西南交通大学考试试卷

课程代码 3046107 课程名称 电路分析（含试验）I 考试时间 120 分钟

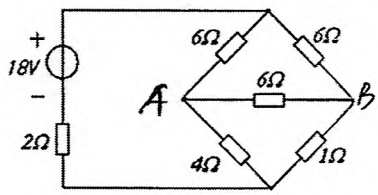
题号	一	二	三	四	五	六	七	八	总成绩
得分									

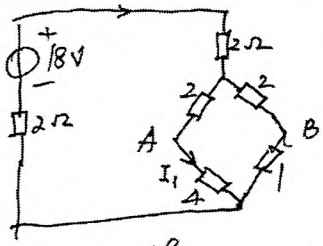
阅卷教师签字：

密封装订线 密封装订线 密封装订线

姓名 学号 班级

一、电路如图：求电压源发出的功率与4Ω电阻吸收的功率。 (12分)





④

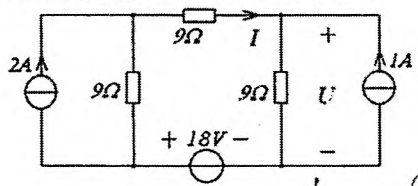
(先出) $P_{电源发}=18\times I=54$ (W)

$I=\dfrac{18}{2+2+\frac{18}{6+3}}=\dfrac{18}{4+2}=3$ (A)

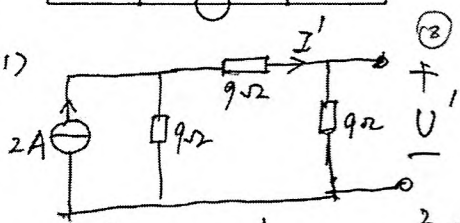
$\therefore P_{4\Omega}=4\times I_1^2=4$ (W) (吸收) ⑧

$I_1=\dfrac{3}{6+3}I=\dfrac{1}{3}\times 3=1$ (A)

二、电路如图所示：用叠加定理求 U、I。 (14分)



(1)



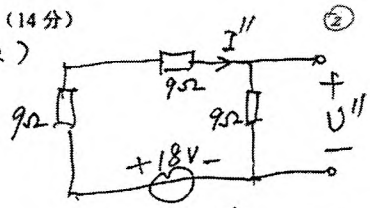
③

$I'=\dfrac{9}{9+18}\times 2=\dfrac{1}{3}\times 2=\dfrac{2}{3}$ (A)

$U'=\dfrac{2}{3}\times 9^3=6$ (V)

$\therefore I=I'+I''+I'''=1A$, $U=U'+U''+U'''=18$ (V) ⑨

(2)

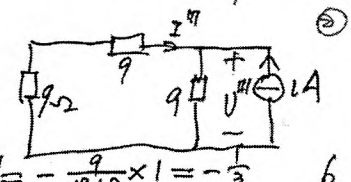


②

$I''=\dfrac{18^2}{3\times 9_1}=\dfrac{2}{3}$ (A)

$U''=9\times I''=9^3\times\dfrac{2}{9_1}=6$ (V)

(3)

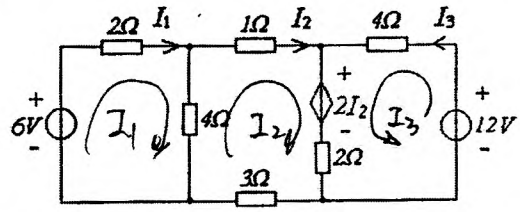


③

$I'''=-\dfrac{9}{18+9}\times 1=-\dfrac{1}{3}$

$U'''=-I'''\times 18=+(\frac{1}{3})\times 18=6$ (V)

三、用网孔电流法求图示电路中的电流 I_1、I_2、I_3。（14分）



I_1: $6I_1-4I_2=6 \rightarrow I_1=\frac{6+4I_2}{6}$ ①

I_2: $-4I_1+10I_2+2I_3=-2I_2$ ②

I_3: $+2I_2+6I_3=12-2I_2 \rightarrow I_3=\frac{12-2I_2-2I_2}{6}=\frac{12-4I_2}{6}$ ③ (H)

①, ③ 代至 ②: $-4\frac{(6+4I_2)}{6}+10I_2+2\frac{(12-4I_2)}{6}=-2I_2$

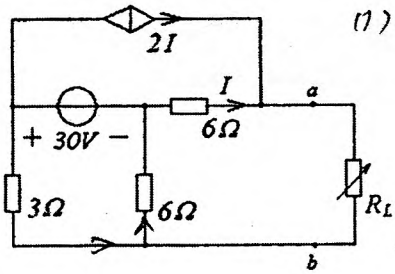
$-24-16I_2+60I_2+24-8I_2=-12I_2$

$0=-48I_2$

$\therefore I_2=0$ (A) 代至①: $I_1=1$ (A)

$\therefore$ 代至③: $I_3=2$ (A) ③

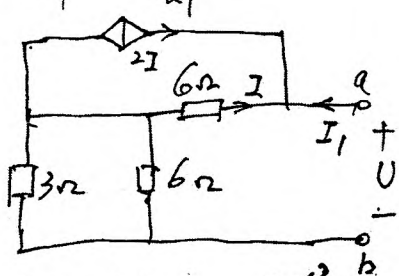
四、电路如图：当负载电阻 R_L 取何值时可以获得最大功率 P_{max}，且 $P_{max}=?$ （12分）

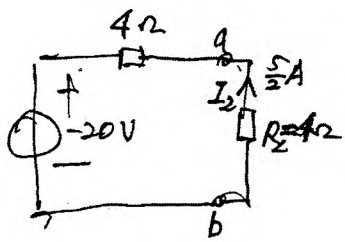


(1) 当 R_L 开路: $I=-2I$ $\therefore I=0$

$\therefore U_{ab开}=\frac{10}{5}\times 6=-20$ (V)

(2)





$I_1=-3I$

$\therefore U=-6I+6\times\left(-3I\times\frac{3}{3+6}\right)$

$=-6I+6\left(-3\times\frac{I_1}{-3}\right)$ (10)

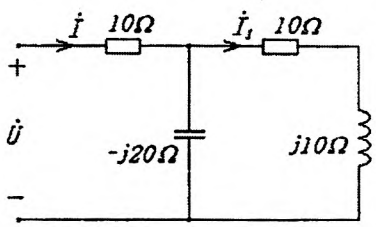
$=-6\times\frac{I_1}{-3}+2I_1$

$=+2I_1+2I_1$ $R_2=4\Omega$ 获 P_{max}

$=4I_1$

$\therefore R_{eq}=\frac{U}{I_1}=4(\Omega)$, $P_{max}=R_2I_2^2=25$ (W) ②

五、电路如图，已知$\dot{U}=90\angle 0^{\circ}(V)$。求：(1) 电流$\dot{I}$及$\dot{I}_1$，(2)电路吸收的有功功率$P$、无功功率$Q$及功率因数$\cos\phi$。 (14分)



解：(1) $\dot{I}=\dfrac{\dot{U}}{10+\dfrac{-j20\times 10\sqrt{2}\angle 45^{\circ}}{10+j10-j20}}$

$=\dfrac{90\angle 0^{\circ}}{30}$

$=3\angle 0^{\circ}$ (A)

$\dot{I}_1=\dfrac{-j20}{10-j10}\dot{I}$

$=\dfrac{20\angle -90^{\circ}}{10\sqrt{2}\angle -45^{\circ}}\times 3$

$=3\sqrt{2}\angle -45^{\circ}$ (A) ⑧

(2) $P=10I^2+10I_1^2$

$=90+180$ ⑫

$=270$ (W)

(3) $\because \varphi=\angle\dot{U}-\angle\dot{I}$

$=0^{\circ}-0^{\circ}$

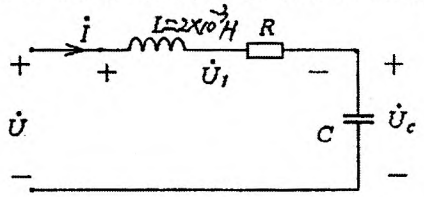
$=0^{\circ}$

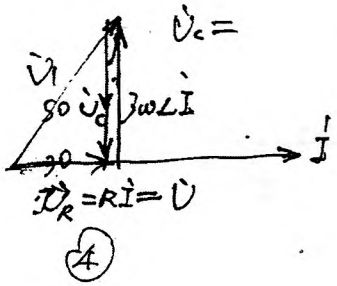
$\therefore \cos\varphi=1$ ② $\sin\varphi=0^{\circ}$

$\therefore Q=UI\sin\varphi=UI\times 0=0$ (VAR) ②

六、如图：已知$\dot{U}$、$\dot{I}$同相，$U=30V$，$U_1=50V$，$I=5A$，$L=20mH$。

要求：(1) 作出关于图中各电压、电流的相量图。 (2) 求电阻R、电容C的值。 (12分)





④

设 $\dot{U}=30\angle 0^{\circ}$ $\dot{I}=5\angle 0^{\circ}$

$\therefore R=\dfrac{\dot{U}}{\dot{I}}=\dfrac{30}{5}=6$ (Ω) ④

$\therefore U_L=U_C=\sqrt{U_1^2-U^2}$

$=\sqrt{2500-900}$

$=40$ (V)

$\therefore X_L=X_C=\dfrac{40}{5}=8$ (Ω)

$\dfrac{1}{\omega C}=\omega L=8$，即 $\omega\times 20\times 10^{-3}=8$

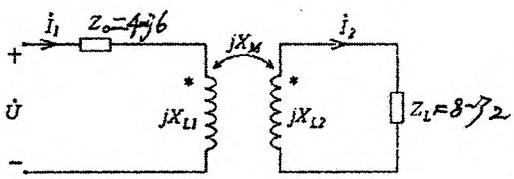
$\omega=\dfrac{8}{20\times 10^{-3}}=400$

$C=\dfrac{1}{\omega^2 L}=\dfrac{1}{400\times 8}$

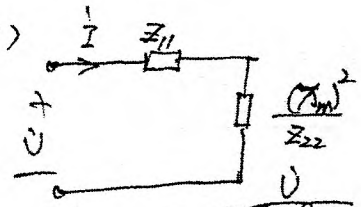
$\approx 0.3125\times 10^{-3}$ (F) ④

七、如图：已知 $X_M=8\Omega$，$X_{L1}=16\Omega$，$X_{L2}=10\Omega$，$Z_L=8-j2(\Omega)$，$Z_0=4-j6(\Omega)$，

$\dot{U}=100\angle 0^\circ(V)$。求：$\dot{I}_1$、$\dot{I}_2$。（12分）



(1)



$$\dot{I}=\frac{\dot{U}}{4-j6+j16+\frac{8\times 8}{8-j2+j10}}$$

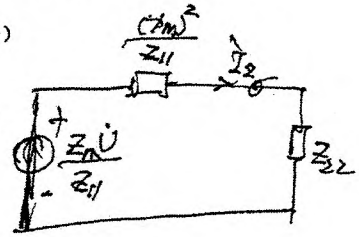
$$=\frac{100\angle 0^\circ}{4+j10+4-j4}$$

$$=\frac{100}{8+j6}$$

$$\approx\frac{100}{10\angle 36.9^\circ}$$

$$\approx 10\angle -36.9^\circ\ (A)$$ ⑥

(2)



$Z_{11}=4-j6+j16=4+j10$

$$\frac{jX_M\dot{U}}{Z_{11}}=\frac{j8\times 100}{4+j10}\approx\frac{j8\times 100}{10.78\angle 68.2^\circ}\approx 74.2\angle 21.8^\circ$$

$$\frac{(X_M)^2}{Z_{11}}=\frac{8\times 8}{10.78\angle 68.2^\circ}\approx 5.94\angle -68.2^\circ$$

$Z_{22}=8-j2+j10=8\sqrt{2}\angle 45^\circ$

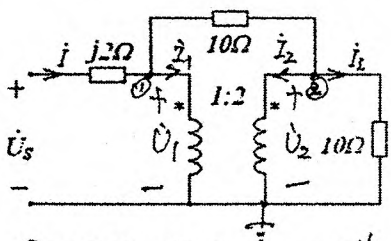
$$\therefore\dot{I}_2=\frac{74.2\angle 21.8^\circ}{2.2-j5.48+8+j8}$$

$$=\frac{74.2\angle 21.8^\circ}{10.2+j2.48}$$

$$=\frac{74.2\angle 21.8^\circ}{10.5\angle 13.7^\circ}$$

$$\approx 7.1\angle 8.1^\circ\ (A)$$ ⑥

八、电路如图：已知 $\dot{U}_S=40\angle 0^\circ(V)$。求电流 $\dot{I}$ 及 $\dot{I}_L$。（10分）



①：$\left(\frac{1}{j2}+\frac{1}{10}\right)\dot{U}_1-\frac{1}{10}\dot{U}_2=\frac{\dot{U}_S}{j2}-\dot{I}_1$ ①

②：$-\frac{1}{10}\dot{U}_1+\left(\frac{1}{10}+\frac{1}{10}\right)\dot{U}_2=\dot{I}_2$ ②

$\dot{U}_1=\frac{1}{2}\dot{U}_2$ ③

$\dot{I}_1=-2\dot{I}_2$ ④

④分至①，③代至①及②得含 $\dot{U}_1$、$\dot{I}_1$

$$\begin{cases}\left(\frac{1}{j2}+\frac{1}{10}\right)\times\frac{1}{2}\dot{U}_2-\frac{1}{10}\dot{U}_2=\frac{\dot{U}_S}{j2}+2\dot{I}_2 & ⑤\\ -\frac{1}{10}\times\frac{1}{2}\dot{U}_2+\frac{2}{10}\dot{U}_2=-\dot{I}_2 & ⑥\end{cases}$$

解之：$\dot{U}_2=40\sqrt{2}\angle -45^\circ$

$\therefore\dot{U}_1=\frac{1}{2}\dot{U}_2=20\sqrt{2}\angle -45^\circ$

$\therefore\dot{I}=\frac{\dot{U}_S-\dot{U}_1}{j2}=10\sqrt{2}\angle -45^\circ\ (A)$

$\dot{I}_L=\frac{\dot{U}_2}{10}=4\sqrt{2}\angle -45^\circ\ (A)$ ②