

FACULTY OF ELECTRICAL ENGINEERING	
Subject <b>ELECTRICAL ENGINEERING LABORATORY</b>	Review : <b>6</b>
Subject Code <b>SKEE 2742</b>	Release Date : <b>February 2020</b>
	Last Amendment : <b>March 2023</b>
	Procedure Number : <b>PK-UTM-FKE-(O)-08</b>



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

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# **SKEE 2742**

## **ELECTROTECHNIC LABORATORY**

### **EXPERIMENT 2**

### **AC CIRCUIT**

Disediakan oleh : Nama : Dr. Hafiz Habibuddin : Dr. Mona Riza Mohd Esa : Dr. Mohd Fadli Rahmat : Dr. Norzanah Rosmin	Disahkan oleh : Ketua Jabatan Nama : Prof. Madya Ts. Dr. Shahrin Bin Md Ayob
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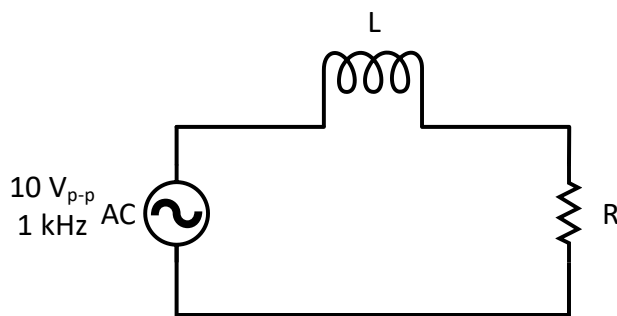
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### I. PRELIMINARY EXERCISE (10 marks)

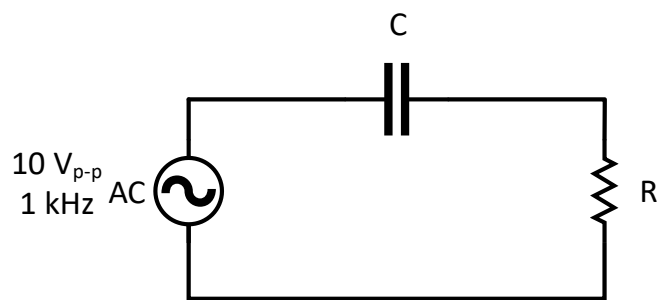
**Important Note: Student required to do this exercise BEFORE the lab session**

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

- The total impedance of the circuit for  $R = 2.3 \text{ k}\Omega$ ,  $L = 100 \text{ mH}$ .
- The voltage across the resistor,  $R$  and capacitor,  $L$ .
- Obtain the AC waveform of the voltage across the source ( $V_S$ ), the resistor ( $V_R$ ) and the capacitor ( $V_L$ ) for one full cycle using any simulation tool (PSPICE, MATLAB, Multisim, etc.).
- Write the phasor expression and draw phasor diagram of the voltage across the source ( $V_S$ ), the resistor ( $V_R$ ) and the capacitor ( $V_L$ ) in a single figure.
- Calculate the Apparent, Real, Reactive power delivered by the voltage source.
- Repeat part (ii)-(v) by using  $L = 200 \text{ mH}$
- The inductor of **Figure 1**. is then replaced by a capacitor as shown in **Figure 2.**,
- Repeat part (ii)-(v) by using  $C = 0.1 \mu\text{F}$ .



**Figure 1.**



**Figure 2.**

**Important Note: Student required to bring their laptop to VERIFY all simulations result**

**Recommended Reference:**

Alexander & Sadiku, 'Fundamental of Electric Circuit 6<sup>th</sup> edition', McGraw Hill.

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## II. EXPERIMENT

### ‘AC Circuit’

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

#### 1. Aims:

To observe and measure the phase different between voltage and current in AC circuit.

#### 2. Instruction:

##### i. Series RL Circuit Test

Based on the circuit shown in **Figure 1.**, perform an experiment to show the phase different between the voltage source,  $V_S$ , the voltage across the resistor,  $V_R$  and the voltage across the inductor,  $V_L$ . Use  $R = 2.3 \text{ k}\Omega$  and  $L = 100 \text{ mH}$ .

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  $L = 200 \text{ mH}$ ,  $300\text{mH}$  and  $400\text{mH}$ .

##### ii. Series RC Circuit Test

Repeat part 2.1 by replacing the capacitor with an inductor. Use  $C = 0.1 \mu\text{F}$ ,  $0.2 \mu\text{F}$  and  $0.3\mu\text{F}$ , respectively.

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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 and current phasor diagram of each circuit.

Discussion must include:

- i. Phase shift difference between the current and voltage for different combinations 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. Changes in Apparent, Real and Reactive power delivered by the voltage source with respect to the variation of phase shift. Changes in the shape and size of the power triangle must be discussed.