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 #:	5	Lab Title:	Introduction to Function Generators, Oscilloscopes & AC Meassurements

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***Signature*:**	

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

Section #:	11
Submission date and time:	23/3/23 - 17:00
Due date and time:	23/3/23 - 17:00

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.*

T (msec.)	f = 1/T (Hz)	V_P (volts)	V_{max} (volts)	V_{min} (volts)	V_{P-P} (volts)	V_{rms} (volts)
1	**995**	**5.0**	**5.0**	**5.0**	**10.0**	**3.535**

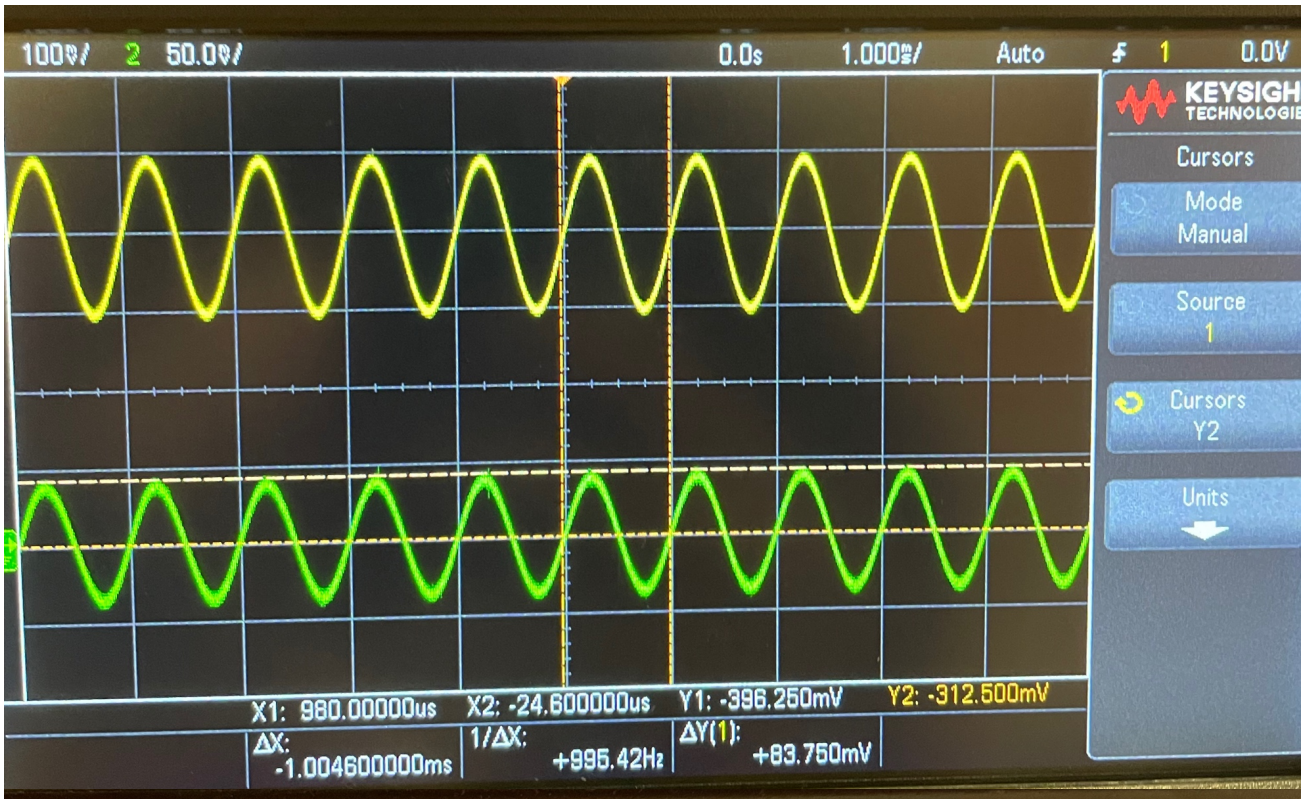
f (Hz)	V_A (volts)	V_B (volts)	$V_{R1} = V_A - V_B$ (volts)	$V_{R2} = V_B$ (volts)
1000	4.98	2.0	2.98	2

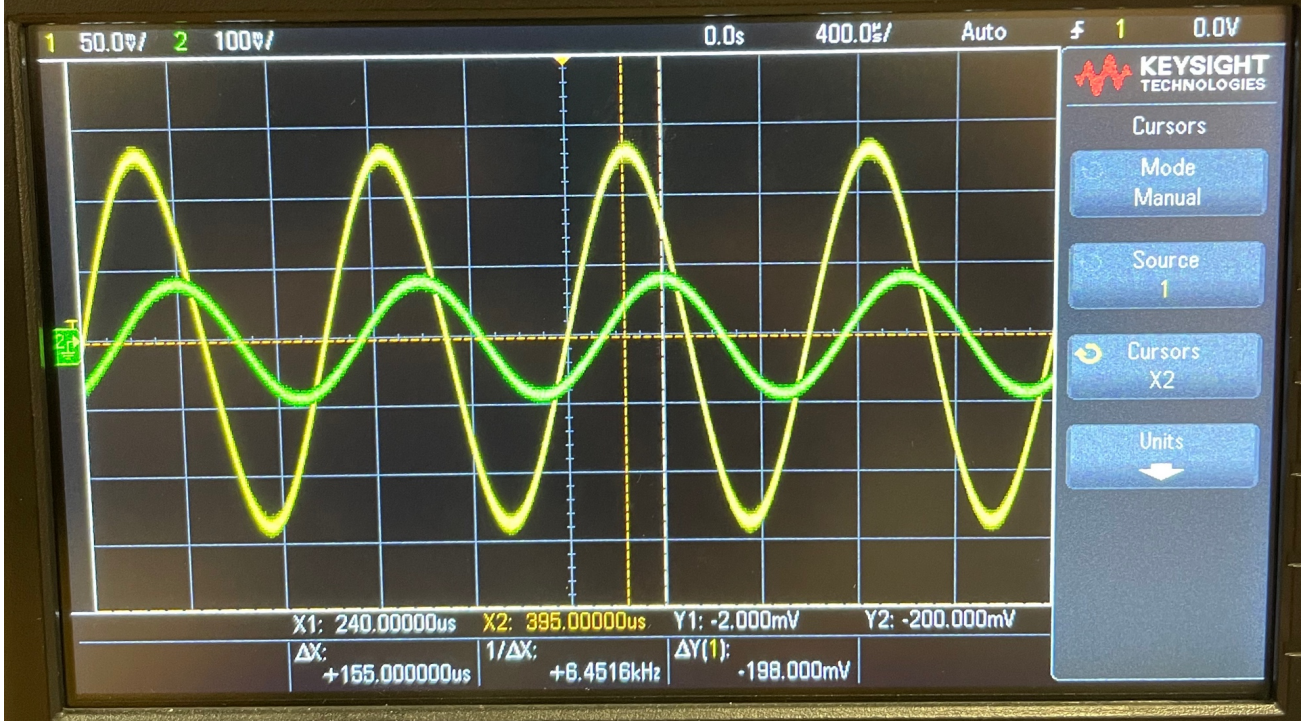
Table 4.1: In-Lab measurement values of Figure 2.0 circuit

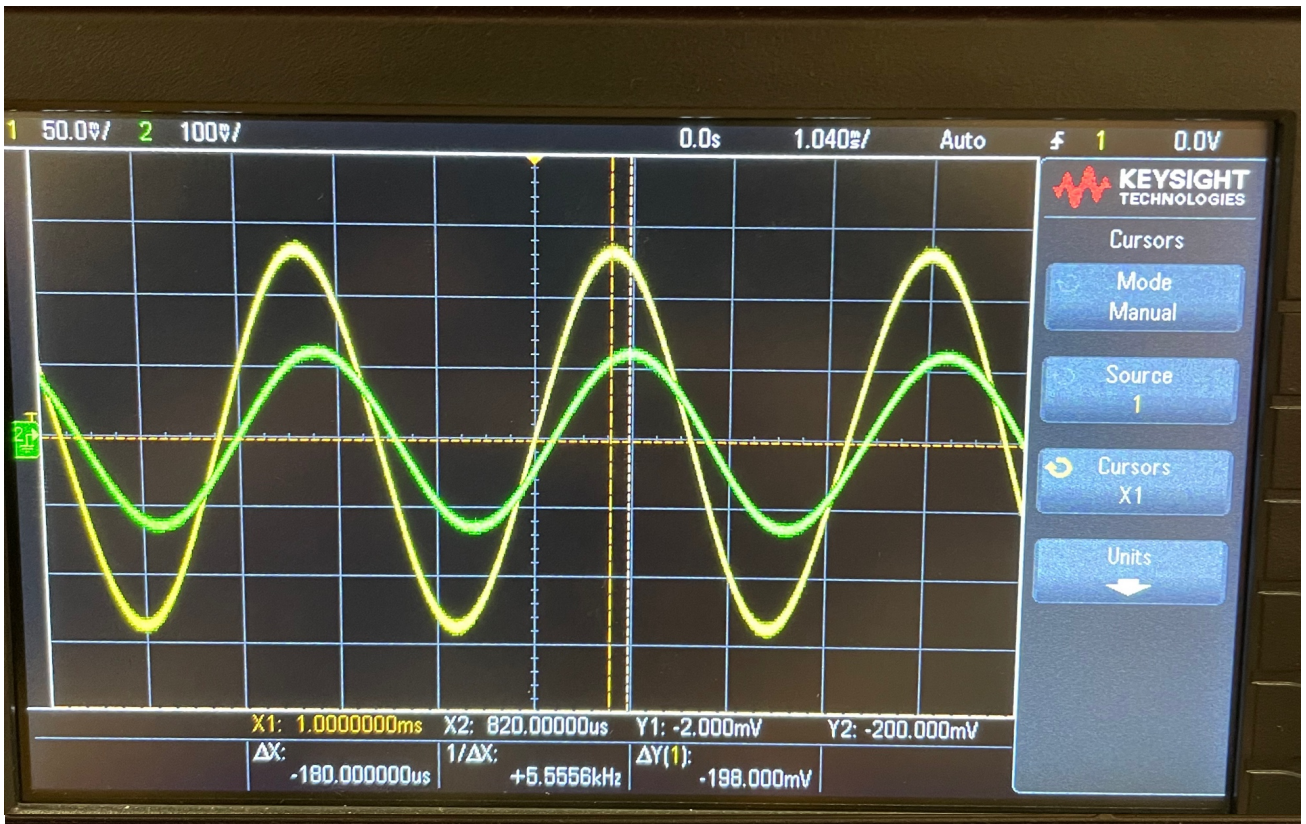
f	T calculated from freq., f	ΔT In-Lab measurements	Θ_o determined from ΔT
300 (Hz)	3.33ms	180us	19.44
1000 (Hz)	1ms	155us	55.8
10000 (Hz)	10ms	26us	93.6

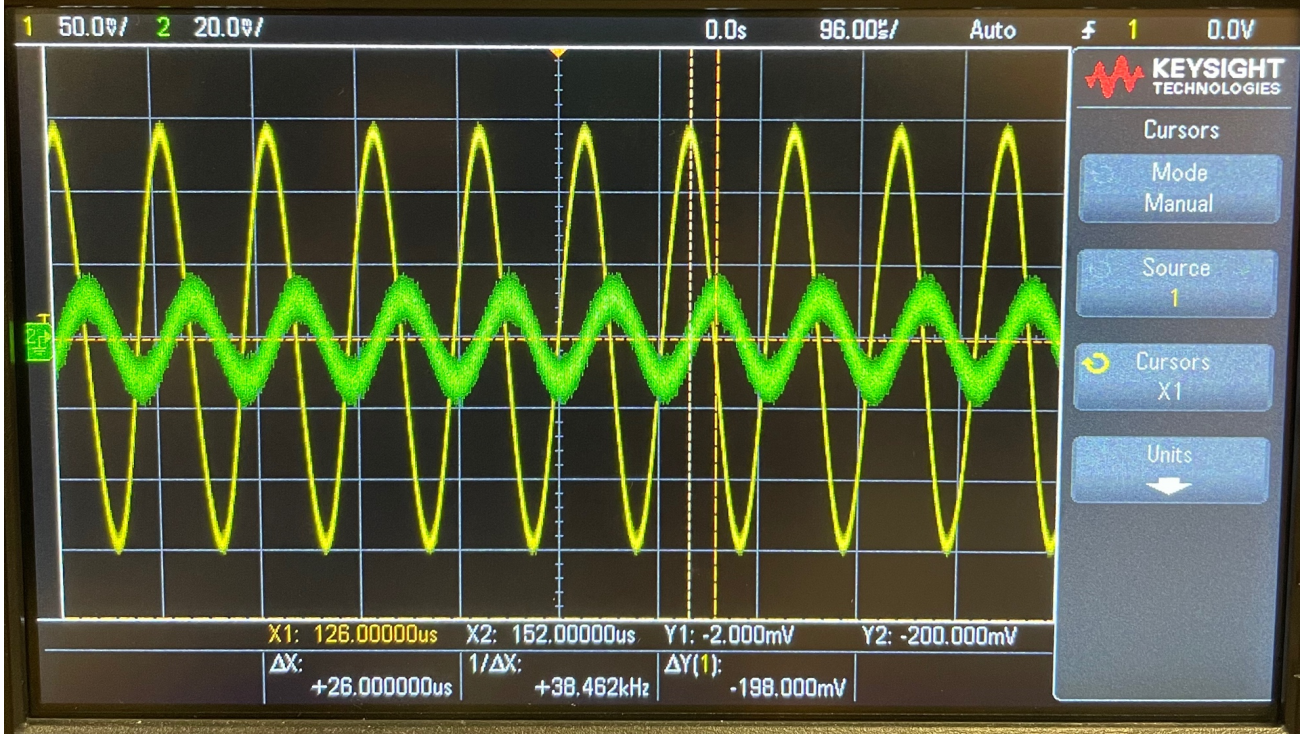
1 Hz Square-wave waveform with:	Circle the **color** of blinking LED	Circle the perceived **brightness** level on a scale of 1 to 5
Zero DC Offset	R G	1 2 3 4 5
-5V DC Offset	R G	1 2 3 4 5
+5V DC Offset	R G	1 2 3 4 5
Frequency at which the LED appears to stop blinking? =>		67hz


KEYSIGHT
DSOX1202G
Digital Storage Oscilloscope
70 MHz 2 G
1 5.00V/ 2 20.0V/
0.0s
1.000ms/
Auto
1
-40.0V
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source 1
Cursors Y1
Units
X1: -48.000000us X2: -24.600000us Y1: 5.00000V Y2: 0.0V
ΔX: +23.400000us
1/ΔX: +42.735kHz
ΔY(1): -5.00000V
1 5.00V/ 2 20.0V/
0.0s
1.000ms/
Auto
1
-40.0V
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source 1
Cursors X1
Units
X1: 980.00000us X2: -24.600000us Y1: 5.00000V Y2: -5.00000V
ΔX: -1.004600000ms
1/ΔX: +995.42Hz
ΔY(1): -10.0000V


100V/ 2 50.0V/ 0.0s 1.000ms/ Auto 1 0.0V
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source 1
Cursors Y2
Units
X1: 980.00000us X2: -24.600000us Y1: -396.250mV Y2: -312.500mV
ΔX: -1.004600000ms
1/ΔX: +995.42Hz
ΔY(1): +83.750mV


1 50.0V/ 2 100V/ 0.0s 400.0ns/ Auto 1 0.0V
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source 1
Cursors X2
Units
X1: 240.00000us X2: 395.00000us Y1: -2.000mV Y2: -200.000mV
ΔX: +155.000000us
1/ΔX: +6.4516kHz
ΔY(1): -198.000mV


1 50.0mV/ 2 100mV/
0.0s 1.040ms/ Auto
1 0.0V
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source 1
Cursors X1
Units
X1: 1.0000000ms X2: 820.00000us Y1: -2.000mV Y2: -200.000mV
ΔX: -180.000000us
1/ΔX: +5.5556kHz
ΔY(1): -198.000mV


1 50.0mV/ 2 20.0mV/
0.0s 96.00ms/ Auto
1 0.0V
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source 1
Cursors X1
Units
X1: 126.00000us X2: 152.00000us Y1: -2.000mV Y2: -200.000mV
ΔX: +26.000000us
1/ΔX: +38.462kHz
ΔY(1): -198.000mV

Date: _____

Post lab

6.0

a) (i) The values are approximately same with 0.5 % difference in frequency seen in in-lab result. This could be due to environmental factors.

ii) In this case both measurements of V_p resulted in the same value. ~~Integer values decimal values~~

iii) NO! the function generator had an issue with resistance as mentioned by the TA. So for the input of V_{p-p}, the ~~s~~ generator produced sine wave of V_p of that value.

b) (i) Measurements are almost identical with a few variation which have been seen due to the friction~~s~~ between the wires as it is not accounted in theoretical measurements.

ii) V_s was 5 V and $V_{t_1} = 3$ V, $V_{t_2} = 2$ V. Hence $V_s - V_{t_1} - V_{t_2} = 0$ is true.

c (i) The theoretical and Multisim values were identical but the in-lab values were slightly different. This is because of multiple reasons. Manual measurment of ΔT by adjusting the cursors led to variation in time period. This was not done ~~effect~~ 100% accurately which led to different result.

ii) Vertical cursor use was not convenient as a little movement of cursor from designated position resulted in huge difference in answers. The cursor was very sensitive which subjected in wrong readings.

Date: _____

d(i) LEDs are diodes which only allow current to flow in one direction so when AC is supplied, the current alternates and appears to be blinking.

ii) Red was blinking when -5 V offset was added.
Green was blinking when +5 V off-set was added.
Red was blinking because it had lower forward voltage drop than green and adding offset causes it to drop below threshold so it turns off for an instance before being lit again.
Green was blinking because it had higher voltage drop than red light. It requires higher voltage to turn on so with offset added it lights up for an instance.

iii) Yes! the brightness was higher because addition of offset increases voltage across led, increasing current through led.