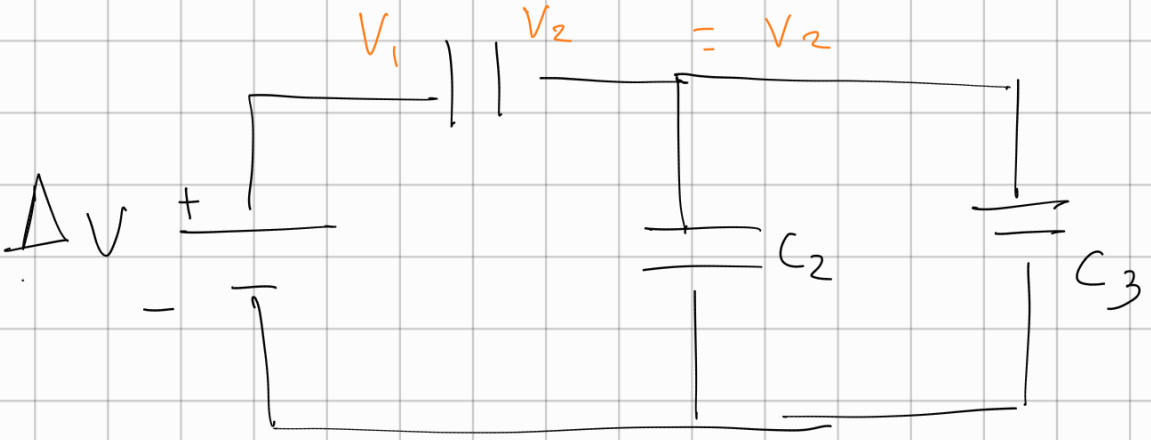
ES. 1



$C_1 = 3C \qquad C_2 = C \qquad C_3 = 5C$

1) C_{eq}

2) Ordiniamo i condensatori in ordine crescente di carica

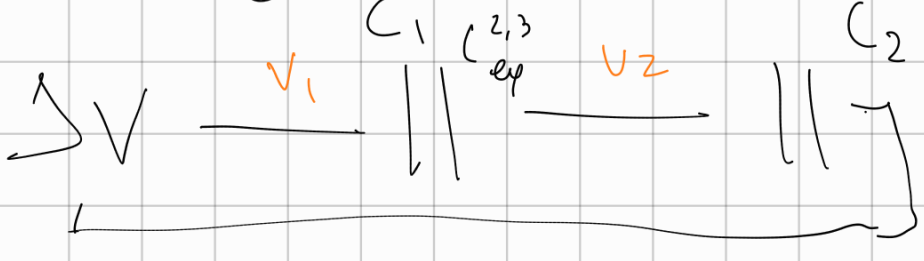
3) " " decrescente di Tensione

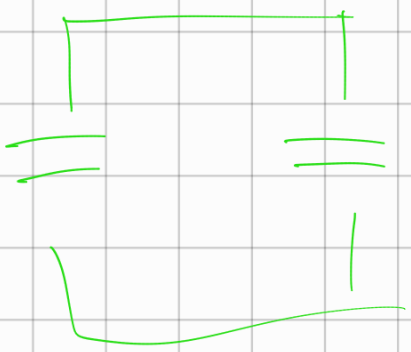
4) Cosa succede se si aggiunge C_3

$$C = \frac{Q}{\Delta V} \qquad C_{eq}^{2,3} = C_2 + C_3 = 6C$$

$$C_{eq} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_{eq}^{2,3}}} = \frac{1}{\frac{1}{3} + \frac{1}{6C}} =$$

$$= \frac{1}{\frac{2+1}{6}} \Rightarrow C_{eq} = 2C$$





$$C = \frac{Q}{\Delta V}$$

$$Q = C \Delta V_{32} \quad (= V_3 - V_2)$$

$$C = (C_2 + C_3)$$

$$Q_2 + Q_3 = (C_2 + C_3)(V_3 - V_2)$$

$C_2 = C$, $C_3 = 5C$

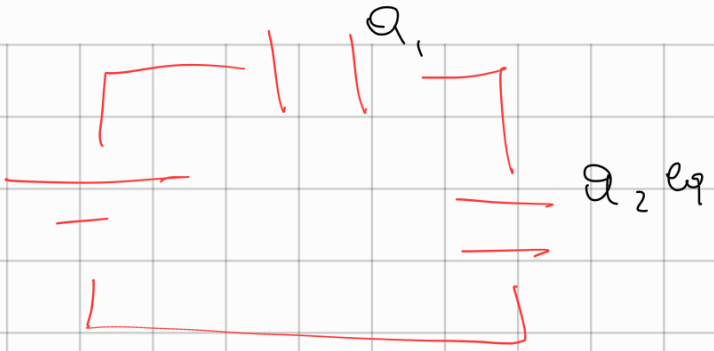
$$\frac{Q_2 + Q_3}{\Delta V} = 6C$$

$$\frac{Q_2}{\Delta V} = C \qquad \frac{Q_3}{\Delta V} = 5C$$

$$V_e - V_1 = \frac{Q}{6C} + V_e$$

$$C_{2eq} = C_2 + C_3$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_{2eq}} = .2C$$



$$Q_1 = Q_2 + Q_3$$

$$Q_1 = 2C\,\Delta V$$

$$\Delta V_1 = \frac{Q_1}{3C} = \frac{2C\Delta V}{3C}$$

$$\Delta V_2 = \Delta V - \Delta V_1 = \Delta V - \frac{3}{2}\Delta V = \frac{1}{3}\Delta V$$

$$Q_2 = \Delta V_2 \cdot C \qquad Q_3 = \Delta V_2 \cdot 5C$$

$$\Delta V_3$$

$$\frac{Q_2}{C} = \frac{Q_3}{5C} \Rightarrow 5Q_2 = Q_3$$

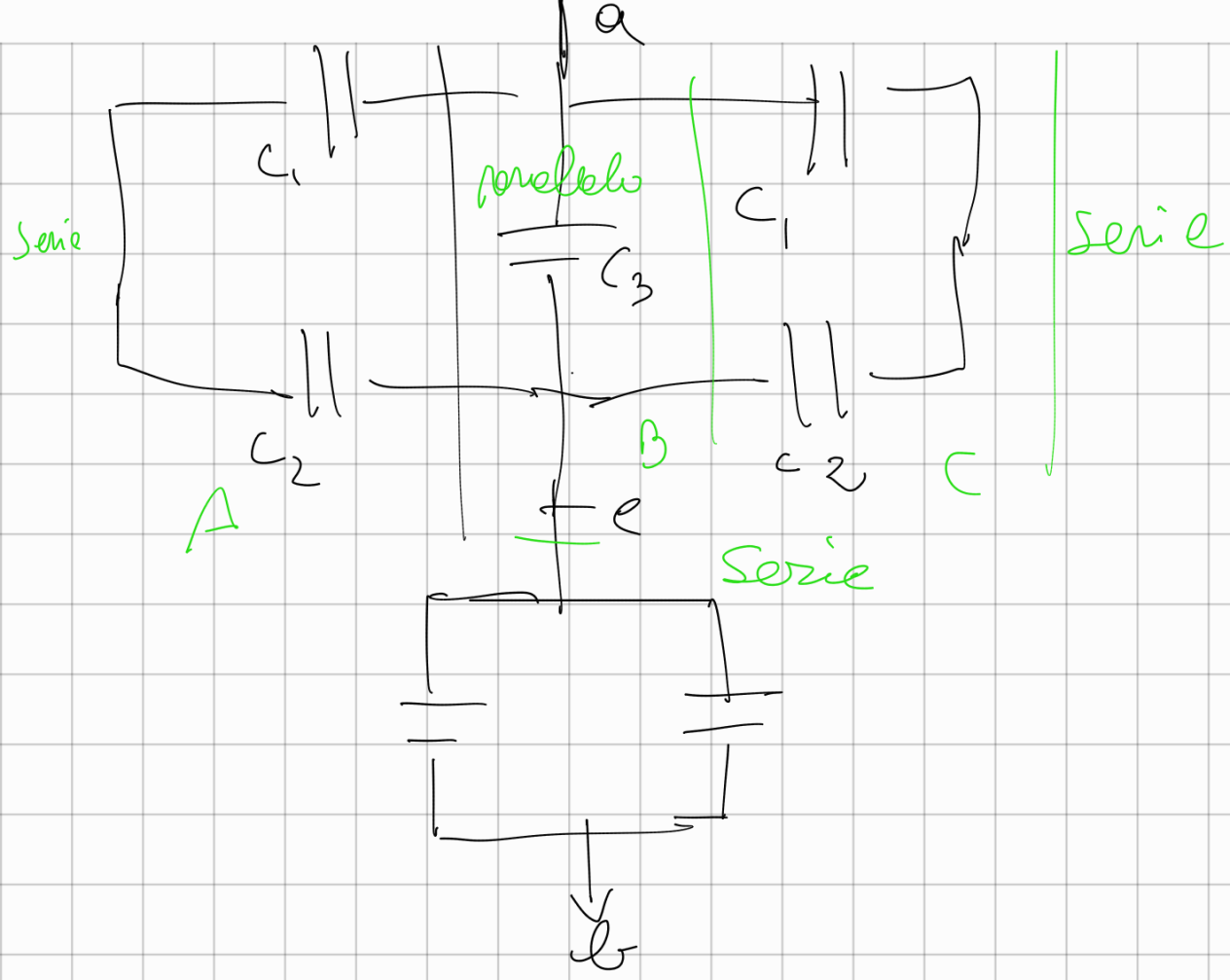
$$Q_1 = Q_2 + 5Q_2 = 6Q_2$$

Se aumenta Q_3 $\quad C_3 = aC \quad a > 5$

$$Q_2 = \frac{Q_3}{a} \qquad Q_1 = \frac{Q_3}{a} + Q = \frac{(a+1)\,Q_3}{a}$$

Se aumenta a, aumenta Q_1

ES



1) C_{eq} $\quad Q_3$ si $\quad \Delta V_{ab} = 60\,V$

$$C_{eq}^{A} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} = \frac{1}{\frac{1}{5\cdot10^{-6}} + \frac{1}{10\cdot10}} = \frac{1}{\frac{2+1}{10\cdot10^{-6}}} =$$

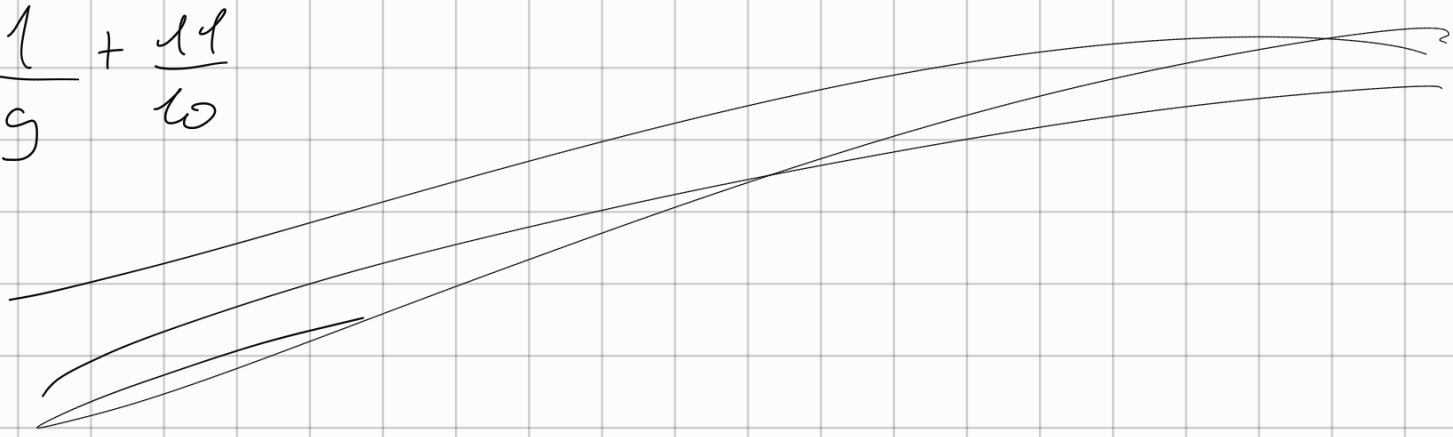
$$= \frac{10}{3}\,\mu F$$

$$C_{eq}^{B} = \frac{1}{\frac{3}{10} + \frac{1}{2}} = \frac{1}{\frac{3+5}{10}} = \frac{5}{4}\,\mu F$$

$$C_{eq}^{D} = \frac{1}{\frac{4}{5} + \frac{3}{10}} = \frac{8+2}{10} = \frac{10}{11}\,\mu F$$

$$= C_{eq}^{ABC} + C_{eq}^{D} \quad \leftarrow 20\,\mu F$$

$$\frac{1}{\frac{1}{19} + \frac{11}{10}} =$$



$$C_{eq}^{A} = C_{eq}^{C} = \frac{10}{3}\,\mu F$$

$$C_{eq}^{B} = C_{eq}^{A} + C_{eq}^{B} + C_3 = 8{,}66\,\mu F$$

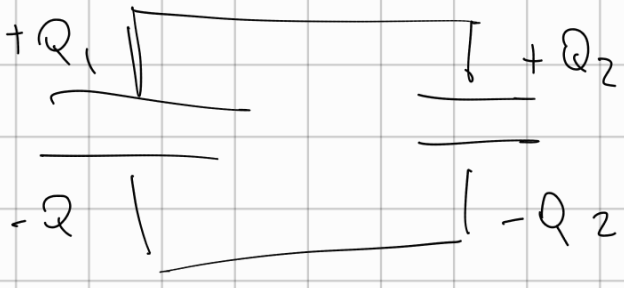
$$C_{eq} = \frac{1}{\frac{1}{C_{eq}^{B}} + \frac{1}{C_{eq}^{D}}} = 8{,}66\,\mu F$$

$$Q = \Delta V\, C_{eq} = 363\,\mu C.$$

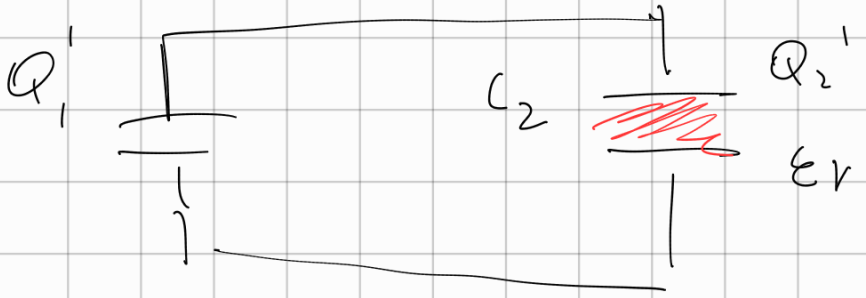
$$\Delta V_{AC} = \frac{Q}{C_{eq}} = 41{,}2\,V$$

$$\Delta V_{AC} \cdot C_3 = 83{,}8\,\mu C = Q_3$$

Es. 3 Stato iniziale



Stato finale



$\varepsilon_r = 3$ $\quad Q = Q_1 + Q_2 = 2\mu C$

$C_1 = 1\mu F$ $\quad C_2 = 2\mu F$

1) Calcolare Q_1' e Q_2'

2) $\Delta U = U_{fin} - U_{in}$

$C_2' = \varepsilon_r C_2$

$C_{eq} = C_1 + C_2 = 3\mu F$

$$C_1 + C_2 = \frac{Q_1 + Q_2}{V_2 - V_1} = \frac{2\mu C}{\Delta V} = 3\mu F$$

$$\frac{2\mu C}{3\mu F} = \Delta V = \frac{2}{3} V$$

$$(C_1 + \varepsilon_r C_2) = \frac{Q_1' + Q_2'}{\Delta V}$$

$$7\mu F = \frac{2\mu C}{\Delta V} \Rightarrow \Delta V = \frac{2}{7} V$$

$$C_{eq} = C_1 // C_2'$$

$$\Delta V_f = \frac{Q}{C'_{eq}} = \frac{Q}{C_1 + \varepsilon_r C_2}$$

$$Q_1' = C_1 \Delta V_f = \frac{C_1 Q}{C_1 + \varepsilon_r C_2} = 0,25\mu C$$

$$Q_2' = C_2' \Delta V_h = \frac{\varepsilon_r C_2 Q}{C_1 + \varepsilon_r C_2} = 1{,}2\ \mu C$$

$$U_u = \frac{1}{2} \frac{Q^2}{C_u} = \frac{1}{2} \frac{Q^2}{(C_1 + C_2)}$$

$$U_{lim} = \frac{1}{2} \frac{Q^2}{C_{11}} = \frac{1}{2} \frac{Q^2}{(C_1 + \varepsilon_r C_2)}$$

$$\Delta U = -3{,}8 \cdot 10^{-9}\ J$$