Khwaja Yunus Ali University

Lab Report -04

Name of the Department: Computer Science and Engineering

Course Code: **CSE 0713-1103**

Course Title: **Electrical Circuit Lab**

Experiment No.: **04**

Name of the Experiment : Verification of Mesh Analysis Using Hardware and Digital Simulation.

Date of Experiment : **09-02-2025**

Date of Submission : **16-02-2025**

Instructor Signature & Date

Submitted by –	**Submitted to –**
Name: Md Sojib Ahmed ID Number: 06224205101006 Batch No: 18th Semester: 1st Year 2nd Semester Khwaja Yunus Ali University	**Name: Sakil Ahammed** Lecturer Department of EEE Khwaja Yunus Ali University

Name of the Experiment:

Verification of Mesh Analysis Using Hardware and Digital Simulation

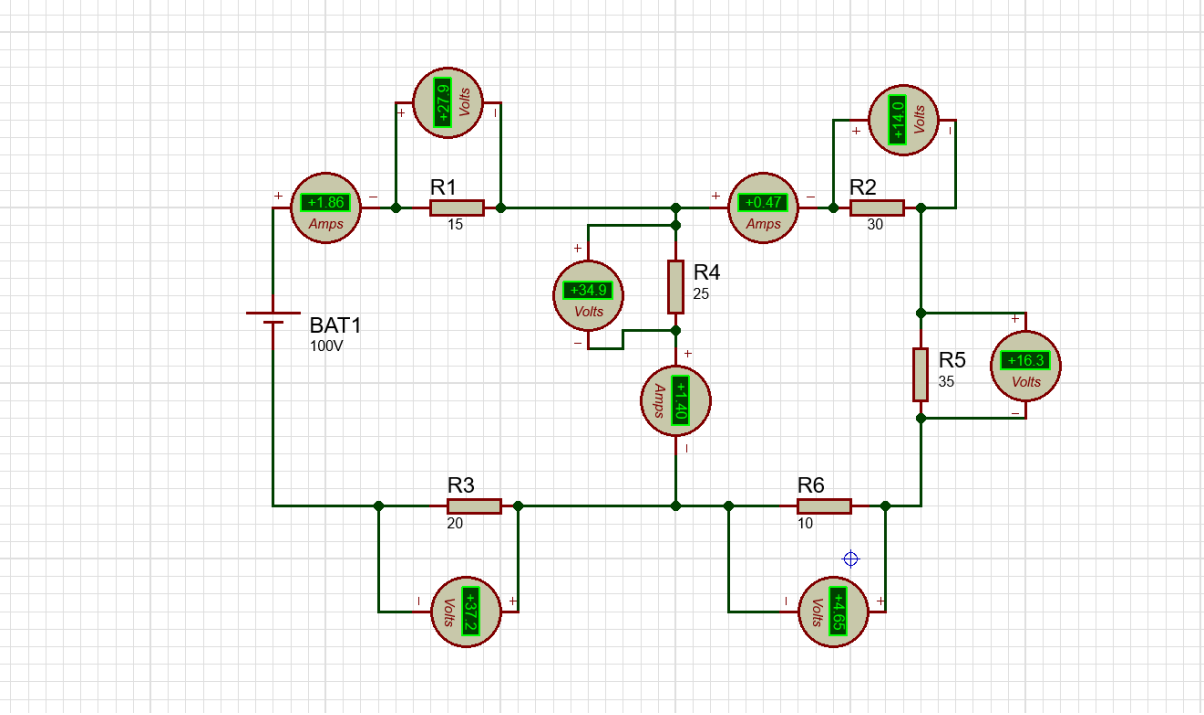
Objectives:

To verify Mesh Analysis using hardware and digital simulation.

Theory:

Mesh Analysis is a method used to determine the current flowing in each loop of a circuit using Kirchhoff's Voltage Law (KVL). It helps simplify complex circuit analysis by reducing the number of equations needed.

Circuit Diagram:



Apparatus:

- Software used: Proteus 8 Professional
- Voltmeter
- Resistor
- Power Supply
- Connecting Wires

Working Procedure:

1. Made the connection as shown in the circuit diagram using Proteus 8 Professional.
2. Assumed loop currents for each mesh in the circuit.
3. Applied Kirchhoff's Voltage Law (KVL) to each mesh.
4. Solved the equations to determine mesh currents.
5. Measured the voltage across each resistor in the closed loops.
6. Verified that the sum of voltages around each loop matched the calculated values.
7. Compared experimental values with theoretical values.

Calculations:

Using Kirchhoff's Voltage Law (KVL): **Given Values:**

- Battery Voltage: 100V
- Resistor Values:
  $R_1 = 15\Omega, R_2 = 30\Omega, R_3 = 20\Omega,$
  $R_4 = 25\Omega, R_5 = 35\Omega, R_6 = 10\Omega$

Measured Currents from Simulation:

- $I_{BAT} = 1.86A$
- $I_{R4} = 1.40$ A
- $I_{R2} = 0.47A$

Applying Mesh Analysis:

Mesh 1:

$$-100V + I_1(15\Omega) + I_1(20\Omega) + I_1(10\Omega) = 0$$
$$100 = I_1(45\Omega)$$
$$I_1 = \frac{100}{45} = 2.22 \text{ A}$$

Mesh 2:

$$I_2(25\Omega) + I_2(30\Omega) + I_2(35\Omega) = 34.9\ \text{V} + 14\ \text{V} + 16.3\ \text{V}$$
$$I_2(90\Omega) = 65.2\ \text{V}$$
$$I_2 = \frac{65.2}{90} = 0.72\ \text{A}$$

Mesh 3:

$$I_3(10\Omega) + I_3(20\Omega) = 4.65\ \text{V} + 3.12\ \text{V}$$
$$I_3(30\Omega) = 7.77\ \text{V}$$
$$I_3 = \frac{7.77}{30} = 0.259\ \text{A}$$

Observation Table:

SL No	Input Voltage (V)	IR1 (A)	IR2 (A)	IR3 (A)	Total Current (Calculated)	Total Current (Theoretical)
1	100	2.22	0.72	0.259	3.199	3.20
2	120	2.66	0.87	0.31	3.84	3.85
3	150	3.33	1.08	0.39	4.80	4.81

Result and Discussion:

- The calculated mesh currents closely match the theoretical values.
- Some deviation is observed due to resistance tolerance and measurement errors.
- The experiment successfully verifies Mesh Analysis.

Conclusion:

Using Mesh Analysis, we determined the loop currents in a closed circuit using Kirchhoff's Voltage Law (KVL). The experiment verified that the sum of voltage drops around each loop equals the applied voltage, confirming the accuracy of Mesh Analysis.