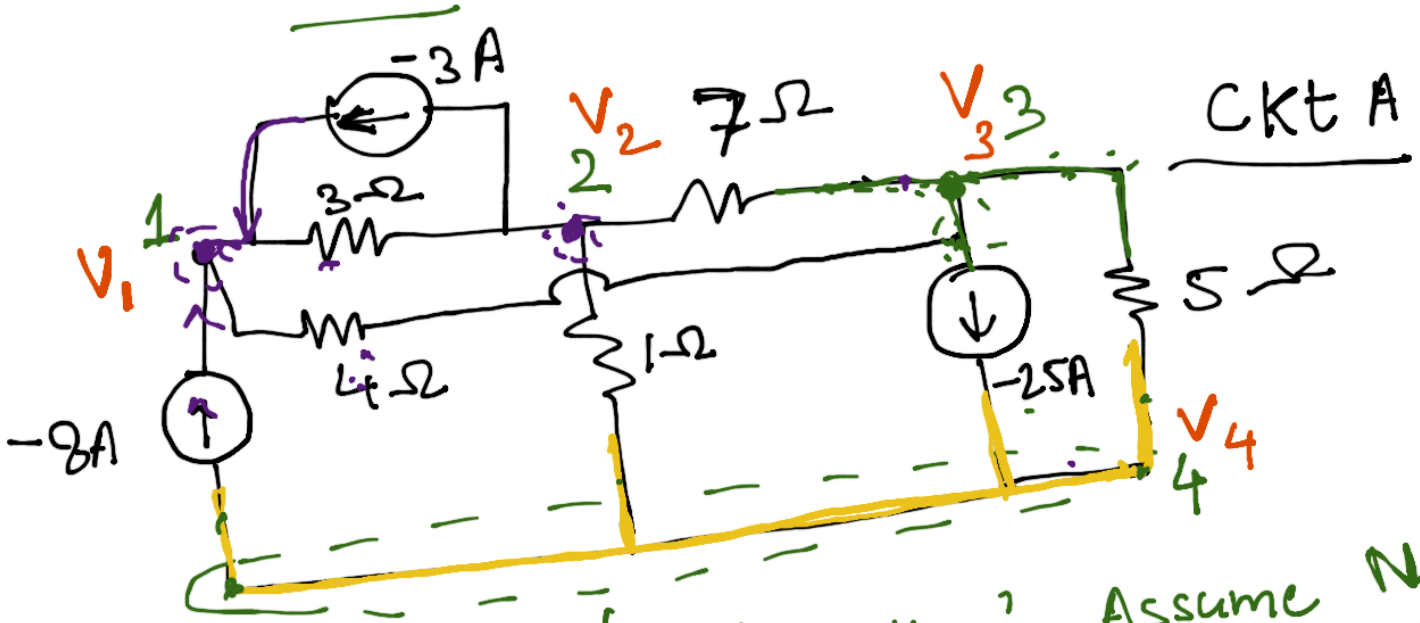
KCL

Steps: KCL



1. Identify Nodes. 'Node voltge'. Assume Node volte.
2. Determine current flow
3. Write equation at node $\sum i = 0$

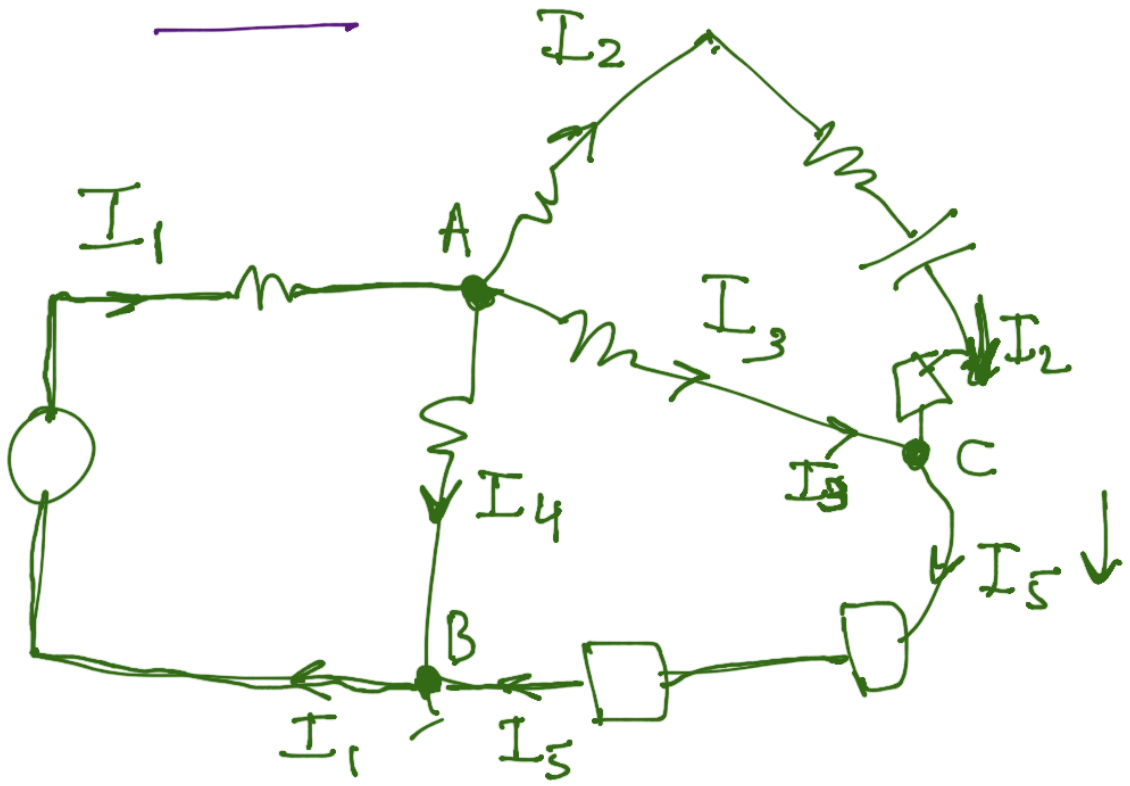
(N1) KCL $\quad -8A - 3A + \frac{V_2 - V_1}{3} + \frac{V_3 - V_1}{4} = 0 \quad \cdots (1)$

$$-8A - 3 - \frac{V_1 - V_2}{3} - \frac{V_1 - V_3}{4} = 0 \quad \cdots (1)$$

N2, N3, N4

V_1 V_2 V_3 V_4

KVL



1. Branch currents [KCL]

2. Loop currents

$+I_1 - I_2 - I_3 - I_4 = 0$

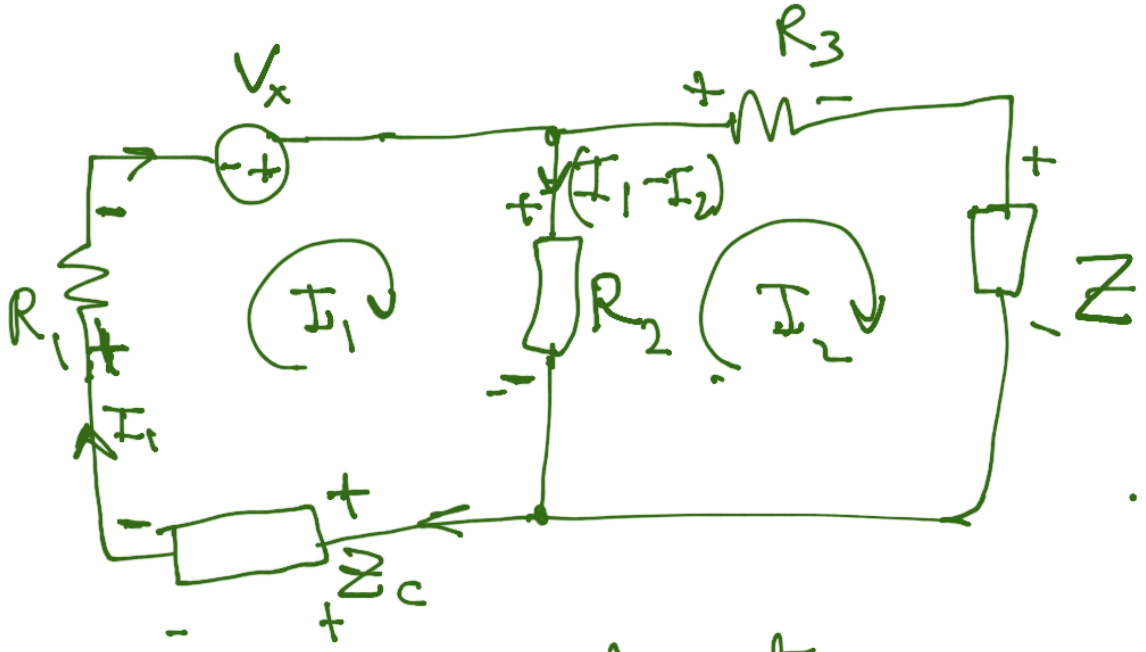
$I_1 = I_1 - I_2 - I_3$

'A' $\{ I_4 = + (I_1 + I_2 + I_3)$

Node 'C' $I_2 + I_3 = I_5$

'C' $+I_2 + I_3 + (-I_5) = 0$

B $+I_4 + I_5 - I_1 = 0$



Assign loop current

& ① KVL

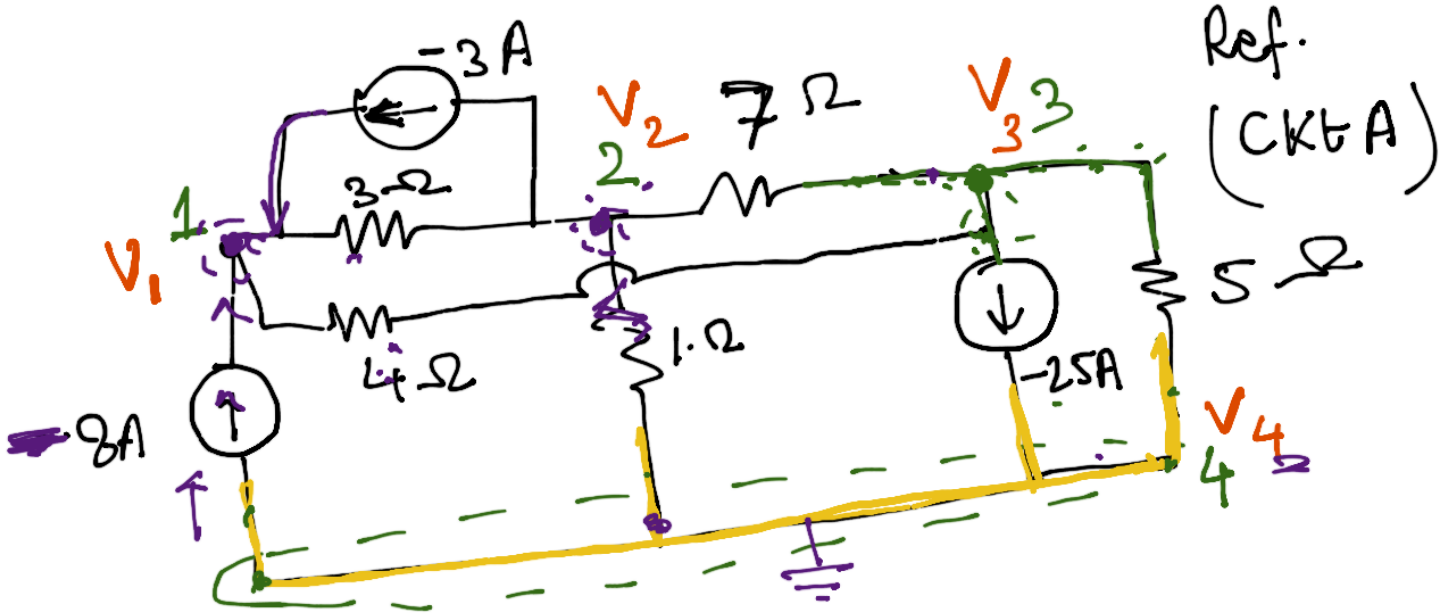
$$-I_1 R_1 + V_x - (I_1 - I_2) R_2 - Z_c I_1 = 0$$

② $$+(I_1 - I_2) R_2 - I_2 R_3 - I_2 Z = 0$$

	A	B	C	D
	8	10	10	10
	10	10	10	10
→	10	10	8	5+
	10			

KCL

1. Identify the node
2. Assign voltages to node (unknown)
3. Balance currents at each node.



N2 $\quad \dfrac{V_2 - V_1}{3} + \dfrac{V_2 - V_3}{7} + \dfrac{V_2 - V_4}{1} = 3$ (2)

N3 $\quad \dfrac{V_3 - V_2}{7} + \dfrac{V_3 - V_4}{5} + \dfrac{V_3 - V_1}{4} + (-25) = 0$ (3)

N4 $\quad + \dfrac{V_4 - V_3}{5} + \dfrac{V_4 - V_2}{1} + (-8) = -25$

4 Node & 4 Equation

⇓

4 unknown. . Assign a reference node

$V_1\ V_2\ V_3\ V_4$ gnd = 0

Reference Node : Any node = GND (zero volts)

Unknown V_1, V_2, V_3

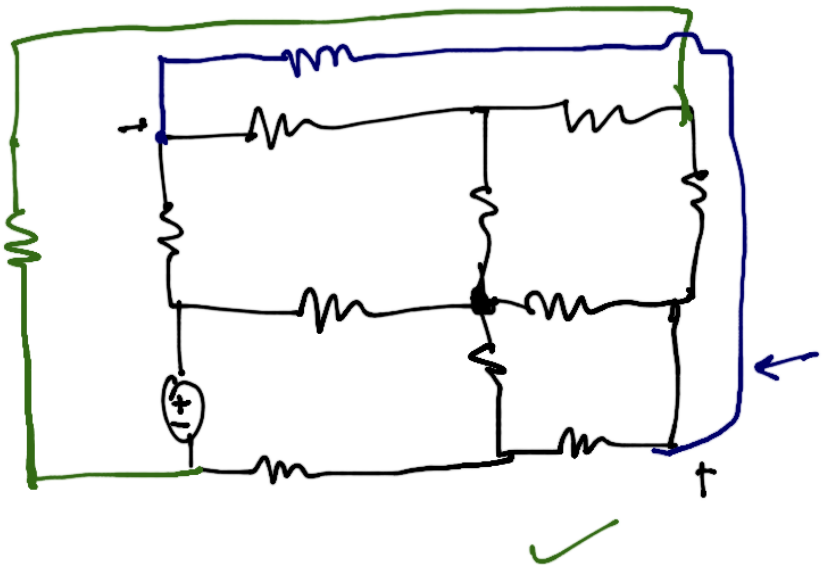
Eqn ①, ②, ③ } Algebra

Mesh : Multiple connection of various elements / components in a circuit making different loops.

Planar circuit : 2 dimensional = planar.

Simplify ckt. s.t. No branches overlapping ie..

no branch passes over or under any other branch → planar circuit.



Not a planar