Date: 01/07/2022

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Exp No: 05 Experiment Name: L.E.D. CHARACTERISTICS

## DAY TO DAY EVALUATION:

| | Preparation | Algorithm | Source Code | Program Execution | Viva | Total |
|---|---|---|---|---|---|---|
| | | Performance in the Lab | Calculations and Graphs | Results and Error Analysis | | |
| Max. Marks | 4 | 4 | 4 | 4 | 4 | 20 |
| Obtained | 4 | 4 | 4 | 4 | 4 | 20 |

Signature of Lab I/C

START WRITING FROM HERE:

## CHARACTERISTICS OF LED

AIM: To study the V-I characteristics of light emitting diode and find the Threshold voltage and forward resistance of LED.

APPARATUS: Light emitting diode (LED)

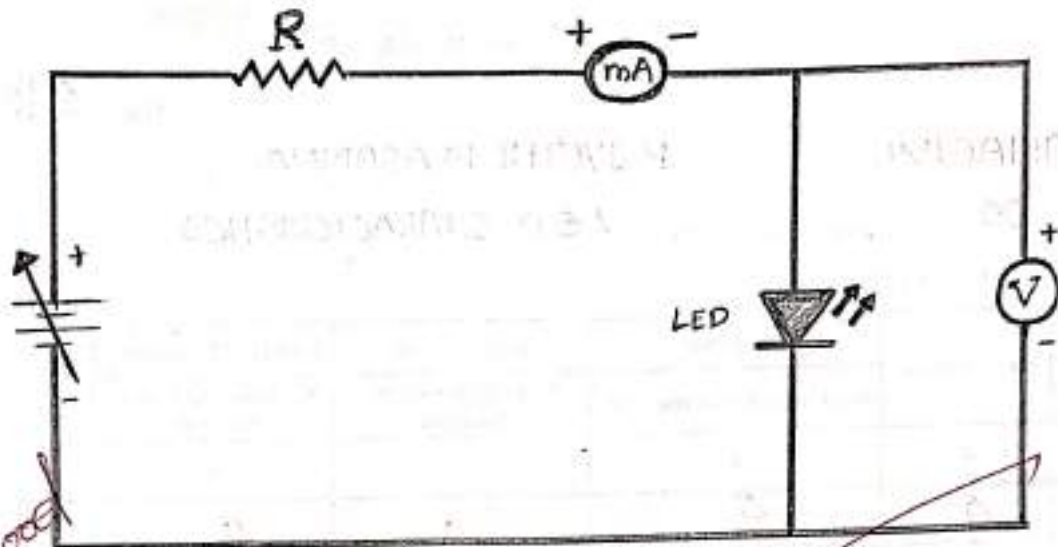0-5V variable supply

0-10 v Voltmeter

0-50mA DC Ammeter

RESULT: V-I characteristics of given LED are studied.

Calculated Threshold Voltage (V$_{th}$) = __0.70__ v
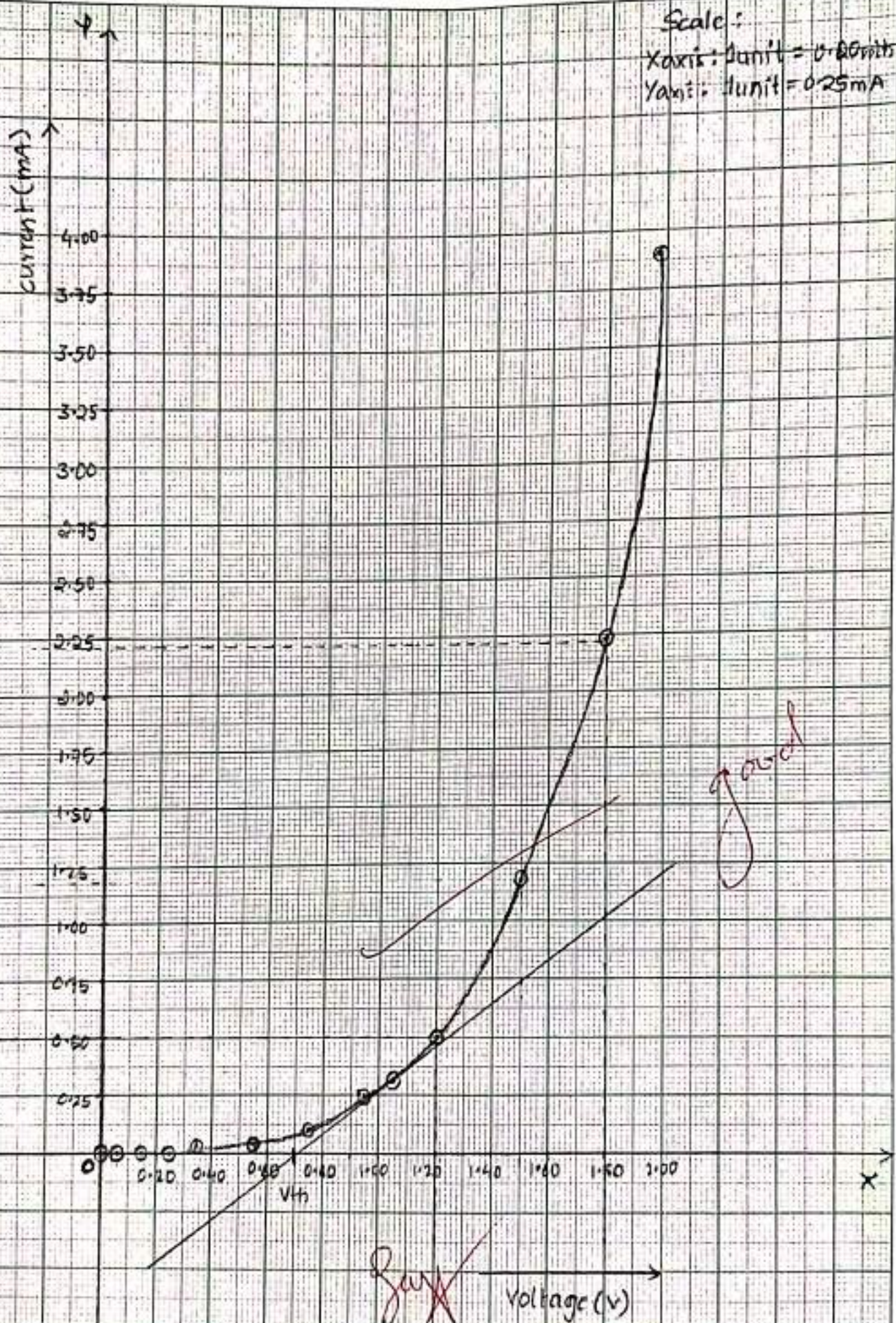
Forward Resistance R$_f$ = __346.82__ Ω

# CIRCUIT DIAGRAM:



## OBSERVATIONS:

| S.No. | Voltage (Volts) | Current (mA) |
|-------|-----------------|--------------|
| 1 | 0.00 | 0 |
| 2 | 0.05 | 0 |
| 3 | 0.15 | 0 |
| 4 | 0.25 | 0 |
| 5 | 0.35 | 0.01 |
| 6 | 0.55 | 0.05 |
| 7 | 0.75 | 0.10 |
| 8 | 0.95 | 0.25 |
| 9 | 1.05 | 0.35 |
| 10 | 1.20 | 0.50 |
| 11 | 1.50 | 1.18 |
| 12 | 1.80 | 2.23 |
| 13 | 1.87 | 3.69 |

Scale:
X axis: 1 unit = 0.20 volts
Y axis: 1 unit = 0.25 mA

current I (mA)

4.00
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25

0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00

Vth

Voltage (V)

## VIVA VOCE:

**1) What is forward biased diode?**

Ans) Forward bias is where the external voltage is delivered across the P-N junction diode. In a forward bias setup, the P-side of the diode is attached to the positive terminal of the battery & N-side is fixed to -ve terminal of the battery.

**2) What are p-type and n-type semiconductors?**

Ans) N-type: It is an extrinsic semiconductor obtained by doping the impurity pentavalent atoms such as Sb, P, Ar etc, to the pure Ge or Si semiconductor.

p-type: It is an extrinsic semiconductor obtained by doping trivalent impurity atoms such as boron, galuim, indium etc to the pure Ge or Si semiconductor.

**3) Define threshold voltage.**

Ans) The threshold voltage, commonly abbreviated as $V_{th}$, of a field-effect transistor is the value of the gate source voltage when the conducting channel just begins to connect the source & drain contacts of the transistor, allowing significant current to flow.
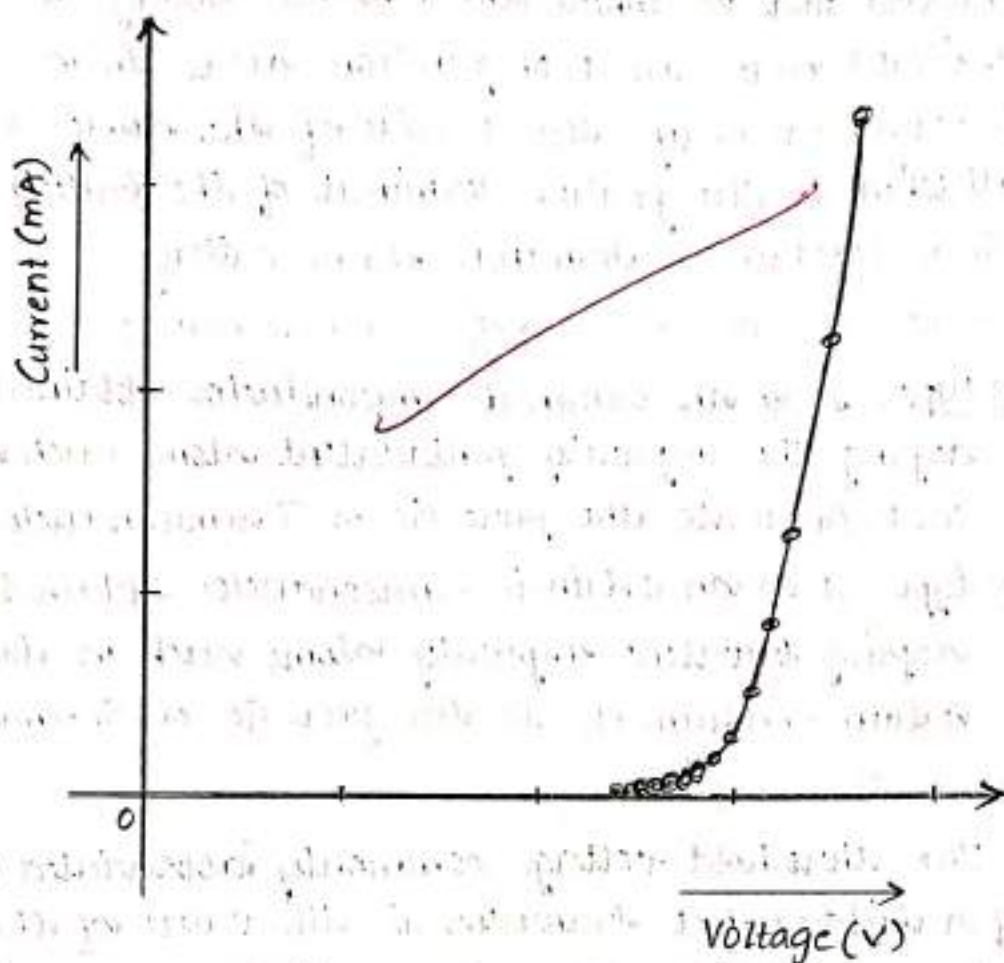
**4) What is depletion layer?**

Ans) Depletion layer is a region in a P-N junction diode where no mobile charge carriers are present. Depletion layer acts like a barrier that opposes the flow of electrons from n-side & holes from p-side.

RESULT: V-I characteristics of LED diode are obtained.

# MODEL GRAPH :



**CALCULATION :**

$$V_2 = 1.8 \, V \qquad\qquad V_1 = 1.2 \, V$$

$$I_2 = 2.23 \, mA = 2.23 \times 10^{-3} \, A \qquad I_1 = 0.50 \, mA = (0.50) \times 10^{-3} \, A$$

$$R = \frac{V}{I} \quad\Rightarrow\quad R_f = \frac{V_2 - V_1}{I_2 - I_1}$$

$$R_f = \frac{(1.8 - 1.2)}{(2.23 - 0.50) \times 10^{-3}}$$

$$R_f = 346.82 \, \Omega$$