

principles assignment 1

transients

by Nicholas Devoy

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HNC Electrical and Electronic
Engineering

Electrical and Electronic Principles

Assignment 1 – Investigation onto DC transients

PSDE4001

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1. Introduction

The key objective of this assignment is to examine and measure DC transient and fully charge time at component level and in a circuit. At component level a Capacitor will be charged and discharged and the transient and fully charge time measured and recorded for both. Then a test and measurement will be carried out for transients in a more complicated electronic circuit and an inductive circuit. An analysis will be carried out using CCT simulation and practical CCT with calculations. When carrying out the practical work the measuring instruments needed will be an oscilloscope and a multi-meter with probes to determine the characteristics of the RC and RL circuits. A math formula will be used to predict the instrumental values as well as the final values. The values gained will be compared to the measured values from the practical and simulation tests.

Task 1 is the testing and measurement of the charge of a capacitor from a basic RC circuit. Multi-sim will be used as well as a practical task where 20 measurements will be taken equally spaced within a 285 second period.

Task 2 is the testing and measurement of the discharge of a capacitor from a basic RC circuit. Multi-sim will be used as well as a practical task where 20 measurements will be taken equally spaced within a 285 second period. The main objective of task 2 is to prove that the current and the voltage act similarly but opposite in a discharge circuit compared to a charge circuit as in task 1.

Task 3 will involve a more complex circuit, calculations will be made on multi-sim to discover how the changes of ohms in a resistor which is in parallel with a capacitor will affect the current and voltage. This will be done for both charge and discharge circuits of an RC circuit, For this task there is no practical involved.

Task 4 and final task will be on an inductive circuit. For the inductive RL circuit, calculations will be carried out to discover the transient LR discharge and the transient RL discharge. A results table will be made, calculated and compared with the graphs. A formula will also have to be transposed to the correct formula.

2. Testing and Results

Task 1 – Transient behaviour of a charging capacitor

The image of the simple RC circuit is shown below, it consists of a resistor of $5.6\text{K}\Omega$, labelled R1, a $10000\mu\text{F}$ capacitor labelled C1 and a 6V DC battery which is labelled V1. This is all functioned by the switch, labelled S1. The capacitor will charge up through the resistor once the switch is operated to the closed position.

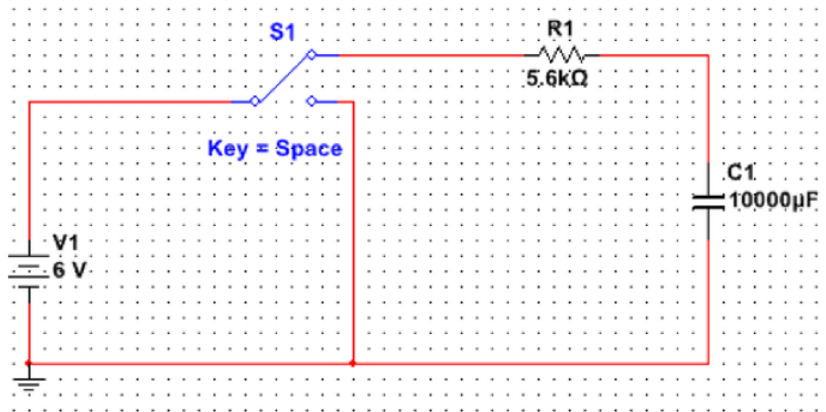


Figure 1: charging capacitor circuit

Time constant = $R \times C$ (R in ohms, C in farads)

Time constant = $5.6\text{ K}\Omega \times 10000\mu\text{F}$

Time constant = $5600\Omega \times 0.01\text{ farads}$

Time constant = 56 seconds

For this section of the assignment there were many measurements and calculations carried out for the charge of the RC circuit. The practical was carried out and the time constant was then calculated using an electronic bread board shown in the images below.

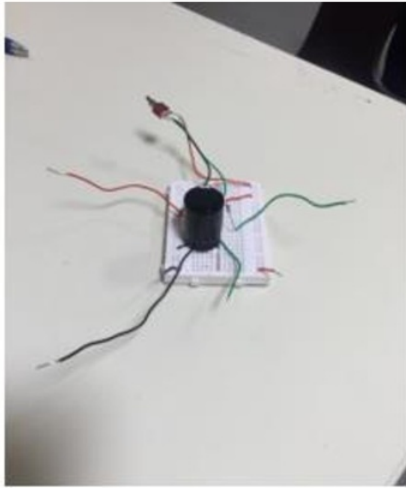


Figure 3: Bread board for practical



Figure 2: Set up for practical

A 6V battery supply was then used to charge the RC circuit via a normally open switch. An ammeter and voltmeter was used to measure the volts and amps and 20 readings were taken over a period of 300 seconds.

The time constant results were also carried out. Time constant is when the voltage or current gets to 63.2% of the end value. This means once all the 5-time constants have passed the steady state will be achieved. The voltage would have reached its maximum value and the current is near enough to 0. The exponential graphs have been created for both current and voltage. The time constant which is shown below can be recognised as 56 seconds, this means that the steady state has been reached at 280 seconds ($5T = 5 \times 56 \text{ secs} = 280 \text{ seconds}$). Many calculations were then carried out, the reason for this was to test if the graphs were correct. Overall the results calculated were very comparable to the measured practical values for both voltage and current.

The formula which is used for instantaneous voltage is shown below

$$VC = V(1 - e^{-\frac{t}{RC}})$$

The formula which is used for instantaneous current is shown below

$$I = I_{MAX}(e^{-\frac{t}{T}})$$

The results gained on multi-sim which were from instantaneous current and voltage tests are shown below.

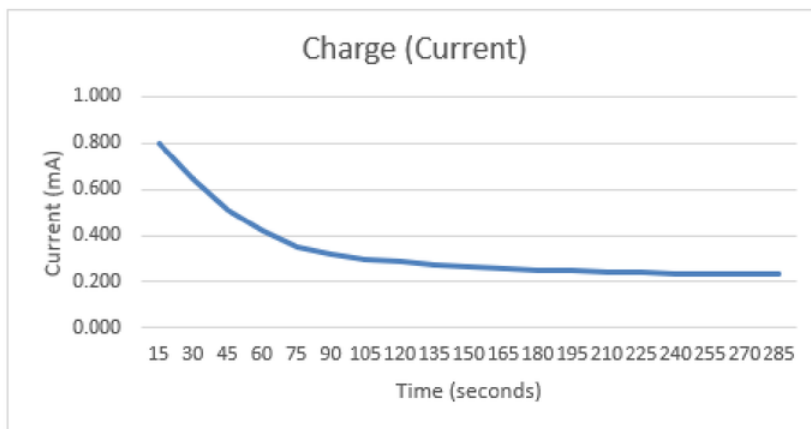


Figure 4: Graph showing charge of current

Above, you can see the charge for the capacitor and its transient behaviour for current. You can also see that the graph shows us that there is a decline of current from the circuit. As the voltage increases, the current drops until it gets to 0. The curve is exponential it doesn't reach 0 but comes very close. The reason behind this is because the when the capacitor gains charge the current is reduced to such a small value, this called negligible.

Below shows a graph of the charge transient of a capacitor in respect of voltage. The graph shows that the max voltage reaches a steady state of 5 time constants and the first time constant in the graph shows us it reaches nearly 63% of the max voltage.

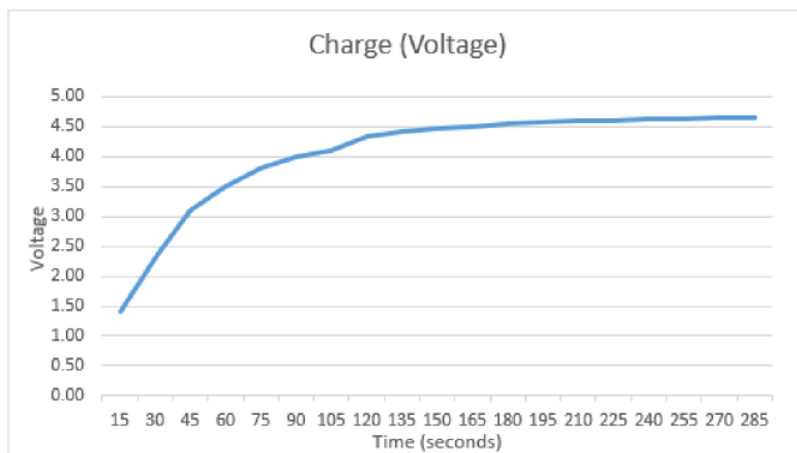


Figure 5: Graph showing charge of voltage

The table below shows the results for voltage and current against time which were gained from charge practical.

Charge		
t(s)	I (mA)	V
0	0.000	0.00
15	0.801	1.40
30	0.641	2.30
45	0.511	3.10
60	0.421	3.50
75	0.354	3.80
90	0.320	4.00
105	0.298	4.11
120	0.285	4.34
135	0.275	4.42
150	0.266	4.46
165	0.259	4.50
180	0.253	4.54
195	0.248	4.56
210	0.244	4.59
225	0.241	4.60
240	0.238	4.62
255	0.236	4.63
270	0.234	4.64
285	0.232	4.65

The simulated results are shown below, these results were gained through using multi-sim for both current and voltage of the charging capacitor. There were three random times chosen and calculations made will verify that the practical and multi-sim results were both very accurate.

Instantaneous Times for charge (voltage)

30 seconds

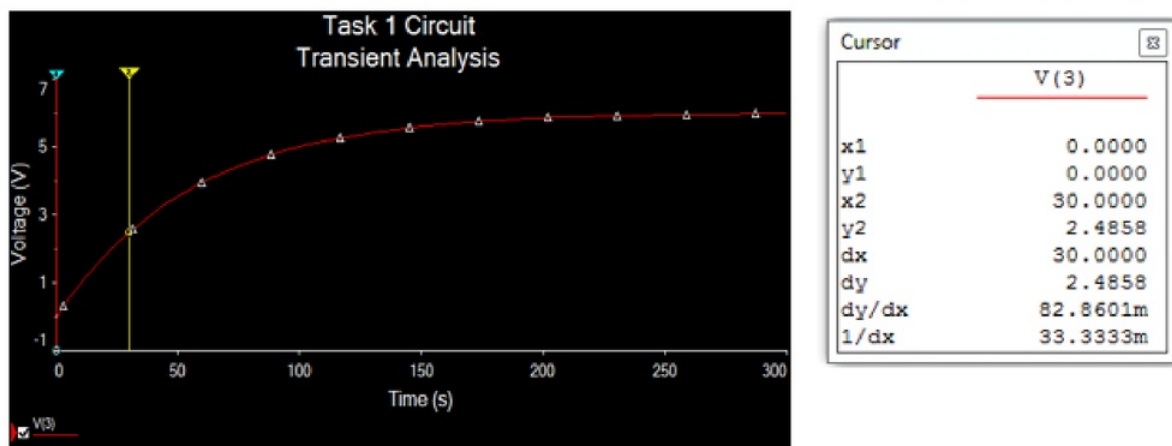


Figure 6: graph showing charge of voltage at 30 seconds

The graph above states that the capacitors charge is increasing and gets to its steady state at 5 time constants. 30 seconds was chosen for this example to find the voltage at a certain point and it was 2.48V.

60 seconds

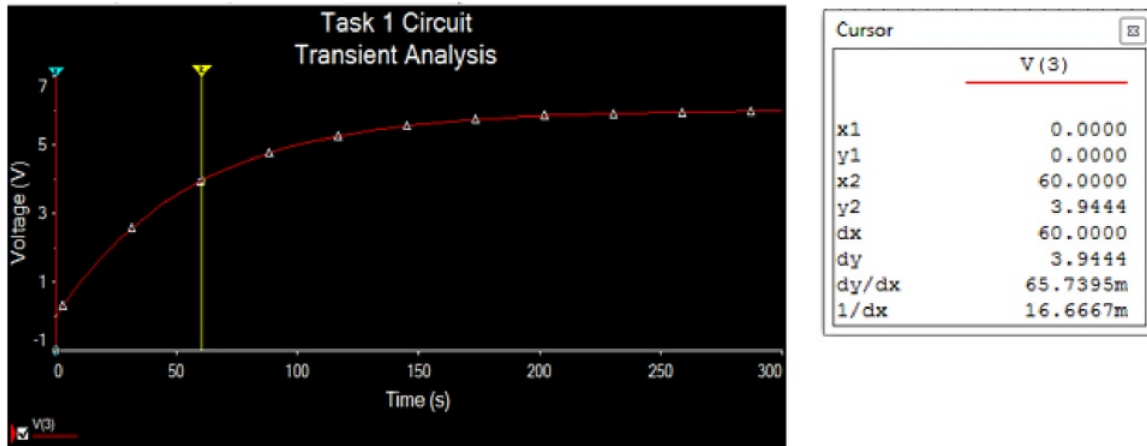


Figure 7: Vgraph showing charge of voltage at 60 seconds

The graph above states that the capacitors charge is increasing and gets to its steady state at 5 time constants. 60 seconds was chosen for this example to find the voltage at a certain point and it was 3.94V.

90 seconds

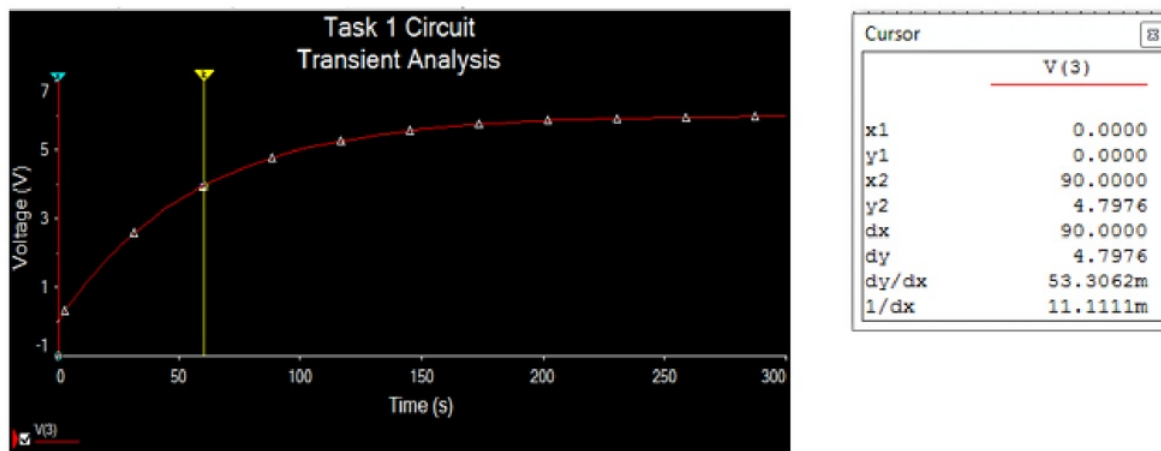


Figure 8: graph showing charge of voltage at 90 seconds

The graph above states that the capacitors charge is increasing and gets to its steady state at 5 time constants. 90 seconds was chosen for this example to find the voltage at a certain point and it was 4.7976V.

Calculations of instantaneous times for charge (voltage)

At 30 seconds

$$VC = 6 \left(1 - e^{-\frac{30}{56}} \right) = +2.48 \text{Volts}$$

At 60 seconds

$$VC = 6 \left(1 - e^{-\frac{60}{56}} \right) = +3.94 \text{Volts}$$

At 90 seconds

$$VC = 6 \left(1 - e^{-\frac{90}{56}} \right) = +4.79 \text{Volts}$$

The results gained from these calculations justify that the values gained from multi-sim and practical are very close. Any differences would down to human error or any components not being their exact value.

Instantaneous Times for charge (current)

At 30 seconds

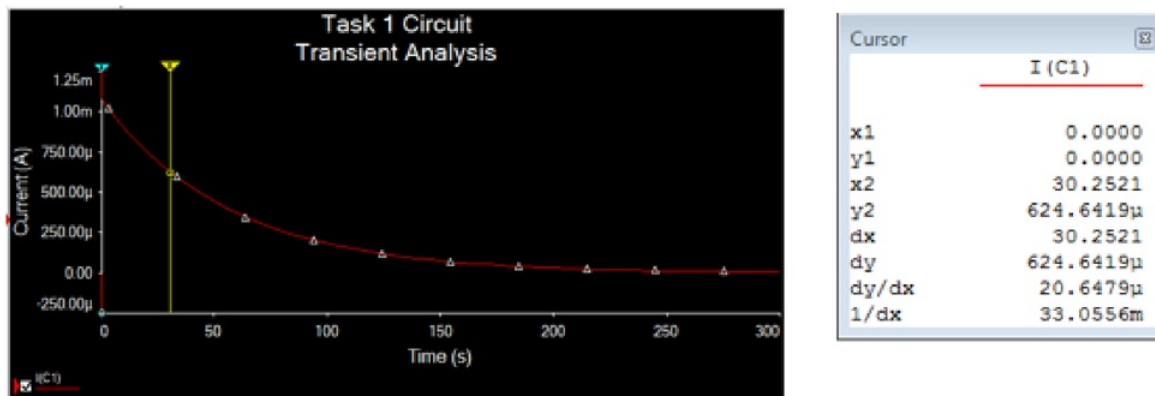
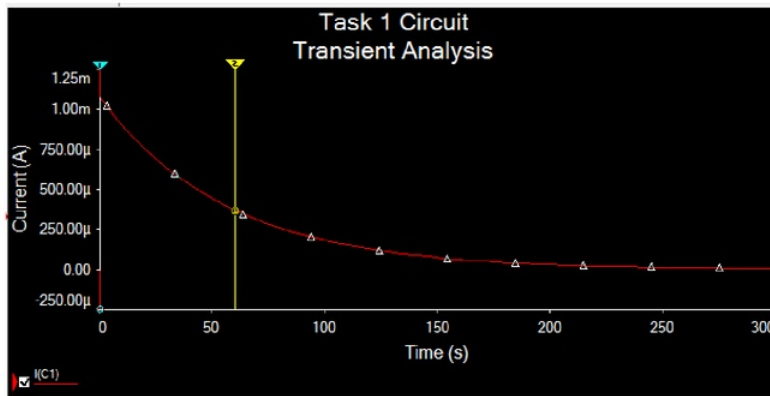


Figure 9: graph showing charge of current at 30 seconds

As can be seen from graph above the current is descending with regards to the time elapsed which means when the voltage to the capacitor is increasing, less current is drawn in the circuit. An elapsed time of 30 seconds was chosen for this example to find the current at a that certain time. A value of 624.6μA(0.62milli Amps) was produced.

At 60 seconds

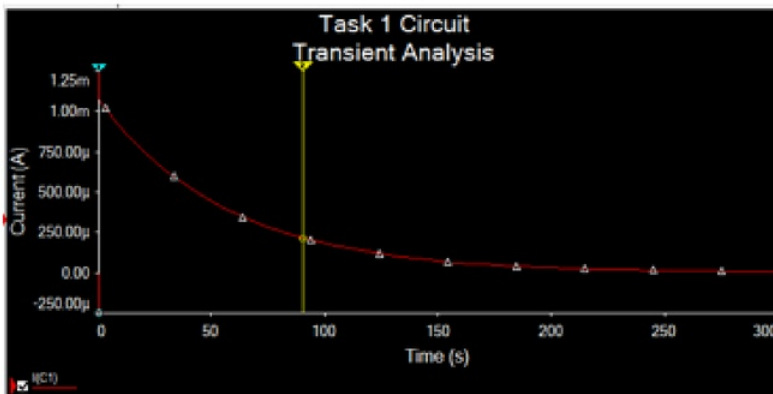


Cursor		I (C1)
x1	0.0000	
y1	0.0000	
x2	60.0000	
y2	367.0771μ	
dx	60.0000	
dy	367.0771μ	
dy/dx	6.1180μ	
1/dx	16.6667m	

Figure 10: graph showing charge of current at 60 seconds

As can be seen from graph above the current is descending with regards to the time elapsed which means when the voltage to the capacitor is increasing, less current is drawn in the circuit. An elapsed time of 60 seconds was chosen for this example to find the current at a that certain time. A value of 367.07μA (0.37milli Amps) was produced.

90 seconds



Cursor		I (C1)
x1	0.0000	
y1	0.0000	
x2	90.2521	
y2	213.7321μ	
dx	90.2521	
dy	213.7321μ	
dy/dx	2.3682μ	
1/dx	11.0801m	

Figure 11: graph showing charge of current at 90 seconds

As can be seen from graph above the current is descending with regards to the time elapsed which means when the voltage to the capacitor is increasing, less current is drawn in the circuit. An elapsed time of 90 seconds was chosen for this example to find the current at a that certain time. A value of 213.73 μA (0.21milli Amps) was produced.

Calculations of instantaneous times for current

At 30 seconds

$$I = 1.07 \left(e^{\frac{-30}{56}} \right) = +0.63 \text{ milliAmps}$$

At 60 seconds

$$I = 1.07 \left(e^{\frac{-60}{56}} \right) = +0.37 \text{ milliAmps}$$

At 90 seconds

$$I = 1.07 \left(e^{\frac{-90}{56}} \right) = +0.21 \text{ milliAmps}$$

Voltage table of results

The voltage comparison table which is below shows values for calculated, simulated and practical tests. As you can see from the table, the simulated and calculated values are very similar, but the practical values are out slightly. The reason behind the practical values being slightly out could be due to the 56K ohm resistor tolerance accuracy which is inherent from manufacture, the voltage meter accuracy or how accurate the time counting was.

Time	Calculated	Simulated	Practical
30 seconds	2.48V	2.4858V	2.30V
60 seconds	3.94	3.9444V	3.50V
90 seconds	4.79	4.7976V	4.0V

Current table of results

The current comparison table which is below shows values for calculated, simulated and practical tests. As you can see from the table, the simulated and calculated values are very similar, but the practical values are out slightly. The reason behind the practical values being slightly out could be due to the manufacture of the 56K ohm resistor due to the tolerance accuracy, the ammeter accuracy or how accurate the time counting was.

Time	Calculated	Simulated	Practical
30 seconds	0.63mA	624.64μ	0.641mA
60 seconds	0.366mA	367.1μ	0.421mA
90 seconds	0.214mA	213.73μ	0.320mA

Task 2 - The transient behaviour of a discharging capacitor

This task involved removing the switch and the 6V battery supply on the bread board and installing a pulse voltage labelled V1.

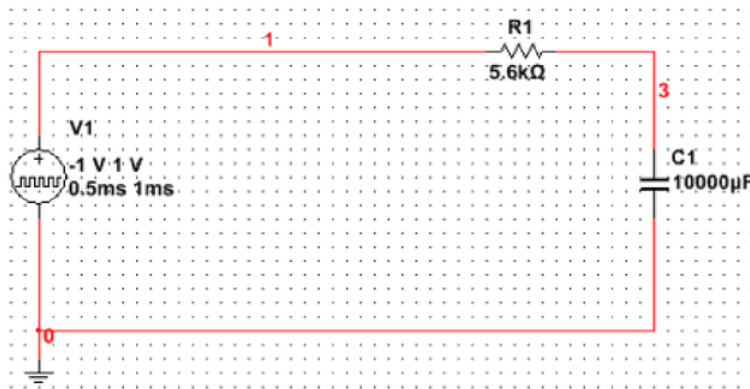


Figure 12: Circuit of discharging capacitor

In task 1, calculations and tests were carried out on how the capacitor charges fully up going through a resistor only until it reaches 5 time constants to get its steady state.

After the circuit was modified, it was used for the discharge of a capacitor. The difference in this test is that the power is turned off instead of being turned on, but still went on for 285 seconds and took values for voltage and current during the discharge.

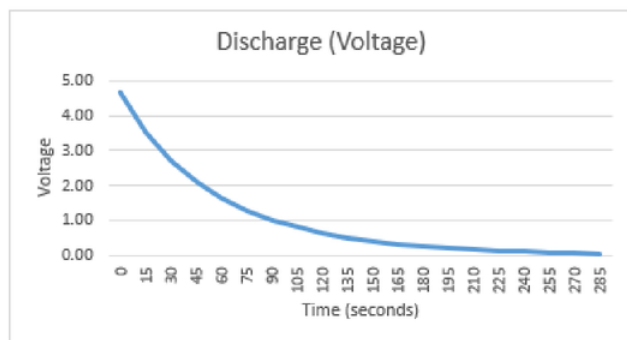


Figure 13: Graph showing voltage discharge

In the graph above you can see the discharge voltage of the capacitor when the power is turned off in the circuit. Different from the last test, you can see that the voltage is dropping as time elapses as the circuit uses up the energy, resulting in the charge of the capacitor declining.

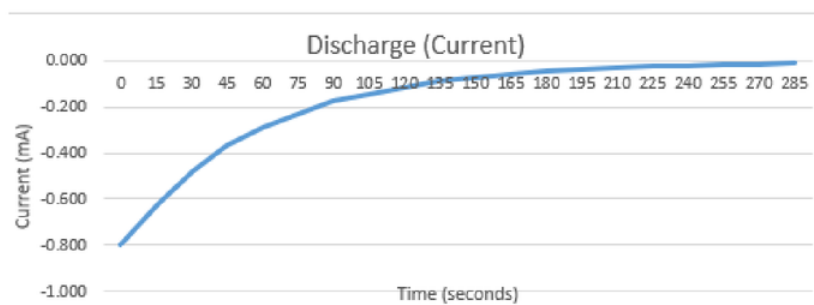


Figure 14: Graph showing current of discharge

In the graph above it shows the current in the discharge of a capacitor in a RC circuit. The graph is showing negative and the negative signs show the direction of which the current is flowing in. As the capacitor discharge decreases so does the rate of the current flow, it decreases in the opposite direction.

The table below shows the results for voltage and current against time which were gained from the discharge practical.

Discharge		
t(s)	I (mA)	V
0	-0.800	4.66
15	-0.623	3.53
30	-0.482	2.69
45	-0.370	2.09
60	-0.291	1.64
75	-0.228	1.29
90	-0.174	1.01
105	-0.147	0.80
120	-0.112	0.63
135	-0.087	0.50
150	-0.072	0.40
165	-0.056	0.32
180	-0.046	0.25
195	-0.036	0.20
210	-0.029	0.16
225	-0.023	0.12
240	-0.019	0.11
255	-0.015	0.09
270	-0.012	0.07
285	-0.010	0.06

The simulated results are shown below, these results were gained through using multi-sim for both current and voltage of the discharging of the capacitor. The calculations made will verify that the practical and multi-sim were both very similar.

Instantaneous Times for discharge (voltage)

At 30 seconds

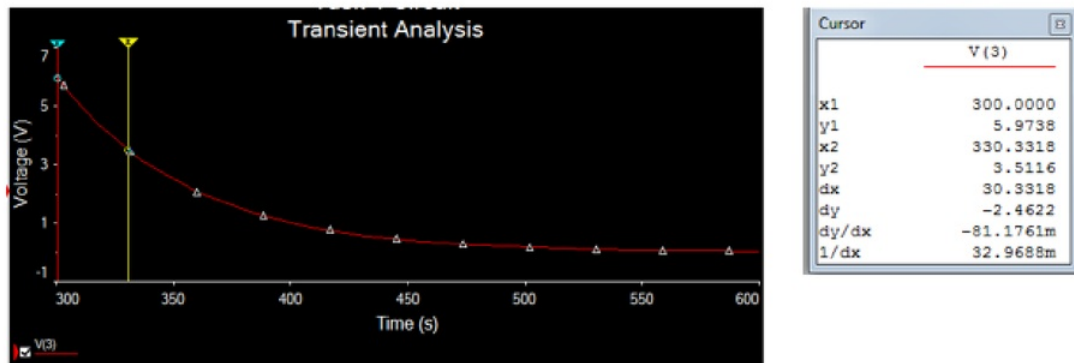


Figure 15:Graph showing discharge of voltage at 30 seconds

As you can understand from the graph above the curve is descending which means that the capacitor voltage is discharging. Firstly 30 seconds was chosen for this example to find the voltage at that time. The voltage at 30 seconds was 3.51V.

60 seconds

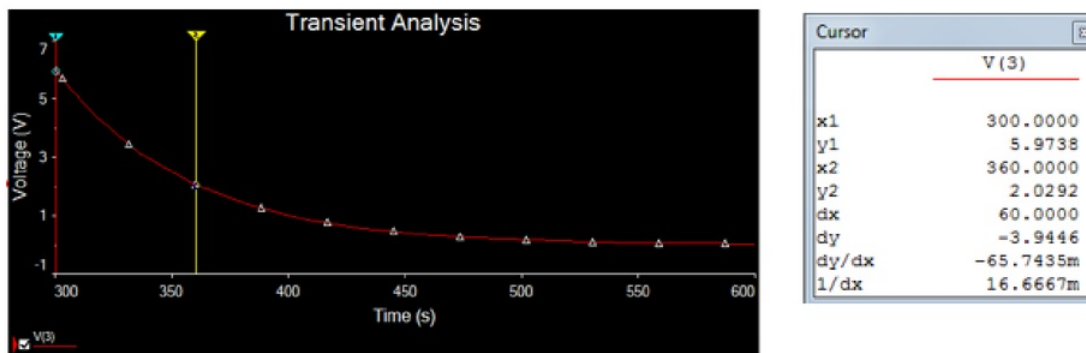


Figure 16:Graph showing discharge of voltage at 60 seconds

As you can understand from the graph above the curve is descending which means that the capacitor voltage is discharging. Secondly 60 seconds was chosen for this example to find the voltage at that time. The voltage at 60 seconds was 2.029V.

90 seconds

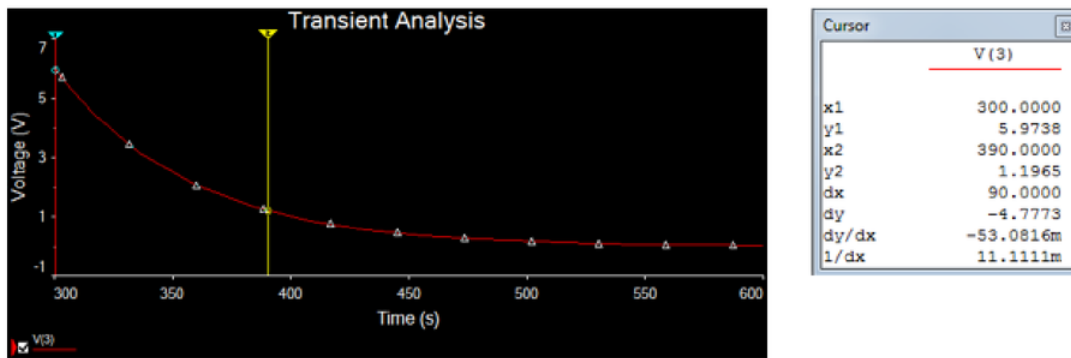


Figure 17: Graph showing discharge of voltage at 90 seconds

As you can understand from the graph above the curve is descending which means that the capacitor voltage is discharging. Thirdly 90 seconds was chosen for this example to find the voltage at that time. The voltage at 90 seconds was 1.1965V.

Calculations of instantaneous times for discharge (voltage)

At 30 seconds

$$VC = 6 \left(e^{\frac{-30}{56}} \right) = 3.51 \text{Volts}$$

At 60 seconds

$$VC = 6 \left(e^{\frac{-60}{56}} \right) = 2.06 \text{Volts}$$

At 90 seconds

$$VC = 6 \left(e^{\frac{-90}{56}} \right) = 1.20 \text{Volts}$$

As you can see above these calculations justify that the values gained from multi-sim are the same as the calculations but the practical on the other hand is slightly out. The reason behind the practical values being slightly out could be due to the manufacture of the 56K ohm resistor due to the tolerance accuracy or the voltmeter accuracy.

Instantaneous Times for discharge (current)

30 seconds

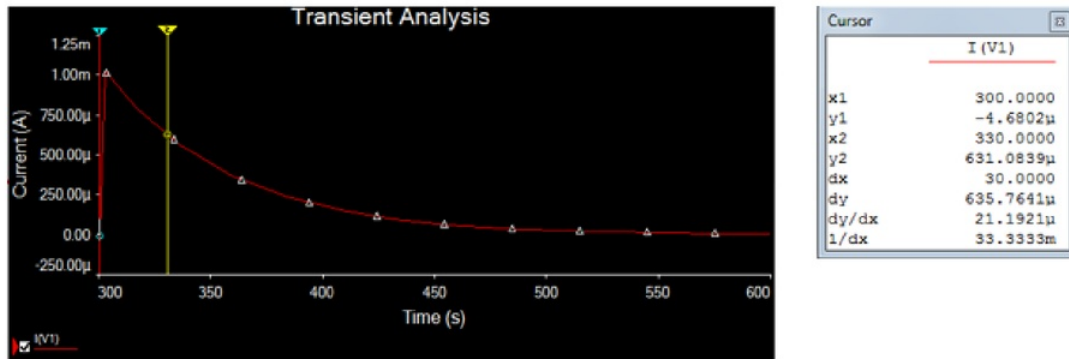


Figure 18: Graph showing discharge of current at 30 seconds

As you can understand from the graph above the curve is descending which means that the capacitor current is discharging. Firstly 30 seconds was chosen for this example to find the current at that time. The current at 30 seconds was 631.08μA (0.63m)

60 seconds

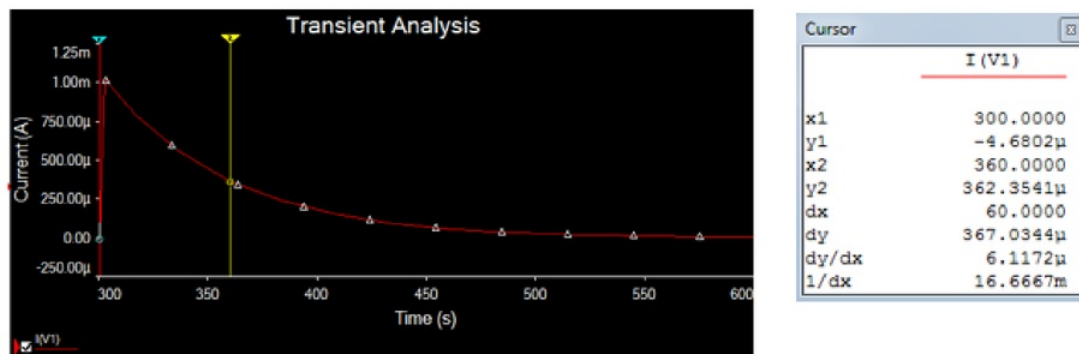


Figure 19: Graph showing discharge of current at 60 seconds

In the graph above it shows the curve is descending, which means that the capacitor current is discharging. Secondly 60 seconds was chosen for this example to find the current at that time. The current at 60 seconds was 362.03μA (0.36mA)

90 seconds

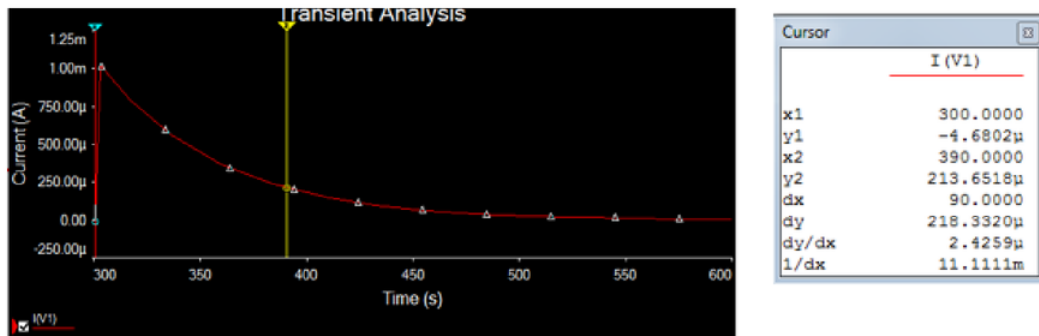


Figure 20: Graph showing discharge of current at 90 seconds

In the graph above it shows the curve is still descending, which means that the capacitor current is continuing to discharge. Thirdly 90 seconds was chosen for this example to find the current at that time. The current at 90 seconds was 213.65μA (0.21mA).

Current table of results

The current comparison table which is below shows values for calculated, simulated and practical tests. As you can see from the table, the simulated and calculated values are very similar, but the practical values are out slightly. The reason behind the practical values being slightly out could be due to the manufacture of the 56K ohm resistor due to the tolerance accuracy, the ammeter accuracy or how accurate the time counting was.

Time	Calculated	Simulated	Practical
30 seconds	0.63mA	631.08μ	-0.482mA
60 seconds	0.366mA	362.35μ	-0.291mA
90 seconds	0.214mA	213.65μ	-0.174mA

Voltage table of results

The voltage comparison table which is below shows values for calculated, simulated and practical tests. As you can see from the table, the simulated and calculated values are very similar, but the practical values are out slightly. The reason behind the practical values being slightly out could be due to the 56K ohm resistor tolerance accuracy which is inherent from manufacture, the voltage meter accuracy or how accurate the time counting was.

Time	Calculated	Simulated	Practical
30 seconds	3.51V	3.511V	2.69V
60 seconds	2.06V	2.029V	1.64V
90 seconds	1.20V	1.196V	1.01V

Task 3 – The transient behaviour of a more complex circuit

For this task an investigation will be carried out on a complex circuit, the time constant will have to be calculated using the correct formula below, this will allow me to predict the instantaneous time values for current and voltage.

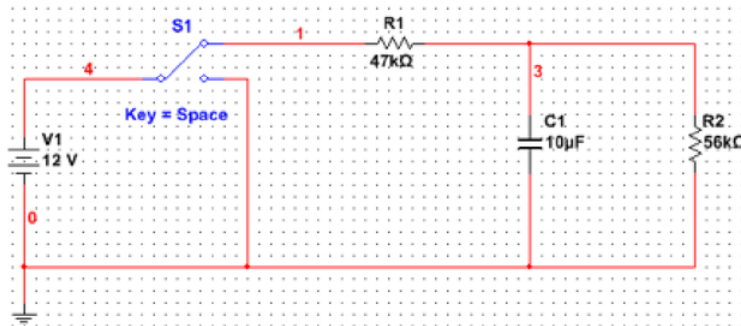


Figure 21:Complex circuit

Above you can see a complex circuit. This circuit consists of a capacitor which is parallel to a resistor (R2). To work out the time constant of the circuit, you will have to use the parallel resistance and other calculations.

If the power supply with taken away the resistors, they will go parallel and the calculations below will have to be carried out.

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

$$RT = \frac{47K\Omega \times 56K\Omega}{47K\Omega + 56K\Omega}$$

$$RT = 25553.4\Omega$$

$$T = RT \times C1$$

$$T = 25553.4\Omega \times 0.00001F$$

$$T = 0.255534s$$

The next step was to work out the voltage drop from across each resistor.

Voltage drop across Resistor 1 is below

$$VD1 = \frac{R1}{R1 + R2} \times V1$$

$$VD1 = \frac{47000\Omega}{47000\Omega + 56000\Omega} \times 12$$

$$VD1 = 5.5V$$

Voltage drop across Resistor 2 is below

$$VD2 = \frac{R1}{R1 + R2} \times V1$$
$$VD2 = \frac{56K}{47K + 56K} \times 12$$
$$VD2 = 6.5V$$

Instantaneous voltage calculations

$$Vc = VMAX \left(1 - e^{-\frac{t}{T}} \right)$$
$$Vc = 12 \left(1 - e^{-\frac{-2}{1.33}} \right) = 9.33V$$
$$Vc = 12 \left(1 - e^{-\frac{-4}{1.33}} \right) = 11.40V$$

To work out the VMAX across the capacitor labelled C1 is show below

$$12V - 5.5V = 6.5V$$

Instantaneous times for charge (current)

15 milliseconds

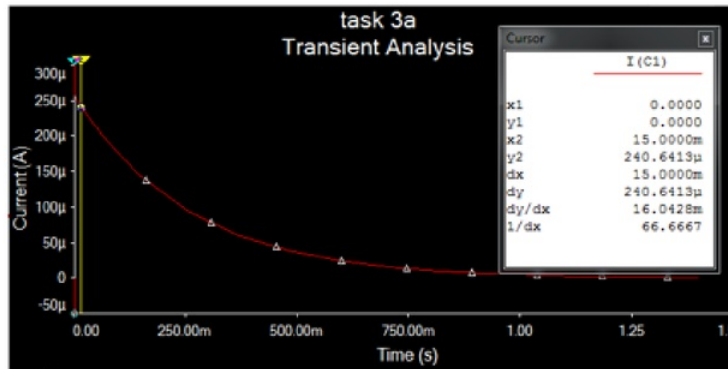


Figure 22: Graph showing charge of current 15 milliseconds

As you can see from the graph above, the current is higher at the beginning. The reason for this is because the capacitor acts as a short circuit. You can also see that the curve is going down which means that the current is descending. Firstly 15 milliseconds was chosen as an example to find the current at a certain time and it was 240.64 μ A.

60 milliseconds

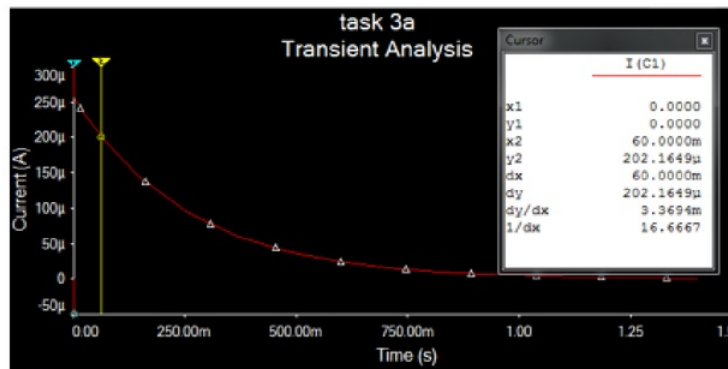


Figure 23: Graph showing charge of current 60 milliseconds

As you can see from the graph above, the current is higher at the beginning. The reason for this is because the capacitor acts as a short circuit. You can also see that the curve is going down which means that the current is descending. Secondly 30 milliseconds was chosen as an example to find the current at a certain time and it was 202.15 μ A.

165 milliseconds

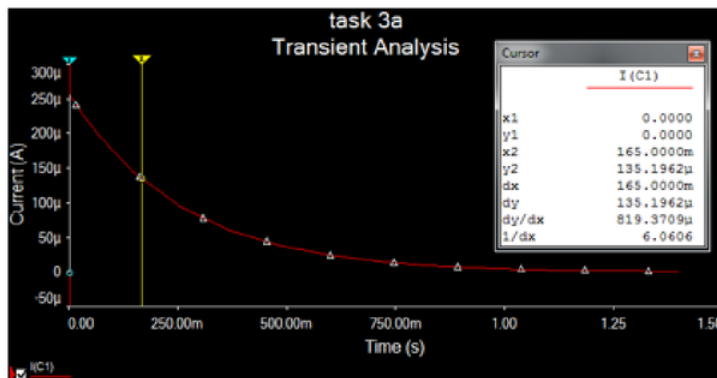


Figure 24: Graph showing charge of current 165 milliseconds

As you can see from the graph above, the current is higher at the beginning. The reason for this is because the capacitor acts as a short circuit. You can also see that the curve is going down which means that the current is descending. Thirdly 165 milliseconds was chosen as an example to find the current at a certain time and it was 135.19μA.

All the graphs above show the instantaneous times that were chosen to make sure that my calculations were correct and accurate. The calculations are below.

$$I_{MAX} = \frac{6.52}{255534} = 260.8\mu A$$

R1 is being used for I_{max} because of the capacitor acts like a short circuit. This means that the current will travel in the path with the least resistance, ignoring R2, due to this the current will only travel through the capacitor. Once the I_{MAX} value has been discovered, the instantaneous values can be discovered by the calculations below.

Calculations for current

15 milliseconds

$$I = 260.8\mu A \left(e^{\frac{-15\text{milliseconds}}{.26}} \right) = +246.2\mu A$$

60 milliseconds

$$I = 260.8\mu A \left(e^{\frac{-60\text{milliseconds}}{.26}} \right) = +207.05\mu A$$

165 milliseconds

$$I = 260.8\mu A \left(e^{\frac{-165\text{milliseconds}}{.26}} \right) = +138.26\mu A$$

Table below is a comparison table for charge of current

Time	Calculated	Simulated
15 milliseconds	246.2 μ A	240.64 μ A
60 milliseconds	207.05 μ A	202.15 μ A
165 milliseconds	138.26 μ A	135.19 μ A

Instantaneous times for discharge (current)

15 milliseconds

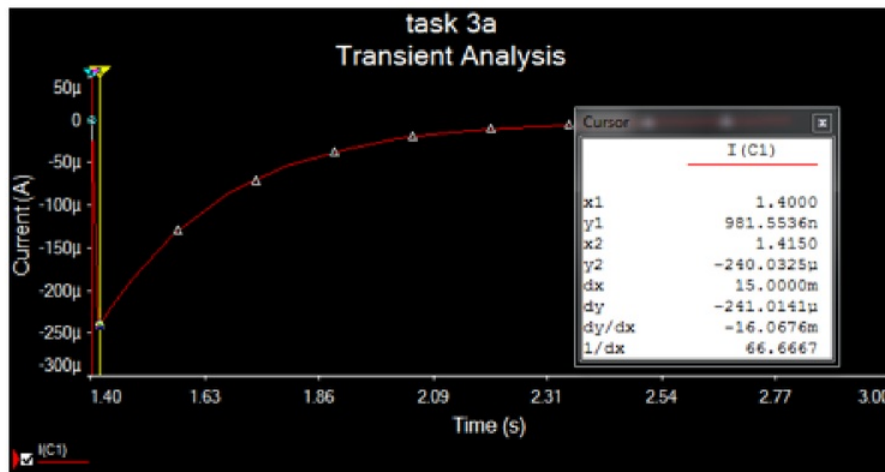


Figure 25: Graph showing discharge of current at 15 milliseconds

The graph above states that the curve reaches a steady state, meaning that's the capacitor is charged after 5 time constants. As the curve increases so does the current. Firstly 15 milliseconds was chosen for this example to find out the current at a certain point and it was -240.03 μ A.(0.24mA)

60 milliseconds

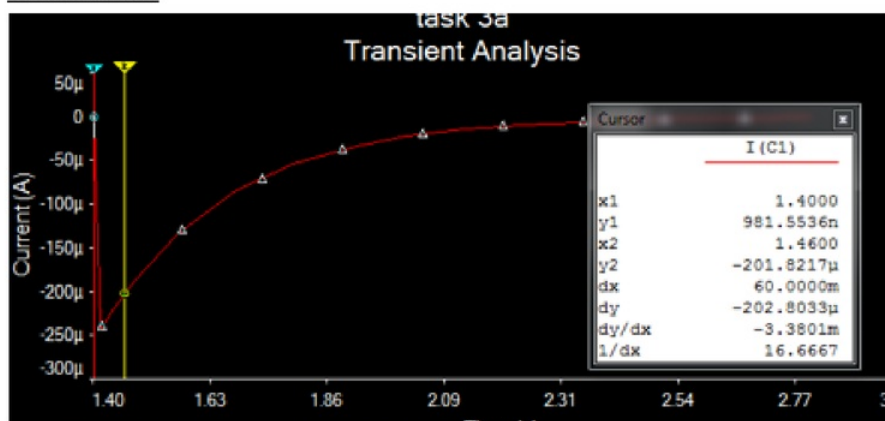


Figure 26: Graph showing discharge of current at 60 milliseconds

The graph above states that the curve reaches a steady state, meaning that's the capacitor is charged after 5 time constants. As the curve increases so does the current. Secondly 65 milliseconds was chosen for this example to find out the current at a certain point and it was -201.82µA (0.2mA)

165 milliseconds

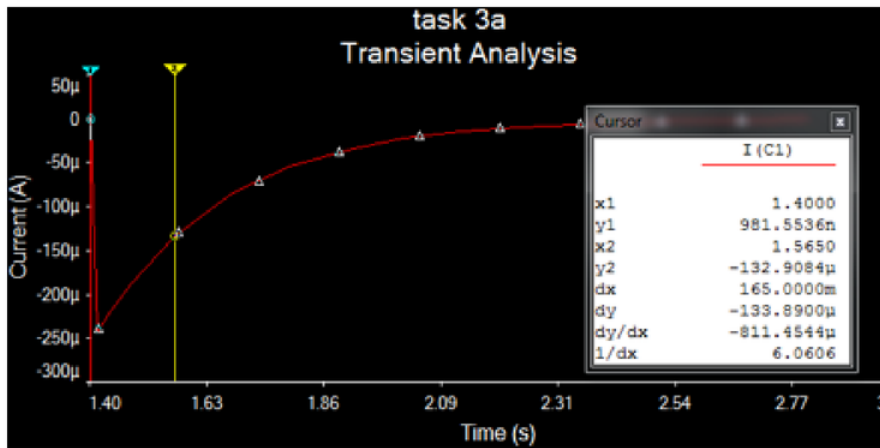


Figure 27: Graph showing discharge of current at 165 milliseconds

The graph above states that the curve reaches a steady state, meaning that's the capacitor is charged after 5 time constants. As the curve increases so does the current. Thirdly 165 milliseconds was chosen for this example to find out the current at a certain point and it was -132.91µA. (0.13mA)

Calculations for instantaneous times discharge (current)

15milliseconds

$$I = -260.8\mu\text{A} \left(e^{\frac{-15\text{milliseconds}}{.26}} \right) = -246.2\mu\text{A}$$

60 milliseconds

$$I = -260.8\mu\text{A} \left(e^{\frac{-60\text{milliseconds}}{.26}} \right) = -207.05\mu\text{A}$$

165 milliseconds

$$I = -260.8\mu\text{A} \left(e^{\frac{-165\text{milliseconds}}{.26}} \right) = -138.26\mu\text{A}$$

Table of results for current discharge

Time	Calculated	Simulated
15 seconds	-246.2µA	-240.03µA
60 seconds	-207.05µA	-201.82µA
165 seconds	-138.26µA	-132.91µA

Task 4 - Transient behaviour for inductive circuit

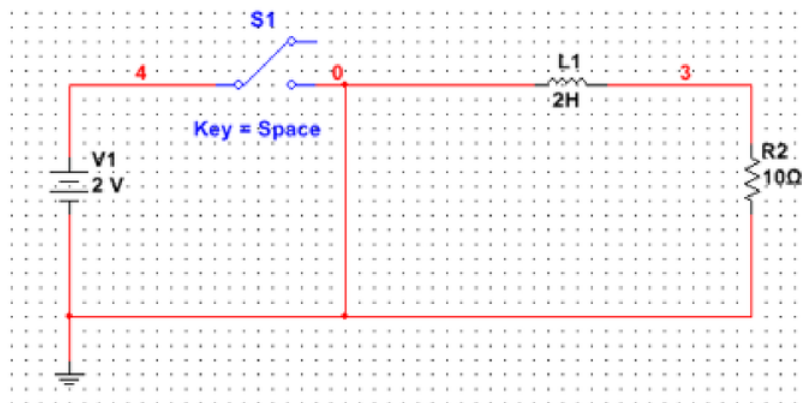


Figure 28: Inductive circuit

Time constant calculation for inductive circuit

$$T = \frac{L}{R}$$

$$T = \frac{2}{10}$$

$$T = .2s$$

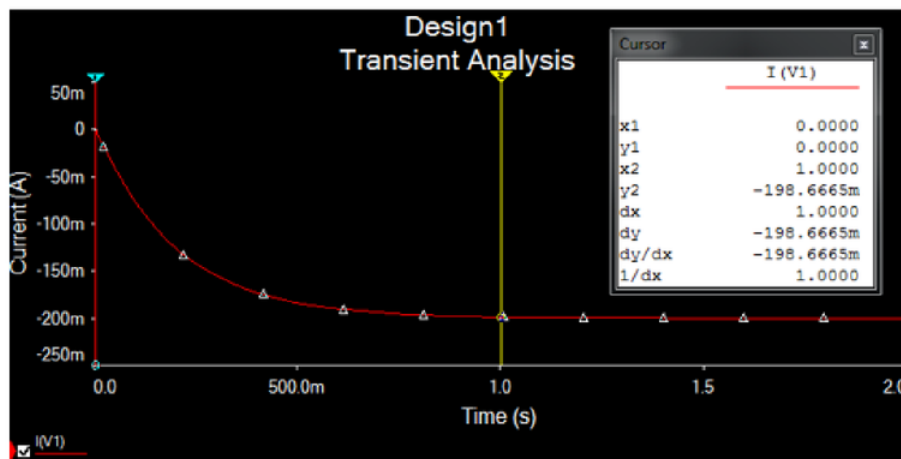


Figure 29: 5 time constants

From the graph above you can see that the curve is declining which means that the current is also falling. 1 second was chosen for this example and the current was -198.67mA.

Instantaneous times for inductive circuit (current)

60 milliseconds

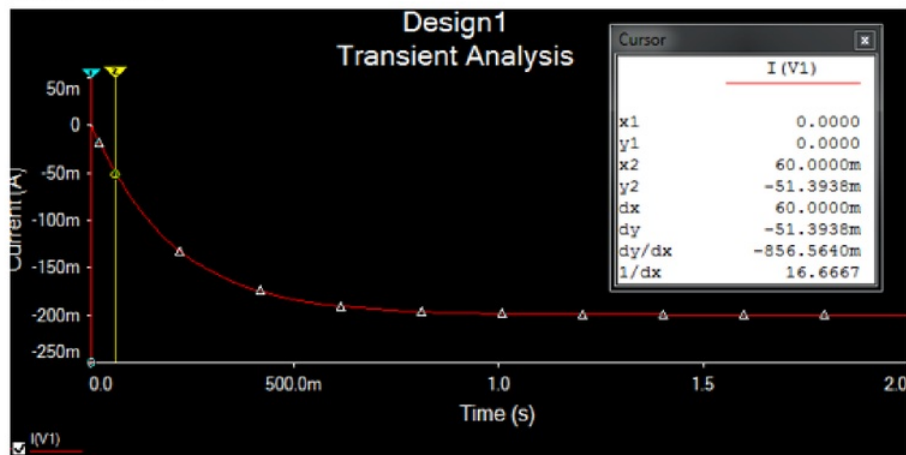


Figure 30: Graph showing current at 60 milliseconds

The graph above tells us that the current is decreasing due to the curve descending. Firstly 60ms was chosen for this example.

Calculation below

$$I_{MAX} \left(1 - e^{-\frac{t}{T}} \right)$$
$$-0.2 \left(1 - e^{-\frac{60 \text{ milliseconds}}{0.2}} \right) = -0.052 \text{ mA}$$

The calculation above proves that they match with the simulated results.

100 milliseconds

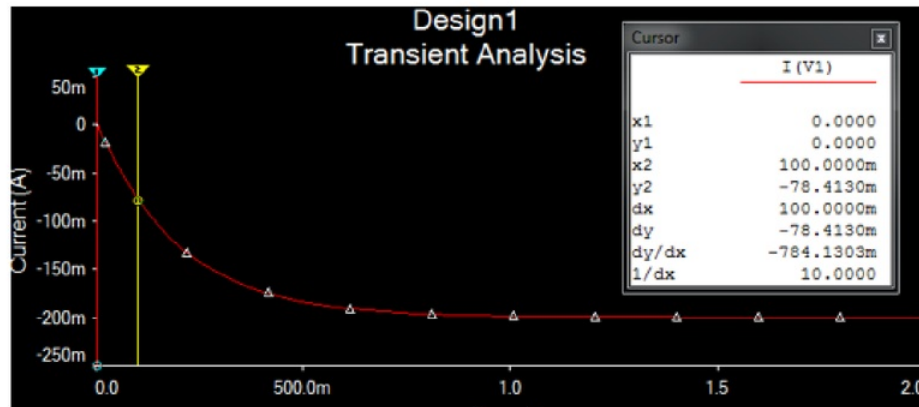


Figure 31: Graph showing current at 100 milliseconds

The graph above states that the curve is descending which also tells us that the current is decreasing. Secondly 100 milliseconds was chosen.

Calculation for 100ms below

$$-0.2 \left(1 - e^{\frac{-100 \text{ milliseconds}}{0.2}} \right) = -0.079 \text{ mA}$$

This calculation, just like the last one proves that they are correspondent.

500 milliseconds

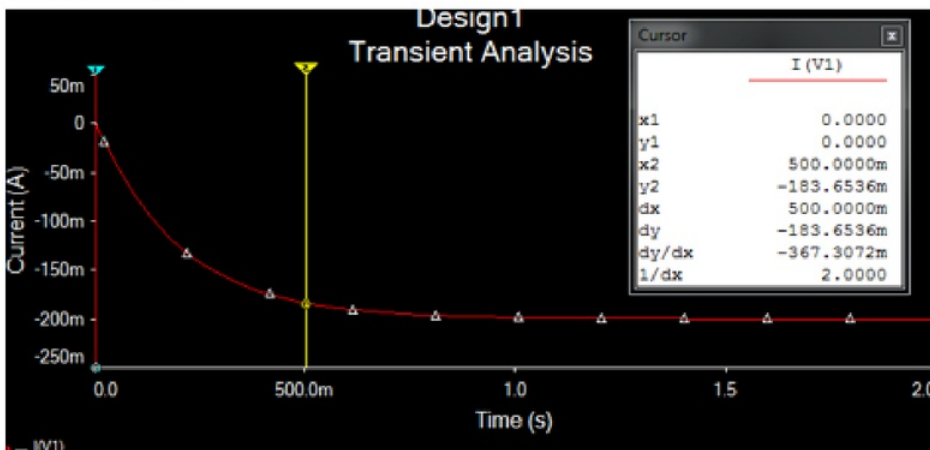


Figure 32: Graph showing current at 500 milliseconds

The graph above states that the current again is falling due to the curve descending. Thirdly 500 milliseconds was chosen for this example. The calculation for 500 milliseconds is below:

$$-0.2 \left(1 - e^{\frac{-500 \text{ milliseconds}}{0.2}} \right) = -0.183 \text{ milliAmps}$$

The calculation proves that it is same as the simulated value.

Falling time at 100mA

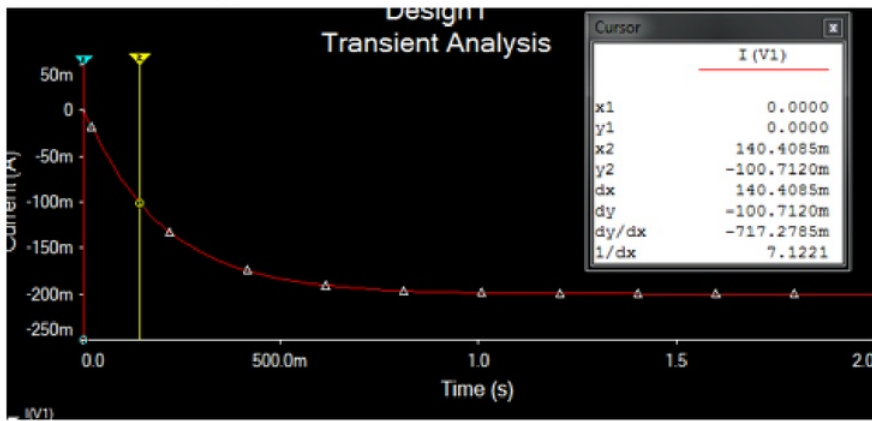


Figure 33: Time to fall 100mA

The time it took the current to fall to 100mA = 140.41ms

$$-0.2 \left(\ln \left(\frac{0.1}{0.2} \right) \right) = 138.6ms$$

falling time at 10mA

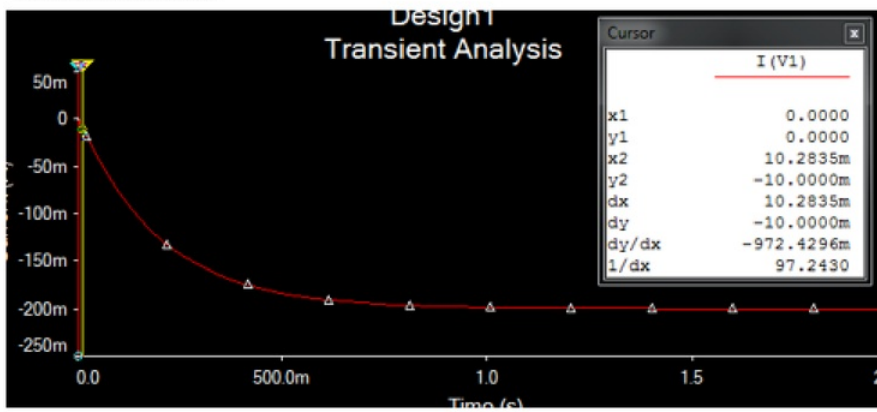


Figure 34: Time to fall 10mA

The time it took the current to fall to 10mA = 10.28ms

$$-0.2 \left(\ln \left(\frac{0.01}{0.2} \right) \right) = 10.28ms$$

As you can see in the calculation and graph above it took 10.28ms. The simulated result and calculation are the same.

Further Calculations

$$T = \frac{L}{R}$$

$$T = \frac{2}{10}$$

$$T = 0.2\text{seconds}$$

Calculations for LR discharge for every 0.2 seconds are below.

$$0.4\text{seconds} = 0.632 (200 - 126.4) + 126.4 = 172\text{milliAmps}$$

$$0.6\text{seconds} = 0.632 (200 - 172.9) + 172.9 = 190\text{milliAmps}$$

$$0.8\text{seconds} = 0.632 (200 - 190) + 190 = 196.3\text{milliAmps}$$

$$1\text{second} = 0.632 (200 - 196.3) + 196.3 = 198.6\text{milliAmps}$$

3. Conclusions and Recommendations

Overall this assignment was a success. The calculated values, practical values and simulated values were all very similar with a few slightly out, this was down to component, instrument or even human error. The other slight problem was that the rounding off of decimal places that could have been made more thorough. Taking in all the differences in errors that happened and the number of factors that had to be considered, the results from the practical, simulation and calculations were very accurate and comparable.

If this assignment was to be carried out again, there would be only a couple of changes made and there would be a slightly different approach also. Examples of these would be more attention to the accuracy of the components and measuring instruments used. Next time also it would be ideal to use different valued and sized capacitors, resistors and inductors, this would mean they would have longer time constants. If this was the case the results gained would be much more accurate and the practical result values would be much more like the calculated values.

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principles assignment 1 transients

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

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GRADING FORM: CSG-RUBIC

NICHOLAS DEVOY

0

RESEARCH-INFORMED LITERATURE

KNOWLEDGE AND UNDERSTANDING



There are errors which are confusing understanding.

12/25

ANALYSIS



Errors in calcs, missing calcs and sims missing. Too many errors overall.

18/40

PRACTICAL APPLICATION AND DEP.



Part of the report ties in prac with theory.

12/25

SKILLS FOR PROFESSIONAL PRAC.



Report is reasonable.

5/10