ELEC 240
Lab 3 –INSERT TITLE

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1 Objective

In the first section of this lab, we explored running various amounts of AC and DC current through a voltage divider of different voltages. We also used a potentiometer as a voltage divider and verified its accuracy. In the second portion of this lab, we measured the transfer function of an RC Circuit by measuring its phase and amplitude with various input frequencies, and we then compared it with the calculated transfer function generated using MATLAB. Finally, we simulated two different RC circuits using LTSpice software and plotted the gain of the circuit at various input frequencies.

2 Materials

- Virtual Bench (Software, Oscilloscope, Function Generator, DC Power Supply)
- Computer with LTSpice Software
- BNC Male to Clips cord
- BNC T connector
- Oscilloscope Probe
- Breadboard
- 2 10 cm length wires (with 6 mm stripped on each end)
- Digital Multimeter
- $10k\Omega$ potentiometer
- 2 47Ω resistors
- 2 $1M\Omega$ resistors
- 2.2 $k\Omega$ resistor
- $2.2\mu F$ resistor

3 Test Description

In Part A of Experiment 3.1, we explored the freuqency range that the DMM on the Virtual Bench could usefully measure by outputting a sine wave from the function generator and recording the maximum voltage recorded by the DMM hooked up to this outputted sine wave. In Part B, we measured the output of a voltage divider and observed how circuits in reality deviate from ideal circuits. In Part C, we used a poteniometer as a voltage divider and verified that turning the slider in equal increments would proportionally increase the resistance of the potentiometer.

In Part A of Experiment 3.2, we measured the transfer function of an RC Circuit that we wired on the breadboard by inputting various AC frequencies and measuring and plotting the resulting voltage signal. In Part B, we simulated an RC circuit by creating a virtual circuit on LTSpice. We then performed AC analysis by plotting the gain of the RC Circuit over a wide frequency range.

3.1 Pre-Lab Calculations and Schematics

No pre-lab calculations were needed, but an understanding of how to measure a transfer function of an AC circuit was needed. Depicted below in Fig. 1 is the desired oscilloscope output overlay needed to measure the transfer function:

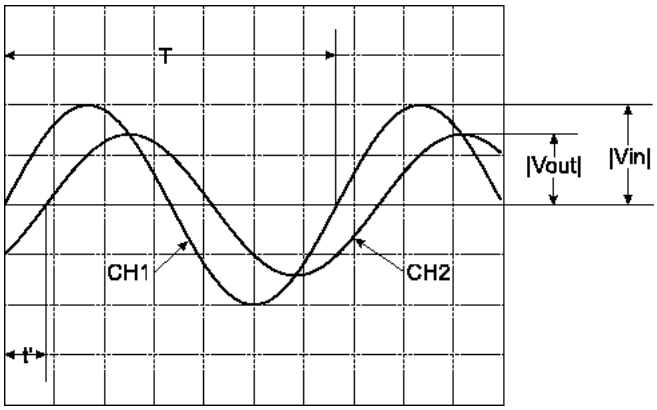

Figure 1: Circuit Output Signal Overlayed with Function Generator Output

To measure the transfer function at a given frequency, we needed to measure both $|V_{IN}|$ and $|V_{OUT}|$, which was achieved by measuring the height of the peaks of CH1 and CH2. To measure the phase Φ, we measured the horizontal distance between the peaks of CH1 and CH2. With this technique, we are able to perform AC circuit analysis in Part A of Experiment 3.2.

4 Results and Discussion

Your text here

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