1. naloga

a)

2T 2T 2T

$$R_{n1} = R1 + R2 = 2.5\Omega, \qquad R_{n2} = R3 + R2 = 1.5\ \Omega, \qquad R_{n3} = \frac{R_{n1} \cdot R_{n2}}{R_{n1} + R_{n2}} = 0.9375\Omega$$

$$R_n = R_{n3} + R4 = 1.0375\Omega$$

2T **Rezultat: 2T**

b)

$$I_0 = \frac{U_0}{R_n} = 4.819A \quad \textbf{2T}$$

2T 2T 2T

$$I_2 = \frac{U_{n2}}{R_{n2}} = \frac{U_0 - U_4}{R_{n2}} = \frac{U_0 - R_4 \cdot I_0}{R_{n2}} = \frac{5V - 0.1\Omega \cdot 4.819A}{1.5\Omega} = 3.012A \quad \textbf{1T}$$

$$I_1 = \frac{U_{n1}}{R_{n1}} = \frac{U_0 - U_4}{R_{n1}} = \frac{U_0 - R_4 \cdot I_0}{R_{n1}} = \frac{5V - 0.1\Omega \cdot 4.819A}{2.5\Omega} = 1.807A \quad \textbf{1T}$$

Ali iz K.Z.

$$1: I_1 + I_2 = I_0, \qquad I_0 = \frac{U_0}{R_n} = 4.819A \ \textbf{2T}$$

2T 2T

$$2: U - I_0 R_4 - I_2(R_3 + R_2) = 0, \qquad 3: U - I_0 R_4 - I_1(R_1 + R_2) = 0$$

$$2: I_2 = \frac{U - I_0 R_4}{R_3 + R_2} = 3.012A, \qquad 3: I_1 = \frac{U - I_0 R_4}{R_1 + R_2} = 1.807A$$

Enačba I_2 ali I_1: 2T **Rezultat: 1T+1T**

c)

2T 2T 1T

$$P = U \cdot I = U_4 \cdot I_0 = 2.32\ W$$

3. naloga

a)

2T $\Delta W = 0,$ 2T $\Delta W_k + \Delta W_{ep} = 0,$ 2T $\mathrm{W_k^k} - W_k^z + W_{ep}^k - W_{ep}^z = 0,$ 2T $\frac{mv^2}{2} = eU$

2T $v = \sqrt{\frac{2eU}{m}},$ $v(^3He^+) = 254 \cdot 10^3 m/s$ 2T

b)

2T $ma_c = evB,$ $a_c = \frac{v^2}{R},$ 3T $R = \frac{mv}{eB},$ 2T $D = 2R(^3He^+) = 2 * 7{,}15\ cm = 14{,}3cm$

c)

2T $v(\ ^4He^+) = 219{,}7 \cdot 10^3 m/s,$ 2T $D_2 = 2R(^4He^+) = 2 * 8{,}3\ cm = 16{,}6cm$

$\Delta D = 2{,}3\ cm$ 2T

5. naloga

2T $F = IlB = l\frac{I_1 I_2 \mu_0}{2\pi r},$ 2T $\frac{F(r)}{l} = -\frac{I^2\mu_0}{2\pi r},$ 2T $F = ma = m\ddot{r},$ 3T $\frac{F}{l} = \lambda\ddot{r},$

$\ddot{r} = -\left(\frac{I^2\mu_0}{2\pi\lambda}\right)\frac{1}{r} = -A\frac{1}{r},$ $\frac{d^2r}{dt^2} = \frac{dv}{dt} = \frac{dv}{dr}\frac{dr}{dt} = -A\frac{1}{r}$ 5T

$vdv = -\frac{Adr}{r}$ $\int$ 3T

$\int_0^v v'dv' = -A\int_{r_0}^r \frac{dr'}{r'},$ 4T $\frac{v^2}{2}\Big|_0^v = -A\ln r\Big|_{r_0}^r,$ 2T $\frac{v^2}{2} = -A\ln\frac{r}{r_0}$

$v(r) = \pm\sqrt{-2A\ln r/r_0},$ 2T $v(r) = -I\sqrt{-\frac{\mu_0}{\pi\lambda}\ln\frac{r}{r_0}}$

Ali

2T $F = IlB = l\frac{I_1 I_2 \mu_0}{2\pi r},$ 2T $A = \Delta W_k,$ 2T $A = \int F dr,$ 3T $W_k^{konč} = \int F dr$

3T $\frac{mv^2}{2} = -\frac{I^2\mu_0 l}{2\pi}\int_{r_0}^r \frac{dr'}{r'},$ 3T $\frac{v^2}{2} = -\frac{I^2\mu_0}{2\pi\lambda}\ln r\Big|_{r_0}^r,$ 4T $\frac{v^2}{2} = -A\ln\frac{r}{r_0}$

Meje: 2T

2. naloga

$$F_{el} = \frac{e_1 e_2}{4\pi\epsilon_0 r^2}\ (2T)$$

$$F_2 = F_3 = \frac{2e_1^2}{4\pi\epsilon_0 a^2} = 180N\ (2T)$$

$$F_4 = \frac{-3e_1^2}{8\pi\epsilon_0 a^2} = -135N\ (2T)$$

$$F_{REZ} = \frac{4\sqrt{2}-3}{2}\frac{e_1^2}{4\pi\epsilon_0 a^2} = 120N\ (5+2T)$$

$$F_{REZ}\ \text{direction} \rightarrow (\cos 135^\circ, \sin 135^\circ)\ (2T)$$

$$A = W_K - W_Z\ (3T)$$

$$W_Z = \frac{e_1 e_2}{4\pi\epsilon_0 a} + \frac{e_1 e_3}{4\pi\epsilon_0 a} + \frac{e_1 e_4}{4\pi\epsilon_0\sqrt{2}a} + \frac{e_2 e_3}{4\pi\epsilon_0\sqrt{2}a} + \frac{e_2 e_4}{4\pi\epsilon_0 a} + \frac{e_3 e_4}{4\pi\epsilon_0 a}\ (2T)$$

$$W_K = \frac{e_1 e_2}{4\pi\epsilon_0 a} + \frac{e_1 e_3}{4\pi\epsilon_0 a} + \frac{e_2 e_3}{4\pi\epsilon_0\sqrt{2}a}\ (2T)$$

$$A = -(\frac{e_1 e_4}{4\pi\epsilon_0\sqrt{2}a} + \frac{e_2 e_4}{4\pi\epsilon_0 a} + \frac{e_3 e_4}{4\pi\epsilon_0 a}) = 63.5J\ (2+1T)$$

4. naloga

$$J_{palica} = \frac{m_P l^2}{3}\ (2T)$$

$$J_{disk} = \frac{m_D R^2}{2} + m_D(l+R)^2\ (\text{drugačna os od težišča})\ (3T)$$

$$J = J_P + J_D = 3.76\,\text{kg m}^2\ (3+2T)$$

$$M = m_P g\frac{l}{2}\sin\phi + m_D g(l+R)\sin\phi + k(\frac{4l}{5})^2\sin\phi\cos\phi\ (1+1+3T)$$

$$M \simeq (m_P g\frac{l}{2} + m_D g(l+R) + k(\frac{4l}{5})^2)\,\phi\ (\text{razvoj})\ (3T)$$

$$M = J\alpha \rightarrow \ddot{\phi} + \frac{M}{J} = 0\ (3T)$$

$$\ddot{\phi} + \frac{M}{J} = 0 \rightarrow \ddot{\phi} + \omega^2\phi = 0\ (\text{dobimo}\,\omega)\ (2T)$$

$$t_0 = \frac{2\pi}{\omega} = 2s\ (2T)$$