ELEC-313
Lab 3: Diode Circuits

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1 Objective

The objective is to observe the basic operation of a diode. In addition, the Schockley equation (Eq 2) is used to find the diode's reverse saturation current (I_S) and thermal voltage (V_T) using values measured in the lab.

2 Equipment

Diode: 1N4007
Zener diode: 1N5231
Resistors: 47 Ω
Capacitor: 1 µF
Resistive decade box: HeathKit IN-3117
Power supply: HP E3631A
Function generator: HP 33120A
Multimeter: Fluke 8010A
Oscilloscope: Agilent 54622D

3 Schematics

(a) Circuit used for Parts A and Part B.

(b) Circuit used for Part C.

Figure 1: Circuits used in this lab.

4 Procedure

4.1 Rectifier

4.2 Voltage Regulator

5 Results

	Nominal (Ω)	**Measured** (Ω)	**% Difference**
R_1	470	465.3	1.00

Table 1: Comparison of nominal and measured resistance in Part A.

Figure 2: Diode characteristics measured in Parts A and B.

R (Ω)	V_d (V)	I_d (mA)
200	0.751	46.00
500	0.713	18.60
1k	0.682	9.30
2k	0.650	4.70
5k	0.605	1.85
10k	0.571	0.94
20k	0.538	0.47
50k	0.494	0.19
100k	0.464	0.10

Table 2: Diode characteristics measured in Part B.

V_d (V)	I_d (mA)	V_{OC} (V)
0.712	27.2	6.70

Table 3: Diode characteristics measured in Part C.

m	V_T (V)	V_d (V)	I_d (mA)	I_s (µA)
21.772	0.046	0.687	10.18	0.325

Table 4: Results from data analysis.

6 Conclusion

7 Equations

$$\%_{diff} = \frac{|nominal - measured|}{nominal} 100\% \tag{1}$$

$$I_D = I_S \left(e^{\frac{V_D}{V_T}} - 1 \right) \tag{2}$$

$$m = \frac{ln(I_2) - ln(I_1)}{V_2 - V_1} = \frac{1}{V_T} \tag{3}$$