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:

**A diagram of a circuit

Description automatically generated**

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 |

**W0** = 1/RC = 141.84

**F0** = 22.57 Hz

**What is the attenuation at f0?**

**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:

**A diagram of a circuit

Description automatically generated**

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:

A screen shot of a graph

Description automatically generated

τ 2τ 3τ

0.63 V

0.86 V

0.96 V

Discharging Sketch:

A screen shot of a graph

Description automatically generated

τ 2τ 3τ

0.39 V

0.17V

0.05 V

**Part 2:**

**AC Analysis**

Simulation**:**

**A screenshot of a computer

Description automatically generated**

Findings:

**Attenuation at f0?**

f0 = -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:

A screenshot of a computer

Description automatically generatedA screenshot of a computer

Description automatically generated

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**

A screenshot of a computer

Description automatically generated



**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.