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

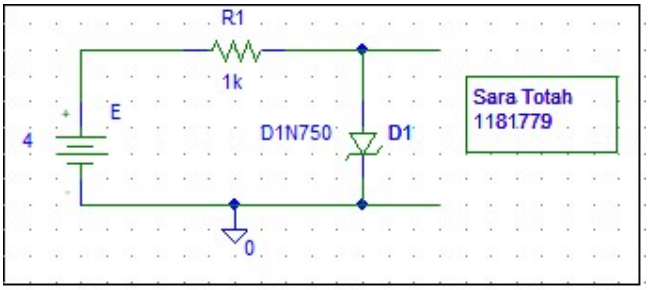

Figure (1)

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 µA
0.5	13.05mV	486.95mV	13.05 µA
0.6	43.87mV	556.13mV	43.87 µA
0.7	98.78mV	601.22mV	98.78 µA
0.8	170.35mV	629.65mV	170.35 µA
0.9	251.48mV	648.52mV	251.48 µA
1	0.338V	661.92mV	338.08 µA
2	1.286V	713.19mV	1.287mA
3	2.268V	731.57mV	2.268mA
4	3.257V	742.69mV	3.257Ma

Table (1)

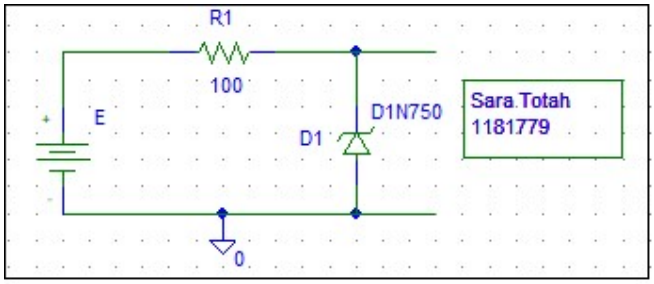

Figure (2)

E(V)	V_Z	I
0.1	100mV	6.234nA
0.5	500mV	40.67nA
1	1V	141.89nA
2	2V	1.839µA
3	2.998V	24.13 µA
4	3.970V	297.19µA
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)

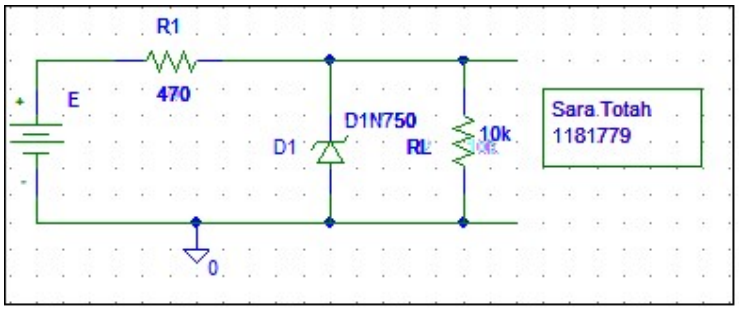

Figure (3)

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	8.2kΩ	6.8 kΩ	4.7 kΩ	2.2 kΩ
V_L	4.457V	4.455V	4.449V	4.421V

Table (4)

II. THE VOLTAGE REGULATED POWER SUPPLY

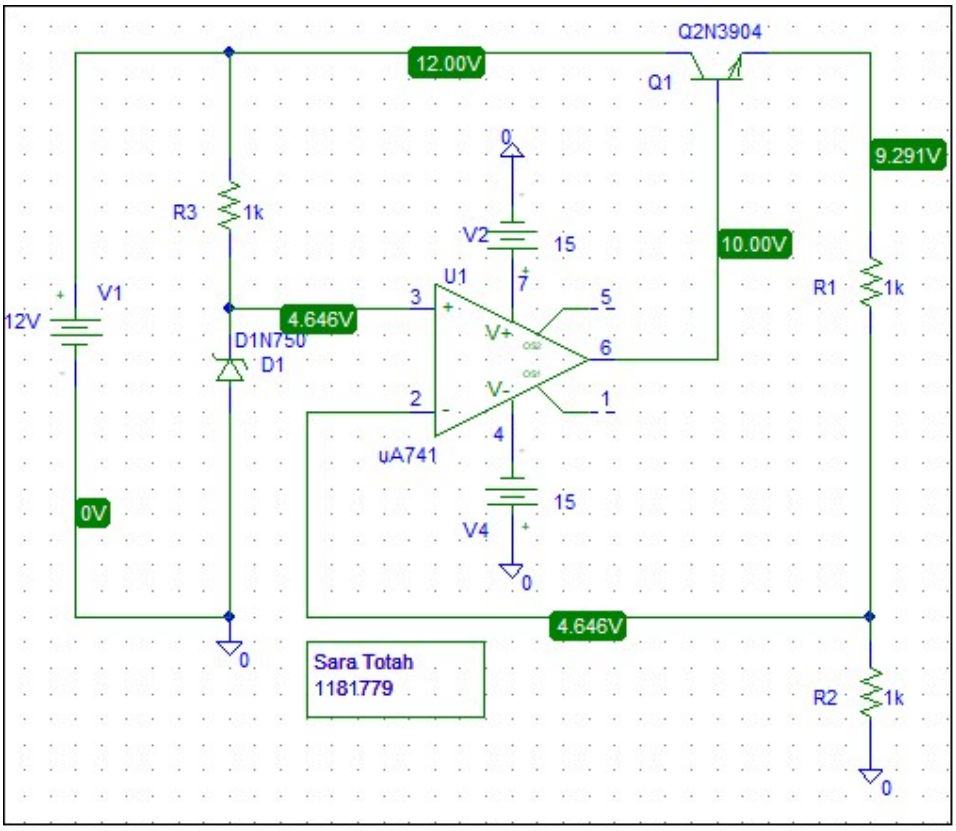

Figure (4)
$V_O = 9.291V$

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

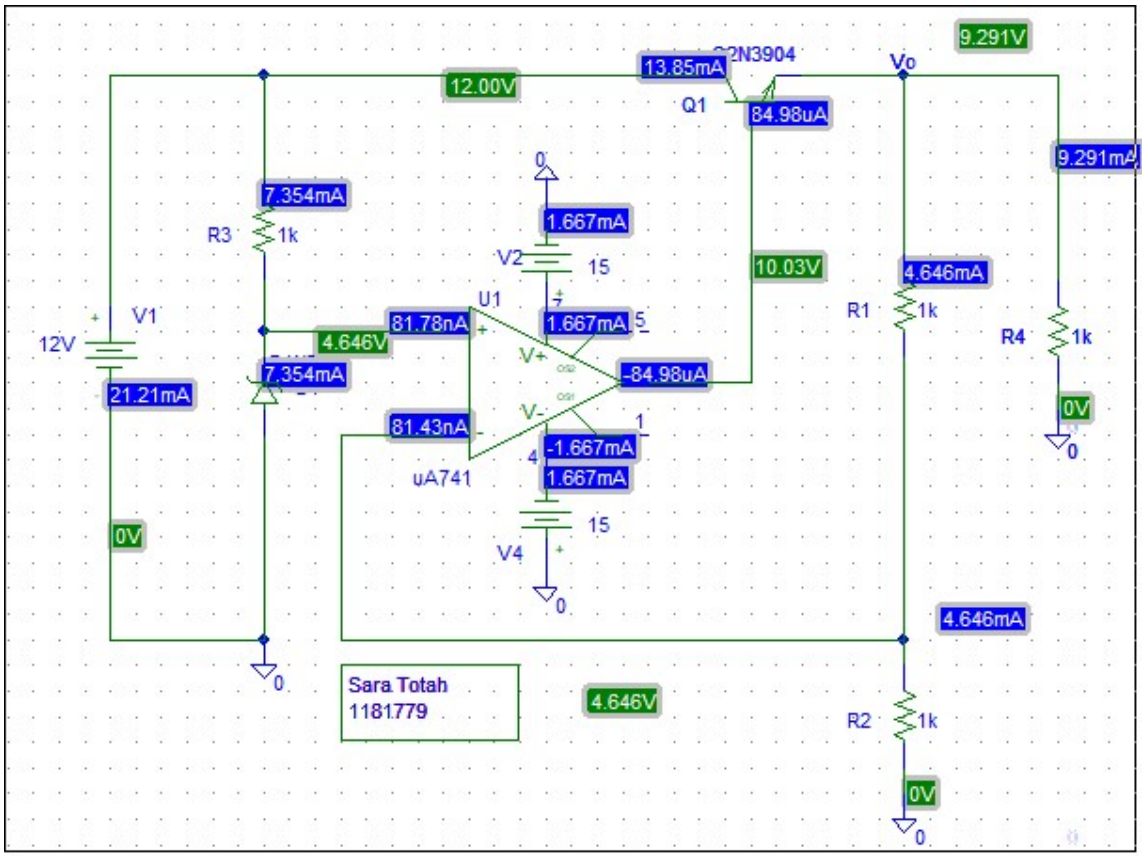

Figure (5)

$V_O = 9.291V$

$I_O = 9.291mA$

R_L	open	1kΩ	680Ω	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 R2 to 470 ohm . What is the new output voltage?

$V_O = 12V$

$I_O = 12Ma$

- Change R2 to 2.2k. What is the output voltage now?

$V_O = 6.757V$

$I_O = 6.757mA$

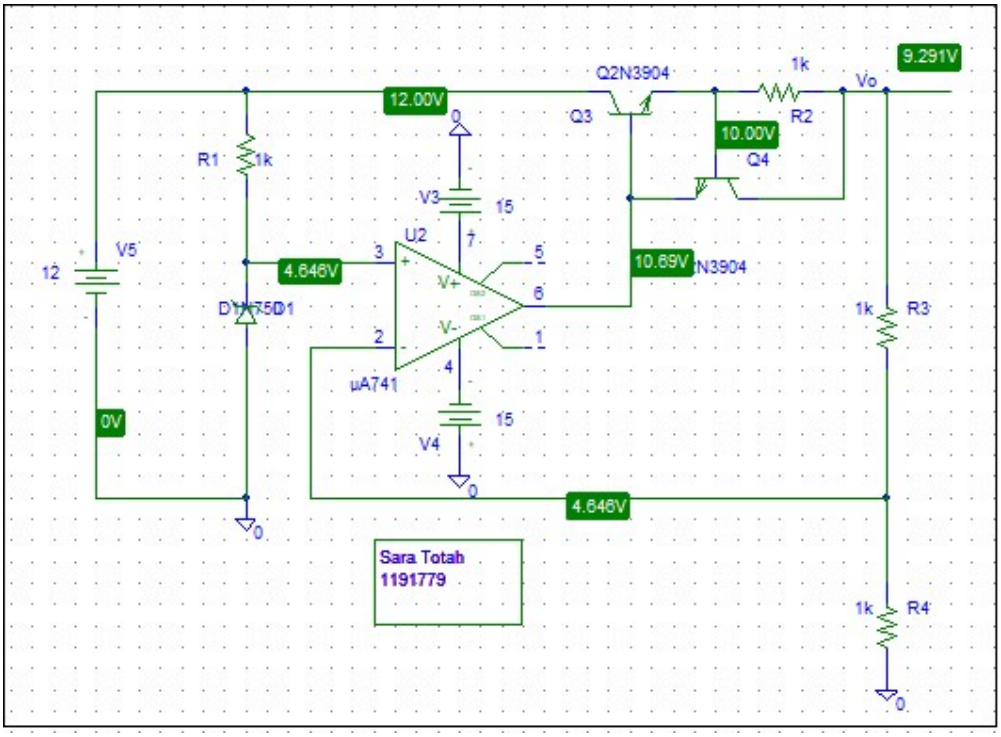

Figure (6)

$V_O = 9.291V$

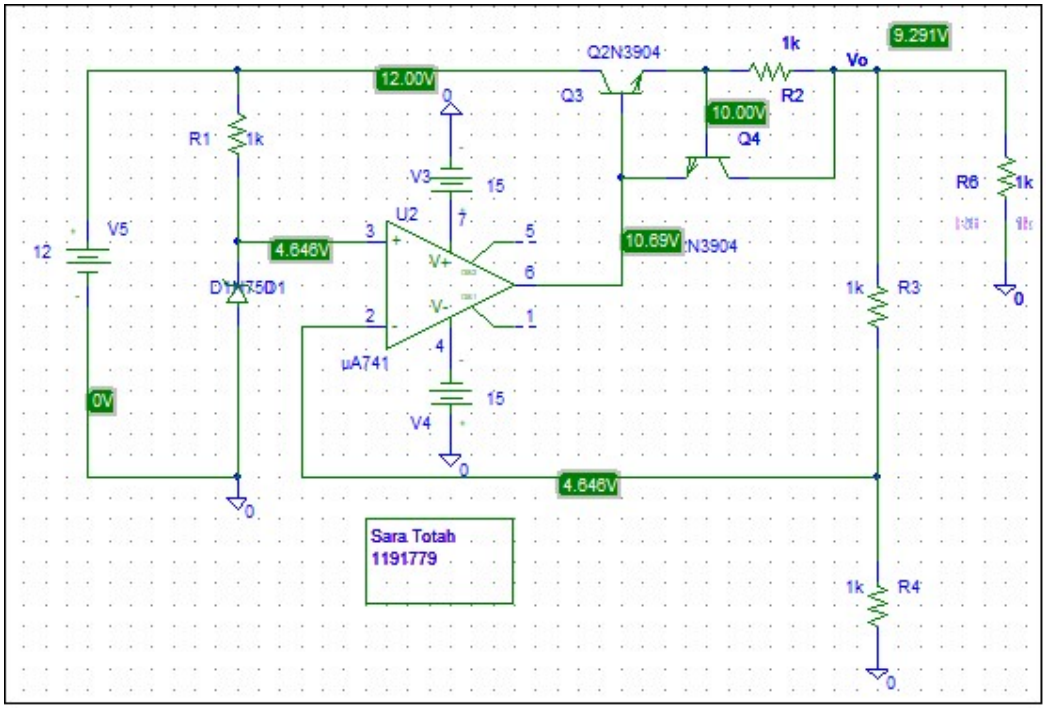

Figure (7)

R_L	open	1kΩ	680Ω	470Ω	220Ω	100Ω	50Ω
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

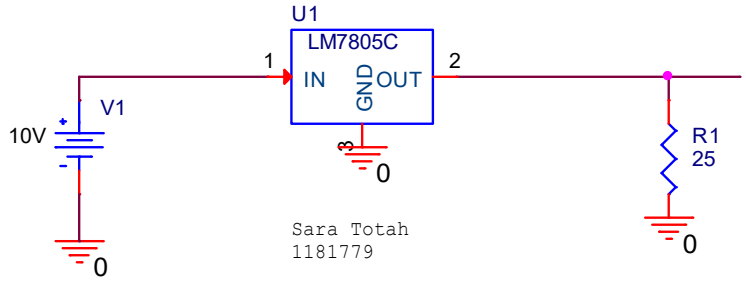

Figure (8)

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)

$$\text{Load Regulation} = \frac{\Delta VL}{\Delta IL} = -0.01001$$

Set RL=100 ohm, adjust the input voltage Vi, Measure VL and IL for each input voltage in the table:

Vi(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)

$$\text{Line regulation} = \frac{\Delta VL}{\Delta Vi} \approx 0$$

IV. THE LM317 ADJUSTABLE VOLTAGE REGULATOR

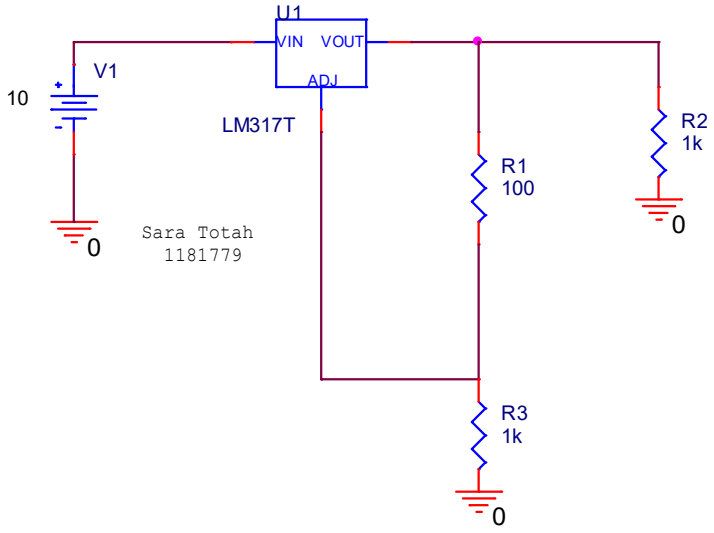

Figure (9)

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 RL =1k , R1=100 ohm , R2=220 , adjust Vi as listed in table 10.5.

Vi(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)

$$\text{Line regulation} = \frac{\Delta VL}{\Delta Vi} \approx 0$$

- With Vi=10V, R1=100 ohm, R2=220, adjust RL as shown in table

RL(Ω)	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)