CG1108 – Lab 4 : Oscilloscope and DC transients

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

1. Objectives of the Experiment

a) To learn about the behaviour of capacitors and inductors in DC circuits.
b) To learn about the use of the Oscilloscope.
c) To learn about the charging / discharging of capacitors.
d) To measure the time constants for RC, RL circuits using the oscilloscope.

2. Equipment to be used

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

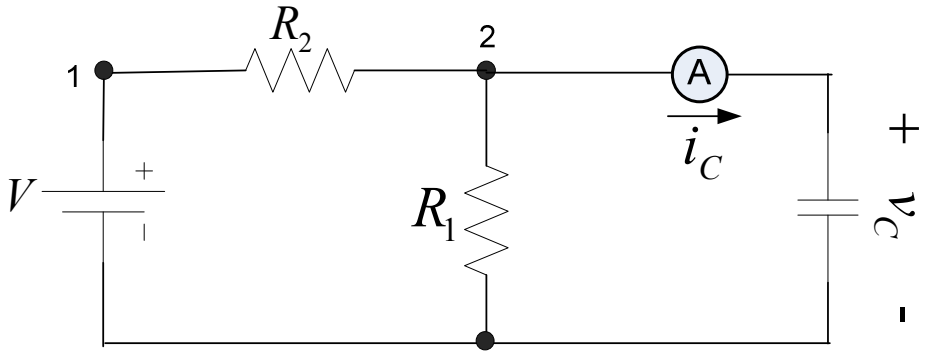
3. Components

- Resistors
- Capacitors
- Inductors

In-lab activities

Build the circuits in parts (a) to (d) on the breadboard by choosing the components from the component rack. Note down the values used and make the measurements required.

a)



Note down the following values :

V= R_1=

R_2= C=

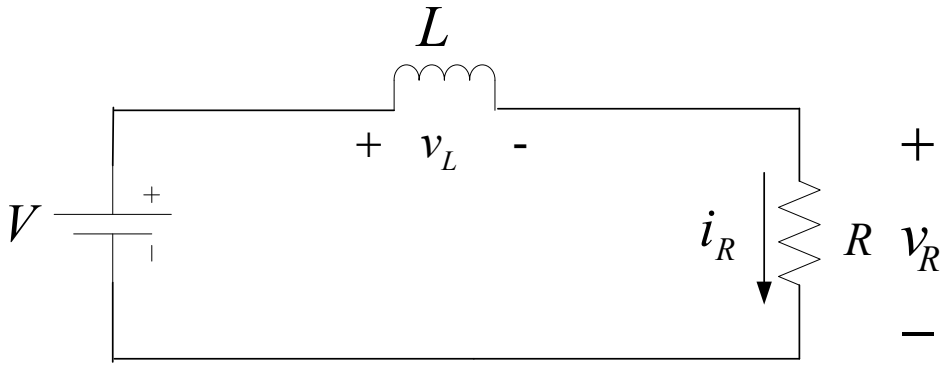
Measure the values of the voltage and current through the capacitor :

V_C= i_C=

Explain your observations.

What do you think would be the voltage across R_1 if the capacitance value is doubled?

b) Make sure the ammeter is securely connected to the circuit, before you switch on the power to the circuit. Do not touch the exposed ammeter terminals.



Measure the voltages across the inductor and the resistor.

V_L= V_R=

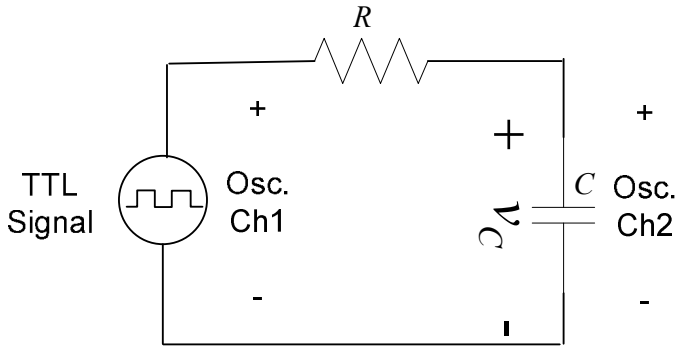
Explain your observations.

Measuring the Time Constant.

In parts (c) and (d), you will be measuring the time constants of the RC and RL circuit. Before you begin, check that both channels of the oscilloscope are functional using the test signal provided by the oscilloscope.

c) RC Constant

Construct the circuit below and **apply a TTL Signal from the signal generator.**



Theoretical Time Constant (RC) obtained from the values of R and C = _____

(1) Measure the voltage drop across the capacitor on the oscilloscope and try to obtain a nice waveform.

You need to *adjust the frequency of the TTL signal* in order to observe a nice waveform to measure the time constant. A nice waveform will **clearly** demonstrate the charging and discharging process of the capacitor.

(**Hint**: Time period of the TTL signal should be about ten times the time constant of the circuit so as to see a nice wave form.)

(2) Measure an approximate value of the time constant.

The time constant is defined as the time taken from the signal change to reach 63.2% of final steady-state value.

Adjust the time scale of waveform in both vertical and horizontal axes to read the value of the time constant.

Measured Time constant (RC) obtained from the Oscilloscope trace = _____

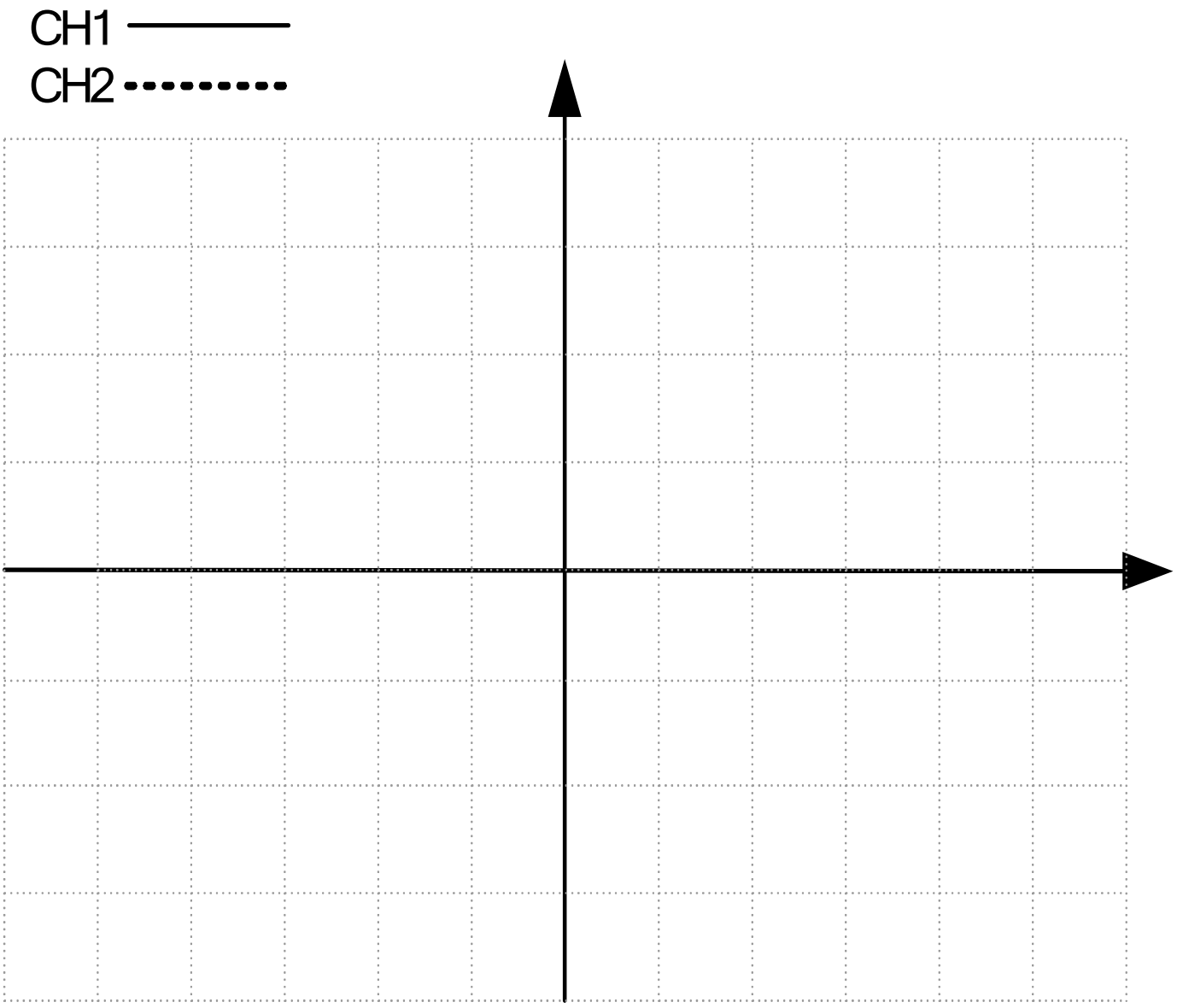
(3) Sketch one cycle of BOTH waveforms.

Note down the following

i. Voltage Scale = */Div*

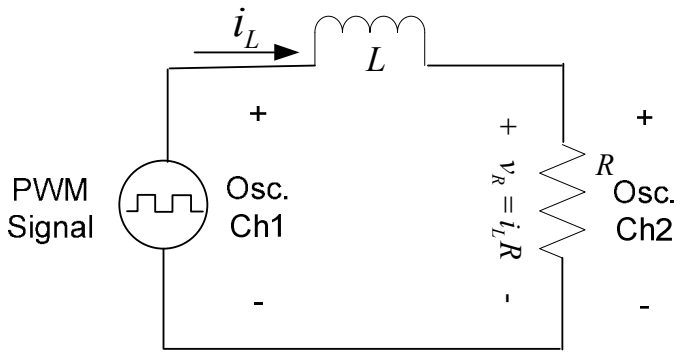
ii. Time Scale = */Div*

iii. Measured Value of the time constant =



d) RL Constant

Construct the circuit below and **apply a TTL Signal from the signal generator.**
(**Recommended** : For the inductor, use values in the range of _____
For the resistor, use values in the range of _____)



Theoretical Time Constant obtained from the values of R and L = _____

(1) Measure the voltage drop across the RESISTOR on the oscilloscope and try to obtain a nice waveform.

You need to *adjust the frequency of the TTL signal* in order to observe a nice waveform to measure the time constant. A nice waveform will **clearly** demonstrate the charging and discharging process of the capacitor.

(**Hint**: Time period of the TTL signal should be about ten times the time constant of the circuit so as to see a nice wave form.)

(2) Measure an approximate value of the time constant.

The time constant is defined as the time taken from the signal change to reach 63.2% of final steady-state value.

Adjust the time scale of waveform in both vertical and horizontal axes to read the value of the time constant.

Measured Time constant obtained from the Oscilloscope trace = _____

(3) Sketch one cycle of BOTH waveforms.

Note down the following

i. Voltage Scale = */Div*

ii. Time Scale = */Div*

iii. Measured Value of the time constant =