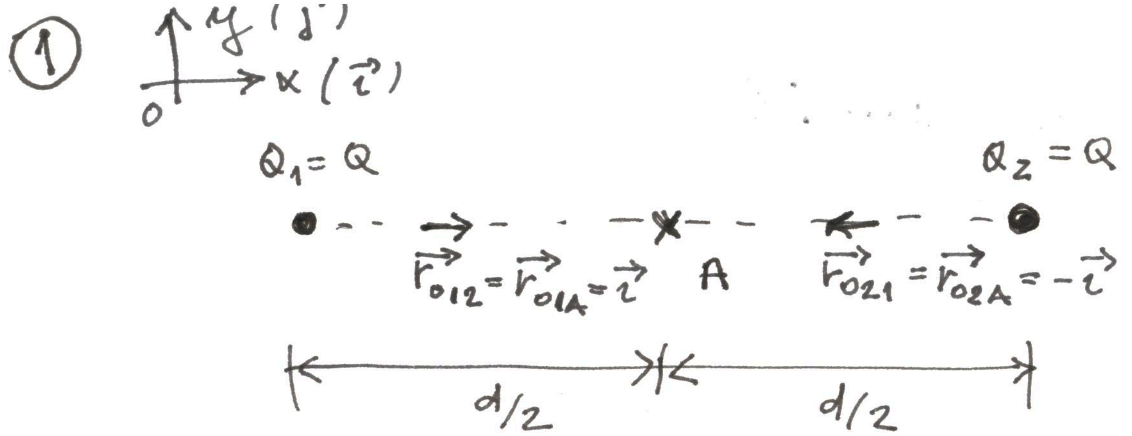
(1)



SILA: $\vec{F}_{12} = \dfrac{Q_1 Q_2}{4\pi\varepsilon d^2}\vec{r}_{012} = \dfrac{Q^2}{4\pi\varepsilon d^2}\vec{i}$ (Q_1 – aktivno, Q_2 – pasivno, odbojna sila)

$\vec{F}_{21} = \dfrac{Q_1 Q_2}{4\pi\varepsilon d^2}\vec{r}_{021} = \dfrac{Q^2}{4\pi\varepsilon d^2}(-\vec{i})$ (Q_2 – aktivno, Q_1 – pasivno, odbojna sila)

$\vec{F}_{12} = -\vec{F}_{21}$

POLJE: $\vec{K}_A = \vec{K}_{A1}\Big|_{\text{od } Q_1} + \vec{K}_{A2}\Big|_{\text{od } Q_2} = \dfrac{Q_1}{4\pi\varepsilon\left(\frac{d}{2}\right)^2}\vec{r}_{01A} + \dfrac{Q_2}{4\pi\varepsilon\left(\frac{d}{2}\right)^2}\vec{r}_{02A}$

$$\vec{K}_A = \frac{Q}{4\pi\varepsilon\frac{d^2}{4}}\vec{i} + \frac{Q}{4\pi\varepsilon\frac{d^2}{4}}(-\vec{i}) = \vec{0}$$

POLJE: $V_A = V_{A1}\Big|_{\text{od } Q_1} + V_{A2}\Big|_{\text{od } Q_2} = \dfrac{Q_1}{4\pi\varepsilon(d/2)} + \dfrac{Q_2}{4\pi\varepsilon(d/2)}$

$$V_A = \frac{Q}{2\pi\varepsilon d} + \frac{Q}{2\pi\varepsilon d} = \frac{Q}{\pi\varepsilon d}$$

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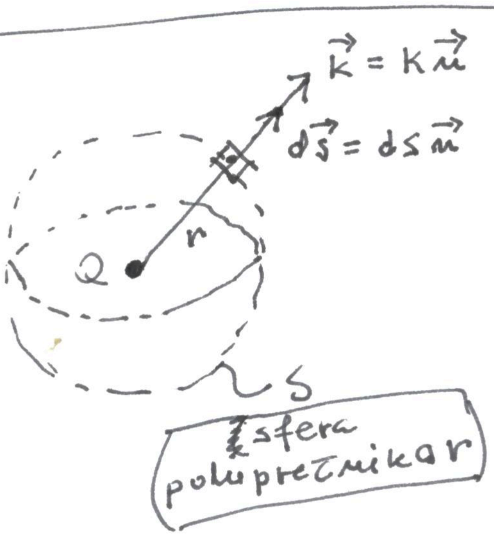
(2)



$\left.\begin{array}{l}\vec{K} = K\vec{n} \\ d\vec{s} = ds\,\vec{n}\end{array}\right\}$ $\measuredangle(\vec{K}, d\vec{s}) = 0$ (kolinearni vektori)

$\vec{K}\,d\vec{s} = K\,ds\cos\measuredangle(\vec{K}, d\vec{s}) = K\,ds\cos(0)$

$\vec{K}\,d\vec{s} = K\,ds$

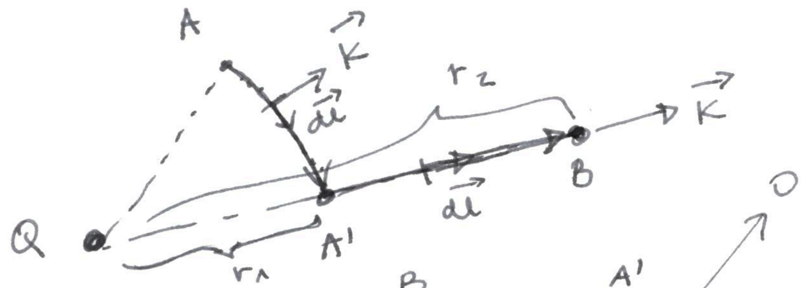
$$\Psi_S = \oiint_S \vec{K}\,d\vec{s} = K\oiint_S ds = KS = 4\pi K r^2$$

GAUSOV ZAKON: $\Psi_S = \dfrac{Q}{\varepsilon}$

$$\Rightarrow 4\pi K r^2 = \frac{Q}{\varepsilon}$$

$$\boxed{K = \frac{Q}{4\pi\varepsilon r^2}}$$

3



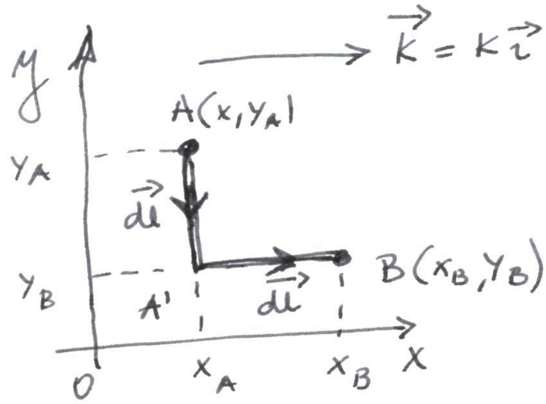
$\boxed{\text{I NAČIN}}$

$$U_{AB} = \int_A^B \vec{K}\,\vec{dl} = \underbrace{\cancel{\int_A^{A'} \vec{K}\,\vec{dl}}}_{\sphericalangle(\vec{K},\vec{dl})=90^\circ,\ \cos(90^\circ)=0}^{0} + \underbrace{\int_{A'}^{B} \vec{K}\,\vec{dl}}_{\sphericalangle(\vec{K},\vec{dl})=0,\ \cos(0)=1} = \int_{A'}^{B} K\,dl$$

$$U_{AB} = \int_{r_1}^{r_2} \frac{Q\,dr}{4\pi\varepsilon r^2} = -\frac{Q}{4\pi\varepsilon r}\Big|_{r_1}^{r_2} = -\frac{Q}{4\pi\varepsilon r_2} + \frac{Q}{4\pi\varepsilon r_1}$$

$\boxed{\text{II NAČIN}}$ $\quad U_{AB} = V_A - V_B = \dfrac{Q}{4\pi\varepsilon r_A} - \dfrac{Q}{4\pi\varepsilon r_2}$

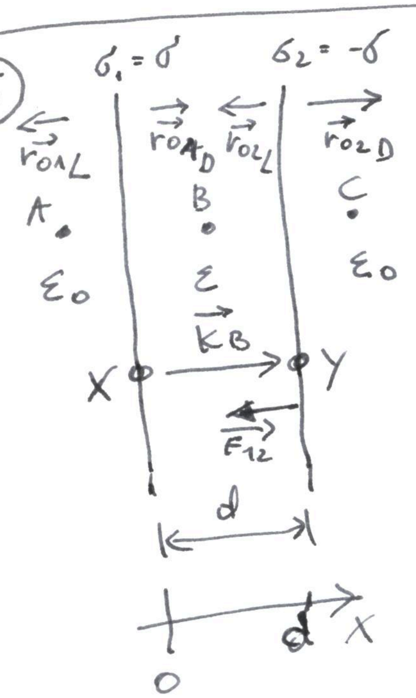
4



$$U_{AB} = \int_A^B \vec{K}\,\vec{dl} = \underbrace{\cancel{\int_A^{A'} \vec{K}\,\vec{dl}}}_{\sphericalangle(\vec{K},\vec{dl})=90^\circ,\ \cos(90^\circ)=0}^{=0} + \underbrace{\int_{A'}^{B} \vec{K}\,\vec{dl}}_{\sphericalangle(\vec{K},\vec{dl})=0,\ \cos(0)=1}$$

$$U_{AB} = \int_{A'}^{B} K\,dl = K\int_{x_A}^{x_B} dx = Kx\Big|_{x_A}^{x_B} = K(x_B - x_A)$$

5



$$\vec{K}_A = \frac{\sigma_1}{2\varepsilon_0}\vec{r}_{01L} + \frac{\sigma_2}{2\varepsilon_0}\vec{r}_{02L} = \frac{\sigma}{2\varepsilon_0}(-\vec{i}) + \frac{-\sigma}{2\varepsilon_0}(-\vec{i})$$

$$\vec{K}_A = \vec{0}$$

$$\vec{K}_C = \frac{\sigma_1}{2\varepsilon_0}\vec{r}_{01D} + \frac{\sigma_2}{2\varepsilon_0}\vec{r}_{02D} = \frac{\sigma}{2\varepsilon_0}\vec{i} + \frac{-\sigma}{2\varepsilon_0}\vec{i} = \vec{0}$$

$$\vec{K}_B = \frac{\sigma_1}{2\varepsilon}\vec{r}_{01D} + \frac{\sigma_2}{2\varepsilon}\vec{r}_{02L} = \frac{\sigma}{2\varepsilon}\vec{i} + \frac{-\sigma}{2\varepsilon}(-\vec{i})$$

$$\boxed{\vec{K}_B = \frac{\sigma}{\varepsilon}\vec{i}}$$

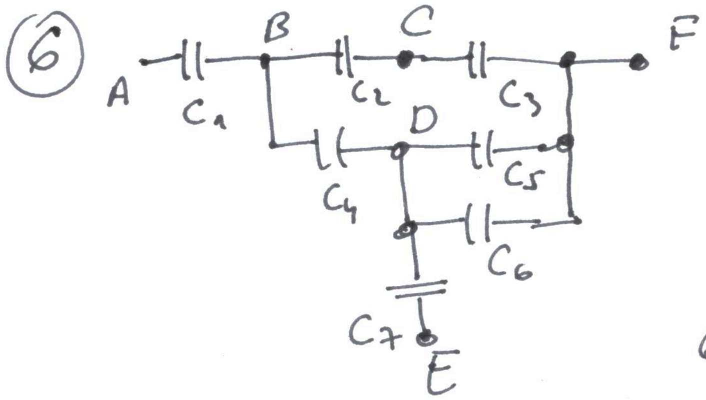
$$U_{xy} = \underbrace{\int_x^y \vec{K}_B\,\vec{dl}}_{\sphericalangle(\vec{K}_B,\vec{dl})=0,\ \cos(0)=1} = \int_0^d \frac{\sigma}{\varepsilon}\,dx = \frac{\sigma d}{\varepsilon} = Kd$$

$$C = \frac{Q}{U_{xy}} = \frac{\sigma S}{\frac{\sigma d}{\varepsilon}} = \frac{\varepsilon S}{d}$$

$$\vec{F}_{12} = \vec{K}_1 \cdot Q_2 = \frac{\sigma}{2\varepsilon}\vec{i}\cdot(-\sigma S)$$

$$\vec{F}_{12} = -\frac{\sigma^2 S}{2\varepsilon}\vec{i} = -\frac{Q^2}{2\varepsilon S}\vec{i} \text{ (PRIVLAČNA)}$$

(6)



$C_{EAF} = ?$ Probajte sami između drugih tačaka

C_7 – nije povezan sa oba kraja $\Rightarrow$ ne figuriše u izrazima !

$$C_{56} = C_5 + C_6 \quad (\text{PARALELNO } C_5 \text{ i } C_6)$$

$$C_{456} = \frac{1}{\frac{1}{C_4} + \frac{1}{C_{56}}} \quad (\text{Redno } C_4 \text{ i } C_{56})$$

$$C_{23} = \frac{1}{\frac{1}{C_2} + \frac{1}{C_3}} \quad (\text{Redno } C_2 \text{ i } C_3)$$

$$C_{23456} = C_{23} + C_{456} \quad (\text{PARALELNO } C_{23} \text{ i } C_{456})$$

$$C_{EAF} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_{23456}}} \quad (\text{Redno } C_1 \text{ i } C_{23456})$$

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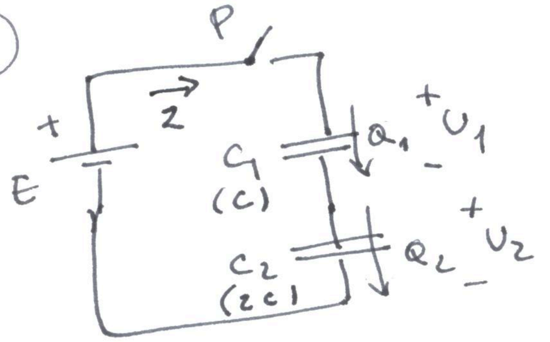
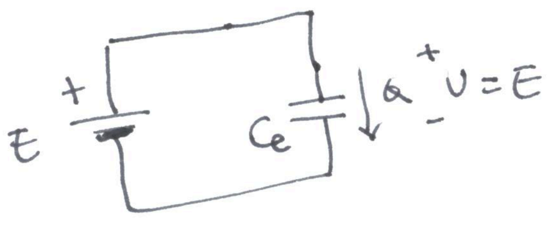
(7)



$$q = Q = Q_1 = Q_2$$

$$C_e = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} = \frac{C_1 C_2}{C_1 + C_2} = \frac{C \cdot 2C}{C + 2C}$$

$$C_e = \frac{2}{3} C$$



$$Q = Q_1 = Q_2 = C_e E = \frac{2}{3} CE$$

$$U_1 = \frac{Q_1}{C_1} = \frac{\frac{2}{3} CE}{C} = \frac{2}{3} E$$

$$U_2 = \frac{Q_2}{C_2} = \frac{\frac{2}{3} CE}{2C} = \frac{1}{3} E$$

PROVER

$V = E = U_1 +$

✓

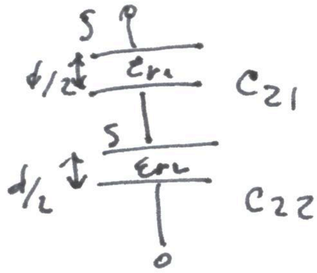
$$W_1 = \frac{1}{2} Q_1 U_1 = \frac{1}{2} \cdot \frac{2}{3} CE \cdot \frac{2}{3} E = \frac{2}{9} CE^2$$

$$W_2 = \frac{1}{2} C_2 U_2^2 = \frac{1}{2} 2C \cdot \frac{E^2}{9} = \frac{1}{9} CE^2$$

$$\frac{W_1}{W_2} = 2$$

Probajte da uradite isto ako je veza C_1 i C_2 paralelna ...

(8) $C_1 = \frac{\varepsilon_0 S}{d}$



Redna veza

$$C_2 = \frac{1}{1/C_{21} + 1/C_{22}}$$

$$C_{21} = \frac{\varepsilon_0 \varepsilon_{r1} S}{d/2} = \frac{2\varepsilon_0 \varepsilon_{r1} S}{d}$$

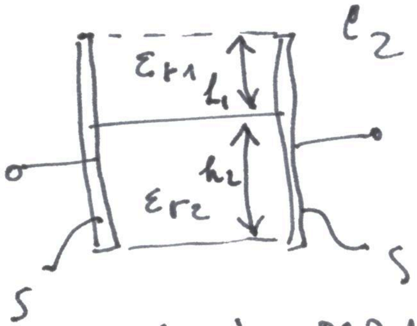
$$C_{22} = \frac{\varepsilon_0 \varepsilon_{r2} S}{d/2} = \frac{2\varepsilon_0 \varepsilon_{r2} S}{d}$$

$$C_2 = \frac{1}{\frac{d}{2\varepsilon_0 \varepsilon_{r1} S} + \frac{d}{2\varepsilon_0 \varepsilon_{r2} S}}$$

$$C_2 = \frac{2\varepsilon_0 S}{d} \frac{\varepsilon_{r1}\varepsilon_{r2}}{\varepsilon_{r2} + \varepsilon_{r1}}$$

$$C_2/C_1 = 2 \frac{\varepsilon_{r1}\varepsilon_{r2}}{\varepsilon_{r1} + \varepsilon_{r2}}$$

Probajte isto za



$h_1 = 0{,}4h$

$h_2 = 0{,}6h$

ovde je PARALELNA VEZA . . .