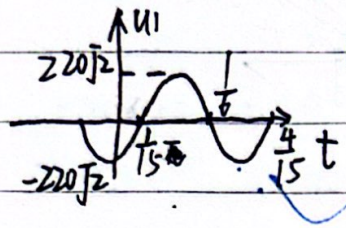
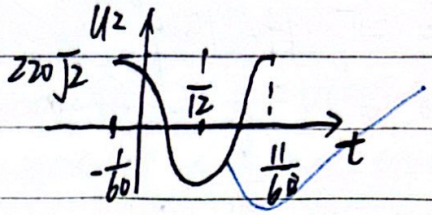
第8章作业

Date. /

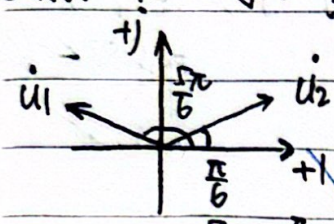
8-10 (1) $u_1 = 220\sqrt{2}\sin(10\pi t - \frac{2\pi}{3})$　　$u_2 = 220\sqrt{2}\cos(10\pi t + \frac{\pi}{6})$

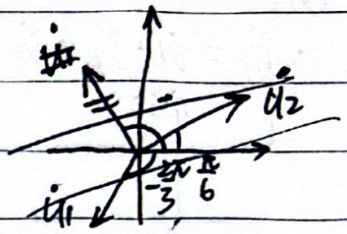


$\omega = \frac{2\pi}{10\pi} = \frac{1}{5}$



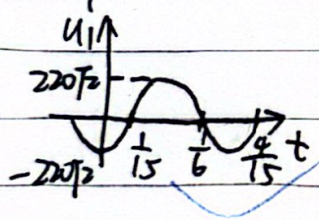
8-11 (2) $\dot{u}_1 = 220\sqrt{2}\angle -\frac{2\pi}{3}$　　$\dot{u}_2 = 220\sqrt{2}\angle \frac{\pi}{6}$

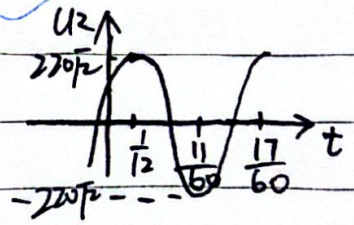


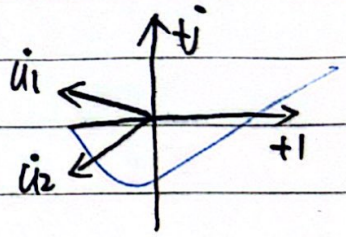


$\Delta\varphi = \frac{5}{6}\pi - \frac{\pi}{6} = \frac{2\pi}{3}$

(3) 即 $u_2 = 220\sqrt{2}\cos(10\pi t - 150°)$





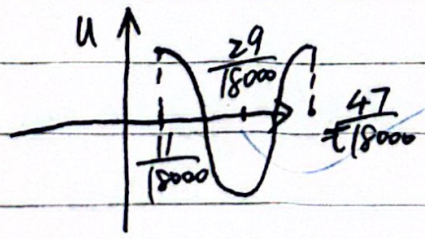


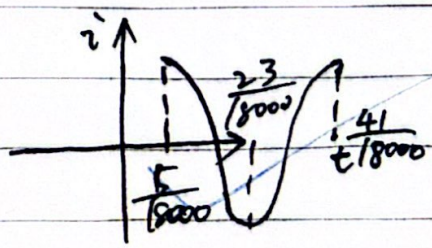
$\dot{u}_1 = 220\sqrt{2}\angle \frac{5\pi}{6}$　　$\dot{u}_2 = 220\sqrt{2}\angle -\frac{5\pi}{6}$

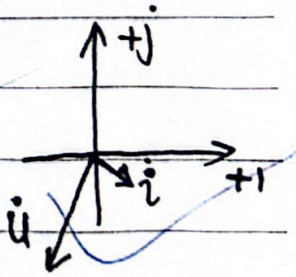
$\Delta\varphi = \frac{5\pi}{6} - (-\frac{5\pi}{6}) = \frac{10}{6}\pi = -\frac{\pi}{6} - \frac{\pi}{3}$

8-11 (1) $u = 10\cos(1000t - 20° - 90°) = 10\cos(1000t - \frac{11}{18}\pi)$

$i = 2\cos(1000t - \frac{5}{18}\pi)$

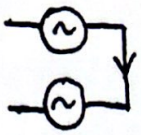






(2) $\Delta\varphi = -\frac{11}{18}\pi - (-\frac{5}{18}\pi) = -\frac{\pi}{3}$

$\frac{\dot{u}}{\dot{I}} = \frac{10\angle -\frac{11}{18}\pi}{2\angle -\frac{5}{18}\pi} = 5\angle -\frac{6}{9}\pi$　$5\angle -60°$

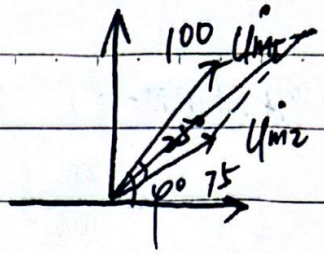


Date. /

8-14 运用相量法，设 U_1 相位为 0

$\therefore U_{m1} + U_{m2} = 170.94\angle -10.69^\circ$

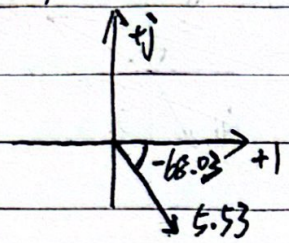
$\therefore$ 峰值为 170.94



8-15 由 KCL：$\dot{i}_1 + \dot{i}_2 = \dot{i}_4 + \dot{i}_3$

$\therefore \dot{i}_4 = \dot{i}_1 + \dot{i}_2 - \dot{i}_3 = (-6.88 + j9.83) + 10\Phi - (1.05 + j14.96) = 2.07 - j5.13$

$= 5.53\angle -68.03$



第9章作业

带单位.

Date. /

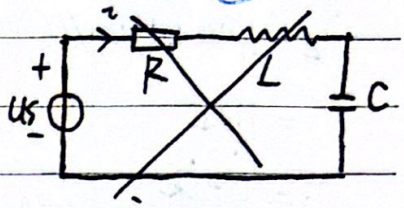
9-1 (1) $\dot{U}=150\angle 20°$ $\dot{I}=3\angle -52°$ $Z=\frac{\dot{U}}{\dot{I}}=50\angle 72°$ $Y=\frac{\dot{I}}{\dot{U}}=\frac{1}{50}\angle -72°$

(2) $\dot{U}=20\angle 60°$ $\dot{I}=0.01\angle 15°$ $Z=\frac{\dot{U}}{\dot{I}}=2000\angle 45°$ $Y=\frac{\dot{I}}{\dot{U}}=0.0005\angle -45°$

(3) $\dot{U}=220\sqrt{2}\angle 0°$ $\dot{I}=2\sqrt{2}\angle 120°$ $Z=\frac{\dot{U}}{\dot{I}}=110\angle -120°$ $Y=\frac{\dot{I}}{\dot{U}}=\frac{1}{110}\angle 120°$

9-6 $\omega=2\pi f=1000\pi$

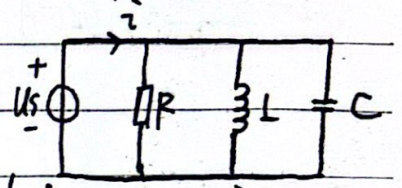
$u=35\cos(1000\pi t+0°)$ $\dot{U}=35\angle 0°$



$j\omega L=20j$, $-\frac{j}{\omega C}=-100j$

~~$Z=R+j\omega L-\frac{j}{\omega C}=100-80j=128\angle -38.7°$~~

~~$\therefore \dot{I}=\frac{\dot{U}}{Z}=0.27\angle 38.7°$~~



$Z=\frac{1}{Y}$ $Y=\frac{1}{R}+\frac{1}{j\omega L}+j\omega C=\frac{1}{100}+(-\frac{1}{20}j)+\frac{1}{100}j=\frac{1}{100}+0.05j$

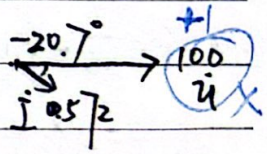
~~$\therefore Z=\frac{100}{1}+\frac{400}{17}j$~~ $\dot{I}=\frac{\dot{U}}{Z}=\dot{I}=\dot{U}Y=0.646\angle 57.17°A$

$I_R=\frac{U}{R}=0.35A$ $I_L=U/\omega L=0.557A$ $I_C=U\cdot\omega C=1.099A$

9-7 $Z_{总}=Z_1+Z_2+Z_3=$

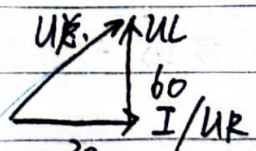
$\dot{I}=\frac{\dot{U}_S}{Z_{总}}=5.7\angle -20.7°mA$

相量图:



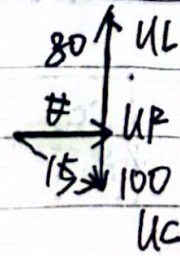
9-9 由电感的电压超前电流 $\frac{\pi}{2}$:

$\therefore U_{总}=\sqrt{70^2+60^2}=67.08V$



∵电表所读为有效值 ∴此为电压有效值三角形

9-10 由电容,电感的电流与电压相位关系:



$\therefore U_{有}=\sqrt{15^2+(100-80)^2}=25V$

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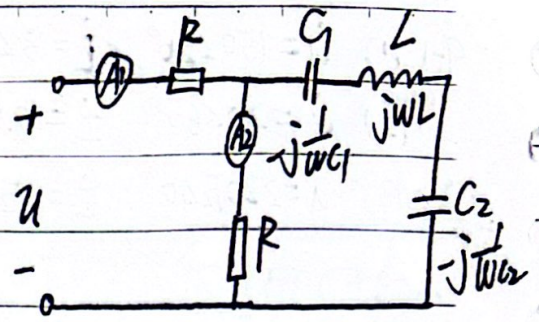
9-12 $\omega = 250\,rad/s$

$X_L = \omega L = 250\Omega$ $X_{C_1} = \frac{1}{\omega C_1} = 200\Omega$

$X_{C_2} = \frac{1}{\omega C_2} = 50\Omega$

$\therefore Z = 110\Omega + 110\Omega // (j\omega L - j\frac{1}{\omega C_1} - j\frac{1}{\omega C_2})$

$= 110\Omega$



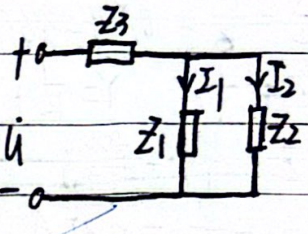
$I_2 = \frac{\dot{u} - \dot{I}_1 R}{R} = 0\angle 0°A$ $\dot{I}_1 = \frac{\dot{u}}{Z} = 2\angle 20°A$

9-13

$Z = Z_3 + \frac{Z_1 Z_2}{Z_1 + Z_2} = 2\angle 0°\Omega$ $Y = \frac{1}{Z} = \frac{1}{2}\angle 0° S$

$\dot{I} = \frac{\dot{u}}{Z} = 4\angle 0°A$ $\dot{I}_1 = \frac{Z_2}{Z_1 + Z_2}\cdot\dot{I} = 3.16\angle -18.43°A$

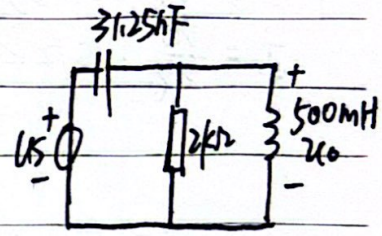
$\dot{I}_2 = \frac{Z_1}{Z_1 + Z_2}\dot{I} = 1.41\angle 45°A$



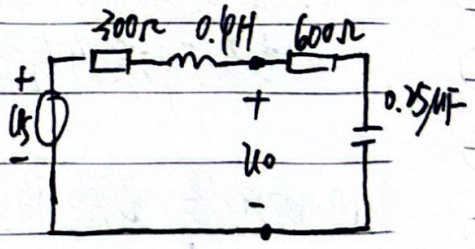
9-14 $X_C = \frac{1}{\omega C} = 4\Omega$ $X_L = \omega L = 4000\Omega$

$\therefore Z = -jX_C + R // j\omega L = 1600 + 796j\Omega$

$u_0 = u_S \frac{R // j\omega L}{Z} \approx u_S = 6\cos(8000t)V$



9-23 $\dot{u}_0 = \frac{600 + (-j)X_{C2})}{600 + (-j)X_{C2}) + 300 + j\omega L} = 50\angle 106.26°V$

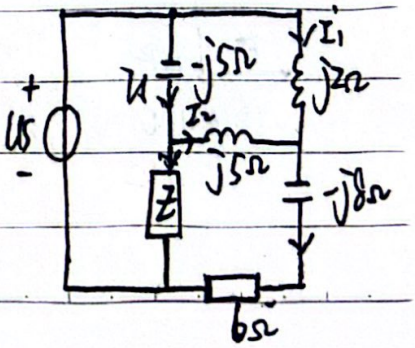


9-24 $I_2 = \frac{\dot{u}_S - \dot{I}_1 \cdot j2\Omega}{6 - j8\Omega} - \dot{I}_1 = 3 + 9j$

$u_2 = \frac{\dot{I}_2 \cdot j5\Omega}{j5\Omega} = -45 + 15j$

$\therefore u = u_S - u_2 - u_3 = 55 - 15j$

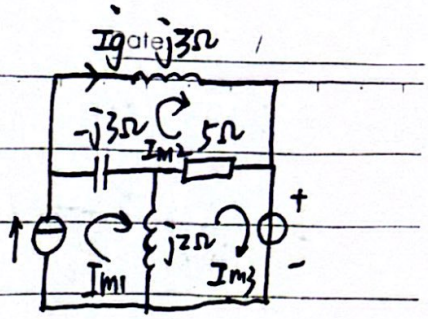
$Z = \frac{\dot{u}}{\dot{I}} = \frac{\dot{u}_S - \dot{u}}{\frac{\dot{u}}{j5\Omega} - \dot{I}_2} = 7.5 - 2.5j$



9-26 $\dot{I}_{m1}=5\angle 0°\,A$

$-(-j3)\dot{I}_{m1}+(j3-j3+5)\dot{I}_{m2}-5\dot{I}_{m3}=0$

$-j2\dot{I}_{m1}-5\dot{I}_{m2}+(5+j2)\dot{I}_{m3}=-5\angle 90°$



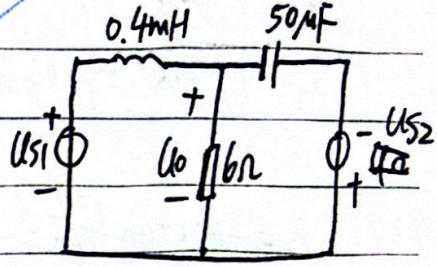
$\therefore \dot{I}_{m2}=\dot{I}_g=3\angle -90°\,A \quad \dot{I}_{m1}=5\angle 0°\,A \quad \dot{I}_{m3}=0\,A$

9-27 $j\omega L=2j\,\Omega \quad -j\frac{1}{\omega C}=-j0.25\,S$

$\frac{\dot{U}_{s1}}{j\omega L}-\dot{U}_{s2}j\omega C=\dot{U}_{om}\left(-j\frac{1}{\omega L}+j\omega C+\frac{1}{R}\right)$

$\therefore \dot{U}_{om}=\frac{24-36j}{2-j3}=12\angle 0°\,V$

$u_0(t)=120\cos(5000t)\,V$



开关接通瞬时.

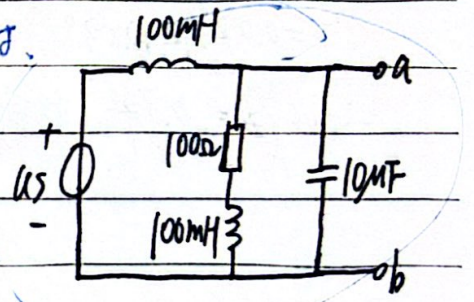
9-29 $\dot{I}_S=24\angle 45°\,A$

$j\omega L=100j\,\Omega$

$-j\frac{1}{\omega C}=100j\,\Omega$

$\therefore Z=\frac{(100+100j)(-100j)}{100+100j+(-100j)}=100-j100\,\Omega$

$\therefore \dot{U}_{oc}=\frac{Z}{100j+Z}\cdot\dot{U}_S=250\angle 0°\,V$



电压源短路: $Z_{等}=\frac{Z\cdot j\omega L}{Z+j\omega L}=100+j100\,\Omega$

9-35 $I=\frac{P}{U\cos\varphi}=\frac{4000}{24\times 0.65}=256.41\,A \quad \therefore \varphi=\arccos\frac{1}{2}0.65=49.46°$

$I'=\frac{P}{U\cdot\cos\varphi'}=\frac{4000}{20\times 0.85}=196.08\,A \quad \varphi'=\arccos 0.85=31.79°$

$I_C=I\sin\varphi-I'\sin\varphi'=91.56\,A \quad \therefore C=\frac{I_C}{\omega U}=1517.94\,\mu F$

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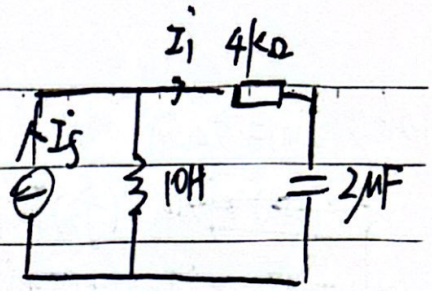
9.36 $\dot{I}_S = 15\sqrt{2}\angle 0°\,A$, $j\omega L = 1000j\,\Omega$, $-j\frac{1}{\omega C} = -5000j\,\Omega$

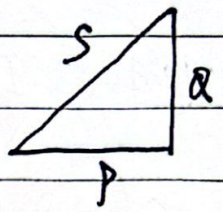


$$\dot{I}_1 = \frac{j\omega L}{j\omega L + (R - j\frac{1}{\omega C})} \cdot \dot{I}_S = 3.75\angle 135°\,mA$$

$P = I_1^2 R = 56.25\,mW$

$Q = -I_1^2 \frac{1}{\omega C} = -70.31\,mVar$

$S = \sqrt{P^2 + Q^2} = 90.04\,mVA$



9.37 $\varphi_2 = -\arctan\frac{120}{160} = -36.87°$ $\therefore \cos\varphi_2 = 0.8$ (超前)

$\varphi_3 = -\arctan\frac{90}{30} = -53.13°$ $\therefore \cos\varphi_3 = 0.6$ (超前)

$Y = 0.026\angle 42.03°$ $\therefore \varphi_Z = -\varphi_Y = -42.03°$

$\therefore \cos\varphi_Z = 0.74$ (超前)