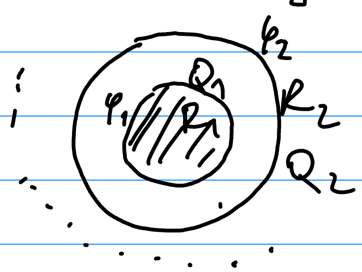
1.2.5

KOND.

$C_{ij} = ?$ $\qquad Q = C \cdot U \qquad U = \varphi_1 - \varphi_2$



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

$C_{12} = C_{21}$ (viz předn.)

$$\varphi_i = f(Q_1, Q_2)$$

$$\begin{cases} \varphi_1 = B_{11} Q_1 + B_{12} Q_2 \\ \varphi_2 = B_{21} Q_1 + B_{22} Q_2 \end{cases} \qquad C = B^{-1}$$

$\varphi_1 = \cancel{\frac{1}{4\pi\varepsilon_0}} \frac{Q_1}{R_1}$

$\cancel{\varphi_2 = \frac{1}{4\pi\varepsilon_0} \frac{Q_2}{R_2}}$

$R < R_1: \quad \varphi = \varphi_1$

$R_2 > R > R_1 \quad \varphi = \frac{1}{4\pi\varepsilon_0}\frac{Q_1}{R} + konst_1$

$R > R_2 \quad \varphi = \frac{1}{4\pi\varepsilon_0}\frac{Q_1 + Q_2}{R} + \underbrace{konst_2}_{0}$

$$\varphi_2 = \varphi(R_2) = \varphi(R_2) \to konst_1 = \frac{1}{4\pi\varepsilon_0}\frac{Q_2}{R_2}$$

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

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

$$B = \frac{1}{4\pi\varepsilon_0}\begin{pmatrix} \frac{1}{R_1} & \frac{1}{R_2} \\ \frac{1}{R_2} & \frac{1}{R_2} \end{pmatrix} \qquad C = B^{-1}$$

$$\left(\begin{array}{cc|cc} \frac{1}{R_1} & \frac{1}{R_2} & 1 & 0 \\ \frac{1}{R_2} & \frac{1}{R_2} & 0 & 1 \end{array}\right) \sim \left(\begin{array}{cc|cc} \frac{1}{R_1} & \frac{1}{R_2} & 1 & 0 \\ 0 & \frac{1}{R_2}\cdot\left(\frac{1}{R_1} - \frac{1}{R_2}\right) & -\frac{1}{R_2} & \frac{1}{R_1} \end{array}\right) \sim$$

$$\sim \left(\begin{array}{cc|cc} \frac{1}{R_1}\cdot\left(\frac{1}{R_2}-\frac{1}{R_1}\right) & 0 & \left(\cancel{\frac{1}{R_2}}-\frac{1}{R_1}\right)-\cancel{\frac{1}{R_2}} & -\frac{1}{R_1} \\ 0 & \frac{1}{R_2}\left(\frac{1}{R_1}-\frac{1}{R_2}\right) & -\frac{1}{R_2} & \frac{1}{R_1} \end{array}\right) \sim$$

$$\sim \left(\begin{array}{cc|cc} 1 & 0 & -\frac{R_1R_2}{R_1-R_2} & +\frac{R_1R_2}{R_1-R_2} \\ 0 & 1 & -\frac{R_1R_2}{R_2-R_1} & \frac{\cancel{\frac{1}{R_1}}}{\frac{1}{R_2}\,\frac{R_2-R_1}{\cancel{R_1}R_2}} = \frac{R_2^2}{R_2-R_1} \end{array}\right)$$

$$C_{11} = 4\pi\varepsilon_0 \cdot \frac{R_1R_2}{R_2-R_1}$$

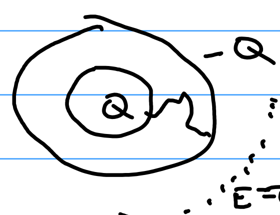
$$C_{12} = -C_{11}$$

$$C_{21} = -\|-$$

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

1.2.6 V 1.2.5 KONDENZÁTOR $C_{ij} \to C$

$$\underbrace{Q_1 = -Q_2 = Q} \qquad C = \frac{Q}{U}$$



$E=0$

$\Rightarrow \varphi$ konst. $=0$

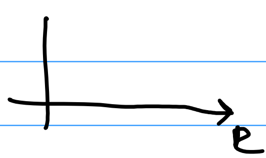
$\Rightarrow \varphi_2 = 0$

$$\varphi_1, \varphi_2 \to \underbrace{U = \varphi_1 - \varphi_2}$$

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

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

$$U = \frac{Q}{4\pi\varepsilon_0}\left(\frac{1}{R_1} - \frac{1}{R_2} - \cancel{\frac{1}{R_2}} + \cancel{\frac{1}{R_2}}\right) =$$



$$= -\frac{Q}{4\pi\varepsilon_0}\,\frac{R_2-R_1}{R_1R_2}$$

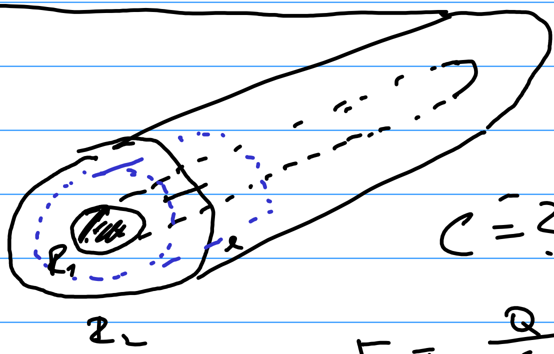
$$C = (-)4\pi\varepsilon_0 \frac{R_1R_2}{R_2-R_1} \qquad Q = C_{11}U$$

$$r > R_2 \quad E = 0 \Rightarrow \varphi_2 = 0 \qquad C = C_{11}$$

JINAK: $U = \varphi_2 - \varphi_1 = \int_1^2 \vec{E}\cdot d\vec{r} = \frac{Q}{4\pi\varepsilon_0}\int_{R_1}^{R_2}\frac{dr}{r^2} =$

$$= \frac{Q}{4\pi\varepsilon_0}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

KAPACITA VÁLC. KOND.



$U = \varphi_2 - \varphi_1 =$

$C = ?$

$= \int_1^2 \vec{E} \cdot d\vec{r}$

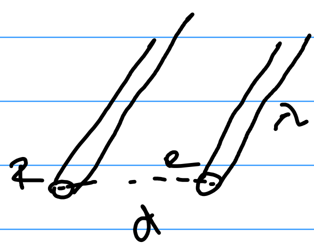
$$E = \frac{Q}{\varepsilon_0 S} = \frac{Q}{\varepsilon_0} \cdot \frac{1}{2\pi \varrho \cdot l}$$

$$U = \int_1^2 \frac{Q}{\varepsilon_0} \frac{1}{2\pi \varrho \cdot l} \, d\varrho = \frac{Q}{2\pi\varepsilon_0 l} \cdot \ln \frac{R_2}{R_1}$$

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

D.Ú.

KAPACITA DVOJLINKY NA JEDN. DÉLKU



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