

Case Study

- Mesh current analysis of a DC circuit
- Form mesh equations and solve for unknown currents using matrix methods.

* DC Circuit Mesh Analysis :

⇒ For Mesh - ①

$$I_1 R_1 + R_2 (I_1 - I_2) = S$$

$$\therefore 5I_1 + 3(I_1 - I_2) = S \quad \text{--- (1)}$$

For Mesh - ②

$$R_3 I_2 + R_2 (I_2 - I_1) + R_4 (I_2 - I_3) = 0$$

$$\therefore -3I_1 + 12I_2 - 5I_3 = 0 \quad \text{--- (2)}$$

For Mesh - ③

$$R_5 I_3 + R_6 I_3 + R_4 (I_3 - I_2) = 0$$

$$6I_3 + 4I_3 + 5(I_3 - I_2) = 0$$

$$-5I_2 + 15I_3 = 0$$

$$RI = V$$

$$\begin{bmatrix} 8 & -3 & 0 \\ -3 & 12 & -5 \\ 0 & -5 & 15 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 0 \\ 0 \end{bmatrix}$$

Matlab Code:

```
clc
clear

V = 5; % source voltage
R = [ 8 -3 0;
     -3 12 -5;
     0 -5 15];
B = [V; 0; 0];
I = R\B;
disp('Mesh currents (A):')
I1 = I(1)
I2 = I(2)
I3 = I(3)
```

Result:

Mesh currents (A):

I1 = 0.7014

I2 = 0.2036

I3 = 0.0679