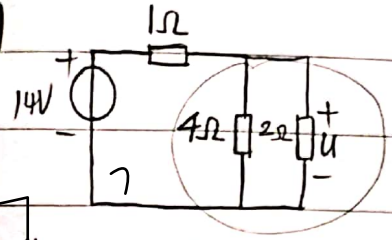
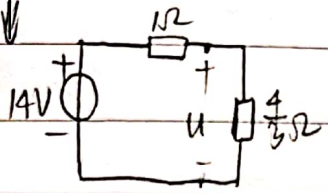
课后作业 [习题2]

[2-1]

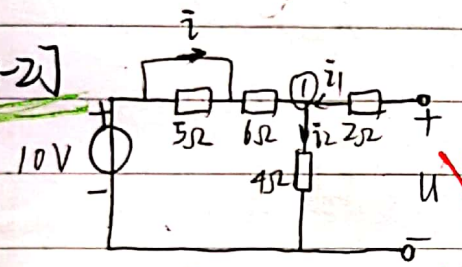


$R_{eq}=\frac{4}{3}\Omega$



$\therefore u=\frac{\frac{4}{3}}{\frac{4}{3}+1}\times 14V=8V$

[2-2]



~~(题目有问题)~~

这里是断开的！不是接了电压源！

① KCL $i+i_1=i_2$

KVL: $2i_1+4i_2=u$

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

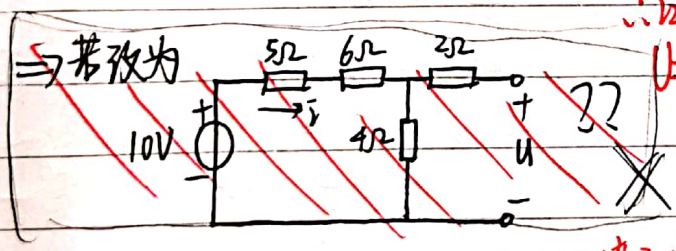
$i_1=0!$

$10i_2-6i_1=10$

$\therefore i_2=1A$

$u=4V$

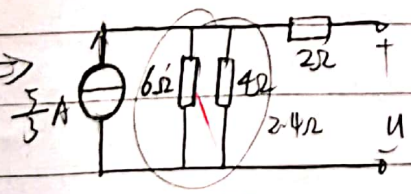
~~⇒若改为~~



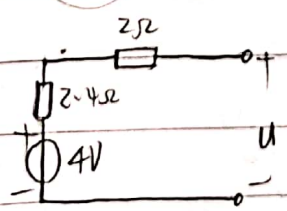
??

(相当于接了一个电压表)

⇒



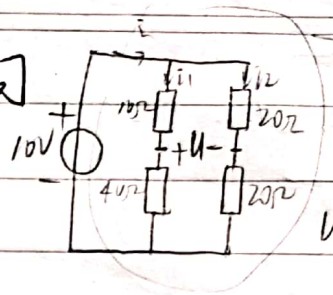
⇒



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

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

[2-3]

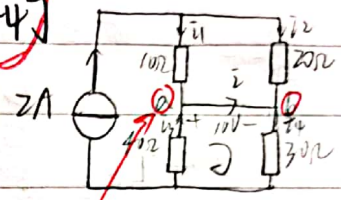


$R_{eq}=25\Omega$

$i_1=i_2=0.2A$

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

[2-4]



$i_1=i_2=1A$

~~$u_{ab}=10V$~~

$i_3=i-i_1$

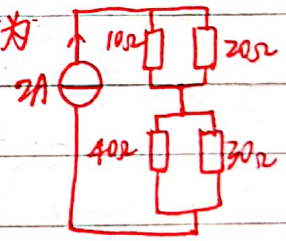
$i_4=i+i_2$

$10V+30i_4-40i_3=0$ $\therefore i=0$? ✗

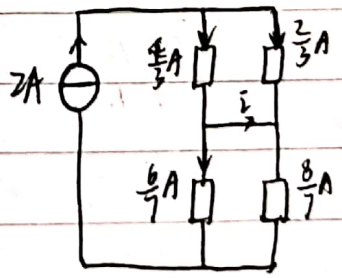
$\therefore 10+30(i+1)-40(i-1)=0$???

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

等价为

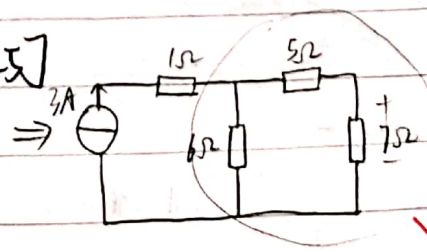


把每个电阻上的电流求出来然后在原图中用KCL



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

[2-5]



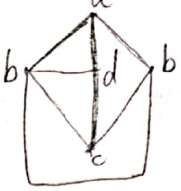
$R_{eq}=4\Omega$

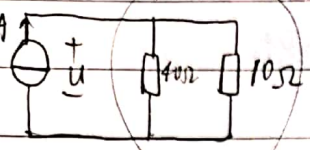
$1A\cdot 7\Omega=7V$

$u=7V$

HUSTEI Czj y

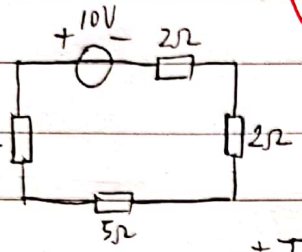
扫描全能王 创建



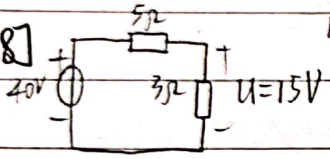
[2-6] 

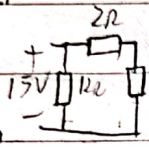
$R_{eq}=8\Omega$

$U=16V$

[2-7] 

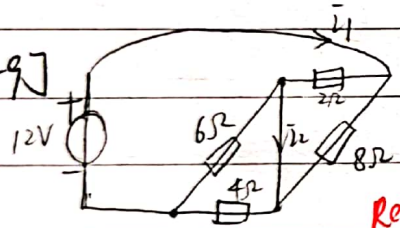
$I=\frac{10V}{12\Omega}=\frac{5}{6}A$

[2-8] 

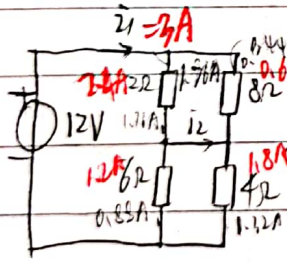


$R_{eq}=2\Omega$

$I=\frac{7.5V}{6\Omega}=1.25A$

[2-9] 

$i_1=2.2A$



$R_{eq}=2\Omega//8\Omega+6\Omega//4\Omega$

$=1.6\Omega+2.4\Omega=4\Omega$

$R_{eq}=\frac{10\times12}{10+12}=\frac{120}{22}=\frac{60}{11}\Omega$

$I=\frac{12}{\frac{60}{11}}=2.2A$

不是先串后并!

$i_2=1.76A-0.88A$

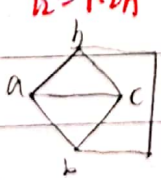
$=0.88A$

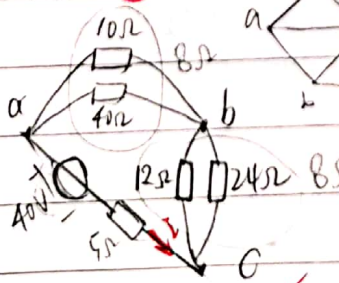
是先并后串!!!

$\therefore i_1=\frac{12V}{4\Omega}=3A$

$i_2=1.2A$

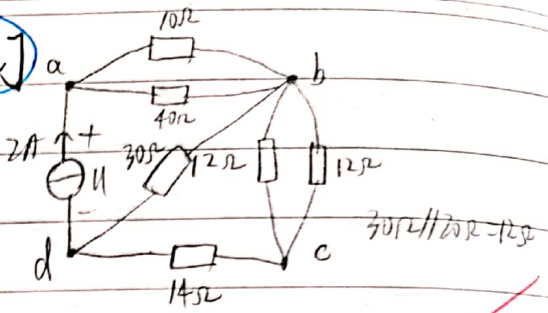
[2-10] $i=\frac{10V}{10\Omega}=1A$



[2-11] 

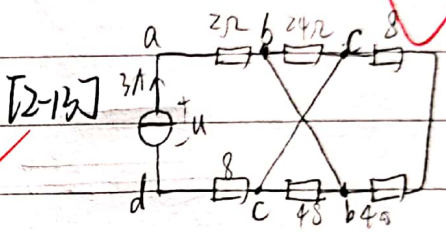
$i=\frac{-40V}{21\Omega}=-\frac{40}{21}A$

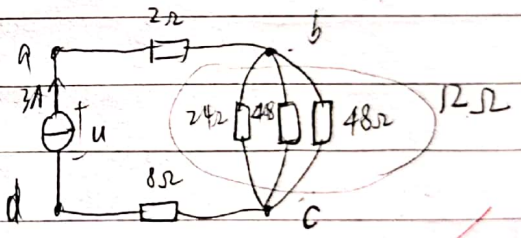
(非关联方向)

[2-12] 

$R_{eq}=12\Omega+8\Omega=20\Omega$

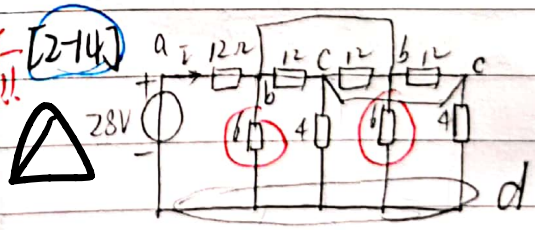
$U=2A\cdot20\Omega=40V$

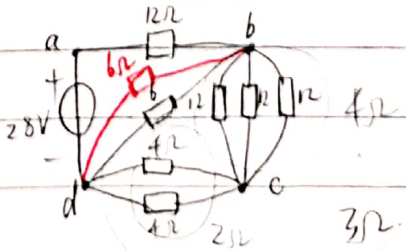
[2-13] 



$R_{eq}=22\Omega$

$U=3A\cdot22\Omega=66V$

[2-14] 



$6\Omega//6\Omega//6\Omega=2\Omega$

画掉了一个6Ω的电阻!!

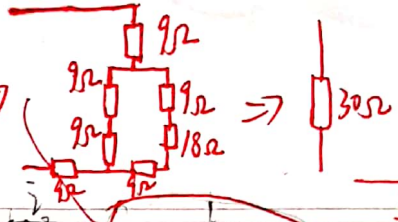
$R_{eq}=15\Omega$ 14Ω

$i=\frac{28V}{15\Omega}=\frac{28}{15}A$ 2A

⇒检查改变电路图摆放后有没有漏画电阻!!

HUSTEI Czjy

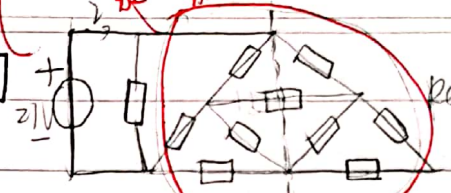
扫描全能王 创建



$R_{eq}=27\Omega//30\Omega$

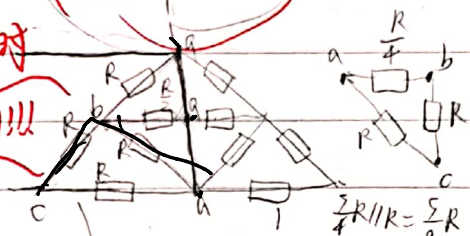
$\frac{27}{27\times30/27+30}=1.9A$

[2-15]



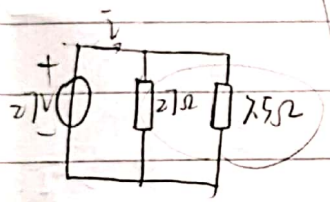
$R_{eq}=27\times\frac{10}{9}=30\Omega$

这样连接时不是对称的!!!



$\frac{5}{4}R//R=\frac{5}{9}R$

$R=\frac{1}{2}\times\frac{5}{9}R=\frac{15}{2}\Omega$

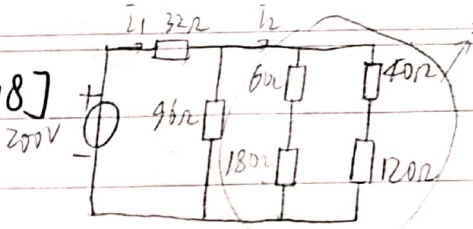


$\frac{1}{27}+\frac{2}{15}=\frac{5+18}{135}=\frac{23}{135}$

$R_{eq}=\frac{135}{19}\Omega$

$\bar{I}=27\times\frac{23}{135}=4.6A$ ~~1.9A~~

[2-18]

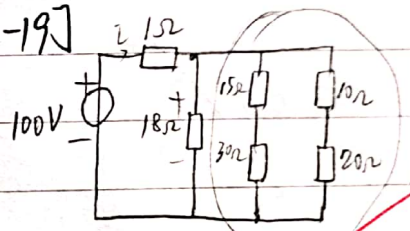


$240\Omega//160\Omega=96\Omega$

$\bar{I}_1=\frac{200V}{32\Omega+48\Omega}=2.5A$

$\bar{I}_2=\frac{1}{2}\bar{I}_1=1.25A$

[2-19]



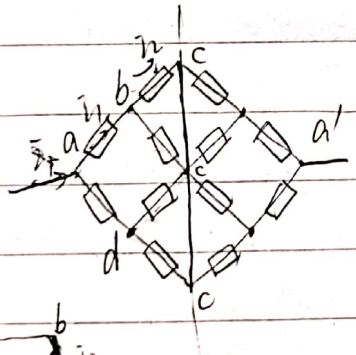
$R=45\Omega//30\Omega=18\Omega$

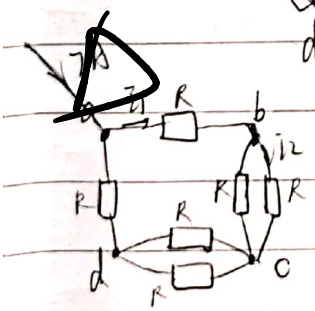
$R_{eq}=9\Omega$

$U=90V$

$\bar{I}=\frac{100V}{1\Omega+9\Omega}=10A$

[2-16]





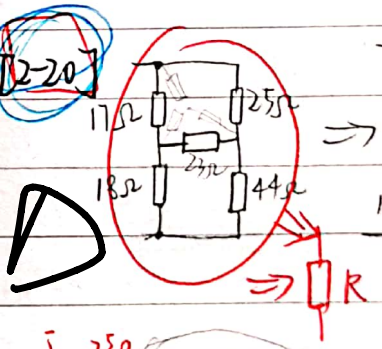
$R_{ac}=\frac{3}{4}R=15\Omega$

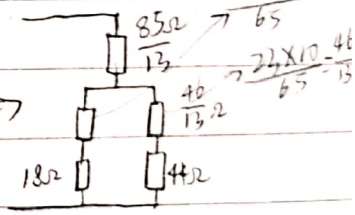
$R_{aa'}=15\Omega+15\Omega=30\Omega$

$U=2A\times30\Omega=60V$

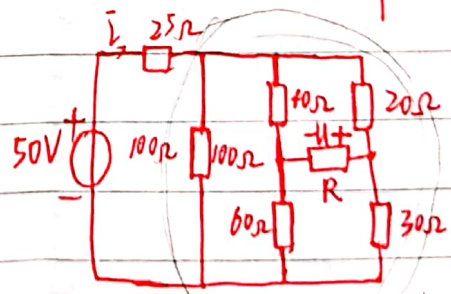
$\bar{I}_1=\frac{1}{2}I=1A$ $\bar{I}_2=\frac{1}{2}\bar{I}_1=0.5A$

[2-20]





这一堆等效为一个R 根本不需要算出来!

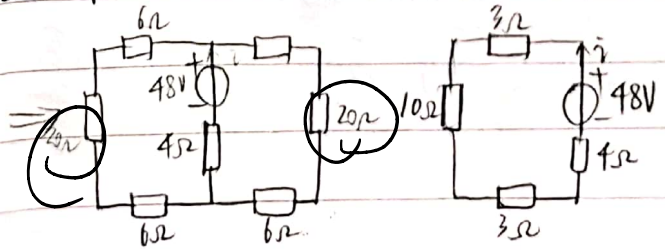


电桥平衡!!

$R_{eq}=25\Omega$

$\therefore\bar{I}=\frac{50V}{50\Omega}=1A$ $U=0$

[2-17]



$\bar{I}=\frac{48V}{20\Omega}=2.4A$

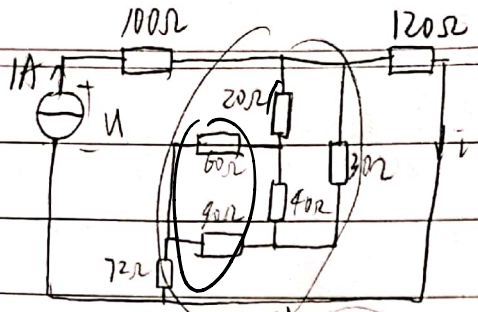
☆先观察是否存在电桥平衡

标节点、改画电路图

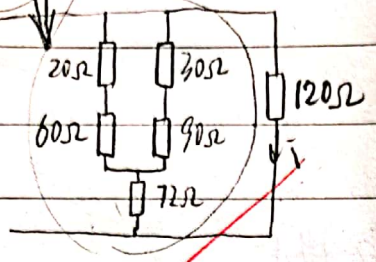
HUSTEI Czjy

扫描全能王 创建

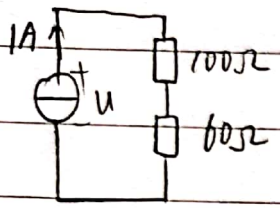
[2-21]



电桥



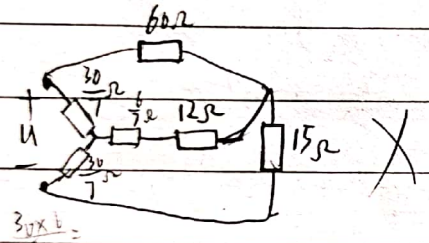
80Ω//120Ω=48Ω



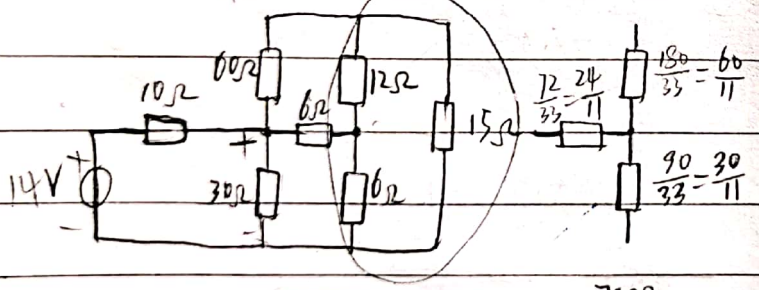
∴U=160V

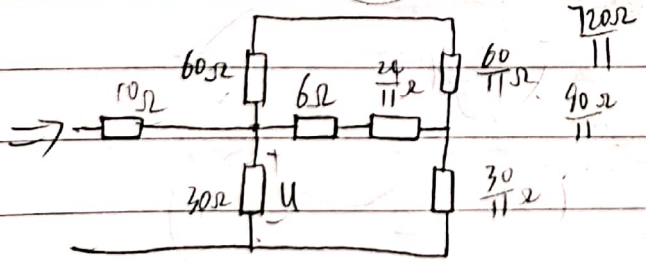
$i=1A\times\frac{1}{2}=0.5A$

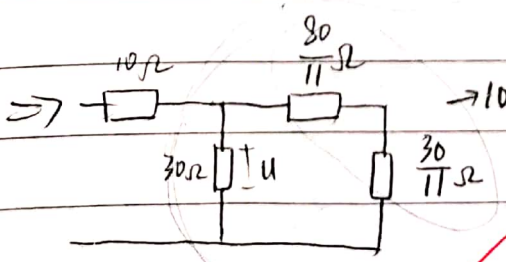
[2-22]



$\frac{30\times6}{42}=$



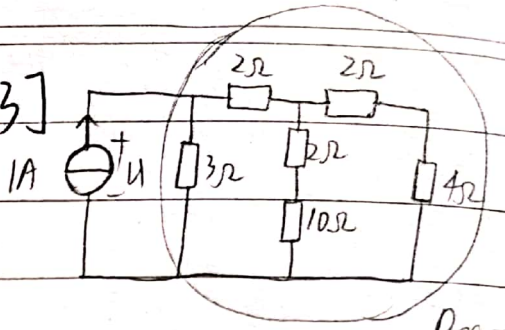




Req=7.5Ω

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

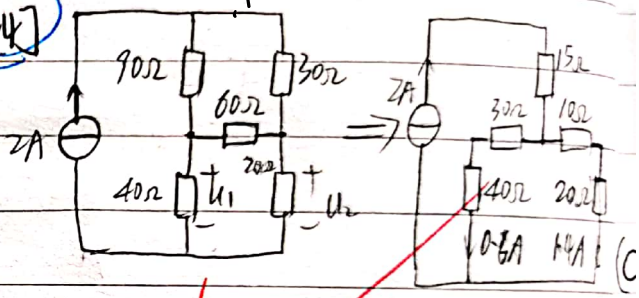
[2-23]



Req=2Ω

U=1A×2Ω=2V

[2-24]

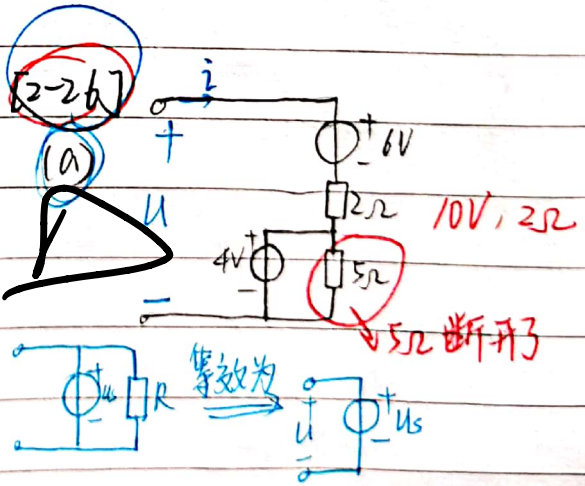


$U_1=24V$, $U_2=28V$

[2-25] 1) $U_S=10V$, $R_S=5\Omega$ (2)

2) $I_S=2A$, $R_P=5\Omega$

[2-26]

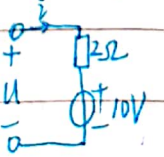


[法2] 用U-I关系转化:

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

10V、2Ω

故



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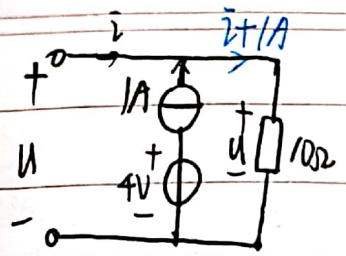
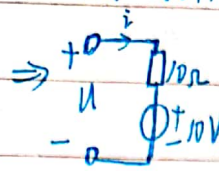
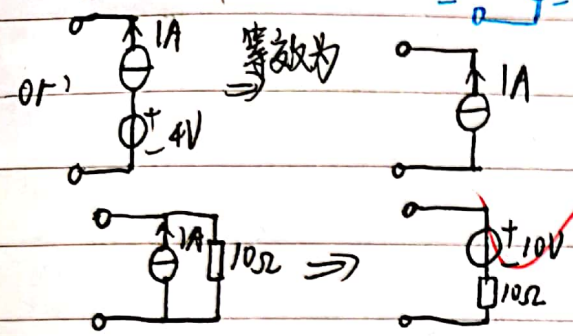
(b)



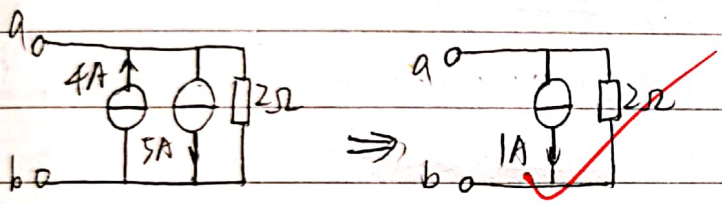
KVL: $10(i+1)=u$

$\therefore u=10i+10$

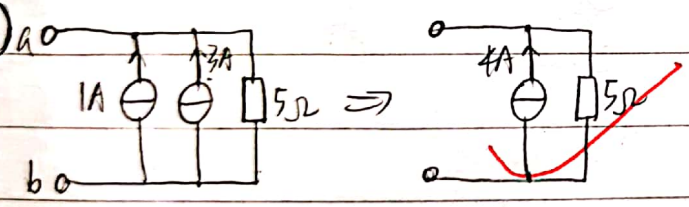




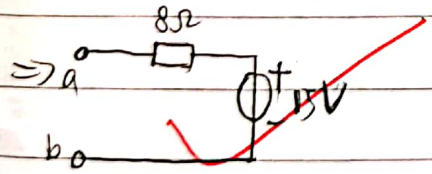
(c)



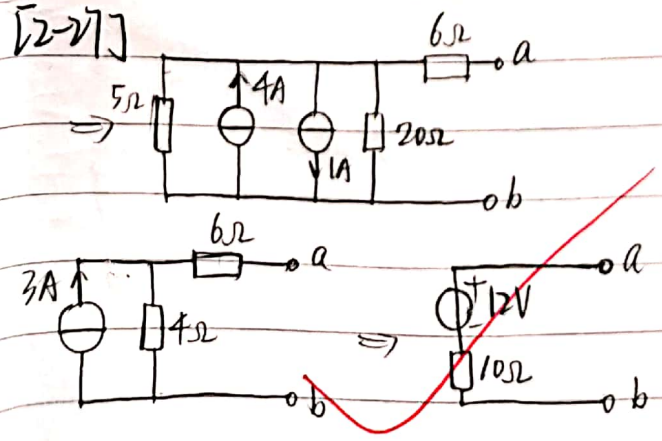
(d)



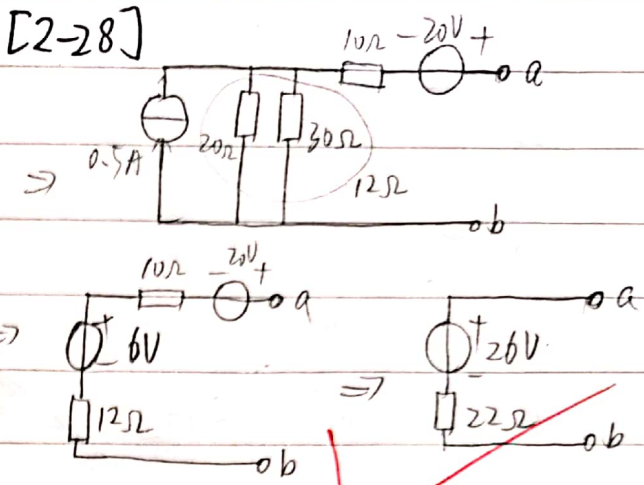
(e)



[2-27]

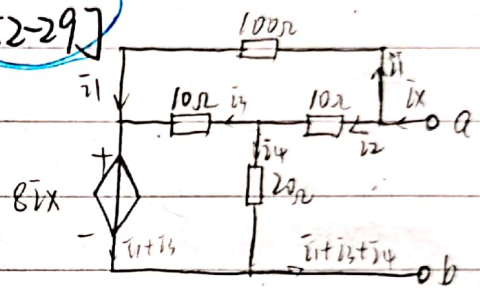


[2-28]



[2-29]

简单做法?



$U_{ab}=10i_2+20i_4$

$R_{eq}=\frac{U_{ab}}{i_x}$

$$\begin{cases} i_x=i_1+i_2 \quad i_2=i_3+i_4 \\ 8i_x=-10i_3+20i_4 \\ 100i_1=10i_2+10i_3 \end{cases}$$

$8(i_1+i_2)=-10i_3+20i_4$

$$\begin{cases} 8(i_1+i_3+i_4)=-10i_3+20i_4 \\ 10i_1=2i_3+i_4 \end{cases}$$

$\frac{4}{5}(2i_3+i_4)=-18i_3+12i_4$

$\frac{98}{5}i_3=\frac{56}{5}i_4 \quad 7i_3=4i_4$

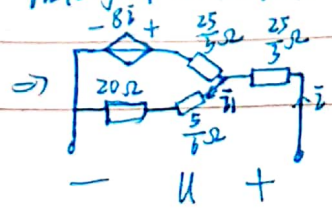
$i_3=\frac{4}{7}i_4 \quad i_2=\frac{11}{7}i_4 \quad 10i_1=\frac{15}{7}i_4$

$i_x=i_1+i_3+i_4=\frac{15+110}{70}=\frac{125}{70}i_4$

$U_{ab}=\left(\frac{110}{7}+20\right)i_4=\frac{250}{7}i_4$

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

[法2] Y-Δ变换后列方程简单一些



$$\begin{cases} \frac{25}{3}i+\frac{125}{6}i_1=u \\ \frac{125}{6}i_1=\frac{25}{3}(i-i_1)+8i \end{cases}$$

$\Rightarrow 25i_1=14i$

消去i有 $u=20i$

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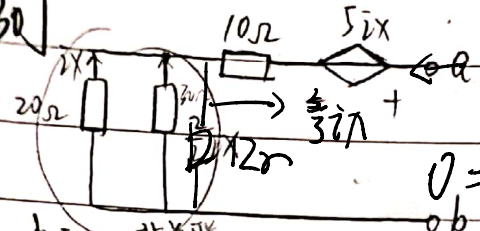
[2-30]



非关联

$\frac{5}{3}ix$ 12Ω

$\frac{5ix}{-\frac{5}{3}ix} = -3\Omega$

$U = i$

$q = -\frac{5}{3}ix$

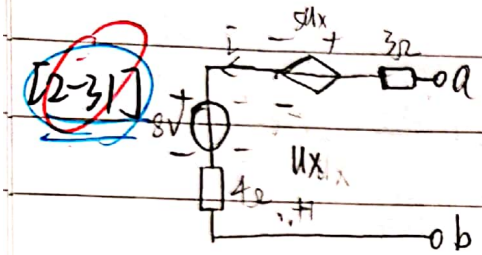
$U = 5ix$

$\therefore Req = 10\Omega + 12\Omega - 3\Omega = 19\Omega$

$U = \frac{5}{3}ix$

$-\frac{5}{3}ix + 10 - 5$

[2-31]

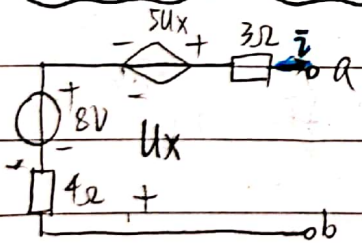


$-Ux = 8 + 4i$. $U_{ab} = 5Ux + 3i - Ux = 4Ux + 3i$

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

$4\Omega \to -Ux$ $5Ux \to -20\Omega$ "负电阻"的物理意义?

⇒



$Req = -20\Omega + 3\Omega + 4\Omega$

$= -13\Omega$

$U_{ab} = -3i + 4Ux$ $i = 2 + \frac{Ux}{4}$

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

$-Ux = 8 + 4i = 8 + 8 + Ux$

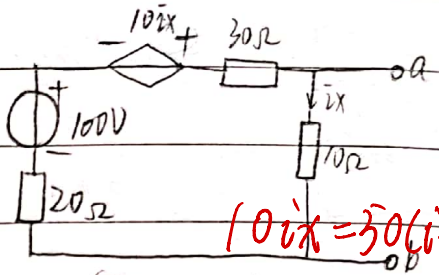
$Ux = -8V$???

受控源电压 $5Ux = -40 - 20i$

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

$= -13i - 32$

[2-32]

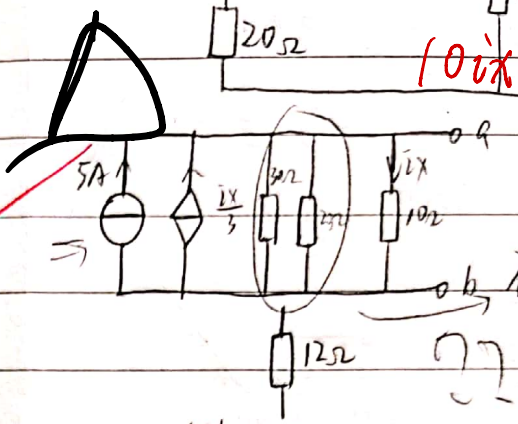


$10ix = 30(i - ix)$

$-100 - 10ix$

$50i - 60ix$

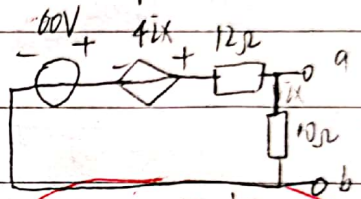
不能这么变

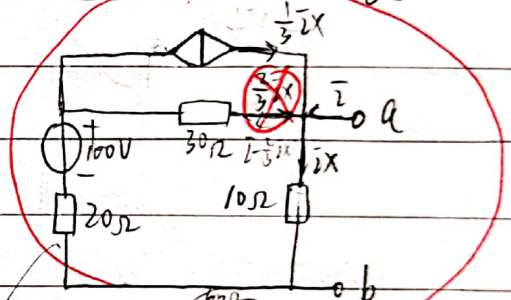


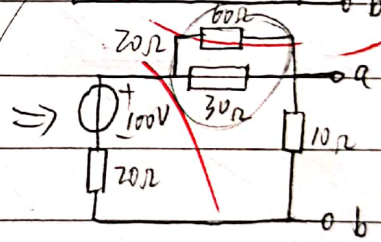
$70ix = 50i - 100$

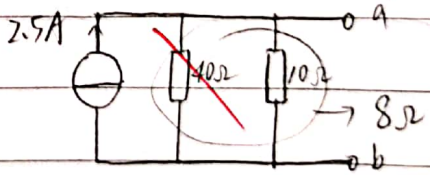
$70 = 50i - 100$

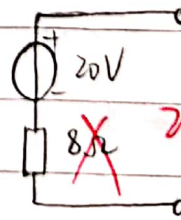
$U = \frac{50}{7}i - \frac{100}{7}$











20V 10Ω

$U_{ab} = 10ix = 30(i - \frac{2}{5}ix) + 100 + 20(i - \frac{1}{5}ix)$

$10ix = 30i - 20ix + 100 + 20i - \frac{20}{5}ix$

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

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

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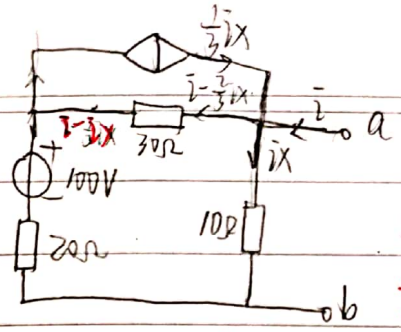
[2-32]



$\dot{i}-\frac{2}{3}\dot{i}X-\frac{1}{3}\dot{i}X=\dot{i}-\dot{i}X$

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

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

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

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

$U_{ab}=10\dot{i}X=\frac{30}{11}(5\dot{i}+10)$ 方程列错了

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

$10\dot{i}X=30\dot{i}-20\dot{i}X+100+20\dot{i}-20\dot{i}X$

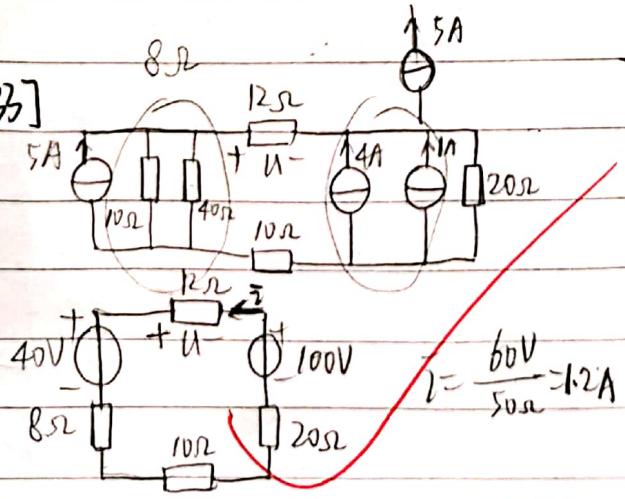
$50\dot{i}X=50\dot{i}+100$

$\therefore \dot{i}X=\dot{i}+2$

$U_{ab}=10\dot{i}X=10\dot{i}+20$

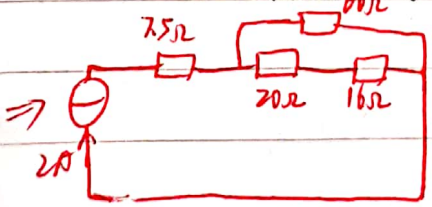
∴等效为 $R=10\Omega$，$U=20V$

[2-33]



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

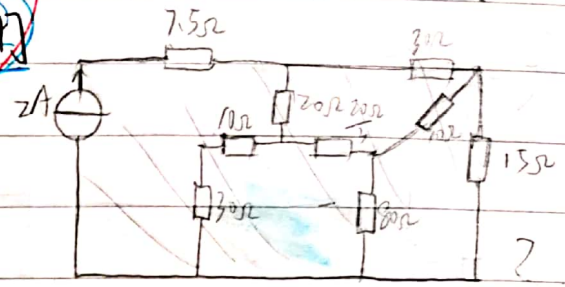
$\therefore U=-12\dot{i}=-14.4V$

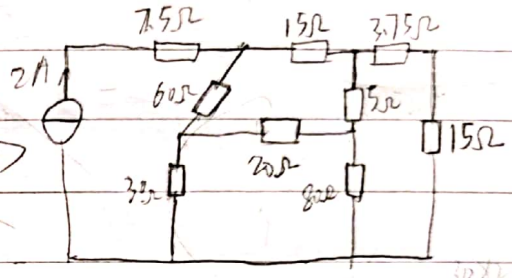


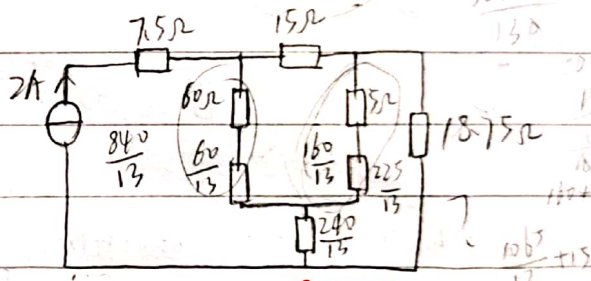
$\frac{60\times 96}{60+96}=37.5\Omega$

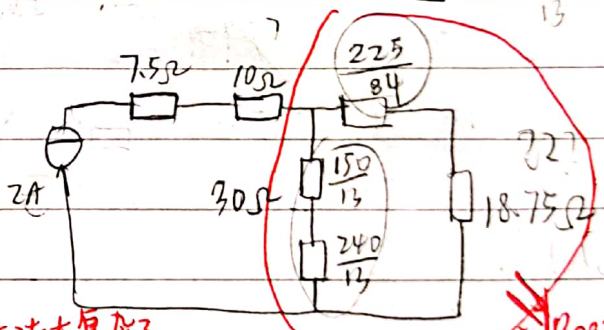
$\therefore R_{eq}=30\Omega$ $P=120W$

[2-34]



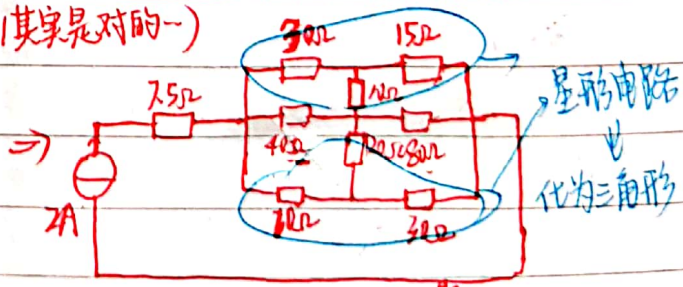


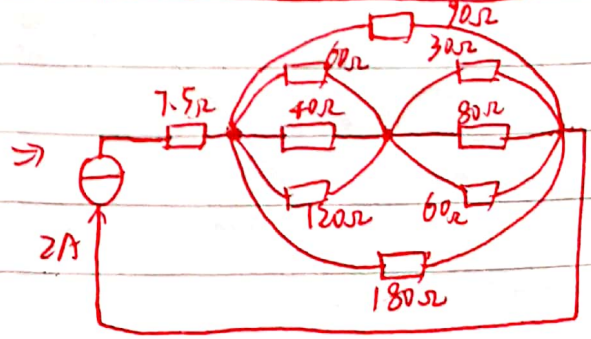




$R_{eq}=12.5\Omega$

(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--)





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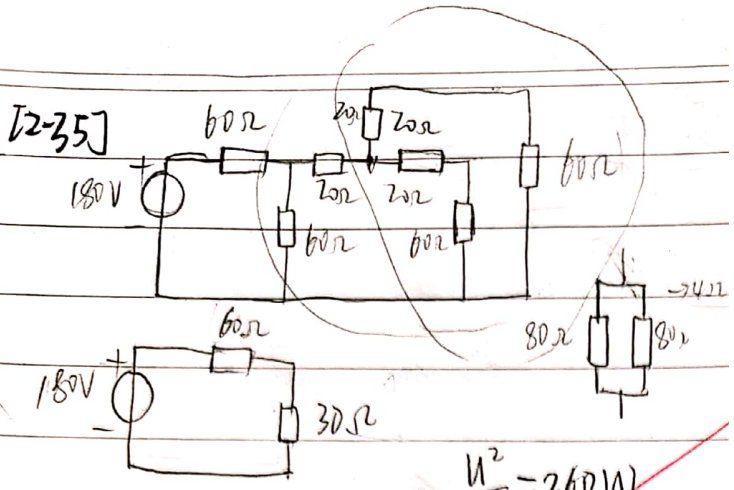
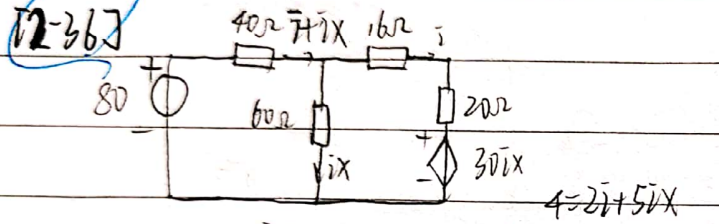
[2-35]



$P=\frac{U^2}{R_{总}}=360W$

[2-36]



$80=40(i+ix)+60ix$ $4=2(i+ix)+3ix$

$4=2i+5ix$

$60ix=36i+30ix \Rightarrow 5ix=6i$

$i=0.5A$. $ix=0.6A$

[2-37] (1) $2\times10^{-4}(R_1+R_2+R_3+200)=90$

$2\times10^{-4}(R_2+R_1+200)=30$

$2\times10^{-4}(R_1+200)=10$

$R_1=5\times10^4-200=49800\Omega$

$R_2=15\times10^4-5\times10^4=10^5\Omega$

$R_3=45\times10^4-15\times10^4=3\times10^5\Omega$

(2) $R_1+R_2+R_3=\frac{2\times10^{-4}\times249}{50\times10^{-3}-2\times10^{-4}}=\frac{2\times10^{-4}\times249}{49.8\times10^{-3}}=1\Omega$

$R_2+R_3=\frac{2\times10^{-4}\times(249+R_1)}{99.8\times10^{-3}}=\frac{249+R_1}{499}$

$R_3=\frac{2\times10^{-4}\times(249+R_1+R_2)}{199.8\times10^{-3}}=\frac{249+R_1+R_2}{999}$

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

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