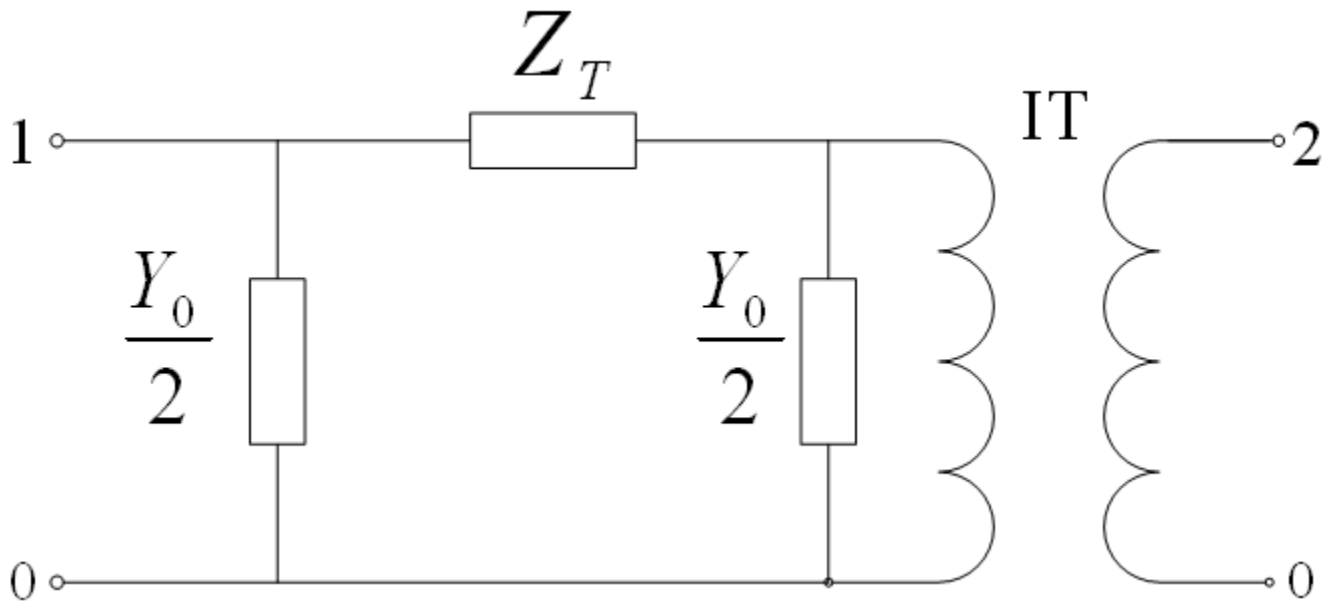
ANALIZA ELEKTROENERGETSKOG SUSTAVA

Predavanje br. 3.



- <u>Natpisna pločica:</u>

$$S_n(MVA), u_k(\%), U_{n1}(kV),\ P_k\ (MW),\ i_0(\%),\ P_0(MW), w_1/w_2$$

- Izvod na ploči:

$$Z_T = R + jX = \frac{U_n^2}{S_n}\left[\frac{P_k}{S_n} + j\sqrt{u_k^2 - \left(\frac{P_k}{S_n}\right)^2}\right] [\Omega]$$

$$Y_0 = \frac{S_n}{U_n^2}\left[\frac{P_0}{S_n} - j\sqrt{i_0^2 - \left(\frac{P_0}{S_n}\right)^2}\right] [\mathrm{S}]$$

- Relativne veličine:

$$Z_T' = \left(\frac{U_B}{U_n}\right)^2 \cdot Z_T = \frac{U_B^2}{S_n}\left[\frac{P_k}{S_n} + j\sqrt{u_k^2 - \left(\frac{P_k}{S_n}\right)^2}\right] \ [\Omega]$$

$$Y_0' = \left(\frac{U_n}{U_B}\right)^2 \cdot Y_0 = \frac{S_n}{U_B^2}\left[\frac{P_0}{S_n} - j\sqrt{i_0^2 - \left(\frac{P_0}{S_n}\right)^2}\right] \ [\mathrm{S}]$$

- Jedinične veličine:

$$Z_{Tp.u.} = \frac{S_B}{U_B^2} \cdot Z_T = \frac{S_B}{S_n}\left[\frac{P_k}{S_n} + j\sqrt{u_k^2 - \left(\frac{P_k}{S_n}\right)^2}\right] \ [p.u.]$$

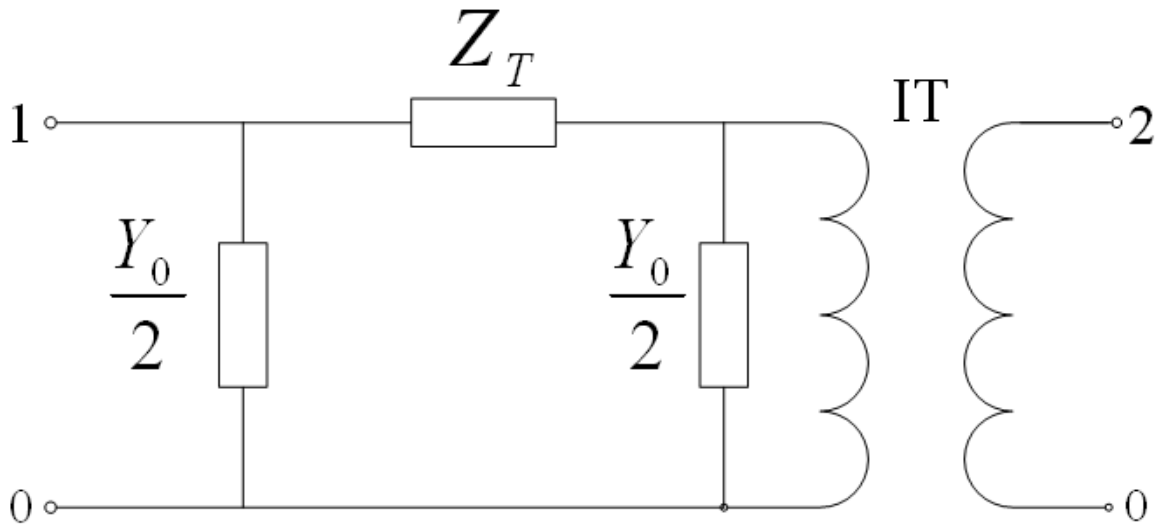
$$Y_{0p.u.} = \frac{U_B^2}{S_B} \cdot Y_0 = \frac{S_n}{S_B}\left[\frac{P_0}{S_n} - j\sqrt{i_0^2 - \left(\frac{P_0}{S_n}\right)^2}\right] \ [p.u.]$$

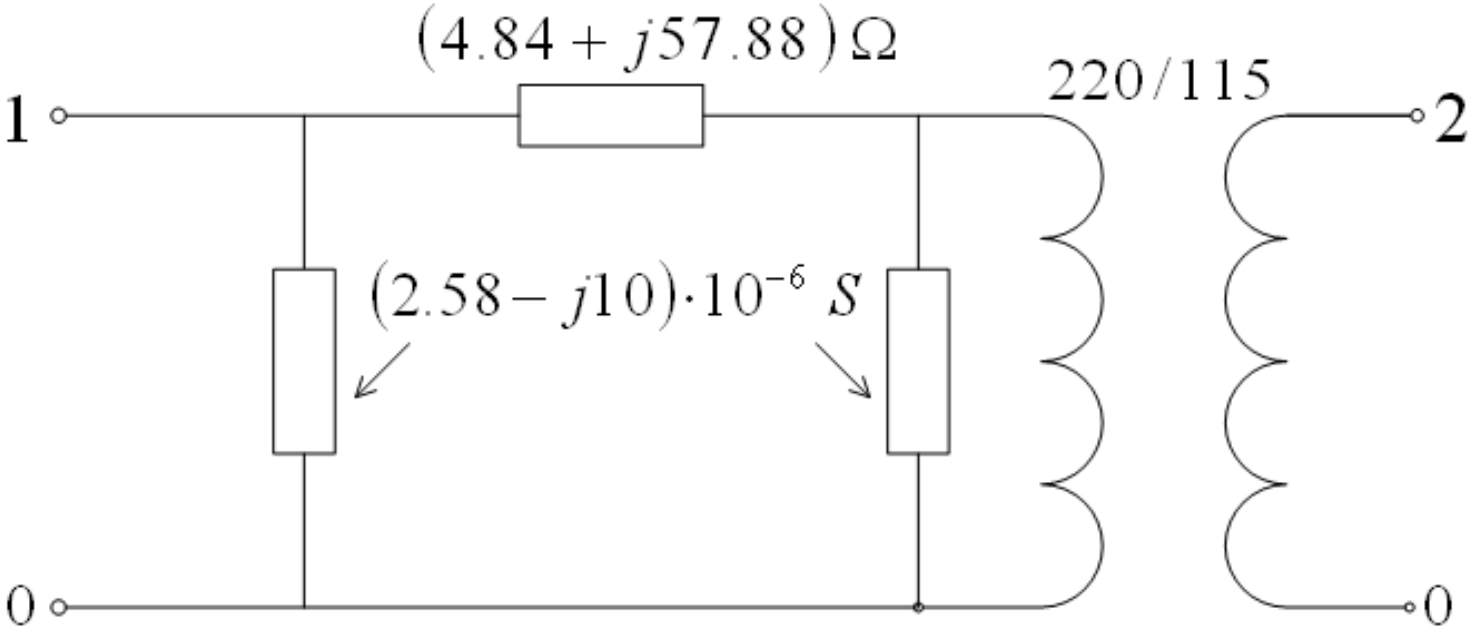
- PRIMJER:

$S_n = 100\ MVA\ ;\ u_k\ \% = 12\%\ ;\ i_0 = 1\%$

$P_k = 1\%\ od\ S_n\ ;\ P_0 = 25\%\ P_k = 0{,}25\%\ od\ S_n$

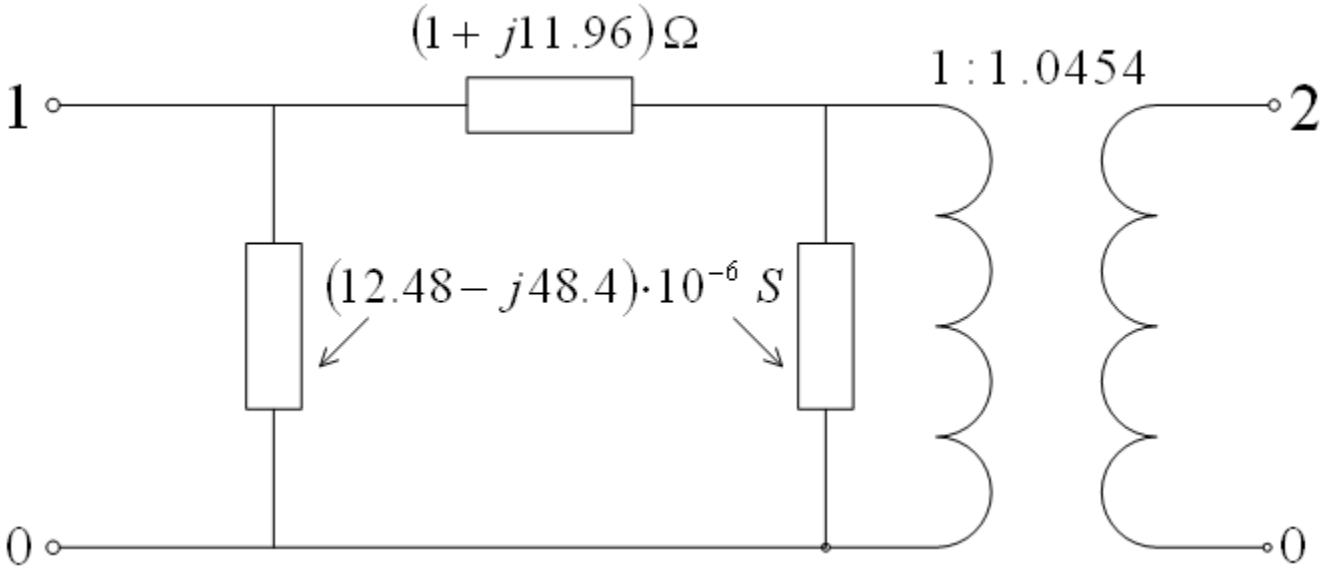
$Prijenosni\ odnos\ 220/115\ kV$




$(4.84 + j57.88)\,\Omega$
220/115
1
2
$(2.58 - j10)\cdot 10^{-6}\ S$
0
0

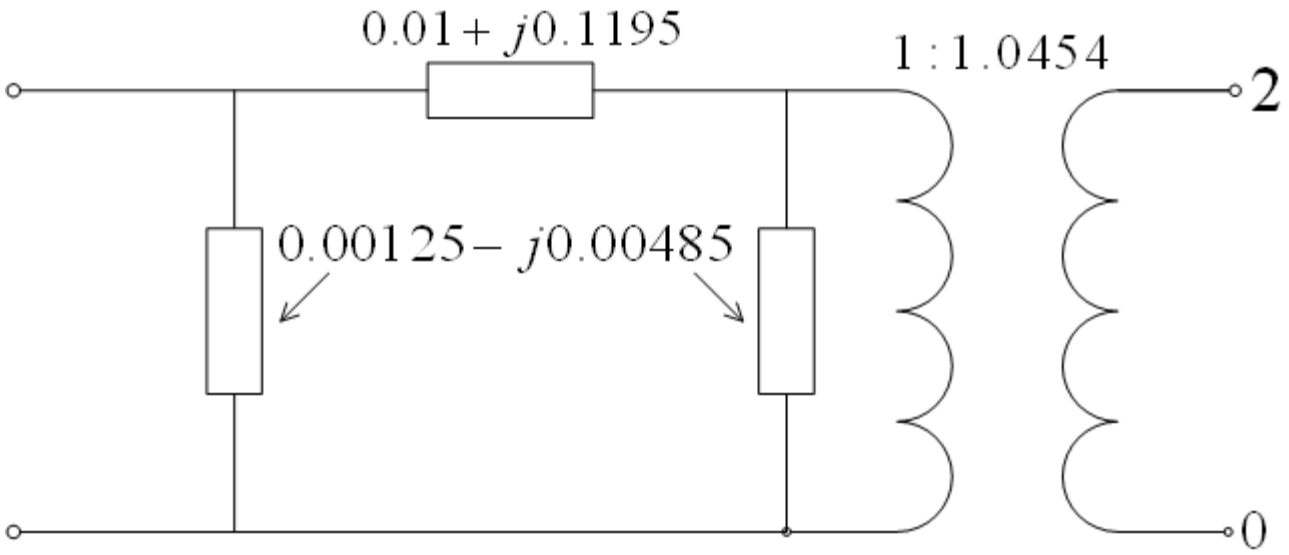
- Metoda otpora (relativne vrijednosti):

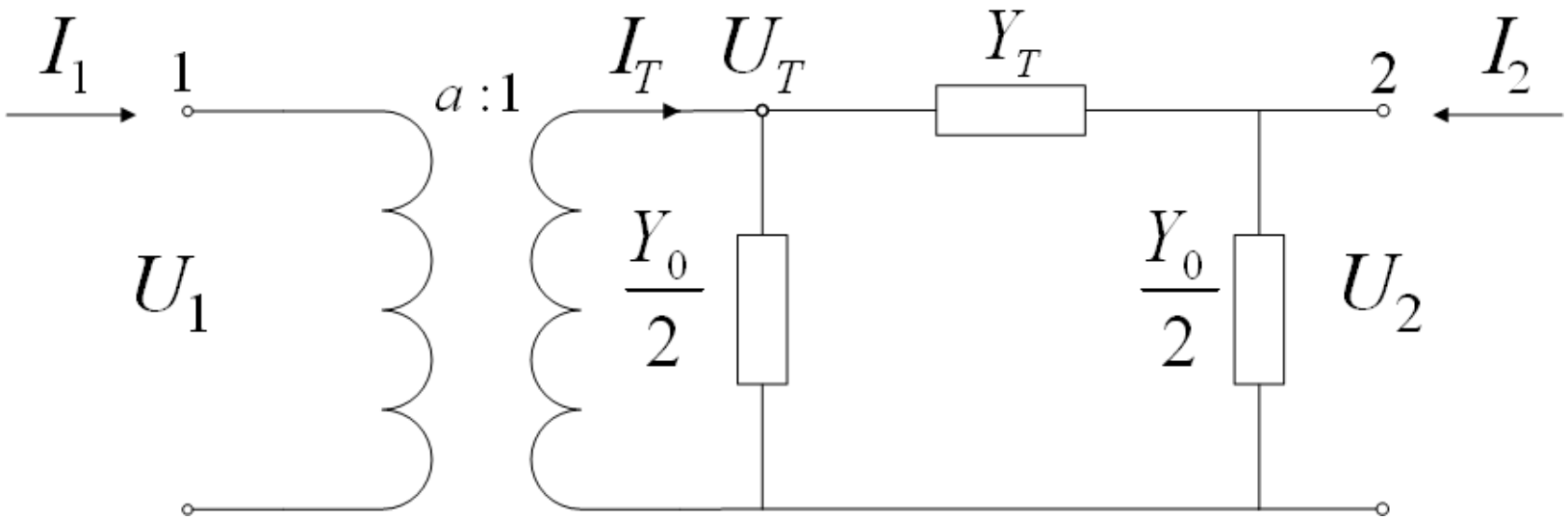
$$U_B = 100\ kV$$



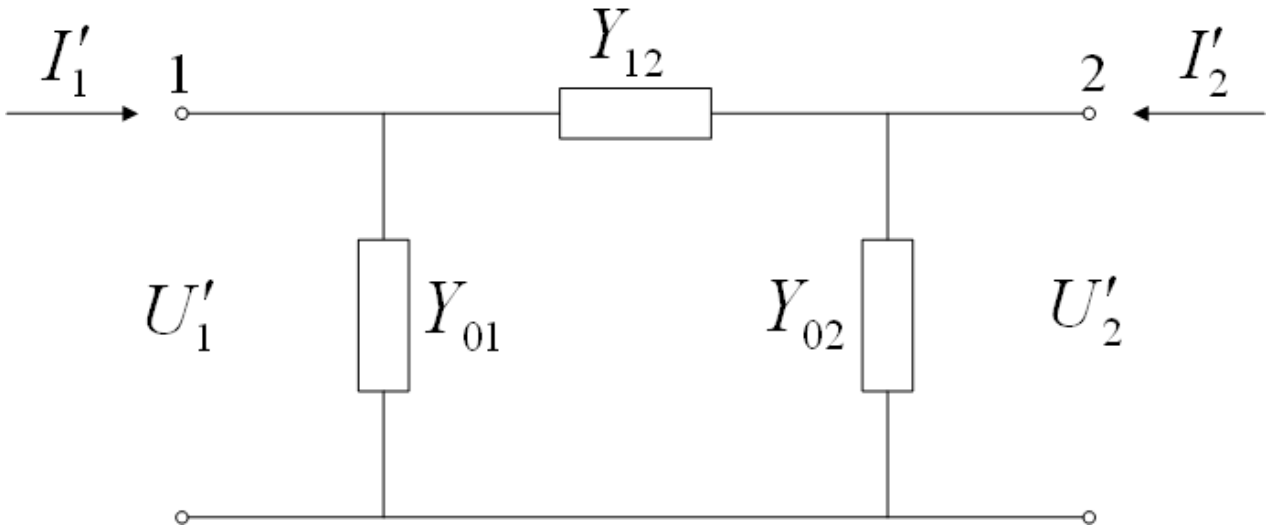
- Jedinične vrijednosti (p.u.):

$$S_B = 100\ MVA$$





$$\frac{U_1}{U_T} = a = \frac{I_T}{I_1}$$

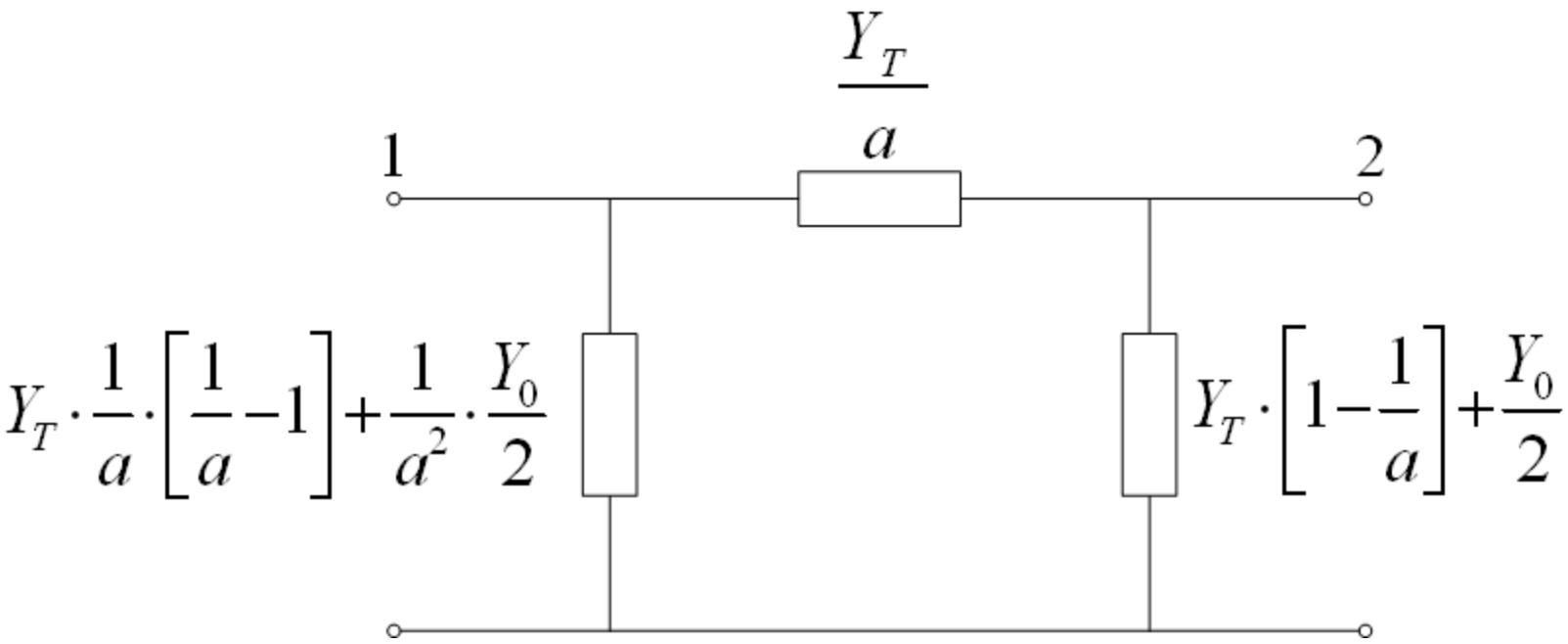


- <u>Konačni rezultat</u>

$$Y_{12} = \frac{Y_T}{a}$$

$$Y_{01} = Y_T \cdot \frac{1}{a} \cdot \left[\frac{1}{a} - 1\right] + \frac{1}{a^2} \cdot \frac{Y_0}{2}$$

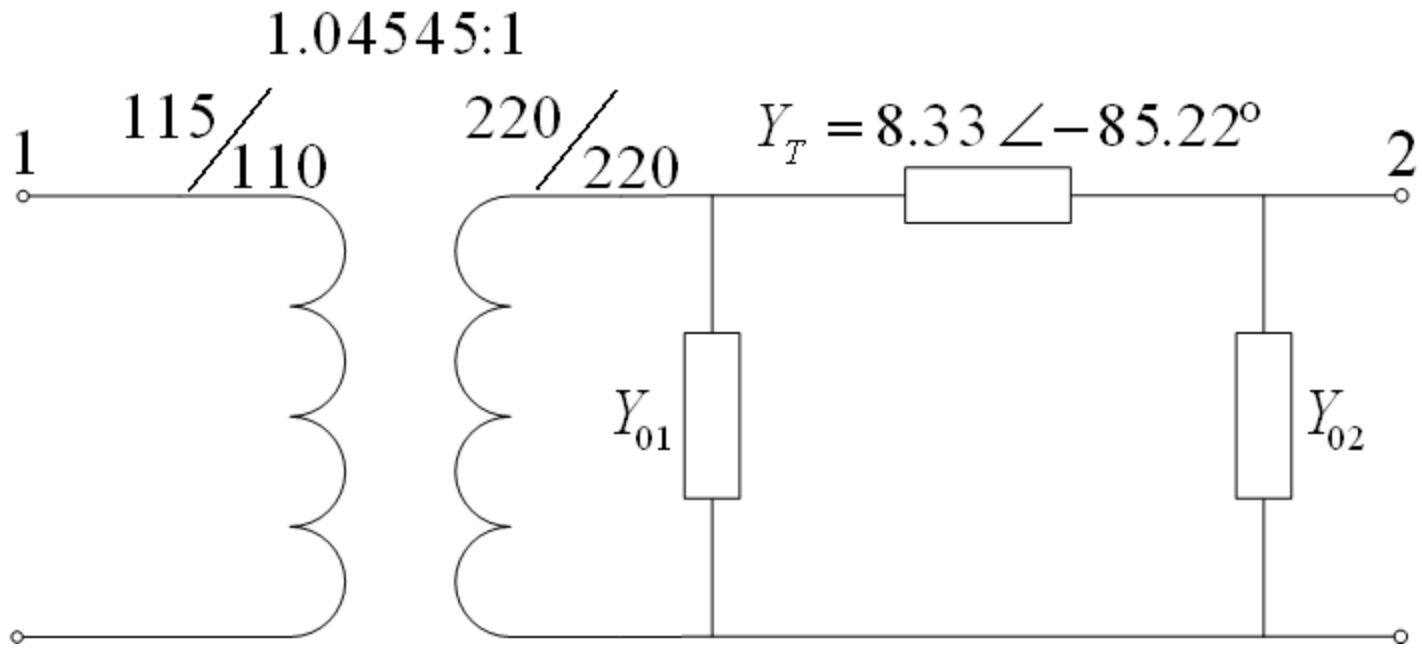
$$Y_{02} = Y_T \cdot \left[1 - \frac{1}{a}\right] + \frac{Y_0}{2}$$



- <u>Zapamti:</u>
  - Prijenosni omjer IT se izražava kao:

$$\frac{U_1 / U_{n1}}{U_2 / U_{n2}}$$

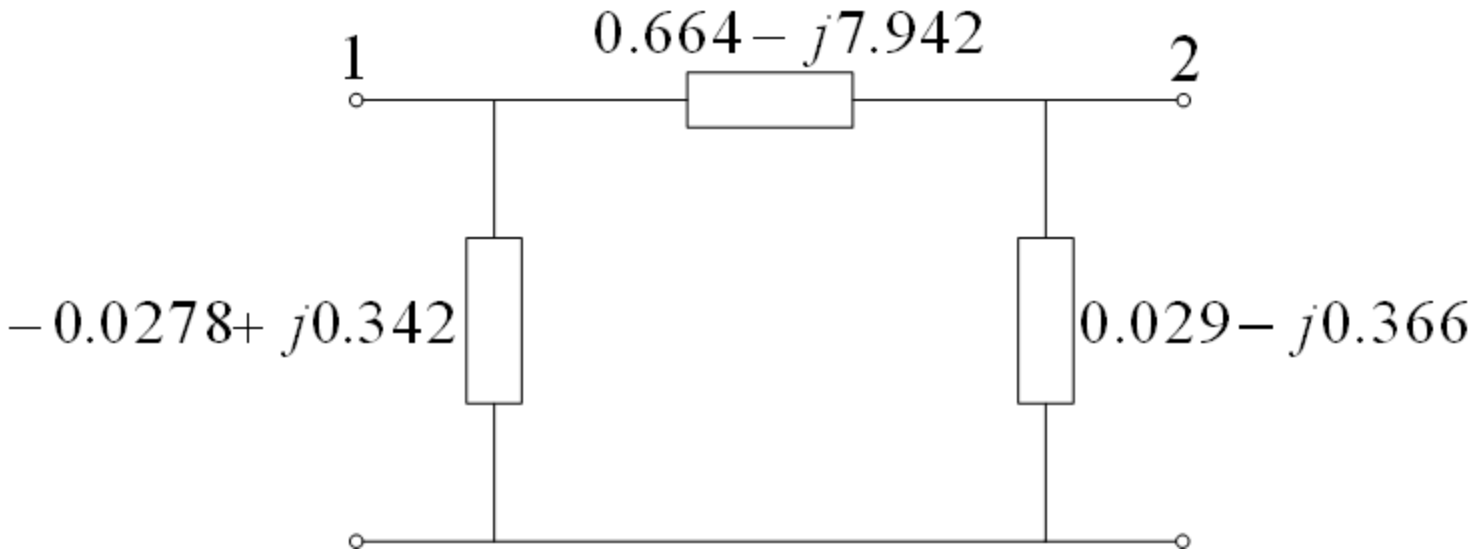
- PRIMJER:



$$Y_{12} = \frac{Y_T}{a} = \frac{8.33 \angle -85.22°}{1.0454} = 7.97 \angle -85.22°$$

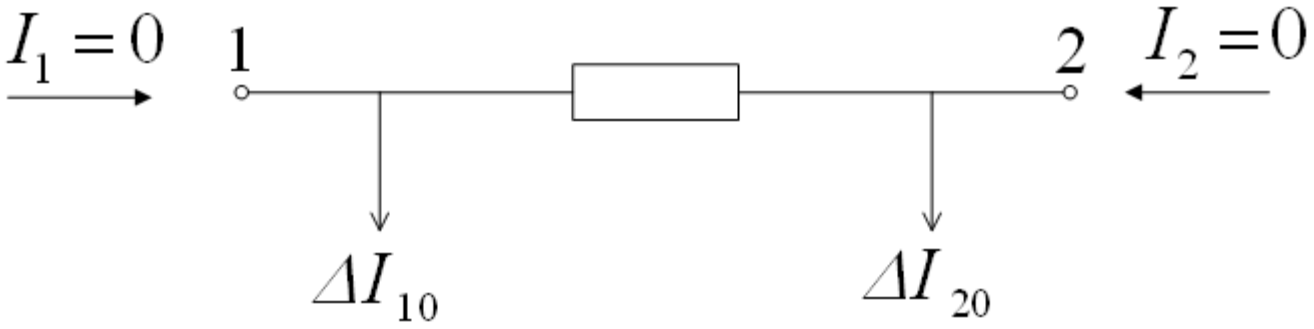
$$Y_{01} = Y_T \cdot \frac{1}{a} \cdot \left[\frac{1}{a} - 1\right] + \frac{1}{a^2} \cdot \frac{Y_0}{2} = -0.0278 + j0.342$$

$$Y_{02} = Y_T \cdot \left[1 - \frac{1}{a}\right] + \frac{Y_0}{2} = 0.029 - j0.366$$



$Y_0 - zanemarimo$

- Prazni hod



$$\Delta I_{10} = U_1 \cdot (-0.0289 + j0.346)$$

$$\Delta I_{20} = U_2 \cdot (0.0302 - j0.361)$$

$$\sum I = 0$$

$$\Delta I_{10} = -\Delta I_{20}$$

$$\frac{U_1}{U_2} = \frac{0.0302 - j0.361}{0.0289 - j0.34} = \frac{0.3628\angle 85.22°}{0.3471\angle 85.22°} = 1.045$$

$$\Delta I_2 = U_2 \cdot Y_{02} = U_2 \cdot Y_T \cdot \left(1 - \frac{1}{a}\right)$$

$$\Delta I_1 = U_1 \cdot Y_{01} = U_1 \cdot Y_T \cdot \frac{1}{a} \cdot \left(\frac{1}{a} - 1\right)$$

$$\frac{U_1}{U_2} = a$$