EE 205 Circuit Theory

Lab 7

RC Circuit Response

Procedure:

1. Step Response : Capacitor charging

Implement the RC circuit shown in Fig.1. Take a piece of wire from the power supply + terminal, and by touching-on the tip of the wire to the RC-circuit, you can emulate switching for charging.

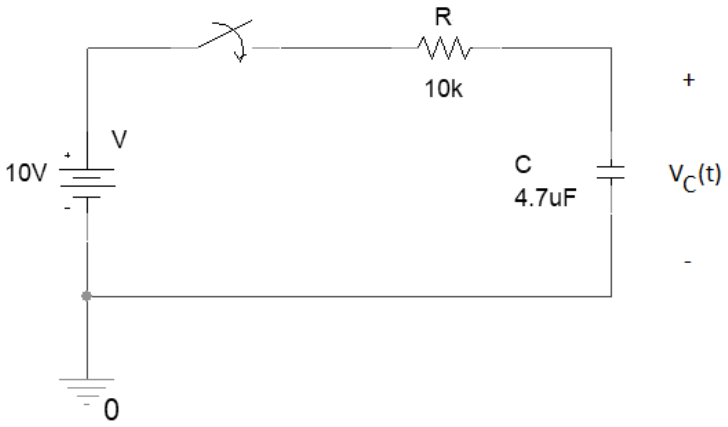

Fig.1

Connect an oscilloscope probe to $V_C(t)$. Make sure to adjust your scope settings correctly so that you can see the charging completely. Pause the scope screen when the charging is completed. Roughly measure the time it takes for the capacitor to charge. You may use the scope cursors to find the charging time. Then, you can calculate the time constant from the following relation

$$Charging\ time \cong 5\tau$$

where τ is the time constant.
In theory, the time constant is given as

$$\tau = RC.$$

Table 1. Calculated and Measured Values

Calculated Values		Measured Values	
Charging time	Time Constant	Charging time	Time Constant

2. Natural Response : Capacitor discharging

Implement the RC circuit shown in Fig.2. Take a piece of wire from the power supply + terminal, and by touching-off the tip of the wire from the RC-circuit, you can emulate switching for discharging.

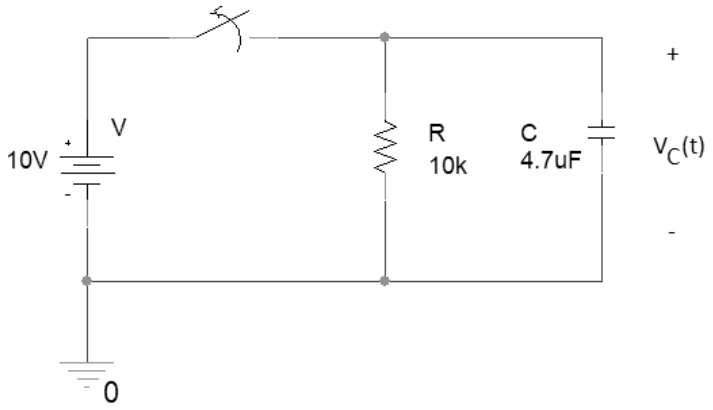

Fig.2

Connect an oscilloscope probe to $V_C(t)$. Pause the scope screen when the discharging is completed. Roughly measure the time it takes for the capacitor to discharge. You may use the scope cursors to find the discharging time. Then, you can calculate the time constant from the following relation

$$Charging\ time \cong 5\tau$$

where τ is the time constant.
In theory, the time constant is given as

$$\tau = RC.$$

Table 2. Calculated and Measured Values

Calculated Values		Measured Values	
Charging time	Time Constant	Charging time	Time Constant

3. This time connect the circuit in Fig.1. with C=3.3nF, R=1k and connect the signal generator at the source. For the signal generator, use a square wave with 10V peak-to-peak and 5V offset at 20kHz frequency. Observe the voltage across the capacitor on the oscilloscope screen. What can you say about the charging and /or discharging of the capacitor ?

   Your answer: