

2.1. $V = 16V$, $R = 5k\Omega$

$$I = \frac{V}{R} = \frac{16}{5 \times 10^3} = \boxed{3.2 \text{ mA}}$$

Answers

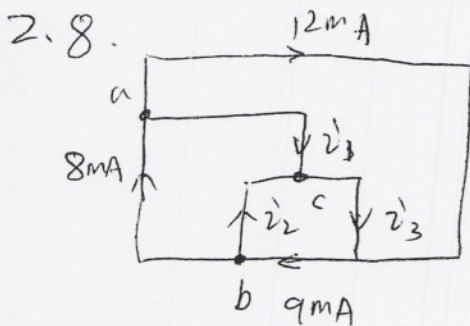
2.4. (a) position 1, $R = 100\Omega$, $V = 3V$,

$$i = \frac{V}{R} = \frac{3}{100} = \boxed{30 \text{ mA}}$$

(b) position 2, $R = 150\Omega$, $V = 3V$

$$i = \frac{V}{R} = \frac{3}{150} = \boxed{20 \text{ mA}}$$

2.5 $\boxed{n=9}$, $\boxed{b=15}$, $\boxed{l=7}$



Node a: KCL's. $8 = 12 + i_1$, $\boxed{i_1 = -4 \text{ mA}}$

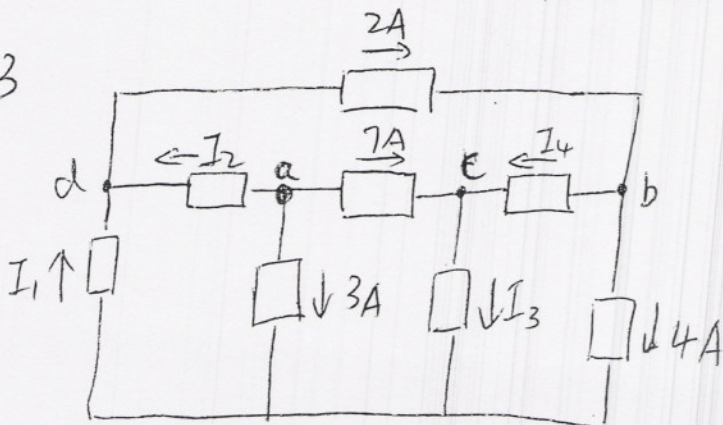
Node b: $9 = 8 + i_2$, $\boxed{i_2 = 1 \text{ mA}}$

Node c: $i_1 + i_2 = i_3$, $\boxed{i_3 = -3 \text{ mA}}$

2.11. $1 + 5 - V_1 = 0$, $\boxed{V_1 = 6V}$

$2 + V_2 - 5 = 0$, $\boxed{V_2 = 3V}$

2.13



Node a: $-7 - 3 - I_2 = 0$, $\boxed{I_2 = -10A}$

Node b: $2 - I_4 - 4 = 0$, $\boxed{I_4 = -2A}$

Node c: $I_4 + 7 - I_3 = 0$, $\boxed{I_3 = 5A}$

Node d: $I_1 + I_2 - 2 = 0$, $\boxed{I_1 = 12A}$

KVL:

$$2.20. \quad 4v_o + 5v_o - 36 = 0$$

$$\boxed{v_o = 4 \text{ A}}$$

2.21. KVL: $v_x + 2v_x + v_x + 2v_x - 15 = 0$

ohm's $v_x = \frac{V_x}{5}$

$$\boxed{V_x = 4.167 \text{ V}}$$

$$v_o = 4v_o$$

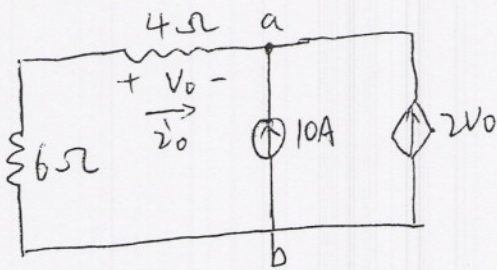
KCL, $v_o + 10 + 2v_o = 0$

$$v_o + 10 + 2(4v_o) = 0$$

$$v_o = -\frac{10}{9} \text{ A} = 1.11 \text{ A}$$

$$v_o = 4v_o = -\frac{40}{9} \text{ V} = \boxed{4.44 \text{ V}}$$

2.22



$$V_{ab} = -10v_o = 11.1 \text{ V}$$

$$P = V_{ab} \cdot 2v_o = (11.1) \cdot 2 \cdot (-4.44) = \boxed{-98.8 \text{ W}}$$

2.30

$$R_{6+2} = 8 \Omega$$

$$R_{2||8} = \frac{(2)(8)}{2+8} = 1.6 \Omega$$

$$R_{1.6+6} = 7.6 \Omega \quad \boxed{R_{eq} = 7.6 \Omega}$$

2.33. $G_{3+6} = \frac{3 \times 6}{3+6} = 2 \text{ S}$

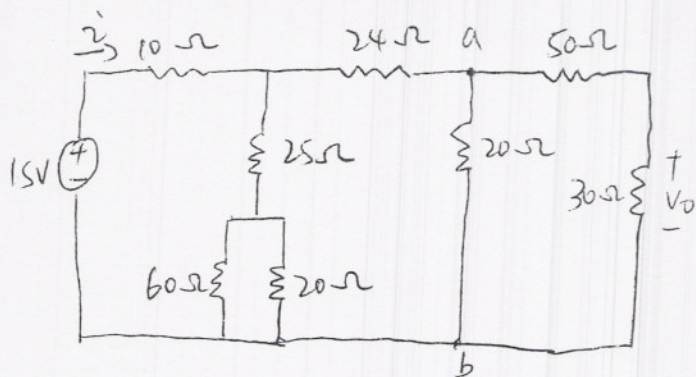
$$G_{2||2} = 4 \text{ S}$$

$$G_{4+4} = \frac{4 \times 4}{4+4} = 2 \text{ S}$$

$$i = \left(\frac{2}{1+2} \right) 9 = \boxed{6 \text{ A}}$$

$$V = \left(\frac{1}{1+2} \right) \times 9 \times 1 = \boxed{3 \text{ V}}$$

2.36

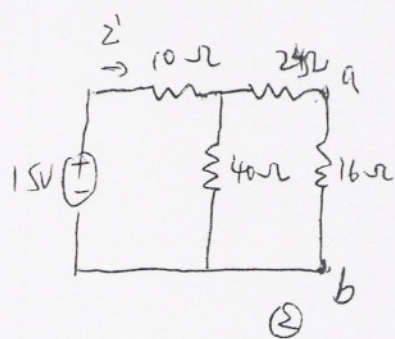


$$R_{60||20} = 15\Omega$$

$$\longrightarrow R_{25||15} = 40\Omega$$

$$R_{50+30} = 80\Omega$$

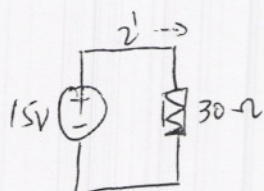
$$R_{20||80} = 16\Omega$$



$$R_{24||16} = 40\Omega$$

$$\longrightarrow R_{40||40} = 20\Omega$$

$$R_{20||10} = 30\Omega$$



$$\Rightarrow i' = \frac{15}{30} = \boxed{0.5A}$$

② $i'_{40} = 0.25A, V_{ab} = 15 - 10i' - 24i'_{40} = \boxed{4V}$

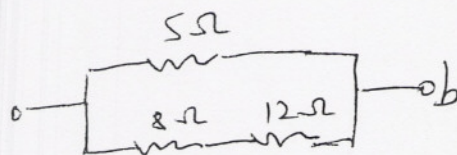
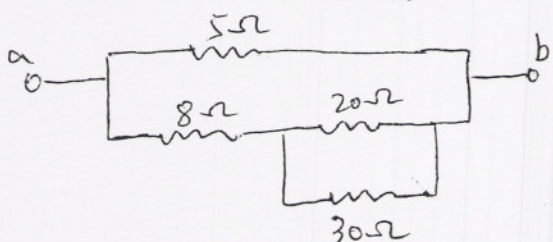
$$V_0 = \frac{30}{50+30} V_{ab} = \boxed{1.5V}$$

2.41 $R_{12||12||12} = \frac{12}{3} = 4\Omega$

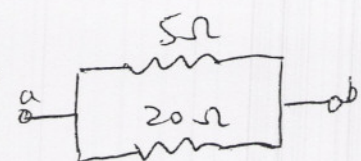
$$R_{eq} = \frac{60(4+10+R)}{60+4+10+R} + 30 = 50$$

$$\boxed{R = 16\Omega}$$

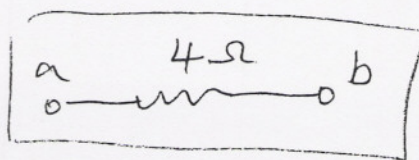
2.42 (a) $R_{20||30} = 12\Omega$

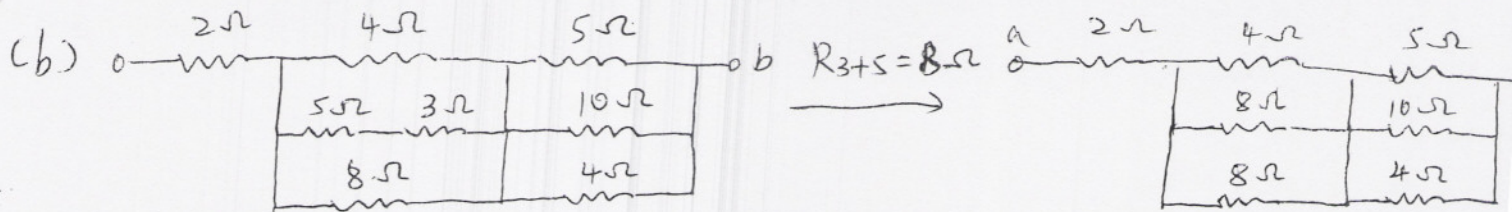


$$R_{8||12} = R_{20}$$



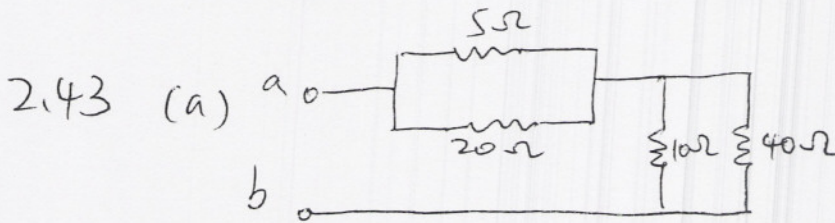
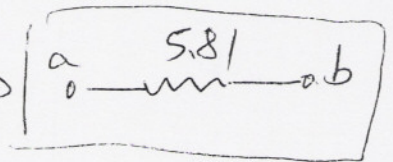
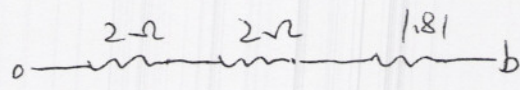
$$\longrightarrow R_{5||20} = 4\Omega$$





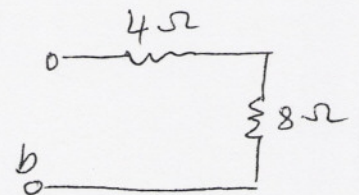
$$R_{4||8||18} = 2\Omega$$

$$R_{5||10||4} = 1.81\Omega$$

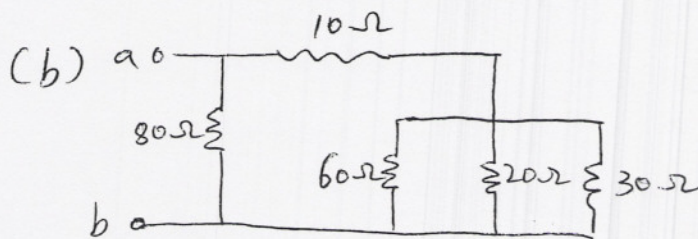
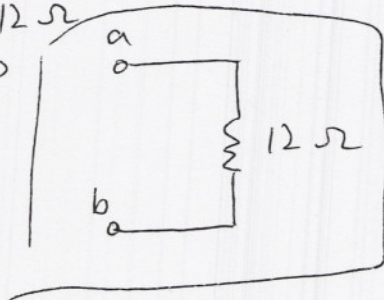


$$R_{5||20} = 4\Omega$$

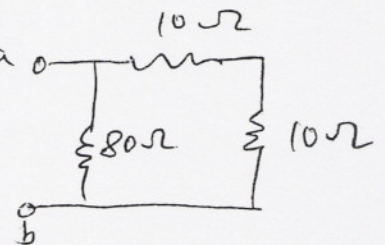
$$R_{10||40} = 8\Omega$$



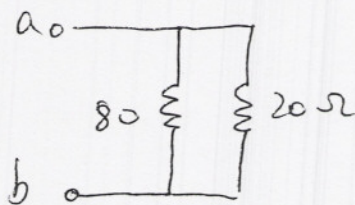
$$R_{4+8} = 12\Omega$$



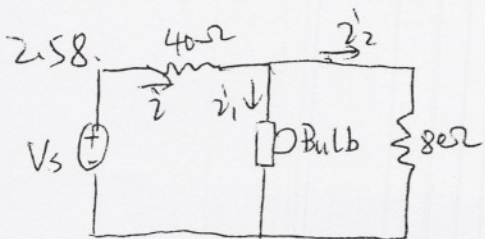
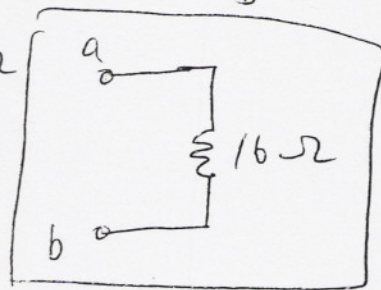
$$R_{60||20||30} = 10\Omega$$



$$R_{10+10} = 20$$



$$R_{80||20} = 16\Omega$$



$$i_{80} = \frac{V}{R} = \frac{120}{80} = 1.5A$$

$$i = i_1 + i_2 = 0.75 + 1.5 = 2.25A$$

$$V_s = 40i + 120 = \boxed{210V}$$