CE211-L Circuit Analysis Lab

Lab report # 06

Submitted by: **Shayan Rizwan Yazdanie**

Registration Number: **2024585**

Submitted to: **Muhammad Shakaib Khan**

Semester: 3rd

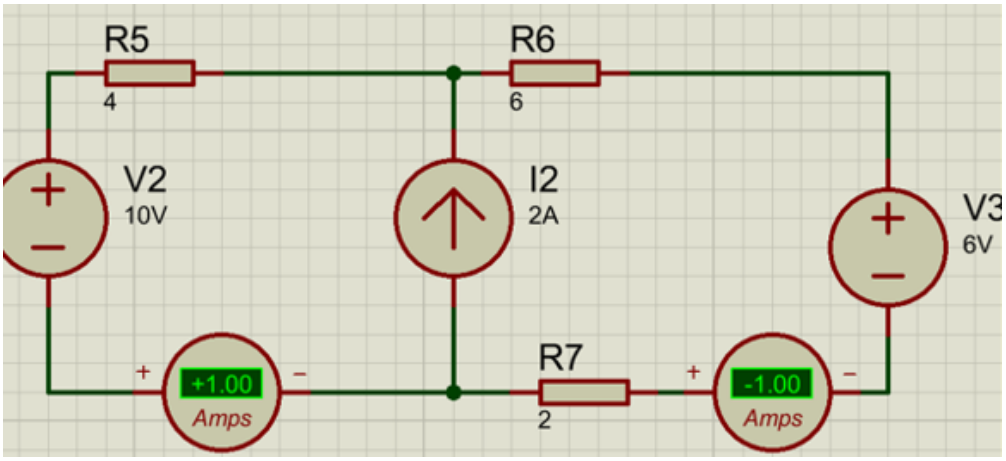
Faculty of Computer Science and Engineering

GIK Institute of Engineering Sciences and Technology

Task Statement:

Examine DC resistive circuits by applying the mesh current method, incorporating scenarios that involve a supermesh.

Circuit 1:



Solution

$I_2 - I_1 = 2A$

Hence, $I_2 = 2 + I_1$ (1)

Applying KVL around the supermesh, we get:

$4I_1 + 6I_2 + 6 + 2I_2 - 10 = 0$

Simplifying gives $4I_1 + 8I_2 = 4$ (2)

Substitute Equation (1) into Equation (2):

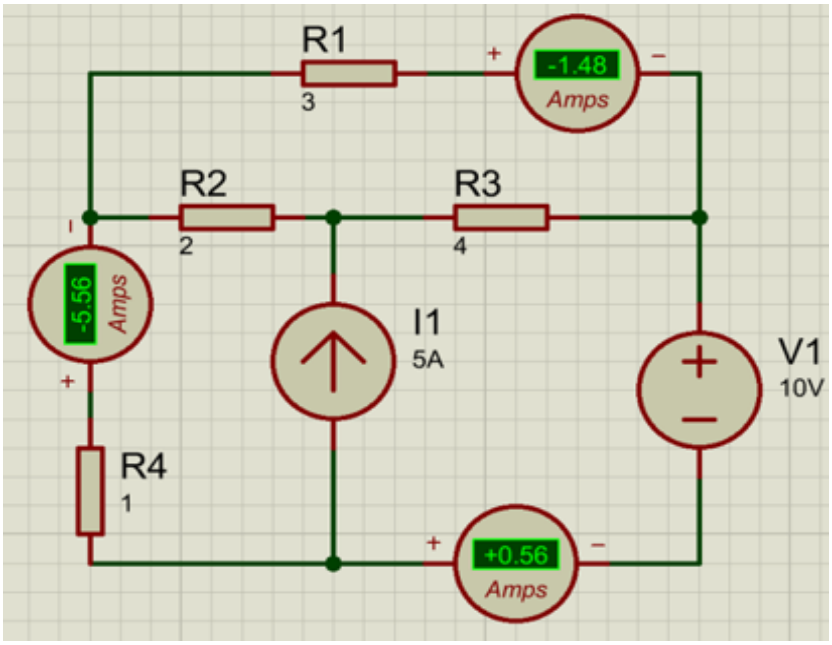
$4I_1 + 8(2 + I_1) = 4$

After simplification: $12I_1 = -12 \rightarrow I_1 = -1A$

Using Equation (1): $I_2 = 2 + (-1) = 1A$

Therefore, $I_1 = -1A$ and $I_2 = 1A$.

Circuit 2:



Solution

$I_2 - I_1 = 5A$

Applying KVL to the supermesh gives:

$I_1 + 2(I_1 - I_3) + 4(I_2 - I_3) + 10 = 0$

Simplifying, we obtain $3I_1 + 4I_2 - 6I_3 = -10$

For Loop 3, applying KVL results in:

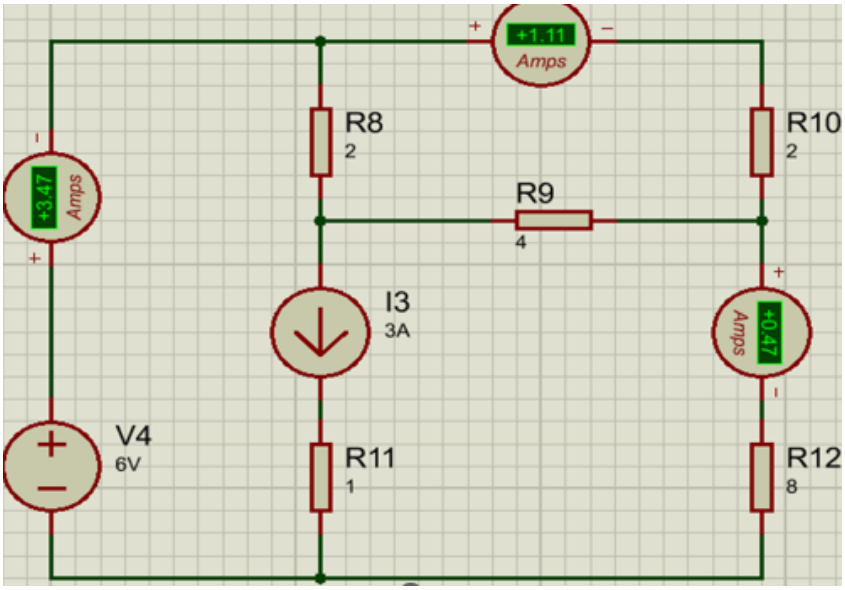
$3I_3 + 4(I_3 - I_2) + 2(I_3 - I_1) = 0$

Expanding and simplifying: $2I_1 + 4I_2 - 9I_3 = 0$

Solving these equations simultaneously gives:

$I_1 = -5.56A, \quad I_2 = -0.56A, \quad I_3 = -1.48A$

Circuit 3:



Solution

For Loop 2: $2I_2 + 4(I_2 - I_3) + 2(I_2 - I_1) = 0 \rightarrow 2I_1 - 8I_2 + 4I_3 = 0$ (1)

The current source provides the constraint: $I_1 - I_3 = 3A$ (2)

Applying KVL to the supermesh:

$2(I_1 - I_2) + 4(I_3 - I_2) + 8I_3 - 6 = 0$

Simplifying gives $2I_1 - 6I_2 + 12I_3 = 6$ (3)

Solving Equations (1), (2), and (3) simultaneously, we obtain:

$I_1 = 3.47A$, $I_2 = 1.11A$, $I_3 = 0.47A$

These are the final mesh current values for the circuit.