1. $C = 3\ nF$

$e_1 = 10\ \mu As$

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$\nu = \frac{\omega_0}{2\pi}$$

$$\nu^2 = \frac{\omega_0^2}{(2\pi)^2} = \frac{1}{4\pi^2 LC}$$

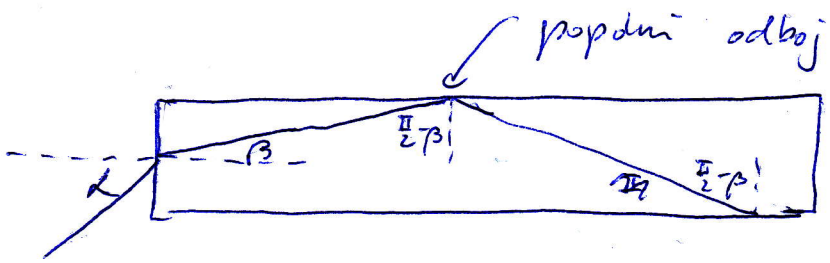
$$L = \frac{1}{4\pi^2 \nu^2 C} = 2{,}11 \cdot 10^{-6}\ H$$

$$W = \frac{e_1^2}{2C} = 16{,}7\ mJ$$

$$W = \frac{L I_0^2}{2} \Rightarrow I_0 = \sqrt{\frac{2W}{L}}$$

$$= 126\ A$$

2.



$\sin\alpha = n \sin\beta$ lom

$n \sin\left(\frac{\pi}{2} - \beta\right) > 1$

$n \cos\beta > 1$

$n\sqrt{1 - \sin^2\beta} > 1$

$\sqrt{n^2 - n^2 \sin^2\beta} > 1$

$\sqrt{n^2 - \sin^2\alpha} > 1$

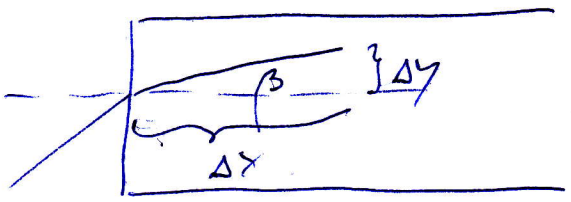
$n^2 - \sin^2\alpha > 1$

$\sin\alpha < \sqrt{n^2 - 1}$ sin

$\alpha < \arcsin\left(\sqrt{n^2 - 1}\right)$

$\alpha < 65{,}1°$

(A) Žarek prepotuje $\Delta x = 100\ m$



in $\Delta y = \Delta x \, tg\beta$

celotna pot

$$s = \sqrt{\Delta x^2 + \Delta x^2 tg^2\beta}$$

$$= \Delta x \sqrt{1 + tg^2\beta}$$

$$= \frac{\Delta x}{\cos\beta}$$

čas : $t = \frac{s}{(c/n)}$, $c = 3 \cdot 10^8\ m/s$

$$t = \frac{\Delta x}{c} \frac{\cos\beta}{n} = \frac{\Delta x}{\sqrt{1 - \sin^2\beta}}$$

$$t = \frac{\Delta x}{c} \frac{}{\sqrt{1 - \frac{\sin^2\alpha}{n^2}}}$$

n

pri maksimalnem kotu α velja

$$n \cos\beta = 1$$

$$\Rightarrow t = \frac{\Delta x}{c} n^2 = 6{,}1 \cdot 10^{-7}\ s$$

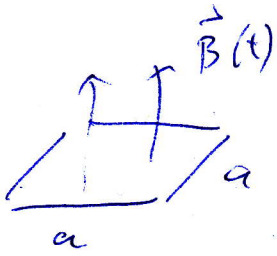
3. a) $B(t) = \frac{\mu_0 I(t) N}{l} = \frac{\mu_0 I_0 \sin(\omega t) N}{l}$

$B(t) = B_0 \sin \omega t$, $B_0 = \frac{\mu_0 I_0 N}{l} = 1{,}57$ mT

ϕ skozi zanko

$\phi = B(t) a^2$

$= B_0 a^2 \sin \omega t$



inducirana napetost in tok skozi zanko

$U_i = \frac{d\phi}{dt} = \omega B_0 a^2 \cos \omega t$

$I_i = \frac{U_i}{R} = \frac{\omega B_0 a^2}{R} \cos \omega t$

$I_{oi} = 2{,}22$ mA

$\bar{P} = I_{eff}^2 R$, $I_{eff} = \frac{I_{oi}}{\sqrt{2}}$

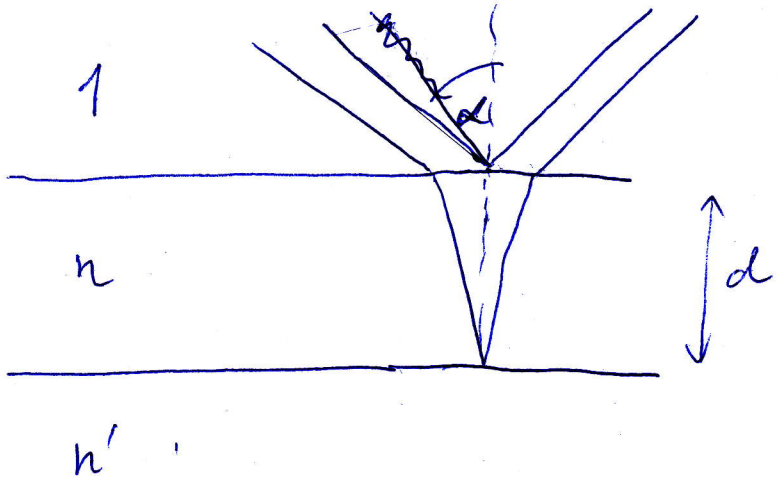
$= \frac{I_{oi}^2 R}{2} = 4{,}92\ \mu W$

b) $I(t_1) = 0{,}5$ A $\Leftrightarrow$ $\sin \omega t_1 = \frac{1}{2}$

$I_i(t_1) = I_{oi} \cos \omega t_1 = I_{oi} \sqrt{1 - \sin^2 \omega t_1}$

$= \frac{I_{oi}}{2} = 1{,}11$ mA

(4)

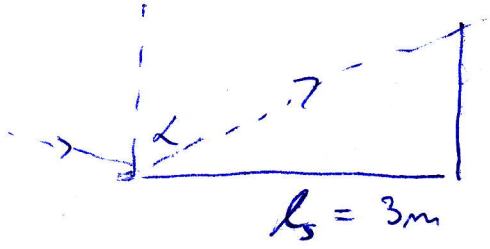


$n > n'$

pogoj za ojačeni odboj (konstruktivno interferenco):

$$\frac{2d\sqrt{n^2-\sin^2\alpha}}{\lambda} = N + 1/2\,, \quad N = 0, 1, \ldots$$

sin:



$$\sin\alpha = \frac{l_s}{\sqrt{l_s^2 + h_s^2}} = 0{,}928$$

$$\lambda = \frac{2d\sqrt{n^2-\sin^2\alpha}}{N+1/2} = \frac{779{,}6\,nm}{N+1/2} = \begin{cases} 1560\,nm;\ N=0 \\ \boxed{520\,nm;\ N=1} \\ 312\,nm;\ N=2 \\ \vdots \end{cases}$$

sin vidi $\lambda_s = 520$ nm

oče:

$$\sin\alpha = \frac{l_o}{\sqrt{l_o^2 + h_o^2}} = 0{,}935$$

$$\lambda = \frac{821{,}2\,nm}{N+1} = \begin{cases} 1642\,nm;\ N=0 \\ \boxed{547\,nm;\ N=1} \end{cases}$$