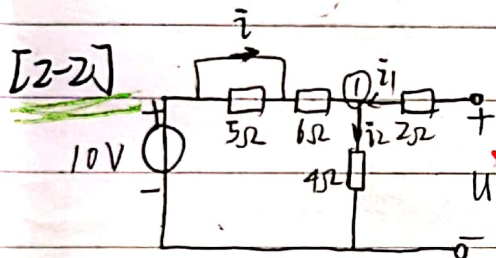
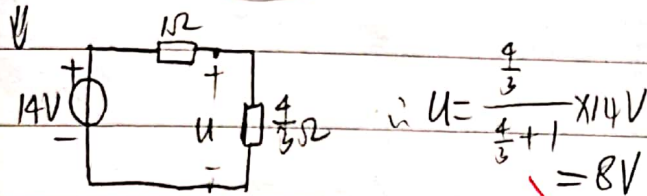
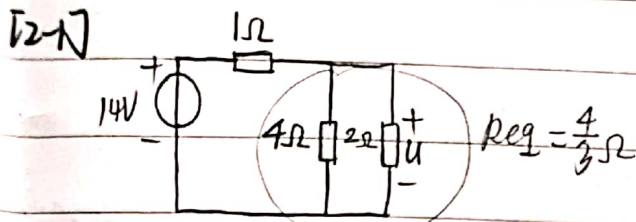


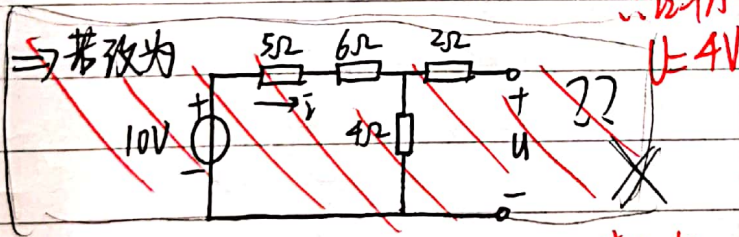
课后作业 [问题2]



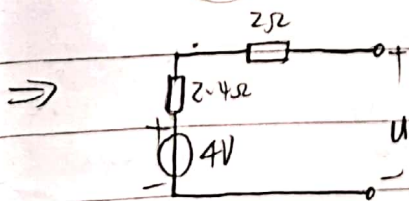
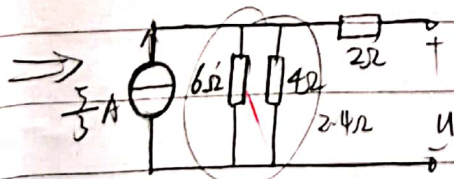
① KCL $i_1 + i_2 = i_3$

KVL: $2i_1 + 4i_2 = U$

$6i_2 + 4i_2 = 10 \Rightarrow 6(i_2 - i_1) + 4i_2 = 10$

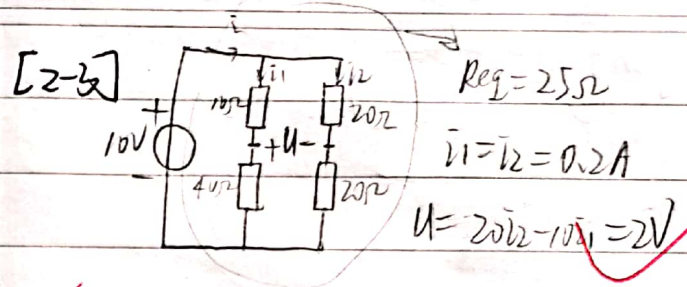


(相当于接了一个电压表)



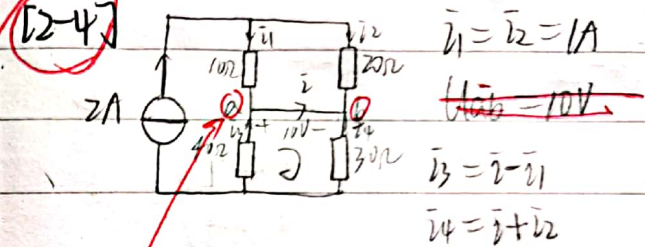
$i = \frac{10V}{6\Omega + 4\Omega} = 1A$

$U = \frac{4}{4+6} \times 10V = 4V$



$i_1 = i_2 = 0.2A$

$U = 20i_2 - 10i_1 = 2V$



$i_1 = i_2 = 1A$

$U = 20i_2 - 10i_1 = 10V$

$i_3 = i_2 - i_1$

$i_4 = i_1 + i_2$

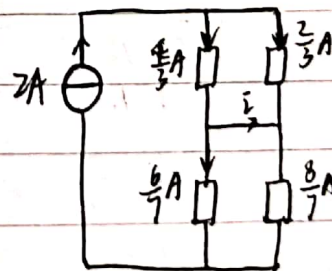
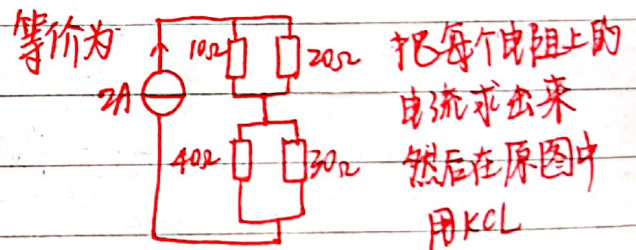
$10V + 30i_4 - 40i_3 = 0$

$\therefore 10 + 30(i_1 + i_2) - 40(i_2 - i_1) = 0$

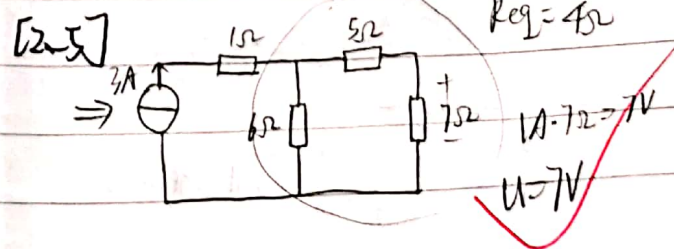
a和b是同一个节点

不能用2个字母表示, 电压为0!

电压为0 电流不一定为0



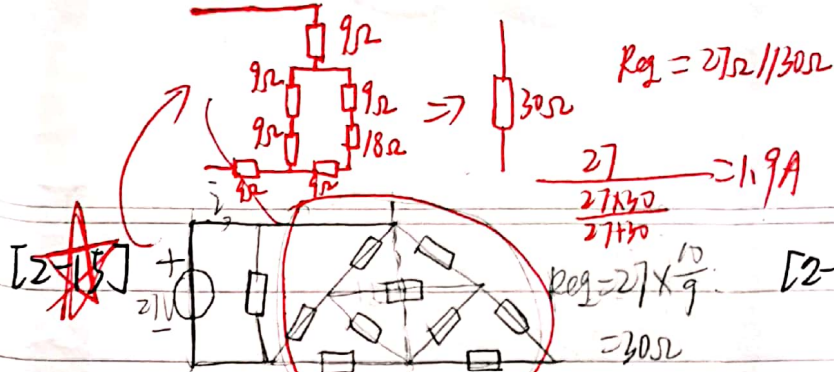
$i = \frac{4}{3}A - \frac{6}{7}A = \frac{10}{21}A$

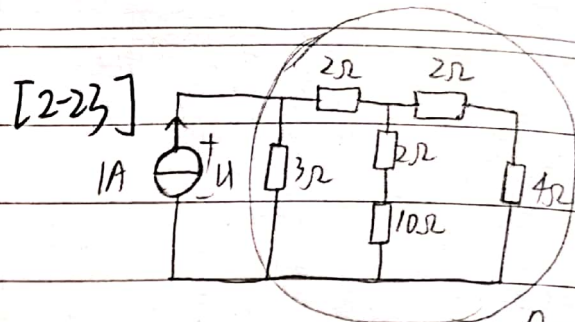
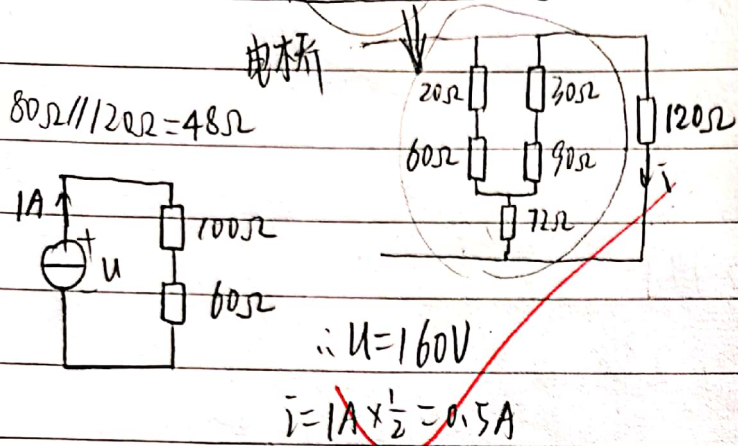
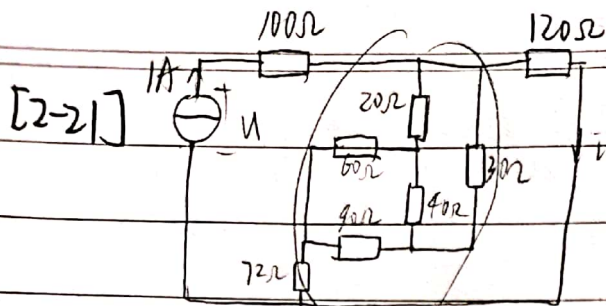


$1A \cdot 7\Omega = 7V$

$U = 7V$

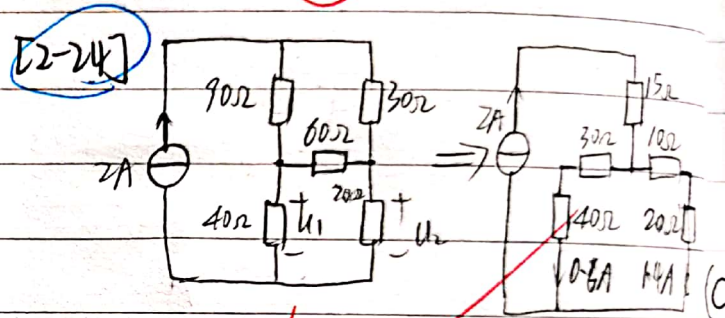




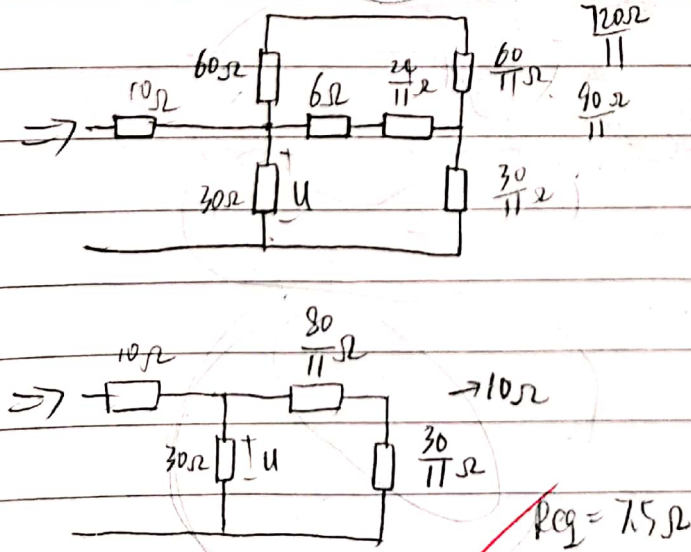
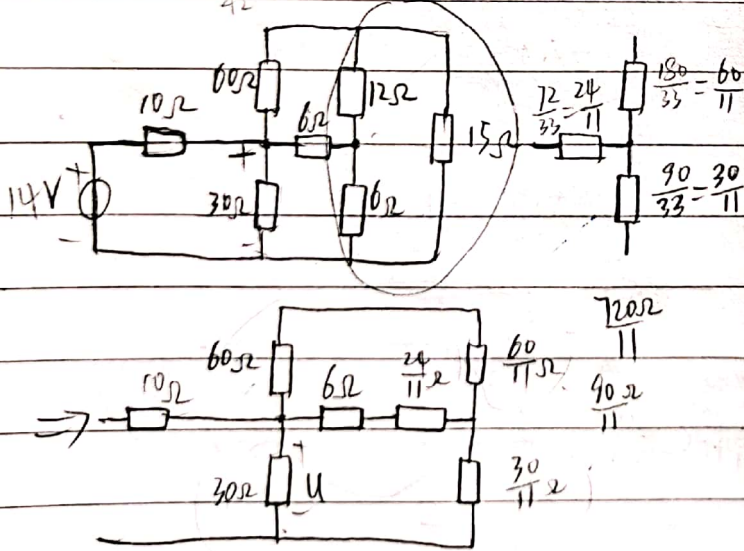
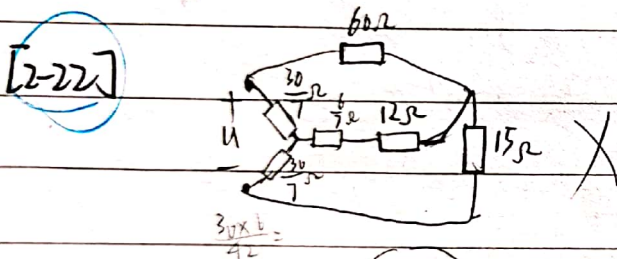


$U = 1A \times 2\Omega = 2V$

$R_{eq} = 2\Omega$



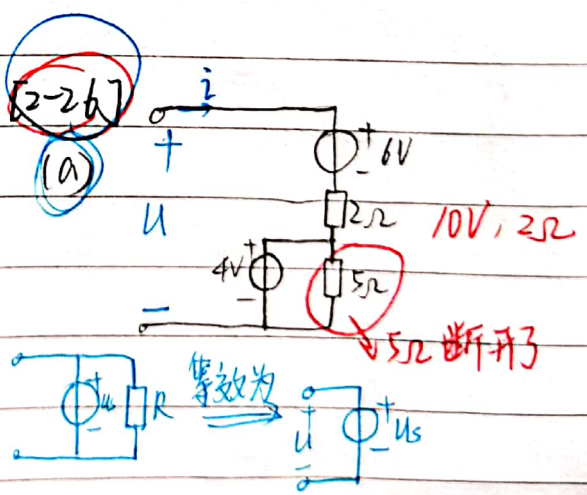
$U_1 = 24V, U_2 = 28V$



$U = 14 \times \frac{3}{4+3} = 6V$

[2-25] 1) $U_s = 10V, R_s = 5\Omega$

2) $I_s = 2A, R_p = 5\Omega$



[法2] 用U-i关系转化:

$U = 6 + 2i + 4 = 10 + 2i$

$10V, 2\Omega$

故

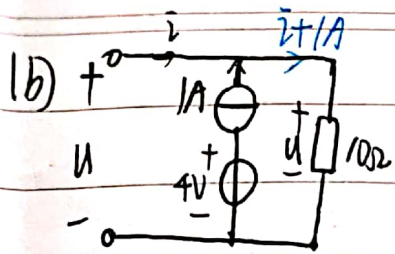
U

2Ω

$10V$

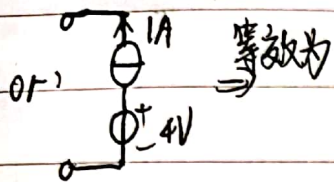
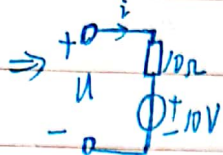


扫描全能王 创建

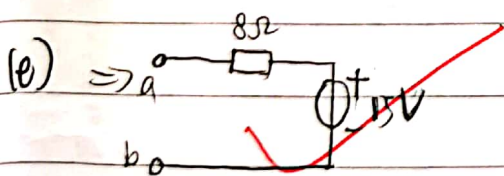
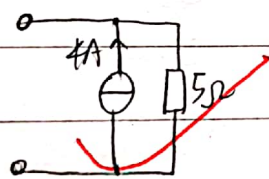
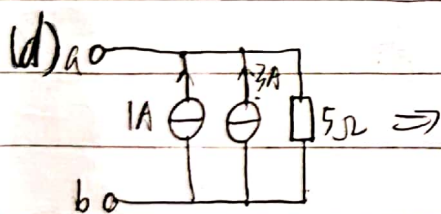
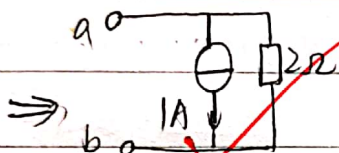
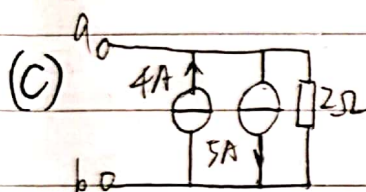
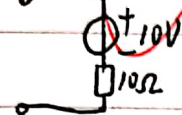
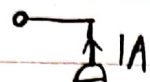


KVL: $10(i+1) = U$

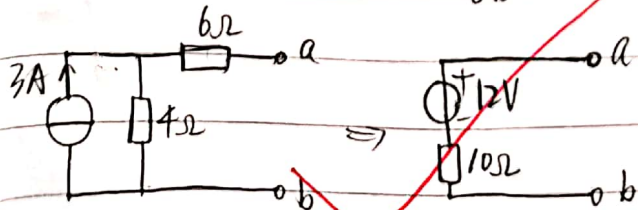
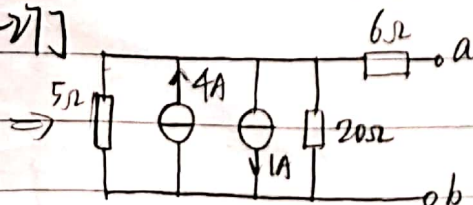
$\therefore U = 10i + 10$



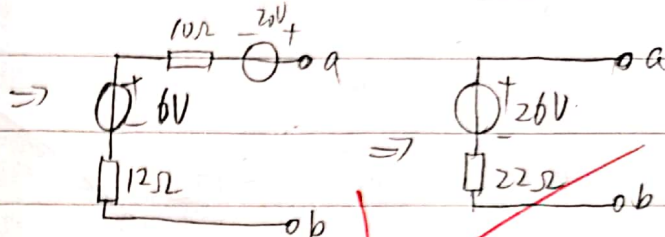
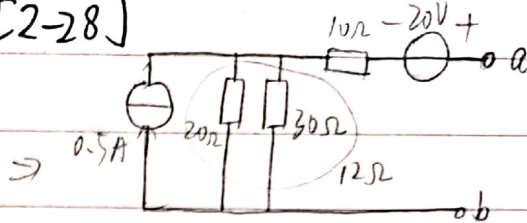
等效为



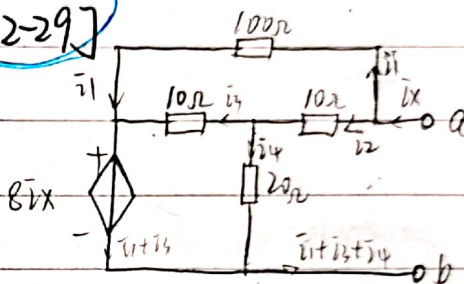
[2-27]



[2-28]



[2-29]



简单做法?

$U_{ab} = 10\bar{i}_2 + 20\bar{i}_4$

$R_{eq} = \frac{U_{ab}}{\bar{i}_X}$

$\bar{i}_X = \bar{i}_1 + \bar{i}_2 \quad \bar{i}_2 = \bar{i}_3 + \bar{i}_4$

$8\bar{i}_X = -10\bar{i}_3 + 20\bar{i}_4$

$100\bar{i}_1 = 10\bar{i}_2 + 10\bar{i}_3$

$8(\bar{i}_1 + \bar{i}_2) = -10\bar{i}_3 + 20\bar{i}_4$

$8(\bar{i}_1 + \bar{i}_3 + \bar{i}_4) = -10\bar{i}_3 + 20\bar{i}_4$

$10\bar{i}_1 = 2\bar{i}_3 + \bar{i}_4$

$\frac{4}{5}(2\bar{i}_3 + \bar{i}_4) = -18\bar{i}_3 + 12\bar{i}_4$

$\frac{8}{5}\bar{i}_3 = \frac{56}{5}\bar{i}_4 \quad 7\bar{i}_3 = 4\bar{i}_4$

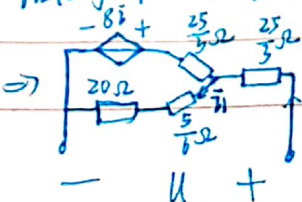
$\bar{i}_3 = \frac{4}{7}\bar{i}_4 \quad \bar{i}_2 = \frac{11}{7}\bar{i}_4 \quad 10\bar{i}_1 = \frac{15}{7}\bar{i}_4$

$\bar{i}_X = \bar{i}_1 + \bar{i}_2 + \bar{i}_4 = \frac{15+11}{7}\bar{i}_4 = \frac{26}{7}\bar{i}_4$

$U_{ab} = (\frac{110}{7} + 20)\bar{i}_4 = \frac{250}{7}\bar{i}_4$

$R_{eq} = \frac{U_{ab}}{\bar{i}_X} = \frac{250}{7} \times \frac{70}{125} = 20\Omega$

法2. Y-Δ变换后列方程简单一些

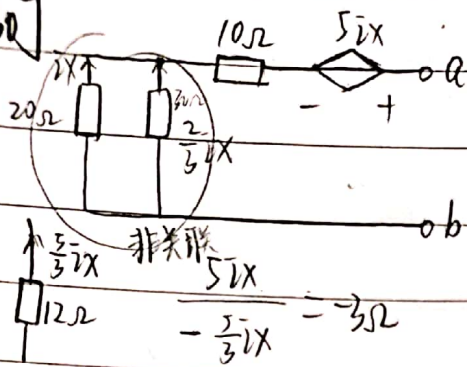


$\frac{25}{3}\bar{i}_1 + \frac{125}{6}\bar{i}_2 = U$
 $\frac{125}{6}\bar{i}_1 - \frac{25}{3}(\bar{i}_2 - \bar{i}_1) + 8\bar{i}_2 = 0$
 $\Rightarrow 25\bar{i}_1 = 4\bar{i}_2$
 代入后有 $U = 20\bar{i}_1$



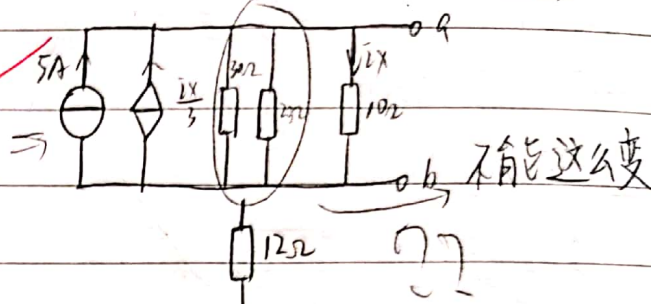
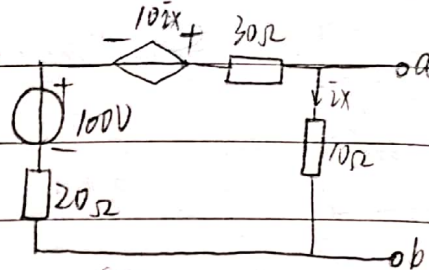
扫描全能王 创建

[2-30]

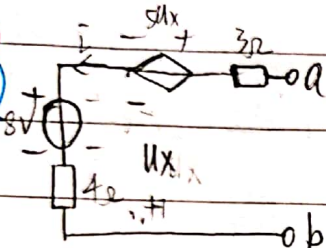


$$R_{eq} = 10\Omega + 12\Omega - 3\Omega = 19\Omega$$

[2-32]



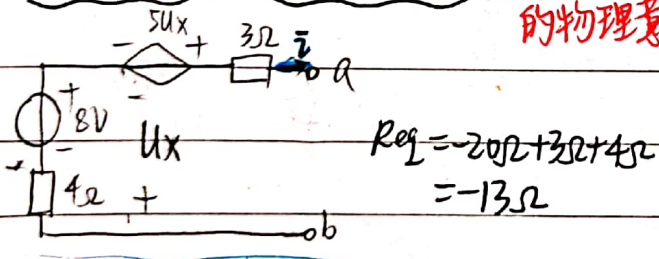
[2-31]



$$-u_x = 8 + 4i, U_{ab} = 5u_x + 3i - u_x = 4u_x + 3i$$

$$= 4(-8 - 4i) + 3i = -13i - 32$$

$4\Omega \rightarrow -u_x$ $5u_x \rightarrow -20\Omega$ "负电阻" 的物理意义?



$$R_{eq} = -20\Omega + 3\Omega + 4\Omega = -13\Omega$$

$$U_{ab} = 3i + 4u_x, i = 2 + \frac{u_x}{4}$$

$$U_{ab} = -6 + \frac{13}{4}u_x$$

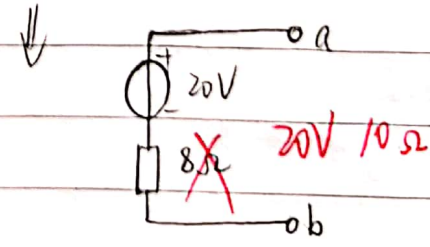
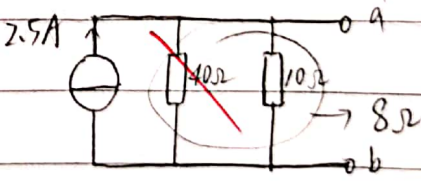
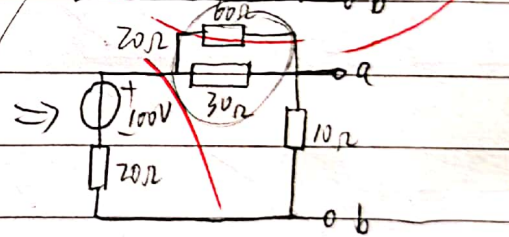
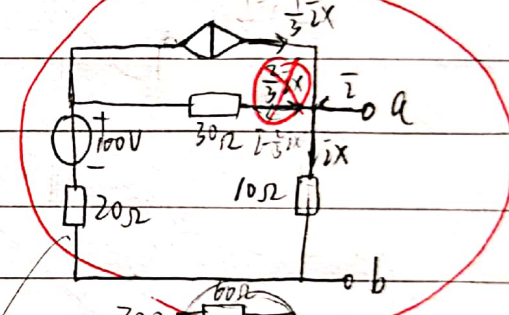
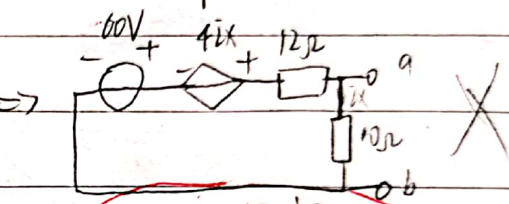
$$-u_x = 8 + 4i = 8 + 8 + u_x$$

$$u_x = -8V$$

受控源电压 $5u_x = -40 - 20i$

$$U_{ab} = 3i - 40 - 20i + 4i + 8$$

$$= -13i - 32$$



$$U_{ab} = 10i_x = 30(i - \frac{2}{3}i_x) + 100 + 20(i - \frac{1}{3}i_x)$$

$$10i_x = 30i - 20i_x + 100 + 20i - \frac{20}{3}i_x$$

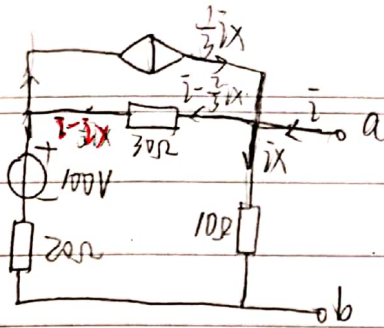
$$\frac{110}{3}i_x = 50i + 100, \frac{11}{3}i_x = 5i + 10$$

$$U_{ab} = 10i_x = \frac{30}{11}(5i + 10)$$



扫描全能王 创建

[2-32]



$$i - \frac{2}{3}i_x - \frac{1}{3}i_x = i - i_x$$

$$U_{ab} = 10i_x = 30(i - \frac{2}{3}i_x) + 100 + 20(i - \frac{1}{3}i_x)$$

$$10i_x = 30i - 20i_x + 100 + 20i - \frac{20}{3}i_x$$

$$\frac{110}{3}i_x = 50i + 100$$

$$\frac{11}{3}i_x = 5i + 10$$

$$U_{ab} = 10i_x = \frac{30}{11}(5i + 10)$$

方程列错了

$$U_{ab} = 10i_x = 30(i - \frac{2}{3}i_x) + 100 + 20(i - i_x)$$

$$10i_x = 30i - 20i_x + 100 + 20i - 20i_x$$

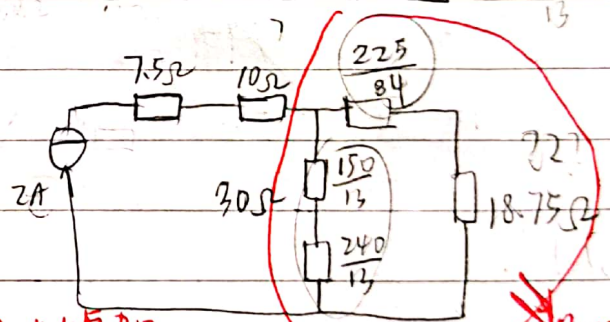
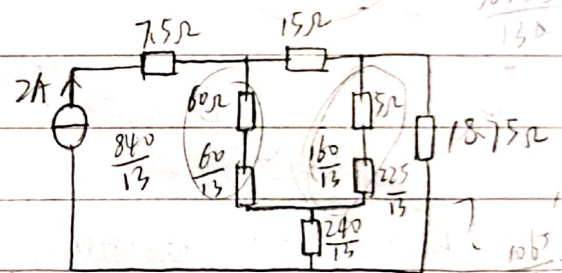
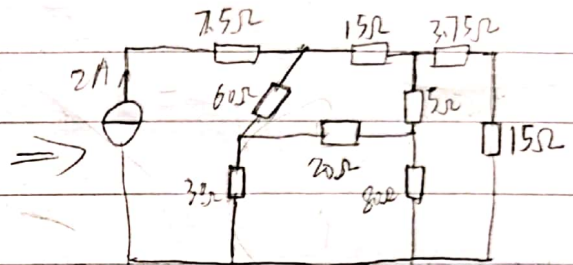
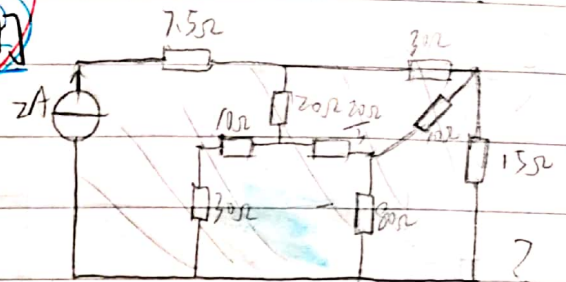
$$50i_x = 50i + 100$$

$$i_x = i + 2$$

$$U_{ab} = 10i_x = 10i + 20$$

等效为 $R=10\Omega$, $U=20V$

[2-34]

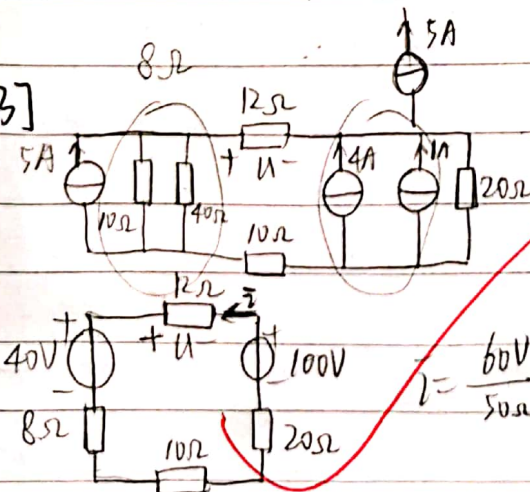


(方法太复杂了
导致计算量很大最后算不下去了...)

其实是对的)

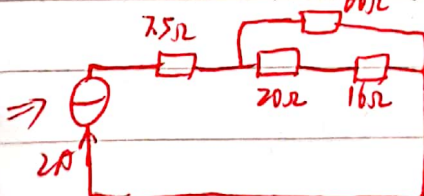
$R_{eq} = 2.5\Omega$

[2-35]

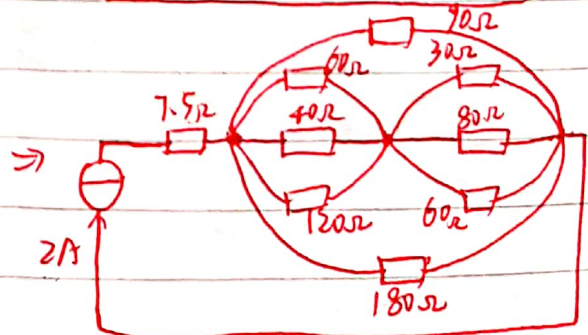
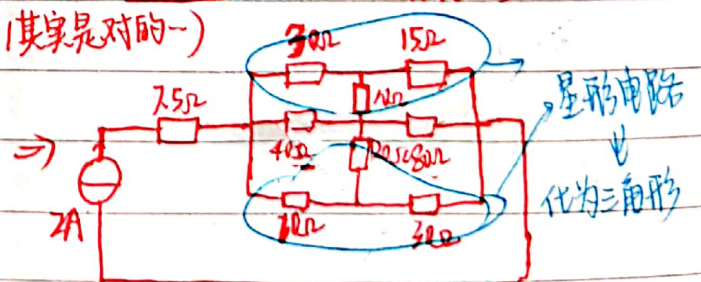


$$i = \frac{60V}{50\Omega} = 1.2A$$

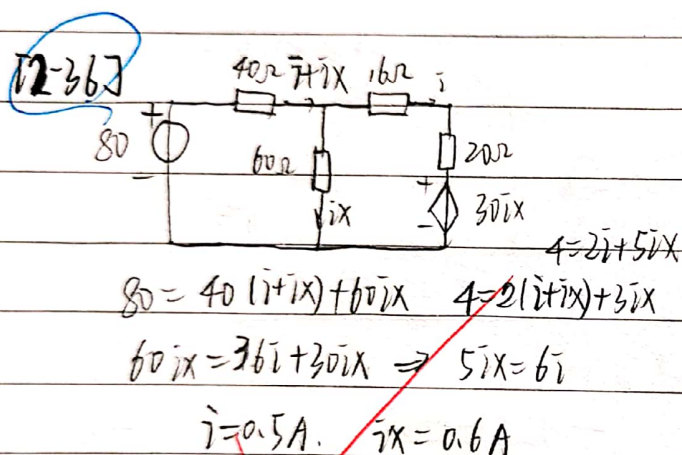
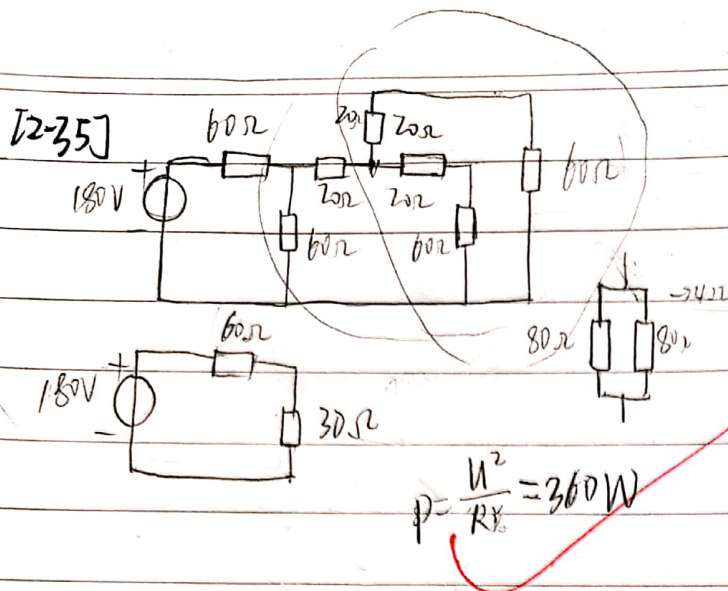
$$U = -12i = -14.4V$$



$$R_{eq} = 30\Omega \quad P = 120W$$



扫描全能王 创建



12-37 (1)

$$2 \times 10^{-4} (R_1 + R_2 + R_3 + 200) = 90$$

$$2 \times 10^{-4} (R_2 + R_1 + 200) = 30$$

$$2 \times 10^{-4} (R_1 + 200) = 10$$

$$R_1 = 5 \times 10^4 - 200 = 49800 \Omega$$

$$R_2 = 15 \times 10^4 - 5 \times 10^4 = 10^5 \Omega$$

$$R_3 = 45 \times 10^4 - 15 \times 10^4 = 3 \times 10^5 \Omega$$

(2)

$$R_1 + R_2 + R_3 = \frac{2 \times 10^{-4} \times 249}{50 \times 10^{-3} - 2 \times 10^{-4}} = \frac{2 \times 10^{-4} \times 249}{49.8 \times 10^{-3}} = 1 \Omega$$

$$R_2 + R_3 = \frac{2 \times 10^{-4} \times (249 + R_1)}{99.8 \times 10^{-3}} = \frac{249 + R_1}{499}$$

$$R_3 = \frac{2 \times 10^{-4} \times (249 + R_1 + R_2)}{199.8 \times 10^{-3}} = \frac{249 + R_1 + R_2}{999}$$

$$\therefore R_1 = 0.5 \Omega, R_2 = 0.25 \Omega, R_3 = 0.25 \Omega$$

