



# ELEMENTS OF ELECTRICAL ENGINEERING

## Course Code : UE25EE141A/B

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# ELEMENTS OF ELECTRICAL ENGINEERING

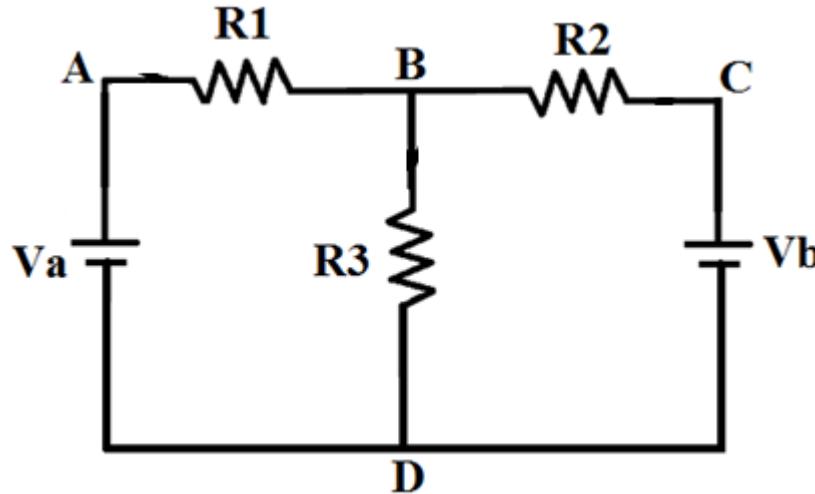
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## Mesh Analysis

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- A Loop is a closed path with current flow in every element in that path.
- A mesh is a fundamental loop. It doesn't have smaller loops within itself.



### Loops:

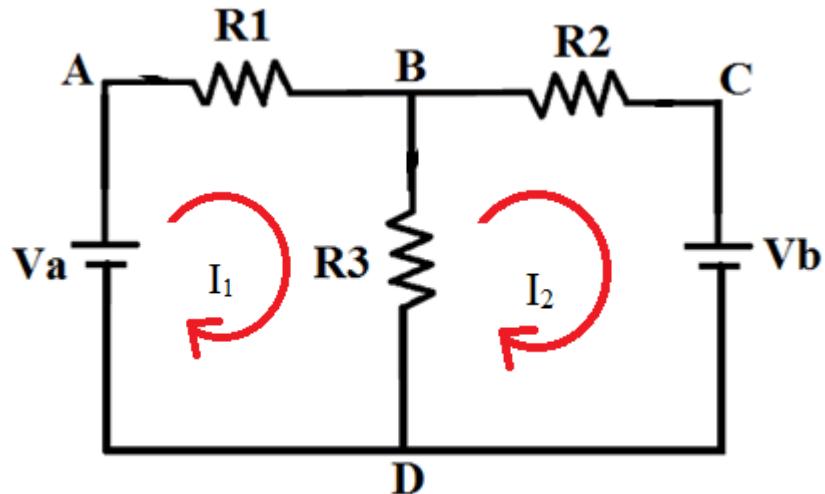
A-B-D-A  
B-C-D-B  
A-B-C-D-A

### Mesches:

A-B-D-A  
B-C-D-B

Step 1: Identify the number of meshes in the network.

Step 2: Assign one mesh current in each mesh  
preferably in the same direction.

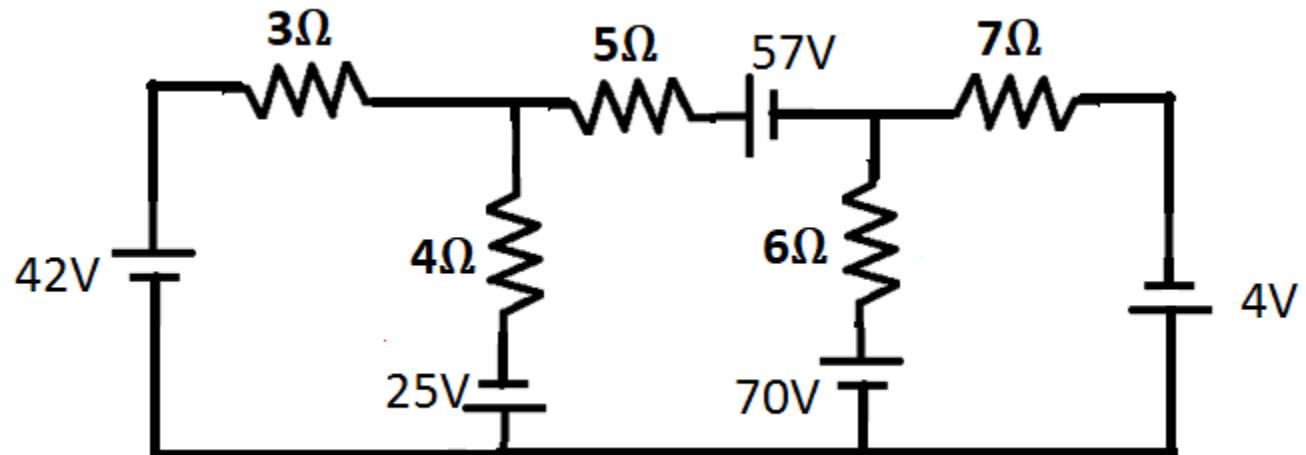


Step 3: Write KVL in every mesh.

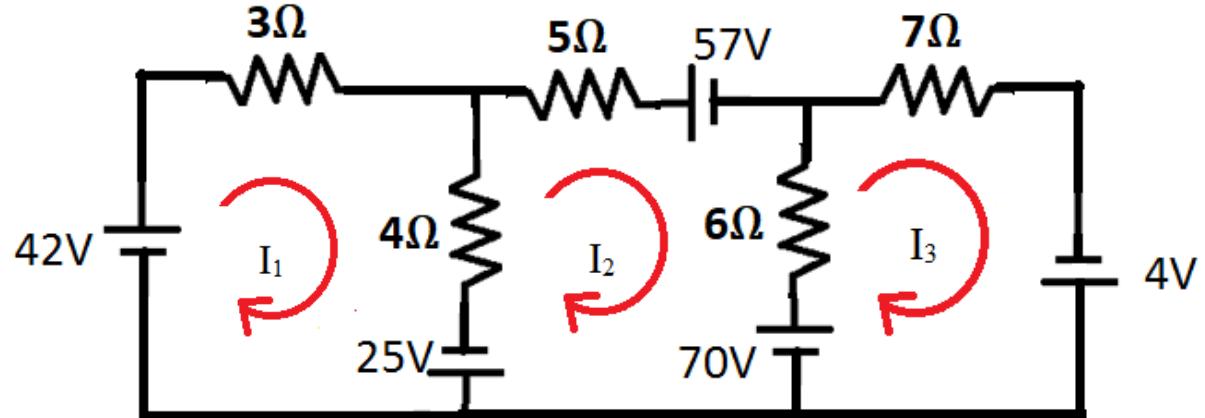
Step 4: Solve simultaneous equations to obtain Mesh currents.

### Question:

Obtain current through  $6\Omega$  resistor using Mesh Analysis.



Solution:



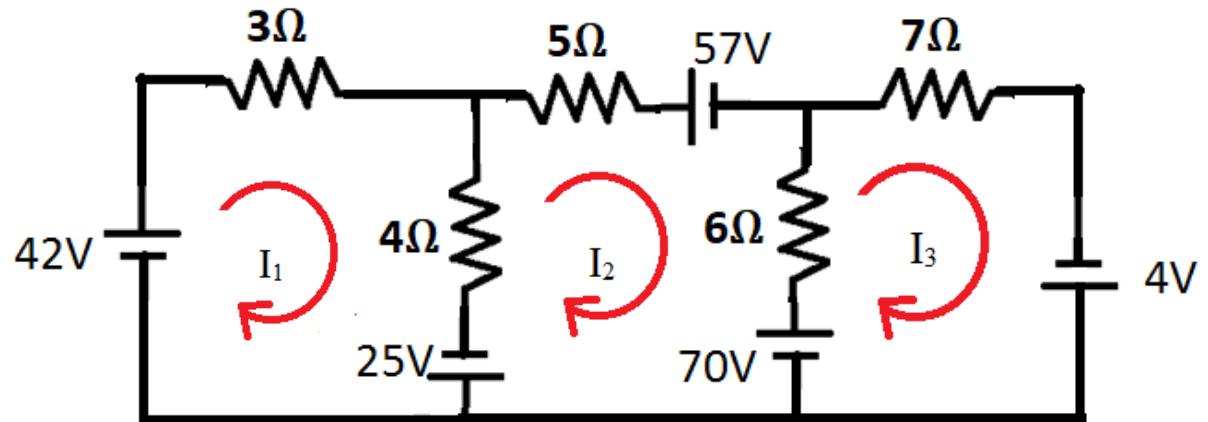
Number of Meshes = 3

$$\text{KVL (Mesh 1)} : -3I_1 - 4(I_1 - I_2) + 25 + 42 = 0 \quad \text{---- (1)}$$

$$\text{KVL (Mesh 2)} : -5I_2 - 57 - 6(I_2 - I_3) - 70 - 25 - 4(I_2 - I_1) = 0 \quad \text{---- (2)}$$

$$\text{KVL (Mesh 3)} : -7I_3 + 4 + 70 - 6(I_3 - I_2) = 0 \quad \text{---- (3)}$$

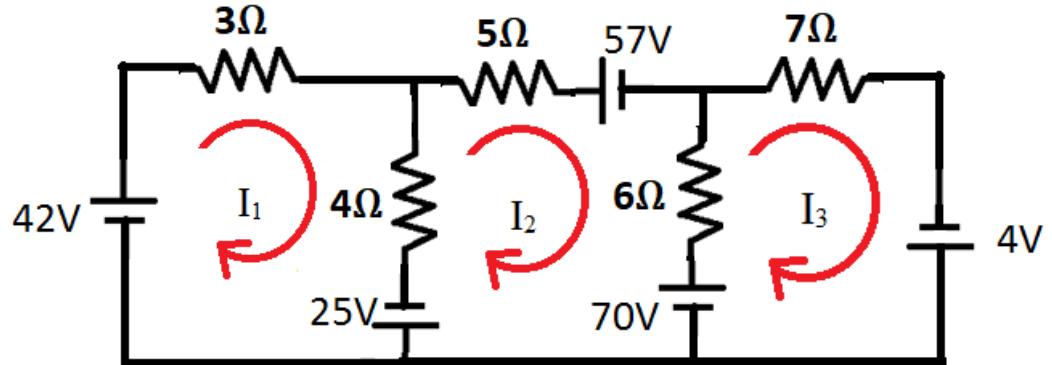
Solution (Continued..):



Solving the simultaneous equations (1), (2) & (3),

$$I_1 = 5A \quad ; \quad I_2 = -8A \quad ; \quad I_3 = 2A$$

Current through  $6\Omega$  resistor =  $(I_2 \sim I_3) = (I_3 - I_2) = 10A$



- Coefficient of same mesh current = Sum of all resistances in that mesh.
- Coefficient of other mesh current = Negative of Sum of all common resistances between the meshes.

$$\text{KVL (Mesh 1)} : 7I_1 - 4I_2 - 0I_3 = +25 + 42 \quad \text{---- (1)}$$

$$\text{KVL (Mesh 2)} : -4I_1 + 15I_2 - 6I_3 = -57 - 70 - 25 \quad \text{---- (2)}$$

$$\text{KVL (Mesh 3)} : 0I_1 - 6I_2 + 13I_3 = +4 + 70 \quad \text{---- (3)}$$

### Text Book:

1. "Basic Electrical Engineering" S.K Bhattacharya, 1<sup>st</sup> Edition Pearson India Education Services Pvt. Ltd., 2017
2. "Basic Electrical Engineering", D. C. Kulshreshtha, 2<sup>nd</sup> Edition, McGraw-Hill. 2019
3. "Special Electrical Machines" E G Janardanan, PHI Learning Pvt. Ltd., 2014

### Reference Books:

1. "Engineering Circuit Analysis" William Hayt, Jack Kemmerly, Jamie Phillips and Steven Durbin, 10<sup>th</sup> Edition McGraw Hill, 2023
2. "Electrical and Electronic Technology" E. Hughes (Revised by J. Hiley, K. Brown & I.M Smith), 12<sup>th</sup> Edition, Pearson Education, 2016.



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**THANK YOU**

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