（科目：　　）**数　学　作　业　纸**

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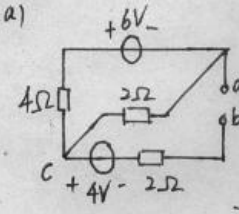
1-10

(a)



$U_{ab}=U_{ac}+U_{cb}$

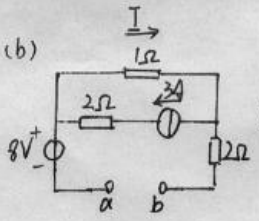
$U_{ac}=-\frac{6V}{4\Omega+2\Omega}\times 2\Omega$

$=-2V$

$U_{cb}=4V$

$\therefore U_{ab}=2V$

(b)

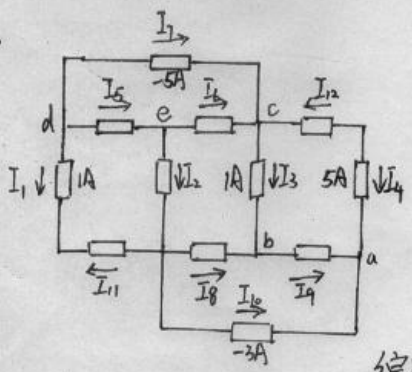


$I=3A$

$U_{ab}=-8V+3A\cdot 1\Omega$

$=-5V$

1-13



已知 $I_1=1A$　$I_3=1A$　$I_4=5A$　$I_7=-5A$　$I_{10}=-3A$

$I_{12}=-I_4=-5A$　$I_{11}=-I_1=-1A$

节点a，由KCL　$I_4+I_9+I_{10}=0 \Rightarrow I_9=-2A$

节点b，由KCL　$I_3+I_8=I_9 \Rightarrow I_8=-3A$

节点c，由KCL　$I_6+I_7+I_{12}=I_3 \Rightarrow I_6=11A$

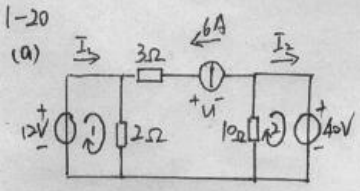
节点d，由KCL　$0=I_1+I_5+I_7 \Rightarrow I_5=4A$

节点e，由KCL　$I_5=I_2+I_6 \Rightarrow I_2=-7A$

综上　$I_2=-7A$　$I_5=4A$　$I_6=11A$　$I_8=-3A$　$I_9=-2A$　$I_{11}=-1A$　$I_{12}=-5A$

1-20

(a)

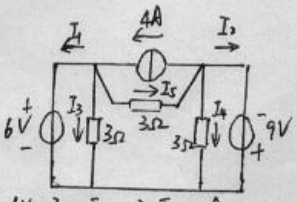


KVL：$12V=(I_1+6A)\cdot 2\Omega \Rightarrow I_1=0$

KVL：$40V=-10\Omega\times(6A+I_2) \Rightarrow I_2=-10A$

KVL：$12V+6A\times 3\Omega-U-40V=0 \Rightarrow U=-10V$

(b)



KVL：$6V=3\Omega\cdot I_3 \Rightarrow I_3=2A$

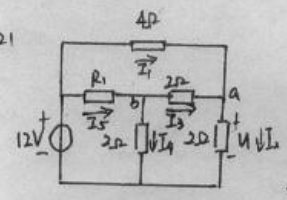
KVL：$-9V=3\Omega\cdot I_4 \Rightarrow I_4=-3A$

KVL：$6V+9V=I_5\cdot 3\Omega \Rightarrow I_5=5A$

KCL：$4A=I_1+I_3+I_5 \Rightarrow I_1=-3A$

KCL：$I_5=I_2+I_4+4A \Rightarrow I_2=4A$

1-21



KVL：$12V=4\Omega\cdot I_1+U \Rightarrow I_1=1.5A$

$I_2=\frac{U}{2\Omega}=3A$

节点a KCL：$I_1+I_3=I_2 \Rightarrow I_3=1.5A$

KVL：$2\Omega\cdot I_4=2\Omega\cdot I_3+2\Omega\cdot I_2 \Rightarrow I_4=4.5A$

节点b KCL：$I_5=I_3+I_4 \Rightarrow I_5=6A$

$R_{eq}=\frac{12V}{I_1+I_5}=1.6\Omega$

$R_1=\frac{12V-2\Omega\cdot I_3-2\Omega\cdot I_2}{I_5}=0.5\Omega$

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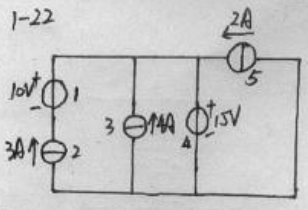
1-22



$P_1 = 10V \cdot 3A = 30W$（发出）

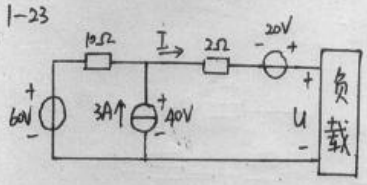
$P_2 = (15V - 10V) \cdot 3A = 15W$（发出）

$P_3 = 15V \cdot 4A = 60W$（发出）

$P_4 = 15V \cdot (-2A - 4A - 3A) = -135W$（发出）

$P_5 = 15V \cdot 2A = 30W$（发出）

1-23

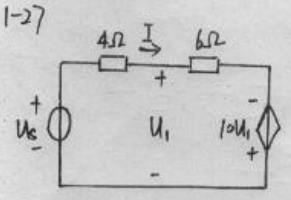


$I = 3A + \frac{60V - 40V}{10\Omega} = 5A$

$U = 40V + 20V - 2\Omega \cdot I = 50V$

$P = 50V \times 5A = 250W$（吸收）

1-27



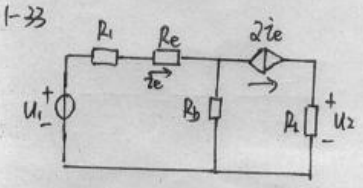
KVL：$U_S + 10U_1 = I \cdot (4\Omega + 6\Omega)$

$U_1 = I \cdot 6\Omega - 10U_1$

$\Rightarrow \frac{U_S}{I} = \frac{50}{11}\Omega = 4.56\Omega$

$R_{eq} = 4.56\Omega$

1-33

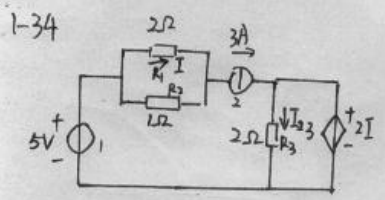


KVL：$U_1 = i_e(R_1 + R_e) + (1-\alpha)i_e \cdot R_b \Rightarrow i_e = \frac{U_1}{70}$

$U_2 = R_L \cdot 2i_e = 21U_1 \quad \therefore \frac{U_2}{U_1} = 21$

$\frac{P_2}{P_1} = \frac{U_2}{U_1} \cdot \frac{I_2}{I_1} = 21 \cdot \frac{2i_e}{i_e} = 20.58$

1-34



$P_1 = 5V \cdot 3A = 15W$（发出）

$I = \frac{3A}{1\Omega + 2\Omega} \cdot 1\Omega = 1A$

$P_{R_1} = I^2 R_1 = 2W$（吸收）

$P_{R_2} = (3A - I)^2 R_2 = 4W$（吸收）

$U_3 = 2I = 2V$

$I_2 = \frac{U_3}{R_3} = 1A$

$P_{R_3} = I_2^2 R_3 = 2W$（吸收）

$P_2 = (5V - U_3 - R_1 \cdot I) \cdot (-3A) = -3W$（发出）

$P_3 = U_3 \cdot (I_2 - 3A) = -4W$（发出）

功率守恒：

$P_{发} = 15W - 3W - 4W = 8W = 2W + 4W + 2W = P_{吸}$

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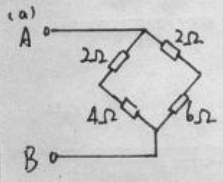
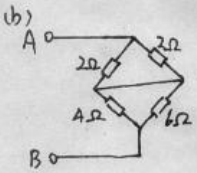
2-1

(a)



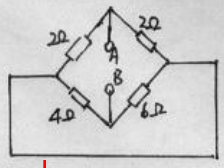
$R_{AB}=(2\Omega+4\Omega)//(2\Omega+6\Omega)=3.43\Omega$

(b)



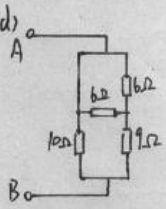
$R_{AB}=(2\Omega//2\Omega)+(4\Omega//6\Omega)$
$=3.4\Omega$

(c)



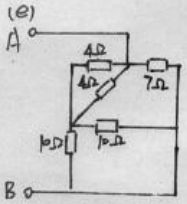
电路为b一致
$R_{AB}=3.43\Omega$ 3.4Ω

(d)



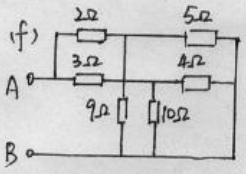
$R_{AB}=10\Omega//(9\Omega+(6\Omega//6\Omega))$
$=5.5\Omega$ 5.45Ω

(e)



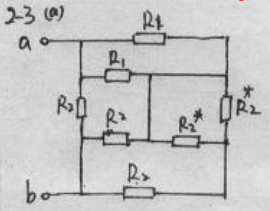
$R_{AB}=7\Omega//((4\Omega//4\Omega)+(10\Omega//10\Omega))$
$=3.5\Omega$

(f)



$R_{AB}=(2+9//5)//(3+10//4)$
$=2.76\Omega$

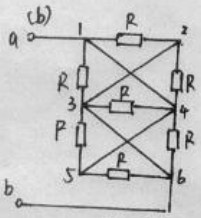
2-3 (a)



两个R_1并联，*标出两个R_2并联

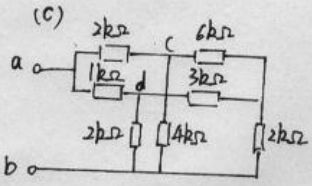
$R_{ab}=R_2//(\frac{1}{2}R_1+(R_2//(R_2+\frac{1}{2}R_2)))$
$=\frac{R_2(0.6R_2+0.5R_1)}{0.5R_1+1.6R_2}$

(b)



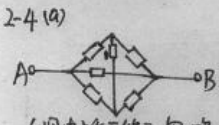
∵1,4,5点短接
2,3,6点短接
∴六个电阻并联
$R_{ab}=\frac{1}{7}R=0.143R$

(c)



利用Y-Δ变换，对c,d节点进行变换
$R_{ab}=(\frac{22}{3}//\frac{11}{3})//((11//\frac{11}{2})+(11//2//22))$
$=1.67k\Omega$

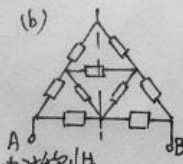
2-4 (a)



利用电桥平衡，忽略电阻1

$R_{AB}=2//2//1=0.5\Omega$

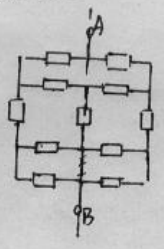
(b)



由对称性

$R_{AB}=2\cdot(1//(1+(1//1//0.5)))$
$=1.11\Omega$

(c)



由对称性

$R_{AB}=\frac{1}{2}\cdot(1+1+(1//(1+1+2)))$
$=1.4\Omega$

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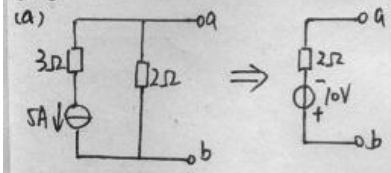
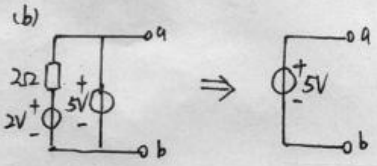
2-6

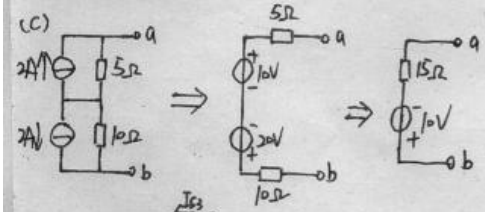
(a)



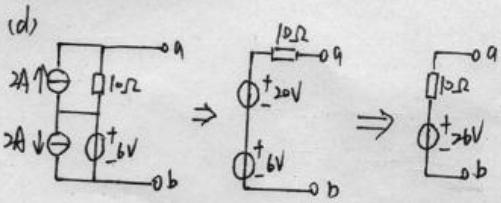
(b)



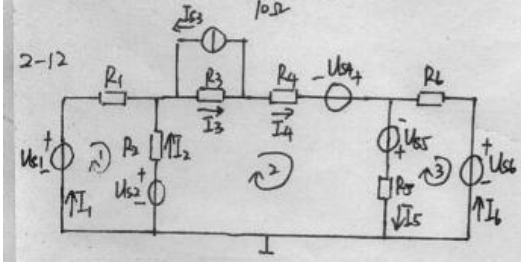
(c)



(d)



2-12



列方程求解：

由KCL有 $I_1+I_2=I_3-I_{S3}=I_4=I_5-I_6$

由KVL有 1: $U_{S1}-I_1R_1+I_2R_2-U_{S2}=0$

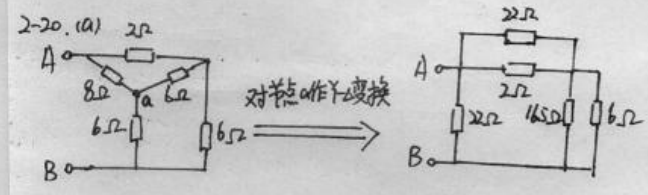
2: $U_{S2}-I_2R_2-I_3R_3-I_4R_4+U_{S4}+U_{S5}-I_5R_5=0$

3: $I_5R_5-U_{S5}+I_6R_6-U_{S6}=0$

6个方程，6个未知数

$\Rightarrow I_1=1.2A$　$I_2=0.4A$　$I_3=11.6A$　$I_4=1.6A$　$I_5=4.55A$　$I_6=2.95A$

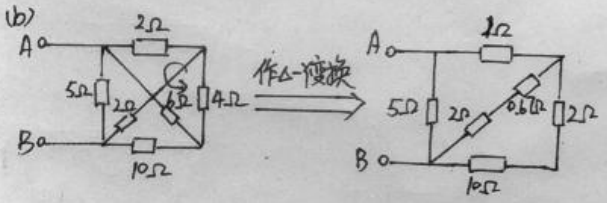
2-20. (a)



$\therefore R_{AB}=22//((22//2)+(16.5//6))$

$=4.86\Omega$

(b)



$\therefore R_{AB}=5//(1+2.67//12)=1.94\Omega$

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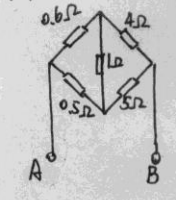
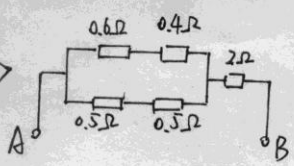
(c)

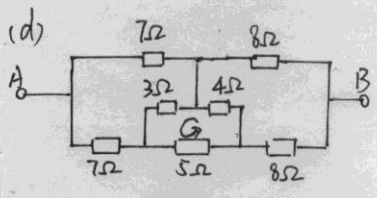


对右侧作Δ-Y变换

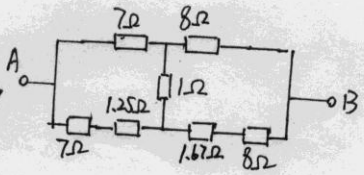


$R_{AB}=2+(1//1)=2.5\Omega$

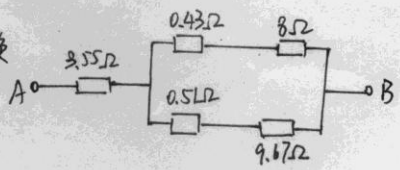
(d)



Δ-Y变换



左侧Δ-Y变换



$R_{AB}=3.55+(8.43//10.18)=8.16\Omega$