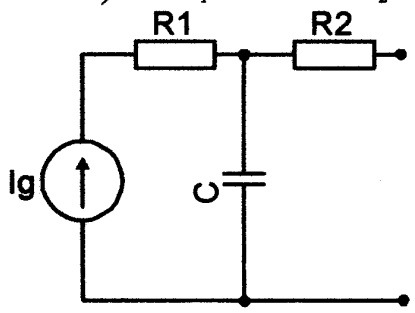
DIGITALNA TEHNIKA

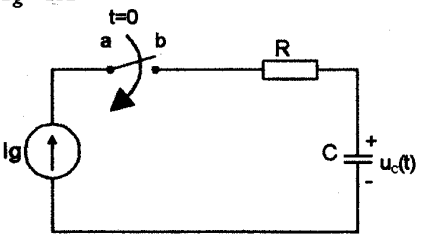
(1. kolokvij)

16. 4. 2007

1. Izračunajte parametre Theveninovega nadomestnega vezja za narisani neidealni generator.
Upoštevajte: $I_g=5mA\ cos(2000t+60°)$ $R_1=1k\Omega$ $R_2=2k\Omega$ $C=1\mu F$



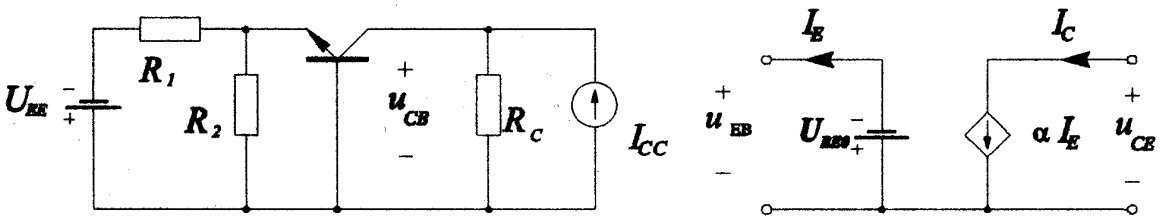
2. V trenutku $t=0$ sklenemo stikalo. Izračunajte napetost $u_C(t)$ na kondenzatorju C z uporabo Laplaceove transformacije. Začetna napetost $u_C(t)$ na kondenzatorju je $u_C(0^+)=1V$!
$C=1F$ $R=1\Omega$ $I_g=1A$



3. Z uporabo operacijskih ojačevalnikov realizirajte funkcijo:

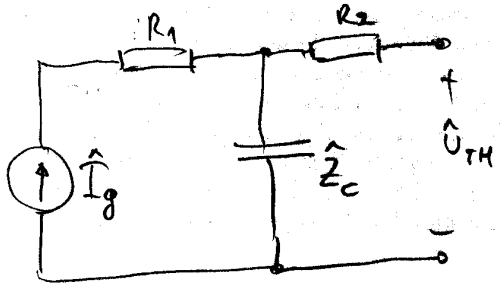
$$u_z = 3u_x + u_y - 5V$$

4. Izračunajte napetost U_{CB} v narisanem vezju.
$U_{BE0}=0,7V$ $\alpha=0,9$ $R_1=2k\Omega$ $R_2=6,8k\Omega$ $R_C=4,7k\Omega$ $U_{EE}=4V$ $I_{CC}=5mA$

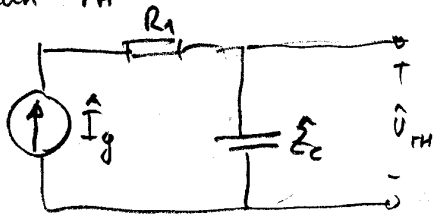


Čas pisanja je 60min. Vsaka naloga je vredna 10 točk. Na list z rešitvami se podpišite in napišite vpisno številko. Ocene bodo objavljene v sistemu e-študent, rešitve pa na domači strani predmeta: http://dt.fe.uni-lj.si/.

① $\hat{I}_g = 5mA\angle 60°$ $\quad \hat{Z}_C = \frac{1}{j\omega C} = -j\cdot\frac{1}{2\cdot10^3\cdot10^{-6}} = -j500\Omega$



Izračun $\hat{U}_{TH}$:



$\hat{U}_{TH} = \hat{I}_g \cdot \hat{Z}_C = 5mA\cdot\angle 60° \cdot 0.5k\Omega\cdot\angle -90° = 2{,}5\angle -30°$

$u_{TH} = 2.5V\cos(2000t - 30°)$

$\hat{Z}_{TH} = R_2 + \hat{Z}_C = 1k\Omega - j500\Omega = \underline{1{,}11k\Omega\cdot\angle -26{,}56°}$

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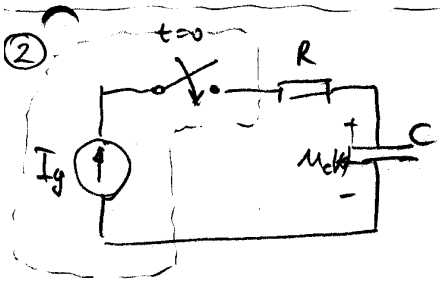
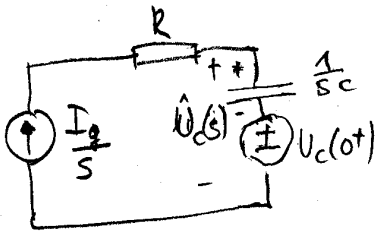
②





$\hat{U}_C(s) = \frac{1}{sC}\cdot\frac{I_g}{s} + \frac{U_C(0^+)}{s}$

$U_C(s) = \frac{1}{s^2}\frac{I_g}{C} + \frac{U_C(0^+)}{s}$

$U_C(s) = \frac{1}{s} + \frac{1}{s^2}$ · (TABELLE)

$u_C(t) = 1(t) + t\cdot 1(t)$

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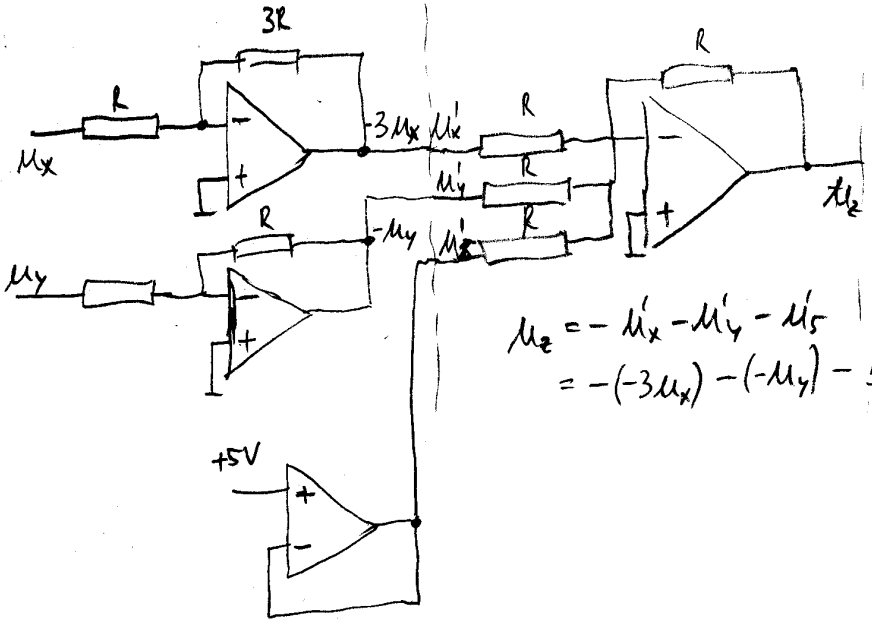
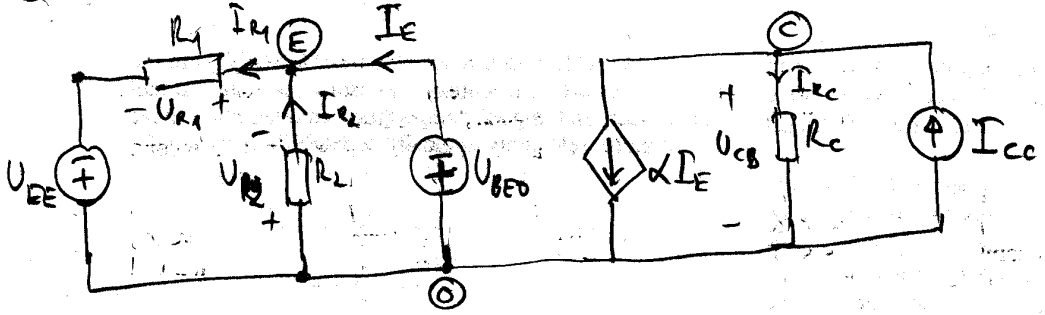
③ $u_z = 3u_x + u_y - 5V$



$u_z = -u_x' - u_y' - u_5'$

$= -(-3u_x) - (-u_y) - 5V$

(4)



$U_{R_2} = U_{BED}$

$U_{R_1} + U_{BED} = U_{EE} \Rightarrow U_{R_1} = U_{EE} - U_{BED}$

KTZ (E) : $I_{R_1} = I_{R_2} + I_E$

$$\frac{U_{R_1}}{R_1} = \frac{U_{R_2}}{R_2} + I_E$$

$$\frac{U_{EE} - U_{BED}}{R_1} = \frac{U_{BED}}{R_2} + I_E$$

$$I_E = \frac{U_{EE}}{R_1} - \frac{U_{BED}}{R_1} - \frac{U_{BED}}{R_2}$$

$$I_E = \frac{4V}{2k\Omega} - \frac{0.7V}{2k\Omega} - \frac{0.7V}{6.8k\Omega}$$

$$I_E = \underline{1.54mA}$$

KTZ (C) $I_{Rc} + \alpha I_E = I_{cc}$

$$U_{CB} = R_c \cdot I_{Rc} = R_c [I_{cc} - \alpha I_E]$$

$$U_{CB} = 4.7k\Omega [5mA - 0.9 \cdot 1,54mA]$$

$$U_{CB} = \underline{16.95V}$$