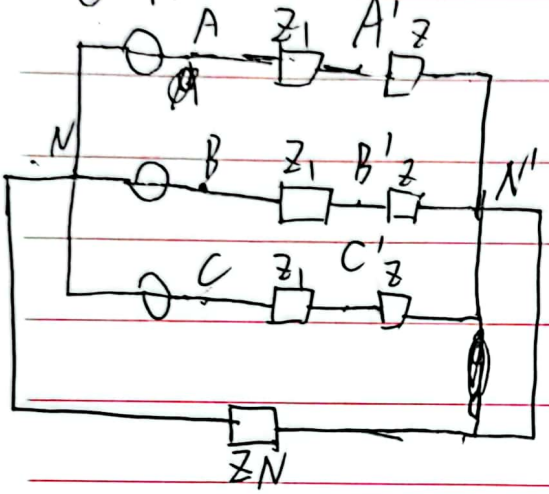
12-1.

电路图如下



$U_p = \frac{U_L}{\sqrt{3}} = 220V$

设 $\dot{U}_A = 220\angle 0°V$, $\dot{U}_B = 220\angle -120°V$, $\dot{U}_C = 220\angle 120°V$

$\dot{I}_A = \frac{\dot{U}_A}{Z_{1+2}} = \frac{220\angle 0°}{167+j85} = 1.174\angle -26.98°A$

$\dot{U}_{A'N'} = \dot{I}_A \cdot Z = 217.34\angle 0.05°V$

$\dot{U}_{A'B'} = \sqrt{3}\dot{U}_{A'N'}\angle 30° = 376.5\angle 30.05°V$

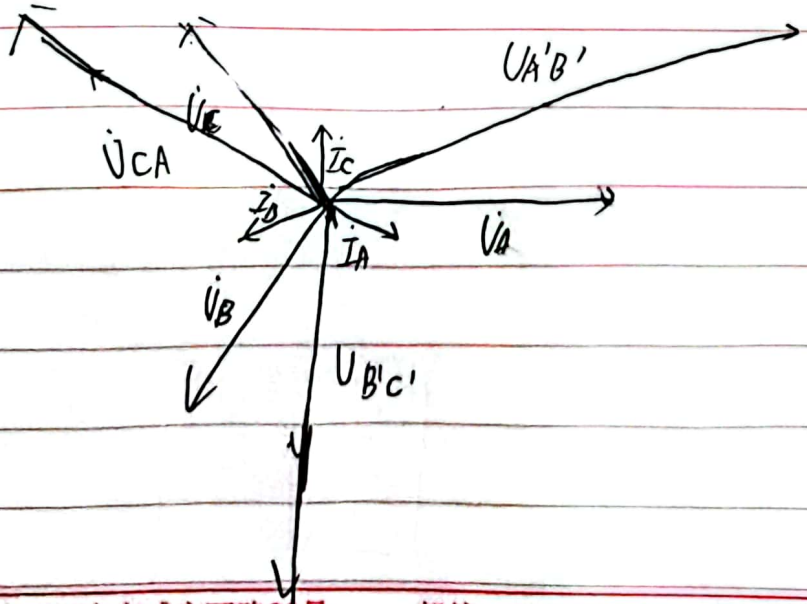
$\dot{I}_B = \dot{I}_A\angle -120° = 1.174\angle -146.98°A$

$\dot{I}_C = \dot{I}_A\angle 120° = 1.174\angle 93.02°A$

$\dot{U}_{B'C'} = \dot{U}_{A'B'}\angle -120° = 376.5\angle -89.95°V$

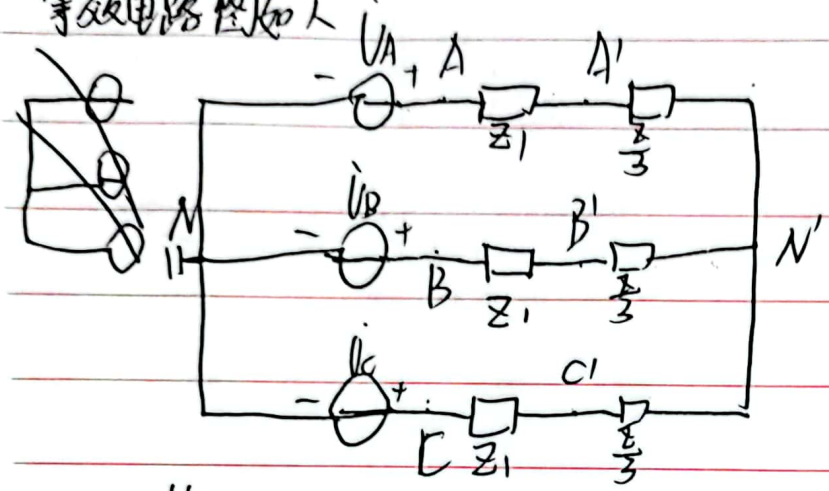
$\dot{U}_{C'A'} = \dot{U}_{A'B'}\angle 120° = 376.5\angle 150.05°V$

相量图如下：



12-2.

等效电路图如下



$U_P = \frac{U_L}{\sqrt{3}} = 220V$

设 $\dot{U}_A = 220\angle 0°$, $\dot{U}_B = 220\angle -120°$, $\dot{U}_C = 220\angle 120°$.

$\dot{I}_{A'} = \frac{\dot{U}_A}{Z_1 + \frac{Z}{3}} = 30.08\angle -65.78°A$

$\dot{I}_{B'} = \dot{I}_{A'}\angle -120° = 30.08\angle -185.78°A = 30.08\angle 174.22°A$

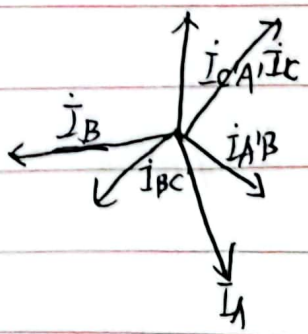
$\dot{I}_{C'} = \dot{I}_{A'}\angle 120° = 30.08\angle 54.22°A$

~~$\dot{I}_{A'B'} = \frac{\dot{I}_{A'}}{\sqrt{3}}\angle 30° =$~~

$\dot{I}_{A'B} = \frac{1}{\sqrt{3}}\dot{I}_{A'}\angle 30° = 17.37\angle -35.78°A$

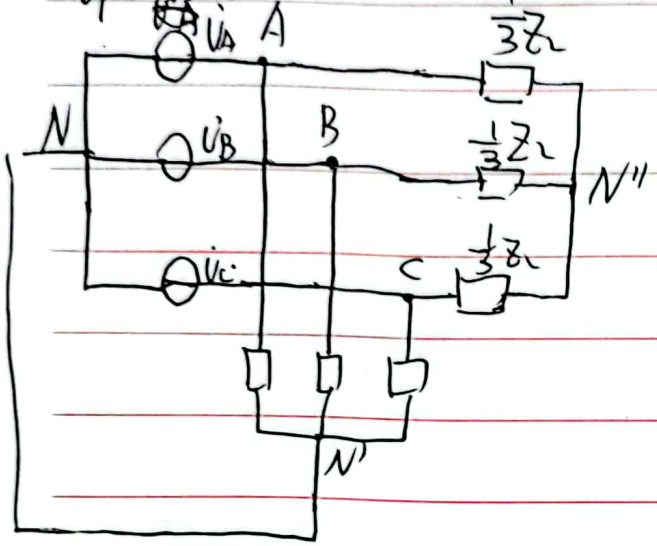
$\dot{I}_{B'C'} = \frac{1}{\sqrt{3}}\dot{I}_{B'}\angle 30° = 17.37\angle -155.78°A$

$\dot{I}_{C'A'} = \frac{1}{\sqrt{3}}\dot{I}_{C'}\angle 30° = 17.37\angle 84.22°A$



例3-4.

$U_p = \frac{U_L}{\sqrt{3}} = 220\,V$，设 $\dot{U}_A = 220\angle 0°\,V$，$\dot{U}_B = 220\angle -120°\,V$，$\dot{U}_C = 220\angle 120°\,V$，



$\dot{I}_{AN'} = \frac{\dot{U}_A}{Z} = 22\angle -53.1\,A$

$\dot{I}_{BN} = \frac{\dot{U}_B}{Z} = 22\angle -173.1\,A$

$\dot{I}_{CN} = \frac{\dot{U}_C}{Z} = 22\angle 66.9\,A$.

$I_{AN''} = \frac{U_A}{\frac{1}{3}Z} = 13.2\angle 90°\,A$

$I_{BN''} = \frac{U_B}{\frac{1}{3}Z} = 13.2\angle -30°\,A$

$I_{CN''} = \frac{\dot{U}_C}{\frac{1}{3}Z} = 13.2\angle 150°\,A$

$I_{A'B'} = \frac{I_{AN''}}{\sqrt{3}}\angle 30° = 7.6\angle 120°$

$I_{B'C'} = \frac{I_{BN''}}{\sqrt{3}}\angle 30° = 7.6\angle 0°\,A$

$I_{C'A'} = \frac{I_{CN''}}{\sqrt{3}}\angle 30° = 7.6\angle -120°\,A$

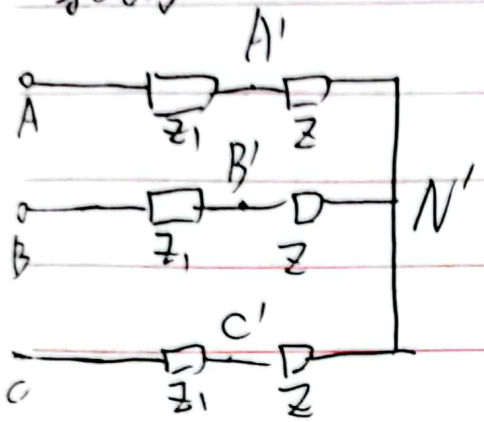
~~$\dot{I}_{AB} = \dot{I}_{AN}$~~ $\dot{I}_{AB} = \dot{I}_A = \dot{I}_{AN'} + \dot{I}_{AN''} = 13.9\angle 48.4$

$\dot{I}_{BC} = \dot{I}_B = 13.9\angle -138.4°\,A$

$\dot{I}_{CA} = \dot{I}_C = 13.9\angle 101.6°\,A$

12-6、

等效为



$P=1400=\frac{380}{\sqrt{3}}\cdot|\dot{I}_A|\times 3$, $|\dot{I}_A|=2.456A$.

设 $\dot{I}_A=2.456\angle 0°A$

$|\dot{U}_{AN}|=\frac{380}{\sqrt{3}}=220V$.

$|Z|=\frac{|\dot{U}_{A'N'}|}{|\dot{I}_A|}=89.33\Omega$

arc cos 0.866 = 30°

$Z=89.33\angle 30°$

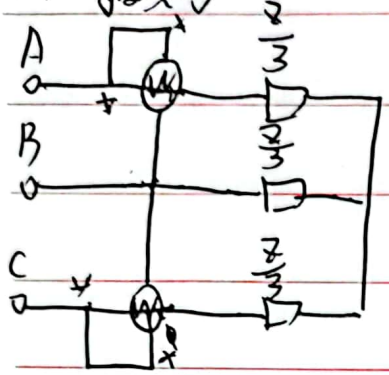
$\dot{U}_A=\dot{I}_A(Z+Z_1)=191.69\angle 7.61°$

$\dot{U}_{AB}=\sqrt{3}\dot{U}_A\angle 30°=332.02\angle 22.39°$

$\varphi=\Phi-7.61°$, $\lambda'=\cos(-7.61)=0.991$.

12.7.

以A为



~~P有功=782+1976.44=2758.44W~~

~~$|\dot{U}_A| = \frac{|\dot{U}_{AB}|}{\sqrt{3}} = 220$ V~~. 设 $\dot{U}_A = 220\angle 0°$ V, $\dot{U}_B = 220\angle -120°$ V, $\dot{U}_C = 220\angle 120°$ V.

设 $Z = |Z|\angle\varphi$

$\dot{I}_A = \frac{\dot{U}_A}{\frac{Z}{3}} = \frac{220}{\frac{|Z|}{3}}\angle\varphi$

$\dot{U}_1 = \dot{U}_{AB} = 380\angle 30°$ V.

$P_1 = 380 \cdot \frac{220}{\frac{|Z|}{3}} \cos(30° + \varphi)$

同理: $\dot{I}_C = \frac{220}{\frac{|Z|}{3}}\angle 120°-\varphi$.

$\dot{U}_2 = \dot{U}_{CB} = 380\angle 90°$ V

$P_2 = 380 \cdot \frac{220}{\frac{|Z|}{3}} \cos(90° - \varphi - 30°)$

联立解得: $\tan\varphi = 0.75 \Rightarrow \varphi = 36.87°$

$|Z| = \begin{matrix} 25.98\Omega \\ 42A \end{matrix}$

, $\dot{I}_A = 5.23\angle -36.87$ A

$\therefore \bar{S} = 3\dot{U}_A \dot{I}_A^* = 1276.2 + j2074.7$ VA

12-12.

(1). $U_p = \frac{U_L}{\sqrt{3}} = 220V$

设 $\dot{U}_A = 220\angle 0°V$, $\dot{U}_B = 220\angle -120°V$, $\dot{U}_C = 220\angle 120°V$.

流经电阻线电流

$I_{A'N''} = \frac{\frac{\dot{I}_A}{\sqrt{3}}}{\sqrt{3}} = 3.3\angle 0°A$

$I_{B'N''} = \frac{\frac{\dot{I}_B}{\sqrt{3}}}{\sqrt{3}} = 3.3\angle -120°A$

$I_{C'N''} = \frac{\frac{\dot{I}_C}{\sqrt{3}}}{\sqrt{3}} = 3.3\angle 120°A$.

$I_{A'B'} = \frac{I_{A'N''}}{\sqrt{3}}\angle 30° = 19.05\angle 30°A$

$I_{B'C'} = \frac{I_{B'N''}}{\sqrt{3}}\angle 30° = 19.05\angle -90°A$

$I_{C'A'} = \frac{I_{C'N''}}{\sqrt{3}}\angle 30° = 19.05\angle 150°$

设 $\frac{1}{j\omega C} = Z_C$

$\frac{|\dot{U}_A|^2}{Z_C} = \frac{1520\sqrt{3}}{3}$

$Z_C = 18.38\Omega 55.15°\Omega$

$\therefore Z_C = -j18.38\Omega = 18.38\angle -90°$

$\dot{I}_{A'N'} = \frac{\dot{U}_A}{Z_C} = 11.97\angle 90°A$ $3.99\angle 90°A$

$I_{B'N'} = 3.99\angle -30°A$, $I_{C'N'} = 3.99\angle 150°A$

$\dot{I}_{B'N'} =$

$\dot{I}_{C'N'} =$

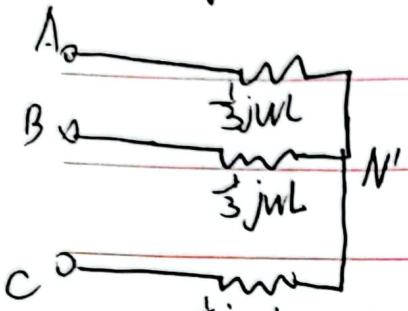
$\dot{I}_A = I_{A'N''} + I_{A'N'} = 12.42\angle 74.59A$, $\dot{I}_B = 12.42\angle -45.41A$ $\dot{I}_C = 12.42\angle 165.41A$

$\dot{I}_A = 5.18\angle 50.41A$. $\dot{I}_B = 5.18\angle -69.59A$, $\dot{I}_C = 5.18\angle 170.41A$.

12) $\bar{S}=3\dot{I}_A^{*}\dot{U}_A=$~~(2178.30+j1902.50)V·A~~ $=(2178-j2624.31)$ V·A

12-13.

电路等效为



$U_P=\frac{U_L}{\sqrt{3}}=220V$

设 $\dot{U}_A=220\angle 0°V$, $\dot{U}_B=220\angle -120°V$, $\dot{U}_C=220\angle 120°V$

~~$\dot{I}_A=\dot{U}_A$~~ $I_A=\frac{|U_A|}{\frac{1}{3}\omega L}=\frac{3|U_A|}{\omega L}=\sqrt{3}I_{A'B'}$

$\omega L=110\sqrt{3}\Omega$

$\dot{I}_A=\frac{\dot{U}_A}{\frac{1}{3}j\omega L}=2\sqrt{3}\angle -90°$, $\dot{I}_B=2\sqrt{3}\angle 150°A$, $\dot{I}_C=2\sqrt{3}\angle 30°A$

~~$\dot{U}_{AB}=380\angle 30°$~~ $\dot{U}_{AC}=-\dot{U}_{CA}=380\angle -150°V$, $\dot{U}_{BC}=380\angle 90°V$

$P_1=380\times 2\sqrt{3}\times\cos(-150°-(-90°))=658.18W$

$P_2=380\times 2\sqrt{3}\times\cos(-90°-150°)=-658.18W$