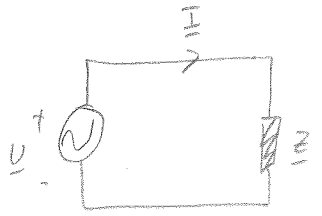
1.11)



$\underline{U} = 380\angle 0°$ V

$\underline{Z} = (16 + j12)\,\Omega = 20\angle 36{,}87°\,\Omega$

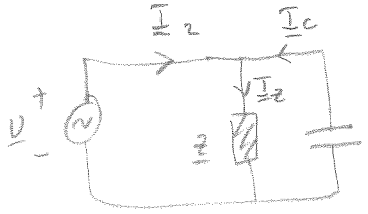
a) Bestäm S, P och Q.

$$\underline{I} = \frac{\underline{U}}{\underline{Z}} = \frac{380\angle 0°}{20\angle 36{,}87°} = 19\angle -36{,}87°\ \text{A} = 15{,}20 - j11{,}40\ \text{A}$$

$$\underline{S} = \underline{U}\cdot\underline{I}^* = 380\angle 0° \cdot 19\angle -36{,}87° = 7220\angle -36{,}87 = 5776 + j4332\ \text{VA}$$

svar: $S = 7{,}22$ kVA
$P = 5{,}78$ kW
$Q = 4{,}33$ kVAr

b)



Strömmen är minimal om bara aktiv effekt överförs, då är kompenseringen optimal,
$S = \sqrt{P^2 + Q^2}$, $S = \underline{U}\cdot\underline{I}^*$

$\underline{I}_2 = \frac{\underline{U}}{\underline{Z}} = \{\text{samma som tidigare}\} = 19\angle -36{,}87°\ \text{A} = 15{,}20 - j11{,}40\ \text{A}$

$\underline{I}_z = \underline{I}_2 + \underline{I}_c$, $\underline{I}_2 = \{\text{rent reell}\} = 15{,}2$ A
$\underline{I}_c = \{\text{rent imaginär}\} = -j11{,}40$ A (kondensatorn bidrar bara med reaktiv effekt)

$$+\underline{U} = +jX_c\cdot\underline{I}_c$$

$$\Rightarrow jX_c = \frac{\underline{U}}{\underline{I}_c} = \frac{380\angle 0°}{11{,}40\angle -90°} = 33\angle 90° = j33\,\Omega$$

$$\Rightarrow X_c = 33\,\Omega$$

Från generatorns sida: $\underline{S}_g = \underline{U}\cdot\underline{I}_2^* = 380\angle 0° \cdot 15{,}20\angle 0° =$

$= 5{,}78$ kVA (rent aktiv)

$\Rightarrow \underline{P}_g = 5{,}78$ kW

$\underline{Q}_g = 0$ kVAr

c) kondensatorn minskas med 25 %

$$\underline{X}_{C2} = 0{,}75 \cdot X_C = 25\ \Omega$$

$$\underline{Z}_{par} = \underline{Z} /\!/ -jX_C = \frac{20\angle 36{,}87^\circ \cdot 25\angle -90^\circ}{16 + j12 - j25} = \frac{500\angle -53{,}13^\circ}{20{,}62\angle -39{,}09^\circ} = 24{,}25\angle -14{,}04^\circ\ \Omega$$

$$\Rightarrow \underline{I} = \frac{\underline{U}}{\underline{Z}_{par}} = \frac{380\angle 0^\circ}{24{,}25\angle -14{,}04^\circ} = 15{,}67\angle 14{,}04^\circ$$

$$\underline{S} = \underline{U} \cdot \underline{I}^* = 380\angle 0^\circ \cdot 15{,}67\angle -14{,}04^\circ = 5955\angle -14{,}04^\circ =$$

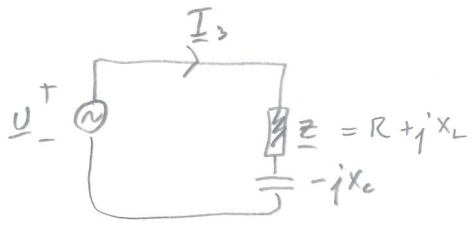
$$= 5777 - j1445\ \text{VA}$$

Svar: $S = 5{,}96$ kVA

$P = 5{,}78$ kW

$Q = -1{,}45$ kVAr (generatorn upptar reaktiv effekt)

d)



$$\underline{Z}_{tot} = \underline{Z} + (-jX_C) = R + j(X_L - X_C)$$

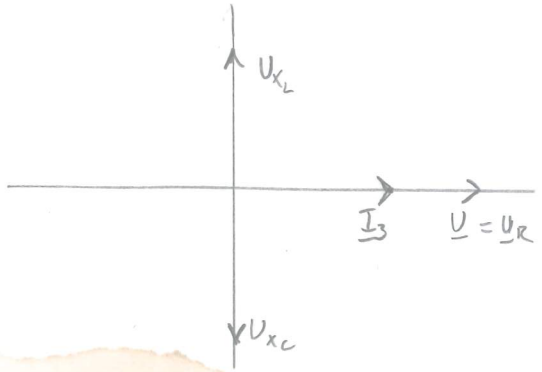
Den aktiva effekt blir maximal om $X_C = X_L = 12\ \Omega$

$$\Rightarrow \underline{Z}_{tot} = R = 16\ \Omega$$

$$\underline{I}_3 = \frac{\underline{U}}{\underline{Z}_{tot}} = \frac{380\angle 0^\circ}{16\angle 0^\circ} = 23{,}75\angle 0^\circ\ \text{A}$$

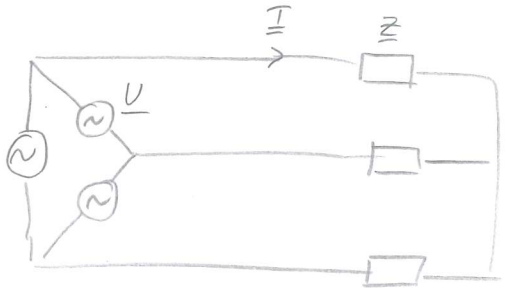
$$\underline{U}_{XC} = \underline{I}_3 \cdot (-jX_C) = 23{,}75\angle 0^\circ \cdot 12\angle -90^\circ = 285\angle -90^\circ\ \text{V}$$

Svar: spänningen över kondensatorn blir 285 V



Övning 2 – 1

2.9)



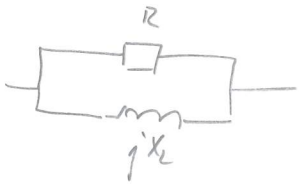
$U = 500$ V

$I = 30$ A

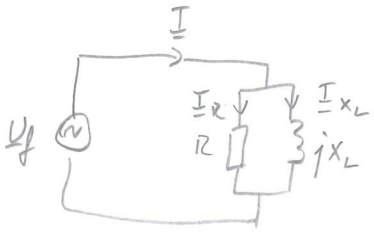
$\cos\varphi = 0{,}8$

$\Rightarrow \varphi = 36{,}87°$

$Z = R /\!/ jX_L$



Ekvivalent Y-fas



$$P = 3 \cdot U_f \cdot I \cos\varphi = 3 \cdot \frac{500}{\sqrt{3}} \cdot 30 \cdot 0{,}8 = \underline{20{,}78 \text{ kW}}$$

$$I_R = I \cdot \cos\varphi = 30 \cdot 0{,}8 = 24 \text{ A}$$

$$I_{X_L} = I \cdot \sin\varphi = 18 \text{ A}.$$

$$P = 3 \cdot R \cdot I_R^2 \Rightarrow R = \frac{P}{3 I_R^2} = \underline{12 \ \Omega/\text{fas}}$$

$$Q = 3 \cdot U_f \cdot I \sin\varphi = 15{,}59 \text{ kVAr}$$

$$Q = 3 \cdot X_L I_{X_L}^2 \Rightarrow X_L = \frac{Q}{3 \cdot I_{X_L}^2} = 16 \ \Omega/\text{fas}.$$

övning 2-4