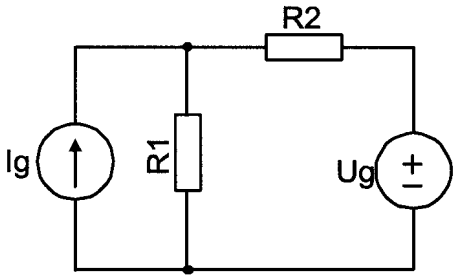
DIGITALNA TEHNIKA I

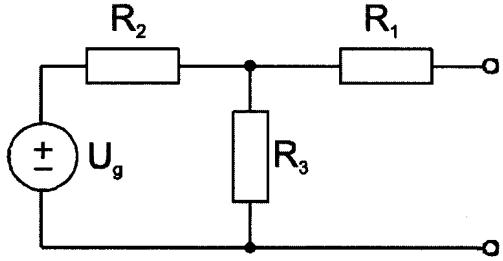
VSŠ

1.kolokvij 12. 12. 2005

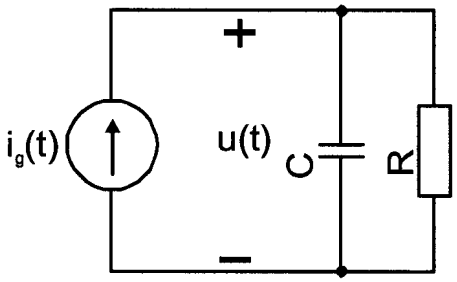
1. Izračunajte napetosti v vozliščih vezja.
   Upoštevajte: $Ug=5V$ $Ig=1A$ $R_1=1\Omega$ $R_2=2\Omega$



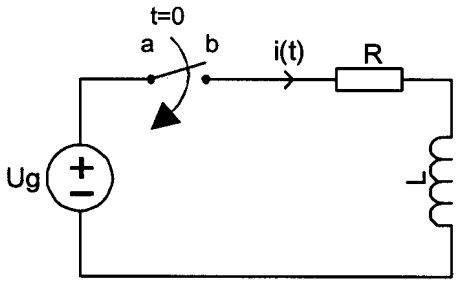
2. Izračunajte parametre Nortonovega nadomestnega vezja za spodnji neidealni generator.
   Upoštevajte: $Ug=5V$ $R_1=1\Omega$ $R_2=2\Omega$ $R_3=3\Omega$



3. Izračunajte napetost na kondenzatorju $u(t)$ vezja na sliki.
   Upoštevajte: $C=1F$ $R=1\Omega$ $i_g(t)=1A\ cos(\omega t)$ $\omega=2rd/s$

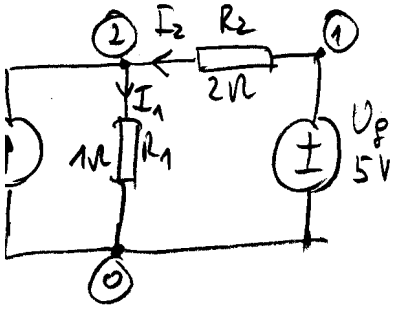


4. V trenutku $t=0$ sklenemo stikalo. Izračunajte tok $i(t)$ skozi induktivnost L z uporabo Laplaceove transformacije. Začetni tok $i(t)$ skozi induktivnost je $i(0^+)=0A$!
   Upoštevajte: $L=1H$ $R=1\Omega$ $U_g=5V$



Čas pisanja je 60min. Vsaka naloga je vredna 10 točk. Na list z rešitvami se podpišite in napišite še vpisno

Kolokvij 12.12.05 VSŠ



Vezje ima 3 vozlišča: 0 - referenčno in

$U_1 = U_g$ ter $U_2 = ?$

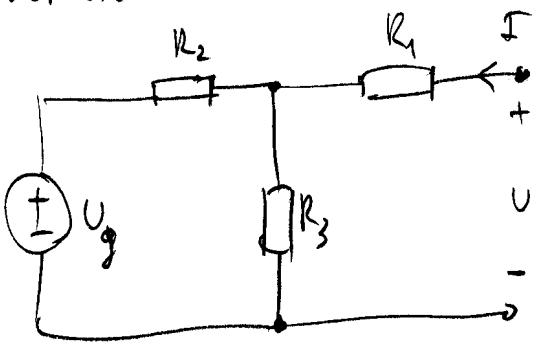
KTZ ② $I_g + I_2 = I_1$

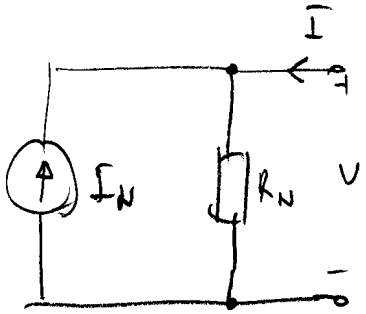
$$I_1 = \frac{U_2}{R_1} \quad I_2 = \frac{U_1 - U_2}{R_2} = \frac{U_g - U_2}{R_2}$$

$$I_g + \frac{U_g - U_2}{R_2} = \frac{U_2}{R_1} \rightarrow I_g + \frac{U_g}{R_2} = \frac{U_2}{R_1} + \frac{U_2}{R_2}$$

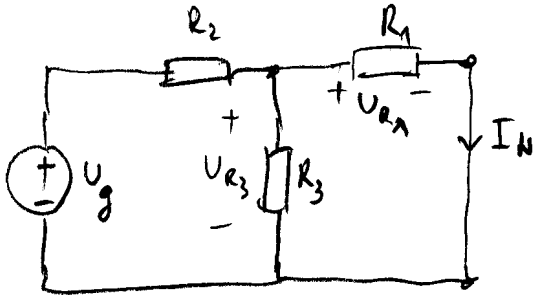
$$U_2 = \frac{1A + \frac{5V}{2\Omega}}{\frac{1}{1\Omega} + \frac{1}{2\Omega}} = \underline{2,3V}$$

Norton





I_N =



$$U_{R_3} = \frac{R_1 \| R_3}{R_2 + R_1 \| R_3} \cdot U_g \; ; \quad R_1 \| R_3 = \frac{R_1 R_3}{R_1 + R_3} =$$

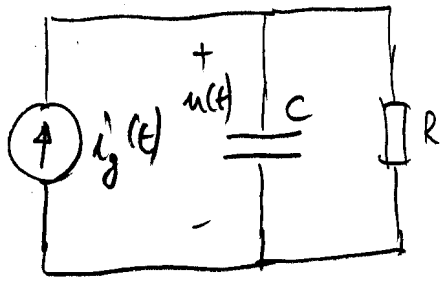
$$R_1 \| R_3 = \frac{3 \cdot 1}{3+1} = \frac{3}{4}\Omega$$

$$U_{R_3} = \frac{\frac{3}{4}\Omega}{2 + \frac{3}{4}\Omega} \cdot 5V$$

$$U_{R_3} = 1,\overline{36}\,V \rightarrow I_N = \frac{U_{R_1}}{R_1} = \frac{U_{R_3}}{R_{\|}} = \frac{1,\overline{36}}{1\Omega} =$$

$$I_N = \underline{1,36A}$$

Kazalci:



Transform vzbujanja

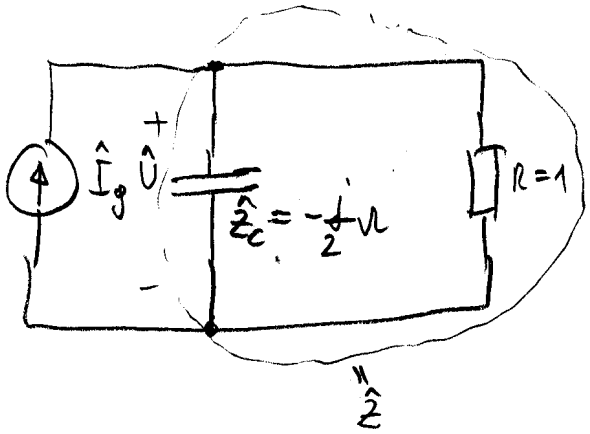
$i_g(t) = 1\cos(\omega t)\,A \quad \omega = 2\,s^{-1}$

$\downarrow$

$\hat{I}_g = 1$

Impedance $R \to R = 1\,\Omega$

$$\hat{Z}_C = \frac{1}{j\omega C} = \frac{1}{j\cdot 2\cdot 1} = -\frac{j}{2}\,\Omega$$



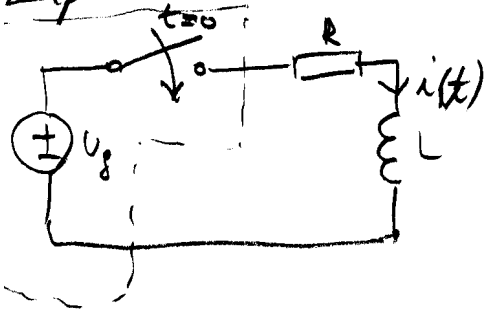
$$\hat{Z} = R \parallel \hat{Z}_C = \frac{R\cdot \hat{Z}_C}{R + \hat{Z}_C}$$

$$\hat{Z} = \frac{1\cdot\left(-\frac{j}{2}\right)\Omega}{1-\frac{j}{2}\Omega} = \frac{\frac{1}{2}\cdot(-j)}{\frac{1}{2}(2-j)} = \frac{e^{-j90^\circ}}{\sqrt{5}\cdot e^{-j26{,}56^\circ}}$$

$$\hat{Z} = \frac{1}{\sqrt{5}}\cdot e^{-j63{,}44^\circ} \to \hat{U} = \hat{I}\cdot\hat{Z} = \frac{1}{\sqrt{5}}e^{-j63{,}44^\circ}\,V$$

$$u(t) = \frac{1}{\sqrt{5}}\cos(2t - 63{,}44^\circ)$$

Laplaceova transformacija



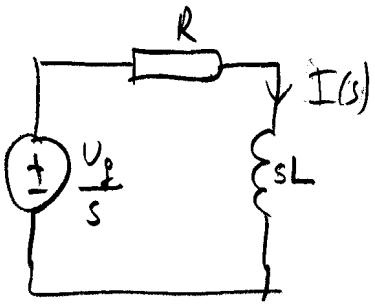
Transform vzbujanja

$$U_g(s) = \mathcal{L}[u_g\cdot 1(t)] = \frac{U_g}{s} = \frac{5}{s}$$

Transform impedance

$R \to R = 1\,\Omega$

$L \to sL = s\,\Omega$



$$I(s) = \left[\frac{U_g}{s}\right]\frac{1}{R+sL} = \frac{5}{s(1+s)} = \frac{A}{s} + \frac{B}{1+s}$$

$$A = \lim_{s\to 0}\frac{5}{1+s} = 5\,; \quad B = \lim_{s\to -1}\frac{5}{s} = -5$$

$$I(s) = \frac{5}{s} - \frac{5}{s+1}$$