

Electronics lab

Assignment Zero: Plotting data

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Preliminaries

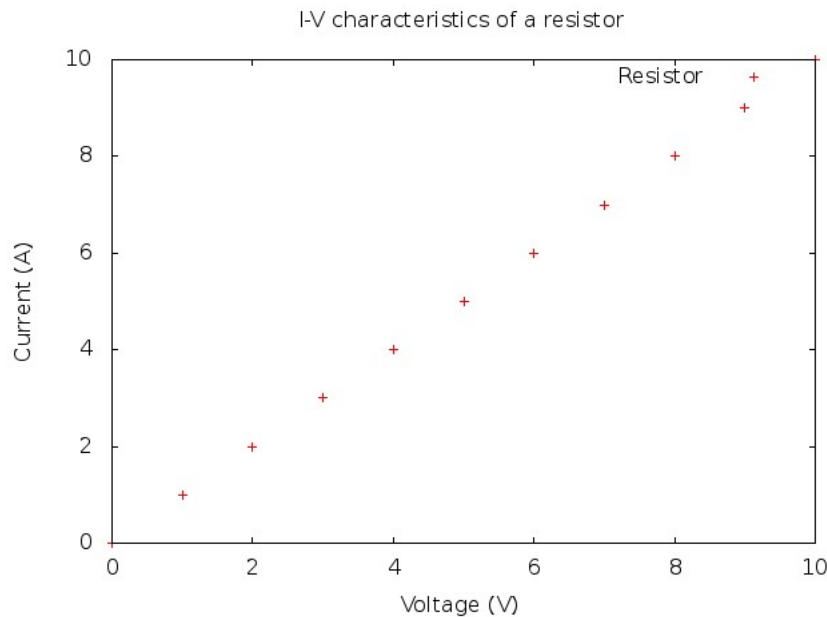
This assignment has a total of 10 points. All tasks are all or nothing. There is no partial credit given for this assignment. You need to create a document in single pdf file. You are encouraged to use LaTeX. However one is allowed to use MS word or any other word processor as well. The assignment needs to be submitted in PDF format. You will be plotting data for four different electrical components namely: resistors, diodes, capacitors, and inductors. You are encouraged to look into the details of these components. Again lab partners are allowed to work and submit a single document. If any plagiarism is found between other groups, two groups (four students) will be be punished.

Task1: Resistors (2 points)

If we use $1\ \Omega$ resistor and apply a sweep voltage of say 1 to 10 V with a step of 1V, the current measured will be 1 to 10 A. The current-voltage equation is shown below:

$$I = V / R(\Omega)$$

If suppose you plot the Voltage in X-axis and calculated current in y-axis. You should get a graph similar to the figure shown below.



Your task is to create three such graphs on the same plot for resistors of value $1\ \Omega$, $5\ \Omega$, and $10\ \Omega$. You can create a graph using gnuplot or Matlab or MS Excel or libre office. Label this graph as Figure 1. An example gnuplot files are uploaded in LMS and dropbox. Your graph should contain legends, axis labels, three different symbols representing three different resistors, and major tick values. If any of these are missing, your graph will be considered as not readable and incomplete and you will lose all points.

Task 2: Ideal diode and tunnel diode (2 points)

Plot another graph (Figure 2) for ideal diode and tunnel diode. Diode is a device which conducts current in one direction. The following data needs to be plotted for diode. Consider Voltage in X-axis and Current in Y-axis.

Ideal diode	
Voltage(V)	Current(A)
0	0
0.1	0
0.2	0
0.3	0
0.4	0
0.5	0
0.6	0
0.7	1
0.8	1
0.9	1
1.0	1

Tunnel diode	
Voltage(V)	Current(A)
0	0
0.1	0.008
0.2	0.006
0.3	0.005
0.4	0.006
0.5	0.011
0.6	0.090

Task 3: Solar cell (2 points)

Plot the current density (Y-axis) -voltage (X-axis) curve for a solar cell under two conditions: dark current and open circuit voltage. Label this graph as Figure 3.

For open circuit voltage

Voltage(V)	Current-density(mA/cm ²)
-0.8	-18
-0.6	-17
-0.4	-16
-0.2	-15
0	-14
0.2	-12

0.4	-6
0.6	0
0.8	12

For dark current

Voltage(V)	Current-density(mA/cm ²)
-0.8	0
-0.6	0
-0.4	0
-0.2	0
0	0
0.2	0
0.4	0
0.6	5
0.8	12

Task 4: Voltage divider circuits (2 points)

Draw a graph (Figure 4) of voltage divider circuit following the algorithm shown below. You are supposed to draw a graph of V_{out}/V_{in} versus R_{in} in terms of R_{out} .

$$V_{out} = V_{in} \times \frac{R_{in}}{R_{out} + R_{in}}$$

For reference check Figure 1.12 in *The art of electronics* reference book in the library. Consider the fractional Voltage in Y-axis and load resistance (units of R_{out}) in X-axis.

Task 5: Resistor and Capacitor (2 points)

You will learn about the RC charging and discharging circuit in the next lab, but before that you should be able to draw this curve. Draw a graph (Figure 5) of an RC circuit with Time as x-axis and Voltage as Y-axis using the following data.

Time(units of time constants in RC)	Voltage (V)
0	0
1	0.63
2	0.86
3	0.95
4	0.98
5	0.99

Submission

Make sure that all the graphs/figures are put in a pdf file. Name this file according to your ROLL No. Suppose your roll no. is IMT2014097 and IMT2014098, then your assignment should be named as *IMT2014097.pdf* or *IMT2014098.pdf*. Also write both students email-id, roll nos, and name in the document. If the students name, roll-nos, and email-id is found missing in the document submitted, then no scores will be given. You are supposed to submit the PDF file in LMS by Tuesday September 16, 2016 by 11:59:59 AM.