

12-8. 解: 视电压源为Y形联结, 将 Δ 形阻抗 Z_1 等效为Y形, 电源中性点与两组Y形负载中性点等电位。由 $\dot{U}_{AB} = 380 \angle 0^\circ \text{ V}$, A相电压

$$\dot{U}_{AN} = \dot{U}_{AB} \times \frac{1}{\sqrt{3}} \angle -30^\circ = 219.4 \angle -30^\circ \text{ V}$$

$$\text{线电流 } \dot{I}_{Aa} = \frac{\dot{U}_{AN}}{Z_1 + \frac{Z_2}{3} \parallel Z_2} = 25.1 \angle -64.0^\circ \text{ A}$$

由分流关系有 Z_2 的 A 相电流

$$\dot{I}_{a2} = \frac{Z_1/3}{Z_1/3 + Z_2} \dot{I}_{Aa} = 14.3 \angle -39.3^\circ \text{ A}$$

$$\text{进而有 } Z_1 \text{ 的 A 相电流 } \dot{I}_{a1} = \frac{Z_2}{Z_1/3 + Z_2} \dot{I}_{Aa} \times \frac{1}{\sqrt{3}} \angle 30^\circ = 7.74 \angle -60.6^\circ \text{ A}$$

12-20 负载吸收 $P_1 = 3 \text{ kW}$, $\cos \varphi_1 = 0.6$ (感性), 则 $\bar{S}_1 = P_1 + jQ_1$

又有Y形电路线电压 $U_{AB} = 400 \text{ V}$, 容抗 $= (3 + j4) \text{ kV} \cdot \text{A}$

$$X_C = 20 \Omega, \text{ 故电容吸收复功率 } \bar{S}_2 = -j3 \times \frac{(U_{AB}/\sqrt{3})^2}{X_C} = -j8 \text{ kV} \cdot \text{A}$$

电源发出复功率 $\bar{S} = \bar{S}_1 + \bar{S}_2 = (3 - j4) \text{ kV} \cdot \text{A}$, 故电源发出有功功率

$$P = 3 \text{ kW}, \cos \varphi = \frac{P}{S} = 0.6 \text{ (容性)}$$

$$\text{则 } I_a = \frac{S}{\sqrt{3} U_{AB}} = 7.2 \text{ A}$$

12-26 解: Δ 形负载每相电压已知, 可求每相电流

$$\dot{I}_{a1} = \frac{\dot{U}_{AB}}{Z_A} - \frac{\dot{U}_{CA}}{Z_C} = (10 + 5\sqrt{3} + j5) \text{ A} \quad \dot{I}_{b1} = \frac{\dot{U}_{BC}}{Z_B} - \frac{\dot{U}_{AB}}{Z_A} = (-5\sqrt{3} + j5 - 10) \text{ A}$$

$$\text{同理有 } \dot{I}_{c1} = 10.0 \angle -90^\circ \text{ A}$$

$$\text{对于Y形负载线电流, 有 } \dot{I}_{a2} = \frac{\dot{U}_{AB} \times \frac{1}{\sqrt{3}} \angle -30^\circ}{Z_2} = \frac{20\sqrt{3}}{3} \angle -30^\circ \text{ A}$$

$$\dot{I}_{b2} = \frac{20\sqrt{3}}{3} \angle -150^\circ \text{ A} \quad \dot{I}_{c2} = \frac{20\sqrt{3}}{3} \angle -90^\circ \text{ A}$$

$$\text{故 } \dot{I}_a = \dot{I}_{a1} + \dot{I}_{a2} = 28.7 \angle -1.5^\circ \text{ A} \quad \dot{I}_b = 28.7 \angle -178.5^\circ \text{ A}$$

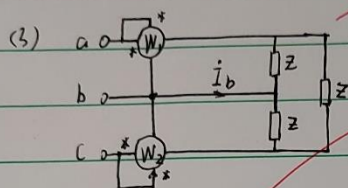
$$\dot{I}_c = 1.5 \angle 90^\circ \text{ A}$$

12-28 解: (1) 电压源视为Y形联结, Δ 负载等效为Y, 则B相电压为

$$\dot{U}_b = \dot{U}_{bc} \times \frac{1}{\sqrt{3}} \angle -30^\circ = \frac{380}{\sqrt{3}} \angle -150^\circ \text{ V}$$

$$\dot{I}_b = \frac{\dot{U}_b}{Z/3} = \frac{38}{\sqrt{15}} \angle -176.6^\circ \text{ A}$$

$$(2) P = 3 I_b^2 \times \operatorname{Re}\left[\frac{Z}{3}\right] = 5776 \text{ W}$$



12-34. 解: (1) $I_1 = \frac{S}{\sqrt{3} U_1} = 55.0 \text{ A} \Rightarrow \lambda = 0.9, \varphi = \arccos 0.9 = 25.8^\circ$ (感)

$$\dot{U}_{CN} = \frac{6.3}{\sqrt{3}} \angle 0^\circ \text{ kV}, \dot{I}_C = \frac{\dot{U}_{CN}}{80} + 55.0 \angle -25.8^\circ \text{ A} = 98.0 \angle -14.1^\circ \text{ A}$$

$$\dot{I}_B = 55.0 \angle 94.2^\circ \text{ A}, \dot{I}_A = 55.0 \angle -145.8^\circ \text{ A}$$

$$(2) \dot{U}_{AB} = \sqrt{3} \dot{U}_{CN} \angle -90^\circ, \dot{U}_{CB} = \sqrt{3} \dot{U}_{CN} \angle -30^\circ$$

$$P_1 = \operatorname{Re}[\dot{U}_{AB} \times \dot{I}_A^*] = 194.8 \text{ kW}, P_2 = \operatorname{Re}[\dot{U}_{CB} \times \dot{I}_C^*] = 593.8 \text{ kW}$$

$$P_1 + P_2 = 788.6 \text{ kW}$$

S 闭合时中线电流不为0, 不满足两表法, 功率表读数和不等于有功功率

$$(3) P_1 + P_2 = S \times \lambda = 540 \text{ kW}$$

