Exos n°1 :

1) $P_T = P_{13}^1 + P_{23}^2 = 15\,kW + 5\,kW = 20\,kW$

$Q_T = \sqrt{3}\,(P_T) = \sqrt{3}\,20.10^3 = 17,32\,kVAR.$

$S_T = \sqrt{P_T^2 + Q_T^2} = \sqrt{20^2 + 17,32^2} = 26,46\,kVA.$

2) $\cos(\varphi_T) = \frac{P_T}{S_T} = 0,76 \iff \varphi_T = 40,9° \iff \tan(\varphi_T) = 0,87.$

3) $\underline{I}_T = \frac{S_T}{3V} = 38,34A.$

$\underline{I}_1 = I_T e^{-j\varphi_T} = 38,34\, e^{-j40,9°}\,A. \; ; \; \underline{I}_2 = a^2 \underline{I}_1 \; ; \; \underline{I}_3 = a\,\underline{I}_1$

4) $\cos(\varphi_g) = 0,93 \qquad C_\Delta = ?$

$P_G = P_T$

$Q_c = 3C_\Delta \omega V^2 \iff C_\Delta = \frac{Q_c}{3\omega U^2}$

$Q_G < Q_T = Q_T - Q_c$

S_G

$Q_c = Q_T - Q_T' = P_T \tan(\varphi_T) - P_T \tan(\varphi_G) = 20.10^3 . 0,87 - 20.10^3 . 0,4 = 9416\,VAR.$

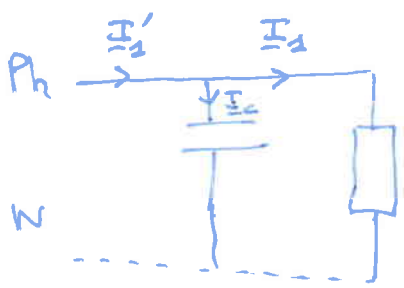
$C_\Delta = \frac{Q_c}{3\omega U^2} = 64,64\,\mu F.$

$\underline{I}_1' = I_T' e^{-j\varphi_T'} \; ; \; \underline{I}_2' = a^2 \underline{I}_1' \; ; \; \underline{I}_3' = a\,\underline{I}_1'$

5) $P_T' = P_T = 3VI_T' \cos(\varphi_T')$

$I_T' = \frac{P_T}{\cos(\varphi_T')\,3V} = 31,17A < I_T = 38,34A. \quad \underline{I}_1' = I_T' e^{-j\varphi_T'} = 31,17\, e^{-j21,6°}\,A.$

6)



7) $\underline{Z}_T = ? \qquad C_y = ?$

$\underline{Z}_T = Z_T e^{j\varphi_T}$

C_y

$Q_c = 3C_\Delta \omega U^2 = 3C_y \omega V^2$

où $U = V\sqrt{3}$

$3C_\Delta \omega 3V^2 = 3C_y \omega V^2$

$\underline{Z}_T = \frac{V_1}{I_1} = \frac{V}{I_T e^{-j\varphi_T}} = \frac{V}{I_T} e^{j\varphi_T}$

$Z_T = \frac{V}{I_T} = \frac{230}{38,34} = 6\,\Omega.$

$\underline{Z}_T = 6 e^{j40,9°}$

$\boxed{C_y = 3C_\Delta}$

$C_y = 193\,\mu F$

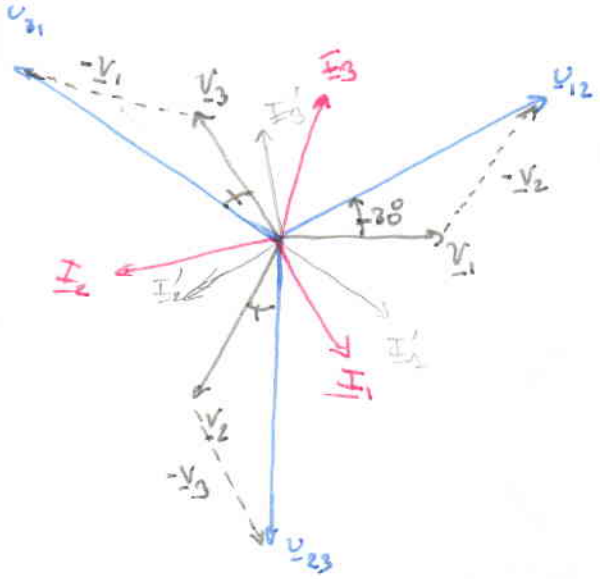
$\underline{Z} = Z_T e^{j\varphi_T} = \underbrace{R}_{Z_T\cos(\varphi_T)=P_T} + \underbrace{jL\omega}_{Z_T\sin(\varphi_T)=Q_T}$

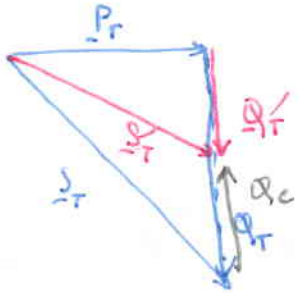
$P_T = 3RI_T^2 = 20\,kW$

$Q_T = 3L\omega I_T^2 = 17,32\,KVAR$

$R = Z_T\cos(\varphi_T) = 4,53\,\Omega$

$L\omega = Z_T\sin(\varphi_T) = 3,93\,\Omega$.





Exos n°2 :

$\sqrt{3}$ → déphasage 30°

$\underline{U}_{12} = Ue^{j30°}$; $\underline{U}_{23} = a^2\underline{U}_{12}$; $\underline{U}_{31} = a\underline{U}_{12}$ | $\underline{I}_1 = I_T e^{-j\varphi_T}$; $\underline{I}_2 = a^2\underline{I}_1$; $\underline{I}_3 = a\underline{I}_1$

1) $P_T = P_{13}^1 + P_{23}^2 = 736\,W$

$Q_T = \sqrt{3}(P_{13}' - P_{23}^2) = 1732\,W$

2) $S_T = 3VI_T = \sqrt{P_T^2 + Q_T^2} = 1881,0\,VA$.

$\cos(\varphi_T) = \frac{P_T}{S_T} = 0,76$. → $\varphi_T = 67°$.

$I_T = \frac{S_T}{3V} = 2,73\,A$. $\underline{I}_1 = I_T e^{-j\varphi_T} = 2,73e^{-j67°}\,A$.

3) $I_T = J_T\sqrt{3}$ ⇒ $J_T = \frac{I_T}{\sqrt{3}} = 1,57\,A$.

4) $\underline{Z} = Ze^{j\varphi_T}$ → $Z = \frac{U}{J_T} = \frac{400}{1,57} = 254\,\Omega$.

$\underline{Z} = \underbrace{Ze^{j\varphi_T}}_{R+jL\omega} = \underbrace{Z\cos(\varphi_T)}_{R} + j\underbrace{Z\sin(\varphi_T)}_{L\omega}$ $\begin{cases} R = 99,34\,\Omega \\ L\omega = 233,79\,\Omega. \end{cases}$

5) étoile ⇒ V || triangle ⇒ U.

$\underline{I}_1' = \underline{I}_T' e^{-j\varphi_T}$ $I_T' = \frac{V}{Z} = \frac{230}{254} = 0,91\,A$.

6) $P_T' = 3VI_T'\cos(\varphi_T) = 3RI_1'^2 = 244,3\,W$

$Q_T' = 3VI_T'\sin(\varphi_T) = 3L\omega I_T'^2 = 575\,VAR$ ⇒ $\begin{cases} P_T = 3P_T' \\ Q_T = 3Q_T' \end{cases}$