Jelek és rendszerek 1. – 1. gyakorlat

$\begin{pmatrix} \cdot \\ \vdots \\ \cdot \end{pmatrix}$ $(\cdots)$ $(\cdot\ \cdot\ \cdot)\cdot\begin{pmatrix} \cdot \\ \cdot \\ \cdot \end{pmatrix} = \cdot + \cdot + \cdot$

$(x_1\ \ x_2\ \ x_3)\begin{pmatrix} 7 \\ 8 \\ 9 \end{pmatrix} = 7x_1 + 8x_2 + 9x_3$

$$3x_1 + 2x_2 = -4$$
$$2x_1 - 4x_2 = 3$$

$\Rightarrow$ $(3\ 2)\cdot\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = 3x_1 + 2x_2$

$(2\ -4)\cdot\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = 2x_1 - 4x_2$

$$\begin{pmatrix} 3 & 2 \\ 2 & -4 \end{pmatrix}\cdot\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} \square \\ \square \end{pmatrix} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

sor, oszlop ↓ ↓ 2x2 mátrix

oszlopvektor

$$\begin{pmatrix} 3 & 2 \\ 2 & -4 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

$$\underline{\underline{A}} \cdot \underline{x} = \underline{B}$$

determináns:

$$\det\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = a\cdot d - b\cdot c$$

első ismeretlen

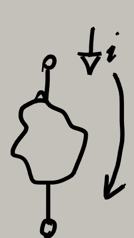
$$x_1 = \frac{\begin{vmatrix} -4 & 2 \\ 3 & -4 \end{vmatrix}}{|\underline{\underline{A}}|} = \ldots$$

2.

$$x_2 = \frac{\begin{vmatrix} 3 & -4 \\ 2 & 3 \end{vmatrix}}{|\underline{\underline{A}}|} = \ldots$$

– nem kell minden ismeretlent kiszámítani,

II.



áram (folyik)

u feszültség (esik)

$f(u,i) = 0$ karakterisztika (általános alak)

$u = g(i)$
$i = h(u)$ } explicit kar.

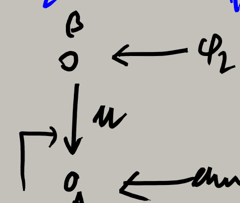
$u - 2i^2 = 0$
- implicit alakú
- nemlineáris

$u \to 2u$

$2u \to i = \frac{\sqrt{2 \cdot u}}{2} = \sqrt{2} \cdot \frac{\sqrt{u}}{2}$

$u = 2i^2$

$i = \frac{\sqrt{u}}{2}$

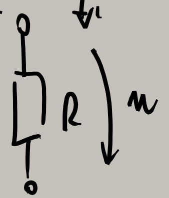


$\varphi_2 - \varphi_1 = u$

annak pontnál a potenciálja

ahova a nyíl mutat az a kisebb pot.

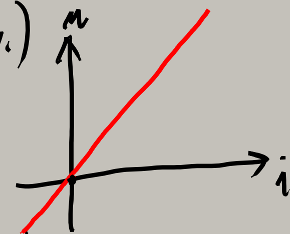
Ellenállás



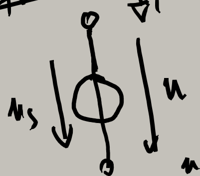
$u = R \cdot i$ (ohm-tv.)

vagy

$i = \frac{1}{R} \cdot u = G \cdot u$

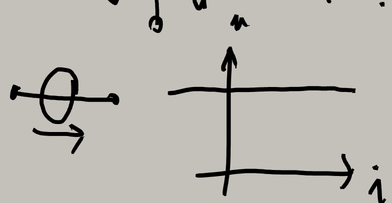


Feszforrás



$u = u_s(t)$ (meghatározott)

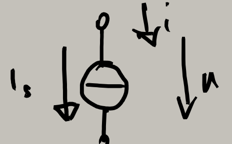
$i = ?$ (környezet, a hálózat határozza meg)



egyen (DC) forrás

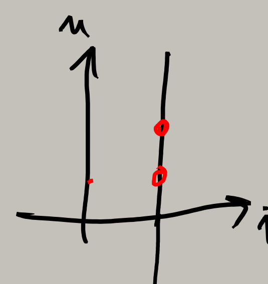
$u_s(t) = U_0$

Áramforrás



$i = i_s(t)$ vagy DC: $i = I_0$

$u = ?$ a hálózati környezet



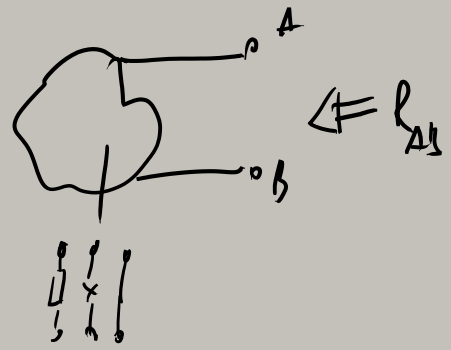
$u=0$ ⇒ két pólus potenciálja azonos ($u=0$) ⇒ rövidzár – short circuit i

$u = 0 \cdot i$
$R = 0$ ellállás
($G \to \infty$ vezetés ohm)

$i=0$ ⇒ nem folyik áram szakadás: u ⇝ nem zérus általában

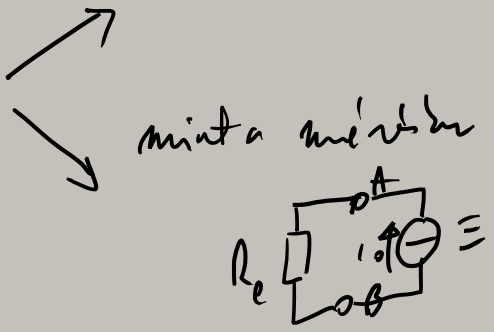
($R \to \infty$ vagy $G = 0$)

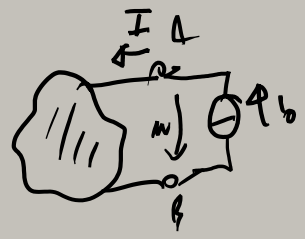
III. Eredő ellenállás



$\Leftarrow R_{AB}$

ebből ellenőrizhető visszavezethető



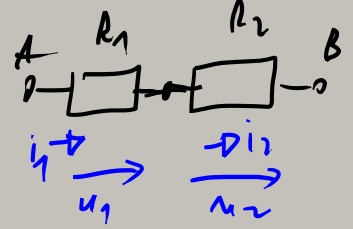


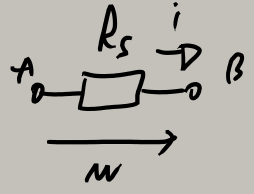
$u = R_e \cdot I_0$

Eleri elrendezés

- Soros

$i = i_1 = i_2$





$u = u_1 + u_2$

$i R_s = i_1 R_1 + i_2 R_2 = i \cdot (R_1 + R_2)$

$\boxed{R_s = R_1 + R_2}$

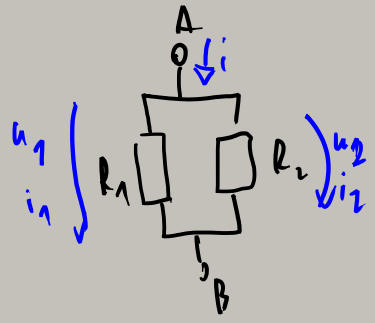
ált. $R_s = \sum_i R_i$ $\qquad R_s \geq \max\{R_i\}$

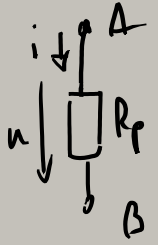
$$\boxed{u_1 = i \cdot R_1 = \frac{u}{R_s} \cdot R_1 = \frac{R_1}{R_s} \cdot u}$$

potenciométer formula

pl. $u_1 = \frac{R_1}{R_1 + R_2} \cdot u$

- Párhuzamos → $\boxed{u = u_1 = u_2}$





$i = i_1 + i_2$

$\frac{u}{R_p} = \frac{u}{R_1} + \frac{u}{R_2}$

$R_p \leq \min\{R_i\}$

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \rightarrow R_p = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$

Replus:

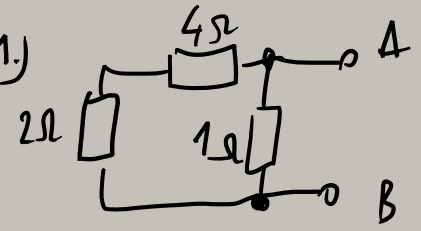
$R_1 \times R_2 = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{R_1 R_2}{R_1 + R_2}$

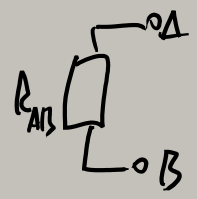
$$\boxed{i_1 = \frac{u}{R_1} = \frac{i \cdot R_p}{R_1} = i \cdot \frac{R_p}{R_1}}$$

pl. $\boxed{i_1 = \frac{R_1 \times R_2}{R_1} \cdot i}$

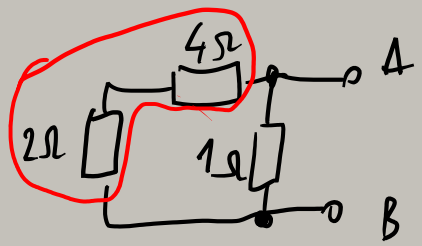
Cvičení 4

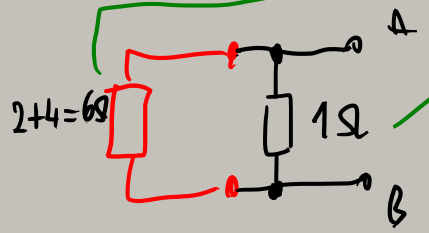
1.)



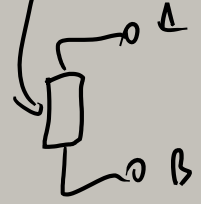


$$R_1 \times R_2 = \frac{R_1 \cdot R_2}{R_1 + R_2}$$



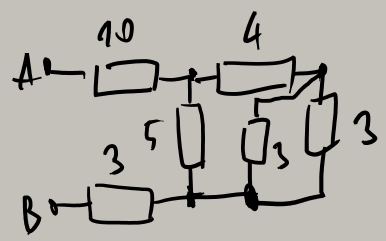


$$6\Omega \times 1\Omega = \frac{6 \cdot 1}{6+1} = \frac{6}{7}\Omega$$

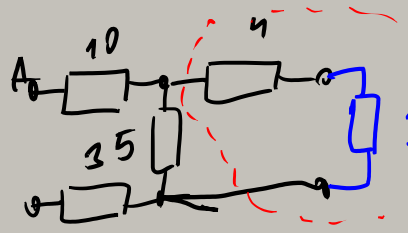


$$R_{AB} = \frac{6}{7}\Omega$$

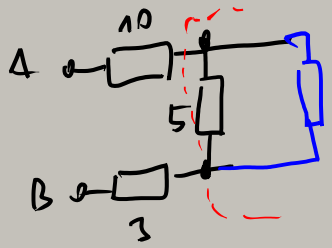
2.) [Ω]



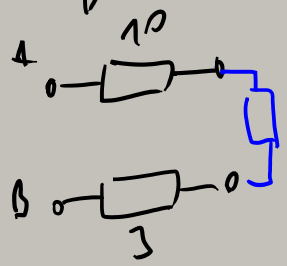
$R_{AB} = ?$



$3 \times 3 = \frac{3 \cdot 3}{3+3} = \frac{9}{6} = 1{,}5$



$4 + 1{,}5 = 5{,}5$



$5 \times 5{,}5 = \frac{5 \cdot 5{,}5}{5+5{,}5} = 2{,}619$

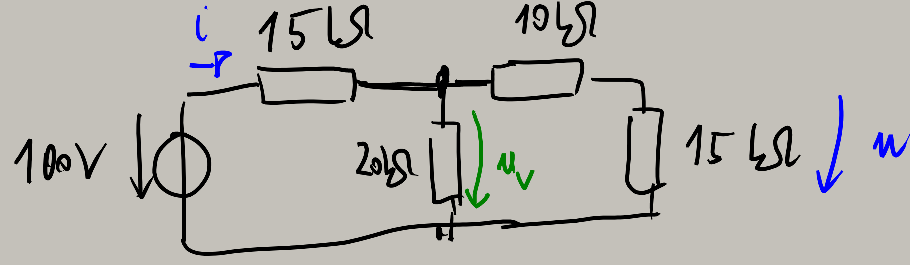
$10 + 2{,}619 + 3 = 15{,}619\ \Omega$

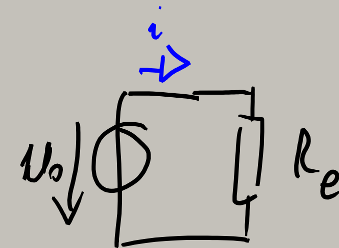
$R_{AB} = 15{,}619\Omega$

Mezi.

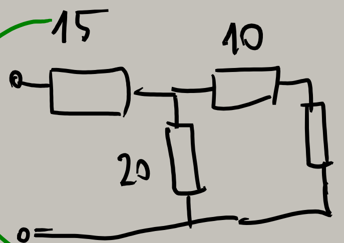
$R \times R = \frac{R}{2}$

Fesz. osztó kivitele

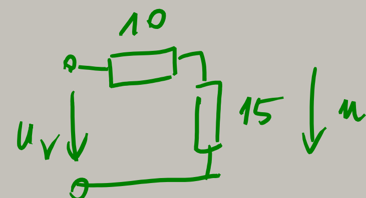


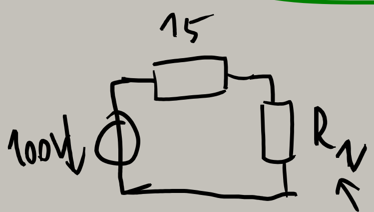


$$i = \frac{U_0}{R_e} = \frac{100V}{26{,}11\,k\Omega} = 3{,}8299\ mA$$



$$R_e = (15+10) \times 20 + 15 = 20 \times 25 + 15 = 11{,}11 + 15 = 26{,}11\ k\Omega$$





$$u_v = 100V \cdot \frac{11{,}11}{15 + 11{,}11} = \frac{11{,}11}{26{,}11} \cdot 100V = 42{,}55\ V$$

$$20 \times (10+15) = 11{,}11$$

$$u = u_v \cdot \frac{15}{10+15} = 42{,}55 \cdot \frac{15}{10+15} = 25{,}53\ V$$

Megj.: a kapott i ismét ellenőrizhető

$$i = \frac{100 - 42{,}55}{15} = \frac{57{,}45\ V}{15\ k\Omega} = 3{,}83\ mA$$