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

Objective:

|  |
| --- |
| Investigation of another RC filter:  To learn about an RC filter. To achieve this will build an RC filter circuit and then take measurements to find the cutoff points by sweeping the frequencies from 10 Hz to 100K Hz. |

Circuit Schematic(s):

|  |
| --- |
|  |
| Figure 1: An RC filter Circuit |

Results/Calculations:

#### Step 1

|  |
| --- |
|  |
| R = 680  C = 0.01 uf |

#### Step 4-5

|  |
| --- |
|  |
| Figure 2: Plotted gain and phase frequency response |

#### Step 6-7

|  |
| --- |
|  |
| Figure 3: -3dB cutoff |

Conclusion:

|  |
| --- |
| In this section we learned about RC filter circuits and the response to frequencies. Also, we learned how to use the frequency response mode on the oscilloscope to sweep through many frequencies. This section also gave us more practice in finding the values of components that are unknown. |

Objective:

|  |
| --- |
| Series RLC: To learn about RLC circuits. Like the previous section we will sweep frequencies and measure various voltages and compute the quality factor. |

Circuit Schematic(s):

|  |
| --- |
|  |
| Figure 4: An RLC filter circuit |

Step 1

|  |
| --- |
|  |
| 5032.92 |

Step 3

|  |
| --- |
|  |
| Figure 5: Plotted Gain and Phase Frequency Response |

Step 4-5

Table I: Measured Voltage at various frequencies.

| Measurement | Measured Voltage |
| --- | --- |
| Resonant freq , fr (V ) | 680mV |
| -3dB Bandwidth (V ) | Didn’t Find |

Step 6

|  |
| --- |
|  |
| 1.56 |

Conclusion:

|  |
| --- |
| In this section we built and measure and RLC filter circuit. We were able to see the response to of the RLC circuit to different frequencies. We learned how to find measurements on a circuit like this and learned how to find the quality factor from the formula. We also got more practice using the frequency response mode on the oscilloscope. |

## 

Objective:

|  |
| --- |
| Oscilloscope input impedance: To learn the oscilloscope input impedance. To do this we will calculate the -3dB point of the filter created by the oscilloscope the take measurements and confirm our calculations. |

Circuit Schematic(s):

|  |
| --- |
|  |
| Figure 4: Test set for scope input |

Results/Calculations

Step 1

|  |
| --- |
|  |
| 3.48\*10^9(i) Hz(obviously wrong) |

Step 3

|  |
| --- |
|  |
| Figure 6: Plotted using 1x mode |

Measured 8.375 MHz

Step 4

|  |
| --- |
|  |
| Estimated 1.4\*10^-11 |

Step 5

|  |
| --- |
|  |
| 3.52\*10^9(i) |

Step 6

|  |
| --- |
|  |
| Figure 7: Plotted using 10x mode |

Measured 11.19 MHz

Step 7

|  |
| --- |
| The capacitance is lowered. |

Step 8

|  |
| --- |
| Our measurements do not line up with the published bandwidth of the scope and scope probe. The discrepancies could be because of human error when measuring or the components aren’t all exactly at their specified levels. |

Conclusion

|  |
| --- |
| In this section we learned the difference between the scope probe being set in 1x mode and 10x mode. We did this by measuring the capacitance and comparing to a calculated value even though our calculations were wrong. Our measured data did seem more correct however. |

Objective

|  |
| --- |
| To do crossover analysis. To achieve this we will build an op amp circuit for a speaker and the take measurements while sweeping frequencies. |

Circuit Schematic

|  |
| --- |
|  |
| Figure 8: Crossover circuit with passive filters. |

Results/Calculations

Step 1

|  |
| --- |
| The potentiometer is the volume knob of the speaker. |

Step 2

|  |
| --- |
| 50k Ohms. No there should be no loading problems. |

Step 3

|  |
| --- |
|  |
| Left filter: |
| Right filter: |

Step 5

|  |
| --- |
| (a) |
| (b) |
| Figure 8: Plotted of both speakers |

Step5 (continued)

Table I: Type in an appropriate caption for the table below.

| Filter | Measured -3dB freq.  ( ) | %Error |
| --- | --- | --- |
|  |  |  |
|  |  |  |

Step 6

|  |
| --- |
| Tweeter is higher pitched, and the woofer is lower pitched and plays more on the lower frequencies. |

Step 7

|  |
| --- |
| The potentiometer is the volume knob for the speaker. |

Conclusion

|  |
| --- |
| In this section we learned about more filters through a crossover circuit. We learned more about how to use the frequency response mode on the oscilloscope and how to use conductors and capacitors in circuits. |