

ΑΝΑΛΥΣΗ ΗΛΕΚΤΡΙΚΩΝ ΚΥΚΛΩΜΑΤΩΝ

1) Για $\cos \varphi = 1$ πρέπει $Q_L = Q_C$ $Q = \sqrt{S^2 - P^2} = \sqrt{1500.000^2 - 1050.000^2} = 1071.214,26 \text{ Var}$
 $\Sigma-34$ $P = UI \cos \varphi = 15000 \cdot 100 \cdot 0,7 = 1050.000 \text{ W}$

a) $C = \frac{Q_C}{2\pi f U^2} = \frac{1071.214,26}{2\pi \cdot 50 \cdot 15000^2} = 15,15 \cdot 10^{-6} \text{ F} = 15,15 \mu\text{F}$

b) $X_C = \frac{1}{C\omega} = \frac{10^6}{15,15 \cdot 314} = 210,21 \Omega$ $I_C = \frac{U}{X_C} = \frac{15000}{210,21} = 71,36 \text{ A}$

2) $Z = \sqrt{R^2 + X_L^2} = \sqrt{30^2 + 23^2} = 37,8 \Omega$ $I = \frac{U}{Z} = \frac{220}{37,8} = 5,82 \text{ A}$

$P = 220 \cdot 5,82 \cdot 0,95 = 1216,38 \text{ W}$ $S = 220 \cdot 5,82 = 1280,4 \text{ V} \cdot \text{A}$

$Q = P \cdot \tan \varphi = 1216,38 \cdot 0,32 = 389,2416 \text{ Var}$

$Q = \sqrt{1280,4^2 - 1216,38^2} = 399,8 \text{ Var}$ $C = \frac{Q_C}{2\pi f U^2} = \frac{399,8}{2\pi \cdot 50 \cdot 220^2} = 26,29 \mu\text{F}$

3) b) $I = \frac{P}{220 \cdot 0,7} = \frac{5000}{220 \cdot 0,7} = 32,467 \text{ A}$ $Q = \sqrt{7142,74^2 - 5000^2} = 5100,85 \text{ Var}$
 $\Delta Q = P \cdot \tan \varphi = 5000 \cdot 0,47 = 2350 \text{ Var}$

$S = 220 \cdot 32,467 = 7142,74$ $Q_C = Q_L - \Delta Q = 5100,85 - 2350 = 2750,85 \text{ Var}$
a) $C = \frac{2750,85}{2\pi f \cdot 220^2} = 181 \mu\text{F}$ $\delta) I = \frac{5000}{220 \cdot 0,9} = 25,25 \text{ A}$ $\delta) 32,467 - 25,25 = 7,217 \text{ A}$

4) $Q_C = C \cdot 2\pi f U^2 = 299 \cdot 10^{-6} \cdot 100\pi \cdot 220^2 = 4546,387 \text{ Var}$

$I = \frac{10.000}{220 \cdot 0,95} = 47,85 \text{ A}$ $S = 47,85 \cdot 220 = 10526,3 \text{ V} \cdot \text{A}$

$Q = \sqrt{10526,3^2 - 10000^2} = 3286,8 \text{ Var}$

$Q_L = Q_C + \Delta Q = 4546,387 + 3286,8 = 7833,18 \text{ Var}$

$\cos \varphi = \frac{P}{S} = \frac{10.000}{\sqrt{10.000^2 + 7833,18^2}} = 0,787$

$\varepsilon \varphi \varphi = \frac{Q}{P} = \frac{7833,18}{10.000} = 0,7833 \leadsto \cos \varphi \approx 0,79 \quad \hat{\varphi} = 38^\circ$