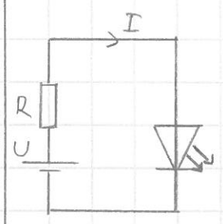
15.9



$U = 4{,}5\,V \qquad I = 20\,mA$

Kirje: valoisan ledin kynnysjännite

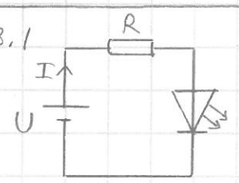
$U_l = 2{,}1\,V$

$\Rightarrow U_R = U - U_l = 4{,}5\,V - 2{,}1\,V = 2{,}4\,V$

$R = \frac{U_R}{I} = \frac{2{,}4\,V}{0{,}020\,A} = \underline{120\,\Omega}$

15.12

3.1



$U = 14{,}4\,V \;,\; U_l = 1{,}7\,V \;,\; I = 20{,}0\,mA$

$U_R = U - U_l = RI$

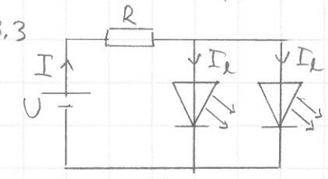
$\Leftrightarrow R = \frac{U - U_l}{I} = \frac{14{,}4\,V - 1{,}7\,V}{0{,}0200\,A} = 635\,\Omega \approx \underline{640\,\Omega}$

3.2 $I = 30{,}0\,mA \;,\; U_l = 1{,}7\,V \;,\; R = 830\,\Omega$

$U_{max} = U_R + U_l = RI + U_l = 830\,\Omega \cdot 0{,}0300\,A + 1{,}7\,V$

$= 26{,}6\,V \approx \underline{27\,V}$

3.3



$U = 14{,}4\,V \;,\; U_l = 1{,}7\,V$

$I_l = 20{,}0\,mA$

$I = 2I_l = 40{,}0\,mA$

K2: $\sum \Delta V = U - U_R - U_l = U - RI - U_l = 0$

$\Leftrightarrow R = \frac{U - U_l}{I} = \frac{14{,}4\,V - 1{,}7\,V}{0{,}0400\,A} = 317{,}5\,\Omega \approx \underline{320\,\Omega}$

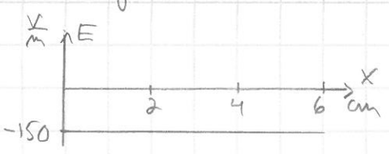
K8.

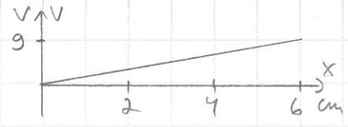
a) Yhdensuuntaiset johdelevyt $\Rightarrow \bar{E}$ vakio ja V muuttuu lineaarisesti levyjen välillä

$U_{BA} = 9{,}0\,V \;,\; s = 6{,}0\,cm$

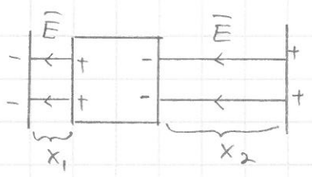
$E = \frac{U_{BA}}{s} = \frac{9{,}0\,V}{0{,}060\,m} = 150\,\frac{V}{m}$

$\bar{E}$ negatiivisen x-akselin suuntaan $\Rightarrow E = -150\,\frac{V}{m}$





b)

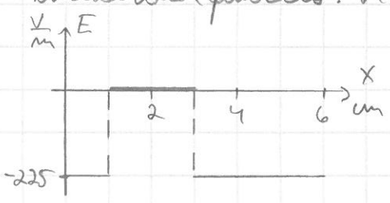


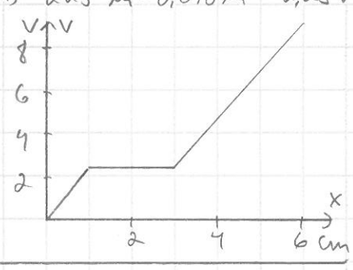
Sähköisen influenssin takia johteen sisällä $\bar{E} = \bar{0}$ ja V vakio johteen ulkopuolella:

$E = -\frac{U_{BA}}{X_1 + X_2} = -\frac{9{,}0\,V}{0{,}010\,m + 0{,}030\,m}$

$= -225\,\frac{V}{m}$

Potentiaali on välillä 0 ... 1,0 cm ja 3,0 cm ... 6,0 cm lineaarinen funktio. $V(1{,}0\,cm) = 225\,\frac{V}{m} \cdot 0{,}010\,m = 2{,}25\,V$





K28.

a) $C = \varepsilon_0 \varepsilon_r \frac{A}{d}$

$\Leftrightarrow A = \frac{Cd}{\varepsilon_0 \varepsilon_r} = \frac{1{,}0 \cdot 10^{-9}\,F \cdot 0{,}010\,m}{8{,}85419 \cdot 10^{-12}\,\frac{F}{m} \cdot 1{,}0006} \approx 1{,}12873\,m^2 \approx \underline{1{,}1\,m^2}$

b) $\frac{C_1}{C} = \frac{\varepsilon_0 \varepsilon_{r1} \frac{A}{d_1}}{\varepsilon_0 \varepsilon_r \frac{A}{d}} = \frac{\varepsilon_{r1} d}{\varepsilon_r d_1} = \frac{6\varepsilon_r d}{\varepsilon_r \cdot \frac{1}{2} d} = 6 \cdot 2 = \underline{12}$