Lab Report 2: RC Circuit on PCB and Introduction to Soldering

V.L.S. Bhargav ; Lanka Kushwanth
Table Number: 3
Room Number: 114
Roll Number: 2025102061

30-09-2025

Aim:

The aim of this experiment is to learn the soldering process and build an RC circuit on a PCB. The objective is to study its time constant, observe the frequency response, and compare the theoretical results with the practical ones.

Components Used:

1. Resistors (different values)
2. Capacitors (different values, including electrolytic)
3. Breadboard and PCB
4. Function generator
5. Oscilloscope (DSO)
6. Multimeter
7. Soldering iron, stand, solder, solder sucker, solder wick
8. Connecting wires

Procedure:

1. Heat up the soldering iron and clean the tip with a damp sponge.
2. Tin the tip with solder to improve conductivity and heat transfer.
3. Place the RC circuit components onto the PCB as per the circuit diagram.
4. Secure the components by bending their leads and solder them carefully, starting with the smaller ones.
5. Check the solder joints to ensure they are shiny, solid, and free from solder bridges.
6. Trim extra leads and clean the board using solder wick or solder sucker if needed.
7. Verify circuit continuity with a multimeter.
8. Connect the circuit to a function generator and observe the capacitor's response using a DSO.
9. Change the input frequency and record the practical time constant and cutoff frequency.
10. Compare the PCB results with those from the breadboard implementation.

Circuit Diagram:

Figure 1: Schematic of the RC circuit implemented on PCB.

Physical Circuit:

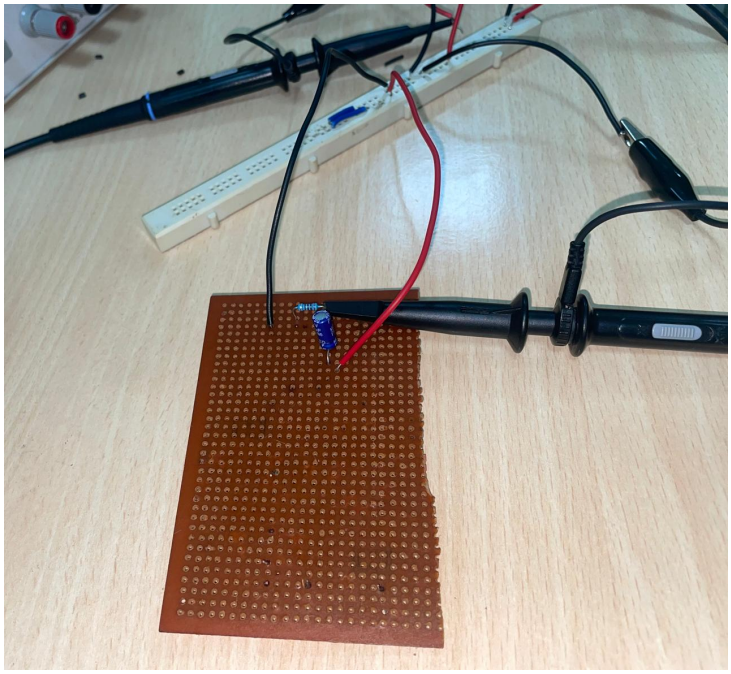

Figure 2: Physical RC circuit implemented on PCB.

Observation:

Experimental Waveforms and Table:

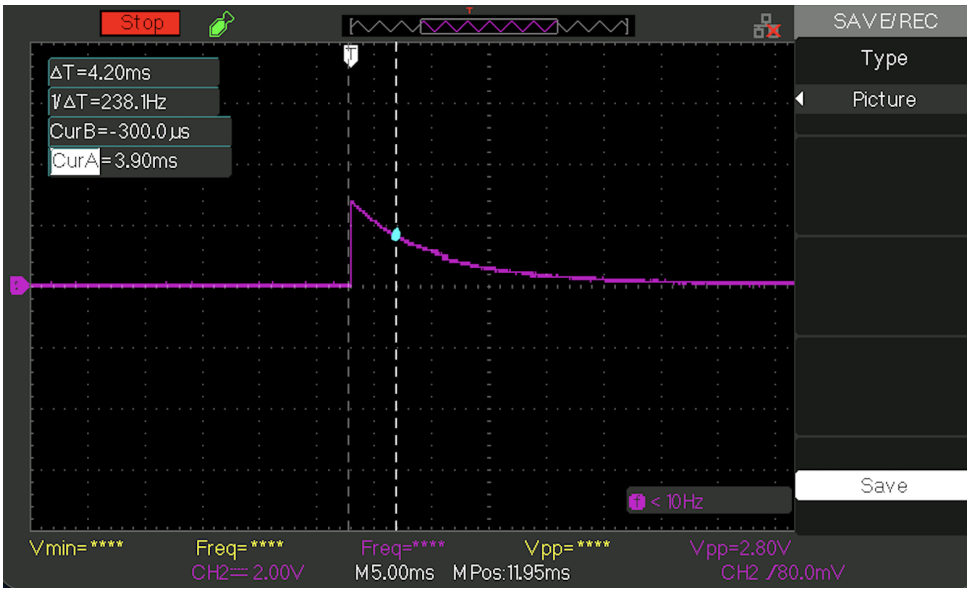

Figure 3: Time response (Δt) of RC circuit on PCB.

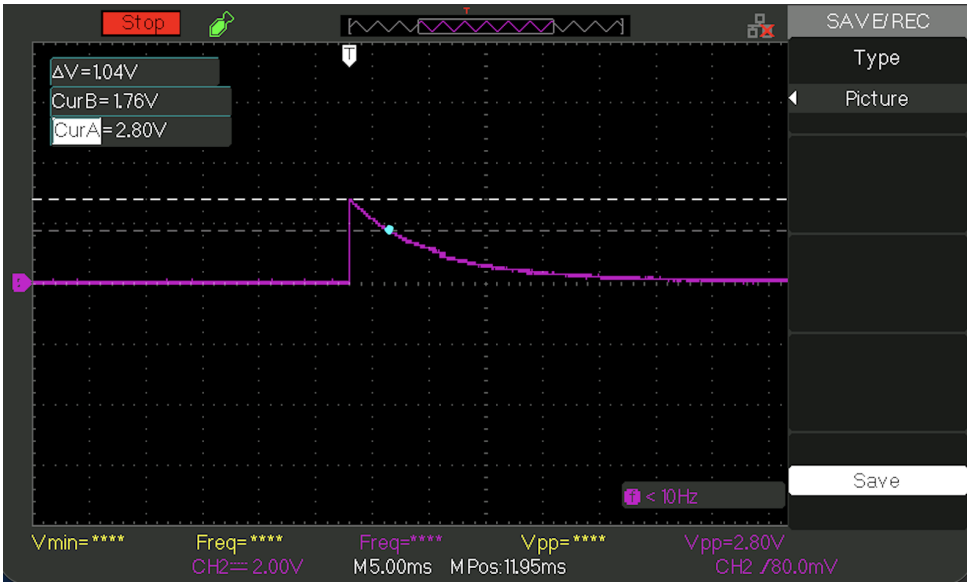

Figure 4: Voltage response (ΔV) of RC circuit on PCB.

Observation Table:

Theoretical and practical values of the time constant and cutoff frequency were measured for different combinations of resistors and capacitors. The results are tabulated below:

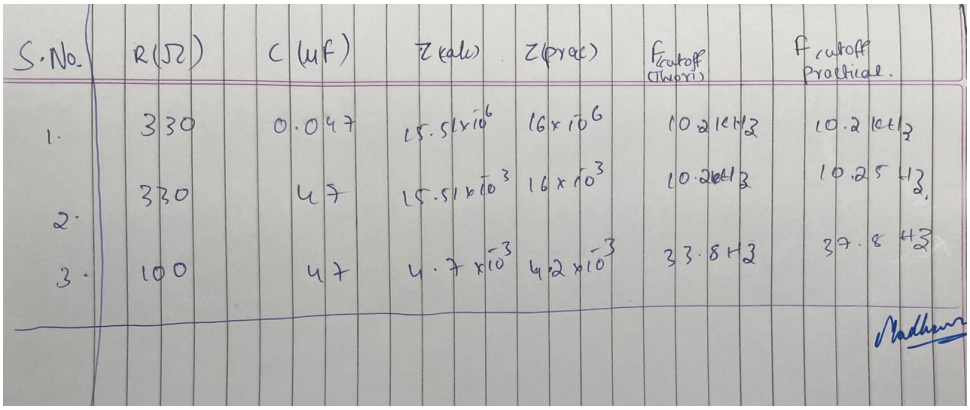

Figure 5: Observation table of RC circuit on PCB.

Explanation:

- Similar to Lab-1, the circuit was assembled using the same components.
- In this lab, the components were soldered onto a PCB (Printed Circuit Board).
- Soldering provides strong and permanent connections between components.
- Using a PCB minimizes loose connections and wiring errors.
- It ensures better stability, durability, and reliability compared to a breadboard.
- The circuit layout becomes more compact and organized, closely resembling practical real-world implementations.

Conclusion:

The experiment introduced soldering and circuit implementation on a PCB. The RC circuit displayed the expected low-pass filter behavior, and the theoretical and practical results were consistent, confirming the concepts of time constant and cutoff frequency.

References:

- Lab manual: Introduction to DSO, Breadboard and RC Circuit Experiment
- Engineering Circuit Analysis by William Hayt et al.
- Signals and Systems by V.A. Oppenheim et al.