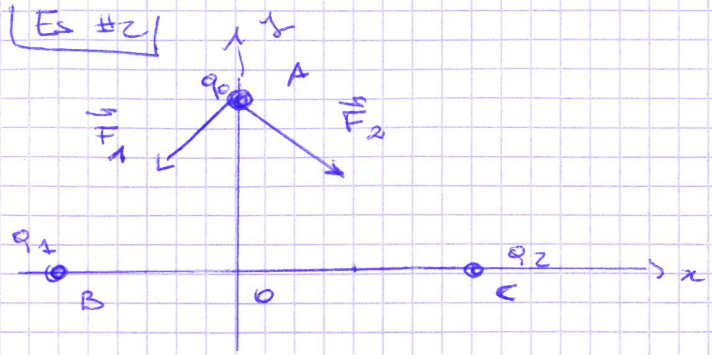
Es #2



$q_0 = -5\ mC$

$q_1 = +10\ mC$

a) Forza totale in A

$$\vec{F}_1 = K_e \frac{q_0 q_1}{r_{AB}^2} \hat{u}_{AB} = K_e q_0 \frac{q_1}{18} \left(-\frac{1}{\sqrt{2}} \vec{i} - \frac{1}{\sqrt{2}} \vec{j} \right)$$

$$\vec{F}_2 = K_e \frac{q_0 q_2}{r_{AC}^2} \hat{u}_{AC} = K_e q_0 \frac{q_2}{25} \left(\frac{4}{5} \vec{i} - \frac{3}{5} \vec{j} \right)$$

A finché $\vec{F}_1 + \vec{F}_2$ non abbia componente lungo l'asse x

$q_0 q_1$ deve avere lo stesso segno di: $q_0 q_2 \Rightarrow q_2$ è positiva

$$\frac{q_1}{18} \frac{1}{\sqrt{2}} = \frac{q_2}{25} \frac{4}{25} \rightarrow q_2 = \frac{125/4}{18\sqrt{2}} q_1 = +12.28\ q_1 = 12.28\ mC$$

b) $$\vec{F}_1 + \vec{F}_2 = K_e q_0 \left\{ -\frac{q_1}{18\sqrt{2}} - \frac{3}{125} q_2 \right\} \vec{j} = -3.09 \times 10^3\ N\ \vec{j}$$

c) $$\vec{F}_1 = K_e \frac{q_0 q_1}{r_{OB}^2} \vec{i} = K_e \frac{-50\ mC^2}{9} \vec{i} = -50 \times 10^3\ N\ \vec{i}$$

$$\vec{F}_2 = K_e \frac{q_0 q_2}{r_{OC}^2} \vec{i} = K_e \frac{-5 \cdot 12.28\ (mC)^2}{16} (-\vec{i}) = +34.54 \times 10^3\ A\ \vec{i}$$

$$\vec{F}_1 + \vec{F}_2 = -15.46 \times 10^3\ A\ \vec{i}$$

d) $$V_A = K_e \left(\frac{q_1}{r_{AB}} + \frac{q_2}{r_{AC}} \right) = K_e \left(\frac{q_1}{3\sqrt{2}} + \frac{q_2}{5} \right) = +43.3 \times 10^6\ V$$

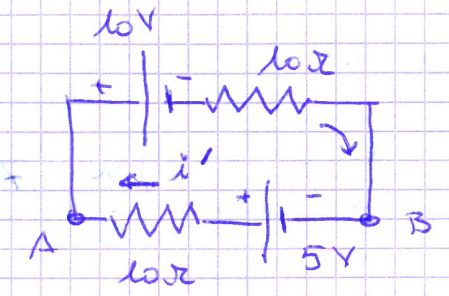
$$V_O = K_e \left(\frac{q_1}{r_{OB}} + \frac{q_2}{r_{OC}} \right) = K_e \left(\frac{q_1}{3} + \frac{q_2}{4} \right) = +57.76 \times 10^6\ V$$

$$V_A - V_O = -14.3 \times 10\ V$$

$$L = q (V_A - V_O) = 71.5 \times 10^3\ J$$

Es #3

a) interruttore aperto => la maglia superiore e quella inferiore sono indipendenti



Legge di Kirch. (Maglie)

$$-10V - i'10\Omega + 5V - i'10\Omega = 0$$

$$i' = -\frac{5V}{20\Omega} = -0.25\,A$$

$$V_A + i'10\Omega - 5V = V_B$$

$$V_A - V_B = 5V - i'10\Omega = +7.5\,V$$

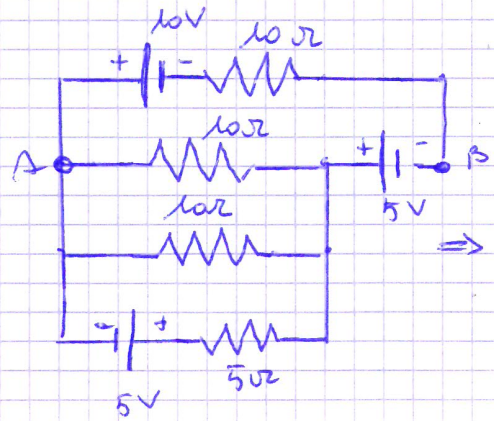
$$P'_{ass} = i'^2(10\Omega + 10\Omega) = 1.25\,W$$

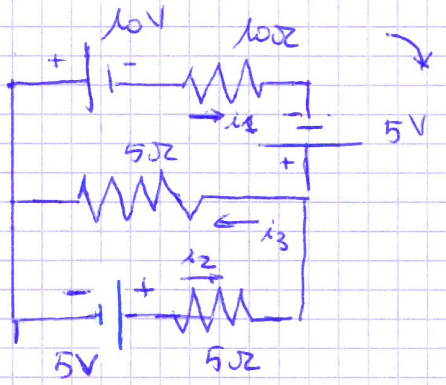
$$i'' = \frac{5V}{15\Omega} = \frac{1}{3}\,A = 0.33\,A$$

$$P'' = i''^2(10\Omega + 5\Omega) = 1.66\,W$$

$$P_{ass} = P' + P'' = 2.92\,W$$

b) interruttore chiuso





verso di percorrenza delle maglie: orario

Legge di Kirch. maglie

$$\begin{cases} -10V - 10\Omega\, i_1 + 5V - 5\Omega \cdot i_3 = 0 \\ 5\Omega \cdot i_2 - 5V + 5\Omega \cdot i_3 = 0 \end{cases}$$

$$\begin{cases} 2i_1 + i_3 = -1\,A \\ i_2 + i_3 = +1\,A \\ i_1 + i_2 - i_3 = 0\,A \end{cases}$$

Legge di Kirch. nodi $\quad i_1 + i_2 - i_3 = 0$

$$\Rightarrow \begin{cases} i_1 = -3/5\ A \\ i_2 = +4/5\ A \\ i_3 = +1/5\ A \end{cases}$$

$V_A + i_2 \cdot 5\Omega - 5V = V_B \qquad V_A - V_B = 5V - 1V = +4V$

$$P = i_1^2 \cdot 10\Omega + i_2^2 \cdot 5\Omega + i_3^2\ 5\Omega = \left(\frac{9}{25} \cdot 10 + \frac{16}{25} \cdot 5 + \frac{1}{25} \cdot 5\right) W = 7\ W$$