数学作业纸

（科目：　　）

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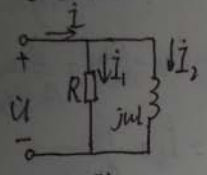
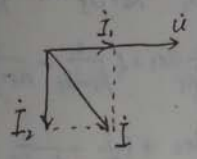
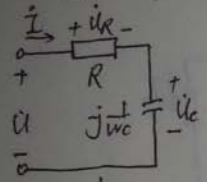
第4次作业参考答案

5-5.

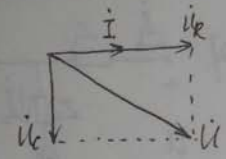


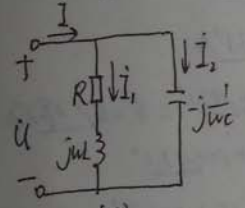
(a)



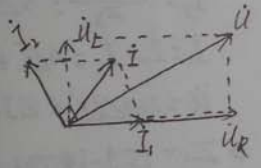


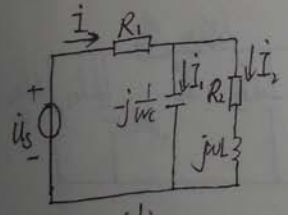
(b)



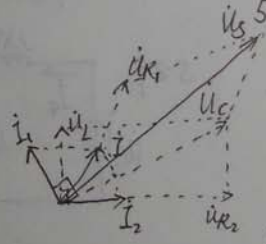


(c)

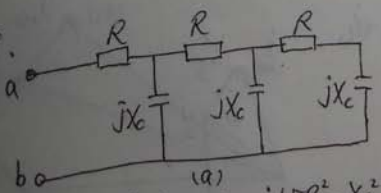




(d)

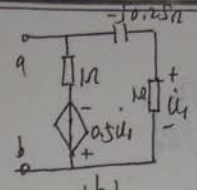


5-8.



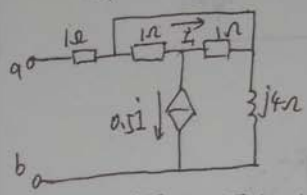
(a)

$$Z_{ab}=\frac{(R^2-6X_c^2)R+j(5R^2-X_c^2)X_c}{(R^2-3X_c^2)+j4RX_c}$$



(b)

$Z_{ab}=0.406-j0.059\,4\Omega$



(c)

$Z_{ab}=1+j2.4\Omega$

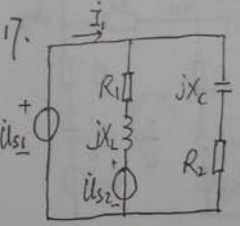
5-11.

$R=\frac{120}{20}=6\Omega$

$\dot{I}_2=\frac{220\angle 0^\circ}{6+j314L}$ 有 $\frac{220}{\sqrt{36+(314L)^2}}=28.8$

则 $L=15.9mH$

5-17.



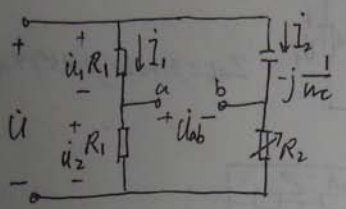
(叠加定理)

$\dot{U}_{S1}$ 单独作用时，$\dot{I}_1'=\frac{100\angle 0^\circ}{103.4\angle 5.7^\circ}=0.962\angle -5.7^\circ A$

$\dot{U}_{S2}$ 单独作用时，$\dot{I}_1''=\frac{100\angle -6^\circ}{94.3\angle 5^\circ}=1.06\angle 6^\circ A$

则 $\dot{I}_1=\dot{I}_1'+\dot{I}_1''=1.46+j0.83=1.68\angle 29.5^\circ A$

5-20.



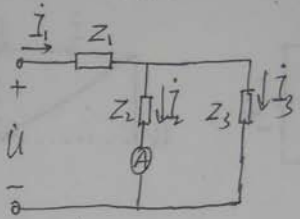
(节点法)

$$\begin{cases} \left(\frac{1}{R_1+jX_1}+\frac{1}{R_5+jX_5}\right)\dot{U}_{n1}-\frac{1}{R_5+jX_5}\dot{U}_{n2}=-\dot{I}_S+\frac{\dot{U}_{S1}}{R_1+jX_1} \\ -\frac{1}{R_5+jX_5}\dot{U}_{n1}+\left(\frac{1}{R_5+jX_5}+\frac{1}{R_2+jX_2}+\frac{1}{R_6}\right)\dot{U}_{n2}-\frac{1}{R_6}\dot{U}_{n3}=\frac{\dot{U}_{S2}}{R_2+jX_2} \\ -\frac{1}{R_6}\dot{U}_{n2}+\left(\frac{1}{R_6}+\frac{1}{R_3+jX_3}\right)\dot{U}_{n3}=\dot{I}_S+\frac{\dot{U}_{S3}}{R_3+jX_3} \end{cases}$$

$\tan(\frac{1}{2}\theta)=\frac{1}{R_2\omega C}$

$\dot{U}_{ab}$的相位变化范围 $-41.3°$ ~ $-120.8°$. (θ-180°).

5-27.



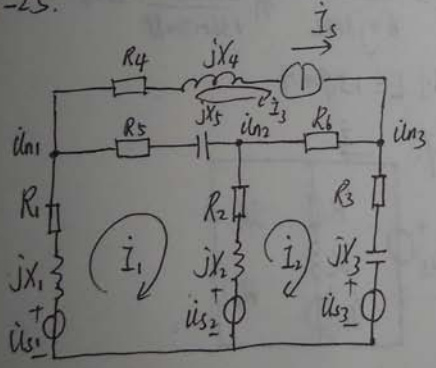
$\dot{I}_3=\frac{Z_2\dot{I}_2}{Z_3}=5\angle 53.1°A$

$\dot{I}_1=\dot{I}_2+\dot{I}_3=4\angle 0°+5\angle 53.1°=8.06\angle 29.7°A.$

$\dot{U}=220\angle 30°=Z\dot{I}_1+100\angle 53.1°$

$\Rightarrow Z=15.9-j4.7\Omega=16.6\angle -16.7°\Omega.$

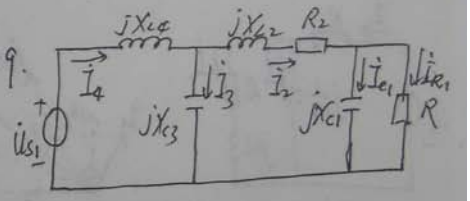
5-25.

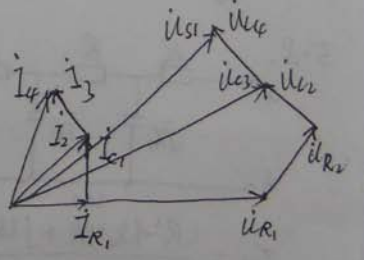


(回路法)

$$\begin{cases} \dot{I}_1[R_1+R_2+R_5+j(X_1+X_2+X_5)]-\dot{I}_3(R_5+jX_5)-(R_2+jX_2)]\dot{I}_2=\dot{U}_{S1}-\dot{U}_{S2} \\ -\dot{I}_1(R_2+jX_2)+\dot{I}_2[R_2+R_3+R_6+j(X_2+X_3)]-\dot{I}_3R_6=\dot{U}_{S2}-\dot{U}_{S3} \\ \dot{I}_3=\dot{I}_S \end{cases}$$

5-29.





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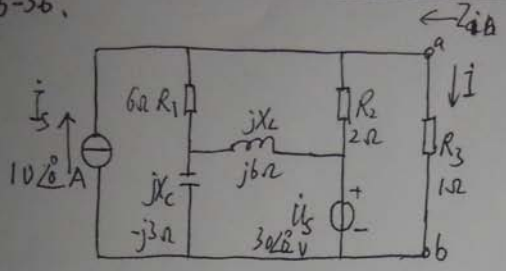
5-36.



ab端的等效阻抗 $Z_{in} = 1.68 - j0.24\Omega$

电流源 I_S 单独作用时，ab端的开路电压

$\dot{U}_{ab}' = 16.97\angle -8.13°$ V

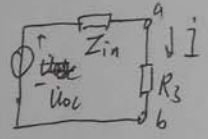
电压源 U_S 单独作用时，ab端的开路电压

$\dot{U}_{ab}'' = 21.6\angle -19.5°$ V

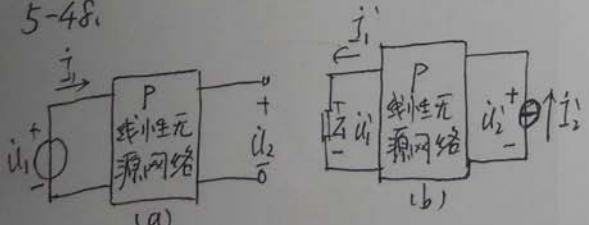
则 $\dot{U}_{oc} = 37.16 - j9.61 = 38.4\angle -14.5°$ V

于是 $\dot{I} = \dfrac{\dot{U}_{oc}}{Z_{in} + R_3}$

$= 14.3\angle -9.5°$ A.



5-48.

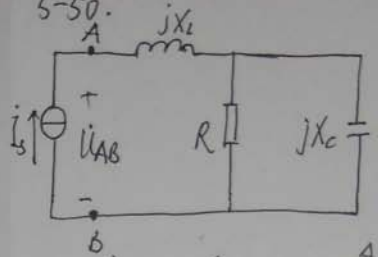


由特勒根定理：

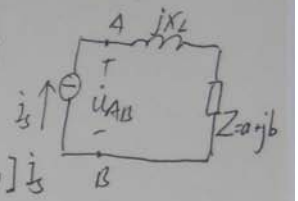
$\dot{U}_1\dot{I}_1' - \dot{U}_2\dot{I}_2' + \sum_{k=3}^{b} \dot{U}_k\dot{I}_k' = -Z_1\dot{I}_1'\dot{I}_1 + \dot{U}_2' \cdot 0 + \sum_{k=3}^{b} \dot{U}_k'\dot{I}_k$

$\Rightarrow \dot{I}_1' = 2.33\angle -48.4°$ A

5-50.



设 $\dot{I}_S = 1\angle 0°$ A



$\Rightarrow \dot{U}_{AB} = [a + j(b + X_L)]\dot{I}_S$

$U_{AB} = \sqrt{a^2 + (b + X_L)^2} = 2$

$\Rightarrow b = -3,\ a = \sqrt{3}$

即 $R // jX_C = \sqrt{3} - j3\Omega$

则 $\begin{cases} R = 4\sqrt{3}\Omega = 6.93\Omega \\ X_C = -4\Omega. \end{cases}$

5-2

(1) $\dot{U} = 220\angle 45°$ V

(2) $\dot{I} = 7.07\angle -30°$ A

(3)