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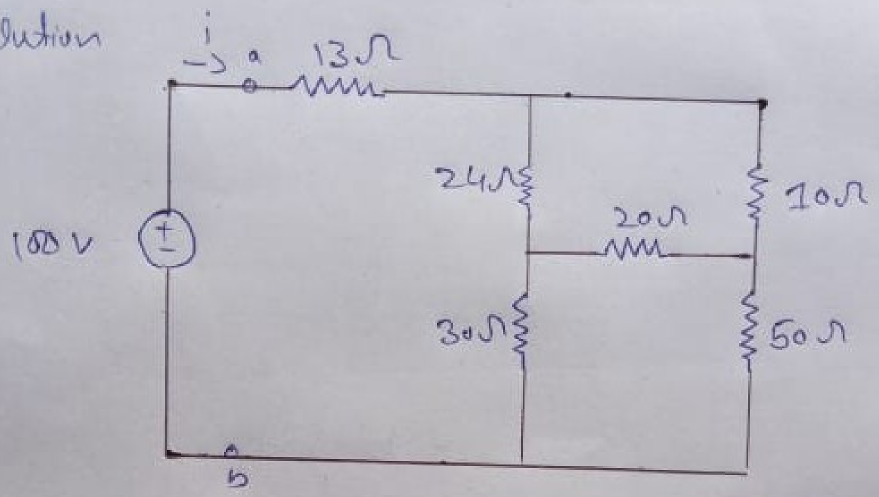
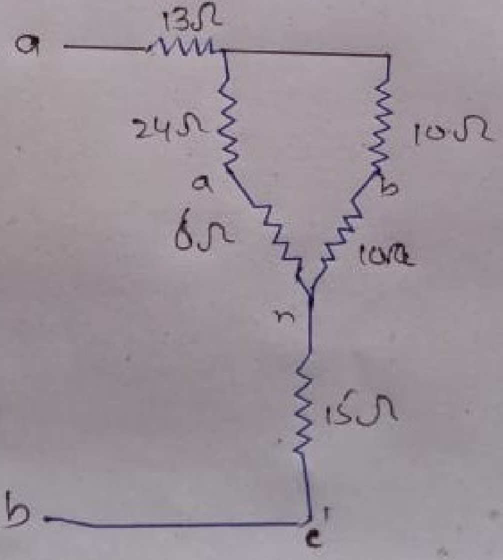
Q(1)

Part(A)

solution



we first find the equivalent resistance, R. we convert the delta sub-network to a wye connected form



P.T.O

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$R_{a'n} = 20 \times 30 / [20 + 30 + 50] = 6$ ohms

$R_{b'n} = 20 \times 50 / 100 = 10$ ohms

$R_{c'n} = 30 \times 50 / 100 = 15$ ohms

Thus, $R_{ab} = 13 + (24+6) \parallel (10+10) + 5 = 28$

$+ 30 \times 20 / (30 + 20) = 40$ (ohms)

$i = 100 / R_{ab} = 100 / 40 = 2.5$ amps

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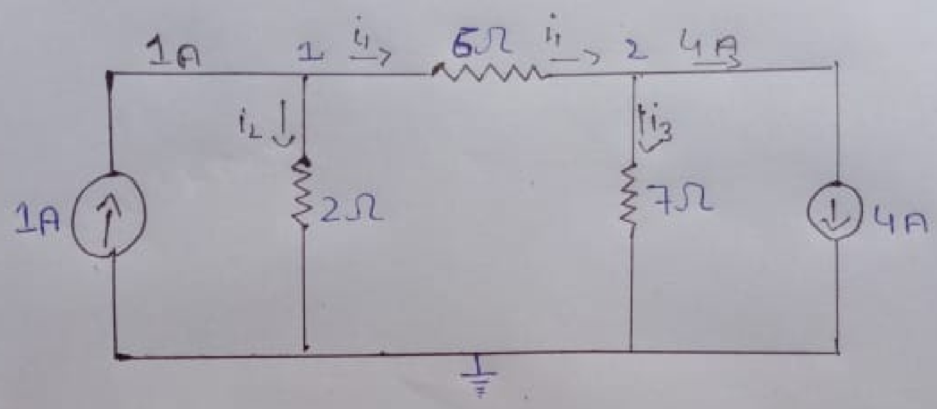
Q(1)

Part (B)



solution:- Now I finding The node voltages in The circuit

So At Node 1,

$1 = i_1 + i_2 \longrightarrow 1 = \frac{V_1 - V_2}{6} + \frac{V_1 - 0}{2}$

$6 = 4V_1 - V_2 \quad (1)$

At node 2,

$i_1 = 4 + i_3 \longrightarrow \frac{V_1 - V_2}{6} = 4 + \frac{V_2 - 0}{7}$

$168 = 7V_1 - 13V_2 \quad (2)$

Solving (1) & (2) gives

$V_1 = -2V, \; V_2 = -14V$

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Q(2)

(a)

Ans: Supernode :- A Supernode is a Theoretical construct That can be used to solve a ckt. This is done by viewing a voltage Source on a wire as a point Source voltage in relation to other Point voltage located at various node in The ckt. relative to ground node assigned a zero or negative charge.

P.T.O

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Properties of supernode

=> Always the difference b/w the voltage of two non refrence nodes is known at supernode. A supernode requires application of both KCL & KVL to solve it.. Any element can be connected in Parallel with the voltage source forming the supernode.

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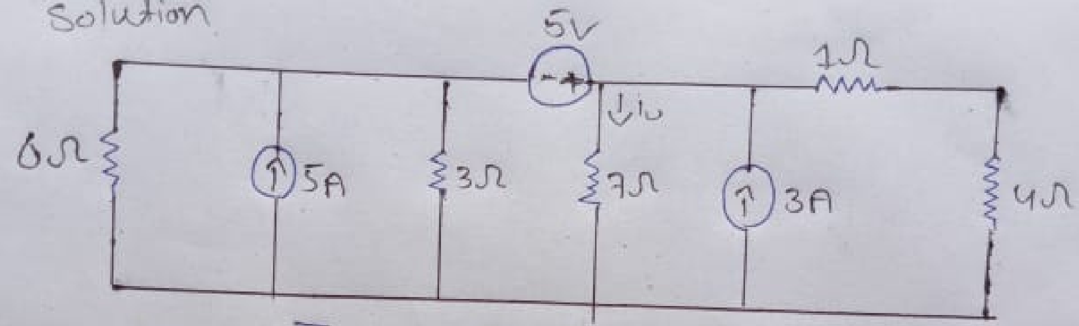
Q(2)

(B)

Solution

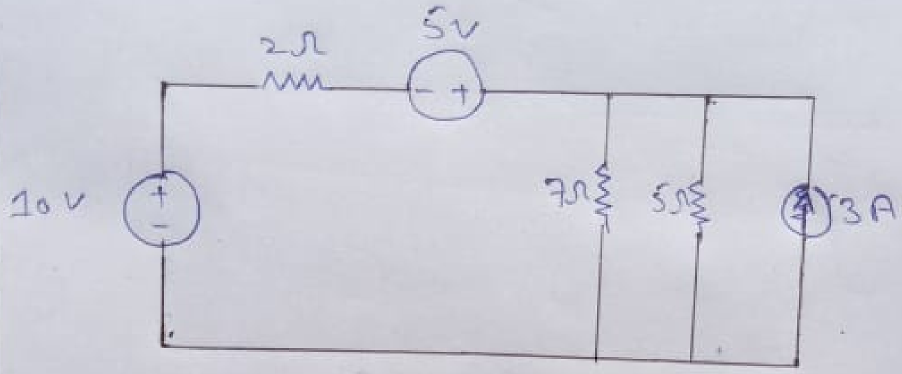


Combing the 6-Ω & 3-Ω resistors in Parallel gives $(6\times3)/(6+3) = 2\Omega$

Adding the 1-Ω and 4-Ω resistor in series gives $1+4=5\Omega$

Transforming the left current source in Parallel with 2-Ω resistor gives the equivalent circuit

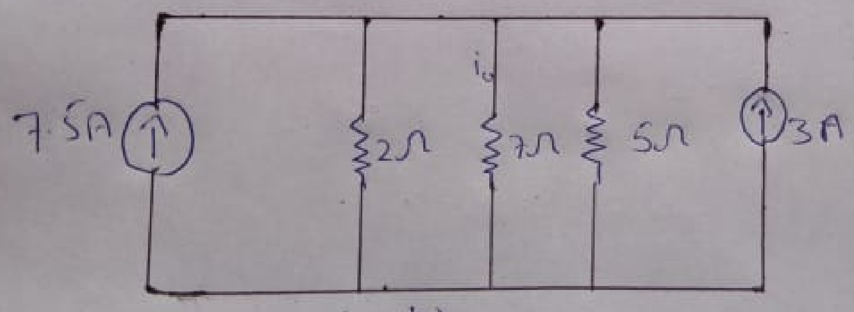
P.T.O



(a)

Adding the 10-V and 5-V voltages sources give a 15-V voltage source

Transforming the 15-V voltage source in series with the 2-Ω resistor gives the equivalent cct.



(b)

Combining the two current source & the 2-Ω & 5-Ω resistors leads to the cct.

(P.T.O)

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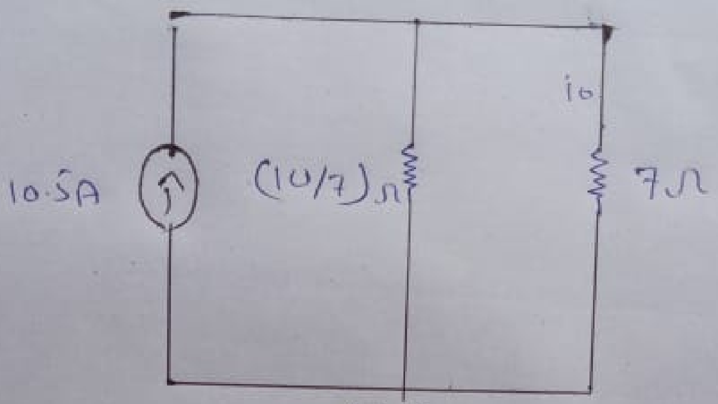

(c)

using current division

$$i_o = \frac{\frac{10}{7}}{\frac{10}{7}+7}(10.5) = 1.787$$

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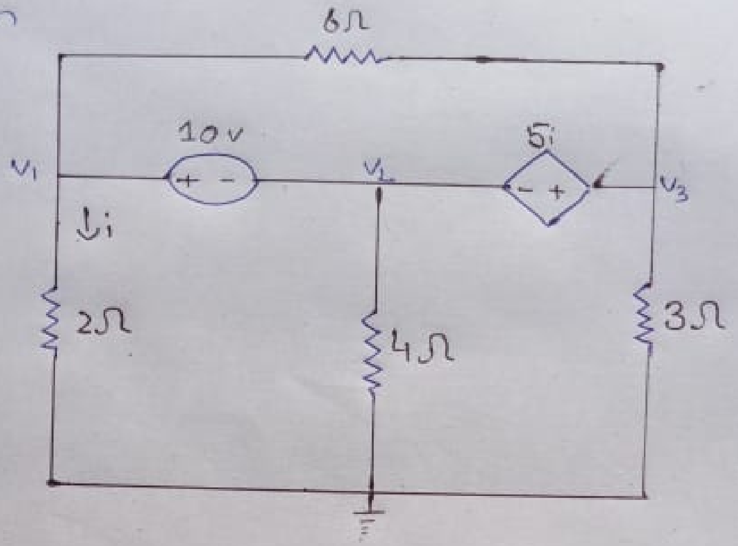
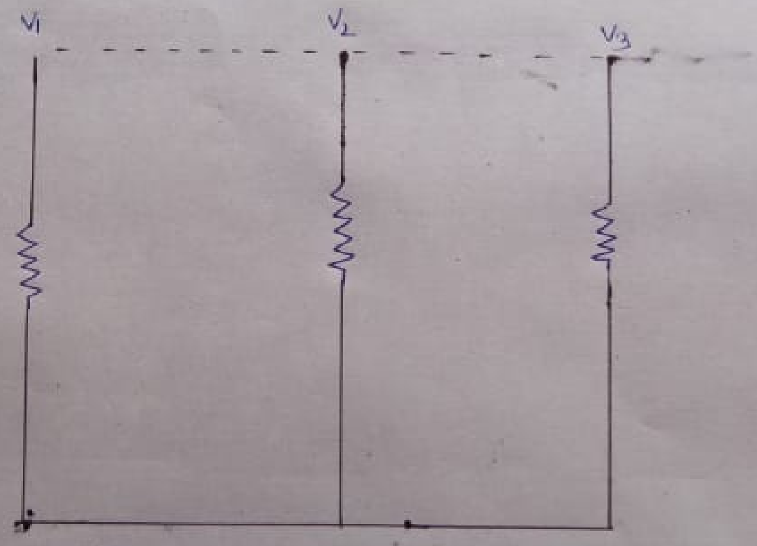
Q(3)
(A)
Solution



Now we apply KCL



$$\frac{V_1}{2} + \frac{V_2}{4} + \frac{V_3}{3} = 0 \longrightarrow 6V_1 + 3V_2 + 4V_3 = 0$$

P.T.O

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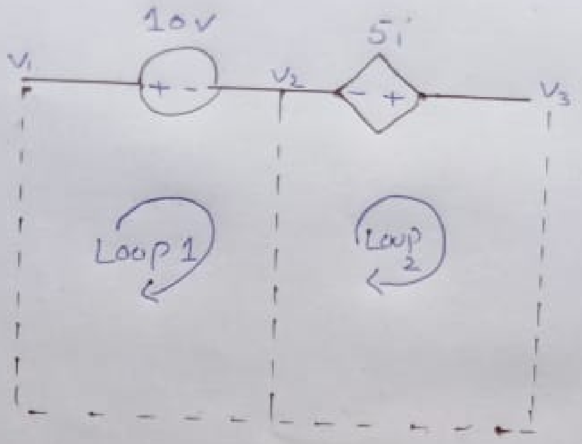
Now we apply KVL



Loop 1

$$-V_1 + 10 + V_2 = 0$$

$$\rightarrow V_1 = V_2 + 10 \quad (2)$$

Loop 2

$$-V_2 - 5i + V_3 = 0$$

$$\rightarrow V_3 = V_2 + 5i \quad (3)$$

Solving (1) to (3) we obtain

$V_1 = 3.043V$, $V_2 = -6.956V$

$V_3 = 652.2mV$

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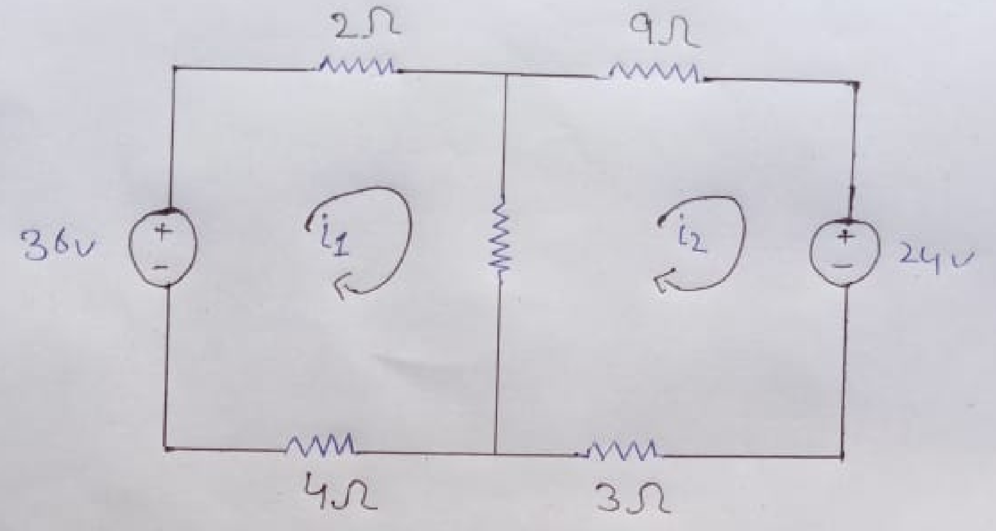
(B)

Solution



Now we apply KVL

$-36 + 18i_1 - 12i_2 = 0$

Mesh 1 $3i_1 - 2i_2 = 6$ (1)

$24 + 24i_2 - 12i_1 = 0$

Mesh 2 $-3i_1 + 6i_2 = -6$ (2)

From (1) and (2) we get

$i_1 = 2A$ $i_2 = 0A$

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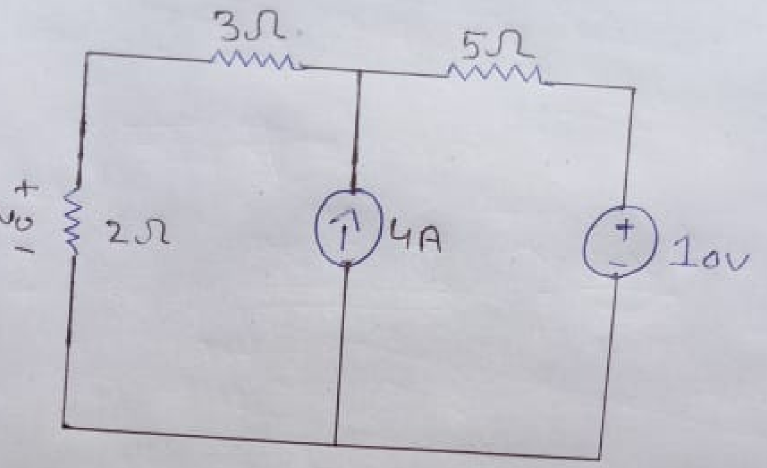
Q(4)

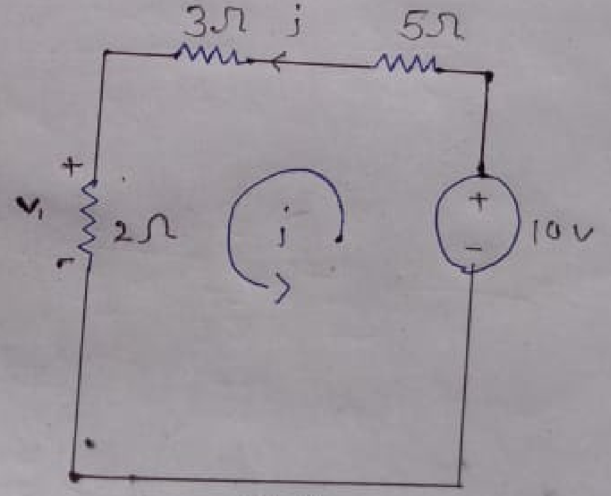
(A)



Solution=>

Let $v_0 = v_1 + v_2$

where v_1 and v_2 are contribution to The 10V and 4A sources respectively



(a)

P.T.O

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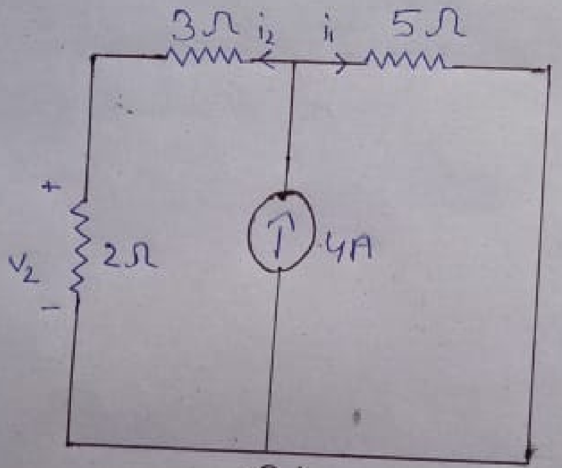
Apply ohm's Law

To get v_1 consider The circuit

$$(2+3+5)i = 10$$

$$i = 10\,(10) = 1A$$

$$V_1 = 2i = 2V$$



(B)

To get v_2 consider The circuit

$i_1 = i_2 = 2A$, $V_2 = 2i_2 = 4V$

Thus

$$V = V_1 + V_2 = 2+4 = 6V$$

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(B)

Thevenin's Theorem :=>

=> Any Linear ckt containing several voltages and resistance can be replaced by just one single voltage in series with a single resistance connected across the load. in other words it is possible to simplify any electrical ckt. no matter how complex, to an equivalent Two Terminal ckt with just a single constant voltage source in series with a resistance or impedance.

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Thevenin's Theorm is especially useful in The circuit analysis of Power or battery Systems & other interconnected resistive CKT where it will have an effect on The adjoining Part of The CKT.

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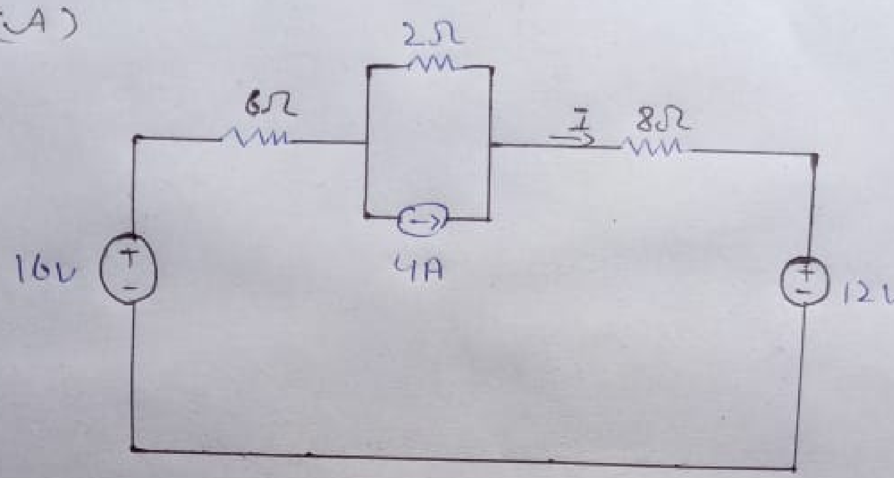
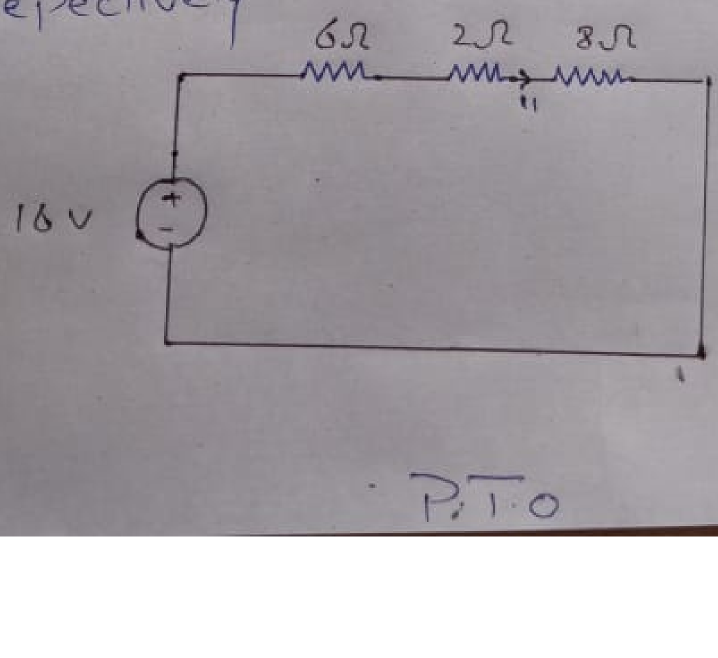
Q(5)
(A)



Solution

Let $i = i_1 + i_2 + i_3$

where i_1, i_2 and i_3 are contribution due to 16V, 4A, 12V source repectively



Apply ohm's Law For i_1

$$i_1 = \frac{16}{6+2+8} = 1A$$

P.T.O

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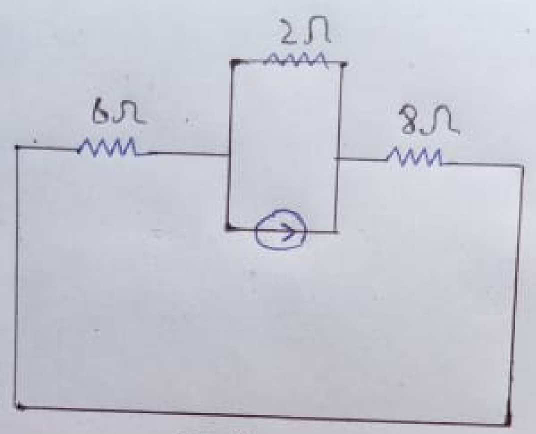
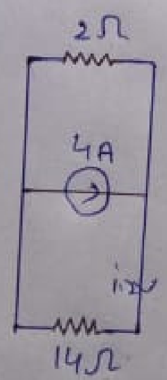


(b)

Apply current Division

For i_2

By current division



$$i_2 = \frac{2}{2+14}(4) = 0.5$$

P.T.O

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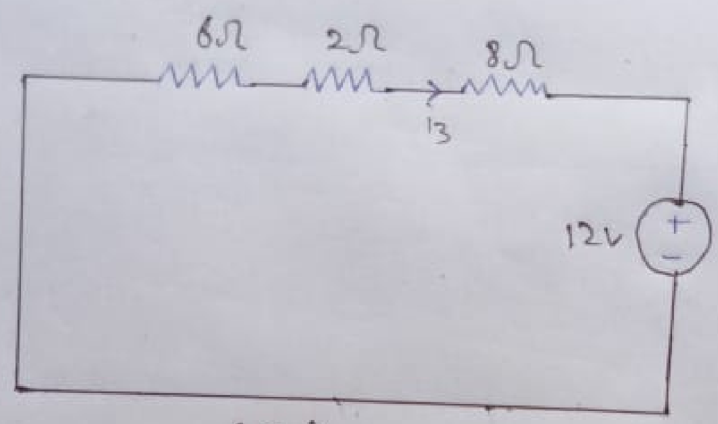

(c)

Apply ohm's Law

For i_3

$$i_3 = \frac{-12}{16} = -0.75A$$

Thus $i = i_1 + i_2 + i_3$

$= 1 + 0.5 - 0.75$

$= 750\,mA$