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North South University

Department of Electrical & Computer Engineering

LAB REPORT

Course Code: EEE 141

Course Title:

Faculty: RQN

Experiment Number: 3

Experiment Name:

Loading Effect of Voltage Divider Circuit

Experiment Date:

Date of Submission: 5/3/25

Section: 19

Group Number:

Submitted To: KASHFIA MAHMOOD

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Experiment NAME: Loading Effect of Voltage ~~and~~ Divider Circuit

Objectives:

1. To analyze how the voltage divider circuit behaves when there is no load resistance connected.
2. Evaluate the performance of the voltage divider circuit due to loading

Apparatus:

1. Trainer Board
2. DMM
3. 2x 560 Ω resistors
4. 1x (0-10kΩ) variable resistor

Theory:

Voltage divider Rule: The voltage rule is the voltage is divided between two series resistors in direct proportion to their resistance.

Loading Effect: When an instrument of lower sensitivity is used with a load the measurement it makes is erroneous, this effect is known as the loading effect.

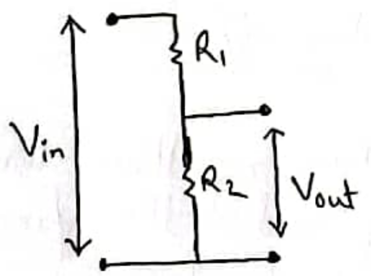
Potentiometer: A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor.

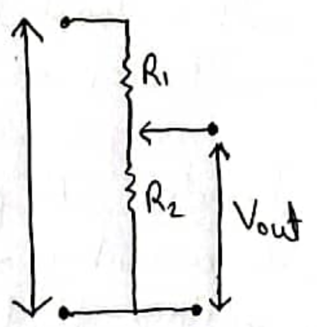
Application of Potentiometer: Potentiometers are used to directly control significant amounts of power. Instead, they are used to adjust the level of analog signals (for example Volume controls on audio equipment), and as control inputs for electronic circuits. For example, a light dimmer ~~used~~ uses a potentiometer to control the switching of a TRIAC and so indirectly to control the brightness of lamps.

The reason we connect load at the end of the circuit:

When we observed from the source end, the word end means the end of the circuit. The output end is where the circuit is designed to deliver power, and the output is where the load is to be utilized. In our home, the power outlets are the output end and the local distribution transformation is the input end. We connect them at the end because of:

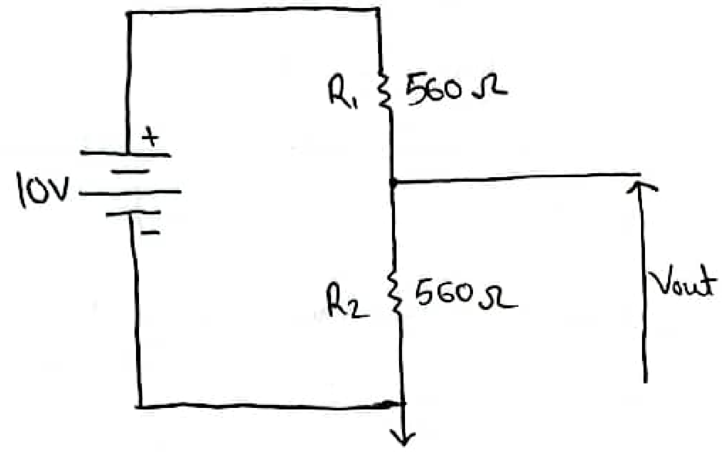
1. A heavy load will draw more circuit while a light load will draw less current.
2. In the case of load less circuit, it will draw minimal current.





Voltage Divider

Circuit Diagram:



Result and Analysis:

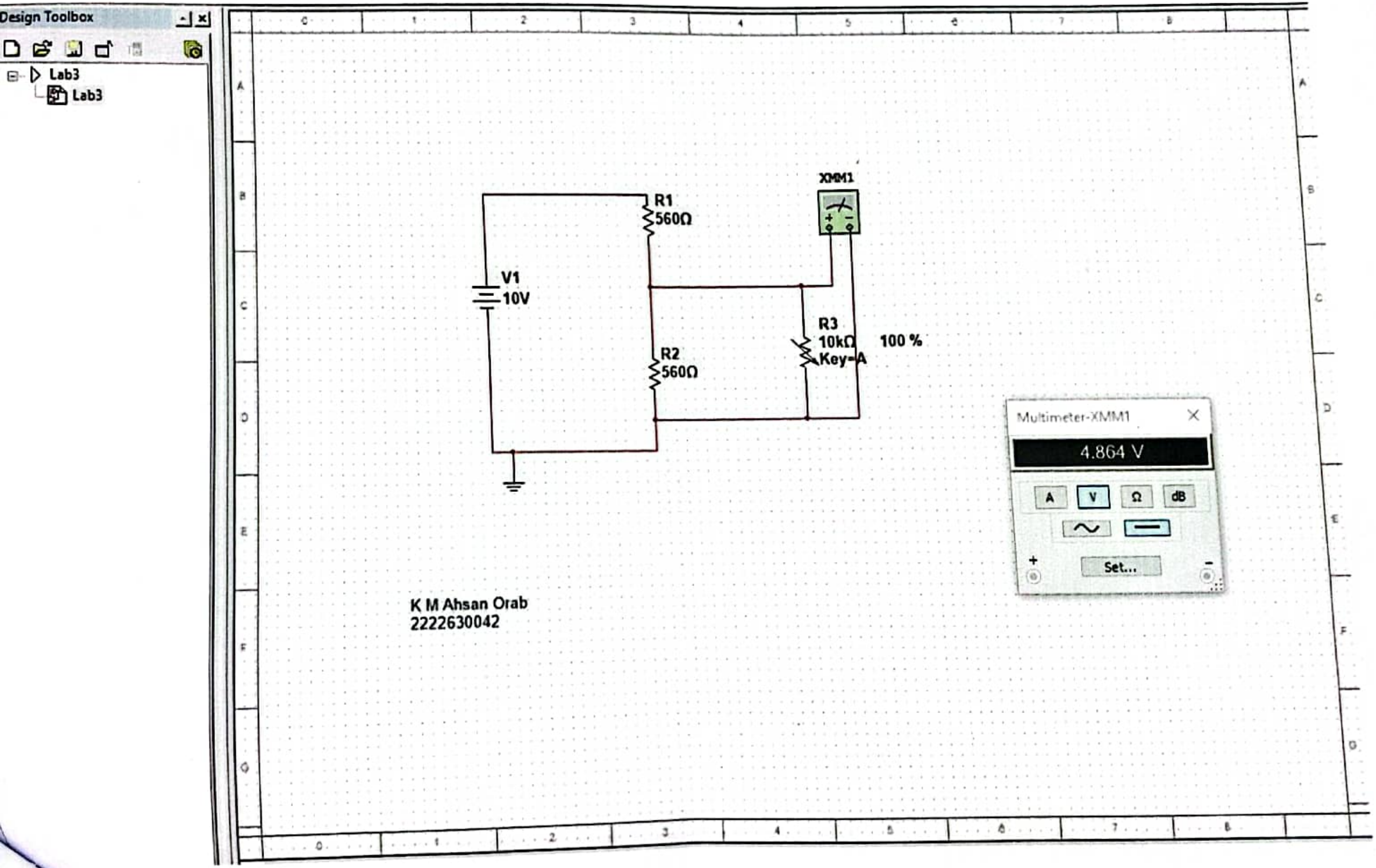
In this experiment, we got to know about the effects of load resistance. If we want to add a potentiometer which is a variable resistance. We set it on parallel with R3. We have to be very careful about connecting. We can connect with leg A, B or B, C. We cannot connect leg A, C.

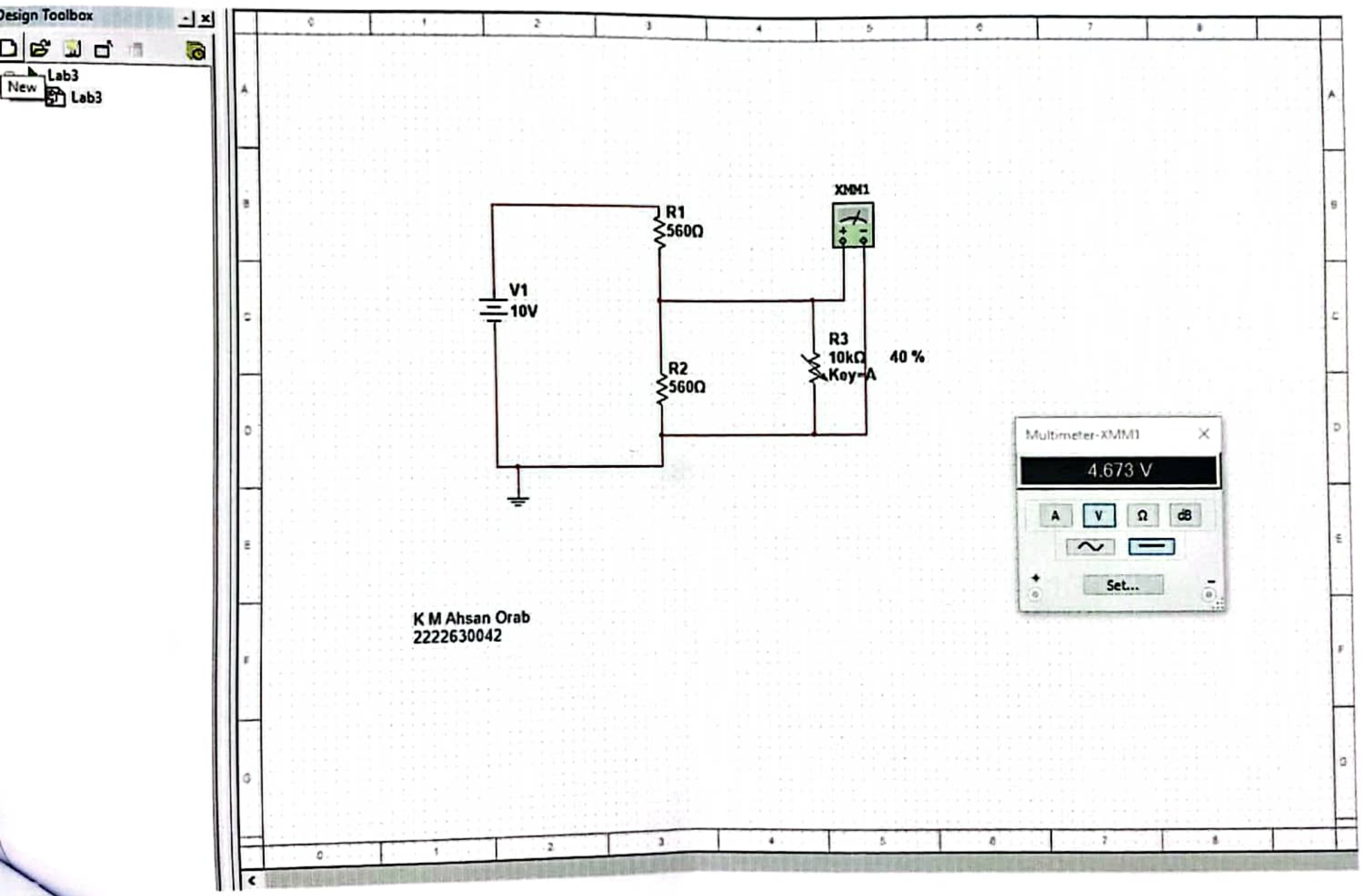
Here, we have three resistors and a variable resistor. 1st 3ones are connected in series. We have to find each voltage and current for every resistance. For 1st measurement, there is no load resistance and now we got the highest voltage output. For the 2nd measurement, we add 4ohms load resistance. And now Vout drops. But as we increase load resistance also rises.

We did their careful measurement of all values. We observed the voltage divider circuit in this experiment we have learned how to create a ladder circuit, how to form a voltage divider circuit on a breadboard and we knew the use variable resistors. For this experiment, the variable resistor was very sensitive for us, actually its measurement. There were very small differences between the theoretical and experimental values such differences can be avoided.

No problem was faced while doing the experiment. But one thing, because of some issues in the components, the theoretical and practical values were slightly different.

In conclusion, we have learned about the loading effect of the voltage divider circuit. We have learned about ladder circuits also, with a variable resistor. We can build the voltage divider circuit. We measured all values including practical and ~~p~~theoretical values. While doing the lab we tuned the variable resistor to get our actual need. Without some DMM and other components issues, the lab was knowledgeable and comfortable for our learning.


Design Toolbox
Lab3
Lab3
V1
10V
R1
560Ω
R2
560Ω
XMM1
R3
10kΩ
Key=A
100 %
K M Ahsan Orab
2222630042
Multimeter-XMM1
4.864 V
A
V
Ω
dB
Set...
+
-


Design Toolbox
New
Lab3
Lab3
R1
560Ω
V1
10V
R2
560Ω
R3
10kΩ
Key=A
40 %
XMM1
K M Ahsan Orab
2222630042
Multimeter-XMM1
4.673 V
A
V
Ω
dB
Set...

Questions:

1. Loading refers to the phenomena that occur when a load circuit having low effective impedance is connected to a supply circuit having a higher impedance, So on connecting the load circuit effectively reduces the resistance, drawing more (load) current causing greater voltage drop in the supply circuit. Consider a lower sensitivity (ohm per volt) voltmeter being used with a high resistance load. Now, as we may know a voltmeter is connected in parallel with the load, such a (low sensitivity) voltmeter when connected across a high resistance load forms a low resistance parallel path for current to pass through thus lowering the overall resistance of the arrangement and thus lowering the voltage drop across it, this causes erroneous readings by the voltmeter.

2. V_{out} (No resistor) $= 10\left(\frac{0.56/1}{0.56(0.56/1)}\right)$

$= 5V$

$$V_{out}(1k) = 10\left(\frac{\frac{0.56\times1}{0.56+1}}{0.56\left(\frac{0.56\times1}{0.56+1}\right)}\right)$$

$= 3.9V$

$$V_{out} = 10\left(\frac{\frac{0.56\times4}{0.56+4}}{0.56\left(\frac{0.56\times1}{0.56+1}\right)}\right)$$

$= 4.67V$

$$V_{out}(7k) = 10\,\frac{0.56\left(\frac{0.56\times7}{0.56+7}\right)}{0.56+\left(\frac{0.56\times7}{0.56+7}\right)}$$

$$= 4.8V$$

$$V_{out} = 10\,\frac{0.56\left(\frac{0.56\times10}{0.56+10}\right)}{0.56+\left(\frac{0.56\times10}{0.56+10}\right)}$$

$$= 4.86\,V \text{ (Ans)}$$

3. Comparing the data we measured and calculated there's a slight error. The relatively accurate to the calculated readings prove that our experiment was a success. The difference in values must be for the shift in variable resistor while handling.

NORTH SOUTH UNIVERSITY

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

EEE41L/ETE141L

Data Collection for Lab 3:

Group No. ________ **Instructor's Signature** __________

Table 1:

RL	Vout (Measured)	Vout (Calculated)	%Error
No resistor	4.95	5	1
1k	3.89	3.90	0.25
4k	4.65	4.67	0.43
7k	4.77	4.80	3.125
10k	4.82	4.86	3.6

Koshedia Mahmood 10.2.2025

Report Question:

1. Explain the loading effect of your circuit (i.e explain how does your Vout vary with increasing Load resistor)
2. Showing all steps in details, theoretically calculate the value of Vout for each load resistor.
3. Comparing the theoretical data to the experimental data, comment how far the loading effect of your circuit supports the theory.