

### HW #3

①  $E = 0.05 \text{ V/m}$  ,  $L = 40 \text{ cm} = 0.4 \text{ m}$

(a)  $\Delta V = E \cdot L = 0.05 \times 0.4 = \underline{2 \times 10^{-2} \text{ V}}$

(b)  $j = \sigma E$  ;  $\sigma = 6 \times 10^7$  then:

$j = 6 \times 10^7 \cdot 0.02 = 12 \times 10^5 \text{ A/m}^2$

current :  $I = j \cdot A = j \frac{\pi d^2}{4} = 12 \times 10^5 \times \frac{3.14 \cdot (10^{-3})^2}{4} = 0.942 \text{ A}$

②  $L = 50 \text{ cm} = 0.5 \text{ m}$        $I = 1 \text{ A}$

$\Delta V = 20 \text{ V}$

Resistance :  $R = \frac{\Delta V}{I} = 20 \Omega = \rho \frac{L}{S} = \rho \frac{L}{\frac{\pi d^2}{4}}$

$\rho = 2.3 \times 10^{-8}$  , then :  $20 = 4 \cdot \frac{2.3 \times 10^{-8} \cdot 0.5}{3.14 \cdot d^2} \Rightarrow \underline{d = 2.7 \times 10^{-5} \text{ m}}$

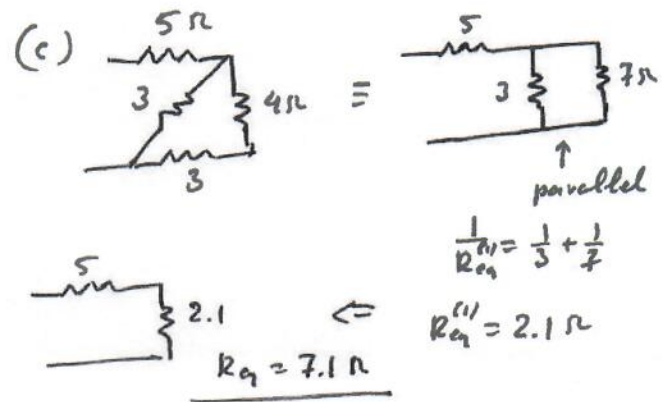
③  $\Delta V_{eq} = 6 + 5 - 10 = 1 \text{ V}$       then  $I = \frac{\Delta V_{eq}}{R_{eq}} = \frac{1}{50} = 0.02 \text{ A}$

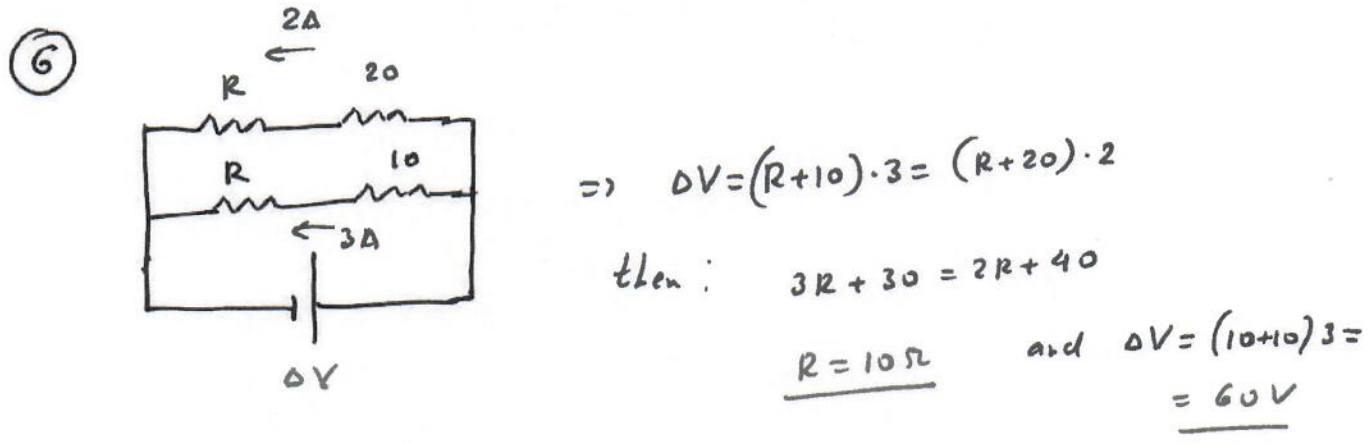
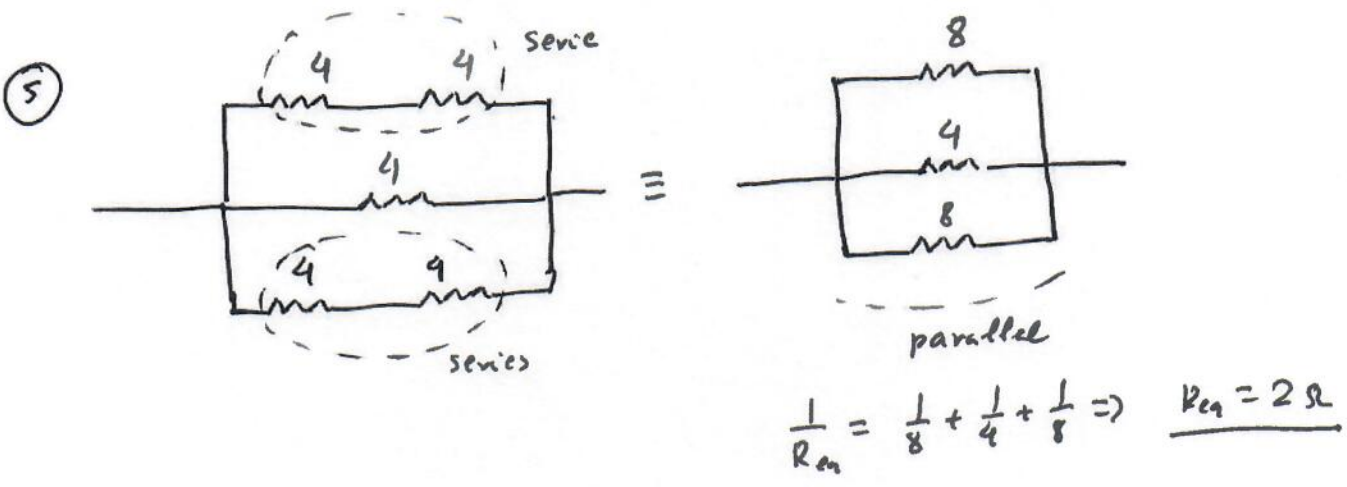
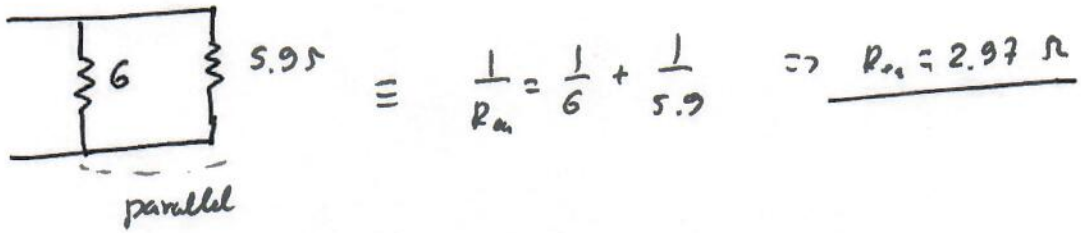
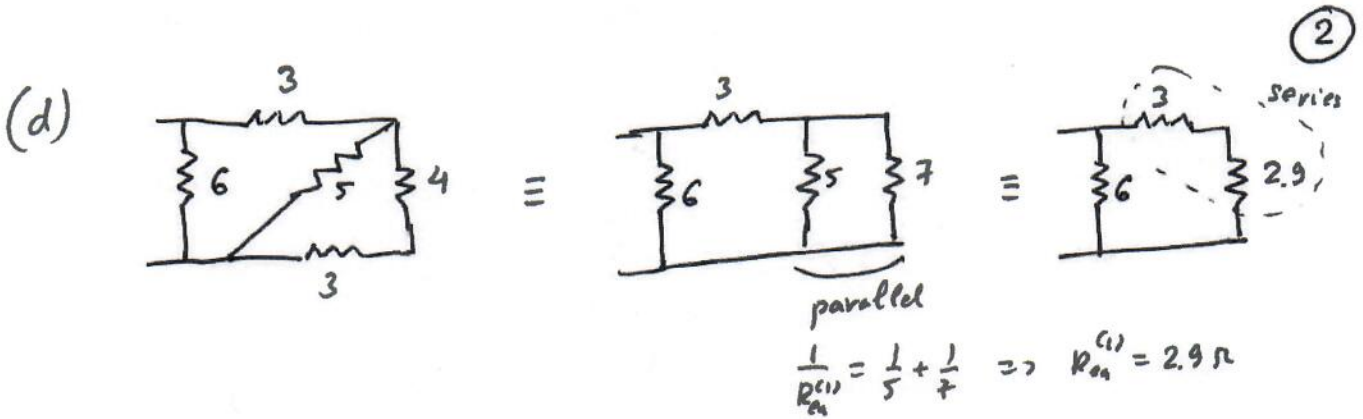
$R_{eq} = 20 + 30 = 50 \Omega$

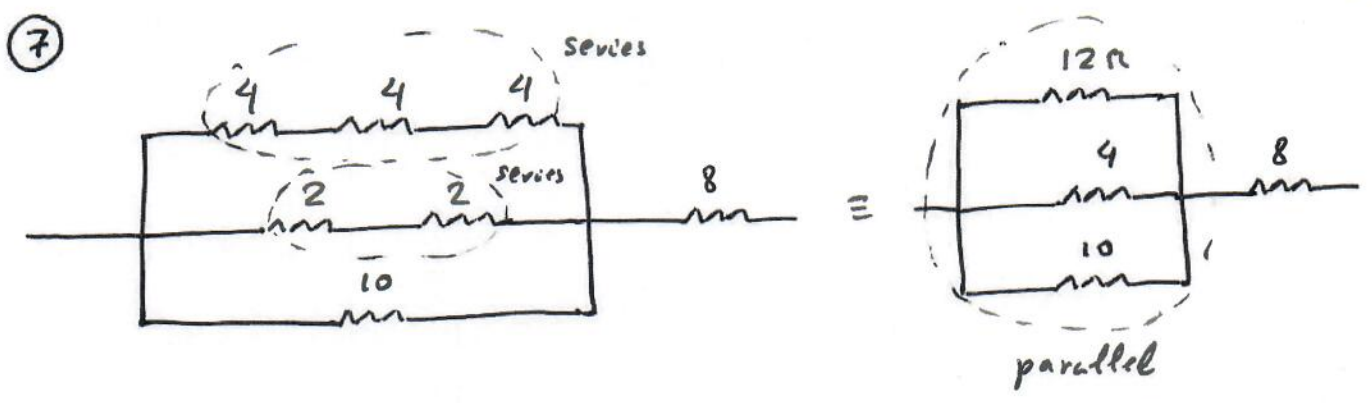
counterclockwise

④ (a)  $R_{eq} = 6 + 3 + 6 = 15 \Omega$

(b)  $R_{eq} = 3 + 3 + 7 = 13 \Omega$





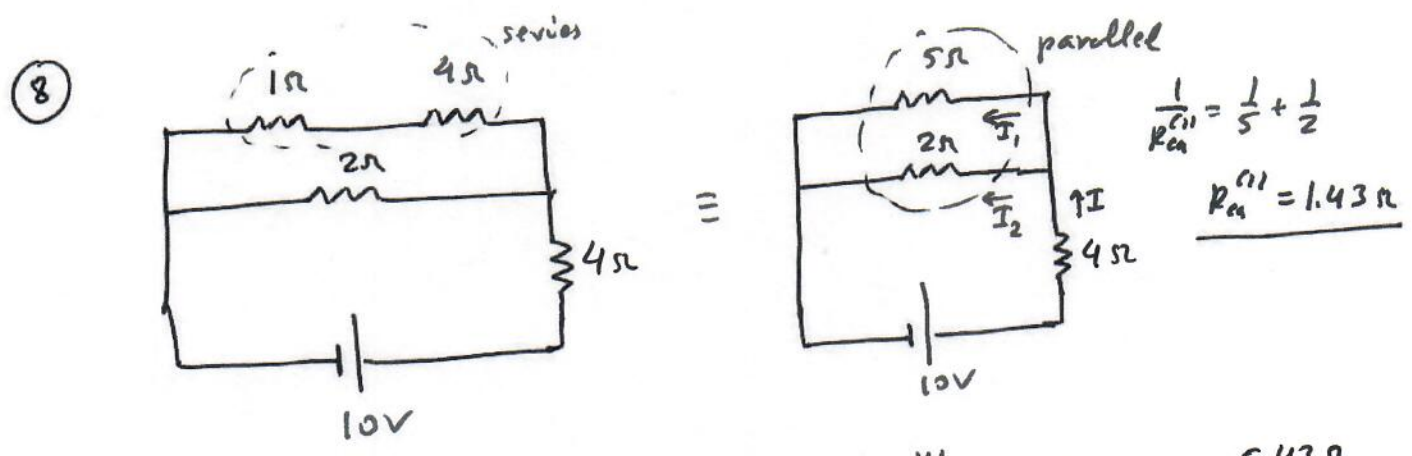


$$\frac{1}{R_{eq}^{(1)}} = \frac{1}{12} + \frac{1}{4} + \frac{1}{10}$$

$$R_{eq}^{(1)} = \underline{2.3 \Omega}$$

then

$$R_{eq} = 2.3 + 8 = \underline{10.3 \Omega}$$



$$\frac{1}{R_{eq}^{(1)}} = \frac{1}{5} + \frac{1}{2}$$

$$R_{eq}^{(1)} = \underline{1.43 \Omega}$$

$$I = I_1 + I_2 \Rightarrow \begin{cases} 1.84 = I_1 + I_2 \\ 5I_1 = 2I_2 \end{cases}$$

$$I_1 = \frac{2}{5} I_2 \Rightarrow 1.84 = \frac{2}{5} I_2 + I_2$$

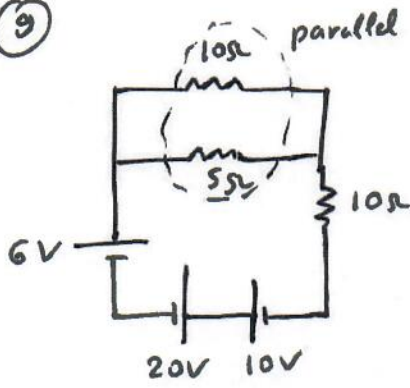
$$I_2 = 1.31 \text{ A}$$

$$I = \frac{10}{5.43} = 1.84 \text{ A}$$

then

$$P = R I_2^2 = 2 \cdot 1.31^2 = \underline{3.43 \text{ W}}$$

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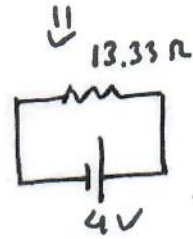
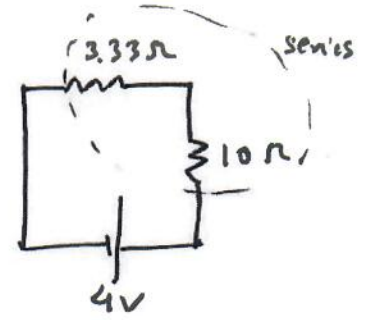
$$\frac{1}{R_{eq}^{(1)}} = \frac{1}{10} + \frac{1}{5}$$

$$R_{eq}^{(1)} = 3.33 \Omega$$

$$V_{eq} = 20 - 6 - 10 =$$

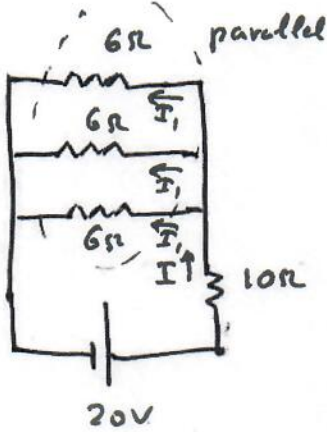
$$= \underline{4V}$$

=>



$$\text{then } I = \frac{4}{13.33} = \underline{\underline{0.3A}}$$

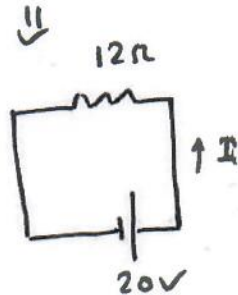
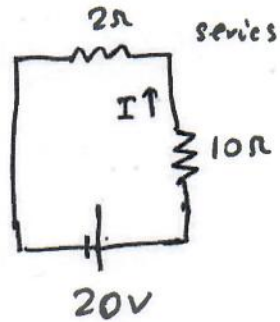
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$$\frac{1}{R_{eq}^{(1)}} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$$

$$R_{eq}^{(1)} = 2 \Omega$$

=>



$$I = \frac{20}{12} = 1.67 A$$

then

$$I_1 = \frac{1}{3} I = \underline{\underline{0.56 A}}$$

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