CG1108 – Lab 5 : Studying AC Signals

Name:_____	**Activities Completed**	**Verified By**	**Marks From 3**
	a		
	b		
Matric. No._____	**c**		
Group:_____			

1. Objectives of the Experiment

a) To study the characteristics of AC signals using the oscilloscope.
b) To measure the phase difference between two AC signals.

2. Equipment to be used

- Lab DC power supply
- Signal Generator
- Oscilloscope
- Digital multi-meter
- Breadboard

3. Components

- Resistors, Capacitors, Inductors

In-lab activities

Before you begin, check that both channels of the oscilloscope are functional using the test signal provided by the oscilloscope.

a) Measure the RMS value of the signals below using the oscilloscope.

Set up the measurement feature of the oscilloscope and note down the RMS values of the AC signals below.

Adjust the offset of the signals such that they are at approximately 0V or the x-axis of the oscilloscope screen.

Keep the Frequency and Peak-to-Peak values of the signals unchanged.

Frequency : _____

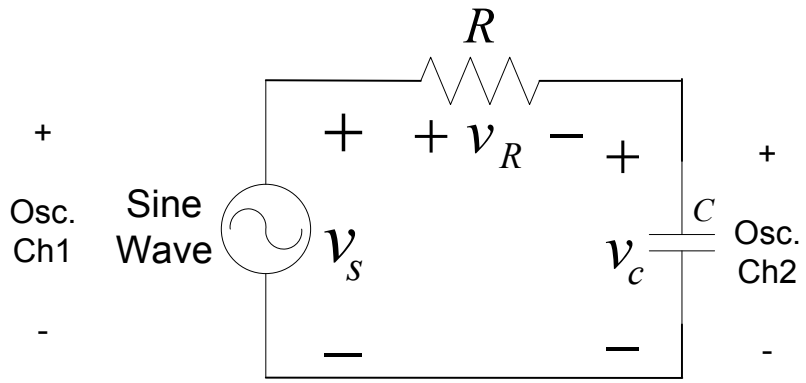
Peak-to-Peak : _____

Signal Type	Measured RMS Value
Sine Wave	
Square Wave	
Trianglular Wave	
CMOS / TTL Wave	

Explain your observations.

b) AC Analysis of RC Circuit

Build the circuit according to the schematic. Choose the value of the components and **input a sine wave from the signal generator**.



Note down the following values:

R = _____ C = _____

Frequency of Input Sine Wave = _____

Calculate the following quantities using above values:

(1) Impedance of C, Z_C

(2) Voltage across C, v_C, in terms of v_S

a) Expression of v_C in terms of v_S

b) RMS value of v_C

c) Phase difference of v_C with respect to v_S.

(3) Voltage across R, v_R, in terms of v_S

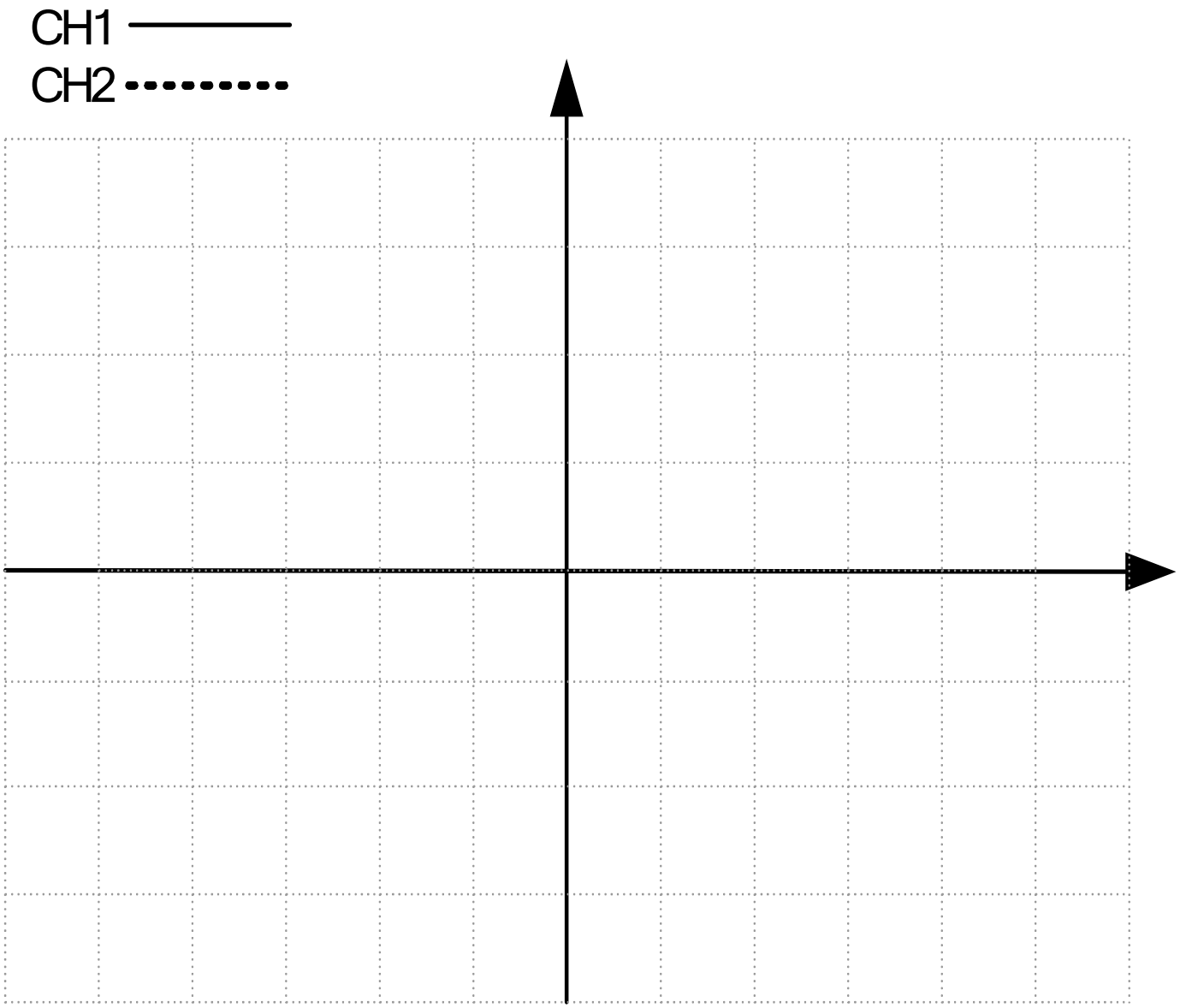
a) Expression of v_R in terms of v_S

b) RMS value of v_R

c) Phase difference of v_R with respect to v_S.

(4) Which signal is leading the other two? Which signal is lagging the other two?

Observe v_S and v_C on the oscilloscope and plot their waveforms below:



Measure the phase difference between CH1 and CH2. Explain how it compares with the calculated value.

Which channel is leading?

Measure the RMS values of the voltages shown in the circuit using oscilloscope. (**Note: You need to swap the positions of R and C to measure v_R. Why?**)

$$v_S =$$

$$v_R =$$

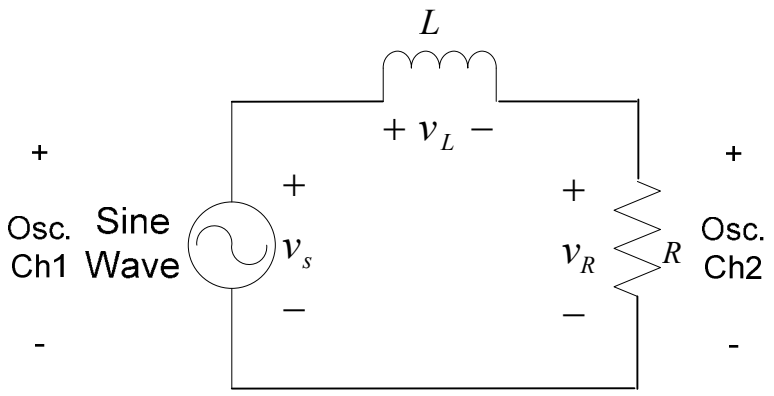
$$v_C =$$

Explain how they compare with the calculated values.

Does the KVL equation hold good here? Explain your observation.

c) AC Analysis of RL Circuit

Build the circuit according to the schematic. Choose the value of the components and **input a sine wave from the signal generator**.



Note down the following values:

R = _____ L = _____

Frequency of Input Sine Wave = _____

Calculate the following quantities using above values:

(1) Impedance of L, Z_L

(2) Voltage across L, v_L , in terms of v_S

a) Expression of v_L in terms of v_S

b) RMS value of v_L

c) Phase difference of v_L with respect to v_S.

(3) Voltage across R, v_R, in terms of v_S

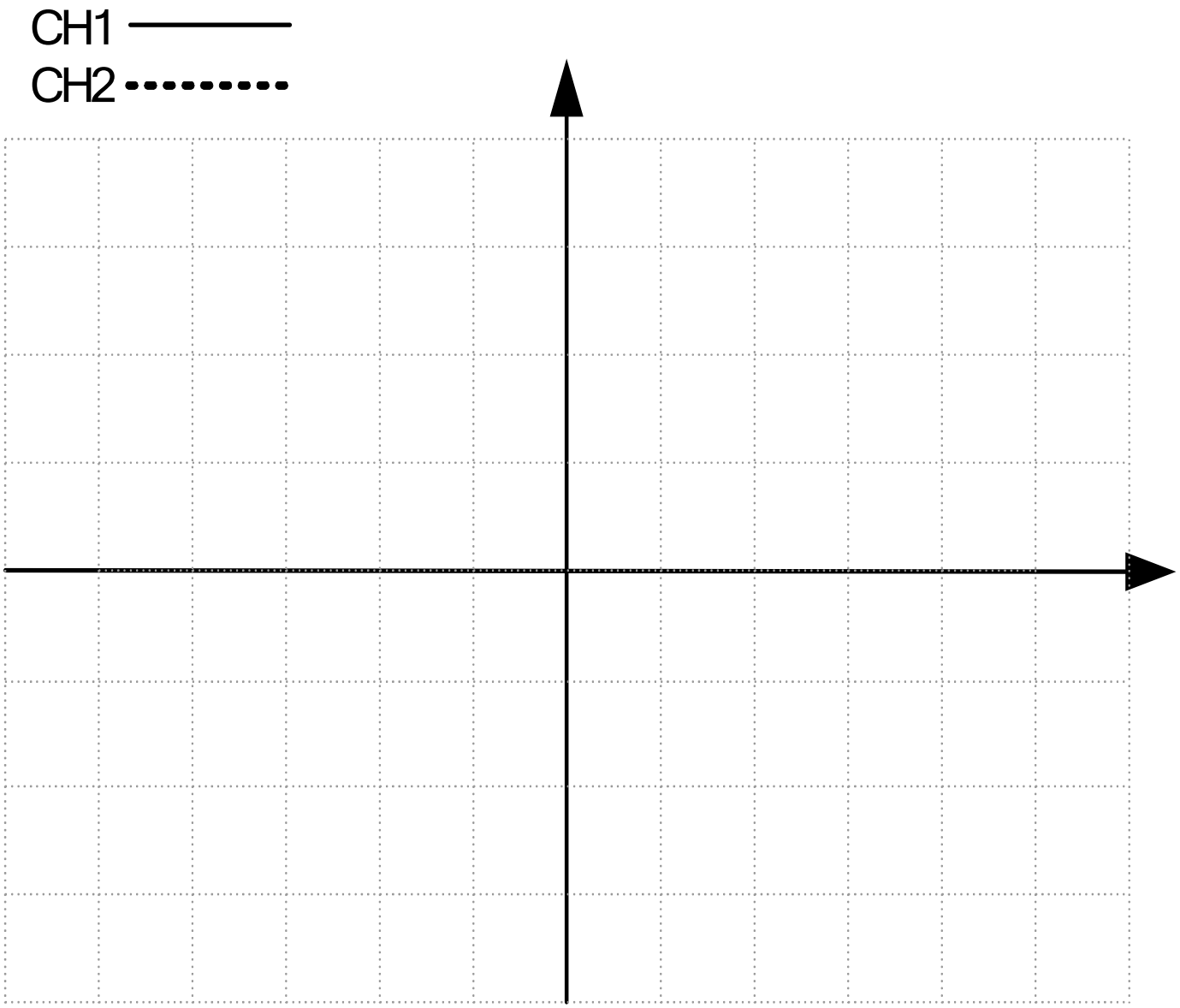
d) Expression of v_R in terms of v_S

e) RMS value of v_R

f) Phase difference of v_R with respect to v_S.

(4) Which signal is leading the other two? Which signal is lagging the other two?

Observe v_S and v_L on the oscilloscope and plot their waveforms below:



Measure the phase difference between CH1 and CH2. Explain how it compares with the calculated value.

Which channel is leading?

Measure the RMS values of the voltages shown in the circuit using oscilloscope. (**Note: You need to swap the positions of R and L to measure v_L. Why?**)

$$v_S =$$

$$v_R =$$

$$v_L =$$

Explain how they compare with the calculated values.

Does the KVL equation hold good here? Explain your observation.