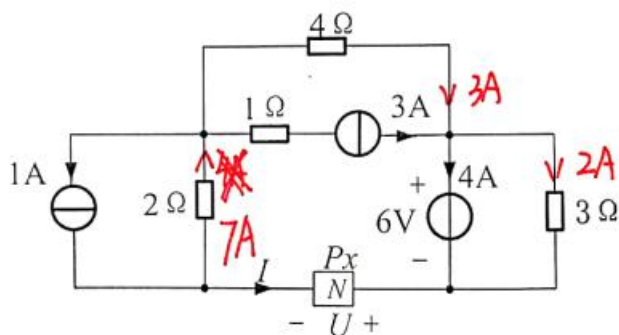


网络专业同学只做前八题

一、电路如图所示。(1) 求 I 、 U ；(2) 求功率 P_x ，并指出是吸收还是供出功率。



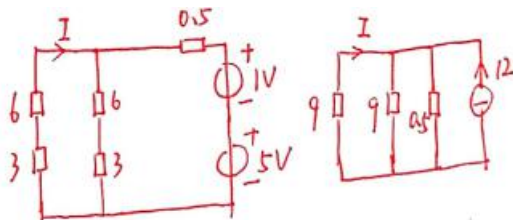
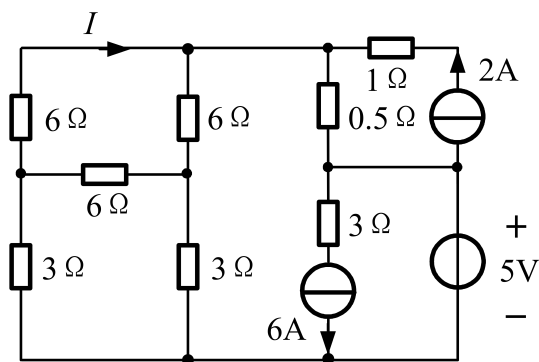
$$I = -4 - 2 = -6A$$

$$U = -6 - 3 \times 4 - 2 \times 3 = -32V$$

$$P_{x\text{吸}} = -UI = 32 \times 6 = 192W$$

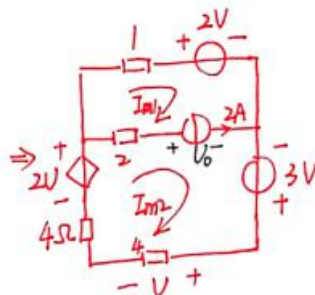
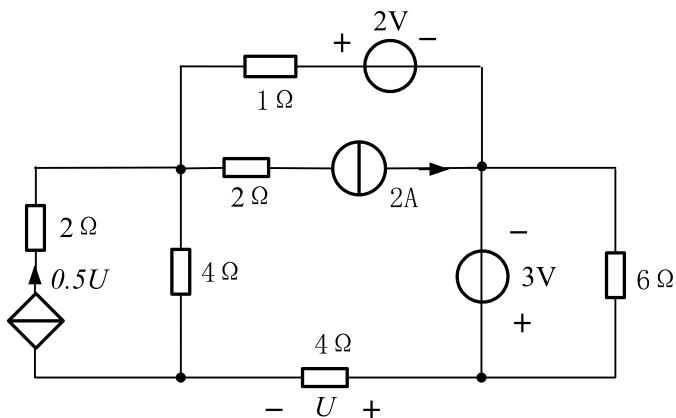
(即供出 192W)

二、试用电源等效变换法求图示电路中的电流 I 。



$$I = \frac{-\frac{1}{9}}{\frac{1}{9} + \frac{1}{3} + \frac{1}{0.5}} \times 12 = -0.6A$$

三、电路如图所示，用网孔电流法求电压 U 。



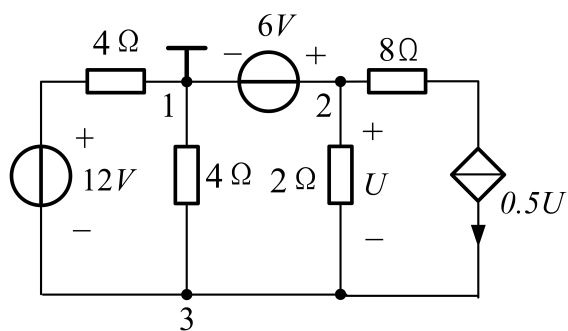
$$3I_{m1} - 2I_{m2} = U_0 - 2$$

$$10I_{m2} - 2I_{m1} = 3 + 2U - U_0$$

补充 $U = 4I_{m2}$, $I_{m2} - I_{m1} = 2$

$$I_{m1} = 1A, I_{m2} = 3A, U = 12V$$

四、电路如图所示，用结点法求结点电压 U_2 、 U_3 和 U 。



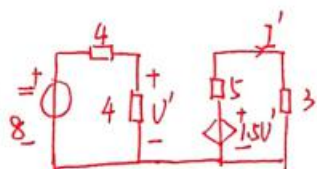
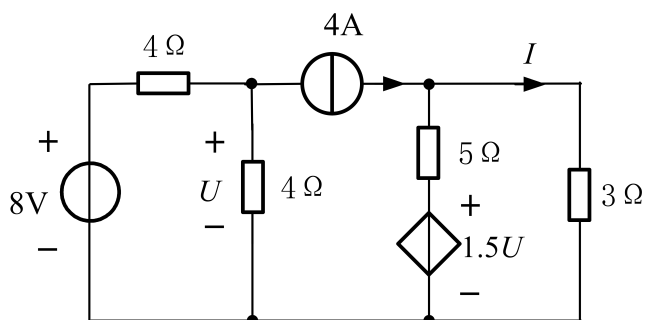
$$U_2 = 6V$$

$$\textcircled{3}: \left(\frac{1}{4} + \frac{1}{4} + \frac{1}{2}\right)U_3 - \frac{1}{2}U_2 = 0.5U - \frac{12}{4}$$

$$\text{补充: } U = U_2 - U_3$$

$$\text{解得: } U_3 = 2V, U = 6 - 2 = 4V$$

五、电路如图所示，用叠加定理求 U 和 I 。

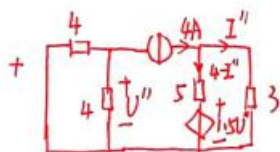


$$U' = 4V$$

$$I' = \frac{1.5 \times 4}{5+3} = \frac{3}{4}A = 0.75A$$

$$\therefore U = U' + U'' = 4 - 8 = -4V$$

$$I = I'' + I' = 1.75A$$

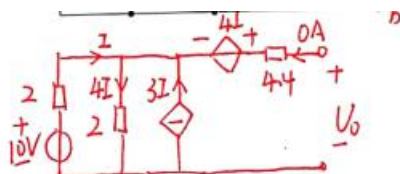
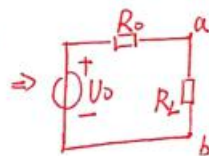
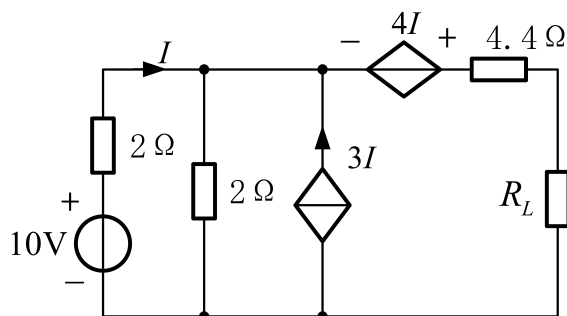


$$U'' = -2 \times 4 = -8V$$

$$3I'' = 5(4 - I'') + 1.5U''$$

$$I'' = 1A$$

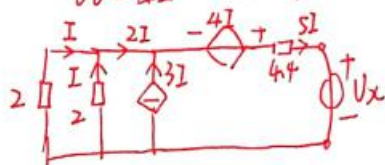
六、求图示电路中的电阻 R_L 等于何值时它吸收的功率最大？此最大功率等于多少？



$$U_0 = 10 = 2I + 4I \times 2$$

$$I = 1 \text{ A}$$

$$U_0 = 4I + 4I \times 2 = 12 \text{ V}$$



$$U_x = -4.4 \times 5I + 4I - 2I = -20I$$

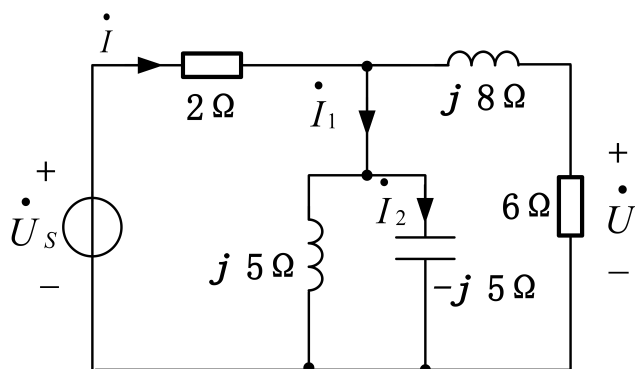
$$R_0 = -\frac{U_x}{5I} = -\frac{-20I}{5I} = 4 \Omega$$

$$R_L = R_0 = 4 \Omega \text{ 可获 } P_{\max}$$

$$P_{\max} = \frac{U_0^2}{4R_0} = \frac{12^2}{4 \times 4} = 9 \text{ W}$$

3

七、图示正弦稳态电路中，已知： $\dot{U}_s = 80 \angle 0^\circ \text{ V}$ ，求 I 、 I_1 、 I_2 及 \dot{U} 。



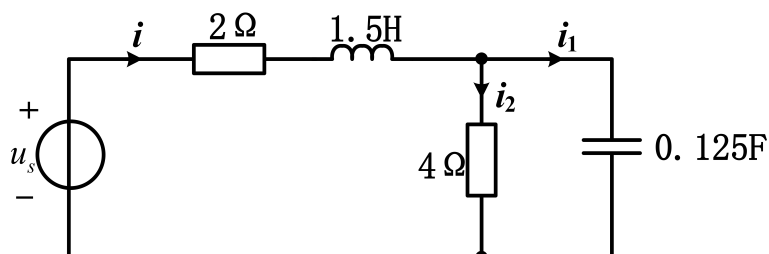
$$I_1 = 0$$

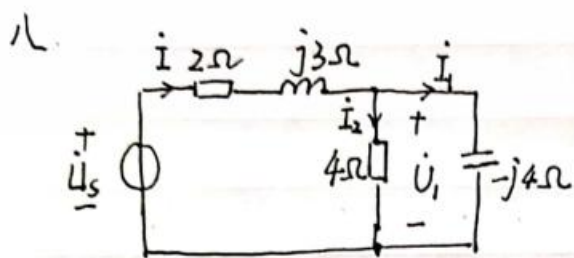
$$\dot{I}_3 = \dot{I} = \frac{\dot{U}_s}{2 + j8 + 6} = \frac{80 \angle 0^\circ}{8 + j8} = \frac{10}{\sqrt{2}} \angle -45^\circ \text{ A}$$

$$\dot{U} = 6\dot{I}_3 = \frac{60}{\sqrt{2}} \angle -45^\circ$$

$$\dot{I}_2 = \frac{(6 + j8)\dot{I}_3}{-j5} = \frac{10 \angle 53.13^\circ \times \frac{10}{\sqrt{2}} \angle -45^\circ}{-j5} = \frac{20}{\sqrt{2}} \angle 98.13^\circ \text{ A}$$

八、已知 $i_2(t) = 3\sqrt{2} \cos 2t \text{ A}$ 。求 $u_s(t)$ 、电路吸收的 P 、 Q 和功率因数 λ 。





解: $\dot{U}_1 = 4\dot{I}_2 = 4 \times 3\angle 0^\circ = 12\angle 0^\circ \text{ V}$

$\dot{I}_1 = \frac{\dot{U}_1}{-j4} = \frac{12\angle 0^\circ}{4\angle -90^\circ} = 3\angle 90^\circ = j3 \text{ A}$

$\dot{I} = \dot{I}_1 + \dot{I}_2 = 3 + j3 = 3\sqrt{2}\angle 45^\circ \text{ A}$

$\dot{U}_s = (2 + j3)\dot{I} + \dot{U}_1 = -3 + j15 + 12 = 9 + j15 = 17.49\angle 59.03^\circ \text{ V}$

$\therefore u_s(t) = 17.49\sqrt{2} \cos(2t + 59.03^\circ) \text{ V}$

$P = U_s I \cos(59.03^\circ - 45^\circ) = 17.49 \times 3\sqrt{2} \cos 14.03^\circ = 71.99 \text{ W}$

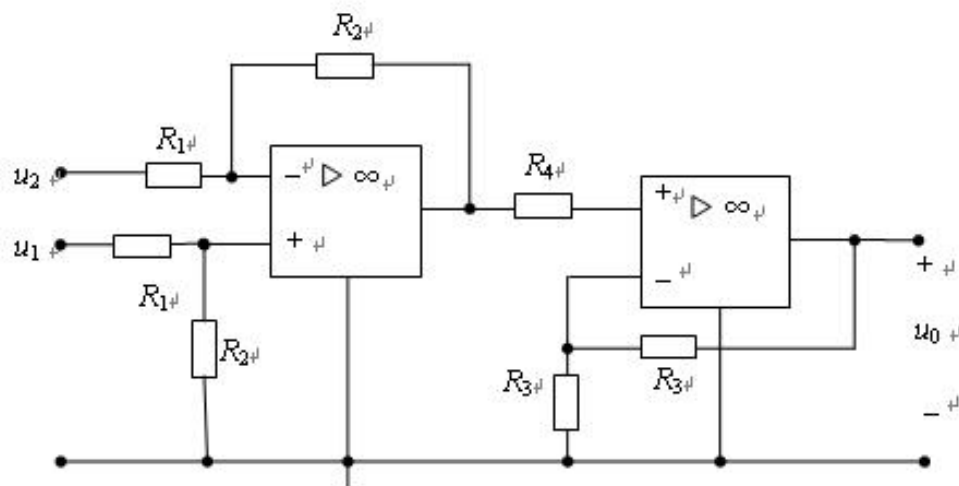
或 $P = I^2 \times 2 + I_2^2 \times 4 = 72 \text{ W}$

$Q = U_s I \sin(59.03^\circ - 45^\circ) = 17.49 \times 3\sqrt{2} \sin 14.03^\circ = 18 \text{ var}$

或 $Q = I^2 \times 3 - I_1^2 \times 4 = 18 \text{ var}$

$\lambda = \cos 14.03^\circ = 0.9702 \text{ (感性)}$

九、图示电路中，求 u_0 与 u_1 、 u_2 的关系。



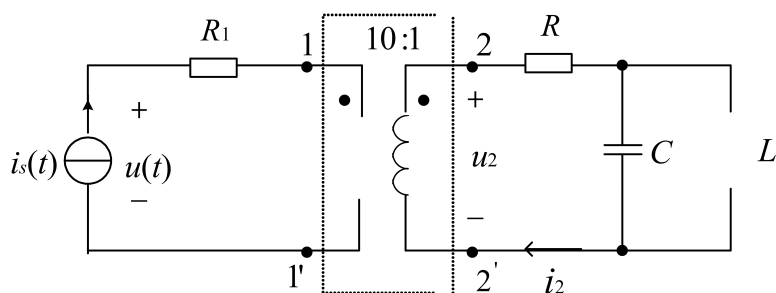
九. $u_{o1} = \frac{R_2}{R_1} (u_1 - u_2)$ — 差分减法

$u_o = (1 + \frac{R_2}{R_1}) u_{o1}$ — 同相比例

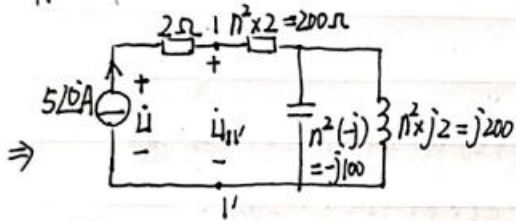
$\therefore u_o = 2(u_1 - u_2) \frac{R_2}{R_1}$

十、电路如图所示，已知 $i_s(t) = 5\sqrt{2} \cos(2t) \text{ A}$ ， $R = 2\Omega$ ， $L = 1\text{H}$ ， $C = 0.5\text{F}$ ， $R_1 = 2\Omega$ ，

试求电压 $u(t)$ 、 $u_2(t)$ 和电流 $i_2(t)$ 。



十.



解：理想变压器

$$\frac{\dot{I}_1}{\dot{I}_2} = \frac{1}{n} = \frac{1}{10} \Rightarrow \dot{I}_2 = 10\dot{I}_1 = 50\angle 0^\circ \text{ A}$$

$$\dot{U} = 5\angle 0^\circ \times [2 + 200 + j200 // (-j100)]$$

$$= 5\angle 0^\circ \times (202 - j200)$$

$$= 1421.3\angle -44.71^\circ \text{ V}$$

$$\dot{U}_{11}' = 5\angle 0^\circ [200 + j200 // (-j100)]$$

$$= 1000 - j1000$$

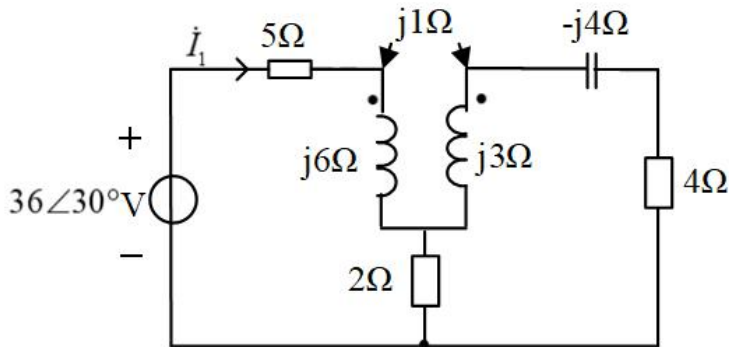
$$= 1000\sqrt{2}\angle -45^\circ \text{ V}$$

$$\frac{\dot{U}_{11}'}{\dot{U}_2} = n \Rightarrow \dot{U}_2 = 100\sqrt{2}\angle -45^\circ \text{ V}$$

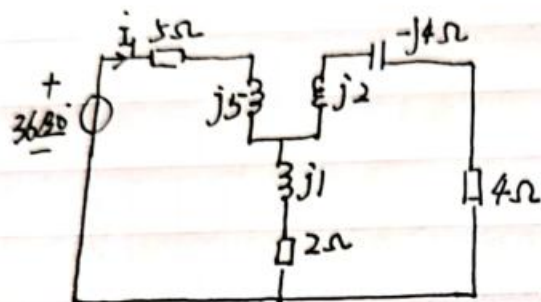
$$\therefore u(t) = 1421.3\sqrt{2} \cos(2t - 44.71^\circ) \text{ V}, \quad u_2(t) = 200 \cos(2t - 45^\circ) \text{ V}$$

$$i_2(t) = 50\sqrt{2} \cos(2t) \text{ A}.$$

十一、如图所示电路，求电流 I_1 。



十一. 解: 去耦



$$\begin{aligned} Z_{\text{总}} &= (j2 - j4 + 4) // (2 + j) + 5 + j5 \\ &= 1.62 + j0.27 + 5 + j5 \\ &= 6.62 + j5.27 \\ &= 8.46 \angle 38.52^\circ \Omega \end{aligned}$$

$$\dot{I}_1 = \frac{36 \angle 30^\circ}{Z_{\text{总}}} = \frac{36 \angle 30^\circ}{8.46 \angle 38.52^\circ} = 4.255 \angle -8.52^\circ \text{ A}$$