# Experiment: 2

**Title:** VI characteristics of p-N junction diode.

**Aim:** To plot the VI characteristics of p-N junction diode in forward and reversed bias and also to calculate static and dynamic resistance.

**Apparatus:**

i) IN4007 diode ii) Resistor 1 KΩ, 470Ω iii) Ammeter iv) Voltmeter v) TRPS vi) BreadBoard vii) Wires.

**Circuit Diagram:**

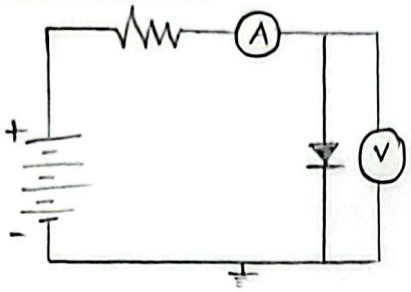



fig: Forward bias

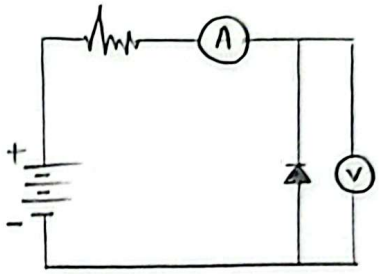


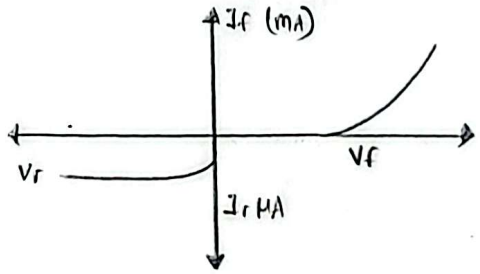

fig: Reverse bias

**Table:**

| Vf | If (mA) |
|---|---|
| 0 | 0 |
| 0.30 | 0 |
| 0.46 | 0.1 |

| Vr | Ir (μA) |
|---|---|
| 0 | 0 |
| 0.14 | 12.4 μA |
| 0.20 | 26.1 μA |

**Graph:**




**Procedure:**

- Forward bias:

- Make connection according to circuit diagram.
- In forward connect positive to anode and negative to cathode
- By varying voltage take reading
- Poll the graph between forward and revesed bias.

Reverse Bias:

- Make connection According to circuit diagram.
- Connect positive to cathode and negative to anode.
- By Varying Voltage take the reading.

• Calculation:

- Static resistance = V/I at a-point.
- Dynamic Resistance = $\Delta V/\Delta I$ at Q-point.

• Precautions:

- Connection must be made carefully to avoid short circuit.

• Result:

the VI characteristics of P-N Junction are observed and the graph are plotted.

Static resistance = 4.6
Dynamic resistance = 4.6
Cut-in voltage = 0.46 V

## Experiment-3:

• Title: VI characteristics of Zener diode and zener diode regulator.

• Aim: To plot the VI characteristics of zener diode in reverse and to verify that Zener diode acts as a voltage regulator.

• Apparatus:

i) Zener Diode ii) 470Ω resistor iii) Ammeter
iv) Voltmeter v) TRPS vi) Breadboard vii) Wire.

• Circuit Diagram:

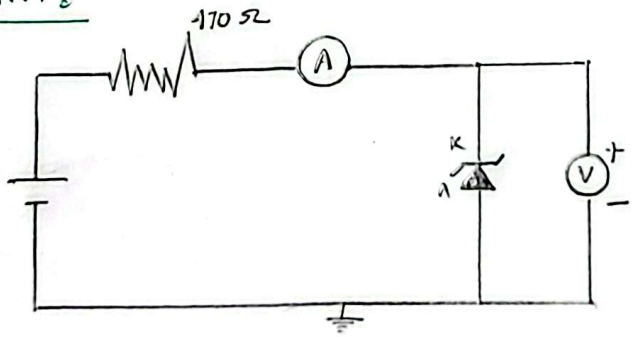


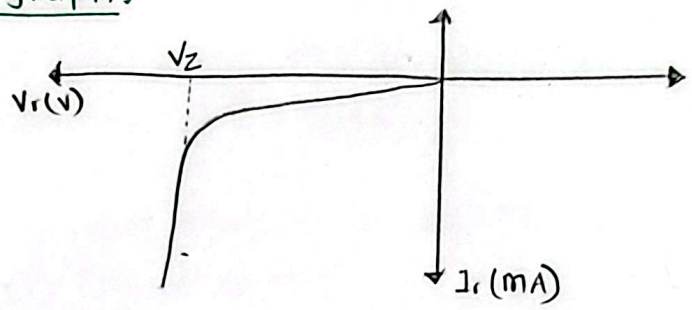

fig: Reverse bias

• Procedure:

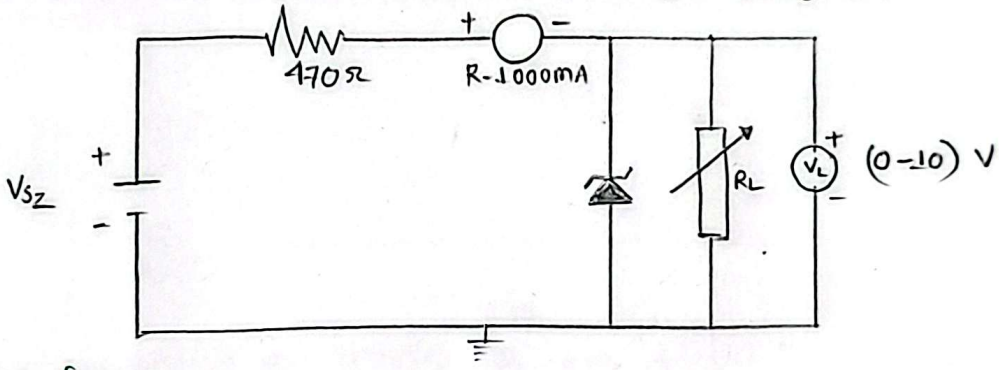
(a) To plot VI characteristics:

- Make the connection as per diagram.
- Vary the RPS voltage from 0V to 30V in steps of 1V.
- Tabulate the reading of Ammeter and voltmeter.
- Plot the graph between $V_Z$ and $I_Z$
- Calculate the breakdown voltage of given Zener diode from the graph.

• Model graph:




• Circuit Diagram: Zener diode as voltage Diagram.




• Tabular form:

| S No | $R_L$ (ohms) | $V_Z$ (Volts) | $I_S = I_Z + I_L$ | % regulation $((V_{NL} - V_L)/V_L \times 100)$ |
|---|---|---|---|---|
| | 1100Ω to 100Ω | | | |

• Procedure:

(b) As voltage regulator:

- Make the connection as shown in the figure.
- Measure $V_{NL}$ (No load voltage) and vary the load resistance from 100Ω to 1100Ω.
- Tabulate the data and calculate.

• Precautions:
- Connection must be made carefully to avoid short circuit
- Reading must be taken without parallax error.

• Result:
- The reverse bias characteristics are observed.
- The regulation characteristics are also plotted.

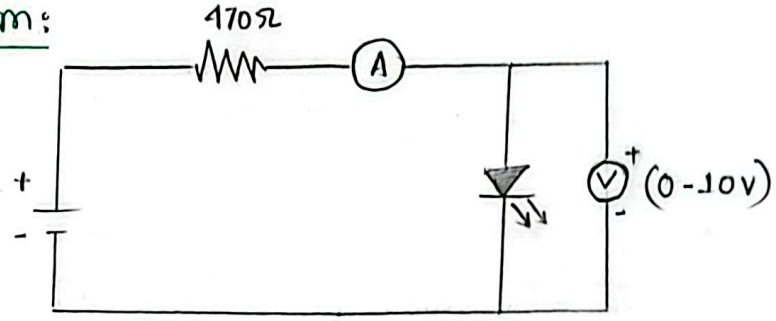
## Experiment:4:

• Title: VI characteristics of Light emitting diode (LED)

• Aim: To determine the forward bias characteristics of the light emitting diode (LED).

• Apparatus:
i) LED ii) 470Ω resistance iii) Voltmeter iv) Ammeter
v) TRPS vi) Bread board.

• Circuit Diagram:

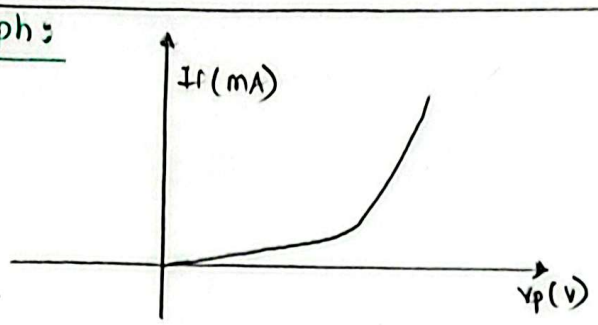



• Procedure:
- Connection must be made as per circuit diagram.
- By varying voltage in steps note down current.
- At the same time note the intensity.

• Table:

| SL NO | Vf Voltage | If (mA) | Intensity |
|---|---|---|---|
| 01 | 1 | 0 | Dim |
| 02 | 2 | 0 | Dim |
| 03 | 2.4 | 0.5 | Low-mid |
| 04 | 2.8 | 6 | mid |
| 05 | 2.9 | 10 | high |

• Model graph:




• Precautions:

- Connection must be followed carefully
- Reading should not exceed meter range.

• Result:

The foward characteristics of a light emitting diode are obtained and the graph was plotted.

## Experiment-5:

Title: Half wave rectifier with and without diode.

Aim: To observe output waveforms and to find ripple factor of a half wave rectifier with and without filter.

• Apparatus:

i) 0-12V stepdown transformer ii) IN407 diode iii) multimeter iv) 1000Ω register v) 1000 Mf 125 V capacitor vi) Bread-board vii) Wires.

• Circuit Diagram:

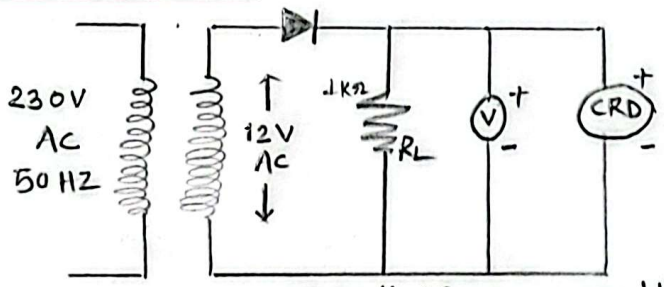



fig: Half wave rectifier without filter.

• Table:

| $V_{AC}$ | $V_{DC}$ | R.F = $\frac{V_{AC}}{V_{DC}}$ |
|---|---|---|
| 5.5 | 4.5 | 1.21 |

## • Circuit Diagram:

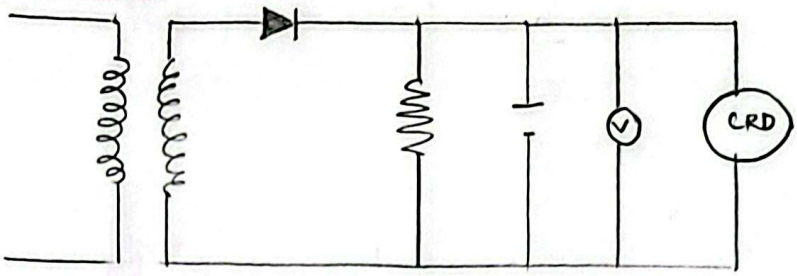



fig: Half wave rectifier with filter

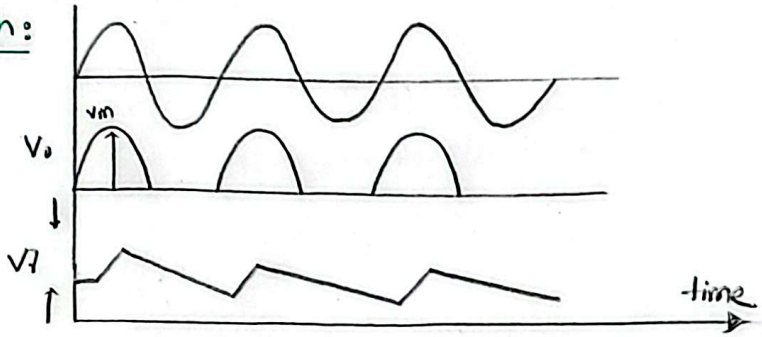
## • Table:

| $V_{AC}$ | $V_{DC}$ | R.F = $\frac{V_{AC}}{V_{DC}}$ |
|---|---|---|
| 0.0939 | 7.32 | 0.0128 |

## • Procedure:

- Connection are made as per the circuit diagram
- Observe the CRD waveform and note down Vdc, Vrms and other parameter.
- Add a 25 Volt 1000 MF capacitors filter.
- Again tabulate data form the CRO and DMM.

## • Model graph:




## • Calculation:

### • Without filter:

~ Vdc = Vm/π
~ Vrms = Vm/2
~ Vr(rms) = $\sqrt{Vrms^2 - Vdc^2}$
~ Ripple factor = Vr(rms)/Vdc

### • With filter:

~ Vdc = Vm − Vr/2
~ Vr(rms) = Vr/2√3
~ Ripple factor = Vr(rms)/Vdc

## • Precautions:

- Connection must be made carefully to avoid short circuit.
- Readings must be taken without parallel OX error.

• Result:

- Ripple factor of Half wave rectifier without filter:
- Ripple factor of Half wave rectifier with filter:

# Experiment: 6:

• Title: Full wave rectifier with and without filter.

• AIM: To observe the output waveform and to find ripple factor of the center tapped full wave rectifier.

• Apparatus:

i) Step down transfomer ii) IN4007 diodes-2 iii) Resistor 1000Ω iv) 1000 Mf/25 V capacitor v) voltmeter (0-20V) vi) Bread board vii) connecting wires.

• Circuit Diagram:

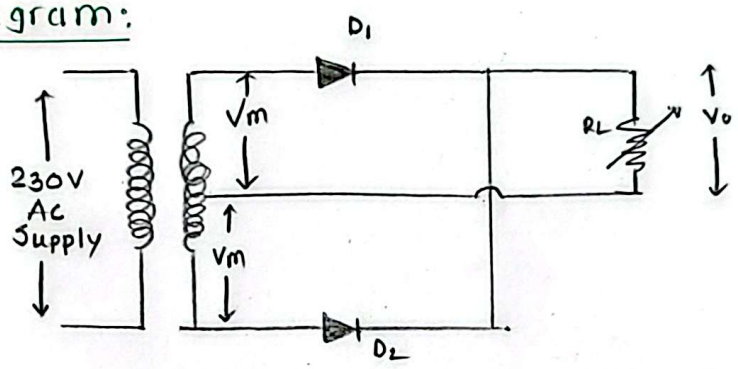



fig: Full wave rectifier with out filter.

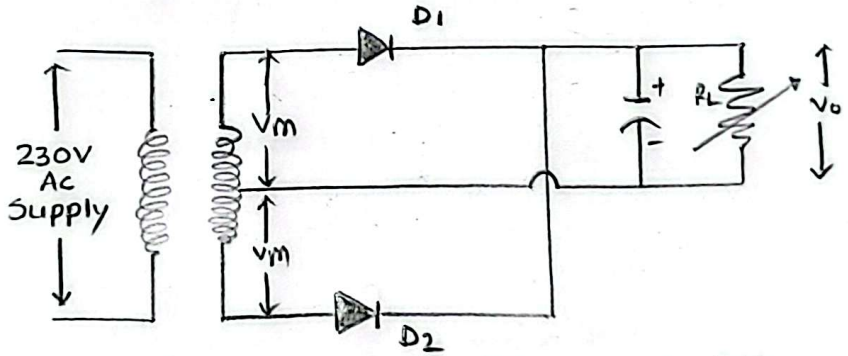


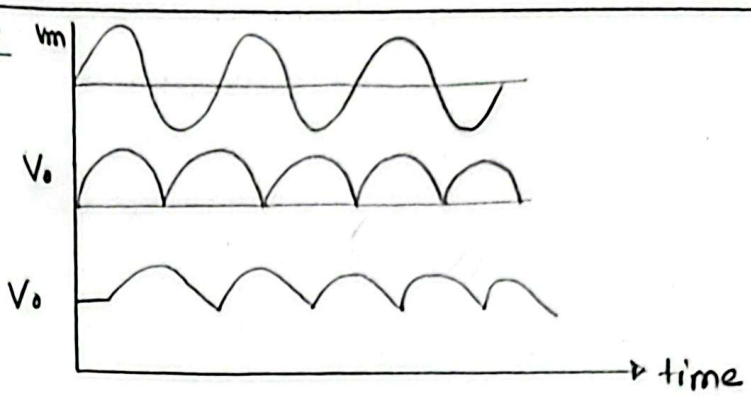

fig: Full wave rectifier with filter.

• Tabular form:

| $V_{AC}$ | $V_{DC}$ | R.F = $V_{AC}/V_{DC}$ |
|---|---|---|
| | | |

| $V_{AC}$ | $V_{DC}$ | R.F. $\frac{V_{ac}}{V_{dc}}$ |
|---|---|---|
| | | |

• Model graph:




• Procedure:

- Connections are made as per the circuit diagram.
- Observe the output waveform on CRO. Note down the peak voltage value VM.
- Using DMM/multimeter down to the AC and DC voltage.
- Calculate Vdc, Vrms and Ripple factor.
- Connect a shunt capacitor and repeat the above process.
- plot the graphs.

• Calculations:

• Without filter:

- $V_{dc} = 2V_m/\pi$
- $V_{rms} = V_m/\sqrt{2}$
- $V_{r(rms)} = \sqrt{V_{rms}^2 - V_{dc}^2}$
- $R.F = (V_r)_{rms}/V_{dc}$

• With filter:

- $V_{dc} = V_m - V_r/2$
- $(V_r)_{rms} = V_r/2\sqrt{3}$
- $R.F = (V_r)_{rms}/V_{dc}$

• Precautions:

- Avoid loose and wrong connections.
- Avoid parallax error.

• Result:

- R.F of full wave rectifier with out filer =
- R.F of full wave rectifier with filter =