VIII-6 | - slican Pr. 16.

Trošilo sastavljeno od serijskog spoja X_C i R priključeno je na izvor napona U i unutrašnje impedancije $\underline{Z_i}$. Ako se otpor trošila mijenja u granicama $R_1 - R_2$, pri kojem otporu R će na trošilu biti najveća snaga. Kolika je ta snaga?

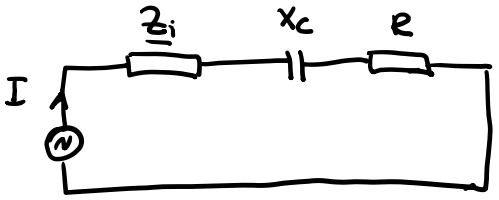
$U = 110\ V$

$\underline{Z} = 4\sqrt{2}\ \angle 45°\ \Omega$

$X_C = -j10\ \Omega$

$R_1 = 40\ \Omega$

$R_2 = 80\ \Omega$



Teorem prijenosa max snage: a) samo R_T ili se samo on mijenja:

$$R_T = \sqrt{R_i^2 + (X_i + X_T)^2}$$

$X_T = 0 \rightarrow R_T = \sqrt{R_i^2 + X_i^2} < |Z_i|$

b) samo X_T postoji

$X_T = -X_i$

c) max. snage trošila

$\underline{Z_T} = \underline{Z_i}^*$

$$R_T = \sqrt{R_i^2 + (X_i + X_T)^2}$$

$$= \sqrt{4^2 + (4-10)^2} = 2\sqrt{13}$$

$$= 7.21\ \Omega$$

↑ MAX SNAGE ZA OVAJ OTPOR

Kako to izgleda?

$$I = \frac{\dot{U}}{\underline{Z_i} + \underline{Z_T}} = \frac{U}{\sqrt{(R_i + R_T)^2 + (X_i + X_T)^2}}$$

$$P_T = I^2 \cdot R_T = \frac{U^2 \cdot R_T}{(R_i + R_T)^2 + (X_i + X_T)^2}$$

Ako uzmemo par vrijednosti R-ova i zapišemo u ovisnosti o U:

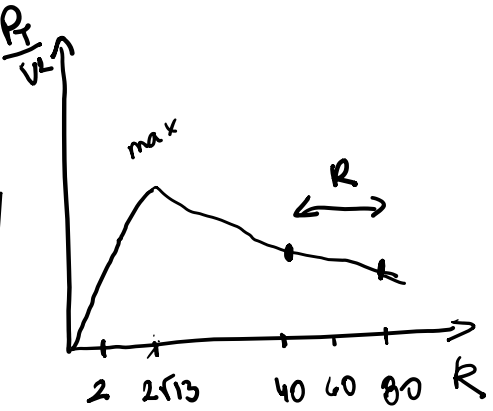
$R = 2\ \Omega \rightarrow P_T = \dfrac{U^2 \cdot 2}{(2+4)^2 + (4-10)^2} = U^2 \cdot 0.027\dot{7}$

$R = 2\sqrt{13} \rightarrow P_T = U^2 \cdot 0.0445986$

$R = 40 \rightarrow P_T = U^2 \cdot 0.0202839$

$R = 60 \rightarrow P_T = U^2 \cdot 0.0145$

$R = 80 \rightarrow P_T = U^2 \cdot 0.011128$



$\boxed{R = 40\ \Omega}$ $P = U^2 \cdot 0.0202839$

$= 245.435\ W$ //

VIII-14.

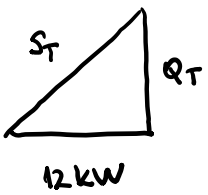
Izvor (transformator) ima nazivnu snagu 25 kVA. Na izvor je priključeno trošilo 12 kW sa faktorom snage 0.6. Odredite:

a) postotak opterećenja izvora

b) koliku radnu dodatnu snagu može dati izvor do punog opterećenja?

Zadatak rješite pomoću trokuta snage.

TROŠILO:



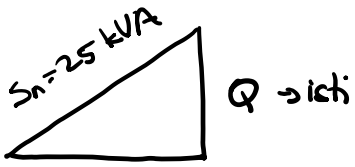
$P_T = 12\,kW$ $\quad P_T = S_T \cdot \cos\varphi \rightarrow S_T = \frac{P_T}{\cos\varphi} = 20\ kVA$

$Q_T = \sqrt{S_T^2 - P_T^2} = \sqrt{20^2 - 12^2} = 16\ kVAr$

a) postotak opterećenja

$S_n = 25\ kVA$ $\quad \frac{S_T}{S_n} = \frac{20}{25} = 0.8 \quad 1 \cdot 100\% = 80\ \%$

b) Ako mijenjamo samo radnu snagu – dakle ne i Q onda:



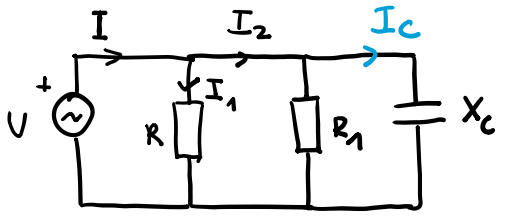
$P + P_d = \sqrt{S^2 - Q^2}$

$12 \cdot 10^3 + P_d = \sqrt{(25 \cdot 10^3)^2 - (16 \cdot 10^3)^2}$

$P_d = 19209.37 - 12000 = 7.209\,kW$

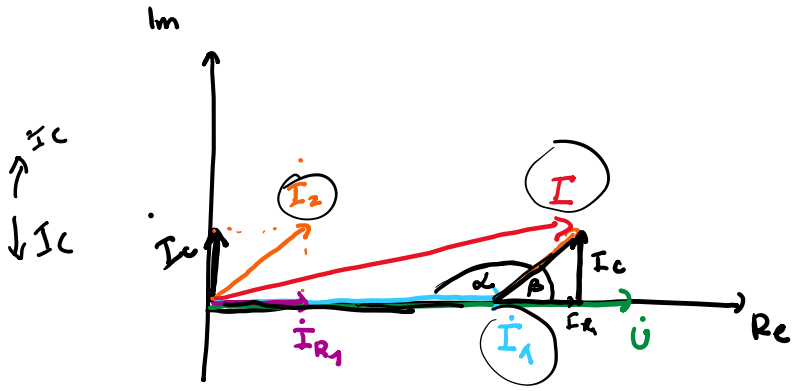
VIII-17.

Izračunajte reaktivnu snagu u spoju prema slici ako su izmjerene struje $I=3A$, $I_1=2A$, $I_2=2A$. Otpornik $R_1=4\Omega$. (X_C nije zadan).



$$Q = \frac{U^2}{X_C} = I_C^2 \cdot X_C$$

$X_C = \frac{U}{I_C}$ → trebaju nam i U i I_C



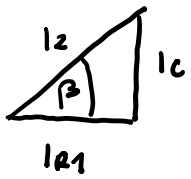
$$I_{R1} = \sqrt{I_2^2 - I_C^2} = \sqrt{4 - I_C^2}$$

KOSINUSOV POUČAK

$$I^2 = I_1^2 + I_2^2 - 2 \cdot I_1 \cdot I_2 \cdot \cos\alpha$$

$$9 = 4 + 4 - 8\cos\alpha \rightarrow \cos\alpha = -\frac{1}{8} \rightarrow \alpha = 97.18°$$

$$\beta = 180° - \alpha = 82.819°$$



$$\sin\beta = \frac{I_C}{I_2} = \frac{I_C}{2} \rightarrow I_C = 2\sin\beta = 1.9843A$$

$$I_{R1} = \sqrt{4 - I_C^2} = 0.2501\ A$$

$$U = R_1 \cdot I_{R1} = 0.2501 \cdot 4 = 1.0004\ V$$

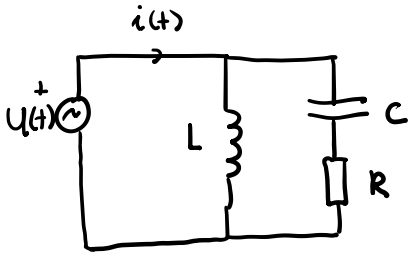
$$X_C = \frac{U}{I_C} = 0.50415\ \Omega$$

$$Q = \frac{U^2}{X_C} = 1.99\ VAr$$

$$= I_C^2 \cdot X_C$$

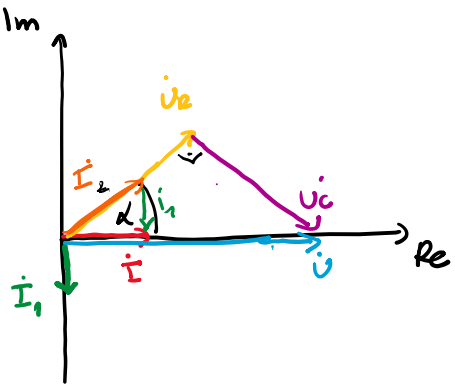
Primjer 19. U krugu prema slici napon i struja su oblika $u(t) = U_m \sin(\omega t)$, $i(t) = I_m \sin(\omega t)$.

Odredite L i C. Zadano: $U_m = 100\,V$, $I_m = 2.5\,A$, $\omega = 500\,s^{-1}$, $R = 20\,\Omega$.



$$\dot{U} = \frac{100}{\sqrt{2}} \angle 0^\circ \; V \qquad X_C = \frac{1}{\omega C} \rightarrow C = \frac{1}{\omega X_C}$$

$$\dot{I} = \frac{2.5}{\sqrt{2}} \angle 0^\circ \; A \qquad X_L = \omega L \rightarrow L = \frac{X_L}{\omega}$$



$\dot{U}$ $\dot{I}$ $\dot{I}_1$ $\dot{I}_2$ $\dot{U}_R$ $\dot{U}_C$

$$\left.\begin{aligned} \cos\alpha &= \frac{I_2 \cdot R}{U} \\ \cos\alpha &= \frac{1}{I_2} \end{aligned}\right\} \quad \frac{I}{I_2} = \frac{I_2 \cdot R}{U} \rightarrow I_2^2 \cdot R = U \cdot I$$

$$I_2 = \sqrt{\frac{U \cdot I}{R}} = 2.5\,A$$

$$\cos\alpha = \frac{1}{I_2} = \frac{\frac{2.5}{\sqrt{2}}}{2.5} = \frac{1}{\sqrt{2}} \rightarrow \alpha = 45^\circ$$

$\dot{U}_R = 2.5 \angle 45^\circ \cdot 20 = 50 \angle 45^\circ = 36.36 + 35.36j \; V$ $\qquad \dot{U}_C = \dot{U} - \dot{U}_R$

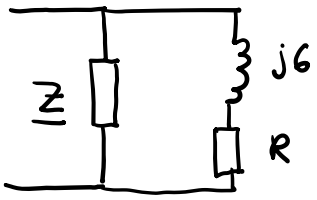
$\dot{U}_C = 35.36 - 35.36j = 50 \angle -45^\circ \; V$

$$X_C = \frac{U_C}{I_2} = \frac{50 \angle -45^\circ}{2.5 \angle 45^\circ} = 20 \angle -90^\circ \; \Omega \longrightarrow C = \frac{1}{20 \cdot 300} = 100\,\mu F$$

$$I_1 = \sqrt{I_2^2 - I^2} = 1.767\;A$$

$$\frac{U}{I_1} = X_L = 40.24 \rightarrow L = 80\,mH$$

Primjer 20. Izračunajte $\underline{Z}$ u spoju prema slici ako je snaga na otporu $R = 3\,\Omega$ jednaka $P_R = 666$ W. Ukupna prividna snaga spoja iznosi $S_{uk} = 3370$ VA, a faktor snage spoja $\cos\varphi = 0.937$ (kap.)



$$P_{uk} = S_{uk} \cdot \cos\varphi = 3370 \cdot 0.937 = 3157.69 \text{ W}$$

$$P_Z = P_{uk} - P_R = 2491.69 \text{ W}$$

$$P_R = I_{RL}^2 \cdot R \rightarrow I_{RL} = \sqrt{\frac{P}{R}} = 14.899 \text{ A}$$

$$\left.\begin{aligned} U_R &= I_{RL} \cdot R = 3 \cdot 14.899 = 44.67 \text{ V} \\ U_L &= I_{RL} \cdot X_L = 89.394 \text{ V} \end{aligned}\right\} \quad U = \sqrt{U_R^2 + U_L^2} = 99.95 \text{ V}$$

$$\cos\varphi = 0.937 \rightarrow \varphi = 20.446^\circ$$

$$Q_{uk} = S \cdot \sin\varphi = 1177.23 \text{ VAr} \quad \text{(kap)}$$

$$Q_L = I_{RL}^2 \cdot X_L = 14.899^2 \cdot 6 = 1332 \text{ VAr}$$

$$Q_Z = Q_{uk} - Q_L = -1177.23 - 1332 = -2509.23 \text{ VAr}$$

$$S_Z = 2491.69 - 2509.23j$$

$$= \dot{U} \cdot \dot{I}^* = \dot{U} \cdot \dot{U} \cdot \underline{Y}^* = |\dot{U}|^2 \cdot Y^* = |\dot{U}|^2 \cdot (G - jB)$$

$$= |\dot{U}|^2 \cdot G - j \cdot |\dot{U}|^2 \cdot B$$

$$|\dot{U}|^2 \cdot G = 2491.69 \rightarrow G = 0.2494 \text{ S}$$

$$|\dot{U}|^2 \cdot B = 2509.23 \rightarrow B = 0.2511 \text{ S}$$

$$\underline{Y} = 0.2494 + 0.2511j \text{ S} \quad \rightarrow \text{prez. 7. slajd 17. predavanje}$$

$$\underline{Z} = \underline{Y}^{-1} = 1.99 - 2.00j \ \Omega$$

1.17. Induktivno trošilo nominalnog napona U_n i nominalne struje I_n priključeno je na mrežu napona U i frekvencije f. Odredite najmanji iznos kapaciteta potrebnog za poboljšanje faktora snage $\cos\varphi$ na iznos $\cos\varphi'$.

$U = 220\ V$

$U_n = 220\ V$

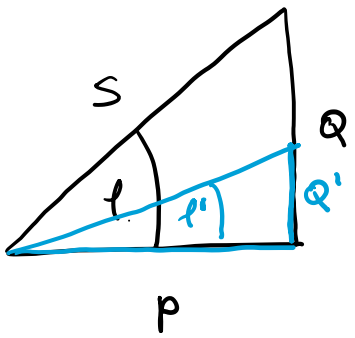
$I_n = 4.5\ A$

$f = 50\ Hz$

$\cos\varphi = 0.866$

$\cos\varphi' = 0.95$

$C = ?$



max. opterećenje: $S = I_n \cdot U_n = 990\ VA$

pri φ: $\cos\varphi = \frac{P}{S} \rightarrow P = S \cdot \cos\varphi = 857.34\ W$

$Q = \sqrt{S^2 - P^2} = 495.04\ VAr$

pri φ'

$\cos\varphi' = \frac{P'}{S'}$

$P = P' = 857.34\ W$

$S' = \frac{P'}{\cos\varphi'} = 902,46\ VA \rightarrow Q' = \sqrt{S'^2 - P'^2} = 281.79\ VAr$

$Q_R = Q - Q' = 495.04 - 281.79 = 213.25\ VAr$

C paralelno priključujemo → znamo U

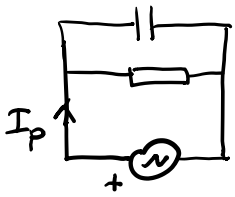
$Q_R = \frac{U^2}{X_C} \rightarrow X_C = \frac{U^2}{Q_R} = 226.96\ \Omega$

$\frac{1}{\omega C} = X_C \rightarrow C = \frac{1}{\omega X_C} = \frac{1}{2\pi \cdot 50 \cdot 226.96} = 14.024\ \mu F$

VIII.-5. | - prezentacija Pr. 9.

Faktor snage otpornika i kondenzatora spojenih paralelno iznosi 0.5. Koliki je ako ih spojimo serijski?

Dakle imamo sljedeće:



znamo da je faktor snage $\cos\varphi = \frac{P}{S}$

znamo da $S = I^2 \cdot |Z|$ i znamo $S = P + jQ$

u ovom sl: $S = I_p^2 \cdot |Z_p|$

$Z_p = ?$ $\quad Z_p = \frac{R \cdot (-jX_C)}{R - jX_C} \cdot \frac{R + jX_C}{R + jX_C} = \frac{R^2(-jX_C) + RX_C^2}{R^2 + X_C^2}$

$$S_p = \underbrace{I_p^2 \cdot \frac{R \cdot X_C^2}{R^2 + X_C^2}}_{P} \underbrace{- j \cdot \frac{R^2 X_C}{R^2 + X_C^2} \cdot I_p^2}_{Q}$$

Znamo $\cos\varphi_p = 0.5$

$$\cos\varphi_p = \frac{P}{S} = \frac{I_p^2 \cdot \frac{R \cdot X_C^2}{R^2 + X_C^2}}{I_p^2 \cdot \sqrt{\left(\frac{RX_C^2}{R^2+X_C^2}\right)^2 + \left(\frac{R^2 X_C}{R^2+X_C^2}\right)^2}}$$

$$0.5 = \frac{\frac{R \cdot X_C^2}{R^2 + X_C^2}}{\frac{\sqrt{R^2 X_C^4 + R^4 X_C^2}}{R^2 + X_C^2}} = \frac{R \cdot X_C^2}{\sqrt{R^2 X_C^4 + R^4 X_C^2}}$$

$$0.5 \sqrt{R^2 X_C^4 + R^4 X_C^2} = R \cdot X_C^2 \quad / ^2$$

$$0{,}25 R^2 X_C^4 + 0{,}25 R^4 X_C^2 = R^2 X_C^4$$

$$0{,}25 R^2 = 0.75 X_C^2 \quad / : 0.25$$

$$R^2 = 3 X_C^2$$

serija:

$Z = R - jX_C$

$S = I_S \cdot |Z| = I_S^2 \cdot R - j \cdot I_S^2 \cdot X_C$

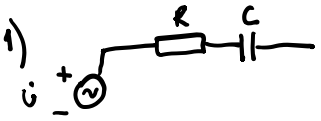
$$\cos\varphi_S = \frac{P}{S} = \frac{I_S^2 \cdot R}{I_S^2 \cdot \sqrt{R^2 + X_C^2}} \quad / ^2$$

$$(\cos\varphi_S)^2 = \frac{R^2}{R^2 + X_C^2} = \frac{3X_C^2}{4X_C^2} = \frac{3}{4}$$

$$\Rightarrow \cos\varphi_S = \frac{\sqrt{3}}{2} \quad //$$

DODATNO

- promjene P ovisno o f

1) 

$X_C = \frac{1}{\omega C} \qquad \omega = 2\pi f$

$S = U \cdot I = \frac{U^2}{|Z|} = \frac{U^2}{\sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2}}$

$P = I^2 R = \left(\frac{U}{\sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2}}\right)^2 \cdot R = \frac{U^2 \cdot R}{R^2 + \left(\frac{1}{\omega C}\right)^2}$

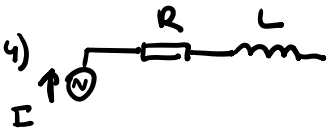
$f \downarrow \rightarrow P \searrow \;\|\; f \nearrow \; P \nearrow$

2) 

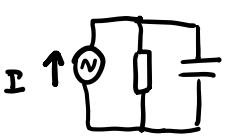
$S = \frac{U^2}{\sqrt{R^2 + (\omega L)^2}} \qquad P = I^2 R = \frac{U^2 \cdot R}{R^2 + (\omega L)^2}$

$f \nearrow P \downarrow \;\|\; f \searrow P \nearrow$

3) 

4) 

$P = I^2 \cdot R \rightarrow$ ostaje isti

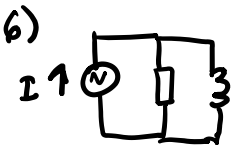
5) 

$Z_{uk} = \frac{R(-jX_C)}{R - jX_C} \cdot \frac{R + jX_C}{R + jX_C} = \frac{-jR^2 X_C}{R^2 + X_C^2} + \frac{R X_C^2}{R^2 + X_C^2} =$

$= \frac{R X_C^2}{R^2 + X_C^2} - j \frac{R^2 X_C}{R^2 + X_C^2}$

$P = I^2 \cdot \mathrm{Re}\{Z_{uk}\} = I^2 \cdot \frac{R \cdot X_C^2}{R^2 + X_C^2} = I^2 \cdot \frac{\left(\frac{1}{\omega C}\right)^2 R}{\left(\frac{1}{\omega C}\right)^2 + R^2} = I^2 \cdot \frac{R}{(\omega C)^2 \cdot R + 1}$

$f \searrow P \nearrow \;\|\; f \nearrow P \searrow$

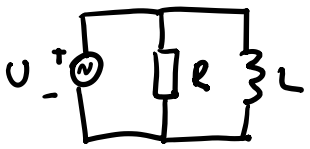
6) 

$Z_{uk} = \frac{X_L^2 R}{R^2 + X_L^2} + j \frac{R^2 X_L}{R^2 + X_L^2}$

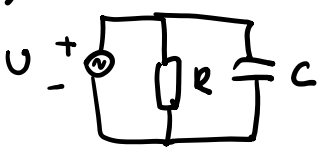
$P = I^2 \mathrm{Re}\{Z_{uk}\} = I^2 \cdot \frac{X_L^2 R}{R^2 + X_L^2} = I^2 \cdot \frac{R}{\frac{R^2 + X_L^2}{X_L^2}} = I^2 \cdot \frac{R}{\frac{R^2}{(\omega L)^2} + 1}$

$f \searrow P \searrow \;\|\; f \nearrow P \nearrow$

7)



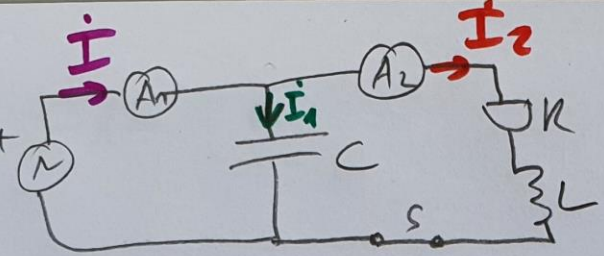
8)



$$P = \frac{U^2}{R}$$

U oba slučaja R je direktno spojen na izvor. Dakle energija se ne mijenja s f.

IX.2-1



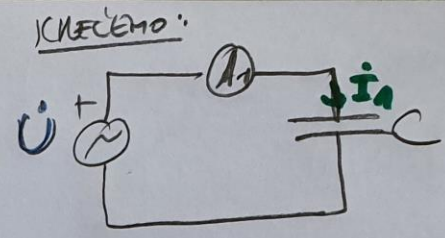
$\dot{U} = 110\angle 0°\ V$

$f = 60\ Hz$

$|\dot{I}| = |\dot{I}_2| = 0.5\ A$

$\dot{I}_1 = \frac{\dot{U}}{-jX_C}$

ZATVORENA SKLOPKA



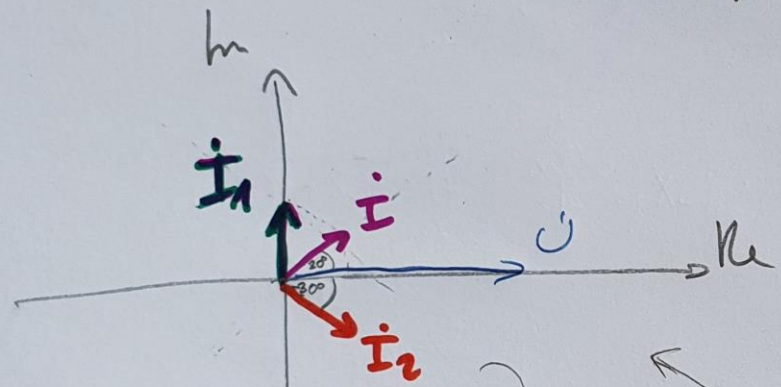
$|\dot{I}_1| = 0.5\ A$

$\dot{I}_1 = \frac{\dot{U}}{-jX_C}$

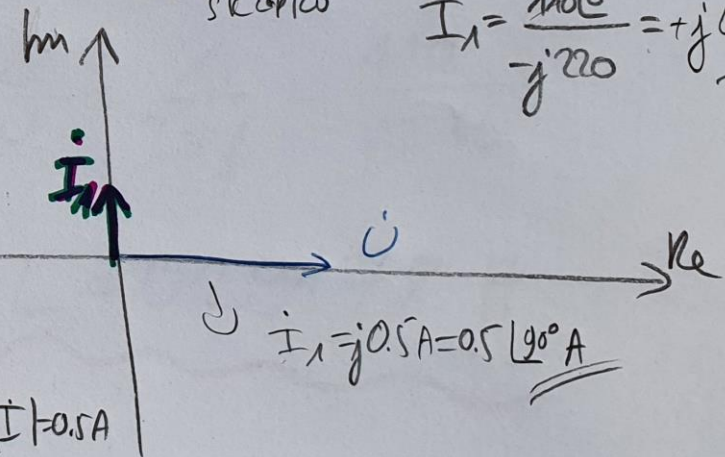
$|\dot{I}_1| = \frac{U}{X_C}$

$X_C = \frac{U}{I_1} = 220\ \Omega$

$\dot{I}_1 = \frac{110\angle 0°}{-j220} = +j0.5\ A$



UZ OTVORENU SKLOPKU



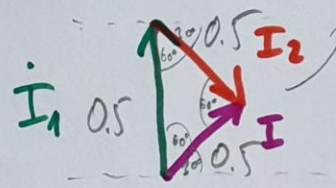
$\dot{I}_1 = j0.5\ A = 0.5\angle 90°\ A$

UZ ZATVORENU SKLOPKU I DALJE JE $\dot{I}_1 = +j0.5\ A$

ONDA: $|\dot{I}_1| = |\dot{I}_2| = |\dot{I}| = 0.5\ A$

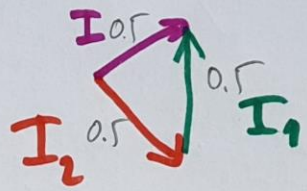
JEDNAKOSTRANIČNI TROKUT!

ZBOG: $\dot{I}_1 + \dot{I}_2 = \dot{I}$



KAKO OVO POSLOŽITI

ILI:



DAKLE ZNAMO:

$\dot{I}_2 = 0.5\angle -30°\ A$

ONDA: $\underline{Z}_{RL} = \frac{\dot{U}}{\dot{I}_2} = \frac{110\angle 0°}{0.5\angle -30°} = 220\angle 30°\ \Omega$

$\underline{Z}_{RL} = 220 \cdot \cos 30° + j220 \cdot \sin 30°$

$$\underline{Z}_{RL} = 220 \cdot \frac{\sqrt{3}}{2} + j\,220 \cdot \frac{1}{2} = 110\sqrt{3} + j\,110\ \Omega$$

$110\sqrt{3}$ → R

110 → X_L

$$R = 190.526\ \Omega$$

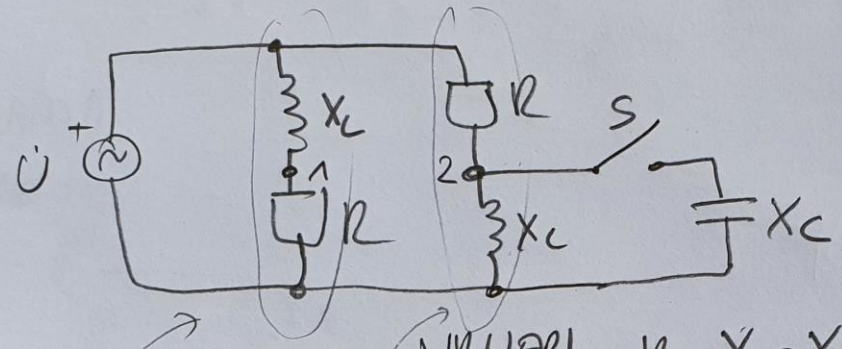
$$X_L = 110\ \Omega$$

$$X_L = \omega L$$

$$L = \frac{X_L}{\omega} = \frac{X_L}{2\pi f} = \frac{110}{2\pi \cdot 60}$$

$$L = 0.29178\ H$$

IX.2-3



$\dot{U}_{12}$ UZ OTVORENU SKLOPKU

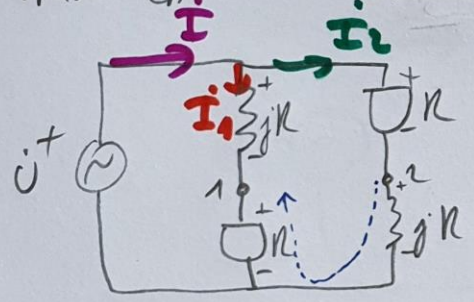
$\dot{U}_{12} = 100\angle 0°\ V$

KOLIKI JE $\dot{U}_{12}$ KADA SE SKLOPKA ZATVORI?

VRIJEDI $R = X_L = X_C$

$\underline{Z}_1 = R + jX_L$ $\quad$ $\underline{Z}_2 = R + jX_L$

PRIJE ZATVARANJA SKLOPKE:



$\dot{I}_1 = \frac{\dot{U}}{\underline{Z}_1} = \frac{\dot{U}}{R+jR}$

$\dot{I}_2 = \frac{\dot{U}}{\underline{Z}_2} = \frac{\dot{U}}{R+jR}$

} ISTO! $\dot{I}_1 = \dot{I}_2$

KZS: $\dot{I} = \dot{I}_1 + \dot{I}_2$

$\dot{I} = 2 \cdot \frac{\dot{U}}{R+jR}$

$\dot{U}_{12} = 100\angle 0°$

← PROLAZIMO KROZ STRUJU OD 2 → 1

AKO ULAZIMO NA + TROŠILA / IZVORA STAVLJAMO —

$\dot{U}_{12} = -\dot{I}_2 \cdot jR + \dot{I}_1 \cdot R$

$100\angle 0° = -\frac{\dot{U}}{R+jR} \cdot jR + \frac{\dot{U}}{R+jR} \cdot R$

$100\angle 0° = -\frac{\dot{U}}{R(1+j)} \cdot jR + \frac{\dot{U}}{R(1+j)} \cdot R \quad / \cdot (1+j)$

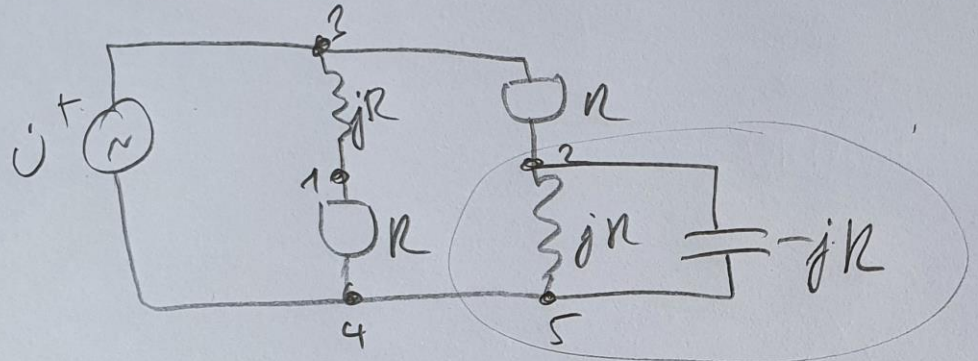
$100 \cdot (1+j) = -j\dot{U} + \dot{U} \Rightarrow \dot{U}(1-j) = 100(1+j)$

$\dot{U} = 100\,\frac{1+j}{1-j}\ V$

$$\dot{U} = 100\,\frac{1+j}{1-j}\,\frac{(1+j)}{1+j} = 100\,\frac{(1+j)^2}{2} = 100\,\frac{1+2j-1}{2} = 100\cdot\frac{2j}{2}$$

$$\boxed{\dot{U} = j100\,V}$$

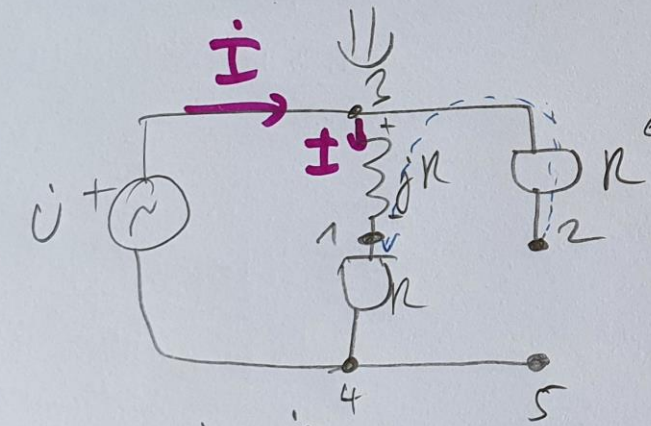
NAKON ZATVARANJA SKLOPKE:



KOLIKO JE OVO

$$\frac{jR\cdot(-jR)}{jR-jR} = \frac{R^2}{0} = \infty$$

BESKONAČNI OTPOR



TU NETEČE STRUJA! TOČKA 2 NA ISTOM POTENCIJALU KAO I 3

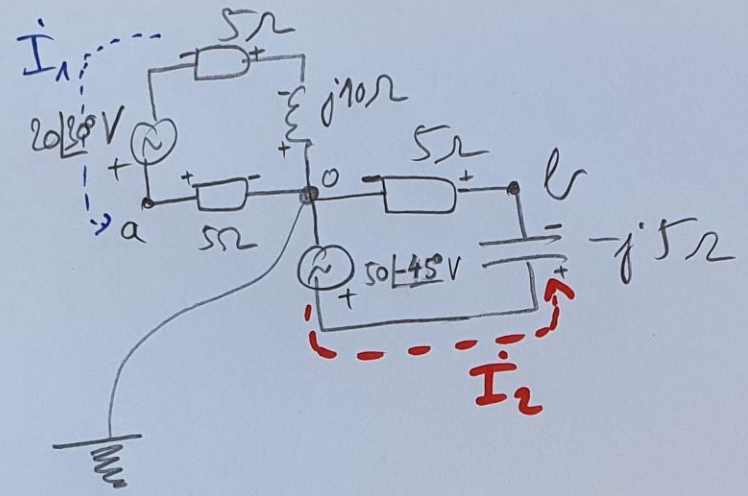
$$I = \frac{\dot{U}}{R+jR}$$

$$\dot{U}_{12} = \dot{U}_{13} = -\dot{I}\cdot jR = -\frac{\dot{U}}{R+jR}\cdot jR =$$

$$= -\frac{\dot{U}}{R(1+j)}\cdot jR = \frac{-j100\cdot j1}{1+j} = \frac{100}{\sqrt{2}\angle 45^\circ} =$$

$$= \frac{100}{\sqrt{2}}\angle -45^\circ = 70.707\angle -45^\circ\,V$$

IX.2–4



$$\dot{I}_1 = \frac{20\angle 30^\circ}{5+5+j10} = \frac{20\angle 30^\circ}{10+j10} = \frac{20\angle 30^\circ}{10\sqrt{2}\angle 45^\circ} \Rightarrow$$

$$\dot{I}_1 = \sqrt{2}\angle -15^\circ \text{ A}$$

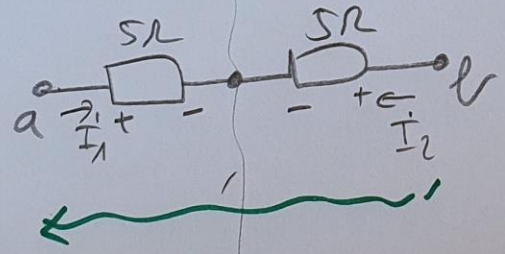
$$\dot{I}_2 = \frac{50\angle 45^\circ}{5-j5} = \frac{50\angle 45^\circ}{5\sqrt{2}\angle -45^\circ} = \frac{10}{\sqrt{2}}\angle 0^\circ \text{ A}$$

ili $\dot{I}_2 = 5\sqrt{2}\angle 0^\circ$ A

$\dot{U}_{ab} =$

$\leftarrow$

SETNJA od b do a

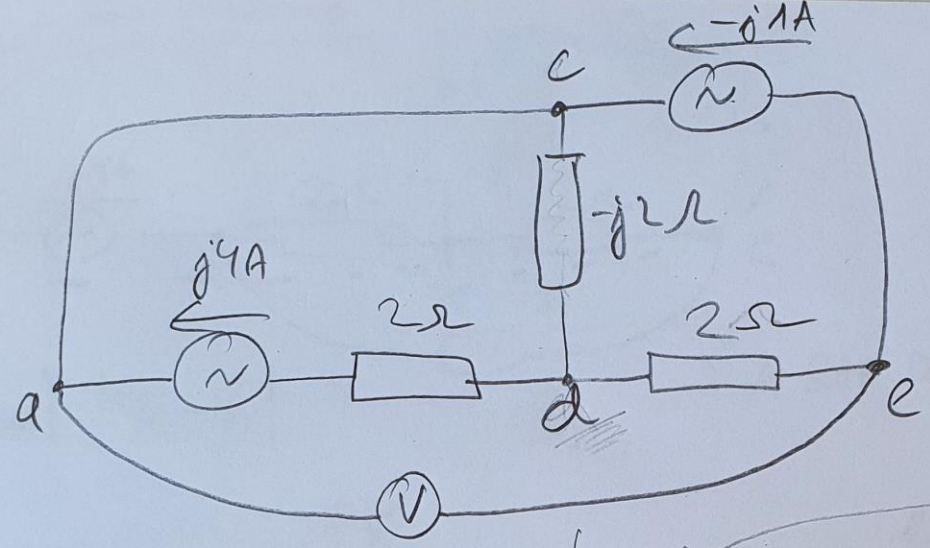


$$\dot{U}_{ab} = -\dot{I}_2 \cdot 5 + \dot{I}_1 \cdot 5 = -5\sqrt{2}\cdot 5 + 5\cdot\sqrt{2}\angle -15^\circ = 5\sqrt{2}(5 + 0.965925826 - j0.258819045) =$$

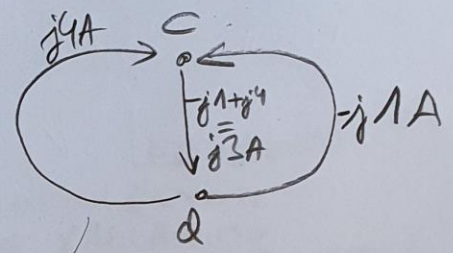
$$\Rightarrow \dot{U}_{ab} = 5\sqrt{2}(-4.034074174 - j\,0.258819045)$$

$$\Rightarrow |\dot{U}_{ab}| = 28.5838608 \text{ V}$$

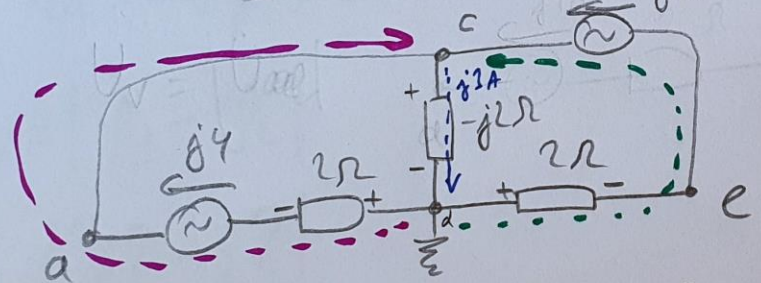
IX.2-5



KCS:



UZEMNIMO d ONDA: -j1A



$$\dot{\varphi}_e = \dot{U}_{ed} = -(-j1)\cdot 2 = j2\,V$$

$$\dot{\varphi}_c = \dot{U}_{cd} = +(j3A)\cdot(-j2\Omega) = +6\,V$$

ONDA VIDIMO:

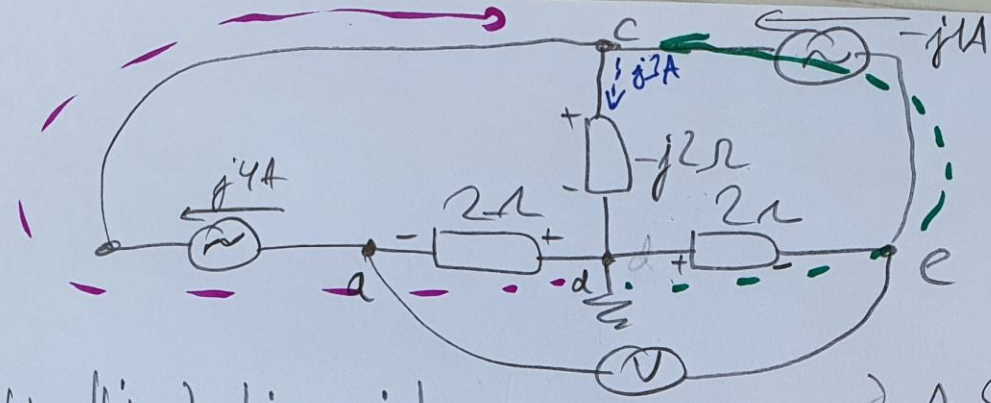
$$\dot{\varphi}_a = \dot{\varphi}_c = +6V$$

ONDA:

$$U_V = |\dot{U}_{ae}| = |\dot{\varphi}_a - \dot{\varphi}_e| =$$

$$= |+6 - j2| = \sqrt{36+4} = \sqrt{40}$$

$$U_V = \sqrt{40} = 2\sqrt{10}\ V$$



$U_V = |\dot{U}_{ae}| = |\dot{\varphi}_a - \dot{\varphi}_e|$

$\dot{\varphi}_a = \dot{U}_{ad} = -j4 \cdot 2 = -j8\,V$

$\dot{\varphi}_e = \dot{U}_{ed} = -(-j1) \cdot 2 = j2\,V$

$U_V = |\dot{\varphi}_a - \dot{\varphi}_e|$

$U_V = |-j8 - j2|$

$U_V = |-j10|$

$$\boxed{U_V = 10\,V}$$

JEDNOSTAVNO

A SAD SE MOŽEMO ~~I SJETATI~~ JER NE PRELAZIMO PREKO STRUJNOG IZVORA

$e \to d \to a$

$\dot{U}_{ae} = +(-j1) \cdot 2 - (j4) \cdot 2 =$

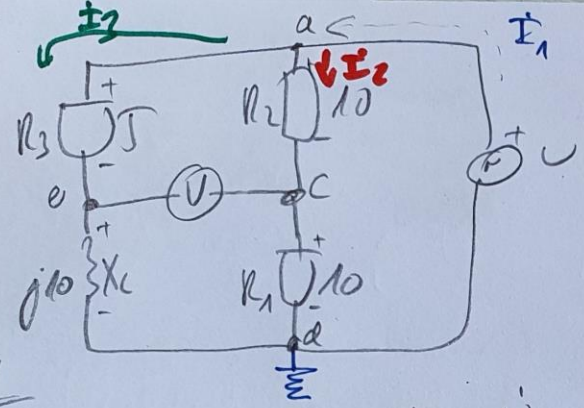
$= -j2 - j8 = -j10\,V$

ODNOSNO

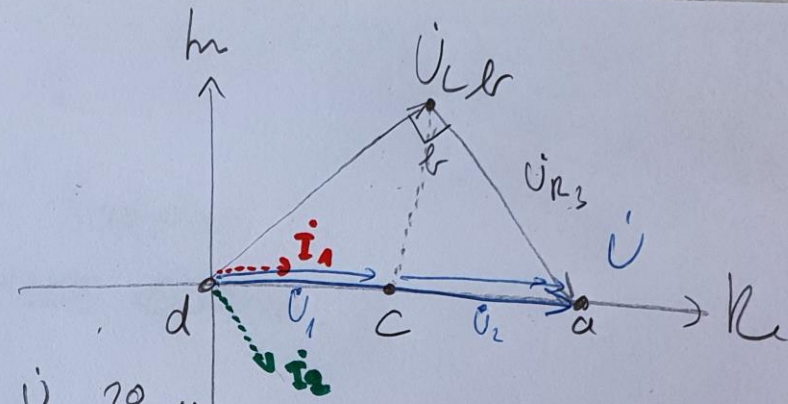
$$\boxed{U_V = |\dot{U}_{ae}| = 10\,V}$$

IX. 10.

TEST PITANJE 10.



$\dot{U} = 20\angle 0°\ V$



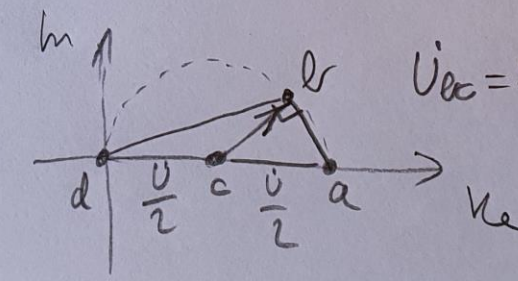
$$\dot{I}_2 = \frac{\dot{U}}{10+10} = \frac{\dot{U}}{20} = \frac{20}{20} = 1A$$

$$\dot{\varphi}_c = \dot{U}_{cd} = \dot{I}_2 \cdot 10 = \frac{\dot{U}}{2} = 10\ V$$

$$\dot{I}_3 = \frac{\dot{U}}{5+j10} = \frac{20\angle 0°}{\sqrt{25+100}\angle 63.43495°} = \frac{20}{\sqrt{125}}\angle -63.43495°\ A$$

$$\dot{\varphi}_v = \dot{U}_{vd} = \dot{I}_3 \cdot j10 = \frac{200}{\sqrt{125}}\angle 26.56505°\ V = 16 + j8\ V$$

$$U_V = |\dot{\varphi}_v - \dot{\varphi}_c| = |16+j8-10| = |6+j8| = \sqrt{36+64} = \sqrt{100} = 10\ V$$



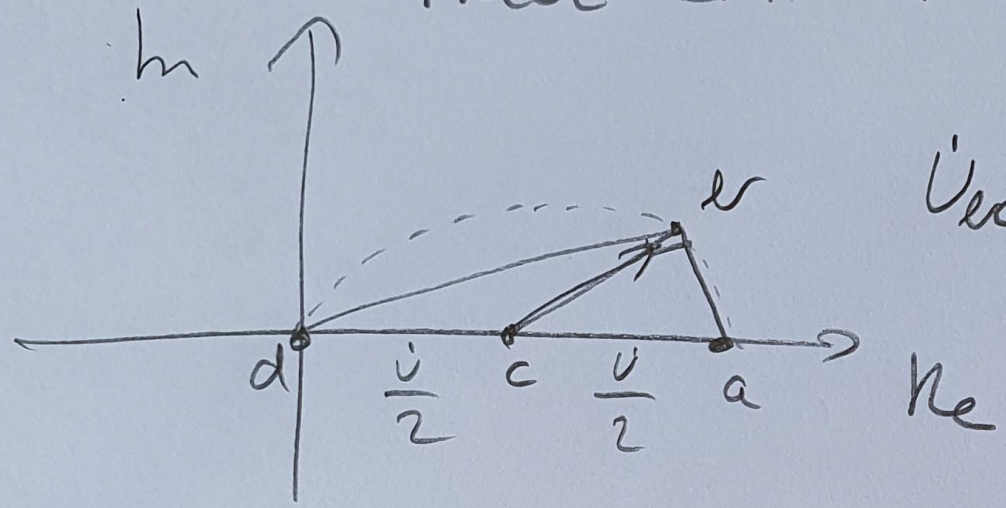
$\dot{U}_{vc} = \frac{\dot{U}}{2}$ → POLUMJER KRUŽNICE

IX, 11.

IX - test pitanje 11

ONDA IZ GORNJE → iz rješenja: IX - test pitanja 10

PRIJE ZNAMO:



$$\dot{U}_{ec} = \frac{\dot{U}}{2}$$

DAKLE

AKO $U_V - |\dot{U}_{ec}| = 10V$

ONDA

$$U = 2 \cdot U_V = 20V$$