FACULTY OF ELECTRICAL ENGINEERING	
Course: **ELECTRICAL ENGINEERING LABORATORY** Course Code: **SEEE 2742**	Review : **7** Release Date : **October 2023** Last Amendment : **September 2023** Procedure Number : **PK-UTM-FKE-(O)-08**

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MALAYSIA

SEEE 2742

ELECTROTECHNIC LABORATORY

EXPERIMENT 2
AC CIRCUIT

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Date	: 04 September 2023	Date	: 04 October 2023

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I. PRELIMINARY EXERCISE (10 marks)

<u>Important Note:</u> Students are required to do this exercise BEFORE the laboratory session.

For the circuit in **Figure 1**, find: -

i. The total impedance of the circuit for R = 2.3 kΩ, L = 100 mH.

ii. The voltage across the resistor, R and inductor, L.

iii. The current flows in the circuit.

iv. Obtain the AC waveform of the voltage across the source (V_S), the resistor (V_R) and the inductor (V_L) for one full cycle using any simulation tool (PSPICE, MATLAB, Multisim, etc.).

v. Write the phasor expression and draw phasor diagram of the voltage across the source (V_S), the resistor (V_R) and the inductor (V_L) in a single figure.

vi. Repeat part (ii)-(v) by using L = 200 mH

vii. The inductor of **Figure 1** is then replaced by a capacitor as shown in **Figure 2.**

viii. Repeat part (ii)-(v) by using C = 0.1 μF and C = 0.2 μF.

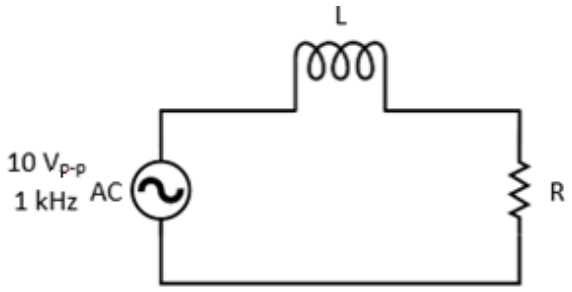

Figure 1

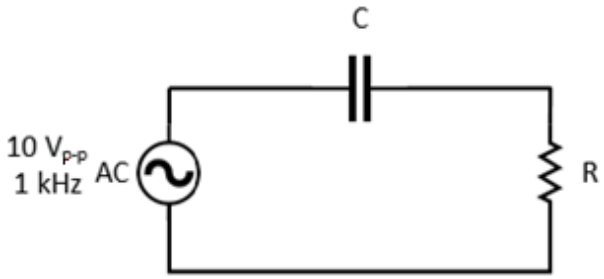

Figure 2

<u>Important Note:</u> Students are required to bring their laptop to VERIFY all simulations results. Students are required to bring a USB drive to capture output from the oscilloscope.

<u>Recommended Reference:</u>

Alexander & Sadiku, 'Fundamental of Electric Circuit 7th edition', *McGraw Hill (2020).*

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II. EXPERIMENT

'AC Circuit'

IMPORTANT: Students need to complete the PRELIMINARY EXERCISE before the laboratory session.

1. Aims:

To observe and measure the phase difference between voltages in AC circuit.

2. Equipment provided:

Oscilloscope, Function Generator, 2 Probes, Decade Inductor, Decade Capacitor, Decade Resistor

3. Instruction:

Precaution:

- ***Ensure that the ground of the oscilloscope probes is connected to the same point and also connected to the negative terminal of the signal generator. Failure to follow this will damage the oscilloscope.***
- ***Ask your laboratory instructor to check your circuit connection before you start the experiment.***

i. Series RL Circuit Test

Based on the circuit shown in **Figure 1**, perform an experiment to show the phase difference between the voltage source (V_S), the voltage across the resistor (V_R) and the voltage across the inductor (V_L). Use R = 2.3 kΩ and L = 100 mH.

Note: You need to use two probes and MATH function of the oscilloscope to get the third waveforms. The phase difference can be measured using the oscilloscope. Save the waveforms into USB drive.

Based on the observed waveform, write the phasor expression and draw the phasor diagram for V_R, V_S, and V_L. Repeat the experiment with L = 200 mH.

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ii. Series RC Circuit Test

Repeat part 3(i) by replacing the inductor with a capacitor. Use C = 0.1 μF and C = 0.2 μF, respectively.

Results must include:

i. Waveform of V_R, V_S, and V_L (or V_C) recorded from the oscilloscope for all cases.
ii. Important parameters tabulated in a suitable table(s).
iii. Voltage phasor diagram of each component in the circuit.

Discussion must include:

i. Phase shift difference between the voltages for different combination of the elements (different value of L (or C) and differences between L and C). The theoretical explanation of the difference must be explained.
ii. The relationship between the voltages and the current flows in the circuit.