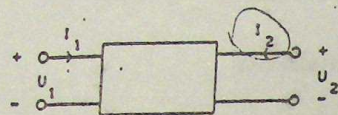


PRETVORBA PARAMETARA CETVEROPOLA



Ako su smjerovi napona i struja kao na slici, vrijede slijedeće matrice parametara i pripadne transformacije:

PARAMETRI	Z	Y	h
Z	$\begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix}$	$\begin{bmatrix} \frac{y_{22}}{\Delta y} & -\frac{y_{12}}{\Delta y} \\ -\frac{y_{21}}{\Delta y} & \frac{y_{11}}{\Delta y} \end{bmatrix}$	$\begin{bmatrix} \frac{\Delta h}{h_{22}} & \frac{h_{12}}{h_{22}} \\ -\frac{h_{21}}{h_{22}} & \frac{1}{h_{22}} \end{bmatrix}$
Y	$\begin{bmatrix} \frac{z_{22}}{\Delta z} & -\frac{z_{12}}{\Delta z} \\ -\frac{z_{21}}{\Delta z} & \frac{z_{11}}{\Delta z} \end{bmatrix}$	$\begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix}$	$\begin{bmatrix} \frac{1}{h_{11}} & -\frac{h_{12}}{h_{11}} \\ \frac{h_{21}}{h_{11}} & \frac{\Delta h}{h_{11}} \end{bmatrix}$
h	$\begin{bmatrix} \frac{\Delta z}{z_{22}} & \frac{z_{12}}{z_{22}} \\ -\frac{z_{21}}{z_{22}} & \frac{1}{z_{22}} \end{bmatrix}$	$\begin{bmatrix} \frac{1}{y_{11}} & -\frac{y_{12}}{y_{11}} \\ \frac{y_{21}}{y_{11}} & \frac{\Delta y}{y_{11}} \end{bmatrix}$	$\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix}$
g	$\begin{bmatrix} \frac{1}{z_{11}} & -\frac{z_{12}}{z_{11}} \\ \frac{z_{21}}{z_{11}} & \frac{\Delta z}{z_{11}} \end{bmatrix}$	$\begin{bmatrix} \frac{\Delta y}{y_{22}} & \frac{y_{12}}{y_{22}} \\ -\frac{y_{21}}{y_{22}} & \frac{1}{y_{22}} \end{bmatrix}$	$\begin{bmatrix} \frac{h_{22}}{\Delta h} & -\frac{h_{12}}{\Delta h} \\ -\frac{h_{21}}{\Delta h} & \frac{h_{11}}{\Delta h} \end{bmatrix}$
Λ_1	$\begin{bmatrix} \frac{z_{11}}{z_{21}} & \frac{\Delta z}{z_{21}} \\ \frac{1}{z_{21}} & \frac{z_{22}}{z_{21}} \end{bmatrix}$	$\begin{bmatrix} -\frac{y_{22}}{y_{21}} & -\frac{1}{y_{21}} \\ -\frac{\Delta y}{y_{21}} & -\frac{y_{11}}{y_{21}} \end{bmatrix}$	$\begin{bmatrix} -\frac{\Delta h}{h_{21}} & -\frac{h_{11}}{h_{21}} \\ -\frac{h_{22}}{h_{21}} & -\frac{1}{h_{21}} \end{bmatrix}$
Λ_2	$\begin{bmatrix} \frac{z_{22}}{z_{12}} & \frac{\Delta z}{z_{12}} \\ \frac{1}{z_{12}} & \frac{z_{11}}{z_{12}} \end{bmatrix}$	$\begin{bmatrix} -\frac{y_{11}}{y_{12}} & -\frac{1}{y_{12}} \\ -\frac{\Delta y}{y_{12}} & -\frac{y_{22}}{y_{12}} \end{bmatrix}$	$\begin{bmatrix} \frac{1}{h_{12}} & \frac{h_{11}}{h_{12}} \\ \frac{h_{22}}{h_{12}} & \frac{\Delta h}{h_{12}} \end{bmatrix}$

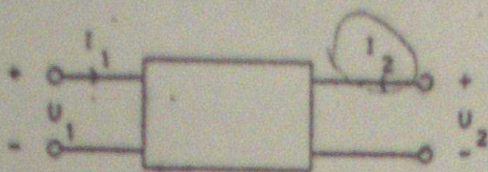
$$\Delta A = AD - BC$$

PARAMETRI	g	Λ_1	Λ_2
Z	$\begin{bmatrix} \frac{1}{g_{11}} & -\frac{g_{12}}{g_{11}} \\ \frac{g_{21}}{g_{11}} & \frac{\Delta g}{g_{11}} \end{bmatrix}$	$\begin{bmatrix} \frac{A}{C} & \frac{\Delta A}{C} \\ \frac{1}{C} & \frac{D}{C} \end{bmatrix}$	$\begin{bmatrix} \frac{D}{C} & \frac{1}{C} \\ \frac{\Delta A}{C} & \frac{A}{C} \end{bmatrix}$
Y	$\begin{bmatrix} \frac{\Delta g}{g_{22}} & \frac{g_{12}}{g_{22}} \\ -\frac{g_{21}}{g_{22}} & \frac{1}{g_{22}} \end{bmatrix}$	$\begin{bmatrix} \frac{D}{B} & -\frac{\Delta A}{B} \\ -\frac{1}{B} & \frac{A}{B} \end{bmatrix}$	$\begin{bmatrix} \frac{A}{B} & -\frac{1}{B} \\ -\frac{\Delta A}{B} & \frac{D}{B} \end{bmatrix}$
h	$\begin{bmatrix} \frac{g_{22}}{\Delta g} & -\frac{g_{12}}{\Delta g} \\ -\frac{g_{21}}{\Delta g} & \frac{g_{11}}{\Delta g} \end{bmatrix}$	$\begin{bmatrix} \frac{B}{D} & \frac{\Delta A}{D} \\ -\frac{1}{D} & \frac{C}{D} \end{bmatrix}$	$\begin{bmatrix} \frac{B}{A} & \frac{1}{A} \\ -\frac{\Delta A}{A} & \frac{C}{A} \end{bmatrix}$
g	$\begin{bmatrix} g_{11} & g_{12} \\ g_{21} & g_{22} \end{bmatrix}$	$\begin{bmatrix} \frac{C}{A} & -\frac{\Delta A}{A} \\ \frac{1}{A} & \frac{B}{A} \end{bmatrix}$	$\begin{bmatrix} \frac{C}{D} & -\frac{1}{D} \\ \frac{\Delta A}{D} & \frac{B}{D} \end{bmatrix}$
Λ_1	$\begin{bmatrix} \frac{1}{g_{21}} & \frac{g_{22}}{g_{21}} \\ \frac{g_{11}}{g_{21}} & \frac{\Delta g}{g_{21}} \end{bmatrix}$	$\begin{bmatrix} A & B \\ C & D \end{bmatrix}$	$\begin{bmatrix} \frac{D}{\Delta A} & \frac{B}{\Delta A} \\ \frac{C}{\Delta A} & \frac{A}{\Delta A} \end{bmatrix}$
Λ_2	$\begin{bmatrix} -\frac{\Delta g}{g_{12}} & -\frac{g_{22}}{g_{12}} \\ -\frac{g_{11}}{g_{12}} & -\frac{1}{g_{12}} \end{bmatrix}$	$\begin{bmatrix} \frac{D}{\Delta A} & \frac{B}{\Delta A} \\ \frac{C}{\Delta A} & \frac{A}{\Delta A} \end{bmatrix}$	$\begin{bmatrix} A & B \\ C & D \end{bmatrix}$

Oznaka Δ označava determinantu matrice. Na primjer:

$$\Delta z = z_{11}z_{22} - z_{12}z_{21}$$

$$\Delta A = AD - BC$$



Ako su smjerovi napona i struja kao na slici, vrijede slijedeće matrice parametara i pripadne transformacije:

PARAMETRI	Z	Y	h
Z	$\begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix}$	$\begin{bmatrix} \frac{y_{22}}{\Delta y} & -\frac{y_{12}}{\Delta y} \\ -\frac{y_{21}}{\Delta y} & \frac{y_{11}}{\Delta y} \end{bmatrix}$	$\begin{bmatrix} \frac{\Delta h}{h_{22}} & \frac{h_{12}}{h_{22}} \\ -\frac{h_{21}}{h_{22}} & \frac{1}{h_{22}} \end{bmatrix}$
Y	$\begin{bmatrix} \frac{z_{22}}{\Delta z} & -\frac{z_{12}}{\Delta z} \\ -\frac{z_{21}}{\Delta z} & \frac{z_{11}}{\Delta z} \end{bmatrix}$	$\begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix}$	$\begin{bmatrix} \frac{1}{h_{11}} & -\frac{h_{12}}{h_{11}} \\ \frac{h_{21}}{h_{11}} & \frac{\Delta h}{h_{11}} \end{bmatrix}$
h	$\begin{bmatrix} \frac{\Delta z}{z_{22}} & \frac{z_{12}}{z_{22}} \\ -\frac{z_{21}}{z_{22}} & \frac{1}{z_{22}} \end{bmatrix}$	$\begin{bmatrix} \frac{1}{y_{11}} & -\frac{y_{12}}{y_{11}} \\ \frac{y_{21}}{y_{11}} & \frac{\Delta y}{y_{11}} \end{bmatrix}$	$\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix}$
g	$\begin{bmatrix} \frac{1}{z_{11}} & -\frac{z_{12}}{z_{11}} \\ \frac{z_{21}}{z_{11}} & \frac{\Delta z}{z_{11}} \end{bmatrix}$	$\begin{bmatrix} \frac{\Delta y}{y_{22}} & \frac{y_{12}}{y_{22}} \\ -\frac{y_{21}}{y_{22}} & \frac{1}{y_{22}} \end{bmatrix}$	$\begin{bmatrix} \frac{h_{22}}{\Delta h} & -\frac{h_{12}}{\Delta h} \\ -\frac{h_{21}}{\Delta h} & \frac{h_{11}}{\Delta h} \end{bmatrix}$
A ₁	$\begin{bmatrix} \frac{z_{11}}{z_{21}} & \frac{\Delta z}{z_{21}} \\ \frac{1}{z_{21}} & \frac{z_{22}}{z_{21}} \end{bmatrix}$	$\begin{bmatrix} -\frac{y_{22}}{y_{21}} & -\frac{1}{y_{21}} \\ -\frac{\Delta y}{y_{21}} & -\frac{y_{11}}{y_{21}} \end{bmatrix}$	$\begin{bmatrix} -\frac{\Delta h}{h_{21}} & -\frac{h_{11}}{h_{21}} \\ -\frac{h_{22}}{h_{21}} & -\frac{1}{h_{21}} \end{bmatrix}$
A ₂	$\begin{bmatrix} \frac{z_{22}}{z_{12}} & \frac{\Delta z}{z_{12}} \\ \frac{1}{z_{12}} & \frac{z_{11}}{z_{12}} \end{bmatrix}$	$\begin{bmatrix} -\frac{y_{11}}{y_{12}} & -\frac{1}{y_{12}} \\ -\frac{\Delta y}{y_{12}} & -\frac{y_{22}}{y_{12}} \end{bmatrix}$	$\begin{bmatrix} \frac{1}{h_{12}} & \frac{h_{11}}{h_{12}} \\ \frac{h_{22}}{h_{12}} & \frac{\Delta h}{h_{12}} \end{bmatrix}$

$$\Delta A = AD - BC$$

PARAMETRI

 δ
 A_1
 A_2

Z	$\begin{bmatrix} \frac{1}{E_{11}} & -\frac{E_{12}}{E_{11}} \\ \frac{E_{21}}{E_{11}} & \frac{\Delta E}{E_{11}} \end{bmatrix}$	$\begin{bmatrix} \frac{A}{C} & \frac{\Delta A}{C} \\ \frac{1}{C} & \frac{D}{C} \end{bmatrix}$	$\begin{bmatrix} \frac{D}{C} & \frac{1}{C} \\ \frac{\Delta A}{C} & \frac{A}{C} \end{bmatrix}$
Y	$\begin{bmatrix} \frac{\Delta E}{E_{22}} & \frac{E_{12}}{E_{22}} \\ -\frac{E_{21}}{E_{22}} & \frac{1}{E_{22}} \end{bmatrix}$	$\begin{bmatrix} \cancel{\frac{D}{B}} & -\frac{\Delta A}{B} \\ -\frac{1}{B} & \frac{A}{B} \end{bmatrix}$	$\begin{bmatrix} \frac{A}{B} & -\frac{1}{B} \\ -\frac{\Delta A}{B} & \frac{D}{B} \end{bmatrix}$
H	$\begin{bmatrix} \frac{E_{22}}{\Delta E} & -\frac{E_{12}}{\Delta E} \\ -\frac{E_{21}}{\Delta E} & \frac{E_{11}}{\Delta E} \end{bmatrix}$	$\begin{bmatrix} \frac{D}{B} & \frac{\Delta A}{B} \\ -\frac{1}{B} & \frac{C}{B} \end{bmatrix}$	$\begin{bmatrix} \frac{B}{\lambda} & \frac{1}{\lambda} \\ -\frac{\Delta A}{\lambda} & \frac{C}{\lambda} \end{bmatrix}$
E	$\begin{bmatrix} E_{11} & E_{12} \\ E_{21} & E_{22} \end{bmatrix}$	$\begin{bmatrix} \frac{C}{A} & -\frac{\Delta A}{A} \\ \frac{1}{A} & \frac{B}{A} \end{bmatrix}$	$\begin{bmatrix} \frac{C}{D} & -\frac{1}{D} \\ \frac{\Delta A}{D} & \frac{B}{D} \end{bmatrix}$
A_1	$\begin{bmatrix} \frac{1}{E_{21}} & \frac{E_{22}}{E_{21}} \\ \frac{E_{11}}{E_{21}} & \frac{\Delta E}{E_{21}} \end{bmatrix}$	$\begin{bmatrix} A & B \\ C & D \end{bmatrix}$	$\begin{bmatrix} \frac{D}{\Delta \lambda} & \frac{B}{\Delta \lambda} \\ \frac{C}{\Delta \lambda} & \frac{A}{\Delta \lambda} \end{bmatrix}$
A_2	$\begin{bmatrix} -\frac{\Delta E}{E_{12}} & -\frac{E_{22}}{E_{12}} \\ -\frac{E_{11}}{E_{12}} & -\frac{1}{E_{12}} \end{bmatrix}$	$\begin{bmatrix} \frac{D}{\Delta A} & \frac{B}{\Delta A} \\ \frac{C}{\Delta A} & \frac{A}{\Delta A} \end{bmatrix}$	$\begin{bmatrix} A & B \\ C & D \end{bmatrix}$

Oznaka Δ označava determinantu matrice. Na primer:

$$\Delta Z = Z_{11}Z_{22} - Z_{12}Z_{21}$$

$$\Delta A = AD - BC$$

$$\begin{bmatrix} U_1 \\ U_2 \end{bmatrix} = \begin{bmatrix} Z_{11} & Z_{12} \\ Z_{21} & Z_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

DODATAK 3

$$\begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{bmatrix} \begin{bmatrix} U_1 \\ U_2 \end{bmatrix}$$

$$\begin{bmatrix} U_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} U_2 \\ -I_2 \end{bmatrix}$$

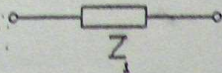
OSNOVNE KONFIGURACIJE CETVEROPOLA I PRIPADNI PARAMETRI

CETVEROPOL

Z-PARAMETRI

Y-PARAMETRI

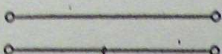
A-PARAMETRI



∞

$$\begin{bmatrix} \frac{1}{Z_1} & \frac{1}{Z_1} \\ -\frac{1}{Z_1} & \frac{1}{Z_1} \end{bmatrix}$$

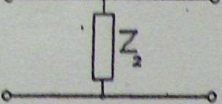
$$\begin{bmatrix} 1 & Z_1 \\ 0 & 1 \end{bmatrix}$$



$$\begin{bmatrix} Z_2 & Z_2 \\ Z_2 & Z_2 \end{bmatrix}$$

∞

$$\begin{bmatrix} 1 & 0 \\ \frac{1}{Z_2} & 1 \end{bmatrix}$$

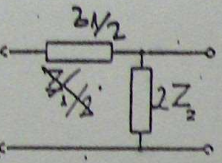


$$\begin{bmatrix} \frac{Z_1 + 2Z_2}{2} & 2Z_2 \\ 2Z_2 & 2Z_2 \end{bmatrix}$$

$$\begin{bmatrix} \frac{Z_1 + 2Z_2}{2} & 2Z_2 \\ 2Z_2 & 2Z_2 \end{bmatrix}$$

$$\begin{bmatrix} \frac{2}{Z_1} & -\frac{2}{Z_1} \\ -\frac{2}{Z_1} & \frac{2}{Z_1} + \frac{1}{2Z_2} \end{bmatrix}$$

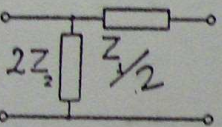
$$\begin{bmatrix} 1 + \frac{Z_1}{4Z_2} & \frac{Z_1}{2} \\ \frac{1}{2Z_2} & 1 \end{bmatrix}$$



$$\begin{bmatrix} 2Z_2 & 2Z_2 \\ 2Z_2 & \frac{Z_1}{2} + 2Z_2 \end{bmatrix}$$

$$\begin{bmatrix} \frac{2}{Z_1} + \frac{1}{2Z_2} & -\frac{2}{Z_1} \\ -\frac{2}{Z_1} & \frac{2}{Z_1} \end{bmatrix}$$

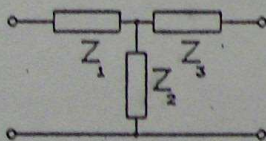
$$\begin{bmatrix} 1 & \frac{Z_1}{2} \\ \frac{1}{2Z_2} & 1 + \frac{Z_1}{4Z_2} \end{bmatrix}$$



$$\begin{bmatrix} Z_1 + Z_2 & Z_2 \\ Z_2 & Z_2 + Z_3 \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{Z_1 + Z_2 + Z_3} & \frac{-1}{Z_1 + Z_2 + Z_3} \\ \frac{-1}{Z_1 + Z_2 + Z_3} & \frac{1}{Z_1 + Z_2 + Z_3} \end{bmatrix}$$

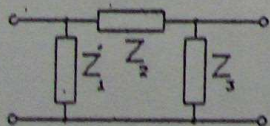
$$\begin{bmatrix} \frac{Z_1}{Z_2} + 1 & Z_1 + Z_2 + \frac{Z_1 Z_3}{Z_2} \\ \frac{1}{Z_2} & \frac{Z_3}{Z_2} + 1 \end{bmatrix}$$



$$\begin{bmatrix} \frac{Z_1(Z_2 + Z_3)}{Z_1 + Z_2 + Z_3} & \frac{Z_1 Z_3}{Z_1 + Z_2 + Z_3} \\ \frac{Z_1 Z_3}{Z_1 + Z_2 + Z_3} & \frac{Z_3(Z_1 + Z_2)}{Z_1 + Z_2 + Z_3} \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{Z_1} + \frac{1}{Z_2} & \frac{1}{Z_2} \\ -\frac{1}{Z_2} & \frac{1}{Z_2} + \frac{1}{Z_3} \end{bmatrix}$$

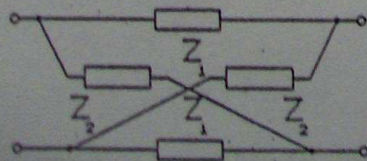
$$\begin{bmatrix} \frac{Z_1}{Z_3} + 1 & Z_2 \\ \frac{1}{Z_1} + \frac{1}{Z_3} + \frac{Z_2}{Z_1 Z_3} & \frac{Z_2}{Z_1} + 1 \end{bmatrix}$$



$$\begin{bmatrix} \frac{Z_1 + Z_2}{2} & \frac{Z_2 - Z_1}{2} \\ \frac{Z_2 - Z_1}{2} & \frac{Z_1 + Z_2}{2} \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{2Z_1} + \frac{1}{2Z_2} & -\left(\frac{1}{2Z_1} - \frac{1}{2Z_2}\right) \\ -\left(\frac{1}{2Z_1} - \frac{1}{2Z_2}\right) & \frac{1}{2Z_1} + \frac{1}{2Z_2} \end{bmatrix}$$

$$\begin{bmatrix} \frac{Z_2 + Z_1}{Z_2 - Z_1} & \frac{2Z_2 Z_1}{Z_2 - Z_1} \\ \frac{2}{Z_2 - Z_1} & \frac{Z_2 + Z_1}{Z_2 - Z_1} \end{bmatrix}$$

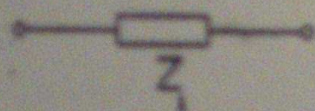


$$\begin{bmatrix} U_1 \\ U_2 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

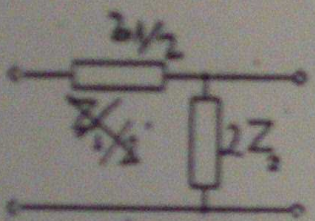
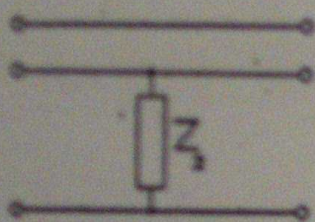
OSNOVNE KONFIGURACIJE CETVEROPOLA I PRIPADNI PARAMETRI

CETVEROPOL

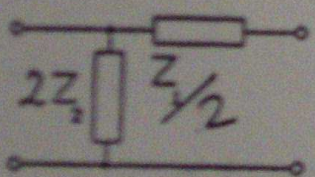
Z-PARAMETRI



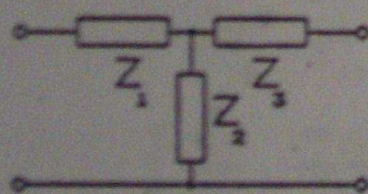
$$\begin{bmatrix} Z_1 & Z_2 \\ Z_2 & Z_2 \end{bmatrix}$$



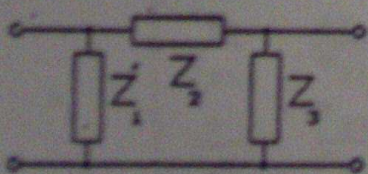
$$\begin{bmatrix} \frac{Z_1}{2} + 2Z_2 & 2Z_2 \\ 2Z_2 & 2Z_2 \end{bmatrix}$$



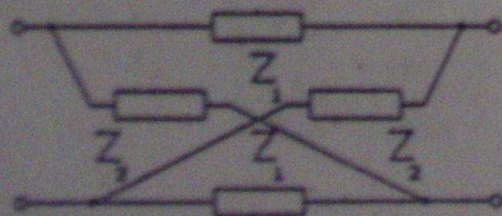
$$\begin{bmatrix} 2Z_2 & 2Z_2 \\ 2Z_2 & \frac{Z_1}{2} + 2Z_2 \end{bmatrix}$$



$$\begin{bmatrix} Z_1 + Z_2 & Z_2 \\ Z_2 & Z_2 + Z_2 \end{bmatrix}$$



$$\begin{bmatrix} \frac{Z_1(Z_2 + Z_3)}{Z_1 + Z_2 + Z_3} & \frac{Z_1 Z_3}{Z_1 + Z_2 + Z_3} \\ \frac{Z_1 Z_3}{Z_1 + Z_2 + Z_3} & \frac{Z_3(Z_1 + Z_2)}{Z_1 + Z_2 + Z_3} \end{bmatrix}$$



$$\begin{bmatrix} \frac{Z_1 + Z_2}{2} & \frac{Z_2 - Z_1}{2} \\ \frac{Z_2 - Z_1}{2} & \frac{Z_1 + Z_2}{2} \end{bmatrix}$$

$$\begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

DODATK 3

$$\begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{bmatrix} \begin{bmatrix} U_1 \\ U_2 \end{bmatrix}$$

$$\begin{bmatrix} U_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} U_2 \\ -I_2 \end{bmatrix}$$

Y-PARAMETRI

$$\begin{bmatrix} \frac{1}{Z_1} & \frac{1}{Z_1} \\ -\frac{1}{Z_1} & \frac{1}{Z_1} \end{bmatrix}$$

A-PARAMETRI

$$\begin{bmatrix} 1 & Z_1 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ \frac{1}{Z_2} & 1 \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{Z_1} + \frac{1}{Z_2} & \frac{1}{Z_2} \\ \frac{1}{Z_2} & \frac{1}{Z_2} \end{bmatrix}$$

$$\begin{bmatrix} \frac{2}{Z_1} & -\frac{2}{Z_1} \\ -\frac{2}{Z_1} & \frac{2}{Z_1} + \frac{1}{Z_2} \end{bmatrix}$$

$$\begin{bmatrix} 1 + \frac{Z_1}{4Z_2} & \frac{Z_1}{2} \\ \frac{1}{2Z_2} & 1 \end{bmatrix}$$

$$\begin{bmatrix} \frac{2}{Z_1} + \frac{1}{2Z_2} & -\frac{2}{Z_1} \\ -\frac{2}{Z_1} & \frac{2}{Z_1} \end{bmatrix}$$

$$\begin{bmatrix} 1 & \frac{Z_1}{2} \\ \frac{1}{2Z_2} & 1 + \frac{Z_1}{4Z_2} \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{Z_1 + \frac{Z_2 Z_3}{Z_2 + Z_3}} & \frac{-1}{Z_1 + Z_3 + \frac{Z_1 Z_3}{Z_2}} \\ \frac{-1}{Z_1 + Z_3 + \frac{Z_1 Z_3}{Z_2}} & \frac{1}{Z_3 + \frac{Z_1 Z_2}{Z_1 + Z_2}} \end{bmatrix}$$

$$\begin{bmatrix} \frac{Z_1}{Z_2} + 1 & Z_1 + Z_3 + \frac{Z_1 Z_3}{Z_2} \\ \frac{1}{Z_2} & \frac{Z_3}{Z_2} + 1 \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{Z_1} + \frac{1}{Z_2} & \frac{1}{Z_2} \\ -\frac{1}{Z_2} & \frac{1}{Z_2} + \frac{1}{Z_3} \end{bmatrix}$$

$$\begin{bmatrix} \frac{Z_2}{Z_3} + 1 & Z_2 \\ \frac{1}{Z_1} + \frac{1}{Z_3} + \frac{Z_2}{Z_1 Z_3} & \frac{Z_2}{Z_1} + 1 \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{2Z_1} + \frac{1}{2Z_2} & -\left(\frac{1}{2Z_1} - \frac{1}{2Z_2}\right) \\ -\left(\frac{1}{2Z_1} - \frac{1}{2Z_2}\right) & \frac{1}{2Z_1} + \frac{1}{2Z_2} \end{bmatrix}$$

$$\begin{bmatrix} \frac{Z_2 + Z_1}{Z_2 - Z_1} & \frac{2Z_2 Z_1}{Z_2 - Z_1} \\ \frac{2}{Z_2 - Z_1} & \frac{Z_2 + Z_1}{Z_2 - Z_1} \end{bmatrix}$$