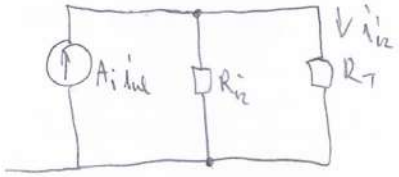
RANJA

① $A_i = 150$

$R_{ul} = 1\,k\Omega$

$R_{in} = 4\,k\Omega$

$A_T = 100$



$$A_I = \frac{i_{iz}}{i_{ul}} = \frac{A_i i_{ul} \cdot \frac{R_{in}}{R_{in}+R_T}}{i_{ul}}$$

$$\frac{A_i}{A_I} = \frac{R_{in}+R_T}{R_{in}} \Rightarrow R_T = R_{in}\cdot\left[\frac{A_i}{A_I} - 1\right] = 4\left[\frac{150}{100} - 1\right] = 2\,k\Omega$$

$\boxed{R_T = 2\,k\Omega}$

$$A_V = \frac{u_{iz}}{u_{ul}} = \frac{i_{iz}\cdot R_T}{i_{ul}\cdot R_{ul}} = A_I \cdot \frac{R_T}{R_{ul}} = 100\cdot\frac{2}{1} = 200$$

$\boxed{A_V = 200}$

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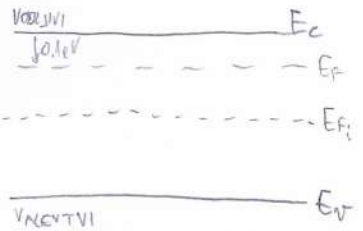
②



$E_F > E_{Fi} \Rightarrow$ n-tip $V = N_D$

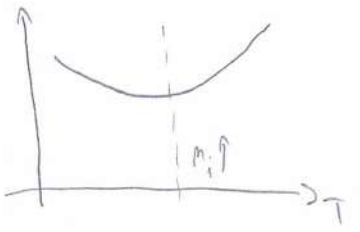
$T = 300\,K$

$n_{om} \approx N$

$T = 400\,K$

$N \gg n_i$ EKSTR.

$n_{om} \approx N$



KONST

$\sigma \cong \sigma_n = q\mu_n \cdot n_{on}$

$T\uparrow \Rightarrow \mu_n \downarrow \Rightarrow \sigma \downarrow$

a) N se donori, σ pada

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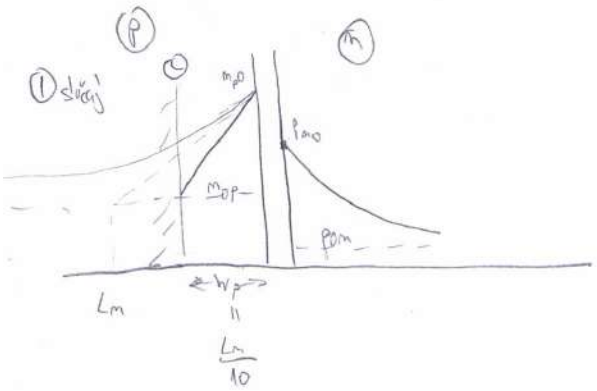
③ $N_D = 1000 N_A$

$p_{om} \approx \frac{n_i^2}{N_D} \ll n_{op} \approx \frac{n_i^2}{N_A}$

n-str p-str

$N_A \ll N_D$ večja koncentracija manjinskih na (p)



① ŠIROKA

$$I_p \cong I_{op} = qS D_n \frac{dn}{dx} = qS D_n \cdot \frac{n_{po}}{L_n}$$

② $I_n \cong I_{pp} = qS D_n \frac{n_{po}}{W_p}$

$$\frac{I_{D_1}}{I_{D_2}} = \frac{L_n}{W_p} = \frac{L_n}{\frac{L_n}{10}} = 10 //$$

strmja raste (gradijent se poveča, nagib)

$I_S = 10fA = 10 \cdot 10^{-15}\ A$

$i_D = I_D + I_{dm} \cdot \sin \omega t = 1 + 0{,}2 \sin \omega t \quad [mA]$

$I_D \doteq I_S \exp \frac{U_D}{U_T} \rightarrow U_D = U_T \ln \frac{I_D}{I_S} = 25 \cdot \ln \frac{10^{-3}}{10 \cdot 10^{-15}} = 633\ mV \approx 630\ mV$

MALI SIGNAL VIDI DINAMIČKI OTPOR!

$r_d = \frac{U_T}{I_D} = \frac{25}{1} = 25\,\Omega$

$U_{dm} = r_d \cdot I_{dm} = 25 \cdot 0{,}2 \cdot 10^{-3} = 5 \cdot 10^{-3}\ V = 5\ mV$

a) $u_D = U_D + U_{dm} \sin \omega t = 630 + 5 \sin \omega t \quad [mV]$

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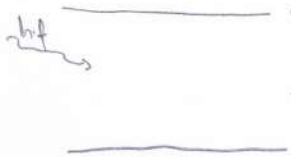
(5)

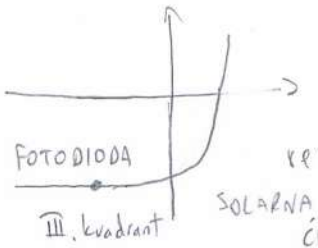


2,1eV

$h \cdot f > E_G$

$h \cdot \frac{c}{\lambda}$

$\lambda = \frac{hc}{E_G} = \frac{1{,}24}{E_G}\ [\mu m] = \frac{1{,}24}{2{,}1} = 0{,}59\ \mu m$



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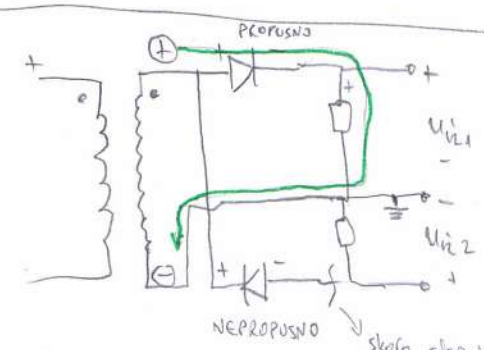
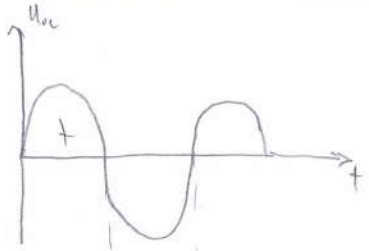
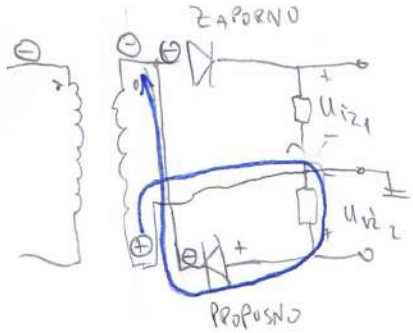
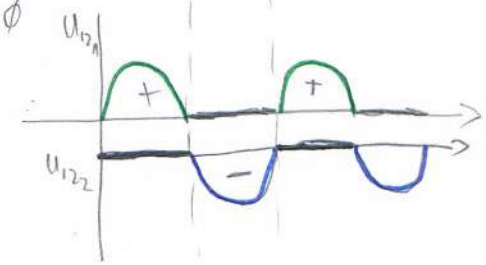
(6)



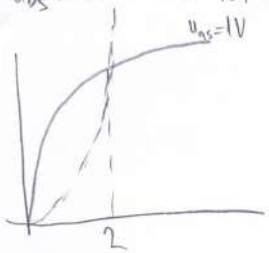






(C) //

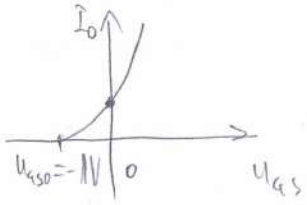
$U_{DS} > 0$ → NMOS



$u_{DS} = u_{GS} - u_{GSO}$

$2 = 1 - u_{GSO}$

$u_{GSO} = -1V$ → osiřomašení



$u_{GSO} = 0$ → $|I_D| > 0$ osiřomaš