

$R \rightarrow$  active comp

$X \rightarrow$  react. comp.

$Z \rightarrow$  passive comp.

$X \begin{cases} X_L - \text{comp. react.} = \omega L = 2\pi f L \\ X_C - \text{comp. reang.} = \frac{1}{\omega C} = \frac{1}{2\pi f C} \end{cases}$

$a + j\beta$

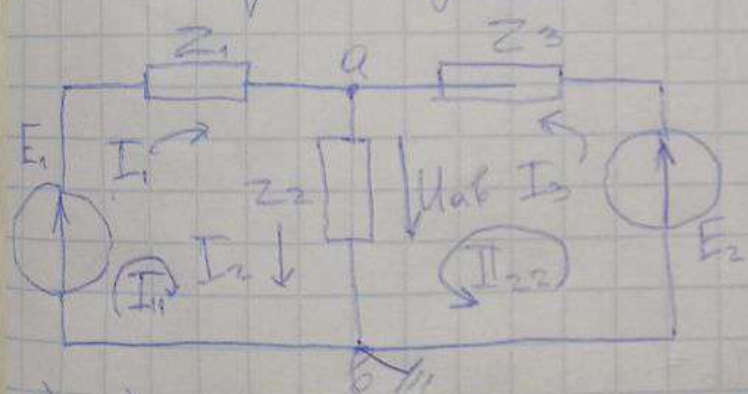
$X_L(j\omega) ; X_C(j\omega) ; R(a)$

$Z = R \pm jX = R + jX_L - jX_C$

$Z_1 = R_1 + jX_{L1} =$

$Z_2 = R_2 - jX_{C2} =$

$Z_3 = jX_{L3} - jX_{C3} =$



2) a)  $I_1 - I_2 + I_3 = 0$

I)  $I_1 \cdot R_1 + I_1 \cdot jX_{L1} + I_2 R_2 + I_2 (-jX_{C2}) = E_1$

II)  $I_3 \cdot jX_{L3} + I_3 \cdot (-jX_{C3}) + I_2 R_2 + I_2 (-jX_{C2}) = E_2$

$I_1 = ; I_2 = ; I_3 =$

3) MKT

$$\begin{cases} I_{11}(Z_1 + Z_2) + I_{22} Z_2 = E_1 \\ I_{22}(Z_2 + Z_3) + I_{11} Z_2 = E_2 \end{cases} \quad \begin{matrix} I_{11} = \\ I_{22} = \end{matrix}$$

$$I_1 = I_{11} =$$

$$I_2 = I_{11} + I_{22} =$$

$$I_3 = I_{22} =$$

4) Мерог glyx ymоб

R → G  
X → B  
Z → Y  
Y =  $\frac{1}{Z}$

$$U_{ab} = \frac{\sum_k E_k Y_k + \sum Y_k}{\sum Y_k}$$

$$U_{ab} = \frac{E_1 Y_1 + E_2 Y_2}{Y_1 + Y_2 + Y_3}$$

$$I_1 = \frac{E_1 - U_{ab}}{Z_1} = (E_1 - U_{ab}) Y_1 =$$

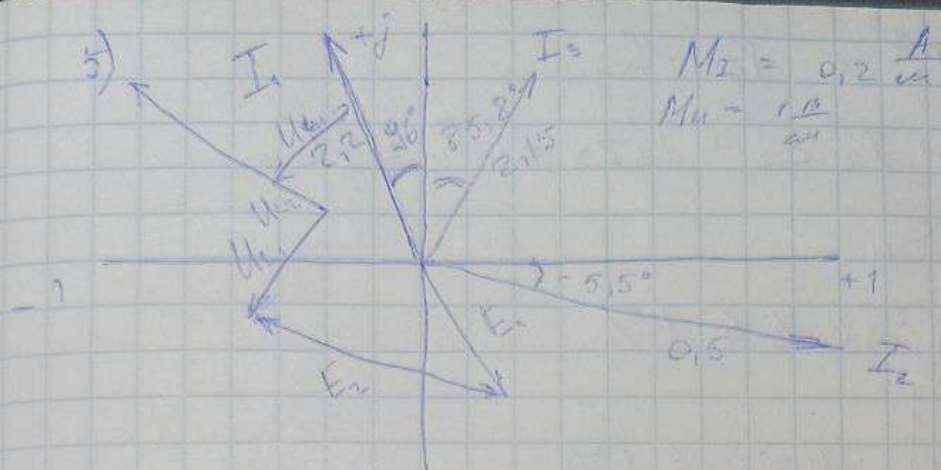
$$I_2 = \frac{U_{ab}}{Z_2} = U_{ab} Y_2 =$$

$$I_3 = \frac{E_2 - U_{ab}}{Z_3} = (E_2 - U_{ab}) Y_3 =$$

4) МУП  $U_b = 0$

$$U_a (Y_1 + Y_2 + Y_3) = E_1 Y_1 + E_2 Y_3$$

$$U_a = \frac{E_1 Y_1 + E_2 Y_3}{Y_1 + Y_2 + Y_3}$$



$$M_1 = 0,2 \frac{A}{m}$$

$$M_2 = \frac{1,5}{m}$$

$$I_1 = 2,2 e^{j29,6^\circ}$$

$$I_2 = 0,5 e^{-j5,5^\circ}$$

$$I_3 = 2,15 e^{j82,8^\circ}$$

$$U_{x1} = I_1 R_1 = 2,2 \cdot e^{-j5} = 11 e^{j96^\circ}$$

$$U_{x2} =$$

$$U_{x3} =$$

$$b) f = 50 \text{ Hz}$$

$$X_L = 2\pi f L = \frac{X_L}{2\pi f} = \frac{X_L}{2 \cdot 3,14 \cdot 50}$$

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

$$7) \text{ Баланс мощностей}$$

$$S_{\text{ист}} = S_{\text{нагр.}}$$

$$P = I \cdot U \cdot \cos \varphi = I^2 R$$

$$Q = I \cdot U \cdot \sin \varphi = I^2 X$$

$$S = \sqrt{P^2 + Q^2} = I \cdot U = I \cdot R$$

$$P_{\text{ист}} = j Q_{\text{ист}} \quad P_{\text{нагр.}} = j Q_{\text{нагр.}}$$

$$\sum E \cdot I^* + \sum U_y \cdot I^* = \sum I^2 \cdot Z$$

$$S = I \cdot U = I e^{-j\varphi_i} \cdot U e^{j\varphi_u} = I \cdot U \cdot e^{j(\varphi_u - \varphi_i)} \rightarrow \varphi = \varphi_u - \varphi_i$$

$$S_{\text{вс}} = E_1 \cdot I_1^* + E_2 \cdot I_3^* = P_H + jQ_H$$

$$S_{\text{нагр}} = I_1^2 Z_1 + I_2^2 Z_2 + I_3^2 Z_3 = P_H + jQ_H$$

$$S_H \approx S_H$$

$$\delta P = \left| \frac{P_H - P_H}{P_H} \right| \cdot 100\% \leq 1\%$$

$$\delta Q = \left| \frac{Q_H - Q_H}{Q_H} \right| \cdot 100\% \leq 1\%$$

Метод сверхтока

$$Z_{\text{экв}} = Z_1 + \frac{Z_2 \cdot Z_3}{Z_2 + Z_3}$$

$$I_1 = \frac{E}{Z} = ; I_2 = I_1 \cdot \frac{Z_3}{Z_2 + Z_3} ; I_3 = I_1 \cdot \frac{Z_2}{Z_2 + Z_3}$$