



BIRZEIT UNIVERSITY

Faculty of Engineering and Technology

Electrical and Computer Engineering Department

Electronics LAB (ENEE3102)

Pre-LAB of Experiment #10

Zener Diodes and Voltage Regulators

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Date:

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Section: #1

Pre-Lab

I. ZENER DIODE

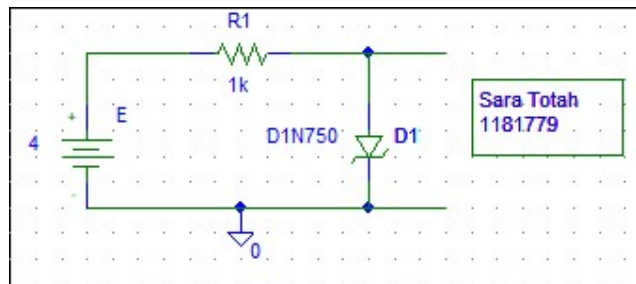


Figure (1)

E(v)	V_R	V_Z	I
0.1	0.01mV	99.99mV	10.17nA
0.2	0.07mV	199.93mV	73.36nA
0.3	0.46mV	299.54mV	459.62nA
0.4	2.68mV	397.32mV	2.676 μ A
0.5	13.05mV	486.95mV	13.05 μ A
0.6	43.87mV	556.13mV	43.87 μ A
0.7	98.78mV	601.22mV	98.78 μ A
0.8	170.35mV	629.65mV	170.35 μ A
0.9	251.48mV	648.52mV	251.48 μ A
1	0.338V	661.92mV	338.08 μ A
2	1.286V	713.19mV	1.287mA
3	2.268V	731.57mV	2.268mA
4	3.257V	742.69mV	3.257Ma

Table (1)

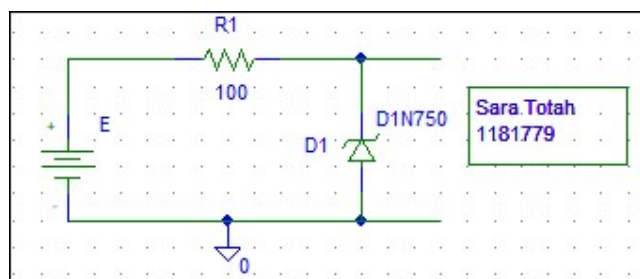


Figure (2)

E(V)	V_Z	I
0.1	100mV	6.234nA
0.5	500mV	40.67nA
1	1V	141.89nA
2	2V	1.839 μ A
3	2.998V	24.13 μ A
4	3.970V	297.19 μ A
5	4.607V	3.928mA
6	4.678V	13.22mA
7	4.707V	22.93mA

8	4.727V	32.74mA
9	4.741V	42.59mA
10	4.753V	52.47mA
11	4.763V	62.37mA
12	4.773V	72.27mA
13	4.781V	82.19mA
14	4.789V	92.12mA
15	4.796V	102.04mA

Table (2)

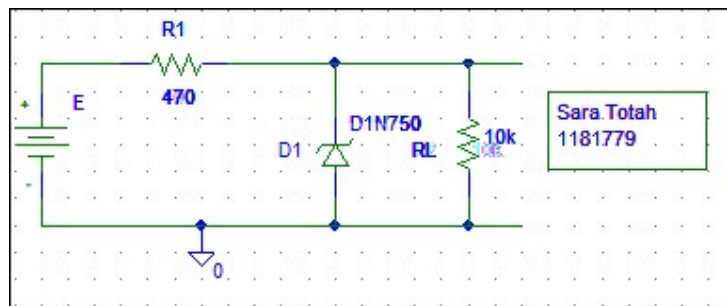


Figure (3)

E	10	11	12	13	14
V_L	4.459V	4.495V	4.519V	4.536V	4.549V

Table (3)

- With E set to 10V measure the load voltage V_L :

R_L	8.2k Ω	6.8 k Ω	4.7 k Ω	2.2 k Ω
V_L	4.457V	4.455V	4.449V	4.421V

Table (4)

II. THE VOLTAGE REGULATED POWER SUPPLY

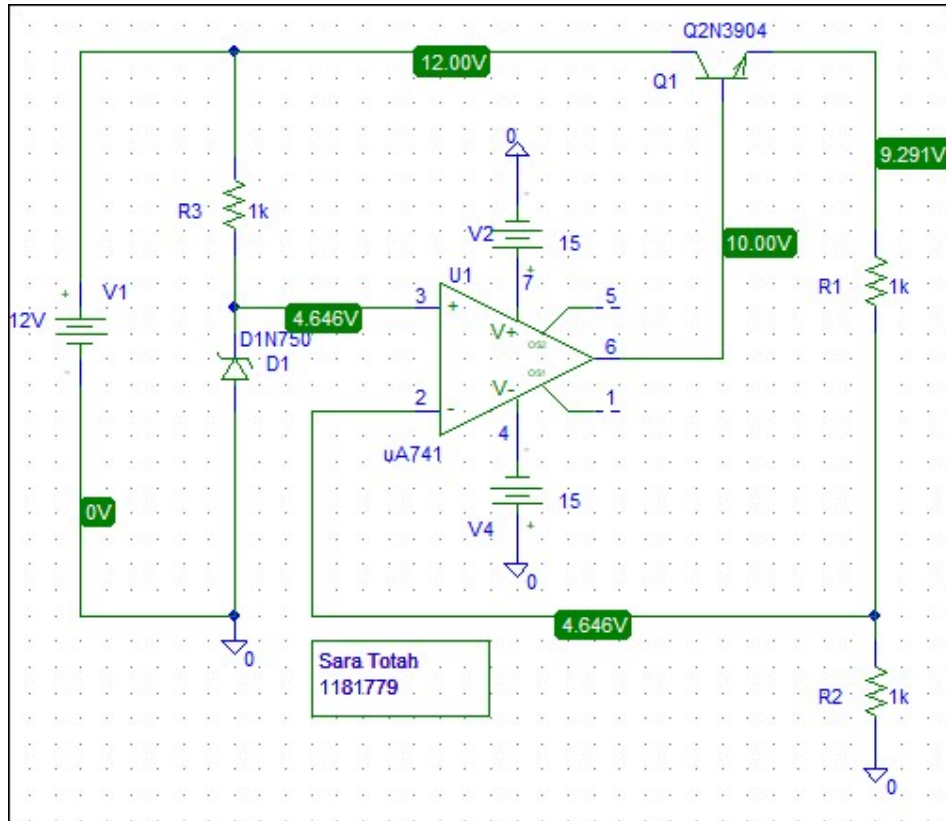


Figure (4)
 $V_O = 9.291V$

- Attach a 1k load resistor to the output and measure V_O and I_O :

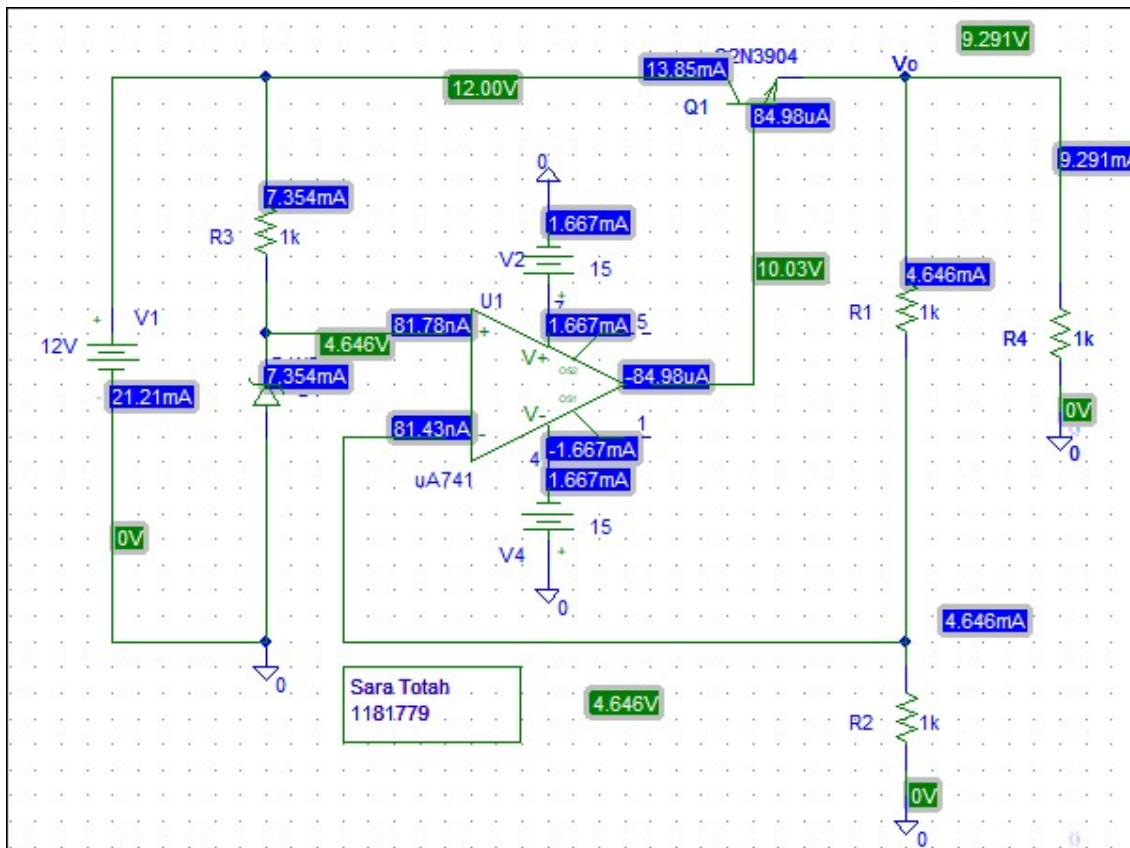


Figure (5)

$$V_O = 9.291V$$

$$I_O = 9.291mA$$

R_L	open	1k Ω	680 Ω	470 Ω	220 Ω	100 Ω
V_O	9.291V	9.291V	9.291V	9.291V	9.291V	9.291V
I_O	0	9.291mA	13.66mA	19.77mA	42.23mA	92.91mA

Table (5)

- Set R_L back to 1k. Change the value of R_2 to 470 ohm . What is the new output voltage?

$$V_O = 12V$$

$$I_O = 12Ma$$

- Change R_2 to 2.2k. What is the output voltage now?

$$V_O = 6.757V$$

$$I_O = 6.757mA$$

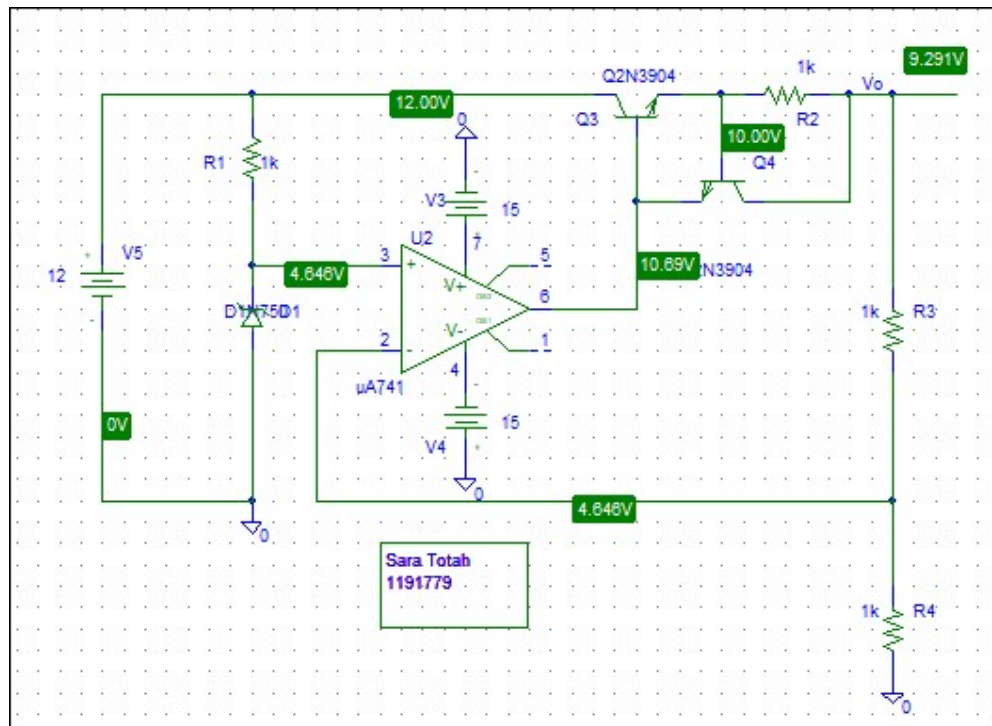


Figure (6)

$$V_O = 9.291V$$

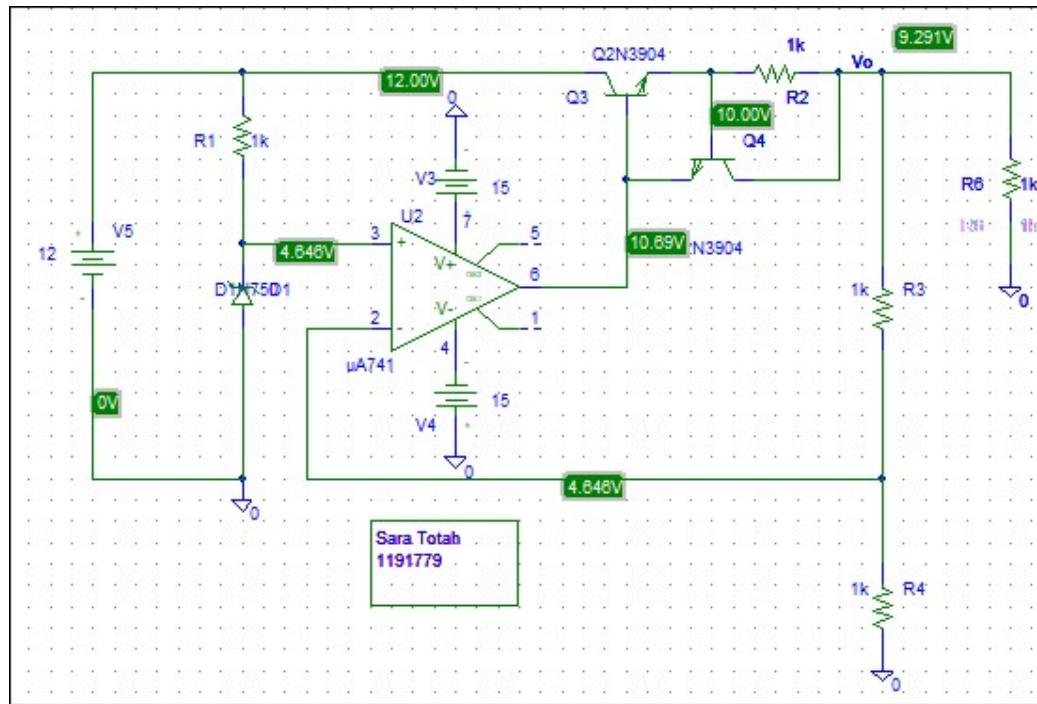


Figure (7)

R_L	open	1k Ω	680 Ω	470 Ω	220 Ω	100 Ω	50 Ω
V_O	9.291V	9.291V	9.291V	9.291V	9.291V	9.200V	4.718V
I_O	0	9.291mA	13.66mA	19.77mA	42.23mA	92.00mA	94.36mA

Table (6)

Note: OrCad was used for the last two parts

III. THREE TERMINAL FIXED VOLTAGE REGULATOR 7805

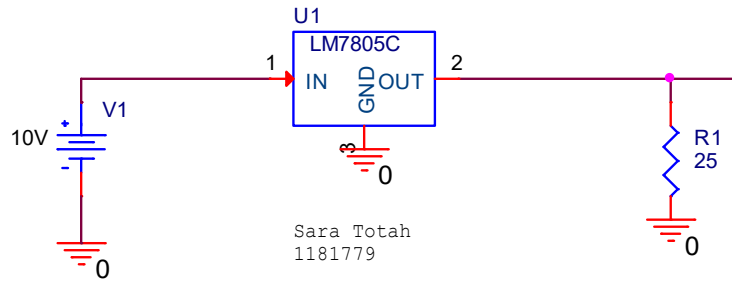


Figure (8)

R_L	V_L	I_L
25	4.995V	199.8mA
50	4.996V	99.9mA
100	4.996V	49.96mA
200	4.997V	24.9mA
400	4.997V	12.5mA
600	4.997V	8.32mA
800	4.997V	6.25mA
1000	4.997V	4.98mA

Table (7)

$$\text{Load Regulation} = \frac{\Delta V_L}{\Delta I_L} = -0.01001$$

Set $R_L=100$ ohm, adjust the input voltage V_i , Measure V_L and I_L for each input voltage in the table:

$V_i(V)$	V_L	I_L
8	4.996V	49.96 mA
9	4.996V	49.96 mA
10	4.996V	49.96 mA
11	4.997V	49.97 mA
12	4.997V	49.97 mA
13	4.997V	49.97 mA
14	4.997V	49.97 mA
15	4.997V	49.98 mA

Table (8)

$$\text{Line regulation} = \frac{\Delta V_L}{\Delta V_i} \approx 0$$

IV. THE LM317 ADJUSTABLE VOLTAGE REGULATOR

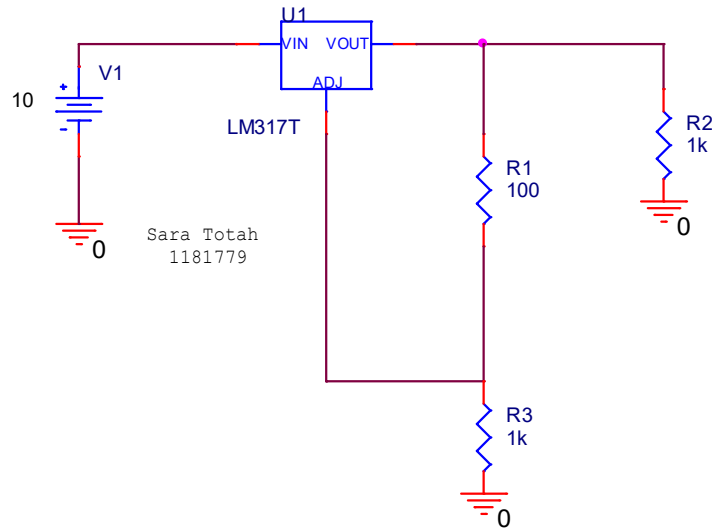


Figure (9)

Table 1

R3(Ω)	V _L (V)	I _L (mA)
0	2.507	2.507
100	2.507	2.507
200	3.762	3.762
300	5.017	5.017
500	7.527	7.527
700	8.500	8.500

Table (9)

- With R_L =1k , R₁=100 ohm , R₂=220 , adjust V_i as listed in table 10.5.

V _i (V)	V _L (V)	I _L (mA)
10	4.007	4.007
12	4.007	4.007
14	4.007	4.007
15	4.007	4.007
16	4.007	4.007
17	4.007	4.007

Table (10)

$$\text{Line regulation} = \frac{\Delta V_L}{\Delta V_i} \approx 0$$

- With $V_i=10V$, $R_1=100\ \Omega$, $R_2=220$, adjust R_L as shown in table

$R_L(\Omega)$	$V_L(V)$	$I_L(mA)$
100	4.013	40.13
200	4.013	20.07
400	4.013	10.03
500	4.013	8.027
600	4.013	6.689
700	4.013	5.733
1000	4.013	4.013

Table (11)