ECE281

Electrical Circuits and Instrumentation + Laboratory

Fall 2016/2017

LAB # 2

10.10.2016

Objective:

To learn the basic measurement and calculation techniques in electronics,

1. **How to measure voltage**
2. **How to measure current**

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1. How to measure Voltage:(15 Points)

Voltage in a circuit is always measured 'ACROSS' a component or it is measured between 'TWO POINTS' in a circuit.

Procedure:

1. Construct the circuit given in Figure-1 on the breadboard. Do not connect the positive terminal of DC power source to the circuit. Set the voltage on channel 1 of the power supply to 10V.

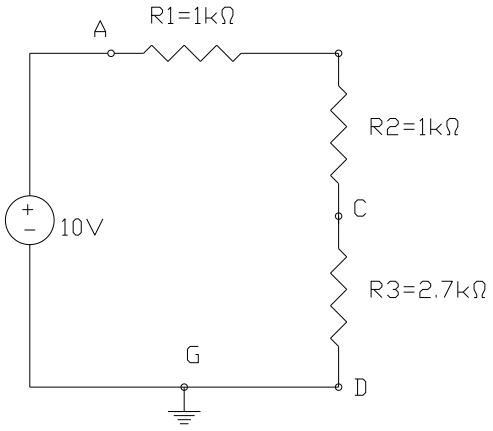

Figure 1

2. After carefully checking all the connections, connect the positive terminal of the DC power source.

3. Use digital multi-meter to measure the voltage drop between the points specified in Table-1 and record them to the corresponding cells in Column A of Table-1,
4. Remove R_3 from the circuit and measure the specified voltages and record them to the corresponding cells in Column B of Table-1,

Table- 1

	Between Points		**(Column A) Circuit shown in Figure-1**	**(Column B) R_3 Removed**
	Black Lead	**Red Lead**		
1	**G**	**A**		
2	**G**	**B**		
3	**G**	**C**		
4	**C**	**A**		
5	**C**	**B**		
6	**C**	**D**		
7	**C**	**G**		
8	**A**	**B**		
9	**A**	**C**		
10	**A**	**D**		
11	**A**	**G**		
12	**B**	**A**		
13	**A**	**B**		
14	**B**	**C**		

Questions:

1. **What happens when the leads of the multi-meter are interchanged?**
2. **Explain what happened to the voltages across the other resistors when $R_3$is removed from the circuit?**

2. How to measure Current:(15 Points)

Current in a circuit is always measured in 'SERIES' with the circuit. Wherever the current is to be measured the ammeter is inserted in series in the circuit by braking the circuit between 'TWO POINTS'.

Procedure:

1. Construct the circuit given in Figure-2a on the breadboard. Connect the positive terminal of DC power source to the circuit. Set the voltage on channel 1 of the power supply to 10V.

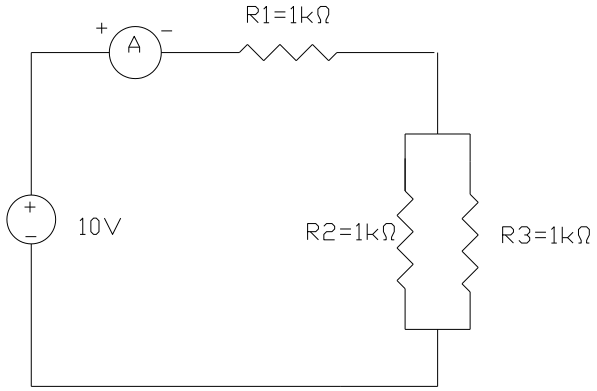

Figure 2a

2. After carefully checking all the connections, connect the positive terminal of the DC power source.
3. Use digital multi-meter to measure the current flow through R_1.
4. Remove the positive terminal of the DC power source (removing power) and reverse the connection of digital multi-meter, connect battery and measure the current flow through R_1 again.
5. Remove the power and replace the multi-meter as shown in Figure-2b.

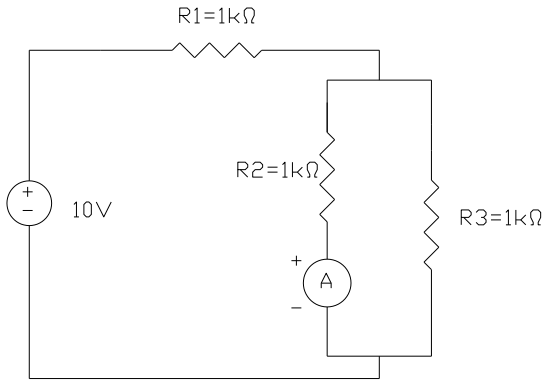

Figure 2b

6. Connect power and measure the current flow through R_2.
7. Remove power reverse the connections of digital multi-meter and connect power.
8. Measure the current flow through R_2 once more.
9. Repeat the same procedure to measure the current flow through R_3.
10. Change the value of $R_3$to **10kΩ**and repeat steps 3-9.
11. Record all your measurements on Table-2.

Table- 2

Resistance Value	**Measured Element**	**Meter Connection**	**Current**
R1=1kΩ	**R_1**	**Normal**	
R1=1kΩ	**R_1**	**Reverse**	
R1=1kΩ	**R_2**	**Normal**	
	R_2	**Reverse**	
	R_3	**Normal**	
	R_3	**Reverse**	
R1=1kΩ	**R_1**	**Normal**	
R1=1kΩ	**R_1**	**Reverse**	
R1=10 kΩ	**R_2**	**Normal**	
	R_2	**Reverse**	
	R_3	**Normal**	
	R_3	**Reverse**	

Questions:

1. **What happens when the leads of the multi-meter are interchanged?**
2. **Explain the difference in the current values from steps 3-9 to step 10.**