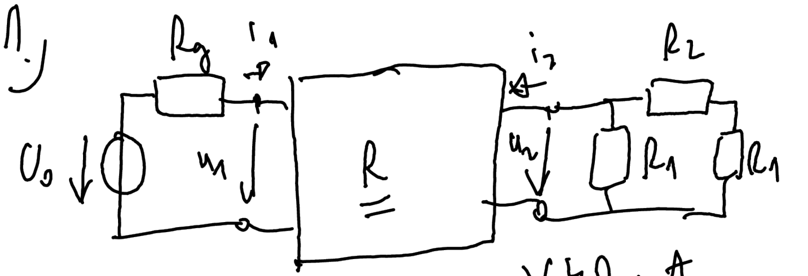
1.)



V, kΩ, mA

$\underline{\underline{R}} = \begin{pmatrix} 5 & 8 \\ -2 & 7 \end{pmatrix} k\Omega$

$R_g = 5\ k\Omega$

$R_1 = 10\ k\Omega\ ;\ U_0 = 20V$

$R_2 = 2\ k\Omega$

egyenletek:

„bal oldali hurok": $U_0 - R_g \cdot I_1 = U_1$ (1) → $20 - I_1 \cdot 5 = U_1$

jobb oldal „hurok": $U_2 = (-I_2) \cdot R_1 \times (R_1 + R_2)$ (2) → $U_2 + I_2 \cdot 10 \times 12 = 0$

karakterisztikák: $U_1 = R_{11} \cdot I_1 + R_{12} \cdot I_2$ (3) → $U_1 = 5I_1 + 8I_2$

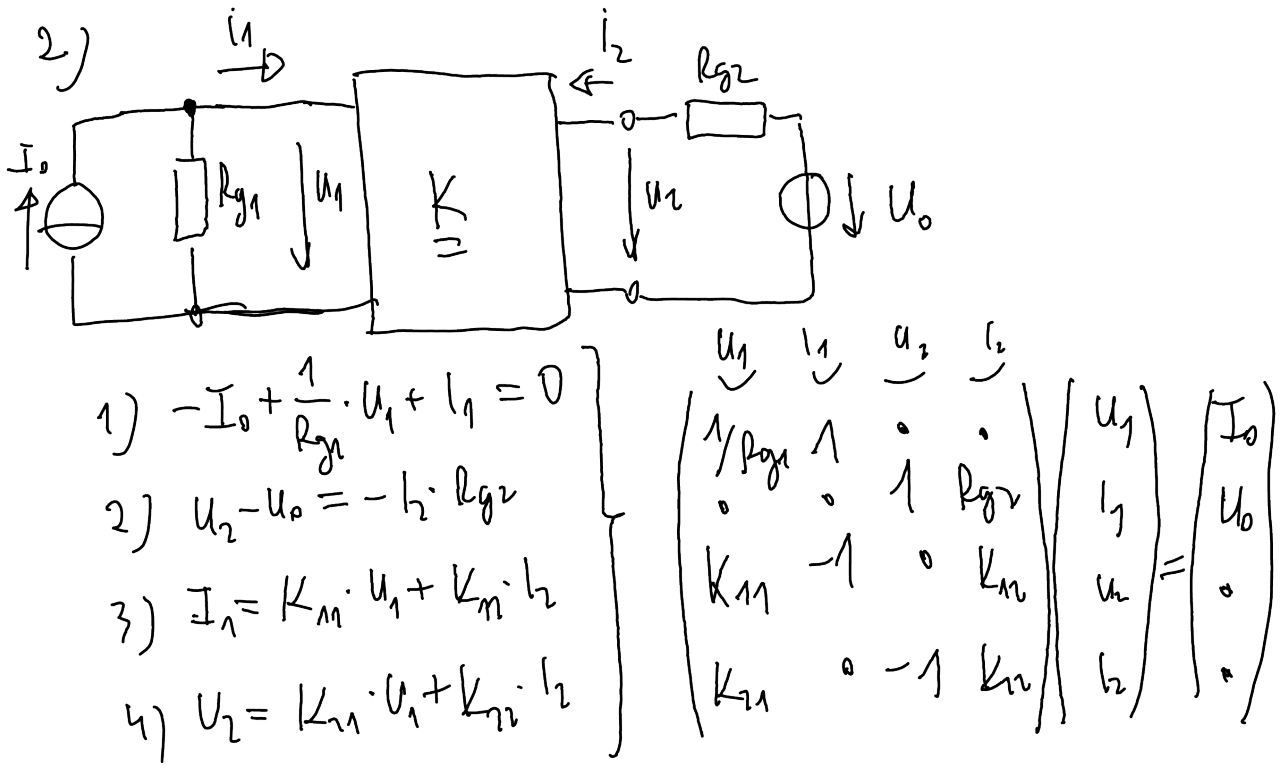
$U_2 = R_{21} \cdot I_1 + R_{22} \cdot I_2$ (4) → $U_2 = -2I_1 + 7I_2$

$10 \times 12 = 120/22 = \frac{60}{11}$

Egyenletrendszer

$$
\begin{aligned}
U_0 - R_g \cdot I_1 = U_1 \\
U_2 = (-I_2) \cdot (R_1 \times (R_1 + R_2)) \\
U_1 = R_{11} \cdot I_1 + R_{12} \cdot I_2 \\
U_2 = R_{21} \cdot I_1 + R_{22} \cdot I_2
\end{aligned} \tag{1}
$$

$$
\begin{pmatrix} 1 & 5 & \cdot & \cdot \\ \cdot & \cdot & 1 & 60/11 \\ -1 & 5 & \cdot & 8 \\ \cdot & 2 & 1 & -7 \end{pmatrix} \cdot \begin{pmatrix} U_1 \\ I_1 \\ U_2 \\ I_2 \end{pmatrix} = \begin{pmatrix} 20 \\ \cdot \\ \cdot \\ \cdot \end{pmatrix} \Rightarrow \begin{pmatrix} U_1 \\ I_1 \\ U_2 \\ I_2 \end{pmatrix} = \begin{pmatrix} 11,138V \\ 1,773mA \\ -1,5524V \\ 0,2846mA \end{pmatrix}
$$



Egyenletek

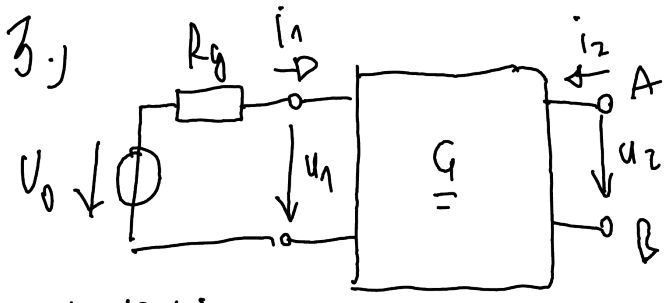
$$-I_0 + \frac{1}{R_{g1}} \cdot U_1 + I_1 = 0 \tag{1}$$

$$U_2 - U_0 = -I_2 \cdot R_{g2} \tag{2}$$

$$I_1 = K_{11} \cdot U_1 + K_{12} \cdot I_2 \tag{3}$$

$$U_2 = K_{21} \cdot U_1 + K_{22} \cdot I_2 \tag{4}$$

$$\begin{pmatrix} 0,1 & 1 & \cdot & \cdot \\ \cdot & \cdot & 1 & 5 \\ 0,2 & -1 & \cdot & -0,5 \\ 1 & \cdot & -1 & 1 \end{pmatrix} \cdot \begin{pmatrix} U_1 \\ I_1 \\ U_2 \\ I_2 \end{pmatrix} = \begin{pmatrix} 5 \\ 100 \\ \cdot \\ \cdot \end{pmatrix} \Rightarrow \begin{pmatrix} U_1 \\ I_1 \\ U_2 \\ I_2 \end{pmatrix} = \begin{pmatrix} 34,7826V \\ 1,5217mA \\ 45,6522V \\ 10,8696mA \end{pmatrix}$$



· Thévenin-fk.

· Norton-h.k

-kSI, V, mA egységek

$U_0 = 10V$;
$R_g = 2k\Omega$

$\underline{\underline{G}} = \begin{pmatrix} 5 & 4 \\ 7 & 8 \end{pmatrix} mS$

① $U_0 - I_1 \cdot R_g - U_1 = 0$

② $I_2 = 0$ ← szakadás → $U_T = U_2$

③ $I_1 = G_{11} \cdot U_1 + G_{12} \cdot U_2$

④ $I_2 = G_{21} \cdot U_1 + G_{22} \cdot U_2$

②* $U_1 = 0$ $I_{rz} = -I_2$

$I_r = -I_{rz} = I_2$

Szakadással történő lezárás ($I_2 = 0$)

$$U_0 - I_1 \cdot R_g - U_1 = 0 \tag{1}$$

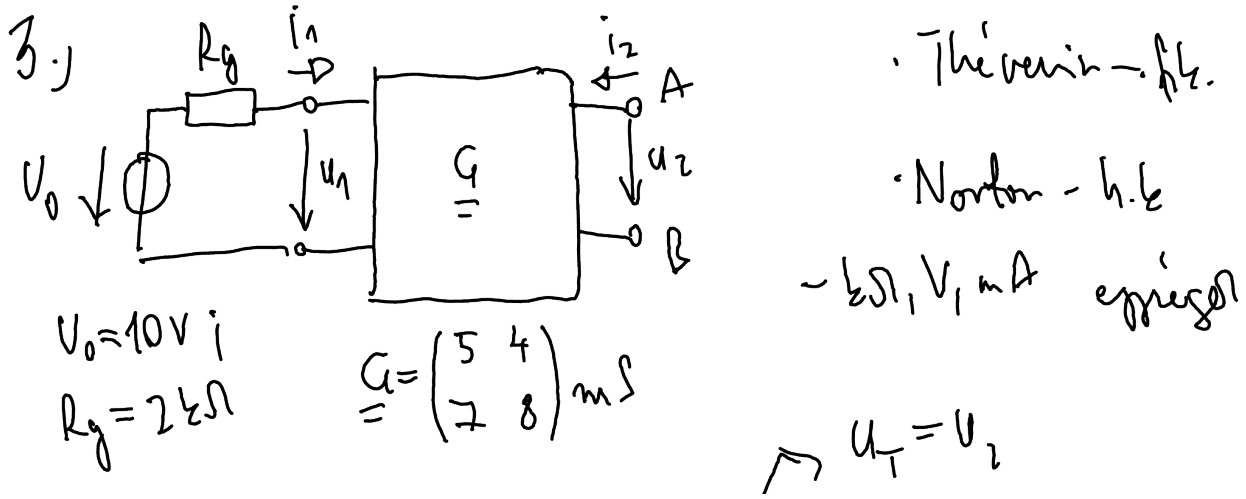
$$I_2 = 0 \tag{2}$$

$$I_1 = G_{11} \cdot U_1 + G_{12} \cdot U_2 \tag{3}$$

$$I_2 = G_{21} \cdot U_1 + G_{22} \cdot U_2 \tag{4}$$

Üresjárási feszültség :

$$U_T = U_2 = -2.1875V$$



Rövidzárral történő lezárás ($I_2 = 0$)

$$U_0 - I_1 \cdot R_g - U_1 = 0 \tag{1}$$
$$2_2 = 0 \tag{2}$$
$$I_1 = G_{11} \cdot U_1 + G_{12} \cdot U_2 \tag{3}$$
$$I_2 = G_{21} \cdot U_1 + G_{22} \cdot U_2 \tag{4}$$

Rövidzát árama :

$$I_N = -I_{rz} = -(-I_2) = I_2 = 6.3636mA$$

R_B számítása :

$$R_B = -\frac{U_T}{I_N} = -\frac{-2,1875V}{6,3636mA} = 0,3438k\Omega$$