

CSE251: ELECTRONIC DEVICES AND CIRCUITS

EXPERIMENT 3:

**STUDY OF IV CHARACTERISTICS OF
DIODE AND ZENER DIODE**

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Task-03: Report

1. Cover page [include course code, course title, name, student ID, group, semester, date of performance, date of submission]
2. Attach the signed Data Sheet.
3. Attach the graphs plotted using google sheets. Go to '<https://cutt.ly/l3QaTBf>' to know how to plot in google sheet.
4. Add a brief Discussion at the end of the report.

Data Sheet

Diode IV Characteristics

$R = 1k\Omega$ (measure the accurate resistance using the digital multi-meter)

$$R = 0.988k\Omega$$

Supply Voltage, V_{DC} (v)	Diode Voltage, V_D (v)	Voltage across the Resistor, V_R (v)	Diode Current, $I_D = I_R = V_R/R$ (mA)
0	5.5×10^3 V	0.00	0.00
0.1	86.8×10^3 V	0.00	0.00
0.2	178.7×10^3 V	0.00	0.00
0.3	285.1×10^3 V	0.00	0.00
0.4	369.9×10^3 V	0.00	0.00
0.5	0.438 V	51.6×10^3 V	0.0522
0.6	0.476 V	122.2×10^3 V	0.1237
0.7	0.499 V	179.9×10^3 V	0.1821
0.8	0.509 V	243.3×10^3 V	0.2463
0.9	0.527 V	361.1×10^3 V	0.3655
1	0.534 V	0.420 V	0.4251
2	0.593 V	1.358 V	1.3749
4	0.639 V	3.342 V	3.3826
6	0.662 V	5.310 V	5.3749
8	0.677 V	7.32 V	7.4089
10	0.699 V	9.30 V	9.4129
12	0.697 V	11.25 V	11.3866
13	0.701 V	12.28 V	12.4221
14	0.704 V	13.28 V	13.4109

$$V_T = 25 \times 10^{-3} V$$

Calculation

Determining Ideality Factor, n

$$\text{Let, } \alpha = \frac{1}{nV_T}$$

Take any two data from the table: $I_{D1} = I_S \exp(\alpha V_{D1})$ and $I_{D2} = I_S \exp(\alpha V_{D2})$

$$I_S = 8.956 \times 10^{-9}$$

Taking ratio of I_{D1} and I_{D2} ,

$$\Rightarrow \frac{I_{D1}}{I_{D2}} = \exp(\alpha(V_{D1} - V_{D2}))$$

$$\Rightarrow \alpha = \frac{\ln\left(\frac{I_{D1}}{I_{D2}}\right)}{V_{D1} - V_{D2}} = \frac{1}{nV_T}$$

$$\Rightarrow n = \frac{1}{\alpha V_T} = 1.92345$$

$$= 20.79587$$

Determining Static (R_D) and Dynamic (r_D) Resistance

$$R_D = V_D / I_D$$

$$r_D \approx \frac{nV_T}{I_D} =$$

Zener Diode IV Characteristics

$R = 470 \Omega$ (measure the accurate resistance using the digital multi-meter)

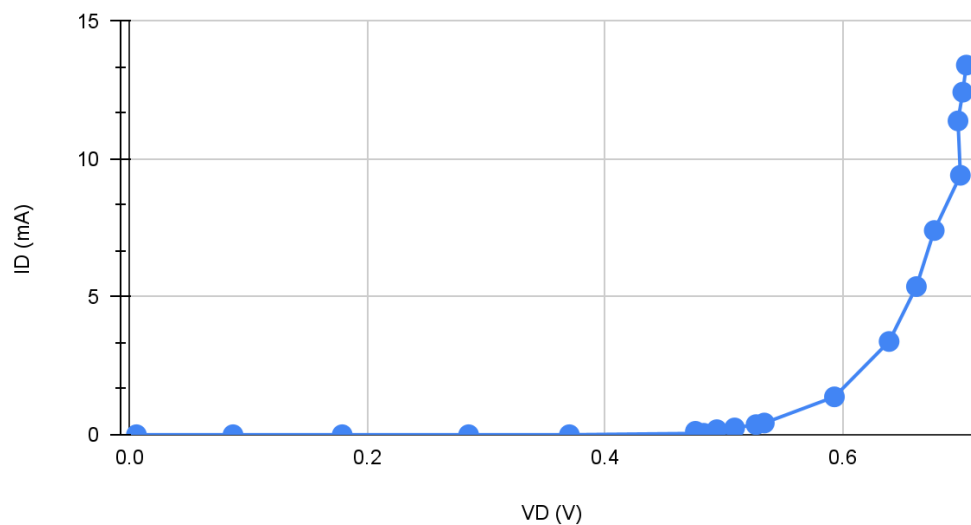
$R = 0.470k\Omega$ (470 Ω)

V (volt)	V_R (volt)	V_Z (volt)	$I_Z = V_R / R$ (mA)
0	0	5.4×10^3	0
1	0	0.991	0
2	0	2.00	0
3	1.5×10^3	3.043	3.19×10^3
4	2.2×10^3	3.96	0.0468
4.9	1.72×10^3	4.72	0.369
5	0.234	4.82	0.4939
5.1	0.265	4.86	0.5638
5.2	0.313	4.90	0.6659
5.3	0.378	4.95	0.8013
5.4	0.406	4.97	0.86383
5.5	0.510	5.02	1.0638
6	0.827	5.12	1.7596
7	1.804	5.22	2.8383
8	2.781	5.25	5.2912
9	3.78	5.27	8.0426
10	4.68	5.28	9.9594

TASK 1 :

A	B	C	D
V_DC (V)	VD (V)	VR (V)	ID (mA)
0	0.0055	0	0
0.1	0.0868	0	0
0.2	0.1787	0	0
0.3	0.2851	0	0
0.4	0.3699	0	0
0.5	0.483	0.0516	0.05222672065
0.6	0.476	0.1222	0.1236842105
0.7	0.494	0.1799	0.1820850202
0.8	0.509	0.2433	0.2462550607
0.9	0.527	0.3611	0.36548583
1	0.534	0.42	0.4251012146
2	0.593	1.358	1.374493927
4	0.639	3.342	3.382591093
6	0.662	5.31	5.374493927
8	0.677	7.32	7.408906883
10	0.699	9.3	9.412955466
12	0.697	11.25	11.38663968
13	0.701	12.28	12.4291498
14	0.704	13.25	13.41093117

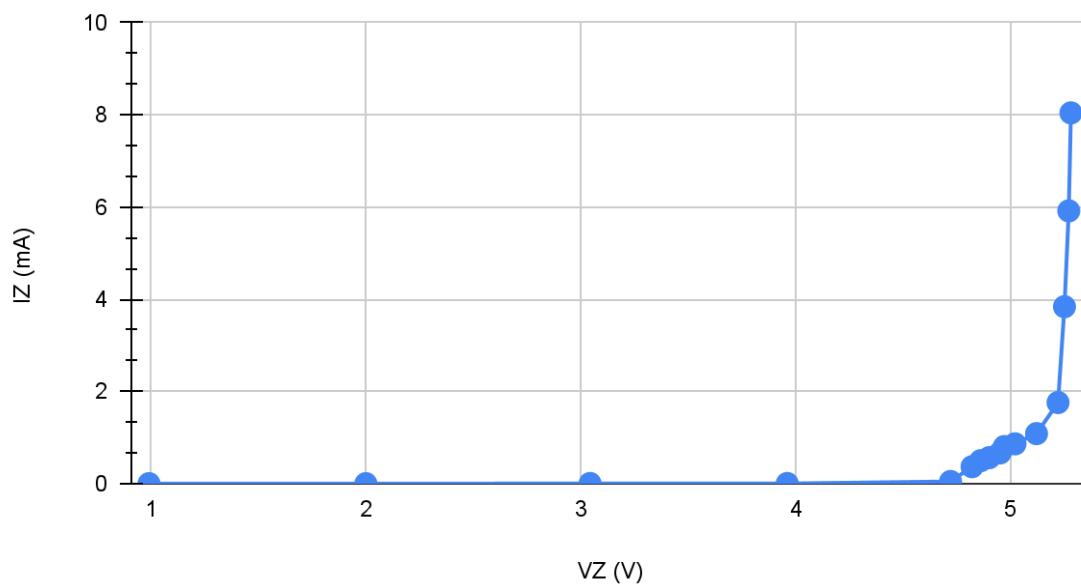
IV characteristic graph of diode



TASK 2 :

A	B	C	D
V (V)	VR (V)	VZ (V)	IZ (mA)
0	0	0.0054	0
1	0	0.991	0
2	0	2	0.003191489362
3	0.0015	3.043	0.003191489362
4	0.022	3.96	0.04680851064
4.9	0.1729	4.72	0.3678723404
5	0.234	4.82	0.4978723404
5.1	0.265	4.86	0.5638297872
5.2	0.313	4.9	0.6659574468
5.3	0.378	4.95	0.8042553191
5.4	0.406	4.97	0.8638297872
5.5	0.51	5.02	1.085106383
6	0.827	5.12	1.759574468
7	1.804	5.22	3.838297872
8	2.781	5.25	5.917021277
9	3.78	5.27	8.042553191
10	4.68	5.28	9.957446809

IV characteristic graph of zener diode



DISCUSSION

For Diode in task 1, the p⁺ anode of diode is connected to the resistor and the cathode is connected to ground. DC voltage is applied according to the values given in data sheet. For each supplied voltage, corresponding voltage across diode and resistor are measured using multimeter.

For Zener Diode in task 2, the cathode of Zener diode is connected to the resistor and the anode is connected to the ground to get the voltage across ~~zener~~ diode and resistor using multimeter beyond the breakdown point of diode.

Google spreadsheets for task 1 and task 2 :

[CSE251_LAB3](#)