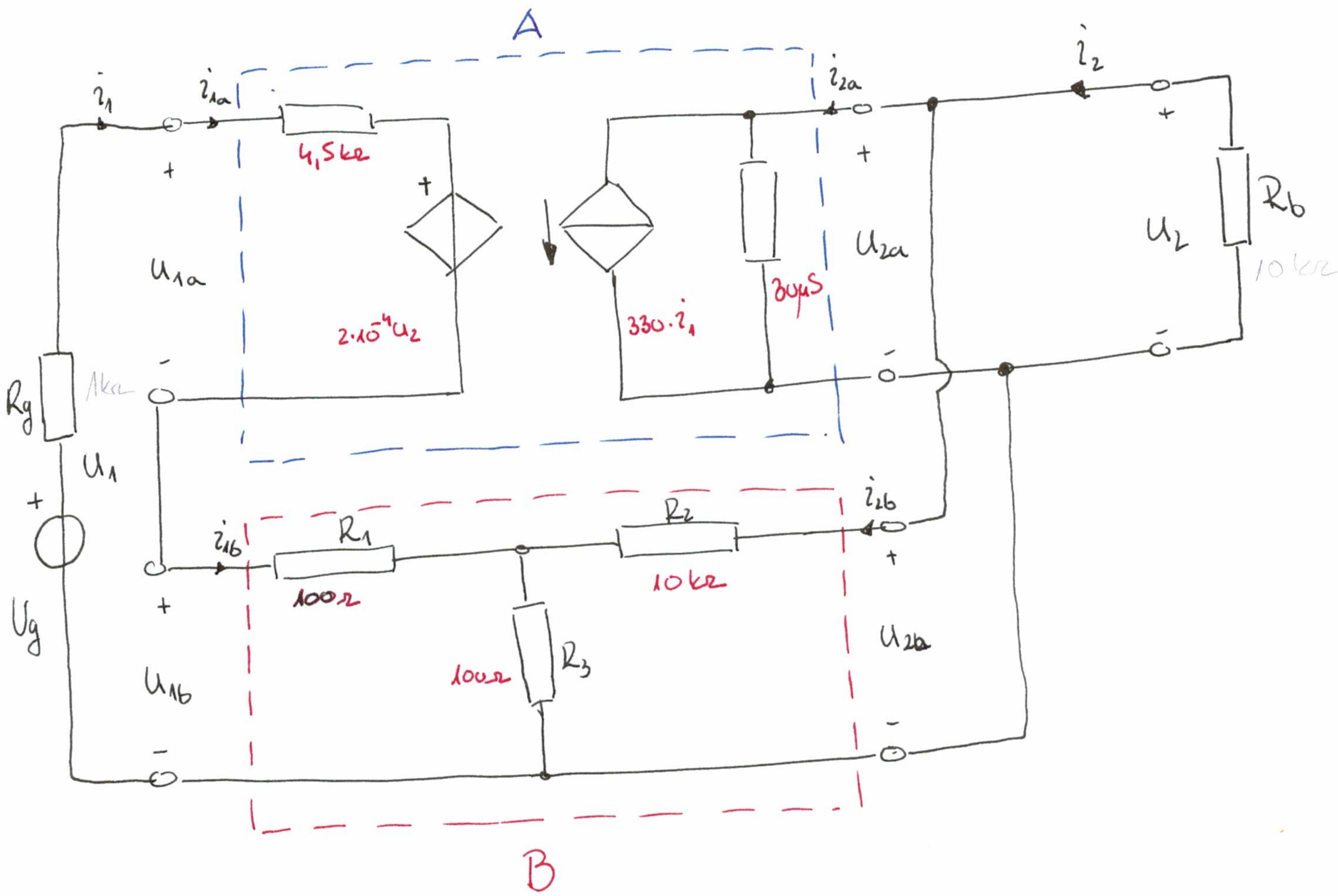


$i_1 = i_{1a} = i_{1b}$ $\qquad$ $u_2 = u_{2a} = u_{2b}$ $\quad$ Skupne veličine

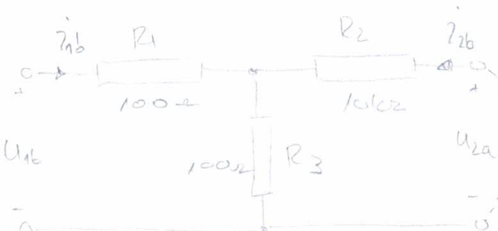
$u_1 = u_{1a} + u_{1b}$ $\qquad$ $i_2 = i_{2a} + i_{2b}$

enačbe

$$u_1 = h_{11} i_1 + h_{12} u_2$$
$$i_2 = h_{21} i_1 + h_{22} u_2$$

$$[Ha] = \begin{bmatrix} 4{,}5k\Omega & 2\cdot10^{-4} \\ 330 & 30\mu S \end{bmatrix}$$

$u_2 = \emptyset$



$[Hb] =$

$$h_{11b} = \left.\frac{u_{1b}}{i_{1b}}\right|_{u_{2b}=\emptyset} = \frac{i_{1b}\cdot(R_1 + R_2 \| R_3)}{i_{1b}} = \boxed{199\,\Omega}$$

$$h_{12b} = \left.\frac{u_{1b}}{u_{2b}}\right|_{i_{1b}=\emptyset} = \frac{\frac{u_{2b}\cdot R_3}{R_2+R_3}}{u_{2b}} = \boxed{9{,}9\cdot10^{-3}}$$

$$h_{21b} = \left.\frac{i_{2b}}{i_{1b}}\right|_{u_{2b}=\emptyset} = \frac{\frac{-i_{1b}\cdot R_2\|R_3}{R_2}}{i_{1b}} = \boxed{-9{,}9\cdot10^{-3}}$$

$$h_{22b} = \left.\frac{i_{2b}}{u_{2b}}\right|_{i_{1b}=\emptyset} = \frac{i_{2b}}{i_{2b}\cdot(R_2+R_3)} = 99\cdot10^{-6}\,S = \boxed{99\,\mu S}$$

Brez P.V. | S P.V.

$$Z_{vh} = \frac{h_{11} + \Delta H_a Z_b}{1 + h_{22} Z_b} = \frac{4{,}5\,k\Omega + 0{,}069 \cdot 10\,k\Omega}{1 + 30\,\mu S \cdot 10\,k\Omega} = 3{,}992\,k\Omega \quad = -9{,}935\,k\Omega$$

$$Z_{iz} = \frac{h_{11} + Z_g}{\Delta H_a + h_{22} Z_g} = \frac{4{,}5\,k\Omega + 1\,k\Omega}{0{,}069 + 30\,\mu S \cdot 1\,k\Omega} = 55{,}56\,k\Omega \quad = -2{,}154\,k\Omega$$

$$A_u = \frac{-h_{21} Z_b}{h_{11} + \Delta H_a Z_b} = \frac{-330 \cdot 10\,k\Omega}{4{,}5\,k\Omega + 0{,}069 \cdot 10\,k\Omega} = -635{,}84 \quad = 145$$

$$A_i = \frac{h_{21}}{1 + h_{22} Z_b} = \frac{330}{1 + 30\,\mu S \cdot 10\,k\Omega} = 253{,}85 \quad = 144$$

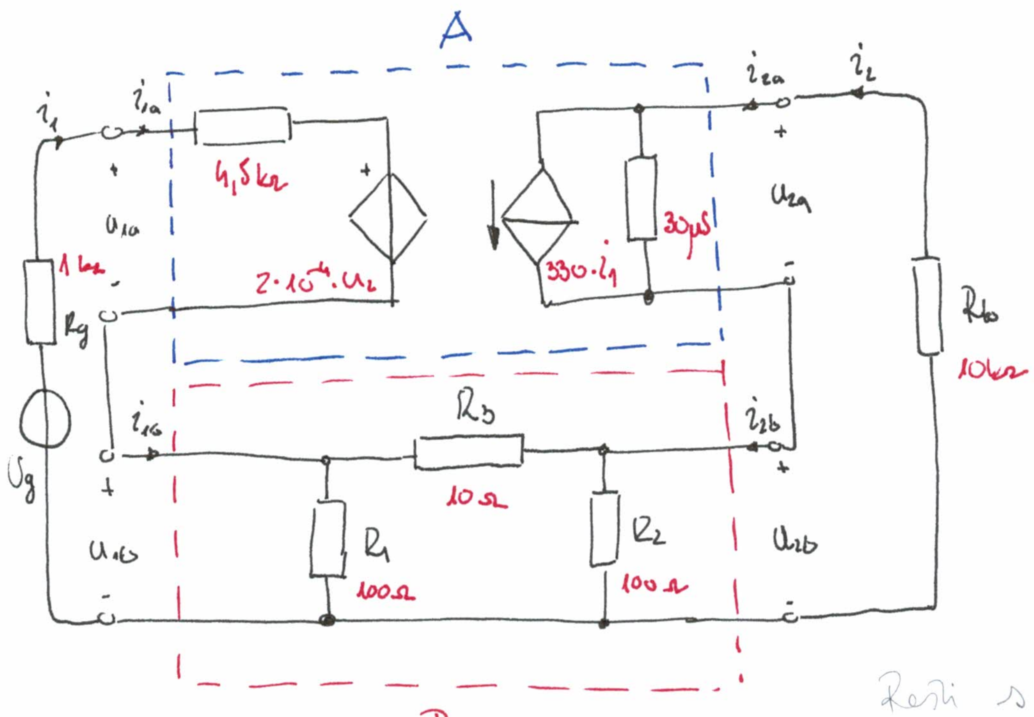
$$A_g = \frac{h_{21}}{h_{11} + \Delta H_a Z_b} = \frac{330}{4{,}5\,k\Omega + 0{,}069 \cdot 10\,k\Omega} = 63{,}58\,mS \quad = -14{,}5\,mS$$

$$A_r = \frac{-h_{21} Z_b}{1 + h_{22} Z_b} = \frac{-330 \cdot 10\,k\Omega}{1 + 330 \cdot 10\,k\Omega} = -2{,}54\,M\Omega \quad = -1{,}44\,M\Omega$$

$$A_p = A_u \cdot A_i =$$

$$[H_a] = \begin{bmatrix} 4{,}5\,k\Omega & 2 \cdot 10^{-4} \\ 330 & 30\,\mu S \end{bmatrix} \qquad [H] = [H_a] + [H_b] = \begin{bmatrix} 4{,}619\,k\Omega & 10{,}1 \cdot 10^{-3} \\ 329{,}99 & 129\,\mu S \end{bmatrix}$$

$$\Delta H_a = 0{,}069 \qquad \Delta H = -2{,}737$$



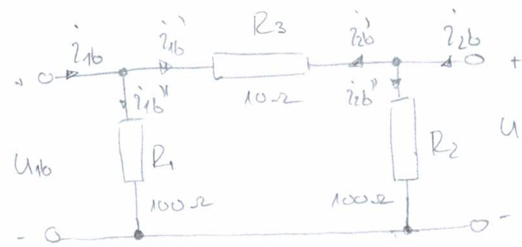
Reši s Z parametri

$$[H_a] = \begin{bmatrix} 4{,}5\,k\Omega & 2\cdot10^{-4} \\ 330 & 30\,\mu S \end{bmatrix} \Rightarrow [Z_a] = \begin{bmatrix} 2{,}3\,k\Omega & 6{,}67\,\Omega \\ -11\,M\Omega & 33{,}3\,k\Omega \end{bmatrix}$$

$$\Delta Z_a = 1{,}5\cdot10^{8}$$

$[Z_b] =$

$$u_1 = Z_{11} i_1 + Z_{12} i_2$$
$$u_2 = Z_{21} i_1 + Z_{22} i_2$$



$$Z_{11b} = \frac{u_{1b}}{i_{1b}}\Big|_{i_{2b}=0} = \frac{i_{1b}(R_1 \| (R_3+R_2))}{i_{1b}} = 52{,}38\,\Omega$$

$$i_{2b}' = \frac{u_{2b}}{R_1+R_3} \qquad i_{2b}'' = \frac{u_{2b}}{R_2}$$

$$u_{1b} = +i_{2b}'\cdot R_1 = \frac{+u_{2b}R_1}{R_1+R_3}$$

$$i_2 = i_{2b}' + i_{2b}'' = \frac{u_{2b}(R_2+R_1+R_3)}{R_2(R_1+R_3)}$$

$$Z_{12b} = \frac{u_{1b}}{i_{2b}}\Big|_{i_{1b}=0} = \frac{\dfrac{+u_{2b}R_1}{(R_1+R_3)}}{\dfrac{u_{2b}(R_1+R_2+R_3)}{R_2(R_1+R_3)}} = \frac{+R_1R_2}{R_1+R_2+R_3} = +47{,}61\,\Omega$$

$$i_{1b}' = \frac{u_{1b}}{R_3+R_2} \qquad i_{1b}'' = \frac{u_{1b}}{R_1}$$

$$i_{1b} = \frac{u_{1b}(R_1+R_2+R_3)}{R_1(R_2+R_3)}$$

$$u_{2b} = +i_{1b}'\cdot R_2 = +\frac{u_{1b}R_2}{R_2+R_3}$$

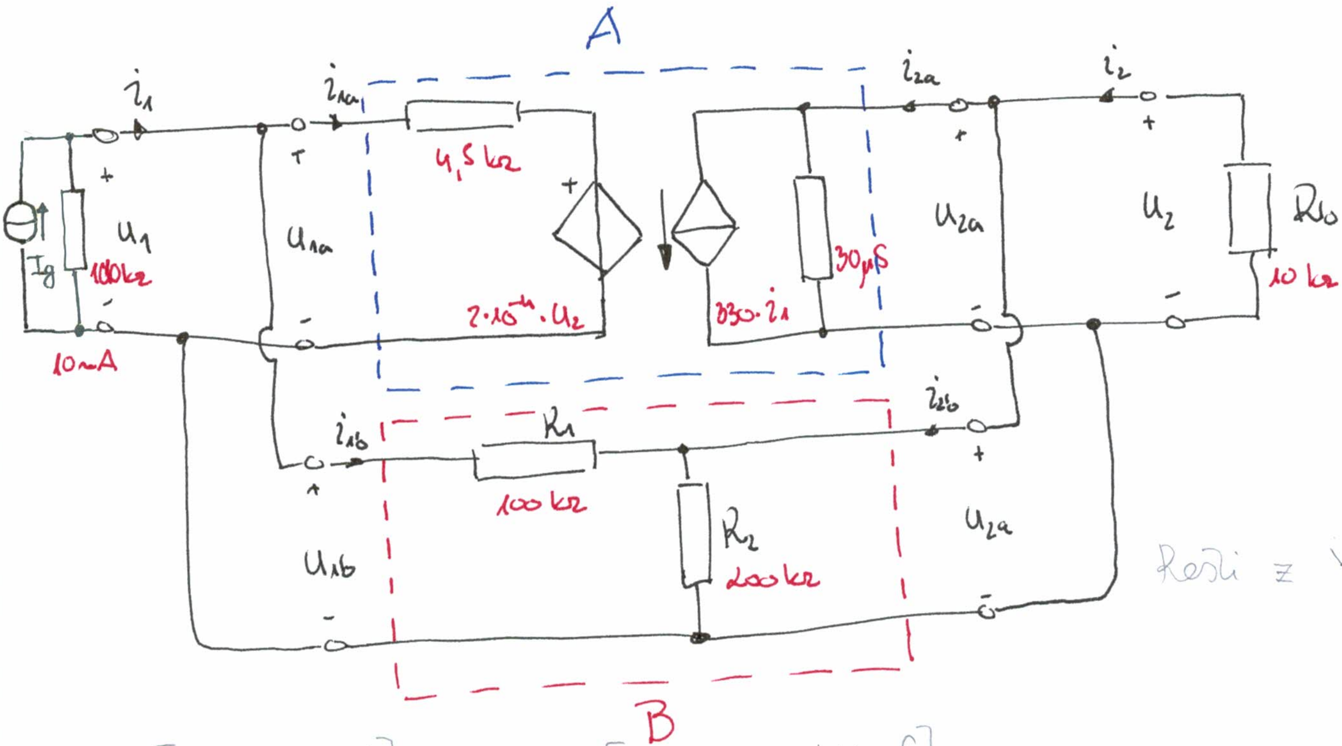
$$Z_{21b} = \frac{u_{2b}}{i_{1b}}\Big|_{i_{2b}=0} = \frac{+\dfrac{u_{1b}R_2}{R_2+R_3}}{\dfrac{u_{1b}(R_1+R_2+R_3)}{R_1(R_2+R_3)}} = \frac{+R_1R_2}{R_1+R_2+R_3} = -47{,}61\,\Omega$$

$$Z_{22b} = \frac{u_{2b}}{i_{2b}}\Big|_{i_1=0} = \frac{i_{2b}\cdot(R_1+R_3)\|R_2}{i_{2b}} = 52{,}38\,\Omega$$

$$[Z_b] = \begin{bmatrix} 52{,}38\,\Omega & +47{,}61\,\Omega \\ +47{,}61\,\Omega & 52{,}38\,\Omega \end{bmatrix}$$

$$[Z] = [Z_a] + [Z_b] = \begin{bmatrix} 2{,}352\,k\Omega & 54{,}28\,\Omega \\ -10{,}99\,M\Omega & 33{,}353\,k\Omega \end{bmatrix}$$

Brez P.V.	S P.V.
$Z_{vh} = \frac{Z_{11} Z_b + \Delta Z}{Z_{22} + Z_b} = \frac{2{,}3\,k\Omega \cdot 10\,k\Omega + 1{,}5 \cdot 10^8}{33{,}3\,k\Omega + 10\,k\Omega} = 3{,}995\,k\Omega$	$= 16{,}12\,k\Omega$
$Z_{izh} = \frac{Z_{22} Z_g + \Delta Z}{Z_{11} + Z_g} = \frac{33{,}3\,k\Omega \cdot 1\,k\Omega + 1{,}5 \cdot 10^8}{2{,}3\,k\Omega + 1\,k\Omega} = 55{,}53\,k\Omega$	$= 211{,}5\,k\Omega$
$A_u = \frac{Z_{21} Z_b}{Z_{11} Z_b + \Delta Z} = \frac{-11\,M\Omega \cdot 10\,k\Omega}{2{,}3\,k\Omega \cdot 10\,k\Omega + 1{,}5 \cdot 10^8} = -636$	$= -157$
$A_i = \frac{-Z_{21}}{Z_{22} + Z_b} = \frac{+11\,M\Omega}{33{,}3\,k\Omega + 10\,k\Omega} = 254$	$= 254$
$A_g = \frac{-Z_{21}}{Z_{11} Z_b + \Delta Z} = \frac{11\,M\Omega}{2{,}3\,k\Omega \cdot 10\,k\Omega + 1{,}5 \cdot 10^8} = 63{,}6\,m$	$= 15{,}74\,m$
$A_r = \frac{Z_{21} Z_b}{Z_{22} + Z_b} = \frac{-11\,M\Omega \cdot 10\,k\Omega}{33{,}3\,k\Omega + 10\,k\Omega} = -2{,}54\,M$	$= -2{,}54\,M$
$A_p = A_u \cdot A_i = -1{,}62 \cdot 10^5$	$= -39{,}93 \cdot 10^5$



Reši z Y parametri

$$[T_a] = \begin{bmatrix} 4{,}5\,k\Omega & 2\cdot 10^{-4} \\ 330 & 30\,\mu S \end{bmatrix} \rightarrow [Y_a] = \begin{bmatrix} 222\,\mu S & -444\,\mu S \\ 73{,}3\,mS & 15{,}3\,\mu S \end{bmatrix}$$

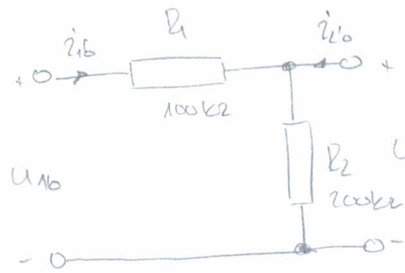
$$\Delta Y_a = 32{,}5\ \mu S^2$$

$u_{1a} = u_{1b} = u_1 \qquad u_{2a} = u_{2b} = u_2$

$i_1 = i_{1a} + i_{1b} \qquad i_2 = i_{2a} + i_{2b}$

$i_1 = y_{11} u_1 + y_{12} u_2$

$i_2 = y_{21} u_1 + y_{22} u_2$



$$y_{11} = \left.\frac{i_{1b}}{u_{1b}}\right|_{u_2=0} = \frac{i_{1b}}{i_{1b}\cdot R_1} = \frac{1}{100k\Omega} = 10\,\mu S$$

$$y_{12} = \left.\frac{i_{1b}}{u_{2b}}\right|_{u_1=0} = \frac{i_{1b}}{-i_{1b}\cdot R_1} = -10\,\mu S$$

$$y_{21} = \left.\frac{i_{2b}}{u_{1b}}\right|_{u_2=0} = \frac{-i_{1b}}{i_{1b}\cdot R_1} = -10\,\mu S$$

$$y_{22} = \left.\frac{i_{2b}}{u_{2b}}\right|_{u_{1b}=0} = \frac{\frac{u_{2b}}{R_1 \| R_2}}{u_{2b}} = \frac{1}{R_1 \| R_2} = 15\,\mu S$$

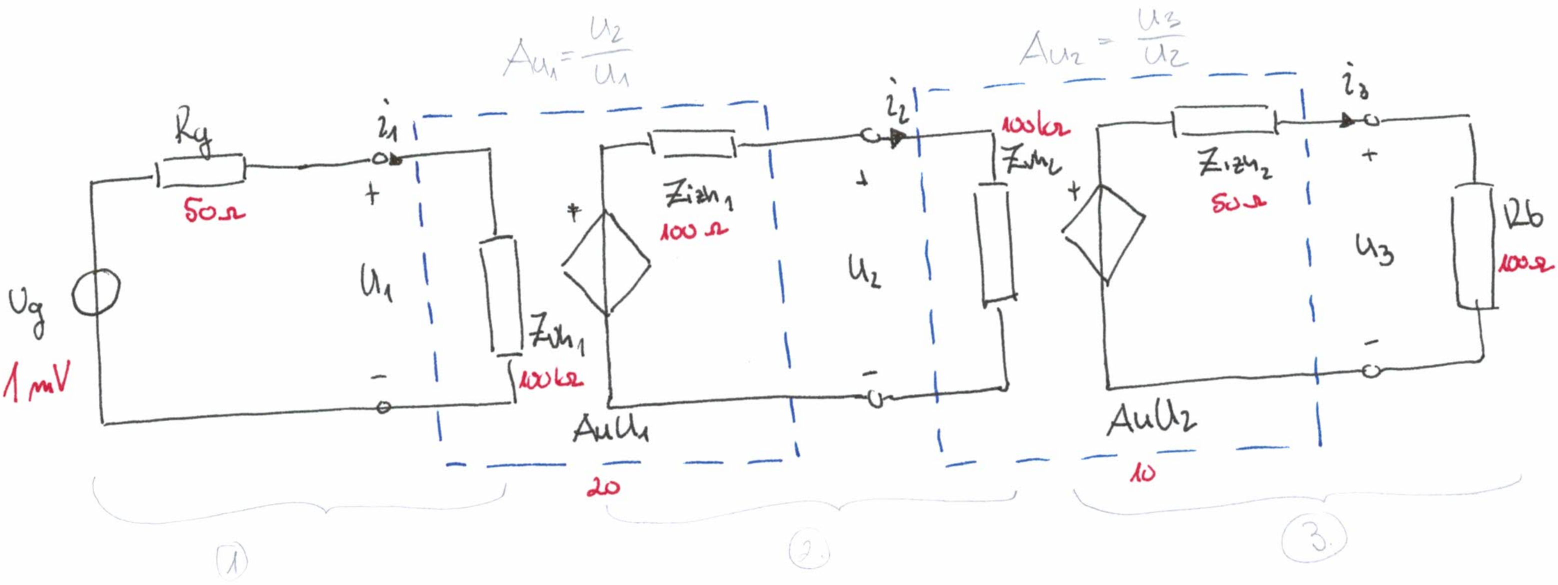
$$[Y_b] = \begin{bmatrix} 10\,\mu S & -10\,\mu S \\ -10\,\mu S & 15\,\mu S \end{bmatrix}$$

$$[Y] = [Y_a] + [Y_b] = \begin{bmatrix} 232\,\mu S & -454\,\mu S \\ 73{,}29\,mS & 30{,}3\,\mu S \end{bmatrix}$$

$$\Delta Y = 32{,}5\,\mu S^2$$

Brez P.V.	S P.V.
$Z_{vh} = \dfrac{1+y_{22}Z_b}{y_{11}+\Delta y Z_b} = \dfrac{1+30{,}3\mu S\cdot 10k\Omega}{232\mu S + 32{,}5\mu S^2\cdot 10k\Omega} = 3{,}54\Omega$	$= 4\Omega$
$Z_{izh} = \dfrac{1+y_{11}Z_g}{y_{22}+\Delta y Z_g} = \dfrac{1+232\mu S\cdot 1k\Omega}{30{,}3\mu S + 32{,}5\mu S\cdot 1k\Omega} = 7{,}13\Omega$	$= 7{,}44\Omega$
$A_u = \dfrac{-y_{21}Z_b}{1+y_{22}Z_b} = \dfrac{-73{,}29mS\cdot 10k\Omega}{1+30{,}3\mu S\cdot 10k\Omega} = -636$	$= -563$
$A_i = \dfrac{y_{21}}{y_{11}+\Delta y Z_b} = \dfrac{73{,}29mS}{232\mu S + 32{,}5\mu S\cdot 10k\Omega} = 0{,}23$	$= 0{,}23$
$A_g = \dfrac{y_{21}}{1+y_{22}Z_b} = \dfrac{73{,}29mS}{1+30{,}3\mu S\cdot 10k\Omega} = 63{,}57m$	$= 56{,}25m$
$A_v = \dfrac{-y_{21}Z_b}{y_{11}+\Delta y Z_b} = \dfrac{-73{,}29mS\cdot 10k\Omega}{232\mu S + 32{,}5\mu S\cdot 10k\Omega} = -2{,}25k$	$= -2{,}25k$

$A_p = A_u \cdot A_i = -143$ | $= -127$



(1)

$$U_g - i_1 R_g - i_1 Z_{vh1} = 0$$

$$U_1 = i_1 Z_{vh1}$$

$$i_1 = \frac{U_g}{R_g + Z_{vh1}}$$

$$U_1 = \frac{U_g Z_{vh1}}{R_g + Z_{vh1}}$$

(2)

$$A_u U_1 - i_2 Z_{izh2} - i_2 Z_{vh2} = 0$$

$$U_2 = i_2 Z_{vh2}$$

$$U_2 = \frac{A_u U_1 Z_{vh2}}{Z_{izh2} + Z_{vh2}}$$

(3)

$$A_u U_2 - i_3 Z_{izh2} - i_3 R_b = 0$$

$$U_3 = i_3 R_b$$

$$U_3 = \frac{A_u U_2 R_b}{Z_{izh2} + R_b}$$

1. 2. 3.

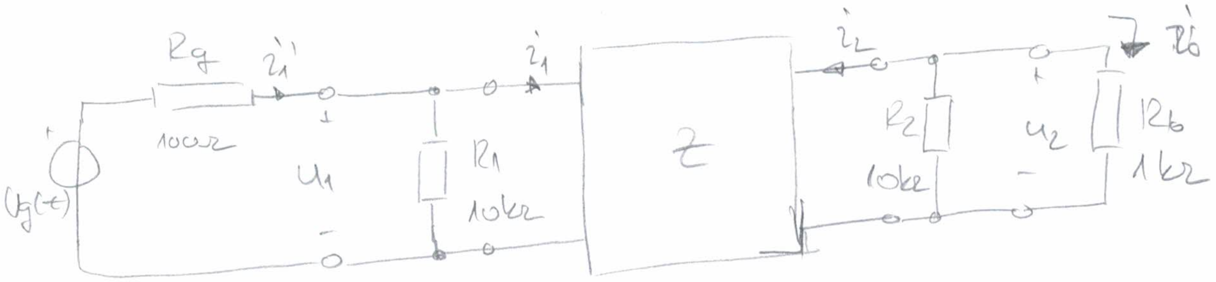
$$U_3 = \frac{U_g Z_{vh1}}{R_g + Z_{vh1}} \cdot \frac{A_u Z_{vh2}}{Z_{izh2} + Z_{vh2}} \cdot \frac{A_u R_b}{Z_{izh2} + R_b}$$

$$A_{uv} = \frac{U_3}{U_g}$$

$$\Rightarrow \frac{U_3}{U_g} = \frac{Z_{vh1}}{R_g + Z_{vh1}} \cdot \frac{A_u Z_{vh2}}{Z_{izh2} + Z_{vh2}} \cdot \frac{A_u R_b}{Z_{izh2} + R_b}$$

$$= \underbrace{\frac{100k\Omega}{50\Omega + 100k\Omega}}_{0{,}9995} \cdot \underbrace{\frac{20 \cdot 100k\Omega}{50 + 100k\Omega}}_{19{,}99} \cdot \underbrace{\frac{10 \cdot 100\Omega}{50 + 100\Omega}}_{6{,}67}$$

$$= \boxed{133{,}2}$$



$A_v = \frac{u_2}{i_1}$

$A_i = \frac{i_b}{i_1}$

$P_{Rb} = ?$

$U_g(t) = 10\,mV \cdot \sin(\omega t)$

$f = 1\,kHz$

$$[Z] = \begin{bmatrix} z_{11} = 2{,}3\,k\Omega & z_{12} = \emptyset \\ z_{21} = -11\,M\Omega & z_{22} = 33{,}3\,k\Omega \end{bmatrix}$$

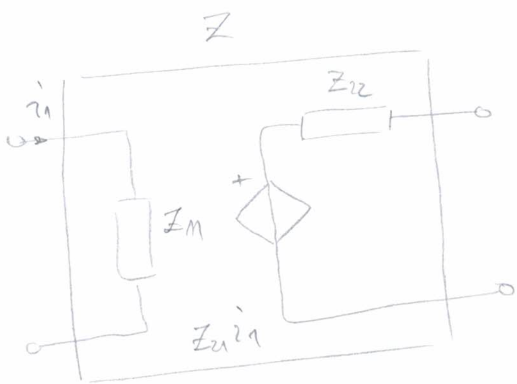
$U_g - i_1' R_g - u_1 = \emptyset$

$u_1 = z_{11} i_1 + z_{12} i_2$

$u_2 = z_{21} i_1 + z_{22} i_2$

$u_2 - i_b R_b = \emptyset$

$u_2 = -i_2 \cdot (R_2 \| R_b)$



$i_1 = \frac{u_1}{z_{11}}$ $\quad u_2 = \frac{z_{21} i_1 \cdot R_2 \| R_b}{z_{22} + R_2 \| R_b}$

$$A_v = \frac{u_2}{i_1} = \frac{z_{21}\, R_2 \| R_b}{z_{22} + R_2 \| R_b} = -292319\,\Omega$$

$$A_i = \frac{i_b}{i_1} = \frac{u_2}{R_b \cdot i_1} = \frac{A_v}{R_b} = -292{,}319$$

$$P_{Rb} = U_{Rb} \cdot i_b = i_b^2 \cdot R_b = \boxed{1{,}46\,mW} \cdot \sin^2(\omega t) = p(t)$$

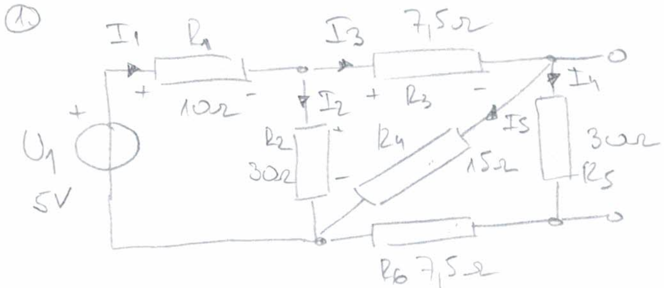
$$P = \frac{1}{T}\int_0^T p(t)\,dt$$

$$u_1 = \frac{U_g (R_1 \| z_{11})}{R_g + R_1 \| z_{11}} = \boxed{9{,}49\,mV} \sin(\omega t)$$

$$i_b = A_i i_1 = A_i \frac{u_1}{z_{11}} = \boxed{1{,}2\,mA} \cdot \sin(\omega t)$$

po metodi superpozicije

①



$$I_1 = \frac{U_1}{R_1 + R_2 \| (R_3 + R_4 \| (R_5 + R_6))} = \frac{5\,V}{21{,}33\Omega} = \boxed{0{,}23\,A}$$

$R_5 + R_6 = 37{,}5$

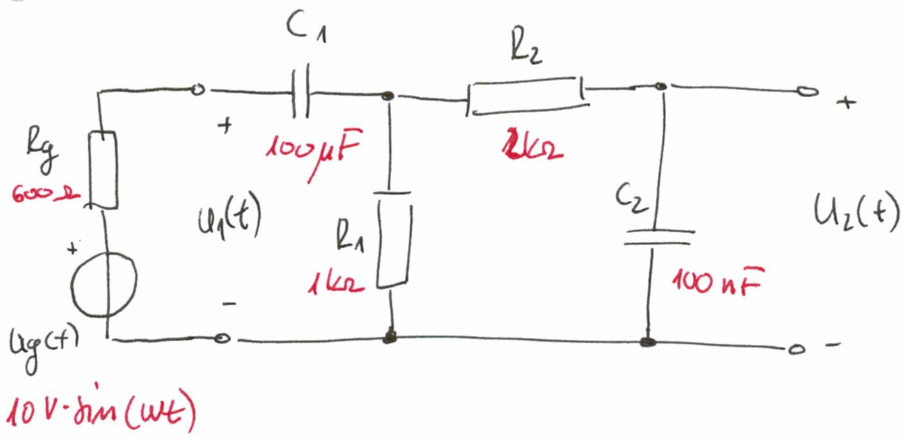
$R_4 \| (R_5 + R_6) = 10{,}71$

$R_3 + R_4 \| (R_5 + R_6) = 18{,}21$

$R_2 \| (\ldots) = 11{,}33$

$$I_2 = \frac{U_1'}{R_2} = \frac{2{,}66}{30\Omega} = 0{,}0885\,A$$

$$I_3 = \frac{U_1'}{18{,}21} = 0{,}1458\,A$$



$$H(j\omega) = \frac{U_2(j\omega)}{U_1(j\omega)}$$

$$\frac{j\omega R_2C_2+1}{j\omega C_2} \,\|\, R_1 = \frac{\frac{j\omega R_2C_2R_1+R_1}{j\omega C_2}}{\frac{j\omega R_2C_2+1}{j\omega C_2}+R_1} = \frac{j\omega R_2C_2R_1+R_1}{j\omega R_2C_2+1+j\omega C_2R_1}$$

998,51 + j22,25

$$U_2(j\omega) = \frac{U_1(j\omega)\cdot R_1\|\left(R_2+\frac{1}{j\omega C_2}\right)\cdot\frac{1}{j\omega C_2}}{\left(\frac{1}{j\omega C_1}+R_1\|\left(R_2+\frac{1}{j\omega C_2}\right)\right)\cdot\left(R_2+\frac{1}{j\omega C_2}\right)}$$

998,51 + j22,25

$$\Rightarrow \frac{U_2(j\omega)}{U_1(j\omega)} = \frac{\frac{j\omega R_2C_2R_1+R_1}{j\omega C_2R_2+1+j\omega C_2R_1}\cdot\frac{1}{j\omega C_2}}{\left(\frac{1}{j\omega C_1}+\frac{j\omega R_2C_2R_1+R_1}{j\omega C_2R_2+1+j\omega C_2R_1}\right)\cdot\frac{j\omega R_2C_2+1}{j\omega C_2}} =$$

$$= \frac{\frac{j\omega R_2C_2R_1+R_1}{j\omega C_2(j\omega C_2R_2+1+j\omega C_2R_1)}}{\frac{j\omega C_2R_2+1+j\omega C_2R_1+(j\omega R_2C_2R_1+R_1)\cdot j\omega C_1}{j\omega C_1\cdot(j\omega C_2R_2+1+j\omega C_2R_1)}\cdot\frac{j\omega R_2C_2+1}{j\omega C_2}}$$

$$= \frac{R_1 j\omega C_1(j\omega R_2C_2+1)}{(j\omega C_2R_2+1+j\omega C_2R_1-\omega^2R_1R_2C_1C_2+j\omega R_1C_1)\cdot(j\omega R_2C_2+1)}$$

$$= \frac{j\omega C_1R_1}{j\omega C_1\left(\frac{C_2R_2}{C_1}+\frac{1}{j\omega C_1}+\frac{C_2R_1}{C_1}+j\omega R_1R_2C_2+R_1\right)} = \frac{R_1}{\left[\frac{C_2R_2}{C_1}+\frac{C_2R_1}{C_1}+R_1\right]+\left[\frac{1}{j\omega C_1}+j\omega R_1R_2C_2\right]} \;*$$

$$\frac{C_2R_2+C_2R_1+R_1C_1}{C_1} = \frac{C_2(R_2+R_1)+R_1C_1}{C_1}$$

(2.)

$$= \frac{R_1}{\left[\frac{C_2(R_1+R_2)+R_1C_1}{C_1}\right]\cdot\left[1+\frac{j\left(\omega R_1R_2C_2-\frac{1}{\omega C}\right)}{\frac{C_2(R_1+R_2)+R_1C_1}{C_1}}\right]} = \frac{R_1}{\underbrace{\left[\frac{C_2(R_1+R_2)+R_1C_1}{C_1}\right]}_{1003}} \cdot \frac{1}{\left[1+\underbrace{\frac{jC_1\left(\omega R_1R_2C_2-\frac{1}{\omega C_1}\right)}{C_2(R_1+R_2)+R_1C_1}}\right]} \doteq$$

$$\Downarrow$$

$$\frac{1000}{1003} \doteq 1$$

$$0{,}997$$

$$= \frac{jC_1\left(\frac{\omega^2R_1R_2C_1C_2-1}{\omega C_1}\right)}{C_2(R_1+R_2)+R_1C_1} = \frac{j\cancel{C_1}(\omega^2R_1R_2C_1C_2-1)}{\omega\cancel{C_1}(C_2(R_1+R_2)+R_1C_1)} = j\left(\frac{\omega^{\cancel{2}}R_1R_2C_1C_2}{\cancel{\omega}(C_2(R_1+R_2)+R_1C_1)} - \frac{1}{\omega(C_2(R_1+R_2)+R_1C_1)}\right)$$

$$= \frac{\omega\cdot 2\cdot 10^{-5}}{0{,}1003} - \frac{1}{\omega\cdot 0{,}1003} = \frac{\omega}{5015} - \frac{9{,}97}{\omega}$$

$$\frac{\omega\cdot a}{b} = \frac{\omega}{\frac{b}{a}} \qquad \frac{a}{\omega b} = \frac{\frac{a}{b}}{\omega}$$

$$\doteq \frac{1}{1+j\left(\frac{\omega}{5015}-\frac{9{,}97}{\omega}\right)}$$

$$C_1\left(\omega R_1R_2C_2-\frac{1}{\omega C_1}\right) = \emptyset$$

$$\omega R_1R_2C_2C_1 - \frac{1}{\omega} = \emptyset$$

$$\omega^2 = R_1R_2C_1R_2$$

$$\boxed{\omega = \sqrt{R_1R_2C_1C_2}}$$

$$Im\{H(j\omega)\} = \emptyset$$

$$\frac{\omega}{5015} = \frac{9{,}97}{\omega}$$

$$\omega^2 = 9{,}97\cdot 5015$$

$$\omega_0 = \sqrt{500.00} = \boxed{223{,}61\ \left[\frac{rad}{s}\right]}$$

$$f_0 = \frac{\omega_0}{2\pi} = \boxed{35{,}59\ Hz} = f$$

(3)

$$\overset{*}{=} \frac{R_1}{\frac{C_2(R_1+R_2)+R_1C_1}{C_1} + j\left(\omega R_1R_2C_2 - \frac{1}{\omega C_1}\right)} = \frac{R_1 \cdot \left[\frac{C_2(R_1+R_2)+R_1C_1}{C_1} - j\left(\omega R_1R_2C_2 - \frac{1}{\omega C_1}\right)\right]}{\left(\frac{C_2(R_1+R_2)+R_1C_1}{C_1}\right)^2 + \left(\omega R_1R_2C_2 - \frac{1}{\omega C_1}\right)^2}$$

$$\varphi = \operatorname{arctg} \frac{-\omega R_1R_2C_2 + \frac{1}{\omega C_1}}{\frac{C_2(R_1+R_2)+R_1C_1}{C_1}} = \operatorname{arctg} \frac{\frac{1}{\omega} - \omega R_1R_2C_1C_2}{C_2(R_1+R_2)+R_1C_1} = \operatorname{arctg} \frac{1-\omega^2 R_1R_2C_1C_2}{\omega(C_2(R_1+R_2)+R_1C_1)}$$

$$U_2(j\omega) = H(j\omega) \cdot U_1(j\omega)$$

$$I(j\omega) = \frac{U_g(t)}{\underbrace{R_g + \frac{1}{j\omega C_1}}_{600+j44{,}72} + \underbrace{R_1 \| \left(R_2 + \frac{1}{j\omega C_2}\right)}_{998{,}51+j22{,}26}} = \frac{10\,V \cdot \sin(\omega t)}{1589{,}51 + j66{,}98\,\Omega} =$$

$1589{,}51 + j66{,}98\,\Omega$

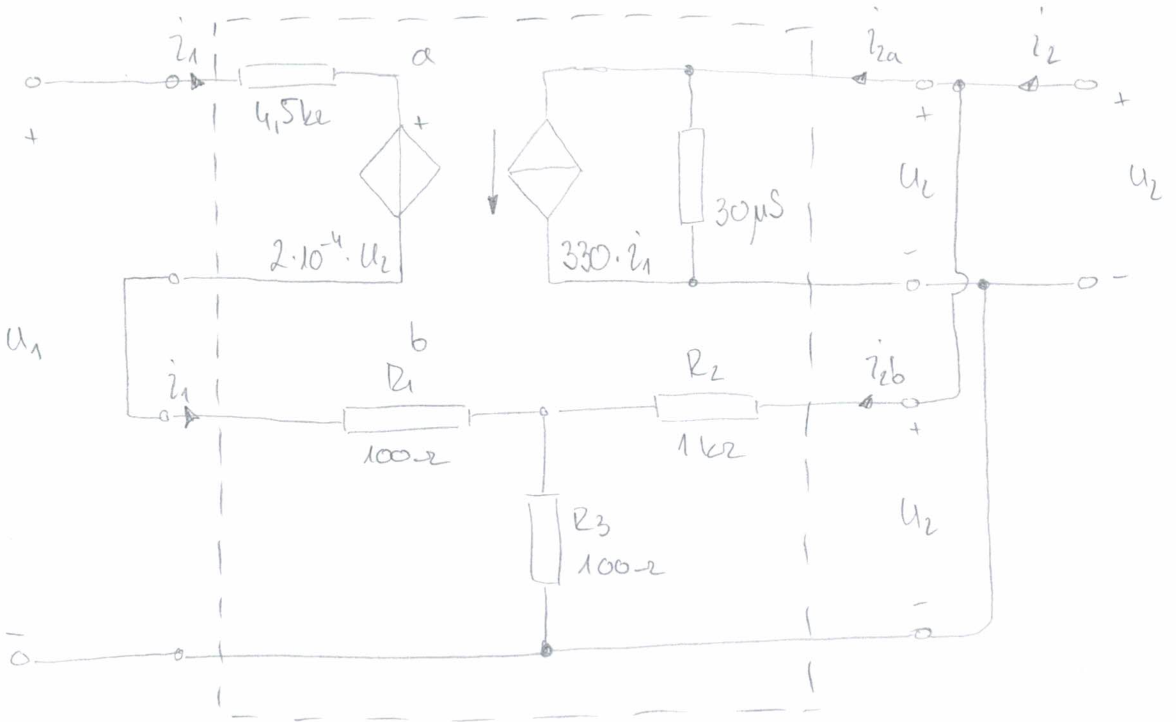
$$= (6{,}25 - j0{,}262) \cdot 10^{-3} A \cdot \sin(\omega t)$$

$$U_1(j\omega) = I(j\omega) \cdot \overbrace{\left(\frac{1}{j\omega C_1} + R_1 \| \underbrace{\left(R_2 + \frac{1}{j\omega C_2}\right)}_{2000+j4472{,}36}\right)}^{998{,}51+j66{,}98} = \underbrace{6{,}25 + j0{,}157\,V \cdot \sin(\omega t)}_{6{,}26V \cdot \sin(\omega t + 1{,}44^\circ)}$$

$$U_2 = \frac{R_1 \cdot \left[\overbrace{\frac{C_2(R_1+R_2)+R_1C_1}{C_1}}^{1003} - j\overbrace{\left(\omega R_1R_2C_2 + \frac{1}{\omega C_1}\right)}^{\emptyset}\right]}{\underbrace{\left(\frac{C_2(R_1+R_2)+R_1C_1}{C_1}\right)^2}_{1006009} + \underbrace{\left(\omega R_1R_2C_2 + \frac{1}{\omega C_1}\right)^2}_{\emptyset}} \cdot (6{,}25 + j0{,}157) \cdot \sin(\omega t)$$

$$U_2 = \underbrace{(6{,}24 + j0{,}157)}_{6{,}24V \cdot e^{j1{,}44^\circ}} \cdot \sin(\omega t)\,V$$

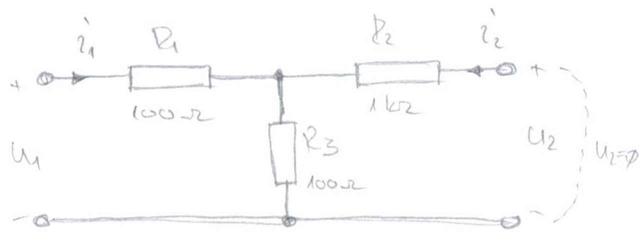
GregorN



$$[H_a] = \begin{bmatrix} 4{,}5\,k\Omega & 2\cdot10^{-4} \\ 330 & 30\mu S \end{bmatrix}$$

$[H_b] =$

$$u_1 = h_{11} i_1 + h_{12} u_2$$
$$i_2 = h_{21} i_1 + h_{22} u_2$$



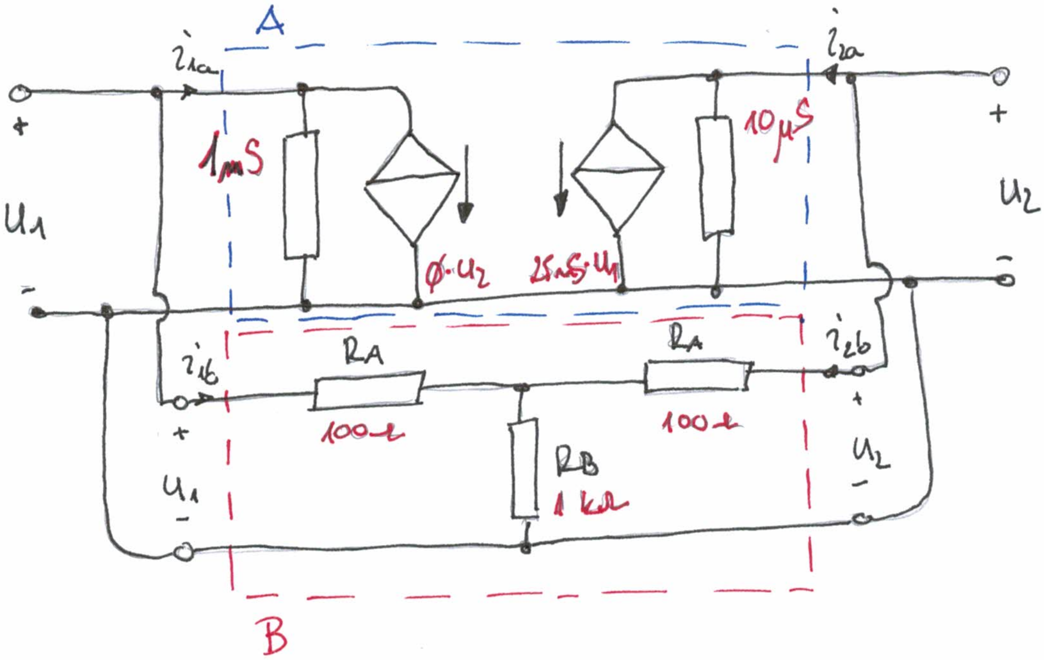
$$h_{11} = \frac{u_1}{i_1}\bigg|_{u_2=\emptyset} = \frac{i_1\cdot(R_1+R_2\|R_3)}{i_1} = \boxed{190{,}91\,\Omega}$$

$$h_{21} = \frac{i_2}{i_1}\bigg|_{u_2=\emptyset} = \frac{-i_1\,\frac{R_2\|R_3}{R_2}}{i_1} = \frac{R_3}{R_2+R_3} = \boxed{-90{,}91\cdot10^{-3}}$$

$$h_{12} = \frac{u_1}{u_2}\bigg|_{i_1=\emptyset} = \frac{i_2\cdot R_3}{i_2\cdot(R_2+R_3)} = \boxed{90{,}91\cdot10^{-3}}$$

$$h_{22} = \frac{i_2}{u_2}\bigg|_{i_1=\emptyset} = \frac{i_2}{i_2\cdot R_2+R_3\|R_1} = \boxed{952{,}381\,\mu S}$$

$$[H] = [H_a]+[H_b] = \begin{bmatrix} 4{,}691\,k\Omega & 9{,}11\cdot10^{-2} \\ 330{,}09 & 982{,}381\,\mu S \end{bmatrix}$$

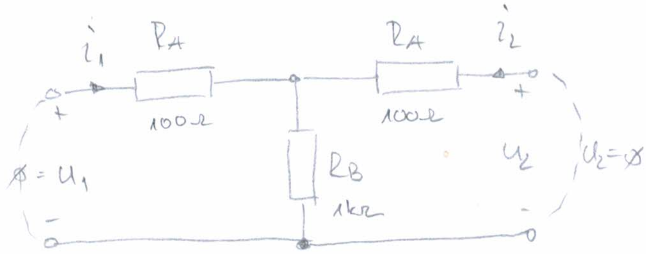


$$[Y_A] = \begin{bmatrix} 1\,mS & \emptyset \\ 25\,mS & 10\,\mu S \end{bmatrix}$$

$$i_1 = y_{11} U_1 + y_{12} U_2$$

$$i_2 = y_{21} U_1 + y_{22} U_2$$

$$[Y_B] =$$



$$y_{11} = \frac{i_1}{U_1}\bigg|_{U_2=\emptyset} = \frac{i_1}{i_1 \cdot (R_A + R_A \| R_B)} = \boxed{5{,}238\,mS}$$

$$y_{12} = \frac{i_1}{U_2}\bigg|_{U_1=\emptyset} = \frac{-\frac{i_2 \cdot R_A \| R_B}{R_A}}{i_2 (R_A + R_A \| R_B)}$$

$$i_1 = \frac{i_2 \cdot R_A \| R_B}{R_A}$$

$$U_2 = i_2 \cdot (R_A + R_A \| R_B)$$

$$= \frac{\frac{R_A R_B}{R_A + R_B}}{R_A \left(R_A + \frac{R_A R_B}{R_A + R_B}\right)} = \frac{\frac{-R_B}{R_A + R_B}}{\frac{R_A(R_A + R_B) + R_A R_B}{R_A + R_B}} = \frac{-R_B}{R_A(R_A + 2R_B)} = \boxed{-4{,}762\,mS}$$

$$y_{21} = \frac{i_2}{U_1}\bigg|_{U_2=\emptyset} = y_{12} = \boxed{-4{,}762\,mS}$$

$$[Y_B] = \begin{bmatrix} 5{,}238\,mS & -4{,}762\,mS \\ -4{,}762\,mS & 5{,}238\,mS \end{bmatrix}$$

$$y_{22} = \frac{i_2}{U_2}\bigg|_{i_1=\emptyset} = \frac{i_2}{i_2 (R_A + R_A \| R_B)} = \boxed{5{,}238\,mS}$$

$$[Y] = [Y_A] + [Y_B] = \begin{bmatrix} 6{,}238\,mS & -4{,}762\,mS \\ 20{,}238\,mS & 5{,}248\,mS \end{bmatrix}$$