Mesh Current Method (Mesh Analysis)

The Mesh Current Method, also referred to as Mesh Analysis, is the systematic application of KVL to solve for the current through and voltage across each circuit element. This technique can only be used with **planar circuits**.

Definitions:

Loop (L): A path that starts and ends at the same node.

Mesh (M): A loop that does not contain any other loops.

Super Mesh (SM): A composite mesh comprising two or more Ms having a common branch that contains one or more independent and/or a dependent current sources.

Mesh Analysis:

1. Identify and label each M. Use an arrow to indicate the direction of the mesh current. Assume there are “n” Ms.
2. Identify and label each SM. Use an arrow to indicate the direction of the mesh current. Assume a SM contains “m” Ms.
3. Generate one KVL equation, in terms of the mesh currents, for each M that is not part of a SM and does not contain an independent or dependent current source.
4. Generate one constraint equation, in terms of the mesh currents, for each M that is not part of a SM but does contain an independent or a dependent current source.
5. Generate one KVL equation, in terms of the mesh currents, for each SM that does not contain an independent or dependent current source.
6. Generate one constraint equation, in terms of the mesh currents, for each SM that does contain an independent or dependent current source.
7. Generate “m-1” constraint equations, in terms of the mesh currents, for each SM.
8. Generate one constraint equation, in terms of the mesh currents, for each dependent voltage source and dependent current source. Assume there are “d” dependent sources.
9. This process will generate a linear system of “d+n” equations and “d+n” unknowns. Solve the linear system of equations to determine the mesh currents and the values of the dependent sources.
10. Use the calculated values of the mesh currents from step 9 to solve for the current through and voltage across each circuit element.