

EXPERIMENT V
CAPACITORS AND INDUCTORS



Fall - 2023/2024

EEE 281 – Electrical
Circuits
Lab 5 Report

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Objective:

1. We will learn about parallel and series connections of linear capacitors.
2. We will understand how we can measure capacitance and inductance
3. We will observe the terminal characteristics of the circuits by using LTspice program.

EQUIPMENT & COMPONENT LIST:

Multimeter,

Digital Oscilloscope,

Function Generator,

Capacitors (0.1 μ F, 0.47 μ F, 100 μ F, 220 μ F),

Inductor (0.1 mH),

Resistors (100 Ω , 1 k Ω , 100 k Ω)

Results:

1 Capacitor

A.

After we create the circuit, we saw that the current is equal to 5.46 mA and voltage is equal to 4.2 V.

$$C = I / (2 \pi f V)$$

Frequency = 500 Hz

We get the value $C = 4.13 \mu\text{F}$, that is approximate to 0.47

B.

a.

q-v characteristics of Capacitor $C = 220 \mu\text{F}$

(Digital Oscilloscope X-Y Mode figure 1.1)

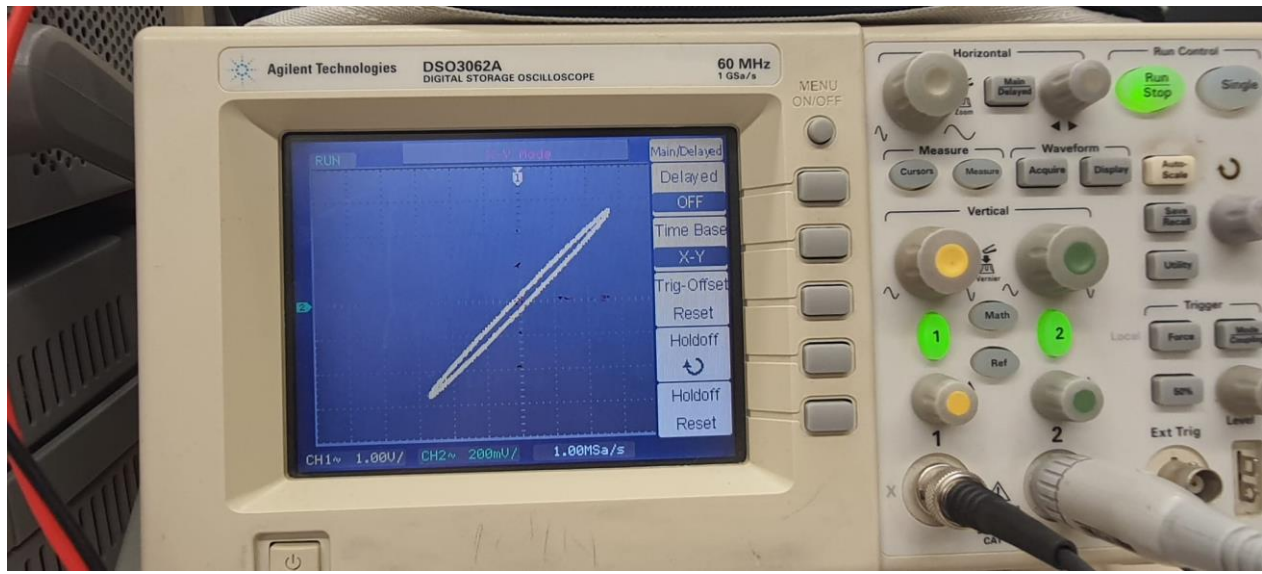


Figure 1.1

(Digital Oscilloscope Y-t Mode figure 1.2)

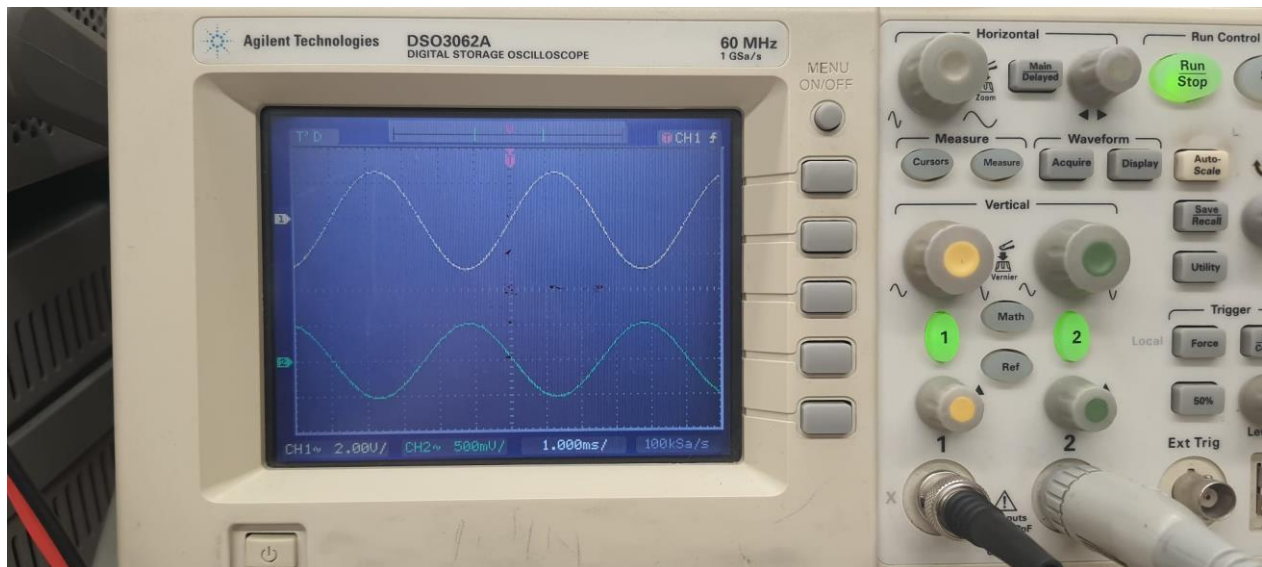


Figure 1.2

b. We connected a capacitor of 100 μF nominal capacitance value in parallel with C. We found the equivalent capacitance using the new q-v characteristics by using LTspice.

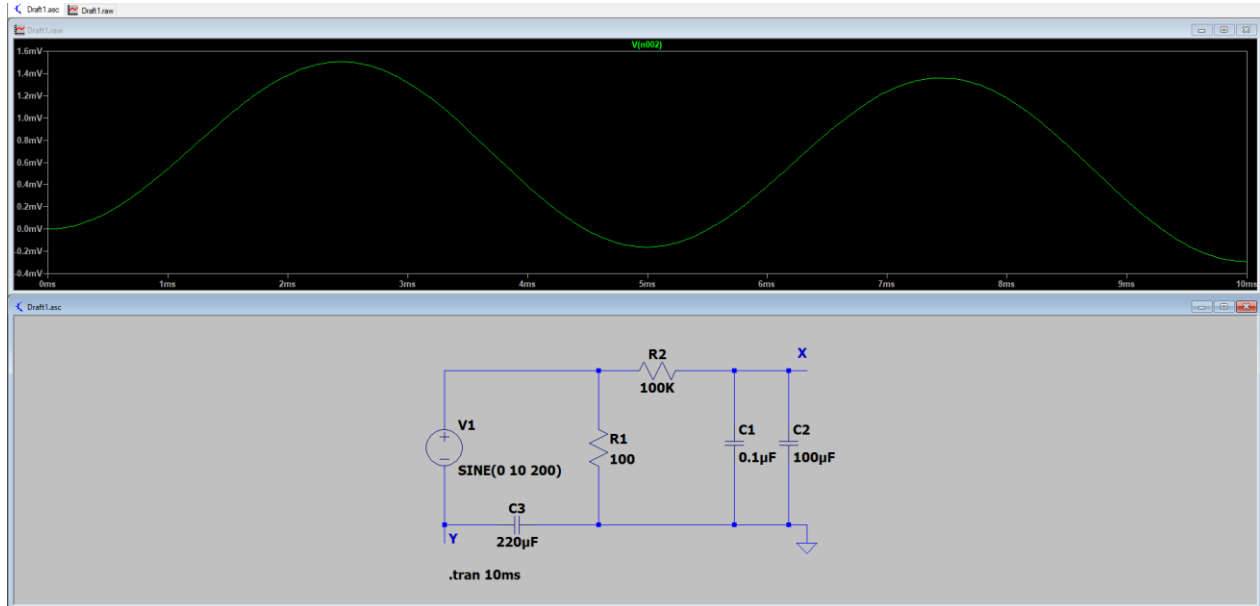


Figure 2.1

***($V(n002) = V_x$ for figure 2.1)**

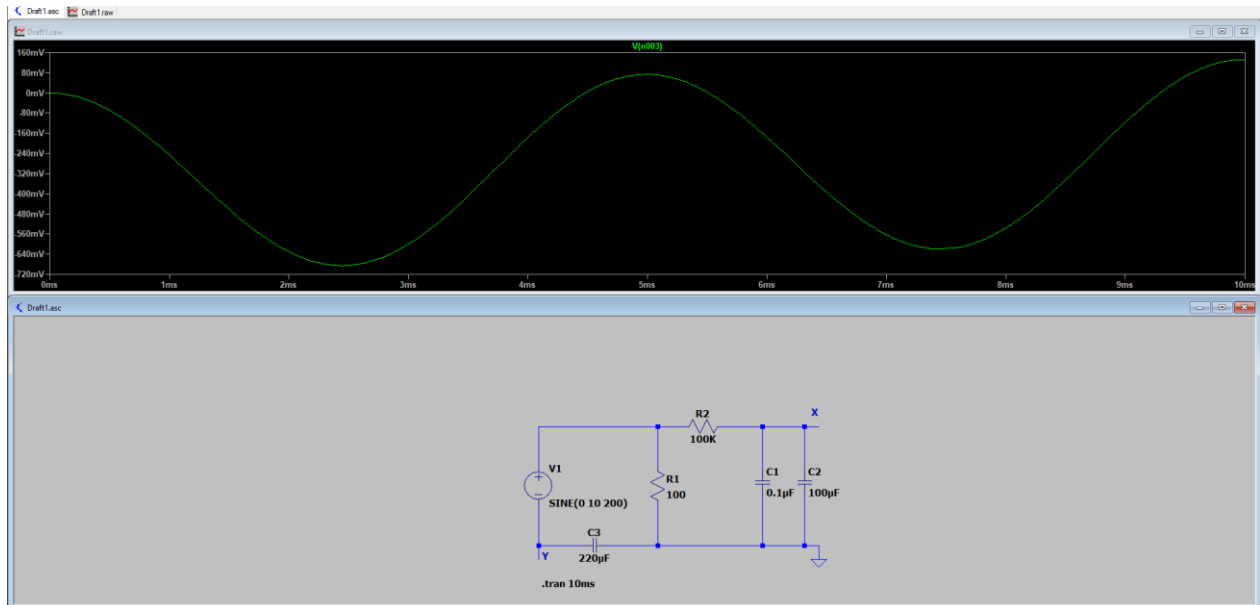


Figure 2.2

***($V(n003) = V_y$ for figure 2.2)**

We used Ltspice for this part of the experiment. These are the graphs when 100 μF capacitor connected in parallel.

C.

We connected a capacitor of 100 μF nominal capacitance value in series with C, we found the equivalent capacitance using the new q-v characteristics.

(Digital Oscilloscope in X-Y Mode figure 3.1)

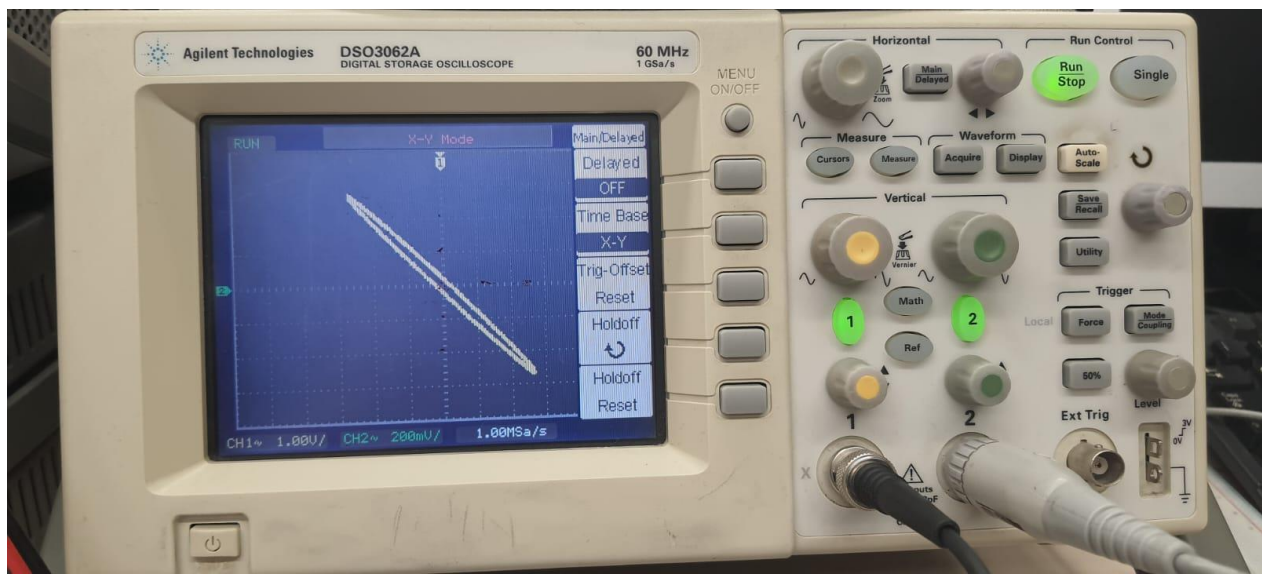


Figure 3.1

(Digital Oscilloscope Y-t Mode figure 3.2)

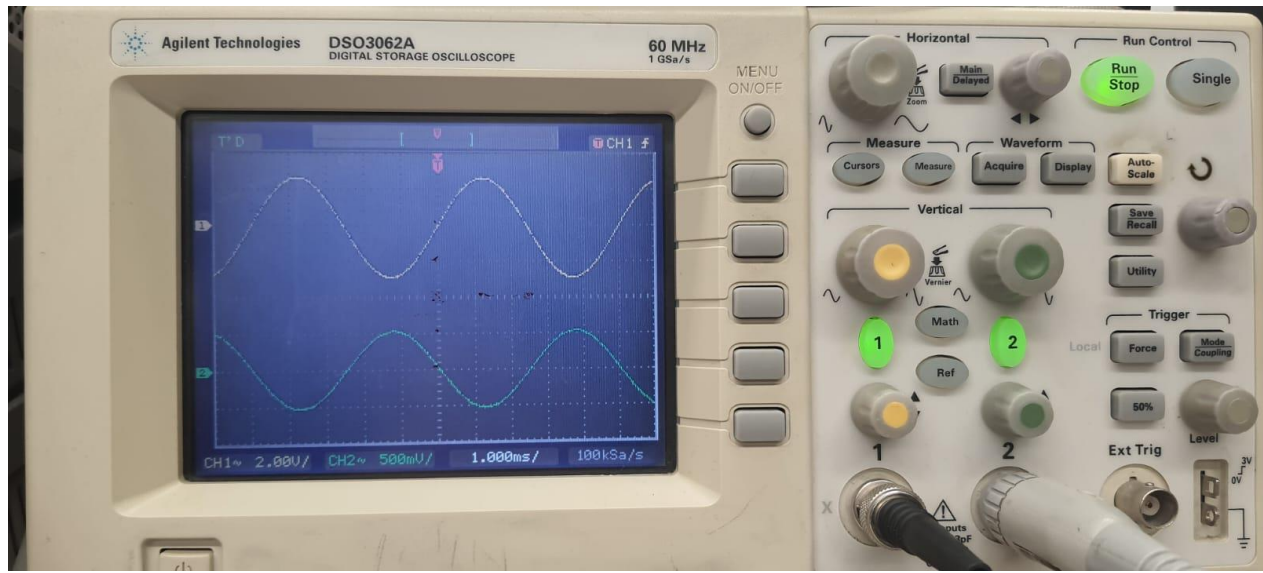


Figure 3.2

We connected the $100\mu\text{F}$ capacitance in series with C, then we observed these graphs on the oscilloscope.

2. Inductor

By using multimeter, we measured these;

- Current = 25 mA
- Voltage = 0.16 V
- The internal resistance of the inductor = $3.4\ \Omega$

Conclusion

1. By connecting oscilloscope to the circuits, we observed the q-v characteristics of the circuits.
2. We understand how we can find the internal resistance of Inductors.
3. We understand how we build the capacitor-inductor circuits with both in series and parallel connections.
4. We learned how we measure the internal resistance of the inductor.