Ryerson University
Department of Electrical, Computer, & Biomedical Engineering
Faculty of Engineering & Architectural Science

ELE 202
Electric Circuit Analysis
LAB COVER PAGE for Part II submission.

Lab #:	6	Lab Title:	Transient Response of First Order RC & RL Circuits

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(* Note: remove the first 4 digits from your student ID)

Section #:	11
Submission date and time:	29/3/23 - 15:00
Due date and time:	29/3/23 - 15:00

Document submission for Part II:

- A completed and signed "COVER PAGE – **Part II**" has to be included with your submission, a copy of which is available on D2L. The report will not be graded if the signed cover page is not included.
- Scan your completed pages of **Section 5.0** and **Section 6.0** (via a scanner or phone images), together with any required In-Lab Oscilloscope screen-shot images.
- Collate and create a .pdf or .docx file of the above, and upload it via D2L **by 11.59 p.m. on the same day** your lab is scheduled. ***Late submissions will not be graded.***

**By signing above, you attest that you have contributed to this submission and confirm that all work you have contributed to this submission is your own work. Any suspicion of copying or plagiarism in this work will result in an investigation of Academic Misconduct and may result in a "0" on the work, an "F" in the course, or possibly more severe penalties, as well as a Disciplinary Notice on your academic record under the Student Code of Academic Conduct, which can be found online at: www.ryerson.ca/senate/current/pol60.pdf.*

6.0 POST-LAB: OBSERVATIONS AND ANALYSIS OF RESULTS

1. From your observations of the transient waveforms for the **R-C** circuit from the **Section 5.0(a)** lab experiment, **compare** your measured values of the respective time-constants, τ and the Steady-State value of $V_C(t)_{\text{“S-S”}}$ in **Table 4.0** with the corresponding Pre-Lab and MultiSIM values obtained in **Table 2.0**; and possible causes of errors that may explain any discrepancies.

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The values are very close, there are some discrepancies which can be due to rounding error or measurement error

2. From your observations of the transient waveforms for the **R-L** circuit from the **Section 5.0(b)** lab experiment, **compare** your measured values of the respective time-constants, τ and the Steady-State value of $I_L(t)_{\text{“S-S”}}$ in **Table 5.0** with the corresponding Pre-Lab and MultiSIM values obtained in **Table 3.0**; and possible causes of errors that may explain any discrepancies.

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The values are very close, there are some discrepancies which can be due to the human error in measuring or due to reading error

3. From the waveforms captured for ***either*** **R-C *or* R-L** circuit, what general observations can be made of the transient response behavior between the two different values of time-constant, **τ** used for each circuit?

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As the capacitance increases so does the .
As the resistance decreases do does the .
As the increases so does the transient response for an RL circuit

As increases the steady state response will stay almost the same for an RC circuit

4. In regard to the ***longer*** time-constant, **τ** of ***either*** the **R-C *or* R-L** circuit, did the transient response (during the "*charging*" phase) reach its final Steady-State value within the first half-period (T/2) of the square-wave waveform? From your observation of the transient responses, what in your estimation is ***minimum*** *multiple* of **τ** (in time) needed for the transient response to almost reach its steady-state value? Explain.

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The minimum multiple of needed is 5. We can see this observation from the graph and the calculations done in the PreLab

5. For the **R-C** circuit of **Figure 2.0b**, the Function Generator (**FG**) was assumed to be ideal, meaning that its output (source) resistance, $\mathbf{R_S}$ = 0$\mathbf{\Omega}$. In reality, the **FG** has $\mathbf{R_S}$ = 50$\mathbf{\Omega}$ as depicted below, and so if one takes this into account then what percentage error does $\mathbf{R_S}$ introduce to the intended (theoretical) time-constants (**τ**) presented in **Table 2.0**? Can this measurement error be considered negligible? Why?

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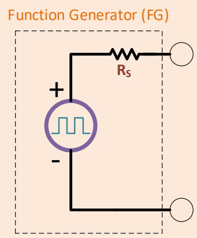

Since the Rs is very small compared to the resistance in the circuit it can be ignored and so percent error introduced by Rs will be very very small and negligible

6. For the **R-L** circuit of **Figure 3.0b**, the Function Generator (**FG**) was also assumed to be ideal, meaning that its output (source) resistance, $\mathbf{R_S}$ = 0$\mathbf{\Omega}$. In reality the **FG** has $\mathbf{R_S}$ = 50$\mathbf{\Omega}$ as noted above. In addition, **(i)** a 'dummy' resistor, $\mathbf{R_d}$ = 100$\mathbf{\Omega}$ was introduced in the circuit to facilitate inductor current measurement with the Oscilloscope, and **(ii)** this particular inductor itself has an inherent internal resistance, $\mathbf{R_L}$ = 99$\mathbf{\Omega}$; which all contribute to the overall series resistance of the circuit.
By taking these "additional" series resistances into account, calculate the percentage error introduced in each of your intended (theoretical) time-constants (**τ**) in **Table 3.0**. Which of the two time-constants (**τ**) had the largest error, and was this confirmed by your In-Lab results recorded in **Table 5.0**? Explain.

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1) Percent Error around 2.4%
2) Percent Error around 5%

Second had to have large error
This was taken into account as the InLab values were slightly different than the PreLab values