THE UNIVERSITY OF TEXAS AT ARLINGTON

COMPUTER SCIENCE AND ENGINEERIG

LABORATORY 1 REPORT

ELECTRONICS LABORATORY

Submitted toward the partial completion of the requirements for CSE 3323-002

Submitted by,

Servando Olvera

1001909287

Date 8/31/2023

Lab 1: RC Lowpass in Time Domain & Frequency Domain

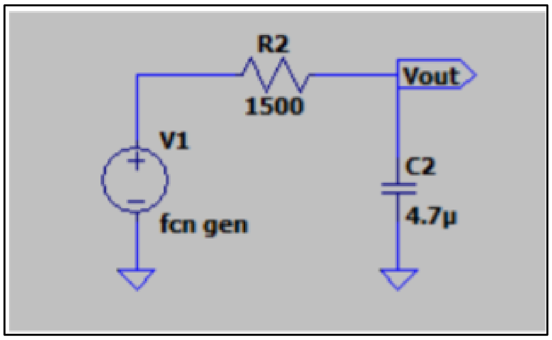
Goal of the Experiment

The main goal of this lab is to test our knowledge over basic circuitry, electrical concepts and our understanding of such. Initially, we will demonstrate how to translate some circuit schematics into physical components to test our skills on both understanding how to read schematics, and how to assemble them into a breadboard. From there we will gather data about the frequency domain and time domain of an RC low pass circuit. Afterwards, we will input the same circuit into the software LTspice to simulate the behavior of the circuit and gather some of the same data gathered with the physical circuit. The point of this is to compare the data gathered on both parts and realize how close some of the values are, meaning part 2 was merely a double check on part 1. Thus, it is good to know that the LTspice software can be used to double-check our work for future labs. Lastly, part 3 of this lab entails showing our understanding of the LTspice software and demonstrating that we are capable of properly simulating circuits on it.

Part 1:

Frequency Domain Characterization

Circuit:



Findings:

Frequencies Hz	Vout V	Vin V	[Vo/Vin] V/V	10log10|V0/VIN|^2 dB
1	4	4	1	0
2	4	4	1	0
5	3.96	4	0.99	-0.0873
10	3.68	4	0.92	-0.72424
20	2.96	4	0.74	-2.61537
50	1.62	4	0.405	-7.8509
100	0.9	4	0.225	-12.9563
200	0.5	4	0.125	-18.0618
500	0.2	4	0.05	-26.0206
1000	0.11	4	0.0275	-31.2133

W_0 = 1/RC = 141.84

F_0 = 22.57 Hz

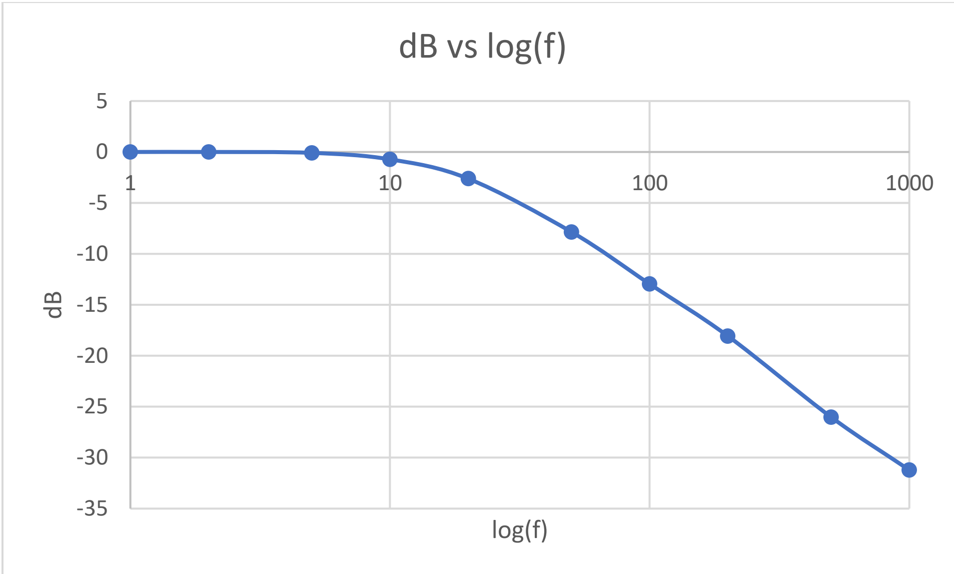
What is the attenuation at f_0?

Atte = ~ -3.22 Hz

Attenuation Difference between 50 Hz and 100Hz => 5.1 Hz

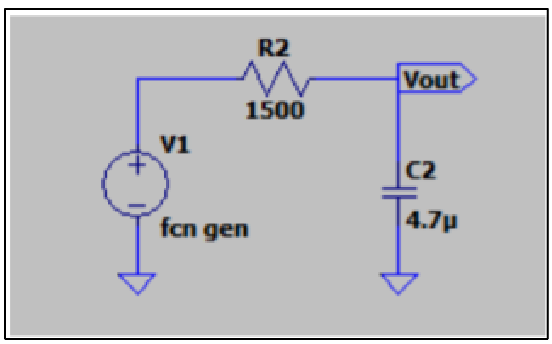
Attenuation Difference between 50 Hz and 500Hz => 18.17 H

Graph Sketch:



Time Domain Characterization

Circuit:

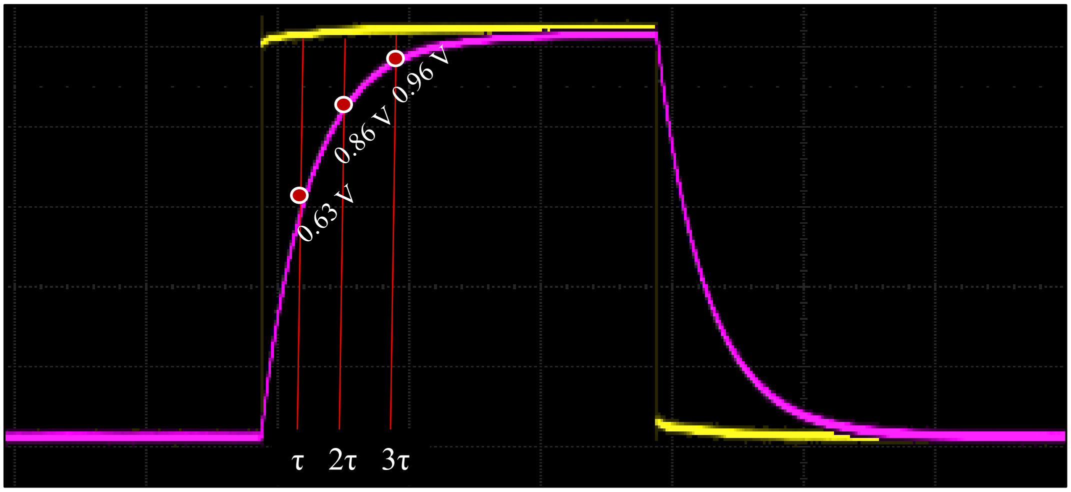


Findings:

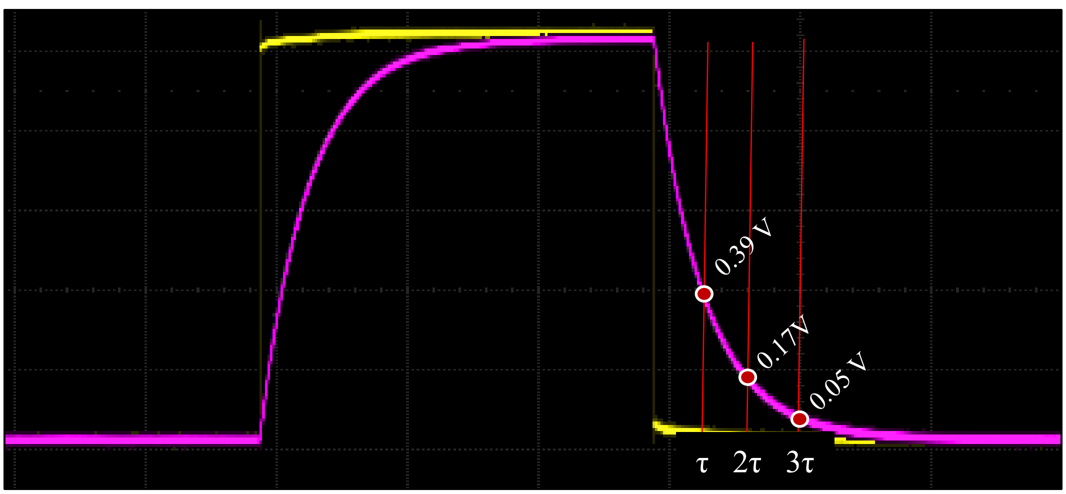
Time Constant τ = 7.05 ms

Time **Sec**	**Charging** **V**	**Discharging** **V**
7.05 ms or (1τ)	0.63	0.39
14.1 ms or (2τ)	0.86	0.17
21.15 ms or (3τ)	0.96	0.05

Charging Sketch:



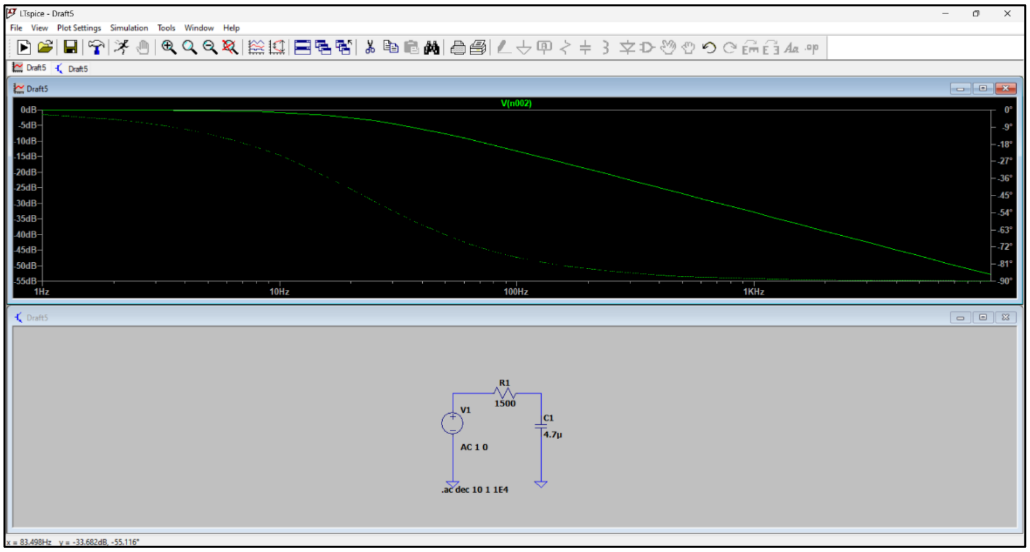
Discharging Sketch:



Part 2:

AC Analysis

Simulation:



Findings:

Attenuation at f_0?

f_0 = -3dB

Attenuation Difference between 50Hz and 100Hz (Octave)

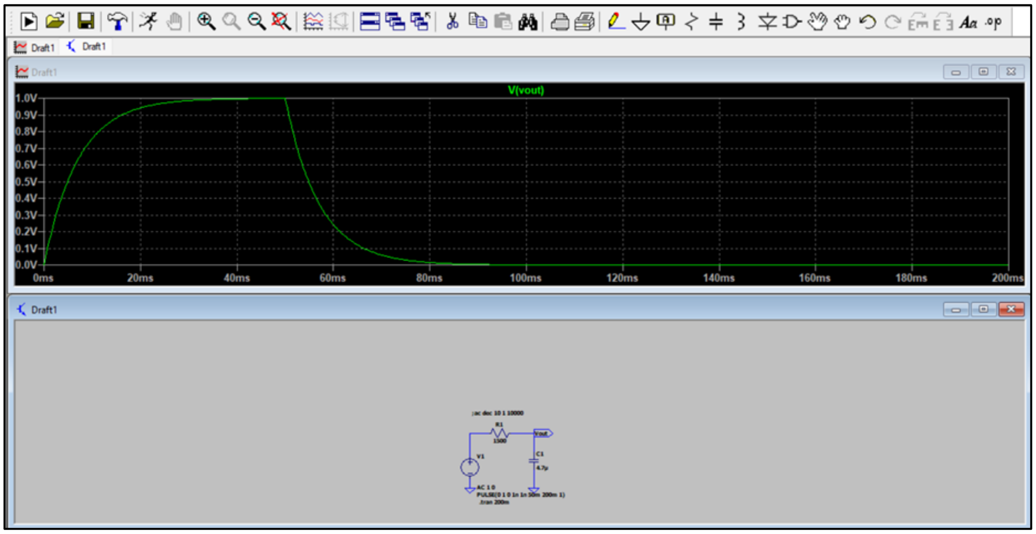
-7.7dB – (-13.14dB) = 5.44 Hz

Attenuation Difference between 50Hz and 500Hz (Decade)

-7.7dB – (-26.9dB) = 19.2 Hz

Time Domain Analysis

Simulation:

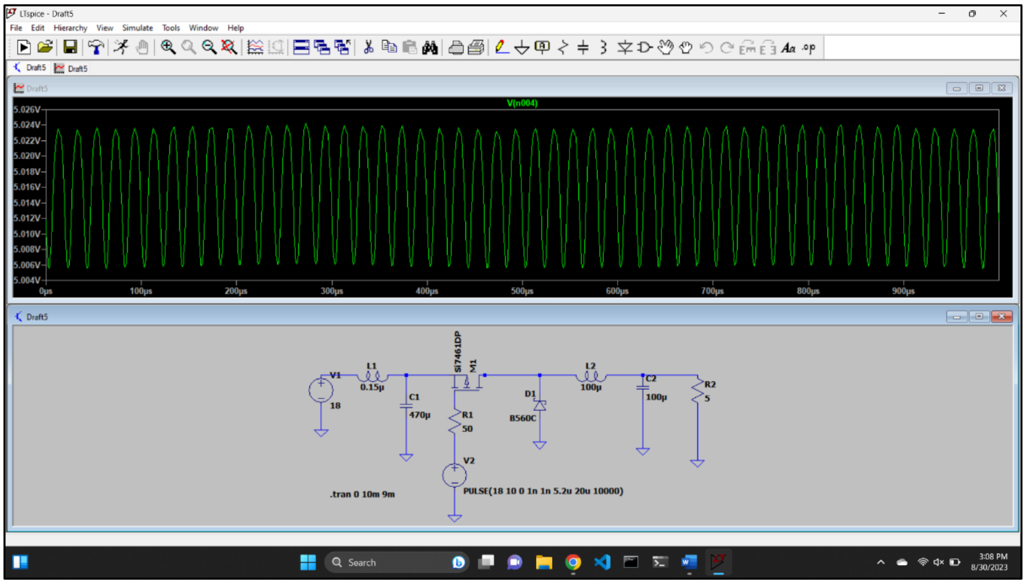


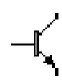
Findings:

At	Charging	Discharging
1τ	630 mV	370 mV
2τ	862.6 mV	130 mV
3τ	949.2 mV	51 mV

Part 3:

Practice Schematic





Draft5.asc

Summary & Conclusion

In conclusion, throughout this lab we regained the knowledge to translate circuit schematics from paper to physical components, as well as gather data about the behavior of said circuit using the oscilloscope. Said circuit was a RC lowpass circuit, and we got to observe its behavior as the capacitor on it charged and discharged with the passing of time. In part two of this lab, we used the LTspice software to double-check our data from part one. We essentially ran a simulation of the RC lowpass circuit and gathered the same data as in part one, with the goal to verify that our initial calculations and measurements were accurate, or at least close enough to the "correct" value. Furthermore, this was done to also show us how the LTspice software can be a helpful tool for future labs in case we want/need to verify our measurements or calculations.