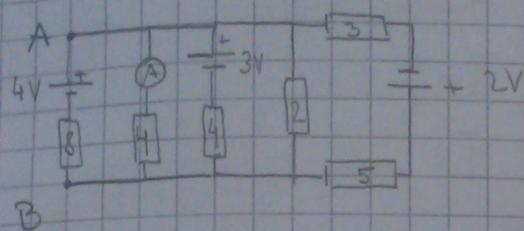


2. TEOREMI MREŽA

a) MILLMANOV TEOREM

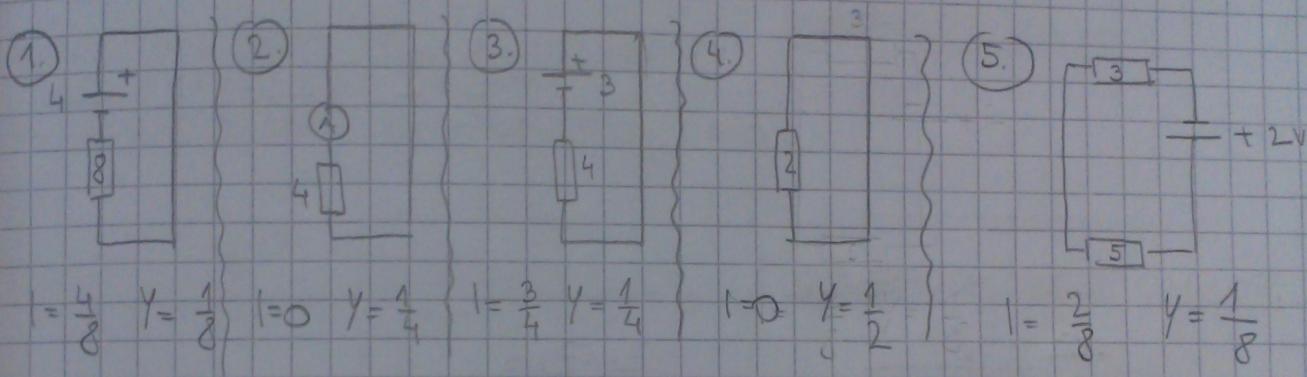
- u mreži u spajju imamo 2 izvora

Priček:



$$U_{AB} = \frac{\text{STRUJE}}{\text{ADMITANC.}} = \frac{\frac{1}{8} + 0 + \frac{3}{4} + 0 - \frac{2}{8}}{\frac{1}{8} + \frac{1}{4} + \frac{1}{4} + \frac{1}{2} + \frac{1}{8}}$$

$$I_A = \frac{U_{AB}}{4} = 0,2 \text{ A}$$



$$I = \frac{4}{8} \quad Y = \frac{1}{8}$$

$$I = 0 \quad Y = \frac{1}{4}$$

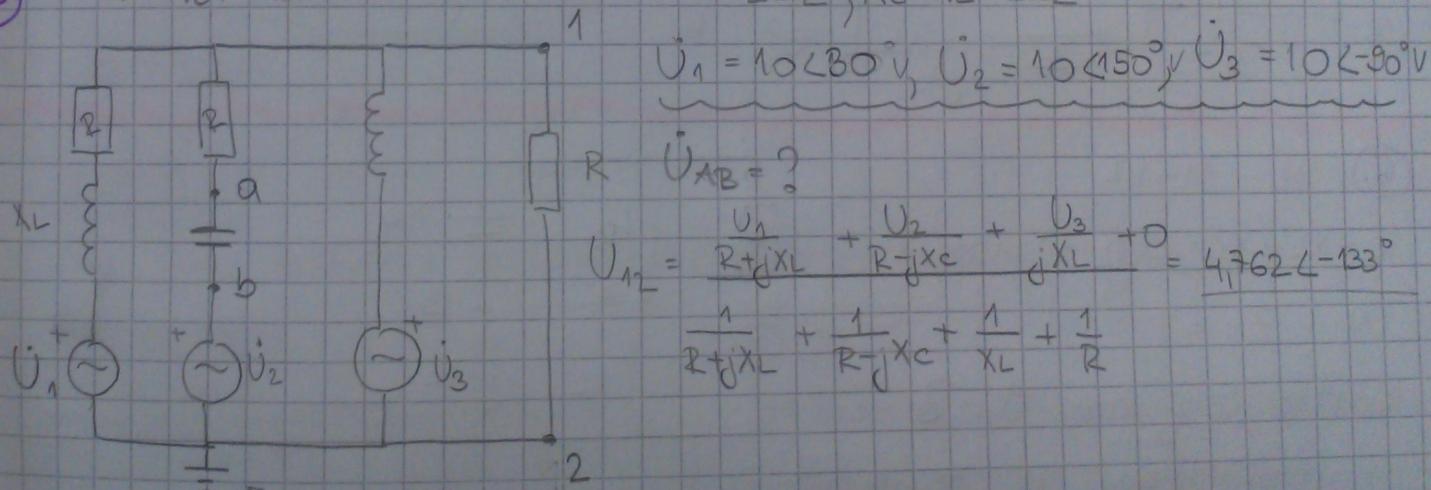
$$I = \frac{3}{4} \quad Y = \frac{1}{4}$$

$$I = 0 \quad Y = \frac{1}{2}$$

$$I = \frac{2}{8} \quad Y = \frac{1}{8}$$

10. Zadatak 13.-14.

$$R = 2 \Omega, X_C = X_L = 2 \Omega$$



$$\dot{U}_1 = 10 \angle 30^\circ \text{ V}, \dot{U}_2 = 10 \angle 150^\circ \text{ V}, \dot{U}_3 = 10 \angle -90^\circ \text{ V}$$

$$\dot{U}_{AB} = ?$$

$$\dot{U}_{12} = \frac{\dot{U}_1}{R+jX_L} + \frac{\dot{U}_2}{R-jX_C} + \frac{\dot{U}_3}{jX_L} + 0 = 4762 \angle -133^\circ$$

$$\frac{1}{R+jX_L} + \frac{1}{R-jX_C} + \frac{1}{jX_L} + \frac{1}{R}$$

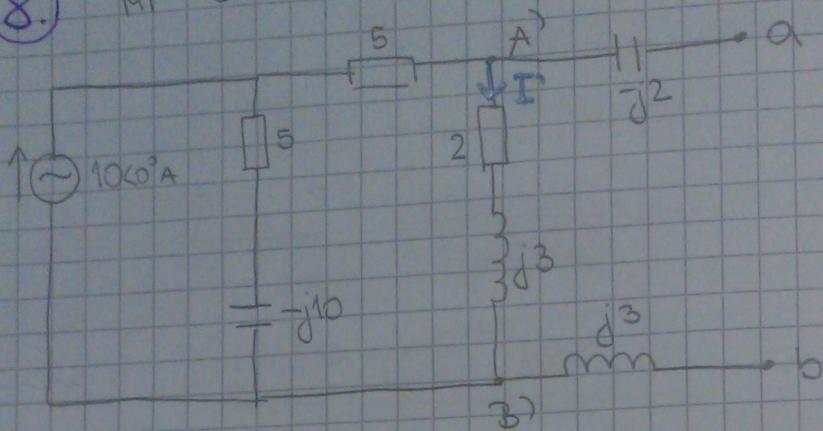
$$- u zemljomje \rightarrow \dot{U}_B = 0 + \dot{U}_2 = 10 \angle 150^\circ \text{ V}$$

$$I_1 = \frac{\dot{U}_1 - \dot{U}_B}{R-jX_C} = \frac{4762 \angle -133^\circ - 10 \angle 150^\circ \text{ V}}{2-j2 \Omega} = 3,55 \angle -12^\circ \text{ A}$$

$$\dot{U}_{AB} = I_1 \cdot jX_C = 7,1 \angle -103^\circ \text{ V}$$

b) THEVENINOV TEOREM

8. MI 13-14.



$$U_{AB} = U_T = ?$$

$$P_A = P_A$$

$$P_B = P_B$$

$$I_{uk} = 10A$$

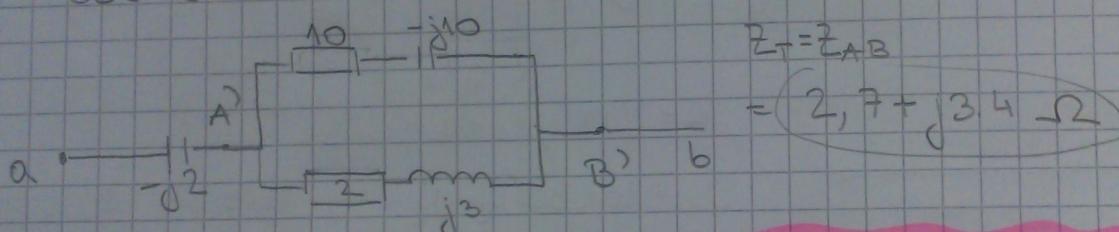
$$I' = ?$$

$$I' = I_{uk} - \frac{5 - j10}{5 - j10 + 7 + j3} = \#$$

$$U_{AB} = I' \cdot (2 + j3) = 29 \angle 23^\circ V$$

$$Z_T = ?$$

→ ODSPOLIMO STRUJNI VZVOR!



$$Z_T = Z_{AB}$$

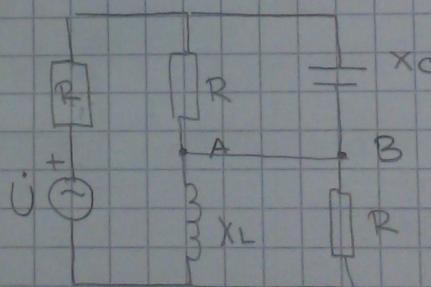
$$= 2,7 + j3 \Omega$$

6. MI 11-12.

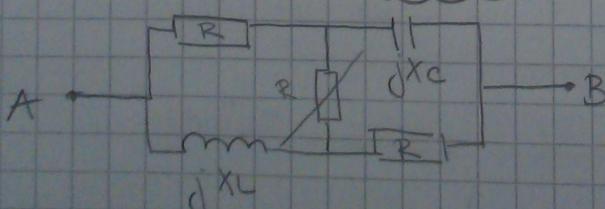
$$R = X_L = X_C = 10\Omega \quad U = 100V$$

$$I_N \quad Z_N = ?$$

- krateko spojimo A i B



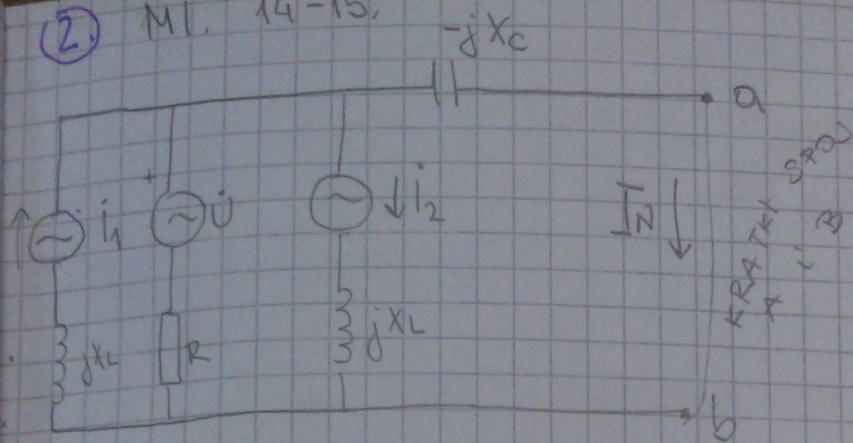
- mostmi spoj u RAVNOTEŽI!



$$Z_N = (R + jX_L) \parallel (R - jX_C) = 10\Omega$$

$$I = 0 A$$

(2) MI. 14-15.



→ MILLMANOV TEOREM

$$U_{AB} = i_1 + \frac{U}{R} - i_2 + 0$$

$$0 + \frac{1}{R} + 0 + \frac{1}{-jX_c}$$

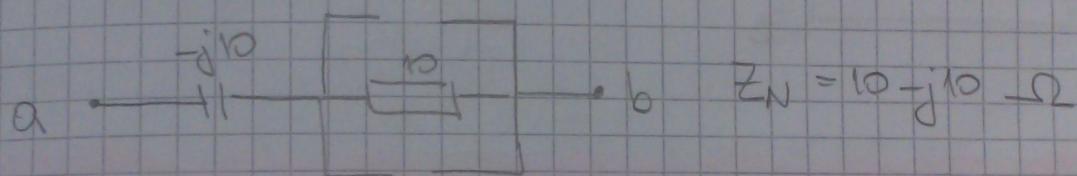
$$= 13.9 + j5.24 V$$

$$I_N = \frac{U_{AB}}{-jX_c} = -0.524 + j1.39 A$$

$$Z_N = ?$$

→ od spojirimo strujni izvor

→ mapomski krotno spojimo:

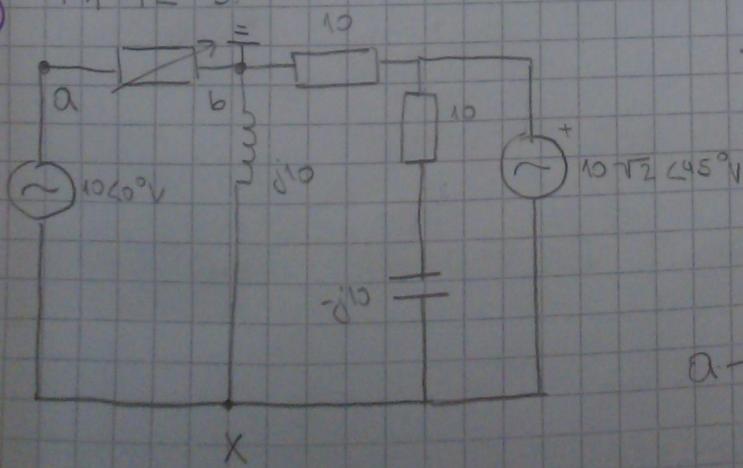


MAX SNAGA ?

$$: Z_{\text{TROŠILA}} = Z_{\text{IZVORA}}^*$$

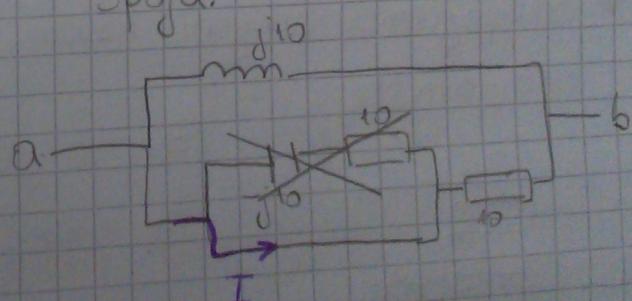
→ ako pale imamo primjenjuj samo R , $R_p = |Z_{\text{IZVORA}}|$

(3) MI 12-13.



$$P_{\text{MAX}} = ?$$

→ krotno spojimo strujne izvore, a R_p izvadimo iz spoja.



$$Z_{ab} = 5 + j5$$

$$R_p = |Z_{ab}| = \sqrt{50} \Omega$$

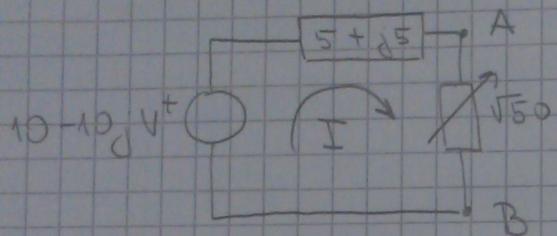
$$U_T = ?$$

- Oper ulegčimo strujne izvore
→ uzemljimo točku B.

$$P_x = -I \cdot 10j$$

$$P_A = P_x + 10 = -I \cdot 10j + 10 = 10 - 10j \text{ V}$$

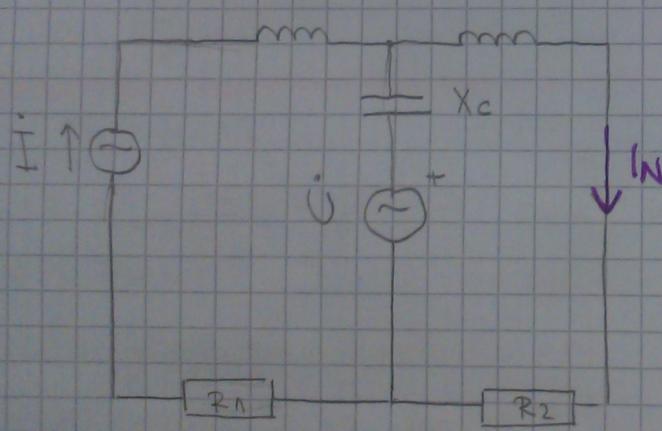
→ SHEMA S NADOMJESNIM IZVOROM



$$I = \frac{10 - 10j}{5 + j5 + j5} = 1,082 \angle -67,5^\circ$$

$$P = |I|^2 \cdot R_1 \\ \approx 8,3 \text{ W}$$

16. JR 15



$$U_{AB} = I + \frac{U}{jX_C} + 0 = 30 \angle 10^\circ$$

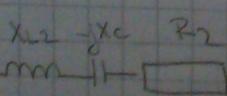
$$0 + \frac{1}{jX_C} + \frac{1}{R_2 + jX_C}$$

$$I_N = \frac{U_{AB}}{R_2 + jX_C} = \frac{30 - j10}{5 + j15}$$

$$= -j2 \text{ A}$$

$$Z_{TH} = ?$$

→ odstojimo strujni izvor i kratko spojimo mopolaski:

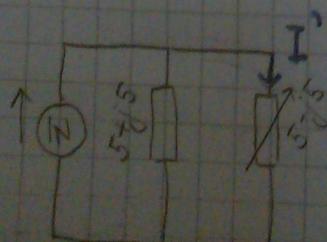


$$Z_m = 5 + j5 \Omega$$

$$Z_1 = Z_m^* = 5 - j5 \Omega$$

NAD. SH.

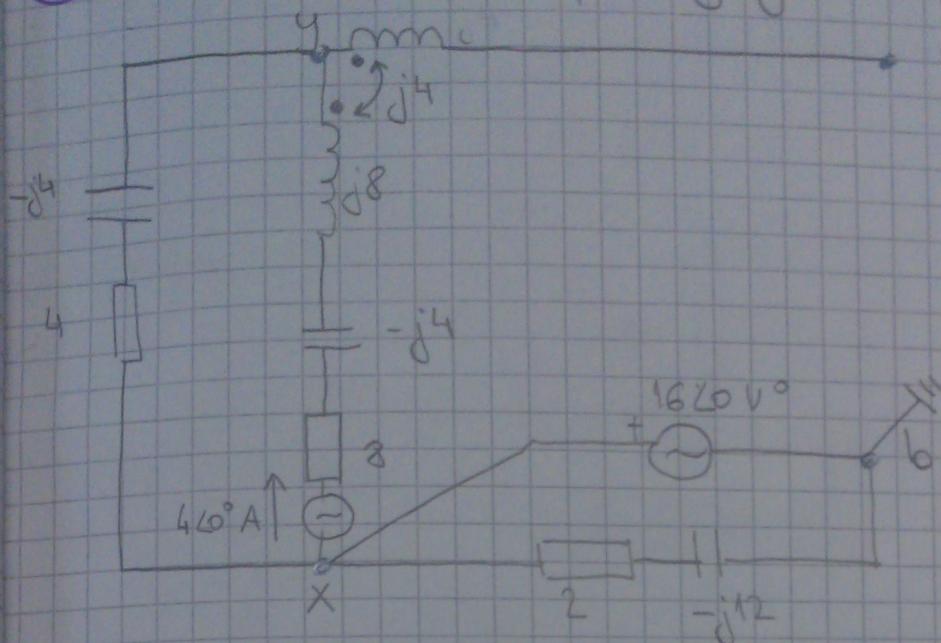
NAD. SHEMA:



$$I = I_N \cdot \frac{5 + j5}{5 + j5 + 5 - j5} = \frac{5 + j5}{10} \text{ A}$$

$$P = |I|^2 \cdot R_1 = 10 \text{ W}$$

(5.) → makneemo promijenjivi otpornik



$$\rho(x) = 16 V$$

$$\rho(y) = \rho(x) + I \cdot (4 - j4)$$

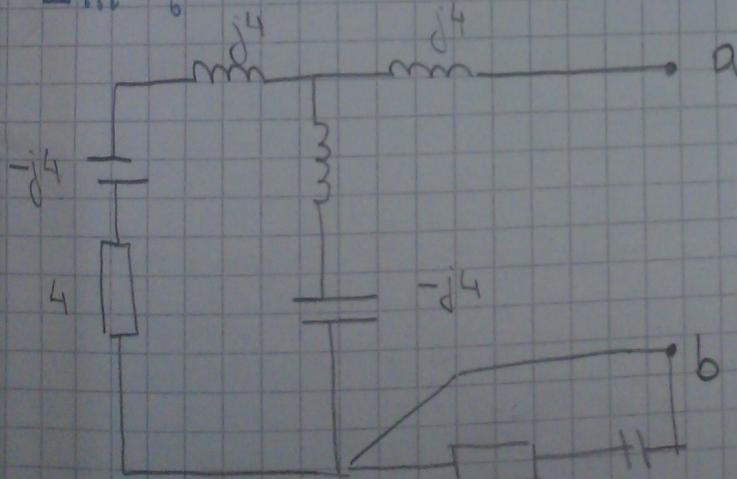
$$\rho(y) = 16 + 4 \cdot (4 - j4) + I \cdot j4 = 32 V$$

$$U_T = \rho_y - \rho_b = 32 V$$

$$Z_{TH} = ?$$

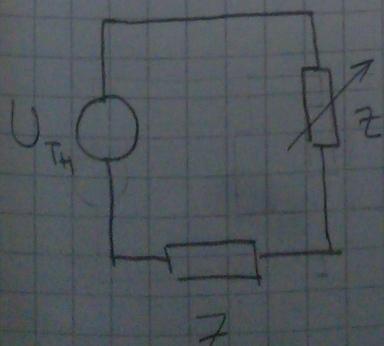
$$Z_T = j4 + j4 - j4 + 4 = 4 + j4$$

$$Z_T = Z_T^* = 4 - 4j$$



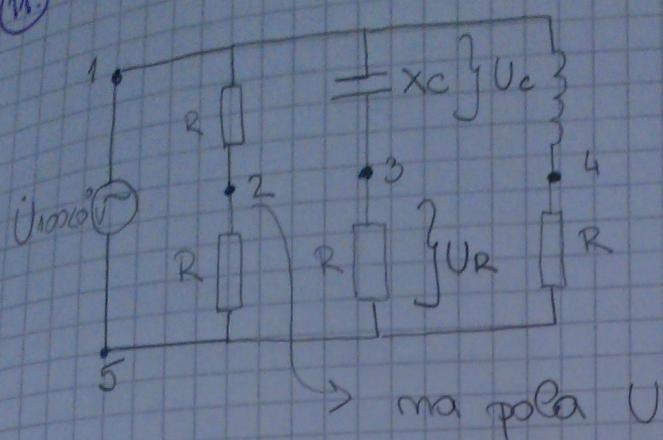
NAD. SHEMA :

$$I = \frac{U_T}{Z} = 4 A$$

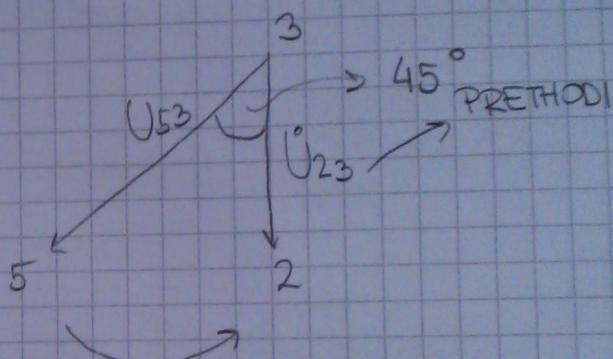
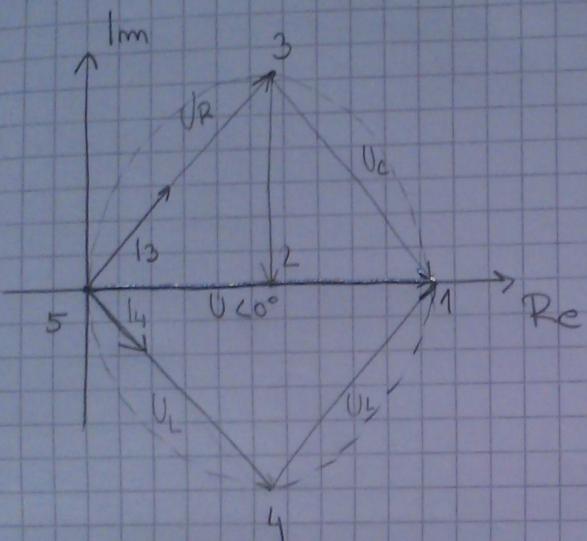


$$P = |I|^2 \cdot R = 64 W$$

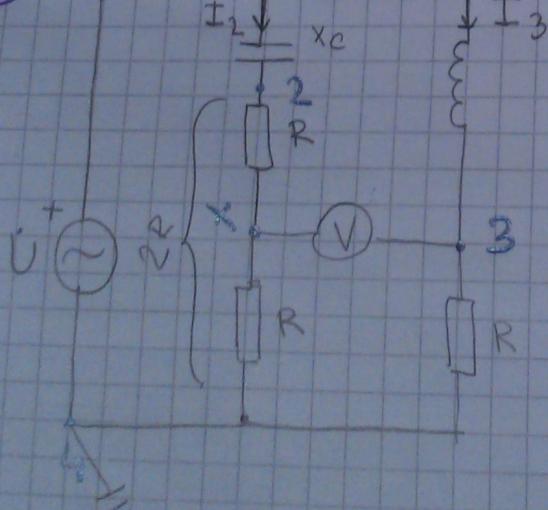
(16) $D = X_L = X_C$ U_{53} u odnosu na fazor \dot{U}_{23} :



$$\begin{aligned} U_R &= I_3 \cdot R \\ &= \frac{100 \angle 0^\circ}{R - jX_C} \cdot R \\ &= \frac{100 \angle 0^\circ V}{A - jA} \\ &= \frac{100 \angle 0^\circ}{\sqrt{2} \angle -45^\circ} \\ &= \frac{100}{\sqrt{2}} \angle 45^\circ \end{aligned}$$

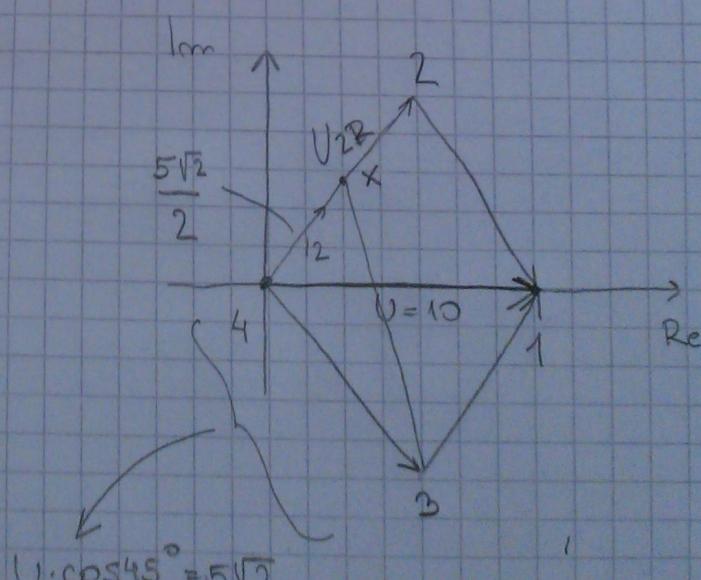


(17)



$$U = 10V$$

$$R = X_L = \frac{1}{2} X_C \quad X_C = 2R$$



$$U_r = \sqrt{\left(\frac{5\sqrt{2}}{2}\right)^2 + \left(5\sqrt{2}\right)^2} = 7.9V$$