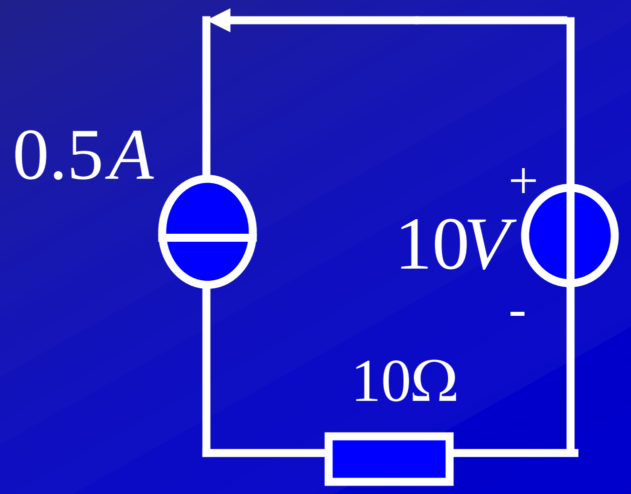
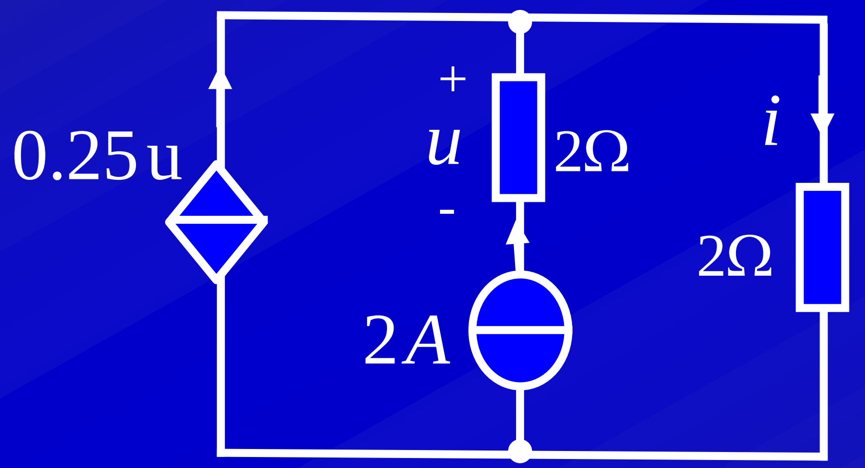
参考方向如下图，求电阻端电压U及电流源的功率。



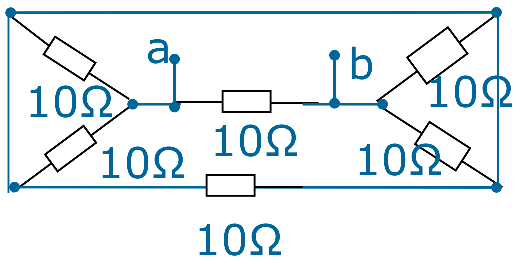
$$P_U = -I_s U_s = -5W$$

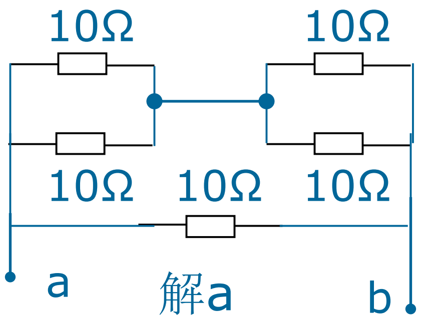
$$P_I = I_s(U_s - RI_s) = 2.5W$$

求电流i



2-6 试求题图2-6中各电路a、b端间的等效电阻。

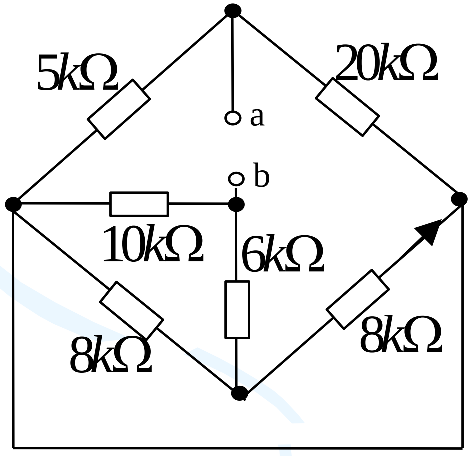




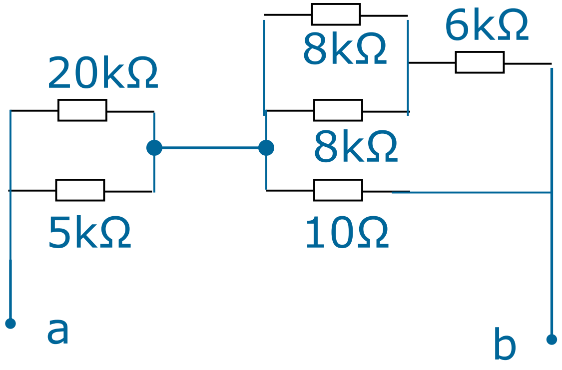
解a

解: (a)原电路可等效为解**a**所示电路，由图可得

$$R_{ab} = 10//[10//10 + 10//10] = 5\Omega$$

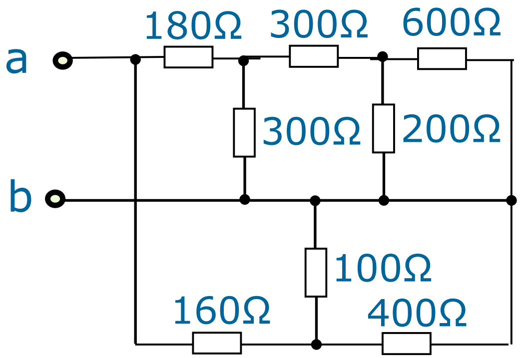


题图 2-6(b)



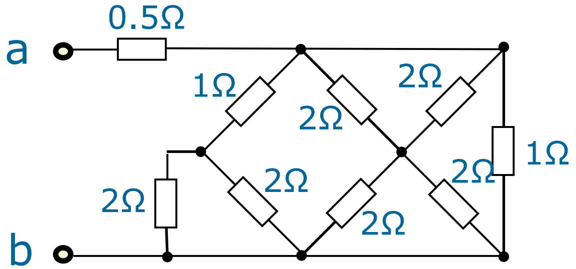
解b

(b)由图可得： $R_{ab} = 5//20 + 10//[8//8 + 6] = 9k\Omega$



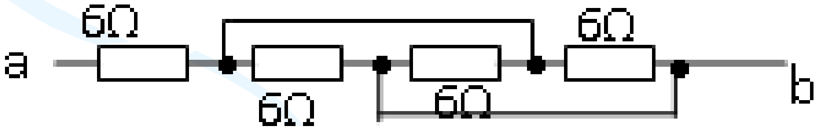
(c)

$$R_{ab} = [160 + 100//400)]//\{180 + 300//[300 + 600//200]\}$$
$$= 144\Omega$$



(d)

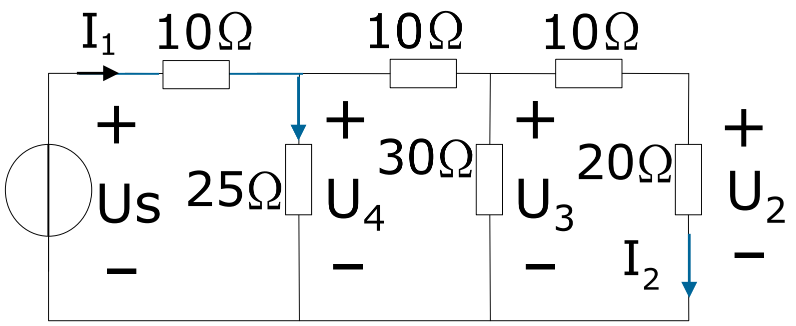
$$R_{ab} = 0.5 + [(1 + 2//2)//(2//2 + 2//2)//1] = 1\Omega$$



(e)

$$R_{ab} = 6 + 6//6//6 = 8\Omega$$

2－10 电路如题图2－10所示，(1)若U_2＝10V，求电流I_1和电源电压U_s； (2)若U_s＝10V，求电压U_2。



解: (1) $I_2=\frac{U_2}{20}=0.5A$

$$U_3=I_2(10+20)=15V$$

$$U_4=\left(\frac{U_3}{30}+I_2\right)\times 10+U_3=25V \qquad \therefore I_1=\frac{U_4}{25}+\frac{U_3}{30}+I_2=2A$$

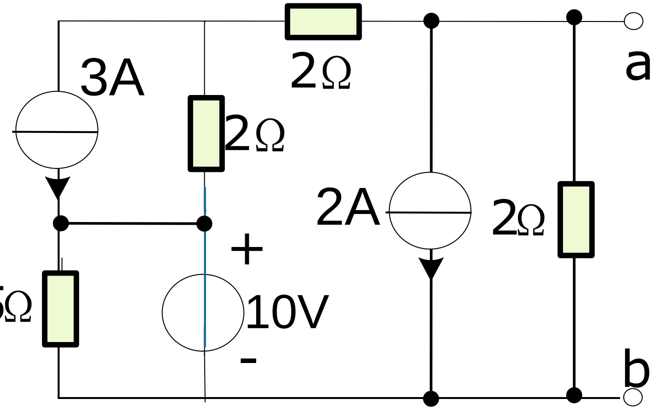
$$U_s=I_1\times 10+U_4=45V$$

(2) $I_1=\frac{U_s}{10+25//[10+30//(10+20)]}=\frac{10}{22.5}A$

$$\therefore I_2=\frac{10}{22.5}\times\frac{25}{25+[10+30//(10+20)]}\times\frac{25}{30+10+20}=\frac{10}{22.5}\times\frac{1}{2}\times\frac{1}{2}$$

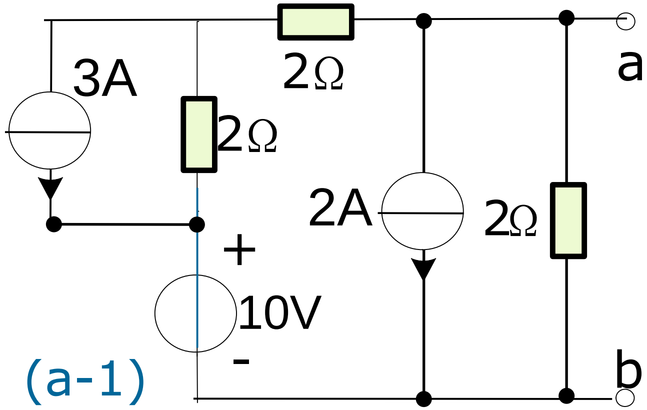
$$=\frac{1}{9}A$$

2-15(a) 化简题图2-15所示电路为等效戴维南电路。

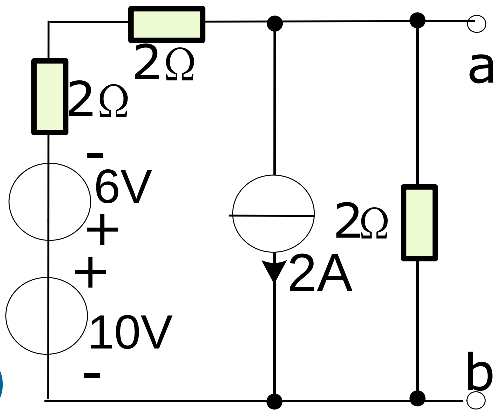


(a)

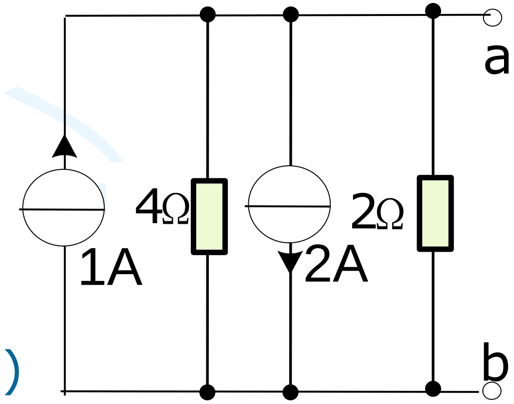
解:



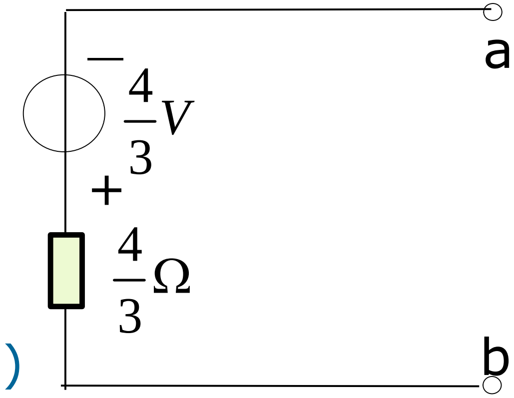
(a-1)



(a-2)

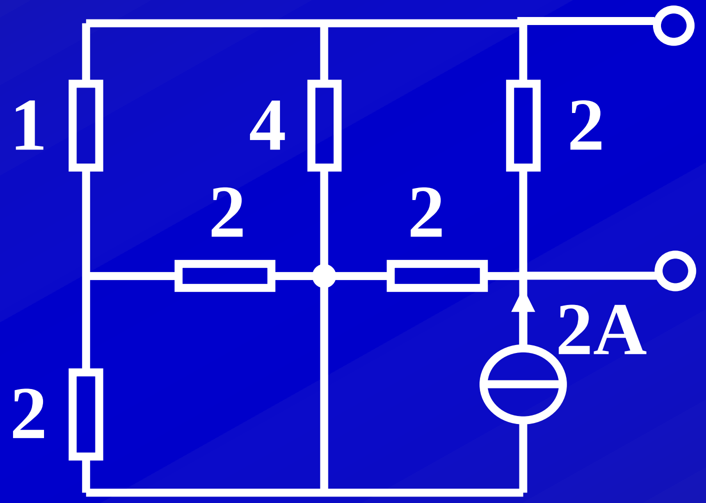


(a-3)

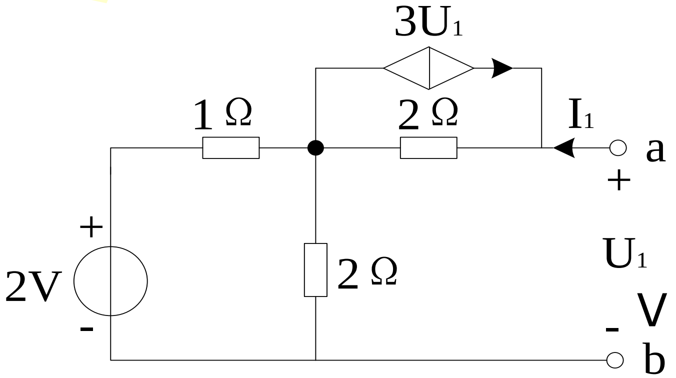


(a-4)

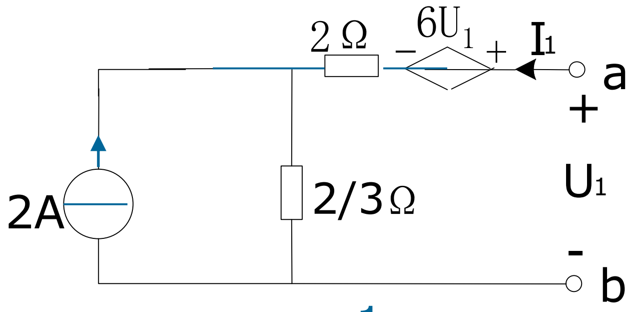
化简



2-24(a) 化简题图2-24所示电路为等效戴维南电路。



a

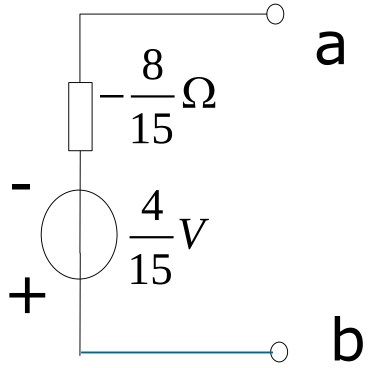


a-1

解(a)：首先将图a所示电路等效化简为图a-1所示电路，设端口上电压、电流参考方向如图，则：

$$U_1 = 6U_1 + 2I_1 + \frac{2}{3}(2 + I_1)$$

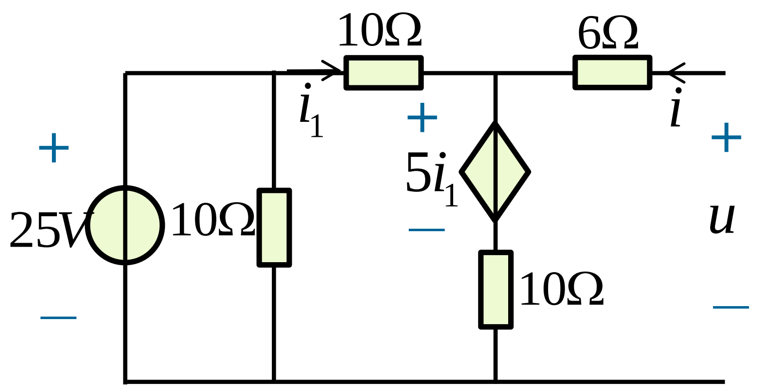
$$\therefore U_1 = -\frac{4}{15} - \frac{8}{15} I_1$$



a-2

所以戴维南等效电路如图a-2所示.

2-24(b) 化简题图2-24所示电路为等效戴维南电路。

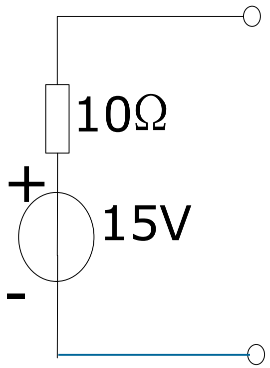


解：设端口电压、电流的参考方向如图，则 ：

$$\begin{cases} u = 6i - 10i_1 + 25 \\ u = 6i + 5i_1 + 10(i_1 + i) \end{cases}$$

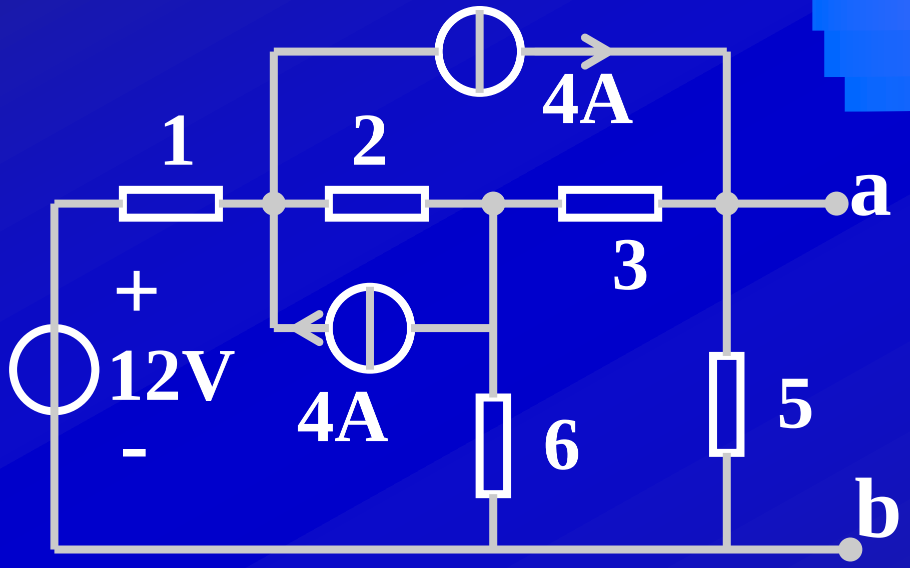
消去i_1，有： $u = 10i + 15$

所以戴维南等效电路如图b-1所示

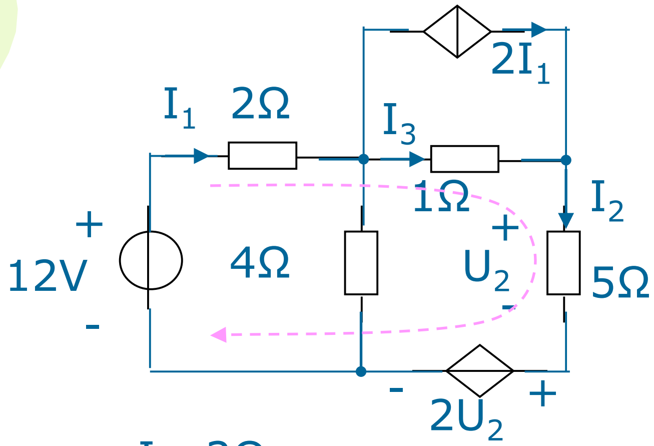


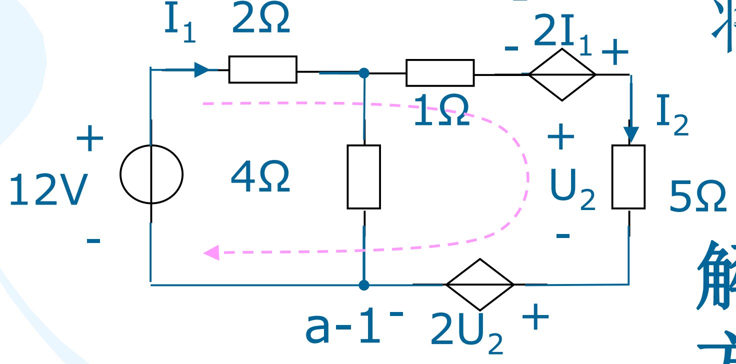
b-1

化简



2－27 试求题图2-27电路中的电流I_2。





解一：先将原电路进行等效变换如图b-1，列图示回路KVL方程，有：

$$2I_1+I_2\times1-2I_1+5I_2+2U_2-12=0$$

将 $U_2=5I_2$ 代入上式，可得：

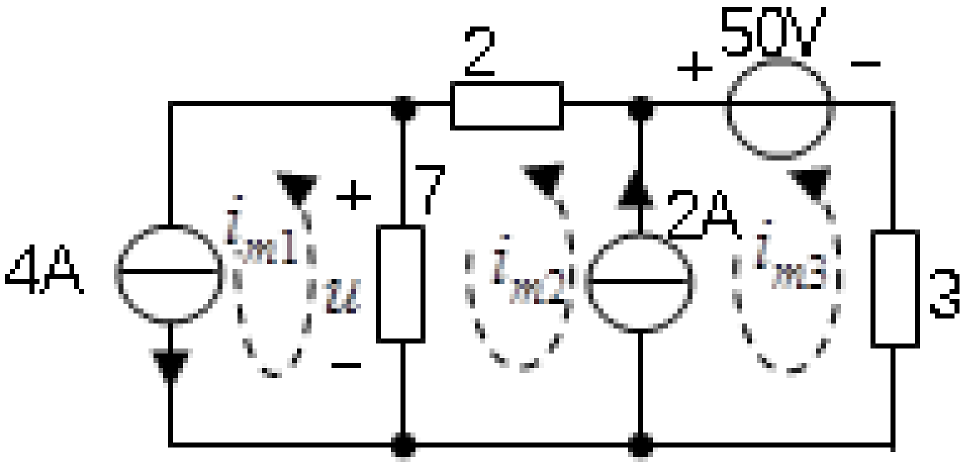
$$I_2=0.75A$$

解二：在原电路上列图示回路KVL方程，有：

$$2I_1+I_3\times1+5I_2+2U_2-12=0$$

将 $I_3=I_2-2I_1, U_2=5I_2$ 代入上式，可得：$I_2=0.75A$

用网孔分析法求解题图所示电路中的电压u。



$$\begin{cases} i_{m1} = 4 \\ -7i_{m1} + 12i_{m2} - 3i_{m3} = 50 \\ i_{m3} = 2 \\ u = 7\left(i_{m2} - i_{m1}\right) \end{cases}$$

$$\therefore u = 21V$$

列节点方程

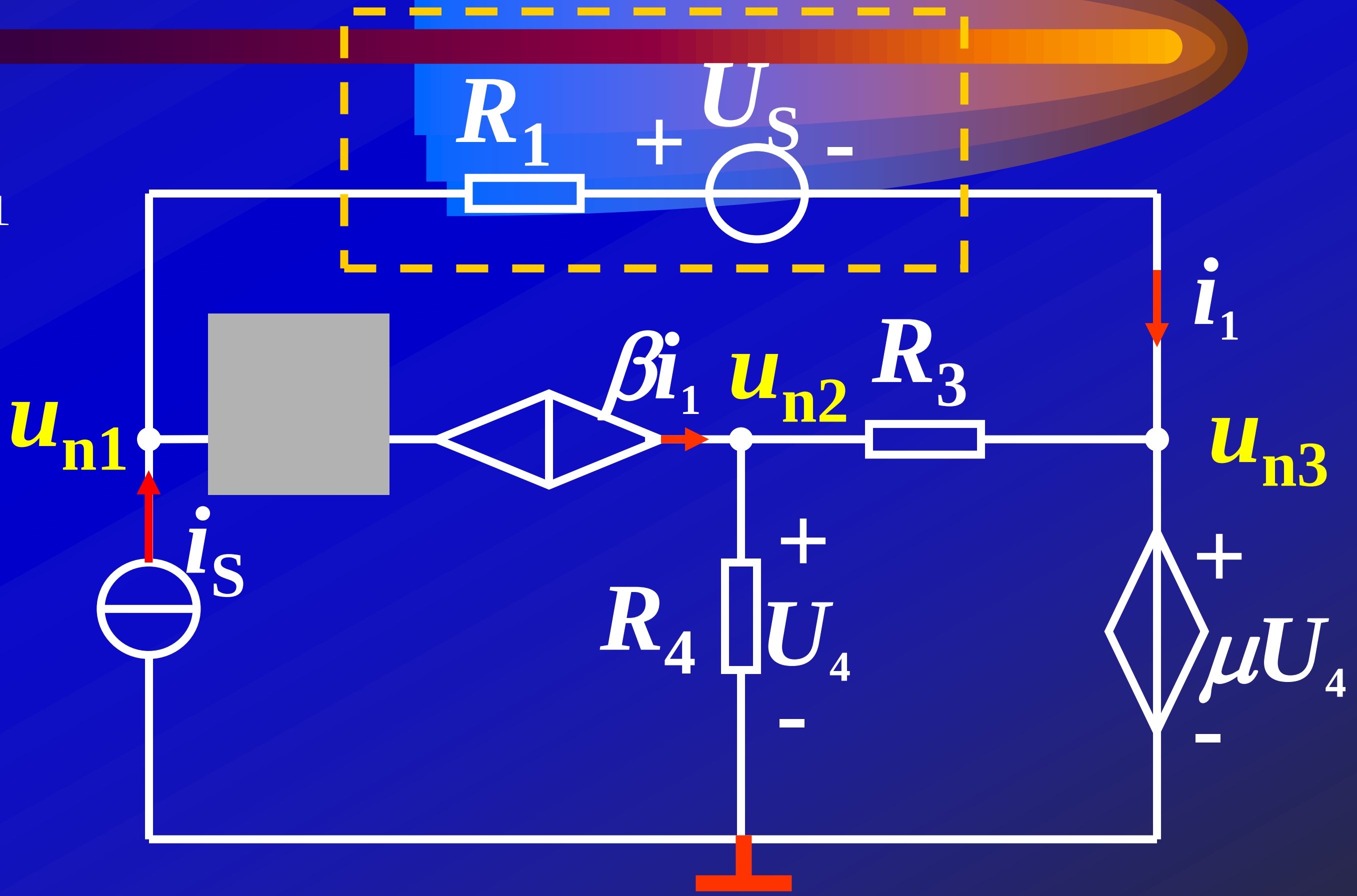
$$\frac{1}{R_1}u_{n1}-\frac{1}{R_1}u_{n3}=\frac{U_S}{R_1}+i_S-\beta i_1$$

$$(\frac{1}{R_3}+\frac{1}{R_4})u_{n2}-\frac{1}{R_3}u_{n3}=\beta i_1$$

$$u_{n3}=\mu u_{n4}$$

$$i_1=\frac{1}{R_1}(u_{n1}-u_{n3}-U_S)$$

$$U_4=u_{n2}$$

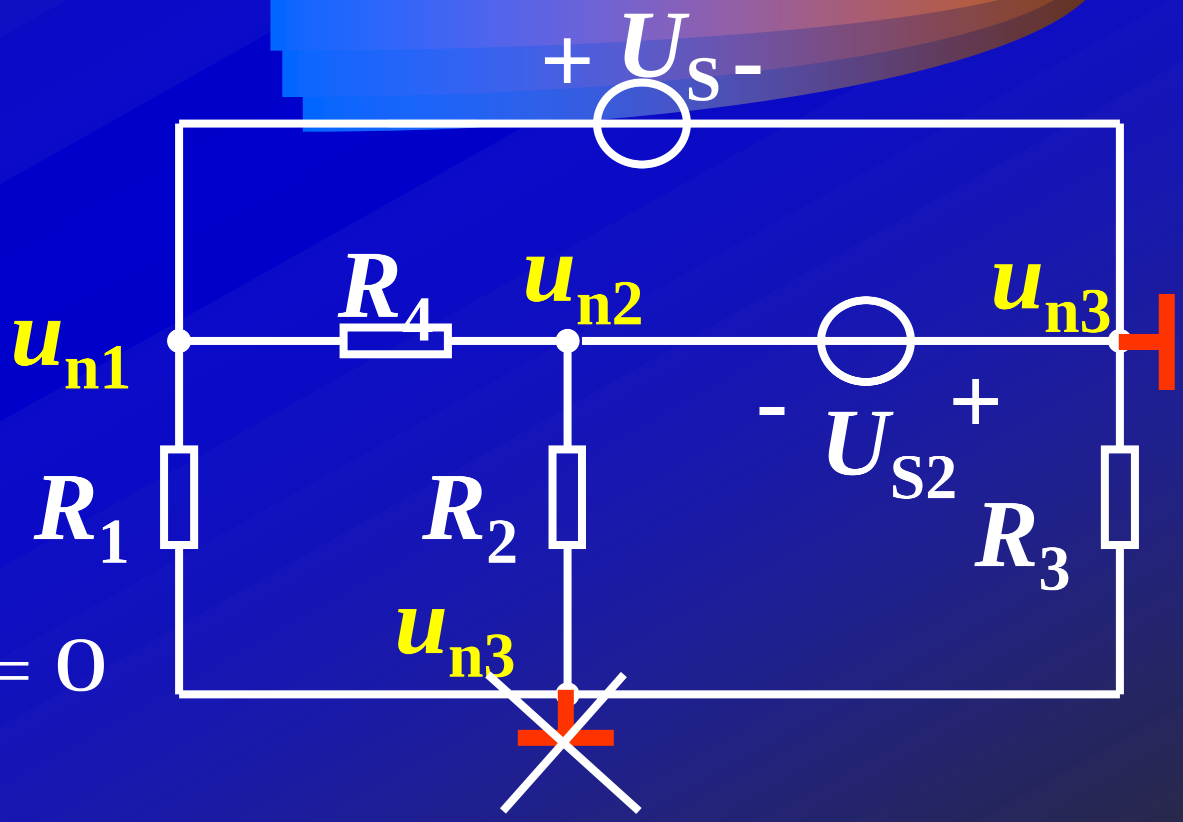


列节点方程

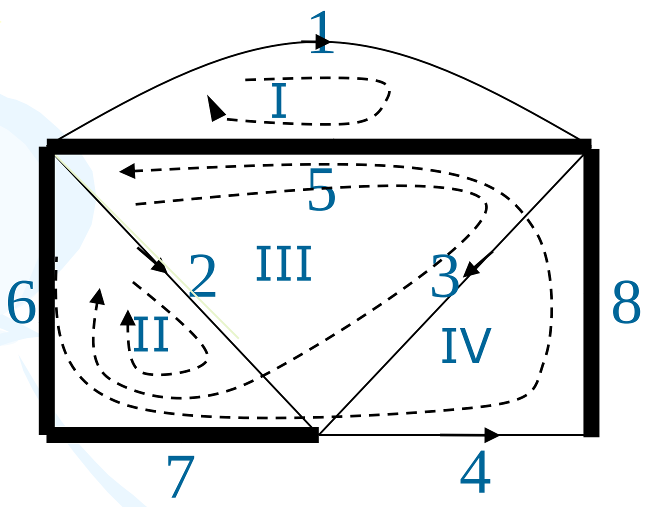
$$u_{n1} = U_S$$

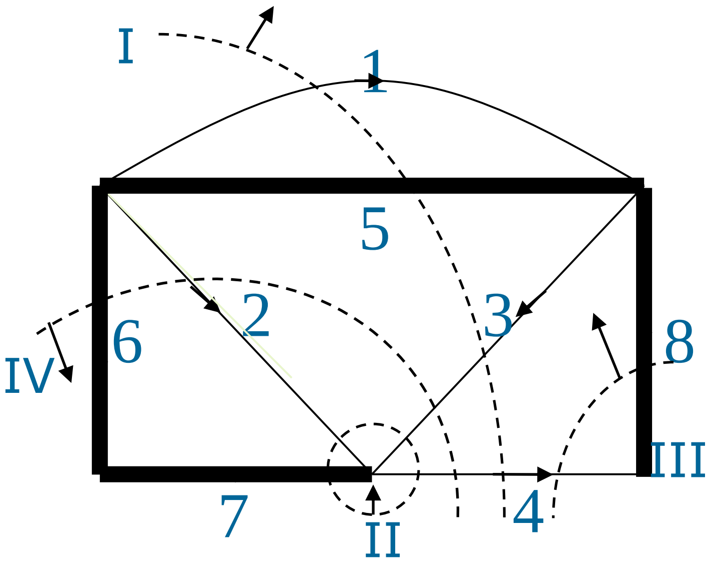
$$u_{n2} = -U_{S2}$$

$$-\frac{1}{R_1}u_{n1} - \frac{1}{R_2}u_{n2} + \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)u_{n3} = 0$$

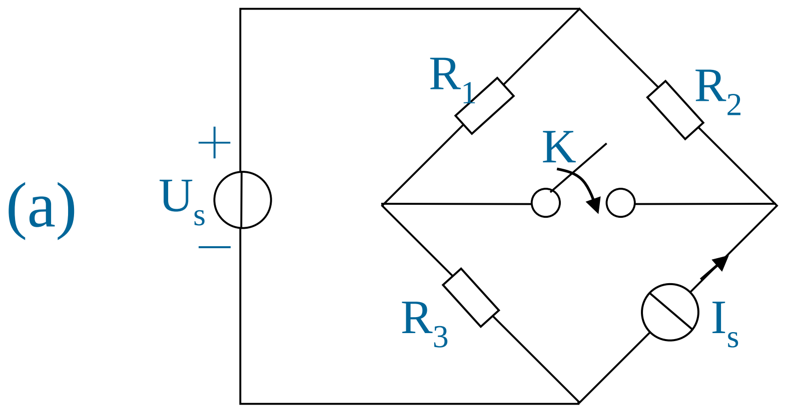


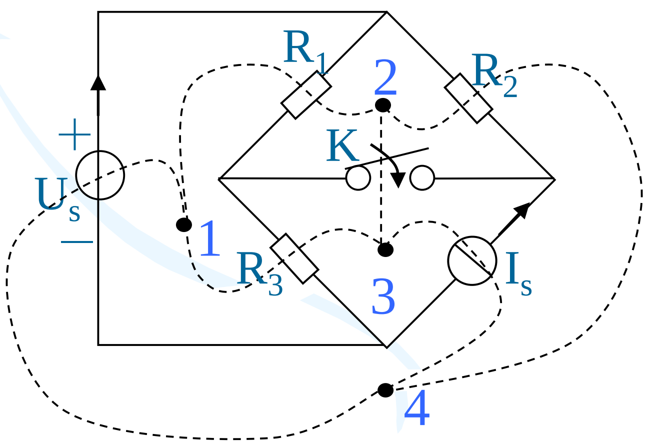
3-15、线图如图所示，粗线表示树，试列出其全部基本回路和基本割集。

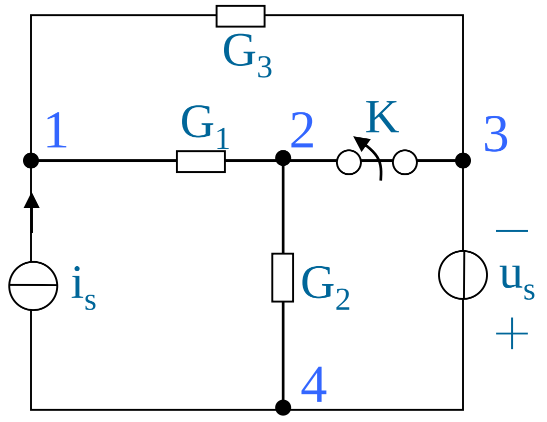




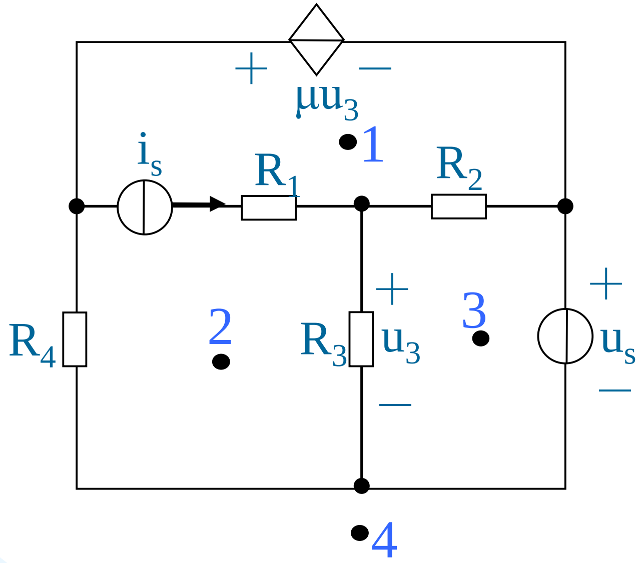
3-20、画出下图电路的对偶电路

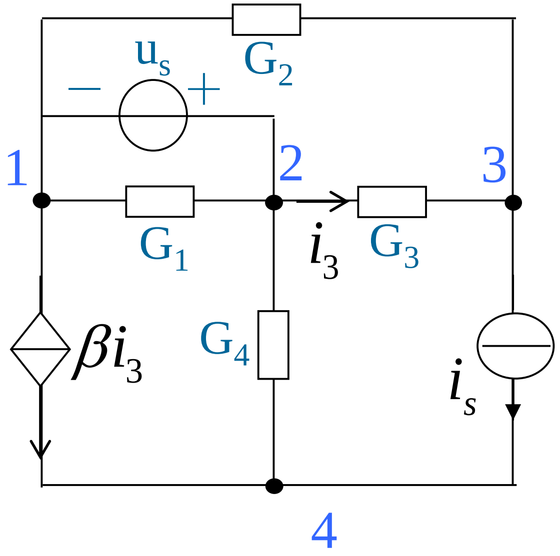




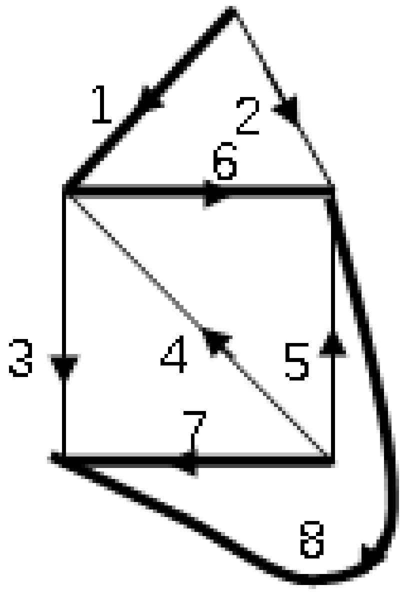


(b)

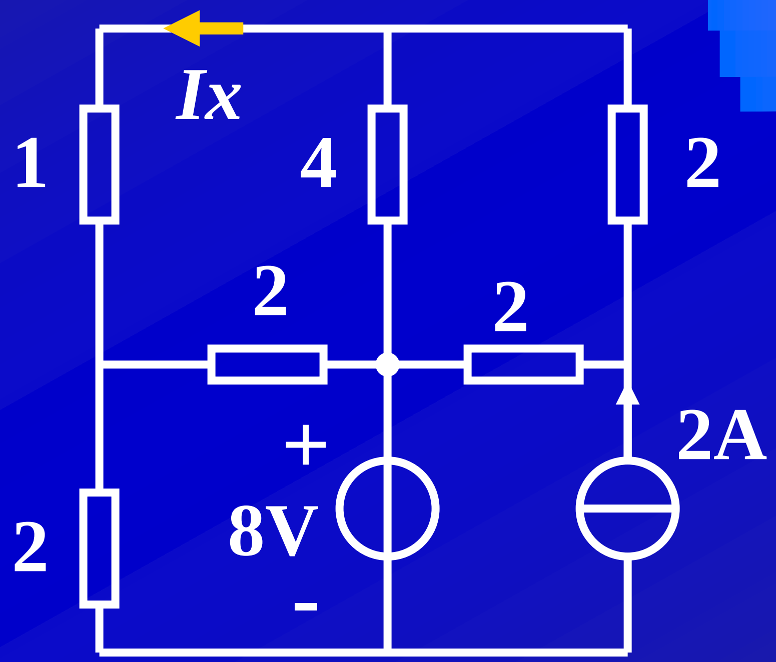


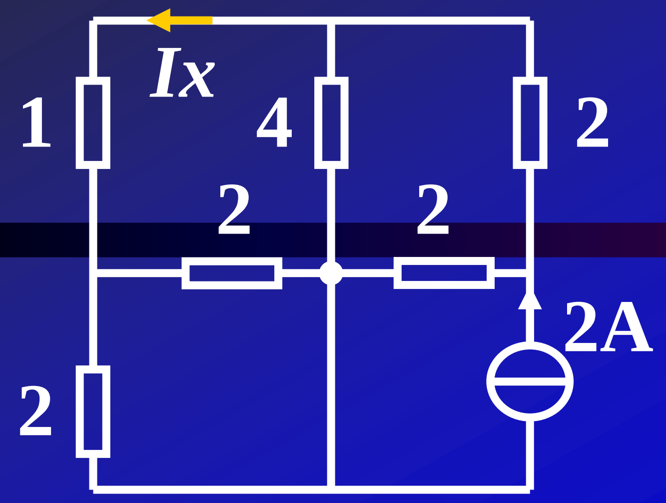


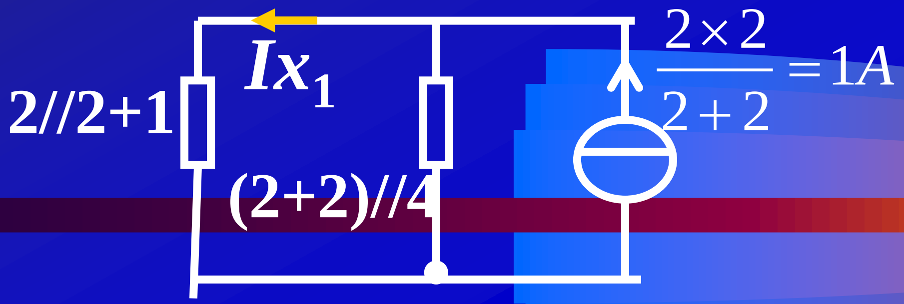
线图如题图，粗线表示树，画出下图电路的全部基本回路和基本割集。



求电流i_x

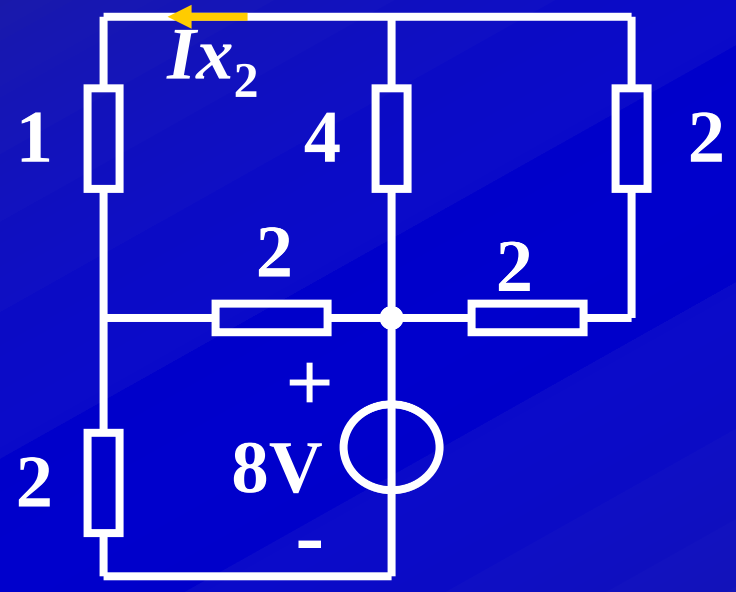


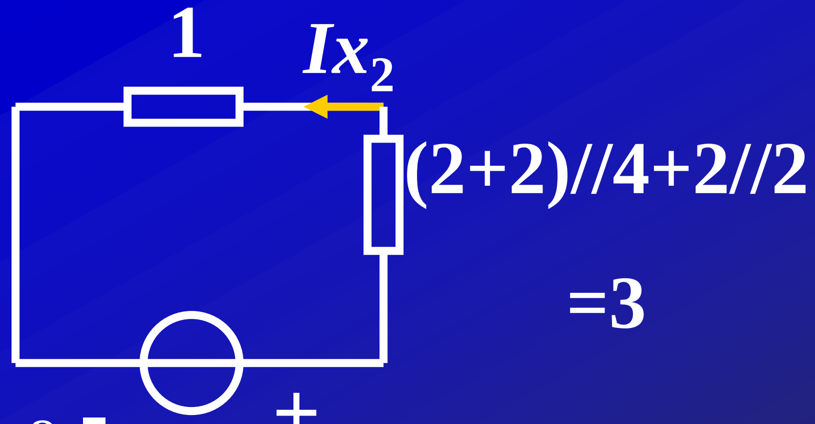




$$Ix = Ix_1 + Ix_2$$

$$=0.5+1=1.5A$$

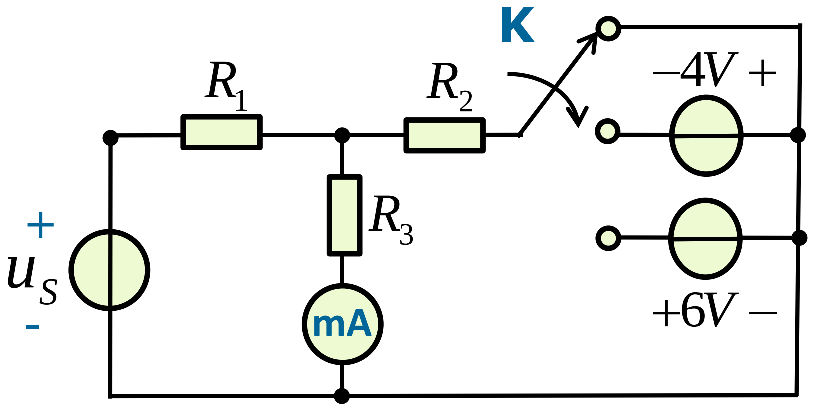


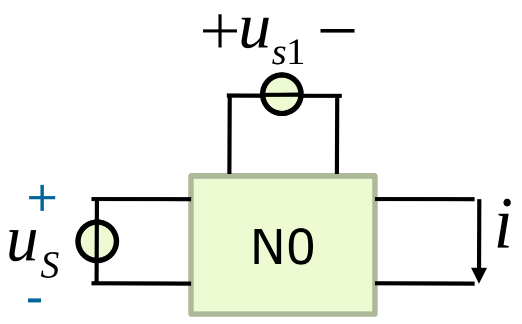


=3

$$\frac{8}{2}\times(2//2)=4V$$

4-6　如题图4-6所示电路，当开关K合在位置1时电流表读数为40mA；当K合在位置2时，电流表读数为－60mA。试求K合在位置3时电流表的读数。





解图4-6

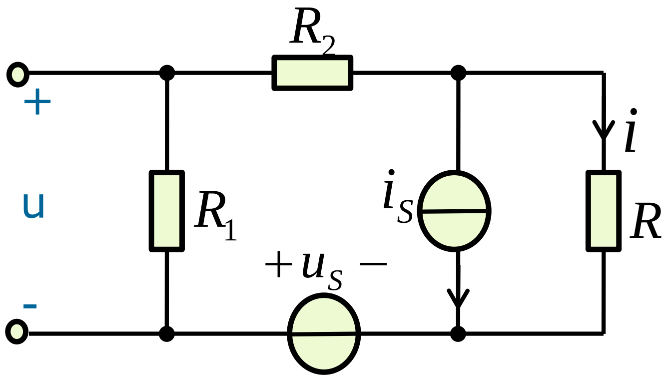
解：设N0为R1、R2和R3构成的线性无源网络，而i为电流表的读数，则有：$i = k_1 u_S + k_2 u_{S1} = 40 + 25 u_{S1}$

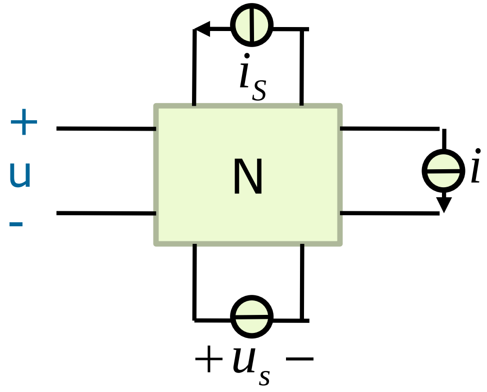
代入条件：$u_{S1} = 0V, i = 40mA; u_{S1} = -4V, i = -60mA$

则有：$\begin{cases} 40 = k_1 u_S + k_2 \times 0 \\ -60 = k_1 u_S + k_2 \times (-4) \end{cases} \Rightarrow k_2 = 25, k_1 u_S = 40$

$$\therefore i = 40 + 25 \times 6 = 190mA$$

4-8 如题图4-8所示电路，当改变电阻R值时，电路中各处电压和电流都将随之改变，已知当 $i=1A$时，$u=20V$；当$i=2A$时，$u=30V$；求当 $i=3A$ 时，电压u为多少？





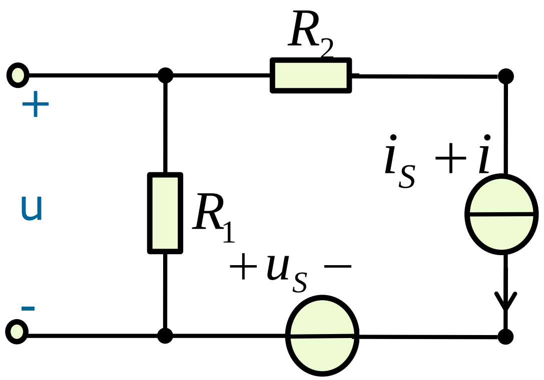
解：根据替代定理，可变电阻支路用电流源替代，根据线性网络的齐次性和叠加性，可设：

$$u = k_1 u_S + k_2 i_S + k_3 i$$

代入条件，则：$k_1 u_S + k_2 i_S + k_3 = 20$　　$\therefore k_3 = 10$

$k_1 u_S + k_2 i_S + 2k_3 = 30$　　$k_1 u_S + k_2 i_S = 10$

故当 $i=3A$ 时：　$u = 10 + 10\times 3 = 40V$



错解：根据替代定理有：

$$u = (i_S + i)R_1$$

代入条件，有：

$$(i_S + 1)R_1 = 20$$

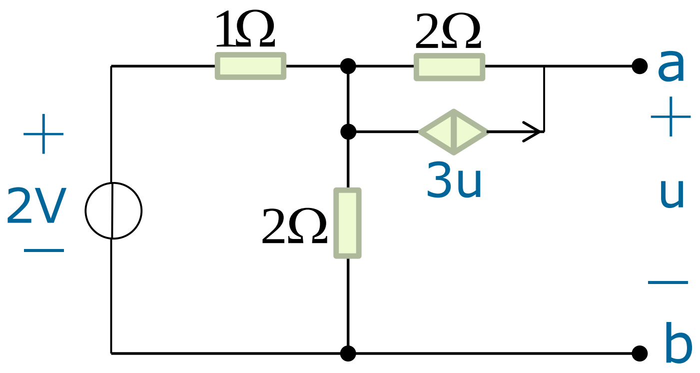
$$(i_S + 2)R_1 = 30$$

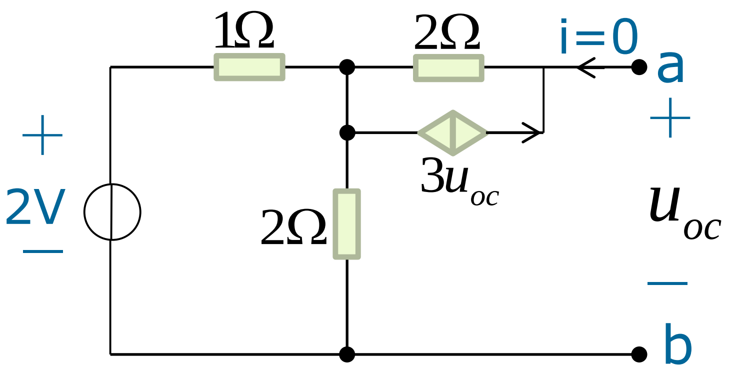
$$i_s = 1A, R_1 = 10\Omega$$

故，当 $i = 3A$

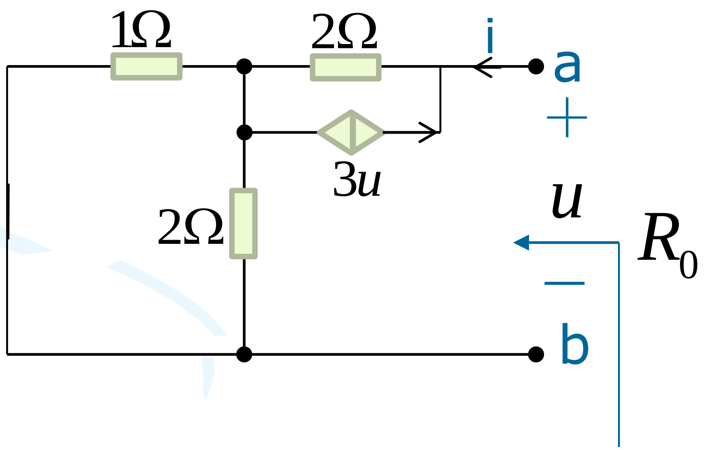
$$u = (i_S + i)R_1 = 40V$$

4-9(b). 试求题图4-9所示二端网络的戴维南等效电路。



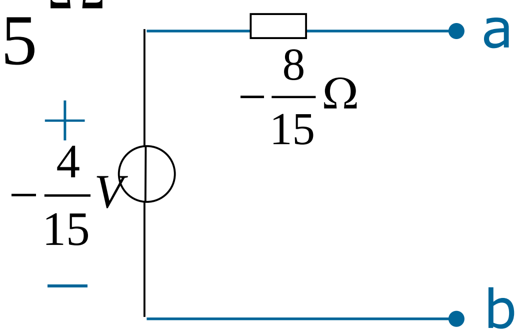


$$u_{oc} = 2\times 3u_{oc} + 2\times\frac{2}{1+2} \Rightarrow u_{oc} = -\frac{4}{15}V$$

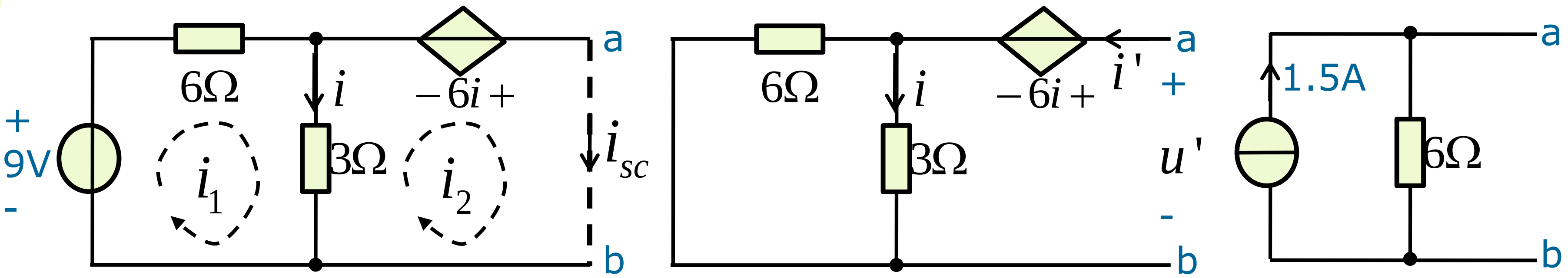


$$u = 2\times(3u+i) + \frac{1\times 2}{1+2}\times i$$

$$\therefore R_0 = \frac{u}{i} = -\frac{8}{15}\Omega$$



4-10(b)试求题图4-10所示二端网络诺顿等效电路。



解： （1）先求短路电流 i_{sc}：令端口ab短路，网孔法有：

$$\begin{cases} 9i_1 - 3i_2 = 9 \\ -3i_1 + 3i_2 = 6i \\ i = i_1 - i_2 \end{cases}$$

$$\therefore i_{sc} = i_2 = 1.5A$$

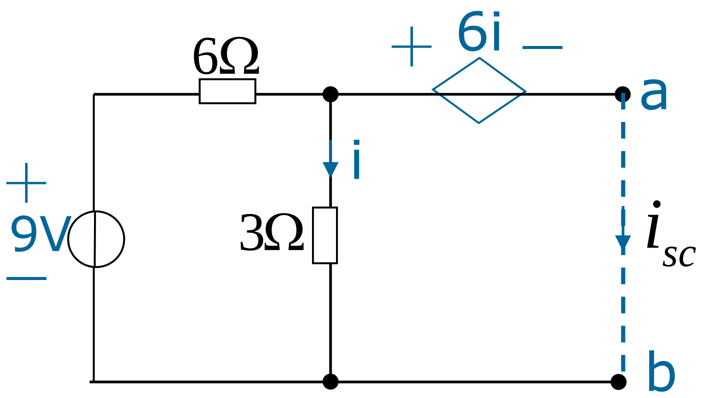
（2）求输出电阻 R_0： 令独立电压源短路：

$$\begin{cases} u' = 6i + 3i = 9i \\ i = \dfrac{6}{6+3} i' \end{cases}$$

$$\therefore u' = 9 \times \frac{6}{6+3} i' = 6i'$$

$$R_0 = 6\Omega$$

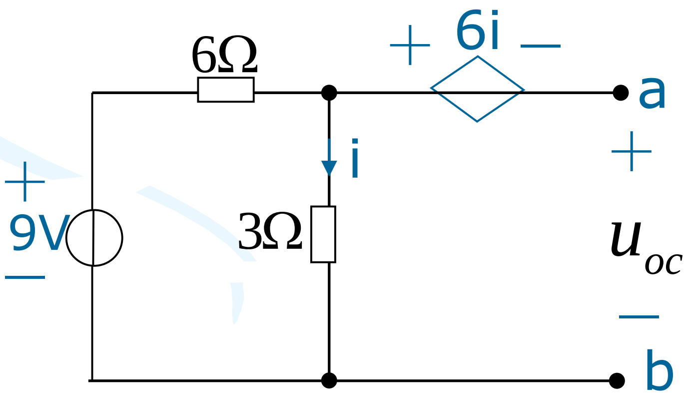
另解1：（1）先求短路电流 i_{sc} ：



$$\because 6i = -3i \qquad \therefore i = 0$$

$$\therefore i_{sc} = \frac{9}{6} = 1.5A$$

另解2：（1）先求短路电流 i_{sc} ，方向为a➔b：

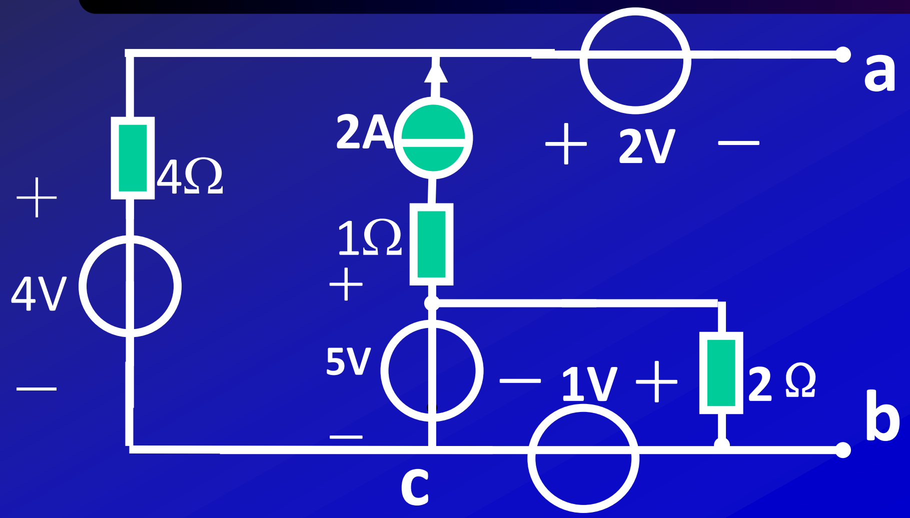


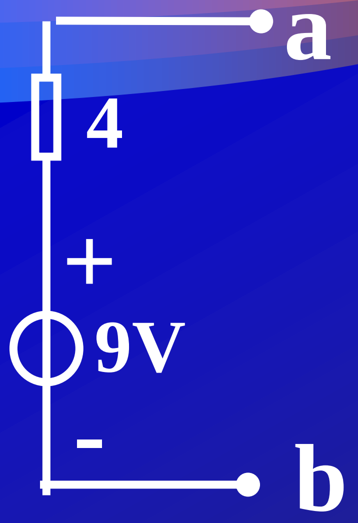
$$u_{oc} = 6i + 3i = 9i$$

$$i = \frac{9}{6+3} = 1A$$

$$\therefore i_{sc} = \frac{u_{oc}}{R_0} = 1.5A$$

化简

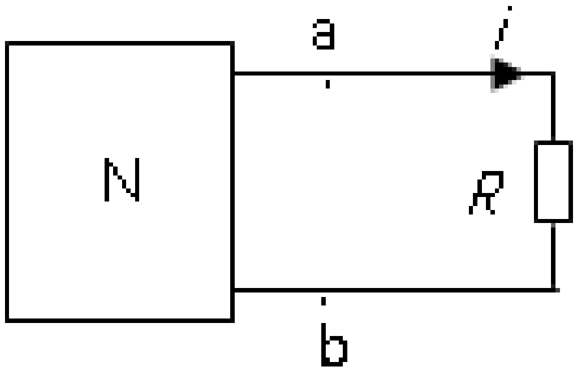




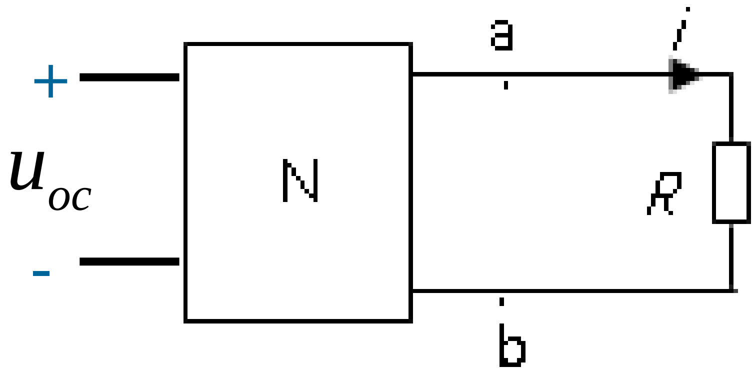
$$U_{OC} = -2 + 2 \times 4 + 4 - 1 = 9V$$

$$R_0 = 4\Omega$$

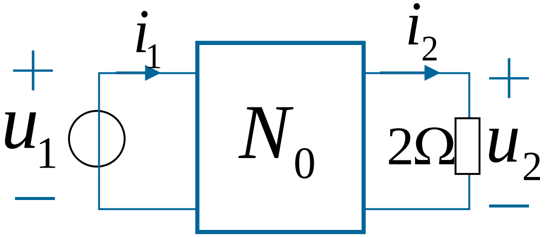
电路中N为含源线性网络，当R＝5Ω时,i =10A；当R＝15Ω时，i = 5 A ；试求R＝20Ω时，i =?



电路中N为含源线性网络，当改变外接电阻R时，电路中各处电压和电流将随之改变。当i =1A时，u_{oc}=6V；当i =2A时，u_{oc}=10V；试求当i =5A时，u_{oc}=?

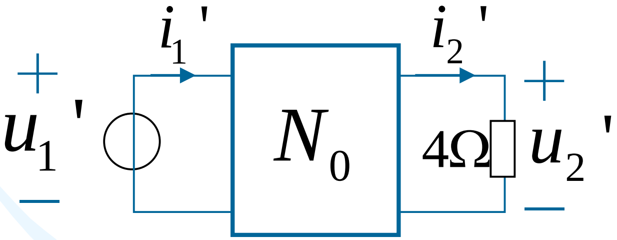


4-17　题图4-17中N_0为无源线性网络，只含电阻。当 $R_2=2\Omega, u_1=6V$时，$i_1=2A, u_2=2V$。 试求当R_2改为 $4\Omega, u_1=10V$时，测得$i_1=3A$情况下的电压u_2为多少？



解：作$R_2=4\Omega$时的电路如解图4-17：

$$\because \sum u_k i_k' = \sum u_k' i_k$$



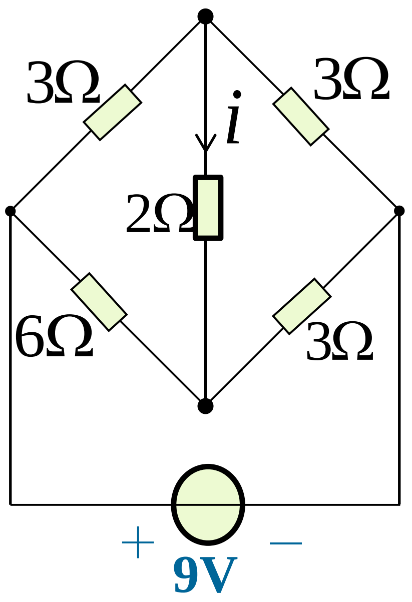
解图4-17

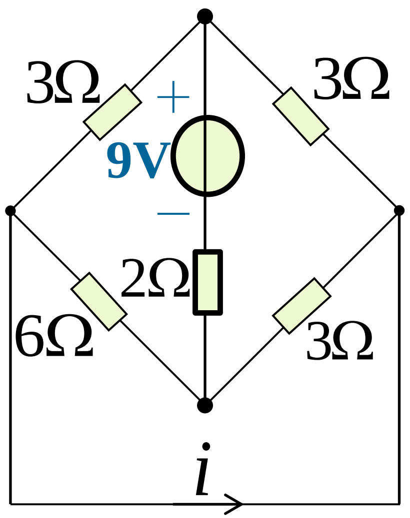
$$\therefore -u_1 i_1' + u_2 i_2' = -u_1' i_1 + u_2' i_2$$

$$\therefore -6\times 3 + 2\times i_2' = -10\times 2 + u_2'\times i_2$$

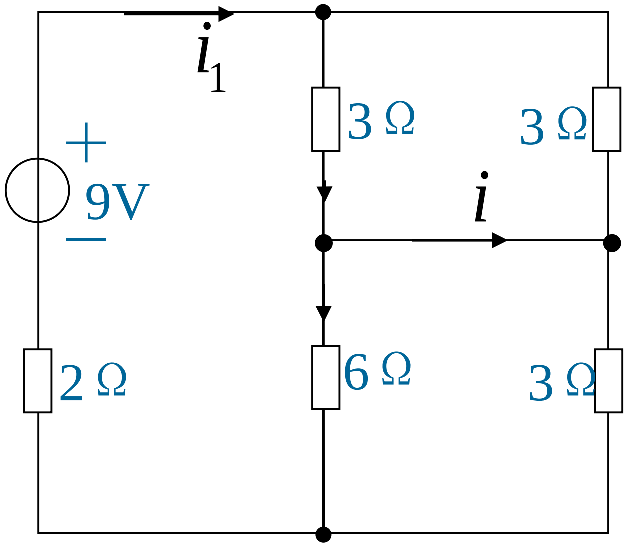
$$\because i_2' = \frac{u_2'}{4}, i_2 = \frac{u_2}{2} = 1A \qquad \therefore u_2' = 4V$$

4-18 试用互易定理求题图4-18所示电路中的电流i。





解图4-18-1

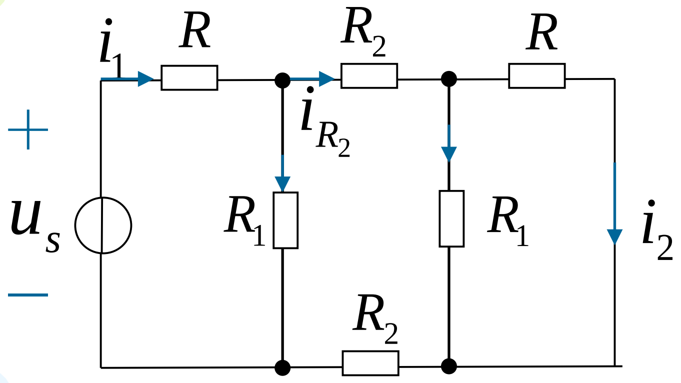


解图4-18-2

$$i_1 = \frac{9}{2+3//3+6//3} = \frac{18}{11} A$$

$$i = \frac{1}{2} i_1 - \frac{3}{6+3} i_1 - = \frac{1}{6} i_1 = \frac{3}{11} A$$

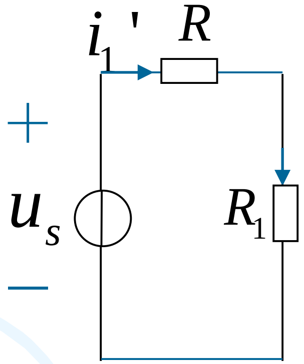
4-19 在题图4-19电路中，已知 $i_1=2A, i_2=1A$，若把电路中间的R_2支路断开，试问此时电流 i_1为多少？



解一：（1）断开前：

$$i_1-\frac{u_s-i_1R}{R_1}=i_{R_2}=i_2+\frac{i_2R}{R_1}$$

$$\therefore u_s=R_1+R$$



（2）断开后：

$$u_s=i_1'(R_1+R)$$

$$\therefore i_1'=1A$$

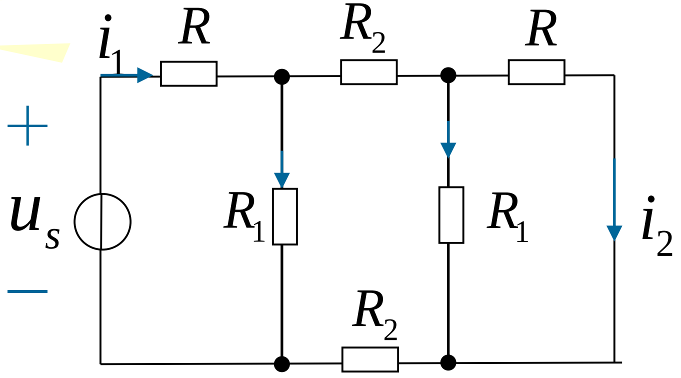


图4-19

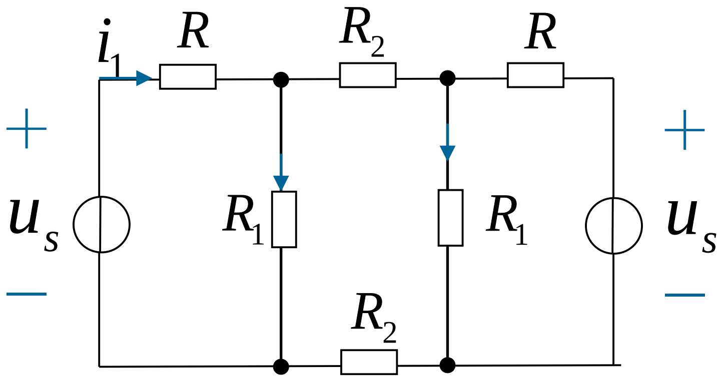


图4-19-1

解二：

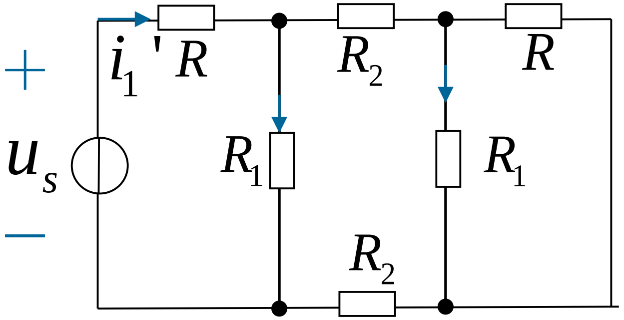


图4-19-2

求图4-19中 R_2 断开时的电流 i_1，相当于求图4-19-1中的电流 i_1，而：

$$i_1 = i_1' + i_1''$$

且已知：$i_1' = 2A$

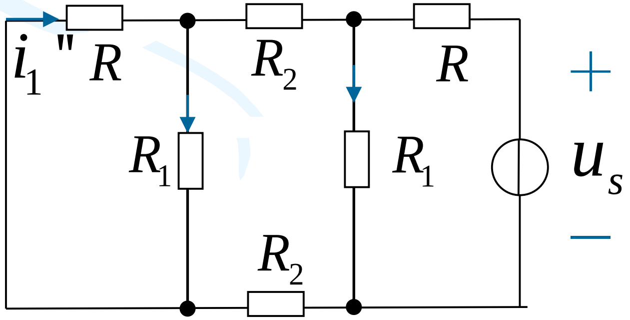


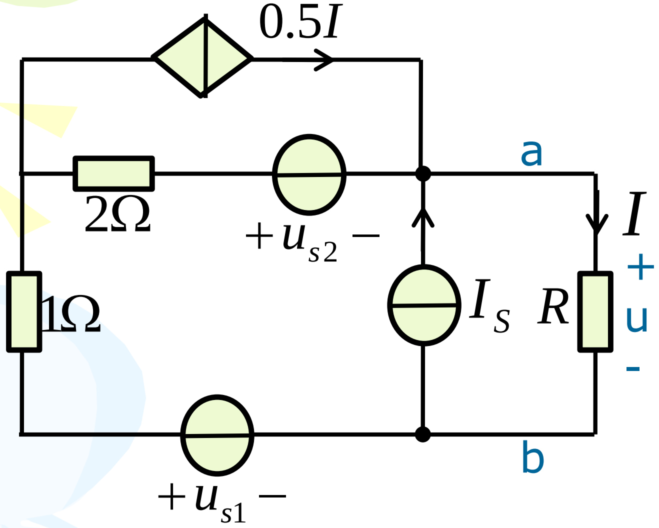
图4-19-3

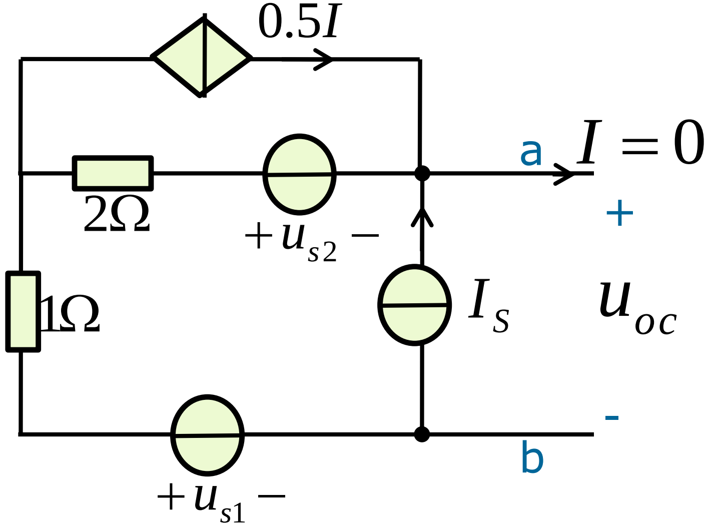
又根据互易定理形式一有：

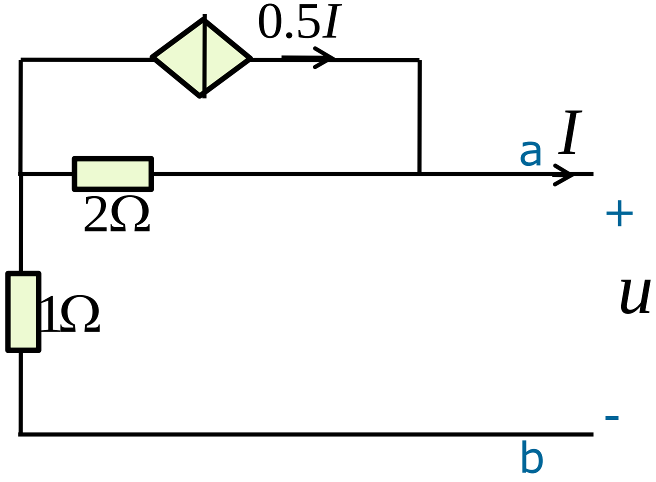
$$i_1'' = -i_2 = -1A$$

$$\therefore i_1 = i_1' + i_1'' = 1A$$

4-23 已知题图4-23中，当$U_{S1}=1V, R=1\Omega$时，$U=\frac{4}{3}V$，试求$U_{S1}=1.2V, R=2\Omega$时，$U=?$







解：将R左端电路化为戴维南等效电路。

（1）求开路电压u_{oc}

因为I=0，故受控源0.5I=0，则有：

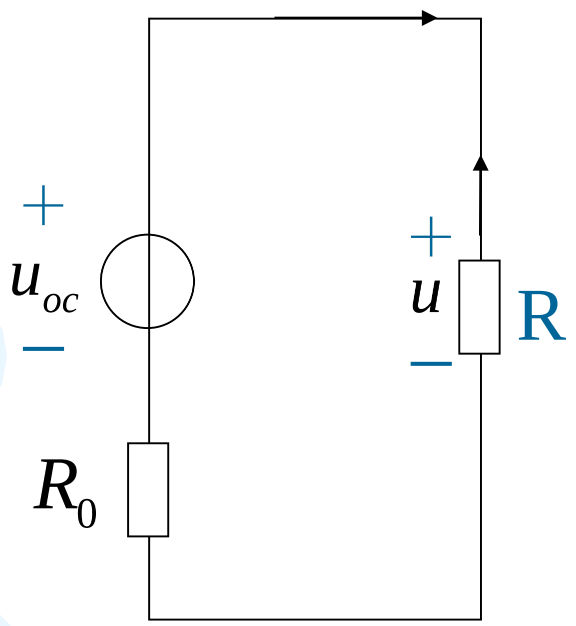
$$u_{oc}=-U_{S2}+3I_S+U_{S1}$$

(2)求输出电阻R_0

$$u=-2\times(I-0.5I)-I=-2I$$

$$R_0=-\frac{U}{I}=2\Omega$$

$$\therefore u = \frac{R}{R_0 + R} u_{oc}$$



代入 $R = 1\Omega, U_{S1} = 1V$ 时 $u = \frac{4}{3}V$，有：

$$u_{oc} = 1 - U_{S2} + 3I_S = \frac{R_0 + R}{R} u$$

$$\therefore -U_{S2} + 3I_S = 3$$

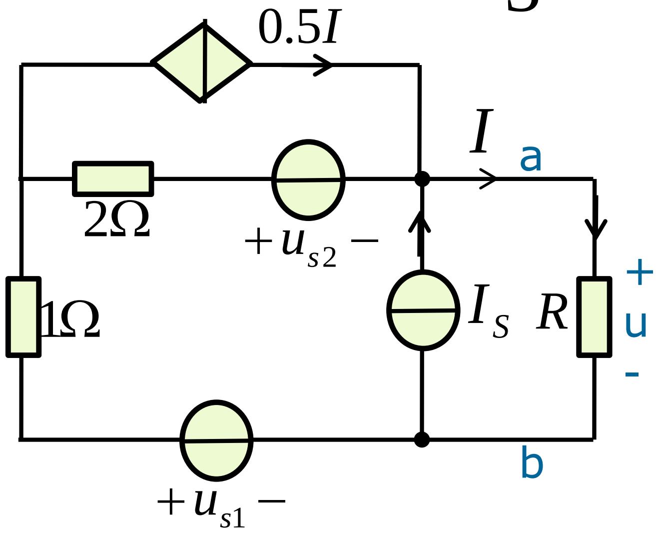
(3) 求当 $U_{S1} = 1.2V, R = 2\Omega$ **时电压u:**

$$\because u_{oc} = -U_{S2} + 3I_S + U_{S1}$$

$$\therefore U_{OC} = 4.2V$$

$$U = \frac{2}{2+2} U_{OC} = 2.1V$$

4-23 已知题图4-23中，当$U_{S1}=1V, R=1\Omega$时，$u=\dfrac{4}{3}V$，试求 $U_{S1}=1.2V, R=2\Omega$时，$u=?$



另解：

$$u-U_{S1}+1\times(I-I_s)$$
$$+2\times(I-0.5I-I_s)+U_{S2}=0$$

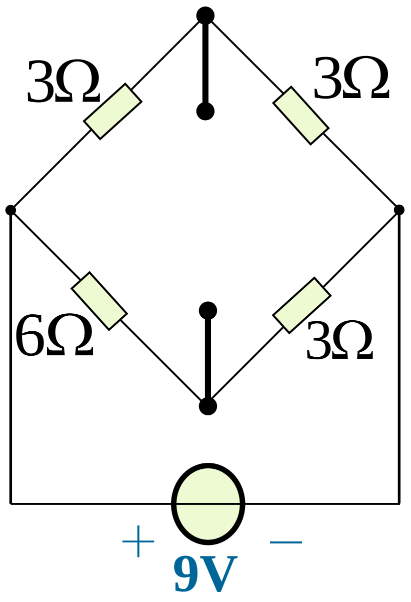
$$\therefore u-U_{S1}+2I-3I_s+U_{S2}=0=u-U_{S1}+2\cdot\frac{u}{R}-3I_s+U_{S2}$$

当$U_{S1}=1V, R=1\Omega$时，代入 $u=\dfrac{4}{3}$，有：

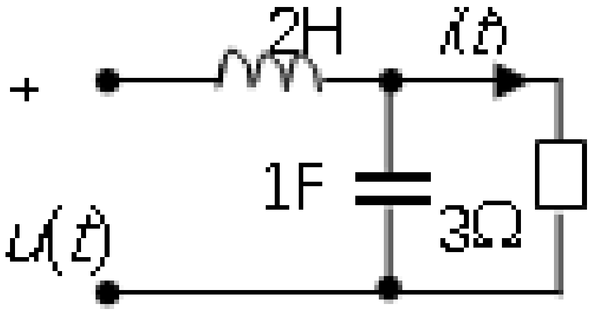
$$\therefore -U_{S2}+3I_S=3$$

再代入 $U_{S1}=1.2V, R=2\Omega$，故：$u=2.1V$

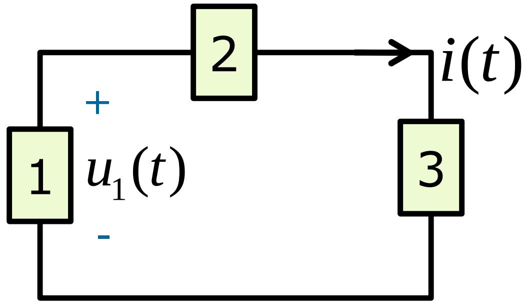
化简。



已知 $i(t)=\mathrm{e}^{-2t}A$ ，试求题图6所示电路的 。



6-8 已知题图6-8所示电路由一个电阻R、一个电感L和一个电容C组成。且其中 $i(t)=10e^{-t}-20e^{-2t}A, t\geq 0$，$u_1(t)=-5e^{-t}+20e^{-2t}V, t\geq 0$。若在t=0时电路总储能为25J，试求R、L、C的值。



解：$i_1(t)=i(t)=10e^{-t}-20e^{-2t}A, t\geq 0$

$u_1(t)=-5e^{-t}+20e^{-2t}V, t\geq 0$

由于 $u_1(t)$ 和 $\frac{du_1(t)}{dt}$ 与 $i_1(t)$ 的比值不为常数，故元件1肯定不是电阻和电容，故：

元件1是电感，且 $L=u_1(t)/\frac{di_1(t)}{dt}=0.5H$

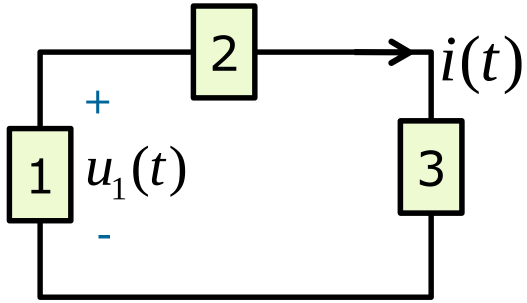
$$w_L(0)=\frac{1}{2}Li_1^{\ 2}(0)=\frac{1}{2}\times 0.5\times(10-20)^2=25J$$

又因为电路的**总储能**即：

$$w_C(0)+w_L(0)=25J$$

$$\therefore w_C(0)=0J \quad =\frac{1}{2}Cu_C{}^2(0)$$

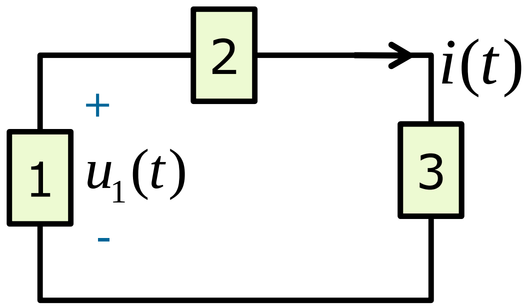
$$\therefore u_C(0)=0$$



由KVL有： $u_R(0)=-(u_1(0)+u_C(0))=-15V$

而： $u_R(0)=Ri(0)=-10R \qquad \therefore R=1.5\Omega$

$$\therefore u_R(t)=1.5i(t)=15e^{-t}-30e^{-2t}V$$



$$\therefore u_C(t) = -u_R(t) - u_1(t)$$

$$= -15e^{-t} + 30e^{-2t} - (-5e^{-t} + 20e^{-2t})$$

$$= -10e^{-t} + 10e^{-2t} V$$

$$i_C(t) = i(t) = 10e^{-t} - 20e^{-2t} A$$

$$\therefore C = i(t) / \frac{du_C(t)}{dt} = 1F$$

直流激励下三要素法求全响应的步骤

1.计算初始值$r(0^+)$(换路前电路已稳定):

(1)画$t=0^-$图，求初始状态$u_C(0^-)$或$i_L(0^-)$；

(2)由换路定则，确定$u_C(0^+)$和$i_L(0^+)$；

(3)画$t=0+$图，求响应初始值$r(0^+)$：用数值为$u_C(0^+)$的电压源替代电容或用$i_L(0^+)$ 的电流源替代电感，得直流电阻电路再计算$r(0^+)$;

2.计算稳态值$r(\infty)$(画$t=\infty$图)

根据$t>0$电路达到新的稳态，将电容用开路或电感用短路代替，得一个直流电阻电路，再对该稳态图进行直流稳态分析确定稳态值$r(\infty)$

3.计算时间常数τ (换路后令所有独立电源置0后的电路图)

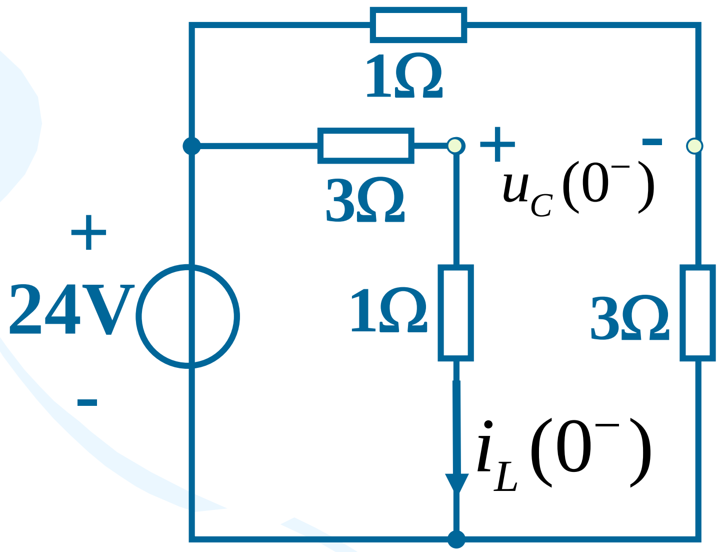
先计算与动态元件连接的电阻单口网络的输出电阻R_o，然后用$\tau=R_oC$或$\tau=L/R_o$计算时间常数。

4. 将$r(0^+)$,$r(\infty)$和 τ 代入三要素公式得到恒定激励下一阶电路全响应的一般表达式：

$$r(t)=r(\infty)+[r(0^+)-r(\infty)]\mathrm{e}^{-t/\tau},\ t>0$$

6−12 题图6-12所示电路原已稳定，开关K在t=0时打开，试求$i_C(0^+)$、$u_1(0^+)$和$\left.\frac{du_C}{dt}\right|_{t=0^+}$。

解：t<0时电路已稳定，则电容开路，电感短路，有：

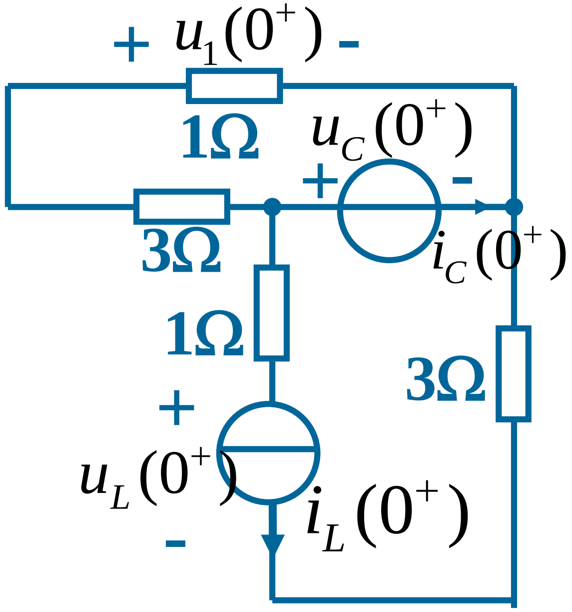


$$i_L(0^+)=i_L(0^-)=\frac{24}{1+3}=6A$$

$$u_C(0^+)=u_C(0^-)$$

$$=\frac{1}{1+3}\times 24-\frac{3}{3+1}\times 24=-12V$$

换路后：

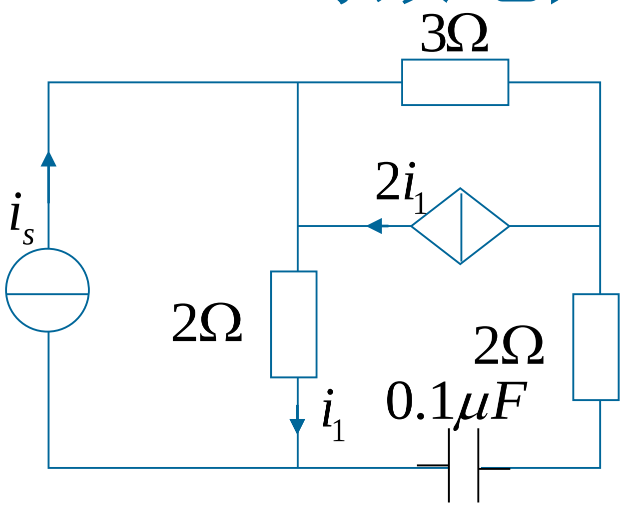


$$u_1(0^+) = \frac{1}{1+3} \times u_C(0^+) = -3V$$

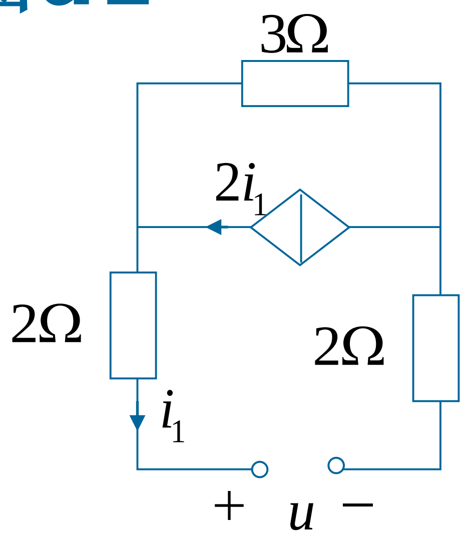
$$i_C(0^+) = -\frac{u_1(0^+)}{1} - i_L(0^+) = -3A$$

$$\left.\frac{du_C}{dt}\right|_{t=0^+} = \frac{1}{C} i_C(0^+) = -6V/s$$

6-14（d）等效电阻电路如图d1



(d)



(d1)

$$2i_1 + u + 2i_1 + 3(i_1 - 2i_1) = 0$$

$$R_0 = -\frac{u}{i_1} = 1\Omega$$

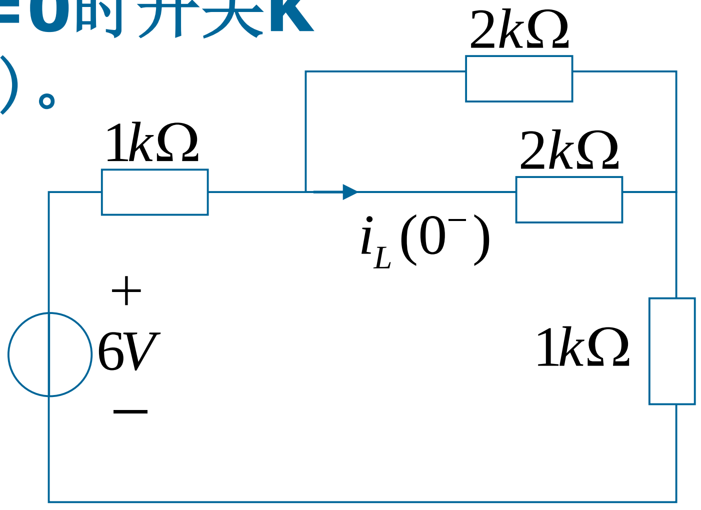
$$u = -i_1$$

$$\tau = R_0 C = 0.1\mu s$$

6-17 题图6-17所示电路原已稳定，**t=0**时开关**K**闭合，试求**t>0**时的$i_L(t)$、$i(t)$和$i_R(t)$。

解：**(1)**求$i_L(0+)$、$i(0+)$和$i_R(0+)$；

首先求$i_L(0-)$ 。换路前电感相当于短路，得0-等效电路如解图（1),由**0-**等效电路图得:

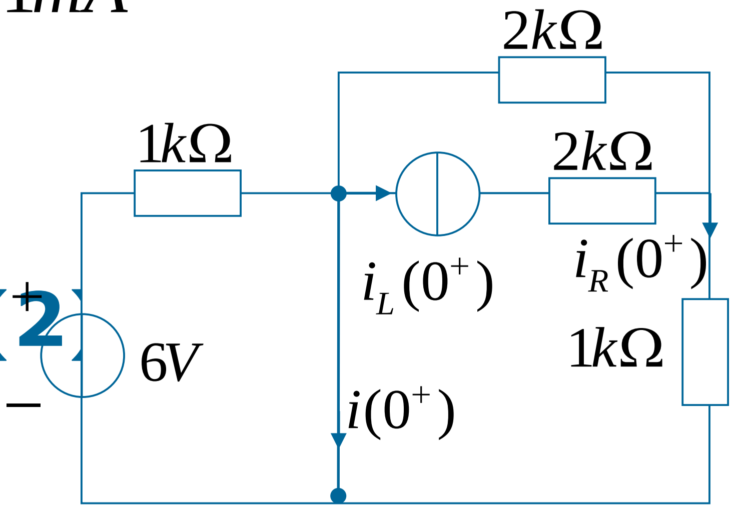


（1） 0^-图

$$i_L(0^-)=\frac{6}{(1+2//2+1)\times10^3}\bullet\frac{2}{2+2}=1mA$$

由换路定则得 $i_L(0^+)=i_L(0^-)=1mA$

作0+时刻等效电路如解图**5-17(2)**



（2） 0^+图

$$i_R(0^+)=i_L(0^+)\times\frac{2}{2+1}=\frac{2}{3}mA$$

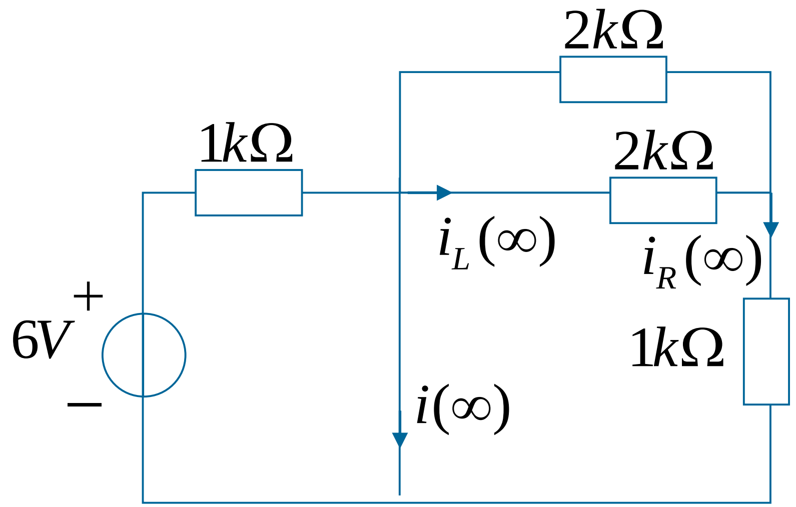
$$i(0^+)=\frac{6}{10^3}-i_R(0^+)=6\times10^{-3}-\frac{2}{3}\times10^{-3}=\frac{16}{3}mA$$

(2)求$i_L(\infty)$、$i(\infty)$和$i_R(\infty)$

$t \to \infty$时电路达到新的稳定，电感相当于短路，得：

$$i_L(\infty) = 0 \qquad i_R(\infty) = 0$$

$$i(\infty) = \frac{6}{10^3} = 6mA$$

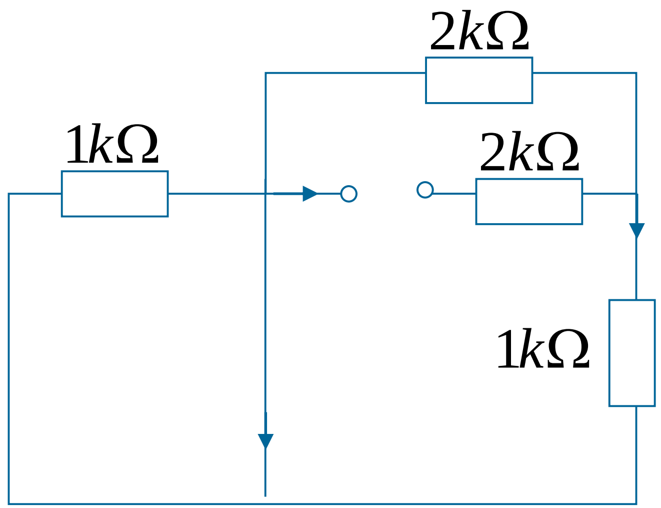


(3) ∞图

(3)求τ

$$R_{eq} = (2 + 2 // 1) \times 10^3 = \frac{8}{3} \times 10^3 \Omega$$

$$\tau = \frac{L}{R_{eq}} = \frac{3}{4} ms$$



(4） 等效电阻电路

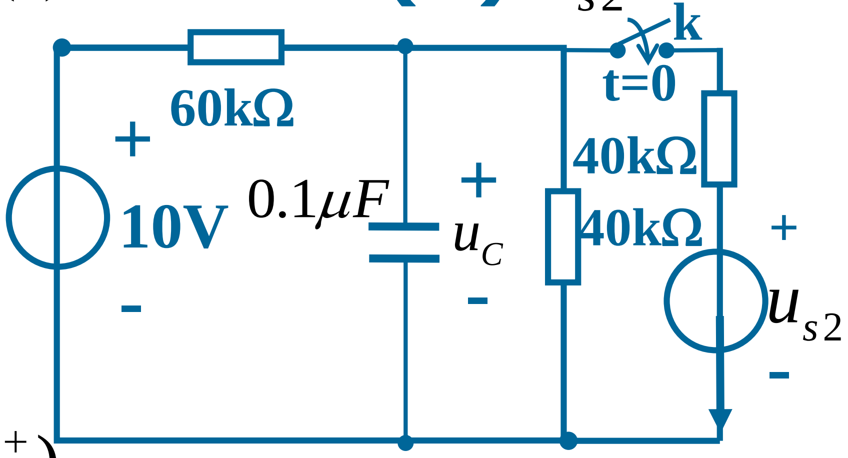
(4)求 $i_L(t), i(t)$和$i_R(t)$ 由三要素公式:

$$i_L(t) = i_L(\infty) + \left[i_L(0^+) - i_L(\infty) \right] e^{-\frac{t}{\tau}} = e^{-\frac{4}{3}\times 10^3 t} mA, t \geq 0$$

$$i(t) = i(\infty) + \left[i(0^+) - i(\infty) \right] e^{-\frac{t}{\tau}} = 6 - \frac{2}{3} e^{-\frac{4}{3}\times 10^3 t} mA, t > 0$$

$$i_R(t) = i_R(\infty) + \left[i_R(0^+) - i_R(\infty) \right] e^{-\frac{t}{\tau}} = \frac{2}{3} e^{-\frac{4}{3}\times 10^3 t} mA, t > 0$$

6–26 题图6-26所示电路原已稳定，在**t=0**时开关**K**闭合。试求**(1)** $u_{s2}=6V$时的$u_C(t)$，**t>0**；**(2)** $u_{s2}=?$时，换路后不出现过渡过程。

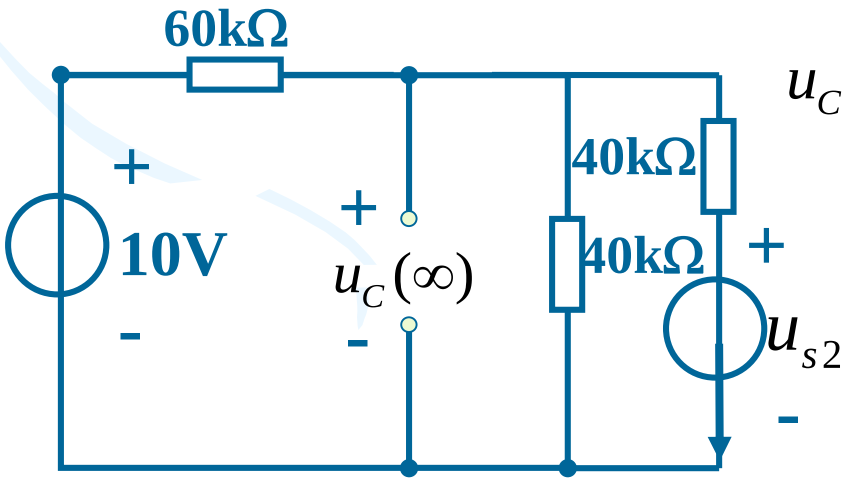


解：先求 $u_C(t)$：

t<0时电路已稳定，则电容开路，有：

$$u_C(0^-)=\frac{40}{60+40}\times 10=4V=u_C(0^+)$$

$t\to\infty$时电路已稳定，则电容开路，用叠加法求 $u_C(\infty)$：



$$u_C(\infty)=\frac{40//40}{40//40+60}\times 10+\frac{60//40}{60//40+40}\times u_{s2}$$

$$=\frac{10}{4}+\frac{3}{8}u_{s2}$$

$$R_0=40//40//60=15k\Omega$$

$$\therefore \tau=R_0C=15\times 10^3\times 0.1\times 10^{-6}=1.5ms$$

$$u_C(t)=u_C(\infty)+[u_C(0^+)-u_C(\infty)]e^{-\frac{t}{\tau_C}}$$

$$=\frac{10}{4}+\frac{3}{8}u_{s2}+(4-\frac{10}{4}-\frac{3}{8}u_{s2})e^{-\frac{2}{3}\times 10^{-3}t}$$

(1) $u_{s2}=6V$ **时：**

$$u_C(t)=\frac{10}{4}+\frac{3}{8}\times 6+(4-\frac{10}{4}-\frac{3}{8}\times 6)e^{-\frac{2}{3}\times 10^{-3}t}$$

$$=4.75-0.75e^{-\frac{2}{3}\times 10^{3}t},t\geq 0$$

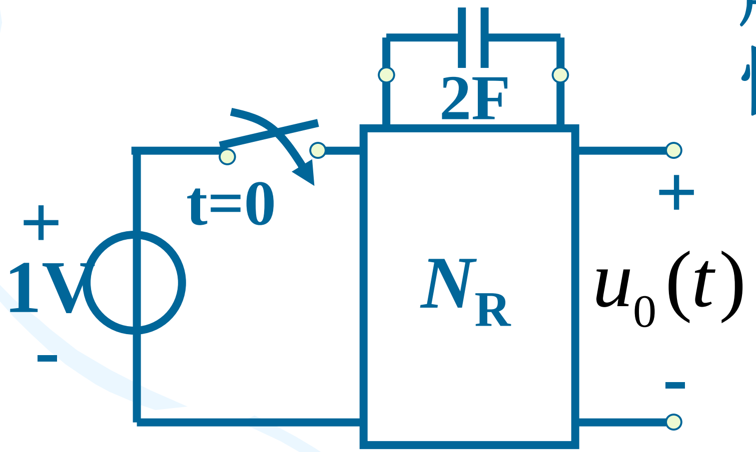
(2) 若要换路后不出现过渡过程，则：

$$4-\frac{10}{4}-\frac{3}{8}u_{s2}=0 \qquad \therefore u_{s2}=4V$$

6–30 题图6-30所示电路中，N_R为线性电阻网络，开关**K**在**t=0**时闭合，已知输出端的零状态响应为

$$u_0(t)=\frac{1}{2}+\frac{1}{8}e^{-0.25t}V,t>0$$

若电路中的电容换为**2H**的电感，试求该情况下输出端的零状态响应。



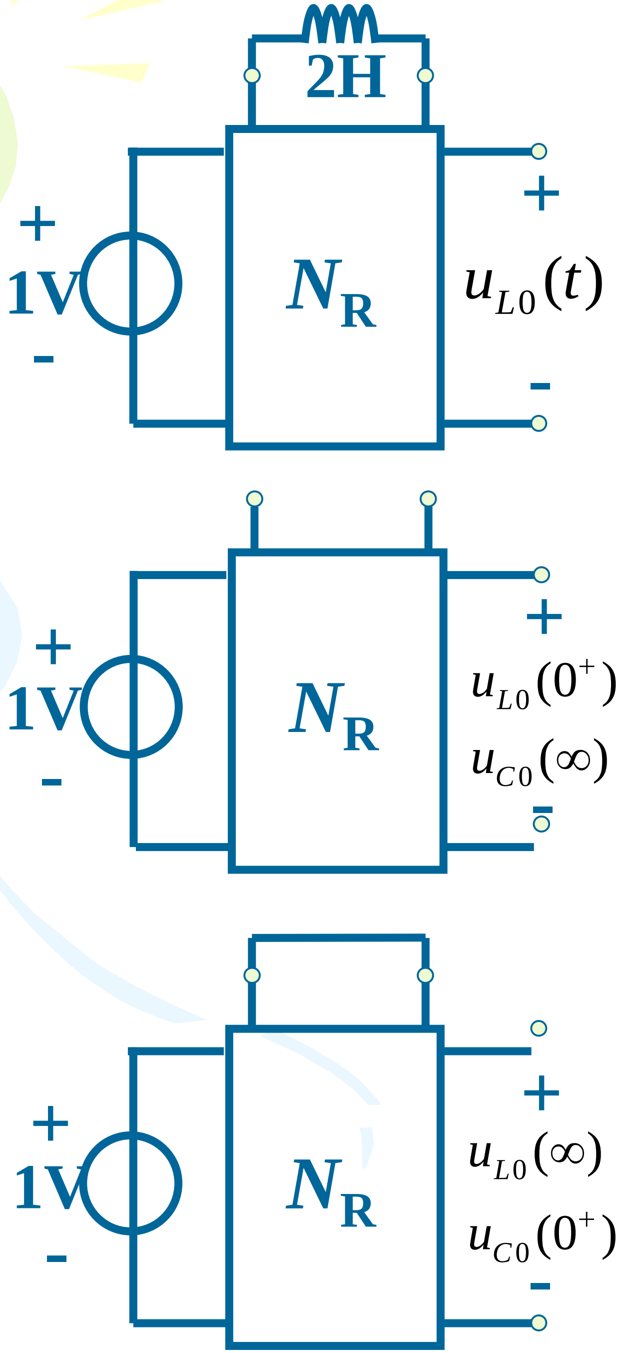
解：是一个直流激励的一阶**RC**线性网络，故应用三要素法：

$$u_{C0}(t)=\frac{1}{2}+\frac{1}{8}e^{-0.25t}V$$

$$=u_{C0}(\infty)+[u_{C0}(0^+)-u_{C0}(\infty)]e^{-\frac{t}{\tau_C}}$$

故有：$u_{C0}(\infty)=\frac{1}{2}V,u_{C0}(0^+)=u_{C0}(\infty)+\frac{1}{8}=\frac{5}{8}V$

$$\tau_C=R_0C=4s\Rightarrow R_0=2\Omega$$



应用三要素法求电感电路输出端的零状态响应：

1)求初始值 $u_{L0}(0^+)$：

它是$i_L(0^+)=0$ 即电感开路时输出端的零状态响应，与电容电路达到稳态即电容开路时的情况一样，故：

$$u_{L0}(0^+)=u_{C0}(\infty)=\frac{1}{2}V$$

2)求稳态值 $u_{L0}(\infty)$：

它是接电感的电路稳态即电感短路时输出端的零状态响应，与电容电路在$u_C(0^+)=0$即电容短路时的情况一样，故：

$$u_{L0}(\infty)=u_{C0}(0^+)=\frac{5}{8}V$$

3)求时间常数τ_L：

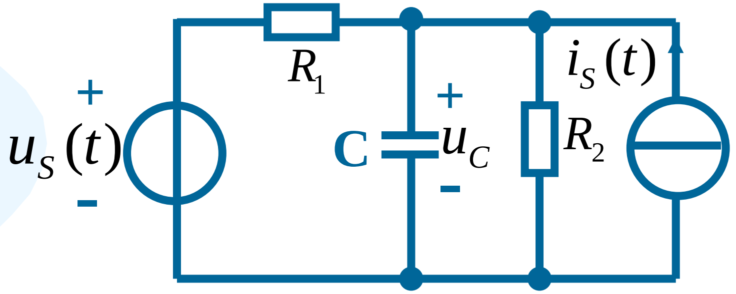
$$\tau_L = \frac{L}{R_0} = 1s$$

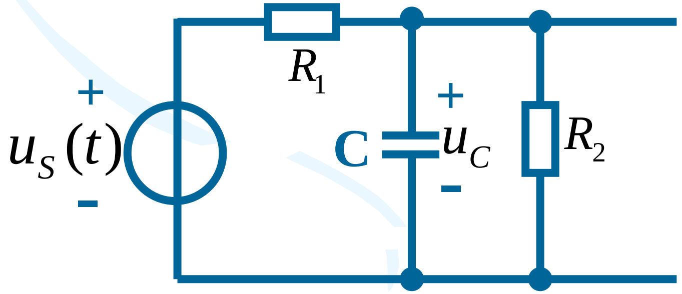
4) 写出电感电路的零状态响应：

$$u_{L0}(t) = u_{L0}(\infty) + [u_{L0}(0^+) - u_{L0}(\infty)]e^{-\frac{t}{\tau_L}}$$

$$= \frac{5}{8} - \frac{1}{8}e^{-t}V, t > 0$$

6-32 题图6-32所示电路中，已知当$u_S(t)=\varepsilon(t)V, i_S(t)=0$ 时 $u_C(t)=2e^{-2t}+\frac{1}{2}V, t>0$；当$i_S(t)=\varepsilon(t)A, u_S(t)=0$ 时，$u_C(t)=\frac{1}{2}e^{-2t}+2V, t>0$。求(1) R_1、R_2 和C；(2)$u_S(t)=\varepsilon(t)V$, $i_S(t)=\varepsilon(t)A$ 时电路$u_C(t)$的全响应。





解：1)当 $u_S(t)=\varepsilon(t)V, i_S(t)=0$时：

$$u_C(t)=2e^{-2t}+\frac{1}{2}V$$

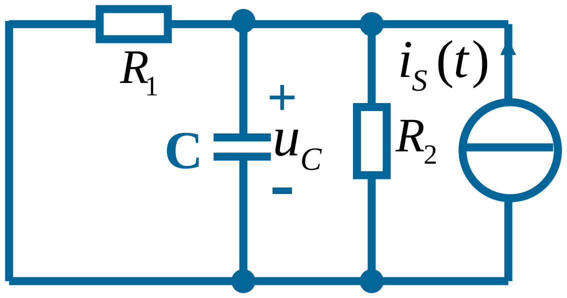
$$=u_C(\infty)+[u_C(0^+)-u_C(\infty)]e^{-\frac{t}{\tau}}$$

$$\therefore u_C(\infty)=\frac{1}{2}, u_C(0^+)=2+u_C(\infty)=\frac{5}{2}$$

故：$u_{Czi}(t)=\frac{5}{2}e^{-2t}V$

$$u_{Czs1}(t)=\frac{1}{2}[1-e^{-2t}]V$$

而$u_C(\infty)=\frac{R_2}{R_1+R_2}\times 1=\frac{1}{2}\Rightarrow R_1=R_2$



当 $i_S(t)=\varepsilon(t)A, u_S(t)=0$时：

$$u_C(t)=\frac{1}{2}e^{-2t}+2V, t>0$$

$$=u_C(\infty)+[u_C(0^+)-u_C(\infty)]e^{-\frac{t}{\tau}}$$

$$\therefore u_C(\infty)=2, \quad u_C(0^+)=\frac{1}{2}+u_C(\infty)=\frac{5}{2}$$

故：$u_{Czi}(t)=\frac{5}{2}e^{-2t}V,$ $\quad u_{Czs2}(t)=2[1-e^{-2t}]V$

而$u_C(\infty)=\frac{R_1R_2}{R_1+R_2}\times 1=2$ 　且 $R_1=R_2$ 　$\therefore$ $R_1=R_2=4\Omega$

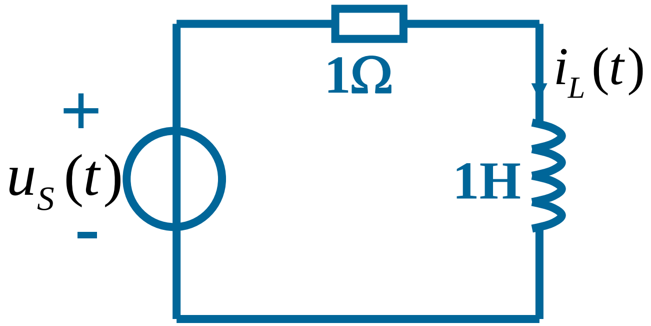
而 $\quad \tau=(R_1//R_2)C=\frac{1}{2} \quad \Rightarrow C=\frac{1}{4}F$

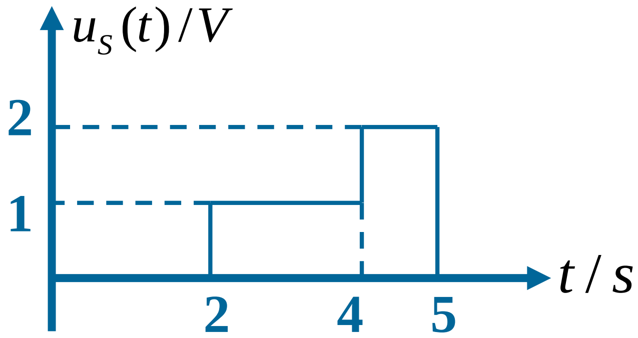
2)当 $u_S(t)=\varepsilon(t)V, i_S(t)=\varepsilon(t)A$ **时：**

$$u_C(t)=u_{Czi}(t)+u_{Czs1}(t)+u_{Czs2}(t)$$

$$=\frac{5}{2}e^{-2t}+\frac{1}{2}[1-e^{-2t}]+2[1-e^{-2t}]=\frac{5}{2}\text{V}, \quad t\geq 0$$

6-33 题图6-33(a)电路中，已知 $i_L(0^-)=1A$，其$u_S(t)$波形如图(b)所示，试求 $i_L(t)$。





1）求零输入响应：

由换路定则可知：$i_L(0^+)=i_L(0^-)=1A,$

$$\tau=1s \qquad \therefore i_{Lzi}(t)=e^{-t}A, t\geq 0$$

2）求零状态响应：

当 $u_S(t)=\varepsilon(t)$ 时， $S_{i_L}(\infty)=1A;\quad \therefore S_{i_L}(t)=(1-e^{-t})\varepsilon(t)$

当 $u_S(t)=\varepsilon(t-2)+\varepsilon(t-4)-2\varepsilon(t-5)$ 时，

$$\therefore i_{Lzs}(t)=[1-e^{-(t-2)}]\varepsilon(t-2)+[1-e^{-(t-4)}]\varepsilon(t-4)-2[1-e^{-(t-5)}]\varepsilon(t-5)$$

3）求全响应：

$$\therefore i_L(t) = i_{Lzi}(t) + i_{Lzs}(t)$$

$$= e^{-t} + [1 - e^{-(t-2)}]\varepsilon(t-2) + [1 - e^{-(t-4)}]\varepsilon(t-4) - 2[1 - e^{-(t-5)}]\varepsilon(t-5)A$$

$$, t \geq 0$$