**Chapter 3: Methods of Analysis**

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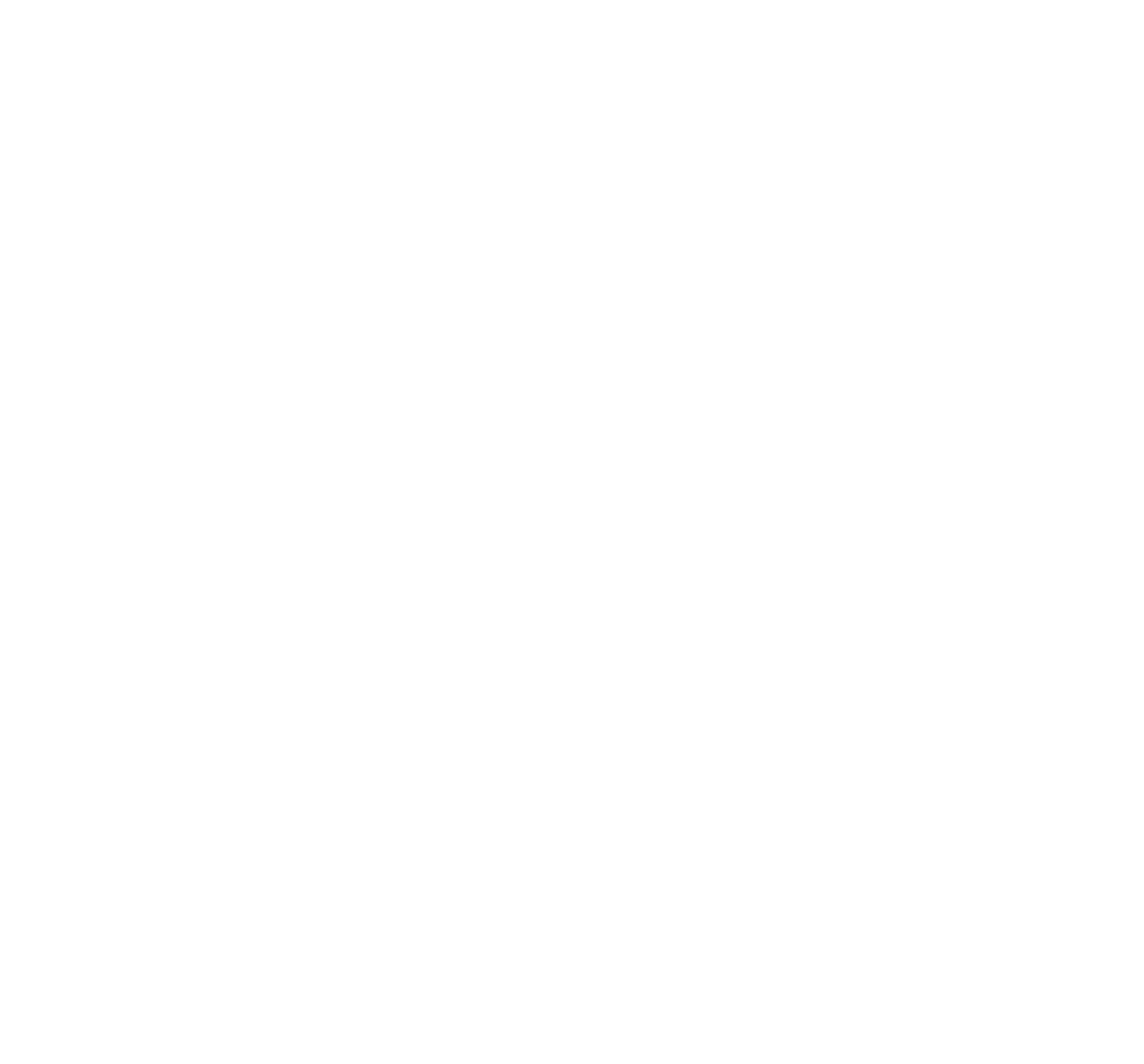
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## 3.2 Nodal Analysis

Current flows from higher potential to lower potential. Nodal analysis makes use of this to form equations involving the current entering a node, and the current leaving it.



At each node, it is assumed that that node has the highest potential. This can be done since in the case that the node has a lower potential, current would be leaving, meaning that term will be negative, taking it to the right-hand side of the equation, following KCL.

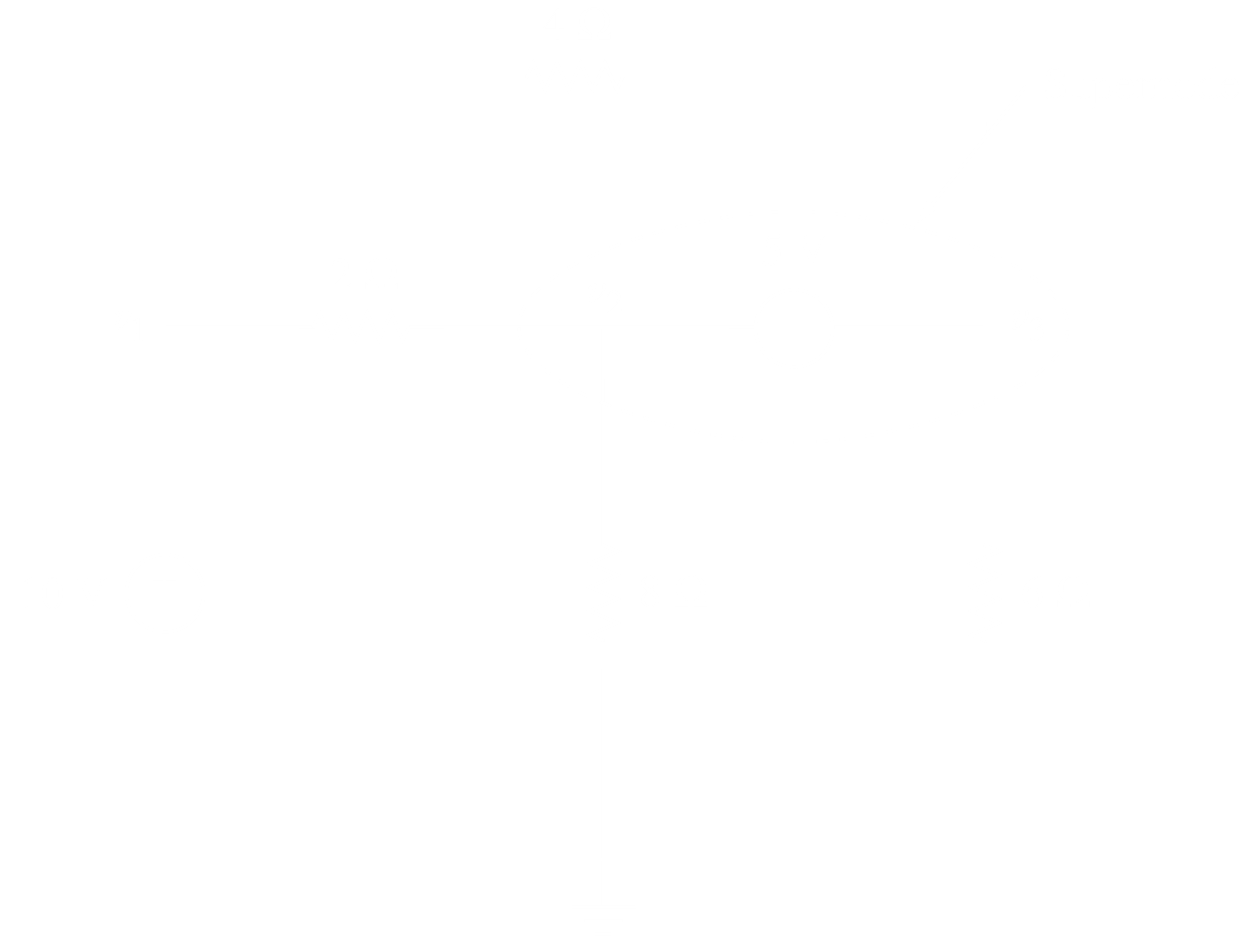
At Node 1,

At Node 2,

This gives us two equations which can be solved to find and

## 3.3 Nodal Analysis with Voltage Sources (Super Nodes)

If, in between two nodes, there is a voltage source, then these nodes are called super nodes. Super nodes act as a single node when considering K.C.L.

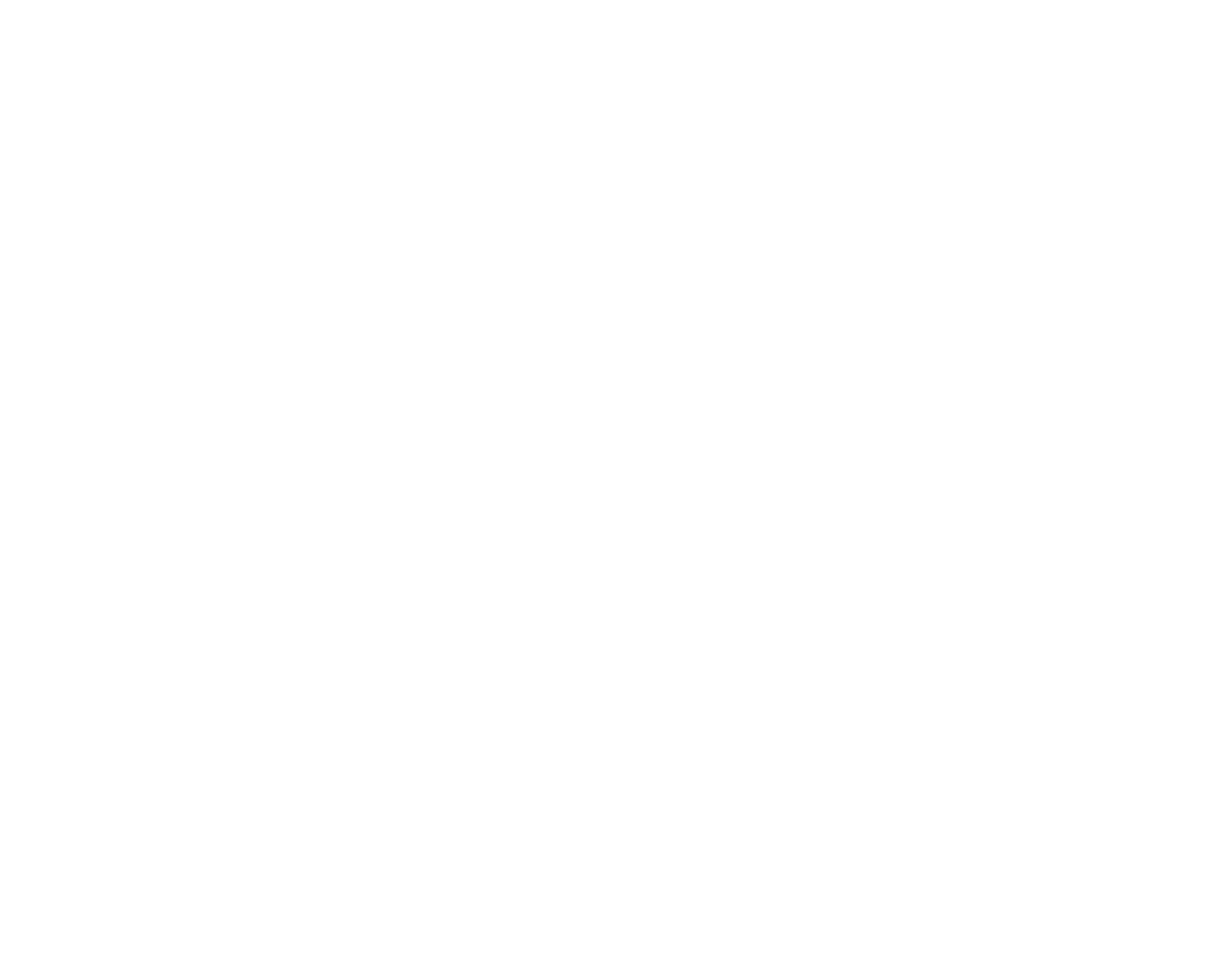


Here, Node 2 and Node 3 are super nodes.

Since the voltage between them is given, it must be taken into account while forming equations. A super node gives two equations.

For the second equation, the voltage or is being used with their respective branches.

Practice Problem 3.4



Assuming

and make super nodes.

and make super nodes.

Thus, , and are a single node.

- (i)

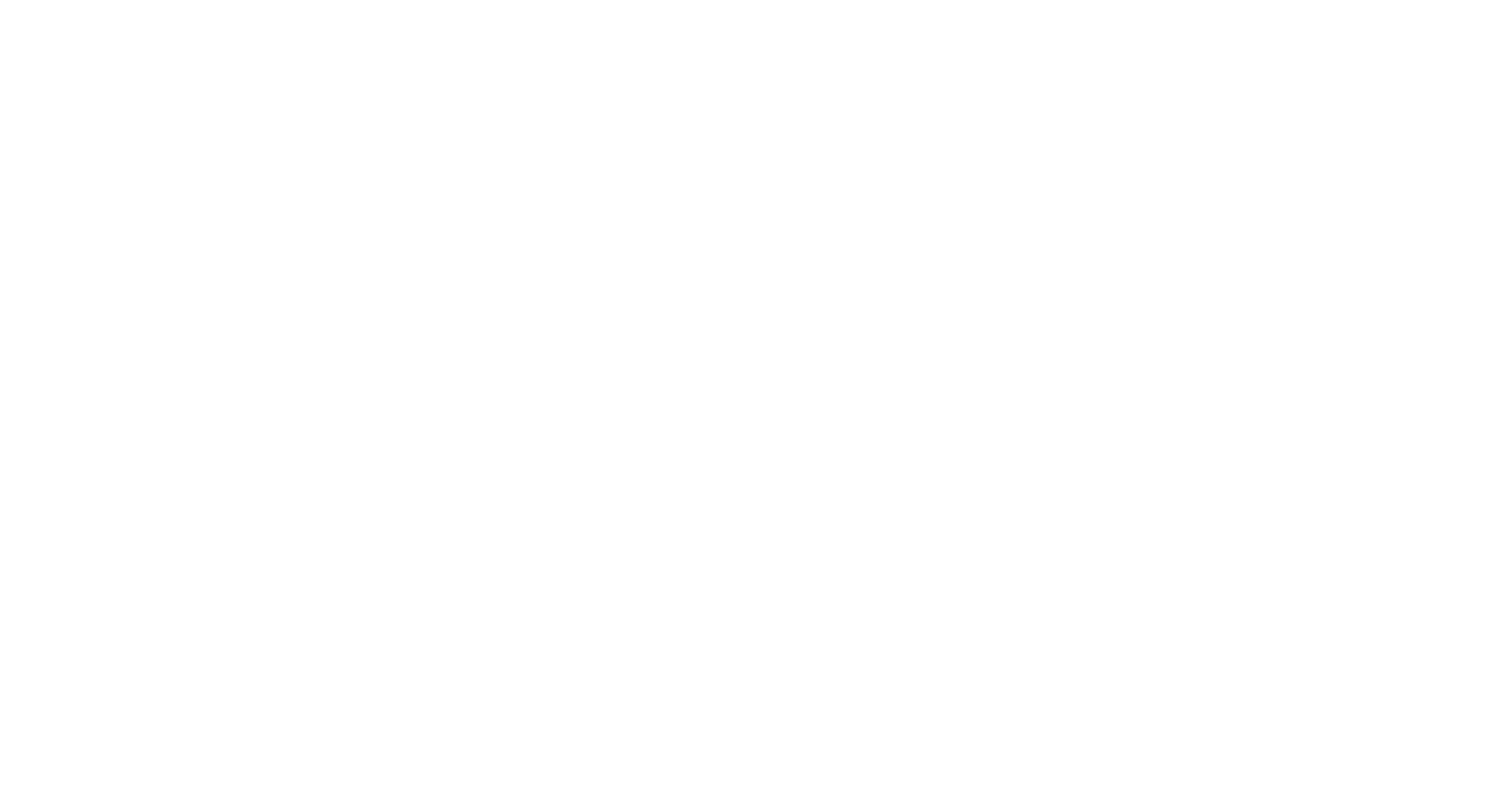
- (ii)

- (iii)

Equations (i), (ii) and (iii) can be solved simultaneously to find the values of , and .

## 3.4 Mesh Analysis

A mesh is a loop which does not contain any other loops inside it. Current will enter from the positive terminal and leave from the negative terminal. K.V.L. is used.



Steps:

1. Identify the meshes.
2. Assumed a current direction. All meshes must have the same current direction, either clockwise or anti-clockwise.
3. If the sign for a component given does not match direction of assumed current, then the value found will be negative.

There are 2 meshes in the diagram above.

- (i)

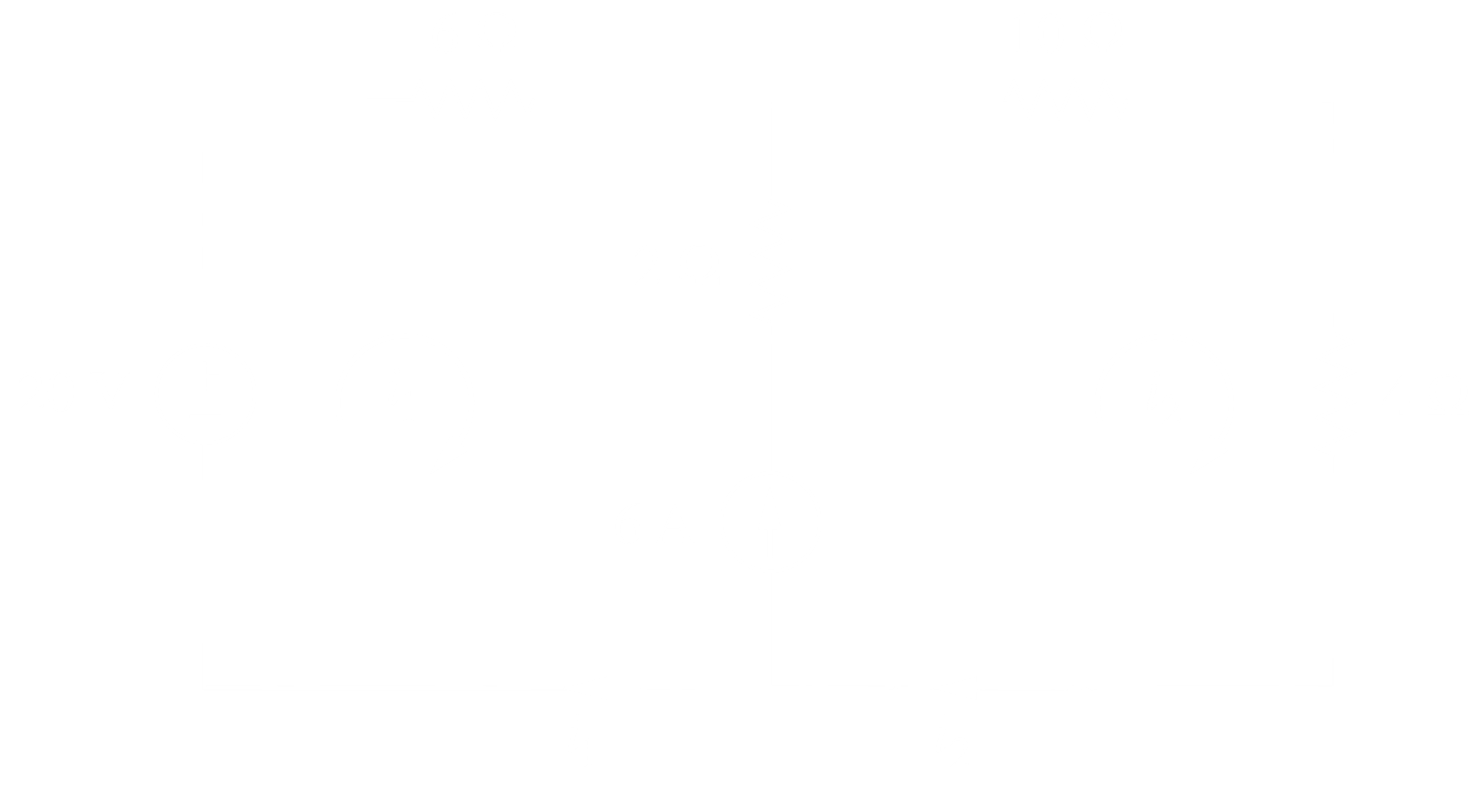
is being subtracted here since is current under consideration and opposes with regards to .

is being subtracted for the same reason given above. is negative since its sign is in the opposite direction.

Equations (i) and (ii) can be solved simultaneously to find , .

## 3.5 Mesh Analysis with Current Sources (Super Mesh)

If, in between two meshes, there is a current source, then those meshes are called super meshes. In case of super meshes, the two meshes are considered as a single mesh and K.V.L. is used.



Here, and make a super mesh.

This is since the current source supports the direction of .

The two meshes are used as a single mesh, with the respective current of each mesh being used with their components.

These 2 equations can be solved simultaneously to find and .