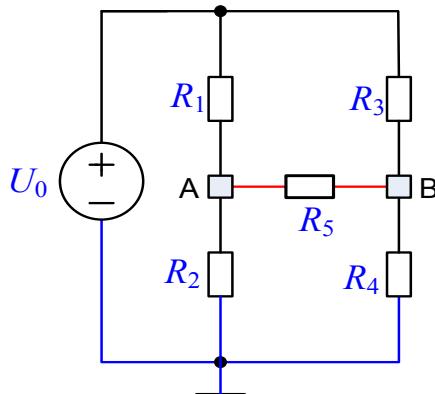



De1.

Mostično vezje je napajano z napetostjo $U_0 = 25 \text{ V}$.Elementi so: $R_1 = 1,5 \text{ k}\Omega$, $R_2 = 3,3 \text{ k}\Omega$, $R_3 = 3,9 \text{ k}\Omega$, $R_4 = 4,7 \text{ k}\Omega$ in $R_5 = 2,2 \text{ k}\Omega$.Izračunajte potenciale V_A , V_B , napetost U_{AB} in tok I , ki ga daje napetostni vir.

| | |
|------------|--|
| $V_A =$ | |
| $V_B =$ | |
| $U_{AB} =$ | |
| $I =$ | |
| | |

De2.

Uporovni delilnik z linearnim potenciometrom $R_p = 250 \Omega$ priključimo na napetost $U_0 = 6 \text{ V}$ in nastavimo na $p = 0,6$ (60%). Potenciometer obremenimo z bremensko upornostjo R_B tako, da je izhodna napetost U_2 (na bremenu) = 2,4 V. Izračunate upornost bremena R_B . Izračunajte tok I_1 , ki teče iz vira napetosti, in moč na bremenu P_B .

| | |
|---------|--|
| $R_B =$ | |
| $I_1 =$ | |
| $P_B =$ | |

De3.

Realni napetostni vir obremenimo z žarnico 24 W/12 V in izmerimo napetost $U_1 = 18 \text{ V}$.Nato priključimo še (dodatno) žarnico 40W/20 V in izmerimo napetost $U_2 = 17,8 \text{ V}$.Izračunajte napetost odprtih sponk U_0 , notranjo upornost R_N in tok kratkega stika I_k .

| | |
|---------|--|
| $U_0 =$ | |
| $R_N =$ | |
| $I_k =$ | |

De4.

Realni tokovni vir obremenimo z žarnico 10 W/24 V in izmerimo napetost $U_1 = 33 \text{ V}$.Nato priključimo (dodatno) še žarnico 12 W/24 V in izmerimo napetost $U_2 = 18 \text{ V}$.Izračunajte tok tokovnega vira I_0 , notranjo upornost R_N in napetost odprtih sponk U_0 .

| | |
|---------|--|
| $I_0 =$ | |
| $R_N =$ | |
| $U_0 =$ | |

De5.

Uporovni delilnik z linearnim potenciometrom $R_p = 5 \text{ k}\Omega$ priključimo na napetost $U_0 = 30 \text{ V}$ in nastavimo na $n = 0,40$ (40%). Potenciometer obremenimo z bremensko upornostjo $R_B = 6 \text{ k}\Omega$.Izračunajte tok I_1 , ki teče iz vira napetosti, moč na potenciometru (P_p) in napetost na bremenu (U_B).

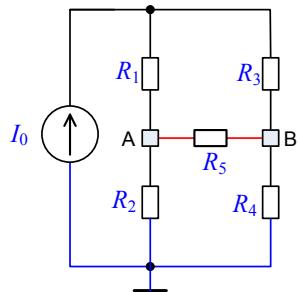
| | |
|---------|--|
| $U_B =$ | |
| $I_1 =$ | |
| $P_p =$ | |

De6.

ELE 2**Kontrolna naloga 3****Demo z rešitvami 2022**

Za uporovni mostiček določite mostično napetost U_{AB} , potenciale sponk V_A , V_B in V_C , če so vrednosti elementov:

$$I_0 = 0,1 \text{ A}, R_1 = 150 \Omega, R_2 = 240 \Omega, R_3 = 280 \Omega, R_4 = 330 \Omega, R_5 = 750 \Omega.$$

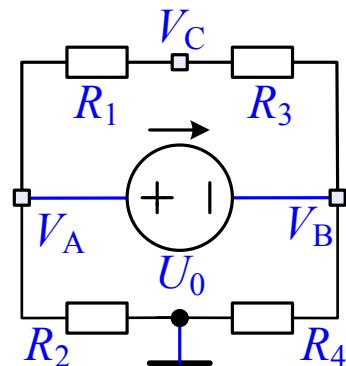


| | |
|------------|--|
| $V_A =$ | |
| $V_B =$ | |
| $V_C =$ | |
| $U_{AB} =$ | |

De7.

Za vezje določite potenciale sponk A, B , C in moč, ki jo porablja vezje.

Podatki: $R_1 = 2,1 \text{ k}\Omega$, $R_2 = 3,3 \text{ k}\Omega$, $R_3 = 3,9 \text{ k}\Omega$, $R_4 = 1,7 \text{ k}\Omega$; $U_0 = 18 \text{ V}$

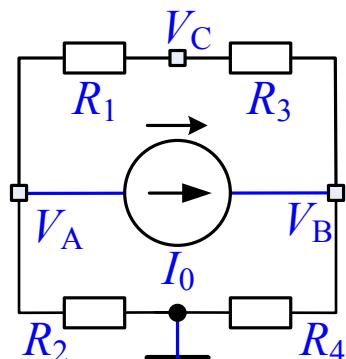


| | |
|---------|--|
| $V_A =$ | |
| $V_B =$ | |
| $V_C =$ | |
| $P =$ | |

De8.

Za vezje določite potenciale sponk A, B , C in moč, ki jo porablja vezje

Podatki B2: $R_1 = 2,5 \text{ k}\Omega$, $R_2 = 2,8 \text{ k}\Omega$, $R_3 = 3,8 \text{ k}\Omega$, $R_4 = 1,7 \text{ k}\Omega$; $I_0 = 24 \text{ mA}$



| | |
|---------|--|
| $V_A =$ | |
| $V_B =$ | |
| $V_C =$ | |
| $P =$ | |

Rešitve:

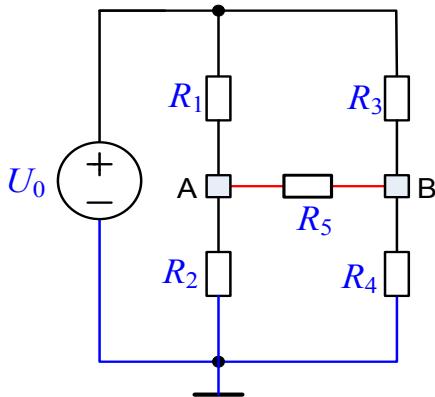
Poglejte le za kontrolo rezultatov, ali v primeru ko »sploh ne gre«. Če se rezultati ne ujemajo poskusite ponovno (naslednjič).

De1.

Mostično vezje je napajano z napetostjo $U_0 = 25 \text{ V}$.

Elementi so: $R_1 = 1,5 \text{ k}\Omega$, $R_2 = 3,3 \text{ k}\Omega$, $R_3 = 3,9 \text{ k}\Omega$, $R_4 = 4,7 \text{ k}\Omega$ in $R_5 = 2,2 \text{ k}\Omega$.

Izračunajte potenciale V_A , V_B , napetost U_{AB} in tok I , ki ga daje napetostni vir.



| | | |
|------------|---------|--|
| $V_A =$ | 16,51 V | |
| $V_B =$ | 15,06 | |
| $U_{AB} =$ | 1,45 V | |
| $I =$ | 8,21 mA | |

De2.

Uporovni delilnik z linearnim potenciometrom $R_p = 250 \Omega$ priključimo na napetost $U_0 = 6 \text{ V}$ in nastavimo na $p = 0,6$ (60%). Potenciometer obremenimo z bremensko upornostjo R_B tako, da je izhodna napetost U_2 (na bremenu) = 2,4 V. Izračunate upornost bremena R_B . Izračunajte tok I_1 , ki teče iz vira napetosti, in moč na bremenu P_B .

| | | |
|---------|--------------|--|
| $R_B =$ | 120 Ω | |
| $I_1 =$ | 36 mA | |
| $P_B =$ | 48 mW | |

De3.

Realni napetostni vir obremenimo z žarnico 24 W/12 V in izmerimo napetost $U_1 = 18 \text{ V}$.

Nato priključimo še (dodatno) žarnico 40W/20 V in izmerimo napetost $U_2 = 17,8 \text{ V}$.

Izračunajte napetost odprtih sponk U_0 , notranjo upornost R_N in tok kratkega stika I_k .

| | | |
|---------|----------------|--|
| $U_0 =$ | 18,3 V | |
| $R_N =$ | 0,115 Ω | |
| $I_k =$ | 160 \pm 5 A | |

De4.

Realni tokovni vir obremenimo z žarnico 10 W/24 V in izmerimo napetost $U_1 = 33 \text{ V}$.

Nato priključimo (dodatno) še žarnico 12 W/24 V in izmerimo napetost $U_2 = 18 \text{ V}$.

Izračunajte tok tokovnega vira I_0 , notranjo upornost R_N in napetost odprtih sponk U_0 .

| | | |
|---------|--------------|--|
| $I_0 =$ | 0,825 A | |
| $R_N =$ | 131 Ω | |
| $U_0 =$ | 108 V | |

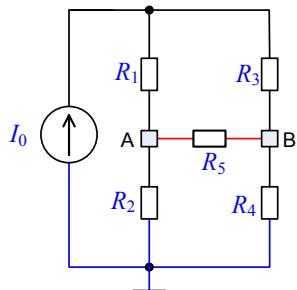
De5.

Uporovni delilnik z linearnim potenciometrom $R_p = 5 \text{ k}\Omega$ priključimo na napetost $U_0 = 30 \text{ V}$ in nastavimo na $n = 0,40$ (40%). Potenciometer obremenimo z bremensko upornostjo $R_B = 6 \text{ k}\Omega$. Izračunajte tok I_1 , ki teče iz vira napetosti, moč na potenciometru (P_p) in napetost na bremenu (U_B).

| | | |
|---------|---------|--|
| $U_B =$ | 10 V | |
| $I_1 =$ | 6,67 mA | |
| $P_p =$ | 183 mW | |

De6.

Za uporovni mostiček določite mostično napetost U_{AB} , potenciale sponk V_A , V_B in V_C , če so vrednosti elementov: $I_0 = 0,1 \text{ A}$, $R_1 = 150 \Omega$, $R_2 = 240 \Omega$, $R_3 = 280 \Omega$, $R_4 = 330 \Omega$, $R_5 = 750 \Omega$.

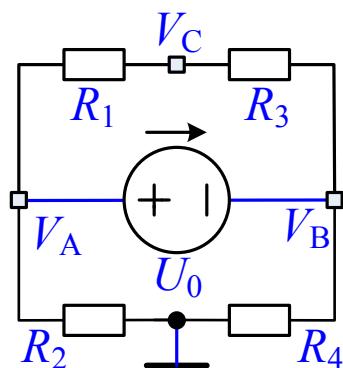


| | | |
|------------|---------|--|
| $V_A =$ | 14,46 V | |
| $V_B =$ | 13,12 V | |
| $V_C =$ | 23,76 V | |
| $U_{AB} =$ | 1,334 V | |

De7.

Za vezje določite potenciale sponk A, B, C in moč, ki jo porablja vezje.

Podatki: $R_1 = 2,1 \text{ k}\Omega$, $R_2 = 3,3 \text{ k}\Omega$, $R_3 = 3,9 \text{ k}\Omega$, $R_4 = 1,7 \text{ k}\Omega$; $U_0 = 18 \text{ V}$

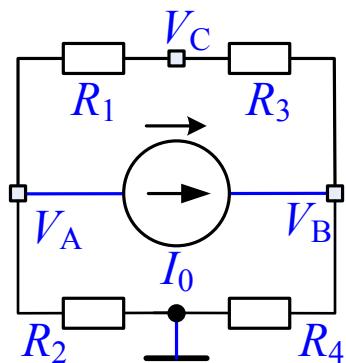


| | | |
|---------|---------|--|
| $V_A =$ | 11,88 V | |
| $V_B =$ | -6,12 V | |
| $V_C =$ | +5,58 V | |
| $P =$ | 119 m W | |

De8.

Za vezje določite potenciale sponk A, B, C in moč, ki jo porablja vezje

Podatki B2: $R_1 = 2,5 \text{ k}\Omega$, $R_2 = 2,8 \text{ k}\Omega$, $R_3 = 3,8 \text{ k}\Omega$, $R_4 = 1,7 \text{ k}\Omega$; $I_0 = 24 \text{ mA}$



| | | |
|---------|---------|--|
| $V_A =$ | -39,2 V | |
| $V_B =$ | +22,8 V | |
| $V_C =$ | -14,2 V | |
| $P =$ | 1,51 W | |



$$P = U \cdot I = U^2 / R \Rightarrow R = \frac{U^2}{P}$$

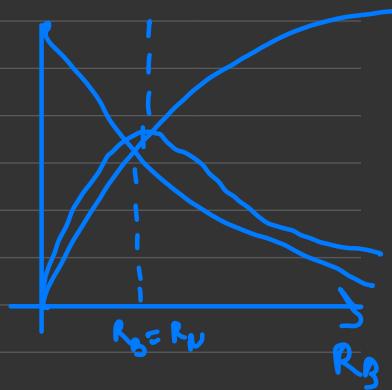
$$R = 24\Omega$$

$$P_s = 92W$$

$$U = 96V$$

$$P = UI \Rightarrow \frac{P}{U \cdot I} \Rightarrow I = \frac{P}{U} = \frac{12W}{18V} = 0,667A$$

MOC OSTM V1 R

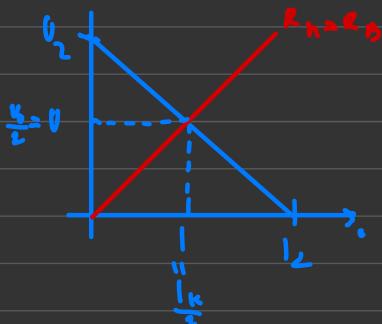


$$I_K = 9 \text{ A}$$

$$V_0 = 20 \text{ V}$$

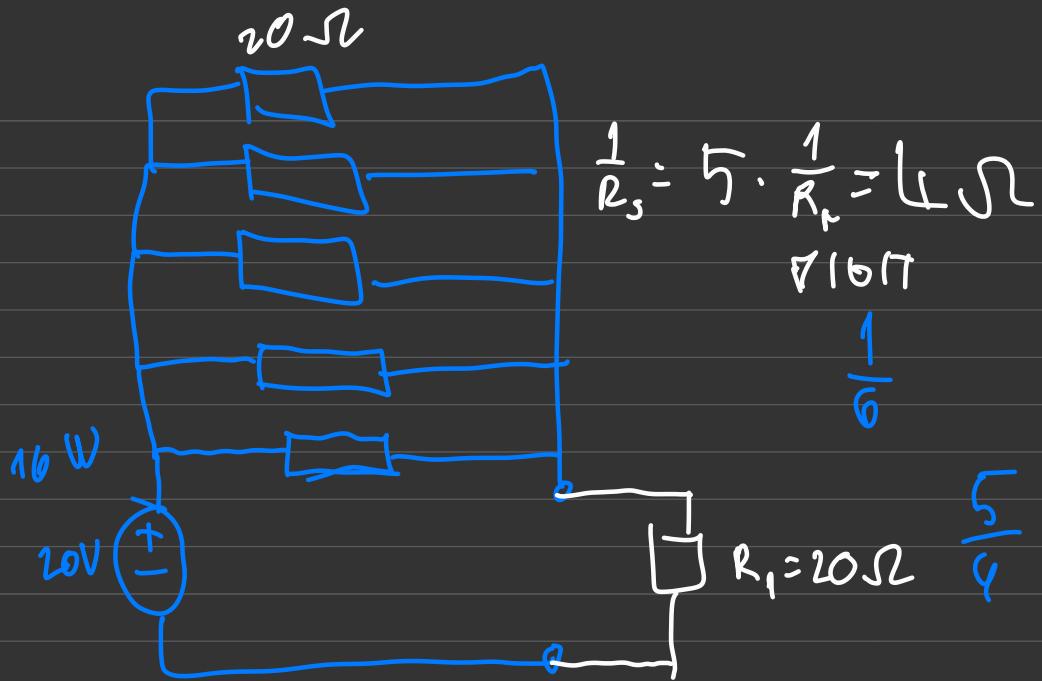
$$R_N = \frac{V_0}{I_K} = 20 \Omega = R_B$$

PLUGGAR IN R



$$P = V \cdot I_K = 10 \text{ V} \cdot 0.5 \text{ A} = 5 \text{ W}$$





$$U = 20V$$

$$R_p = 24\Omega$$

$$P = U \cdot I - 20V \cdot 0,833A = 16,6W \cdot \frac{5}{6} = 13,83W$$

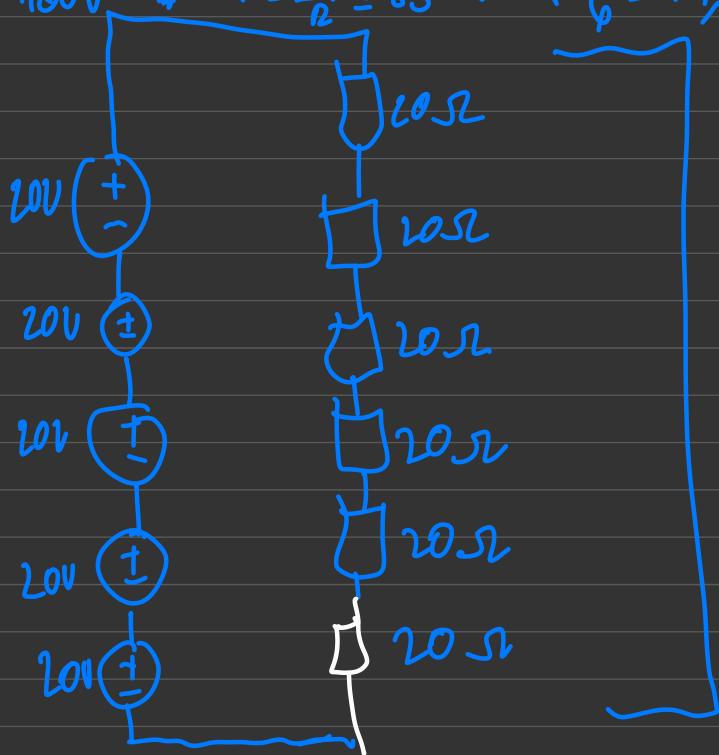
$$U = I \cdot R \quad I = \frac{U}{R} = \frac{20V}{24\Omega} = 0,833A$$

$$R = 120 \Omega$$

$$U = 100V$$

$$P = \frac{U^2}{R} = 83 W$$

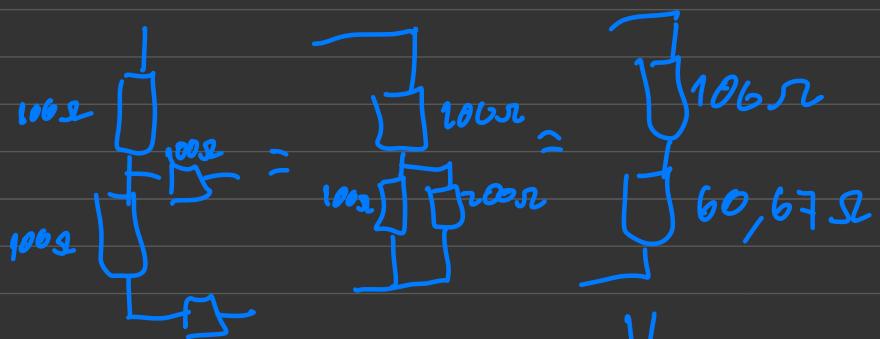
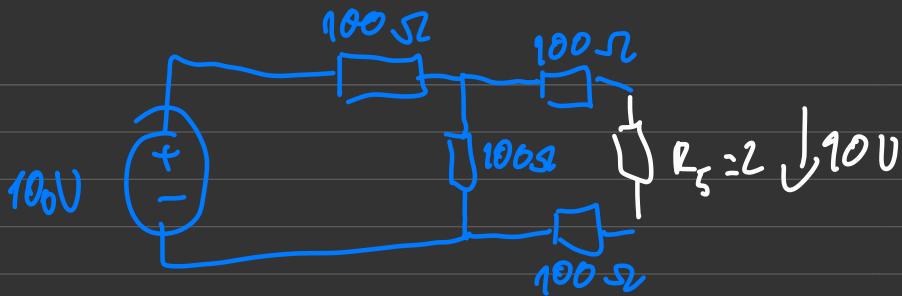
$$\cdot \frac{1}{6} = 13,89 W$$



$$P = 83 W$$

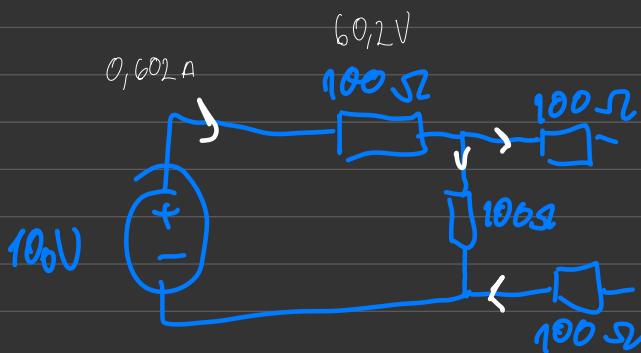
$$P_1 = \frac{P}{6} = 13,89 W$$

PRI PRILAGOJENEM BREZNERU VLF = USP



$$\frac{U}{R_L} = \frac{U}{R_T} = \frac{100\text{V}}{166,67\Omega} = 0,602\text{A}$$

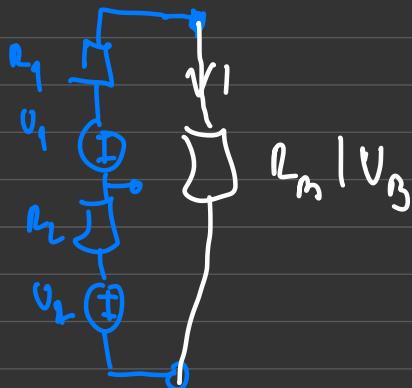
$$\downarrow \quad 166,67\Omega = R_T$$



LÍNEARIA

V_{E2} J A Z V_{E2} V_I R

MÉTODO DE SUPERPOSIÇÃO



VEDMO JE AKTIVNA
1 V (R)

$$A: V_1 = 0$$



$$B: V_2 = 0$$



$$I_B = \frac{V_1}{R_1 + R_2 + R_3}$$

$$V_{BA} = \frac{V_1 \cdot R_3}{R_1 + R_2 + R_3}$$

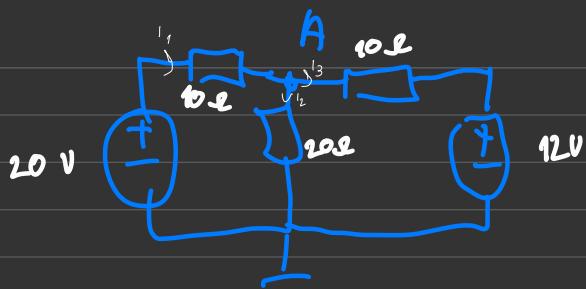
$$I_A = \frac{V_2}{R_1 + R_2 + R_3}$$

$$V_{BA} = \frac{V_2 \cdot R_3}{R_1 + R_2 + R_3}$$

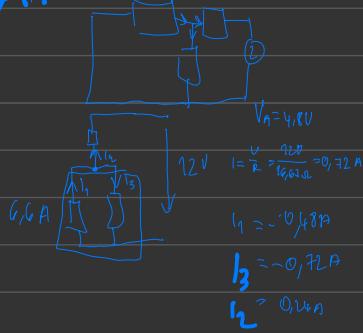
$$I = I_A + I_B$$

$$I = \frac{V_2 + V_1}{R_1 + R_2 + R_3}$$

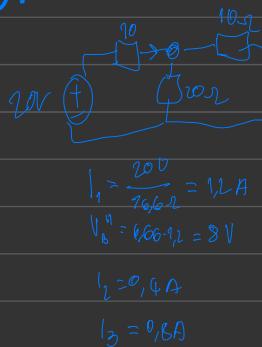
$$V = V_{BA} + V_{BB}$$



A:



B:



$$V_A = 4,8V + 8V = 12,8V$$

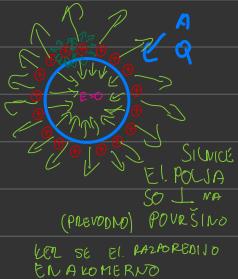
$$I_1 = -0,48A + 1,2A = 0,72A$$

$$I_2 = 0,24A + 0,4 = 0,64A$$

$$I_3 = 0,08A$$

$E = 0$

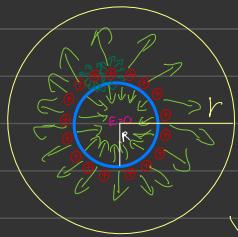
V PREDMETU TELESU
PEREDATEVU KRETAKA



$$\frac{Q}{A} = \sigma \left(\frac{A_0}{m^2} \right)$$

POUVRŠINSKA
GOSTOTA NABOJA

GOSTOTA POUVRŠINSKOGA
NABOJA



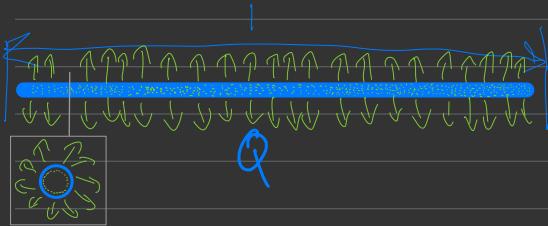
$$D = \frac{Q}{4\pi r^2} \Rightarrow E = \frac{Q}{4\pi \epsilon_0 r^2}$$

$$R = r \\ D = \sigma$$



$$E_{max} = \frac{Q}{4\pi\epsilon_0 R^2} = \frac{\sigma}{\epsilon_0}$$

VABLEZTREN (PREMI) VOORNE



$$(\text{PREMI} \text{ VABO}) \quad q = \frac{Q}{l}$$

$$D = \frac{q}{2\pi r l} = \frac{q}{2\pi r} = \epsilon_0 \cdot E$$

$$E = \frac{q}{2\pi \epsilon_0 r}$$

$$q = 10^{-6} \frac{C}{m}$$

$$E = \frac{q_m}{2\pi \cdot 1m \cdot m \cdot 8,85 \cdot 10^{-12}} = \frac{1}{2\pi \cdot 1m \cdot 8,85 \cdot 10^{-12}} = \frac{10^6 \text{ V}}{17,7 \text{ m}} = 17,7 \frac{\text{kV}}{\text{m}}$$

$$\underline{\underline{D \cdot d}} = \frac{d_1}{d_2} \quad q_1 = q_2$$

$$l = 50 \text{ m} \quad F = \frac{q_1}{2\pi \epsilon_0 r} \cdot q_2 \cdot l$$

$$d = 10 \text{ m}$$

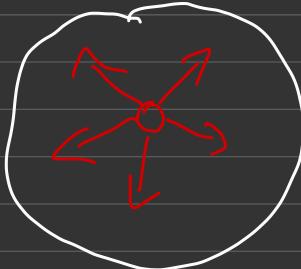
$$F = \frac{q_1 \cdot q_2}{2\pi \epsilon_0 r} \cdot l \quad F = E_1 \cdot Q_2$$

$$E = \frac{F}{Q}$$

6. AUSSEN ZAKON



RODNIK $\lambda = \frac{Q}{l}$



$$\begin{array}{c} \uparrow \uparrow \uparrow \uparrow \uparrow \\ \hline \downarrow \downarrow \downarrow \downarrow \downarrow \end{array}$$
$$E = \frac{\lambda}{2\pi k_F r}$$

$$\rightarrow E = \frac{D}{\epsilon_0} \quad D = \frac{Q}{A} = \epsilon_0 \cdot E$$

JAKOST
ELEKTRIČNEGA
POLOJA

GOSTOTA
ELEKTRIČNEGA
PLOŠČE

?

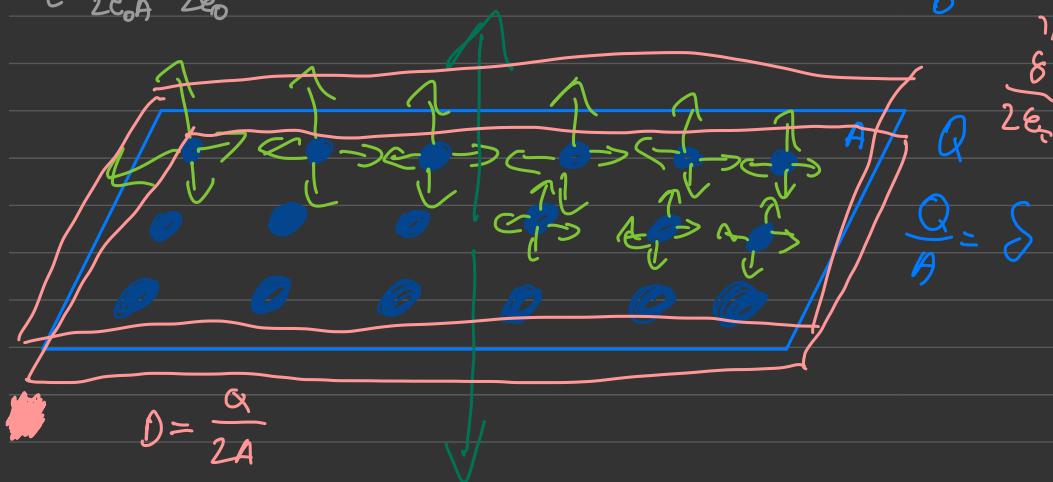
$$E = \frac{Q}{2\epsilon_0 A} > \frac{\delta}{2\epsilon_0}$$

E1. POLJE NAPOLE KLINE

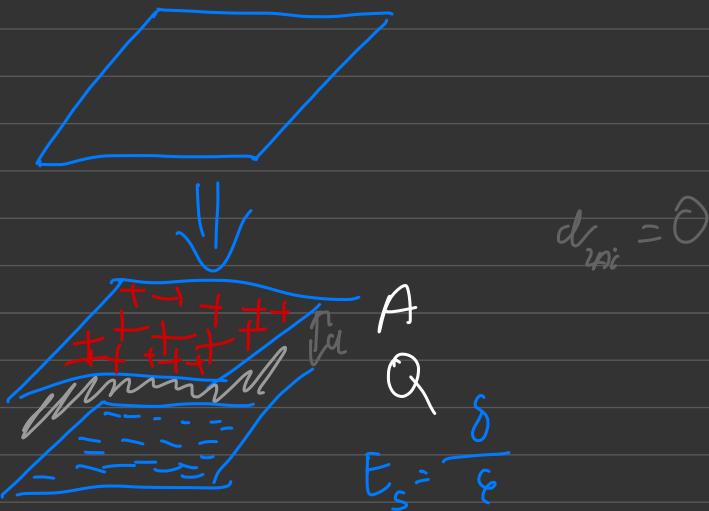
TAKT PREVODNE PLOŠČE

$$E = \frac{D}{\epsilon_0} = \frac{Q}{2A\epsilon_0}$$

$$\frac{\delta}{2\epsilon_0}$$



Eнергија електричног поља



$$d_{\text{air}} = 0$$

$$E_s = \frac{\sigma}{\epsilon}$$

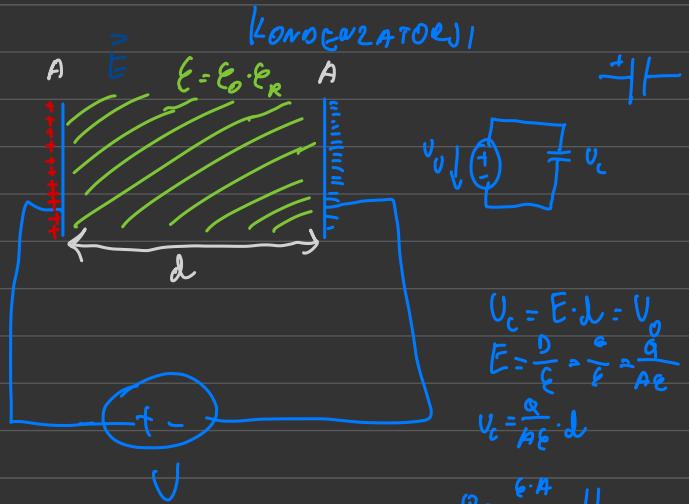
$$F = \frac{\sigma}{2\epsilon} \cdot Q$$

$$\Delta W = A \cdot F \cdot d = W_E = \frac{Q}{2} \cdot \frac{Q}{A \cdot \epsilon} \cdot d = \frac{Q \cdot Ed}{2}$$

$$E = \frac{V}{d} \quad W_E = \frac{Q \cdot V}{2}$$

$$W_E = Q \cdot U \quad V = A \cdot d$$

$$f_E = \frac{W_E}{V} = \frac{Q \cdot U}{2A \cdot d} = \frac{Q \cdot E}{2} = \frac{1}{2} D \cdot E \left[\frac{J}{m^2} \right]$$



$$U_C = E \cdot d = V_0$$

$$E = \frac{U}{d} = \frac{V_0}{d} = \frac{q}{A\epsilon}$$

$$U_C = \frac{q}{A\epsilon} \cdot d$$

$$Q = \frac{\epsilon \cdot A}{d} \cdot U_C$$

$$\frac{Q}{U_C} = \epsilon \cdot \frac{A}{d} = C \quad \begin{matrix} \downarrow \\ \text{FACIAD} \end{matrix}$$

\uparrow KAPACITIVNOST

$$E_p \geq 20 \text{ MV/m}$$

$$C = \epsilon \cdot \frac{A}{d}$$

$$U = 200 \text{ V}$$

$$\epsilon = 20 \frac{As}{Vm}$$

$$A = 20 \text{ m}^2 = 0,02 \text{ m}^2$$

$$d = 50 \mu\text{m} = 50 \cdot 10^{-6} \text{ m}$$

$$Q =$$

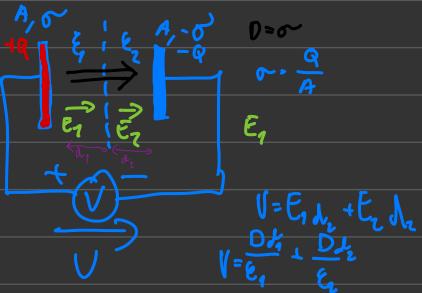
$$C = \epsilon \cdot \frac{A}{d} = 20 \frac{As}{Vm} \cdot \frac{0,002 \text{ m}^2}{50 \cdot 10^{-6} \text{ m}}$$

$$C = \frac{Q}{U}$$

$$Q = C \cdot U = 4 \cdot 10^{-9} \frac{As}{Vm} \cdot 100 \text{ V} = 4 \cdot 10^{-9} \text{ As}$$

$$C = 0,0004 \cdot 10^{-4} \frac{As}{Vm} = 4 \cdot 10^{-9} \text{ F}$$

KONDENZATOR Z ROZŁICZALNIM OBŁĘDNIKI



$$V = E_1 d_1 + E_2 d_2$$

$$V = \frac{Q d_1}{\epsilon_1 A} + \frac{Q d_2}{\epsilon_2 A}$$

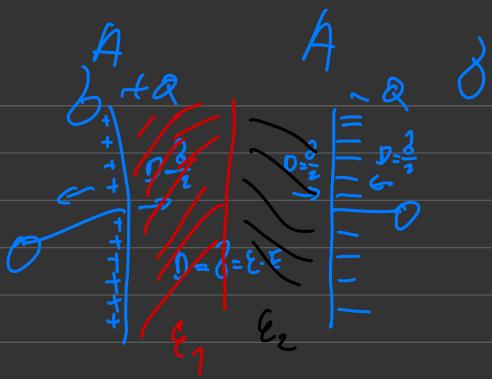
$$V = \frac{Q d_1}{\epsilon_1 A} + \frac{Q d_2}{\epsilon_2 A}$$

$$V = Q \left(\frac{d_1}{\epsilon_1 A} + \frac{d_2}{\epsilon_2 A} \right)$$

$$\frac{V}{Q} = \frac{d_1}{\epsilon_1 A} + \frac{d_2}{\epsilon_2 A}$$

$$\frac{1}{C} = \frac{1}{\epsilon_1 A} + \frac{1}{\epsilon_2 A}$$

$$C_1 = \frac{\epsilon_1 A}{d_1}$$



$$U_a = E_1 \cdot d_1 \quad U_{a'} = E_2 \cdot d_2$$

$c_1 \quad c_2$

$$\begin{array}{c} | \\ \text{---} \\ | \end{array} \quad I$$

V

$$z_{\text{PAUL}} = 30 \frac{60}{m} = 3 \frac{60}{m} = 3 \frac{m}{m} = E_p$$

7

SUM ZPAUL

$$D_1 \cdot \epsilon_0 \cdot \epsilon_r \cdot R_1 \cdot R_1 = 70 \frac{60}{m}$$

$$E_{p1} = \frac{D_{p1}}{\epsilon_1}$$

$$D_{p1} = E_{p1} \cdot \epsilon_1$$

$$E_{p2} = \frac{D_{p2}}{\epsilon_2}$$

$$D_{p2} = E_{p2} \cdot \epsilon_2$$

$$D_{p1} = D_{p2}$$

$$\epsilon_1 E_1 = \epsilon_2 E_2$$

