

Electrical and electronic principles - lab report example

[Science](#), [Physics](#)



Electrical and Electronic principles

Aims and Objectives The purpose of this lab is to experience and study the transient behaviour of capacitors (charging and recharging of a capacitor networks) and also to examine simple electronic circuits containing parallel/series combinations of capacitors. You will construct the circuit using Multisim on your PC and then perform simulation. By the end of this lab, you should be able to analyse circuit behaviour when DC or AC voltages are applied to the circuits. You are required to record all activities (observations, results and comments) in your logbook as you perform the simulation.

Equipment required:

Desktop PC, NI Multisim software, scientific calculator and Logbook

Procedure:

1. draw the following circuits:

a) Examine the charging and discharging phases of the circuits and then answer the following:

i. What is the RC time constant (τ) of both circuits in each case?

ii. Write down the mathematical expressions of VR1 and VR2?

iii. Write down the mathematical expressions of VR3 and VR4?

iv. Describe the voltage across capacitor and current through capacitor in both charging and discharging phases.

When connected to the DC power source, the current flows through the circuit. The potential difference increases while the capacitor is being charged. When the voltage on the terminals is of the capacitors is equal to the power supply voltage, the capacitor is fully charged. When the circuit is disconnected from the power supply, the capacitor is said to be discharging

through the resistors. The voltage across the circuits then drops gradually until it is zero.

b) Calculate the total capacitance of the left-hand side circuit and verify your results by simulating the circuit.

2. Draw the circuit shown in part 1 by replacing 5V DC power supply with a 10V AC 50Hz power supply and then perform the following:

a) Analyse the circuits' behaviour by measuring the voltage across the resistor and capacitor when the switch is on charging position.

At first, there is very little charge in the circuit. When power is supplied from the DC source, a charge builds up in the both the resistors and the capacitors. It is noted that as the charge increases in the circuit, the current recorded on the circuit gets smaller.

b) What value of the current may be recorded when the switch is on charge position?

c) What is the total phase angle of the circuit?

d) Calculate the voltage and current phase angles in both circuits when the switch is kept on charge position?

e) Identify the phase difference between voltage and current in both circuits by running Multisim simulation.

3. Discussion on Results and Observations:

Summarise the whole lab session in your own words and conclude what did you gain from this exercise?

From the experiment carried out above, we can learn that the changes in both the voltage and current in a multisim circuit when charging and discharging. The charge Q in a circuit is dependent on the amount of voltage

present and in turn this influences the current measured on the circuit. When the amount of charge gets larger, the amount of current measured gets smaller. When discharging, the voltage across the resistors and the capacitors drops gradually until it reduces to zero. The phase angles of both current and the voltage in this circuit have equal but opposite magnitude.

The tests carried out in the lab and through simulation of the multisim circuit have been used to demonstrate that these conclusions are true.

In conclusion, it has the concept of charging and recharging of multisim circuits has been well understood and all the factors that influence the obtained results have been identified hence the objective has been fully met.