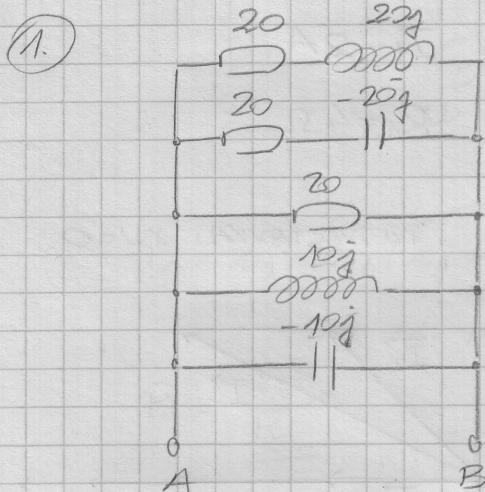
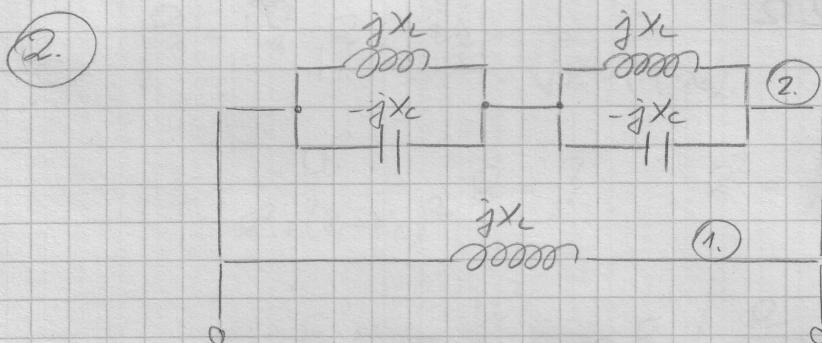


2. MEDUUISPIT - AK. GOD 2009/10



$$\frac{1}{Z_{UR}} = \frac{1}{20+20j} + \frac{1}{20-20j} + \frac{1}{20} + \frac{1}{10j} + \frac{1}{-10j}$$

$$\frac{1}{Z_{UR}} = \frac{1}{10} \rightarrow Z_{UR} = 10 \Omega$$



$i=0 A \rightarrow \text{REZONANCIJA}$

$U=10V$

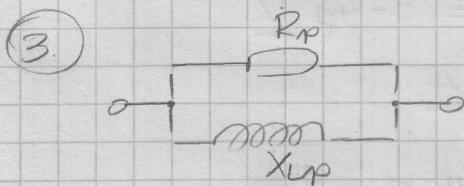
$L=3mH, C=10\text{ nF}$

$$Z_{(1)} = Z_{(2)} \rightarrow jX_L = jX_U \parallel (-jX_C) + jX_L \parallel (-jX_C)$$

$$jX_L = 2 \frac{jX_C}{j(X_U - X_C)} \rightarrow -1 = \frac{2X_C}{X_U - X_C} \rightarrow X_C - X_U = 2X_C$$

$$3X_C = X_U \rightarrow \omega = \sqrt{\frac{3}{LC}}$$

$$\omega = 10000 \text{ rad/s}$$



$$R_s = 8 \Omega \quad X_{LS} = 6 \Omega$$

$$Z_s = 8 + 6j$$

ZADANO: $Z_s = Z_p$

$$\frac{R_p(jX_{LP})}{R_p + jX_{LP}} \cdot \frac{R_p + jX_{LP}}{R_p(jX_{LP})} = 8 + 6j$$

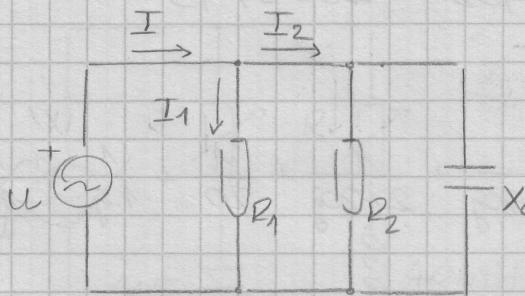
$$\frac{R_p X_{LP}^2}{R_p^2 + X_{LP}^2} + j \frac{R_p^2 X_{LP}}{R_p^2 + X_{LP}^2} = 8 + 6j$$

$$\frac{(1)}{(2)} = \frac{8}{6} \rightarrow \frac{X_{LP}}{R_p} = \frac{8}{6}$$

$$R_p = \frac{3}{4} X_{LP} \quad \text{OVO U (1) ILI (2)}$$

$$R_p = 12.5 \Omega \quad X_{LP} = \frac{50}{3} \Omega$$

(4.)



ZADANO JE:

$$I = 3A \quad I_1 = 2A$$

$$I_2 = 2A \quad R_1 = 4\Omega$$

PRETPOSTAVKA: $\chi U = 0$

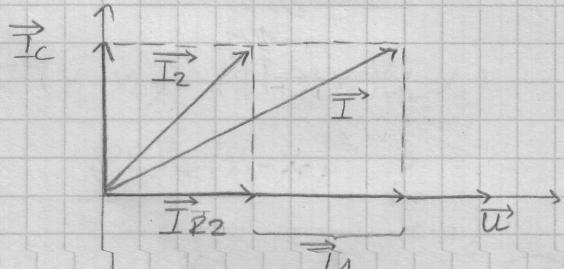
$$\begin{aligned} 2^2 &= I_{R2}^2 + I_c^2 \\ 3^2 &= (I_{R2}+2)^2 + I_c^2 \end{aligned} \quad \left. \right\} I_{R2} = 9.25A$$

$$\underline{I}_{R2} R_2 = \underline{I}_{R1} R_1 \rightarrow R_2 = 32.5\Omega$$

$$P_{VK} = P_1 + P_2$$

$$P_{VK} = I_{R1}^2 R_1 + I_{R2}^2 R_2$$

$$P_{VK} = 18W$$



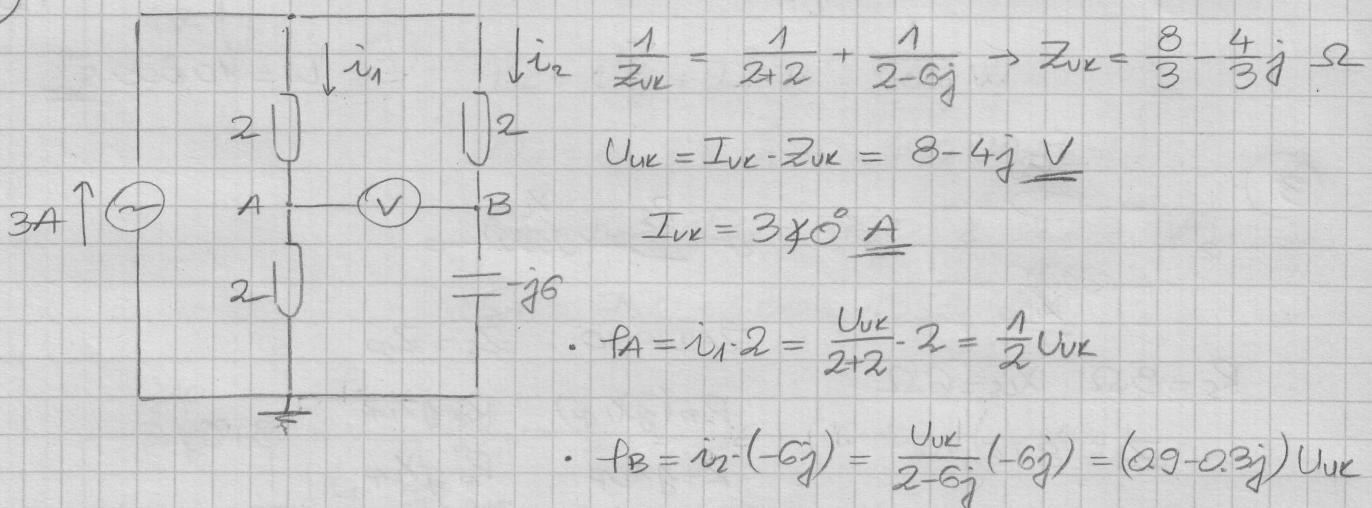
(5.)

$$\dot{I} = 5\angle 45^\circ \quad f = 50 \text{ Hz} \rightarrow \omega = 2\pi f = 100\pi \text{ s}^{-1}$$

$$i(t) = 5\sqrt{2} \sin(100\pi t + \frac{\pi}{4}) \quad t_1 = 15 \cdot 10^{-3} \text{ s}$$

$$i(t_1) = 5\sqrt{2} \sin(\frac{3\pi}{2} + \frac{\pi}{4}) = -5 \text{ A}$$

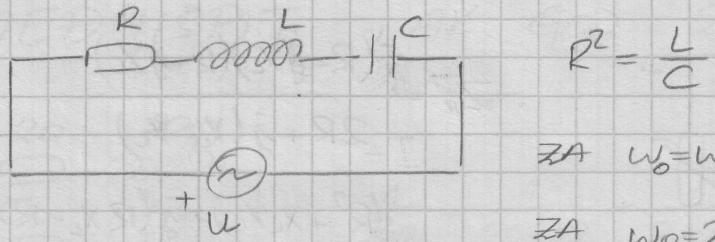
(6.)



$$U_V = f_A - f_B = U_{VK} \left(\frac{1}{2} - 0.9 + 0.3j \right)$$

$$U_V = -2 + 4j = 4.47 \angle 116.56^\circ \text{ V}$$

7.



$$R^2 = \frac{L}{C}$$

$$\text{ZA } \omega_0 = \omega_r \rightarrow P_1 = 100 \text{ W}$$

$$\text{ZA } \omega_0 = 2\omega_r \rightarrow P_2 = ?$$

$$P_1 = i_1^2 \cdot R, \quad i_1 = \frac{U}{R} \quad \text{OVO VRJEDI SAMO ZA REZONANTNI KRUG}$$

$$P_1 = \frac{U^2}{R}$$

$$P_2 = i_2^2 \cdot R, \quad i_2 = \frac{U}{\sqrt{R^2 + (X_L - X_C)^2}}$$

$$P_2 = \frac{U^2}{R^2 + (X_L - X_C)^2} R = ? \quad R^2 = \frac{L}{C} = \frac{WL}{WC} = X_L X_C$$

$$P_2 = \frac{U^2}{R^2 + (X_L - X_C)^2} R \quad | \quad \frac{R}{U^2}$$

$$\frac{P_2}{P_1} = \frac{R^2}{R^2 + (X_L - X_C)^2} = \frac{1}{1 + \left(\frac{X_L - X_C}{R}\right)^2}$$

$$\text{ZA } \omega_0 = \omega_r \rightarrow X_L = X_C$$

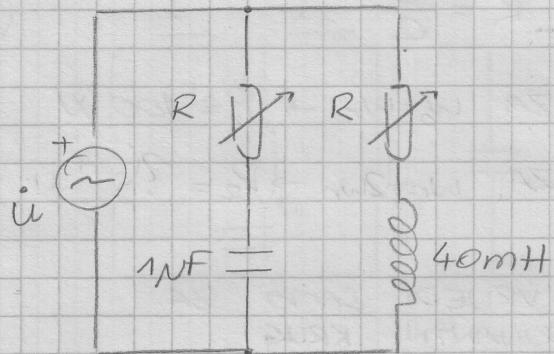
$$\text{ZA } \omega_0 = 2\omega_r \rightarrow 2\omega_r L = \frac{1}{2\omega_r C} \rightarrow \frac{1}{\omega_r C} = 4\omega_r L$$

$$X_C = 4X_L \rightarrow R^2 = 4X_L^2$$

$$X_C = 4X_L, \quad R = 2X_L$$

$$\frac{P_2}{P_1} = \frac{1}{1 + \left(\frac{-3X_L}{2X_L}\right)^2} \rightarrow P_2 = 30.769 \text{ W}$$

(8)



$$Z_{UR} = \frac{(R - jX_C)(R + jX_L)}{2R + j(X_L - X_C)}$$

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

$$Z_{UR} = \frac{2R(R^2 + X_L X_C) + R(X_L - X_C)^2}{(2R)^2 + (X_L - X_C)^2} + j \frac{2R^2(X_L - X_C) - (R^2 + X_L X_C)(X_L - X_C)}{(2R)^2 + (X_L - X_C)^2}$$

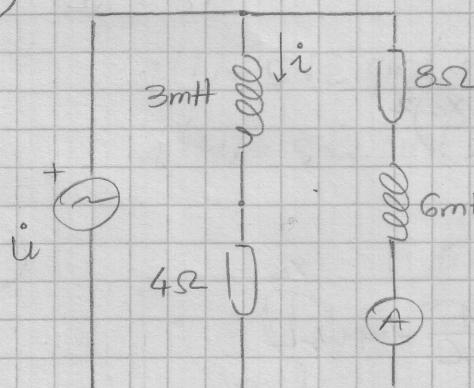
$$= 0 \quad (\text{U REZONANCIU})$$

$$2R^2(X_L - X_C) - (R^2 + X_L X_C)(X_L - X_C) = 0, \quad \text{d.h.}$$

$$2R^2 - R^2 = X_L X_C \rightarrow R^2 = X_L X_C \rightarrow R^2 = \omega_r L \frac{1}{\omega_r C} \rightarrow R = \sqrt{\frac{L}{C}}$$

$$R = 200 \Omega$$

(9.)



$$u = U_m \sin 1000t$$

$$X_L = 3\Omega \quad X_C = 6\Omega$$

$$I_A = \sqrt{8^2 + 6^2} = i \sqrt{4^2 + 3^2} \rightarrow i = 10A$$

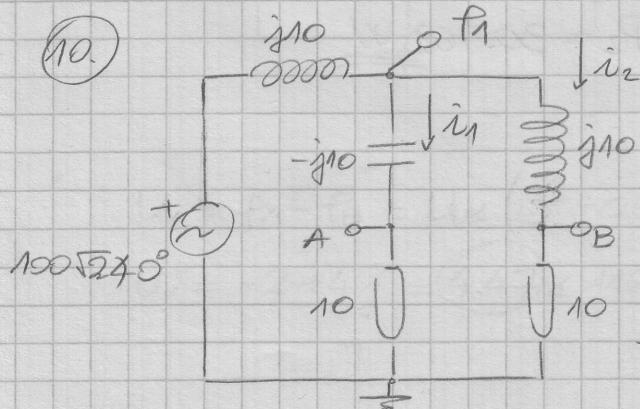
$$P_{UR} = i^2 4 + I_A^2 \cdot 8 = 600 \text{ W}$$

$$Q_{UR} = i^2 \cdot 3 + I_A^2 \cdot 6 = 450 \text{ VAR (ind.)}$$

$$S_{UR} = P_{UR} + j Q_{UR} = 750 \angle 36.87^\circ \text{ VA}$$

$$S_m = 750 + 600 = 1350 \text{ VA}$$

(10.)



$$Z_{UR} = j10 + (10 - 10j) \parallel (10 + 10j)$$

$$Z_{UR} = 10 + 10j \rightarrow I_{UR} = 10 \angle -45^\circ A$$

$$f_1 = I_{UR} \cdot (10 - 10j) \parallel (10 + 10j) = 100 \angle -45^\circ V$$

$$P_A = i_1 \cdot 10 = \frac{f_1}{10(1-j)} \cdot 10 = \frac{f_1}{1-j}$$

$$P_B = i_2 \cdot 10 - \frac{f_1}{10(1+j)} \cdot 10 = \frac{f_1}{1+j}$$

$$\left. \begin{array}{l} U_{ab} = P_A - P_B \\ U_{ab} = 100 \angle 45^\circ V \end{array} \right\}$$