UNIVERSITY
OF WOLLONGONG
IN DUBAI

Assignment Cover Sheet

Student Name	**Student number**
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Subject code and name	ECTE202 – Circuits and Systems
Lab Instructor	Ms. Eva Barbulescu
Title of Assignment	Lab 4
Lab Number	4

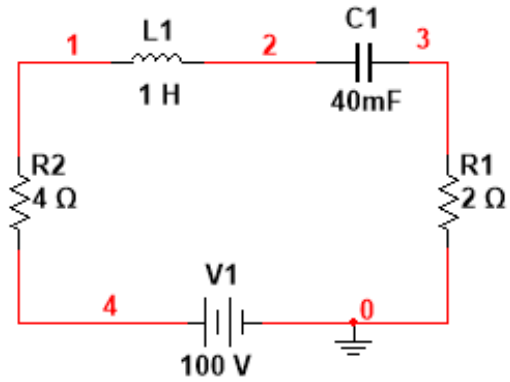
Student declaration and acknowledgment

By submitting this assignment online, the submitting student declares on behalf of the team that:

1. All team members have read the subject outline for this subject, and this assessment item meets the requirements of the subject detailed therein.
2. This assessment is entirely our work, except where we have included fully documented references to the work of others. The material in this assessment item has yet to be submitted for assessment.
3. Acknowledgement of source information is by the guidelines or referencing style specified in the subject outline.
4. All team members know the late submission policy and penalty.
5. The submitting student undertakes to communicate all feedback with the other team members.

Lab 4

Task 1: RLC Series Circuit



Voltage at stabilization (V)	100.023
Time of stabilization (s)	2.779
Number of Samples	73
Type of Graph	Underdamped

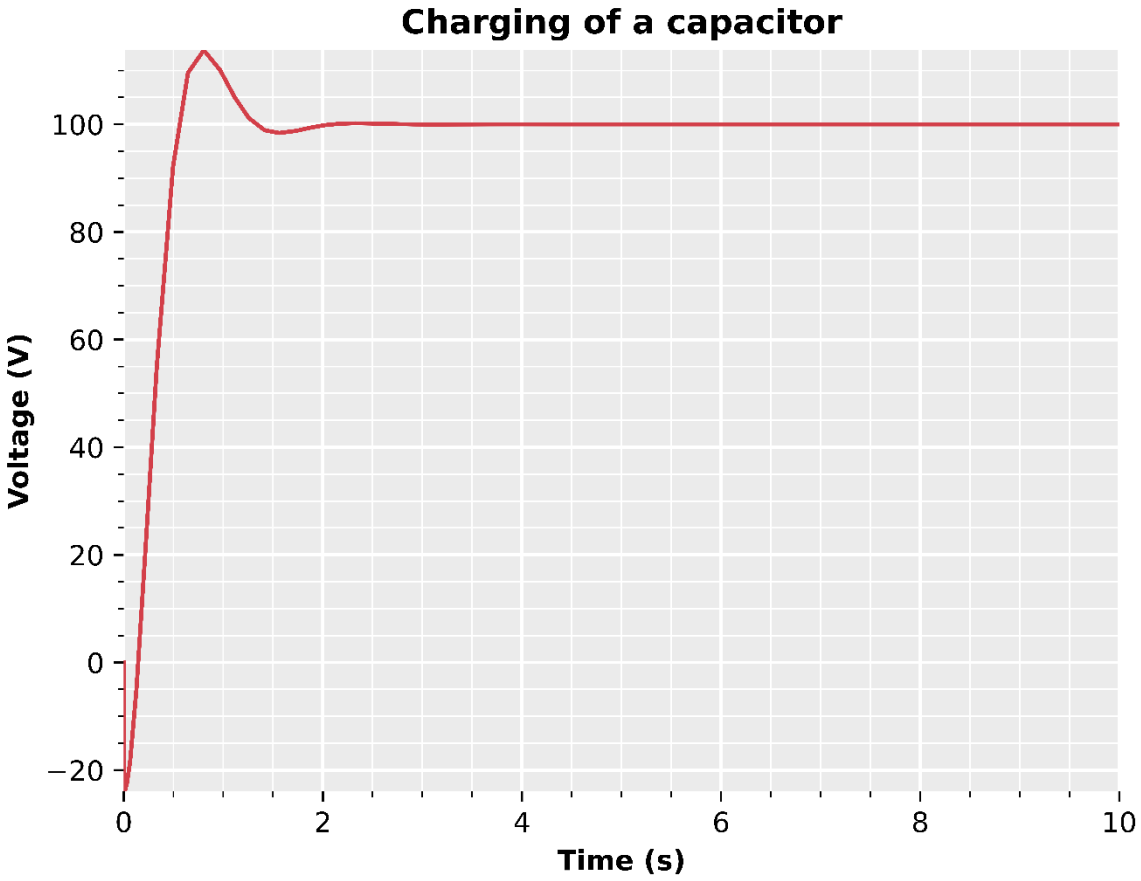
$\alpha = \frac{R}{2L}$ $\omega_0 = \frac{1}{\sqrt{LC}}$

$R = 6\ \Omega$ $L = 1\ H$ $C = 40 \times 10^{-3}\ F$

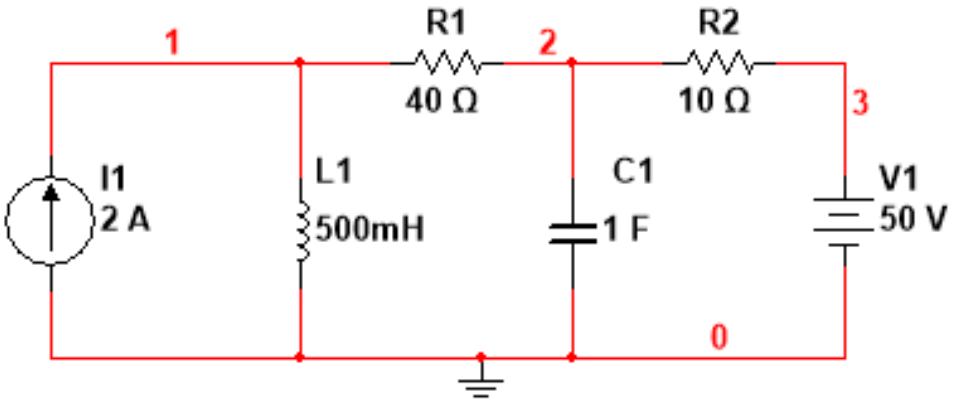
$\alpha = \frac{6}{2\times1} = 3$ $\omega_0 = \frac{1}{\sqrt{1\times40\times10^{-3}}} = 5$

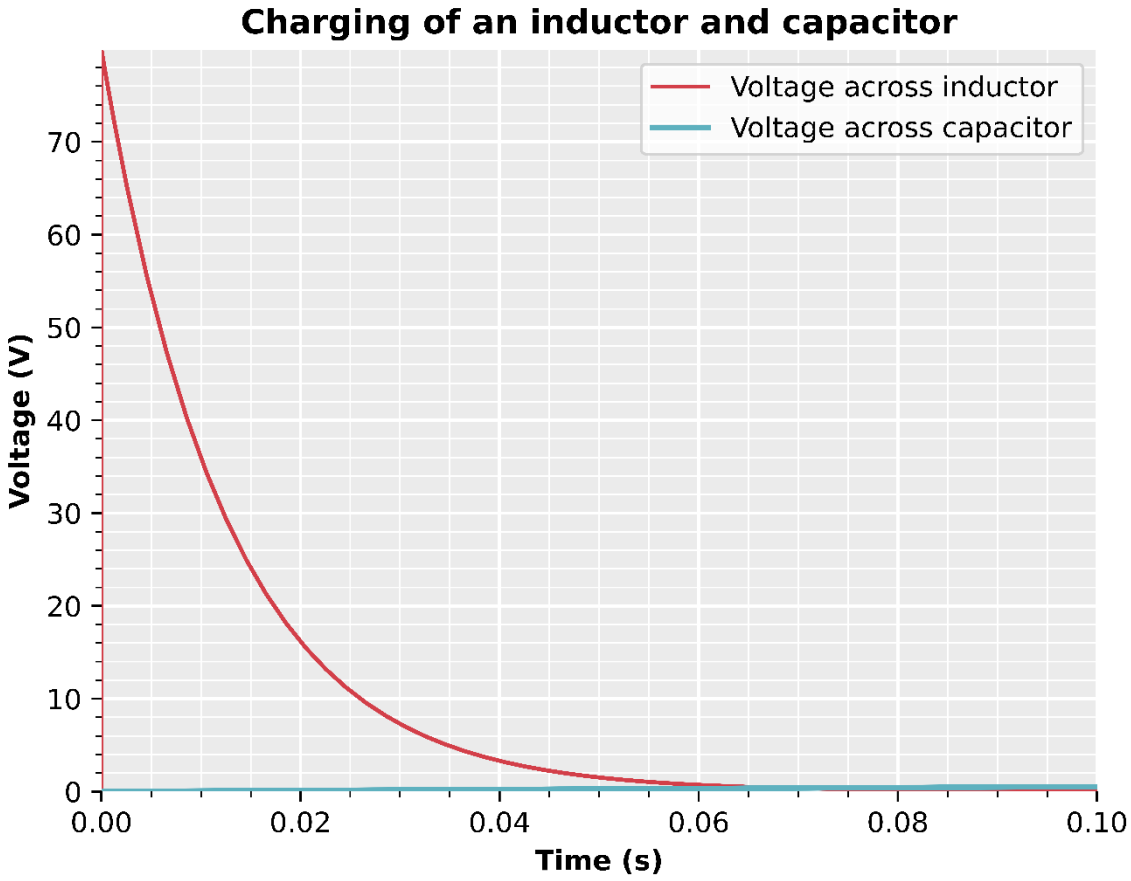
$\alpha < \omega_0 \Rightarrow$ Underdamped

The graph shows the voltage across a capacitor during charging in an underdamped RLC circuit. The overshoot before settling indicates the system is underdamped.


Charging of a capacitor
Voltage (V)
100
80
60
40
20
0
−20
0
2
4
6
8
10
Time (s)

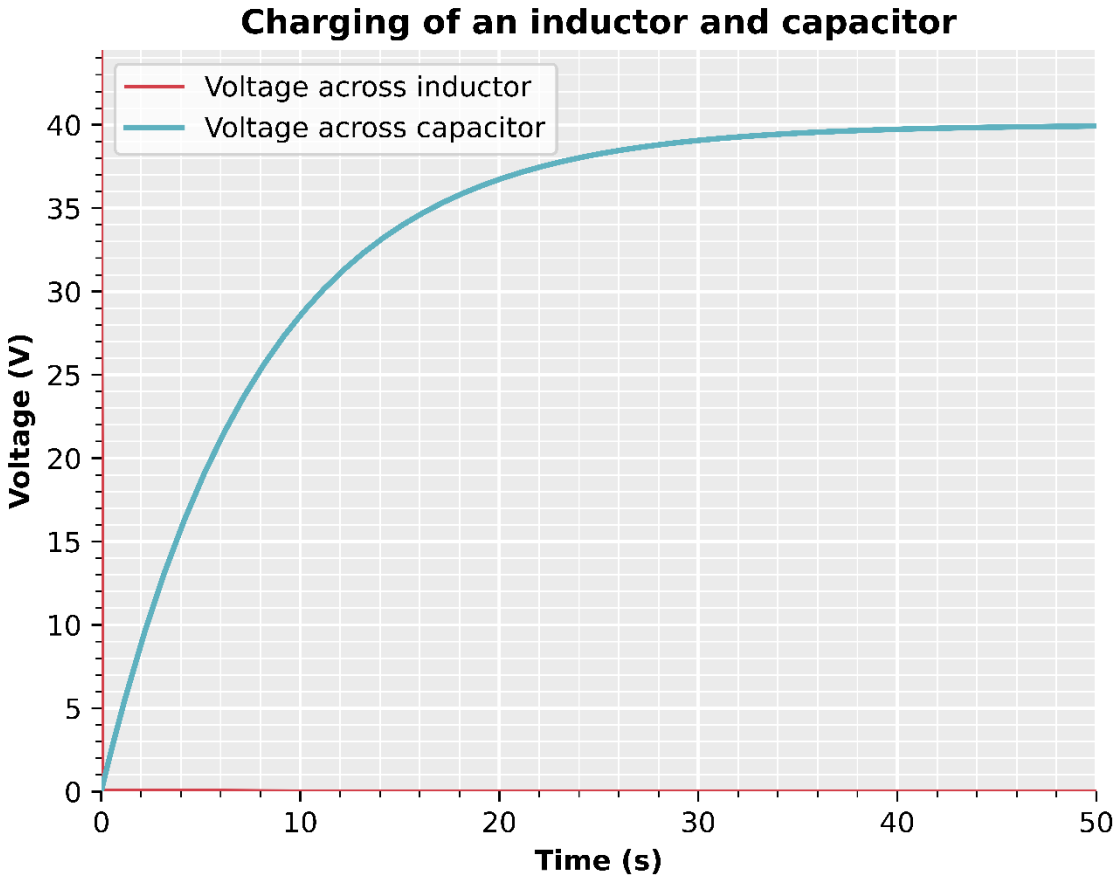
Task 2: RLC Parallel Circuit





The value reached by the voltage spike is 79.872 V

The inductor voltage shows an exponential decay from its initial peak to zero, demonstrating typical overdamped or critically damped circuit behaviour. Meanwhile, the capacitor voltage stays near 0 throughout, suggesting the circuit is dominated by the inductor rather than the capacitor.



Voltage across the capacitor follows an exponential rise, characteristic of an RLC circuit, where the capacitor gradually charges and asymptotically approaches its final voltage.

Voltage across the inductor initially spikes up before dropping to zero, which is expected as the inductor resists sudden changes in current and then settles to a steady state where it behaves as a short circuit.

$R_{eq} = \frac{40\times10}{40+10}$ $R_{eq} = \frac{400}{50} = 8\,\Omega$

$C = 1\ F$ $L = 500\ mH = 0.5\ H$

$\alpha = \frac{1}{2RC}$ $\alpha = \frac{1}{2\times8\times1}$ $\alpha = \frac{1}{16} = 0.0625$

$\omega_0 = \frac{1}{\sqrt{LC}}$ $\omega_0 = \frac{1}{\sqrt{(0.5\times1)}}$ $\omega_0 = \sqrt{2} = 1.414$

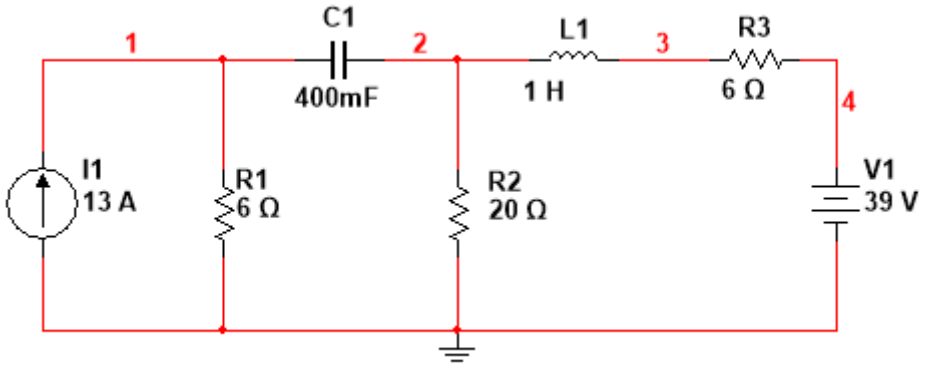
$\omega_0 > \alpha \Rightarrow$ Underdamped

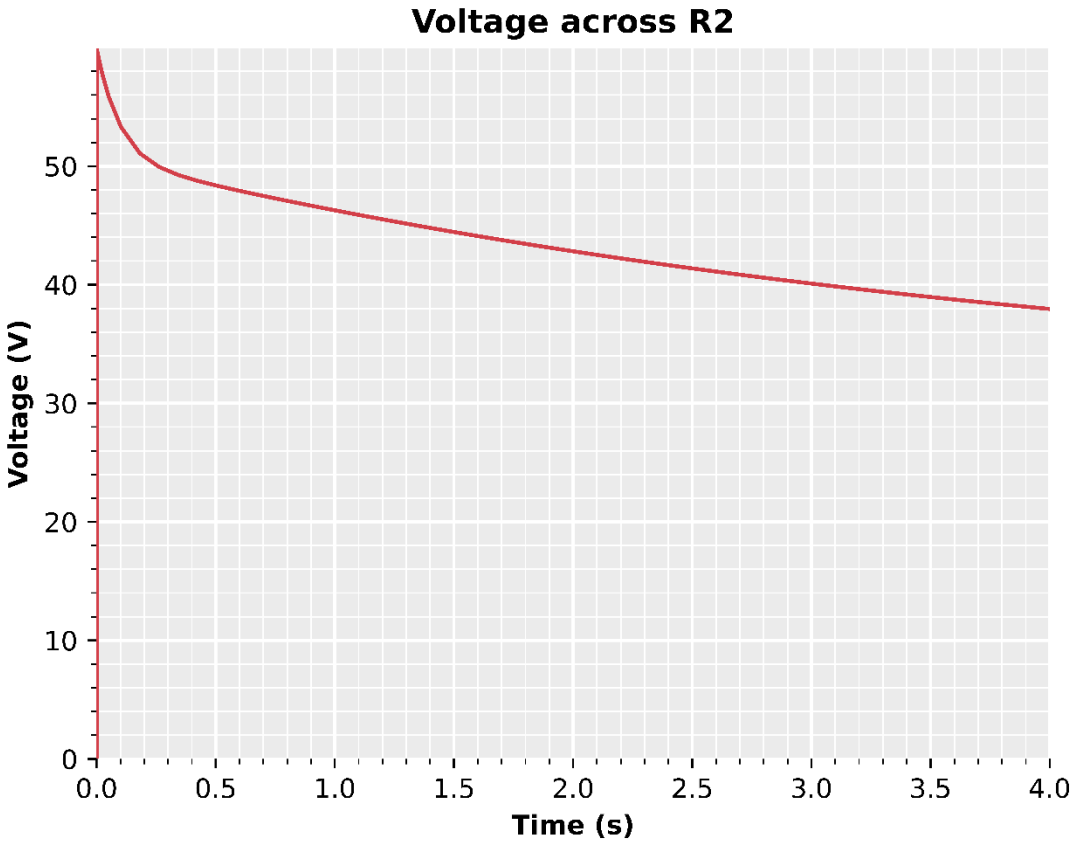
Steady state value of capacitor's voltage = V(τ)

τ = RC = 8 × 1 = 8 s

V(τ) = 25.28 V

Task 3: RLC Series–Parallel Circuit





Initial Voltage Value: 59.92 V

The voltage keeps decreasing across R2.