Name :# Syed Daniyal Shah

ID # 15863

Paper # LCA

Date 24/09/2020

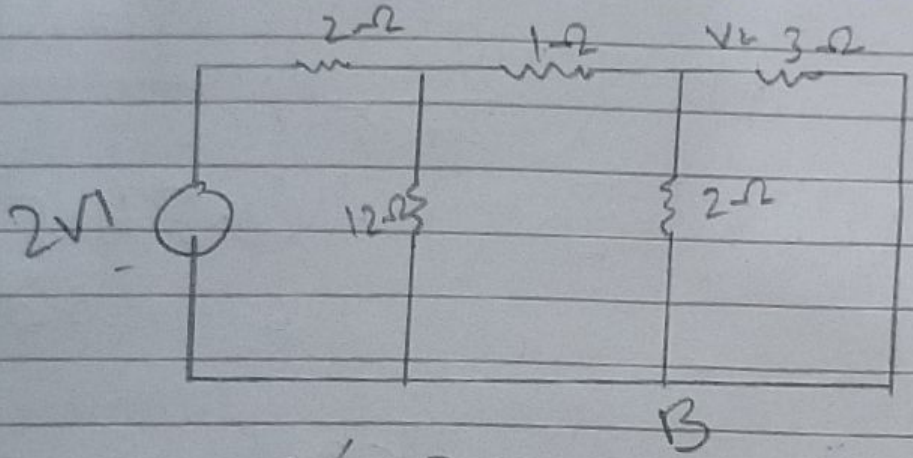
Q No :-> 01

Required V_{AB} = ?

Sol :->

Using Superposition theorem

Suppose do use 2v Source & 4v is Short ckt.



V'_{AB} = ?

Using Nodal Analysis.

$$\frac{V_1 - 2}{2} + \frac{V_1}{12} + \frac{V_1 - V_2}{1} = 0$$

$$6V_1 - 12 + V_1 + 12V_1 - 12V_2 = 6$$

$$19V_1 - 12V_2 = 12 \longrightarrow (1)$$

$$\frac{V_2 - V_1}{1} + \frac{V_2}{2} + \frac{V_2}{3} = 0$$

$$6V_2 - 6V_1 + 3V_2 + 2V_2 = 0$$

$$-6V_1 + 11V_2 = 0$$

$$V_2 = \frac{6V_1}{11} \longrightarrow (2) \quad \text{put in (1)}$$

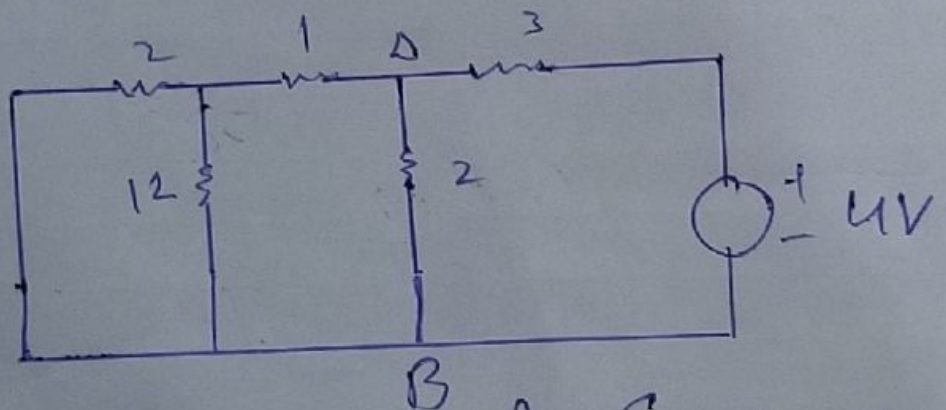
$$19V_1 - 12\left(\frac{6V_1}{11}\right) = 12$$

$$V = 0.9635V$$

$$V_2 = 0.525547V$$

$$V'AB = V_2 - 0 \doteq 0.5225V$$

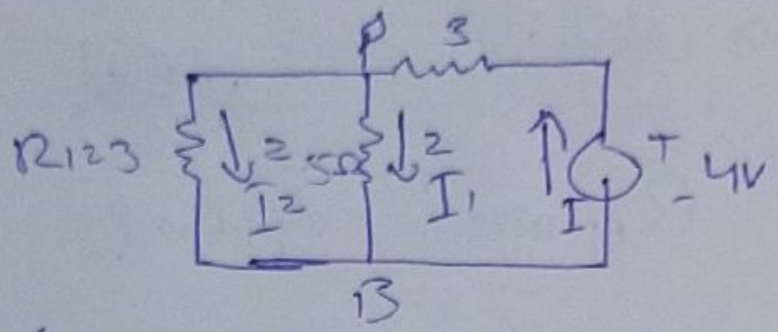
Now 2V is short ckt
and 4V is ckt as source



after parrelel & source
Simplification

$R_{12} = 2 \| 12$ $\quad R_{123} = 2 \| 12 + 1$

$R_{123} = 1.5 + 1 = 2.5\ \Omega$



$V'_{AB} = I_1 (2) \rightarrow (A)$

$$I = \frac{4}{2.5 \,||\, 2 + 3} = \frac{4}{4.111} = 0.9725A$$

Using current division Rules.

$$I_1 = \left(\frac{2.5}{2+2.5}\right) I = 0.5405A$$

$$V''_{AB} = I_1 (2) = (0.5405)(2)$$
$$= 1.081V$$

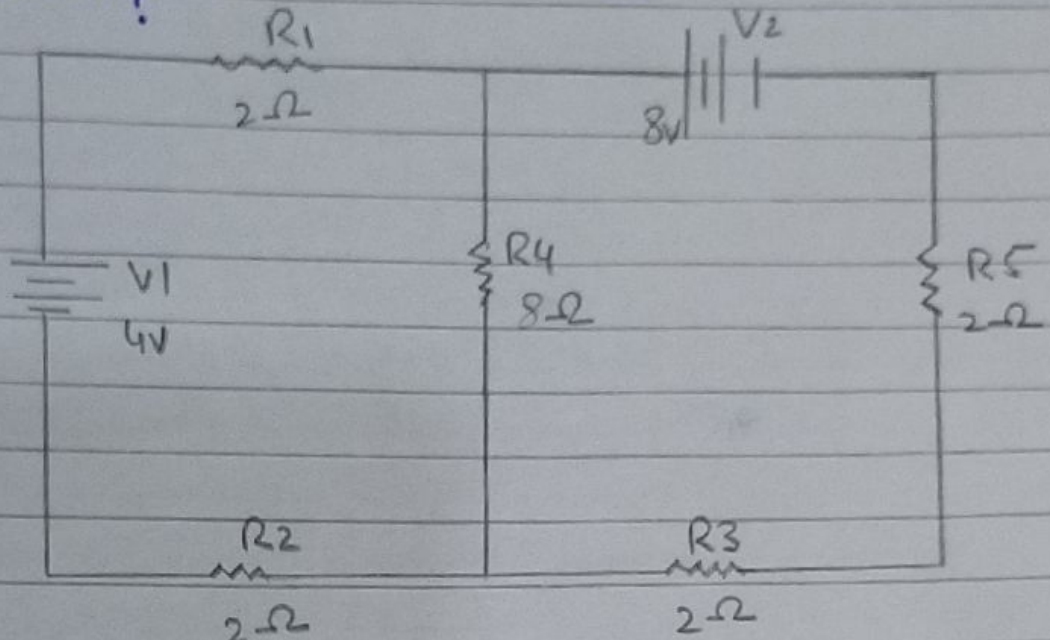
So

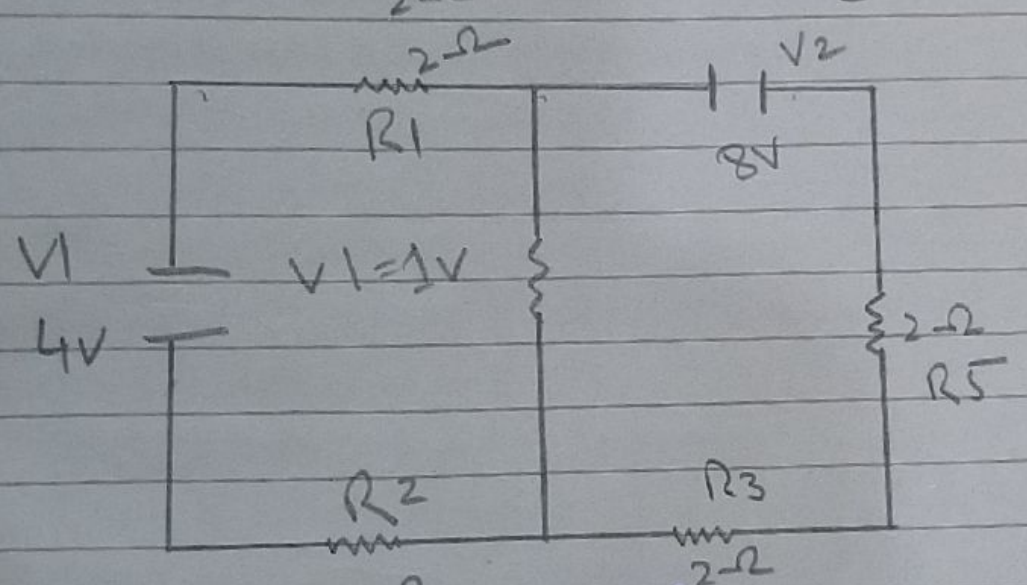
Net voltage

$$V_{AB} = V'_{AB} + V''_{AB} = 0.5225 + 1.081V$$

$$\boxed{V_{AB} = 1.6035V}$$

Q No :→ 2 Find the current is 8Ω Resistor using Thevenin's theorem?





V total = 4 V

R total = 8 Ω

$I = \frac{V}{R}$ $\left(= V = IR \right)$

$I = \frac{4}{8} = 0.5A$

$V_1 = 1\ V$

$V_2 = 1\ V$

$V_3 = 1\ V$

$V_4 = 1V$

$$\frac{1}{R} = \frac{1}{1} + \frac{1}{4}$$

$$\frac{4+1}{4} = \frac{5}{4}$$

$$= \frac{4}{5}$$

$V_{TH} = 6V$

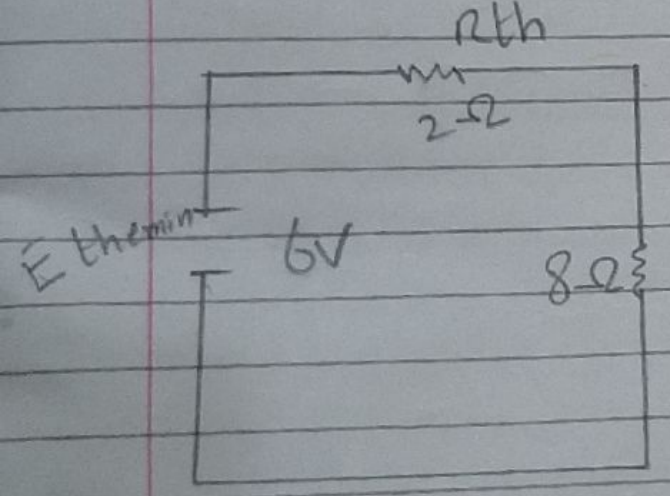
$R_{TH} = 2\Omega$

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{4}$$

$$\frac{1}{R} = \frac{1+1}{4} = 2/4 =$$

$$\frac{1}{R} \quad \frac{1}{2}$$

$R = 2\Omega$

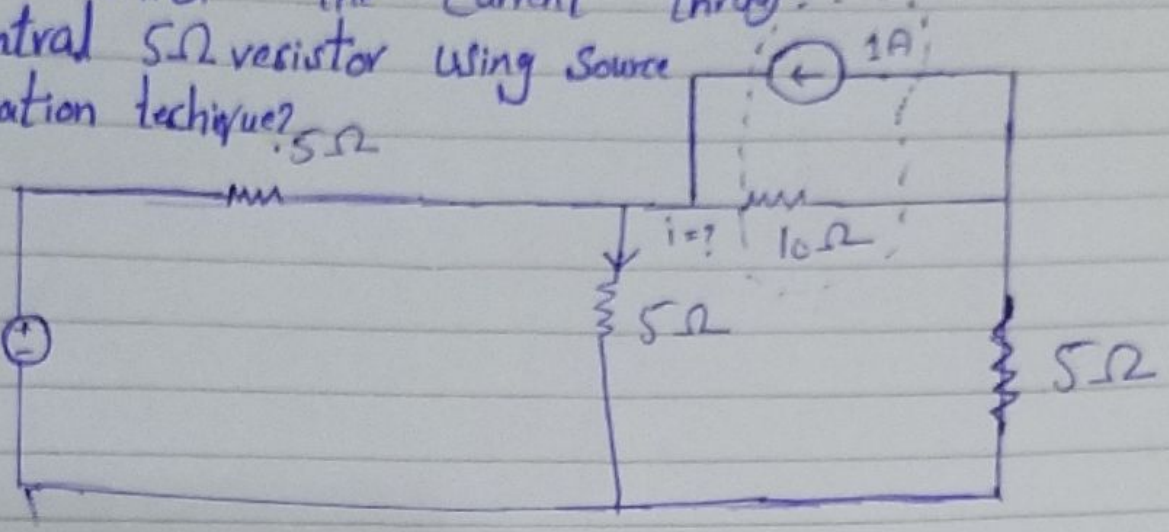


$V = IR$

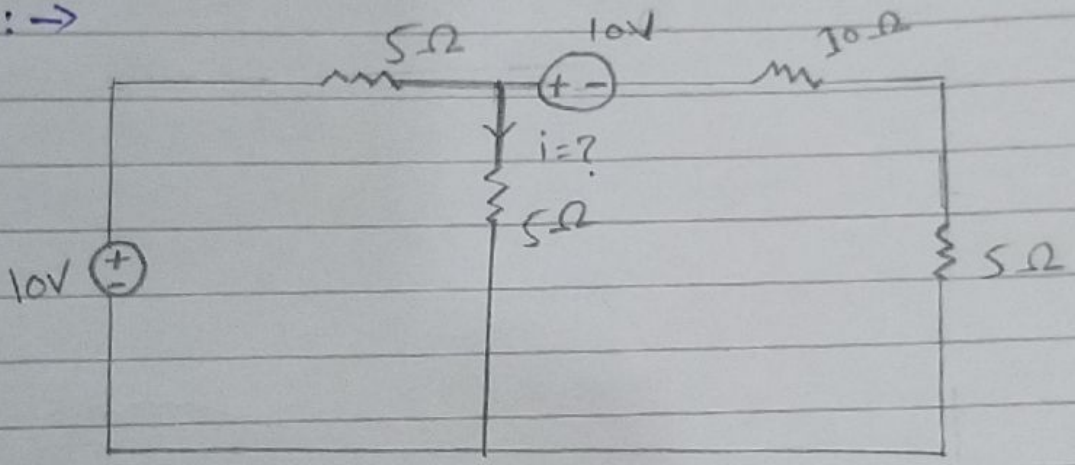
$$I = \frac{V}{R} = \frac{6V}{16} = 0.6A$$

$I = 0.6A$

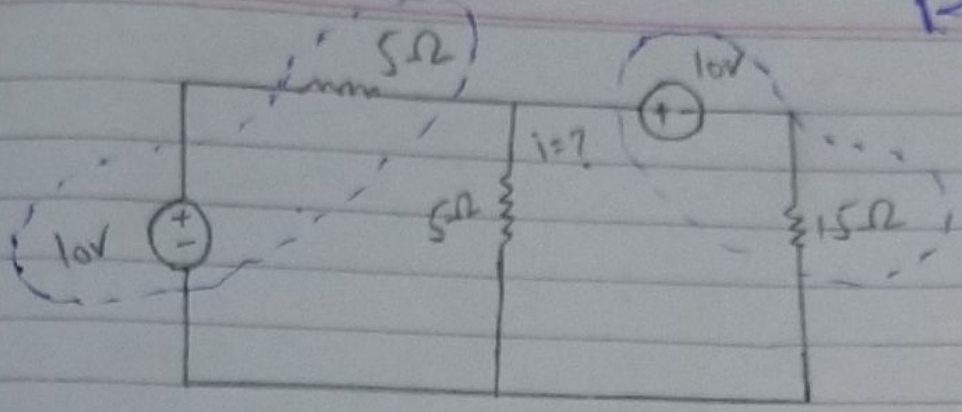
Q No :→ 3 Find the current through the central 5Ω resistor using source transformation technique?

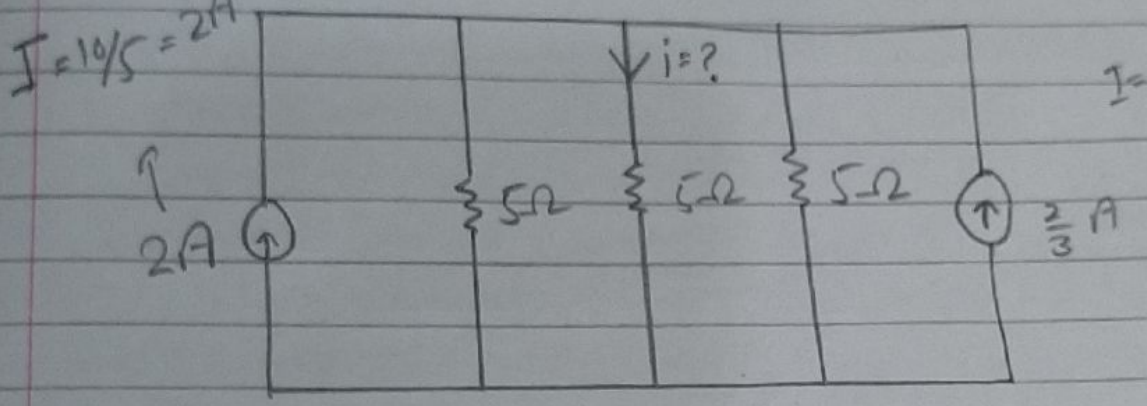


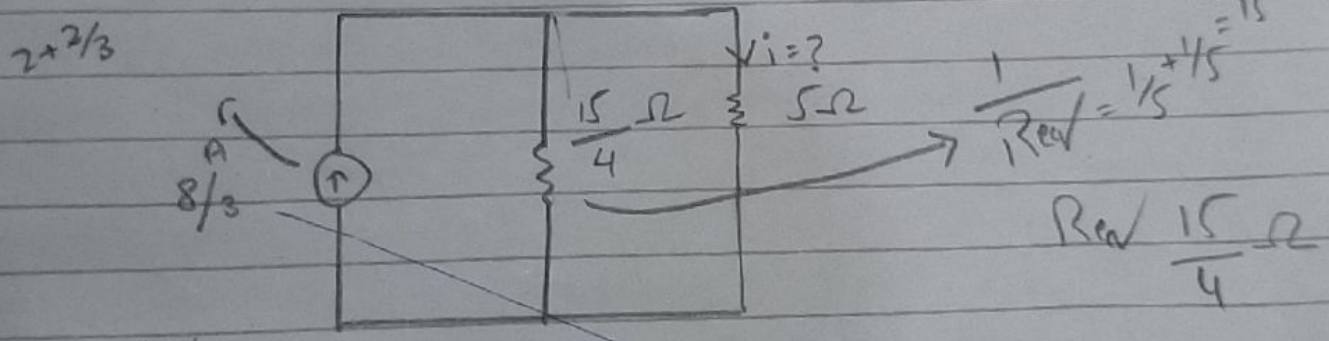
Sol :→

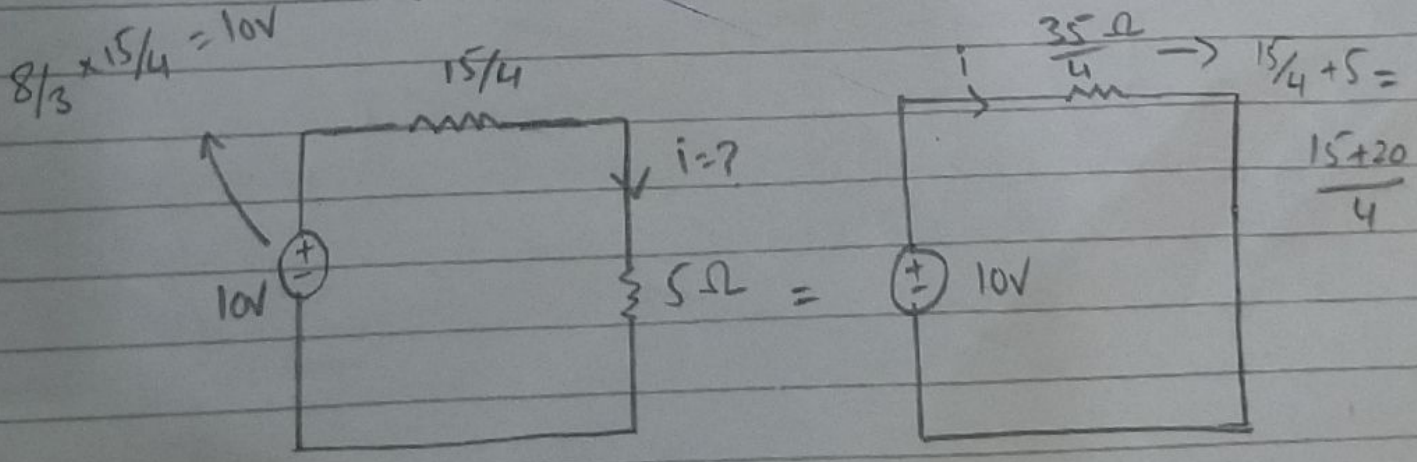


Note that the +ve terminal of the 10V Source is placed to the left because the current Source arrow was pointing to the left.


5Ω
10V
i=?
10V
5Ω
15Ω


I=10/5=2A
i=?
I= 10/15 = 2/3A
2A
5Ω
5Ω
5Ω
2/3 A


2+2/3
i=?
15/4 Ω
5Ω
8/3
A
1/Req = 1/5 + 1/5
3+1/15 = 4/15
= 15
Req 15/4 Ω


8/3 x 15/4 = 10V
15/4
i=?
10V
5Ω
=
35/4 Ω
i
15/4 + 5 =
15+20/4
10V

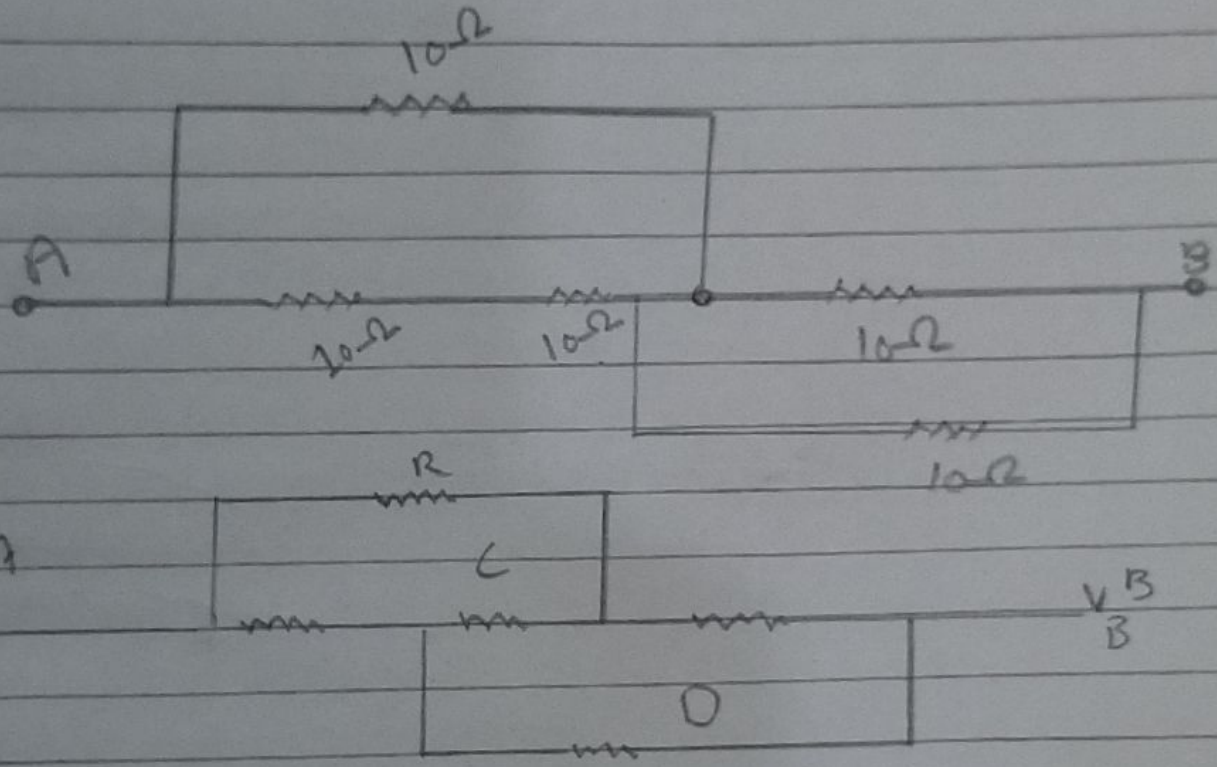
Page NO 08

$$i = \frac{10}{\frac{35}{4}} = \frac{10 \times 4}{35} = \boxed{\frac{8A}{7}}$$

Q NO :→ 4

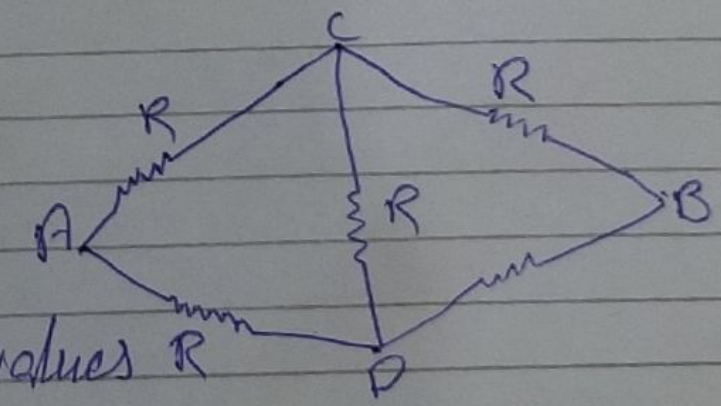
(Part A)

(a) Calculate the resistance between terminal A and B for the circuit shown below:

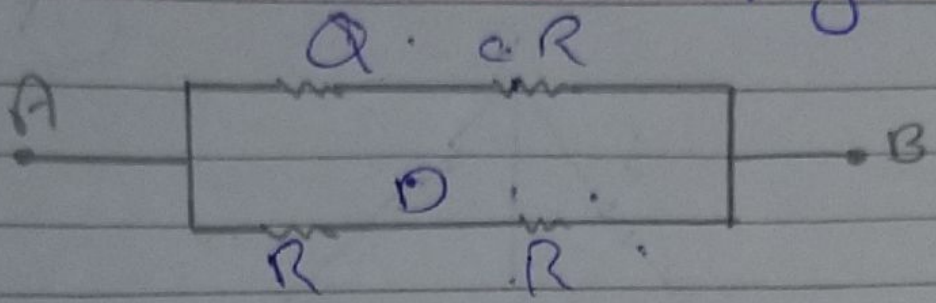


A = VA

B = VB



all have same values R

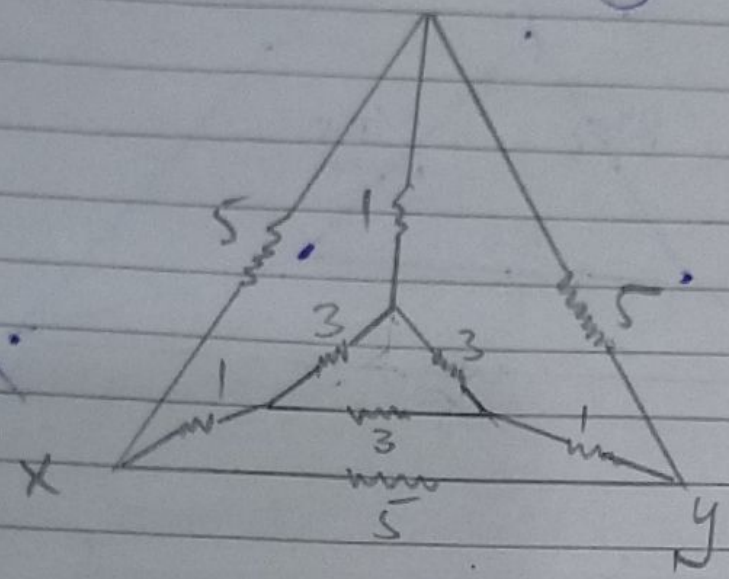


$$R_{eq} = \frac{2R \times 2R}{2R + 2R} \Rightarrow \frac{2(10) \times (2(10)}{2(10) + 2(10)}$$

$$R_{eq} = R$$

Q No 4 :→ part B

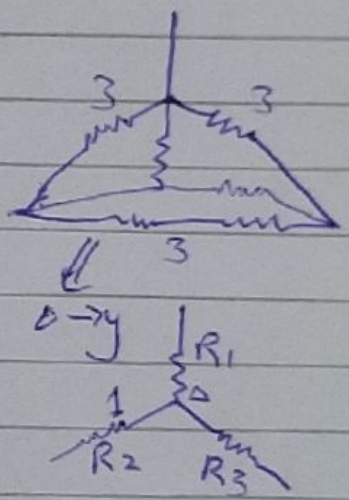
$R_{xy} = ?$



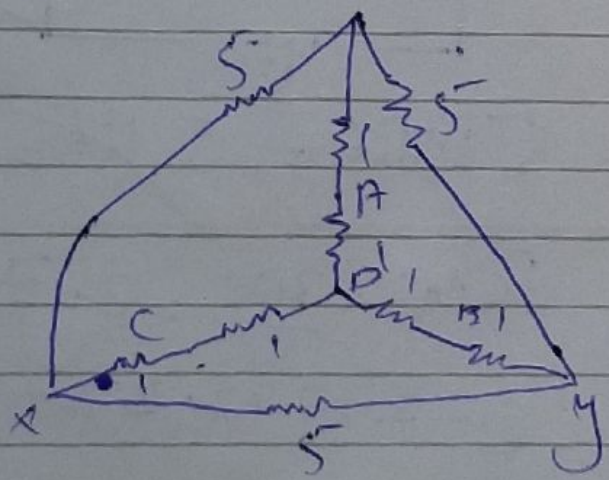
$$R_1 = \frac{3 \times 3}{3 \times 3 \times 3} = \frac{9}{9} = 1$$

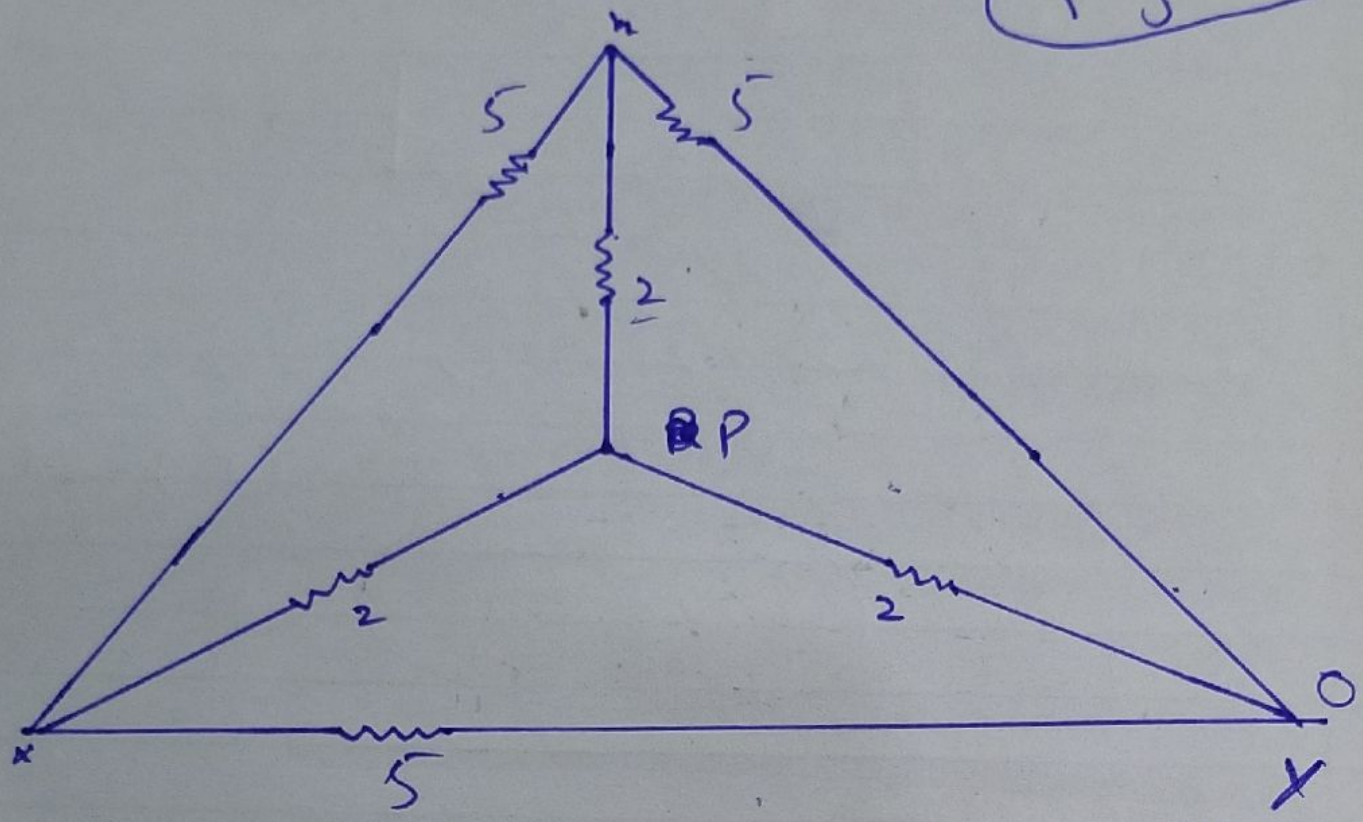
$R_2 = 1$

$R_3 = 1$



Put in Ckt (A)



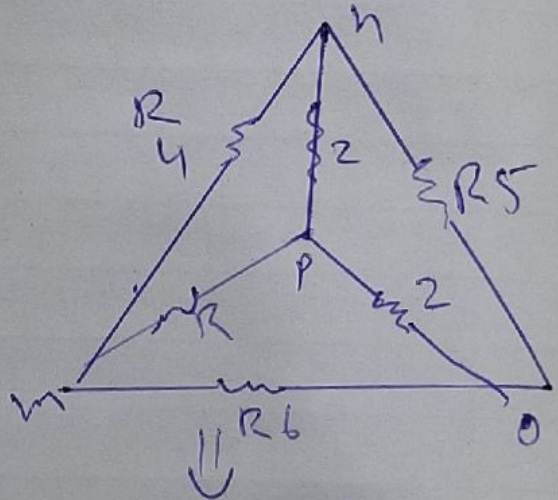


$$R_4 = 2+2+\frac{2\times 2}{2}$$

$$R_4 = 4+2 = 6x$$

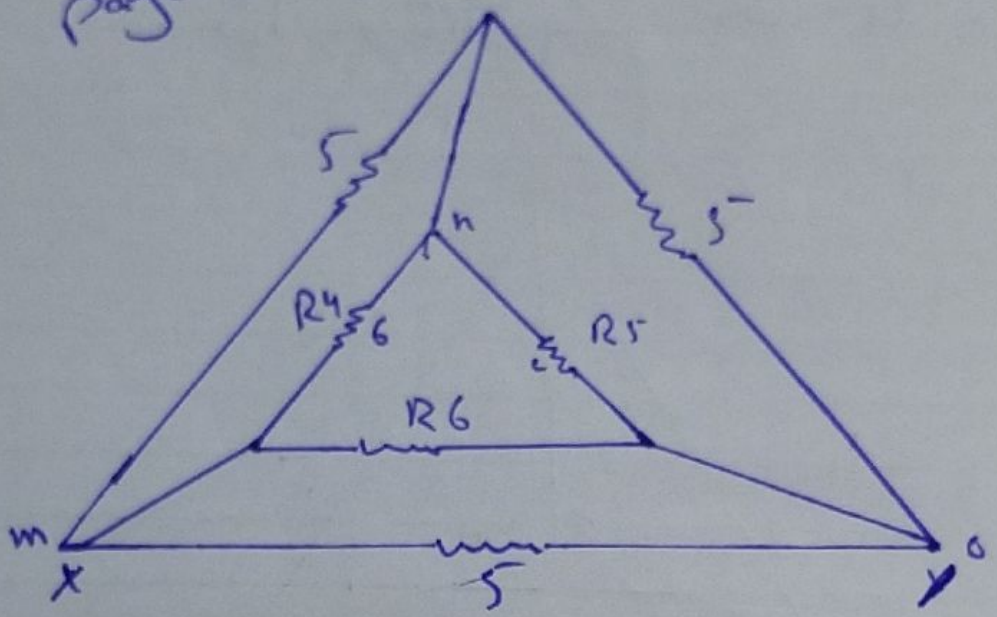
$$R_5\ \ 4+2 = 6x$$

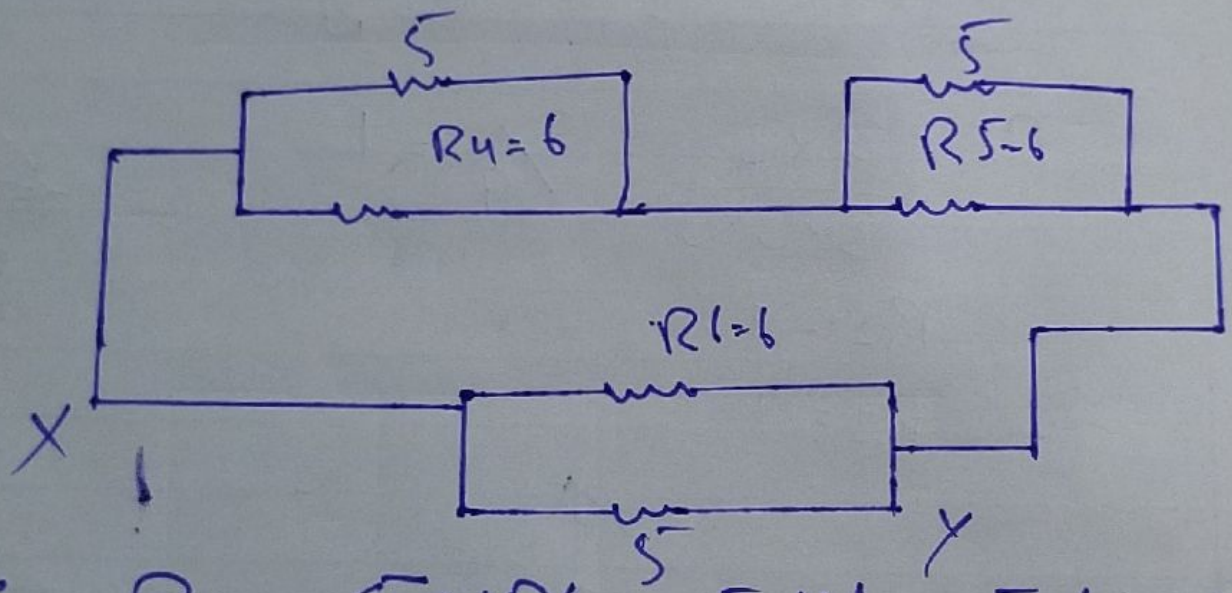
$$R_6 = 6n$$



Put In (B)

Page No 13

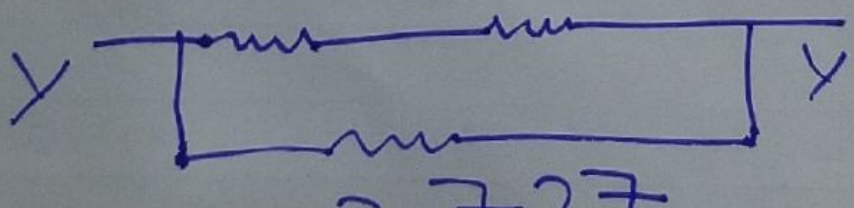




So $R_{eq} = 5 \,||\, R6 = 5 \,||\, 6 = \frac{5 \times 6}{5+6} = \frac{30}{11}$

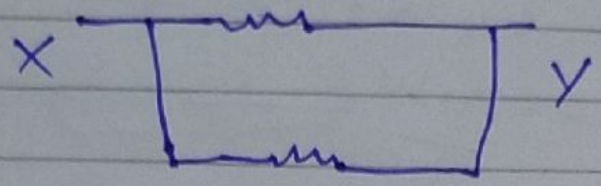
$R_{eq} = \frac{30}{11} = 2.727\ \Omega$

2-727+2.727



2.727

5.45Ω



2.725Ω

1.81717Ω $= \frac{5.45 \times 2.725}{5.45 + 2.725}$

$R_{eq} = Z_{eq} = 1.81717\Omega$