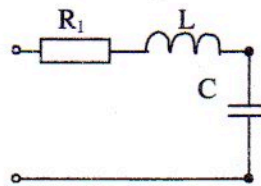
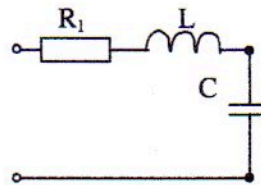


3. domača naloga iz Osnov elektrotehnike II

1. Dva motorja imata skupno delovno moč $P = 1,8$ kW in skupno jalovo moč $Q = 2$ kvar. Faktorja moči obeh motorjev sta $\cos\varphi_1=0,6$ in $\cos\varphi_2=0,7$. Kakšni sta posamezni delovni moči motorjev P_1 in P_2 ?
2. Dve napravi obratujeta v zaporedni vezavi. Skupna napetost je 230 V in v vezje teče tok 20 A. Skupna delovna moč v vezju je $P = 3$ kW. Določite navidezni moči naprav S_1 in S_2 , če sta $\cos\varphi_1=0,5$ in $\cos\varphi_2=0,8$.
3. Dve napravi obratujeta v vzporedni vezavi. Napetost je 220 V in v vezje teče skupni tok $I = 20$ A. Določite obe navidezni moči naprav S_1 in S_2 , če sta $\cos\varphi_1=0,7$ in $\cos\varphi_2=0,9$, skupna jalova moč v vezju pa 2,2 kvar.
4. V vezju na sliki določite C tako, da bo vezje pri $\omega_0 = 1000$ Hz v resonanci. $L = 10$ mH, $R_1 = 25$ Ω .
5. V vezju na sliki izračunajte resonančno krožno frekvenco ω_0 . $L = 20$ mH, $C = 50$ μ F, $R_1 = 25$ Ω .



Rešitve:

1. $P_1 = 0,524$ kW
 $P_2 = 1,276$ kW
2. $S_1 = 2,52$ kVA
 $S_2 = 2,175$ kVA
3. $S_1 = 0,95$ kVA
 $S_2 = 3,493$ kVA
4. $C = 100$ μ F
5. $\omega_0 = 1000$ Hz

DNS / 1. nal. 1

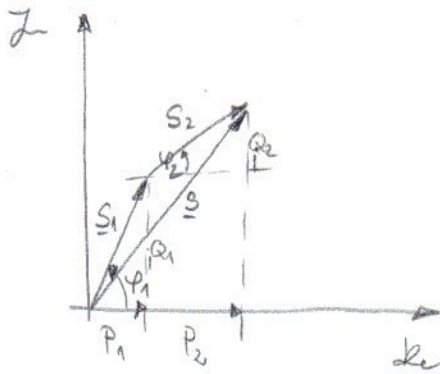
$P = 1,8 \text{ kW}$

$Q = 2 \text{ kvar}$

$\cos \varphi_1 = 0,6$

$\cos \varphi_2 = 0,7$

$P_1, P_2 = ?$



$\sin \varphi_1 = 0,8$

$\sin \varphi_2 = 0,7141$

$P = P_1 + P_2$

$Q = Q_1 + Q_2$

$P = \cos \varphi_1 \cdot S_1 + \cos \varphi_2 \cdot S_2$

$Q = \sin \varphi_1 \cdot S_1 + \sin \varphi_2 \cdot S_2$

① ↙

② ↗

$S_1 = \frac{P - \cos \varphi_2 S_2}{\cos \varphi_1}$

$Q = \sin \varphi_1 \cdot \frac{P - \cos \varphi_2 S_2}{\cos \varphi_1} + \sin \varphi_2 S_2$

$Q \cdot \cos \varphi_1 = \sin \varphi_1 P - \cos \varphi_2 \sin \varphi_1 S_2 + \sin \varphi_2 \cos \varphi_1 S_2$

$Q \cdot \cos \varphi_1 - \sin \varphi_1 P = S_2 (\sin \varphi_2 \cos \varphi_1 - \cos \varphi_2 \sin \varphi_1)$

$S_1 = 0,8714 \text{ kVA}$

$S_2 = \frac{Q \cdot \cos \varphi_1 - \sin \varphi_1 P}{\sin \varphi_2 \cos \varphi_1 - \cos \varphi_2 \sin \varphi_1}$

$P_1 = \cos \varphi_1 \cdot S_1 = 0,523 \text{ kW}$

$S_2 = \frac{2 \cdot 0,6 - 0,8 \cdot 1,8}{0,7141 \cdot 0,6 - 0,7 \cdot 0,8} = 1,8245 \text{ kVA}$

$P_2 = \cos \varphi_2 \cdot S_2 = 1,277 \text{ kW}$

Zmjeriti:

$\begin{bmatrix} \cos \varphi_1 & \cos \varphi_2 \\ \sin \varphi_1 & \sin \varphi_2 \end{bmatrix}^{-1} \cdot \begin{bmatrix} P_1 \\ Q_1 \end{bmatrix} \Rightarrow S_1 = 0,871 \text{ kVA}$
 $\rightarrow S_2 = 1,825 \text{ kVA}$

$P_1 = S_1 \cdot \cos \varphi_1 = 0,523 \text{ kW}$

$P_2 = S_2 \cdot \cos \varphi_2 = 1,278 \text{ kW}$



DN3/2. n. ol. 1

$$U = 230V$$

$$I = 20A$$

$$P = 3kW$$

$$\cos \varphi_1 = 0,5$$

$$\cos \varphi_2 = 0,8$$

$$S_1 = ?$$

$$S_2 = ?$$

$$S = U \cdot I = \boxed{4600 \text{ VA}}$$

$$Q = \sqrt{S^2 - P^2}$$

$$P = P_1 + P_2$$

$$Q = \boxed{3,487 \text{ kvar}}$$

$$Q = Q_1 + Q_2$$

$$Q = \sin \varphi_1 S_1 + \sin \varphi_2 S_2$$

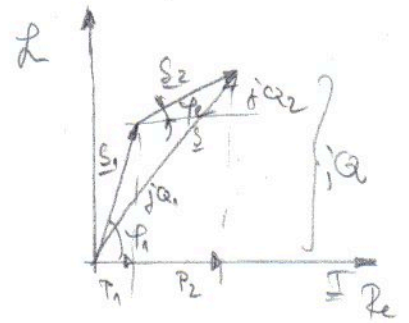
$$P = \cos \varphi_1 S_1 + \cos \varphi_2 S_2$$

$$\sin \varphi_1 = 0,866$$

$$\sin \varphi_2 = 0,6$$

$$\begin{bmatrix} \sin \varphi_1 & \sin \varphi_2 \\ \cos \varphi_1 & \cos \varphi_2 \end{bmatrix}^{-1} \cdot \begin{bmatrix} Q \\ P \end{bmatrix} \rightarrow \begin{matrix} S_1 = \boxed{2,519 \text{ kVA}} \\ S_2 = \boxed{2,175 \text{ kVA}} \end{matrix}$$

$Ax = B \Rightarrow x = A^{-1} \cdot B$
 \downarrow
 S_1, S_2



3. zad.

$$U = 220V$$

$$I = 20A$$

$$\cos \varphi_1 = 0,7$$

$$\cos \varphi_2 = 0,9$$

$$Q = 2,2 \text{ kvar}$$

$$S_1, S_2 = ?$$

$$S = U \cdot I = \boxed{4400 \text{ VA}}$$

$$S = S_1 + S_2$$

$$Q = Q_1 + Q_2$$

$$P = \sqrt{S^2 - Q^2}$$

$$P = \boxed{3,812 \text{ kW}}$$

$$P = \cos \varphi_1 \cdot S_1 + \cos \varphi_2 \cdot S_2$$

$$Q = \sin \varphi_1 \cdot S_1 + \sin \varphi_2 \cdot S_2$$

$$A \cdot x = B$$

$$\sin \varphi_1 = 0,714$$

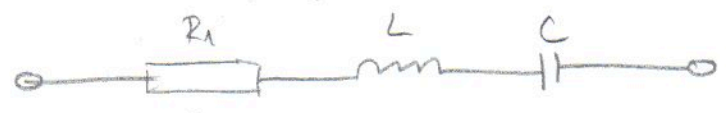
$$x = A^{-1} \cdot B$$

$$\sin \varphi_2 = 0,436$$

$$\begin{bmatrix} \cos \varphi_1 & \cos \varphi_2 \\ \sin \varphi_1 & \sin \varphi_2 \end{bmatrix}^{-1} \cdot \begin{bmatrix} P \\ Q \end{bmatrix} = \begin{bmatrix} S_1 \\ S_2 \end{bmatrix} \rightarrow S_1 = \boxed{0,945 \text{ kVA}}$$
$$\rightarrow S_2 = \boxed{3,498 \text{ kVA}}$$

3. DN / u. ral.

$L = 10 \text{ mH}$
 $\omega_0 = 1000 \text{ Hz}$
 $R_1 = 25 \Omega$

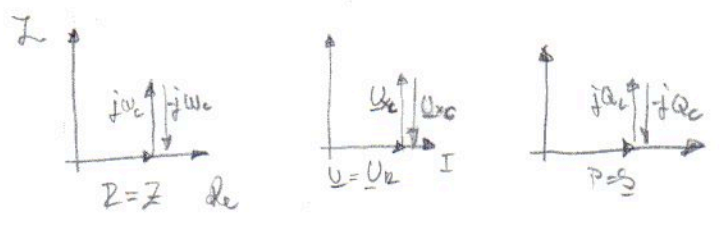


$$\omega_0 = \frac{1}{\sqrt{LC}} \quad Z = R + j \left(\omega L - \frac{1}{\omega C} \right)$$

$C = ?$ da bi
 mreže u rezonanci.

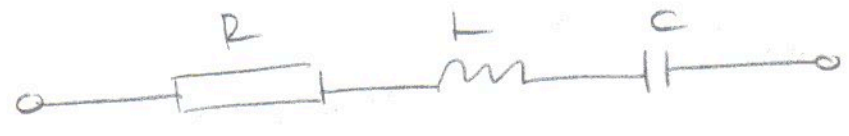
$$\text{Im}(Z) = 0$$

ω_0 rezonancija
 krozna frekvencija



$$\omega_0 = \frac{1}{\sqrt{LC}} \Rightarrow C = \frac{1}{\omega_0^2 L} = \frac{1}{1.10^3 \cdot 10 \cdot 10^{-3}} = 1.10^{-4} \text{ F} = \boxed{100 \mu\text{F}}$$

5. naloga



$L = 20 \text{ mH}$
 $C = 50 \mu\text{F}$
 $R = 25 \Omega$

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{20 \cdot 10^{-3} \cdot 50 \cdot 10^{-6}}} = \boxed{1000 \text{ s}^{-1}}$$

