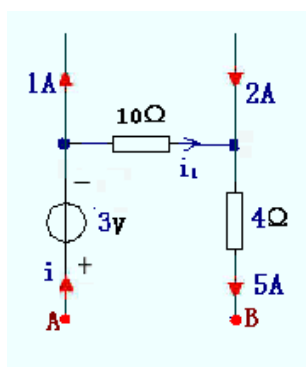
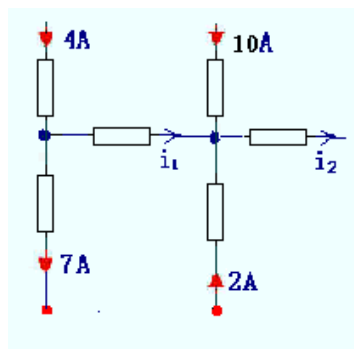


第一章 电路的基本概念与定律

1-1 求图题 1-1 所示电路中的未知电流。



(a)

(b)

图题 1-1

解

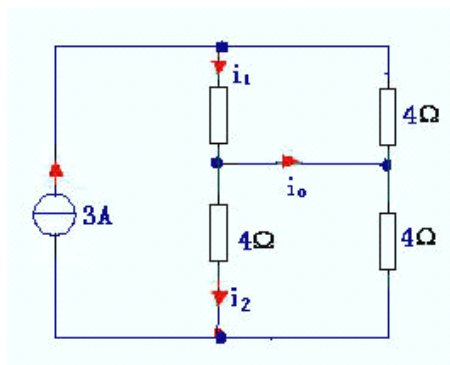
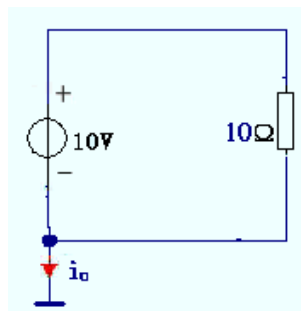
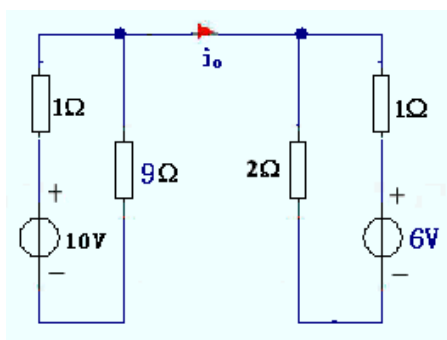
$$(a) \because -4 + 7 + i_1 = 0 \quad i_1 = -3A \quad i_2 = 9A$$

$$(b) \because -i_1 + 5 - 2 = 0 \quad \text{且} \quad \because i_1 + 1 - i = 0$$

$$\text{又} \because 3 + 10i_1 + 4 \times 5 = U_{AB}$$

$$i_1 = 3A \quad i_1 = 4A$$

1-2 求图题 1-2 所示电路中的电流 i_0 。



(a)

(b)

(c)

图题 1-2

解

图 (a) (b) : 由广义节点的 KCL 方程得: $i_o = 0$

图 c:

$$i_2 = \frac{4}{4+4} \times 3 = 1.5A$$

$$i_1 = \frac{4}{2+4} \times 3 = 1.5A$$

$$\therefore i_0 = i_1 - i_2 = 0.5A$$

1-3 写出图题 1-3 所示电路的伏安关系方程

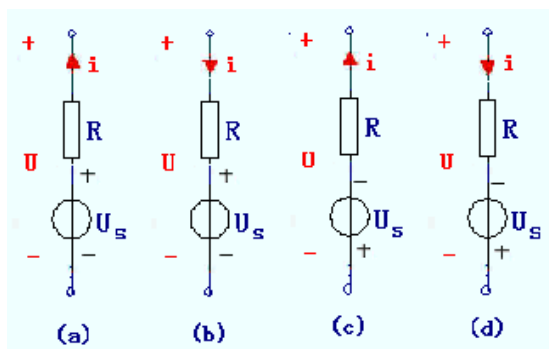
解

(a) $U = U_s - iR$

(b) $U = U_s + iR$

(c) $U = -U_s - iR$

(d) $U = -U_s + iR$



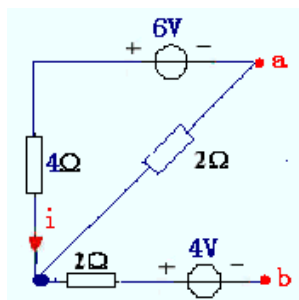
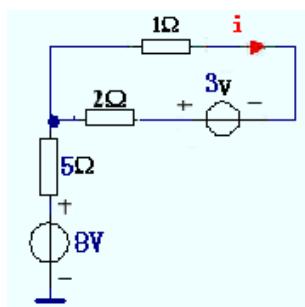
图题 1-3

1-4 图题 1-4 所示电路，求 u_{ab}

解

$$(a) \quad i = \frac{3}{2+1} = 1A \quad u_{ab} = -3 + 2i + 8 = 7V$$

$$(b) \quad i = \frac{6}{4+2} = 1A \quad u_{ab} = -2i + 4 = 2V$$



图题 1-4

1-5 一个 $u_s=10\text{V}$ 的理想电压源，求在下列各情况下它的端电流与输出功率：

(1) 开路；(2) 接 $10\text{ }\Omega$ 电阻；(3) 接 $1\text{ }\Omega$ 电阻；(4) 短路

解

$$\because u_s = 10\text{V} \quad I = \frac{u_s}{R} \quad P = \frac{u_s^2}{R}$$

$$(1) \quad R = \infty \text{ 时} \quad I = 0 \quad P = 0$$

$$(2) \quad R = 10\Omega \quad I = 1\text{A} \quad P = 10\text{W}$$

$$(3) \quad R = 1\Omega \text{ 时} \quad I = 10\text{A} \quad P = 100\text{W}$$

$$(4) \quad R = 0\Omega \quad I = \infty \quad P = \infty$$

1-6 一个 $i_s=10\text{A}$ 的理想电流源求在下列情况下它的端电压与输出功率：

(1) 短路；(2) 接 $10\text{ }\Omega$ 电阻；(3) 接 $100\text{ }\Omega$ 电阻；(4) 开路

解

$$\because i_s = 10\text{A} \quad U = i_s R \quad P = i_s^2 R$$

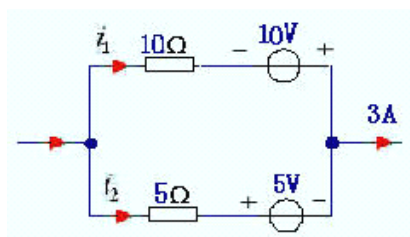
$$(1) \quad R = 0\Omega \quad U = 0 \quad P = 0$$

$$(2) \quad R = 10\Omega \quad U = 100\text{V} \quad P = 1000\text{W}$$

$$(3) \quad R = 100\Omega \text{ 时} \quad U = 1000\text{V} \quad P = 10000\text{W}$$

$$(4) \quad R = \infty \text{ 时} \quad U = \infty \quad P = \infty$$

1-7 图题 1-7 所示电路，求 i_1 , i_2



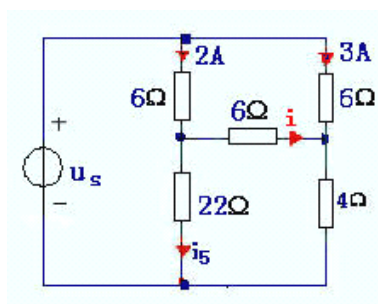
图题 1-7

解

$$\because i_1 + i_2 = 3, \quad 10i_1 - 10 - 5 - 5i_2 = 0$$

$$\therefore i_1 = 2A, \quad i_2 = 1A$$

1-8 图题 1-8 所示电路，求 i_s , u_s



图题 1-8

解

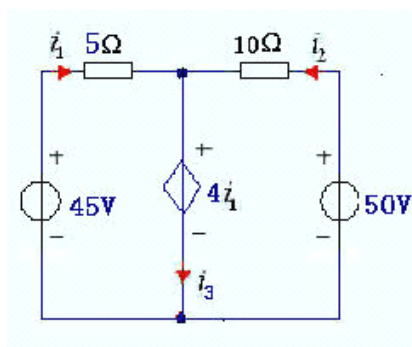
$$\because 2 \times 6 + 6i - 3 \times 6 = 0(KVL) \quad i_s + i - 2 = 0(KVL)$$

$$\therefore i_s = 1A$$

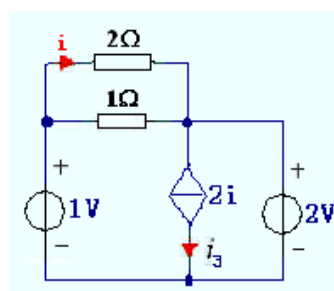
$$\text{又 } 2 \times 6 + 22 \times 1 = u_s (KV)$$

$$\therefore u_s = 34V$$

1-9 图题 1-9 所示电路，求 i_3



(a)



(b)

图题 1-9

解

$$(a) \because 45 - 5i_1 = 4i_1,$$

$$(b) \because i = \frac{1-2}{2} = -0.5A$$

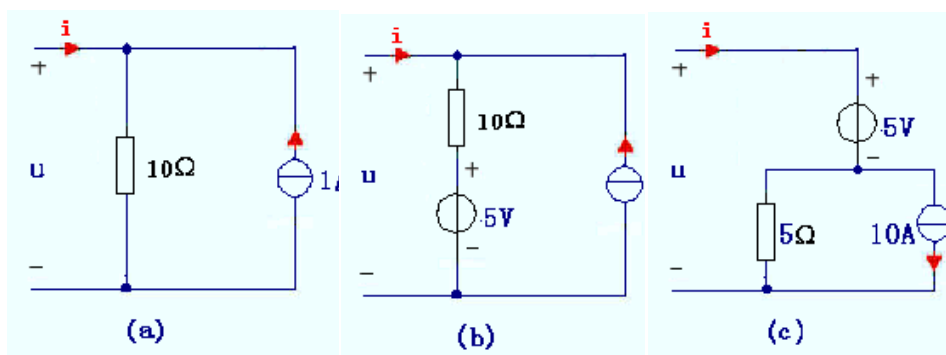
$$50 - 10i_2 = 4i_1$$

$$\therefore i_1 = 5A, i_2 = 3A$$

$$\therefore i_3 = 2i = -1A$$

$$i_3 = i_1 + i_2 = 8A$$

1-10 写出图题 1-10 所示电路两种形式的伏安关系，即 $u=f(i), i=g(u)$

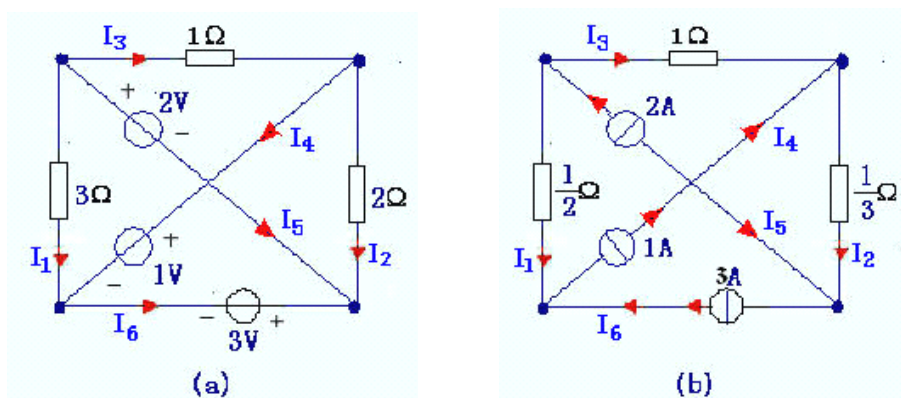


图题 1-10

解

$$\begin{aligned}
 (a) \quad i &= \frac{u}{10} - 1, \quad u = 10i + 10 & (b) \quad i &= \frac{1}{10}u - 2.5, \quad u = 10i + 25 & (c) \quad i &= \frac{1}{5}u + 9, \\
 u &= 5i - 45
 \end{aligned}$$

1-11 求图题 1-11 所示各支路的电流和电压。



图题 1-11

解

$$(a) \quad U_1 = 2 + 3 = 5V,$$

$$I_1 = \frac{5}{3}A$$

$$U_2 = 1 - 3 = -2V,$$

$$I_2 = -\frac{2}{2} = -1A$$

$$U_3 = 2 - 2I_4 = 4V, \quad I_3 = 4A$$

$$I_4 = I_3 - I_2 = 5A,$$

$$I_5 = -I_2 - I_3 = -\frac{17}{3}A$$

(b)

$$(b) \quad I_1 = 1 - 3 = -2A, \quad I_2 = 3 - I_1 = 5A$$

$$I_3 = 2 - I_1 = 4A, \quad U_1 = -1V$$

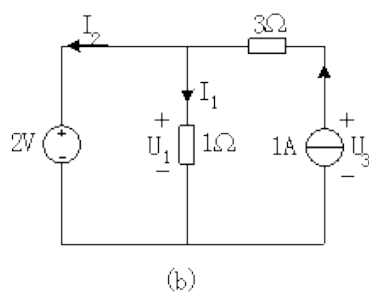
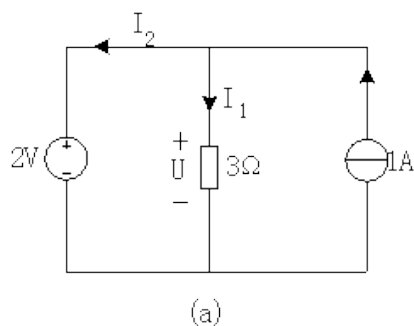
$$U_2 = \frac{5}{3}V, \quad U_3 = 4V$$

$$U_4 = -\frac{1}{2}I_2 + I_3 \times 1 = 3V$$

$$U_5 = U_3 + U_2 = \frac{17}{3}V,$$

$$U_6 = U_1 - U_2 - U_3 = -\frac{20}{3}V$$

1-12 求图题 1-12 所示电路中各支路电源和各元件上的电压



图题 1-12

解

$$(a) \quad I_1 = \frac{2}{3}A, \quad I_2 = 1 - I_1 = \frac{1}{3}A$$

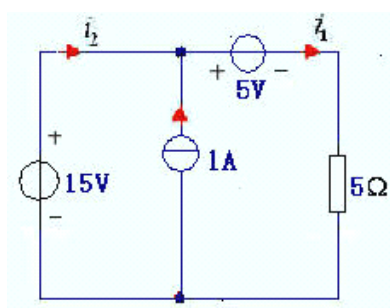
$$(b) \quad I_1 = 2A, \quad I_2 = 1 - I_1 = -1A$$

$$\therefore u_{ab} = -2i + 4 = 2V, U = 2V$$

$$U_1 = 2V, U_2 = -3V$$

$$U_3 = U_1 - U_2 = 5V$$

1—13 图题 1-13 所示电路中 30 欧姆电阻消耗的功率 $P=430W$,求电压源产生的功率 P_s ,



图题 1-13

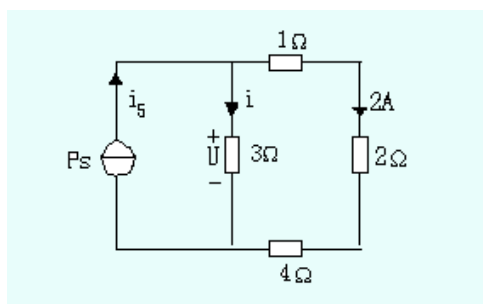
解

$$\therefore P = I^2 R, \therefore I_1 = \sqrt{\frac{P}{R_1}} = 4A$$

$$U_1 = 120V, I_2 = \frac{120}{20} = 6A$$

$$I_3 = I_1 + I_2 = 10A, U_s = 0.5I_3 + U_1 = 125V, P_s = U_s I_s = 1250W$$

1—14 求图题 1-14 所示电路中的 i_s , P_s ,



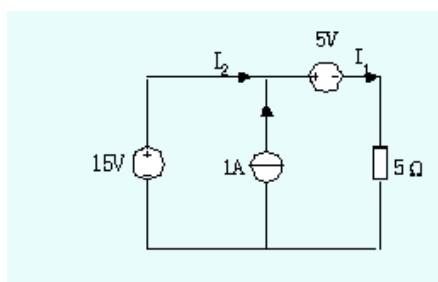
图题 1-14

解

$$U = 2 \times (1 + 2 + 4) = 14V, \quad i = \frac{14}{3}A$$

$$i_s = 2 + i, \quad \therefore P_s = U i_s = \frac{280}{3}W$$

1-15 求图题 1-15 所示电路中的各电源发出的功率



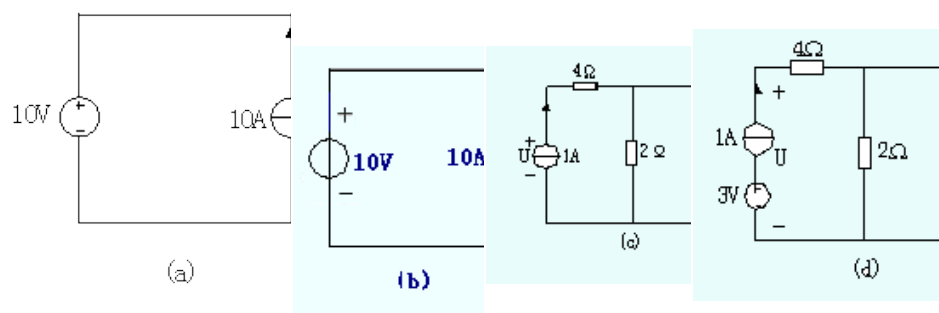
图题 1-15

解

$$i_1 = \frac{15 - 5}{5} = 2A, \quad i_2 = 1A$$

$$\therefore P_{15V} = 15 \times 1 = 15W, \quad P_{5V} = -5 \times 2 = -10W, \quad P_{1A} = 15 \times 1 = 15W$$

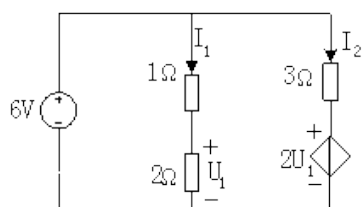
1-16 求图题 1-16 所示电路各电源发出的功率



图题 1-16

解

$$\begin{aligned}
 & (a) \quad P_{10V} = -100W \quad (b) \quad P_{10V} = 100W, \\
 & \quad P_{10A} = 100W \quad P_{10A} = -100W \\
 & (c) \quad U = 1 \times \left(4 + \frac{2 \times 3}{2 + 3}\right) = 5 \\
 & \quad \therefore P_{1A} = 1 \times (5.2 - 3) = 2.2W \\
 & \quad \therefore P_{1A} = 5.2W \\
 & (d) \quad \therefore U = 5.2V \\
 & \quad \therefore P_{3V} = 3W
 \end{aligned}$$



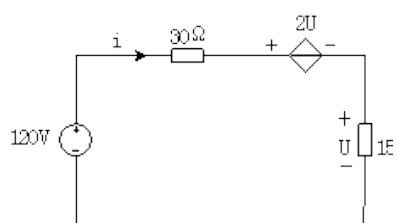
1-17 求图题 1-17 所示电路中的 u_1 和 i

图题 1-17

解

$$i_1 = \frac{6}{1 + 2} = 2A, \quad u_1 = 2i_1 = 4V$$

$$i_2 = \frac{6 - 2u_1}{3} = -\frac{2}{3} A, \therefore i = i_1 + i_2 = \frac{4}{3} A$$



1-18 图题 1-18 所示电路, 求 u 和受控源吸收的功率

图题 1-18

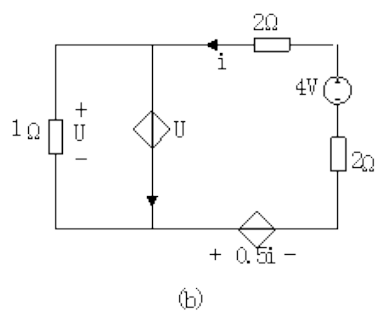
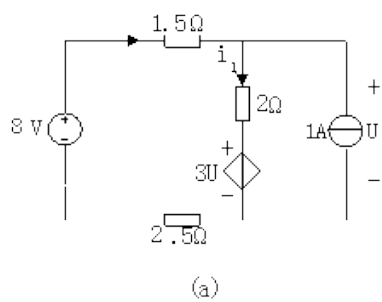
解

$$\therefore 30i + 2u - u = 120, \quad u = -15i$$

$$\text{解得} \quad i = 8A, \quad u = -120V$$

$$\therefore P_{2u} = -2u \times i = 1920W$$

1-19 图题 1-19 所示电路。求 u , i



图题 1-19

解

$$(a) \quad \because i_1 - i - 1 = 0,$$

$$1.5i + 2i_1 + 3u + 2.5i = 8$$

$$1.5i + u + 2.5i = 8$$

$$\therefore i = 3A, u = -4V$$

$$(b)$$

$$\because u = -2i + 4 - 2i - 0.5i = 4 - 4.5i, u = i - u$$

$$\therefore i = 0.8A, u = 0.4V$$