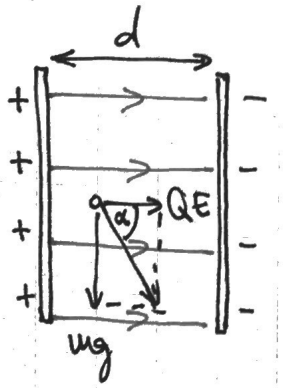
Nagyzárthelyi megoldásai

1.)

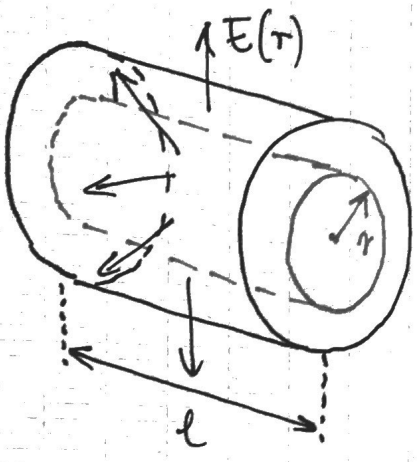


$$E = \frac{U}{d}$$

$$\tan\alpha = \frac{mg}{QE} \rightarrow \underline{\alpha = 67{,}8^\circ}$$

(C)

2.)



Gauss-törvény:

$$\underbrace{E(r)\cdot 2\pi r\cdot l}_{\Psi_{zárt}} = \frac{1}{\varepsilon_0}\cdot \underbrace{\varrho\cdot\pi r^2\cdot l}_{Q_{bezárt}}$$

$$E(r) = \frac{\varrho}{2\varepsilon_0}\cdot r = \underline{11{,}3\ \frac{V}{m}}$$

(B)

3.)

A kondenzátorok összetöltése megmarad:

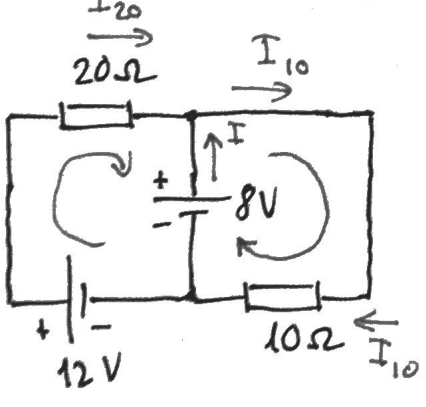
$$\underbrace{C_1 U + C_2 U}_{Q_{kezdeti}} = \underbrace{C_1 U' + \varepsilon_r C_2 U'}_{Q_{végső}},$$

ebből:

$$U' = \frac{2}{1+\varepsilon_r} U = \frac{U}{2} = \underline{12\,V}$$

(B)

4.)



Kirchhoff-törvény:

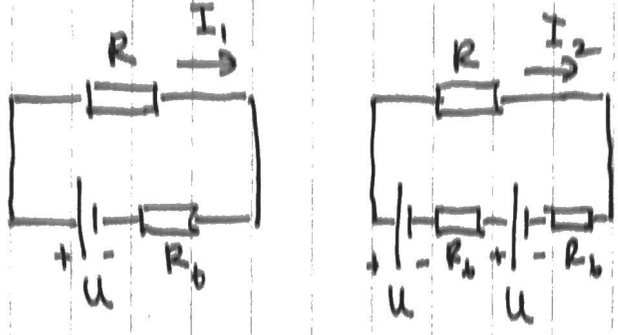
$$12V - 20\Omega\cdot I_{20} - 8V = 0 \rightarrow I_{20} = 0{,}2\ A$$

$$8V - 10\Omega\cdot I_{10} = 0 \rightarrow I_{10} = 0{,}8\ A$$

$$I = I_{10} - I_{20} = \underline{0{,}6A}$$

(D)

5.)



$$I_1 = \frac{U}{R+R_b} \quad (1)$$

$$I_2 = \frac{2U}{R+2R_b} \quad (2)$$

(2) : (1)

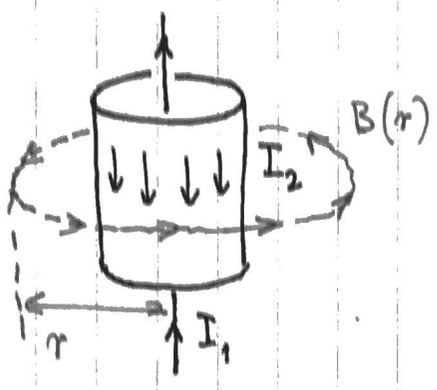
$$\lambda = \frac{I_2}{I_1} = \frac{2(R+R_b)}{R+2R_b} \rightarrow R_b = \frac{2-\lambda}{2(\lambda-1)} R$$

$\lambda = 1{,}8$

$$R_b = 2{,}5\,\Omega$$

(A)

6.)



Ampère - törvény:

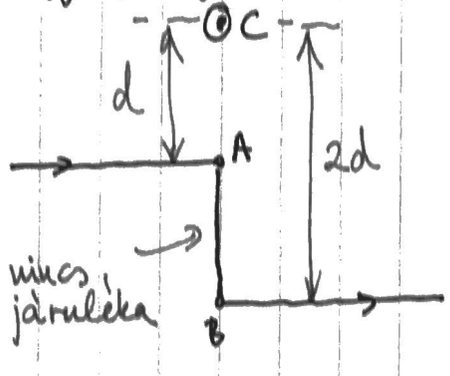
$$B(r) \cdot 2\pi r = \mu_0 (I_1 - I_2)$$

$$B(r) = \frac{\mu_0 (I_1 - I_2)}{2\pi r} = 4 \cdot 10^{-6}\,T$$

(C)

7.) Egy félvégtelen vezető tere a C pontban: $\frac{\mu_0 I}{4\pi r}$.

Az indukció kifelé mutat, nagysága:



$$B_C = \frac{\mu_0 I}{4\pi d} + \frac{\mu_0 I}{4\pi \cdot 2d} = \frac{3\mu_0 I}{8\pi d}.$$

(A)

8.) Addig gyorsul, amíg hat a rúdra Lorentz erő, azaz amíg $I \neq 0$. Ha ez bekövetkezik:

$$I = \emptyset \rightarrow U - B\ell v = \emptyset \rightarrow v = \frac{U}{B\ell} = 1{,}5\,\frac{m}{s}.$$

(B)

9.) $\Phi(t) = B \cdot \pi r^2 \cdot N \cdot \cos(\omega t)$

$$\dot{\Phi}(t) = -B\pi r^2 N \omega \sin \omega t \rightarrow U_{i_{max}} = B\pi r^2 N \omega = 1{,}88\,V$$

(C)