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by Thomas Silman

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- ① SOME EVIDENCE OF KNOWLEDGE AND UNDERSTANDING. EXPLANATIONS WERE OFTEN ILLOGICAL THOUGH.
- ② GOOD FEEDBACK FROM LECTURER.

MARK AGREED.

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Executive Summary

This report aims to compare the charge and discharge of DC transients in a circuit, transient behaviour in a complex circuit and transient behaviours in an inductive circuit, these questions will be answered using equations for calculated values, plotted values from the practical test and multisim for simulated values.

After the values have been calculated they will be compared and potential reasons for variance will be presented.

Once each of the values have been calculated there will be comments on them to present potential reasons for variance.



Introduction

In this report, there will be discussions about transients and their qualities when they are tested through different methods. When a circuit which has a resistor connected to an inductor or capacitor are connected to a voltage source there is a small duration of time where the voltage will be changing across each of them. This value is a transient.

During the testing, time constants are to be used for each of the equations, "the value of a transient at a time equal to one-time constant is 0.632 of its steady state value" (Bird, 2010)

Transients are important in electrical circuitry, for example, when using a motor transients can be used to stop feedback surge from overloading the circuitry in the motor when the motor pulls a current during the initial start-up. Other scenarios can involve adding a capacitor in parallel with the circuitry of the motor.

Below are all of the equations that are needed throughout the investigation.

Equation 1. The Time constant for an RC circuit

$$\tau = RC$$

Equation 2. The Exponential for growth of the charging capacitor voltage

$$V\left(1 - e^{\frac{-t}{\tau}}\right)$$



Equation 3. Ohms Law

$$I = \frac{V}{R}$$

Equation 4. The Exponential for decay of charging capacitor current

$$i = I_{\text{Max}} e^{\frac{-t}{\tau}}$$

Equation 5. Ohms Law for resistors in parallel

$$\frac{R1 \times R2}{R1 + R2} = R$$

Equation 6. The Exponential for decay of discharging capacitor voltage

$$VC = Ve^{\left(\frac{-t}{\tau}\right)}$$

Equation 7. The Exponential for growth of decaying capacitor current

$$i = -Ie^{\left(\frac{-t}{\tau}\right)}$$

Equation 8. The Exponential for current growth in a charging capacitor

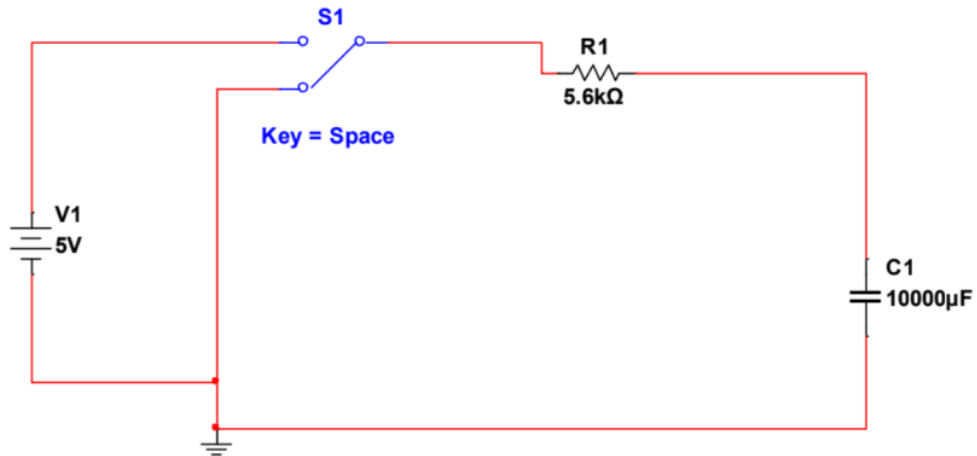
$$imax \left(1 - e^{\frac{-t}{\tau}}\right) = I$$

Equation 9. The Exponential for current decay in a discharging inductor

$$i = I e^{\frac{-t}{\tau}}$$

Task 1

Task 1 provides a 5V RC circuit with a resistor of 5.6K and a capacitor of 10000uF. The practical task that was assigned was to measure and time the charge of the capacitors present within the circuit. The practical was carried out with two multi-meters, a power supply and a breadboard with all the required components. However, due to the Coronavirus the practical was not carried out individually, instead there was a video to observe, this video was carrying out the practical. The chosen times for tasks 1/2 are 27s, 66s and 117s.



Calculations

3.

$$\tau = RC$$

$$5.6K \times 10000\mu = 56s$$

$$V_C = \left(1 - e^{\frac{-t}{\tau}}\right)$$

27S

$$5 \left(1 - e^{\frac{-27}{56}}\right) = 1.912V$$

66S

$$5 \left(1 - e^{\frac{-66}{56}}\right) = 3.461V$$

117S

$$5 \left(1 - e^{\frac{-117}{56}}\right) = 4.381V$$

Amps

7

$$I = \frac{V}{R}$$

$$\frac{5}{5.6K} = 892.857\mu A$$

$$i = I_{Max} e^{-\frac{t}{\tau}}$$

27S

$$892.857 e^{-\frac{27}{56}} = 551.302\mu A$$

66S

$$892.857 e^{-\frac{66}{56}} = 274.748\mu A$$

117S

$$892.857 e^{-\frac{117}{56}} = 110.513\mu A$$

Task 1 plotted table

The readings for current and voltage were recorded in 5 second increments for the first minute of the practical then every 10 seconds for the remainder of the practical, the increments change as over time the change in charge decreases. Recordings were also taken for the 3 random times which were 27 seconds, 66 seconds and 117 seconds. Please see table 1 for the charge of the 3 numbers and table 2 for the multisim readings.

Plotted and calculated results



Charging

Time (Seconds)	Calculated Voltage (V)	Calculated Amps (μA)	Plotted Voltage (V)	Plotted Amps (μA)
27	1.912	551.302	1.91	554
66	3.461	274.748	3.45	278
117	4.381	110.513	4.34	111

Table 1. Calculated and plotted results for charging practical

Plotted and multisim results

Charging

Time (Seconds)	Multisim Voltage (V)	Multisim Amps (μA)	Plotted Voltage (V)	Plotted Amps (μA)
27	1.911	552.726	1.91	554
66	3.460	275.611	3.45	278
117	4.372	108.948	4.37	111

Table 2. Multisim and plotted results for charging practical

In these tables the pattern is that the calculated and Multisim values are quite similar and may be separated only by rounding error.

Calculated compared to plotted

On the first table which shows the charging calculated figures and the charging plotted figures. The difference in voltage at 27s is 2mV more calculated and the difference in amps is $2.698\mu\text{A}$ more plotted. The difference in voltage at 66s is 11mV more calculated and the difference in amps is $3.252\mu\text{A}$ more plotted. The difference in voltage at 117s is 41mV more calculated and difference in amps is $0.487\mu\text{A}$ more plotted.

The results gathered from these tests show that the charge values over time become more separated.



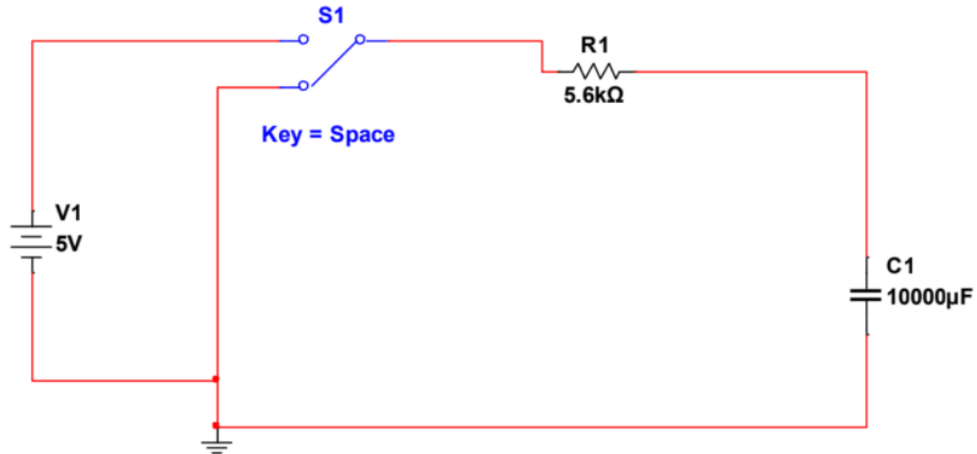
Multisim compared to plotted

When comparing the figures from the second table which shows the charging multisim results and the charging plotted results. The difference in voltage at 27s and 117s are 1mV more multisim and 2mV more multisim. The difference in amps at 27s and 117s are $1.274\mu\text{A}$ more plotted and $2.052\mu\text{A}$ more plotted.

These results show similar results to the calculated comparison, the results show that the charging values over time become more separated. The multisim results can be found in Figure 1 and 2.

Task 2

Task 2 provides the same 5V RC circuit with a resistor of 5.6K and a capacitor of 10000uF. However, the practical task assigned to task 2 was to measure and time the discharge of all of the capacitors within the circuit. The practical was performed with two multi-meters, a power supply and a breadboard with all of the required components. However, due to the Coronavirus the practical was not carried out individually, instead there was a video to observe, this video was carrying out the practical. The chosen times for tasks 1/2 are 27s,



66s and 117s.

Task 2 Calculations

3.

In task 2 the same circuit is used as in task 1.

$$\tau = 56$$

$$V_{max} = 5V$$

$$I_{max} = 892.857\mu A$$

Volts

$$VC = Ve^{\left(\frac{-t}{\tau}\right)}$$

27S

$$5e^{\left(\frac{-27}{56}\right)} = 3.087V$$

66S

$$5e^{\left(\frac{-66}{56}\right)} = 1.538V$$

117S

$$5e^{\left(\frac{-117}{56}\right)} = 0.618V$$

$$i = -Ie^{\left(\frac{-t}{\tau}\right)}$$

27S

$$-892.857\mu\text{A} \times e^{\left(\frac{-27}{56}\right)} = -551.302\mu\text{A}$$

66S

$$-892.857\mu\text{A} \times e^{\left(\frac{-66}{56}\right)} = -274.748\mu\text{A}$$

117S

$$-892.857\mu\text{A} \times e^{\left(\frac{-117}{56}\right)} = -110.513\mu\text{A}$$

Tasks 2 plotted tables

The readings for current and voltage were recorded in 5 second increments for the first minute of the practical then every 10 seconds for the remainder of the practical, the increments change as over time the change in discharge decreased. Recordings were also taken for the 3 random times which were 27 seconds, 66 seconds and 117 seconds. Please see table 3 for the discharge of the 3 numbers and table 4 for the multisim readings.

Plotted and calculated results

Discharging

Time (Seconds)	Calculated Voltage (V)	Calculated Amps (μA)	Plotted Voltage (V)	Plotted Amps (μA)
27	3.087	-551.302	3.12	-551
66	1.538	-274.748	1.56	-270
117	0.618	-110.513	0.67	-110

Table 3. Calculated and plotted results for discharging practical

Plotted and multisim results

Discharging

Time (Seconds)	Multisim Voltage (V)	Multisim Amps (μA)	Plotted Voltage (V)	Plotted Amps (μA)
27	3.062	-561.735	3.12	-552
66	1.549	-271.494	1.56	-270
117	0.651	-113.229	0.67	-110

Table 4. Multisim and plotted results for discharging practical

In these tables the pattern is that the calculated and Multisim values are quite similar and may be separated only by rounding error.

Calculated compared to plotted

On the table 3, you can see it shows the discharge calculated figures for the same time intervals the differences are 33mV more plotted and 0.302 μA more plotted for 27s. 22mV more plotted and 4.748 μA more plotted for 66s. 52mV more plotted and 0.513 μA more plotted.

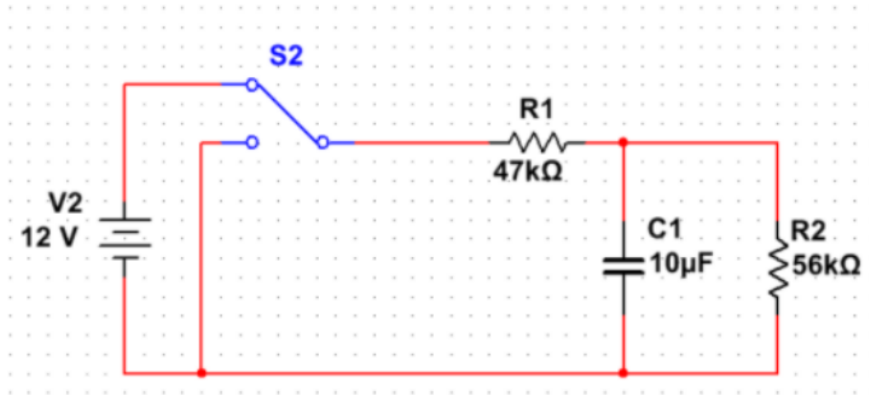


Multisim compared to plotted

The figures of the table 4 compare the discharging multisim results against the discharging plotted results. The difference in voltage at 27s and 117s are 58mV more plotted and 19mV more plotted. The difference in amps at 27s and 117s are 9.735 μA more plotted and 3.229 μA more plotted.

These results show similar results to the calculated comparison, the results show that the discharging values start far apart and slowly become similar. The results can be found in Figure 1 and 2.

Task 3



Task 3 Calculations

The circuit for task 3 had a 47KΩ resistor in series with a 10μF capacitor and a 56KΩ resistor in parallel with a 12V supply.

As the resistors are essentially in parallel you need to find out the total resistance to be able to work out the time constant, for this Ohms Law for resistors in parallel must be used.

1.

$$\frac{R1 \times R2}{R1 + R2} = R \quad \frac{47K \times 56K}{47K + 56K} = 25.55K\Omega$$

4.

$$\tau = RC \quad 25.55K \times 10 = 0.255$$

The next step to take is calculating the voltage drop across the capacitor.

$$V \left(\frac{R2}{R1 + R2} \right) = V_c \quad 12 \left(\frac{56K}{47K + 56K} \right) = 6.5V$$

In order to confirm these figures, a time value can be picked, both the voltage and current si able to be calculated and proven against the simulated value given from multisim.

$$6.5 \left(1 - e^{-\frac{5}{0.25}} \right) = 6.49V$$



The simulated value at 5 seconds was 6.35V, this value was .15V out from the calculated value, this variance however can be caused by rounding. This proves that the voltage across the capacitor is 6.5V.

Charging

The time it takes for a capacitor to become charged/discharged is 5 time constants, with a single time constant taking 0.25 seconds it should take 1.25 seconds for the voltage to reach 6.5V. Multisim records the voltage as 6.535V

At a single time constant the capacitor should read at around 63% value. $6.5 \times 0.63 = 4.09V$ this value can be compared alongside the multisim graph, the value of multisim was 4.140V which can be due to rounding.

Discharging

The equation for discharging is the same $6.5 \times 0.63 = 4.09s$ then $6.5 - 4.09 = 2.41$ the multisim graph shows the value at the time as 2.432V, this is within the rounding tolerances.



Calculating initial/final currents from the supply

5.

By assuming that the supply is at its maximum for the startup current and 0 for the final current.

$$I = \frac{V}{R} \quad \frac{12}{25.55k} = 0.469A \quad \frac{0}{25.55k} = 0A$$

Once created, the simulation and graph were used with maximum voltage to discover what the voltage will be following a single time-constant during both charge and discharge, the results were 4.14V when on a charging cycle and 2.432V when on a discharge cycle.

Charging results = 0.253s



Discharging results = 0.255s

The average of this would be

$$\frac{0.253 + 0.255}{2} = 0.254s$$

Time constant is worked out using $\tau = RC$ this gives us $25.55K\Omega \times 10\mu F = 0.255$

These are the simulated and calculated values, they are very similar, within rounding range.

Task 4

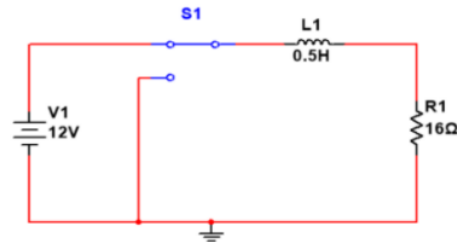


Figure 3

Task 4 Calculations

Calculations will be carried out every 100ms and then plotted on a graph.

$$i_{max} \left(1 - e^{\frac{-t}{\tau}}\right) = I$$

$$1 \left(1 - e^{\frac{-0.1}{0.312}}\right) = 274.223mA \quad 1 \left(1 - e^{\frac{-0.2}{0.312}}\right) = 473.248mA$$

$$1 \left(1 - e^{\frac{-0.3}{0.312}}\right) = 617.695mA \quad 1 \left(1 - e^{\frac{-0.4}{0.312}}\right) = 722.532mA$$

$$1 \left(1 - e^{\frac{-0.5}{0.312}}\right) = 798.620mA \quad 1 \left(1 - e^{\frac{-0.6}{0.312}}\right) = 853.843mA$$

$$1 \left(1 - e^{\frac{-0.7}{0.312}}\right) = 893.922mA \quad 1 \left(1 - e^{\frac{-0.8}{0.312}}\right) = 923.011mA$$

$$1 \left(1 - e^{\frac{-0.9}{0.312}}\right) = 944.123mA \quad 1 \left(1 - e^{\frac{-1}{0.312}}\right) = 959.446mA$$

3.

The current before the switch is activated.

$$i_{max} \left(1 - e^{\frac{-t}{\tau}}\right) = I \quad 1 \left(1 - e^{\frac{-2}{0.312}}\right) = 998.355mA$$

The time constant of the circuit

$$\frac{L}{R} = \tau \quad \frac{5}{16} = 0.312$$

To work out how much time has elapsed before the current reaches 400mA and 200mA the formula for discharging exponential can be used by making time the subject of the formula.

$$i = I e^{\frac{-t}{\tau}} \quad \frac{i}{I} = e^{\frac{-t}{\tau}} \quad \ln\left(\frac{i}{I}\right) = \frac{-t}{\tau} \quad \ln\left(\frac{i}{I}\right) \times \tau = -t$$

400mA

$$\ln\left(\frac{0.4}{1}\right) \times 0.0312 = -285.882mA$$

200mA

$$\ln\left(\frac{0.2}{1}\right) \times 0.0312 = -502.144mA$$



Tests, results and analysis

All of the testing was carried out either on the program Multisim or practically. On multisim the circuit was created with the components on the drawing. However on multisim the power supply was a pulse voltage which would switch every 5 time constants.

4

The calculated current after one-time constant is 0.75A and the multisim current after a single time constant is 0.72A. These results are very similar and could be rounded to the same number, there are several factors which could affect this number such as rounding down on multisim. Both calculations are subject to rounding errors as one is worked out manually on a calculator and the other through the Multisim software.

2.

The multisim result and calculated result are within 3 significant figures of each other. This would be 100% expected from multisim as it is carrying out calculations and displaying the output.

6

Calculated Values

Time to 400mA = 285.882ms

Time to 200mA = 502.144ms



Multisim Values

Time to 400mA = 285.274ms

Time to 200mA = 502.981ms

These values come out very close to one another with only a small degree of inaccuracy, a cause of the numbers varying is that the calculated value is worked out by inputting the time constant equation into a calculator whereas the multisim values had to be obtained after the program has run through a time constant for charging and discharging, these values were marked on the graph which is where the time was obtained.

Conclusion

Comparing the values of calculated, plotted and multisim for tasks 1/2

Charging

Time (Seconds)	Calculated Voltage and Current (V) (μ A)	Plotted Voltage and Current (V) (μ A)	Multisim Voltage and Current (V) (μ A)
27	1.912 551.302	1.91 554	1.911 552.726
66	3.461 274.748	3.45 278	3.460 275.611
117	4.381 110.513	4.34 111	4.372 108.948

Table 5. Calculated, plotted and multisim values for circuit charge.



Discharging

Time (Seconds)	Calculated Voltage and Current (V) (μ A)	Plotted Voltage and Current (V) (μ A)	Multisim Voltage and Current (V) (μ A)
27	3.087 -551.302	3.12 -551	3.062 -561.735
66	1.538 -274.748	1.56 -270	1.549 -271.494
117	0.618 -110.513	0.67 -110	0.651 -113.229

Table 6. Calculated, plotted and multisim values for circuit discharge.

These are the values for all of the methods used in task 1 and 2 for charge and discharge.

When inspecting tables 5 and 6 you can see that the values for multisim and calculated are quite similar whereas the values for plotted are further out. Another trend that can be observed is as time goes on the variance between the plotted results and the calculated/multisim results increases.

Comparison of Calculated and Multisim

When comparing the calculated values with the values given by multisim it comes as no surprise that the values are extremely similar, the calculated values are worked out from a

calculator using the required equations, multisim is similar as it performs the calculations through the program and provides the results.

As the difference in the values is very marginal it could be suggested that the difference is caused by rounding errors made during the calculations. An example of where a rounding error may have taken place is where there are more than 3 significant figures being used, such as using an exponent, the program multisim calculate the value to a different number of significant figures than just the standard calculations. Another example of where there may have been rounding errors is when working with time constants that aren't whole numbers, the value of the time constant may have been rounded up or down.

Another potential cause of the variation between calculated and multisim could be related to the resistance that Multisim adds to components, whereas, in the calculations these resistances are not accounted for.

Comparison of plotted to calculated and multisim

As previously mentioned, the practical couldn't be carried out due to Covid-19, because of this the results had to be gathered from watching a video of the practical being carried out. Due to the nature of these results being gathered there is a likelihood that the results may have been misread.

As aforementioned, it was observed that the plotted results were more varied than the calculated and multisim results, when charging, the variance increased and whilst discharging the variance decreased.

There are a few reasons as to why there was a variance in the values, the first reason to consider is that each component has its own tolerance, without being able to test these components or even see them we cannot calculate the individual tolerance of the component. An example of component would be a resistor, resistors can have a varied tolerance dependant on the type of resistor used and the quality, these tolerances can range between 20% to values as low as 0.05%.

Another potential reason for variance in the values is how the practical was timed, it was timed using a stopwatch app on a phone that has been propped up. When the timer was stopped and started with the practical there would've been a slight delay between the timer being started and the practical being connected/disconnected, where it may have visually appeared to have been started and stopped in time with the practical there is no guarantee due to human error.

Another cause for concern is the power supplies reading during the practical, in the task it is outlined that the voltage to be used is 5V, however at time the multimeter didn't read 5V, this could be down to either a fault in the multimeter or a fault in the power supply.

Recommendations

Although the practical was hindered by the Covid-19 pandemic I would recommend that the practical be done individually for more accurate results, when done individually you have the opportunity to check the individual resistances of components and check all components are providing the correct values by checking them on a known good source.

If constructing this circuit, the results show that both multisim and calculation both yield an idea of how the system would react.

Bibliography

Bird, J. (2010) *Electrical circuit theory and technology*. 4th edn. London: Newnes.

Appendices

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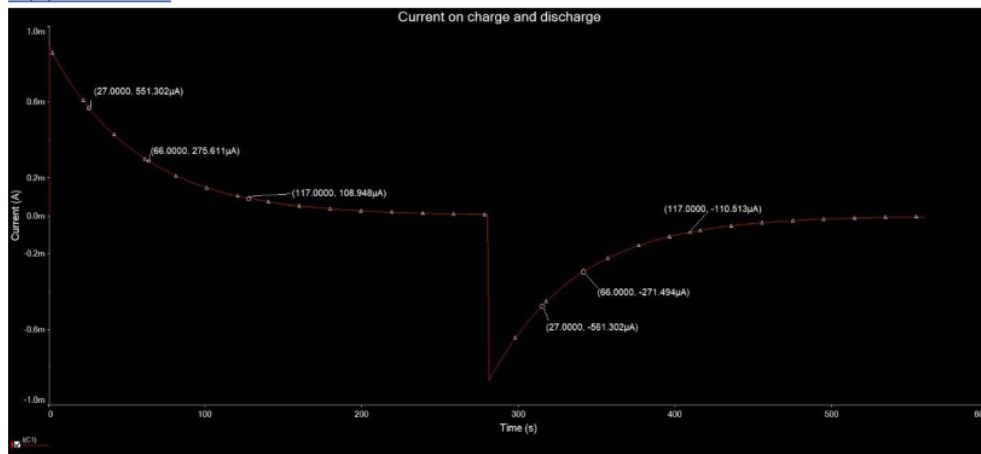


Figure 1. Multisim Graph measuring the current on capacitor charge (Task 1) and discharge (Task 2)

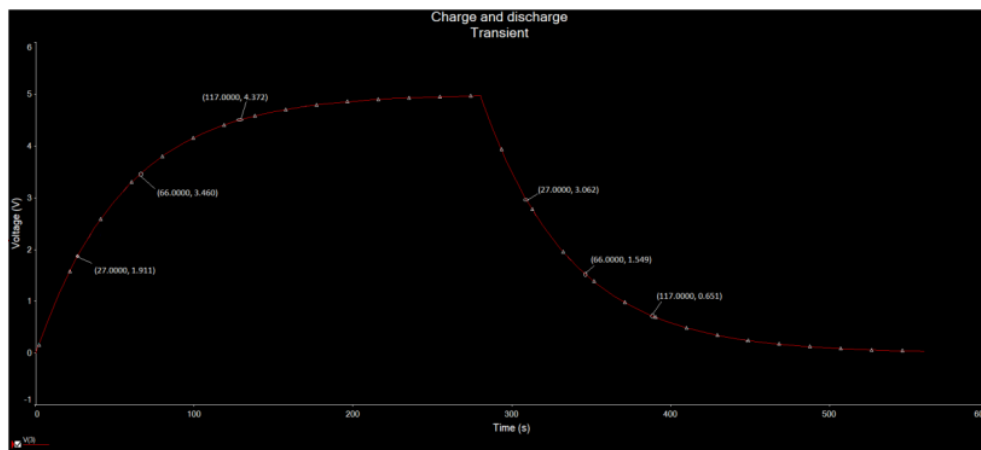


Figure 2. Multisim graph measuring the voltage on capacitor charge (Task 1) and discharge (Task 2)

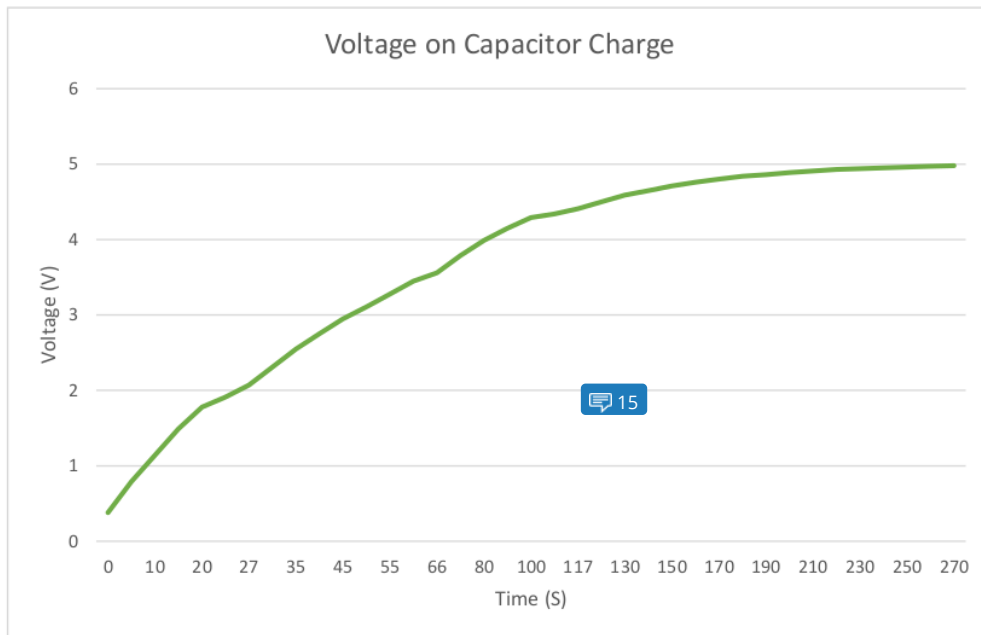


Figure 3. Plotted voltage on capacitor charge (Task 1)

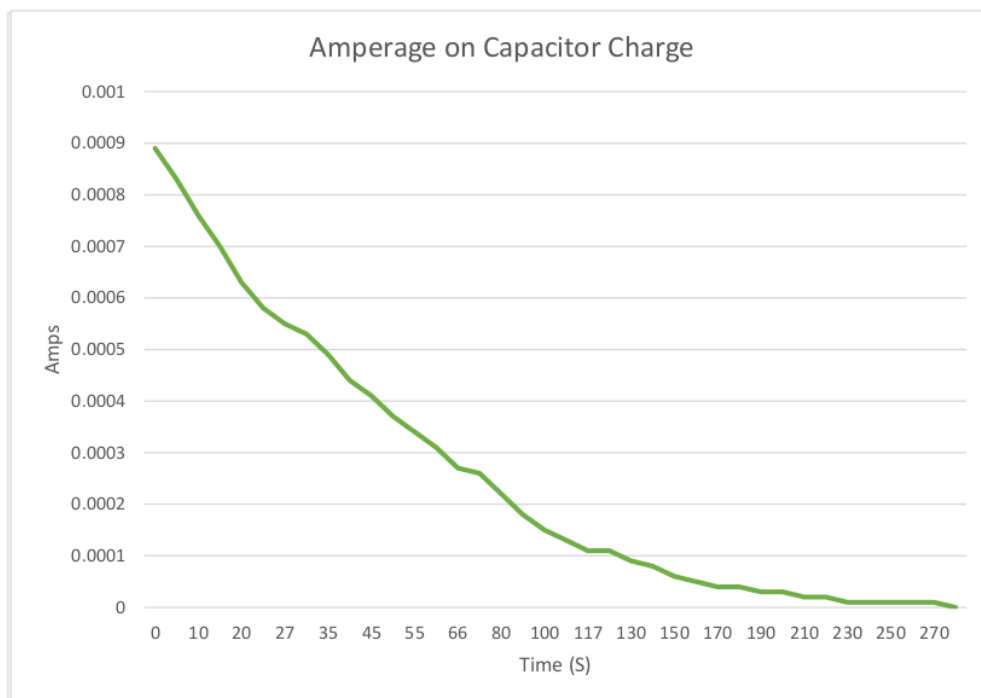


Figure 4.. Amperage on capacitor charge (Task 1)

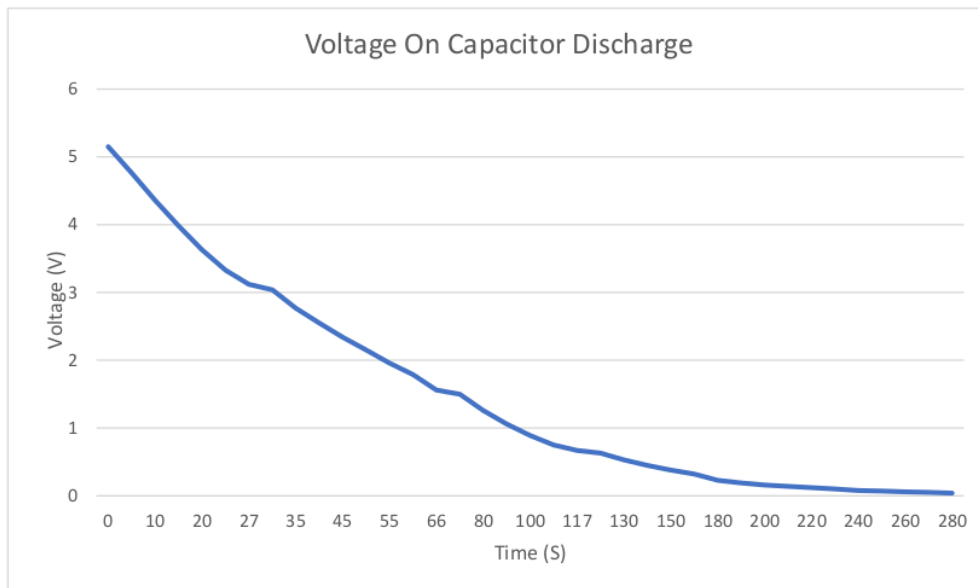


Figure 5. Plotted voltage on capacitor discharge

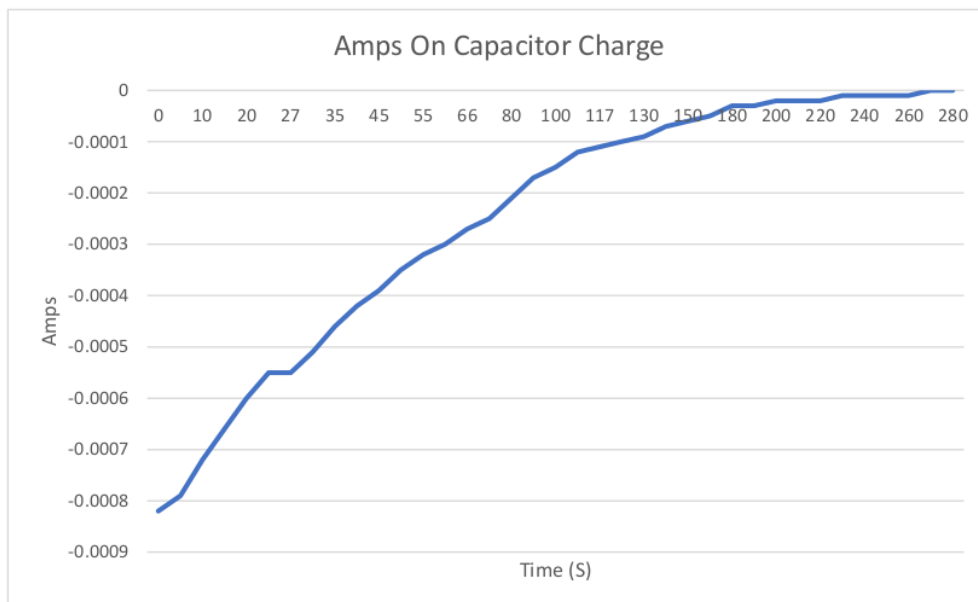


Figure 6. Plotted amperage on capacitor discharge

<u>Time</u> <u>(s)</u>	<u>Volts</u>	<u>Amps</u>
<u>0</u>	<u>0.06</u>	<u>0.00089</u>
<u>5</u>	<u>0.38</u>	<u>0.00083</u>
<u>10</u>	<u>0.79</u>	<u>0.00076</u>
<u>15</u>	<u>1.14</u>	<u>0.0007</u>
<u>20</u>	<u>1.49</u>	<u>0.00063</u>
<u>25</u>	<u>1.78</u>	<u>0.00058</u>
<u>27</u>	<u>1.91</u>	<u>0.00055</u>
<u>30</u>	<u>2.07</u>	<u>0.00053</u>
<u>35</u>	<u>2.31</u>	<u>0.00049</u>
<u>40</u>	<u>2.55</u>	<u>0.00044</u>
<u>45</u>	<u>2.75</u>	<u>0.00041</u>
<u>50</u>	<u>2.95</u>	<u>0.00037</u>
<u>55</u>	<u>3.11</u>	<u>0.00034</u>
<u>60</u>	<u>3.28</u>	<u>0.00031</u>
<u>66</u>	<u>3.45</u>	<u>0.00027</u>
<u>70</u>	<u>3.56</u>	<u>0.00026</u>
<u>80</u>	<u>3.79</u>	<u>0.00022</u>
<u>90</u>	<u>3.99</u>	<u>0.00018</u>
<u>100</u>	<u>4.15</u>	<u>0.00015</u>
<u>110</u>	<u>4.29</u>	<u>0.00013</u>
<u>117</u>	<u>4.34</u>	<u>0.00011</u>
<u>120</u>	<u>4.41</u>	<u>0.00011</u>
<u>130</u>	<u>4.5</u>	<u>0.00009</u>
<u>140</u>	<u>4.59</u>	<u>0.00008</u>
<u>150</u>	<u>4.65</u>	<u>0.00006</u>
<u>160</u>	<u>4.71</u>	<u>0.00005</u>
<u>170</u>	<u>4.76</u>	<u>0.00004</u>
<u>180</u>	<u>4.8</u>	<u>0.00004</u>
<u>190</u>	<u>4.84</u>	<u>0.00003</u>
<u>200</u>	<u>4.86</u>	<u>0.00003</u>
<u>210</u>	<u>4.89</u>	<u>0.00002</u>
<u>220</u>	<u>4.91</u>	<u>0.00002</u>
<u>230</u>	<u>4.93</u>	<u>0.00001</u>
<u>240</u>	<u>4.94</u>	<u>0.00001</u>
<u>250</u>	<u>4.95</u>	<u>0.00001</u>
<u>260</u>	<u>4.96</u>	<u>0.00001</u>
<u>270</u>	<u>4.97</u>	<u>0.00001</u>
<u>280</u>	<u>4.98</u>	<u>0</u>

Figure 7. Plotted Values from Practical Charge

<u>Time</u> <u>(s)</u>	<u>Volts</u>	<u>Amps</u>
<u>0</u>	<u>5.15</u>	<u>-0.00082</u>
<u>5</u>	<u>4.76</u>	<u>-0.00079</u>
<u>10</u>	<u>4.36</u>	<u>-0.00072</u>
<u>15</u>	<u>3.98</u>	<u>-0.00066</u>
<u>20</u>	<u>3.63</u>	<u>-0.0006</u>
<u>25</u>	<u>3.33</u>	<u>-0.00055</u>
<u>27</u>	<u>3.12</u>	<u>-0.00055</u>
<u>30</u>	<u>3.04</u>	<u>-0.00051</u>
<u>35</u>	<u>2.77</u>	<u>-0.00046</u>
<u>40</u>	<u>2.55</u>	<u>-0.00042</u>
<u>45</u>	<u>2.34</u>	<u>-0.00039</u>
<u>50</u>	<u>2.15</u>	<u>-0.00035</u>
<u>55</u>	<u>1.96</u>	<u>-0.00032</u>
<u>60</u>	<u>1.79</u>	<u>-0.0003</u>
<u>66</u>	<u>1.56</u>	<u>-0.00027</u>
<u>70</u>	<u>1.5</u>	<u>-0.00025</u>
<u>80</u>	<u>1.26</u>	<u>-0.00021</u>
<u>90</u>	<u>1.06</u>	<u>-0.00017</u>
<u>100</u>	<u>0.89</u>	<u>-0.00015</u>
<u>110</u>	<u>0.75</u>	<u>-0.00012</u>
<u>117</u>	<u>0.67</u>	<u>-0.00011</u>
<u>120</u>	<u>0.63</u>	<u>-0.0001</u>
<u>130</u>	<u>0.53</u>	<u>-0.00009</u>
<u>140</u>	<u>0.45</u>	<u>-0.00007</u>
<u>150</u>	<u>0.38</u>	<u>-0.00006</u>
<u>160</u>	<u>0.32</u>	<u>-0.00005</u>
<u>180</u>	<u>0.23</u>	<u>-0.00003</u>
<u>190</u>	<u>0.19</u>	<u>-0.00003</u>
<u>200</u>	<u>0.16</u>	<u>-0.00002</u>
<u>210</u>	<u>0.14</u>	<u>-0.00002</u>
<u>220</u>	<u>0.12</u>	<u>-0.00002</u>
<u>230</u>	<u>0.1</u>	<u>-0.00001</u>
<u>240</u>	<u>0.08</u>	<u>-0.00001</u>
<u>250</u>	<u>0.07</u>	<u>-0.00001</u>
<u>260</u>	<u>0.06</u>	<u>-0.00001</u>
<u>270</u>	<u>0.05</u>	<u>0</u>
<u>280</u>	<u>0.04</u>	<u>0</u>

Figure 8. Plotted values from practical discharge

Time	Amps
0	0
0.1	0.274223
0.2	0.473248
0.3	0.617695
0.4	0.722532
0.5	0.798620
0.6	0.853843
0.7	0.893922
0.8	0.923011
0.9	0.944123
1	0.959446

Figure 9. Current on inductor charge

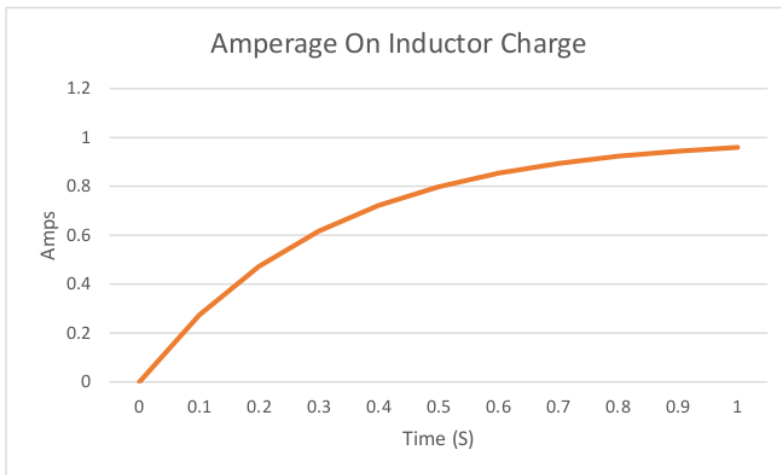


Figure 10. calculated inductor current during charge

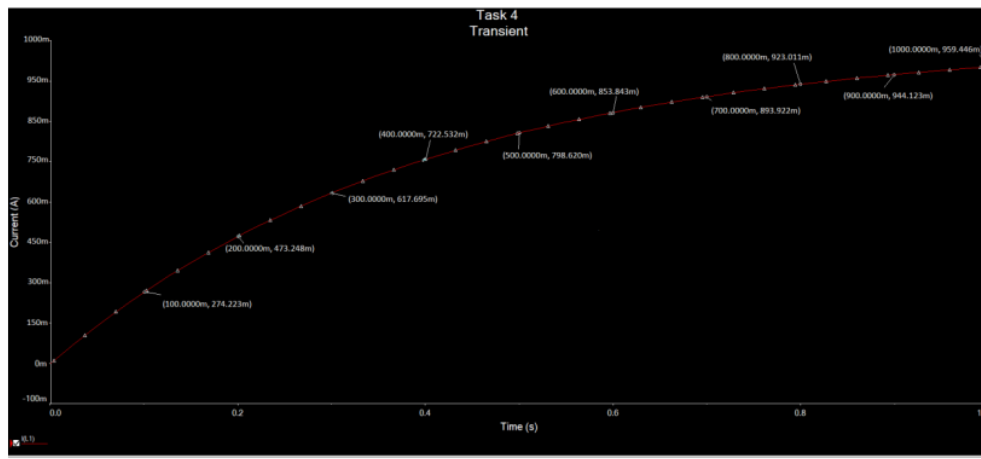


Figure 2. Multisim current during inductor charge

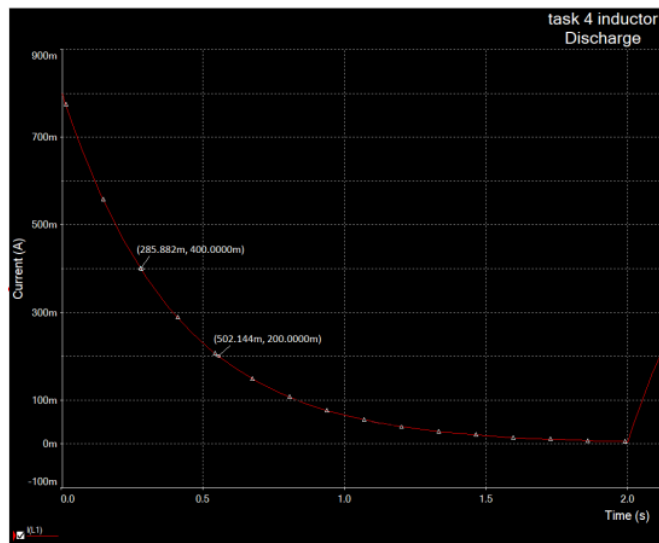


Figure 3. Current decay on inductor discharge on Multisim

FINAL GRADE

GENERAL COMMENTS

Instructor

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PAGE 1

PAGE 2



Comment 1

Use meaningful titles for sections

PAGE 3



Comment 2

A summary summarises the findings and does not leave the reader hanging

PAGE 4



Comment 3

mistakes present, also no glossary

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9



Comment 4

plotted? too vague



Comment 5

your work is not very scientific, you use too many vague terms, like plotted and separated.....?

PAGE 10

PAGE 11

PAGE 12

PAGE 13



Comment 6

more plotted? what are you talking about?

PAGE 14



Comment 7

where are the simulated circuits and graphs?

PAGE 15



Comment 8

I do not understand to what you are referring?



Comment 9

makes very little sense, you must use annotated results which can be seen clearly and then a table for comparison.

PAGE 16

PAGE 17



Comment 10

makes no sense



Comment 11

incorrect

PAGE 18



Comment 12

very messy and confusing, why not use a colum for each quantity?

PAGE 19



Comment 13

such as? where are these results?

PAGE 20

PAGE 21

PAGE 22



Comment 14

use a white background and red trace for clarity

PAGE 23



Comment 15

missing annotations

PAGE 24

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GRADING FORM: NEW CSG-RUBRIC

THOMAS SILMAN

43

1. ENGAGEMENT WITH LITERATURE



NA

0

2. KNOWLEDGE AND UNDERSTANDING



There are gaps evident in knowledge and understanding, you do not explain results in a scientific way, your report is difficult to follow and errors are present, see comments. 11/25

11

3. COGNITIVE AND INTELLECTUAL



Limited attempt at evaluation, with a few reasons offered for discrepancies in the conclusion, but mostly vague terms used and no logic to the report.. 12/30

12

4. PRACTICAL APPLICATION



Simulations have been carried out and there are some annotated results in the appendix, however a more logical approach with concise tabulated figures is needed. 12/24

12

5. TRANSFERABLE SKILLS



Genreally a poor quality report which makes little sense to the reader, think about what you are

8

trying to convey and adopt a logical approach. 8/20