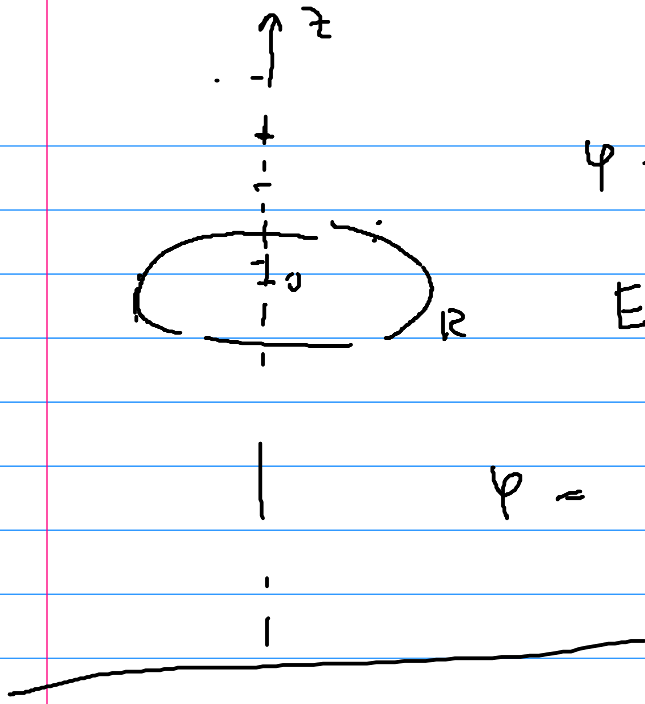


$$\varphi = \frac{1}{4\pi\varepsilon_0}\int_0^{2\pi}\frac{\lambda R\,d\varphi}{\sqrt{R^2+z^2}} = \frac{1}{2\varepsilon_0}\frac{\lambda R}{\sqrt{R^2+z^2}}$$

$$E_z = -\nabla_z \varphi$$

$$\varphi = \int_z^\infty \vec{E}\cdot d\vec{r} = -\int_\infty^z E_z\,dz$$

$$= -\frac{\lambda}{2\varepsilon_0}\int_\infty^z \frac{Rz\,dz}{(z^2+R^2)^{3/2}}$$

$$t = z^2+R^2$$
$$dt = 2z\,dz$$

$$= \frac{-\lambda}{2\varepsilon_0}\int_\infty^{z^2+R^2}\frac{R\,dt}{t^{3/2}} = \frac{+\lambda}{2\varepsilon_0}\frac{R}{2}\frac{1}{\sqrt{R^2+z^2}}$$

1.2.5.

$$(Q = CV)$$
$$C_{ij} = ?$$

$$Q_1 = C_{11}\varphi_1 + C_{12}\varphi_2$$
$$Q_2 = C_{21}\varphi_1 + C_{22}\varphi_2$$

$$\varphi = \cdots f(Q_1, Q_2)$$
$$\varphi_1 = B_{11}Q_1 + B_{12}Q_2$$
$$\varphi_2 = B_{21}Q_1 + B_{22}Q_2$$
$$\mathbb{C} = \mathbb{B}^{-1}$$

$$\to \varphi_1 = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q_1}{R_1} + \frac{Q_2}{R_2}\right)$$

$$E = \frac{1}{4\pi\varepsilon_0}\frac{Q_1}{r^2}$$

$$\to \varphi(R_1) = \varphi_1 = \frac{1}{4\pi\varepsilon_0}\frac{Q_1}{R_1} + C$$
$$\varphi(r) = \frac{1}{4\pi\varepsilon_0}\frac{Q_1}{r} + C$$

$$r > R_2 \qquad E = \frac{1}{4\pi\varepsilon_0} \frac{Q_1 + Q_2}{r^2}$$

$$\varphi = \frac{1}{4\pi\varepsilon_0} \frac{Q_1 + Q_2}{r} + \underset{\downarrow}{C_2}$$

$$\varphi(R_2) = \frac{1}{4\pi\varepsilon_0} \frac{Q_1}{R_2} + C = \overset{0}{} \frac{1}{4\pi\varepsilon_0} \frac{Q_1 + Q_2}{R_2}$$

$$C = \frac{1}{4\pi\varepsilon_0} \frac{Q_2}{R_2}$$

$$\varphi_1 = \frac{1}{4\pi\varepsilon_0} \left(\frac{Q_1}{R_1} + \frac{Q_2}{R_2} \right) \qquad \mathbb{B} = \frac{1}{4\pi\varepsilon_0} \begin{pmatrix} \frac{1}{R_1} & \frac{1}{R_2} \\ \frac{1}{R_2} & \frac{1}{R_2} \end{pmatrix}$$

$$\varphi_2 = \frac{1}{4\pi\varepsilon_0} \left(\frac{Q_1}{R_2} + \frac{Q_2}{R_2} \right)$$

$$\mathbb{C} = \mathbb{B}^{-1} \qquad D = \frac{1}{R_1 R_2} - \frac{1}{R_2^2} = \frac{1}{R_2} \cdot \frac{R_2 - R_1}{R_1 R_2}$$

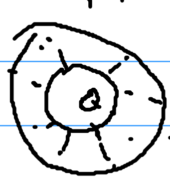
$$\mathbb{C} = 4\pi\varepsilon_0 \begin{pmatrix} \frac{1}{R_2} & -\frac{1}{R_2} \\ -\frac{1}{R_2} & \frac{1}{R_1} \end{pmatrix} \cdot \frac{1}{D} = 4\pi\varepsilon_0 \frac{R_1 R_2}{R_2 - R_1} \cdot \begin{pmatrix} 1 & -1 \\ -1 & \frac{R_2}{R_1} \end{pmatrix}$$

$$C_{11} = -C_{12} = -C_{21} = 4\pi\varepsilon_0 \frac{R_1 R_2}{R_2 - R_1}$$

$$C_{22} = 4\pi\varepsilon_0 \frac{R_2^2}{R_2 - R_1}$$

1.2.6 v 1.2.5 VRAT $C \to C_{ij}$

$Q_1 = Q \quad | \quad Q_2 = -Q$



$-Q$

$\varphi_1, \varphi_2 \to U = \varphi_2 - \varphi_1$

$$Q = C_{11}\varphi_1 + C_{12}\varphi_2$$
$$-Q = C_{21}\varphi_1 + C_{22}\varphi_2$$

DOBR. D.Ú. $C = f(C_{ij})$

$r > R_2$ $\quad \varphi = \dots \dfrac{Q-Q}{r} = 0$

$\varphi_2 = 0$

$U = -\varphi_1$

$Q = C_{11}\varphi_1 = -C_{11}U$

$-Q = C_{21}\varphi_1 = -C_{21}U$

$$C = -C_{11} = C_{21} = (-)\,4\pi\varepsilon_0 \frac{R_1 R_2}{R_2 - R_1}$$

JINAK:

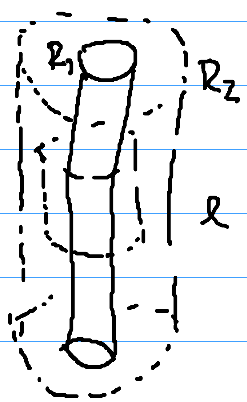
$$U = \varphi_2 - \varphi_1 = \int_1^2 \vec{E}\cdot d\vec{r} =$$

$$E = \frac{1}{4\pi\varepsilon}\frac{Q}{r^2}$$

$$= \frac{Q}{4\pi\varepsilon_0}\int_{R_1}^{R_2}\frac{dr}{r^2} = \frac{Q}{4\pi\varepsilon_0}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$= \frac{Q}{4\pi\varepsilon_0}\frac{R_2 - R_1}{R_1 R_2} \Rightarrow C = 4\pi\varepsilon_0 \frac{R_1 R_2}{R_2 - R_1}$$

KAPACITA VÁLCOVÉHO KOND.



$C = ?$ $\qquad U = \varphi_2 - \varphi_1 = \int \vec{E}\cdot d\vec{r}$

$$E = \frac{1}{2\pi\varepsilon_0}\cdot\frac{\lambda}{r} \qquad \frac{\varrho\cdot R_1^2}{2\varepsilon_0 r} \qquad \pi R_1^2 \varrho = \lambda$$

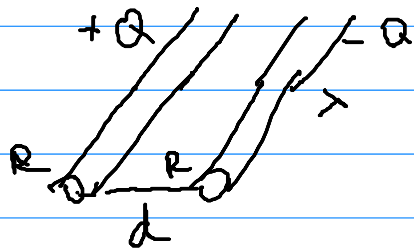
$$\int_1^2 E\,dr = \int_{R_1}^{R_2}\frac{1}{2\pi\varepsilon_0}\frac{\lambda\,dr}{r} = \frac{\lambda}{2\pi\varepsilon_0}\int_{R_1}^{R_2}\frac{1}{r}dr$$

$$= \frac{\lambda}{2\pi\varepsilon_0}\cdot\ln\frac{R_2}{R_1}$$

$$\frac{C}{l} = \frac{2\pi\varepsilon_0}{\ln\frac{R_2}{R_1}}$$

DÚ:

KAPACITU DVOJLINKY NA JEDN. DÉLKY



$$\frac{C}{l} = ?$$