DIGITALNA TEHNIKA I

VSŠ

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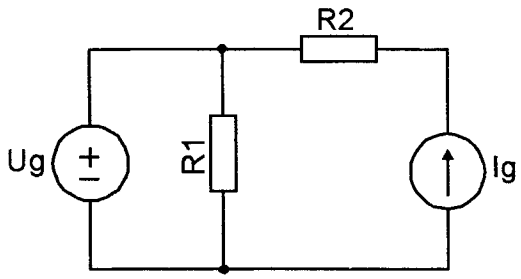
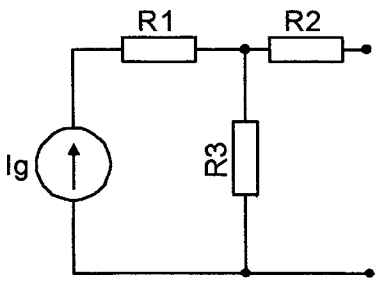
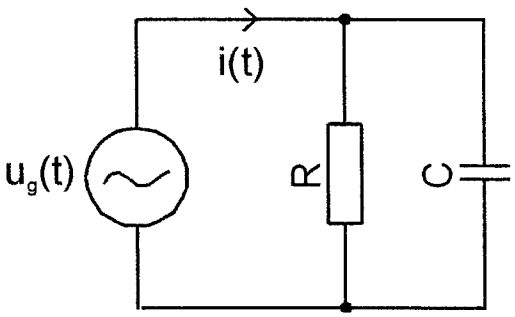
1. Izračunajte napetosti v vozliščih vezja.
   Upoštevajte: $U_g=5V$ $I_g=1A$ $R_1=1\Omega$ $R_2=2\Omega$



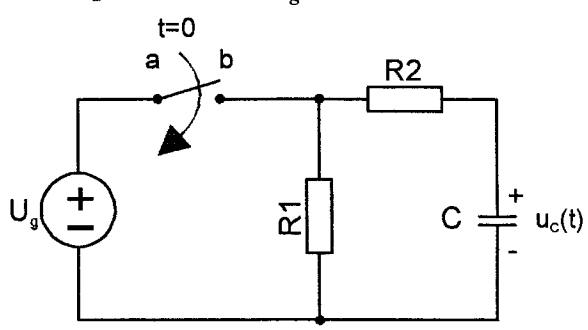
2. Izračunajte parametre Theveninovega nadomestnega vezja za spodnji neidealni generator.
   Upoštevajte: $I_g=5A$ $R_1=1\Omega$ $R_2=2\Omega$ $R_3=3\Omega$



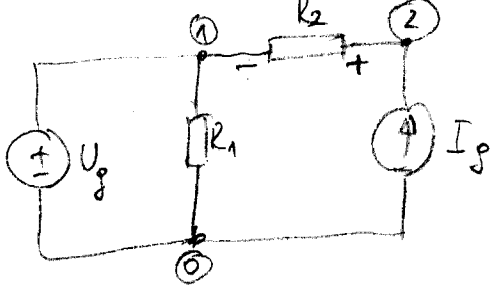
3. Izračunajte tok $i(t)$ v vezju na sliki.
   Upoštevajte: $C=1F$ $R=1\Omega$ $u_g(t)=1V\cos(\omega t)$ $\omega=1rd/s$



4. V trenutku $t=0$ sklenemo stikalo. Izračunajte napetost $u_C(t)$ na kondenzatorju C z uporabo Laplaceove transformacije. Začetna napetost $u_C(t)$ na kondenzatorju je $u_C(0^+)=0V$!
   $C=1F$ $R_1=1\Omega$ $R_2=1\Omega$ $U_g=1V$



Čas pisanja je 60min. Vsaka naloga je vredna 10 točk. Na list z rešitvami se podpišite in napišite še vpisno številko ter kateri predmet pišete. Rezultati bodo objavljeni na https://estudent.fri.uni-lj.si

① 

$U_1 = U_g \qquad U_2 = U_g + I_g R_2 = 5V + 1A \cdot 2\Omega = \underline{7V}$

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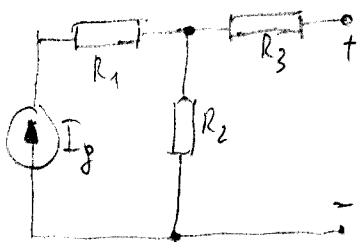
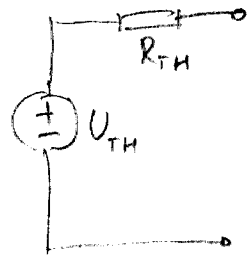
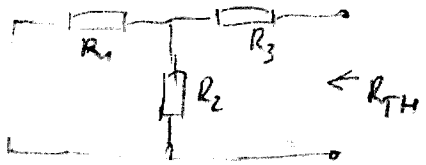
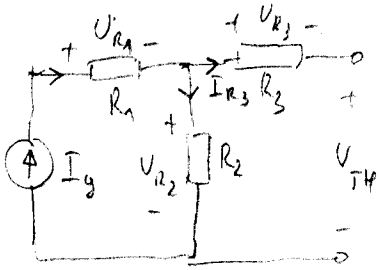
② 



$R_{TH} = R_2 + R_3 = \underline{5\Omega}$





$I_{R_3} = 0 \rightarrow U_{TH} = U_{R_2}$

$U_{TH} = I_g \cdot R_2 = 5A \cdot 2\Omega = \underline{10V}$

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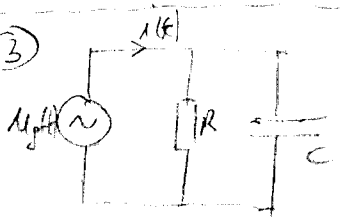
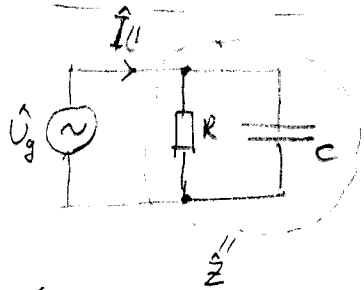
③ 

$u_g(t) = 1V \cos(\omega t) \rightarrow \hat{U}_g = 1V$

$R \rightarrow \hat{Z}_R = R = 1\Omega$

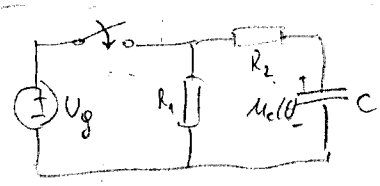
$C \rightarrow \hat{Z}_C = \frac{1}{j\omega C} = \frac{1}{j \cdot 1 \cdot 1} = -j\,\Omega$

$\hat{Z} = \frac{\hat{Z}_R \hat{Z}_C}{\hat{Z}_R + \hat{Z}_C} = \frac{1 \cdot (-j)}{1 - j} = \frac{e^{-j90°}}{\sqrt{2}\, e^{-j45°}}$



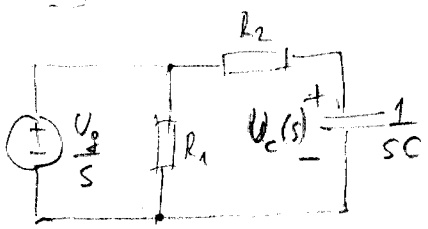
$\hat{Z} = \frac{1}{\sqrt{2}} e^{-j45°} = 0.707\, e^{-j45°}\,\Omega \rightarrow \hat{I} = \frac{\hat{U}_g}{\hat{Z}} = \frac{1V}{0.707\, e^{-j45°}} = \sqrt{2}\, e^{j45°}$

$i(t) = \sqrt{2} \cos(\omega t + 45°)A = \underline{\sqrt{2} \cos(t + 45°)A}$



$\mathcal{L}[U_g \cdot 1(t)] = \frac{U_g}{s}$; $\frac{1}{T}C \rightarrow \frac{1}{sC}\frac{1}{T}$

$U_c(s) = \frac{\frac{1}{sC}}{R_2 + \frac{1}{sC}} \cdot \frac{U_g}{s}$ (NAPETOSTNI DELILNIK)



$U_c(s) = \frac{U_g}{s} \frac{\frac{1}{sC}}{\frac{1}{sC}(R_2 sC + 1)} = \frac{U_g}{R_2 C} \frac{1}{s\left(\frac{1}{R_2 C} + s\right)} = \frac{A}{s} + \frac{B}{s + \frac{1}{R_2 C}}$

$A = \lim_{s \to 0} \frac{U_g}{R_2 C} \frac{s}{s\left(s + \frac{1}{R_2 C}\right)} = \underline{U_g}$

$B = \lim_{s \to -\frac{1}{R_2 C}} \frac{U_g}{R_2 C} \frac{\left(s + \frac{1}{R_2 C}\right)}{s\left(s + \frac{1}{R_2 C}\right)} = \frac{U_g}{R_2 C\left(-\frac{1}{R_2 C}\right)} = \underline{-U_g}$

$U_c(s) = \frac{U_g}{s} - \frac{U_g}{s + \frac{1}{R_2 C}} \Rightarrow \mathcal{L}^{-1}[U_c(s)] = u_c(t) = U_g \cdot 1(t) - U_g e^{-\frac{1}{R_2 C} t} \cdot 1(t)$

$\underline{u_c(t) = U_g\left[1 - e^{-\frac{t}{\tau}}\right] 1(t)\,; \quad \tau = R_2 C}$