Experiment 5 Writeup

Graded

Student

Julia Laine

Total Points

93 / 110 pts

Question 1

Task 1

31 / 38 pts

- **– 0 pts** Correct
- **– 2 pts** Objective
- ✔ **– 2 pts** Schematic

Table 1

- **– 2 pts** Units
- **– 2 pts** Calculation
- **– 2 pts** Measurement
- **– 2 pts** Percent error

- **– 6 pts** Figure 2

Table 2

- **– 2 pts** Units
- **– 2 pts** Calculation
- **– 2 pts** Measurement
- **– 2 pts** Percent error

- ✔ **– 6 pts** Figure 3
- ✔ **– 4 pts** Explanation
- **– 2 pts** Conclusion
- **+ 5 pts** Point adjustment

1. schematics should not be hand drawn
2. what do you observe about capacitor voltage?
3. missing oscilloscope capture for 2.5 V

Question 2

Task 2

54 / 62 pts

- **– 0 pts** Correct
- **– 2 pts** Objective
- ✔ **– 2 pts** Schematic

Table 3

- **– 1 pt** TC - Expected
- **– 1 pt** TC - Measured
- **– 1 pt** TC - Percent error
- **– 1 pt** TV - Expected
- **– 1 pt** TV - Measured
- **– 1 pt** TV - Percent error

- **– 4 pts** Explanation
- **– 6 pts** Figure 3
- **– 1 pt** 13.6 - 1
- **– 1 pt** 13.7 - 1
- **– 4 pts** 13.8 - 1
- **– 2 pts** Schematic

Table 4

- **– 1 pt** TC - Expected
- **– 1 pt** TC - Measured
- **– 1 pt** TC - Percent error
- **– 1 pt** TV - Expected
- **– 1 pt** TV - Measured
- **– 1 pt** TV - Percent error
- **– 1 pt** LTV - Expected
- **– 1 pt** LTV - Measured
- **– 1 pt** LTV - Percent error

- ✔ **– 6 pts** Figure 4
- **– 1 pt** 13.6 - 2
- **– 1 pt** 13.7 - 2

– **4 pts** 13.8 - 2

– **6 pts** Figure 5

– **1 pt** 13.6 - 3

– **1 pt** 13.7 - 3

– **4 pts** 13.8 - 3

– **1 pt** Conclusion

4 needed schematic for circuit

5 reactiveness should increase as the capacitor value decreases

Question 3

Bonus Task

8 / 10 pts

✔ – **0 pts** Correct

– **10 pts** Insufficient/Incomplete

– **2 pts** Missing analysis on benefits/drawbacks

Question assigned to the following page: 1

Student Name: julia laine
Lab partner(s):

Date: 10/12/2023
Lab No./Title: 05
Section # (GTA): 002

Instructions:

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

Task 5.11: Capacitor and RC Characteristics

Objective:

The objective is to see the graph of the voltage change due to a capacitor. We saw this in class and seeing it in lab connects it all.

Circuit Schematic(s):

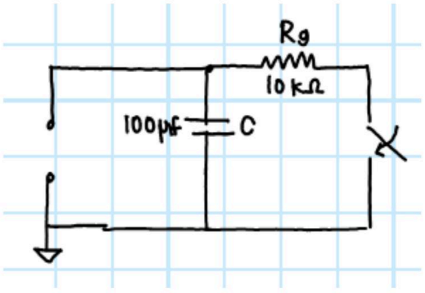

Figure I: Circuit for Part 1

Results/Calculations:

Step 4:

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

Time Constant Calculated [s]	Time Constant Measured [s]	Percent Error
1	.98	2.5%

Questions assigned to the following page: 1 and 3

Student Name: julia laine Date: 10/12/2023

Lab partner(s): Lab No./Title: 05

Section # (GTA): 002

Step 5:

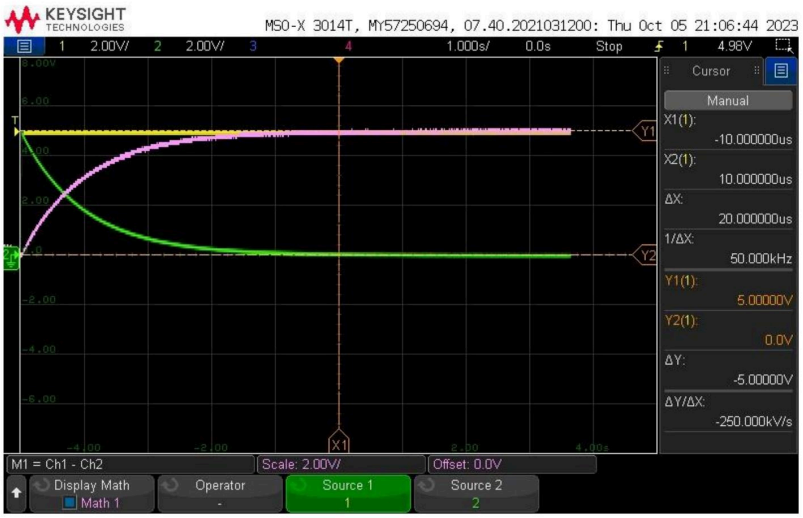

Figure II: Voltage across resistor and capacitor with math mode

Questions assigned to the following page: 1 and 3

Student Name: julia laine
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Date: 10/12/2023
Lab No./Title: 05
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Step 6:

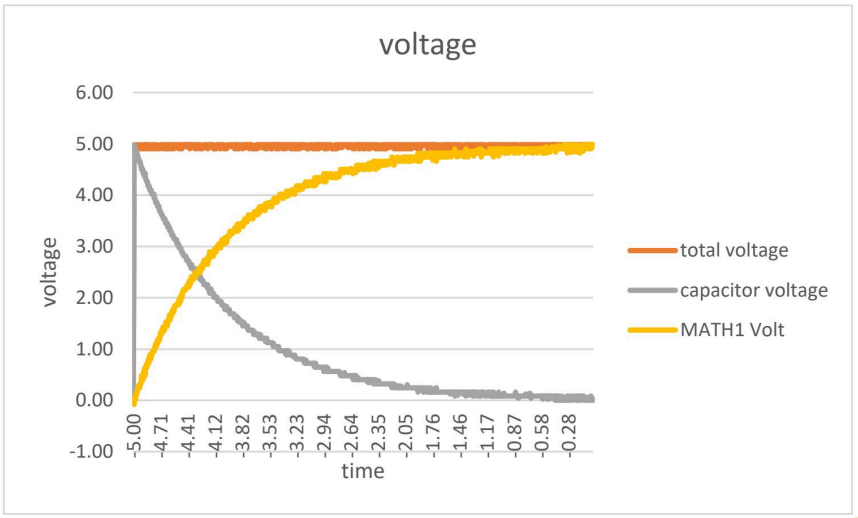

Figure III: Excel graph from oscilloscope data

Step 7:

The graph is half the amplitude but has the same shape. Changing the voltage in an RC circuit just changes the amount of voltage the capacitor stores.

Conclusion:

Changing the voltage in an RC circuit does not change the time it takes the capacitor to charge but it instead just changes the amount of charge the capacitor holds.

Question assigned to the following page: 2

Student Name: julia laine
Lab partner(s):

Date: 10/12/2023
Lab No./Title: 05
Section # (GTA): 002

Task 5.11.1: De-bouncing a Switch

Objective:

The objective is to remove phantom lines that appear from a switch without a capacitor.

Circuit Schematic(s):

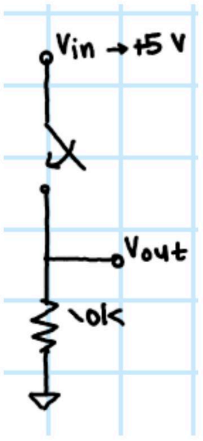

Figure IV: Pull down switch setup

Results/Calculations:

Step 3:

There are phantom lines that show up that are not me connecting the circuit. When zoomed out, overall the graph looks about right, but when we look closer it clearly has phantom lines.

Question assigned to the following page: 2

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Step 4 (Circuit with added capacitor):

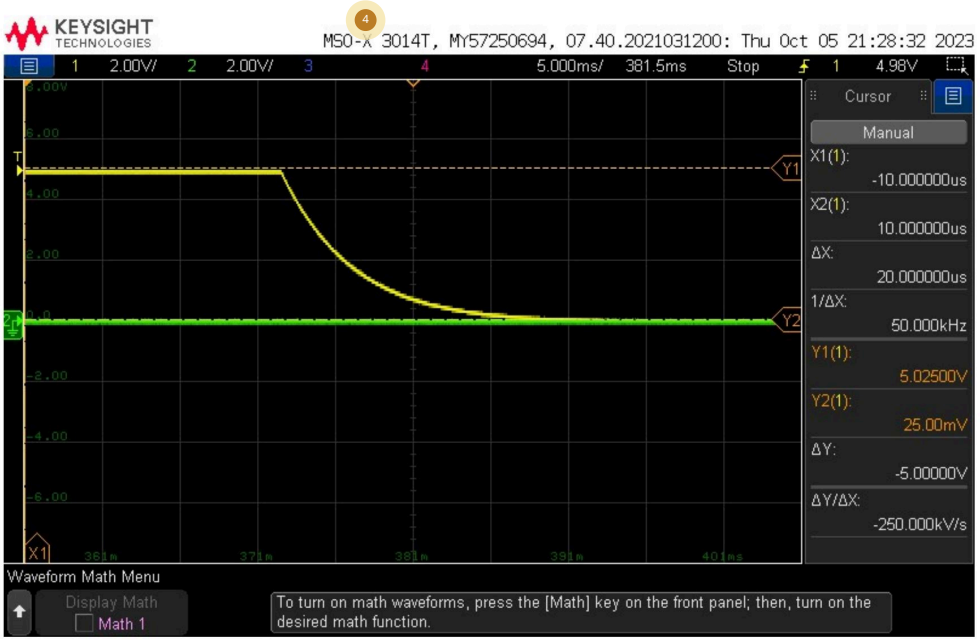

Figure V: pulldown switch setup with capacitor

When I added the capacitor the phantom lines went away but it took longer for the voltage to go to 0.

Capacitor that prevented phantom lines [1uf]

Step 5:

The reactiveness goes down. With a lower capacitor like this one it has no phantom lines.

Combination that best minimized lines and allowed switch to toggle:
R = 10k
C = 1uf

Question assigned to the following page: 2

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Step 6:

The pull up system just has a flipped graph since the voltage was pulled up instead of down to change the switch.

Combination that best minimized lines and allowed switch to toggle:
R = 10k
C = 1uf

Conclusion:

Since the pull up and pull down circuits have the same time constant the same capacitor was reasonable for both. Phantom lines can be eliminated using capacitors but their removal comes at the cost of switch responsiveness.