ECEN 3714--------Network Analysis

Cover Sheet for Final Project

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1. Introduction

1.1. In this final project we are given the task of discovering what is inside of Pandora's Box. Okie Dokie and Oops Doops have done some of the leg work in figuring out the box but have passed it on to me to complete it. They provided me with Raw X and Y axis data and gave me the frequency range. My Task is to load the axis data into MATLAB and come up with a Transfer Function graph. From there I used Bode straight line approximation to come up with the Transfer Function equation. I then designed the circuit from that H(s) equation and compared my findings.

2. Loading Data Files

2.1.

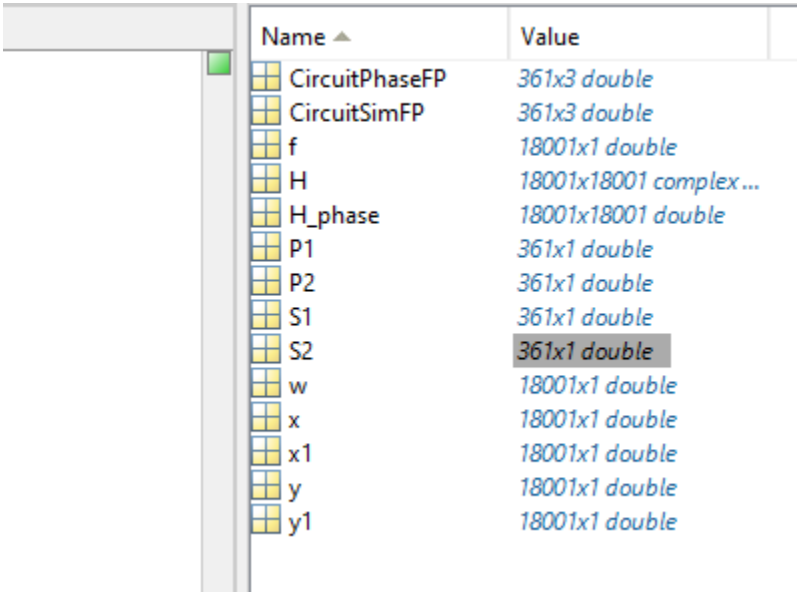


Figure 1: Loaded Data in MATLAB

3. Plotting The Raw Data

3.1.

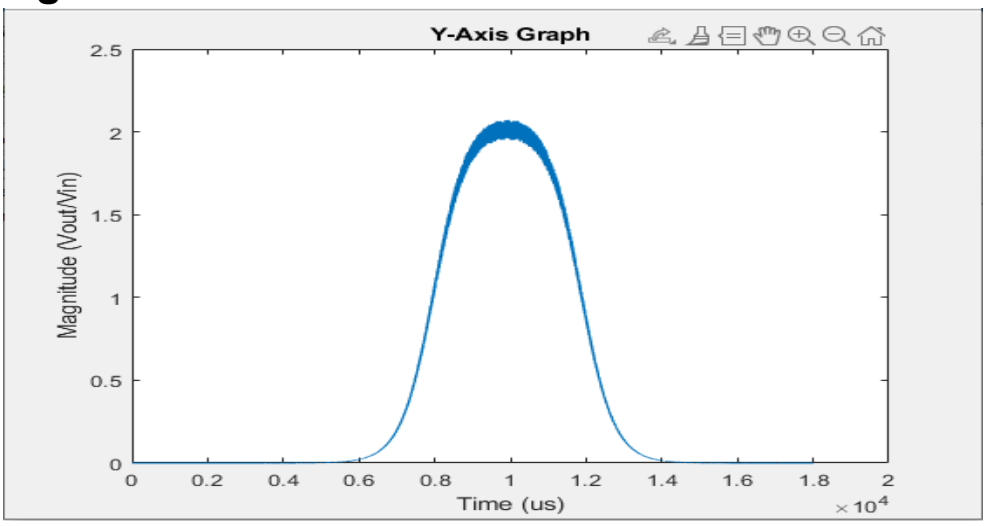


Figure 2: Plot of Raw y-axis Data

3.2.

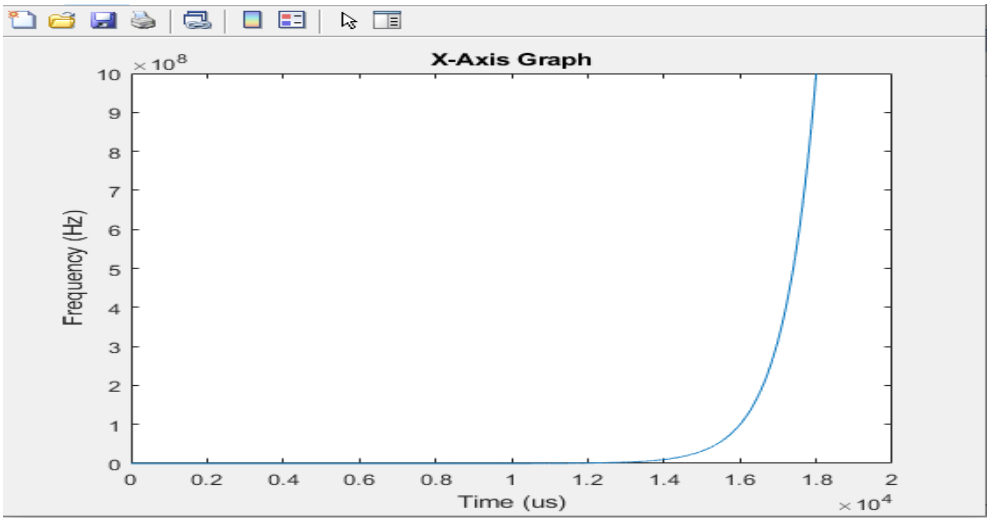


Figure 3: Plot of Raw x-axis Data

3.3.

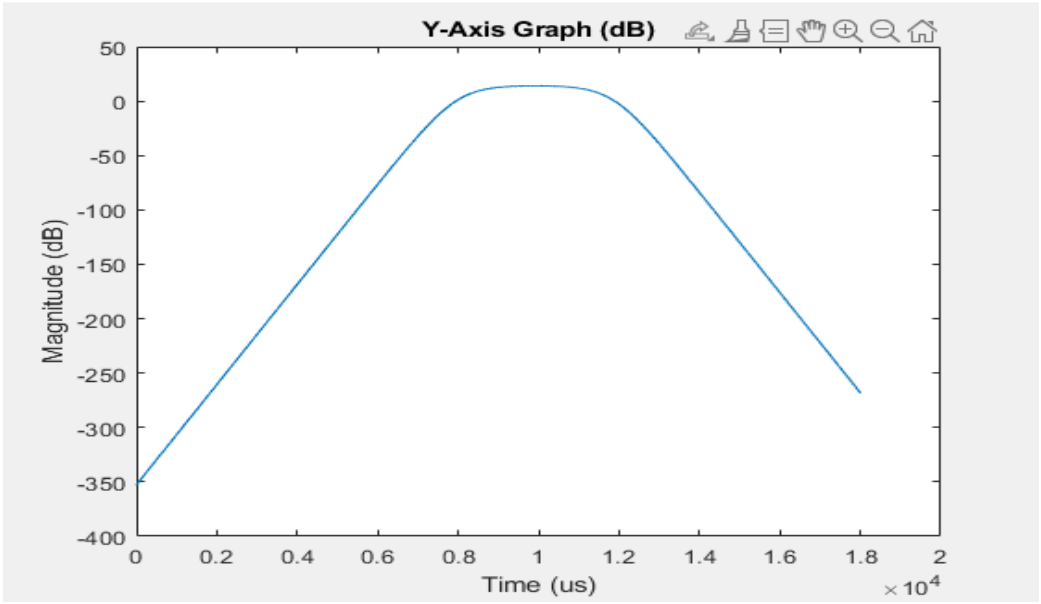
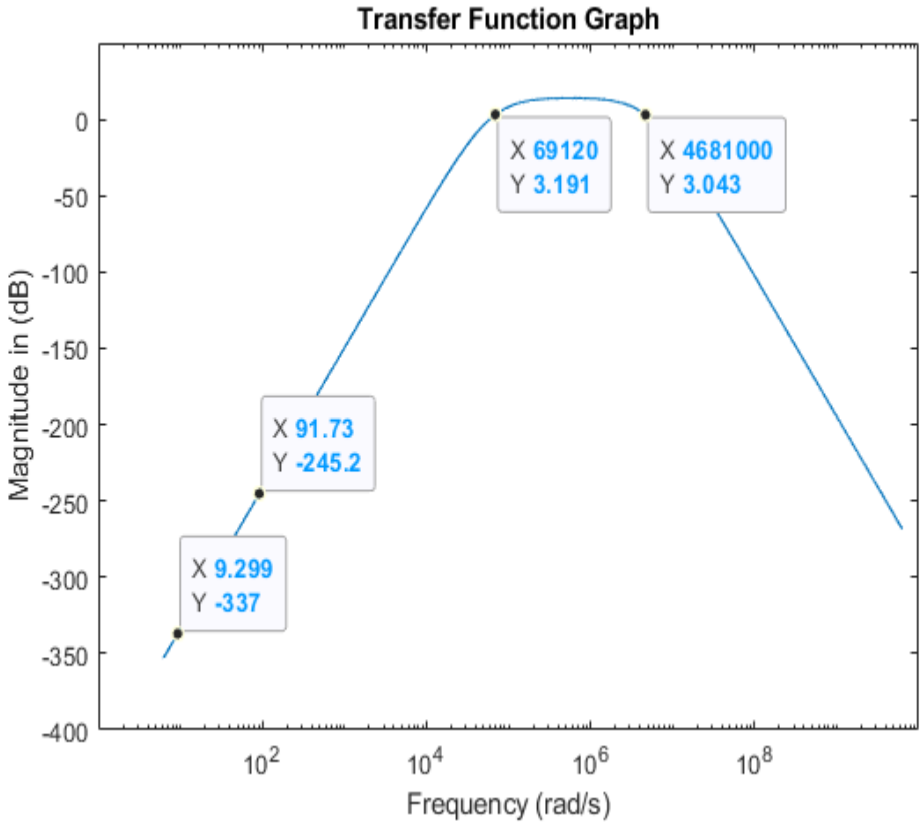


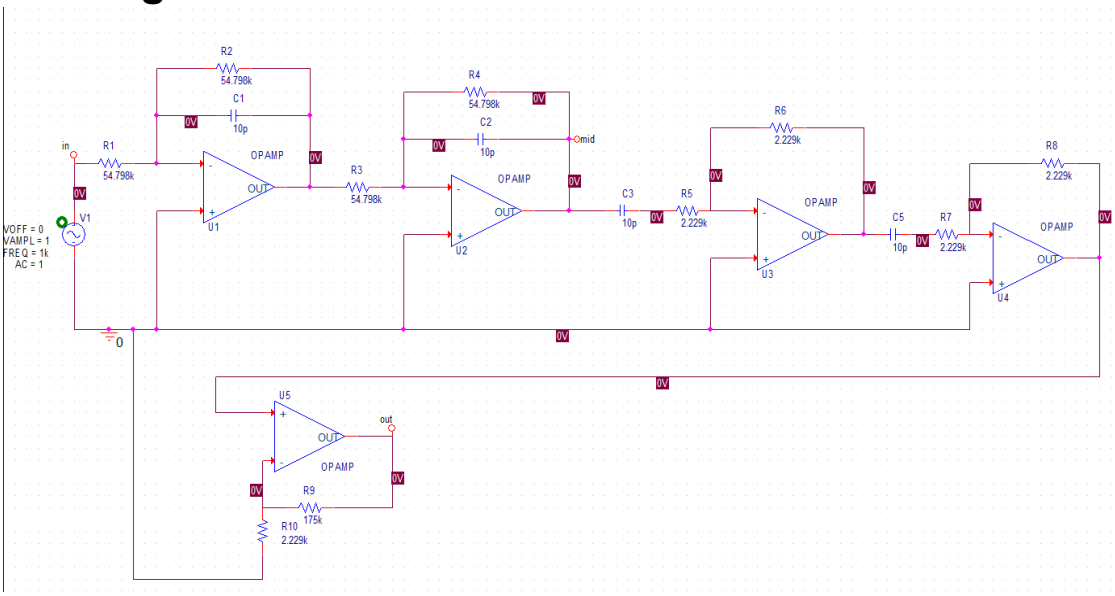
Figure 4: y-axis plotted in dB

4. Transfer Function Estimation



4.1. Figure 5: Plot of Transfer Function

5. Circuit Design in PSPICE



5.1. Figure 6: Designed Bandpass filter with two LPF and two HPF in 2nd-Order

5.2.

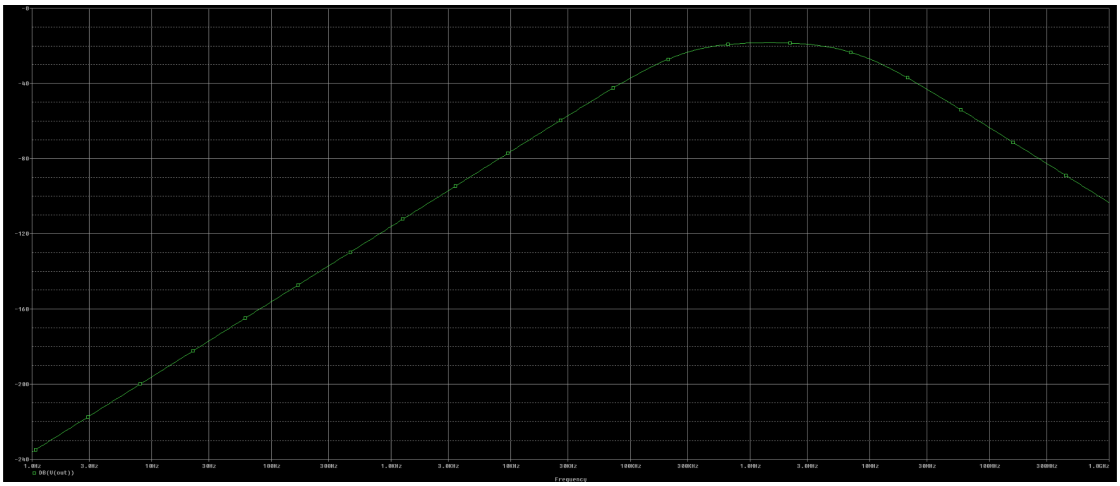


Figure 7: Transfer Function Plot from Designed Circuit

5.3.

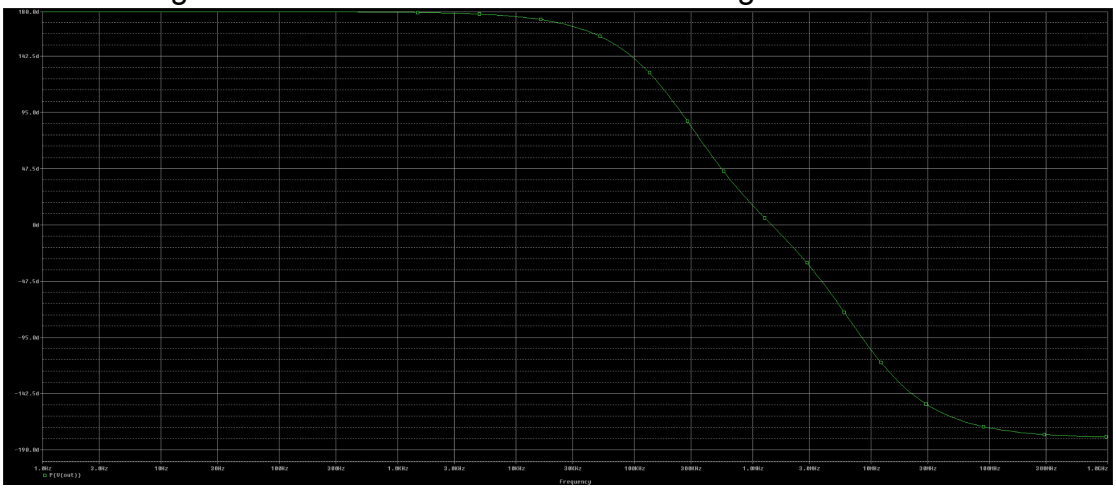
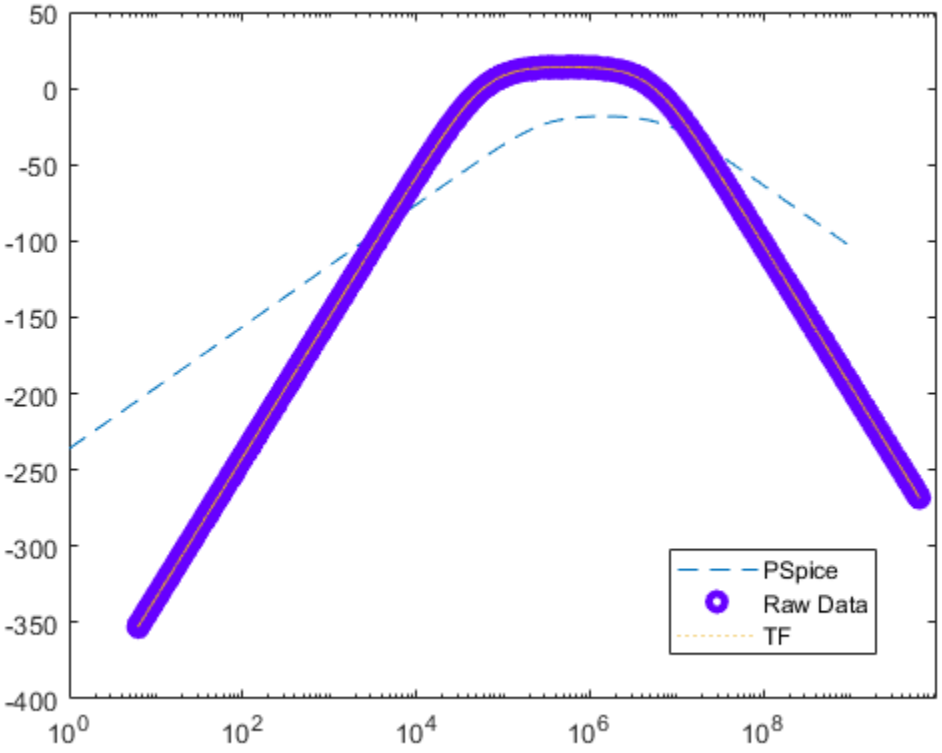


Figure 8: Phase Response From Designed Circuit

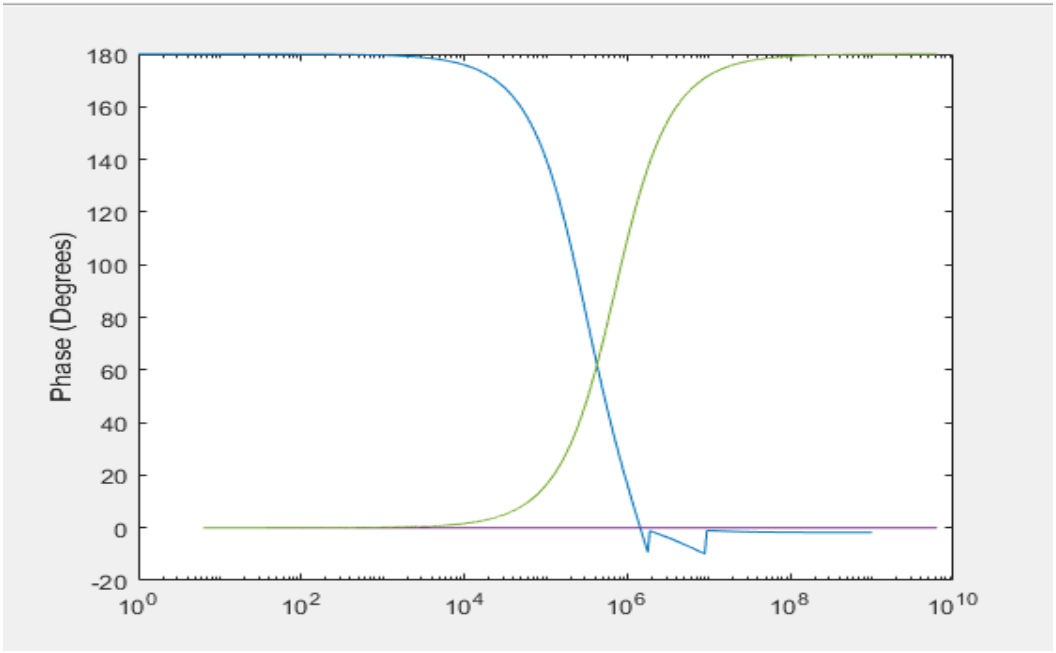
6. Comparison of Magnitude Responses



6.1.

Figure 9: Magnitude Response Comparison between Raw Data, Estimated TF, and Designed Circuit

7. Comparison of Phase Responses



7.1.

Figure 10: Phase Response Comparison between Circuit and TF

8. Discussion

8.1. Loading the data into MATLAB was not that difficult. Once I got software that could read the .rar file and figure out the 2 files that I needed, all I had to do was click the import data button in MATLAB and it did the rest.

8.2. Plotting the raw data was fairly simple as well. I made variables to act as the data such as x1 and y1. I then used “semilogx()” to plot the data points in a graph together.

8.3. Making the y-axis be in dB was straight forward as i just has to do “y1 = 20 * log(y);” and the x-axis to be in rad/s was “x1 = 2*pi*x;”

8.4. After emailing my TA for some help with the Transfer Function Estimation I decided on A = 59,310 - B = 43,040 - C = 3,393,000. The Lower Cut-Off Frequency in 117.45kHz and the Higher Cut-Off Frequency is 6.9MHz

8.5. My Transfer Function was $H(s) = \frac{(\frac{s}{59310})^2}{(1+(\frac{s}{74770})^2)\times(1+(\frac{s}{4436000})^2)}$

8.6. I knew that my circuit was going to be similar to the circuit I did in Lab 10 and after talking to my TA i new it would be two LPF and two HPF cascaded together with a non-inverting Op-Amp Amplifier

8.7. After finding σ to equal 0.6436 for the LPF and 1.5538 for the HPF I found k_f for the LPF and HPF

8.8. LPF: k_f = 182489.123, I chose C = 10pF, k_m = 54797.79, R = 54.798kΩ

8.9. HPF: k_f = 4484523.43, I chose C = 10pF, k_m = 2229.89, R = 2.229kΩ

8.10. My Magnitude Response from the circuit was not quite as desirable as I would have wanted, but after working on that part for two days that was as close to the original as I could get. I did not know what else to do to get it closer to the desired graph.

8.11. My Phase response for the Circuit came out pretty good to what I expected it to be. The Phase from MATLAB mirrored the y-axis and I was unsure why or how to fix it.

8.12. Some of my graphs are unlabeled and that is because my MATLAB kept crashing on me and would not let me add any labeling or even really mess with the code to fix anything. That is also the reason my Phase is flipped and I was unable to fix it.

9. References

9.1. Canvas

9.2. PSpice

9.3. MATLAB

9.4. Md Zobaer’s Email and Peer Advice