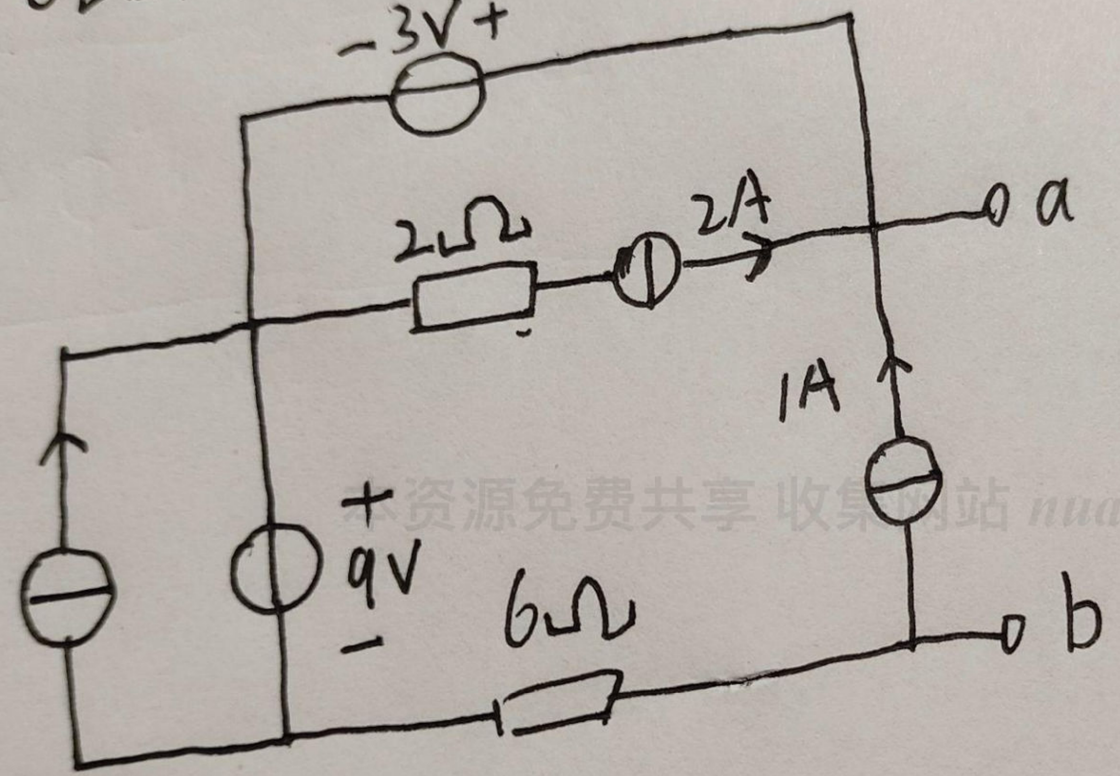
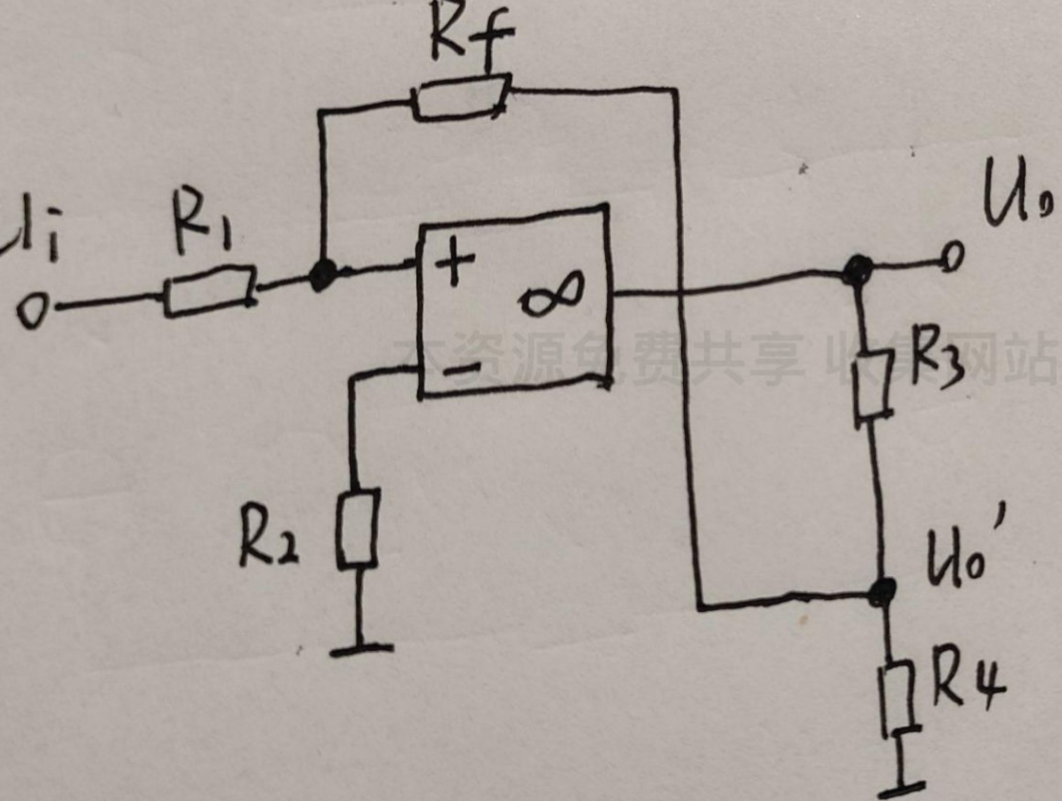
一、1、

求出电路从 a、b 端口看进去的最简等效电路



一、2、 求 $\frac{U_o}{U_i}$

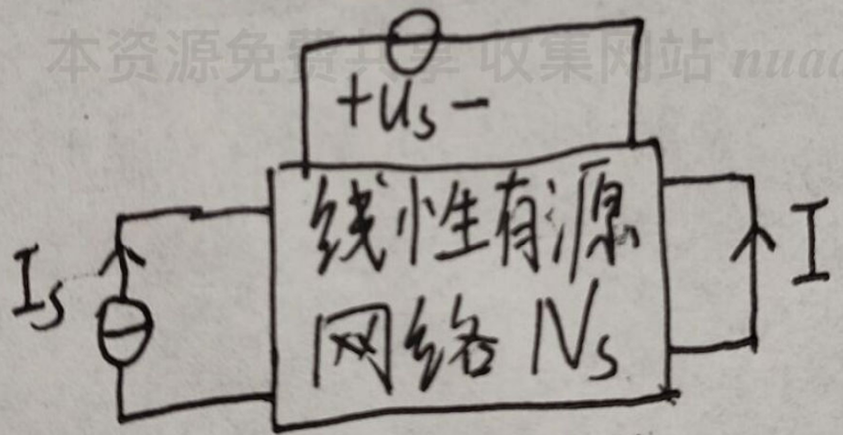


一、3. 已知 $I_S=1A$，$U_S=1V$时，$I=2A$

$I_S=2A$，$U_S=-1V$时，$I=1A$

$I_S=5A$，$U_S=2V$时，$I=4A$

求：$I_S=5A$，$U_S=-3V$时，$I=?$

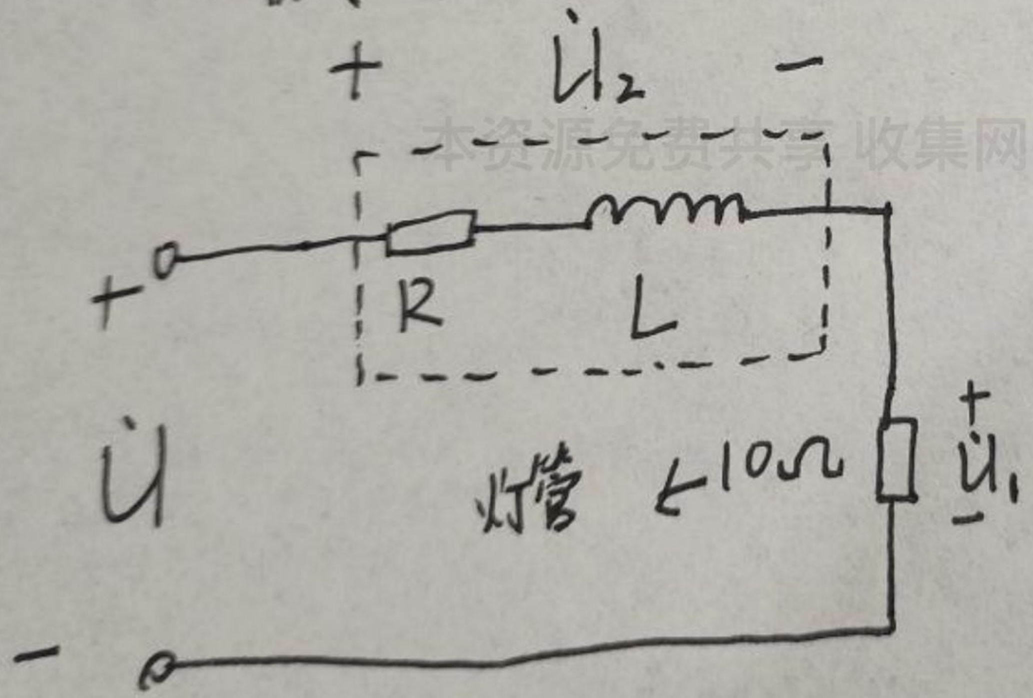


一、4. 图示为一工作于工频的小功率日光灯电路。

已知各电压有效值分别为 $U_1=U_2=10\text{ V}$，$U=17.32\text{V}$

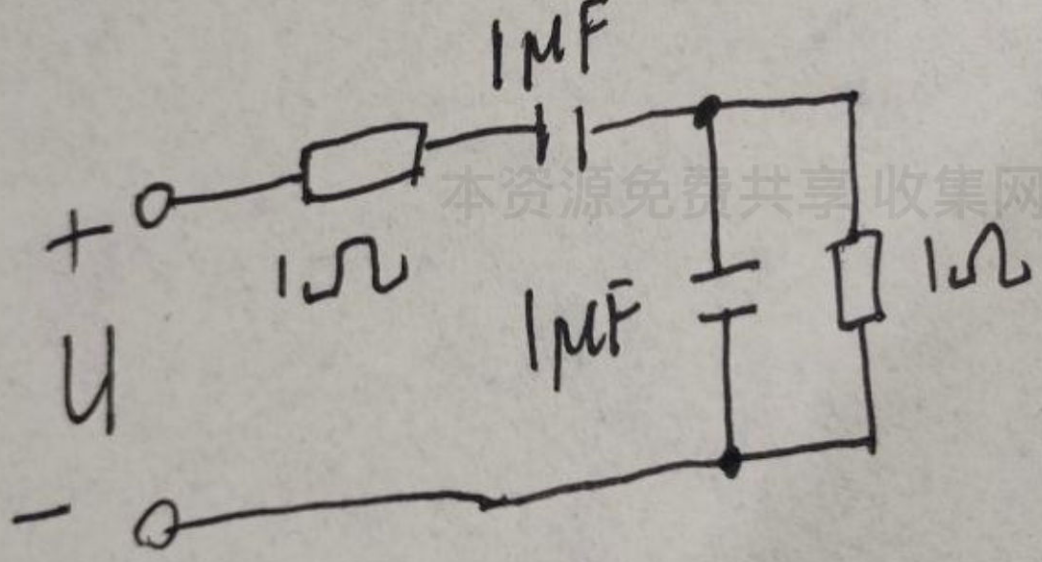
求（1）画出电压相量图

（2）镇流器等效串联模型元件参数 R 和 L 的值



二、5.

$u=3\sqrt{2}\cos 10^6 t$ V，求该一端口网络吸收的有功功率P和无功功率Q



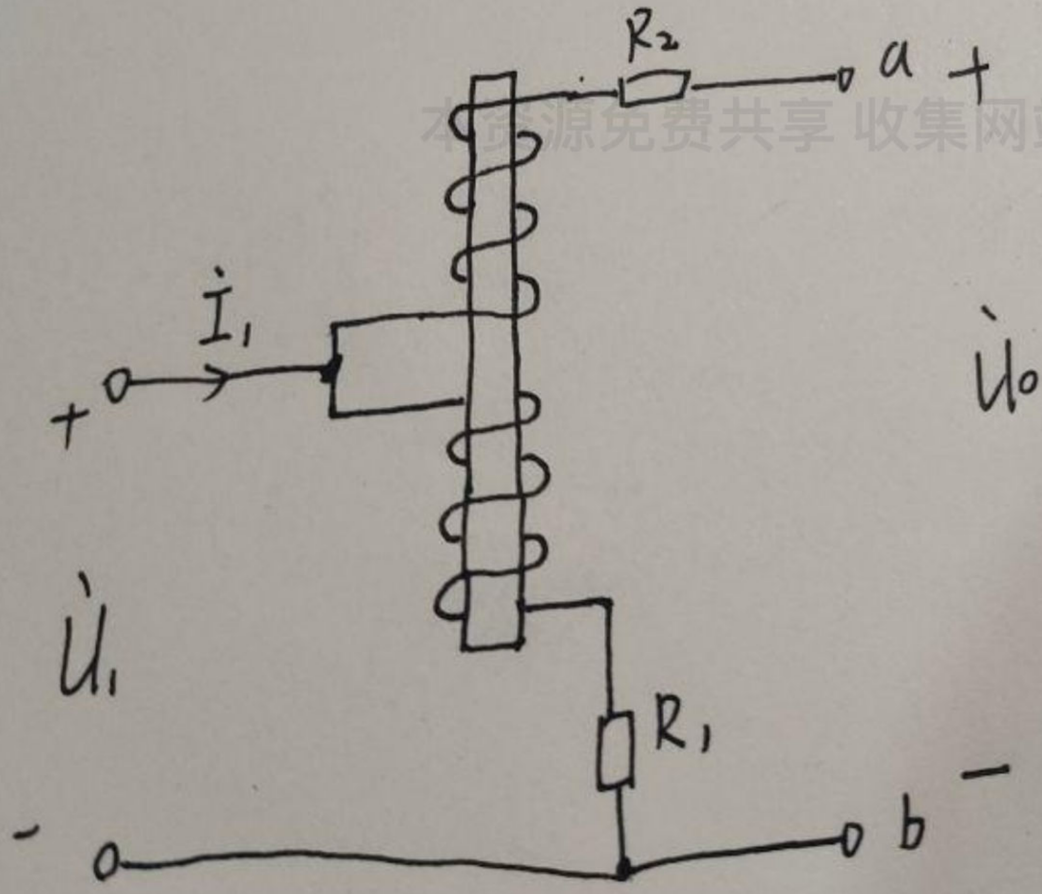
一、6

已知 $R_1=R_2=3\Omega$，$\omega L_1=\omega L_2=4\Omega$，$\omega M=2\Omega$

输入端电压 $\dot{U}_1=10V$

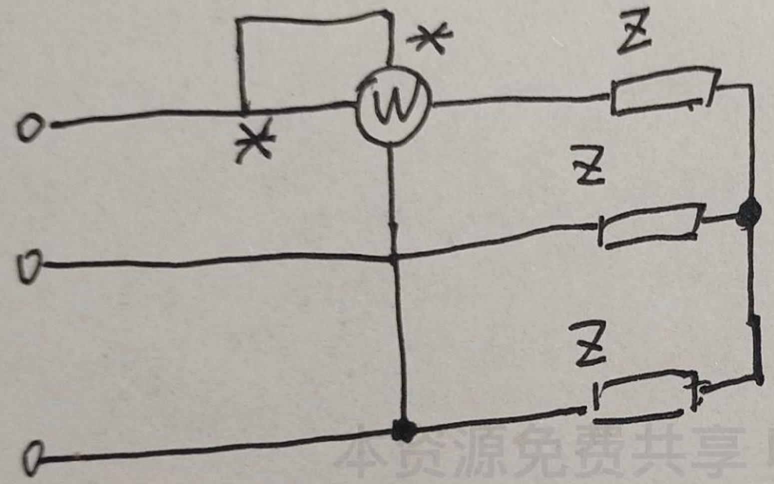
求 (1) 输出~~端~~开路电压 $\dot{U}_0$

(2) 若在输出端 a.b 间接入阻抗 $Z=0.52-j0.36\ \Omega$，~~求~~再求 $\dot{U}_{ab}$

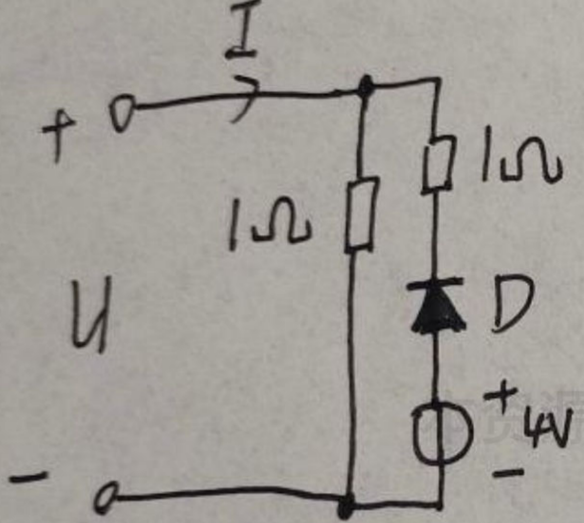


一.7. 图示对称三相电路中，线电压为380V，感性三相负载功率因数为0.6

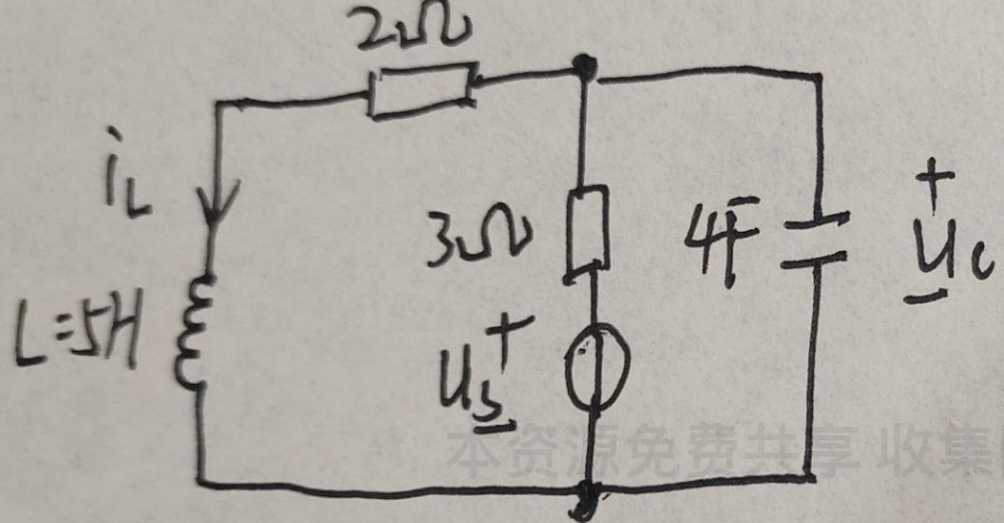
功率表读数 $P=2111.6W$，求线电流 I_A



一、8　试画出如图所示电路端口处的 $U-I$ 关系曲线，其中 D 为理想二极管



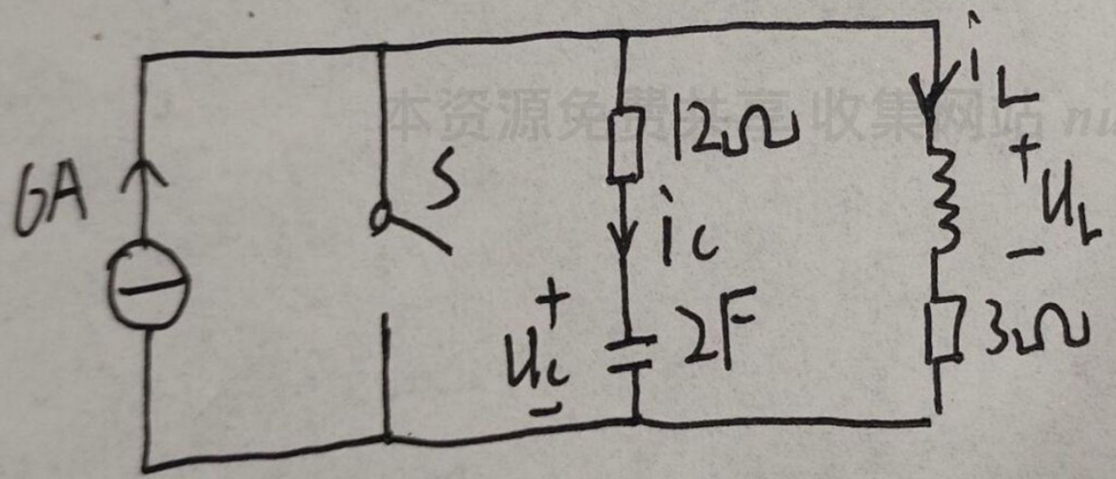
一、9. 写出电路的标准形式状态方程



一、10.

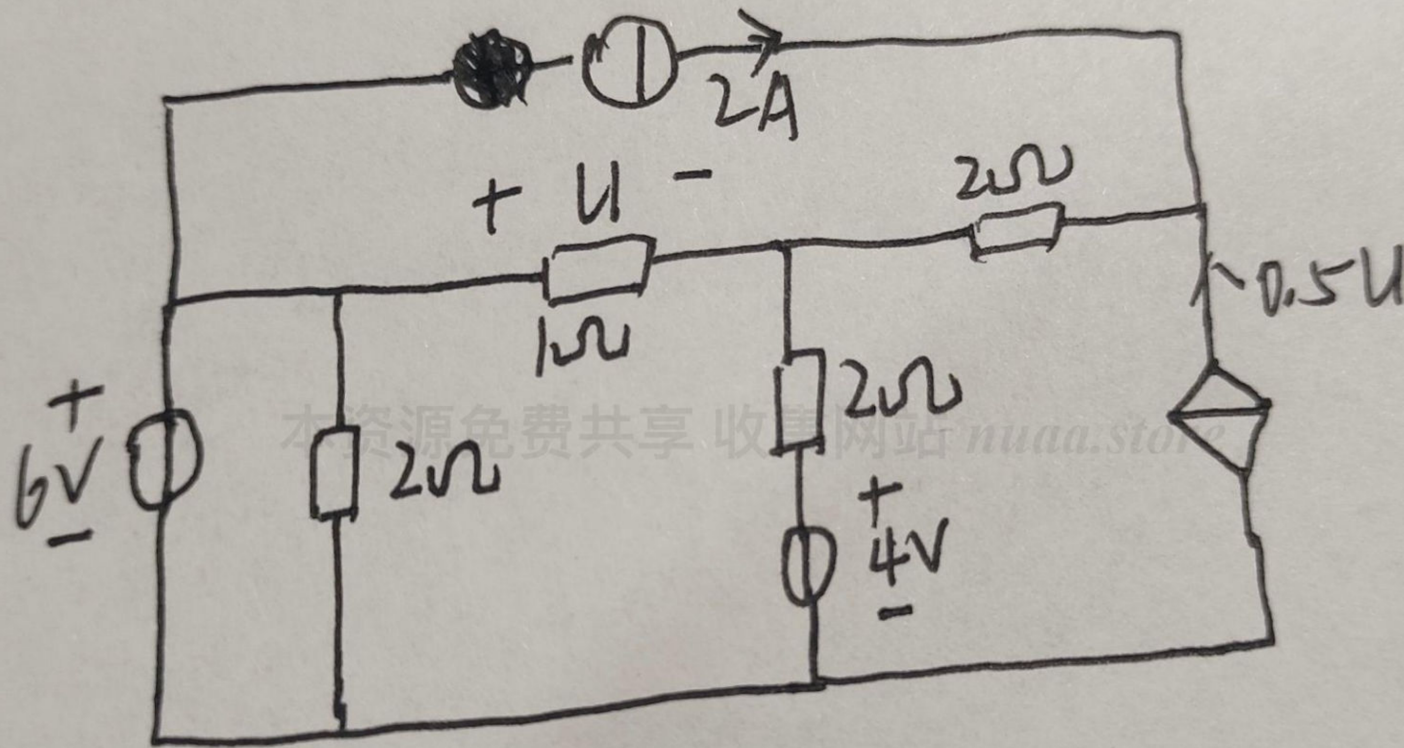
$t<0$时，S断开，电路已达稳态，$t=0$时，S闭合

求$u_c(0_+)$，$i_c(0_+)$



$L=5H$

二、1. 求图示电路两个电压源各自发出的功率

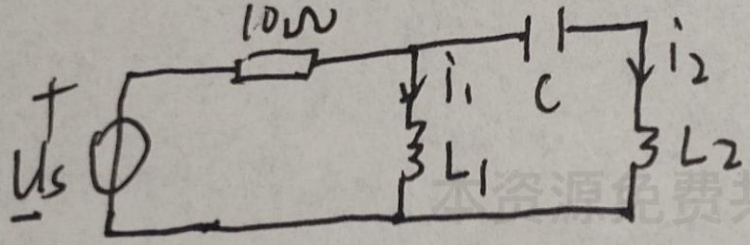


二、2、

$u_s(t) = (10 + 18\cos\omega t + 5\cos 2\omega t)\,V$，$\omega L_1 = 9\Omega$，$\omega L_2 = 3\Omega$，$\frac{1}{\omega C} = 12\Omega$

求 (1) 稳态时 $i_1(t)$ 和 $i_2(t)$

(2) u_s 发出的平均功率



二.3.

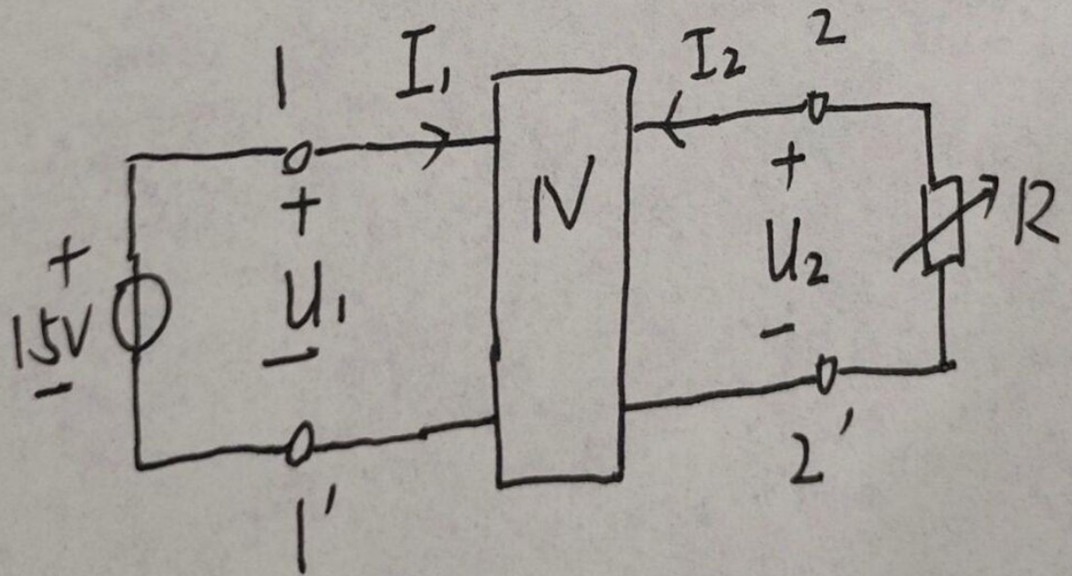
图示二端口网络，其参数矩阵有 $Z=\begin{bmatrix}6 & 3\\ 3 & 9\end{bmatrix}\Omega$

求：(1) 二端口网络的T型等效电路

(2) $R=2.5\Omega$ 时的 I_1 和 I_2

(3) $R=?$ 时可获最大功率？

并求最大功率 P_{max}

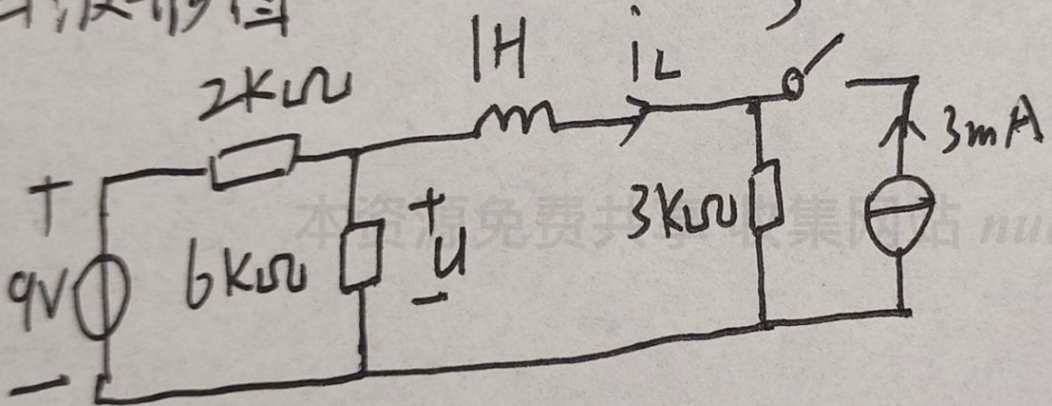


二、4.

如图电路，$t<0$ 时开关 S 闭合前电路已达稳态，$t=0$ 时开关 S 闭合

求 $t>0$ 时的 $u(t)$ 和 $i_L(t)$

并画波形图



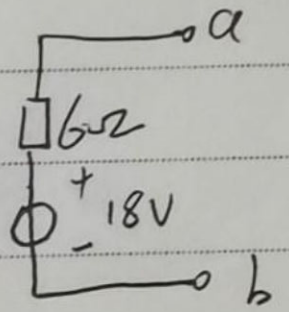
1. R_{eq}:

$R = 6\Omega$

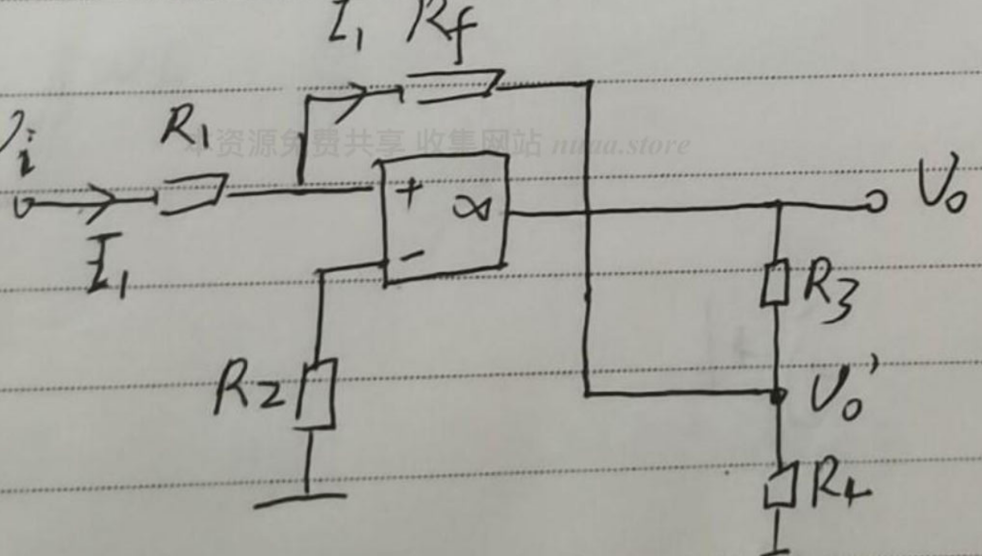
开路电压U_{ab}:

$U_{ab} = 3 + 9 + 6 \times 1 = 18V$

故等效电路为:



2.



$I_1 = \frac{U_i}{R_1}$

$U_o = -I_1 \cdot R_f = -\frac{R_f}{R_1} U_i$

故 $\frac{U_o}{U_i} = -\frac{R_f}{R_1}$

$$I = k_1 I_s + k_2 U_s + b$$

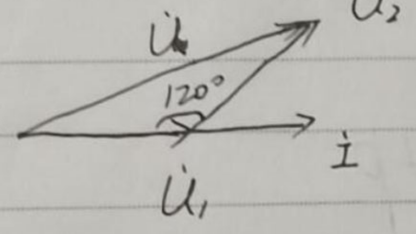
$$\begin{cases} k_1 + k_2 + b = 2 \\ 2k_1 - k_2 + b = 1 \\ 5k_1 + 2k_2 + b = 4 \end{cases}$$

$$\therefore I = \frac{1}{3} I_s + \frac{2}{3} U_s + 1$$

$$\therefore I = \frac{1}{3} \times 5 + \frac{2}{3} \times -3 + 1$$

$$= \frac{2}{3}$$

(1):

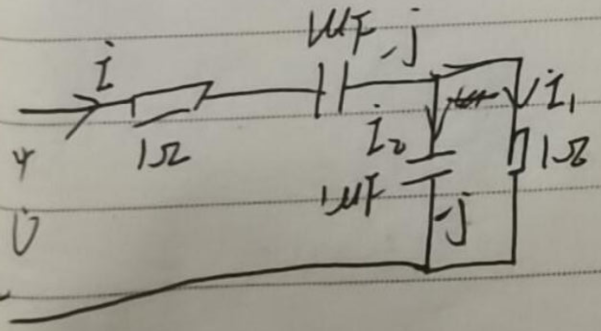


(2): $\frac{U_1}{10} = \frac{U_2\cos 60^\circ}{R}$ 由 $w = 2\pi f = 314$ rad/s

$R = 5\,\Omega$

$\sqrt{3}wL = R$ $\quad L = 9.19\times10^{-3}$ H

5. $\dot{U} = 3\angle 0^\circ$ $\quad w = 10^6$ rad/s



$Z = 1-j + \frac{1\times(-j)}{1-j} = \cancel{1.5\angle 45^\circ}$ $1.5\sqrt{2}\angle 45^\circ$

$\dot{I} = \frac{\dot{U}}{Z} = \sqrt{2}\angle 45^\circ$ A

$\dot{I}_1 = \frac{-j}{1-j}\dot{I} = 1\angle 0^\circ$ A

$\dot{I}_2 = \frac{1}{1-j}\dot{I} = j = 1\angle 90^\circ$ A

故 $P = 1\times I^2 + 1\times I_1^2 = 3$ W

$Q = 1\times I^2 + 1\times I_2^2 = 3$ var

6.

(1): $\begin{cases} \dot{U}_0 = \dot{U}_1 + j\omega M \dot{I}_1 \\ \dot{I}_1 = \dfrac{\dot{U}_0}{j\omega L_1 + R_1} \\ \dot{U}_0 = 10\angle 0^\circ \end{cases}$

$\dot{U}_0 = 10 + 4\angle 37^\circ$ V

(2)

7. 三线电压：$380\angle 30^\circ$

则相电压：~~日~~ $220\angle 0^\circ$

$P = UI\cos\theta$

$= 220 \times 0.6 \times I_A$

$= 2111.6$

$I_A = 16A$ $\cos\theta = 0.6$ $\theta 20$

$\dot{I}_A = 16\angle\theta A = 16\angle 53.1^\circ A$

①若二极管导通

$$I_2=\frac{4-u}{1}\times(-1)$$

$$=u-4$$

$$I_1=u$$

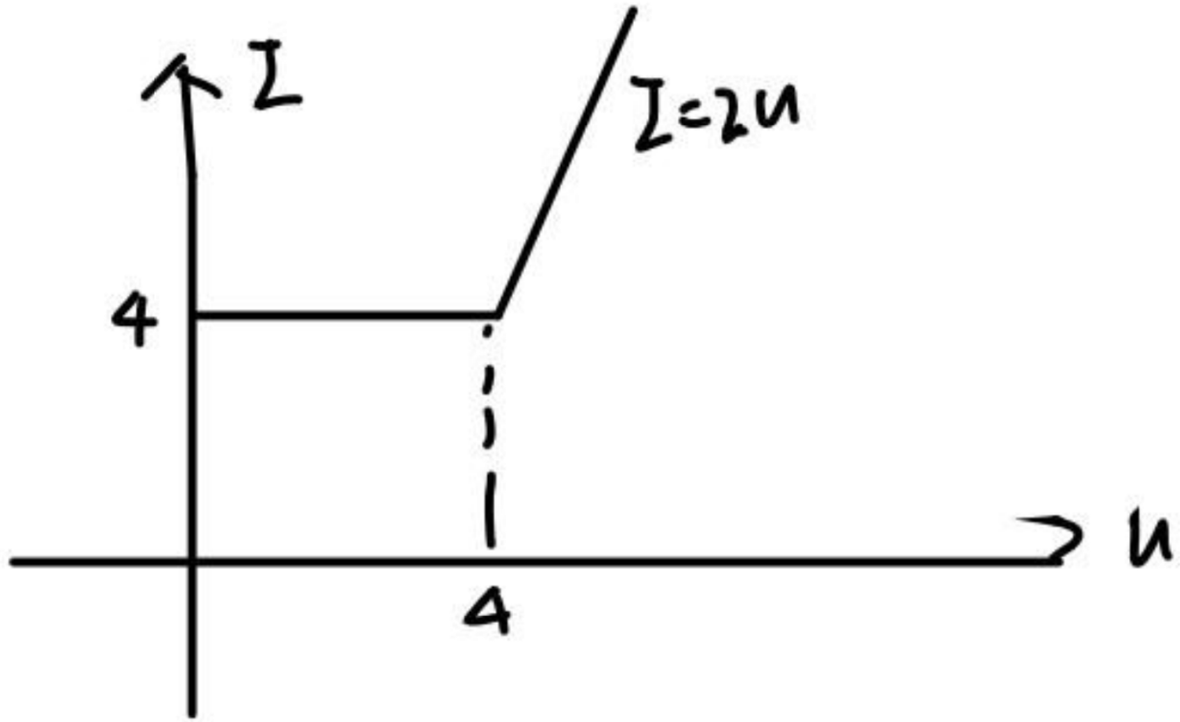
$\therefore I=I_1+I_2=4 \quad (u<4)$

② 二极管不导通

$$I_2=\frac{u}{1}$$

$$I_1=u$$

$\therefore I=2u$



$$i_C = C\frac{du_C}{dt}$$

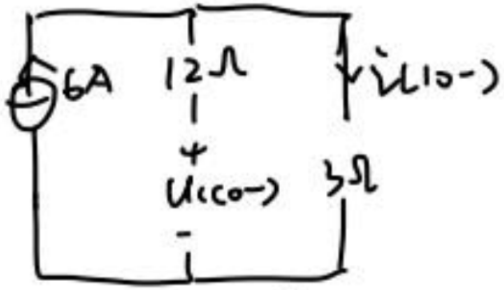
$$u_L = L\frac{di_L}{dt}$$

$$KCL: \frac{u_s - u_C}{3} = C\frac{du_C}{dt} + i_L \Rightarrow \frac{u_s - u_C}{3} = 4\frac{du_C}{dt} + i_L$$

$$KVL: u_C = 2i_L + L\frac{di_L}{dt} \Rightarrow u_C = 2i_L + 5\frac{di_L}{dt}$$

【三要素法】

$t=0^-$



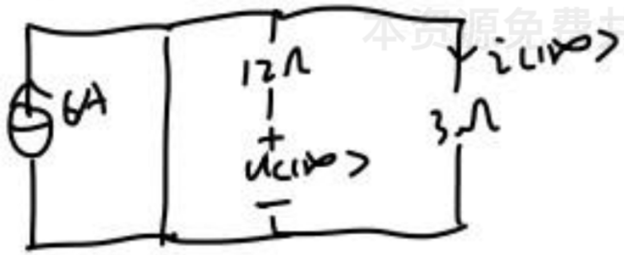
$i_L(0^-)=6A$

$u_C(0^-)=18V$

换路定律：$i_L(0^+)=6A=i_L(0^-)$

$u_C(0^+)=18V=u_C(0^-)$

$t=\infty$



$u_C(\infty)=0V$ L短路

$i_L(\infty)=0A$

双一阶电路，C.L分立．有2个时间常数

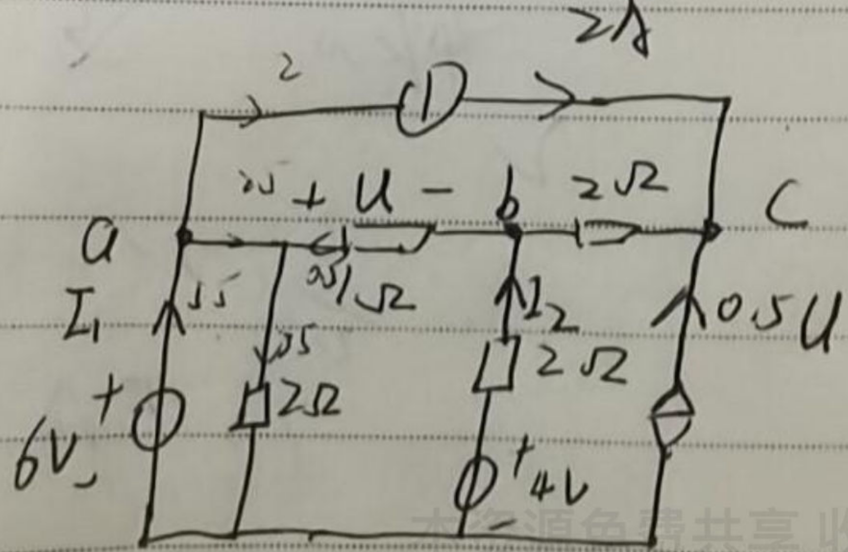
$\tau_C=RC=24s$ $\tau_L=\frac{L}{R}=\frac{5}{3}\Omega$

$u_C(t)=18e^{-\frac{t}{24}}$ $i_L(t)=6e^{-\frac{3}{5}t}$

$i_C(t)=C\frac{du_C}{dt}=2\cdot 18e^{-\frac{t}{24}}\times\frac{-1}{24}=-\frac{3}{2}e^{-\frac{t}{24}}$ $\therefore i_C(0^+)=-\frac{3}{2}A$

$u_L(t)=L\frac{di_L}{dt}=5\cdot 6e^{-\frac{3}{5}t}\cdot -\frac{3}{5}=-18e^{-\frac{3}{5}t}$ $\therefore u_L(0^+)=-18V$

二、1 节点电压法



$$\begin{cases} U_a = 6V \\ \left(\frac{1}{2}+\frac{1}{2}+1\right)U_b - U_a - \frac{1}{2}U_c = 2 \\ \frac{1}{2}U_c - \frac{1}{2}U_b = 0.5U + 2 \\ U_a - U_b = U \end{cases} \Rightarrow \begin{cases} U_a = 6V \\ U_b = 6.5V \\ U_c = 10V \end{cases}$$

$I_1 + \left(\frac{-U}{1} - \frac{U_a}{2}\right) = 2$ $\quad I_2 = -1.25A$

$I_1 = 5.5$ $\quad P_1 = 5.5\times 6 = 33W$ $\quad P_2 = -5W$

(1) ① 当 $u_{s(1)} = 10V$ 时

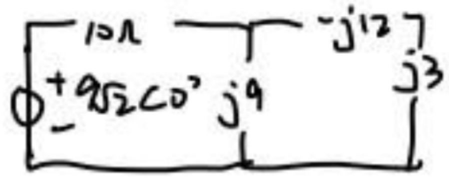
$\therefore i_{1(1)} = 1A$

$i_{2(1)} = 0A$

② 当 $u_{s(2)} = 18\cos\omega t$ 时

W

$\dot{U}_{s(2)} = 9\sqrt{2}\angle 0^\circ$



并谐 → 断路

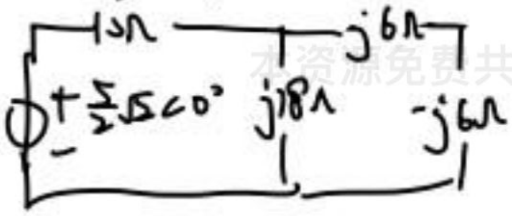
$\dot{I}_{1(2)} = \frac{9\sqrt{2}}{j9} = \sqrt{2}\angle -90^\circ A$

$\dot{I}_{2(2)} = \frac{9\sqrt{2}}{-j9} = \sqrt{2}\angle 90^\circ A$

③ 当 $u_{s(3)} = 5\cos 2\omega t$

$\dot{U}_{s(3)} = \frac{5}{2}\sqrt{2}\angle 90^\circ$

2W



串谐 → 短路

$\dot{I}_{1(3)} = 0A$

$\dot{I}_{2(3)} = \frac{\sqrt{2}}{4}\angle 0^\circ A$

$i_1(t) = 1 + 2\cos(\omega t - 90^\circ)\ A$

$i_2(t) = 0 + 2\cos(\omega t + 90^\circ) + \frac{1}{2}\cos(2\omega t)\ A$

(2) 有功功率只计算电阻就行，电容电感无功

$i_3(t) = 1 + 0 + \frac{1}{2}\cos(2\omega t + 90^\circ)\ A$

$P = \sum UI\cos\varphi$

$= 1 \times 10 + \frac{1}{2} \cdot 5 \cdot \cos 0^\circ = 12.5\ W$

(1) $U_1 = 6I_1 + 3I_2$

$U_2 = 3I_1 + 9I_2$

T

$U_1 = AU_2 - BI_2$

$I_1 = CU_2 - DI_2$

$\therefore 6I_1 = 2U_2 - 18I_2$

$U_1 = 2U_2 - 15I_2$

$I_1 = \frac{1}{3}U_2 - 3I_2$

$\therefore T = \begin{bmatrix} 2 & -15 \\ \frac{1}{3} & -3 \end{bmatrix}$

(2) $U_1 = 15V$

$U_2 = 2.5 \times (-I_2) = -2.5I_2$

$\therefore \begin{cases} 6I_1 + 3I_2 = 15 \\ 3I_1 + 9I_2 = -2.5I_2 \end{cases}$ $\begin{cases} I_1 = 3.6A \\ I_2 = -2.2A \end{cases}$

(3) $6I_1 + 3I_2 = 15 \longrightarrow I_1 = \frac{15 - 3I_2}{6}$

$3I_1 + 9I_2 = U_2$

$U_2 = \frac{15}{2}I_2 + \frac{15}{2}$

$\therefore$ 等效 $U_{oc} = \frac{15}{2}V$ $R_{eq} = \frac{15}{2}\Omega$

$\therefore R = \frac{15}{2}$ $P_{max} = \frac{U_{oc}^2}{4R} = \frac{(\frac{15}{2})^2}{4 \cdot \frac{15}{2}} = \frac{15}{8}W$

解：$R_{eq} = 3k + \dfrac{6k\times 2k}{6k+2k} = 4.5k\Omega$

$\tau = \dfrac{L}{R_{eq}} = \dfrac{1H}{4.5k\Omega} = 2.2\times10^{-4}\ s$

$i_L(0^-) = i_L(0^+) = \dfrac{2}{3}\times\dfrac{9}{2k+\frac{3k\times6k}{3k+6k}} = 1.5\times10^{-3}A = 1.5mA$

$i_L(\infty) = i_L(\infty)_1 + i_L(\infty)_2$

由叠加定理：$i_L(\infty)_1 = \dfrac{9}{4k}\times\dfrac{2}{3} = 1.5\ mA$

$i_L(\infty)_2 = -\dfrac{2}{3}\times3\ mA = -2mA$

$i_L(\infty) = -0.5mA$

$i_L(t) = (-0.5 + 2e^{-\frac{t}{2.2\times10^{-4}}})\times10^{-3}A$

$U_{(0^+)} = U_1 + U_2$

$U_1 = \dfrac{6}{8}\times9 = 6.75V$

$U_2 = -\dfrac{2}{8}\times1.5mA\times6k\Omega = -2.25V$

$U_{(0^+)}\ 4.5V \qquad U_{(\infty)} = 3k\Omega\times2.5mA = 7.5V$

$U(t) = 7.5\cancel{\times} - 3e^{-\frac{t}{2.2\times10^{-4}}}\ V$