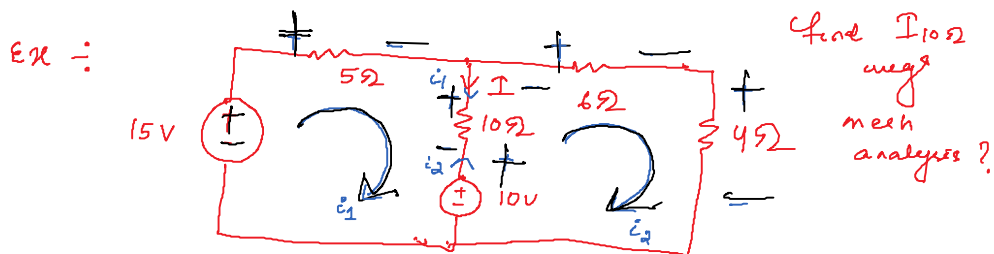
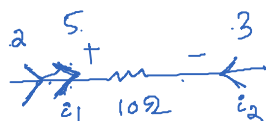


(1) Mesh analysis / Loop Current analysis (KVL)



Mesh 1

$$15 - 5i_1 - 10(i_1 - i_2) - 10 = 0$$

$$5 = 15i_1 - 10i_2$$

$$1 = 3i_1 - 2i_2 \quad \text{--- (1)}$$

Mesh 2

$$10 - 10(i_2 - i_1) - 6i_2 - 4i_2 = 0$$

$$10 + 10i_1 - 20i_2 = 0$$

$$-10 = 10i_1 - 20i_2$$

$$-1 = i_1 - 2i_2 \quad \text{--- (2)}$$

$$\begin{aligned} 1 &= 3i_1 - 2i_2 \\ -1 &= i_1 - 2i_2 \end{aligned}$$

(+) (-) (+)

$$-1 = 1 - 2i_2$$

$$i_2 = 1A$$

$$2 = 2i_1$$

$$i_1 = 1A$$

Determinant method

$$\begin{bmatrix} 3 & -2 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$i_1 = \frac{\Delta_1}{\Delta}$$

$$= \frac{\begin{vmatrix} 1 & -2 \\ -1 & -2 \end{vmatrix}}{\begin{vmatrix} 3 & -2 \\ 1 & -2 \end{vmatrix}}$$

$$= \frac{2}{1}$$

$$= 2$$

$$i_2 = \frac{\Delta_2}{\Delta}$$

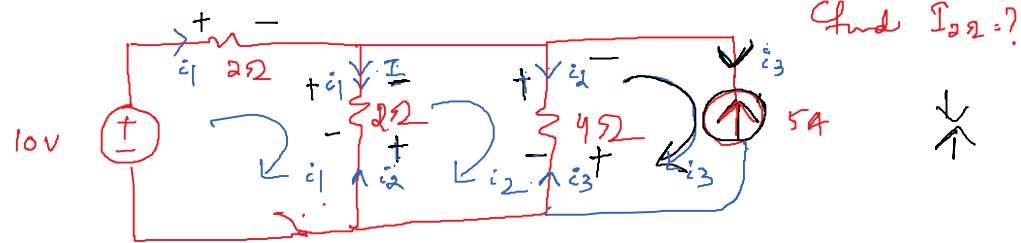
$$= \frac{\begin{vmatrix} 3 & 1 \\ 1 & -1 \end{vmatrix}}{\begin{vmatrix} 3 & -2 \\ 1 & -2 \end{vmatrix}}$$

$$= \frac{-4}{1}$$

$$= -4$$

$$i_{10\Omega} = i_1 - i_2 = 0A$$

Q2.



$$i_3 = -5A$$

Mesh 1

$$10 - 2i_1 - 2(i_1 - i_2) = 0$$

$$10 = 4i_1 - 2i_2 \quad \text{--- (1)}$$

mesh 2

$$-2(i_2 - i_1) - 4(i_2 - i_3) = 0$$

$$2i_1 - 6i_2 + 4i_3 = 0$$

$$2i_1 - 6i_2 = -4 \times -5 = 20 \quad \text{--- (2)}$$

$$\begin{aligned} 4i_1 - 2i_2 &= 10 \\ 2 \times [2i_1 - 6i_2] &= (-20) \\ 10i_1 - 30i_2 &= -20 \end{aligned}$$

$$i_1 = -1A$$

$$i_2 = -3A$$

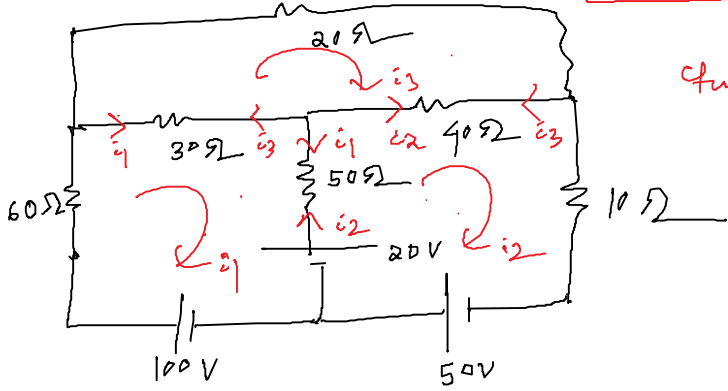
$$I_{2\Omega} = 4A$$

$$4i_1 - 2 \times -3 = 10$$

$$4i_1 + 6 = 10$$

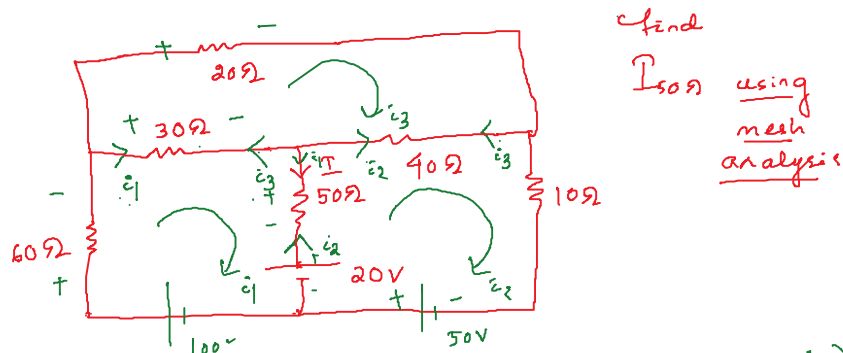
$$i_1 = 1A$$

HW



Find $I_{50\Omega}$
neg
mesh
analysis

Q.1



Mesh 1 $100 - 60i_1 - 30(i_1 - i_3) - 50(i_1 - i_2) - 20 = 0$

$$80 = 140i_1 - 50i_2 - 30i_3$$

$$8 = 14i_1 - 5i_2 - 3i_3 \quad \text{--- (1)}$$

Mesh 2

$$20 - 50(i_2 - i_1) - 40(i_2 - i_3) - 10i_2 + 50 = 0$$

$$70 = -50i_1 + 100i_2 - 40i_3$$

$$7 = -5i_1 + 10i_2 - 4i_3 \quad \text{--- (2)}$$

Mesh 3

$$-20i_3 - 40(i_3 - i_2) - 30(i_3 - i_1) = 0$$

$$30i_1 + 40i_2 - 90i_3 = 0$$

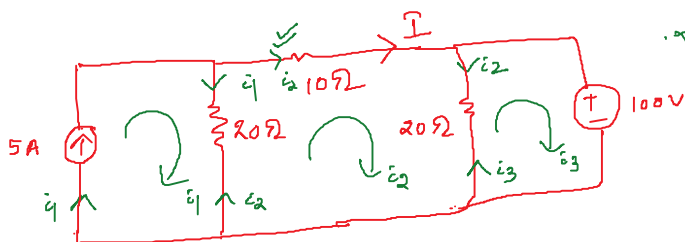
$$3i_1 + 4i_2 - 9i_3 = 0 \quad \text{--- (3)}$$

$$i_1 = 1.65A, \quad i_2 = 2.12A, \quad i_3 = 1.5A$$

$$\begin{aligned} a_1x + b_1y + c_1z &= d_1 \\ a_2x + b_2y + c_2z &= d_2 \\ a_3x + b_3y + c_3z &= d_3 \end{aligned}$$

Q.2

Find $I_{10\Omega}$ using mesh analysis?



$$i_1 = 5A$$

$$i_2 = I_{10\Omega} = 0A$$

$$\begin{array}{rcl}
 10 & = & 5i_2 - 2i_3 \\
 2 \times 5 & = & 2i_2 \quad (+) \\
 (-) & & (-) \\
 0 & = & 3i_2 - 2i_3
 \end{array}$$

$i_2 = 0$

mesh 2

$$\Rightarrow -20(i_2 - i_1) - 10i_2 - 20(i_2 - i_3) = 0$$

$$\Rightarrow 20i_1 - 50i_2 + 20i_3 = 0$$

$$\Rightarrow 2i_1 - 5i_2 + 2i_3 = 0$$

$$\Rightarrow 40 - 5i_2 + 2i_3 = 0$$

$$10 = 5i_2 - 2i_3$$

mesh 3

$$-20(i_3 - i_2) - 100 = 0$$

$$100 = 20i_2 - 20i_3$$

$$5 = i_2 - i_3$$

$$i_3 = -5A$$