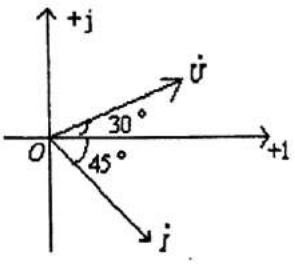
北工大电工习题专题-交流电路

4-2 非客观题(48 小题)

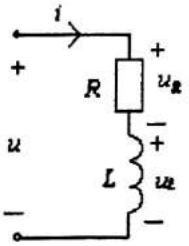
1. 已知 $t=0$ 时正弦量的值分别为 $u(0)=110\text{V}$，$i(0)=-5\sqrt{2}\text{ A}$。它们的相量图如图示，试写出正弦量的瞬时表达式及相量。



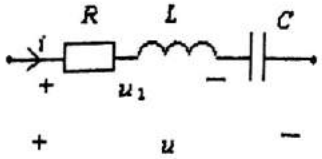
2. 已知电路中某元件的电压 u 和电流 i 分别为 $u=141\cos(314t+60^\circ)\text{V}$，$i=7\sin(314t-120^\circ)\text{A}$。问：(1)元件的性质；(2)元件的复阻抗；(3)储存能量的最大值。

3. 某感性电路施加一正弦交流电压 $u=220\sqrt{2}\sin 314t\text{ V}$，有功功率 $P=7.5\text{kW}$，无功功率 $Q=5.5\text{kvaR}$。求：(1)电路的功率因数λ；(2)若电路为 R，L 并联，R，L 值为多少？

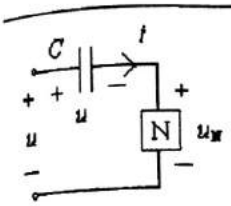
4. 在图示电路中，电源电压 $u=220\sqrt{2}\sin 314t\text{ V}$，有功功率 $P=8.8\text{kW}$，无功功率 $Q=6.6\text{kvaR}$。求：该电路的 R，L 电流 i，电压 u_R，u_L 及功率因数 λ，并画出相量图($\dot{I}$，$\dot{U}_R$，$\dot{U}_L$，$\dot{U}$)。

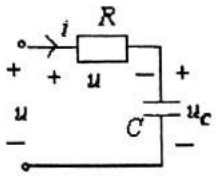


5. 图示电路中，已知 $R=30\Omega$，$L=382\text{mH}$，$C=40\mu\text{F}$，电源电压 $u=250\sqrt{2}\sin 314t\text{V}$。求电流 i 电压 u_1，有功功率 P 和功率因数 λ，并画出相量图($\dot{I}$，$\dot{U}$，$\dot{U}_1$)。



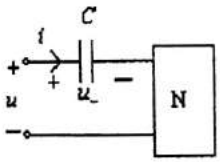
6. 左下图示电路中，$u=10\sqrt{2}\sin(1\,000t+60^\circ)\text{V}$，$u_C=5\sqrt{2}\sin(1\,000t-30^\circ)\text{V}$，容抗 $X_C=10\Omega$。求无源二端网络 N 的复阻抗 Z 及有功功率 P，并画出相量图(含电流及各电压)。

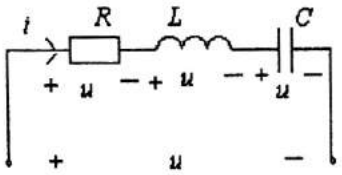




7. 在右上图示电路中，$u=100\cos 1\,000t$ V，$i=10\cos(1\,000t+\frac{\pi}{3})$A。求：(1) R，C 及电路有功功率 P；(2) 当 $t=\frac{\pi}{1\,000}$ s 时的 u_R 及 u_C 的值及实际方向；(3) 画出含 $\dot{U}$，$\dot{I}$，$\dot{U}_R$，$\dot{U}_C$ 的相量图。

8. 在左下图示正弦交流电路中，已知：C=100μF，$u=10\sin(10^3t+60°)$V，u_C=5sin(10^3t−30°)V。试求电路的有功功率 P。

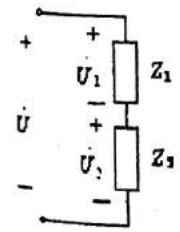




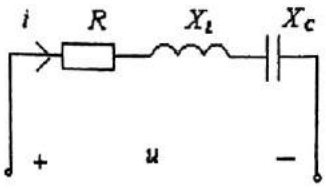
9. 在右上图示电路中，已知：$i=0.2\sin(600t+45°)$A，R=20Ω，感抗 X_L=20Ω，容抗 X_C=30Ω。求：(1) L，C，u；(2) 画出相量图（$\dot{U}$，$\dot{I}$，$\dot{U}_R$，$\dot{U}_L$，$\dot{U}_C$）。

10. 在 R，L，C 串联电路中，已知电源电压 $u=70.7\sin(100t+30°)$V，电流 i=1.5sin100 tA，电容 C=400μF。试求电路的电阻 R 和电感 L。

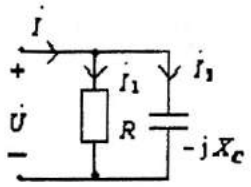
11. 阻抗 Z_1=3+j4Ω，Z_2=6+j8 Ω串联于 $\dot{U}=225\angle 53.1°$ V 的电源上工作。求：(1) Z_1，Z_2 上的电压 u_1，u_2；(2) 有功功率 P，无功功率 Q 及功率因数 λ，该电路呈何性质？



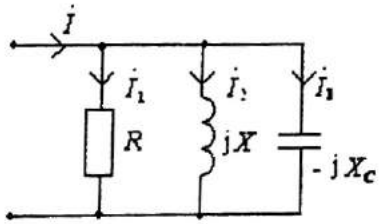
12. 在图示电路中，已知 i=0.2sin(600 t+45°)A，R=20Ω，感抗 $X_L=20\Omega$，容抗 $X_C=30\Omega$。求：(1) 电压 u；(2) 电路的有功功率，无功功率，视在功率和功率因数；(3) 此电路呈何性质。



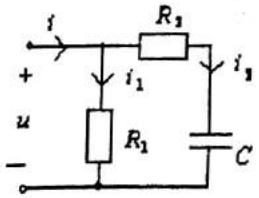
13. 在图示电路中，电流有效值 $I=5\text{A}$，$I_2=3\text{A}$，$R=25\Omega$。求电路的复阻抗 Z。

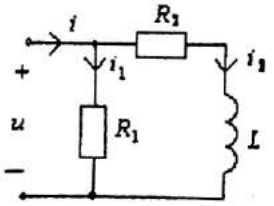


14. 在图示电路中，$R=8\Omega$，$X_L=22.2\Omega$，$X_C=3.13\Omega$，总电流相量 $\dot{I}=12\angle 65.4^\circ$。求：(1)电流相量 $\dot{I}_1$，$\dot{I}_2$，$\dot{I}_3$；(2)电路的功率因数 λ；(3)该电路呈何性质。



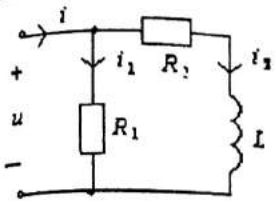
15. 在左下图示电路中，已知 $u=220\sqrt{2}\sin 314t\,\text{V}$，$i_1$ 支路有功功率 $P_1=100\text{W}$，i_2 支路有功功率 $P_2=40\text{W}$，功率因数 $\lambda_2=0.8$。求电路的电流 i，总功率 P 及功率因数 λ，并画出 $\dot{U}$，$\dot{I}$，$\dot{I}_1$，$\dot{I}_2$ 的相量图。



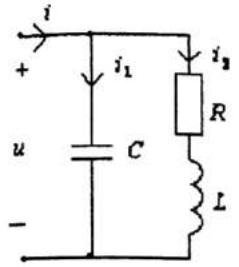


16. 在右上图示电路中，已知 $R_2=30\Omega$，$L=0.4\text{H}$，两支路消耗的有功功率 $P_1=P_2=7.5\text{W}$，电源角频率 $\omega=100\text{Rad/s}$。求 R_1，i，并画相量图（$\dot{U}$，$\dot{I}$，$\dot{I}_1$，$\dot{I}_2$）。

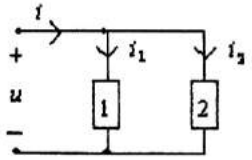
17. 在图示电路中，已知 $u=220\sqrt{2}\sin(314t)\,\text{V}$，$i_1$ 支路有功功率 $P_1=100\text{W}$，i_2 支路 $P_2=40\text{W}$，功率因数 $\lambda_2=0.8$。求电流 i，总功率 P 及总功率因数 λ，并画相量图（$\dot{U}$，$\dot{I}$，$\dot{I}_1$，$\dot{I}_2$）。



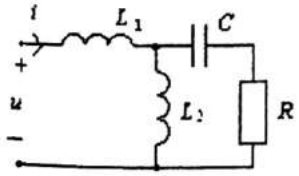
18. 在图示电路中，已知$u=100\sqrt{2}\sin 1\,000t$ V，R=3Ω，L=4mH，C=200μF。求电流 i，i_1，i_2及总有功功率 P，并画相量图（$\dot{U}$，$\dot{I}$，$\dot{I}_1$，$\dot{I}_2$）。

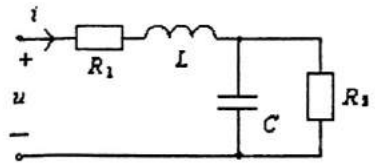


19. 在图示电路中，已知$u=1\,000\sqrt{2}\sin\omega t$V；负载 1，2 的功率、功率因数分别为 P_1=10kW，λ=0.8（容性）；P_2=15kW，λ=0.6（感性）。(1)求电流 i_1，i_2，i；(2)问全电路呈何性质？(3)画相量图（含电压及各电流）。



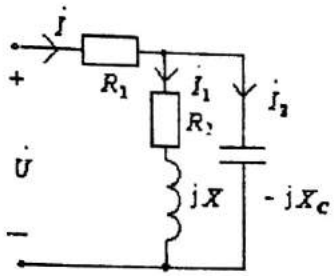
20. 在左下图示电路中，$L_1=\frac{1}{3}$H，$L_2=\frac{5}{6}$H，$C=\frac{1}{3}$F，R=2Ω，$i=\sin(3t+45^\circ)$A。求：(1)电压 u；(2)电路有功功率 P；(3)该电路呈何性质？



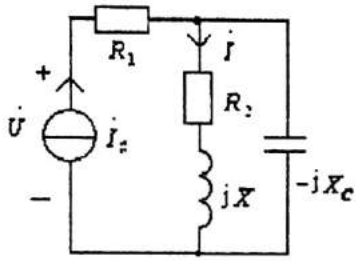


21. 在右上图示电路中，$u=318\sqrt{2}\sin(10\,000t)$V，$R_1$=$R_2$=1Ω，$L$=0.1mH，$C$=100μF。求电流 i，总有功功率 P 及功率因数 λ。

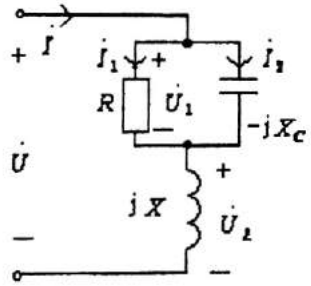
22. 在图示电路中，已知：R_1=5Ω，R_2=3Ω，X_L=X_C=4Ω，$\dot{I}$=30∠30°。求电流 $\dot{I}_1$，$\dot{I}_2$，电压 $\dot{U}$及总有功功率 P。



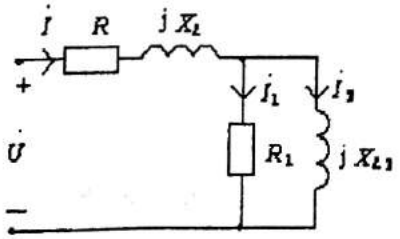
23. 在图示电路中，R_1=5Ω，R_2=3Ω，X_L=X_C=4Ω，$\dot{I}_S = 40\angle -60°\,\mathrm{A}$。求$\dot{I}_S$，$\dot{U}$及电路的有功功率 P。



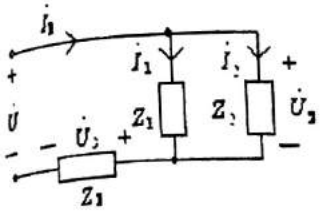
24. 在图示电路中，电流有效值 I_1=I_2=10A，$\dot{U} = 100\angle 120°\,\mathrm{V}$，$\dot{U}_1 = 36.6\angle 0°\,\mathrm{V}$。求 X_L 及总功率因数λ。



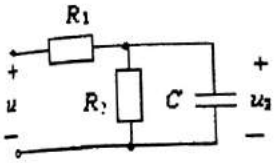
25. 在图示电路中，R_1=5Ω，R=20Ω，X_L=40Ω，I_1=9A，I_2=12A。试求：(1)电源电压的有效值 U；(2)电路消耗的功率及电路的功率因数λ。



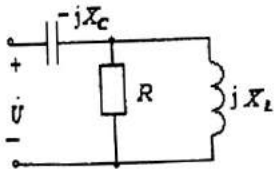
26. 在图示电路中，已知 Z_3=3+j3Ω，$\dot{I}_1 = 40\angle -90°\,\mathrm{A}$，$\dot{I}_2 = 40\angle 0°\,\mathrm{A}$，$\dot{U}_2 = 400\angle -53.1°\,\mathrm{V}$。求：(1)$Z_1$，$Z_2$，$\dot{U}$；(2)$Z_3$ 消耗的有功功率 P_3 及功率因数λ_3；(3)画相量图($\dot{I}_1$，$\dot{I}_2$，$\dot{I}_3$，$\dot{U}_2$，$\dot{U}_3$，$\dot{U}$)。



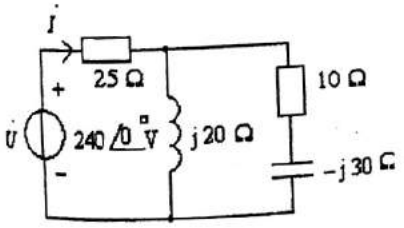
27. 在图示正弦交流电路中，R_1=86.5Ω，R_2=173Ω，$\frac{1}{\omega C}=100\ \Omega$，$U_2$=17.3V，若以电压 u_2 为参考正弦量。试求 u 和电路的有功功率 P，并画出关于各电压，电流的相量图。

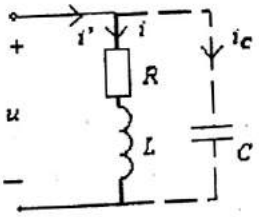


28. 在图示电路中，$R=X_L=X_C=1\Omega$，电路消耗的功率 P=1W。求电压 U 及电路功率因数 λ，并画出含支路电流及各部分电压的相量图。



29. 求左下图示电路中，电压源 $\dot{U}_S$ 供出的有功功率。





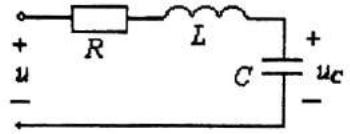
30. 在右上图示 R，L 串联电路中，已知：$i=2.82\sqrt{2}\sin 314t$ A，R=60Ω，L=0.255H。求：(1)若在电路两端并联 C=11.3μF 的电容，电源供出电流的有效值变化了多少？(2)并联电容后的功率因数？

31. 某 R，L 串联电路，施加正弦交流电压 $u=220\sqrt{2}\sin 314t$ V，测得有功功率 P=40W，电阻上电压 U_R=110V。试求电路的功率因数？若将电路的功率因数提高到 0.85，则应并联多大电容？

32. R，L，C 串联电路外加电压 $u=100\sqrt{2}\sin 314t$ V 时发生串联谐振，电 $i=\sqrt{2}\sin 314t$A，且 U_C=180V。求电路元件的参数 R，L，C。

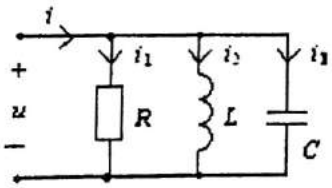
33. R，L，C 并联电路接于 U_S=10V 的正弦交流电源上，已知 R=1kΩ，L=31.8mH C=3.18μF。试求：(1)要使电路产生并联谐振，其谐振频率 f_0=?(2)电路谐振时各元件通 的电流和总电流的有效值。

34. 在图示电路中，已知 $u=100\sqrt{2}\sin 314t$ V，调节电容 C，使电流 i 与电压 u 同相，并 得电容电压 U_C=180V，电流 I=1A。(1)求参数 R，L，C；(2)若 R，L，C 及 u 的有效值 不变，但将 u 的频率变为 f=100Hz，求电路中的电流 i 及有功功率 P，此时电路呈何性质

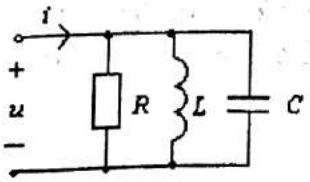


35. 某 R，L，C 串联电路中，已知：R=50Ω，C=10μF。(1)若电源频率 f=1000Hz 时，电 出现谐振，L=？(2)若电路参数保持不变，求 f_1=500Hz 和 f_2=1500Hz 时电路的复阻抗， 说明该电路各呈何性质？

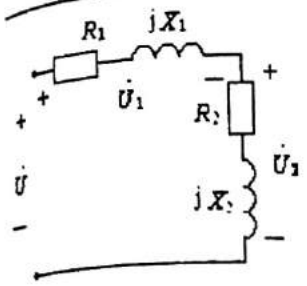
36. 在图示电路中，R=2.5kΩ，C=2μF，该电路在 f=1000Hz 时发生谐振，且谐振时的电 I_0=0.1A。：(1)求 L 及 i_1，i_2，i_3；(2)若电源电压有效值不变，但频率 f=500Hz，求电路 功率 P，此时电路呈何性质？



37. 在图示电路中，已知：$u=200\sqrt{2}\sin 314t$ V，R=25Ω，X_L=50Ω，X_C=20Ω。(1)求电流 及功率因数 λ；(2)若电源电压 u 的有效值不变，只调节其频率使电路谐振，其它参数均 变，求谐振时电路中的电流 I_0 及电源的频率 f_0。

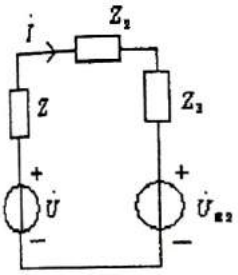


38. 某厂变电所经配电线向一车间供电，若该车间一相等效负载的电阻 R_2=10Ω， X_2=10.2Ω，配电线的 R_1=0.5，X_1=1Ω。(1)欲保证车间电压 U_2=220V，问电源电压 U 等于多少?线路上的电压 U_1 为多少?(2)求负载有功功率 P_2 及线路功率损失 P_1。

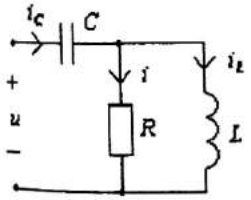


39. 已知 R，L 串联电路的有功功率 $P=8.8\text{kW}$，无功功率 $Q=6.6\text{kvaR}$，电流 $i=70.7\sin(314t+30°)\text{A}$。求：(1) 电源电压 u；(2) 电路的电阻 R，感抗 X_L 及功率因数 λ。

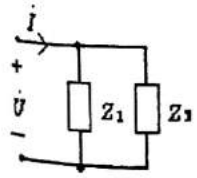
40. 在图示电路中，$Z_1=1-\text{j}\Omega$，$Z_2=2+\text{j}3\Omega$，$Z_3=3+\text{j}6\Omega$，$\dot{U}_{S1}=100\angle 60°\text{V}$，$\dot{U}_{S2}=100\angle 0°\text{V}$。求该电路的电流 $\dot{I}$，有功功率 P，无功功率 Q，视在功率 S 及功率因数 λ。



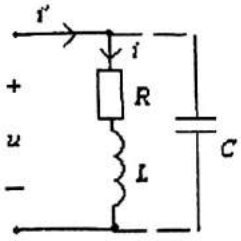
41. 图示为一正弦电路，已知电源频率为 50Hz，$R=100\Omega$，电流有效值 $I_C=2\text{A}$，$I_L=1.41\text{A}$，若电路的总功率因数为 1。求 L 和 C。



42. 图示为两复阻抗并联交流电路，已知 $Z_1=2+\text{j}3\Omega$，$Z_2=3+\text{j}6\Omega$，Z_2 支路的视在功率 $S_2=1490\text{VA}$。求 Z_1 支路的有功功率 P_1。

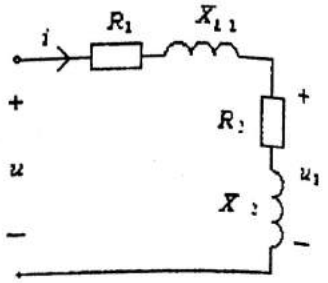


43. 在右图示电路中，已知 $u=220\sqrt{2}\sin 314t\,\text{V}$，$P=10\text{kW}$，$\lambda=0.6$。求：(1) R，L，i；(2) 欲使该电路的功率因数提高到 0.95，应并联多大的电容 C？(3) 求并联电容 C 后的总电流有效值 I'。

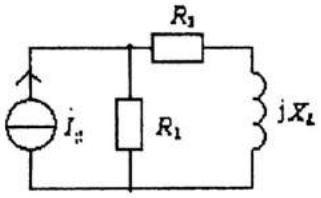


44. 在 R，L 串联电路中，已知 $u=100\sqrt{2}\sin 314t$ V，$i=20\sqrt{2}\sin(314t-53.1^\circ)$ A。求：(1) R，L 电路的有功功率 P，功率因数 λ；(2) 若 R，L 改为并联而 u 不变，求总电流 i'，有功功率 P' 及功率因数 λ'。

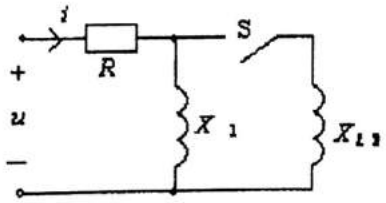
45. 在右图示正弦交流电路中，电压有效值 U=150V，U_2=100V，电流有效值 I=10A，电路的有功功率 P=900W，电阻 R_2=6Ω。求电阻 R_1，感抗 X_{L1} 及 X_{L2}。



46. 在图示电路中，R_2=48Ω，X_L=36Ω，R_1，R_2 所消耗的有功功率 $P_1=P_2$=1.5W。求 R_1 及电流源的电流有效值 I_S。



47. 在图示电路中，R=12Ω，X_{L1}=16Ω，电流 i 的有效值 I=15A，开关 S 闭合后总电流变为 I=20A。求感抗 X_{L2}。



48. 欲用额定容量 S_N=10kVA，电压 $u=220\sqrt{2}\sin 314t$ V 的正弦交流电源，给 P=8kW，λ=0.6 的感性负载供电。问：(1) 该电源供出的电流是否超过其额定电流？(2) 欲将功率因数提高到 0.95，应并联多大的电容？(3) 并联电容后，电源供出的电流是多少？此时是否超过其额定电流？

4-1 单项选择题答案：

1. (c) 2. (a) 3. (b) 4. (c) 5. (a) 6. (c) 7. (c) 8. (c) 9. (a)

10. (b) 11. (b) 12. (b) 13. (b) 14. (a) 15. (b) 16. (c) 17. (b) 18. (b) 19. (b)

20. (a) 21. (c) 22. (b) 23. (b) 24. (b) 25. (b) 26. (a) 27. (b) 28. (c) 29. (c)

30. (c) 31. (b) 32. (a) 33. (b) 34. (b) 35. (b) 36. (c) 37. (b) 38. (c) 39. (c)

40. (a) 41. (b) 42. (c) 43. (a) 44. (c) 45. (a) 46. (a) 47. (c) 48. (b) 49. (a)

50. (b) 51. (b) 52. (a) 54. (c) 55. (b) 56. (b) 59. (a)

60. (a) 64. (a) 65. (b)

4-2 非客观题答案：

1. (1) $t=0$ 时，$u(0)=110\text{V}$，即 $110=U_m\sin 30^\circ$，$U_m=220\text{V}$

$u=220\sin(\omega t+30^\circ)\text{V}$　　相量 $\dot{U}=\frac{220}{\sqrt{2}}\angle 30^\circ\text{V}=110\sqrt{2}\angle 30^\circ\text{V}$

(2) $t=0$ 时，$i(0)=-5\sqrt{2}\text{A}$，即 $-5\sqrt{2}=I_m\sin(-45^\circ)$　　$I_m=10\text{A}$　　$i=10\sin(\omega t-45^\circ)\text{A}$

相量 $\dot{I}=\frac{10}{\sqrt{2}}\angle -45^\circ=5\sqrt{2}\angle -45^\circ\text{A}$

2. (1) $u=141\cos(314t+60^\circ)=141\sin(314t+150^\circ)\text{V}$

u 与 i 相位差 $\varphi=150^\circ-(-120^\circ)=270^\circ$，电流超前电压 $360^\circ-270^\circ=90^\circ$，此元件为纯电容元件

(2) 复阻抗 $Z=\frac{141\angle 150^\circ}{7\angle -120^\circ}\approx 20\angle 270^\circ=20\angle -90^\circ=-j20\ \Omega$

(3) $W_m=\frac{1}{2}CU_m^2=\frac{1}{2}\times\frac{1}{X_C\cdot\omega}U_m^2=\frac{1}{2}\times 141^2\times\frac{1}{314\times 20}\approx 1.58\text{ J}$

3. (1) $\tan\varphi=\frac{Q}{P}=0.73$　　$\varphi=36.25^\circ$　$\lambda=\cos\varphi=\frac{P}{S}=0.81$

(2) $R=\frac{U^2}{P}=\frac{220^2}{7.5\times 10^3}=6.45\Omega$　$X_L=\frac{U^2}{Q}=\frac{220^2}{5.5\times 10^3}=8.8\Omega$　$L=\frac{X_L}{\omega}=\frac{8.8}{314}=28\text{mH}$

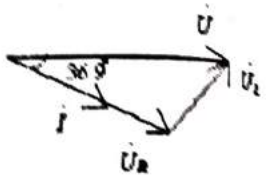
4. 解：$S=\sqrt{P^2+Q^2}=\sqrt{8\,800^2+6\,600^2}=11\,000\text{VA}$

$I=\dfrac{S}{U}=\dfrac{11\,000}{220}=50\text{A}$ $P=I^2R$, $R=\dfrac{P}{I^2}=\dfrac{8\,800}{50^2}=3.52\ \Omega$ $Q=I^2\omega L$,

$L=\dfrac{Q}{I^2\omega}=\dfrac{6600}{50^2\times 314}=8.4\times10^{-3}\text{H}=8.4\text{mH}$ $\lambda=\cos\varphi=\dfrac{8\,800}{11\,000}=0.8$, $\varphi=36.9^\circ$

$U_R=IR=50\times3.52=176\text{ V}$

$U_L=I\omega L=50\times314\times0.008\,4=132\text{ V}$



$i=50\sqrt{2}\sin(314t-36.9^\circ)\text{A}$

$u_R=176\sqrt{2}\sin(314t-36.9^\circ)\text{V}$ $u_L=132\sqrt{2}\sin(314t+53.1^\circ)\text{V}$

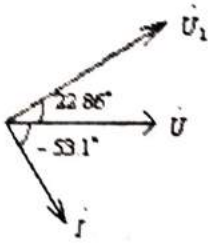
5. $X_L=\omega L=314\times0.382=120\Omega$

$X_C=\dfrac{1}{\omega C}=\dfrac{10^6}{314\times40}=80\Omega$ $|Z|=\sqrt{30^2+(120-80)^2}=50\Omega$ $I=\dfrac{U}{|Z|}=\dfrac{250}{50}=5\text{A}$

$\tan\varphi=\dfrac{X}{R}=\dfrac{40}{30}$ $\varphi=53.1^\circ$ $i=5\sqrt{2}\sin(314t-53.1^\circ)\text{A}$

$\dot{U}_1=\dot{I}(R+jX_L)=5\angle-53.1^\circ(30+j120)$

$=618.5\angle22.86^\circ\text{V}$

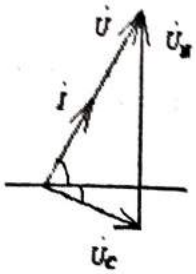


$u_1=618.5\sqrt{2}\sin(314t+22.86^\circ)\text{V}$;

$P=I^2R=5^2\times30=750\text{W}$ $\lambda=\cos53.1^\circ=0.6$

6. $\dot{U}_R=\dot{U}-\dot{U}_C=10\angle60^\circ-5\angle-30^\circ=11.2\angle86.5^\circ\text{V}$ $\dot{I}=\dfrac{\dot{U}_C}{-jX_C}=\dfrac{5\angle-30^\circ}{10\angle-90^\circ}=0.5\angle60^\circ\text{A}$

$Z_1=\dfrac{\dot{U}_1}{\dot{I}}=\dfrac{11.2\angle86.5^\circ}{0.5\angle60^\circ}=22.4\angle26.5^\circ=20+j10\ \Omega$



$P=I^2R=0.5^2\times20=5\text{W}$

7. (1) $Z=\dfrac{\dot{U}}{\dot{I}}=5-j8.66\Omega$ $R=5\Omega$ $C=\dfrac{1}{1\,000\times8.66}=115.5\mu\text{F}$

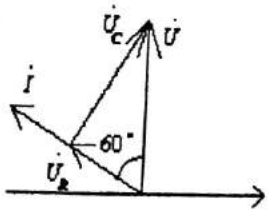
$P=UI\cos\varphi=250\text{W}$

(2) $u_R(\frac{\pi}{1\,000}) = 50\cos(1\,000\times\frac{\pi}{1\,000}+60°) = -25\text{V}$

$u_C(\frac{\pi}{1\,000}) = 86.6\cos(1\,000\times\frac{\pi}{1\,000}-\frac{\pi}{6}) = -75\text{V}$

当 $t=\frac{\pi}{1\,000}\text{s}$ 时，u_R，u_C的实际方向与正方向相反

(3) 相量图

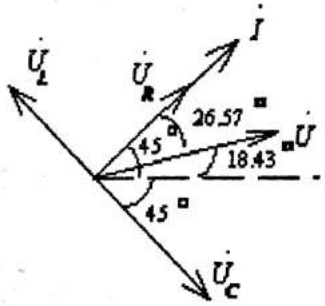


8. $X_C=\frac{1}{\omega C}=10\Omega$ $\dot{I}=\frac{\dot{U}_{Cm}}{-jX_C}=0.5\angle 60°\text{A}$ ； $P=UI\lambda=\frac{10}{\sqrt{2}}\times\frac{0.5}{\sqrt{2}}\cos(60°-60°)=2.5\text{W}$

9. (1) $u_R=i\times R=4\sin(600t+45°)\text{V}$ $u_L=6\sin(600t-45°)\text{V}$ $u_I=4\sin(600t+135°)\text{V}$

$U_m=\sqrt{U_{Rm}^2+(U_{Lm}-U_{Cm})^2}=\sqrt{4^2+(4-6)^2}=4.47\text{V}$

$\varphi=\tan^{-1}\frac{(X_L-X_C)}{R}=\tan^{-1}\frac{(20-30)}{20}=-26.57°$



$u=4.47\sin(600t+18.43°)\text{V}$ $L=\frac{X_L}{\omega}=\frac{20}{600}=33\times10^{-3}\text{ H}=33\text{mH}$

$C=\frac{1}{\omega X_C}=\frac{1}{600\times30}=55.6\times10^{-6}\text{ F}=55.6$ μF

10. $|Z|=\frac{70.7}{1.5}=47.13\Omega$ $R=|Z|\cos30°=47.13\times\frac{\sqrt{3}}{2}=40.82\Omega$

$X=|Z|\sin30°=47.13\times\frac{1}{2}=23.57\Omega$ $X_C=\frac{1}{\omega C}=\frac{1}{100\times400\times10^{-6}}=25\Omega$

$\because X=X_L-X_C \therefore X_L=X+X_C=23.57+25=48.57\Omega$

$L=\frac{X_L}{\omega}=\frac{48.57}{100}=486\text{m H}$

11. (1) $\dot{I}=\dfrac{\dot{U}}{Z_1+Z_2}=\dfrac{225\angle 53.1^\circ}{(3+j4)+(6+j8)}=15\angle 0^\circ$

$\dot{U}_1=\dot{I}Z_1=15\angle 0^\circ\times(3+j4)=75\angle 53.1^\circ\,V$

$\dot{U}_2=\dot{I}Z_2=15\angle 0^\circ\times(6+j8)=150\angle 53.1^\circ\,V$

$u_1=75\sqrt{2}\sin(\omega t+53.1^\circ)\,V\quad u_2=150\sqrt{2}\sin(\omega t+53.1^\circ)\,V$

(2) $\lambda=\dfrac{P}{S}=\cos\varphi=\cos 53.1^\circ=0.6\quad P=UI\lambda=225\times 15\times 0.6=2\ 025W$

$Q=UI\sin\varphi=225\times 15\times 0.8=2\ 700\ Var$ $\dot{U}$超前$\dot{I}$，该电路呈感性

12. (1) $Z=R+j(X_L-X_C)=20+j(20-30)$

$=22.36\angle -26.57^\circ\,\Omega$

$\dot{U}_R=\dot{I}Z=0.2\angle 45^\circ\times 22.36\angle -26.57^\circ$

$=4.47\angle 18.4^\circ\,V\qquad u=4.47\sin(600t+18.4^\circ)\,V$

(2) $P=I^2R=(\dfrac{0.2}{\sqrt{2}})^2\times 20=0.4\,W\quad Q=I^2X=(\dfrac{0.2}{\sqrt{2}})^2\times(-10)=-0.2\ Var$

$S=UI=\dfrac{4.47}{\sqrt{2}}\times\dfrac{0.2}{\sqrt{2}}=0.447VA\quad \lambda=\dfrac{P}{S}=\cos\varphi=\cos(-26.57^\circ)=0.89$

(3) 电路呈容性

13. $I_1=\sqrt{I^2-I_2^2}=4A$ 设：$\dot{I}_1=4\angle 0^\circ A\quad \dot{U}=\dot{I}_1R=100\angle 0^\circ V$

$\dot{I}=5\angle\arctan\dfrac{3}{4}=5\angle 36.9^\circ A\quad Z=\dfrac{\dot{U}}{\dot{I}}=20\angle -36.9^\circ\,\Omega$

14. (1) $Z_{1C}=\dfrac{-j^2X_LX_C}{jX_L-jX_C}=-j3.64\,\Omega\quad \dot{I}_1=\dot{I}\times\dfrac{Z_{1C}}{R+Z_{1C}}=5\angle 0^\circ A$

$\dot{U}_2=\dot{I}_1R=40\angle 0^\circ V\quad \dot{I}_2=\dfrac{\dot{U}_2}{jX_L}=1.8\angle -90^\circ A\quad \dot{I}_3=\dfrac{\dot{U}_2}{-jX_C}=12.7\angle 90^\circ A$

(2) $\lambda=\dfrac{P}{S}=\cos\varphi=\cos 65.4^\circ=0.42$

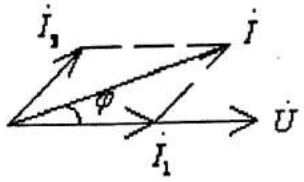
(3) Q_i超前于u_R（即电源电压u），∴电路呈容性

15. $I_1=\dfrac{P_1}{U}=\dfrac{100}{220}=0.45A\quad I_2=\dfrac{P_2}{U\lambda_2}=\dfrac{40}{220\times 0.8}=0.23A$

$\varphi_1 = 36.9°$　$\dot{I}_2 = 0.23\angle 36.9°\,\text{A}$　$\dot{I} = 0.45 + 0.23\angle 36.9° = 0.45 + 0.18 + j0.14 = 0.65\angle 12.5°\,\text{A}$

$i = 0.65\sqrt{2}\sin(314t + 12.5°)\,\text{A}$　$\lambda = \cos 12.5° = 0.976$

$P = UI\cos\varphi = 220 \times 0.65\cos 12.5° = 139.61\,\text{W}$

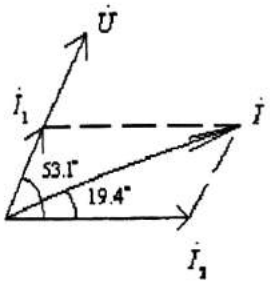


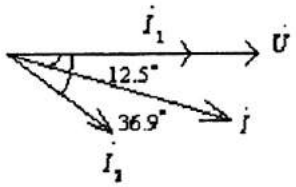
16. (1) $P_2 = I_2^2 R_2$　$I_2 = \sqrt{\dfrac{P_2}{R_2}} = 0.5\,\text{A}$　设：$\dot{I}_2 = 0.5\angle 0°\,\text{A}$

$\dot{U} = \dot{I}_2(R_2 + j\omega L) = 25\angle 53.1°\,\text{V}$　$R_1 = \dfrac{U^2}{P} = 83.33\,\Omega$　$\dot{I}_1 = \dfrac{\dot{U}}{R_1} = 0.3\angle 53.1°\,\text{A}$

$\dot{I} = \dot{I}_1 + \dot{I}_2 = 0.72\angle 19.4°\,\text{A}$　$i = 0.72\sqrt{2}\sin(100t + 19.4°)\,\text{A}$

(2) 相量图见左下图





17. $I_1 = \dfrac{P_1}{U} = \dfrac{100}{220} = 0.45\,\text{A}$　$I_2 = \dfrac{P}{U\lambda_2} = \dfrac{40}{220 \times 0.8} = 0.23\,\text{A}$　$\varphi_2 = 36.9°$

$\dot{I} = \dot{I}_1 + \dot{I}_2 = 0.45\angle 0° + 0.23\angle -36.9° = 0.65\angle -12.5°\,\text{A}$

$i = 0.65\sqrt{2}\sin(314t - 12.5°)\,\text{A}$　$\lambda = \cos 12.5° = 0.98$　$P = P_1 + P_2 = 100 + 40 = 140\,\text{W}$

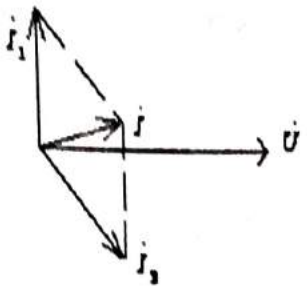
相量图见右上图

18. $Z_1 = -j\dfrac{1}{\omega C} = -j5\,\Omega$　$Z_2 = R + j\omega L = (3 + j4)\,\Omega$　$\dot{I}_1 = \dfrac{\dot{U}}{Z_1} = 20\angle 90°\,\text{A}$

$\dot{I}_2 = 20\angle -53.1°\,\text{A}$　$\dot{I} = \dot{I}_1 + \dot{I}_2 = (12 + j4)\,\text{A}$　$i_1 = 20\sqrt{2}\sin(1\,000t + 90°)\,\text{A}$

$i_2 = 20\sqrt{2}\sin(1\,000t - 53.1°)\,\text{A}$　$i = 12.65\sqrt{2}\sin(1\,000t + 18.4°)\,\text{A}$

$P = UI\lambda = 1.2\,\text{kW}$



19. (1) $I_1 = \dfrac{P_1}{U\lambda_1} = \dfrac{10000}{1000\times 0.8} = 12.5\text{A}$ $\varphi_1 = 36.9^\circ$

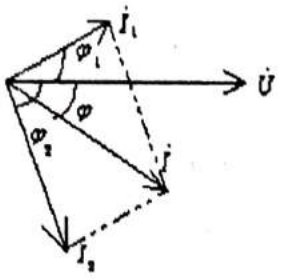
$I_2 = \dfrac{P_2}{U\lambda_2} = \dfrac{15000}{1000\times 0.6} = 25\text{A}$ $\varphi_2 = 53.1^\circ$ $\dot{I} = \dot{I}_1 + \dot{I}_2 = 28\angle -26.6^\circ\text{A}$

$i_1 = 12.5\sqrt{2}\sin(\omega t + 36.9^\circ)\text{A}$ $i_2 = 25\sqrt{2}\sin(\omega t - 53.1^\circ)\text{A}$

$i = 28\sqrt{2}\sin(\omega t - 26.6^\circ)\text{A}$

(2) 全电路呈感性

(3) 相量图：



20. (1) $Z = \text{j}X_{L1} + \dfrac{(R - \text{j}X_C)\text{j}X_{L2}}{(R - \text{j}X_C) + \text{j}X_{L2}} = 2.83\angle 45^\circ\,\Omega$

$\dot{U}_m = \dot{I}_m Z = 2.83\angle 90^\circ\text{V}$ $u = 2.83\sin(3t + 90^\circ)\text{V}$

(2) $P = UI\lambda = 1\text{W}$ (3) u 导前 i 45°，电路呈感性

21. $Z = R_1 + \text{j}\omega L + \dfrac{-\text{j}R_2/\omega C}{R_2 - \text{j}/\omega C} = 1.59\angle 18.4^\circ\,\Omega$

$\dot{I} = \dfrac{\dot{U}}{Z} = 200\angle -18.4^\circ\text{A}$ $i = 200\sqrt{2}\sin(10000t - 18.4^\circ)\text{A}$

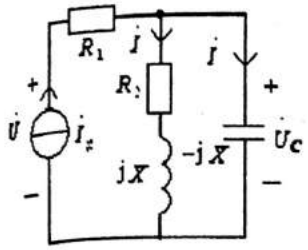
$\lambda = \cos 18.4^\circ = 0.95$, $P = UI\lambda = 60.42\text{kW}$

22. $\dot{I}_2 = \dot{I}\dfrac{R_2 + \text{j}X_L}{(R_2 + \text{j}X_L) - \text{j}X_C} = 50\angle 83^\circ\text{A}$

$\dot{I}_1 = \dot{I}\dfrac{-jX_C}{(R_2+jX_L)-jX_C} = 40\angle -60°\,A$　　$\dot{U} = \dot{I}R_1 + \dot{I}_1(R_2+jX_L) = 332.8\angle 8.7°\,V$

$\lambda = \cos(8.7° - 30°) = 0.93$　$P = UI\lambda = 9.3kW$

23. 电容两端电压$\dot{U}_C$及通过的电流$\dot{I}_C$正方向如图中所设



$\dot{U}_C = \dot{I}(R_2+jX_L) = 200\angle -6.9°\,V$　　$\dot{I}_C = \dfrac{\dot{U}_C}{-jX_C} = 50\angle 83.1°\,A$

$\dot{I}_S = \dot{I} + \dot{I}_C = 30\angle 30°\,A$　$\dot{U} = \dot{I}_S R_1 + \dot{U}_C = 332.5\angle 8.8°\,V$

$P = I_S^2 R_1 + I^2 R_2 = 9.3kW$

24. $\dot{I}_1 = 10\angle 0°\,A$　　$\dot{I}_2 = 10\angle 90°\,A$；$\dot{I} = \dot{I}_1 + \dot{I}_2 = 10\sqrt{2}\angle 45°\,A$

$\dot{U}_L = \dot{U} - \dot{U}_1 = 86.6\sqrt{2}\angle 135°\,V$；$X_L = \dfrac{U_L}{I} = 8.66\Omega$；$\lambda = \cos(120° - 45°) = 0.26$

25. (1) 设$\dot{I}_1 = 9\angle 0°\,A$　　则$\dot{I}_2 = 12\angle -90°\,A$；$\dot{I} = \dot{I}_1 + \dot{I}_2 = 15\angle -53.1°\,A$

$\dot{U} = \dot{I}_1 R_1 + \dot{I}(R + jX_L) = 714.8\angle 9.66°\,V$　　$U = 714.8\,V$

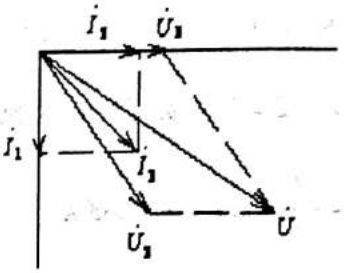
(2) $\lambda = \cos(9.66° + 53.1°) = 0.46$　　$P = UI\lambda = 4.93kW$

26. $Z_1 = \dfrac{\dot{U}_2}{\dot{I}_1} = 8 + j6\Omega$　　$Z_2 = \dfrac{\dot{U}_2}{\dot{I}_2} = 6 - j8\Omega$

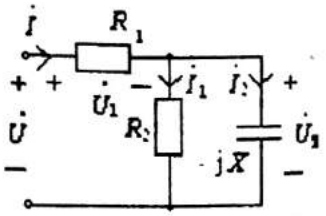
$\dot{I}_3 = \dot{I}_1 + \dot{I}_2 = 40 - j40\,A$

$\dot{U}_3 = \dot{I}_3 Z_3 = 240\angle 0°\,V$　　$\dot{U} = \dot{U}_2 + \dot{U}_3 = 576.9\angle -33.7°\,V$

$P_3 = I_3^2 \times R_3 = 9.6kW$　　$\lambda_3 = \cos 45° = 0.707$



27. (1) 电路的相量模型如图示

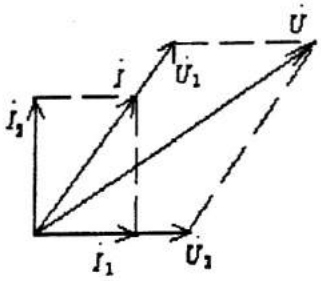


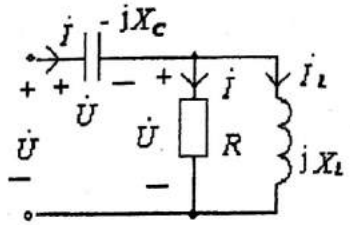
设 $\dot{U}_2 = 17.3\angle 0^\circ \text{V}$ 则 $\dot{I}_2 = \dfrac{\dot{U}_2}{-jX_C} = 0.173\angle 90^\circ \text{A}$ $\dot{I}_1 = \dfrac{\dot{U}_2}{R_2} = 0.1\angle 0^\circ \text{A}$

$\dot{I} = \dot{I}_1 + \dot{I}_2 = 0.2\angle 60^\circ \text{A}$ $\dot{U}_1 = \dot{I}_1 R_1 = 17.3\angle 60^\circ \text{V}$ $\dot{U} = \dot{U}_1 + \dot{U}_2 = 30\angle 30^\circ \text{V}$

$u = 30\sqrt{2}\sin(\omega t + 30^\circ)\text{V}$ $P = UI\lambda = UI\cos\varphi = 5.19\text{W}$

(2) 相量图：





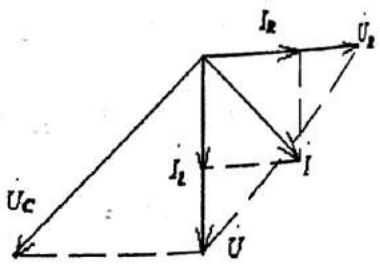
28. 各支路电流和各部分电压相量正方向如右上图中所标示：

$U_R = \sqrt{RP} = 1\text{V}$ 设 $\dot{U}_R = 1\angle 0^\circ \text{V}$ 则

$\dot{I} = \dot{I}_R + \dot{I}_L = 1\angle 0^\circ + 1\angle -90^\circ = \sqrt{2}\angle -45^\circ \text{A}$

$\dot{U} = \dot{I}(-jX_C) + \dot{U}_R = \sqrt{2}\angle -135^\circ + 1\angle 0^\circ = 1\angle -90^\circ \text{V}$

$\lambda = \cos\varphi = \cos(-90^\circ - (-45^\circ)) = 0.707$



相量图(根据所设参量而确定，答案不唯一)

29. $Z = 25 + j20 // (10 - -j30) = 60.38\angle 41.63^\circ \Omega$

$\dot{I} = \dfrac{\dot{U}}{Z} = 3.97\angle -41.63^\circ \text{A}$ $P = UI\lambda = 240 \times 3.97 \times \cos 41.63^\circ = 712.17\text{W}$

30. (1) $X_L = \omega L = 80\Omega$ $\dot{U} = \dot{I}(R + jX_L) = 282\angle 53.1^\circ \text{V}$ 3

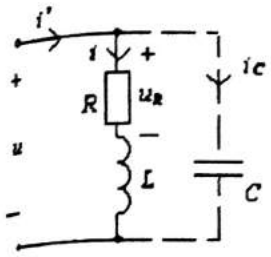
并联电容 C 后 $\dot{I}_C = \dfrac{\dot{U}}{-jX_C} = j282\angle 53.1^\circ \times 314 \times 11.3 \times 10^{-6}$

$= 1\angle 143.1^\circ \text{A}$

$\dot{I} = \dot{I}_R + \dot{I}_C = 2.82\angle 0° + 1\angle 143.1° = 2.11\angle 16.5°\ \text{A}$　　$\Delta I = 2.82 - 2.11 = 0.71\text{A}$

总电流比原电路降低 0.71 A　　(2) $\lambda' = \cos(53.1° - 16.5°) = 0.8$

31. (1) 电路如图：



$$\lambda = \cos\varphi = \frac{U_R}{U} = \frac{110}{220} = 0.5$$

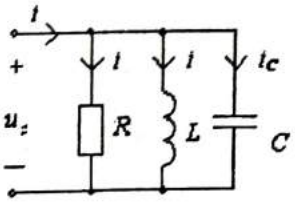
(2) $Q\cos\varphi = 0.5$　　$\tan\varphi = 1.73$　　$\lambda' = \cos\varphi' = 0.85$　　$\tan\varphi' = 0.62$

$$\therefore C = \frac{P}{\omega U^2}(\tan\varphi - \tan\varphi') = \frac{40}{314\times 220^2}(1.73 - 0.62) = 2.93\times 10^{-6}\ \text{F} = 2.93\ \mu\text{F}$$

32. $R = \frac{U}{I} = \frac{100}{1} = 100\Omega$　　$X_L = X_C = \frac{U_C}{I} = \frac{180}{1} = 180\Omega$　　$L = \frac{X_L}{\omega} = 5.73\times 10^{-1}\ \text{H}$

$$C = \frac{1}{\omega X_C} = 17.6\ \mu\text{F}$$

33. 电路如图所示：



(1) $f_0 = \frac{1}{2\pi\sqrt{LC}} = 500\text{Hz}$

(2) 电路谐振时，$X_L = 2\pi f_0 L = 100\Omega$

$$I_C = I_L = \frac{U_S}{X_L} = 0.1\text{A}$$　　$$I = I_R = \frac{U_S}{R} = 0.01\text{A}$$

34. (1) $U = U_R$　　$R = \frac{U}{I} = 100\Omega$　　$X_C = \frac{U_C}{I} = 180\Omega$　　$C = \frac{1}{\omega X_C} = 17.7\mu\text{F}$

$X_L = X_C$　　$L = \frac{X_L}{\omega} = 0.573\text{H}$

(2) $f = 100\text{Hz}$ 时：$X_L = 360\Omega$　　$X_C = 90\Omega$　　$Z = R + j(X_L - X_C) = 287.9\angle 69.7°\Omega$

$I=\frac{U}{|Z|}=0.35\text{A}$　　$i=0.35\sqrt{2}\sin(628t-69.7°)\text{A}$　　$P=UI\lambda=UI\cos\varphi=12.14\text{W}$

此时电路呈感性

35. (1) $L=\frac{1}{(2\pi f_0)^2C}=2.54\times10^{-3}\text{H}=2.54\text{mH}$

(2) 当 $f_1=500\text{Hz}$ 时，$Z_1=50+\text{j}(2\pi f_1L-\frac{1}{2\pi f_1C})=50+\text{j}(7.96-31.85)=50-\text{j}23.89\Omega$

电路呈容性；

当 $f_2=1\,500\text{Hz}$ 时，$Z_2=50+\text{j}(7.96\times3-\frac{31.85}{3})=50+\text{j}13.28\Omega$，电路呈感性

36. (1) 谐振时 $I_1=I_0=\frac{U}{R}$　　$U=RI_0=250\text{V}$　　$L=\frac{1}{(2\pi f_0)^2}=0.0127\text{H}$

$\dot{I}_2=\frac{\dot{U}}{\text{j}\omega L}=3.13\angle-90°\text{A}$　　$\dot{I}_3=-\dot{I}_2=3.13\angle90°\text{A}$

$i_1=0.1\sqrt{2}\sin(6\,280t+0°)\text{A}$　　$i_2=3.13\sqrt{2}\sin(6\,280t-90°)\text{A}$

$i_3=3.13\sqrt{2}\sin(6\,280t+90°)\text{A}$

(2) $f=500\text{Hz}$ 时，$X_C>X_L$　$I_L>I_C$，电路呈感性，$P=I_1^2R=25\text{W}$

37. (1) $\dot{I}_R=\frac{\dot{U}}{R}=8\angle0°\text{A}$　　$\dot{I}_L=\frac{\dot{U}}{\text{j}X_L}=4\angle-90°\text{A}$　　$\dot{I}_C=\frac{\dot{U}}{-\text{j}X_C}=10\angle90°\text{A}$

$\dot{I}=\dot{I}_R+\dot{I}_L+\dot{I}_C=10\angle36.9°\text{A}$　　$i=10\sqrt{2}\sin(314t+36.9°)\text{A}$　　$\lambda=\cos\varphi=0.6$

(2) $I_0=\frac{U}{R}=8\text{A}$　　$L=\frac{X_L}{\omega}=0.159\text{H}$　　$C=\frac{1}{\omega X_C}=159\times10^{-6}\text{F}=159\ \mu\text{F}$

$f_0=\frac{1}{2\pi\sqrt{LC}}=31.7\text{Hz}$

38. (1) 设 $\dot{U}_2=220\angle0°\text{V}$，$\dot{I}=\frac{\dot{U}_2}{R_2+\text{j}X_2}=\frac{220\angle0°}{10+\text{j}10.2}=15.4\angle-45.6°\text{A}$

$\dot{U}_1=\dot{I}(R_1+\text{j}X_1)=17.2\angle17.8°\text{V}$　　$\dot{U}=\dot{U}_1+\dot{U}_2=236\angle1.27°\text{V}$　　$U=236\text{V}$　　$U_1=17.2\text{V}$

(2) $P_2 = I^2 R_2 = 2.37 \times 10^3\ \text{W} = 2.37\ \text{kW}$　　$P_1 = I^2 R_1 = 118.6\text{W}$

39. (1) $S = \sqrt{P^2 + Q^2} = 11 \times 10^3\ \text{VA} = 11\text{kVA}$　$U = \dfrac{S}{I} = 220\text{V}$　$\lambda = \dfrac{P}{S} = 0.8$

$\varphi = 36.9°$　$u = 220\sqrt{2}\sin(314t + 66.9°)\text{V}$

(2) $R = \dfrac{P}{I^2} = 3.52\Omega$　$X_L = \dfrac{Q}{I_2} = 2.64\Omega$　(3) $\lambda = 0.8$

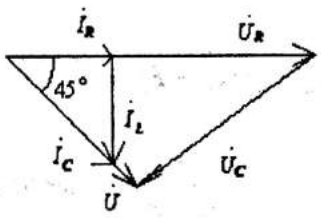
40. $Z = Z_1 + Z_2 + Z_3 = 6 + \text{j}8 = 10\angle 53.1\Omega$　$\dot{I} = \dfrac{\dot{U}_{S1} - \dot{U}_{S2}}{Z} = 10\angle 66.9°\text{A}$

$P = I^2 R = 10^2 \times 6 = 600\ \text{W}$　　$Q = I^2 X = 10^2 \times 8 = 800\ \text{Var}$

$S = \sqrt{P^2 + Q^2} = 1\,000\ \text{VA}$　　$\lambda = \cos(120° - 66.9°) = 0.6$

41. 设$\dot{U}_R = U_R\angle 0°\text{V}$画出 $\dot{I}_R$，$\dot{I}_L$，$\dot{I}_C$及$\dot{U}$，$\dot{U}_C$，$\dot{U}_R$ 的相量图。

由相量图可得：$I_R = \sqrt{I_C^2 - I_L^2} = 1.41\text{A}$　$U_R = I_R R = 141\text{V}$



$\omega L = \dfrac{U_R}{I_L} = 100\Omega$　　$L = 318\text{mH}$

$U_C = U = U_R\cos(-45°) = 100\text{V}$

$X_C = \dfrac{U_C}{I_C} = 50\Omega$　　$C = \dfrac{1}{\omega X_C} = 63.7\ \mu\text{F}$

42. $S_2 = \dfrac{U^2}{\sqrt{3^2 + 6^2}} = \dfrac{U^2}{6.7}$　$S_1 = \dfrac{U^2}{\sqrt{2^2 + 3^2}} = \dfrac{U^2}{3.6}$　$\dfrac{S_1}{S_2} = 1.86$

即 $S_1 = 1.86S_2 = 2.77 \times 10^3\ \text{VA} = 2.77\text{kVA}$

$P_1 = S_1\cos\varphi_1 = 2.77\cos(\arctan\dfrac{3}{2}) = 1.54\ \text{kW}$

43. (1) $I = \dfrac{P}{U\lambda} = 75.76\ \text{A}$　$R = \dfrac{P}{I^2} = 1.74\ \Omega$

$|Z| = \dfrac{U}{I} = 2.9\Omega$　$X = \sqrt{Z^2 - R^2} = 2.32\Omega$　$L = \dfrac{X}{\omega} = 7.4\text{mH}$　$\varphi = \arctan\dfrac{X}{R} = 53.1°$

$i = 75.76\sqrt{2}\sin(314t - 53.1°)\text{A}$

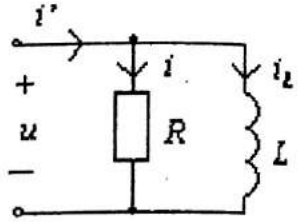
(2) $I = \dfrac{P}{\quad} = 48\ \text{A}$

(2) $C=\dfrac{P}{\omega U^2}(\tan\varphi-\tan\varphi')=658\mu F$ (3) $I'=\dfrac{P}{U\lambda'}=$

44. (1) $|Z|=\dfrac{U}{I}=\dfrac{100}{20}=5\Omega$ $\varphi=53.1°$ $R=|Z|\cos\varphi=3\Omega$

$X_L=|Z|\sin\varphi=4\ \Omega$ $L=\dfrac{X_L}{\omega}=12.7\ \text{mH}$ $P=I^2R=1\ 200\ \text{W}$ $\lambda=\cos53.1°=0.6$

(2) $\dot{I}=\dot{I}_R+\dot{I}_L=\dfrac{100}{3}+\dfrac{100}{\text{j}4}=41.67\angle-36.9°\ \text{A}$



$\lambda'=\cos36.9°=0.8$

$i'=41.67\sqrt{2}\sin(314t-36.9°)\ \text{A}$

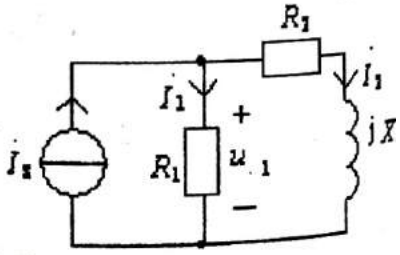
$P'=\dfrac{U^2}{R}=\dfrac{100^2}{3}=3.33\times10^3\ \text{W}=3.33\ \text{kW}$

45. $P=I^2(R_1+R_2)$ $R_1=\dfrac{P}{I^2}-R_2=\dfrac{900}{10^2}-6=3\Omega$ 又 $|Z_2|=\dfrac{U_2}{I}=\dfrac{100}{10}=10\Omega$

$\therefore\ X_{L2}=\sqrt{|Z_2|^2-R_2^2}=\sqrt{100-36}=8\Omega$ $P=UI\lambda$ $\lambda=\dfrac{900}{150\times10}=0.6$ 感性

$\varphi=53.1°$ $\dfrac{X_{L1}+X_{L2}}{R_1+R_2}=\tan53.1°=1.33$ $X_{L1}=1.33\times(3+6)-8=3.97\Omega$

46. 电路相量模型及各支路电流方向如下图：



$I_2=\sqrt{\dfrac{P_2}{R_2}}=0.177\text{A}$ $U_{R1}=I_2\sqrt{R_2^2+X_L^2}=10.6\text{V}$

$R_1=\dfrac{U_{R1}^2}{P_1}=75\Omega$

设 $\dot{U}_{R1}=10.6\angle0°\ \text{V}$，则 $\dot{I}_1=\dfrac{\dot{U}_{R1}}{R_1}=0.142\angle0°\ \text{A}$ $\varphi_2=\arctan\dfrac{X_L}{R_2}=36.9°$

$\dot{I}_2=0.177\angle-36.9°\text{A}$ $\dot{I}_S=\dot{I}_1+\dot{I}_2=0.303\angle-20.5°\ \text{A}$ $I_S=0.303\text{A}$

47. $|Z_1|=\sqrt{R^2+X_{L1}^2}=20\Omega$ $U=I|Z_1|=300\ \text{V}$ 开关闭合后：

$|Z_2|=\dfrac{U}{I}=15\Omega$ $X'=\sqrt{|Z_2|^2-R^2}=9\Omega$ $X'=\dfrac{X_{L1}X_{L2}}{X_{L1}+X_{L2}}$

$X_{\Omega}=20.6\Omega$

48. (1) 电源供出电流 $I=\dfrac{P}{U\lambda}=\dfrac{8\times10^3}{220\times0.6}=60.6\ \text{A}$ $I_N=\dfrac{10\times10^3}{220}=45.45\ \text{A}$

供出的电流超过其额定电流

(2) 若 $\lambda'=0.95$ $\tan\varphi'=0.33$, 根据已知条件 $\tan\varphi=1.33$

$$C=\frac{P}{\omega U^2}(\tan\varphi-\tan\varphi')=\frac{8\times10^3}{314\times220^2}(1.33-0.33)=526\mu\text{F}$$

(3) 并联电容后电源供出的电流

$$I'=\frac{P}{U\lambda'}=\frac{8\times10^3}{220\times0.95}=38.28\ \text{A},\qquad I'<I_N=45.45\text{A}$$