

Circuits 8

①

$$\frac{1}{R} = \frac{1}{16} + \frac{1}{8}$$

$$\frac{1}{R} = 0.1875$$

$$R = \boxed{5.33 \Omega}$$

②

a)
$$\frac{1}{R} = \frac{1}{5} + \frac{1}{10} + \frac{1}{15}$$

$$\frac{1}{R} = 0.3\bar{6}$$

$$R = \boxed{2.73 \Omega}$$

b)
$$I_5 = \frac{V}{R} = \frac{6}{5} = \boxed{1.2 \text{ A}}$$

$$I_{10} = \frac{V}{R} = \frac{6}{10} = \boxed{0.6 \text{ A}}$$

$$I_{15} = \frac{V}{R} = \frac{6}{15} = \boxed{0.4 \text{ A}}$$

c)
$$I = I_5 + I_{10} + I_{15}$$
$$= 1.2 + 0.6 + 0.4$$

$$I = \boxed{2.2 \text{ A}}$$

$$I = \frac{V}{R} = \frac{6}{2.73} = 2.2 \text{ A}$$

$$\textcircled{3} \quad I_1 = \frac{P_1}{V} = \frac{1600}{120} = 13.\bar{3} \text{ A}$$

$$I_2 = \frac{P_2}{V} = \frac{1250}{120} = 10.4 \text{ A}$$

$$I_3 = \frac{P_3}{V} = \frac{600}{120} = 5 \text{ A}$$

$$I = I_1 + I_2 + I_3 \\ = 13.\bar{3} + 10.4 + 5$$

$$I = \boxed{28.75 \text{ A}}$$

$$\textcircled{4} \quad \text{a) } I_1 = \frac{V}{R_1} = \frac{40}{450} = \boxed{0.089 \text{ A}}$$

$$I_2 = \frac{V}{R_2} = \frac{40}{1350} = \boxed{0.030 \text{ A}}$$

$$I_3 = \frac{V}{R_3} = \frac{40}{2700} = \boxed{0.015 \text{ A}}$$

$$\text{b) } I = I_1 + I_2 + I_3 \\ = 0.089 + 0.030 + 0.015$$

$$I = \boxed{0.133 \text{ A}}$$

④

$$c) \quad \frac{1}{R} = \frac{1}{450} + \frac{1}{1350} + \frac{1}{2700}$$

$$\frac{1}{R} = 0.006$$

$$R = \boxed{300 \Omega}$$

$$d) \quad P = I V$$

$$= (0.133)(40)$$

$$P = \boxed{5.33 \text{ W}}$$

$$e) \quad P_1 = I_1 V = (0.089)(40) = \boxed{3.56 \text{ W}}$$

$$P_L = I_L V = (0.030)(40) = \boxed{1.19 \text{ W}}$$

$$P_3 = I_3 V = (0.015)(40) = \boxed{0.59 \text{ W}}$$

⑤

$$a) \quad \frac{1}{R} = \frac{1}{75} + \frac{1}{375} + \frac{1}{525}$$

$$\frac{1}{R} = 0.0179$$

$$R = \boxed{55.9 \Omega}$$

$$b) \quad I_1 = \frac{V}{R_1} = \frac{40}{75} = \boxed{0.53 \text{ A}}$$

$$I_L = \frac{V}{R_L} = \frac{40}{375} = \boxed{0.11 \text{ A}}$$

⑤ b) continued

$$I_3 = \frac{V}{R_3} = \frac{40}{525} = \boxed{0.076 \text{ A}}$$

$$\begin{aligned} c) \quad I &= I_1 + I_L + I_3 \\ &= 0.53 + 0.11 + 0.076 \end{aligned}$$

$$I = \boxed{0.72 \text{ A}}$$

$$\begin{aligned} d) \quad P &= IV \\ &= (0.72)(40) \end{aligned}$$

$$P = \boxed{28.6 \text{ W}}$$

$$e) \quad P_1 = \frac{V^2}{R_1} = \frac{40^2}{75} = \boxed{21.3 \text{ W}}$$

$$P_L = \frac{V^2}{R_L} = \frac{40^2}{375} = \boxed{4.3 \text{ W}}$$

$$P_3 = \frac{V^2}{R_3} = \frac{40^2}{525} = \boxed{3.0 \text{ W}}$$

$$\begin{aligned} ⑥ \quad P_{\text{source}} &= P_1 + P_L + P_3 \\ &= 21.3 + 4.3 + 3.0 \end{aligned}$$

$$P_{\text{source}} = \boxed{28.6 \text{ W}}$$

⑥ continued

$$I_{\text{source}} = \frac{P_{\text{source}}}{V} = \frac{54.69}{75} = \boxed{0.729 \text{ A}}$$

$$V_1 = V_L = V_g = V_{\text{source}} = \boxed{75 \text{ V}}$$

$$I_1 = \frac{P_1}{V} = \frac{37.5}{75} = \boxed{0.5 \text{ A}}$$

$$I_L = \frac{P_L}{V} = \frac{12.5}{75} = \boxed{0.16 \text{ A}}$$

$$I_g = \frac{P_g}{V} = \frac{4.69}{75} = \boxed{0.063 \text{ A}}$$

$$R_1 = \frac{V}{I_1} = \frac{75}{0.5} = \boxed{150 \Omega}$$

$$R_L = \frac{V}{I_L} = \frac{75}{0.16} = \boxed{450 \Omega}$$

$$R_g = \frac{V}{I_g} = \frac{75}{0.063} = \boxed{1199 \Omega}$$

⑦

$$V_1 = V_L = V_3 = V_{\text{source}} = \boxed{120 \text{ V}}$$

$$I_1 = \frac{V}{R_1} = \frac{120}{1250} = \boxed{0.096 \text{ A}}$$

$$P_1 = I_1 V = (0.096)(120) = \boxed{11.52 \text{ W}}$$

$$R_L = \frac{V}{I_L} = \frac{120}{0.032} = \boxed{3750 \Omega}$$

$$P_L = I_L V = (0.032)(120) = \boxed{3.84 \text{ W}}$$

$$I_3 = \frac{P_3}{V} = \frac{1.28}{120} = \boxed{0.011 \text{ A}}$$

$$R_3 = \frac{V}{I_3} = \frac{120}{0.011} = \boxed{11250 \Omega}$$

$$P_{\text{source}} = P_1 + P_L + P_3$$

$$= 11.52 + 3.84 + 1.28$$

$$P_{\text{source}} = \boxed{16.64 \text{ W}}$$

$$I_{\text{source}} = I_1 + I_L + I_3$$

$$= 0.096 + 0.032 + 0.011$$

$$I_{\text{source}} = \boxed{0.139 \text{ A}}$$

⑧

$$V_1 = V_2 = V_3 = V_{\text{source}} = \boxed{0.16 \text{ V}}$$

$$I_{\text{source}} = \frac{P_{\text{source}}}{V} = \frac{0.371}{0.16} = \boxed{2.32 \text{ A}}$$

$$I_2 = \frac{V}{R_2} = \frac{0.16}{0.275} = \boxed{0.582 \text{ A}}$$

$$P_2 = I_2 V = (0.582)(0.16) = \boxed{0.093 \text{ W}}$$

$$R_3 = \frac{V}{I_3} = \frac{0.16}{0.285} = \boxed{0.561 \Omega}$$

$$P_3 = I_3 V = (0.285)(0.16) = \boxed{0.046 \text{ W}}$$

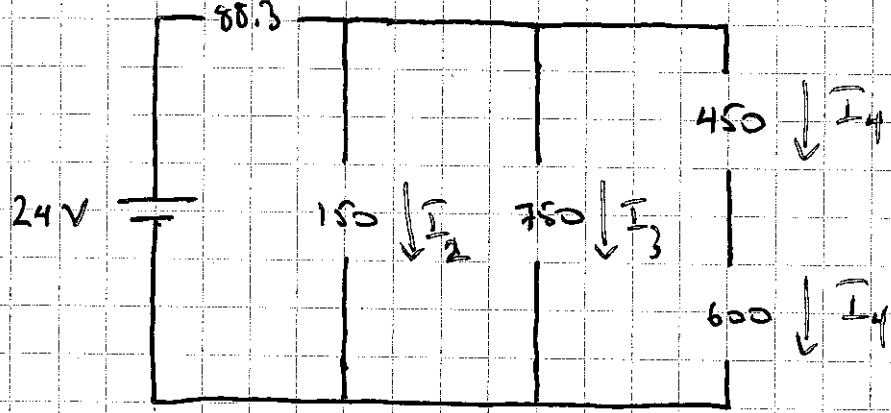
$$P_1 = P_{\text{source}} - P_2 - P_3 \\ = 0.371 - 0.093 - 0.046$$

$$P_1 = \boxed{0.232 \text{ W}}$$

$$I_1 = \frac{P_1}{V} = \frac{0.232}{0.16} = \boxed{1.45 \text{ A}}$$

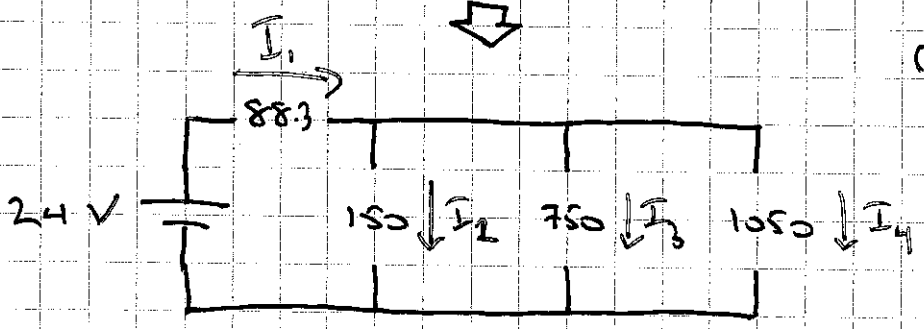
$$R_1 = \frac{V}{I_1} = \frac{0.16}{1.45} = \boxed{0.110 \Omega}$$

9) a) I_1



$$R = 450 + 600$$

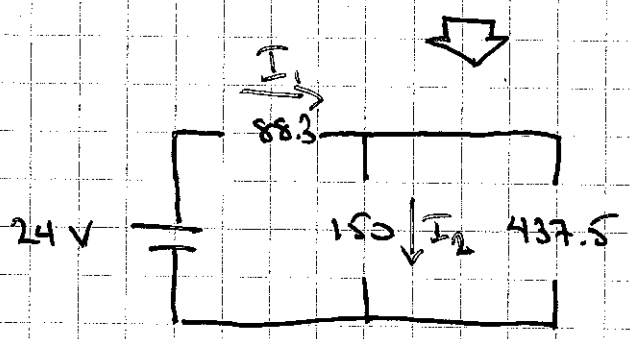
$$R = 1050 \Omega$$



$$\frac{1}{R} = \frac{1}{750} + \frac{1}{1050}$$

$$\frac{1}{R} = 0.00229$$

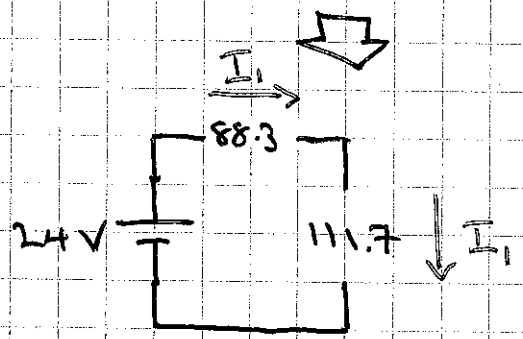
$$R = 437.5 \Omega$$



$$\frac{1}{R} = \frac{1}{150} + \frac{1}{437.5}$$

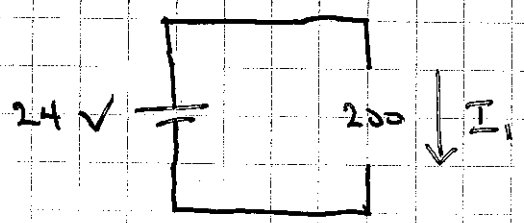
$$\frac{1}{R} = 0.00895$$

$$R = 111.7 \Omega$$



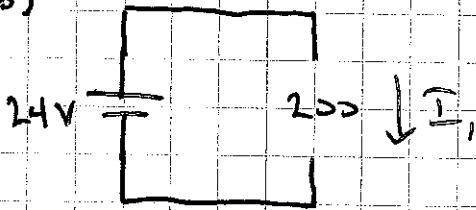
$$R = 88.3 + 111.7$$

$$R = \boxed{200 \Omega}$$



9

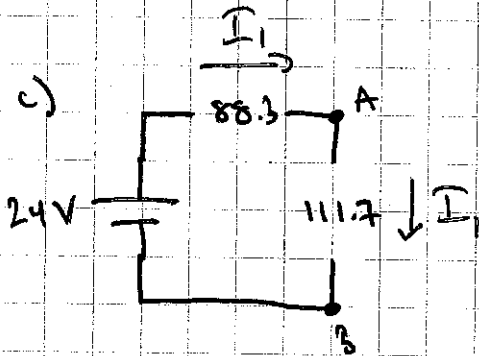
b)



$$I = \frac{V}{R} = \frac{24}{200}$$

$$I_1 = \boxed{0.12 \text{ A}}$$

c)



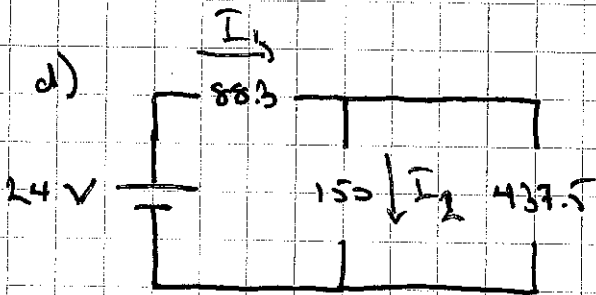
From A to B is "across the parallel combination."

$$V = I R$$

$$= 0.12 (111.7)$$

$$V = \boxed{13.4 \text{ V}}$$

d)

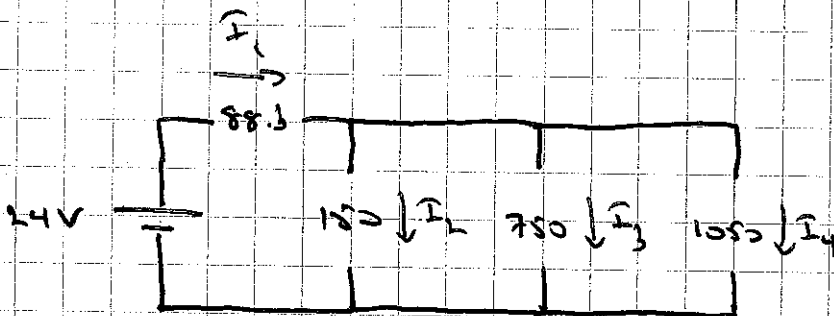


$$V_2 = 13.4 \text{ V}$$

$$I_2 = \frac{V_2}{R_2}$$

$$= \frac{13.4}{150}$$

$$I_2 = \boxed{0.089 \text{ A}}$$



$$I_3 = \frac{V_3}{R_3}$$

$$= \frac{13.4}{750}$$

$$I_3 = \boxed{0.018 \text{ A}}$$

9) d) continued

$$\begin{aligned} I_4 &= \frac{V_4}{R_4 + 5} \\ &= \frac{13.4}{1050} \end{aligned}$$

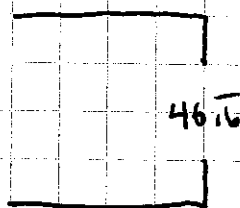
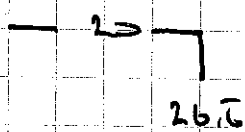
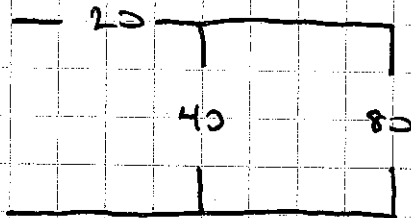
$$I_4 = \boxed{0.013 \text{ A}}$$

e) $P = I \cdot V$
 $= (0.12)(24)$

$$P = \boxed{2.88 \text{ W}}$$

10)

a)



$$\frac{1}{R} = \frac{1}{40} + \frac{1}{80}$$

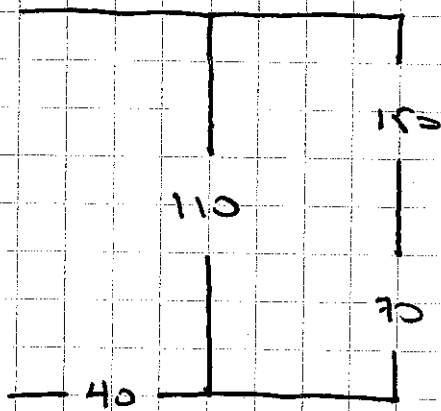
$$\frac{1}{R} = 0.0375$$

$$R = 26.6 \Omega$$

$$R = 20 + 26.6$$

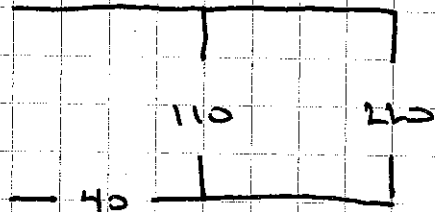
$$R = \boxed{46.6 \Omega}$$

10 b)



$$R = 70 + 150$$

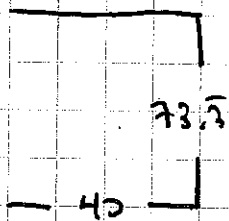
$$R = 220 \Omega$$



$$\frac{1}{R} = \frac{1}{110} + \frac{1}{220}$$

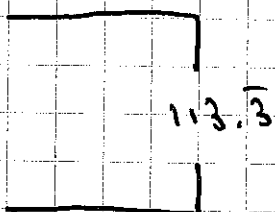
$$\frac{1}{R} = 0.0136$$

$$R = 73.\bar{3} \Omega$$

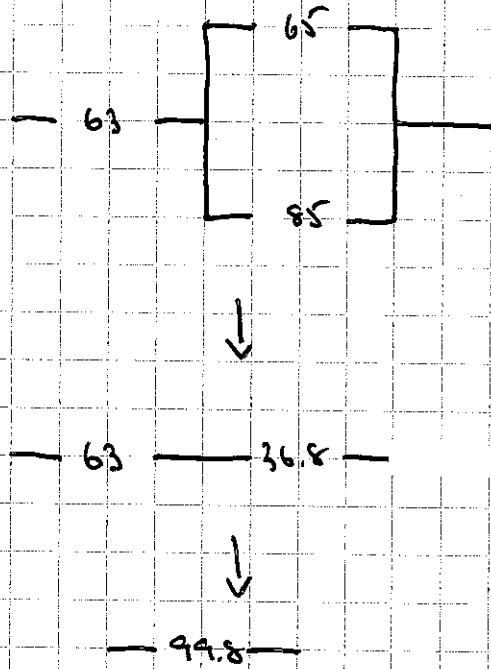


$$R = 40 + 73.\bar{3}$$

$$R = \boxed{113.\bar{3} \Omega}$$



16 c)



$$\frac{1}{R} = \frac{1}{65} + \frac{1}{85}$$

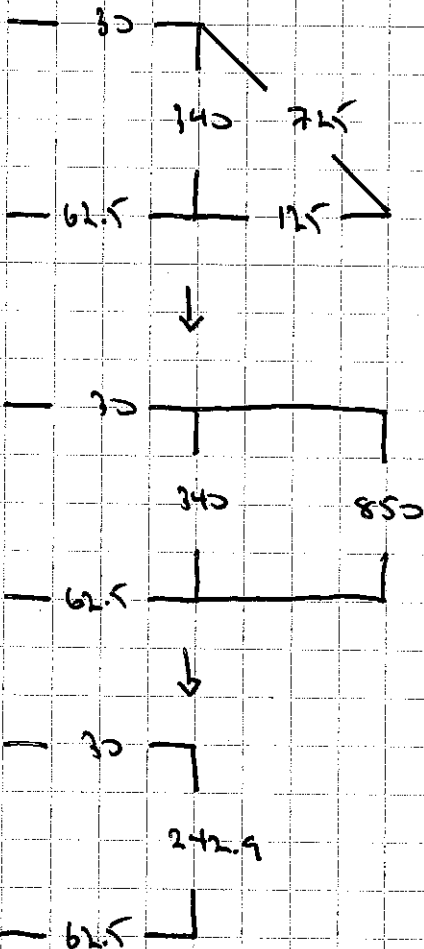
$$\frac{1}{R} = 0.0271$$

$$R = 36.83 \Omega$$

$$R = 63 + 36.8$$

$$R = \boxed{99.8 \Omega}$$

16 d)



$$R = 125 + 725$$

$$R = 850 \Omega$$

$$\frac{1}{R} = \frac{1}{340} + \frac{1}{850}$$

$$\frac{1}{R} = 0.00412$$

$$R = 242.9 \Omega$$

$$R = 30 + 242.9 + 62.5$$

$$R = \boxed{335.4 \Omega}$$