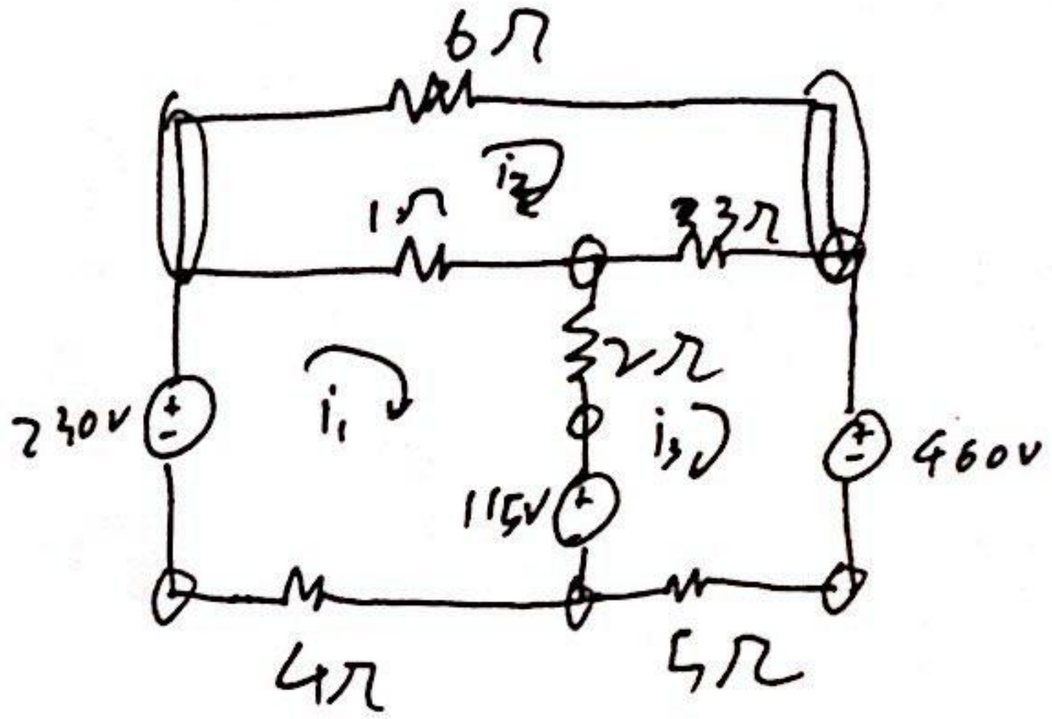
Tutorial 01 (Answers)

① Ohm's law states that for a fixed resistance Voltage drop is proportional to current applied — ①

$V \propto I$

$V = IR$ — ①

2

② 

At mesh-1

$i_1(1+2+4) - i_2(1) - i_3(2) = 230-115$

$7i_1 - i_2 - 2i_3 = 115$ — ①

At mesh-2

$-i_1(1) + i_2(6+3+1) - i_3(3) = 0$

$-i_1 + 10i_2 - 3i_3 = 0$ — ①

At mesh 3

$-i_1(2) - i_2(3) + i_3(2+3+5) = 115-460$

$-2i_1 - 3i_2 + 10i_3 = -345$ — ①

Solving we get

$i_1 = 4.4A$

$i_2 = -10.6A$

$i_3 = -36.8A$.

3 marks for 3 mesh equations

1 mark for result

3 No of nodes = 7 — ①

No of mesh = 3 — ①

2

4 KVL → Kirchoff's voltage law states that Total voltage drop and rise across a mesh/loop is same — ①

KCL → Kirchoff's current law states that Total current entering a node is equal to Total current leaving a node — ①

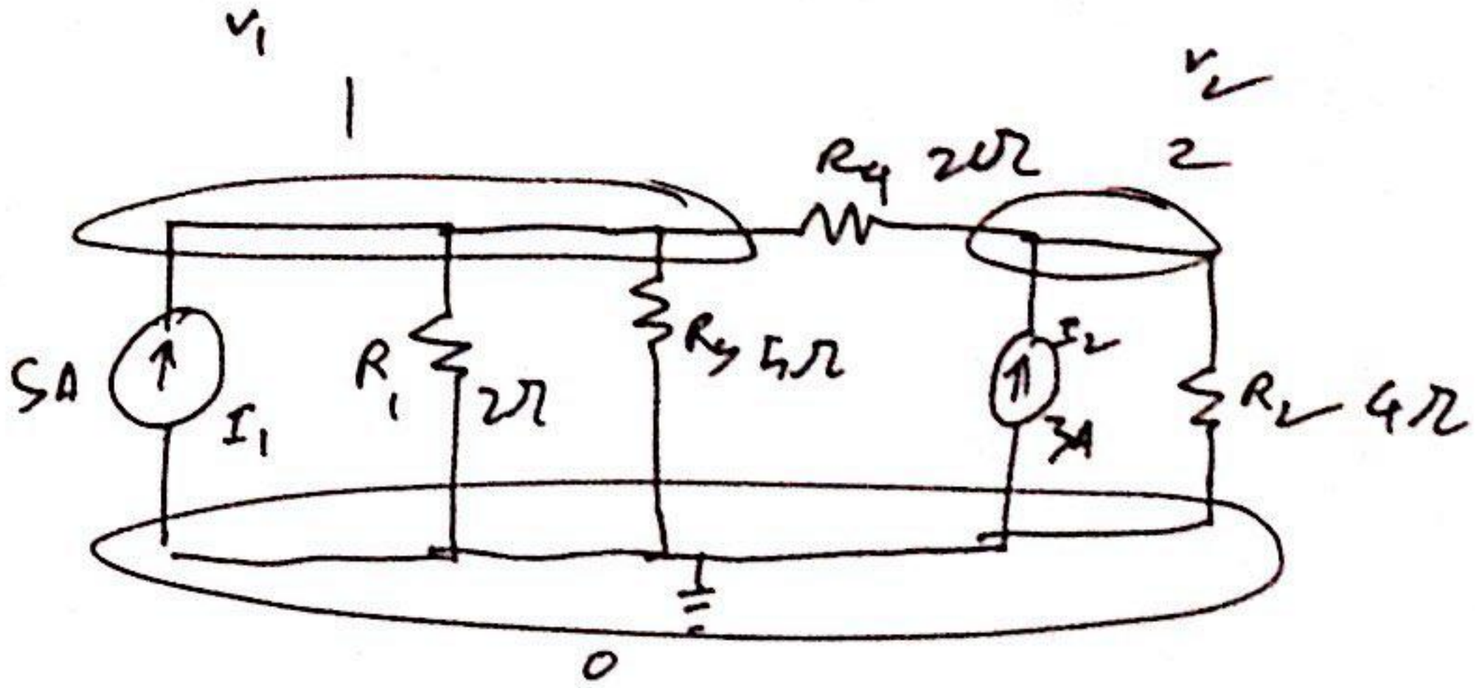
2

on.

KVL $\sum_{i=1}^{n} V_i = 0$

KCL $\sum_{i=1}^{n} i_i = 0$

(5)



At node - 1

$$V_1\left(\frac{1}{2}+\frac{1}{5}+\frac{1}{2}\right) - V_2\left(\frac{1}{2}\right) = 5$$

$$1.2\,V_1 - 0.5V_2 = 5 \qquad \text{—— (1)}$$

At node - 2

$$-V_1\left(\frac{1}{2}\right) + V_2\left(\frac{1}{2}+\frac{1}{4}\right) = 3$$

$$-0.5V_1 + 0.75\,V_2 = 3 \qquad \text{— (2)}$$

solving 2 equations,

$$V_1 = 8.077V$$

$$V_2 = 9.38\,V$$

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writing 2 node equation

solving for V_1 & V_2

$2R_L = 4$

-1

5

$$1.2\ V_1 - 0.5V_2 = 5 \quad -(1)$$

$$-0.5\ V_1 + 0.75V_2 = 3 \quad -(2)$$

(1) × 1.5 $\quad 1.8\ V_1 - 0.75V_2 = 7.5$

(+) $\quad 1.3V_1 = 10.5$

$V_1 = 8.077\,V$

$$V_2 = 2(1.2 \times V_1 - 5)$$

$$= 9.38\ V$$