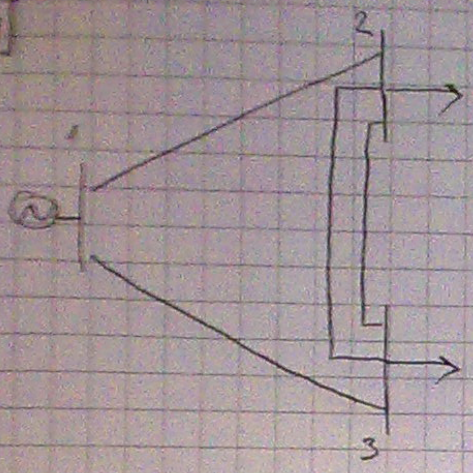
21



$U_n = 110\ kV$

$R_1 = 0{,}12\ \Omega/km$

$X_1 = 0{,}41\ \Omega/km$

$B_1 = 0{,}0028\ mS/km$

$\ell = 20\ km$

$U_1 = 110\angle 0°\ kV$

$U_2 = 108{,}758\angle -1{,}95°\ kV$

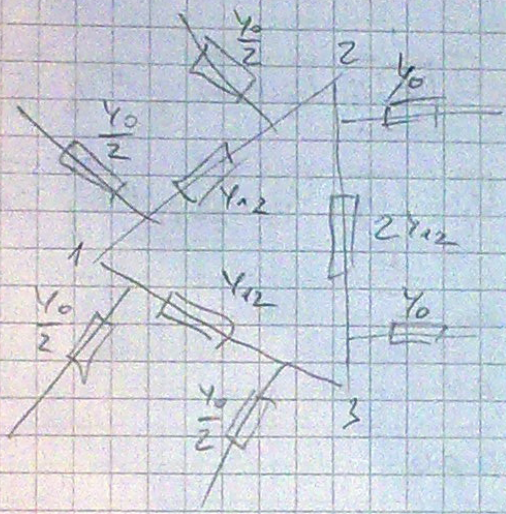
$U_3 = 103{,}059\angle -1{,}99°\ kV$

MAT. ADM. ČV.

$$Y_{12} = \frac{1}{(R_1 + jX_1)\ell}\ [S]$$

$$Y_{12} = \frac{1}{(R_1 + jX_1)\ell} \cdot \frac{U_n^2}{S_B}$$

$\boxed{S_B = 100\ MVA}$



$Y_{12} = 3{,}378 - j\,13{,}592\ p.u.$

$\frac{Y_0}{2} = j\frac{B_1 \ell}{2} \cdot \frac{U_n^2}{S_B} = j\,0{,}003\ p.u.$

ⓒ

$$Y = \begin{bmatrix} 2Y_{12} + Y_0 & -Y_{12} & -Y_{12} \\ -Y_{12} & 3Y_{12} + 3\frac{Y_0}{2} & -2Y_{12} \\ -Y_{12} & -2Y_{12} & 3Y_{12} + 3\frac{Y_0}{2} \end{bmatrix} = \begin{bmatrix} 28{,}518\angle -73{,}603° & 14{,}192\angle 106{,}209 & 14{,}164\angle 106{,}343 \\ 12{,}476\angle -73{,}652 & 28{,}324\angle 106{,}313 & \\ 12{,}476\angle -73{,}652 & & \end{bmatrix}$$

ⓑ $P_i = |U_i| \sum_{j=1}^{n} |U_j| |Y_{ij}| \cos(\delta_i - \delta_j - \Theta_{ij})$

$Q_i = |U_i| \sum_{j=1}^{n} |U_j| |Y_{ij}| \sin(\delta_i - \delta_j - \Theta_{ij})$

$|U_1| = 1\ p.u.$

$|U_2| = 0{,}989\ p.u.$

$|U_3| = 0{,}991\ p.u.$

$P_1 = 1{,}003$ p.u. = 100,3 MW

$Q_1 = 0{,}008$ p.u. = 0,8 Mvar

$P_2 = -0{,}502$ p.u. = -50,2 MW

$Q_2 = -0{,}039$ p.u. = -3,9 Mvar

$P_3 = -0{,}496$ p.u. = -49,6 MW

$Q_3 = 0{,}099$ p.u. = 9,9 Mvar

c) $\Delta \vec{S} = \vec{S}_{1\delta} + \vec{S}_{\delta 1}$

$$\vec{S}_{1\delta} = \vec{U}_1 \cdot \vec{I}_{1\delta}^{*} = \vec{U}_1 \cdot [(\vec{U}_1 - \vec{U}_\delta) \cdot \vec{Y}_{1\delta} + \vec{U}_1 \cdot \vec{Y}_{10}]^{*}$$

$$\vec{S}_{\delta 1} = \vec{U}_\delta \cdot \vec{I}_{\delta 1}^{*} = \vec{U}_\delta \cdot [(\vec{U}_\delta - \vec{U}_1) \cdot \vec{Y}_{\delta 1} + \vec{U}_\delta \cdot \vec{Y}_{\delta 0}]^{*}$$

$S_{12} = 0{,}504 + j\,0{,}024$ p.u.

$S_{13} = 0{,}499 + j\,0{,}013$ p.u.

$S_{03} = 0{,}504 - j\,0{,}016$ p.u.

$S_{31} = 0{,}499 - j\,0{,}026$ p.u.

$S_{23} = -0{,}003 - j\,0{,}056$ p.u.

$S_{32} = 0{,}003 + j\,0{,}073$ p.u.

$\Delta S = \Delta S_{12} + \Delta S_{13} + \Delta S_{23}$

$\Delta S = 0{,}010 + j\,0{,}008$ p.u. = 1,017 + j 0,806 MVA