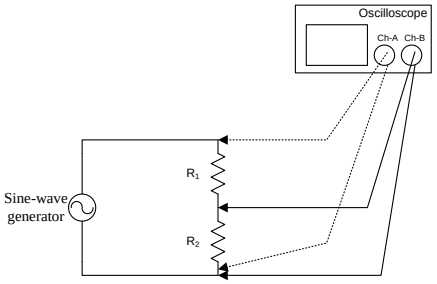
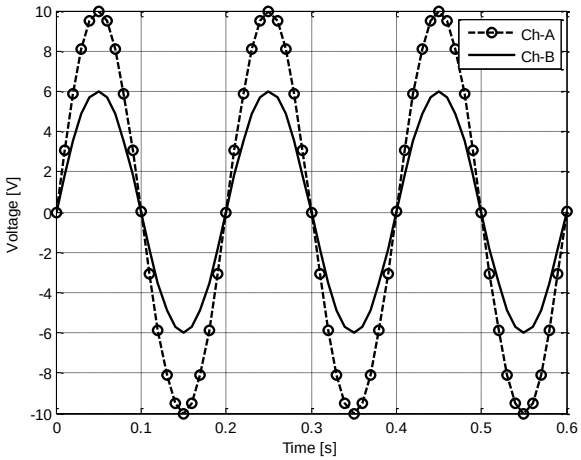
School of Information, Computer and Communication Technology
Sirindhorn International Institute of Technology
Thammasat University

ECS204 Quiz 5 Sample

Consider the circuit and its corresponding measurements below.





Note that channel A of the oscilloscope displays the voltage across the generator. Channel B of the oscilloscope displays the voltage across R_2.

1. Find the peak voltages and the peak-to-peak voltages across each component in the circuit. Put your answers in the table below.

	Peak voltage	Peak-to-peak voltage
Voltage across generator		
Voltage across R_2		
Voltage across R_1		

Hint: For a signal of the form $a(t) = A\cos(2\pi ft + \theta)$, the ***peak value*** is given by its amplitude *A*. Its ***peak-to-peak (p-p) value*** is $2A$. The ***rms value*** is given by $\frac{A}{\sqrt{2}}$.

2. In part C of lab 04, the signal generator output should be adjusted to 2 V (rms). The corresponding peak voltage value is [ ] V. Assume $\sqrt{2} \approx 1.4$.

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1. What does 'CRO' stand for?

2. A sinusoidal waveform has a period of 1 ms. What is its frequency?

3. Consider a circuit that operates at 1592 Hz.

What is the impedance of a 0.4 μF capacitor?

What is the impedance of a 18 mH inductor?

You may assume that $\frac{1}{2\pi} = 0.1592$.

4. In a pure inductor circuit, the current_____the voltage by 90 degrees.

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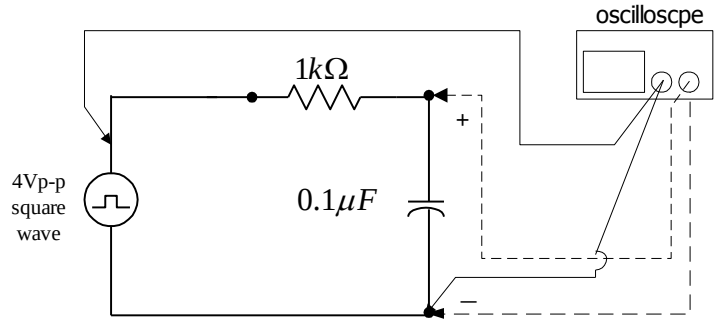
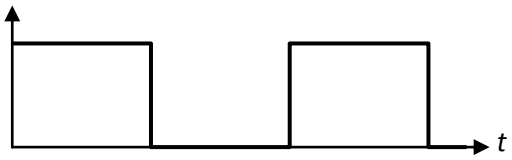
In this lab, we will investigate the discharging of a capacitor. The circuit is connected as shown in the figure below.



1) The plot below shows the voltage across the generator. On the same plot, sketch the voltage across the capacitor.



2) Which of the following equations describes the capacitor voltage when it is discharging?

a) $V(t) = V_{in}(1 - e^{\frac{-t}{\tau}})$ b) $V(t) = V_0 e^{\frac{-t}{\tau}}$

3) What is the value of τ for the circuit above?

4) What is the relationship between τ and t_{half} ?

Hint: The quantity t_{half} is defined in the lab manual as the time elapse that the voltage across the capacitor drops to half of the maximum voltage.

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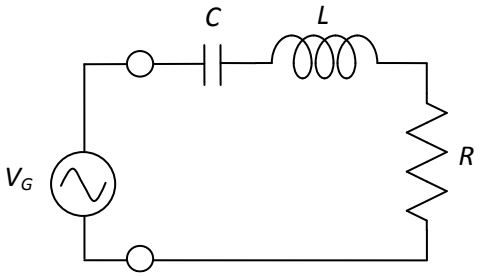
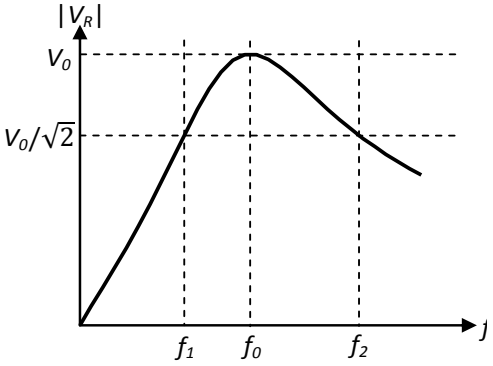
Consider a series RLC circuit with a sinusoidal function generator whose peak voltage V_G = 8V and angular frequency is ω rad/s.



The voltage across the resistor in this circuit is given by

$$V_R = R\frac{V_G}{R + j\omega L + \dfrac{1}{j\omega C}}.$$

The plot of the magnitude of V_R as a function of the frequency f (in Hz) is shown below.



Note that, as usual, $f = \dfrac{\omega}{2\pi}$.

We will also assume $\dfrac{1}{2\pi} \approx 0.1592$.

Suppose

$$L = \frac{1}{200\pi}\ \text{H and } f_0 = 10\ \text{kHz}.$$

1. What is the value of C ?

2. What is the value of V_0 ?

3. Suppose $f_2 - f_1 = 10$ kHz. What is the value of R?

Hint: $BW = \dfrac{R}{L}$ and the unit of BW is in rad/s.

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What is the value in nF of the capacitor that is labeled with numerical code 103K ?

What is the value in nF of the capacitor that is labeled with numerical code 222K ?

What is the numerical code of the capacitor that has the value $84nF$?

What is the numerical code of the capacitor that has the value 47 nF ?

What is the numerical code of the capacitor that has the value 680 nF ?