International University

School of Electrical Engineering

Principle of EE1 Laboratory

EE052IU

[Lab 1]

Introduction to Electric Circuit Laboratory

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Date Submitted:	[11/09/2023]
Date Performed:	[11/02/2023]
Lab Section:	[1]
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GRADING GUIDELINE FOR LAB REPORT

Number	Content		Score	Comment
1	**Format (max 9%)**			
	- Font type	Yes No		
	- Font size	Yes No		
	- Lab title	Yes No		
	- Page number	Yes No		
	- Table of contents	Yes No		
	- Header/Footer	Yes No		
	- List of figures (if exists)	Yes No		
	- List of tables (if exists)	Yes No		
	- Lab report structure	Yes No		
2	**English Grammar and Spelling (max 6%)**			
	- Grammar	Yes No		
	- Spelling	Yes No		
3	**Data and Result Analysis (max 85%)**			
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Nomenclature

V_{DD} = DC Voltage Source

V_{dd} = AC Volatge Source

I_{ref} = Reference Current

Etc.

Theoretical Background

Resistors come in a variety of values, forms, and physical dimensions. Nearly all through-hole resistors, with a power rating of up to one watt, feature a set of colored bands used to convey information about their resistance value, tolerance, and sometimes their temperature coefficient. These bands can range from three to six in number, with four bands being the most commonly encountered configuration. The initial bands consistently denote numerical values in the resistance, followed by a multiplier band that indicates shifting the decimal point either to the right or left. The final bands convey information ab out tolerance and the temperature coefficient.

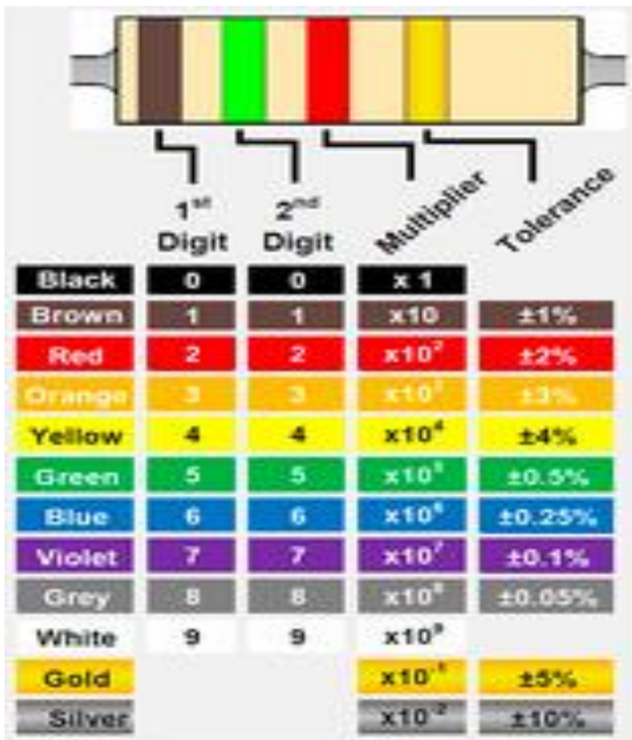

Figure 1

Objective

In this section, we investigated:

1. Lab policies & Lab Safety Rules

2. The use of breadboard.
3. Resistor color codes and capacitor codes.
4. The equipment will be used during this laboratory.

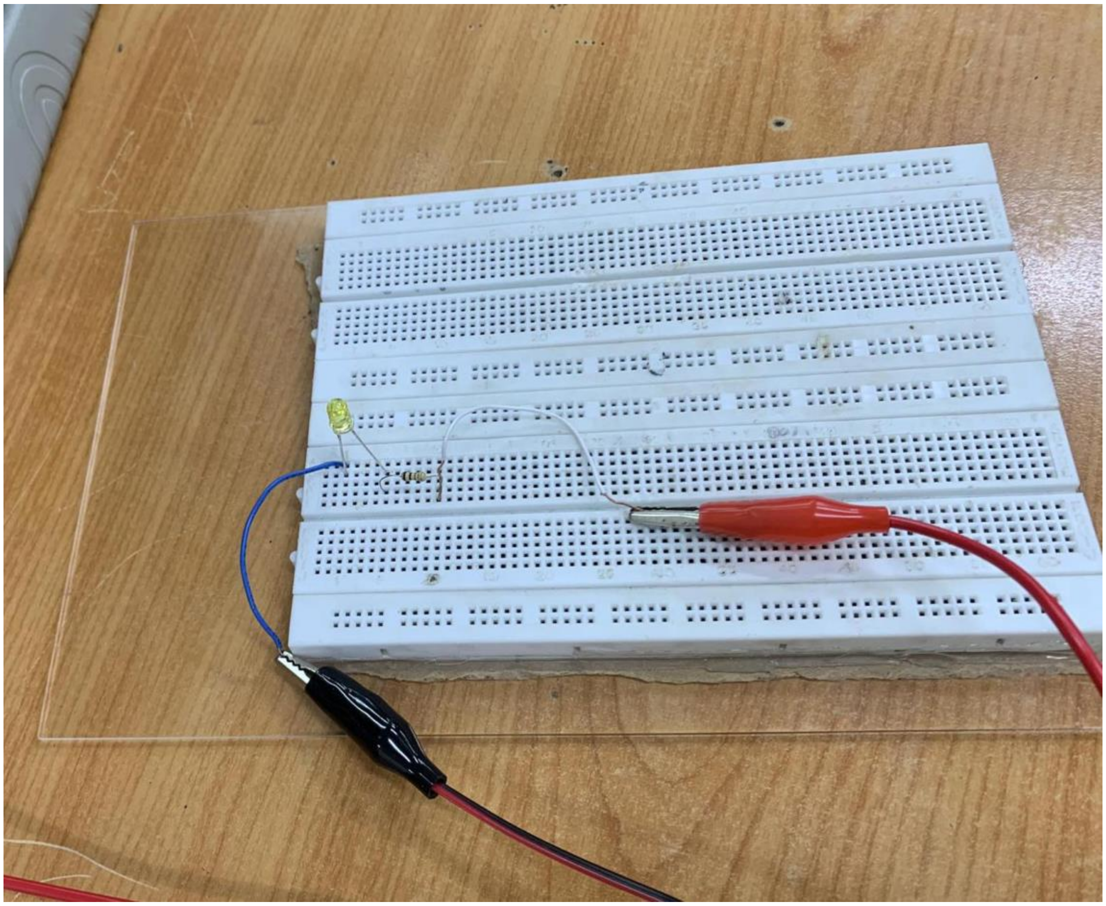

Figure 2

Introduction

In a laboratory setting, breadboards serve as indispensable tools for electrical engineers, students, and researchers. They are key to rapid prototyping, circuit design, and experimentation.

Layout of a Breadboard

1. Rows, Columns, and Tie Points

- A standard breadboard is typically divided into rows, columns, and tie points.
- Rows run horizontally and are usually labeled with numbers (e.g., 1 to 30).
- Columns run vertically and are typically labeled with letters (e.g., A to J).
- Tie points are the holes where components are inserted and connected.

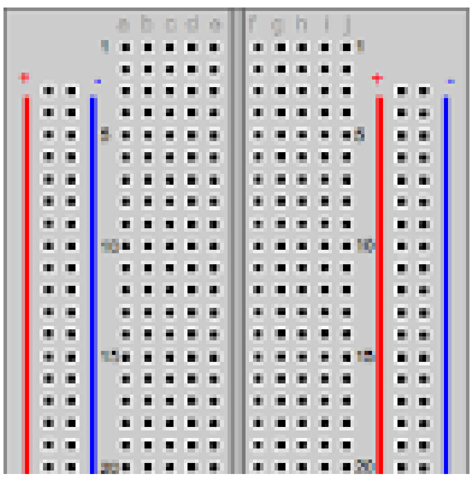

Figure 3

2. Power Buses

- Breadboards have dedicated power buses, often marked as red (positive) and blue (negative or ground).
- Power buses run alongside the rows and provide power to components.

3. Distribution Strips

- Distribution strips run alongside the columns and are connected to the rows.
- They serve as an additional means to distribute power or create common connections.

Using Breadboards in the Lab

1. Component Placement

- Components are inserted into tie points, ensuring their legs contact the metal clips beneath.
- Proper orientation of components is crucial.

2. Power Connections

- Power and ground connections are established by connecting them to the respective power buses on the breadboard.
- Use jumper wires to connect components and create the desired circuits.

3. Neat and Compact Layout

- Arrange components in an organized and compact manner to minimize the risk of loose connections and short circuits.

The equipment will be used during this laboratory

Figure 4

I. Digital Multi Meter(DMM)

Figure 5

How to Use the Functions of a DMM

1. Voltage Measurement

- Set the DMM's function selector to the voltage (V) setting.
- Ensure the appropriate range is selected (higher than the expected voltage).
- Connect the red test led to the positive side and the black test led to the negative side of the circuit or component.
- Read the voltage measurement from the DMM display.
- Important: When measuring voltage, the DMM should be connected in parallel with the circuit or component, meaning it is connected across the component or points of interest.

2. Current Measurement

- Set the DMM's function selector to the current (A) setting.
- Ensure the appropriate range is selected (higher than the expected current).
- Connect the DMM in series with the circuit, breaking the circuit path.
- Read the current measurement from the DMM display.
- Important: When measuring current, we get power probe connected to DMM

3. Resistance Measurement

- Set the DMM's function selector to the resistance (Ω) setting.
- Ensure the appropriate range is selected (higher than the expected resistance).
- Connect the test leads to the component or circuit under the test.
- Read the resistance measurement from the DMM display.
  - Important: Do not measure the components when it still attached in the circuit because the results maybe incorrect.

4. AC Measurements

- For AC voltage and current measurements, set the DMM to the AC function and select the appropriate range. Follow the same connection procedures as for DC measurements.
- The DMM will provide RMS (Root Mean Square) values.

5. Continuity Testing

- Many DMMs have a continuity test function. Set the DMM to continuity mode.
- Touch the test probes to the two points being tested. If a continuous circuit is detected, the DMM will emit an audible beep or display continuity on the screen
- **Power Supply**

Figure 6

To use the Power Supply:

• Step 1: Turn on the device and set all the Current and Voltage buttons to zero values. (Light Signal stays RED) Light Signals Output Control Three Control Modes One Fixed 5V VDC Source Two Adjustable VDC Source

• Step 2: Attach the red wire to the Hotwire and black wire to the Ground to supply the power for your circuit.

• Step 3: Turn the Voltage button to the required value and slowly increase the Current button until the Light Signal turns GREEN.

• Step 4: Turn on the Output button. (If the Light Signal turn RED, check your circuit again, it maybe shorted circuit)

Experimental Procedure

Table1

<table>
<tr><th>Nguyên Đào Anh Khôi</th><th>Nguyễn Đình Ngọc Huy</th><th>Trần Thuận Thành</th></tr>
<tr><td colspan="3">a. Reading the Resistors</td></tr>
<tr><td>150 ohm, 5% =Brown-Green-Brown-Gold
270 ohm, 5% =Red-Purple-Brown-Gold
3300 ohm, 5% =Orange-Orange-Red-Gold
420 ohm, 2% =Yellow-Red-Brown-Red
33K ohm, 5% =Orange-Orange-Orange-Gold
1 ohm, 1% = Black-Brown-Black-Brown
1200 ohm, 5% =Brown-Red-Red-Gold
220 ohm, 1% = Red-Red-Brown-Brown
3900 ohm, 2% = Orange-White-Red-Red
10K ohm, 5% = Brown-Black-Orange-Gold</td><td colspan="2">56K ohm, 5% = Green-Blue-Orange-Gold
1K ohm, 5% = Black-Brown-Orange-Gold
1M ohm, 5% =Black-Brown-Blue-Gold
100000 ohm, 5% = Brown-Black-Yellow-Gold
390 ohm, 5% =Orange-White-Brown-Gold
3300 ohm, 5% =Orange-Orange-Red-Gold
330K ohm, 2% = Orange-Orange-Yellow-Red
47 ohm, 5% =Yellow-Purple-Black-Gold
10K ohm, 5% =Brown-Black-Orange-Gold
1500 ohm, 2% =Brown-Green-Red-Red</td></tr>
<tr><td colspan="3">b. Measure the Resistor values
Each student goes to the counter and randomly picks 5 resistors. Read the nominal value from the color bands and use the DMM to measure the actual values of the resistors.</td></tr>
<tr><td colspan="3">The color band: Brown-Black-Orange-Gold</td></tr>
</table>

Figure 7

The nominal value:10KΩ ±5%	The actual value:9.882kΩ
The color band: Grey-Black-Red-Gold	
The nominal value: 8KΩ±5%	The actual value:8.121KΩ
The color band of resistor: Orange-Orange-Orange-Gold	
The nominal value:33KΩ±5%	The actual value: 33.32KΩ
The color band of resistor: Blue-White-Yellow-Gold	
The nominal value: 68x10KΩ±5%	The actual value: 678KΩ

The color band of resistor: Brown -Green Orange-Gold	
The nominal value: 15KΩ±5%	The actual value: 14.940 KΩ

Experimental Results

The following is the safe state for constructing an electric circuit:

- Prior to establishing a connection between the circuit and the power source, it is imperative to meticulously set the voltage output precisely to 5V and finely adjust the current to a controlled 0.5A. This meticulous calibration serves as a prudent safety measure, effectively mitigating the risk of any inadvertent short-circuit occurrences. Raising the voltage beyond this specified threshold could potentially impose an excessive load on the resistor, resulting in the undesirable consequence of electronic devices incineration and possible damage

Power Supply:

- When the machine's indicator switches from constant voltage (C.V) to constant current (C.C), it signifies the onset of an overload condition. During this phase, the current experiences a significant surge, necessitating an immediate shutdown.

Digital Multi-Meter (DMM):

- When measuring resistance, it is advisable to remove the resistor from the circuit and insert one probe into the resistor while placing the other probe into any component within the circuit.

- When measuring current, it is recommended not to perform a direct measurement at the machine's mA level, as negligence can potentially lead to damage of the internal fuse. This particular fuse serves as a safeguard for the machine, breaking when subjected to excessive current levels.

Discussion of Results

- In comparison to Ohm's Law and the real-world test results, it can be concluded that utilizing a Digital Multi-Meter (DMM) for measuring resistor values is associated with an error margin falling within the range of 5-10%.

- In this lab session, we experienced how the fuse work and method to check out whether one is still working or not.

=>To perform this task, utilize a multimeter by adjusting the selector knob to continuity measurement mode. Position one probe on one end of the fuse and the other probe on the opposite end. If the DMM emits a beep, it indicates that the fuse is open, signifying its operational status as intact. This outcome affirms the absence of any broken connections within the fuse.