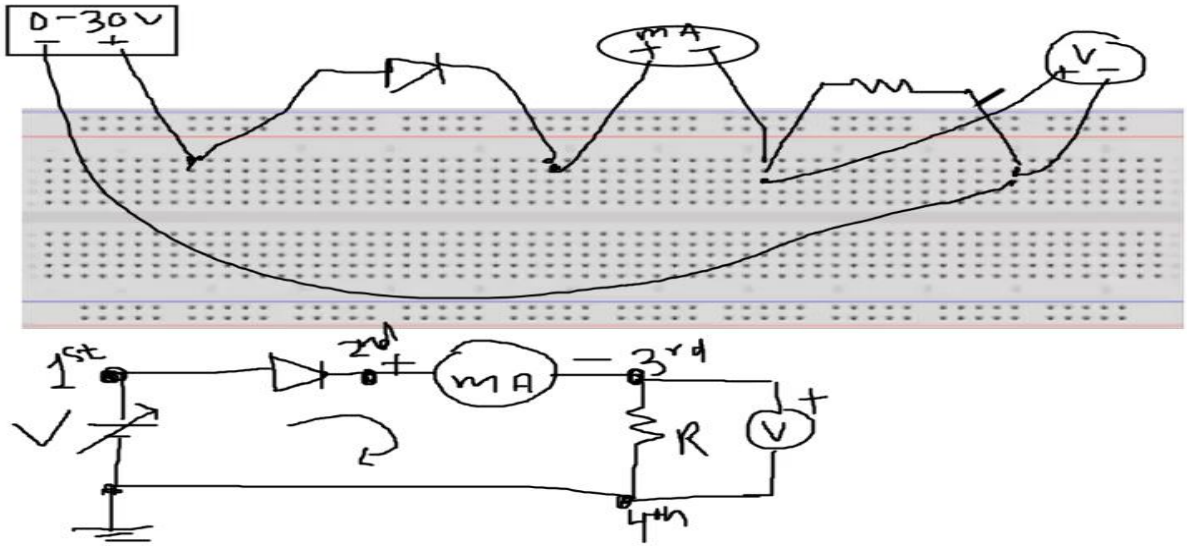


Multimeter

A multimeter or a multitester, also known as a VOM (Volt-Ohm meter), is an electronic measuring instrument that combines several measurement functions in one unit. A typical multimeter may include features such as the ability to measure voltage, current and resistance.

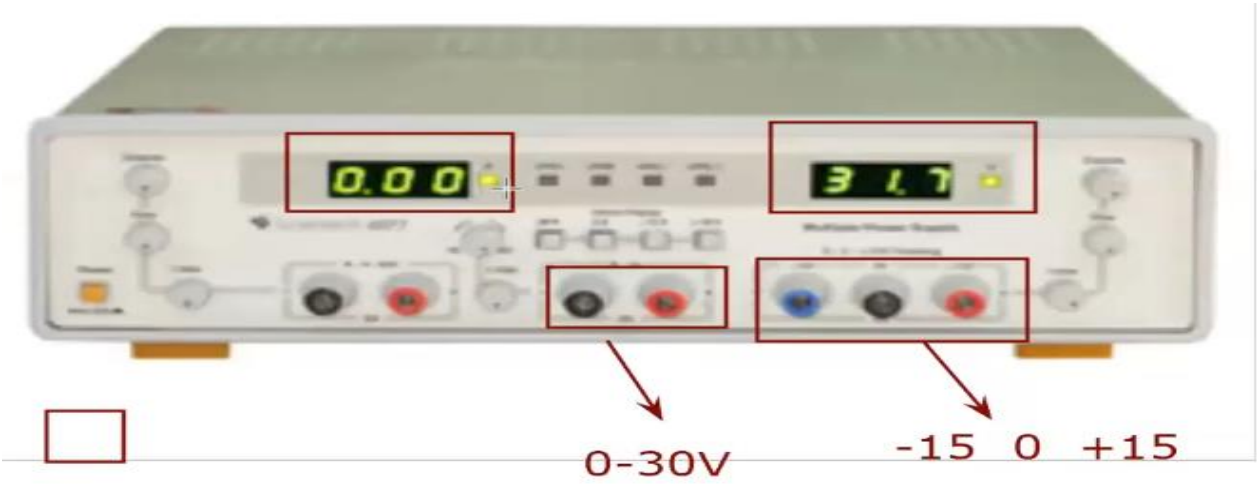
Bread Board

A breadboard (protoboard) is a construction base for prototyping of electronics. The term is commonly used to refer to solderless breadboard (plugboard). Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design.



Power Supply:

A power supply is a device that supplies electric power to one or more electric loads. The term is most commonly applied to devices that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy (mechanical, chemical, solar) to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.



RESULTS AND DISCUSSION:

Study of lab equipment's- CRO, Multimeter, Function Generator, Power supply- Active, and Passive Components & Bread Board has been studied successfully

EXPERIMENT NO. 2

OBJECTIVE:

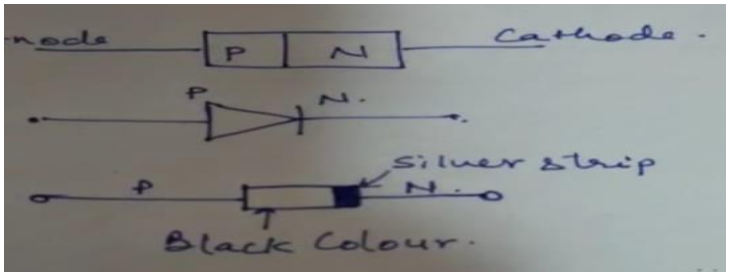
To study the PN junction diode characteristics under Forward & Reverse bias conditions.

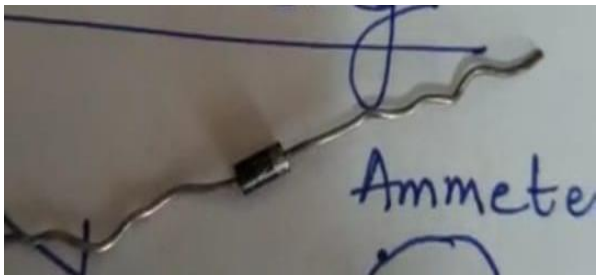
APPARATUS & MATERIAL REQUIRED:

R.P.S, Ammeter, Voltmeter, Diode, Resistor, Wires.

THEORY:

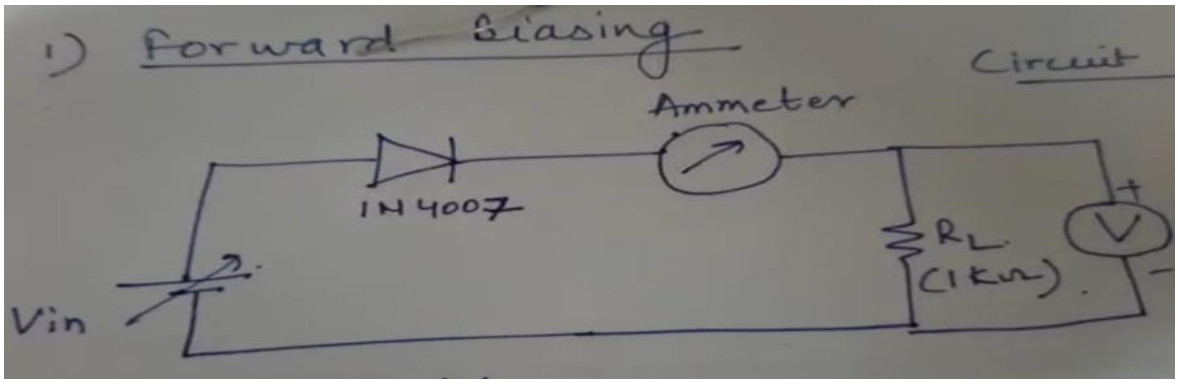
A PN junction diode is a two terminal junction device. It conducts only in one direction (only on forward biasing)





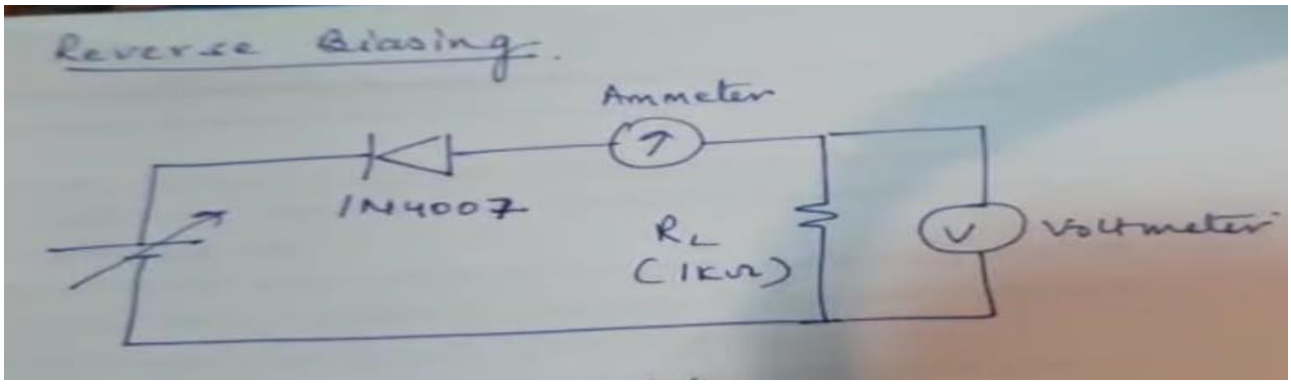
Forward bias:

On forward biasing, initially no current flows due to barrier potential. As the applied potential exceeds the barrier potential the charge carriers gain sufficient energy to cross the potential barrier and hence enter the other region. The holes, which are majority carriers in the P-region, become minority carriers on entering the N-regions, and electrons, which are the majority carriers in the N-region, become minority carriers on entering the P-region. This injection of Minority carriers results in the current flow, opposite to the direction of electron movement.



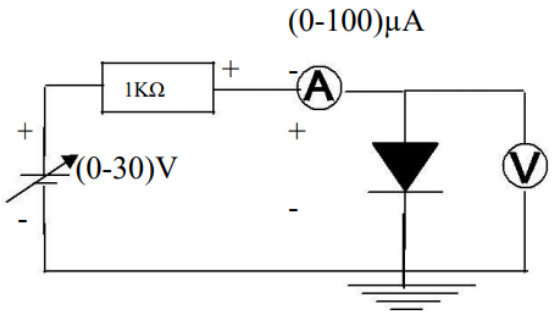
Reverse bias:

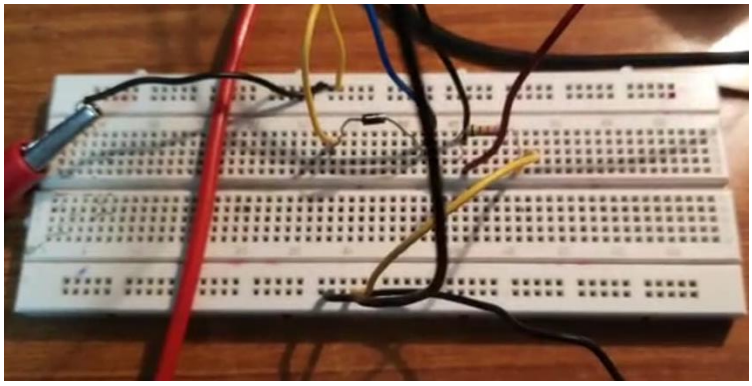
On reverse biasing, the majority charge carriers are attracted towards the terminals due to the applied potential resulting in the widening of the depletion region. Since the charge carriers are pushed towards the terminals no current flows in the device due to majority charge carriers The generation of such carriers is independent of the applied potential and hence the current is constant for all increasing reverse potential. When the applied reverse voltage is increased beyond the certain limit, it results in breakdown. During breakdown, the diode current increases tremendously.



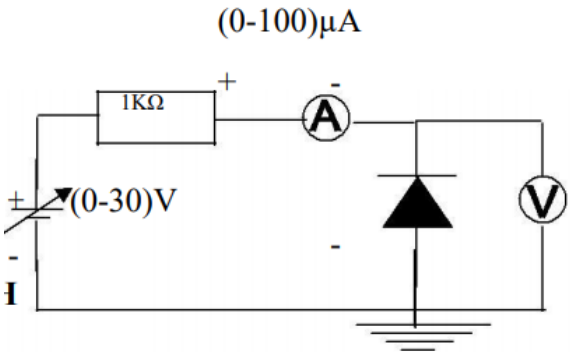
CIRCUIT DIAGRAM:

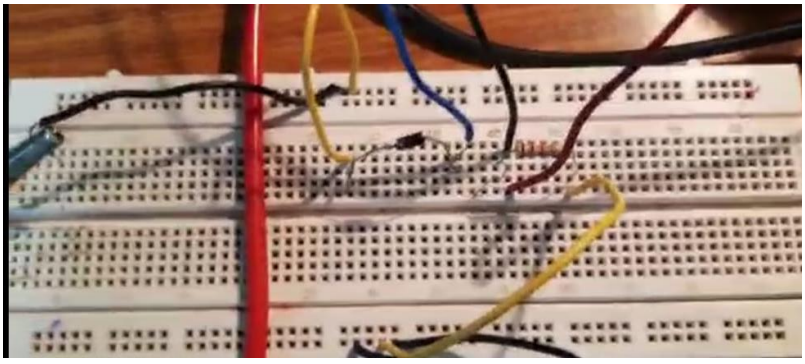
FORWARD BIAS:





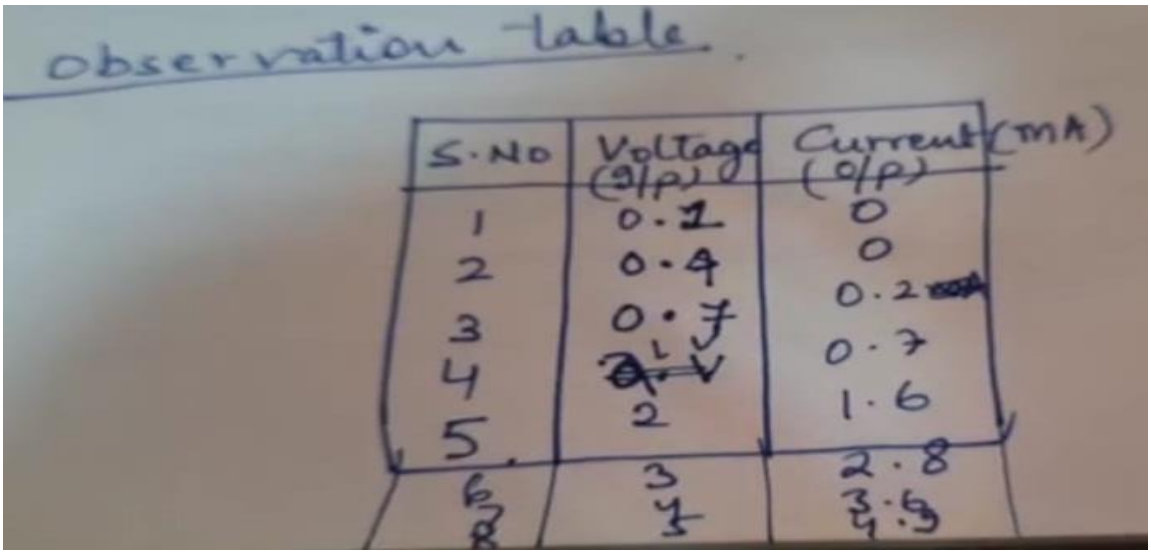
REVERSE BIAS:





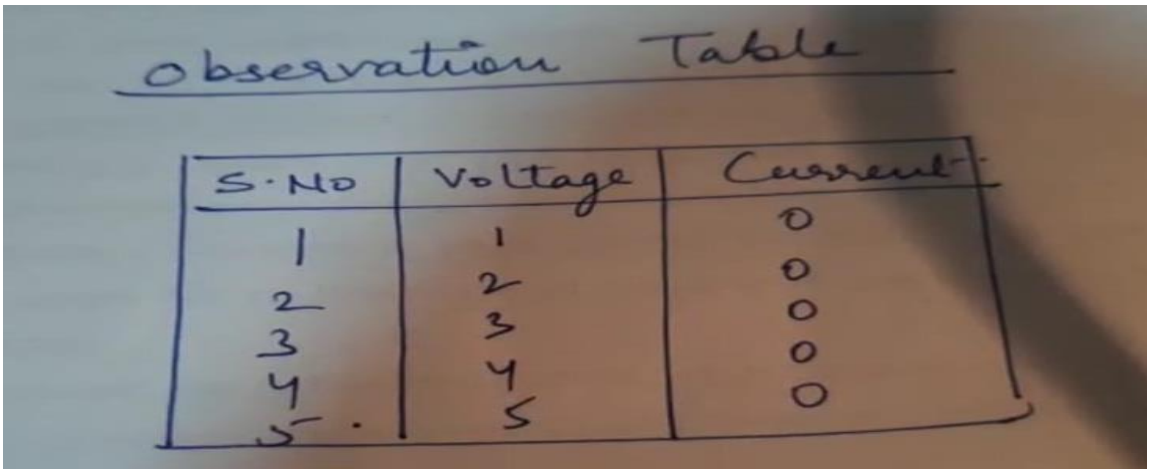
Observation table:

Forward bias:


Observation table.

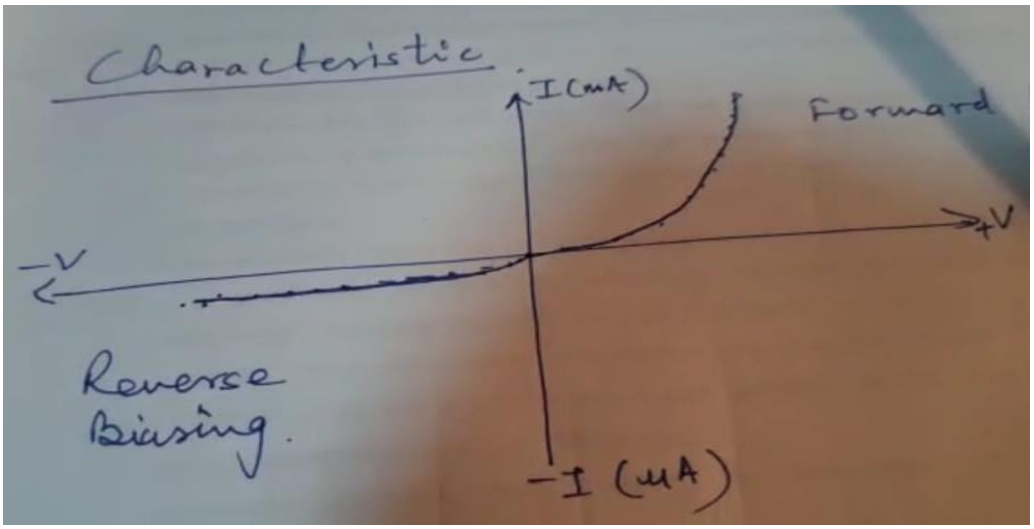
S.No	Voltage (I/P)	Current (O/P) (mA)
1	0.1	0
2	0.4	0
3	0.7	0.2
4	1 V	0.7
5	2	1.6
6	3	2.8
7	4	3.9
8		

Reverse bias:


Observation Table

S.No	Voltage	Current
1	1	0
2	2	0
3	3	0
4	4	0
5	5	0

MODEL GRAPH :



RESULT:

Forward and Reverse bias characteristics of the PN junction diode was Studied.

PRECAUTIONS:

1) Make the connections as per the circuit diagram carefully.

2) Observe the waveform carefully on the CRO.

3) The connections should be tight.

EXPERIMENT NO. 3

OBJECTIVE:

To study the working of Half Wave and Full wave (Bridge Type) Rectifier.

APPARATUS & MATERIAL REQUIRED:

Cathode Ray Oscilloscope (CRO), Bread board, Transformer, diodes, resistors, connecting wires.

THEORY:

Half-wave rectifier:

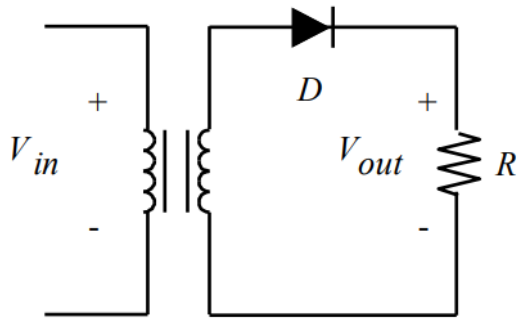
A half-wave rectifier can be connected to the transformer secondary as shown in Figure 2to generate the typical half-wave output signal as discussed before. The half-wave rectifier circuit produces an output signal whose fundamental frequency is the same as the input AC signal

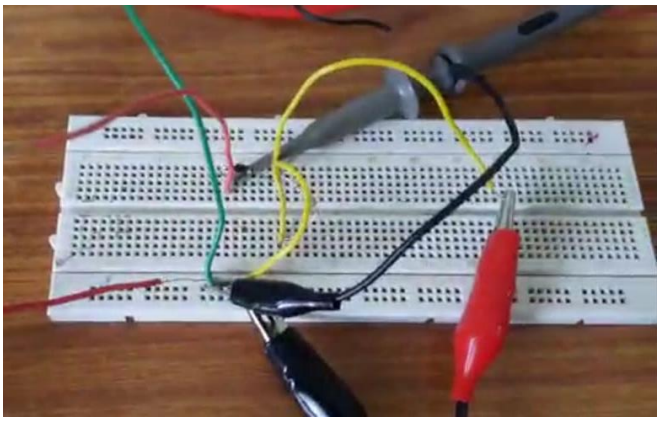
Full-wave rectifier:

When input AC signal is applied across the bridge rectifier, during the positive half cycle diodes D1 and D3 are forward biased and allows electric current while the diodes D2 and D4 are reverse biased and blocks electric current. On the other hand, during the negative half cycle diodes D2 and D4 are forward biased and allows electric current while diodes D1 and D3 are reverse biased and blocks electric current.

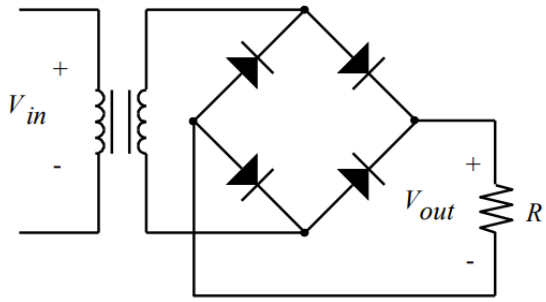
CIRCUIT DIAGRAM:

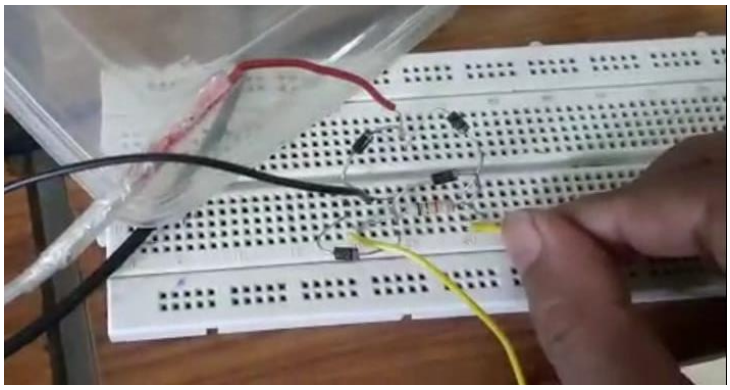
1) Half-wave rectifier:





2) Full-wave rectifier:

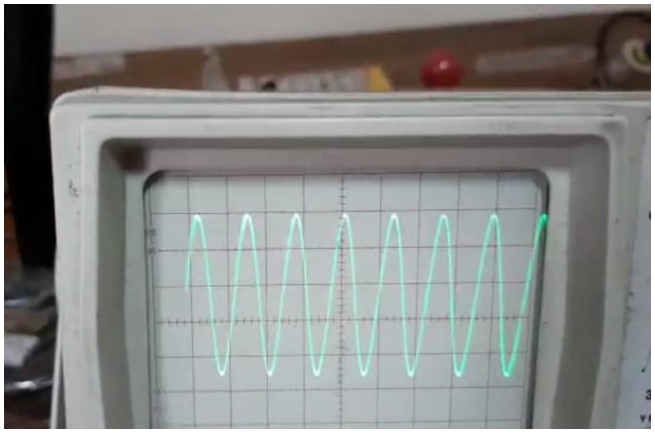




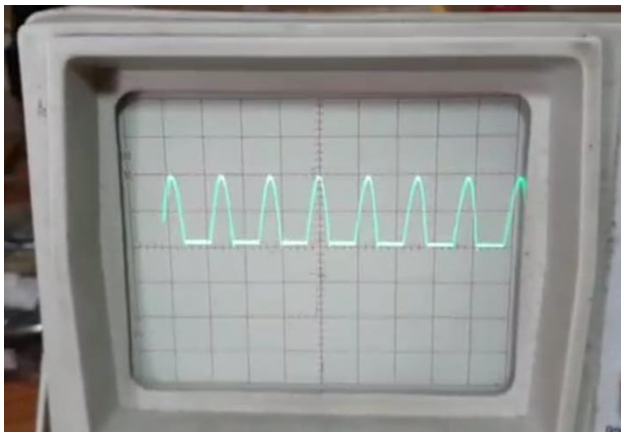
Observation on CRO:

1) Half-wave rectifier:

Input

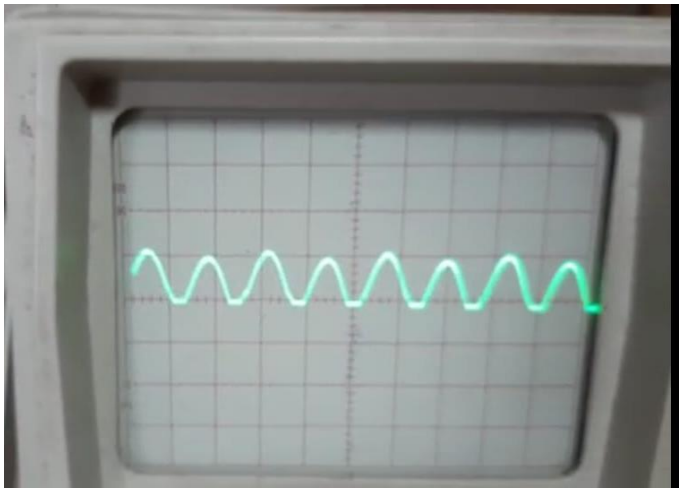


Output

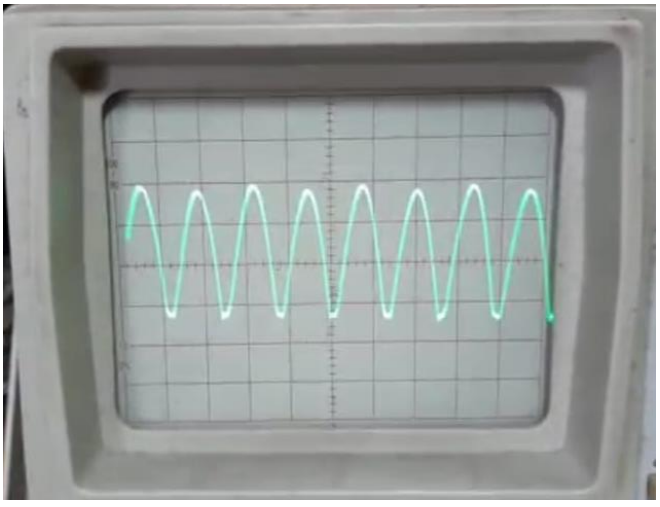


2) Half-wave rectifier:

INPUT



OUTPUT



RESULT:

The application of diode as Rectifier circuits have been studied and input-output waveforms have been observed on the CRO.

PRECAUTIONS:

1) Make the connections as per the circuit diagram carefully.

2) Observe the waveform carefully on the CRO.

3) The connections should be tight.

EXPERIMENT NO. 4

OBJECTIVE:

To study the application of diode as (i) Clipper circuit and (ii) Clamper Circuit.

APPARATUS & MATERIAL REQUIRED:

CRO,

Function Generator,

Bread Board, DC Supply,

Diode, Digital Multimeter

Resistors,

Capacitors,

Connecting wires & CRO Probes

THEORY:

Clipper Circuits:

A clipper is a circuit with which the waveform is shaped by removing or clipping a portion of the applied input signal waveform without distorting the remaining part. Clippers fall into the general category of wave-shaping circuits. The function of a clipper is to limit the amplitude of a signal to some particular maximum positive or negative value. Clipper can remove signal voltages above or below a specified level.

Clamper Circuits:

Clamping circuits shifts or change a signal to different d.c. level. Clamping circuit introduces a d.c. level to an a.c signal. Clampers are networks that clamp the input signal to a different dc level, but the peak-to-peak swing of the applied signal will remain the same. Clamper circuit consists of clipper components plus capacitor.

CIRCUIT DIAGRAM:

Clipper Circuits:-

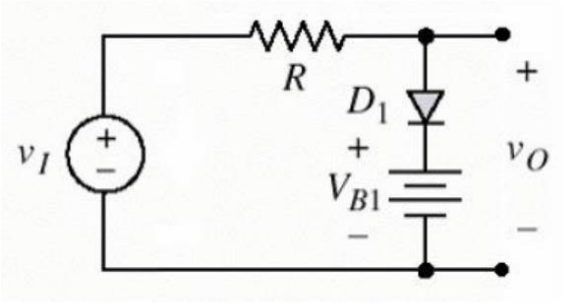
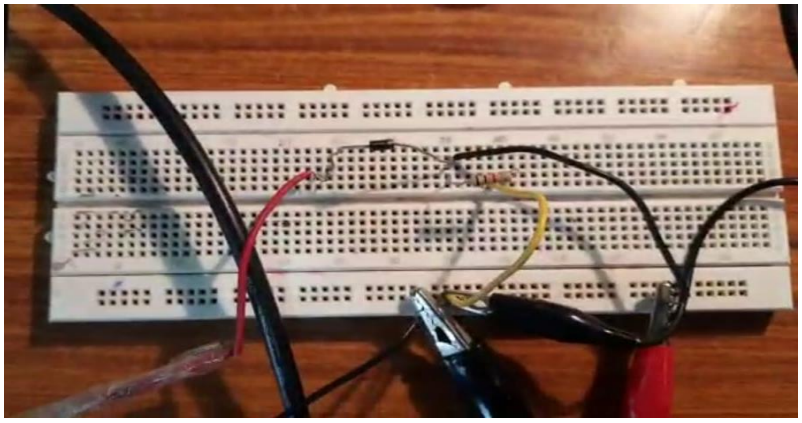


Figure 1: Schematic of a clipper circuit.



Clamper Circuits:-

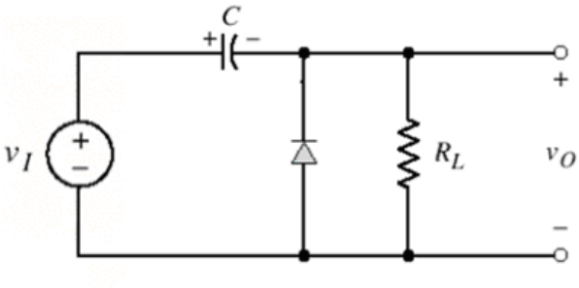
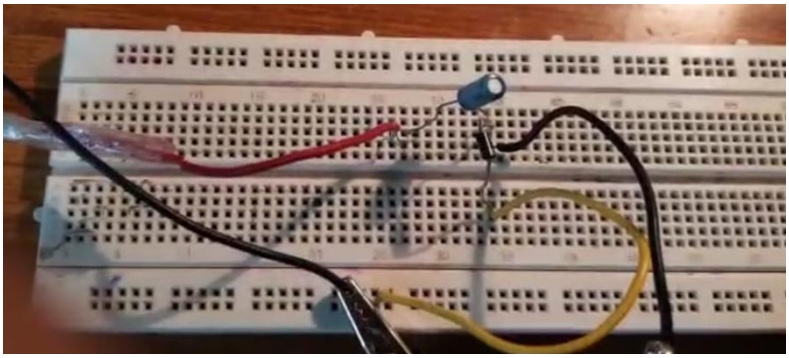


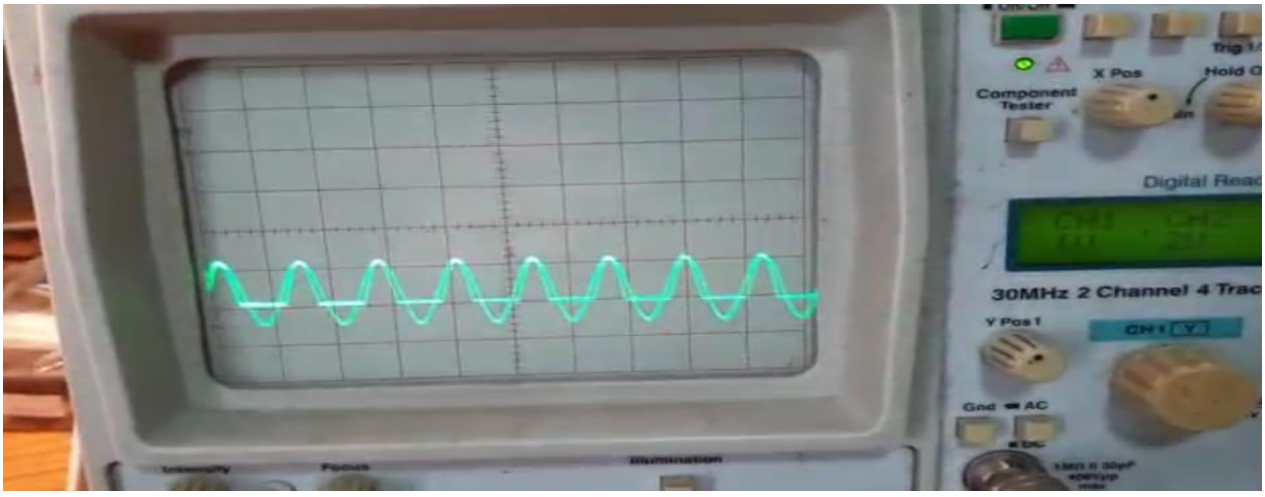
Figure 2: Schematic of a clamper circuit.



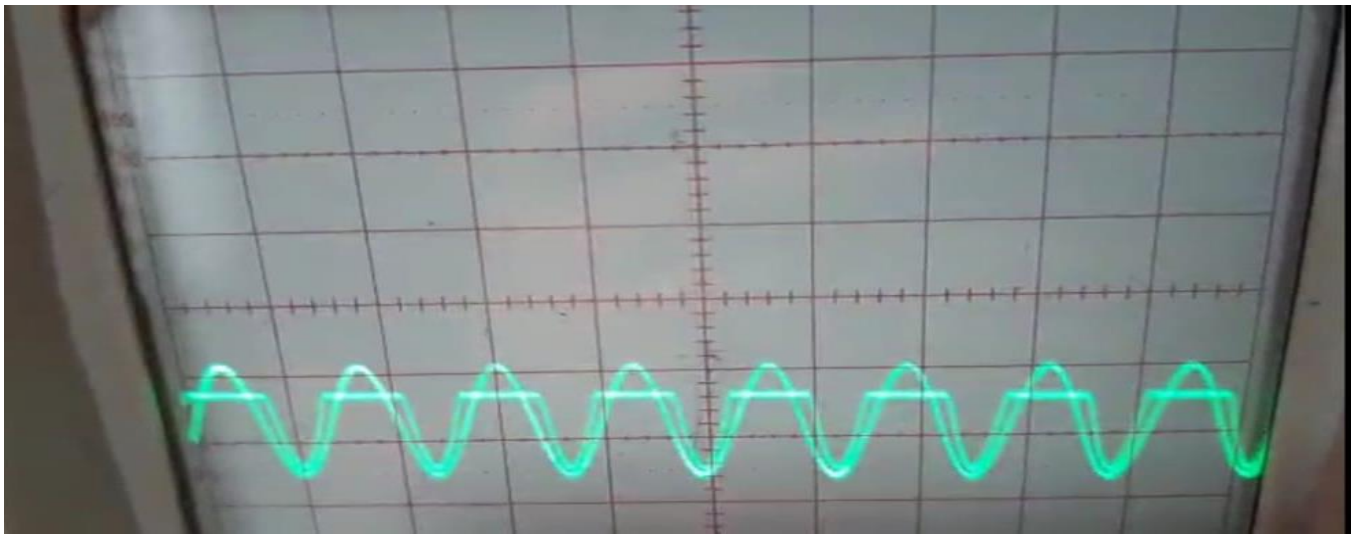
Observation on CRO:

1) Clipper

Clipper removing negative part of signal

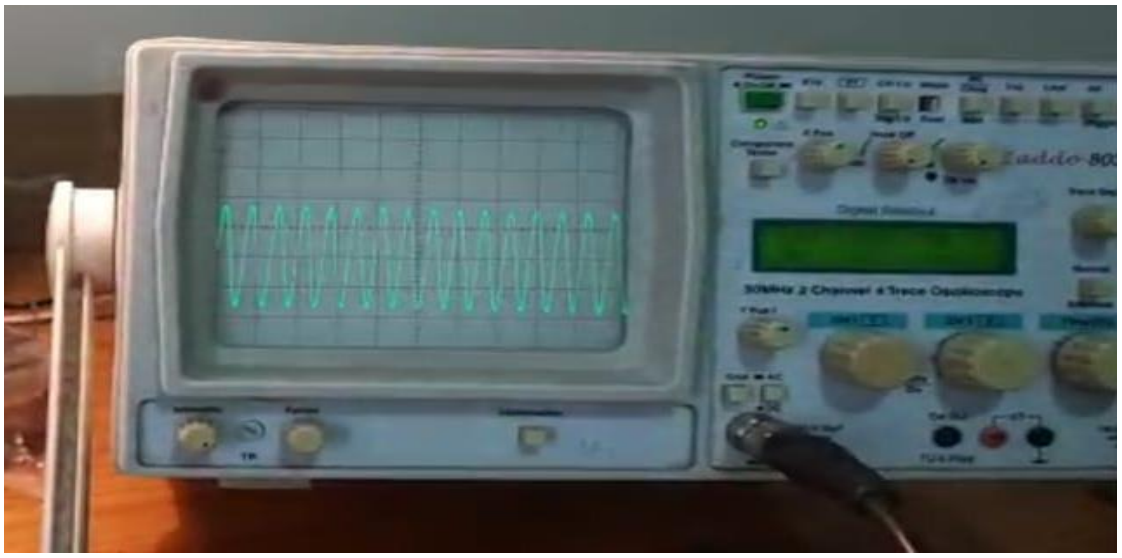


Clipper removing positive part of signal

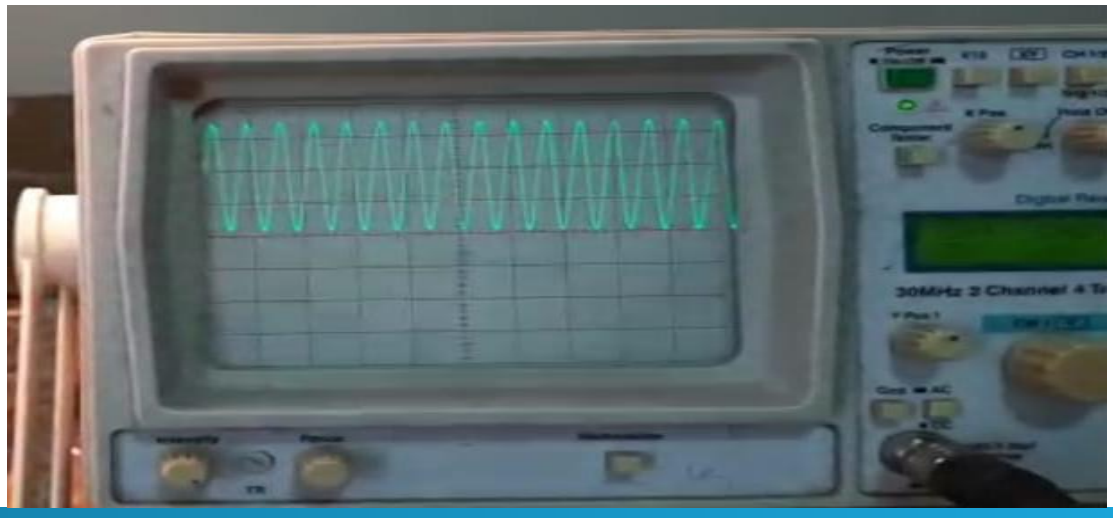


2) Clamper

Clamper shifting downward



Clamper shifting upward



RESULT:

The application of diode as Clipper and Clamper circuits have been studied and input-output waveforms have been observed on the CRO.

PRECAUTIONS:

1) Make the connections as per the circuit diagram carefully.

2) Observe the waveform carefully on the CRO.

3) The connections should be tight.

EXPERIMENT NO. 5

OBJECTIVE:

To study the application of Zener diode as a voltage regulator.

APPARATUS & MATERIAL REQUIRED:

Zener diode, Bread board, Variable DC supply, Multi-meter, Resistors, Variable load (potentiometer).

THEORY:

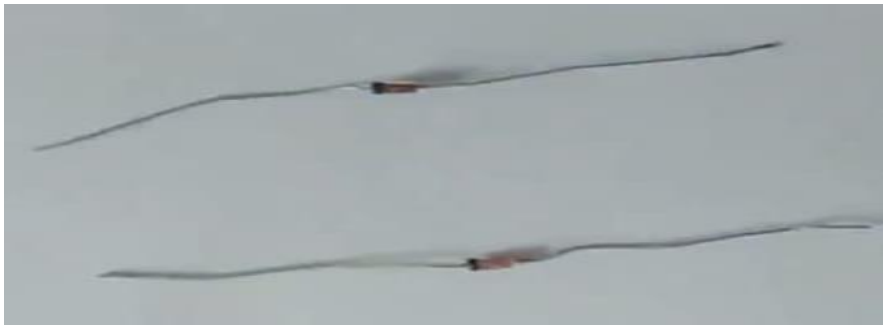
Voltage Regulator:

A voltage regulator circuit is required to maintain a constant dc output voltage across the load terminals in spite of the variation:

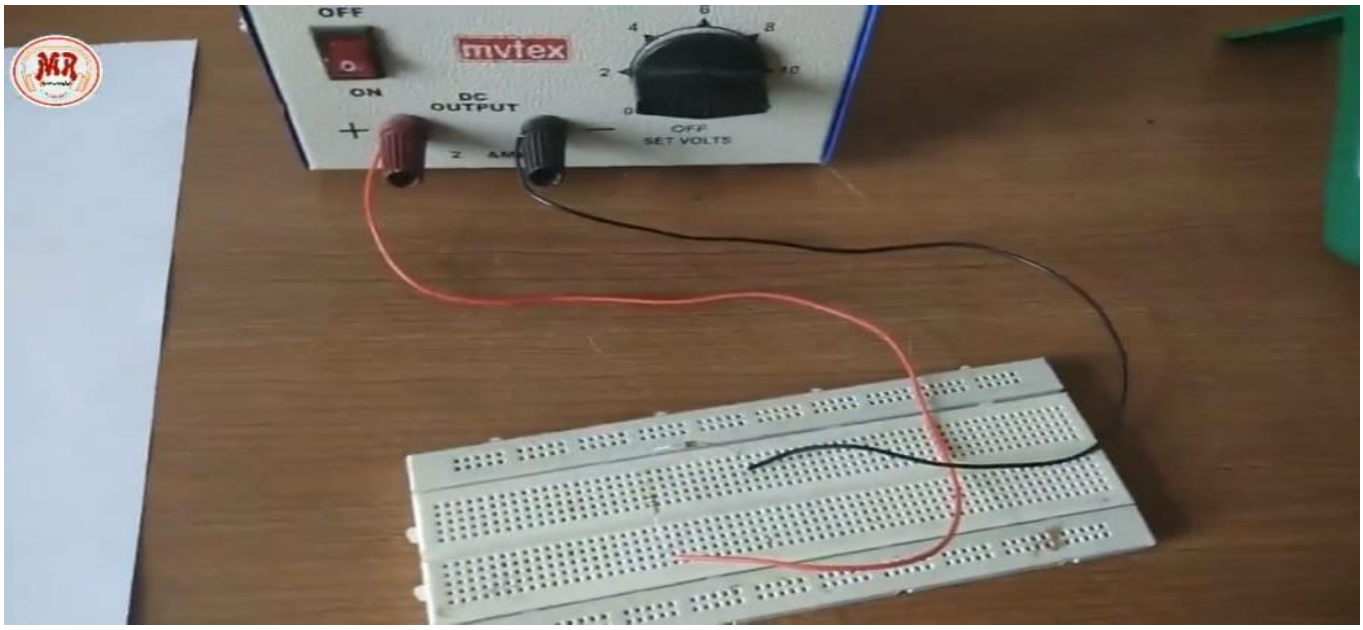
- Variation in input mains voltage
- Change in the load current
- Change in the temperature

The voltage regulator circuit can be designed using Zener diode. For that purpose, Zener diode is operated always in reverse biased condition. Here, Zener is operated in break-down region and is used to regulate the voltage across a load when there are variations in the supply voltage or load current.

The figure shows the Zener voltage regulator, it consists of a current limiting resistor Rs connected in series with the input voltage Vs and Zener diode is connected in parallel with the load RL in reverse biased condition. The output voltage is always selected with a breakdown voltage VZ of the diode.

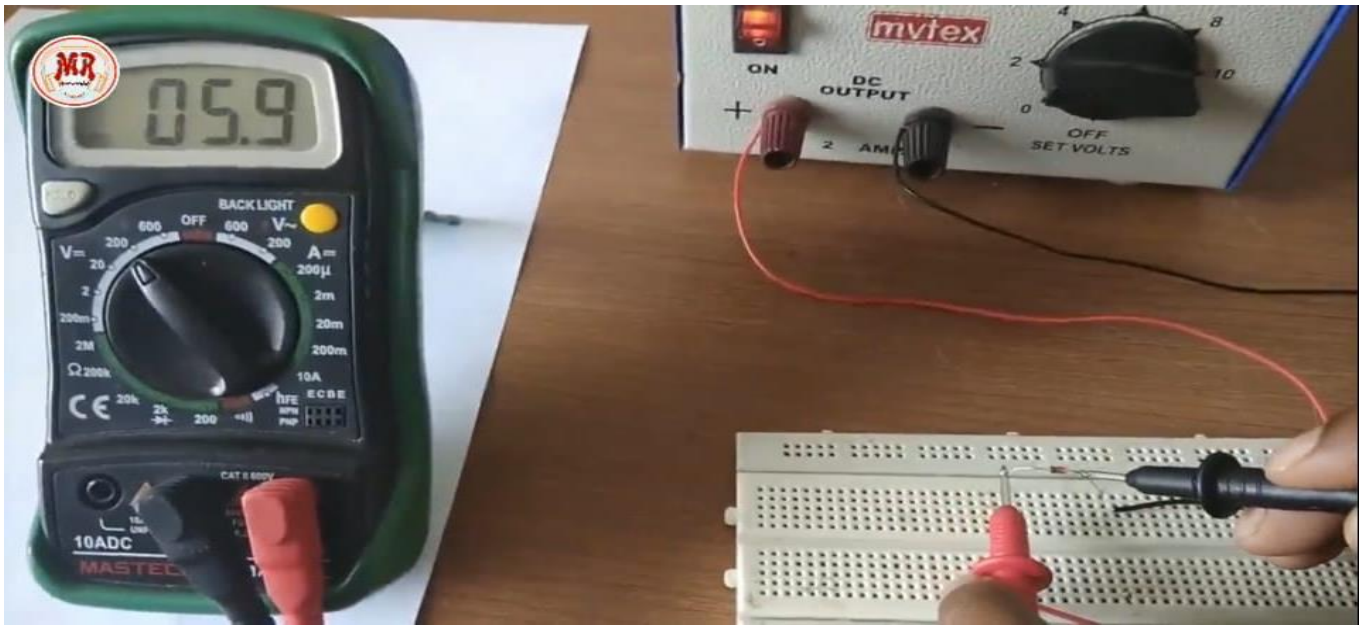


CIRCUIT DIAGRAM :-



RESULT:

The regulation of zener diode as a voltage regulator under the load of 10 KΩ is equal to 6.



PRECAUTIONS:

1. Check the circuit connection before giving supply.
2. Do not retain more reverse voltage for longer time.

EXPERIMENT NO. 6

OBJECTIVE:

Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR Exclusive OR (EX-OR), Exclusive NOR (EX-NOR) Gates.

APPARATUS & MATERIAL REQUIRED:

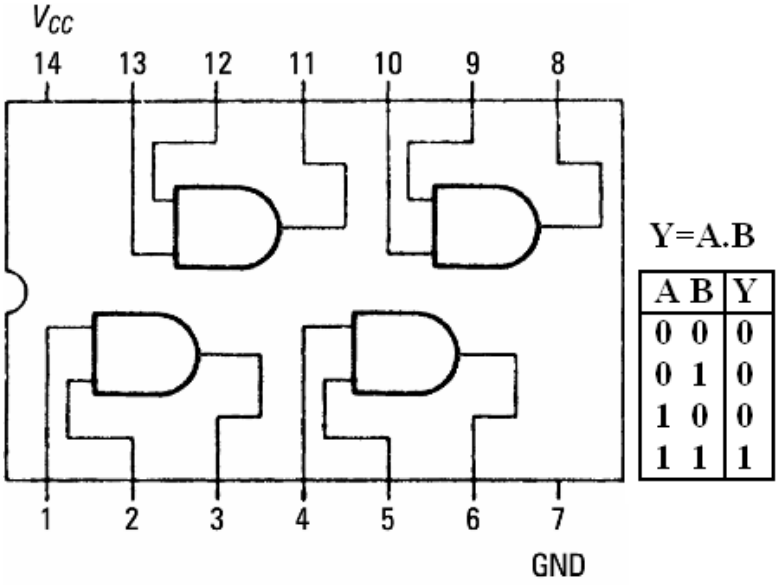
Bread board, logic gates ICs, wires.

THEORY:

Logic gates are electronic circuits which perform logical functions on one or more inputs to produce one output. There are seven logic gates. When all the input combinations of a logic gate are written in a series and their corrresponding outputs written along them, then this input/ output combination is called Truth Table. Various gates and their working is explained here.

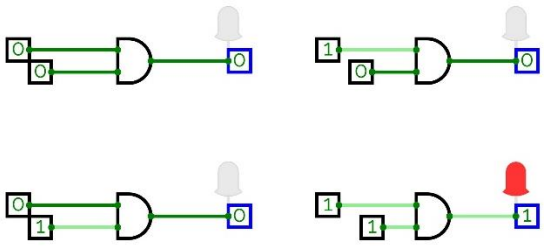
AND Gate:

AND gate produces an output as 1, when all its inputs are 1; otherwise the output is 0. This gate can have minimum 2 inputs but output is always one. Its output is 0 when any input is 0.



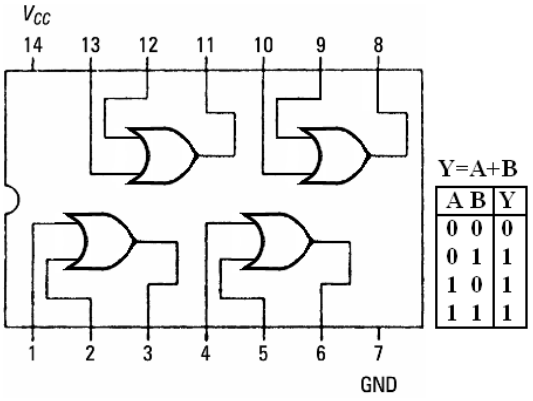
Y=A.B

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



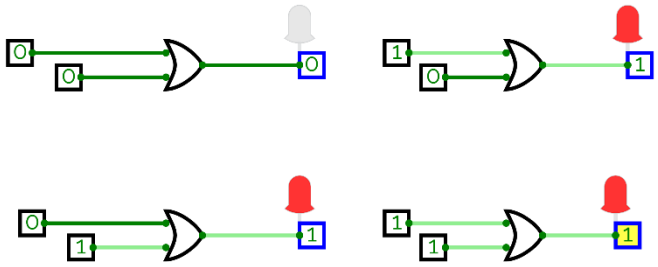
OR Gate:

OR gate produces an output as 1, when any or all its inputs are 1; otherwise the output is 0. This gate can have minimum 2 inputs but output is always one. Its output is 0 when all input are 0.



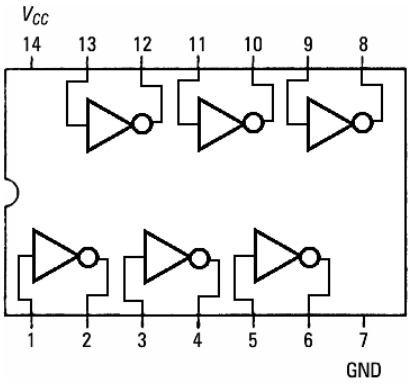
Y=A+B

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1



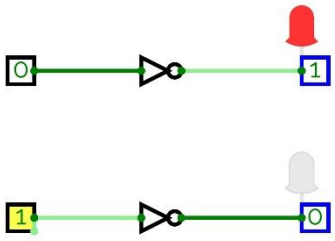
NOT Gate:

NOT gate produces the complement of its input. This gate is also called an INVERTER. It always has one input and one output. Its output is 0 when input is 1 and output is 1 when input is 0.



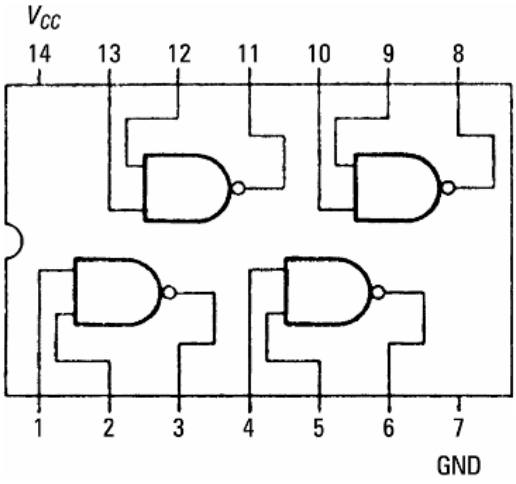
$Y=\overline{A}$

A	Y
0	1
1	0



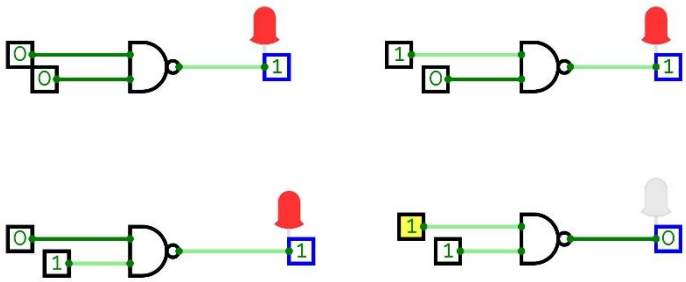
NAND Gate

NAND gate is actually a series of AND gate with NOT gate. If we connect the output of an AND gate to the input of a NOT gate, this combination will work as NOT-AND or NAND gate. Its output is 1 when any or all inputs are 0, otherwise output is 1



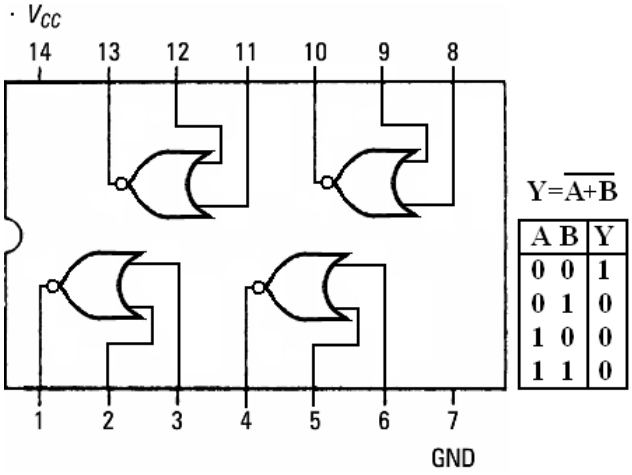
$Y=\overline{A.B}$

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0



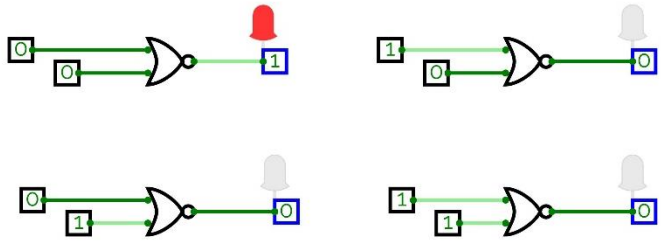
NOR Gate:

NOR gate is actually a series of OR gate with NOT gate. If we connect the output of an OR gate to the input of a NOT gate, this combination will work as NOT-OR or NOR gate. Its output is 0 when any or all inputs are 1, otherwise output is 1.



$Y=\overline{A+B}$

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0



RESULT:

Truth table of all gates are verified.

PRECAUTIONS:

1. IC pin should be connected carefully.
2. Connections should be proper.
3. Negative terminal of 5V fixed DC supply should be used as ground.