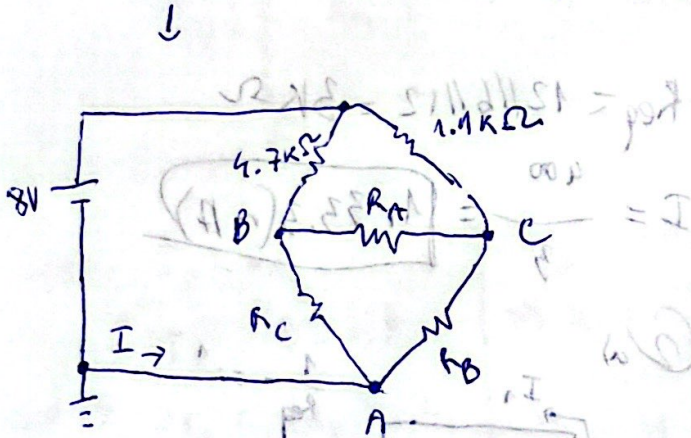
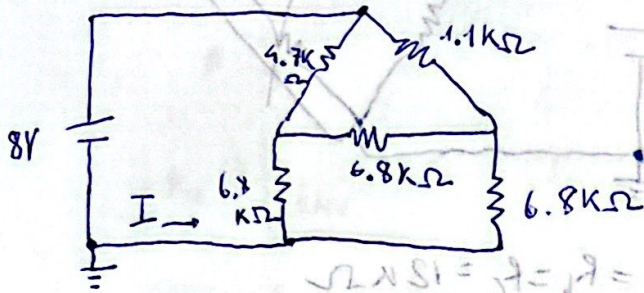


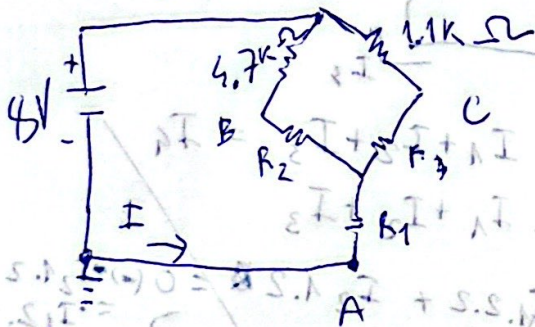
Đỗ Minh Duy
ITITSB22029.

① a)



$$R_1 = \frac{R_B R_C}{R_B + R_C} = \frac{6.8 \times 6.8}{6.8 + 3} = 2.267 \text{ k}\Omega$$

$$R_2 = R_3$$



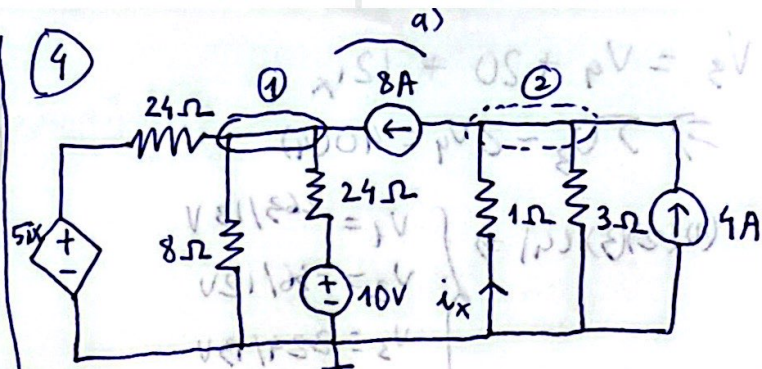
$$R_{eq} = \left[(4.7 + 2.267) \parallel (1.1 + 2.267) \right] + 2.267$$

$$= \left(\frac{6.967 \times 3.367}{6.967 + 3.367} \right) + 2.267$$

$$= 4.537 \text{ k}\Omega$$

$$I = \frac{8}{4.537} = -1.763 \text{ (mA)}$$

④



$$\text{Node ①: } \frac{V_1 - 5}{24} + \frac{V_1}{8} + \frac{V_1 - 10}{24} - 8 = 0$$

$$\Rightarrow 5V_1 + 5V_2 = 202$$

$$\text{Node ②: } 8 + \frac{V_2}{1} + \frac{V_2}{3} - 4 = 0$$

$$\Rightarrow 24 + 3V_2 + V_2 - 12 = 0$$

$$\Rightarrow 12 + 4V_2 = 0 \Rightarrow V_2 = -3V$$

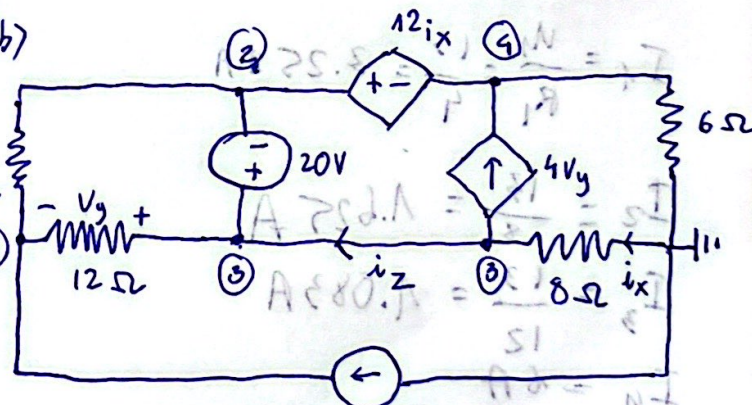
$$\Rightarrow V_1 = \frac{217}{5} V$$

$$i_x = \frac{0 - V_2}{3} = 3A$$

$$a) P_{8A} = 8 \times (V_2 - V_1)$$

$$= 8 \times \left(-3 - \frac{217}{5} \right) = -\frac{1856}{5} W$$

b)



$$\text{node ①: } \frac{V_1 - V_2}{4} + \frac{V_1 - V_3}{12} - 6 = 0 \Rightarrow V_1 = V_2 + 23$$

$$\text{node ②③④: } \frac{V_2 - V_1}{4} + \frac{V_3 - V_1}{12} + \frac{V_4}{6} + \frac{V_3}{8} = 0$$

$$\Rightarrow 5V_3 - 2V_4 = 40 \text{ ③}$$

$$V_3 - V_2 = 20$$

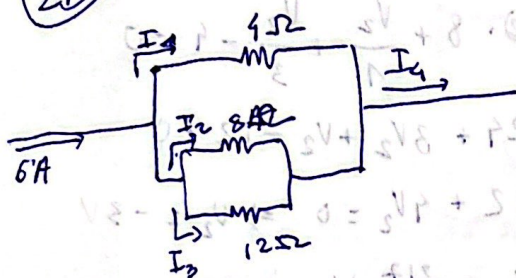
$$V_3 = V_4 + 20 + 12i_x$$

$$\Rightarrow 5V_3 - 2V_4 = 40(4)$$

$$A1(1)(2)(3)(4) \Rightarrow \begin{cases} V_1 = 263/13V \\ V_2 = 36/12V \\ V_3 = 229/13V \\ V_4 = 300/13V \end{cases}$$

$$\text{So } i_z = i_x - 4V_4 = 128/13A$$

2b



$$R_{8\Omega} \parallel R_{12\Omega} \Rightarrow \frac{8 \times 12}{8 + 12} = 4.8 \Omega$$

$$4.8 \Omega \parallel 4 \Omega \Rightarrow \frac{4.8 \times 4}{4.8 + 4} = 2.18 \Omega$$

$$R_{eq} = 2.18 \Omega$$

$$U = IR = 2.18 \times 6 = 13V$$

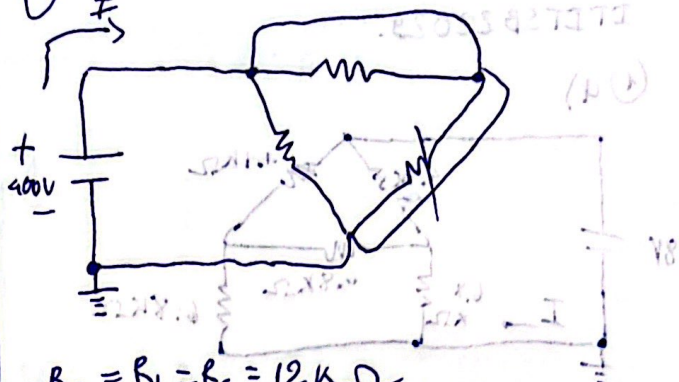
$$I_1 = \frac{U_1}{R_1} = \frac{13}{4} = 3.25A$$

$$I_2 = \frac{13}{8} = 1.625A$$

$$I_3 = \frac{13}{12} = 1.083A$$

$$I_4 = 6A$$

1b

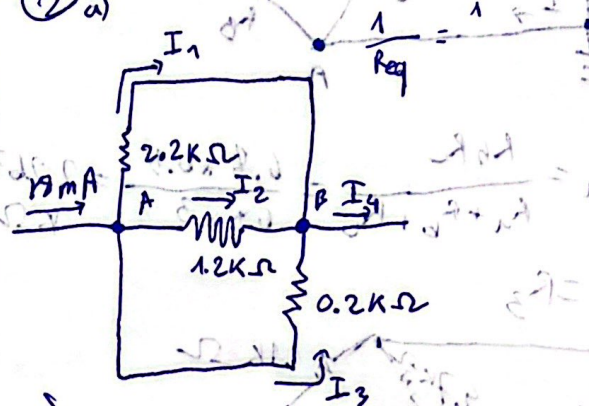


$$R_a = R_b = R_c = 12k\Omega$$

$$R_{eq} = 12 \parallel 12 \parallel 12 = 3k\Omega$$

$$I = \frac{400}{3} = 133.3(mA)$$

2a



$$A: 18 = I_1 + I_2 + I_3 = I_4$$

$$B: I_4 = I_1 + I_2 + I_3$$

$$\text{loop up: } I_1 2.2 + I_2 1.2 = 0 \Rightarrow I_2 = -11I_1$$

$$\text{loop down: } I_3 0.2 + I_2 1.2 = 0 \Rightarrow I_3 = -11I_1$$

$$\Rightarrow I_3 0.2 + (-I_1 2.2) = 0$$

$$\Rightarrow I_3 0.2 = I_1 2.2$$

$$\Rightarrow \frac{I_3}{I_1} = 11 \Rightarrow I_3 = 11I_1$$

$$\text{big loop: } I_1 2.2 + I_3 0.2 = 0 \Rightarrow$$

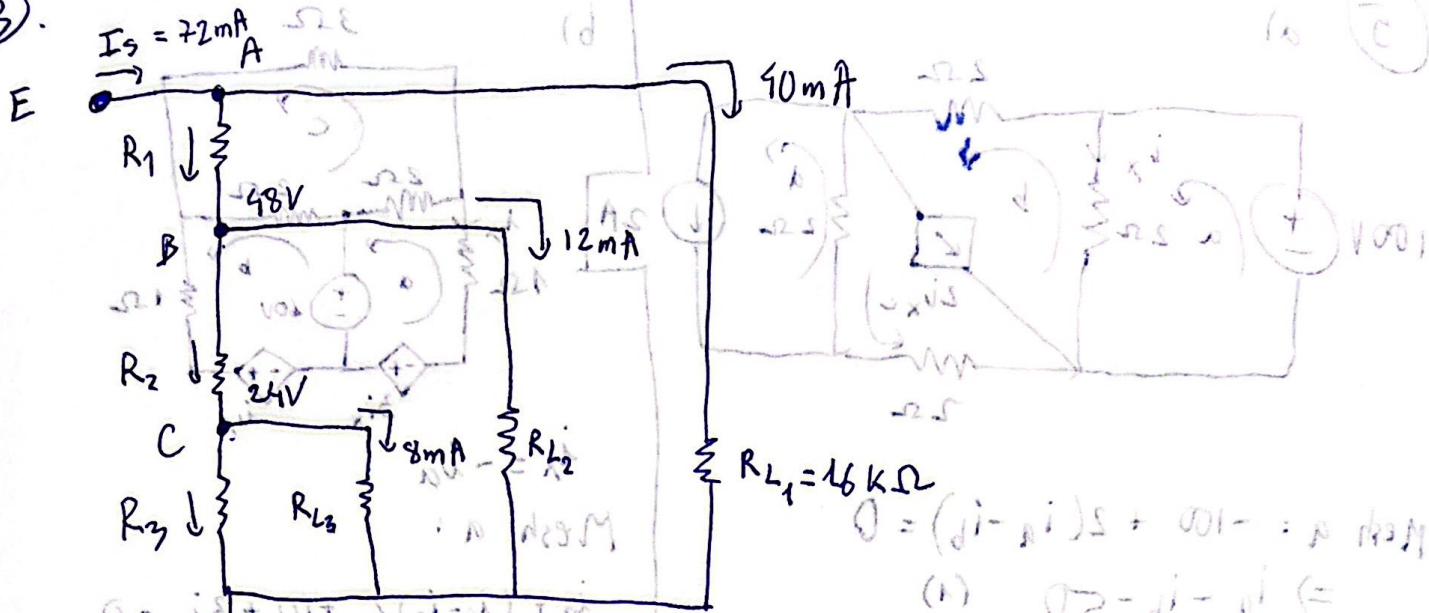
$$\Rightarrow I_1 + I_2 + 11I_1 = I_4 = 18$$

$$\Rightarrow 12I_1 + I_2 = 18$$

$$\Rightarrow 12I_1 - 11I_1 = 18$$

$$\Rightarrow I_1 = 18A \Rightarrow$$

③.



node A: $I_s = I_{R_1} + 40$

$\Rightarrow I_{R_1} = 32 \text{ mA}$

node B: $I_{R_1} = I_{R_2} + 12$

$\Rightarrow I_{R_2} = 20 \text{ mA}$

node C: $I_{R_2} = I_{R_3} + 8$

$\Rightarrow I_{R_3} = 12 \text{ mA}$

$V_{R_3} = 24 \text{ V}$

$\Rightarrow R_3 = \frac{V_{R_3}}{I_{R_3}} = \frac{24}{12 \times 10^{-3}} = 2000 \Omega$

$V_{R_2} = 48 - 24 = 24 \text{ V}$

$\Rightarrow R_2 = \frac{V_{R_2}}{I_{R_2}} = \frac{24}{20 \times 10^{-3}} = 1200 \Omega$

$U_{R_{L1}} = 40 \times 10^{-3} \times 1.6 \times 1000 = 64 \text{ V}$

$U_{R_1} = 64 - 48 = 16 \text{ V}$

$\Rightarrow R_1 = \frac{16}{32 \times 10^{-3}} = 500 \Omega$

$R_{L2} = \frac{48}{12} = 4 \text{ k}\Omega$

$R_{L3} = \frac{24}{8} = 3 \text{ k}\Omega$

$E = (1.6) \times 40 = 64 \text{ V}$

$\frac{1}{S} = \frac{1}{S_1} + \frac{1}{S_2} + \frac{1}{S_3} = \frac{1}{S_{\text{total}}}$

$\frac{1}{S} = \frac{1}{S_1} + \frac{1}{S_2} + \frac{1}{S_3} = \frac{1}{S_{\text{total}}}$

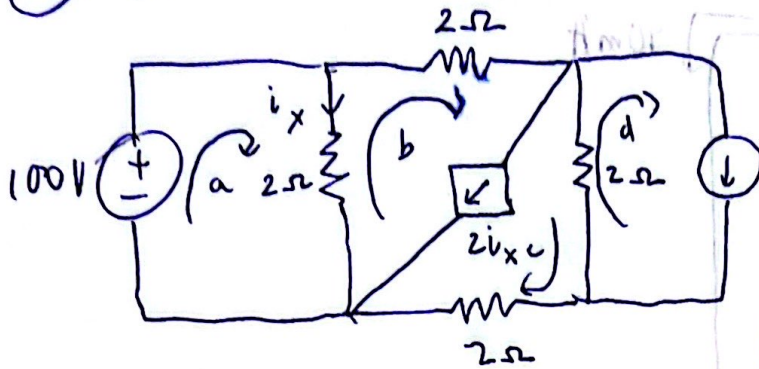
$V \cdot I = P = 18 \times 10^{-3} \times 100 = 1.8 \text{ W}$

$A \text{ m p e . n} = \frac{88.5}{5.5} = 16.1 \text{ I}$

$A \text{ m p n . s} = \frac{88.5}{5.1} = 17.4 \text{ I}$

$A \text{ m p . n} = \frac{88.5}{5.1} = 17.4 \text{ I}$

5) a)



$$\text{Mesh a: } -100 + 2(i_a - i_b) = 0$$

$$\Rightarrow i_a - i_b = 50 \quad (1)$$

Super mesh:

$$i_b - i_c = 2i_x = 2(i_a - i_b)$$

$$\Rightarrow 2i_a - 3i_b + i_c = 0 \quad (2)$$

Mesh b, c:

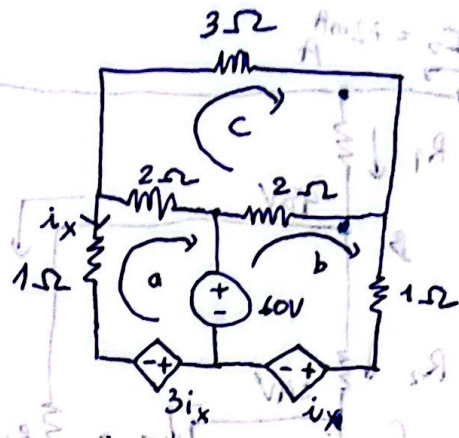
$$2(i_b - i_a) + 2i_b + 2(i_c - i_a) + 2i_c = 0$$

$$\Rightarrow i_a - 2i_b + 2i_c = -2 \quad (3)$$

$$(1)(2)(3) = \begin{cases} i_a = 134 \text{ A} \\ i_b = 84 \text{ A} \\ i_c = -16 \text{ A} \end{cases}$$

$$P_{100V} = -100 \times 134 = -13.4 \text{ (kW)}$$

b)



$$i_x = -i_a$$

Mesh a:

$$i_a + (i_a - i_c)2 + 60 + 3i_x = 0$$

$$\Rightarrow 3i_a - 2i_c + 60 + 3i_x = 0 \Rightarrow i_c = 30 \text{ A}$$

Mesh b:

$$-60 + (i_b - i_c)2 + i_b + i_x = 0$$

$$\Rightarrow -60 + (i_b - 30)2 + i_b - i_a = 0 \quad (2)$$

Mesh c:

$$(i_c - i_a)2 + 3i_c + (i_c - i_b)2 = 0$$

$$\Rightarrow (30 - i_a)2 + 90 + (30 - i_b)2 = 0 \quad (3)$$

$$(2)(3) \Rightarrow \begin{cases} i_a = 195/4 \text{ A} \\ i_b = 225/4 \text{ A} \end{cases}$$

$$\Rightarrow i_x = -\frac{195}{4} \text{ A}$$

$$2a). \frac{1}{R_{eq}} = \frac{1}{2.2} + \frac{1}{1.2} + \frac{1}{0.2} = 6.288$$

$$\Rightarrow R_{eq} = 0.16 \text{ k}\Omega = 160 \Omega$$

$$U = IR = 160 \times 18 \times 10^{-3} = 2.88 \text{ V}$$

$$I_1 = \frac{2.88}{2.2} = 1.31 \text{ mA}$$

$$I_2 = \frac{2.88}{1.2} = 2.4 \text{ mA}$$

$$I_3 = \frac{2.88}{0.2} = 14.4 \text{ mA}$$