

Assignment 1 - Final Submission

by Kieran Williams

FILE	11733_KIERAN_WILLIAMS_ASSIGNMENT_1_-_FINAL_SUBMISSION_139105_1994094575.DOCX (1.14 M)		
TIME SUBMITTED	26-JAN-2019 01:27 AM (UTC+0000)	WORD COUNT	2687
SUBMISSION ID	99845848	CHARACTER COUNT	16824

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PSDE4001 – Electrical and
Electronic Principles
Assignment 1 –
Investigation into DC Transients
Robert Jenkins

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*Good list
of
contents

and
figures*

Introduction

This assignment is an investigation into the behaviour of R_L and R_C circuits when connected to a direct current voltage source. The arrangement will analyse the circuit when a direct current Voltage source is applied and when the voltage source is removed. Analysis will be carried out using simulation techniques and practical methods. The instruments that will be used during the practical test and simulations are as follows: Digital Multimeter, Probes and Oscilloscopes. A comparison of the results will be taken place with reference to calculations using mathematical formulas. The formula will be used to predict the instantaneous values and final values. Any discrepancies in the results will be evaluated and the values chosen for the practical test will be justified.

Good introduction

Task 1

Transient Behaviour for the Charging of a Capacitor

The purpose of the circuit shown below (**Figure 1**) is to monitor the transient behaviour for the charging of a capacitor when connected to a direct current voltage source. The chosen voltage for this experiment is 6V. The chosen resistor value is 5.6 k Ω and the capacitor value is 10 μ F. The reason for choosing these values is that it gives us a time constant of 56 seconds: $T = R \times C = 5600 \times 10 \times 10^{-3} = 56$ seconds. The Transient Period is calculated using the formula: $5 \times T = 280$ seconds. The Transient Period is long enough for us to take practical readings from the multimeter. The Transient Period is the period of change, 5T is the end of the Transient Period. After 5T is the steady state where the capacitor is around 98% fully charged.

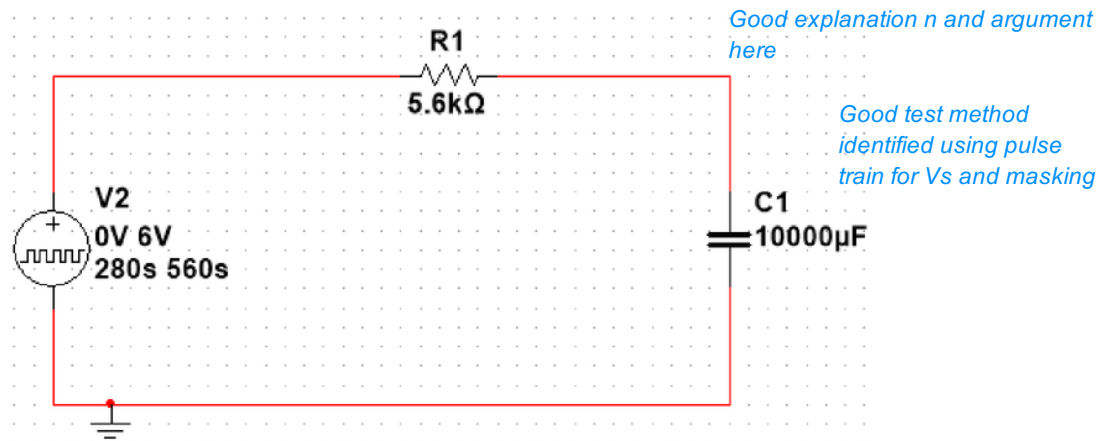
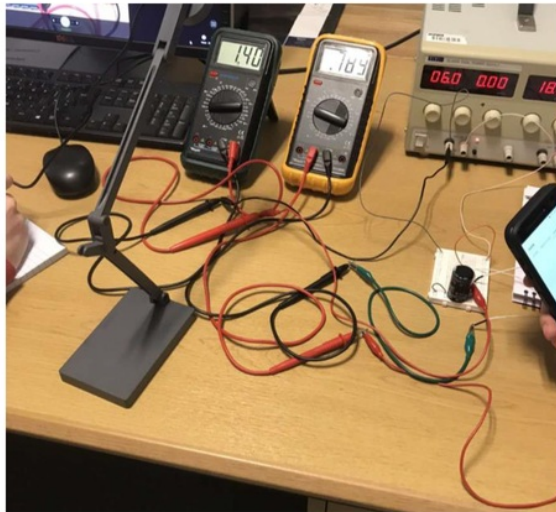


Figure 1 - Transient Circuit

There will be some discrepancies in the practical results which will be down to human error and component tolerances, resistors usually have a tolerance of around 10%. To calculate the instantaneous voltage the following formula can be used: $V_c = V_{\max}[1 - e^{-t/T}]$ where $V_{\max}$ = Voltage Supply and $T = R \times C$. To calculate the instantaneous current the following formula can be used: $I_c = I_{\max}[e^{-t/T}]$ where $I_{\max} = V/R$.

Practical Results

The image below (**Figure 2**) shows how the practical experiment was setup. Two digital multimeters were used, one was to measure the voltage and one was to measure the current. A 6V power supply was connected to the circuit and a timer was started when the circuit became live. Two people would monitor the voltage and current readings whilst a third person would call out 20 second intervals until 280 seconds.



Good use of images to show test procedures

Figure 2 - Practical Setup

The table of results (**Table 1**) shows the values of the voltage (V) and current (μA) taken at 20 second intervals.

Charge Voltage			Charge Current	
Time (s)	Voltage (V)		Time (s)	Current (μA)
20	1.79		20	753
40	3.06		40	525
60	3.94		60	366
80	4.56		80	256
100	4.99		100	179
120	5.29		120	125
140	5.57		140	87.56
160	5.66		160	60.99
180	5.76		180	42.77
200	5.83		200	29.93
220	5.88		220	20.91
240	5.92		240	14.58
260	5.94		260	10.18
280	5.96		280	7.1

Tables of results are correct

Table 1 - Table of Charge Results

The graphs for voltage (**Figure 3**) and current (**Figure 4**) charge are shown below:

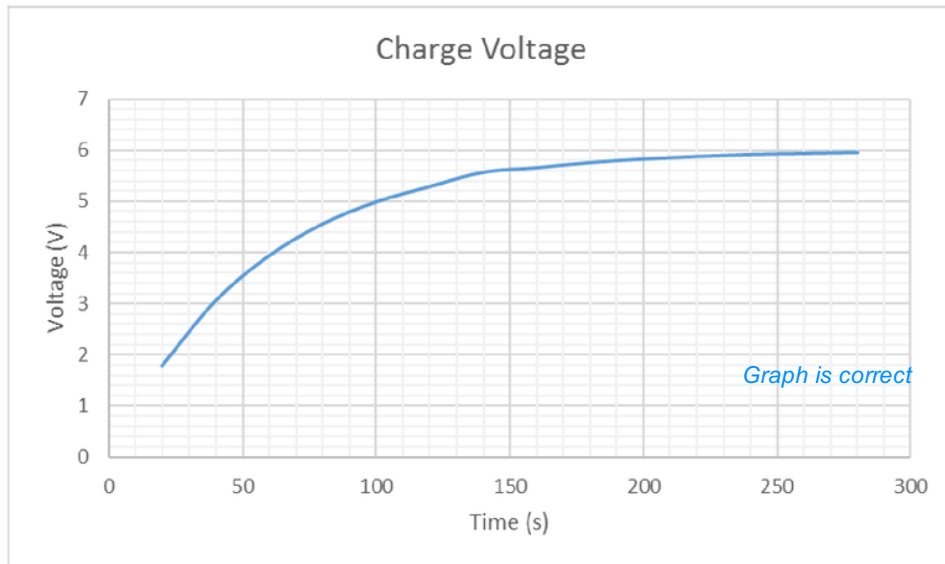


Figure 3 - Voltage Charge Graph

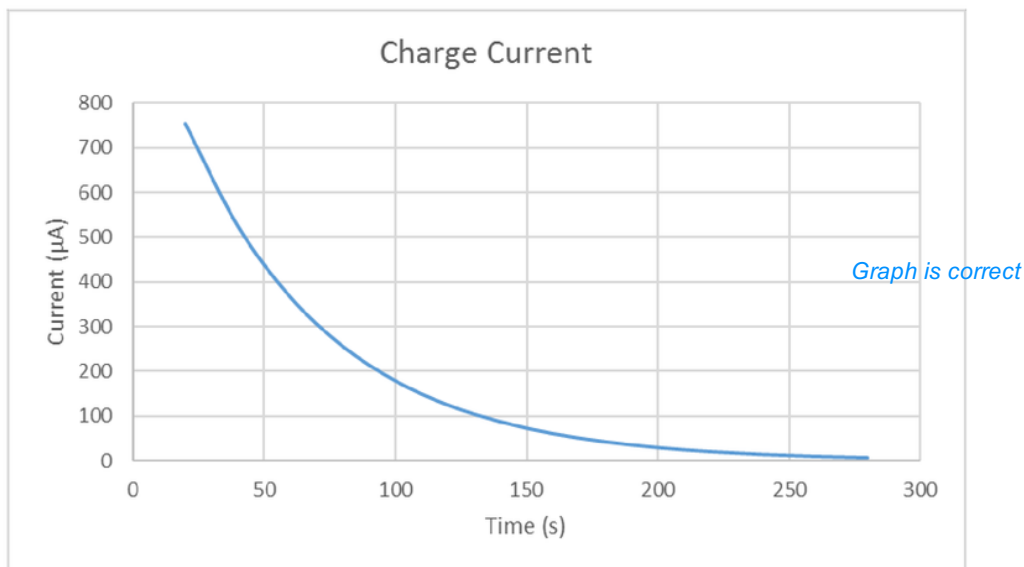


Figure 4 - Current Charge Graph

$\frac{1}{2} V_{cc}$ will always equal to $0.7T$ on the graph, in this case $0.7T = 39.2$ seconds. $1T = 56$ seconds, which is 63% of V_{cc} .

The transient state is the period at which the capacitor is charging which is any time before $5T$ (280 seconds). the steady state is any time after $5T$, this is when the capacitor is around 98% charged and cannot hold anymore charge so therefore there is very little change in the way the graph is shaped.

Good explanation with good significant points made

Calculated Results

Charge Voltage

To calculate the charge voltage the following formula can be used: $V_c = V_{\max}[1 - e^{-t/T}]$ where $V_{\max}$ = Voltage Supply and $T = R \times C$. $V_{\max} = 6V$ and $T = 5600 \times 10 \times 10^{-3} = 56$.

The voltage at 40 seconds:

$$V_c = 6[1 - e^{-40/56}] = 3.06V$$

The voltage at 140 seconds:

$$V_c = 6[1 - e^{-140/56}] = 5.51V$$

*Calcs are
correct and
match the sim
graph values*

The voltage at 240 seconds:

$$V_c = 6[1 - e^{-240/56}] = 5.91V$$

Charge Current

To calculate the charge current the following formula can be used: $I_c = I_{\max}[e^{-t/T}]$ where $I_{\max} = V/R$ and $T = R \times C$. $I_{\max} = 6/5600 = 1.07A$ and $T = 5600 \times 10 \times 10^{-3} = 56$.

The current at 40 seconds:

$$I_c = 1.07[e^{-40/56}] = 523\mu A$$

*Ic max is 1.07mA
not Amps*

The current at 140 seconds:

$$I_c = 1.07[e^{-140/56}] = 87.8\mu A$$

*The calcs are
correct*

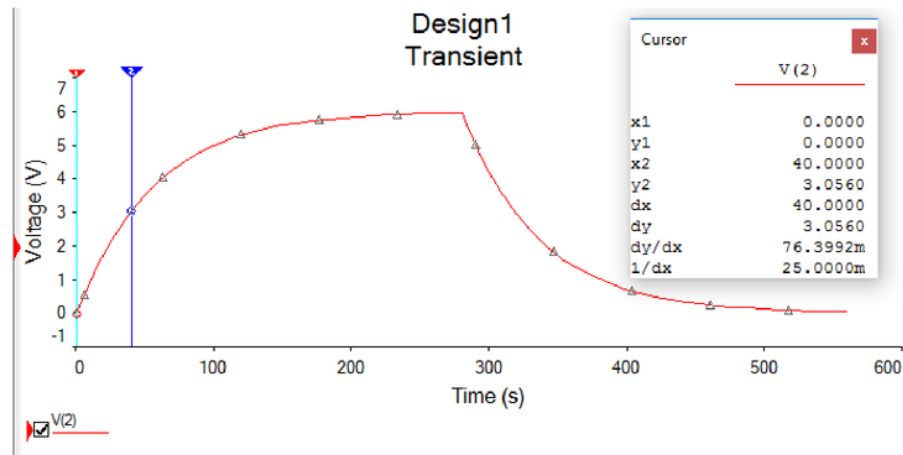
The current at 240 seconds:

$$I_c = 1.07[e^{-240/56}] = 14.7\mu A$$

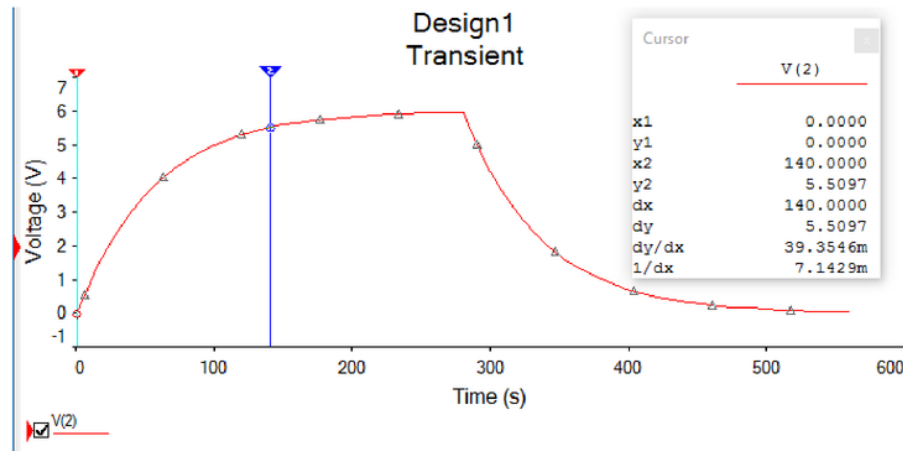
Multisim Results

Charge Voltage Values

40 Seconds = 3.05V

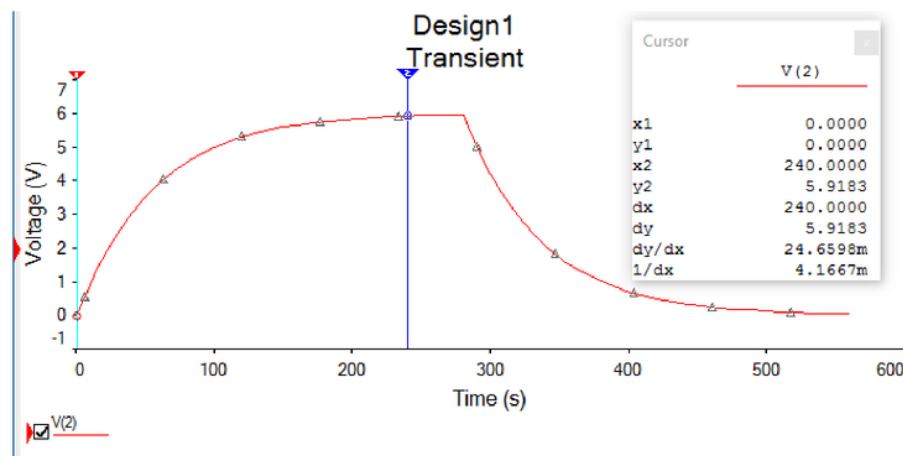


140 Seconds = 5.51V



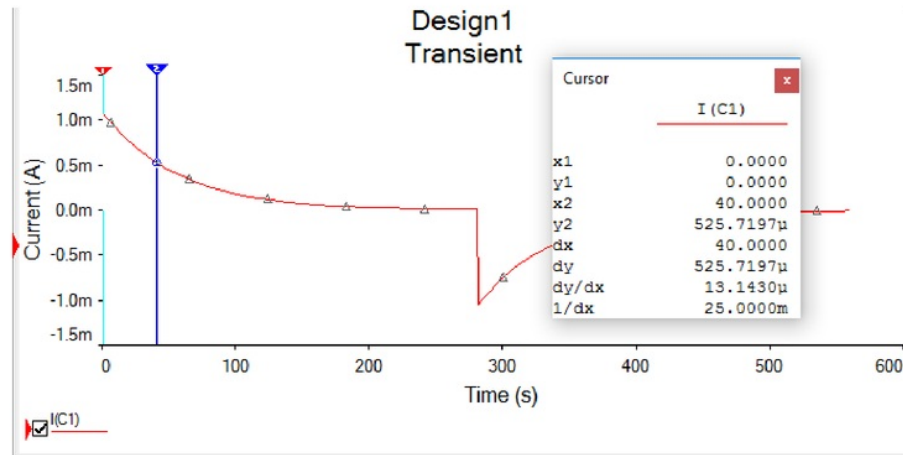
Graphs and values are correct

240 Seconds = 5.91V



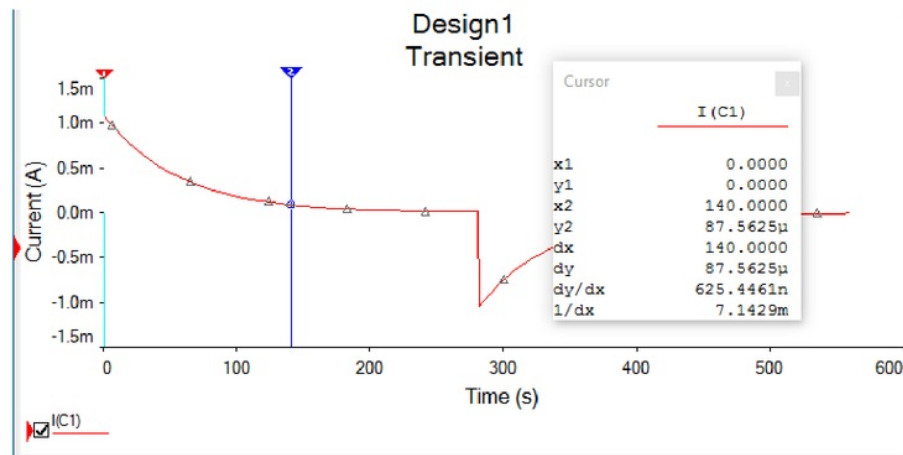
Charge Current Values

40 Seconds = 525 μ A

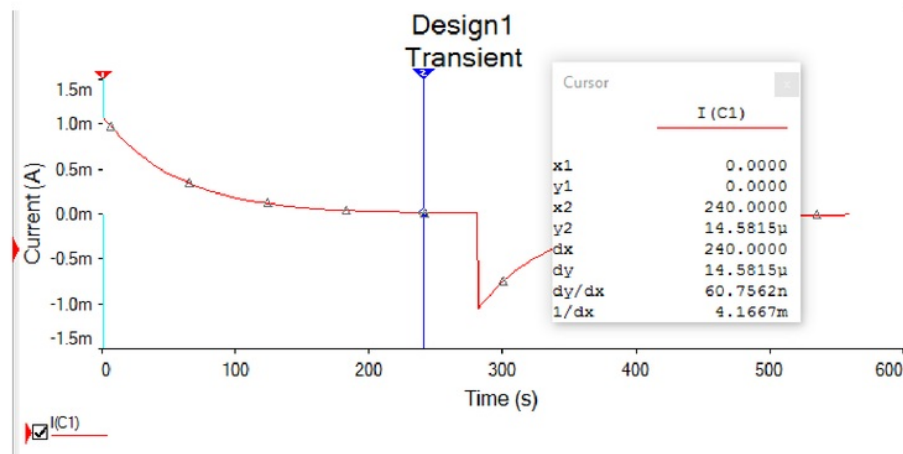


*Graphs and values
are correct*

140 Seconds = 87.56 μ A



240 Seconds = 14.58 μ A



Comparison of Results

Charge Voltage (V)

Time (s)	Practical	Calculated	Simulation
40	3.06	3.06	3.05
140	5.57	5.51	5.51
240	5.92	5.91	5.91

Table 2 - Voltage Charge Comparison

Charge Current (μA)

Time (s)	Practical	Calculated	Simulation
40	525	523	525
140	87.56	87.8	87.56
240	14.58	14.7	14.58

Table 3 - Current Charge Comparison

Between all the results there are very small discrepancies, this is down to human error whilst carrying out the practical experiment. All components used in the practical have tolerances, resistors usually have a tolerance of around 5%-10%.

Fair
argu
ment
s
here

Values are correct

Task 2

Transient Behaviour for the Discharge of a Capacitor

Practical Results

The same practical experiment was taken place as the charge of a capacitor. However, to show the transient behaviour for the discharge of a capacitor the circuit was connected to ground. A timer of 280 seconds was started and reading of the voltage (V) and the current (I) were taken every 20 seconds. The practical results are shown in the table below:

Discharge Voltage			Discharge Current	
Time (s)	Voltage (V)		Time (s)	Current (μA)
20	4.18		20	-747
40	2.92		40	-520
60	2.04		60	-364
80	1.43		80	-255
100	0.99		100	-178
120	0.69		120	-124
140	0.48		140	-86.71
160	0.34		160	-60.81
180	0.24		180	-42.55
200	0.16		200	-29.72
220	0.12		220	-20.72
240	0.08		240	-14.47
260	0.06		260	-10.14
280	0.04		280	-7.06

*Tables of
results are
correct*

Table 4 - Table of Discharge Results

The graphs for voltage and current charge are shown below:

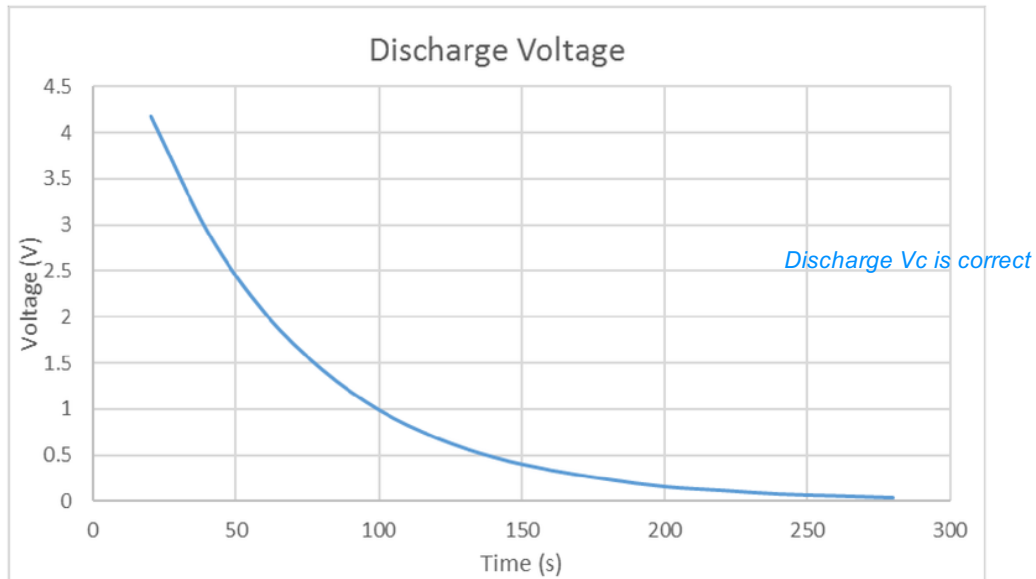


Figure 5 - Voltage Discharge Graph

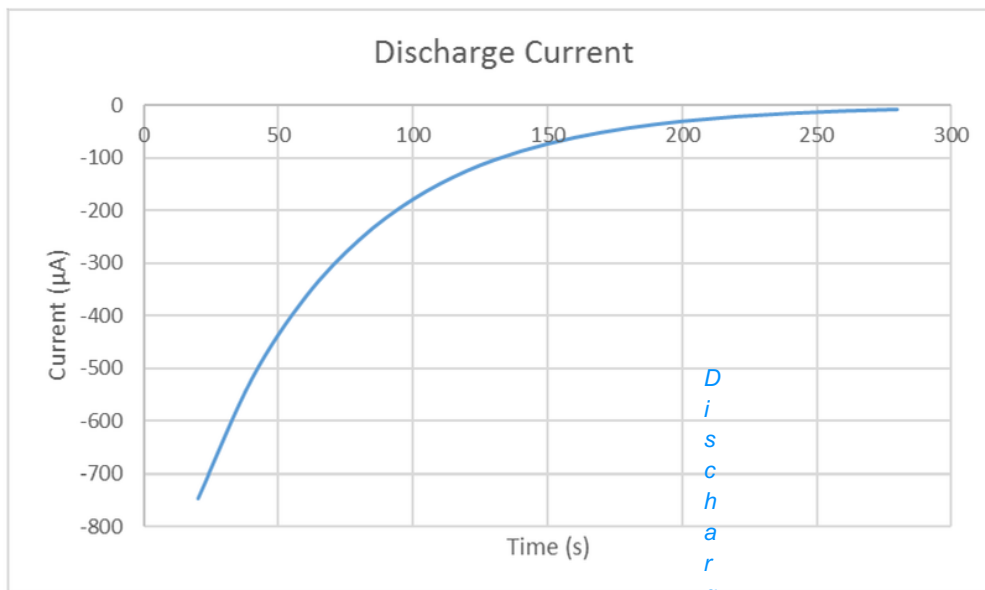


Figure 6 - Current Discharge Graph

When we switch the supply to ground, the capacitor will fall exponentially towards negative I_{max} hence the negative results. $\frac{1}{2} V_{cc}$ will always equal to $0.7T$ on the graph, in this case $0.7T = 39.2$ seconds. $1T = 56$ seconds, which is 63% of V_{cc} .

Calculated Results

Discharge Voltage

To calculate the discharge voltage the following formula can be used: $V_c = V_{\max}[e^{-t/T}]$ where $V_{\max}$ = Voltage Supply and $T = R \times C$. $V_{\max} = 6V$ and $T = 5600 \times 10 \times 10^{-3} = 56$.

The voltage at 40 seconds:

$$V_c = 6[e^{-40/56}] = 2.93V$$

The voltage at 140 seconds:

$$V_c = 6[e^{-140/56}] = 0.49V$$

*Calcs are
correct*

The voltage at 240 seconds:

$$V_c = 6[e^{-240/56}] = 0.08V$$

Discharge Current

To calculate the charge current the following formula can be used: $I_c = -I_{\max}[e^{-t/T}]$ where $I_{\max} = V/R$ and $T = R \times C$. $I_{\max} = 6/5600 = 1.07A$ and $T = 5600 \times 10 \times 10^{-3} = 56$.

The current at 40 seconds:

$$I_c = -1.07[e^{-40/56}] = -523\mu A$$

*Ic is 1.07mA
not Amps*

The current at 140 seconds:

$$I_c = -1.07[e^{-140/56}] = -87.8\mu A$$

The current at 240 seconds:

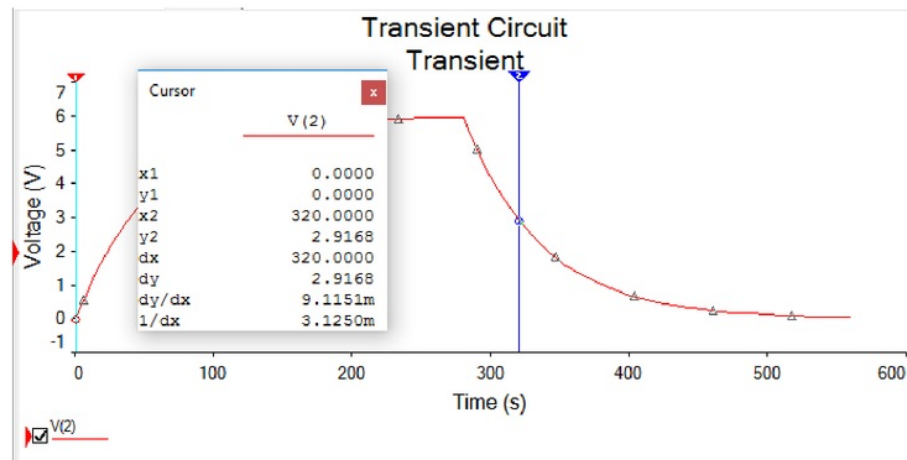
$$I_c = -1.07[e^{-240/56}] = -14.7\mu A$$

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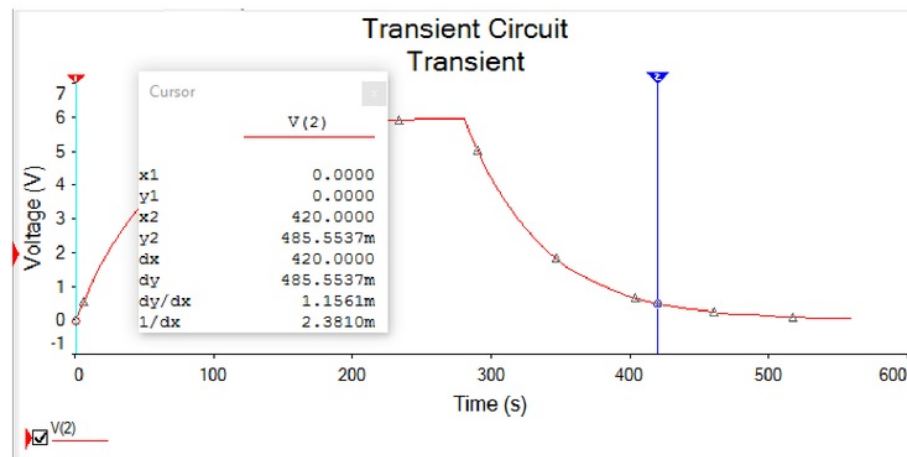
Multisim Results

Discharge Voltage Values

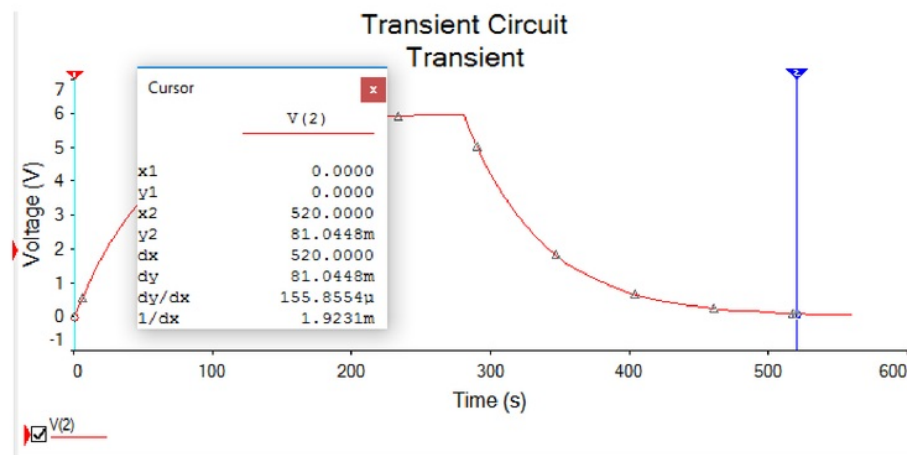
40 seconds = 2.91V



140 seconds = 0.485V



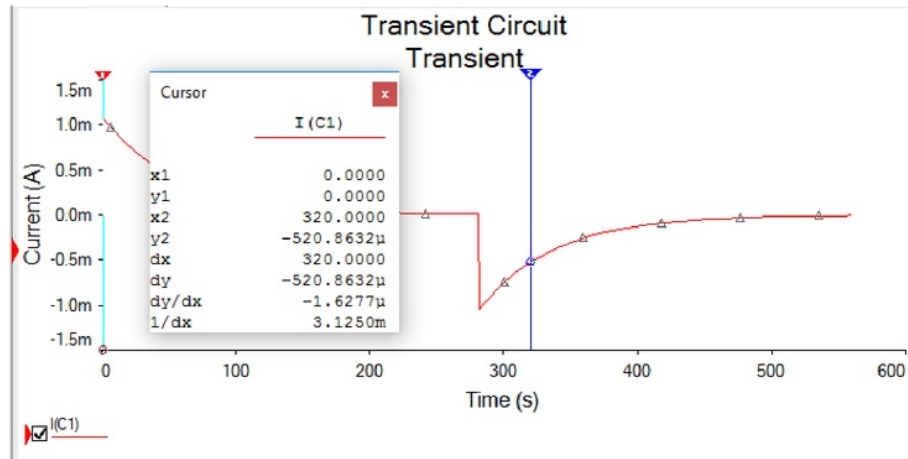
240 seconds = 0.08V



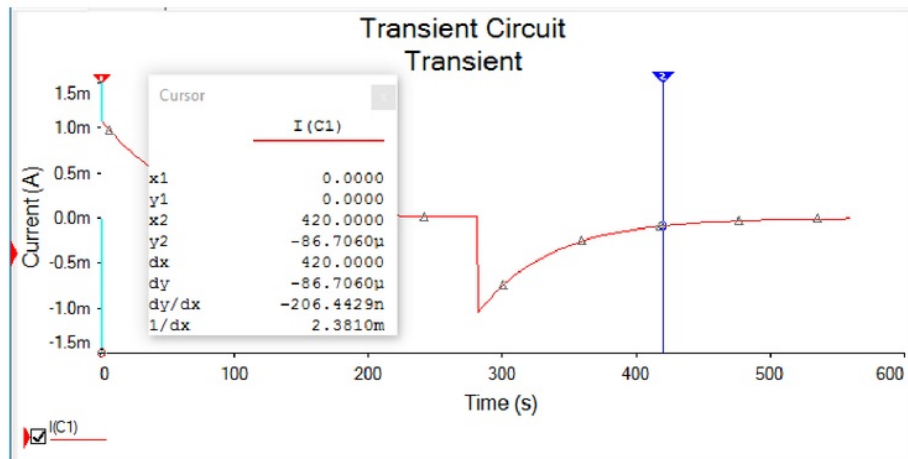
Graphs and values are correct

Discharge Current Values

40 seconds = $-520\mu\text{A}$

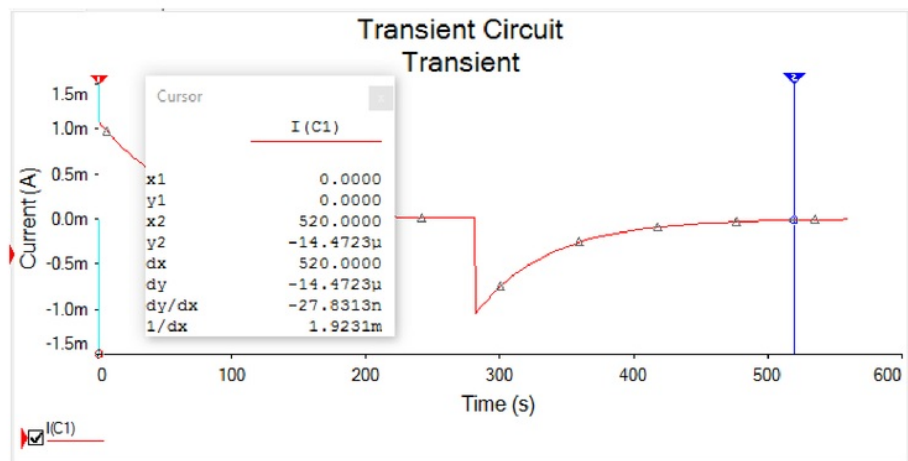


140 seconds = $-86.7\mu\text{A}$



Graphs and values are correct

240 seconds = $-14.47\mu\text{A}$



Comparison of Results

Discharge Voltage (V)

Good table of values for comparison

Time (s)	Practical	Calculated	Simulation
40	2.92	2.93	2.91
140	0.48	0.49	0.49
240	0.08	0.08	0.08

Table 5 - Voltage Discharge Comparison

Discharge Current (μA)

Time (s)	Practical	Calculated	Simulation
40	-520	-523	-520
140	-87.71	-87.8	-86.7
240	-14.47	-14.7	-14.47

Table 6 - Current Discharge Comparison

Between all the results there are very small discrepancies, this is down to human error whilst carrying out the practical experiment. All components used in the practical have tolerances, resistors usually have a tolerance of around 5%-10%.

Fair argument here

Task 3

Transient Behaviour for a more Complex Circuit

The circuit below (**Figure 7**) is an example of a complex transient circuit:

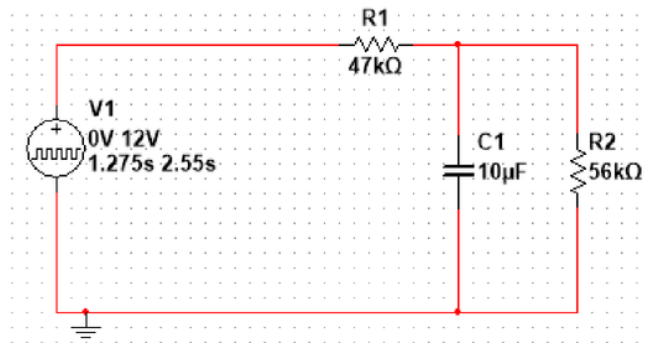
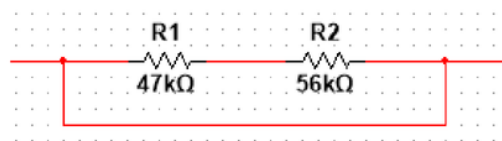


Figure 7 - Complex Transient Circuit

In the circuit at the moment the initial current $I_{MAX} = V/R_1$ this is because the capacitor C_1 acts as a short circuit. In order to take R_2 into consideration to find the final current $I_{MAX} = V/R_1 + R_2$ an equivalent circuit needs to be constructed:

The first step would be to remove the capacitor so we are left with the source and two resistors. Then we can remove the source so that we are left with just the 2 resistors (**Figure 8**).



Good explanation

Figure 8 - Resistors in Parallel

In order to find the total resistance for the equivalent circuit we use the following equation: $R_T = R_1 \times R_2 / R_1 + R_2 = 47 \times 56 / 47 + 56 = 25.55 \text{ k}\Omega$.

The next step is to calculate the voltage divider for the new supply voltage (V_s) (**Figure 9**).

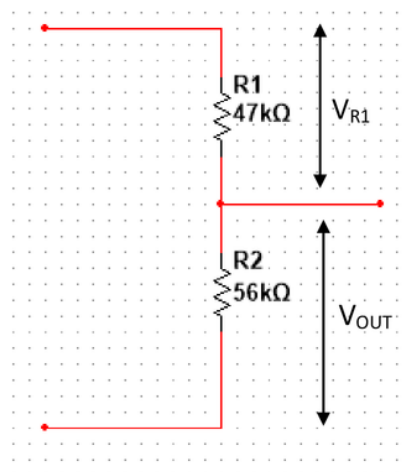
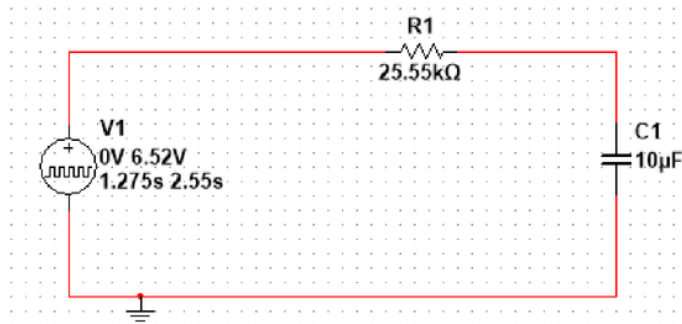


Figure 9 - Voltage Divider

To find V_{R1} the following formula can be used: $V_{R1} = 12V - V_{OUT}$

To find V_{OUT} the following formula can be used: $V_{OUT} = V_s \times R_2 / R_1 + R_2 = 12 \times 47 / 47 + 56 = 6.52V$. Therefore $V_{R1} = 12 - 6.52 = 5.48V$.

The equivalent circuit is as follows (Figure 10):



Parameters are identified for the equivalent cct

Figure 10 - Equivalent Circuit

The time constant (T) can now be calculated for this circuit: $T = R \times C = 25.5k\Omega \times 10\mu F = 0.255$ seconds. The transient period (5T) can now also be worked out: Transient Period = $5 \times T = 5 \times 0.255 = 1.275$ seconds. The final current of the circuit can be calculated using the following formula: $I_{MAX} = V/R_1 = 6.52/25.55 = 0.25A$

This calc for Ic initial current is 6.52/25550 which is 255uA. It is the same as 12v / 47000 because it is the equivalent cct.

Calculated Results

Charge Voltage

To calculate the charge voltage the following equation can be used: $V_c = V_{max}[1 - e^{-t/T}]$.

The voltage at 0.25 seconds:

$$V_c = 6.52[1 - e^{-0.25/0.255}] = 4.07V$$

The voltage at 0.5 seconds:

$$V_c = 6.52[1 - e^{-0.5/0.255}] = 5.60V$$

Calcs are correct

The voltage at 0.75 seconds:

$$V_c = 6.52[1 - e^{-0.75/0.255}] = 6.18V$$

Charge Current

To calculate the charge current the following formula can be used: $I_c = I_{max}[e^{-t/T}]$.

The current at 0.25 seconds:

$$I_c = 0.25[e^{-0.25/0.255}] = 93.79mA$$

The current at 0.5 seconds:

$$I_c = 0.25[e^{-0.5/0.255}] = 35.19mA$$

The current at 0.75 seconds:

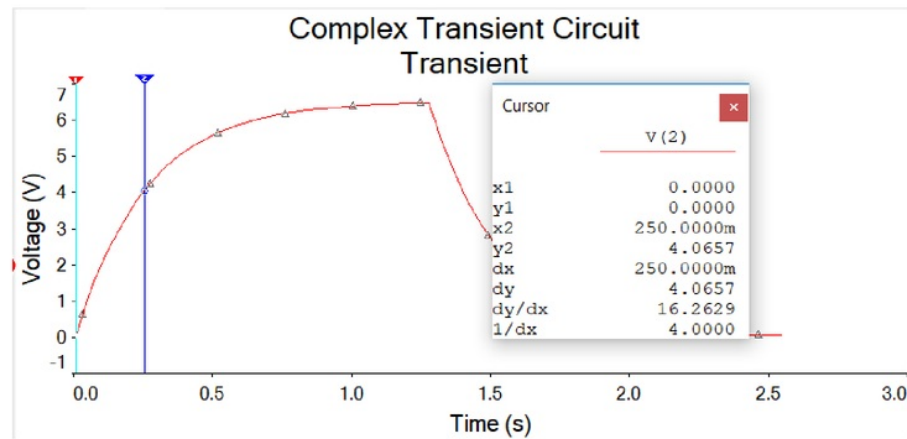
$$I_c = 0.25[e^{-0.75/0.255}] = 13.20mA$$

The calcs here have errors because Ic max should be 0.255uA

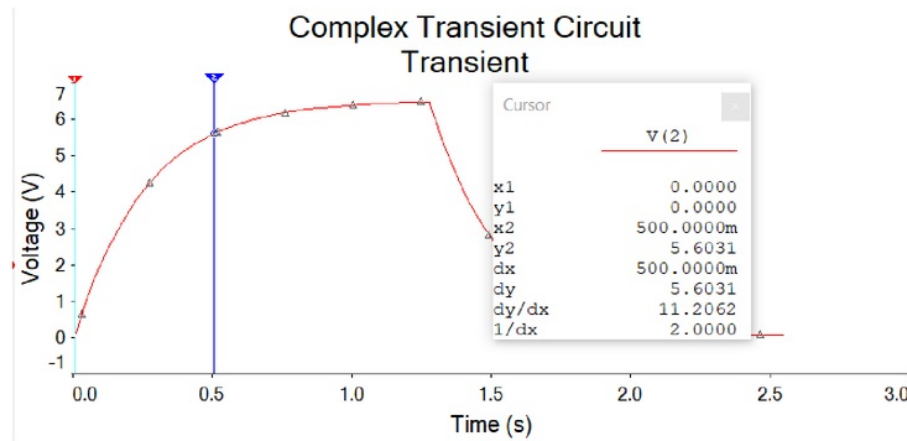
Multisim Results

Charge Voltage

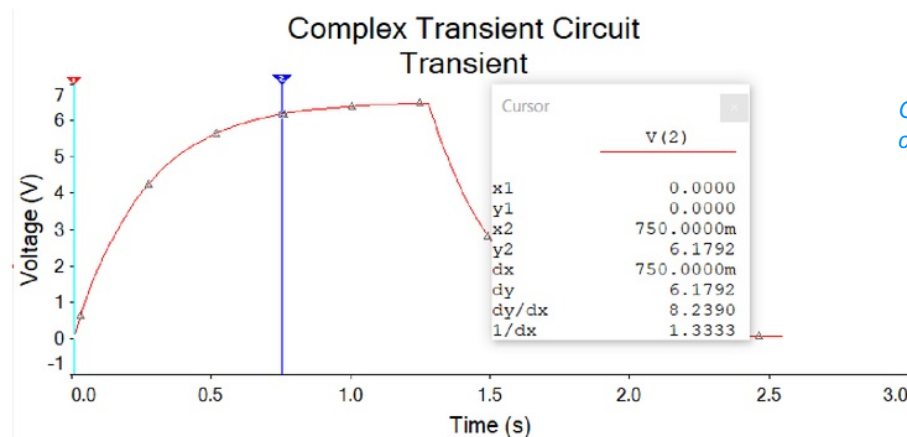
0.25 seconds = 4.07V



0.5 seconds = 5.60V



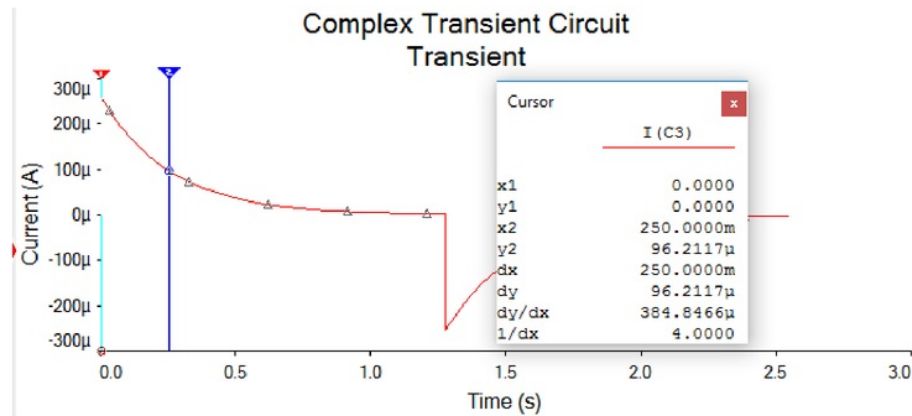
0.75 seconds = 6.18V



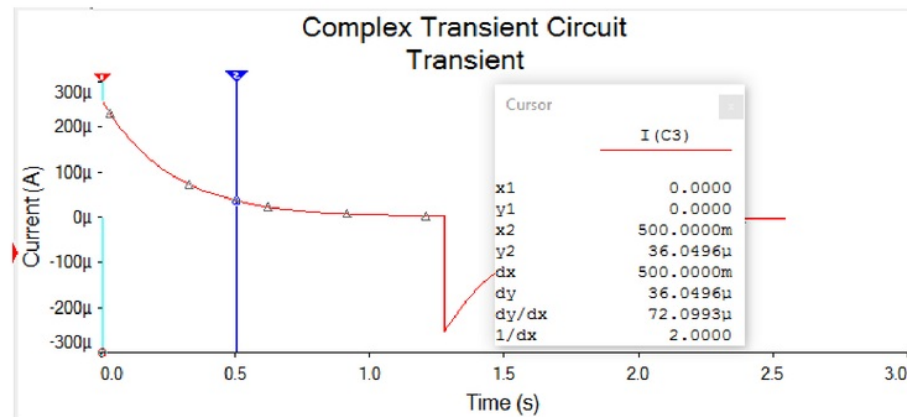
Graphs are correct and match the calcs

Charge Current

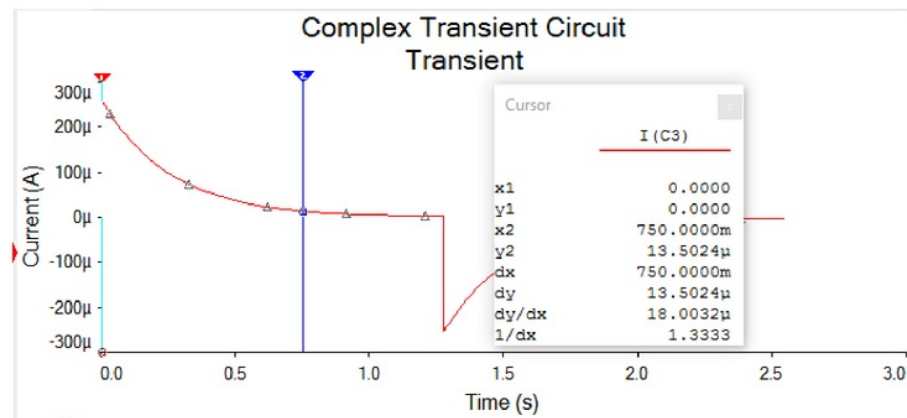
0.25 seconds = 96.21mA



0.5 seconds = 36.05mA



0.75 seconds = 13.50mA



Graphs are correct but the calcs do not match due to an error with $I_c \max$

Comparison of Results

Charge Voltage (V)

Time (s)	Calculated	Simulation
0.25	4.07	4.07
0.5	5.60	5.60
0.75	6.18	6.18

Table 7 - Complex Voltage Charge Comparison

Table of values are good but the values for I_c is incorrect due to an error with I_{max}

Charge Current (μA)

Time (s)	Calculated	Simulation
0.25	93.79	96.21
0.5	35.19	36.05
0.75	13.20	13.50

Table 8 - Complex Current Charge Comparison

There may be a deviation in results due to human error whilst making calculations. The simulation results are more accurate as they are not rounded during the calculations.

Calculated Results

Discharge Voltage

To calculate the discharge voltage the following equation can be used: $V_c = V_{\max}[e^{-t/T}]$.

The voltage at 0.25 seconds:

$$V_c = 6.52[e^{-0.25/0.255}] = 2.44V$$

The voltage at 0.5 seconds:

$$V_c = 6.52[e^{-0.5/0.255}] = 0.92V$$

The voltage at 0.75 seconds:

$$V_c = 6.52[e^{-0.75/0.255}] = 0.344V$$

*Calcs are correct
and match the
sim graphs
values*

Discharge Current

To calculate the discharge current the following formula can be used: $I_c = -I_{\max}[e^{-t/T}]$.

The current at 0.25 seconds:

$$I_c = -0.25[e^{-0.25/0.255}] = -93.79mA$$

The current at 0.5 seconds:

$$I_c = -0.25[e^{-0.5/0.255}] = -35.19mA$$

The current at 0.75 seconds:

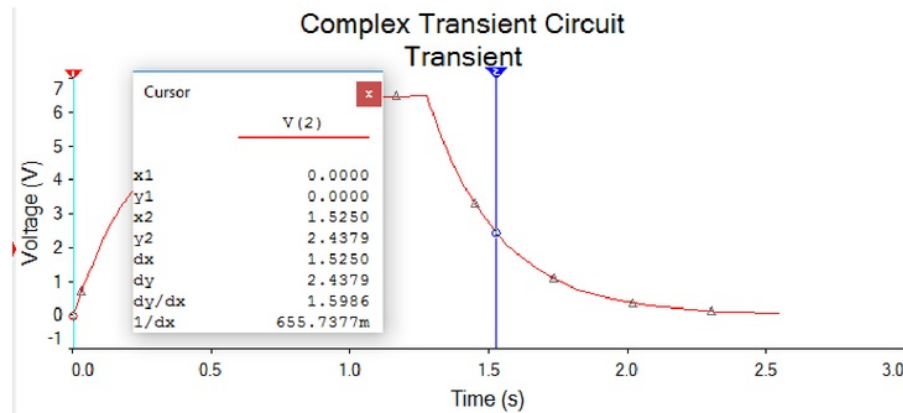
$$I_c = -0.25[e^{-0.75/0.255}] = -13.20mA$$

*Same error here
as the charge
due to the I_c max
value error*

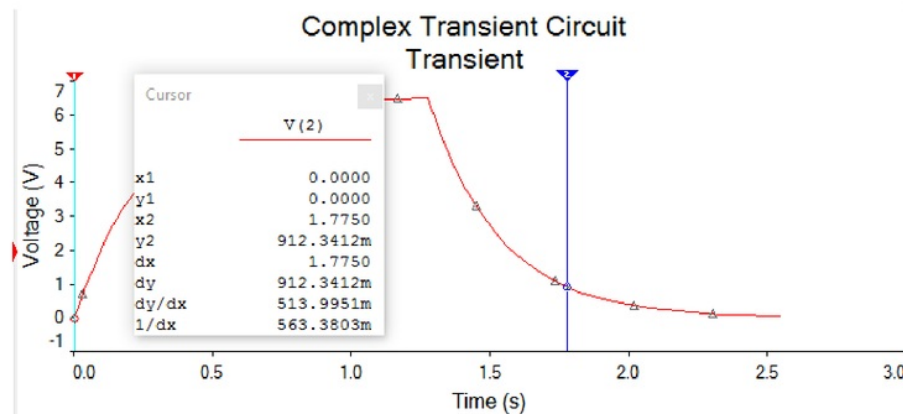
Multisim Results

Discharge Voltage

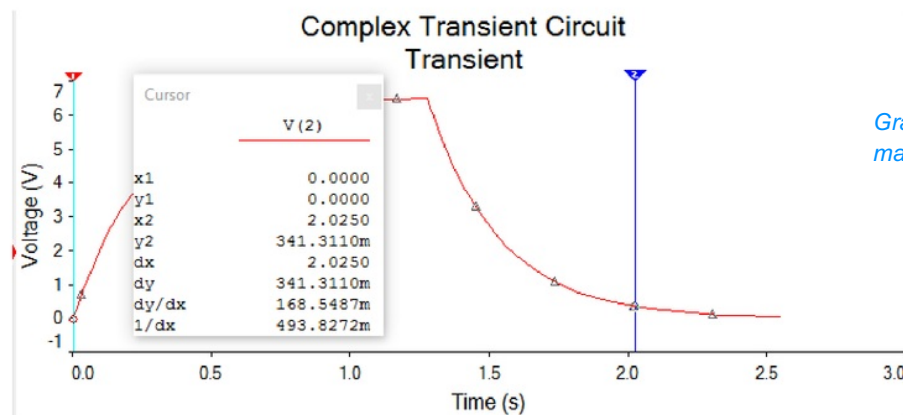
0.25 seconds = 2.44V



0.5 seconds = 0.912V



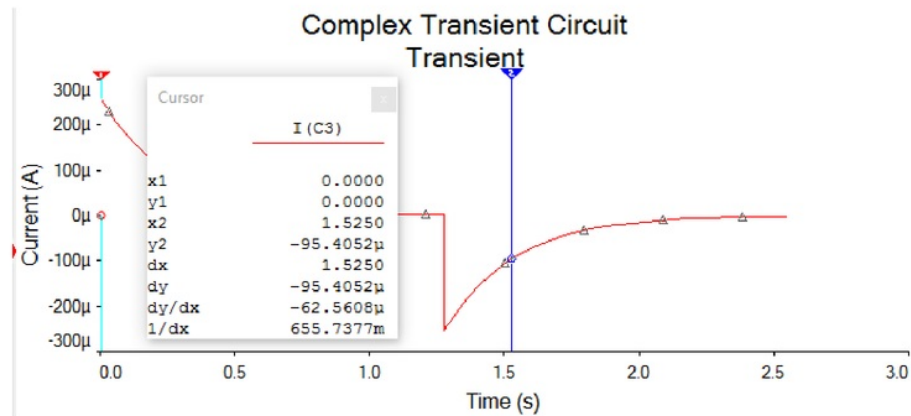
0.75 seconds = 0.341V



Graphs and values are correct and match the calcs

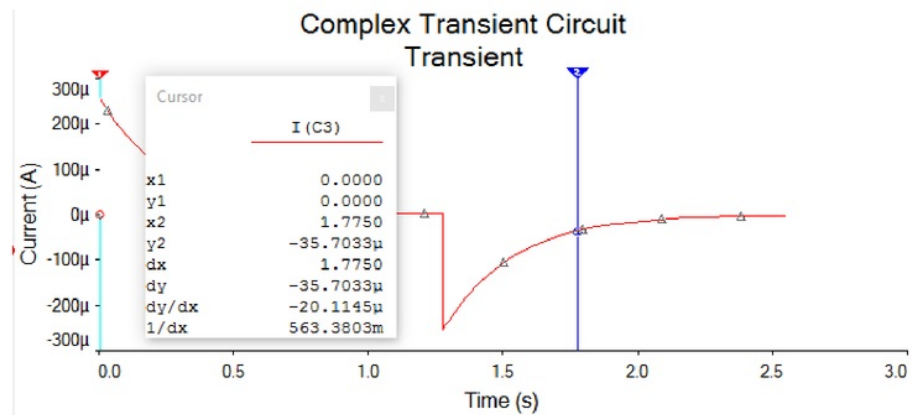
Discharge Current

0.25 seconds = -95.40mA

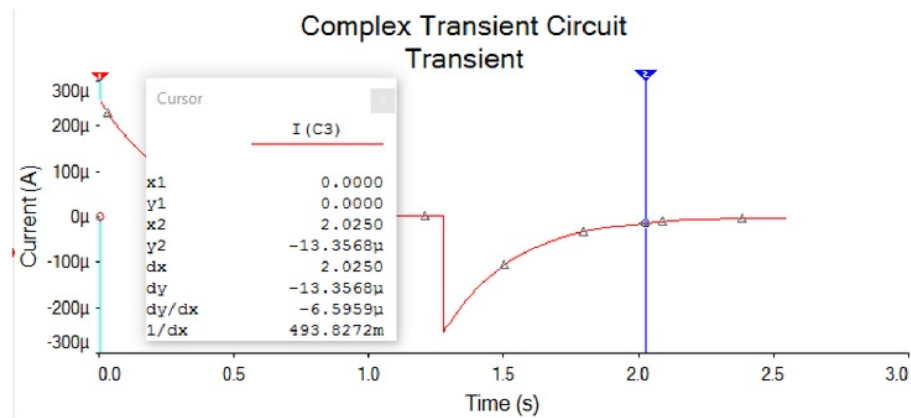


The graphs and values are correct but do not match the calc values due to an error with I_c max. Note that the graph values are μA and the calc values are mA

0.5 seconds = -35.70mA



0.75 seconds = -13.36mA



Comparison of Results

Discharge Voltage (V)

Time (s)	Calculated	Simulation
0.25	2.44	2.44
0.5	0.92	0.912
0.75	0.344	0.341

Table 9 - Complex Voltage Discharge Comparison

Good use of tables for analysis but for the current table I_c values do not match. The calc values are in mA and the graph values are μA . The correct values are in μA

Discharge Current (μA)

Time (s)	Calculated	Simulation
0.25	-93.79	-95.40
0.5	-35.19	-35.70
0.75	-13.20	-13.36

Table 10 - Complex Current Discharge Comparison

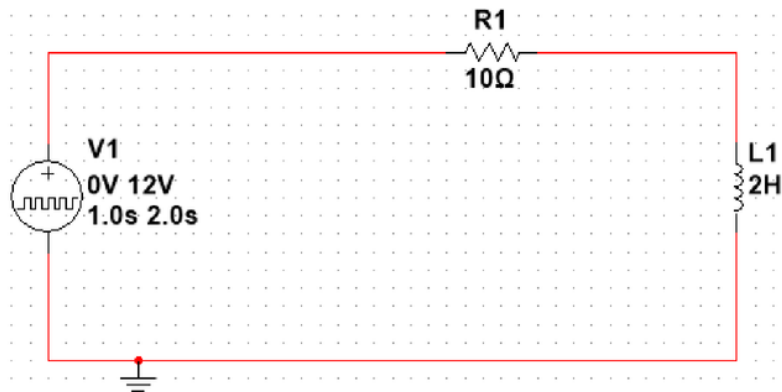
There may be a deviation in results due to human error whilst making calculations. The simulation results are more accurate as they are not rounded during the calculations.

Good argument

Task 4

Transient Behaviour for the Inductive Circuit

The circuit below is an example of an inductive circuit (Figure 11):



Test method is identified using pulse train with masking for Vs

Figure 11 - Inductive Circuit

To calculate the maximum current the following equation can be used: $I_{MAX} = V_s/R = 12/10 = 1.2A$. the time constant can also be calculated: $T = L/R = 2/10 = 0.2$ seconds. The time period = $5 \times T = 1.0$ seconds. In order to show the current growth after the first 1 second, we can compare Multism results to calculated results as follows.

Calculated results

Icmax and T are identified

To calculate the current growth across the inductor after the first 1 second, the following equation can be used: $I_L = I_{MAX}[1 - e^{-(R/L)xt}]$.

Current at 0.2 seconds:

$$I_L = 1.2[1 - e^{-(10/2) \times 0.2}] = 0.7585A$$

Current at 0.4 seconds:

$$I_L = 1.2[1 - e^{-(10/2) \times 0.4}] = 1.0375A$$

Current at 0.6 seconds:

$$I_L = 1.2[1 - e^{-(10/2) \times 0.6}] = 1.1403A$$

Current at 0.8 seconds:

$$I_L = 1.2[1 - e^{-(10/2) \times 0.8}] = 1.1780A$$

Current at 1.0 seconds:

$$I_L = 1.2[1 - e^{-(10/2) \times 1.0}] = 1.1919A$$

Calculations for current growth are correct

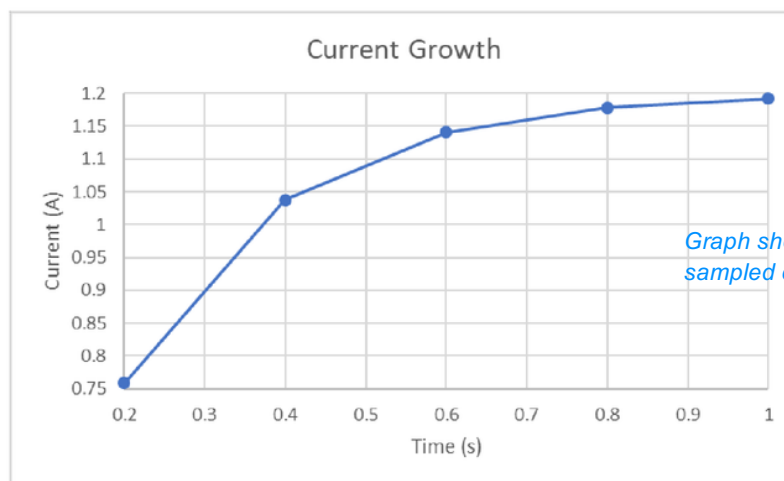
Plotted Results

The calculated values are inputted into a table and a graph was plotted:

Time (s)	Current (A)
0.2	0.7585
0.4	1.0375
0.6	1.1403
0.8	1.178
1	1.1919

Table of values is correct

Table 11 - Table of Calculated Values

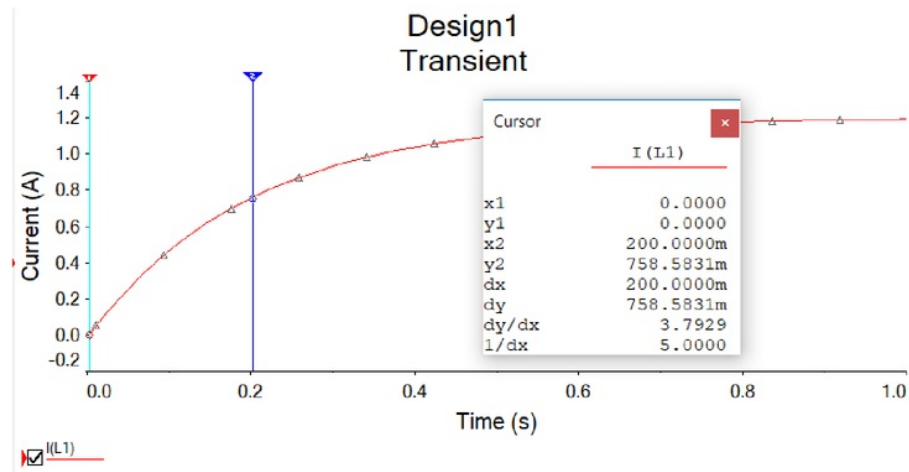


Graph shows a good trend of the sampled calculated values

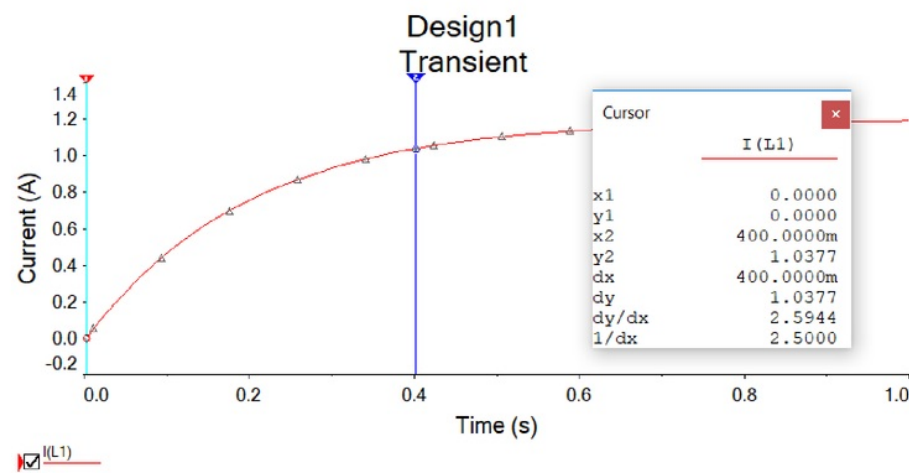
Figure 12 - Graph of Calculated Results

Multisim Results

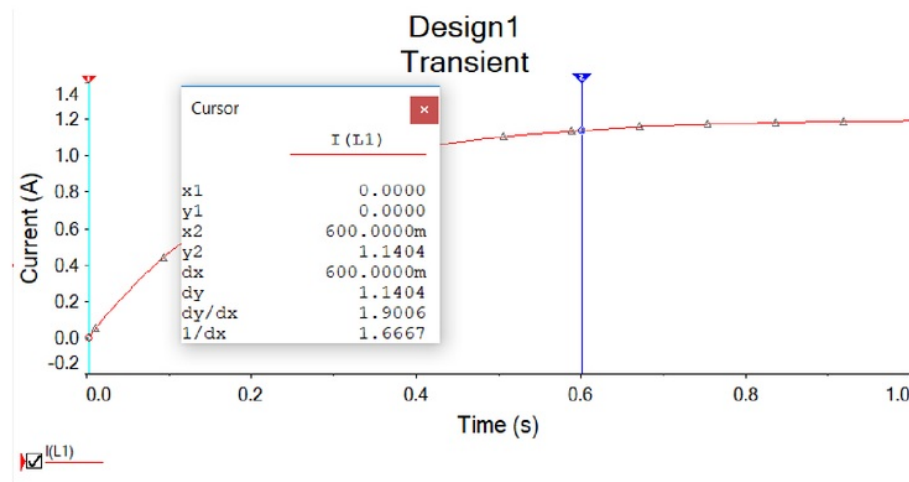
0.2 seconds = 0.7585A



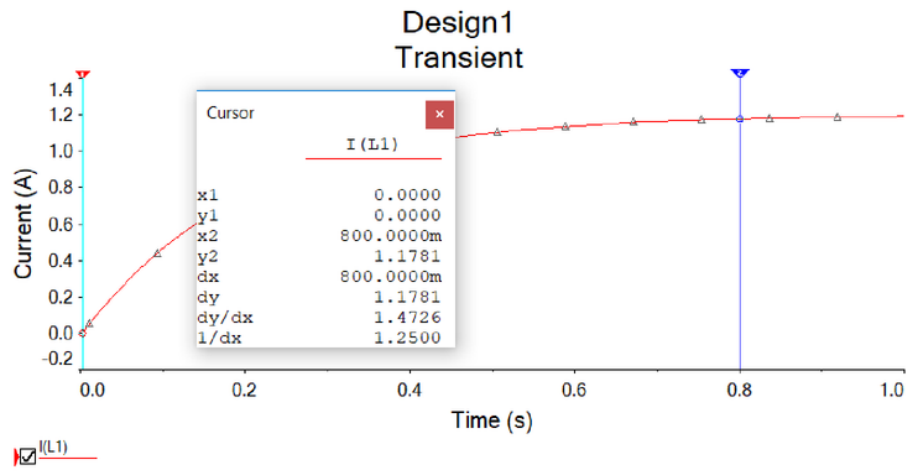
0.4 seconds = 1.0377A



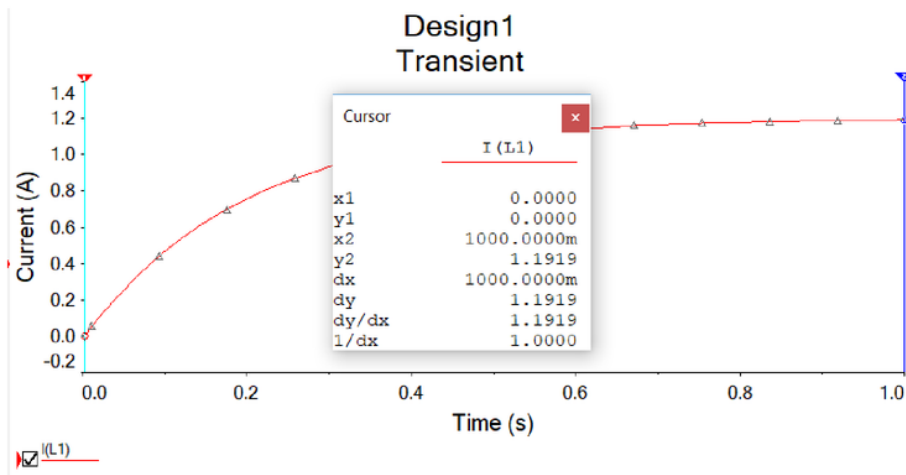
0.6 seconds = 1.1404A



0.8 seconds = 1.1781A



1.0 seconds = 1.1919A



Sim graph values are correct

Comparison of Results

Time (s)	Calculated	Simulation
0.2	0.7585	0.7585
0.4	1.0375	1.0377
0.6	1.1403	1.1404
0.8	1.1780	1.1781
1.0	1.1919	1.1919

Table 12 - Inductive Charge Comparison Table

Good table of values for analysis

To calculate the time that elapses before the current flowing in the circuit has fallen to 100mA and 10mA, the following equation can be used: $I_L = I_{MAX}[e^{-(R/L)xt}]$. The equation must be rearranged to make 't' the subject of the equation:

$$I_L = I_{MAX}[e^{-(R/L)xt}]$$

$$I_L / I_{MAX} = e^{-(R/L)xt}$$

In order to eliminate 'e', log rules must be used:

$$\ln[I_L / I_{MAX}] = \ln[e^{-(R/L)xt}]$$

$$\ln[I_L / I_{MAX}] = -(R/L)xt \quad (T = R/L \text{ so therefore } 1/T = R/L)$$

$$\ln[I_L / I_{MAX}] = -t/T$$

$$t = T [\ln(I_L / I_{MAX})]$$

At 100mA:

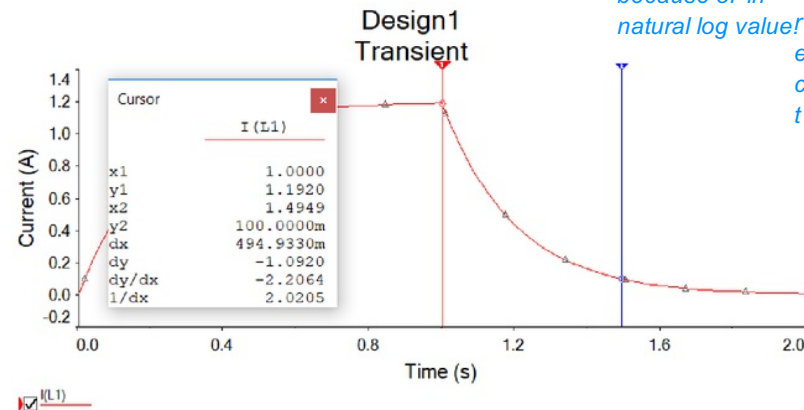
$$t = 0.2 [\ln(100 \times 10^{-3} / 1.2)] = -0.497 \text{ seconds}$$

At 10mA:

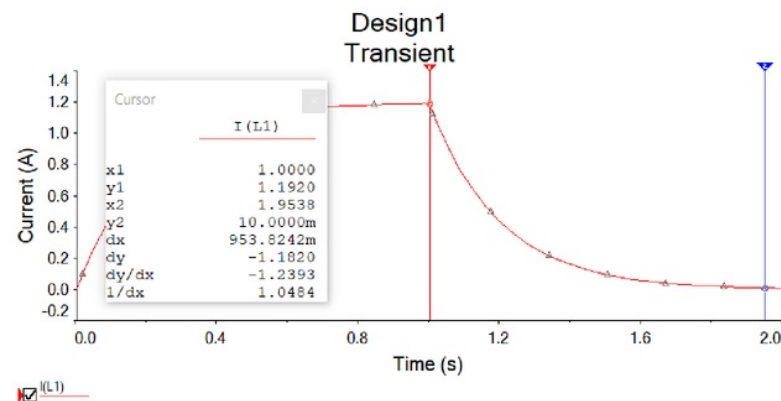
$$t = 0.2 [\ln(10 \times 10^{-3} / 1.2)] = -0.957 \text{ seconds}$$

Multisim Results

$$100\text{mA} = -0.495 \text{ seconds}$$



$$10\text{mA} = -0.954 \text{ seconds}$$



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Numeric values are correct but they are not negative. The negative actually cancels out in the formula because of 'ln' natural log value

Graphs are correct and as you can see the value of I_c is not negative

Conclusions and Recommendations

The aim of this task was to carry out practical testing and mathematical formulae to discuss the transient behaviour of R_C and R_L circuits. During the practical testing there were no problems encountered. There may have been a deviation or some anomalies within the results due to the inaccuracy of recording the practical results. Also, the components used such as resistors and capacitors have 5-10% tolerances so they may not have had the exact value needed for the experiment. The calculations may be slightly different to the simulated results as during the calculations some numbers may have been rounded to 1 or 2 d.p. Rounding calculations decreases the accuracy of the final result. To improve the accuracy of the practical results we could use components with less of a tolerance, however the price of these would be considerably more. To improve the accuracy of the calculated results we could round the calculations to 3 d.p.

*Fair
argumen
ts made
here and
relative
to the
tasks*

Assignment 1 - Final Submission

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

69/100

PAGE 1

PAGE 2

PAGE 3

Text Comment. Good list of contents and figures

PAGE 4

Text Comment. Good introduction

Text Comment. Good explanation and argument here

Text Comment. Good test method identified using pulse train for Vs and masking

PAGE 5

Text Comment. Good use of images to show test procedures

Text Comment. Tables of results are correct

PAGE 6

Text Comment. Graph is correct

Text Comment. Graph is correct

Text Comment. Good explanation with good significant points made

PAGE 7

Text Comment. Calcs are correct and match the sim graph values

Text Comment. Ic max is 1.07mA not Amps

Text Comment. The calcs are correct

PAGE 8

Text Comment. Graphs and values are correct

PAGE 9

Text Comment. Graphs and values are correct

PAGE 10

Text Comment. Good use of tables of comparison

Text Comment. Values are correct

Text Comment. Fair arguments here

PAGE 11

Text Comment. Tables of results are correct

PAGE 12

Text Comment. Discharge Vc is correct

Text Comment. Discharge Ic is correct

PAGE 13

Text Comment. Calcs are correct

Text Comment. Ic is 1.07mA not Amps

Text Comment. Calcs are correct

PAGE 14

Text Comment. Graphs and values are correct

PAGE 15

Text Comment. Graphs and values are correct

PAGE 16

Text Comment. Good table of values for comparison

Text Comment. Fair argument here

PAGE 17

Text Comment. Good explanation

PAGE 18

Text Comment. Parameters are identified for the equivalent cct

Text Comment. This calc for I_c initial current is $6.52/25550$ which is $255\mu A$. It is the same as $12V / 47000$ because it is the equivalent cct.

Text Comment. Calcs are correct

Text Comment. The calcs here have errors because I_c max should be $0.255\mu A$

PAGE 19

Text Comment. Graphs are correct and match the calcs

PAGE 20

Text Comment. Graphs are correct but the calcs do not match due to an error with I_c max

PAGE 21

Text Comment. Table of values are good but the values for I_c is incorrect due to an error with I_{max}

PAGE 22

Text Comment. Calcs are correct and match the sim graphs values

Text Comment. Same error here as the charge due to the I_c max value error

PAGE 23

Text Comment. Graphs and values are correct and match the calcs

PAGE 24

Text Comment. The graphs and values are correct but do not match the calc values due to an error with I_c max. Note that the graph values are μA and the calc values are mA

PAGE 25

Text Comment. Good use of tables for analysis but for the current table I_c values do not match. The calc values are in mA and the graph values are μA . The correct values are in μA

Text Comment. Good argument

PAGE 26

Text Comment. Test method is identified using pulse train with masking for V_s

Text Comment. I_{cmax} and T are identified

Text Comment. Calculations for current growth are correct

PAGE 27

Text Comment. Table of values is correct

Text Comment. Graph shows a good trend of the sampled calculated values

PAGE 28

PAGE 29

Text Comment. Sim graph values are correct

Text Comment. Good table of values for analysis

PAGE 30

Text Comment. Derived formula is correct

Text Comment. Numeric values are correct but they are not negative. The negative actually cancels out in the formula because of 'ln' natural log value.

Text Comment. Graphs are correct and as you can see the value of I_c is not negative

PAGE 31

Text Comment. Fair arguments made here and relative to the tasks

GRADING FORM: CSG-RUBIC

KIERAN WILLIAMS

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RESEARCH-INFORMED LITERATURE



N/a

KNOWLEDGE AND UNDERSTANDING



Intro to practical and assessment topic area was good and showed a good comprehensive understanding. A good intro was given to each task and explanations were good. 8/10 Results and discussion were good and good points were identified. There were some errors in task 2 for I_{max} value, Task 3 I_{max} value and I_c charge and discharge errors in calculations. Alao a minor error in task4 with negative values in calcs.. 11/15

19/20

ANALYSIS



Testing was carried out with explanations and good methods used. There are errors present in task 1 I_{max} value, task 2 I_{max} value, task 3 I_c calc values, task 3 final and initial calc values missing and task 4 contains negative values for current. 20/30 Good conclusions given throughout report and at the end. 7/10

27/40

PRACTICAL APPLICATION AND DEP.



Circuit testing was carried out competently and the results were obtained effectively. There were errors in the calcs and missing calcs in task 4. 10/15 The quality of the results were good despite the errors and included good quality explanations. Methods of testing showed a good understanding of the tasks. 6/10

16/25

SKILLS FOR PROFESSIONAL PRAC.



Quality of the report was good. 7/10

7/10