ECEN 214 - Lab Report

Lab Number: 6

Lab Title: transient Response of a 1st Order RC Circuit

Section Number: 502

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Due Date: April 7, 2023

TA: Pranabesh Bhattacharjee

Introduction:

In this lab, we were able to understand the transient behavior of 1st order circuits. To do this, we build a first order circuit with a capacitor and resistors. After the circuit was built, we were able to observe the actual frequency of oscillation, peak to peak voltage, and root mean square voltage.

Task 1:

The first part of the experiment consisted of making a flashing LED circuit. This circuit consisted of four resistors, an omp- ap, and two LEDs. The outcome of this was the green and red LEDs alternating when lit up. In order to receive a bigger understanding of why this was, we used the oscilloscope with a display of two waveforms. After, we measured the actual frequency of oscillation, peak to peak voltage, and root mean square voltage.

Task 2:

The second part of the experiment was to replace resistor one and two with a 10k ohms potentiometer. Once that was done, we calculated Gamma. The second portion of the experiment was to replace R with half of its resistance value. We originally used a 10K resistor as R in the original circuit. For the modified R, we made a parallel circuit with an additional 10K resistor to make it half the resistance. Once this was done, we made the oscillation value 1 hertz and removed the potentiometer to record the voltage division ratio.

Measured Data:

Task 1:

Voltage 1 Measurements	
Actual Frequency of Oscillation	**401.08 mHz**
Peak- to- Peak Voltage	**110.5 mV**
Root- Mean- Square Voltage (RMS)	**89.5 mV**

Voltage 2 Measurements	
Actual Frequency of Oscillation	**401.08 mHz**
Peak- to-Peak Voltage	**110.5 mV**
Root- Mean- Square Voltage (RMS)	**89.5 mV**

Task 2:

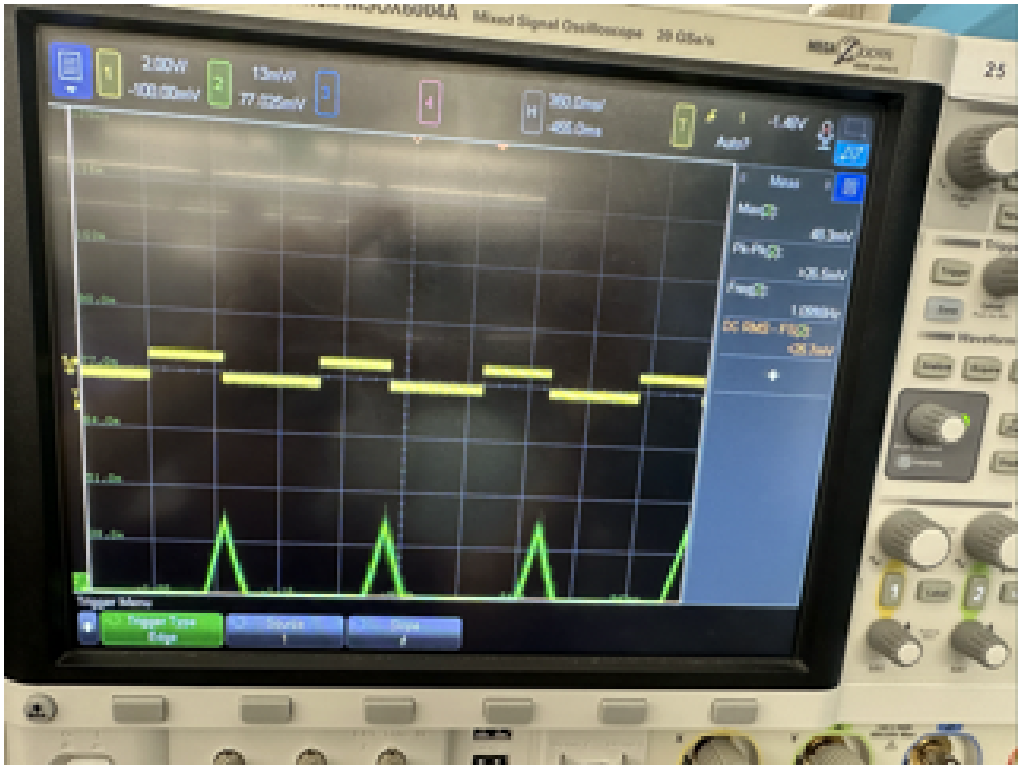
Measured Actual Frequency of Oscillation: 1.09 Hz

Measured Waveforms:

(our data was off but TA said it was okay and measure anyways)

For task 1:

For task 2:



Sample Calculations:

Calculating Gamma, y

$R_1 = 8,700\ \Omega\ R_2 = 1,000\ \Omega$

$$\mathbf{y} = \frac{R_2}{R_1+R_2} = \frac{1000}{1000+8{,}700} = \frac{1000}{9{,}700} = 0.103\ \Omega$$

Measured Voltage Division Ratio

$V_{out} = 1.3\ V$

Voltage Division $= V_{out} * y = 1.3V * 0.103\Omega = 0.134\ V$

Discussion:

There was a big difference between the calculated value in the prelab and the measured values in the lab. This is due to our circuit not producing enough voltage. This was discovered

when the green LED light was not as bright as the red LED light. When trying to troubleshoot the issue, we asked our TA for assistance. After the TA looked over our circuit, he could not find what was wrong with the circuit. This may have been due to a faulty component in the circuit. Due to this, the TA told us to continue to record the data per usual.