1)

$I_{EFO} = I_{SRO} = I_M = 0.1$

$T_i = 0,1$

$T = 1$

$I_{SR} = I_{SRO} \cdot \frac{T_i}{T} = 0.01$

$I_{EF} = I_{EFO} \cdot \sqrt{\frac{T_i}{T}} = 0.0316$

$\xi = \frac{I_{EF}}{I_{SR}} = 3,16$

2)

$U_{EF} = \sqrt{13^2 + \left(\frac{20}{\sqrt{2}}\right)^2 + \left(\frac{8}{\sqrt{2}}\right)^2} = 20\,V$

3)

$z_1 = 7 + 1j\ \Omega$

$z_2 = 6 - j8\ \Omega$

$P = 2000\ W$

Q

$\frac{1}{z_{vk}} = \frac{1}{7+1j} + \frac{1}{6-j8} = \frac{7+1j+6-j8}{(7+1j)(6-j8)}$

$\frac{1}{z_{vk}} = \frac{13-j7}{50-50j} \Rightarrow z_{vk} = \frac{50-50j}{13-j7} \cdot \frac{13+j7}{13+j7}$

$= \frac{650+350j-650j+350}{218}$

$z = 4.58 - 1.37j$

$P_{vk} = I^2 \cdot Re\{z\}$

$I = \sqrt{436.68} = 20.89\,A$

$Q = I^2 \cdot Im\{z\}$

$= -598.25 \approx -600\ VAR$

4) MAX. SNAGA ĆE BIT KAD JE KRUG U REZONANCIJI ZNAČI

$Z_1 = 3 + j4$

$Z_2 = 3 - j4$

$U = 120\ V$

$Z_{uk} = Z_1 + Z_2 = (3+j4) + (3-j4) = 6$

$$I = \frac{U}{Z} = \frac{120}{6} = 20\ A$$

$$P = I^2 \cdot Re\{Z_2\} = 400 \cdot 3 = 1200\ W$$

↓

SEE NAM TREBA MAX SNAGA NA PROMJENJIVOM OTPORU Z

5.

$S_1 = 250\ VA$

$\cos\varphi_1 = 0.5$ (IND)

$P_2 = 180\ W$

$\cos\varphi_2 = 0.8$ (KAP)

$S_3 = 300\ VA$

$Q_3 = 100\ VAR$

$S_1 = 250\ VA$

$P_1 = 125\ W$

$Q_1 = 216.5\ VAR$

$S_2 = 225\ VA$

$P_2 = 180\ W$

$Q_2 = -135\ VAR$ → KAP. ZNAČI "−"

$S_3 = 300\ VA$

$P_3 = 282.84$

$Q_3 = 100\ VAR$

$P_1 = S_1 \cos\varphi_1 = 125\ W$

$Q_1 = \sqrt{S_1^2 - P_1^2} =$

$S_2 = \frac{P_2}{\cos\varphi_2} = 225\ VA$

$Q_2 = \sqrt{S_2^2 - P_2^2} = 135\ VAR$

$P_3 = \sqrt{S^2 - Q^2} = 282.84\ W$

~~$S_{uk} = S_1 + S_2 + S_3$~~

↓ NE VALJA TU SAM SE SA SJEBO

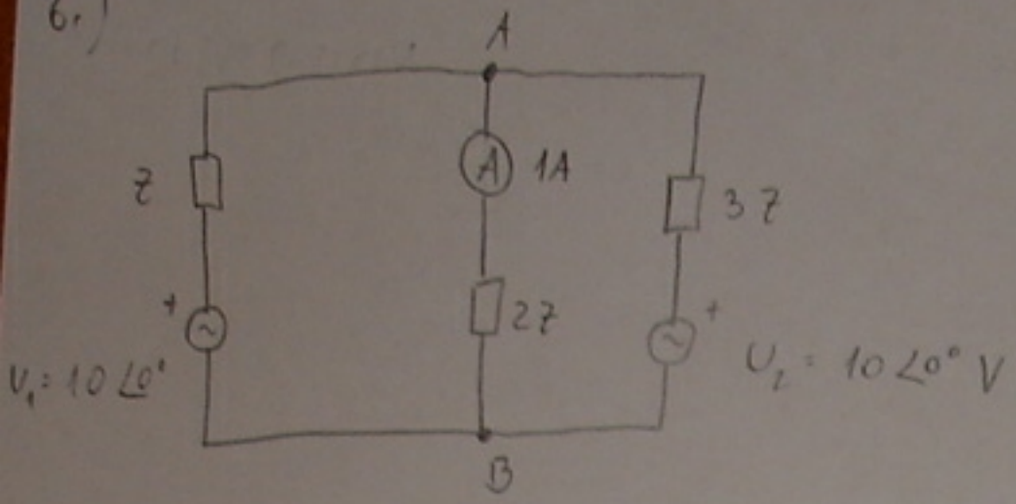
$P_{uk} = P_1 + P_2 + P_3 = 587.84\ W$

$Q_{uk} = Q_1 - Q_2 + Q_3 = 181.5\ VAR$

$S_{uk} = \sqrt{P_{uk}^2 + Q_{uk}^2} = 615.22\ VA$

FAKTOR SNAGE $= \frac{P_{uk}}{S_{uk}} = \underline{0.956}$

6.)



MILLMAN

$$U_{AB} = \frac{\frac{U_1}{Z} + \frac{U_2}{3Z}}{\frac{1}{Z} + \frac{1}{2Z} + \frac{1}{3Z}} = \frac{\frac{3U_1 + U_2}{3Z}}{\frac{6+3+1}{6Z}} = \frac{\frac{40}{1}}{\frac{11}{2}} = \frac{80}{11} = 7.27$$

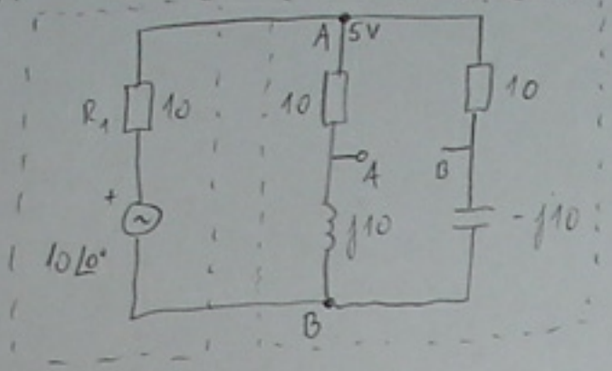
$$I = \frac{U}{R} \Rightarrow R = \frac{U}{I} = \frac{7.27}{1} = 7.27\,\Omega$$

U_1 -> PROMIJENI POLARITET

$$U_{AB} = \frac{-\frac{U_1}{Z} + \frac{U_2}{3Z}}{\frac{1}{Z} + \frac{1}{2Z} + \frac{1}{3Z}} = \frac{\frac{-3U_1 + U_2}{3Z}}{\frac{11}{6Z}} = \frac{-6U_1 + 2U_2}{11} = \frac{-60 + 20}{11} = \frac{-40}{11} = 3.63$$

$$I = \frac{U}{R} = \frac{3.63}{0.27} = 0.5\,A$$

7. 1. 2.



$Z_1 = 10 + j10$

$Z_2 = 10 - j10$

$$\frac{1}{Z_{uk}} = \frac{1}{10+j10} + \frac{1}{10-j10} = \frac{10+j10+10-j10}{(10+j10)(10-j10)} = \frac{20}{200}$$

$$Z_{uk} = \frac{200}{20} = 10\,\Omega$$

$$I = \frac{U}{R} = \frac{10}{20} = 0.5\,A$$

$$R_{uk} = R_1 + Z_{uk}$$

$$= 10 + 10 = 20\,\Omega$$

$U = I \cdot R$

$= 0.5 \cdot 10 = 5V$

NA OTPOR R_1 OTPADA 5V ZNAČI DA JE U TOČKI A POTENCIJAL 5V I SAD MORAMO IZRAČUNAT STRUJU U GRANAMA.

$$I_1 = \frac{U_A}{Z_1} = \frac{U_A}{10+j10} \cdot \frac{10-j10}{10-j10} = \frac{50-j50}{200} = 0.25 - j0.25$$

$$I_2 = \frac{U_A}{Z_2} = \frac{U_B}{10-j10} \cdot \frac{10+j10}{10+j10} = \frac{50+j10}{200} = 0.25 + j0.25$$

I SAD IZRAČUNAMO NAPON U_{AB} -> IDEMO OD TOČKE A DO TOČKE B PREKO INDUKTIVITETA I KAPACITETA

$$U_{AB} = I_1 \cdot j10 - I_2 \cdot (-j10)$$

↓

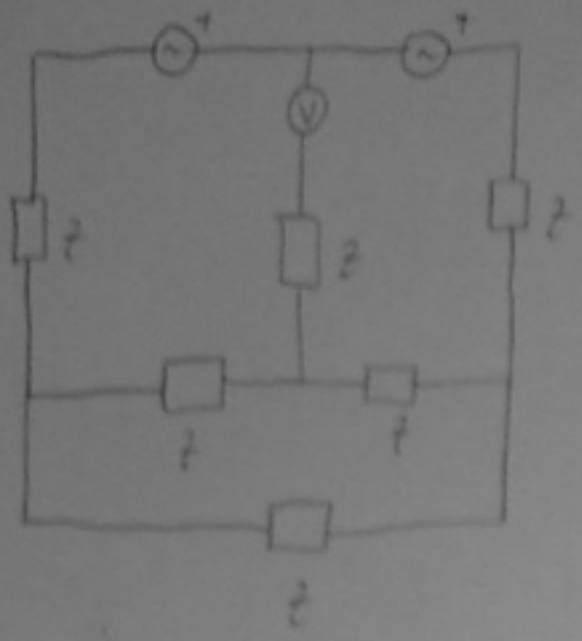
JER SU STRUJE U SUPROTNIM SMJEROVIMA

$= (0.25 - j0.25) \cdot j10 - ((0.25 + j0.25) \cdot (-j10))$

$= 2.5 + j2.5 + j2.5 - 2.5$

$= j5$ -> NAPON JE 5V, A KUT JE 90°, JER IMAMO SAMO IMAG. DIO

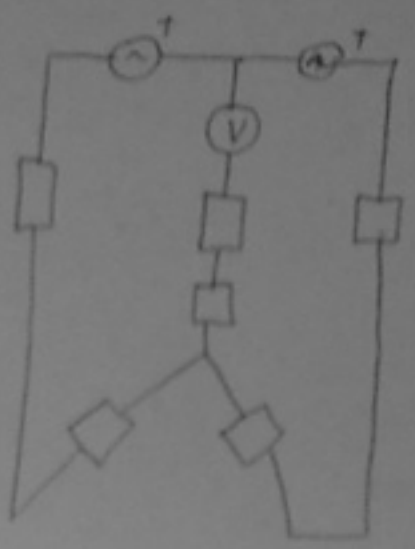
8)



=>

PRETVORBA

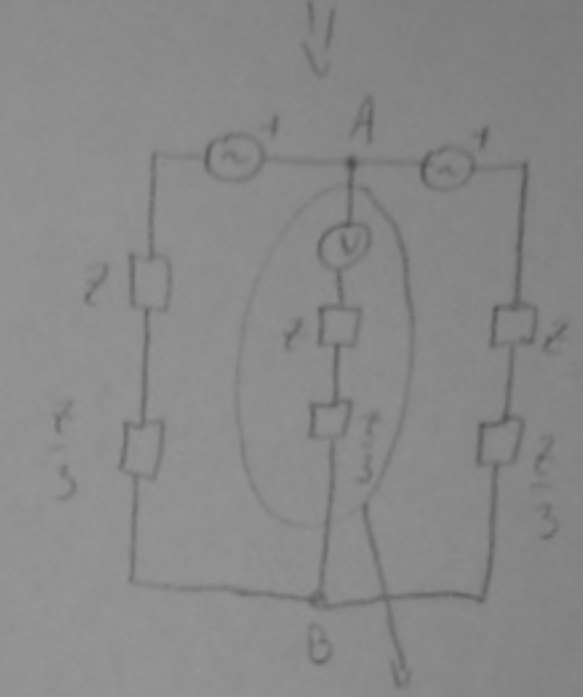
TROKUT -> ZVIJEZDA



$$Z_{vv} = Z + Z + \frac{2Z}{3}$$

$$= \frac{3Z+3Z+2Z}{3} = \frac{8}{3}Z$$

$$I_{uk} = \frac{U}{\frac{8}{3}Z} = \frac{3U}{4Z}$$



NE TEČE STRUJA JER VOLTMETAR IMA BESKONAČNI OTPOR

IDEMO OD A PREMA B

$$U_{AB} = -U + I \cdot Z + I \cdot \frac{Z}{3}$$

$$= -U + \frac{3U}{4Z} \cdot Z + \frac{3U}{4Z} \cdot \frac{Z}{3}$$

$$= -U + \frac{3}{4}U + \frac{U}{4}$$

$$= -U + \frac{3U+U}{4} = -U + U = 0\ V$$

9.)

$U_L = 380\,V \Rightarrow U_f = 220\,V$

$Z_1 = 19.05 - 11j$

$Z_2 = 19.05 - 11j$

$Z_3 = 19.05 - 11j$

$P = U \cdot I \cdot \cos\varphi$

$= 220 \cdot 10 \cdot \cos 30°$

$= 1905 \approx 1900\,W$

$I = \frac{U}{R} = \frac{220}{22\angle -30} = 10\angle 30°$

POŠTO IMA 3 OTPORNIKA NEMOSTE KAO SA ZABORAVIT POMNOŽIT S 3 TAKO DA JE REZULTAT

5.7 KW

10.

$P_1 = 380\,W$

$P_2 = 760\,W$

$P_3 = 1140\,W$

$U_1 = 380\,V \Rightarrow U_L = 220\,V$

$I_N = I_S + I_R + I_T = \cancel{1.72} - \cancel{1.72} - 2.98j - 2.59 + 4.48j = -7.59 + 1.89j$

$I_S = \frac{P_1}{U} = 1.72\angle 0° = 1.72$

$= 3.2 \approx 3\,A$

$I_R = \frac{P_2}{U} = 3.45\angle -120° = -1.725 - 2.98j$

$I_T = \frac{P_3}{U} = 5.18\angle -240° = -2.59 + 4.48j$