DAC

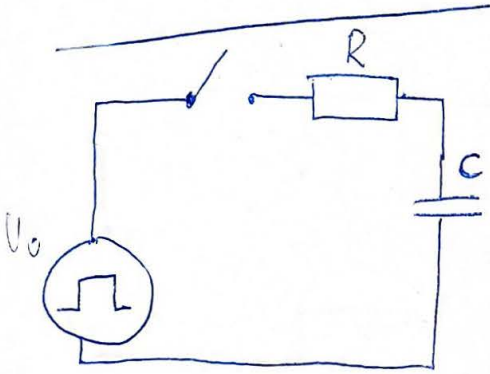
$$U_{out} = N \cdot \frac{U_{ref}}{2^n}$$

N = číslo prevedené do 10 sústavy
n = počet bitov

$$6 \cdot \frac{1}{2^3} = \frac{6}{8} = 0{,}75\,V$$

ADC

$$N = 2^n \cdot \frac{U_{in}}{U_{ref}} = 2^3 \cdot \frac{0{,}75}{1} = 6 \Rightarrow 110_2$$



$U_0 = 1V$ $C = 0{,}1F$

$R = 1\,\Omega$ $U_0 = 1V$

$$i_C(t) = C \cdot \frac{du_C(t)}{dt}$$

$$i(t) = i_C(t) = i_R(t)$$

$$= \frac{U_R}{R}$$

$$\frac{U_R(t)}{R} = C \cdot \frac{du_C(t)}{dt} \Rightarrow \frac{U_0(t) - U_C(t)}{R} = C \cdot \frac{du_C(t)}{dt}$$

$$U_0(t) - U_R(t) - U_C(t) = 0$$

$$U_R(t) = U_0(t) + U_C(t)$$

$$\frac{U_0(t)}{R} - \frac{U_C(t)}{R} = C \cdot \frac{du_C(t)}{dt} \Rightarrow C \cdot \frac{du_C(t)}{dt} + \frac{U_C(t)}{R} = \frac{U_0(t)}{R} \quad /:C$$

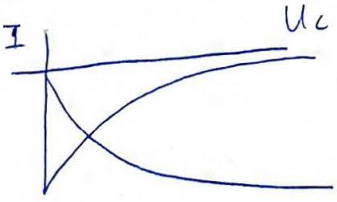
$$\Rightarrow \frac{du_C(t)}{dt} + \frac{U_C(t)}{RC} = 0$$

$\frac{1}{RC} = \frac{1}{0{,}1}$

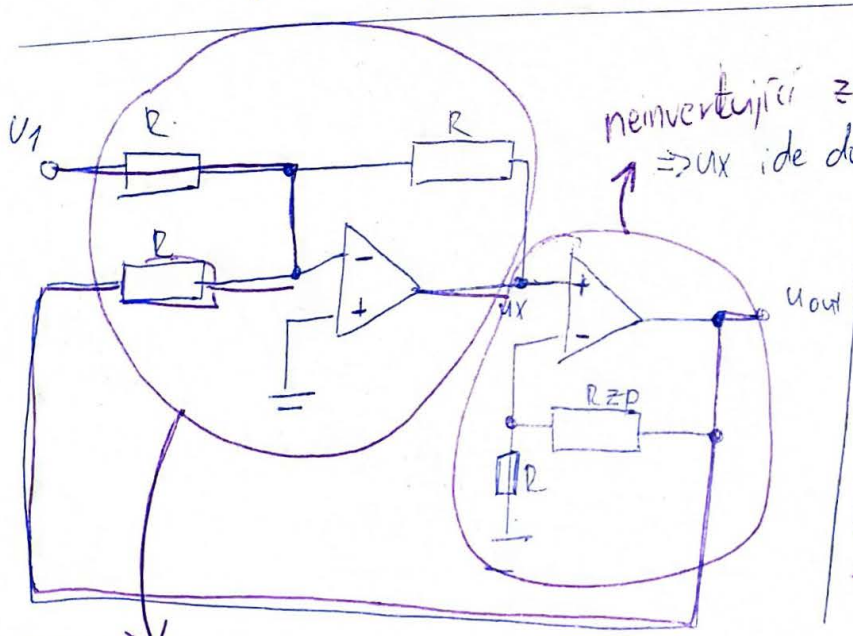
dosadíme 0

$\tau = R \cdot C = 0{,}1$ - kondenzátor sa nabije na 63%

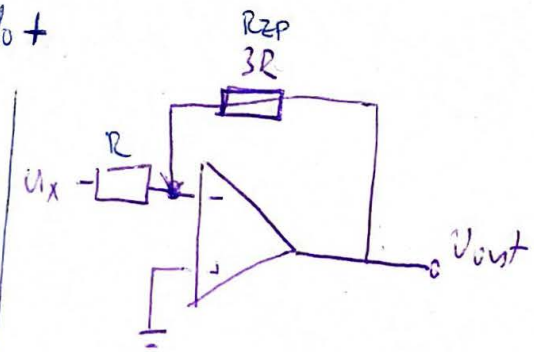
$$\frac{du_C(t)}{dt} \cdot 10 = 0$$



NAPLNO SA NABIJE ZA $5\tau \Rightarrow 0{,}5s$



neinvertujúci zosilňovač
⇒ Ux ide do +



$$U_{out} = -U_x \cdot \left(\frac{R_{ZP}}{R}\right)$$

+ do zeme
− vstup
} sčítač

$$I_1 + I_2 + \dots + I_n = 0$$

$$\frac{U_1}{R} + \frac{U_2}{R} + \dots + \frac{U_x}{R} = 0$$

je opačný súčet predošlých

$$\frac{U_1}{R} + \frac{U_{out}}{R} + \frac{-U_x}{R} = 0$$

$$U_x = -R \cdot \left(\frac{U_1}{R} + \frac{U_{out}}{R}\right)$$

$$U_x = -U_1 - U_{out}$$

$$U_{out} = U_x \cdot \left(1 + \frac{R_{ZP}}{R}\right)$$

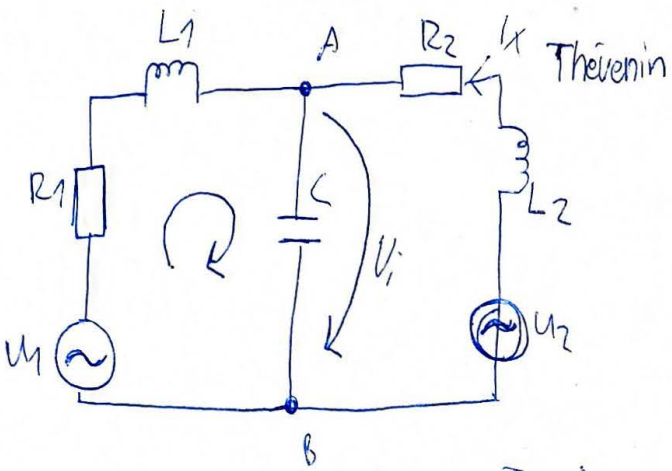
$$U_{out} = U_x \cdot (1 + 1)$$

$$U_{out} = 2U_x$$

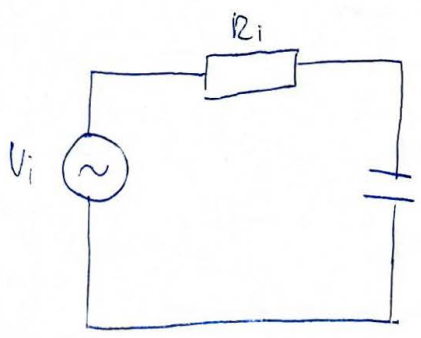
$$U_{out} = 2(-U_1 - U_{out})$$

$$3U_{out} = -2U_1$$

$$U_{out} = -\frac{2}{3}U_1 \Rightarrow U_{out} = -\frac{2}{3} \cdot 6 = -4$$



Thévenin



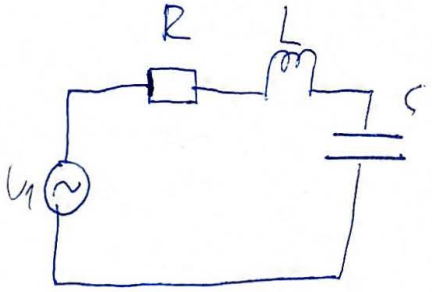
$V_C = Z_C \cdot I$

$R_i = (R_1 + Z_{L1}) \,||\, (R_2 + Z_{L2})$

~~I~~

V_i

$I = \frac{V_i}{R_i + Z_C}$ → nezabudnúť pripočítať (u diódy sa ignoruje)

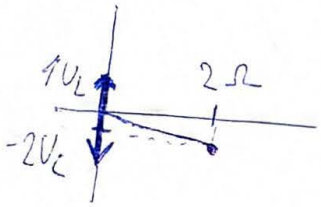


$R = 2\,\Omega \quad L = 1\,H \quad C = 0{,}5\,F$

$u_1(t) = u_1 \sin(\omega t) \quad \omega = 1\ rad/s$

$Z = R + j\omega L - \frac{j}{\omega C}$

$2 + j - 2j = 2 - j$



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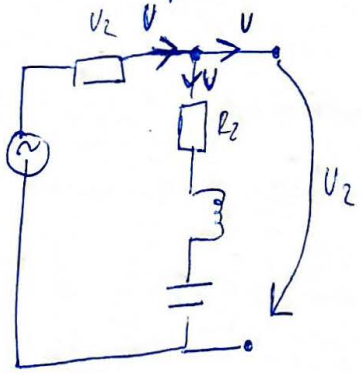
b) $\omega_r = \frac{1}{\sqrt{LC}}$

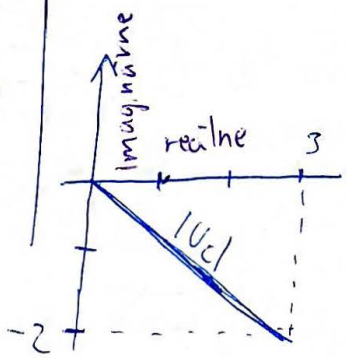
c)

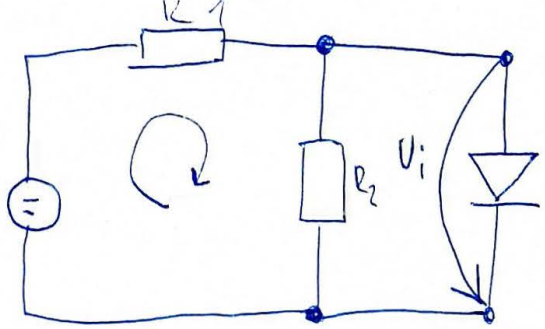


$V_2 = U_{R2}$

$V_L = 3 - 2j\ V$

$|V_L| = \sqrt{3^2 + 2^2}$





$R_1 = R_2 = 100$

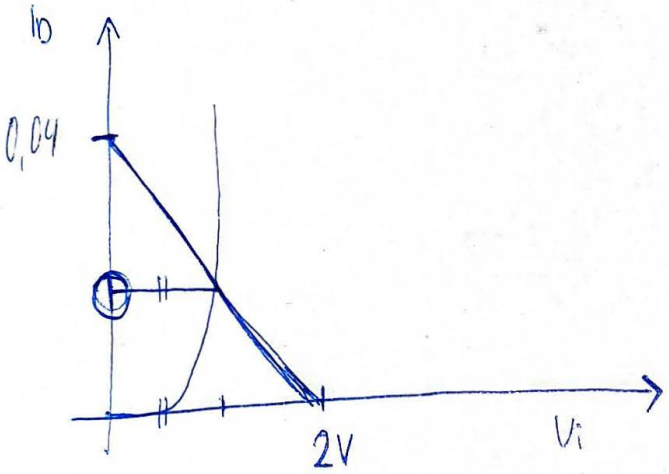
$V = 4V$

$I_D = ?$

$$R_i = \frac{100 \cdot 100}{100+100} = 50\Omega$$

$$U_i = U_{R2} = R_2 \cdot \left(\frac{U}{R_1+R_2}\right) = \frac{100}{200} \cdot 4 = 2V$$

$$I_{max} = \frac{U_i}{R_i} = \frac{2}{50} = 0{,}04A = 40mA$$



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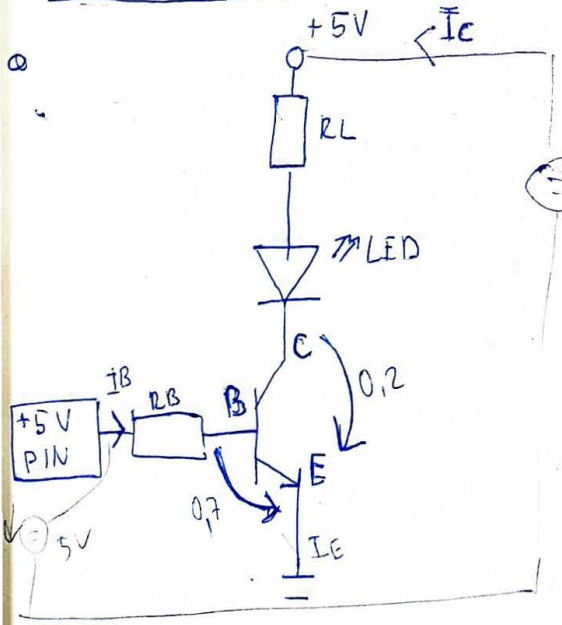
a)



$U_{LED} = 1{,}7V$

$I_C = 20mA$

$I_B < 5mA$

$\beta = 50$

Pri PNP stači prehodiť polarity zdrojov

$I_E = I_B + I_C$

$I_C = \beta \cdot I_B$

$0{,}02 = 50 \cdot I_B$

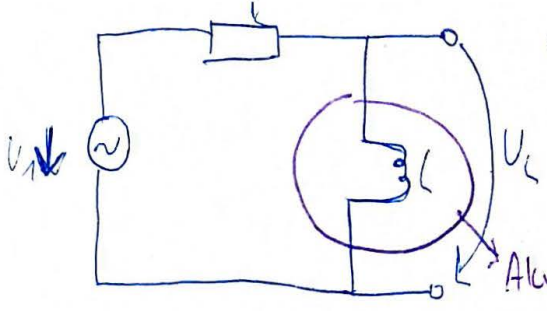
$I_B = \frac{0{,}02}{50} = 0{,}0004A$

$U_B - R_B \cdot I_B - U_{BE} = 0$

$R_B = \frac{U_B - U_{BE}}{I_B} = \frac{4{,}3}{0{,}0004} = 10{,}750\Omega$

$U_{CC} - R_L \cdot I_C - U_{LED} = 0$

$R_L = \frac{U_{LED} - U_{CC} - U_{CE}}{I_C} = 155\Omega$



a) Celková impedancia → prúd $\frac{U}{Z}$ → napätia

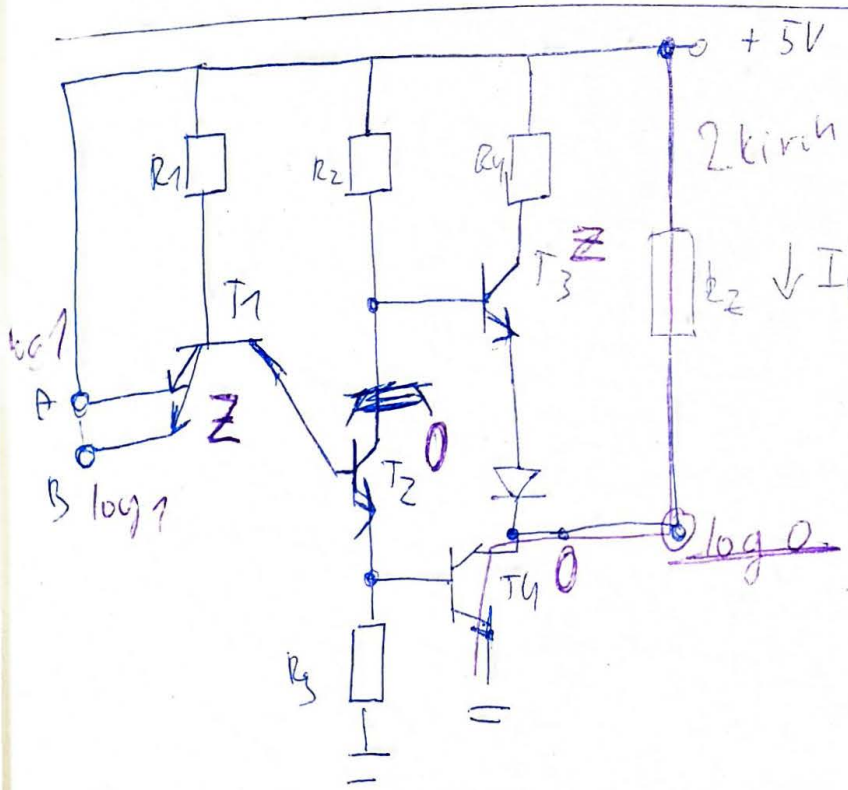
$U_R = R \cdot I$, $U_L = Z_L \cdot I$ → vektor (pytag. veta)

b-) dva uhlové kmitočty

1 rad/s 9 rad/s

Čím je ω vyšší, tým väčšie napätie na cievke a menšie na rezistore

= dolnopriepustný



2. kirch. zákon

$R_Z = 960\,\Omega$

$U_{CC} - R_Z \cdot I_{C_Z} - U_{CE} = 0$

$I_{R_Z} = \frac{U_{CE} - U_{CC}}{R_Z} = \frac{4,8}{960}$

$= 50\,mA$