Experiment 7 Writeup

Graded

Student

Julia Laine

Total Points

68.5 / 100 pts

Question 1

Task 1

19.5 / 21 pts

– 0 pts Correct

✔ – 2 pts Objective

✔ – 2 pts Schematic

Table 1

– 5 pts Units

– 5 pts Incomplete table

– 5 pts Figure 2

– 2 pts Conclusion

+ 2.5 pts Point adjustment

1 values for all your components?

Question 2

Task 2

12 / 29 pts

– **0 pts** Correct

✔ – **2 pts** Objective

✔ – **2 pts** Schematic

– **10 pts** Figure 2 (IV)

✔ – **5 pts** Figure 3 (V)

– **4 pts** Explanation

✔ – **4 pts** Explanation

✔ – **2 pts** Conclusion

– **2 pts** For the schematics you were supposed to show the circuits used in the last part or the settings for the FRA. Please elaborate more for your objectives and conclusions.

6 Need to talk about the resistance value or the internal capacitance and impedance added from the instrument

Question 3

Task 3

37 / 50 pts

– **0 pts** Correct

– **2 pts** Objective

✔ – **2 pts** Schematic

2 Please do not copy and paste schematics from the lab manual. You should be creating your own schematics for your write ups

– **5 pts** Figure 2

✔ – **5 pts** Figure 3

4 Missing figure for one of the potentiometer configurations (either 0k or 10k)

✔ – **4 pts** Explanation

5 Missing values from when potentiometer is set to one of the configurations

– **4 pts** Explanation

– **4 pts** Explanation

– **5 pts** Figure 4

– **5 pts** Figure 5

✔ – **4 pts** Explanation

3 Missing measurements and calculations for the BW and center frequencies

– **4 pts** Explanation

– **4 pts** Explanation

– **2 pts** Conclusion

– **0 pts** Click here to replace this description.

+ **2 pts** Partial credit for step 2

Question assigned to the following page: 1

Student Name: julia laine
Lab partner(s):

Date:10/24/23
Lab No./Title:7
Section #(GTA):002

Instructions:

- ***Submission must contain only original, individual, and current work.***
- ***After completion, save as PDF before submitting.***

Task 7.14: Manual Frequency Response Analysis

Objective:

The purpose of this lab is to make a low pass filter.

Circuit Schematic(s):

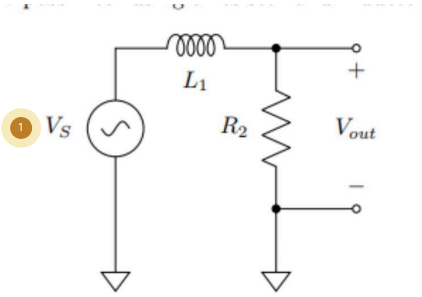

Figure I: Low pass filter (R2=1.6k, L1=10nF)

Results/Calculations:

Step 4 & 5:

Table I: Frequency voltage and gain

Frequency [Hz]	V_{out} [V]	V_{in} [V]	V_{out}/V_{in}
10	0.5199	0.5265	0.9875
25	0.5235	0.5302	0.9874
40	0.5241	0.5307	0.9875
75	0.5244	0.5310	0.9876
100	0.5245	0.5311	0.9876
200	0.5246	0.5312	0.9875
350	0.5246	0.5312	0.9875
500	0.5245	0.5313	0.9873
650	0.5245	0.5313	0.9872
900	0.5244	0.5313	0.9869
1000	0.5243	0.5314	0.9866

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3500	0.5213	0.5335	0.9772
5000	0.5181	0.5358	0.9670
6500	0.5140	0.5380	0.9554
9000	0.5050	0.5455	0.9257
10000	0.5008	0.5500	0.9105
35000	0.3582	0.6301	0.5686
50000	0.2878	0.6576	0.4376
65000	0.2367	0.6737	0.3514
100000	0.1770	0.6800	0.2603
10	0.5199	0.5265	0.9875
25	0.5235	0.5302	0.9874
40	0.5241	0.5307	0.9875
75	0.5244	0.5310	0.9876
100	0.5245	0.5311	0.9876
200	0.5246	0.5312	0.9875
350	0.5246	0.5312	0.9875
500	0.5245	0.5313	0.9873
650	0.5245	0.5313	0.9872
900	0.5244	0.5313	0.9869
1000	0.5243	0.5314	0.9866
3500	0.5213	0.5335	0.9772
5000	0.5181	0.5358	0.9670
6500	0.5140	0.5380	0.9554
9000	0.5050	0.5455	0.9257
10000	0.5008	0.5500	0.9105
35000	0.3582	0.6301	0.5686

Step 6:

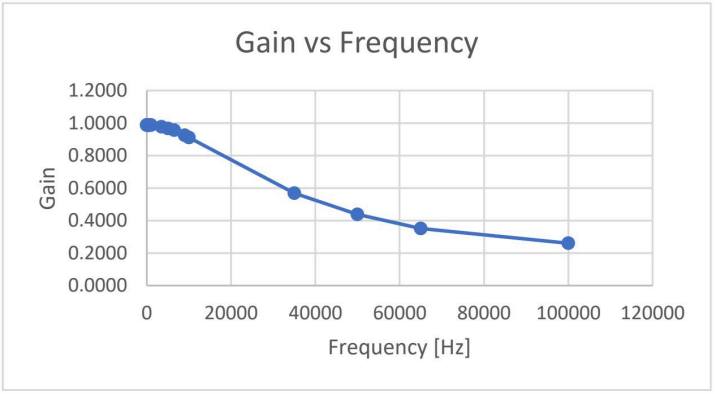

Figure II: Gain Vs Frequency Graph

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Conclusion:

If the gain drops below -3dB then the filter rejects the frequency.

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Task 7.15: Exploring FRA on the Oscilloscope

Objective:

The objective is to show Gain and frequency on graphs to better illustrate what a filer does.

Results/Calculations:

Step 5:

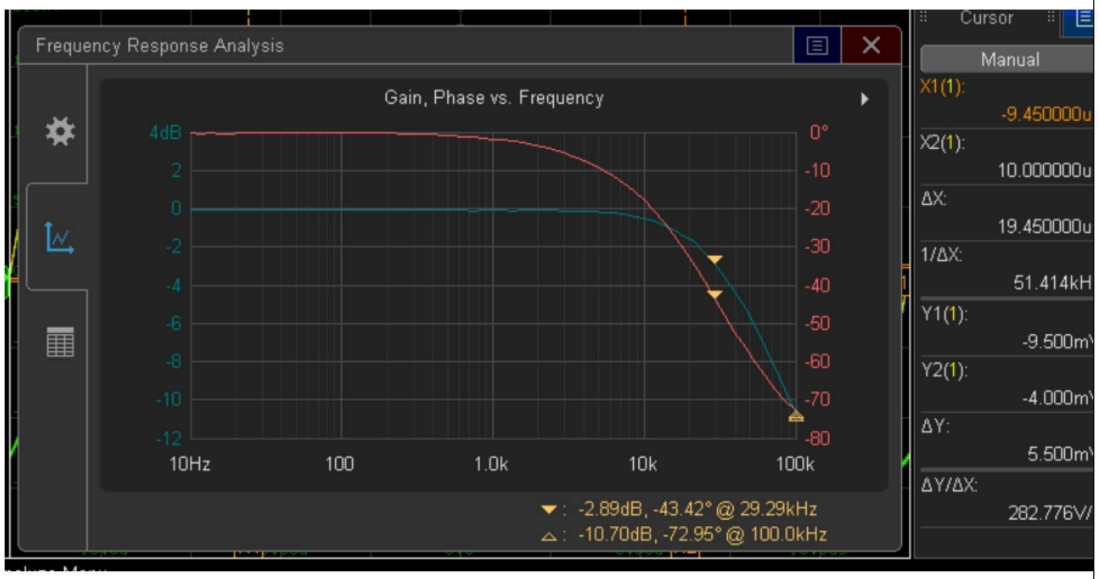

Figure III: RL Low pass Filter

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Step 7:

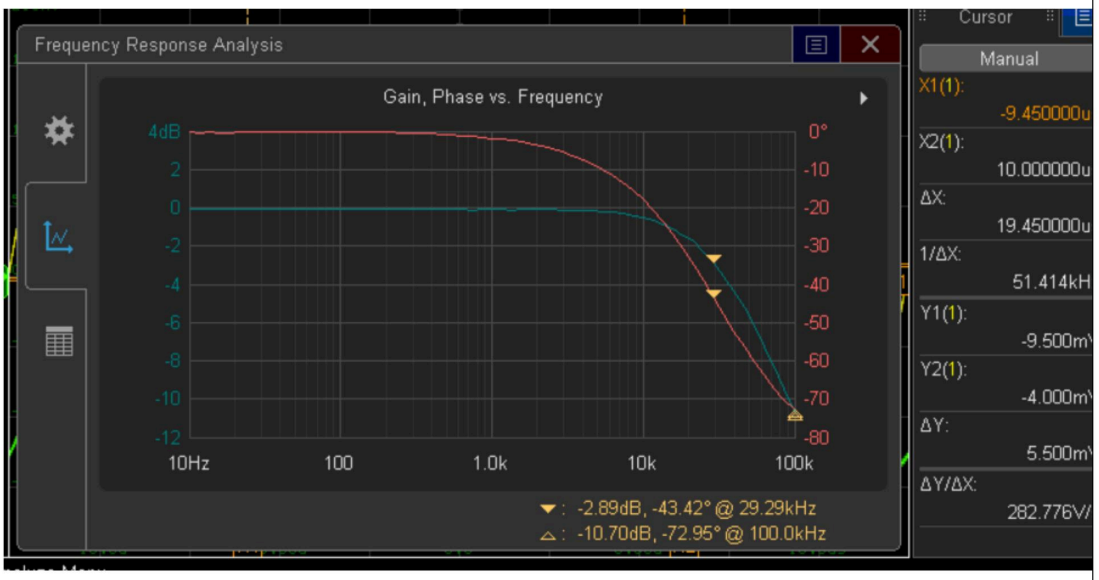

Figure IV: RL Low pass Filter

Step 9:

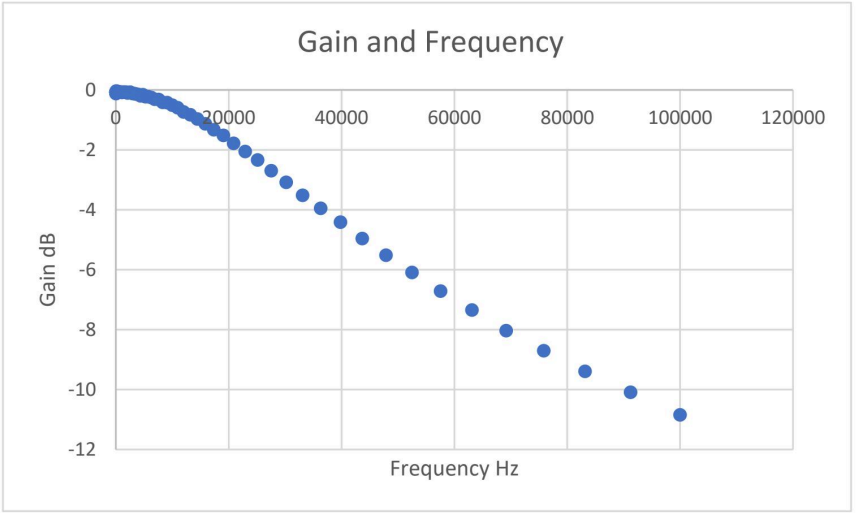

Figure V: Gain Vs Frequency Graph

Question assigned to the following page: 2

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Step 10:

The cutoff frequency calculated in the lab was 29512 while our calculated from the csv file was 30199.5. This gives us a percent error of 2.33%

Step 11:

Having a large distance in between measurements can lead to error. 5 measurements in one decade can quickly become large jumps. It is tedious at first but later it can cause error when jumping high numbers.

Step 12:

Step 12.5:

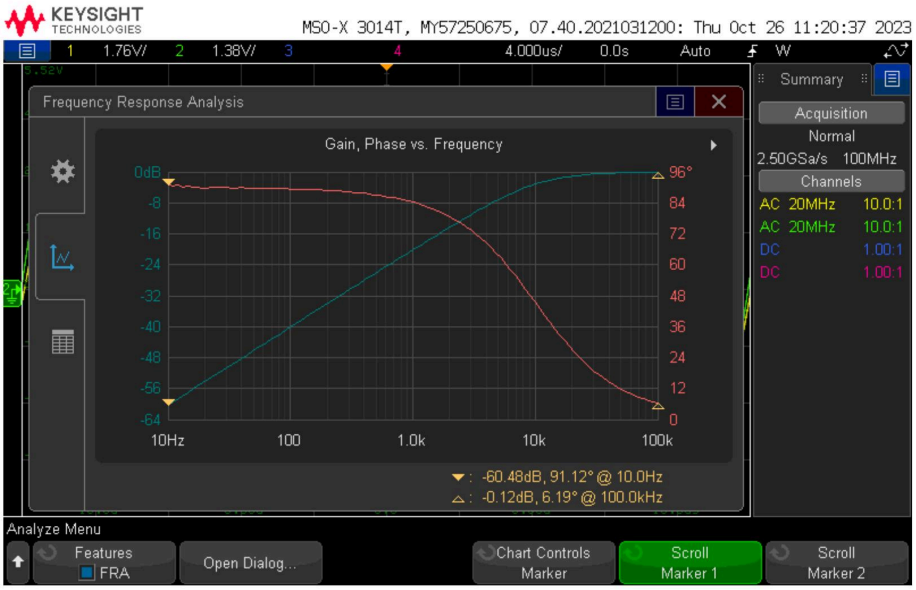

Figure Vi: High pass Filter gain vs frequency graph

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Step 12.7:

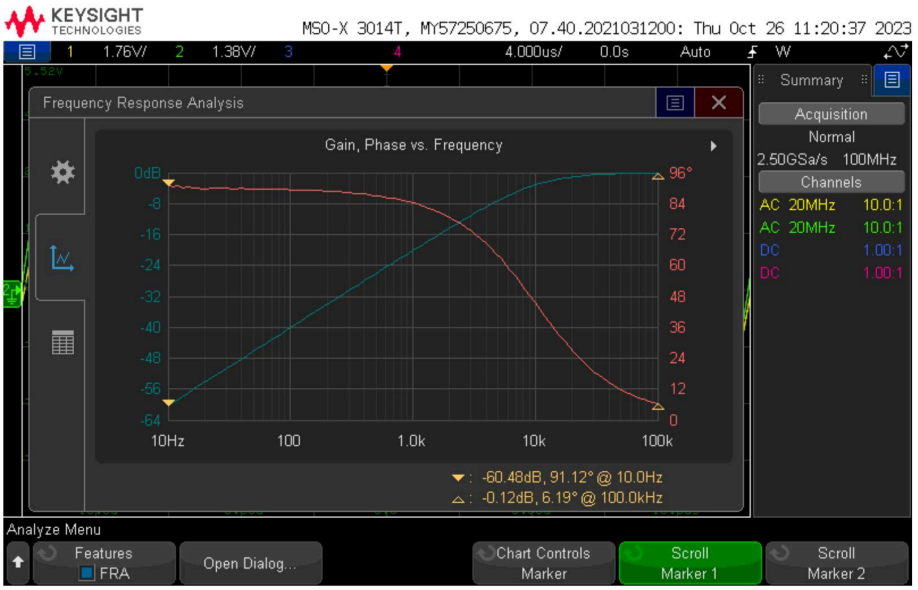

Figure VII: High pass Filter gain vs frequency graph

Step 12.9:

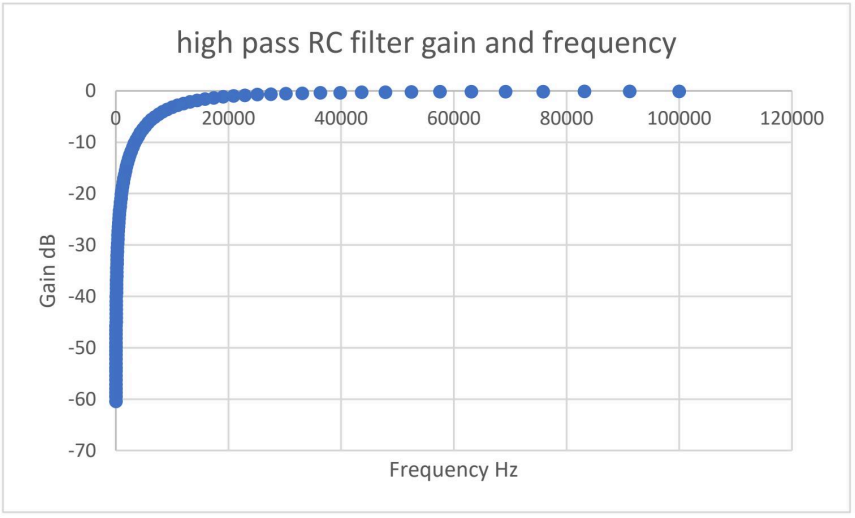

Figure VIII: High pass Filter gain vs frequency graph

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Conclusion:

These graphs show that our cutoff frequency we calculated was correct since

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Task 7.16: Variable Band Filter

Objective:

The objective is to make a band filter that is variable by potentiometer.

Circuit Schematic(s):

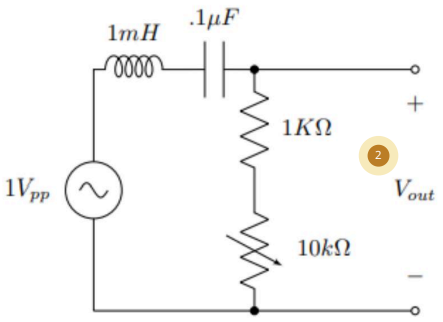

Figure IX: RLC Band Pass Filter

Question assigned to the following page: 3

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Results/Calculations:

Step 2:

Figure X: BPF with the potentiometer all the way to the left

Cutoff gain: -2.8
Mid pass Freq: ~15k ohms

We predicted it to be ~15k ohms so this is fairly accurate.

Step 3:

This is a band pass filter since it passes everything in the middle. This can be used in applications that don't want high or low frequencies but only ones in the middle area.

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Step 4:

As the resistor increases, the frequency increases. We have a high percent error since the plastic potentiometers are not super accurate. The overall shape of the graph is correct though.

Step 5:

Step 5.2:

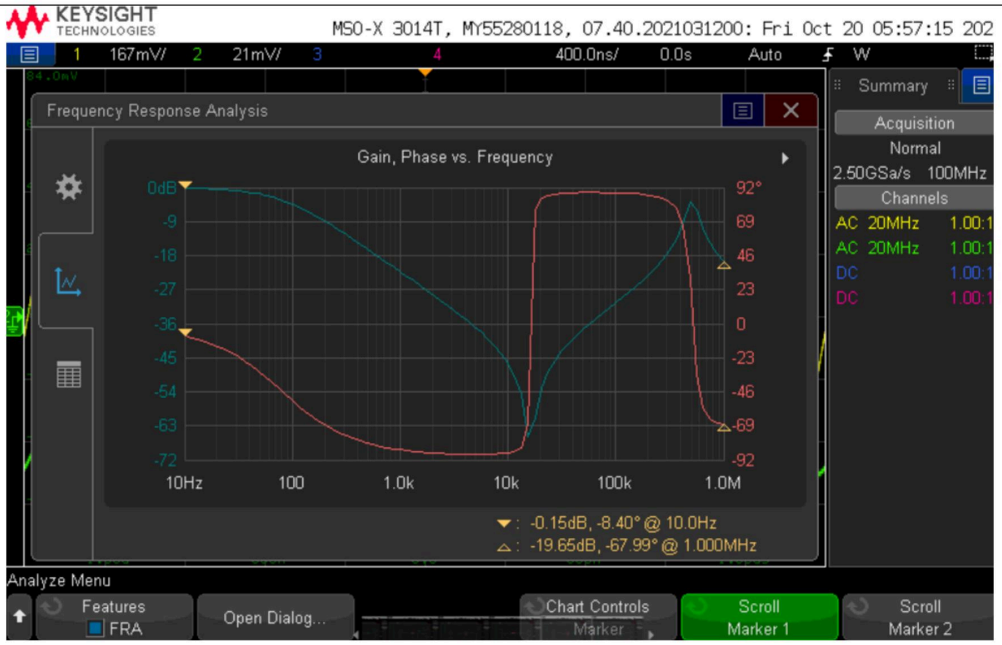

Figure XI: band reject filter with the potentiometer all the way to the left (active components)

This is a mid pass band reject filter graph, shown by the blue line dipping below -3dB.

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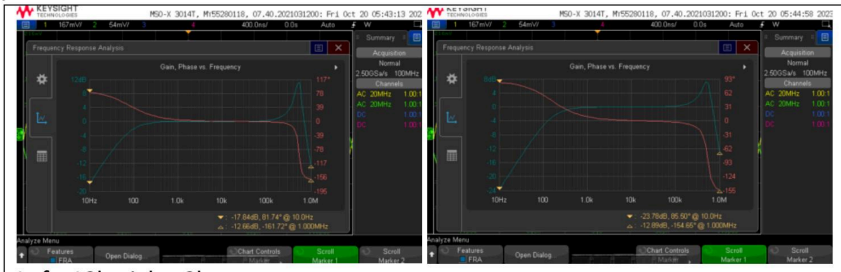
Step 5.3:

Why it's a mid pass
It is a mid pass because below 3dB it does not pass and only lets the higher and lower frequencies pass. It is a band reject filter.

Step 5.4:



Left: 10k, right: 0k
When the potentiometer goes lower, the frequency gain goes lower. More frequencies will not pass.

Conclusion:

Changing resistance changes how the filter works. There are multiple types of filters and they can reject frequencies at different values depending on how they are set up.