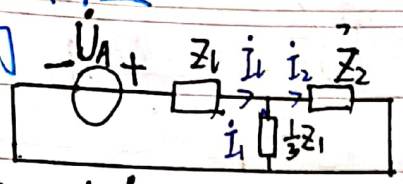
第十二章作业

[12-8]



$\dot{U}_A = \frac{1}{\sqrt{3}}\dot{U}_{AB}\angle -30° = 220\angle -30°$

Z_1 等效变换为 Y 形负载 $\frac{1}{3}Z_1$

$$\dot{I}_1 = \frac{\dot{U}_A}{Z_1 + (\frac{1}{3}Z_1 // Z_2)} = \frac{220\angle -30°}{1+j2+\frac{12(8+j10)}{20+j10}}$$

$= 20.89 - 14.08j = 25.19\angle -63.98° A$

$$\dot{I}_1 = \frac{Z_2}{Z_2 + \frac{1}{3}Z_1}\dot{I}_1 = \frac{12}{20+j10} \times 25.19\angle -63.98°$$

$= 0.54\angle -26.57° \times 25.19\angle -63.98°$

$= 13.52\angle -90.55° A$

$$\dot{I}_2 = \frac{\frac{1}{3}Z_1}{Z_2 + \frac{1}{3}Z_1}\dot{I}_1 = \frac{8+j10}{20+j10} \times 25.19\angle -63.98°$$

$= 0.57\angle 24.78° \times 25.19\angle -63.98°$

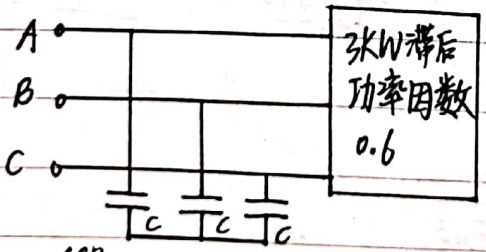
$= 14.35\angle -39.2° A$

原电路中 $\dot{I}_{Z_1} = \frac{1}{\sqrt{3}}\dot{I}_1\angle 30° = 7.81\angle -60.55° A$

∴ 线路电流 $25.19\angle -63.98° A$

Z_1 相电流 $7.81\angle -60.55° A$，Z_2 相电流 $14.35\angle -39.2° A$

[12-20]



设

(1) $\dot{U}_{AN} = \frac{400}{\sqrt{3}}\angle 0° V$

$$\therefore \dot{I}_{L1} = \frac{\dot{U}_{AN}}{-j20} = 11.55\angle 90° A$$

$$\dot{I}_{L2} = \frac{P}{\sqrt{3}U_{AB}\cos\varphi}\angle -\varphi = 7.21\angle -53.13° A$$

$\dot{I}_L = \dot{I}_{L1} + \dot{I}_{L2} = 7.22\angle -53.16° A$

即 $I_L = 7.22 A$

(3) 电容负载吸收的无功功率

$Q_1 = \sqrt{3}U_L I_{L1} = -8000j$ var

负载复功率 $\bar{S} = (3000 + 3000\tan(\arccos 0.6))$ V·A

$= (3000 + j4000)$ V·A

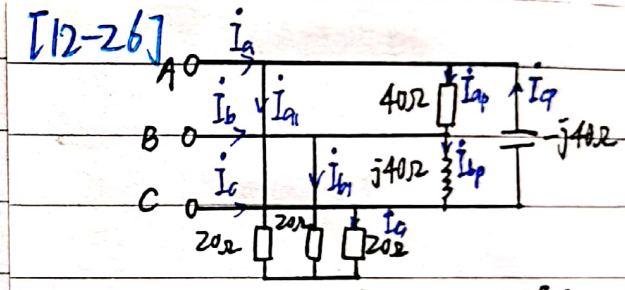
∴ 电源提供的复功率 $\bar{S} = \bar{S}_1 + \bar{S}_2$

$= (3 - j4)$ kV·A

(3) 由(2) $\cos\varphi = \frac{3}{\sqrt{3^2+4^2}} = 0.6$

∴ 电源侧的功率因数为 0.6.

[12-26]



$\dot{U}_{AN} = \frac{1}{\sqrt{3}}\dot{U}_{AB}\angle -30° V$，$\dot{U}_{BN} = \frac{400}{\sqrt{3}}\angle -150° V$，$\dot{U}_{CN} = \frac{400}{\sqrt{3}}\angle$

$$\dot{I}_{a1} = \frac{\dot{U}_{AN}}{20} = 11.55\angle -30° A$$

$$\dot{I}_{b1} = \frac{\dot{U}_{BN}}{20} = 11.55\angle -150° A$$

$$\dot{I}_{c1} = \frac{\dot{U}_{CN}}{20} = 11.55\angle 90° A$$

$$\dot{I}_{ap} = \frac{\dot{U}_{AB}}{40\Omega} = 10\angle 0° A$$

$$\dot{I}_{bp} = \frac{\dot{U}_{BC}}{j40\Omega} = \frac{400\angle -120°}{j40} = 10\angle 150° A$$

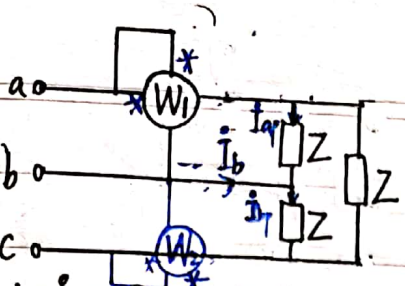
$$\dot{I}_{cp} = \frac{\dot{U}_{CA}}{-j40\Omega} = \frac{400\angle 120°}{-j40} = 10\angle -150° A$$

$$\dot{I}_a = \dot{I}_{a1} + \dot{I}_{ap} - \dot{I}_{cp} = 28.67\angle -1.55° A$$

$$\dot{I}_b = \dot{I}_{b1} + \dot{I}_{bp} - \dot{I}_{ap} = 28.67\angle -178.5° A$$

$$\dot{I}_c = \dot{I}_{c1} + \dot{I}_{cp} - \dot{I}_{bp} = 1.55\angle 90° A$$

[12-28]



(1) $\dot{U}_{bc}=\dot{U}_{ab}\angle -120^\circ=380\angle -120^\circ V$

$\dot{I}_{ap}=\frac{\dot{U}_{ab}}{Z}=\frac{380\angle 0^\circ}{60+j30}=5.66\angle -26.57^\circ A$

$\dot{I}_{bp}=\frac{\dot{U}_{bc}}{Z}=\frac{380\angle -120^\circ}{60+j30}=5.66\angle 146.57^\circ A$

$\dot{I}_b=\dot{I}_{bp}-\dot{I}_{ap}=9.84\angle -176.55^\circ A$

(2) $\dot{U}_{bN}=\dot{U}_{aN}\angle -120^\circ=\frac{1}{\sqrt{3}}\dot{U}_{ab}\angle -150^\circ=220\angle -150^\circ A$

$P=3\dot{U}_{bN}\dot{I}_b\cos\angle -150^\circ+176.55^\circ=5809.53W$

(3) 如图

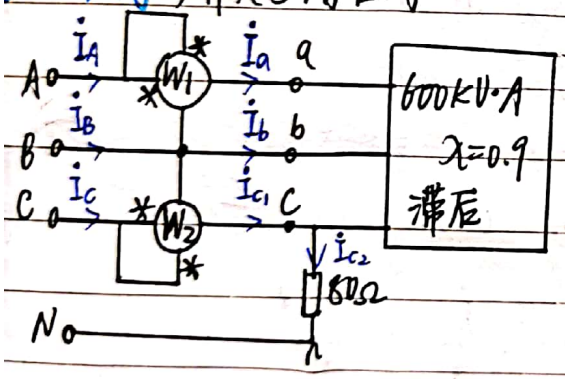
两瓦特表法的适用条件

(180Ω电阻也吸收一部分功率)

(3) S断开时，两表读数代数和为负载吸收的有功功率

$P_1+P_2=\bar{S}\cdot\lambda=540kW$

[12-34] (1) 开关S闭合时



$P=\bar{S}\cos\varphi=540kW$

由 $P=\sqrt{3}U_lI_l\cos\varphi$ 得 $I_l=55A$

$\therefore I_a=I_b=I_{c_1}=55A$

不妨令 $\dot{U}_{AN}=\frac{6.3}{\sqrt{3}}\angle 0^\circ kV$

则 $\dot{U}_{CN}=\frac{6.3}{\sqrt{3}}\angle 120^\circ kV$

$\dot{I}_{c_2}=\frac{\dot{U}_{CN}}{80\Omega}=45.47\angle 120^\circ A$. $I_{c_2}=45.47A$

$I_c=I_{c_1}+I_{c_2}=100.47A$

$\therefore I_A=55A$, $I_B=55A$, $I_C=100.47A$

(2) 不是，此题中 $\dot{I}_a+\dot{I}_b+\dot{I}_c\neq 0$，不符合