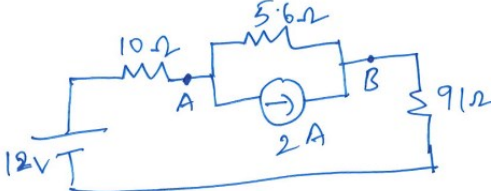
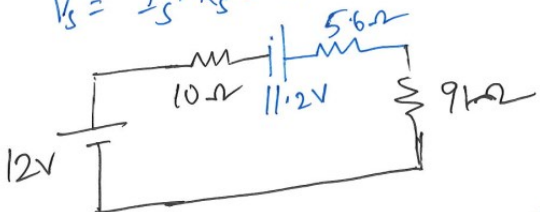
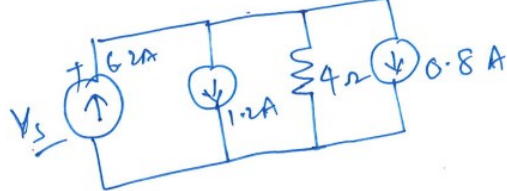
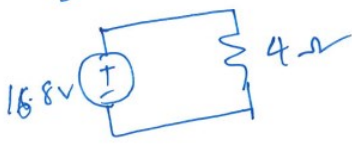
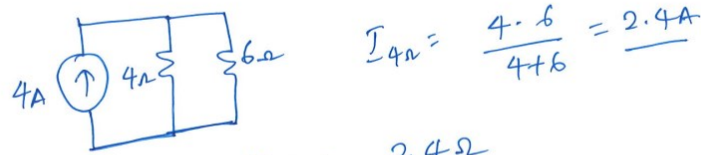
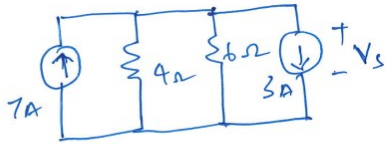


CSET102

Tutorial Sheet - 4 (Solutions)

SNO	Answers
1	 <p> $V_S = I_S \cdot R_S = 2 \times 5.6 = 11.2 \text{ V}$ </p>  <p> $I = \frac{12 + 11.2}{10 + 5.6 + 9} = \underline{\underline{0.218 \text{ A}}}$ </p>
2	 <p> $I = \frac{6.2}{4\Omega} - 1.2 - 0.8 \text{ A} = 4.2 \text{ A}$ </p> <p> $V_S = 4.2 \times 4 = 16.8 \text{ V}$ </p> 

3



$$I_{4\Omega} = \frac{4 \cdot 6}{4+6} = \underline{2.4A}$$

$$\Downarrow \quad 4\Omega \parallel 6\Omega = 2.4\Omega$$

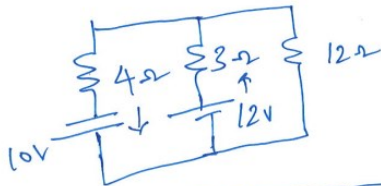
$$V_s = 4 \times 2.4 = 9.6V$$

9.6 V is voltage across 4Ω||6Ω

⇒ 9.6 V is voltage across 4Ω and 6Ω at 7A source and 3A source.

Thus, $V_s = 9.6V$

4

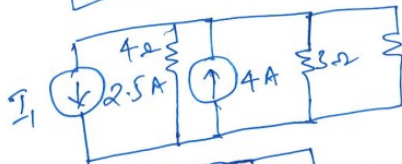


$$10V = I_1 \cdot 4\Omega$$

$$I_1 = 2.5A$$

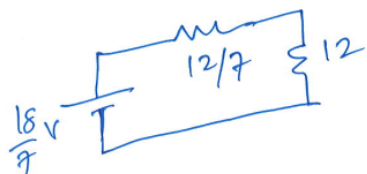
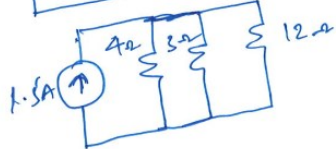
$$12V = I \cdot 3\Omega$$

$$I_2 = 4A$$



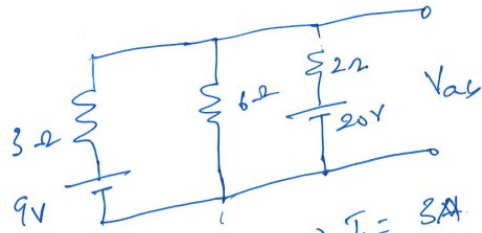
$$4 \parallel 3 = 12/7\Omega$$

$$1.5 \times \frac{12}{7} = \frac{18}{7}A$$



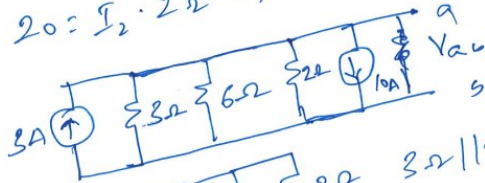
$$I = \frac{18/7}{(12/7 + 12)} = \underline{\underline{\frac{2}{16}A}}$$

5

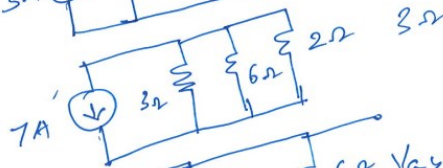


$$9 = I_1 \cdot 3\Omega \Rightarrow I_1 = 3A$$

$$20 = I_2 \cdot 2\Omega \Rightarrow I_2 = 10A$$



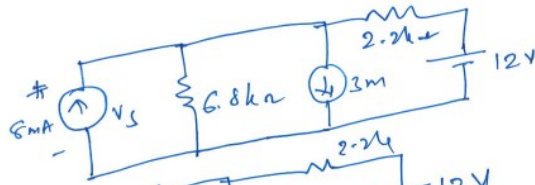
$$3\Omega \parallel 2\Omega = \frac{6}{5}\Omega$$



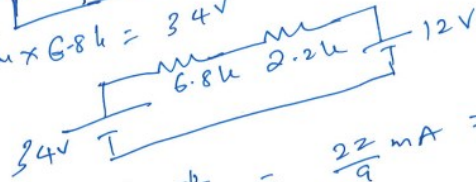
$$I_{6\Omega} = \frac{7 \times 6S}{(6+4S)} = \frac{7}{6} A$$

$$V_{6\Omega} = 7V \quad V_{ab} = \underline{\underline{-7V}}$$

6

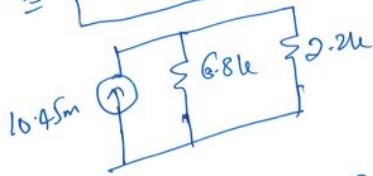
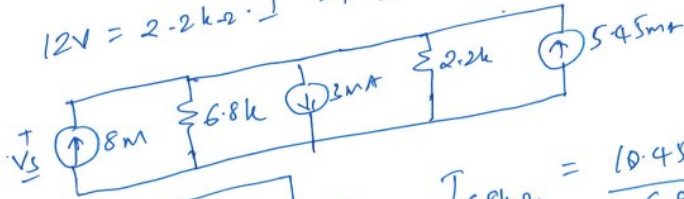


$$V = 5\text{mA} \times 6.8\text{k} = 34\text{V}$$



$$I_{2.2\text{k}} = \frac{34\text{V}}{9\text{k}\Omega} = \frac{22}{9}\text{mA} = 2.44\text{mA}$$

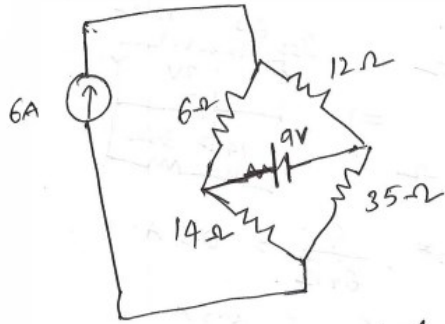
$$12\text{V} = 2.2\text{k}\Omega \cdot I \Rightarrow I = 5.45\text{mA}$$



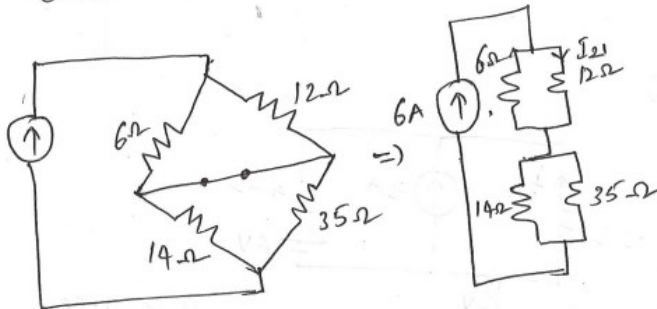
$$I_{6.8\text{k}\Omega} = \frac{10.45 \times 2.2}{6.8 + 2.2} = 2.55\text{mA}$$

$$V_{6.8\text{k}\Omega} = 6.8\text{k} \times 2.55 = 17.35\text{V}$$

7

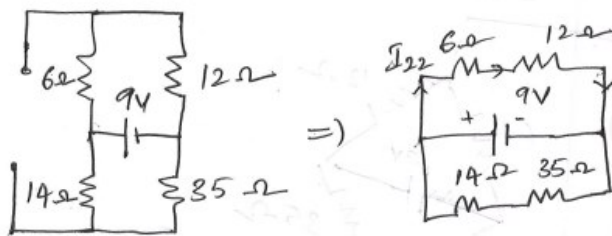


1st Consider the effect of 6A source.



$$I_{21} = \frac{6A \times 6\Omega}{(6\Omega + 12\Omega)} = 2A$$

Consider the effect of 9V source.
Re-drawing the circuit,

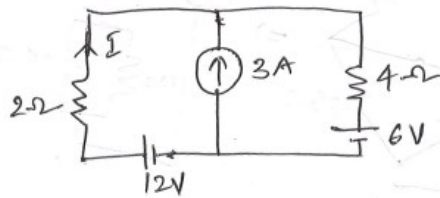


$$I_{22} = \frac{9}{6+12} = 0.5A$$

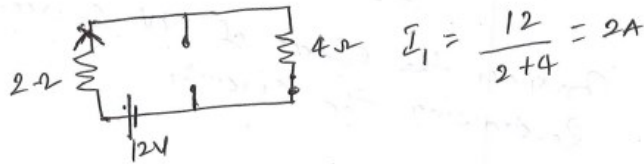
Thus,

$$I_2 = I_{21} + I_{22} = \underline{\underline{2.5A}}$$

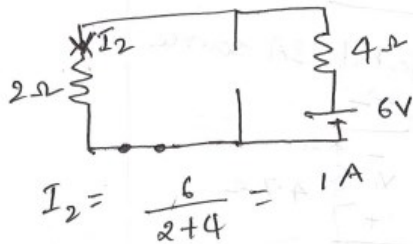
8



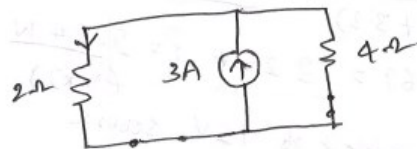
Consider the effect of 12V source.
Re-drawing the circuit,



Consider the effect of 6V source:



Consider the effect of 3A source



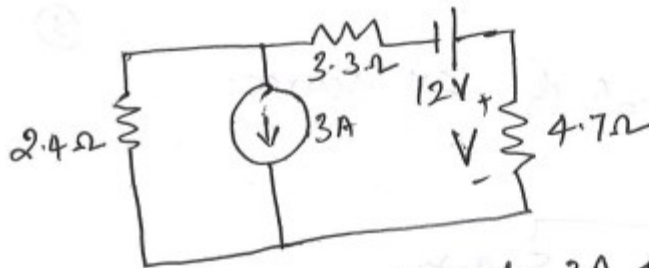
$$I_3 = \frac{3 \times 4}{2+4} = 2A$$

The total current through 2-ohm resistor

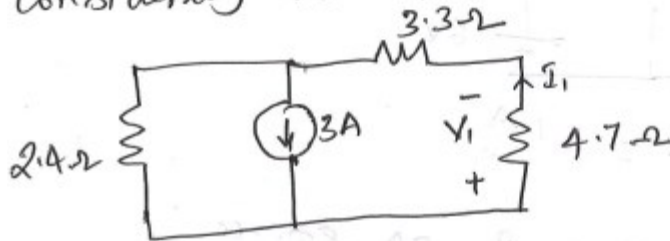
$$I = I_1 + I_2 + I_3 = -2 + 1 + 2 = 1A$$

($\because I_1$ is in opposite direction to I_2 and I_3)

9



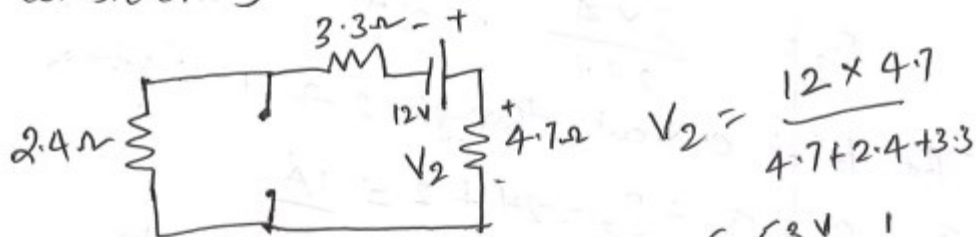
Considering the effect of 3A source,



$$I_1 = \frac{2.4 \times 3A}{2.4 + (4.7 + 3.3)} = 0.69A$$

$$V_1 = 4.7 \times 0.69 = 3.25V \quad P_1 = \frac{2.24W}{(V \times I)}$$

Considering the effect of 12V source



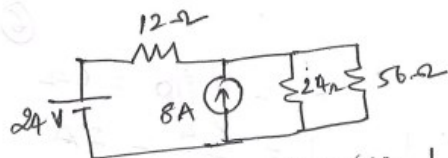
$$V_2 = \frac{12 \times 4.7}{4.7 + 2.4 + 3.3}$$

$$V = 5.53 - 3.25 = 2.28V \quad P_2 = \frac{6.51W}{(V^2/R)}$$

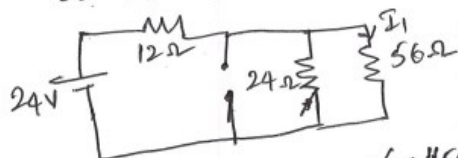
$$P = \frac{V^2}{R} = \frac{(2.28)^2}{4.7} = 1.106W$$

$$\underline{P_1 + P_2 \neq P}$$

10



Considering 24V source



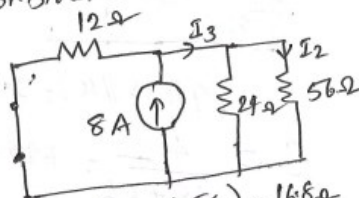
$$I_0 = \frac{24V}{R} \quad R = 12 + (24 \parallel 56) = 28.8 \Omega$$

$$= 0.833 A$$

$$I_1 = \frac{0.833 \times 24}{24 + 56} = 0.25 A$$

$$I = I_1 + I_2 = 0.25 + 1 = 1.25 A$$

Considering 8A source

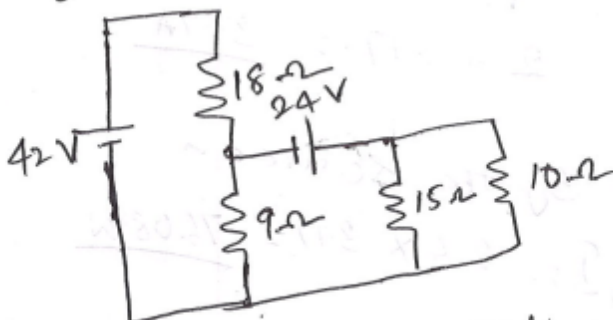


$$R_T = (24 \parallel 56) = 16.8 \Omega$$

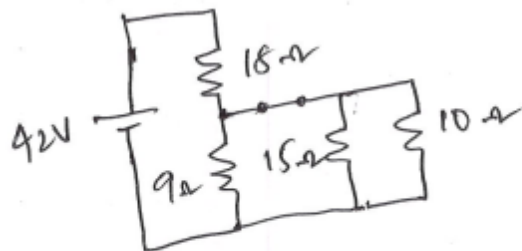
$$I_3 = \frac{8 \times 12}{12 + 16.8} = 3.33 A$$

$$I_2 = \frac{3.33 \times 24}{24 + 56} = 1 A$$

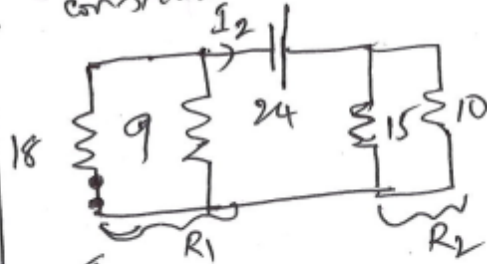
11



Considering 42V source

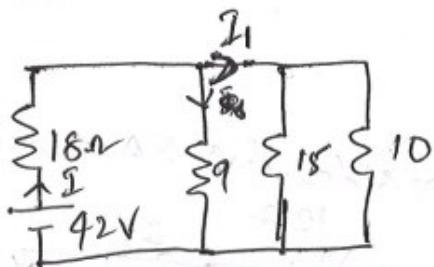


considering 24V source



$$I_2 = \frac{24}{R_1 + R_2}$$

$$R_1 = 18 \parallel 9 = 6 \Omega$$



$$R_1 = (9 \parallel 15 \parallel 10) = 3.6 \Omega$$

$$I = \frac{42}{18 + 3.6} = 1.944 \text{ A}$$

$$I_1 = \frac{9 \times 1.944}{9 \Omega + (15 \parallel 10)} = 1.17 \text{ A}$$

(Total current flowing through 18- Ω resistor gets divided in to two parts. one part through 9- Ω and other through 24V source)

$$I_2 = I_1 + I_2 = 2 + 1.17 = 3.17 \text{ A}$$

Power delivered by the source is

$$P = V \cdot I = 24 \times 3.17 = 76.08 \text{ W}$$

$$R_2 = 15 \parallel 10 = 6 \Omega$$

$$I = \frac{24}{12} = 2 \text{ A}$$