5-2. 已知 $u=220\sqrt{2}\sin(1000t+\frac{\pi}{4})V$，$i=10\sin(1000t-\frac{\pi}{6})A$. $U=\frac{U_m}{\sqrt{2}}$

(1). u,i 相量表达式　　(2) u,i 相位差　　(3) 相量图.

$\dot{U}=Ue^{j\varphi_u}$

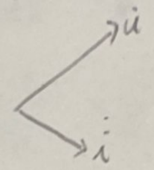
$=220e^{\frac{\pi}{4}j}\ V$

$\dot{I}=Ie^{j\varphi_i}$

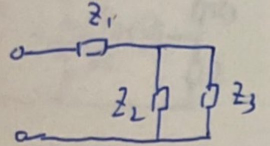
$=5\sqrt{2}e^{-\frac{\pi}{6}j}\ A$

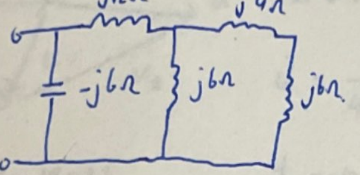
$\Delta\varphi=\frac{\pi}{4}-(-\frac{\pi}{6})$

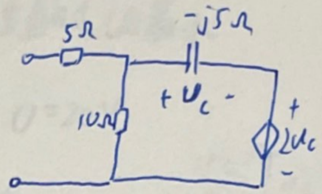
$=\frac{5}{12}\pi$



5-7 求入端阻抗, $Z_1=2+j3\Omega$, $Z_2=50-j20\Omega$, $Z_3=j5.9\Omega$







$Z=(Z_2//Z_3)+Z_1$

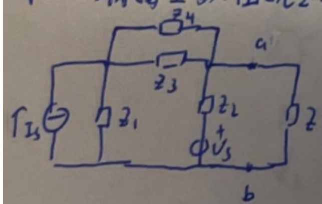
$=2.64+9.08j\ \Omega$

$\left[\left[(j4+j6)//j6\right]+j12\right]//(-j6)$

$=-9.5j\ \Omega$

5-35. $I_s=1\angle30^\circ A$, $U_s=50\angle-60^\circ V$, $Z_1=20\Omega$, $Z_2=15-j10\Omega$, $Z_3=5+j7\Omega$, $Z_4=-j20\Omega$.

求ab端接上多大阻抗Z时, 有 I_{max}, I_{max} 为?



$Z_3//Z_4=10.31+6.8j\ \Omega$

$\dot{I}_s\cdot Z_1=20\angle30^\circ$

$Z_{eq}=Z_1+Z_3//Z_4+Z_2=45.31-3.20j\ \Omega$

$\dot{I}=\frac{\dot{I}_s Z_1+\dot{U}_s}{Z_{eq}}=0.98-0.67j\ A$

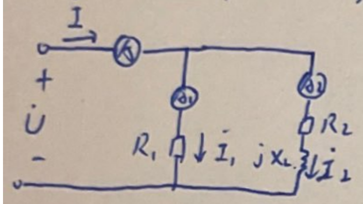
$\dot{U}=Z_2\dot{I}+\dot{U}_s=33.06-63.1j\ V$

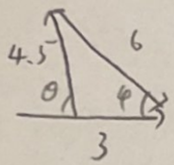
当 $Z_{eq}=3.2j\ \Omega$ 时, 电流最大

$I_{max}=\left|\frac{33.06-63.1j}{45.31}\right|=1.57A$

Scanned with CamScanner

5-49. $I_1=3A$, $I_2=4.5A$, $I=6A$, $R_1=20\Omega$. 求 R_2 和 X_2.





$\cos\theta=-\dfrac{3^2+4.5^2-6^2}{2\times3\times4.5}=\dfrac{1}{4}$

$\cos\varphi=\dfrac{3^2+6^2-4.5^2}{2\times3\times6}=\dfrac{11}{16}$

$\dot{I}_1=4.5\angle104.5^\circ A$

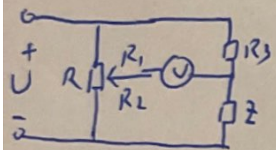
$\dot{U}=90\angle104.5^\circ V$

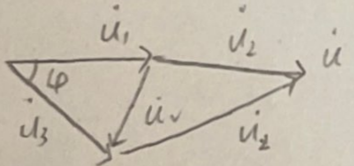
$\dot{I}_2=6\angle-46.6^\circ A$

$Z=\dfrac{\dot{U}}{\dot{I}_2}=7.97-12.7j\ \Omega.$

$\therefore R_2=7.97\Omega\quad X_2=-12.7j\Omega.$

5-31). $U=100V$, $R_3=6.5\Omega$, 可调变阻器 R 在 $R_1=4\Omega$, $R_2=16\Omega$; 30V, 求 Z.

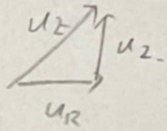




当 $\dot{U}_V$ 与 $\dot{U}$ 垂直时, U_V 最小.

$\dot{U}_1=\dfrac{4}{4+16}\ U=20V$

$\tan\varphi=\dfrac{U_V}{U_1}=1.5.$



$U_3=36.06V$

$|U_Z|^2=U_3^2+U^2-2UU_3\cos\varphi=7300.$

$|U_Z|=85.44V.$

$$\begin{cases}\dfrac{U_L}{U_R+U_3}=\tan\varphi=1.5\\ |U_L|^2+|U_R|^2=|U_Z|^2\end{cases}$$

$\therefore U_R=19.41V.$

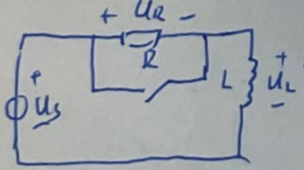
$U_L=83.20V.$

$\dfrac{R}{6.5}=\dfrac{U_R}{U_3}=0.538.$

$\therefore R=3.5\Omega.$

$X_L=(R+6.5)\tan\varphi=15.00\Omega\quad Z=3.50+15.00j\ \Omega.$

6.



$t=0$ 时 k 打开, $u_s(t)=U_m\sin(\omega t+60^\circ)V$.

求 $i_L(0^+)$, $u_L(0^+)$, $u_R(0^+)$.

$t<0$ 时

$\dot{I}_L=-j\dfrac{1}{\omega L}\dot{U}=\dfrac{U_m\angle60^\circ}{\sqrt{2}\omega L\angle90^\circ}=\dfrac{U_m}{\sqrt{2}\omega L}\angle-30^\circ.$

$i_L(t)=\dfrac{U_m}{\omega L}\sin(\omega t-30^\circ)$

$i_L(0^-)=-\dfrac{U_m}{2\omega L}.$

$U_s(0^+)=U_m\sin60^\circ=\dfrac{\sqrt{3}}{2}U_m.$

无冲激.

$i_L(0^+)=i_L(0^-)=-\dfrac{U_m}{2\omega L}.$

$U_R(0^+)=R\,i_L(0^+)=-\dfrac{RU_m}{2\omega L}.$

$\therefore U_L(0^+)=\dfrac{RU_m}{2\omega L}+\dfrac{\sqrt{3}}{2}U_m$

$=U_m\left(\dfrac{R}{2\omega L}+\dfrac{\sqrt{3}}{2}\right)$