ELEC 240
Lab 3 - Basic Circuits

Test performed: September 19,2018

Report submitted: September 26, 2018

Andrew Pham, Aneel Damaraju

1 Objective

In this lab, we explored Kirchoff's laws, and transfer functions through the use of various circuit elements, such as potentiometers, and software, such as LT Spice

Note (To be deleted): Think of this test report as a document with your peers as your readers. This means you can assume a similar knowledge background as you. Your readers should be able to easily understand what is going on, and also be able to repeat your lab results based on your document and all references you cite.

For the Objective section, identify the test you performed and its objectives. The objectives of the test are important to state because they are usually analyzed in the conclusion to determine whether the test succeeded.

2 Materials

Your text here

Note (To be deleted): Provide a bullet point list of components, software tools, and hardware (such as the NI VirtualBench or DMM) used during the lab

3 Test Description

Your text here

Note (To be deleted): This section provides a summary of the test your team performed. Give enough information so readers can understand what you did, but do not go into the details of every step.

3.1 Pre-Lab Calculations and Schematics

Your text here

Note (To be deleted): Include the homework pre-calculations and schematics that serve as the initial setup for the test. Briefly explain the importance of each item you include. You may want to number your equations/figures so you can refer to them in later sections. Including photos of handwritten work is okay.

4 Results and Discussion

4.1 Experiment 3.1: Resistive Voltage Dividers

4.1.1 Part A

The voltage reading on the DMM by a $2V_{pp}$ sine wave is $.704V_rms$, or .704 V_in. The voltage reading on the DMM for a similar square wave is 1.096 V_in. Then, readings were done for various frequencies for the same value sine wave as used in the initial test. The results were as follows

- 5 Hz .641V
- 50 Hz .701V
- 500 Hz .701V
- 5 kHz .49V
- 50 kHz 0V

It seems that the appropriate frequency for the DMM is 50-500 Hz to be safe, but more reasonably 10Hz-1kHz.

4.1.2 Part B

The voltage divider ratio should be $\frac{10,(10+10)}{=}V_in$ for two 10 kOhm Resistors in series. For the sine wave, the output is $.351V_ac$, which is 49% of the initial Voltage, consistent with the voltage divider equation At 47 Ohms the $V_out = .243$, which is inconsistent, with the voltage divider equation, indicating that the voltmeter may have inconsistent readings at low voltages. At 1MOhm the output voltage is .335, indicating that there may be a range of acceptable resistance for the voltmeter, just like we noted an acceptable frequency range.

4.1.3 Part C

Using the same sine wave, but wih 100 Hz, the potentiometer is connected in series and the voltage drop across it is recorded. At the midpoint, $V_out = .386or.55V_in$ this value is reasonable within error for such an analog device. The values of the output voltage at different divisions are given below.

- 1-.76
- 2-.653
- 3-.589
- 4-.506
- 5-.389
- 6-.273
- 7-.181
- 8-.076
- 9-0.002
- 10-0

It seems as if the values were evenly spaced as if they're were only 9 divisions, since the 9th and 10th both had 0V out.

4.2 Experiment 3.2: Filters and Transfer Function

4.3 Part A

Measuring the frequency and the amplitude of the output voltage across an RC circuit. The values recorded can be seen below

Table 1: frequency and the amplitude of the output voltage across an RC circuit

Frequency (Hz)	**Voltage** (V)	**Phase shift** (ms)
20	.99	1.97
50	.96	1.02
100	.88	.869
200	.68	.632
500	.39	.402
1k	.16	.227
2k	.065	.119
5k	.041	.046
10k	.021	.023
20k	.010	.012

These results from 1 were then used plotted onto **??**, using MATLAB. When compared to the values of **??** it can be seen that the experimental results match up with the actual results, confirming the transfer function of AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

4.3.1 Part B

Note (To be deleted): The heart of your report is the presentation of your results and a discussion of those results. In your discussion, you should not only analyze your results, but also discuss the implications of those results.

5 References

Your text here

Note (To be deleted): List any datasheets, websites, lab procedure, etc. used during the lab.

6 Conclusion

Your text here

Note (To be deleted): While the "Results and Discussion" section focused on the test results individually, the "Conclusion" discusses the results in the context of the entire experiment. Usually, the objectives given in the "Introduction" are reviewed to determine whether the experiment succeeded. If the objectives were not met, you should analyze why the results were not as predicted.

7 Errors

Your text here

Note (To be deleted): Briefly list sources of error and discuss how to eliminate or deal with them