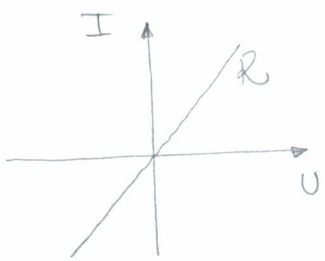
OSNOVE ELEKTRIČNIH VEZIJ

- Teorija električnih vezij poveže posamezne komponente, vezja, opravo, sisteme z medsebojnimi spremembami spremenljivk vezij.

- **Ekvivalentna vezja** (vezja, ki se obnašajo enako kot naša vezja)
- **Matematična analiza**

- **Teorija ekvivalentnih vezij** (network theory)

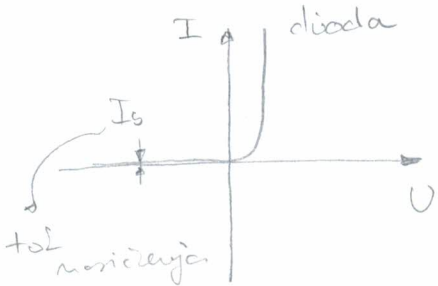
- Linearna



$$I = \frac{U}{R} = \frac{1}{R} \cdot U$$

↑ naklon premice

- Nelinearna



$$I = I_S\left(e^{\frac{U}{U_T}} - 1\right)$$

Termična napetost

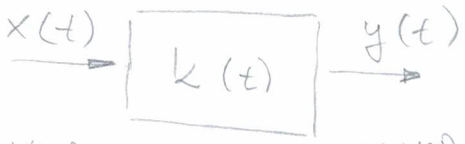
Boltzmanova konstanta

$$U_T = \frac{k \cdot T}{q}$$ ← Temperatura [K]

↓ naboj e^-

- Recipročna
- Nerecipročna
- Unilateralna
- Bilateralna

LINEARNO VEZJE

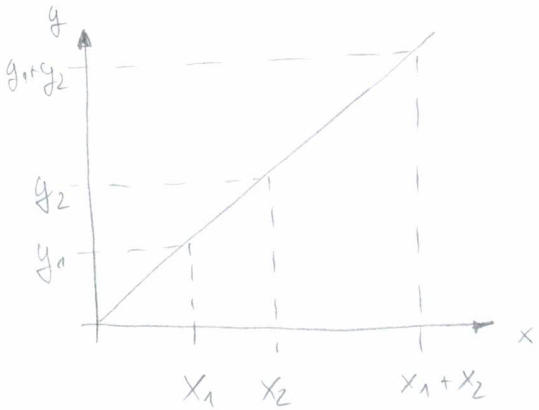


VHOD IZHOD

$x_1(t)$ $y_1(t)$

$x_2(t)$ $y_2(t)$

$x_1(t) + x_2(t) \longrightarrow y_1(t) + y_2(t)$



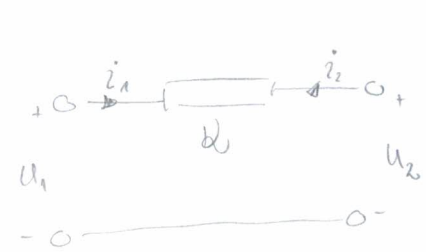
↝ velja v linearnih vezjih

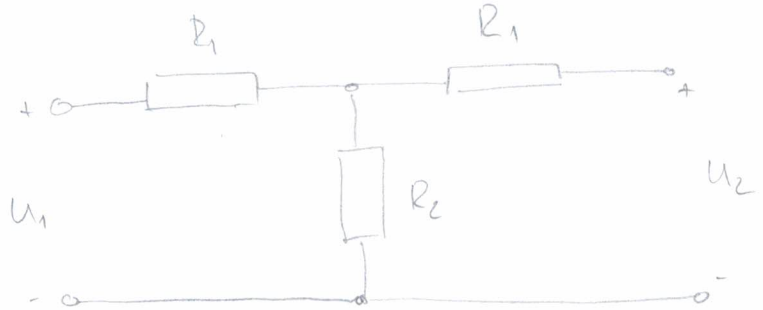
Teorem superpozicije

BILATERALNO VEZJE

Če bi v poljubnem sistemu zamenjali vhode in izhode se v vezju ne spremeni nič.

Primer:

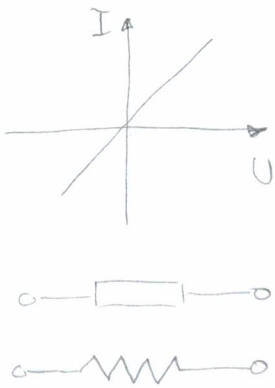




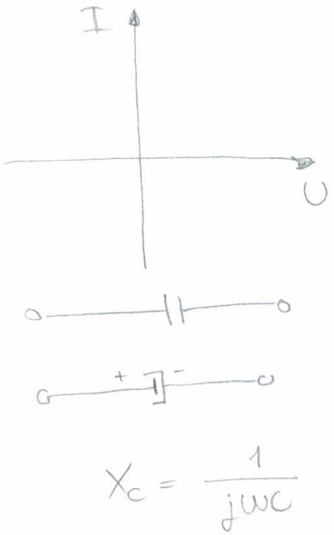
Lahko zamenjamo vhode in izhode

ELEMENTI VEZJA

- UPOR

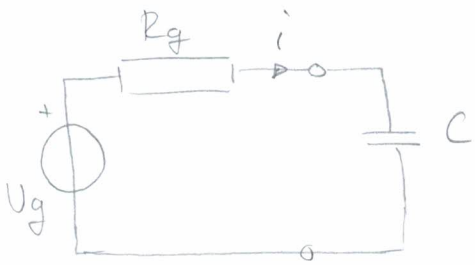


- KONDENZATOR



Ker $\omega \to \infty$

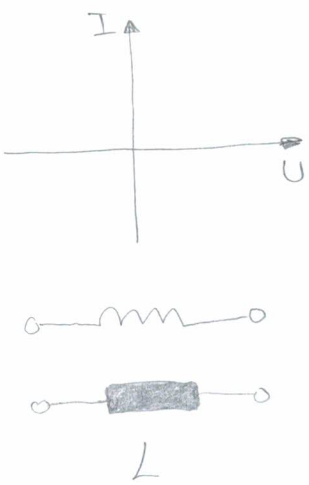
$\Rightarrow X_C \to 0$



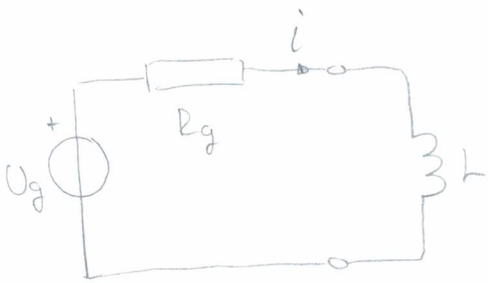
$$X_C = \frac{1}{j\omega C}$$

Tisti elementi, ki imajo karakteristiko v I. in III. kvadrantu so totalno pasivni elementi.

- TULJAVA



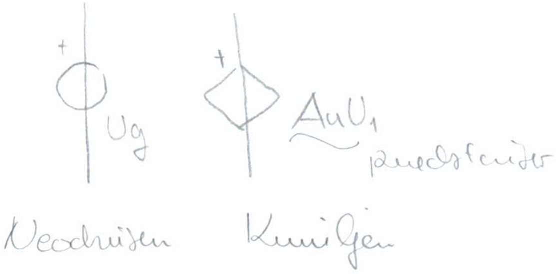
$X_L = \omega L$

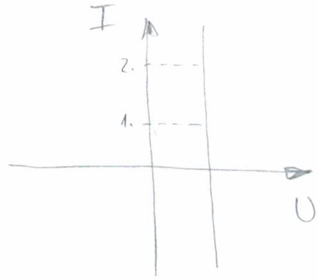


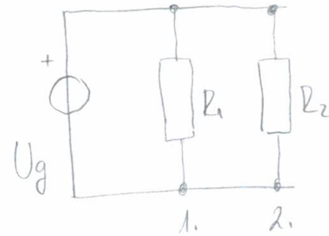
$$I = \frac{U_g}{R_g}$$

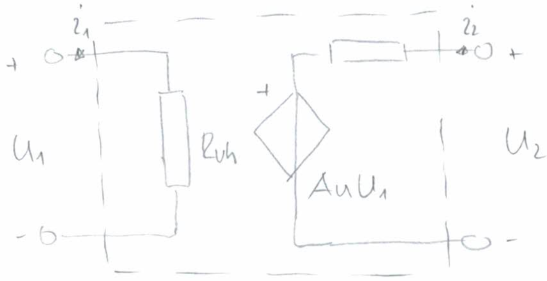
Totalno pasivni element

NAPETOSTNI VIRI

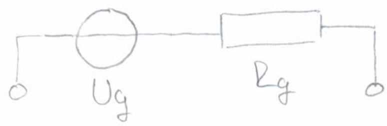




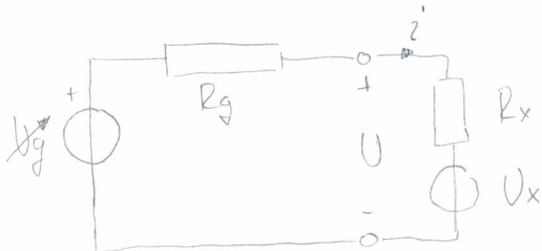




$$A_u = \frac{U_2}{U_1}$$



$R_{not} \rightarrow \emptyset$

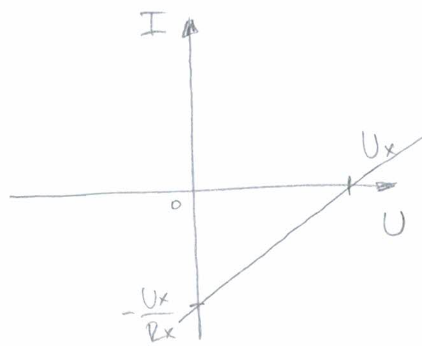


$U = U_g - I R_g$

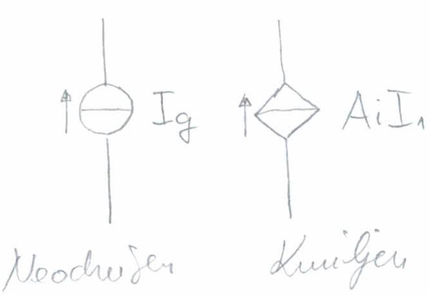
$U = U_x + I R_x$

$i = \emptyset \qquad U_{g1} = U_x$

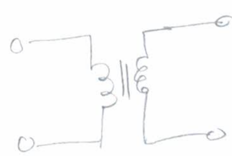
$U = \emptyset \qquad I = -\frac{U_x}{R_x}$



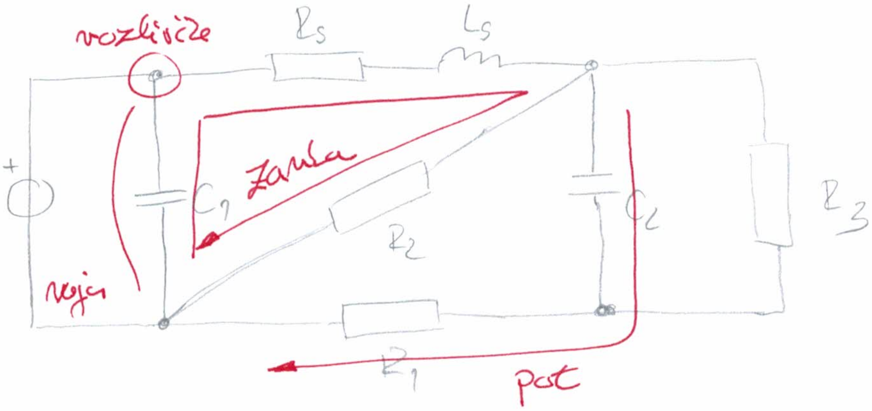
TOKOVNI VIR



- Dvopol ali dvovhoden element je element z dvema priključkoma.
- Četveropol ali dva vhodna elementa, npr.:



- Večpoli



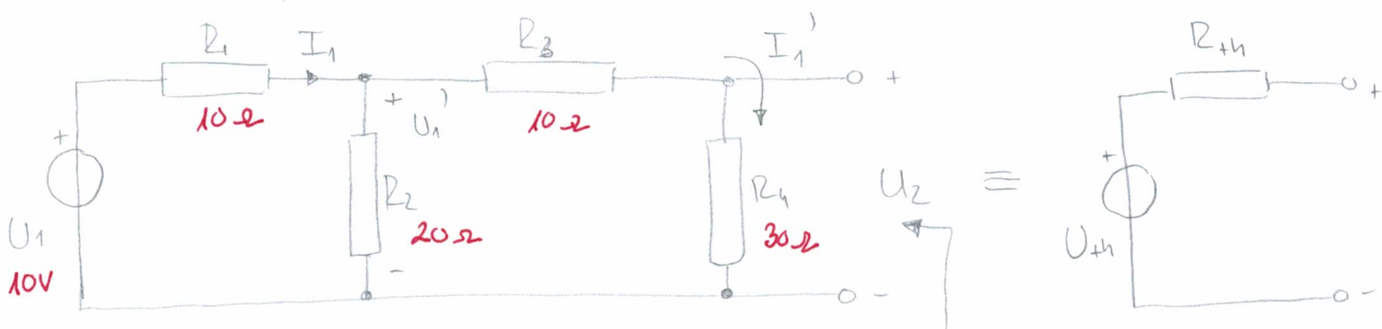
ANALIZA LINEARNIH VEZIJ

• Kirchoffov zakon vozlišča in zanke

$$\sum_{i=1}^{N} I_i = 0 \qquad \sum_{U=1}^{M} U_N = 0$$

TEOREMI ANALIZE VEZIJ

• Theveninov teorem



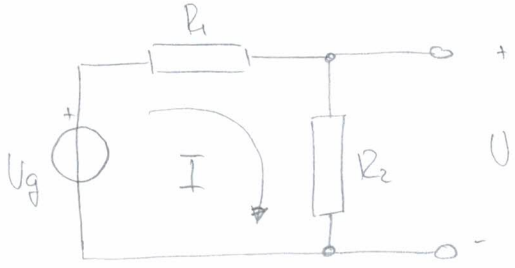
U_{th} = napetost odprtih sponk

R_{th} = kratko vezano napetostne generatorje tam tokovne izvzamemo in izračunamo R_n na sponkah.

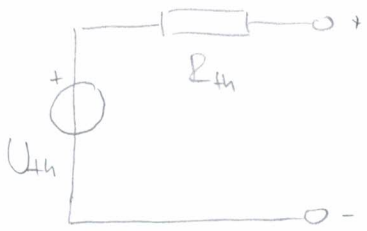
$$U_{th} = \frac{U_1 \cdot R_2 \| (R_3+R_4)}{R_1 + R_2 \| (R_3+R_4)} \cdot \frac{R_2 \| (R_3+R_4)}{(R_3+R_4)} \cdot R_4 = \boxed{4{,}286\ V}$$

$$R_{th} = ((R_1 \| R_2) + R_3) \| R_4 = \boxed{10{,}714\ \Omega}$$

NAPETOSTNI DELILNIK

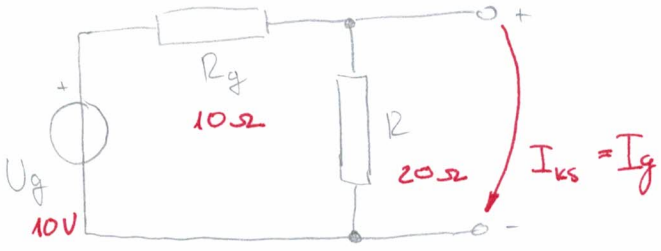


$\equiv$

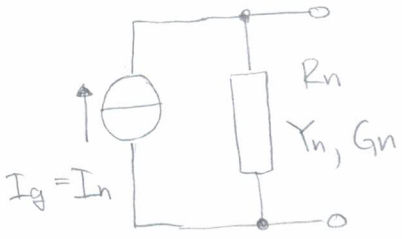


$$I = \frac{U_g}{R_1 + R_2} \qquad U_{th} = \frac{U_g \cdot R_2}{R_1 + R_2} \qquad R_{th} = R_1 \| R_2$$

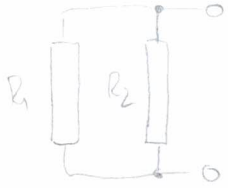
- # Nortonov teorem



$\equiv$



$$I_g = \frac{U_g}{R_g} = I_{KS}$$



$$R_n = R_1 \| R_2 = \frac{R_1 \cdot R_2}{R_1 + R_2} \Rightarrow G_n = \frac{1}{R_n} = \frac{R_1 + R_2}{R_1 R_2}$$