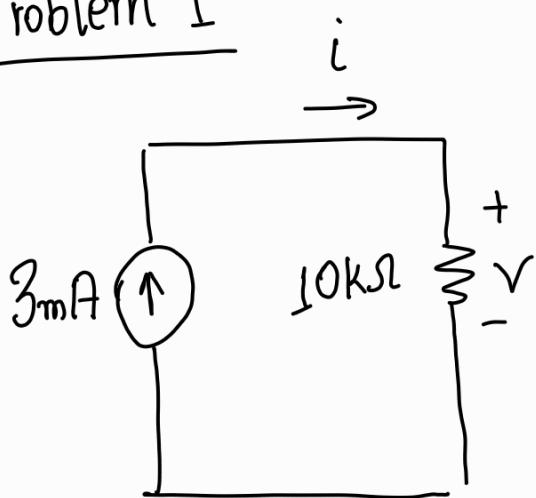


Problem 1



(i) Find v , G and P .

$$V = 3 \times 10^{-3} \times 10 \times 10^3 = 30\text{V}$$

$$G = \frac{1}{R} = \frac{1}{10\text{k}} \text{S} = 0.1 \text{mS} \\ = 100 \mu\text{s}$$

$$P = Vi = 30 \times 3 \times 10^{-3} \text{W} \\ = 90 \text{mW}$$

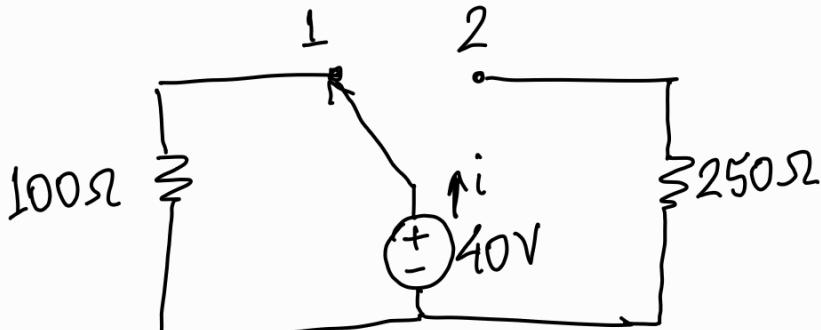
(ii) Skip for now

Problem 2

Given, $P=60\text{W}$ and $V=120\text{V}$. Find R

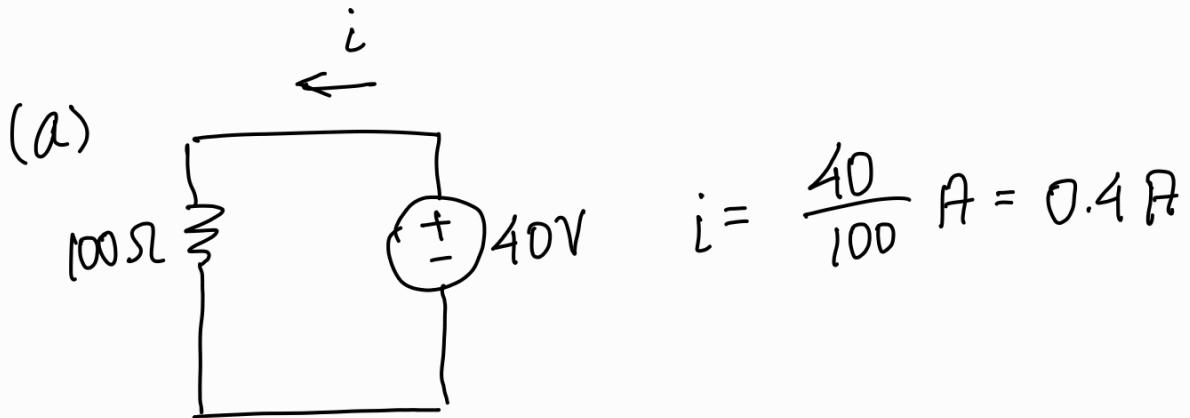
$$P = \frac{V^2}{R} \Rightarrow 60 = \frac{120 \times 120}{R} \Rightarrow R = 240\Omega$$

Problem 3

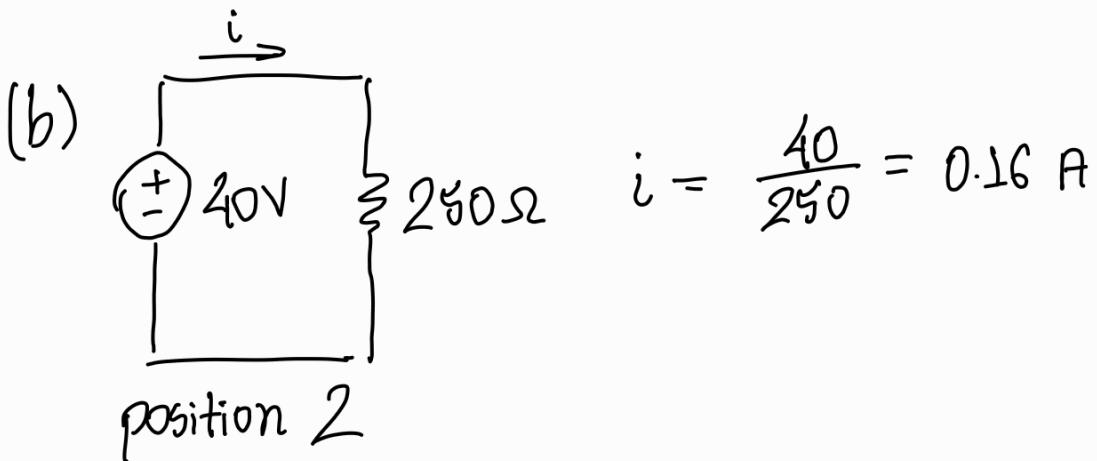


(a) Calculate i , when
Switch is in position 1

(b) Calculate i , when
Switch is in position 2

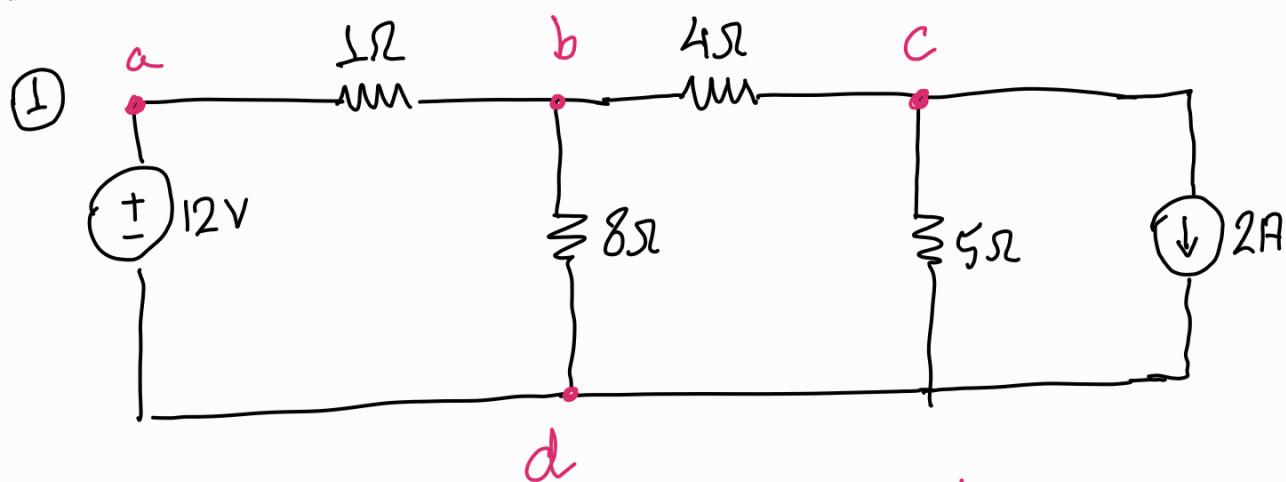


position 1



position 2

Problem 5



d

node = 4

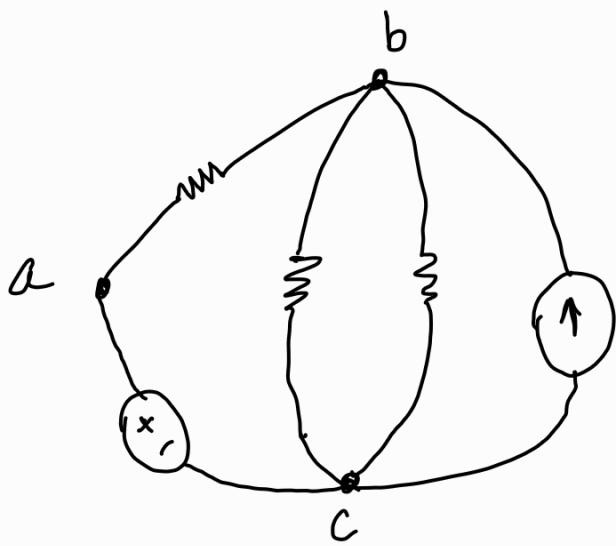
branch = 6 (no. of elements)

$$\therefore \text{mesh} = 6 - 4 + 1 = 3$$

loop = 6 [count yourself]

mesh = branch - node + 1

(2)



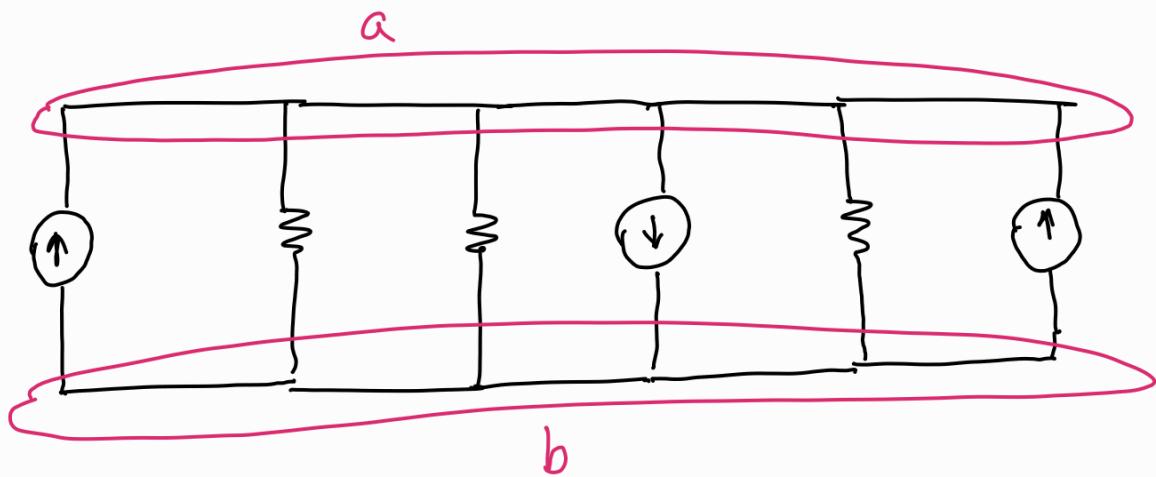
$$\text{node} = 3$$

$$\text{branch} = 5$$

$$\text{mesh} = 5 - 3 + 1 = 3$$

$$\text{loop} = 6$$

(3)



$$\text{node} = 2$$

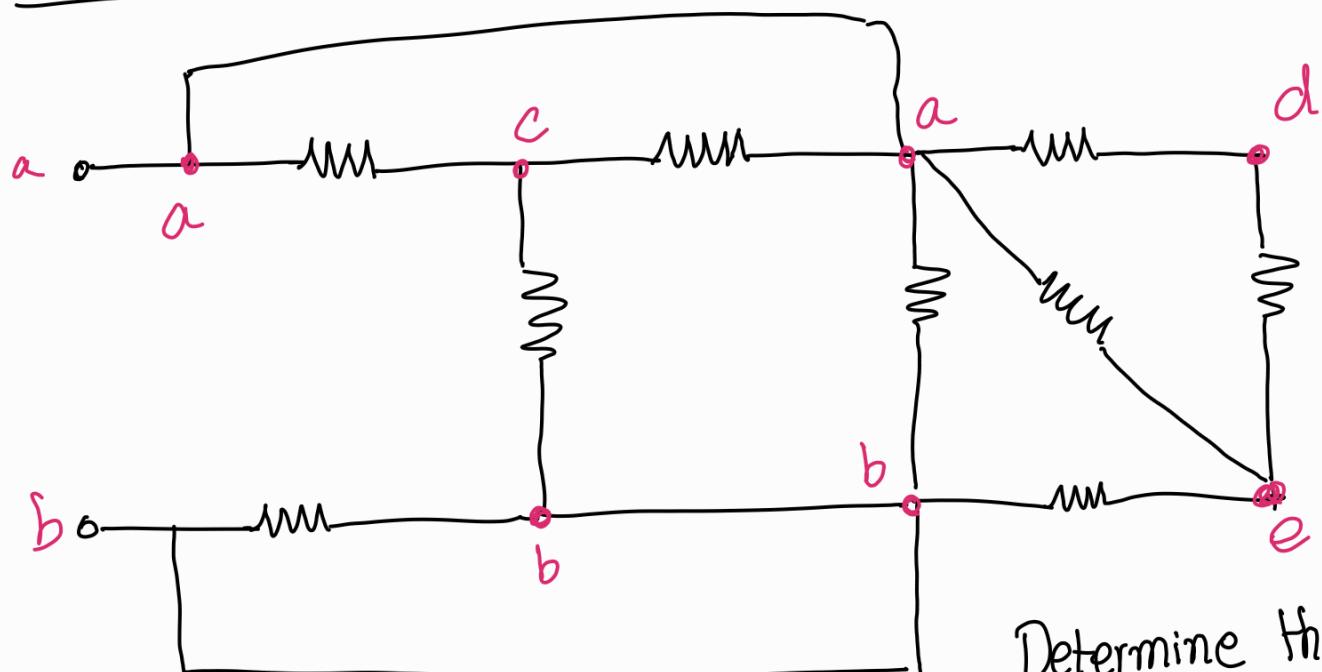
$$\text{branch} = 6$$

$$\text{mesh} = 6 - 2 + 1 = 5$$

$$\begin{aligned}\text{loop} &= 5 + 4 + 3 + 2 + 1 \\ &= 15\end{aligned}$$

Problem 6 (Solution already given)

Problem 7

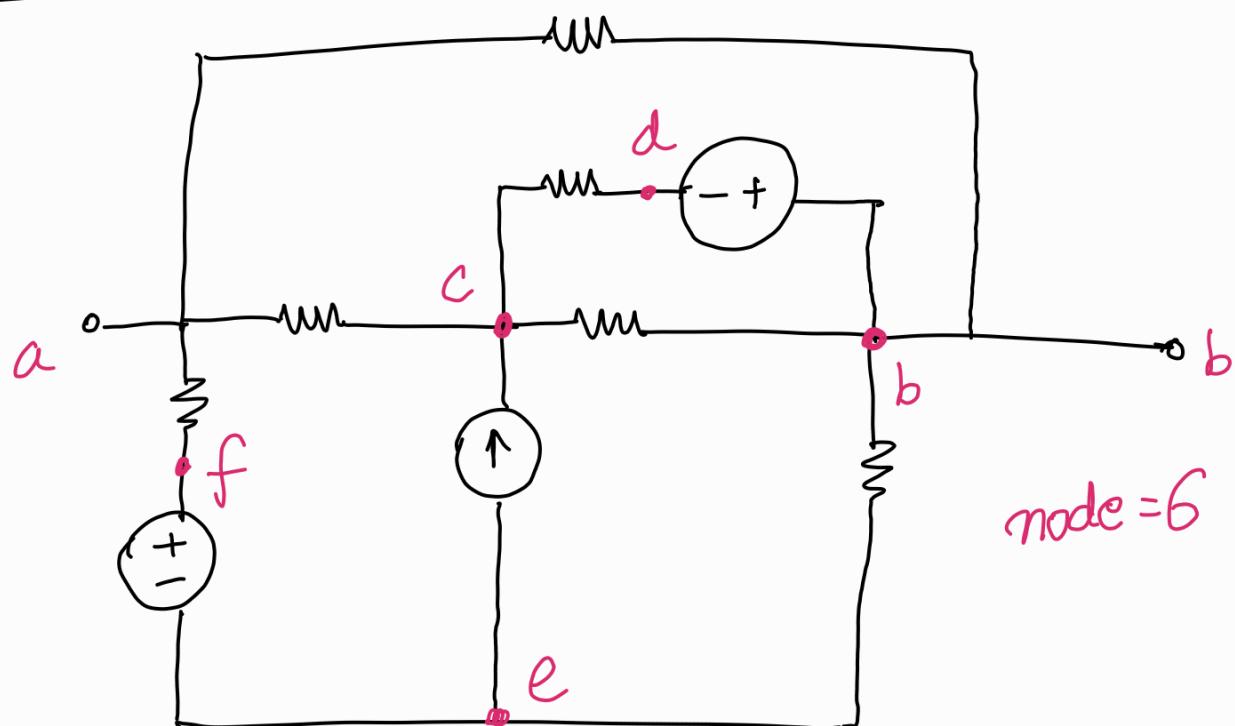


Determine the number of nodes.

node = 5

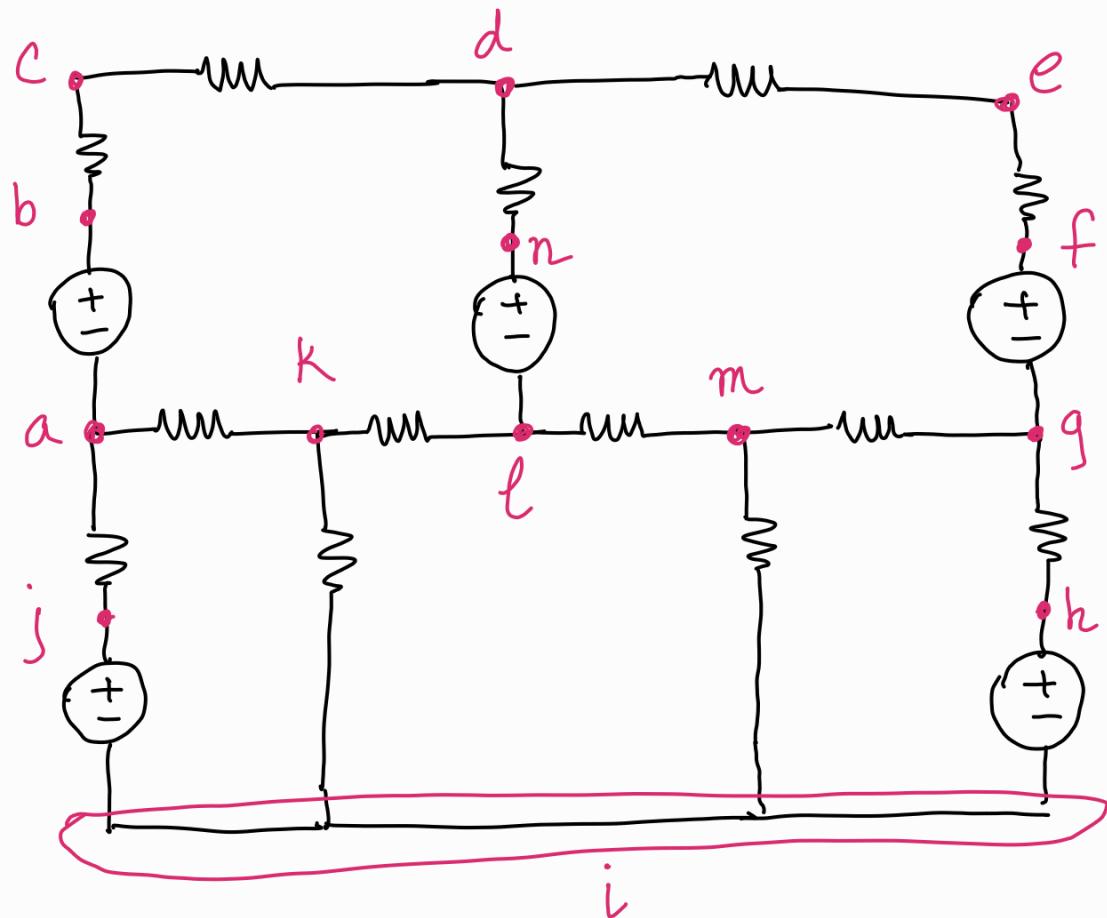
Problem 8 (Solution already given)

Problem 9



node = 6

Problem 10



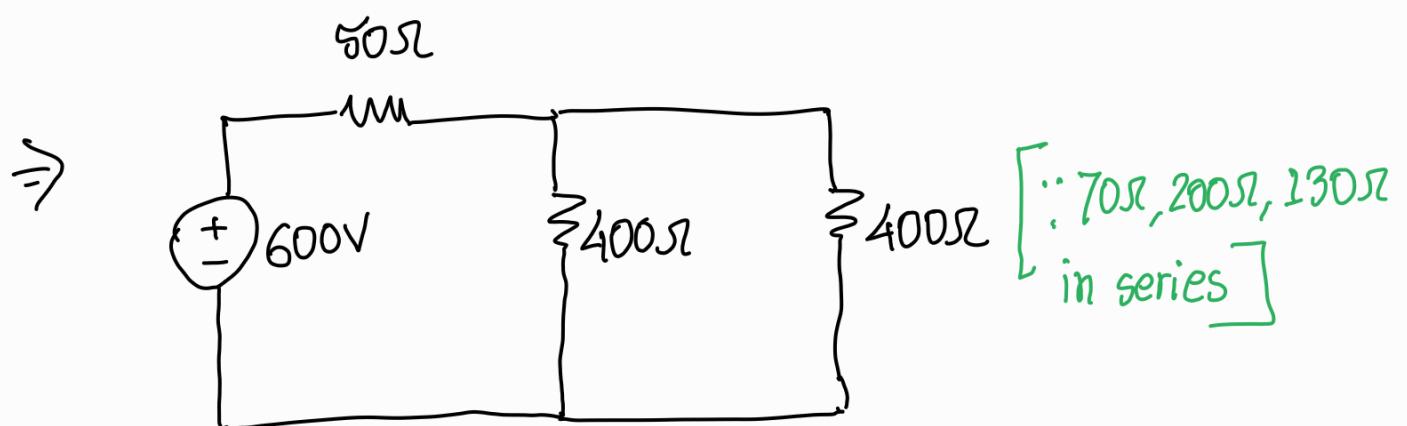
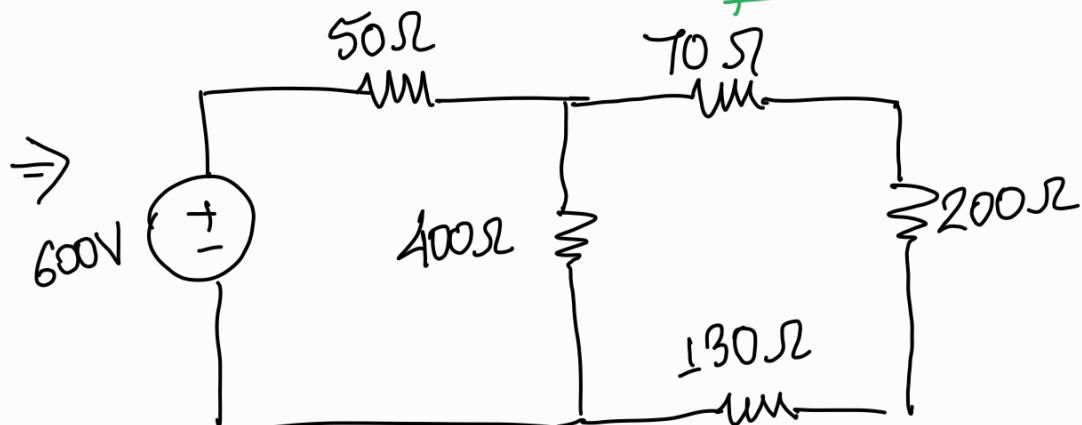
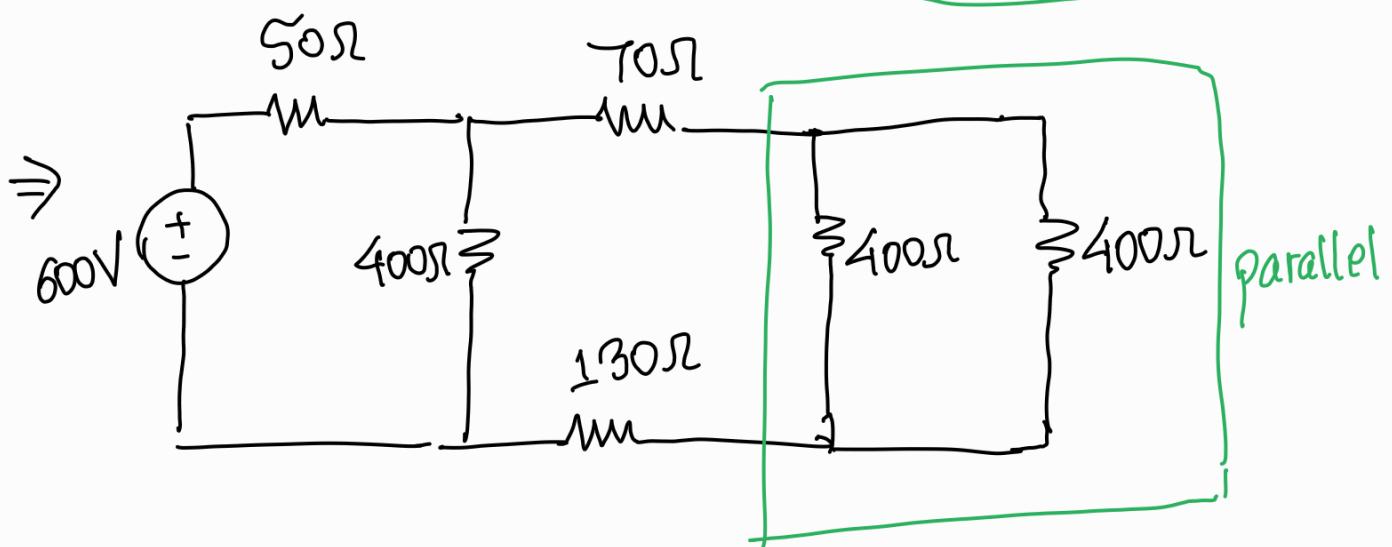
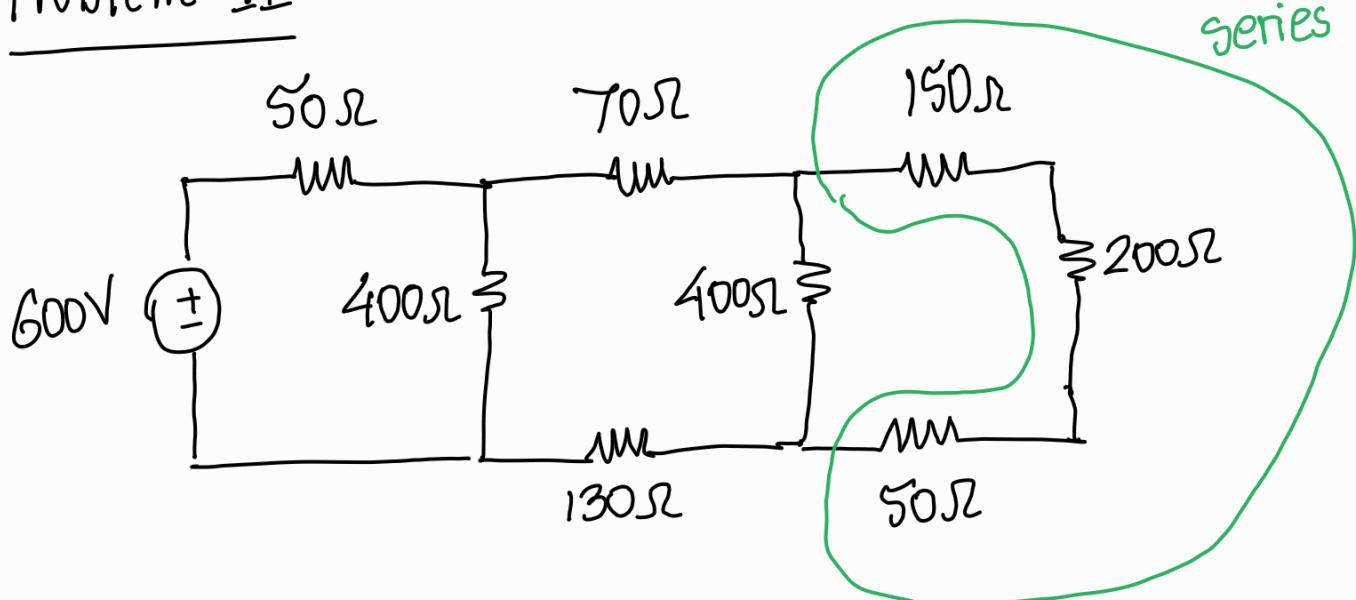
$$\text{node} = 14$$

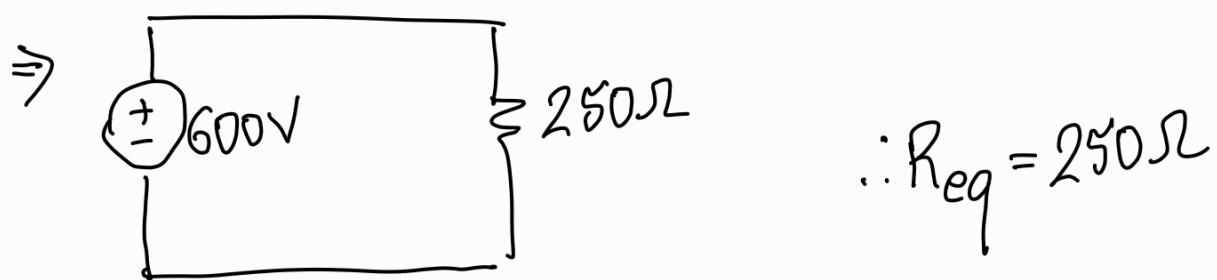
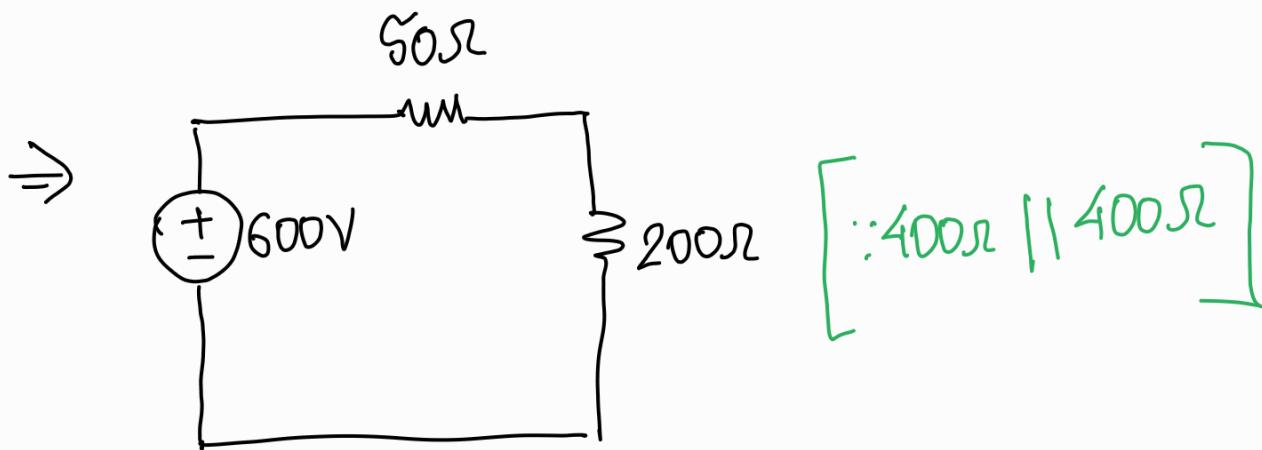
$$\text{branch} = 18$$

$$\text{mesh} = 18 - 14 + 1$$

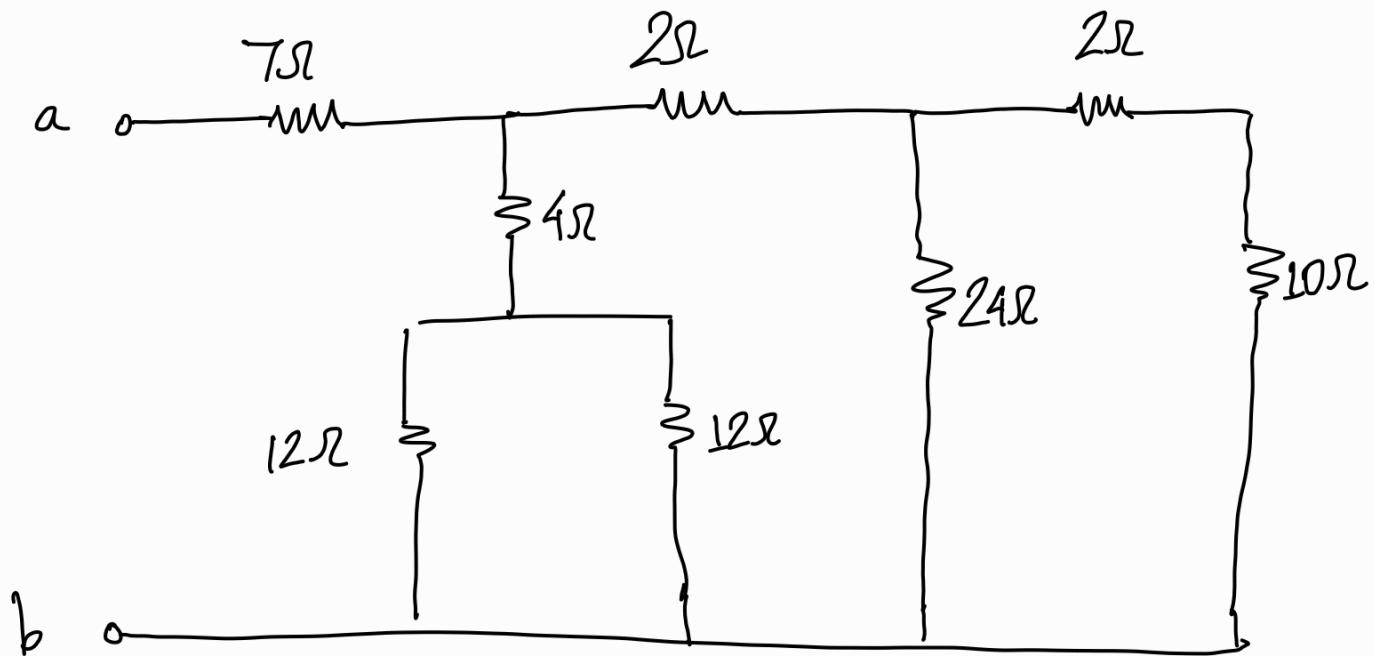
$$= 5$$

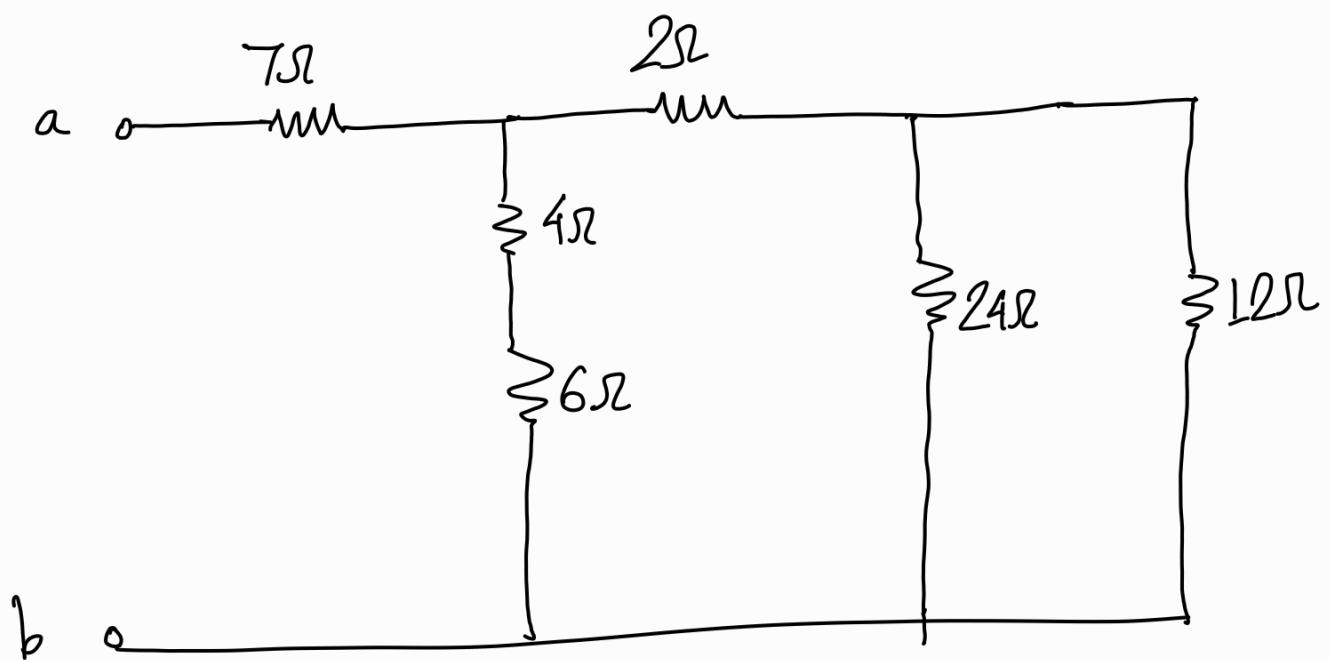
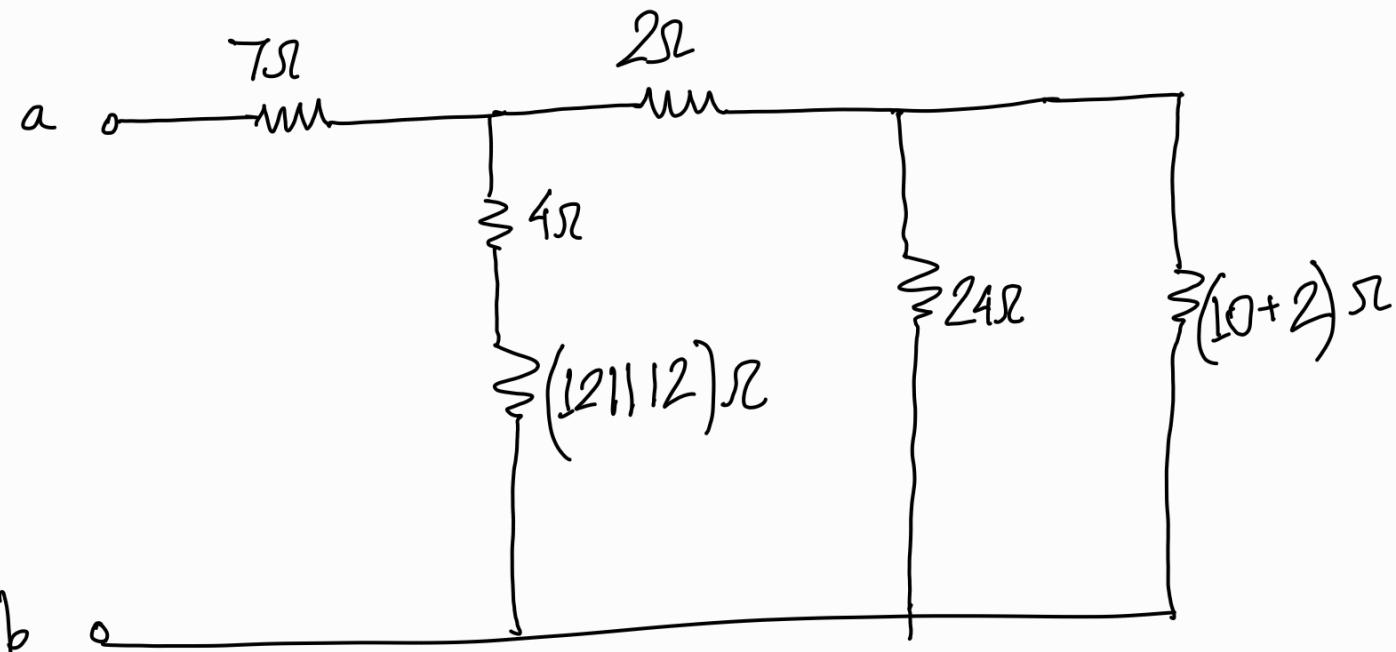
Problem 11

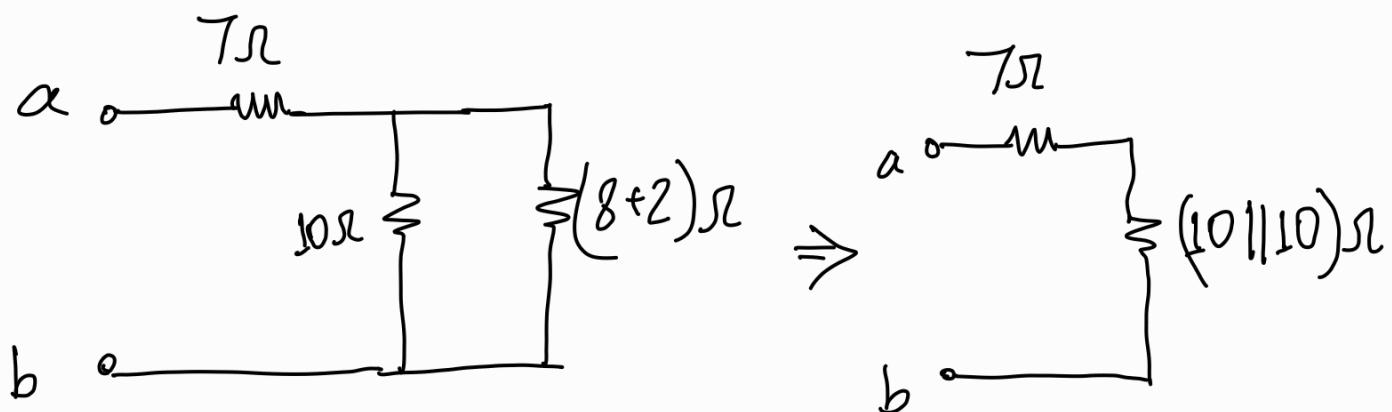
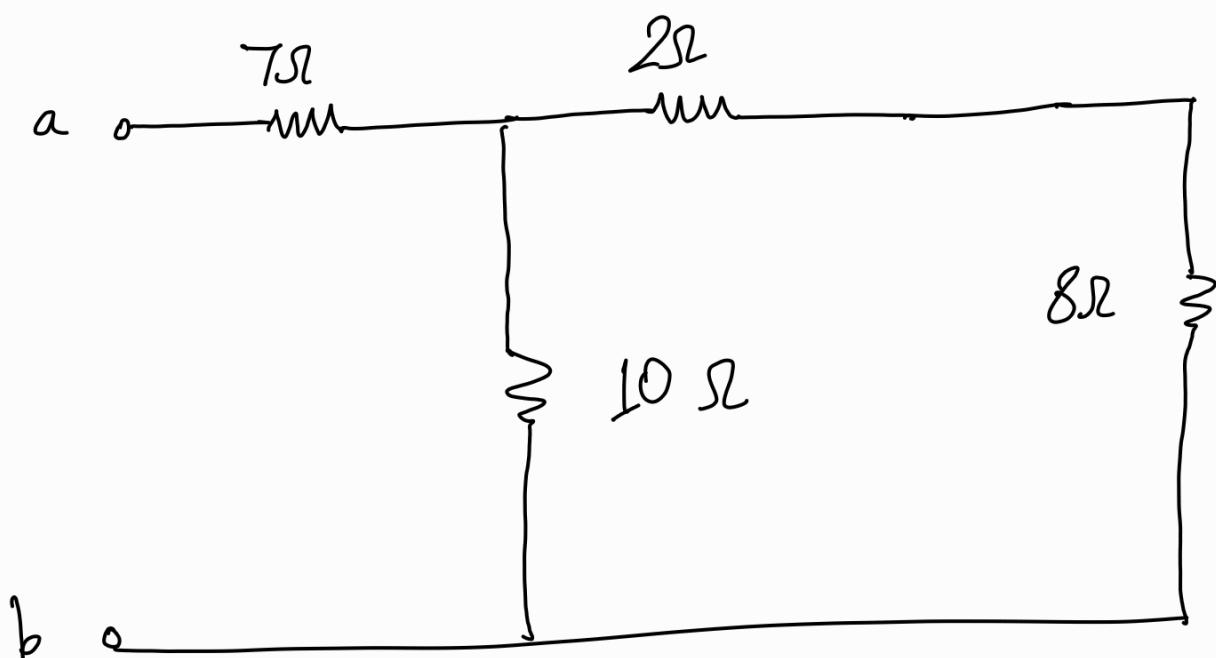
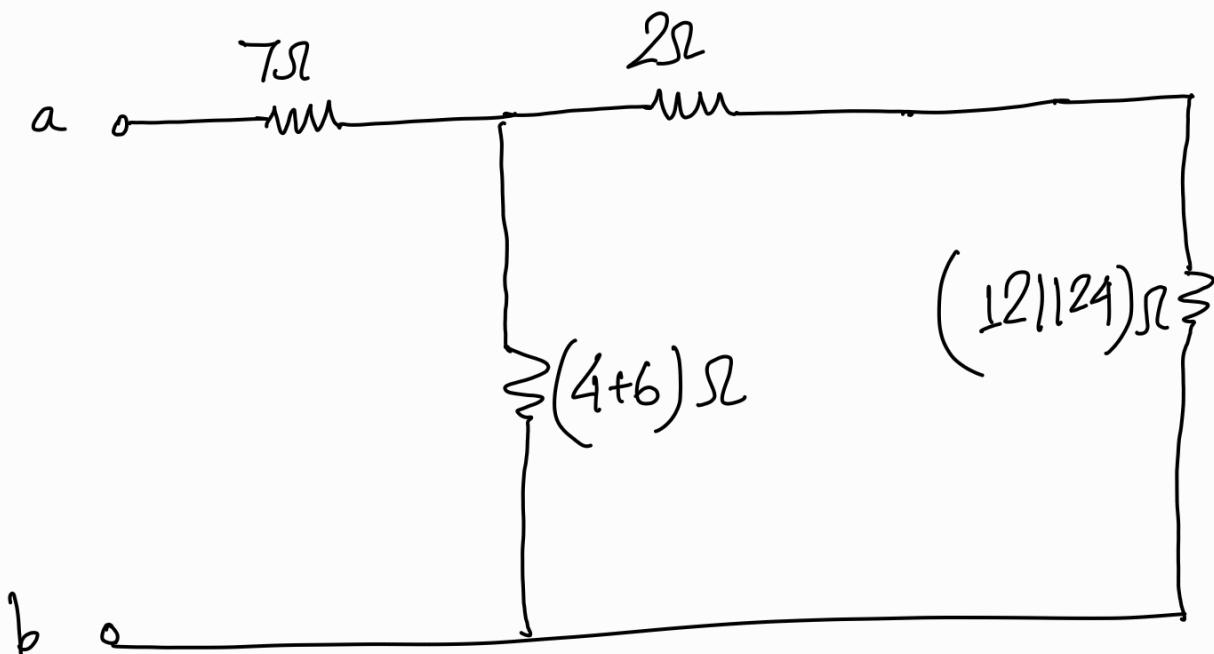




Problem 12

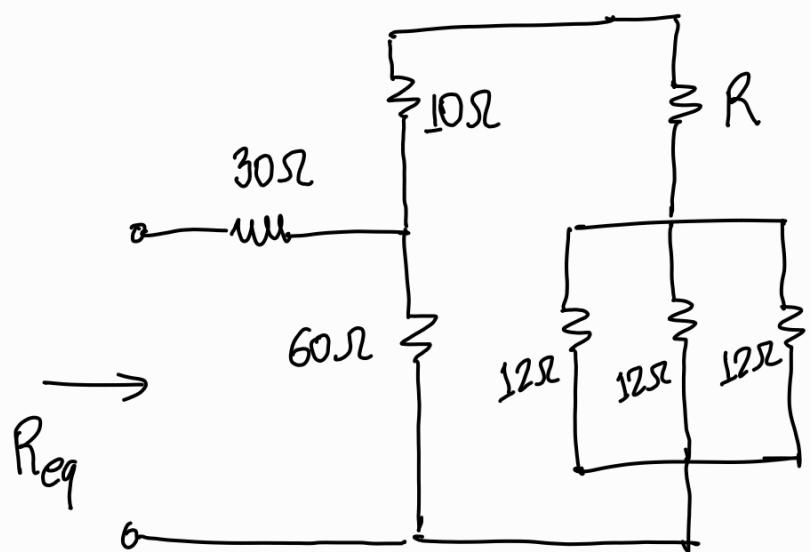






$$\therefore R_{ab} = 12\Omega$$

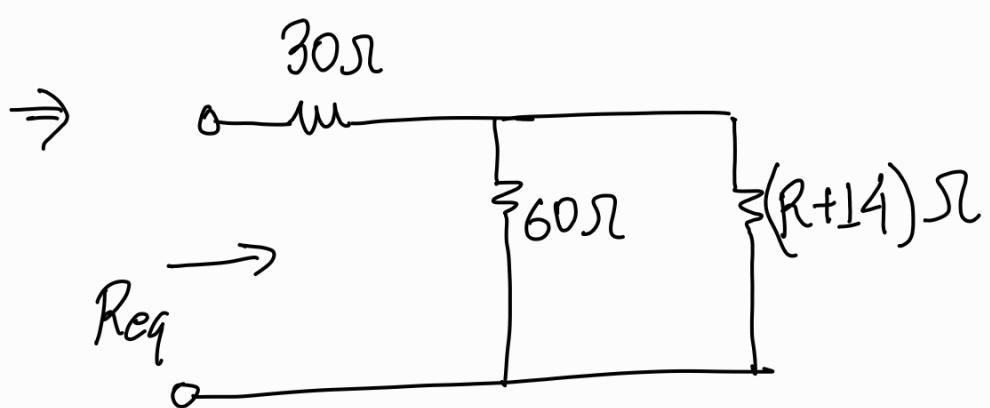
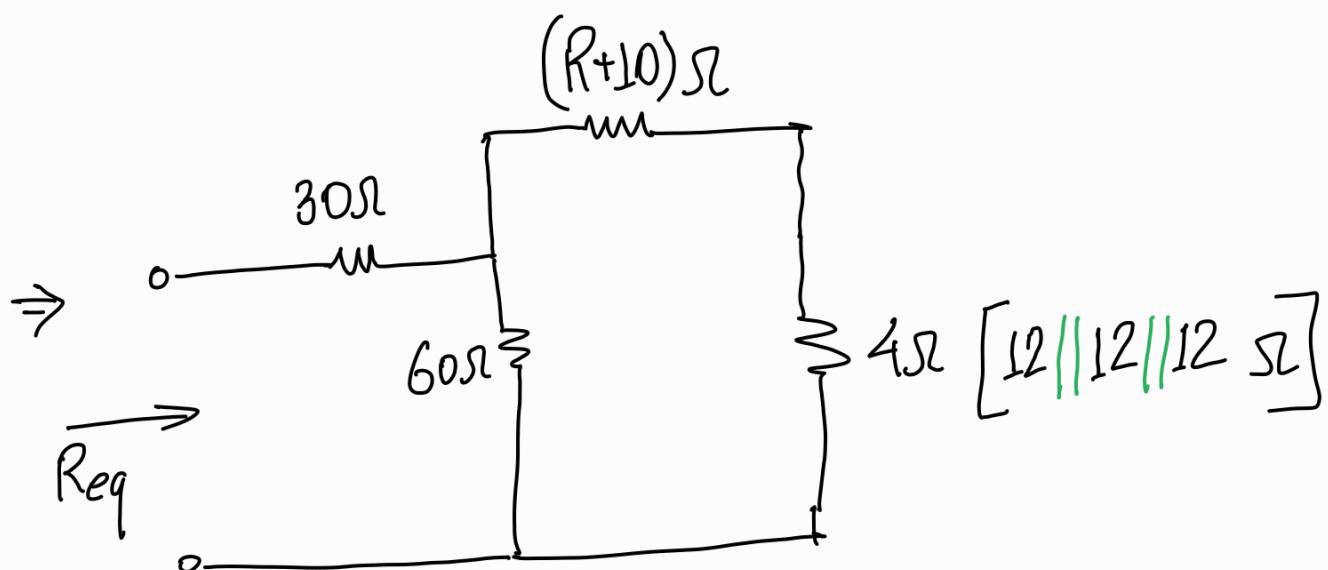
Problem 13



Given,

$$R_{eq} = 50\Omega$$

Find R



$$R_{eq} = 30 + 60 // (R+14)$$

$$\Rightarrow 50 = 30 + \left(\frac{1}{60} + \frac{1}{R+14} \right)^{-1}$$

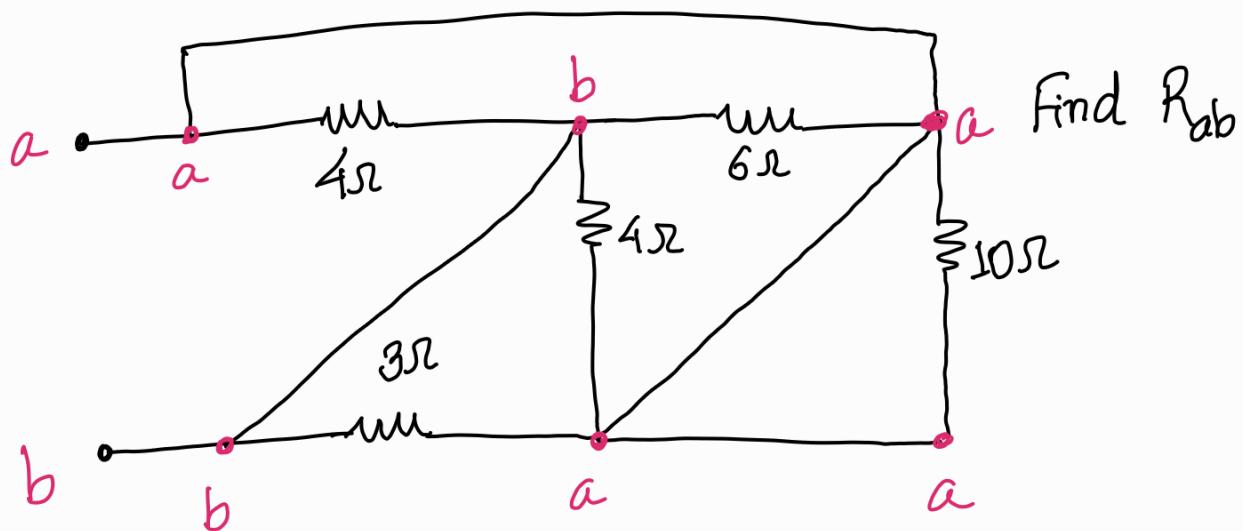
$$\Rightarrow \frac{1}{20} = \frac{1}{60} + \frac{1}{R+14}$$

$$\Rightarrow \frac{3-1}{60} = \frac{1}{R+14}$$

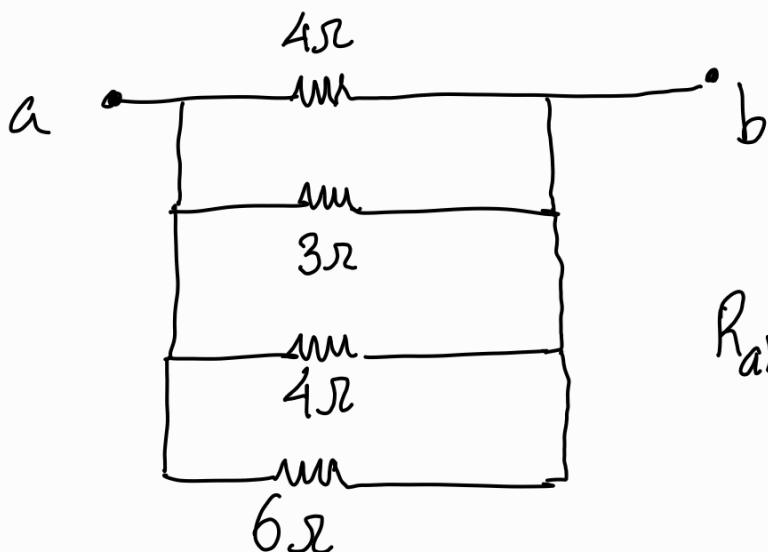
$$\Rightarrow 30 = R + 14$$

$$\Rightarrow R = 16 \Omega$$

Problem 14

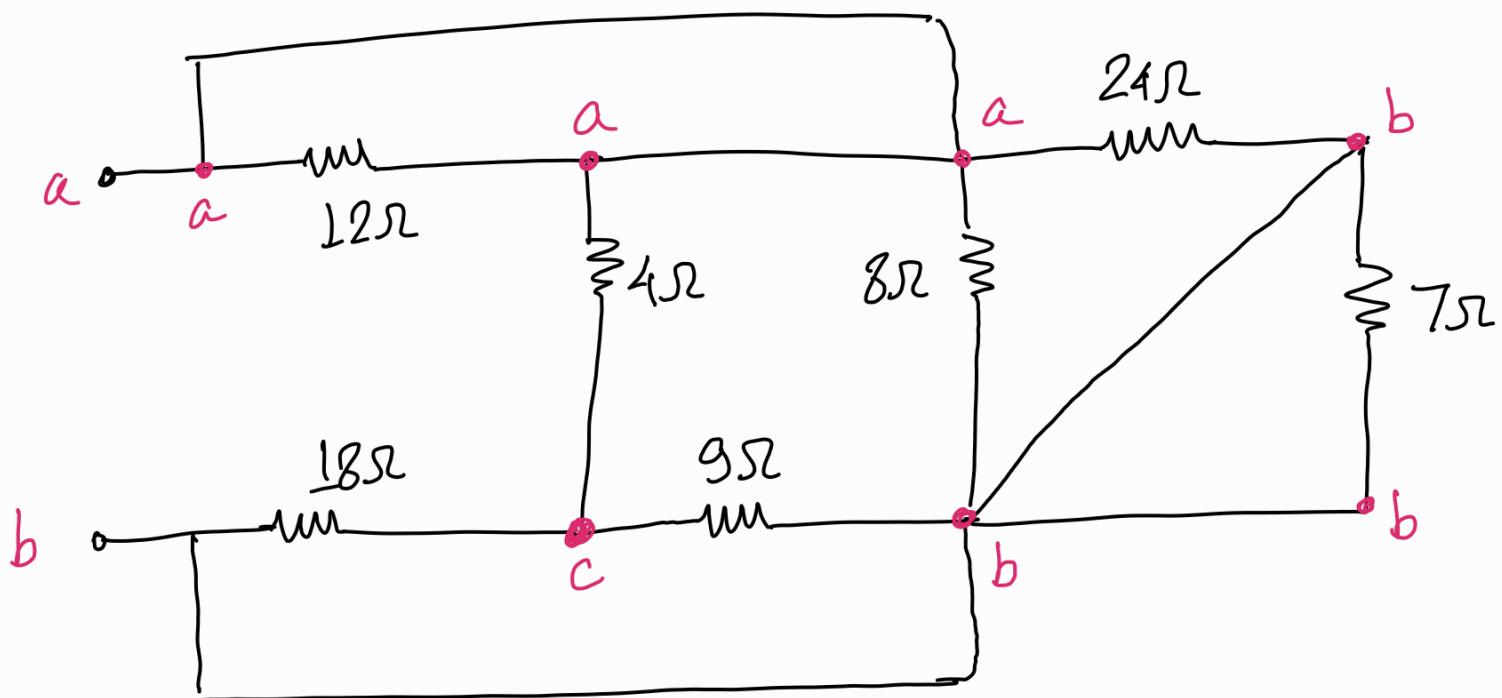


Redrawing —

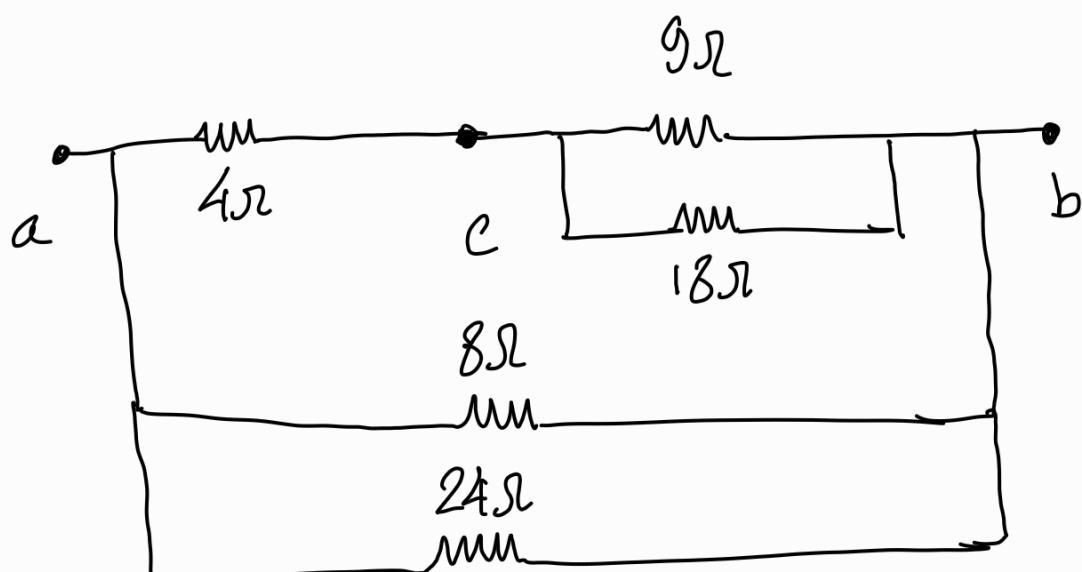


$$R_{ab} = \left(\frac{1}{4} + \frac{1}{4} + \frac{1}{3} + \frac{1}{6} \right)^{-1} \Omega$$
$$= 1 \Omega$$

Problem 15



Redrawing —

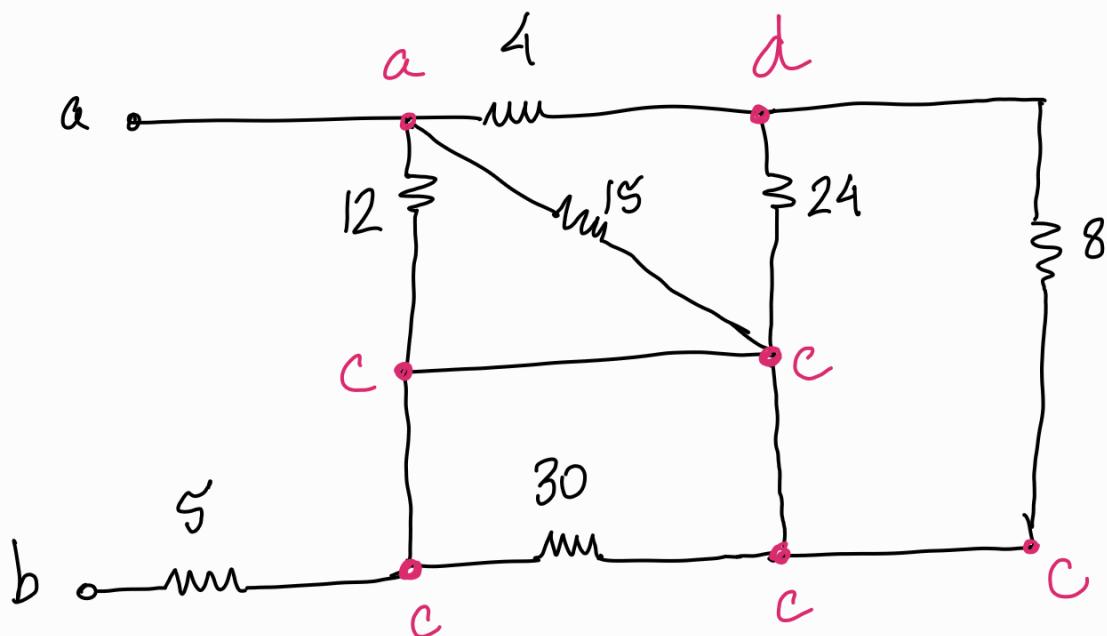


$$\text{Here } (9 \parallel 18)\Omega = 6\Omega \text{ & } (8 \parallel 24)\Omega = 6\Omega$$

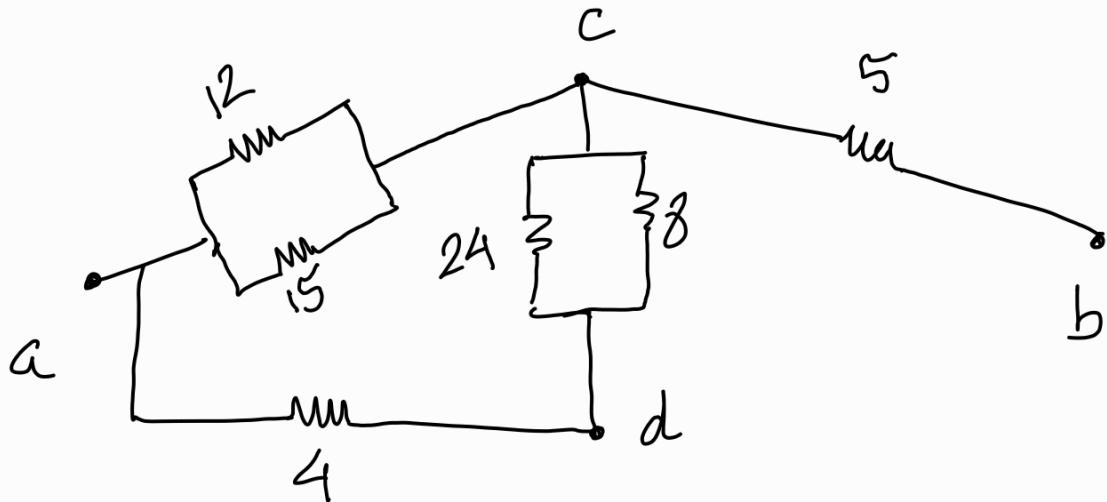


$$\Rightarrow R_{ab} = \left(\frac{1}{10} + \frac{1}{6} \right)^{-1} = \left(\frac{3+5}{30} \right)^{-1} = \frac{30}{8} = 3.75 \Omega$$

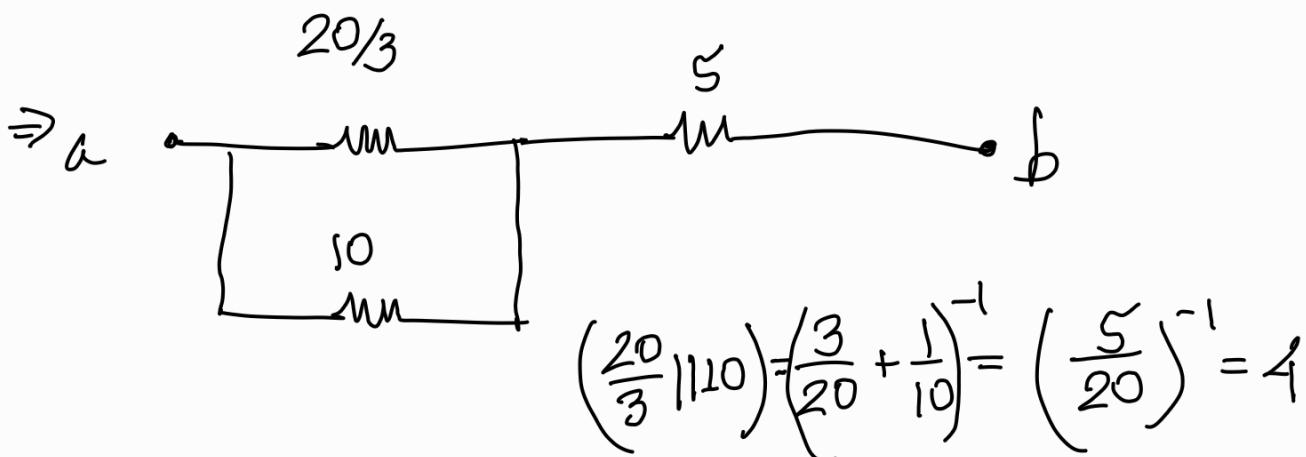
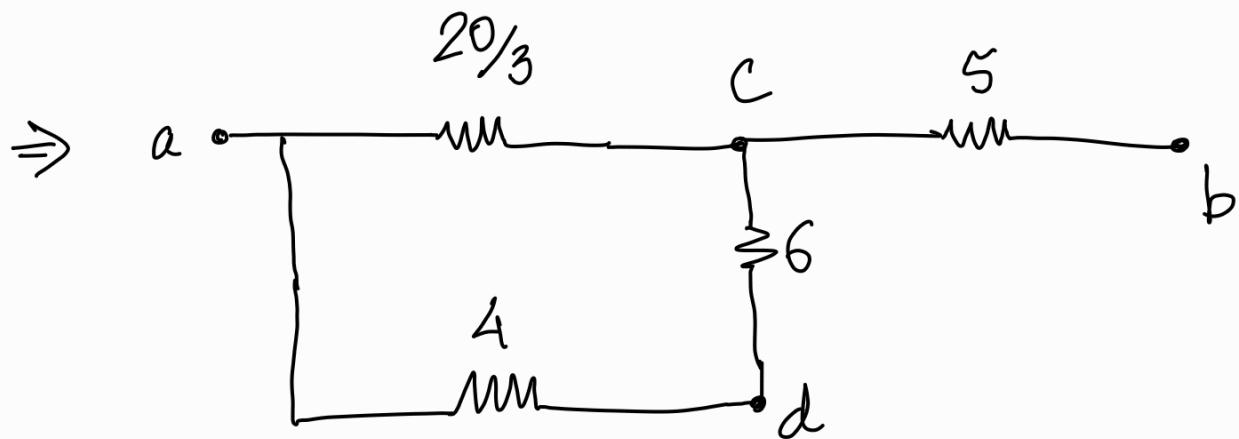
Problem 16



Redrawing —

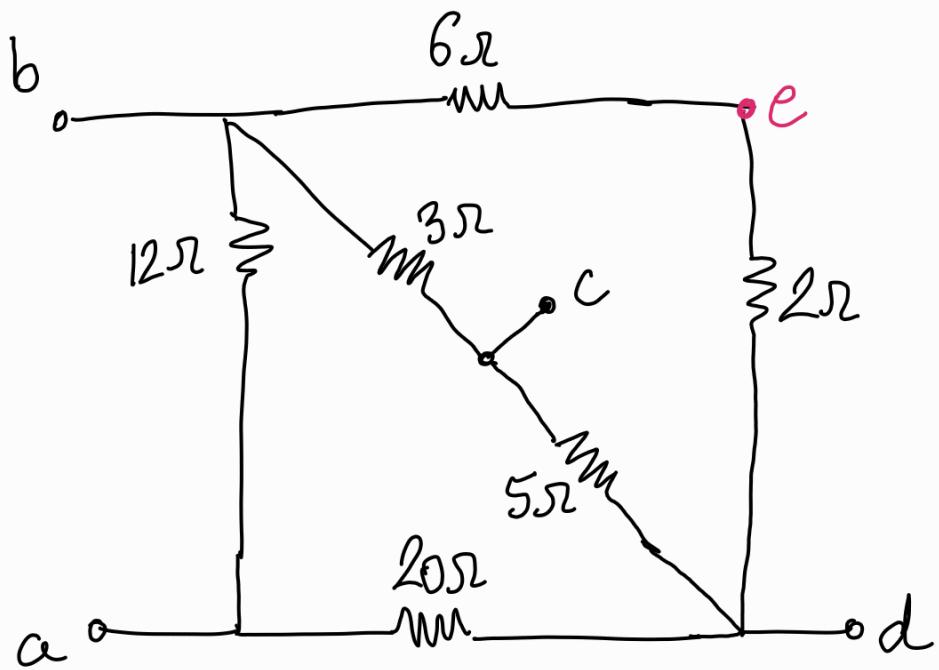


$$\text{Here } (12||15) = \frac{20}{3} \text{ & } (24||8) = 6$$



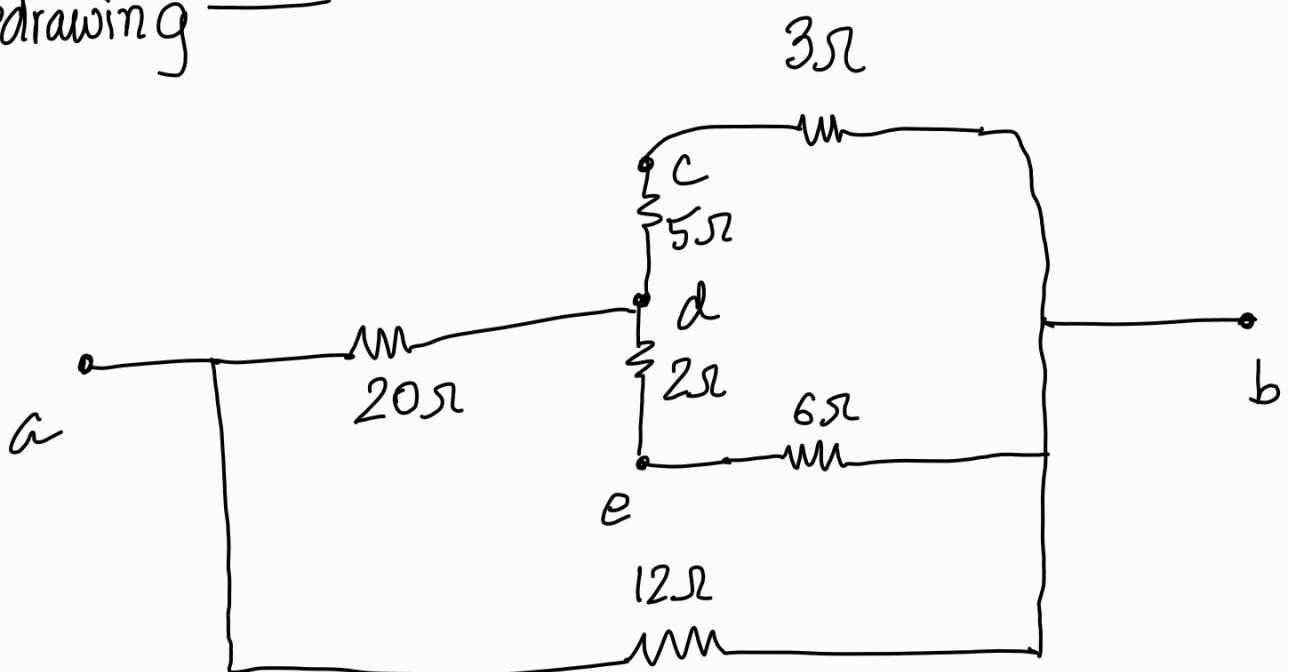
$$\Rightarrow R_{ab} = (4+5) = 9$$

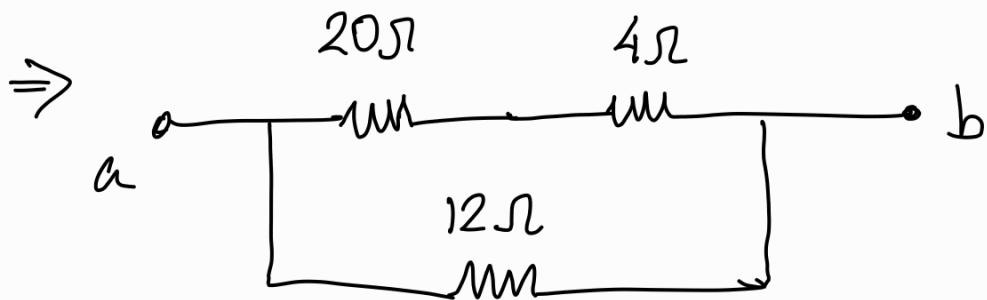
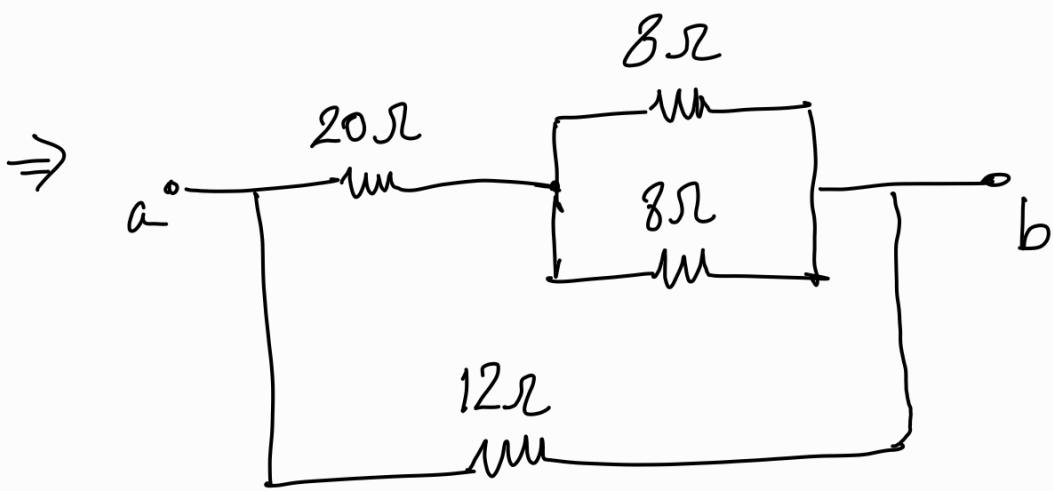
Problem 17



① Find R_{ab}

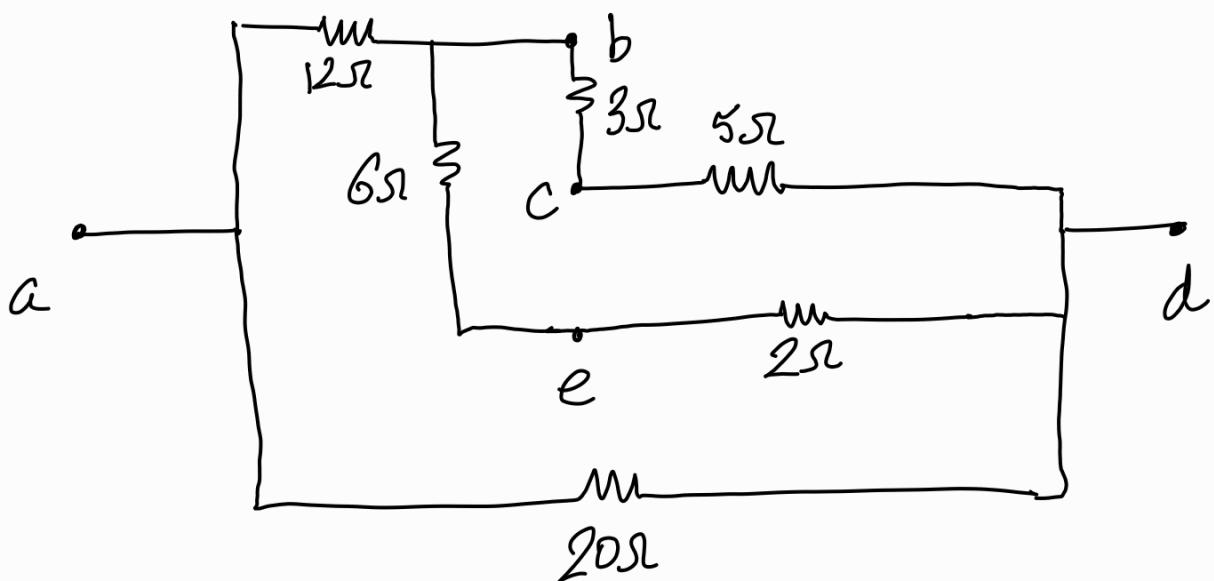
Redrawing —

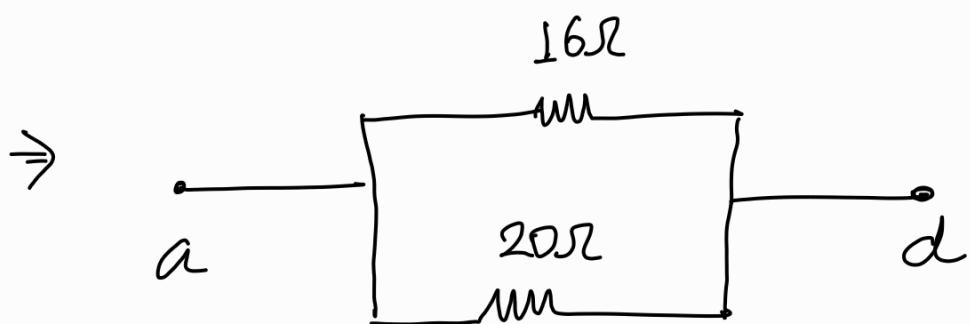
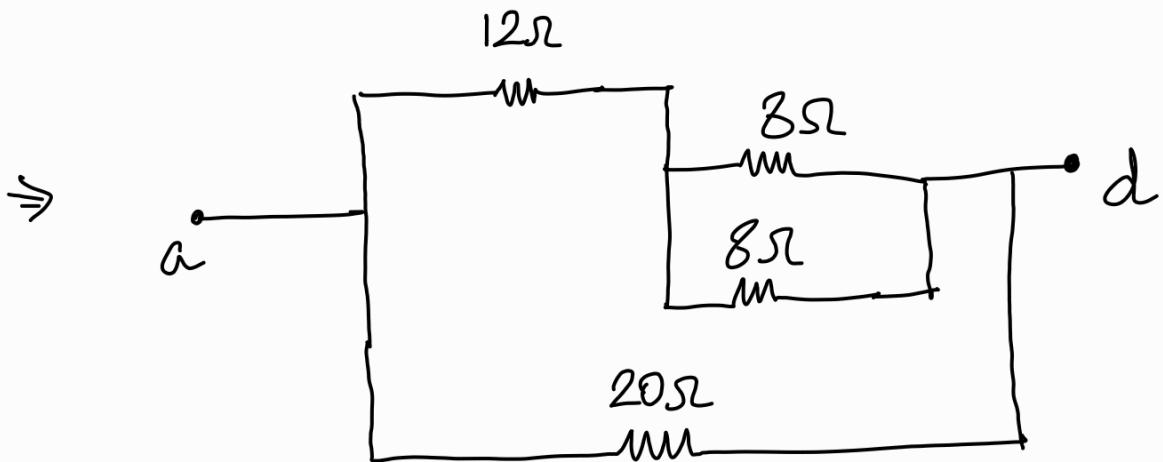




$$\therefore R_{ab} = (24 \parallel 12) \Omega = 8 \Omega$$

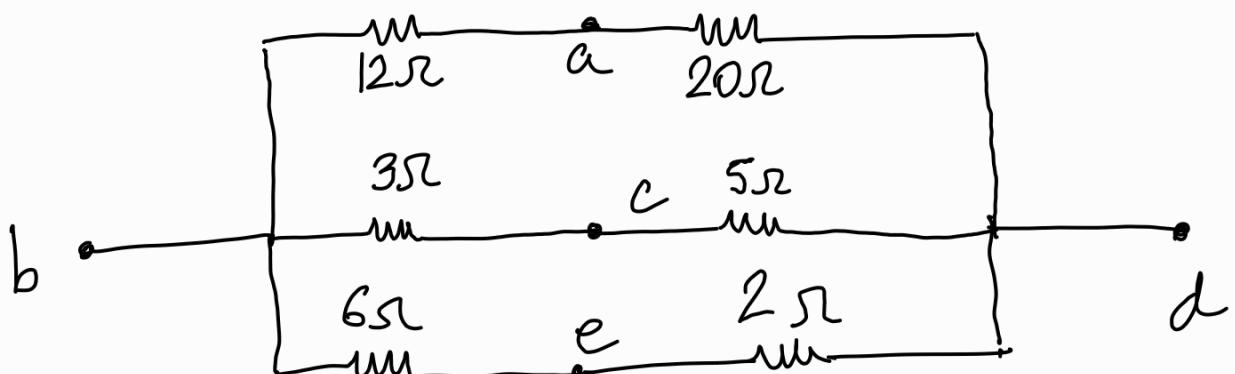
II Find R_{ad}

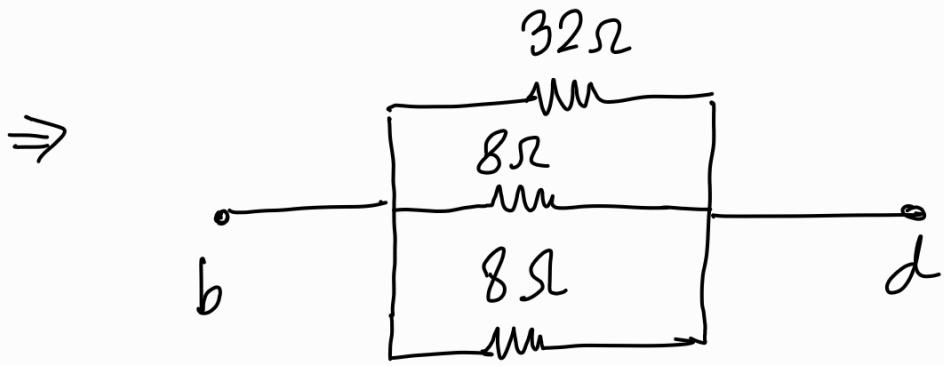




$$R_{ad} = (16 \parallel 20) \Omega = \frac{80}{9} \Omega$$

III Find R_{bd}

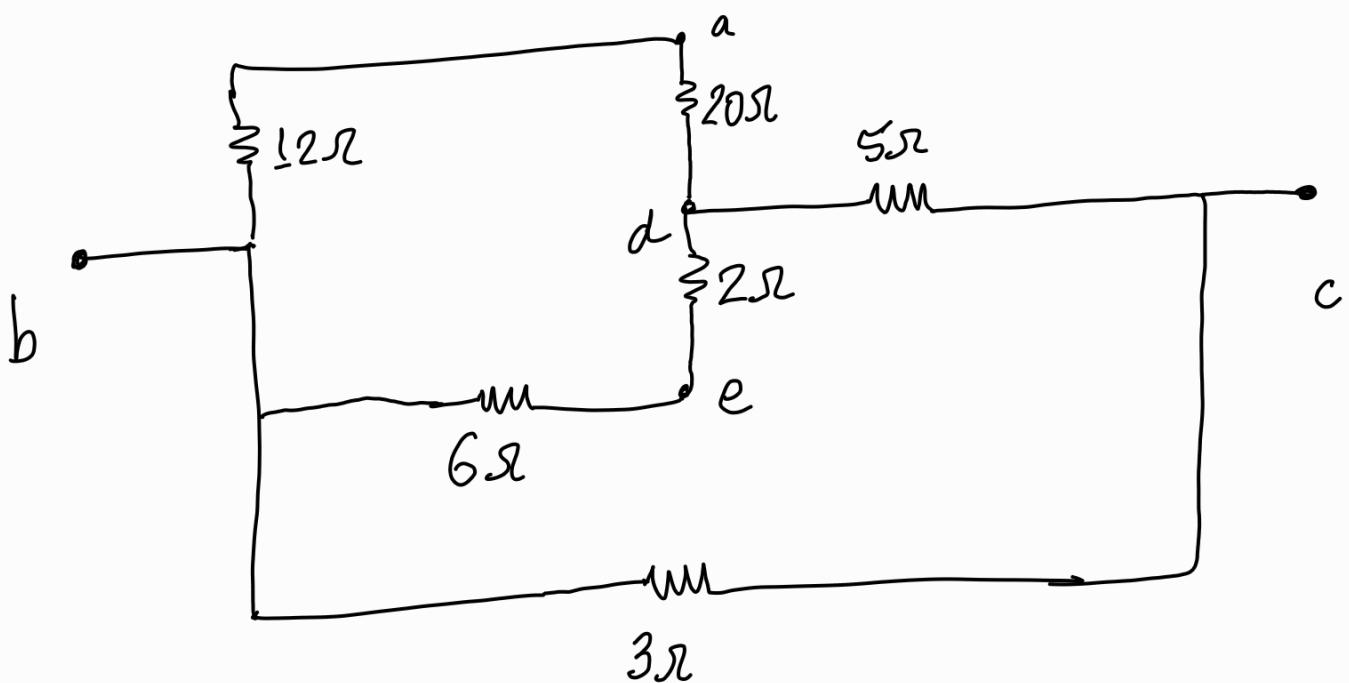


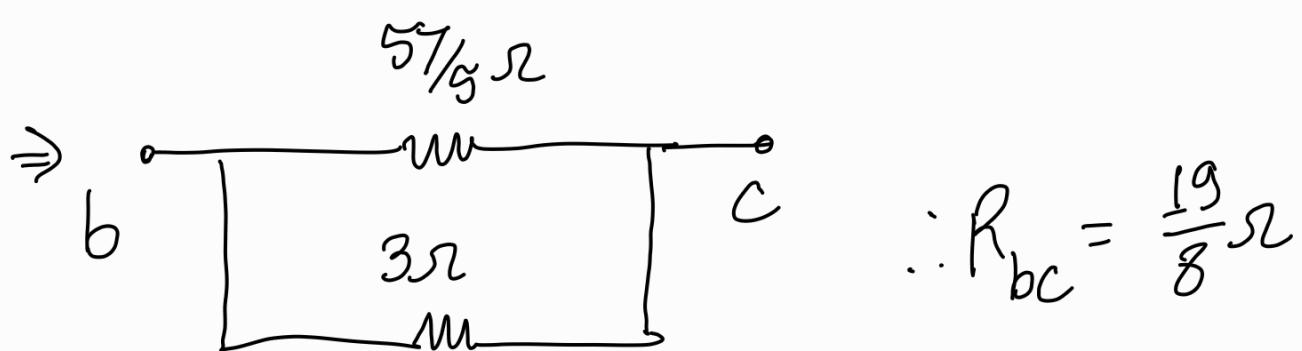
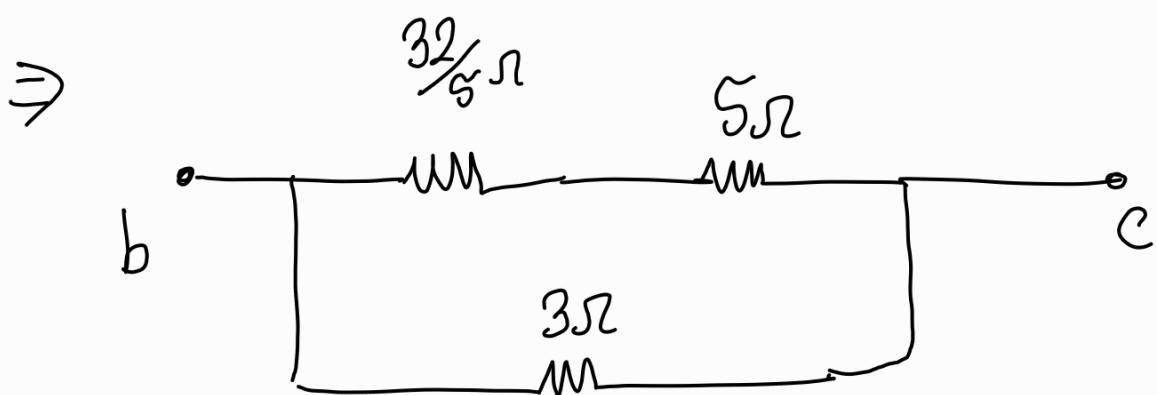
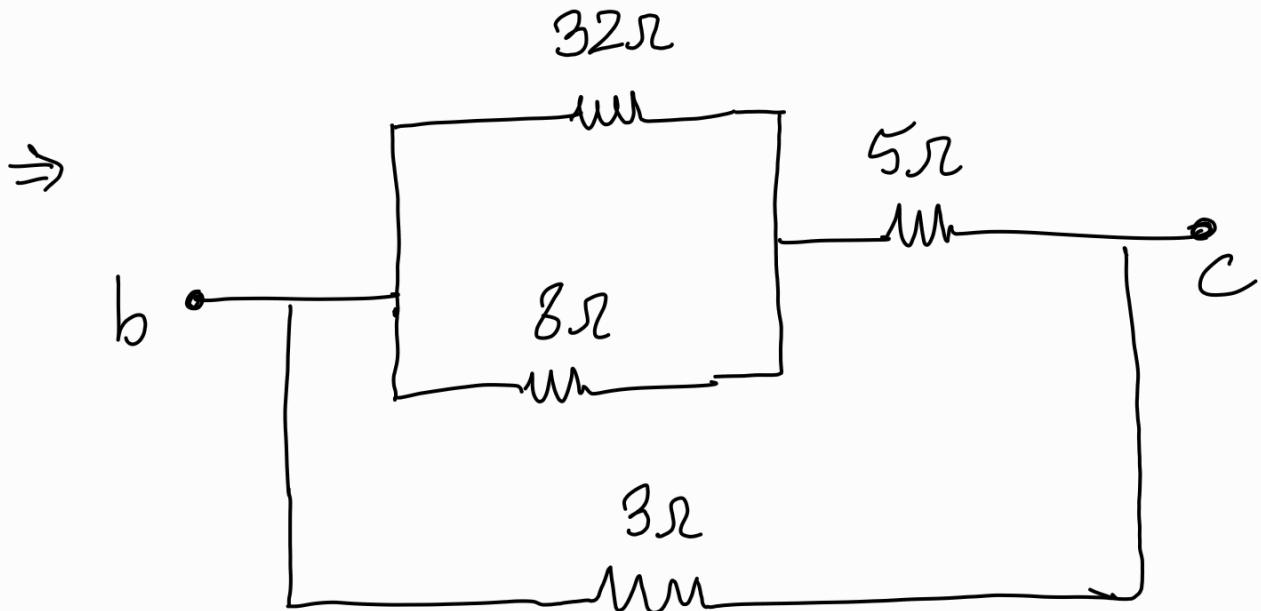


$$R_{bd} = (32 \parallel 8 \parallel 8) \Omega = \frac{32}{9} \Omega$$

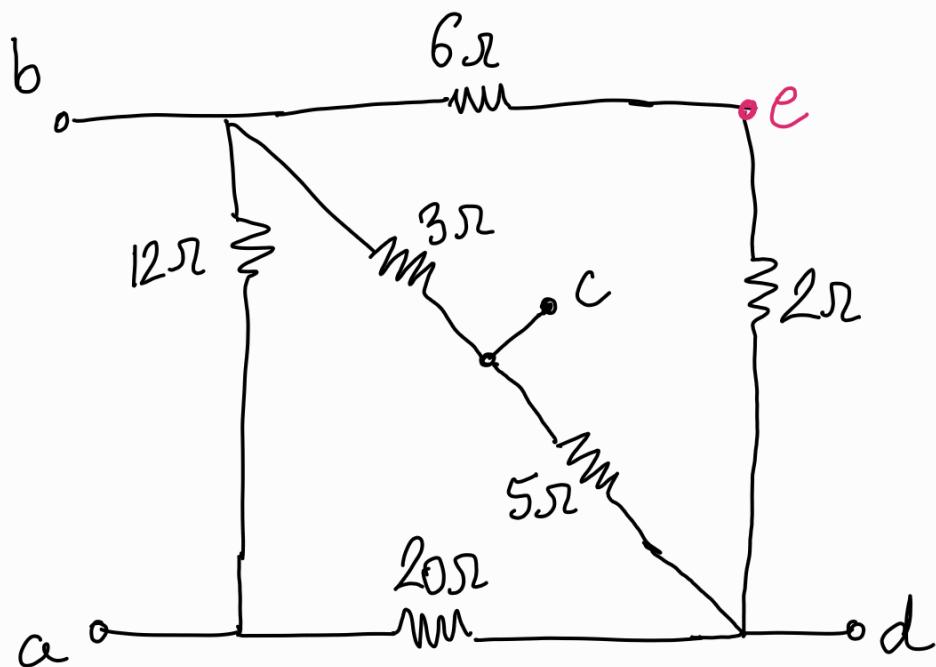
IV Find R_{bc}

Redrawing —

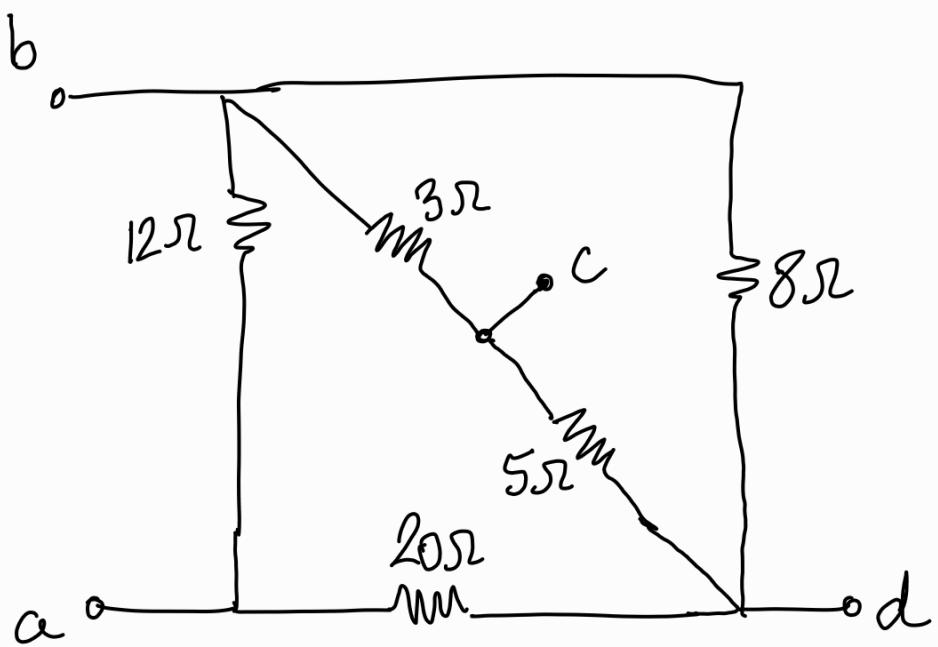




Note



Since none of the questions asks to find R_{eq} between e and any other nodes, we could have merged 6Ω and 2Ω into series equivalent before redrawing the ckts. This would have decreased the redrawing complexity by one node.



You could have redrawn from this point and would have gotten the same answers.