Sekolah Pendidikan Profesional dan Pendidikan Berterusan (SPACE)

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

JABATAN KEJURUTERAAN ELEKTRIK
PUSAT PENGAJIAN DIPLOMA (PPD), SPACE
UNIVERSITI TEKNOLOGI MALAYSIA
KUALA LUMPUR

ELECTRICAL ENGINEERING LABORATORY 2

(DDPE 2701)

CIRCUIT THEORY 2

EXPERIMENT 2
AC CIRCUIT ANALYSIS

Group members	1.
	2.
	3.
	4.
	5.
Lecturer	:
Date	:

No.	PO	CO	Student Marks	Marks
1	PO1	CO1		50%
2	PO2	CO4		20%
3	PO8	CO5		10%
Total Marks				/80%

EXPERIMENT 2 : AC CIRCUITS ANALYSIS

OBJECTIVES

After doing this experiment, students will be able to:

    i.   understand the concept of lagging and leading of phase angle in reactive circuits.'

    ii. make measurements of phase angle between two-voltage waveforms.

    iii. draw the voltage phasor diagrams for reactive circuits.

APPARATUS

1. Function(Audio) generator
2. Oscilloscope
3. Decade resistor
4. Decade inductor
5. Decade capacitor
6. Multimeter

PROCEDURE

PART 1 : SERIES RL CIRCUIT

1. Connect the circuit of Figure 1.
2. Set the function generator to 400 Hz sinewave.
3. Observe this sinewave with the oscilloscope through CHl. Set the amplitude of the sine wave to 20 V_{p-p} ($V_{s\ p-p}$). This can be obtained by adjusting the amplitude knob on the function generator. Record the peak to peak value of V_S, (V_{Sp-p}) in Table 1.
4. Observe the voltage waveform across inductor (V_L) through **CH2**. Record the peak to peak value of V_L (V_{Lp-p}) in Table 1.
5. Set the oscilloscope to view both channels (select **DUAL**).
6. In the report sheet, draw both waveforms on the grid provided in Figure A.
7. Referring to Figure A, compute the phase angle, $\theta°$ and record in Table 1.
8. Disconnect the oscilloscope.
9. Measure the rms value of V_S and V_L using multimeter (ac range). Record the value in Table 1.
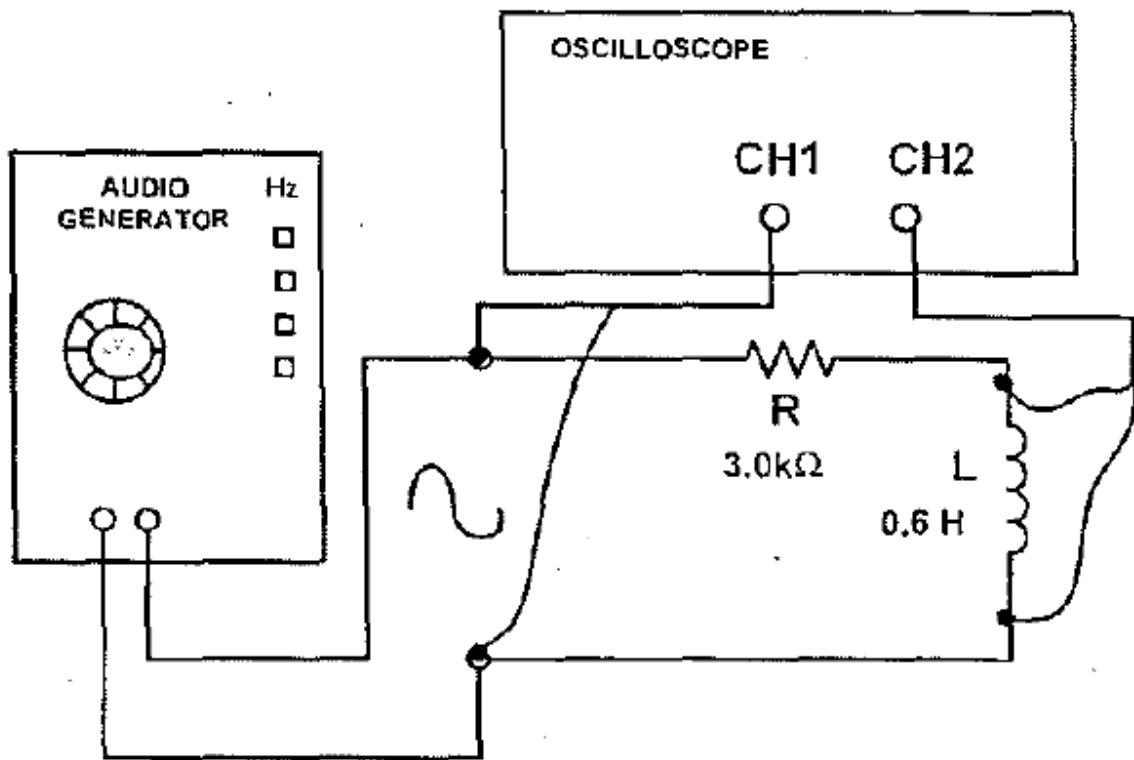
Figure 1

PART 2 : SERIES RC CIRCUIT

1. Connect the circuit of Figure 2.
2. Repeat steps 2 and 3 in **PART 1**.
3. Observe the voltage waveform across capacitor (V_C) through **CH2**. Record the peak to peak value of V_C ($V_{C\,p\text{-}p}$) in Table 2.
4. Set the oscilloscope to view both channels (select **DUAL**).
5. In the report sheet, draw both waveforms on the grid provided in Figure B.
6. Referring to Figure B. compute the phase angle, $\theta°$ and record in Table 2.
7. Disconnect the oscilloscope:
8. Measure the rms value of V_S, and V_C using multimeter (ac range). Record the value in Table 2.
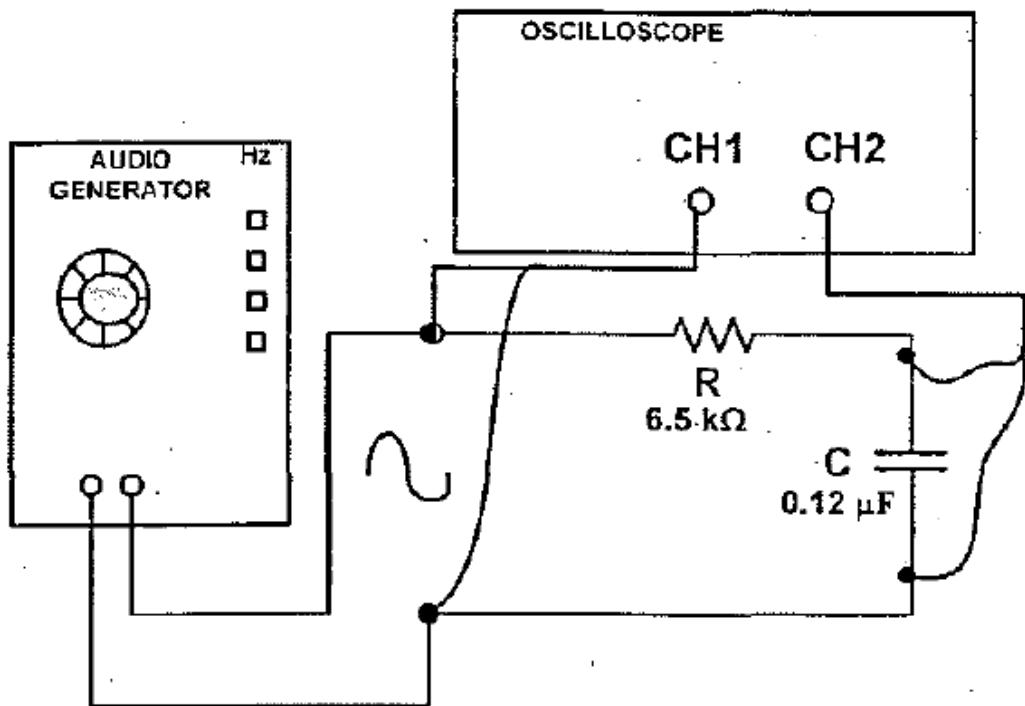
Figure 2

Phase Angle Measurement
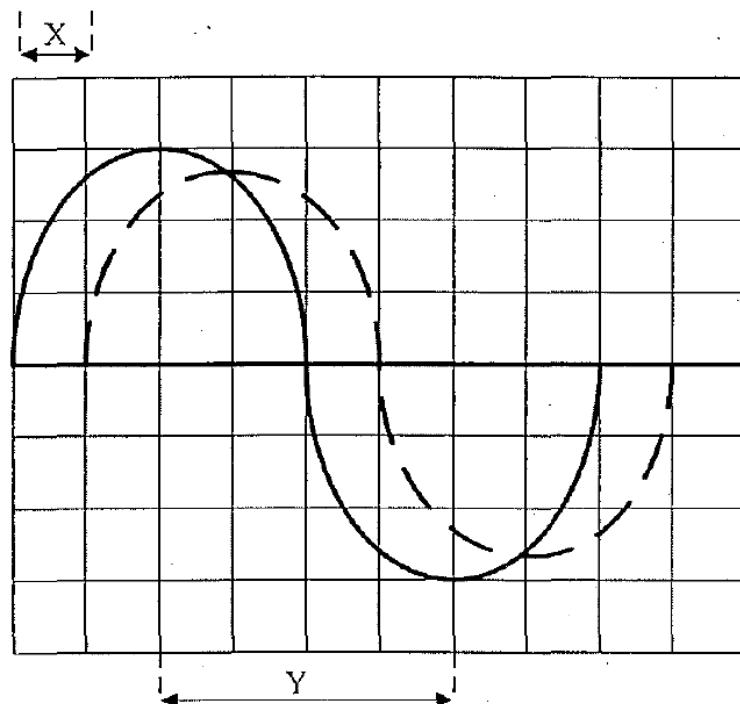
$$Phase\ angle, \theta = \frac{X}{Y}\ x\ 180°$$

RESULT & REPORT

PART 1 : SERIES RL CIRCUIT

Table 1 (Step 3 - 4, Step 7, Step 9)

Peak to peak value	Calculated rms value $V_{rms} = 0.707\ V_P$	Measured rms value (multimeter)	Phase angle
$V_{S\ p-p}$ =	$V_{S\ rms}$ =	$V_{S\ rms}$ =	X = ... Y = ...
$V_{L\ p-p}$ =	$V_{L\ rms}$ =	$V_{L\ rms}$ =	$\theta°$ = ...

PO1	CO1	.... /5m

Figure A (Step 6)
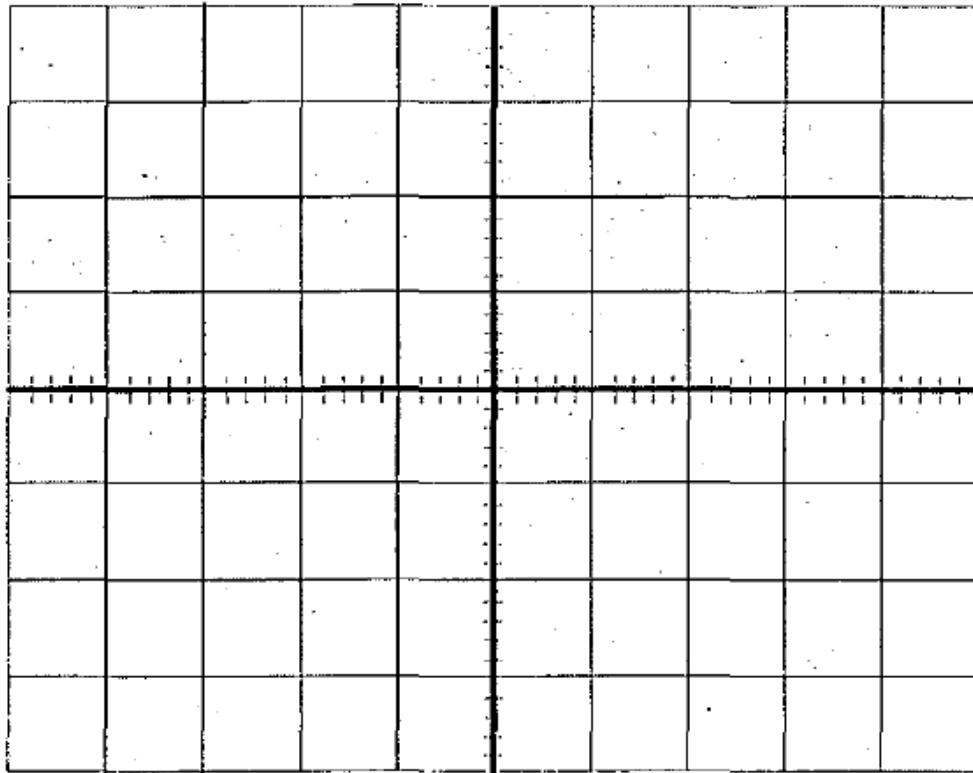
PO1	CO1	.... /5m

1. State the phase relationship between $v_s(t)$ and $v_L(t)$. Take $v_s(t)$ as reference.

PO1	CO1	....	/2m

2. Write the time domain equation for $v_s(t)$ and $v_L(t)$.

PO1	CO1	....	/3m

3. Express $v_s(t)$ and $v_L(t)$ as phasor quantities and draw the phasor diagram.

PO1	CO1	....	/4m

CONCLUSION:

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| PO1	CO1	....	/6m

PART 2 SERIES RC CIRCUIT

Table 2 (Step 2 - 3, Step 6, Step 8)

Peak to peak value	Calculated rms value $V_{rms} = 0.707\ V_P$	Measured rms value (multimeter)	Phase angle
$V_{S\ p\text{-}p}$ =	$V_{S\ rms}$ =	$V_{S\ rms}$ =	X = ... Y = ... θ° = ...
$V_{C\ p\text{-}p}$ =	$V_{C\ rms}$ =	$V_{C\ rms}$ =	

PO1	CO1	.... /5m

Figure B (Step 5)
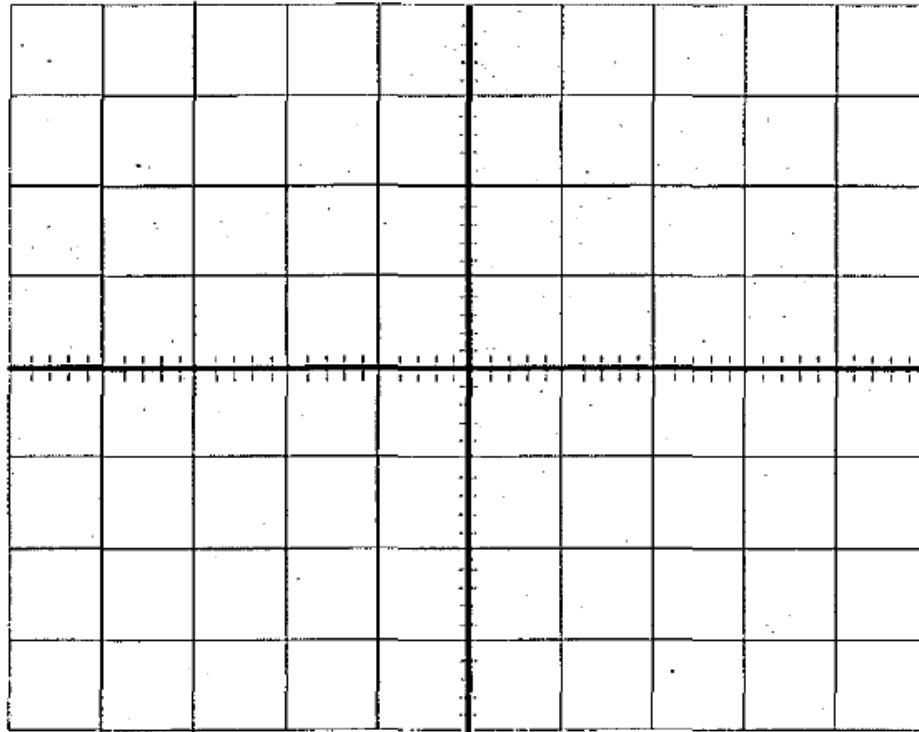
PO1	CO1	.... /5m

1. State the phase relationship between $v_s(t)$ and $v_C(t)$. Take $v_s(t)$ as reference.

PO1	CO1	.... /2m

2. Write the time domain equation for $v_s(t)$ and $v_C(t)$.

PO1	CO1	.... /3m

3. Express $v_s(t)$ and $v_C(t)$ as phasor quantities and draw the phasor diagram.

PO1	CO1	.... /4m

CONCLUSION:

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PO1	CO1	.... /6m

TOTAL MARKS (PO1, CO1) = ... / 50 marks

		Marks	PO2	PO8
Group members	**1.**			
	2.			
	3.			
	4.			
	5.			
Lecturer	**:**			
Date	**:**			

Guideline of practical skill rubric: PO2

Practical skill (100 marks)						
Scale :	**1 (5marks)**	**2 (10marks)**	**3 (15marks)**	**4 (20marks)**	**5 (25marks)**	**Marks**
Criteria ✓ **Demonstrate the practical skill**	**Very Poor**	**Poor**	**Moderate**	**Good**	**Excellent**	
A. Circuit assembly/construction	5	10	15	20	25	
B. Using appropriate measurement equipment and technique	5	10	15	20	25	
C. Troubleshooting skill and technique	5	10	15	20	25	
D. Follow lab regulation	5	10	15	20	25	
					Total marks	**………/100**

Guideline of ethic rubric: PO8

ETHIC AND PROFESSIONAL MORAL (………/100 marks)					
Scale :	**1 (5marks)**	**2 (10marks)**	**3 (15marks)**	**4 (20marks)**	**5 (25marks)**
Criteria ✓ **Understand the economic, environmental and socio-cultural impacts of professional practice**	**Very Poor**	**Poor**	**Moderate**	**Good**	**Excellent**
A. Professional Practice (Punctuality/Follow the Rules)	Tidak menepati/ Tidak Mematuhi	Kurang menepati/ Kurang mematuhi	Adakala menepati / Adakala mematuhi	Menepati / Mematuhi	Sentiasa menepati / Sentiasa mematuhi
B. Ethical Behavior (Trustworthy / Respectfulness)	Tidak mengamalkan	Kurang mengamalkan	Adakala mengamalkan	Mengamalkan	Sentiasa mengamalkan
C. Social Cultural (Racial Harmony)	Tidak mengamalkan	Kurang mengamalkan	Adakala mengamalkan	Mengamalkan	Sentiasa mengamalkan
D. Personality	Tidak menepati	Kurang menepati	Adakala menepati	Menepati	Sentiasa menepati