

EEEE 281 Lab 2 Circuits 1

From: Andrei Tumbar [Computer Engineering]

To: Section 2 TA: LJ Boone, Harrison Keats

Date: Performed: (edit) Due: (edit)

Subject: Lab 2-Loop and Nodal Analysis

Lab Partner(s): (edit)

Table 1: Grading Table

Component	Percentage of Grade	Score	Comment
Report Formatting	20 %		
Hand Calc.: Nodal or Mesh Analysis	10 %		
PSPICE: Simulation Summary	5 %		
PSPICE: Simulation and Data	10 %		
PSPICE Discussion	20 %		
Hardware: Experimental Setup	5 %		
Hardware: Experimental Results/Data	10 %		
Hardware: Discussion	20 %		
Total Score:			
Graded By:			

Abstract

The abstract section should contain a summary of what was performed in the lab and should be approximately 200 words. This should succinctly rephrase the purpose of the laboratory. It should also refer to the data collected. What theory/data is observed for the circuit (specifically focus on the differential voltage drop between $V_{out,+}$ and $V_{out,-}$)?

1 Introduction and Theory

Include 1 paragraph that explains the scope and purpose of the experiment. Please refrain from using exact text from the laboratory handout.

If the data collection has deviated in any way from the rest of your section (for example you had to come back to collect more data), explain this in a second paragraph. In particular, be sure to note if your data was acquired from a different lab than your classmates/using differing equipment.

1.1 Theory: Circuit Topology

In this section, you should introduce the reader to the circuit you investigated in the laboratory, and demonstrate the theoretical value of the circuits.

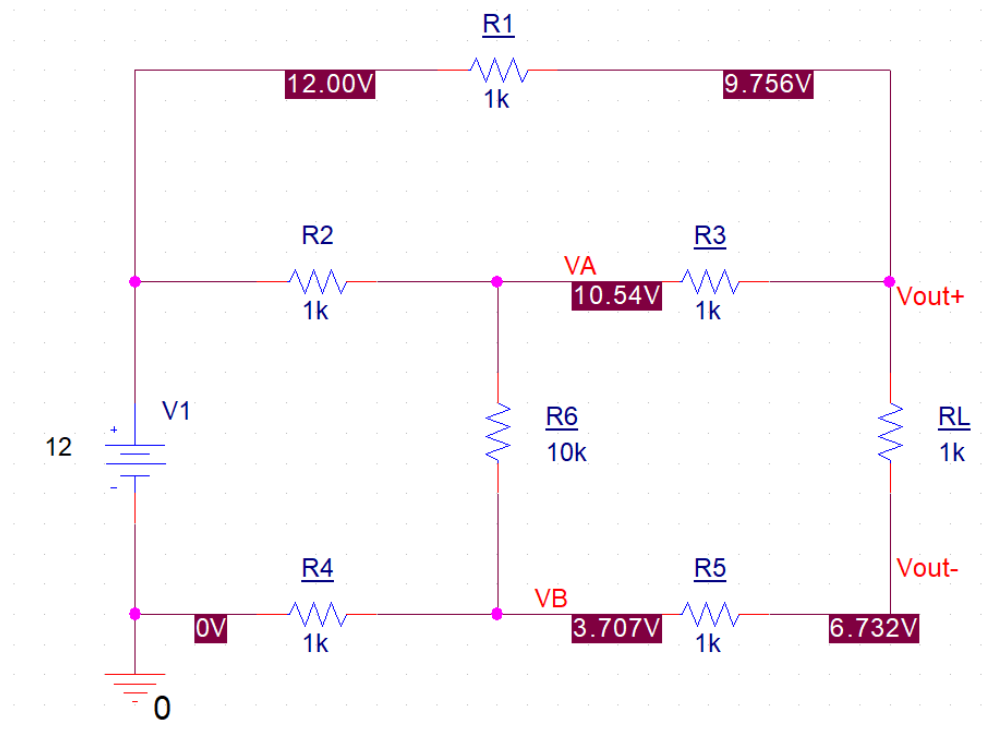


Figure 1: PSPICE simulation with voltage markers.

- A figure of the circuit schematic should be included here. **The ideal figure is a PSPICE image without voltage or current markers.**

- Define the ground in the circuit and specific nodes. **This can ideally be done by using the node labels in PSPICE.**
- This description can be short (about 1 paragraph in length).

1.2 Theory: Nodal or Mesh Analysis (hand calculations)

In this section, you should integrate the hand calculations into the text of the report. You are required to perform either nodal or mesh analysis calculations.

- To simplify your work, you may include a scan of your hand calculations. Be sure to number all of the equations on the right side.
- Show the following steps to justify the calculations:
 - The starting (unsimplified) simultaneous Nodal or Mesh equations
 - The matrix equation used for a solution (preferably along with the simplified equation).
 - The solution matrix
 - The solution of V_{out-} and V_{out} .
- In a second paragraph, define the meaning of a **differential voltage** and calculate the theoretical value of V_{out}

1.3 Theory: PSPICE Simulation Summary

Begin by providing a 1 paragraph description of the PSPICE setup. Was a DC simulation used, transient simulation, etc.? Which **libraries** and **PSPICE elements** were used in the simulation? You can borrow/reuse from the text of your first tech memo here. If you do so, please be sure to cite the tech memo. Note that to determine the libraries used, you can find the information when you look at the properties of each element. There will be a reference to a “.olb” file. This is the library name. **As you will be likely using the same PSPICE setup throughout the term, once it is established, you may reuse the information with the permission of your instructor/TA. Cite your first lab report as a reference. In subsequent reports, you may be appending to this.**

1.3.1 PSPICE: DC Simulation

In Figure 1 the circuit shows the results of the PSPICE simulation and all of the nodal voltages. The nodal voltage at V_A and V_B were 10.54 V and 3.707 V respectively.

2 Hardware Experiment: Results and Discussion

This section of the report should present what was done in hardware. A reader should be able to recreate an experiment from the detail present. One section discusses the equipment used in the experiment. The remaining sections discuss the results for each circuit.

2.1 Equipment Used in the Laboratory

Write a short paragraph to detail the equipment used in the laboratory, and specific model numbers. Ideally, you should create a table of the equipment which should be referred to in text (See Table 2 as an example). The room location where the experiment was performed should be included. Note that this should be a part of all Tech Memos, as it is an essential piece for other users to replicate your experiment. **As you will be likely using the same equipment throughout the term, once the text/tables are established, you may reuse the information with the permission of your instructor/TA. Again, cite your first lab report as a reference.**

Table 2: Equipment/Software required for Lab 2.

Item	Tool	Room
Simulation	OrCAD Capture CIS	All Open EE Labs
DC Power Supply	Agilent E3630A	09-3170
DC Power Supply	Agilent E3631A	09-3200
Multimeter	Agilent 34401A	09-3170, 09-3200

2.2 Hardware Results/Discussion

Begin the section by including the experimental values of the resistors as illustrated in Table 3. Introduce the table in the text and briefly discuss the variation in resistance. Note that the nominal values are the ones provided in the lab handout and used in PSPICE.

Table 3: Resistor Table

Resistor	Nominal Value (k Ω)	Measured Value (k Ω)	Tolerance (%)
R_1	1		
R_2	1		
R_3	1		
R_4	1		
R_5	1		
R_6	10		
R_L	1		

2.3 Hardware Results Summary

The lab handout calls for the measuring equivalent resistance between two points in the circuits to verify the wiring. Report the values that were obtained experimentally. Next, include the following table per the lab documentation. Briefly summarize it. Include a discussion of the **percent error** between theory and experiment.

Table 4: Summary of nodal voltages for Lab 2.

Voltage	Prelab (V)	PSPICE (V)	Hardware (V)	Percent Error With Hand Calc. (%)
V_A		10.54		
V_B		3.707		
V_{out+}		9.756		
V_{out-}		6.732		
$\Delta V_{out} = V_{out+} - V_{out-}$		3.024		

3 Conclusion

Provide a 1 paragraph summary of the laboratory experiment. What were the major conclusions for each part of the experiment? Also did the theory agree with the experiment? The conclusion is a revised version of the abstract.

4 Acknowledgments

Acknowledge **any** source of help received in the experiment/writing the report. This should certainly include your lab partner/teaching assistant/instructor. It may also include other classmates/study partners. State briefly what the nature of the help was.

Your report should include references to appropriate pages in the text, as well as any other sources, websites/etc. consulted in the preparation of the report.

References

- [1] C.K. Alexander, and M.K.O. Sadiku, *Fundamentals of Electric Circuits, 4th Edition*, McGraw Hill, pp. xx-yy(EDIT), 2009.
- [2] A. Student, *EEEE 281 Lab 1 Tech Memo*, page xx-yy, submitted Month, Day, 2015.
- [3] S. Rommel, *EEEE 281 Lab 1 Lecture notes*, slides xx-yy, Spring 2015.