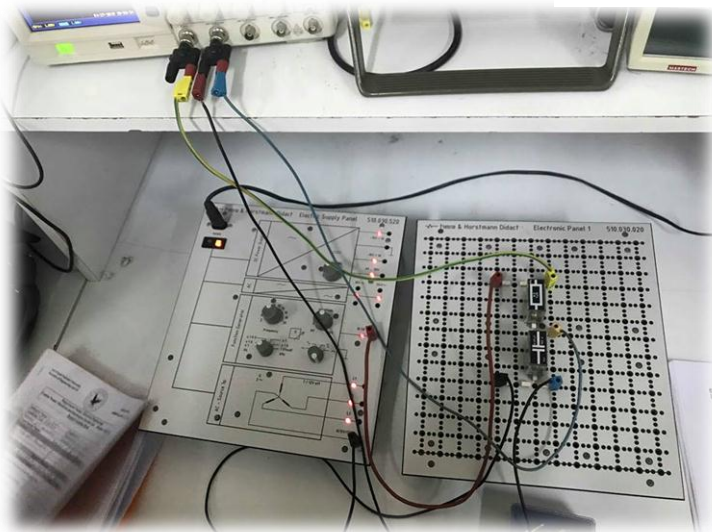
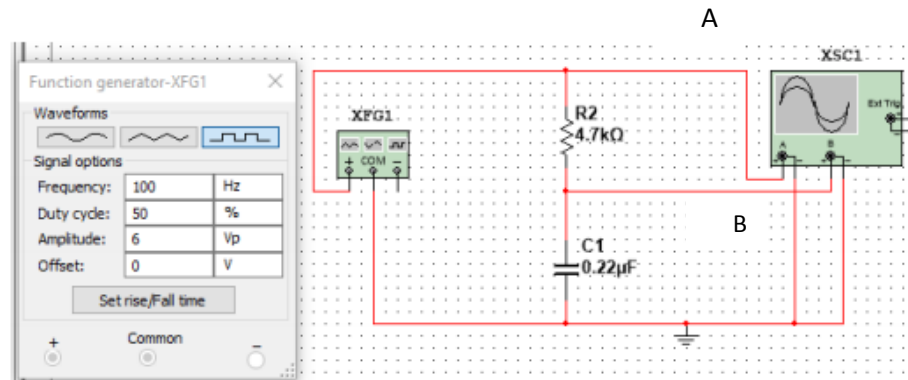


❖ Introduction

In this experiment, we studied the capacitor, and get familiar with its voltage and current response under the application of step response, and study the phase relation between current and voltage on the capacitor under AC excitation.

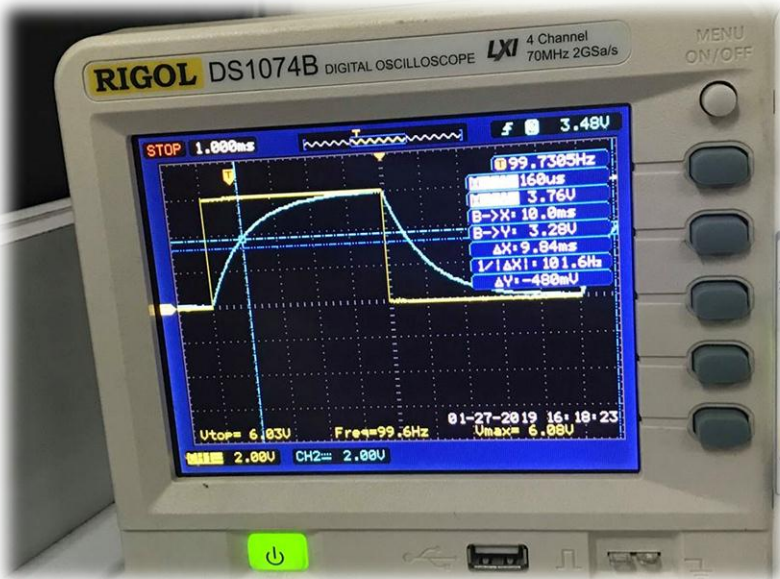
✓ Part (a) study the charging and discharging process of capacitor

1. Build this circuit and supply it with positive square wave Voltage.
2. Make sure that ch1 is connected to point A and ch2 to point B(see the following Fig).



3. Draw the resulting waveform as shown in the screen and determine the Following Q's





- Time constant (τ): by cursor
 $\Delta x = 0.16\text{ms}$ (or by
 Using the squares $\tau=1.0\text{ms}$)

✓ By calculation

$$\tau = 4.7\text{K}\Omega \times 0.22\mu\text{F}$$

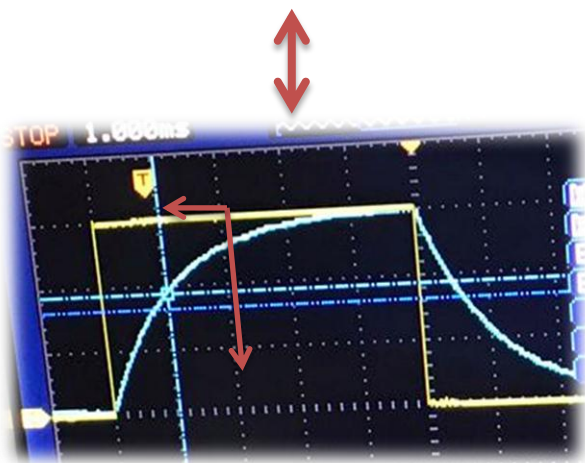
$$= 1.034\text{ ms}$$

The Capacitance=

$$\tau \backslash R = 1\text{ms} \backslash 4.7\text{K}\Omega = 0.21\mu\text{F}$$

✓ By calculation

$$C = 1.034 \backslash 4.7 = 0.22\mu\text{F}$$



- The instantaneous voltage of the capacitor at 2 ms can be found by using the squares

$$v(\text{at}=2\text{ms}) = 2.6 \times 2 = 5.2\text{volt}$$

✓ By calculation

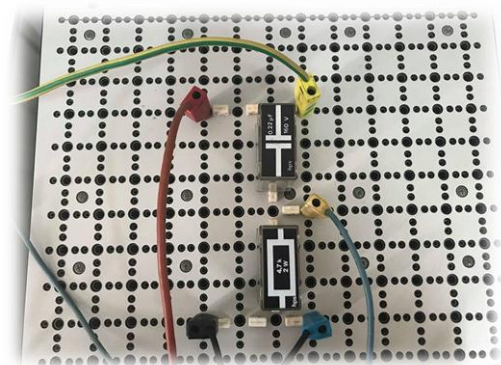
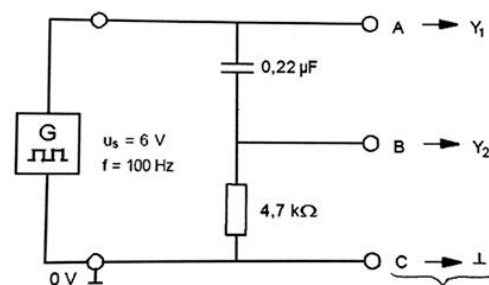
$$V(t=2) = 6 \times (1 - e^{-2 \backslash 1.034}) = 5.12\text{v}$$

- The Charge on the capacitor

$$Q = C \times V = 0.22\mu\text{F} \times 6\text{v} = 27.27\mu\text{c}$$

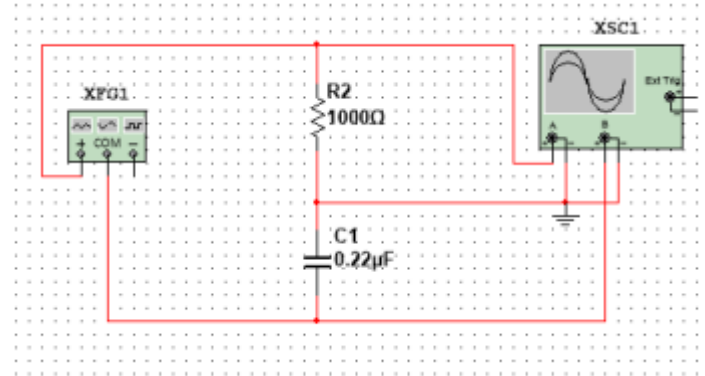
❖ If we connect R between point B & C

✓ We will get the following wave.

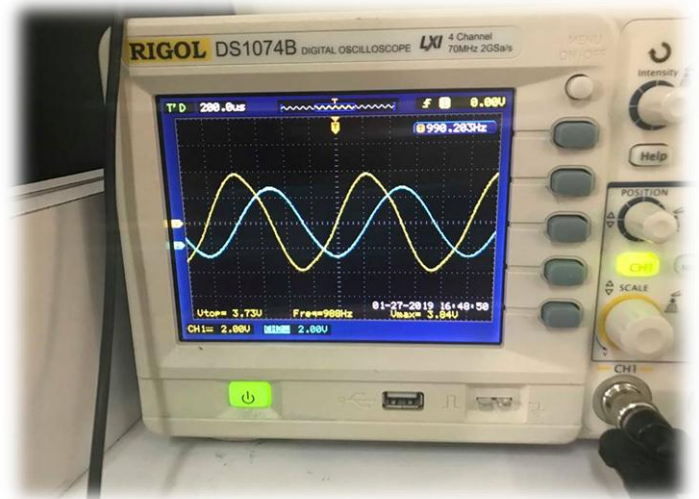


✓ **Part - b** : Voltage And Current Shift measurement

1. Build the following circuit and supply it with sinusoidal signal which it $V_{pp} = 7.68 \text{ V}$

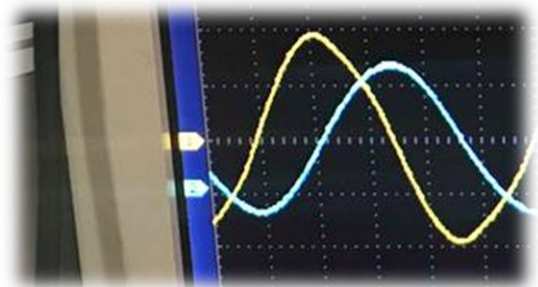


2. From the OSC , we noticed that the Current (I_c) signal leads the Voltage (V_c) Signal



3. We can calculate the angle between I & V

- ✓ We saw that 1 cycle consist of 5 squares
 $5\text{ms} \rightarrow 360^\circ$
 $1.15 \rightarrow ?$
- ✓ we find that the angular frequency = 82.8°
- ✓ or by cursor
 $1.01 \text{ ms} \rightarrow 360^\circ$
 $248 \mu\text{s} \rightarrow ?$ then its = 88.3°



❖ Conclusion:

At this experiment ,we analyzed the RC (resister – capacitor) circuit with AC power supply . From the first part , we found the capacitor charge will increase when the power supply gave a positive voltage , when it didn't give a voltage the charge will be decrease .From the second part , we noticed that the capacitor current signal leads the voltage signal , in other word they are shift between V_c & I_c .