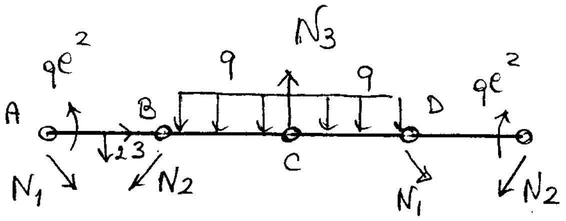
22/05/2002

Risoluzione Esercizio 1



B) $N_1 \frac{\sqrt{2}}{2} 2\ell + q\ell^2 = 0 \longrightarrow \boxed{N_1 = -q\ell\frac{\sqrt{2}}{2}}$

C) $N_1 \frac{\sqrt{2}}{2} 4\ell + q\ell^2 + N_2 \frac{\sqrt{2}}{2} 2\ell + 2q\ell^2 = 0$

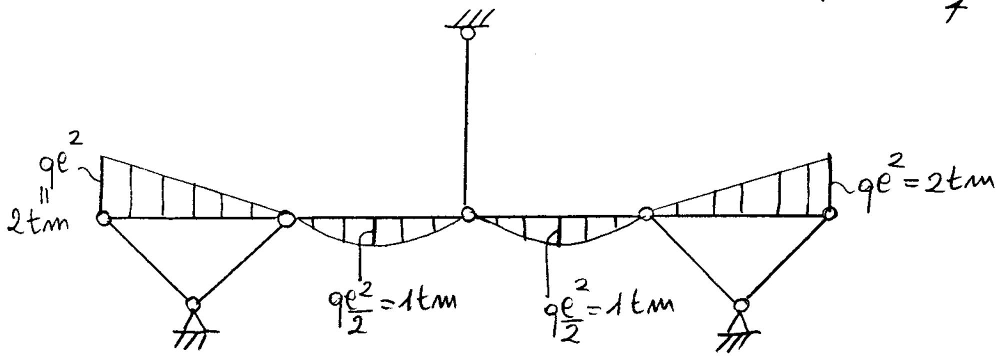
$\hookrightarrow \sqrt{2}\, N_2 = -2q\ell - q\ell - N_1 2\sqrt{2}$

$= -2q\ell - q\ell + q\ell \frac{\cancel{\sqrt{2}}}{\cancel{2}} 2\cancel{\sqrt{2}} = -q\ell$

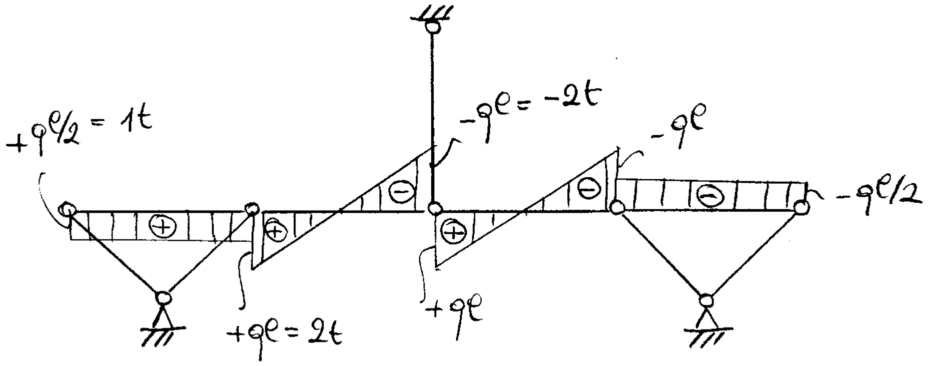
$\hookrightarrow \boxed{N_2 = -q\ell\frac{\sqrt{2}}{2}}$

$\boxed{N_3} = 4q\ell + 2N_1\frac{\sqrt{2}}{2} + 2N_2\frac{\sqrt{2}}{2}$

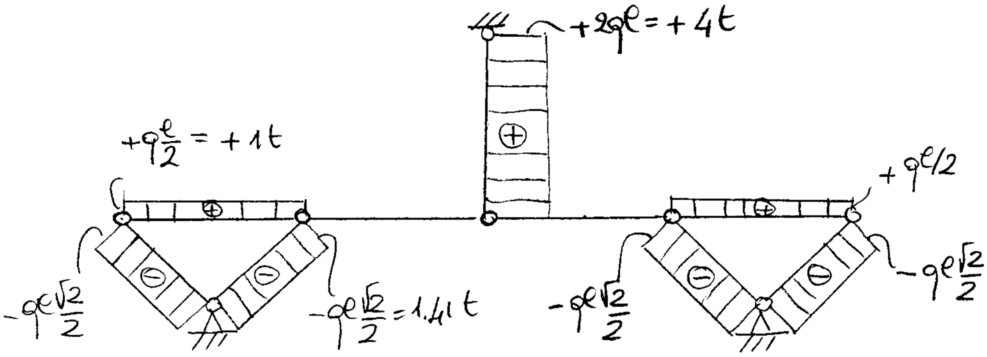
$= 4q\ell - q\ell\frac{\cancel{\sqrt{2}}}{\cancel{2}} 2\cancel{\sqrt{2}} = \boxed{2q\ell}$



(M)



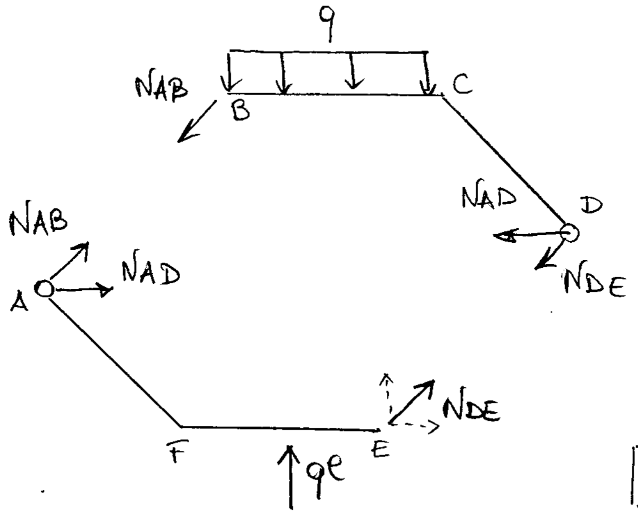
(T)



(N)

Risoluzione Esercizio 2 — 22/05/02

NB : $\ell := L_1$



A ↺ $\quad N_{DE}\frac{\sqrt{2}}{2}\cancel{\ell} + N_{DE}\frac{\sqrt{2}}{2}2\cancel{\ell} + q\ell\frac{3}{2}\cancel{\ell} = 0$

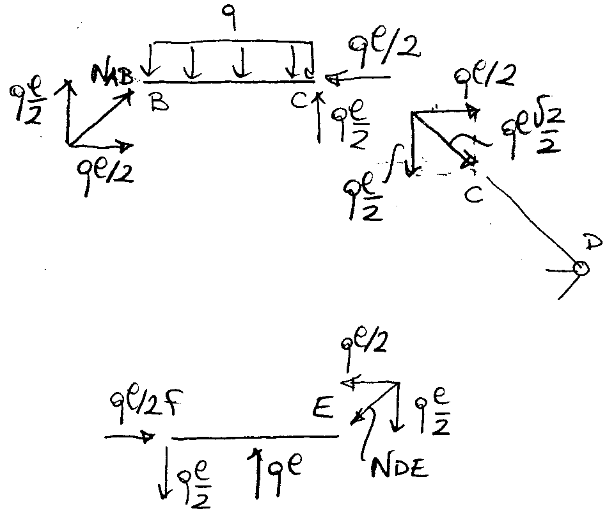
↳ $N_{DE}\sqrt{2}\,\frac{\cancel{3}}{\cancel{2}} = -\frac{\cancel{3}}{\cancel{2}}q\ell \rightarrow \boxed{N_{DE} = -q\ell\frac{\sqrt{2}}{2}}$

D ↺ $\quad N_{AB}\frac{\sqrt{2}}{2}\cancel{\ell} + N_{AB}\frac{\sqrt{2}}{2}2\cancel{\ell} + q\ell\frac{3}{2}\cancel{\ell} = 0$

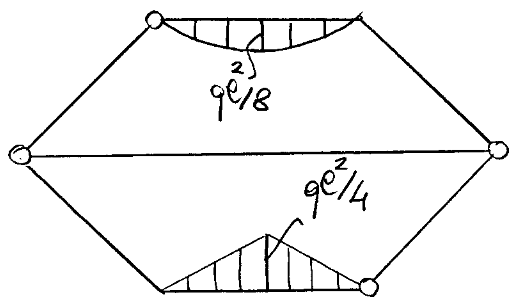
↳ $N_{AB}\frac{\cancel{3}}{\cancel{2}}\sqrt{2} = -\frac{\cancel{3}}{\cancel{2}}q\ell \rightarrow \boxed{N_{AB} = -q\ell\frac{\sqrt{2}}{2}}$

$\boxed{N_{AD}} = -N_{AB}\frac{\sqrt{2}}{2} - N_{DE}\frac{\sqrt{2}}{2} = -2\frac{\cancel{\sqrt{2}}}{2}\left(-q\ell\frac{\cancel{\sqrt{2}}}{\cancel{2}}\right) = \boxed{+q\ell}$

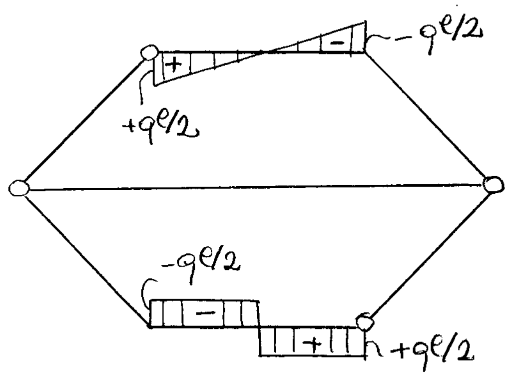
Calcoli



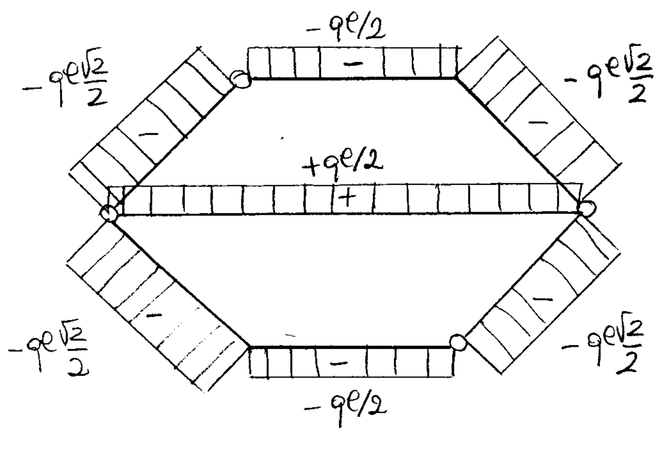
(M)



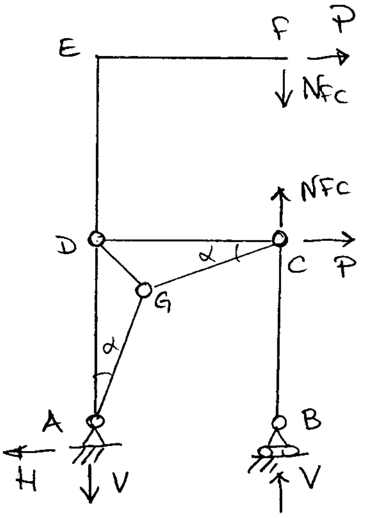
(T)



(N)



Risoluzione Esercizio 3



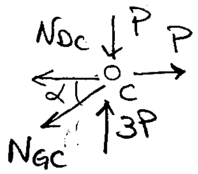
Reazioni vincolari:

$$\boxed{H = 2P}$$

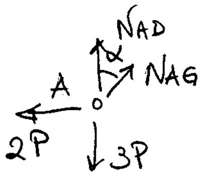
$$A \circlearrowleft \quad V\cdot\cancel{\ell} - P\cancel{\ell} - P\cdot 2\cancel{\ell} = 0 \longrightarrow \boxed{V = 3P}$$

Azioni interne:

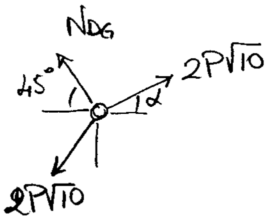
$$D \circlearrowleft \quad N_{FC}\,\ell + P\ell = 0 \longrightarrow N_{FC} = -P$$



$$\begin{cases} N_{GC}\,\mathrm{sen}\,\alpha = 2P \\ N_{DC} = P - N_{GC}\cos\alpha \end{cases} \longrightarrow \begin{cases} N_{GC} = 2P\sqrt{10} \\ N_{DC} = -5P \end{cases}$$

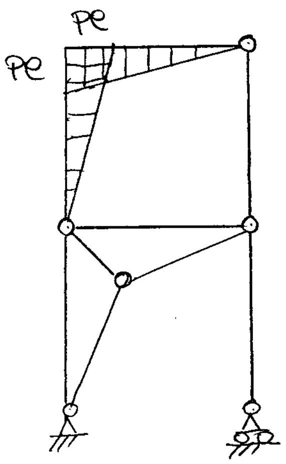


$$\begin{cases} N_{AG}\,\mathrm{sen}\,\alpha = 2P \\ N_{AD} = 3P - N_{AG}\cos\alpha \end{cases} \longrightarrow \begin{cases} N_{AG} = 2P\sqrt{10} \\ N_{AD} = -3P \end{cases}$$

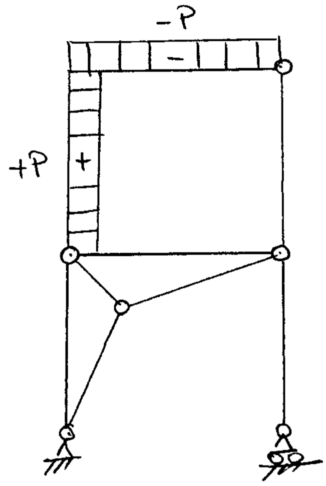


$$N_{DG}\frac{\sqrt{2}}{2} = 2P\sqrt{10}\cos\alpha - 2P\sqrt{10}\,\mathrm{sen}\,\alpha = 2P\sqrt{10}\frac{3}{\sqrt{10}} - 2P\sqrt{10}\frac{1}{\sqrt{10}} = 4P \longrightarrow N_{DG} = 4P\sqrt{2}$$

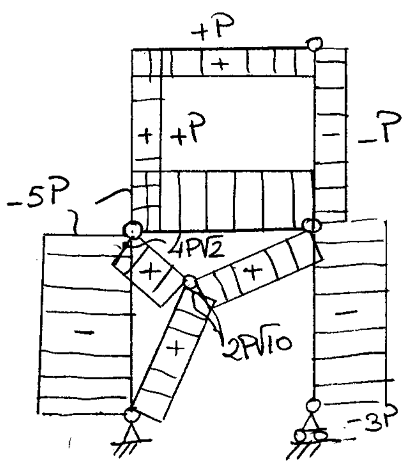
Diagrammi:



(M)



(T)



(N)

22/05/02

Risoluzione Esercizio 4

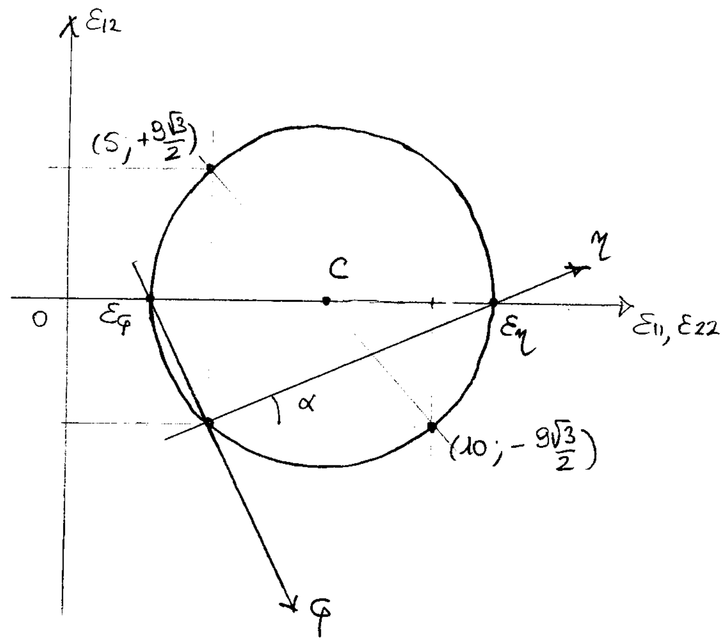
a) Si pone $\varepsilon_{12} = x \cdot 10^{-5}$. Allora: $E = 10^{-5}\begin{bmatrix} 10 & x \\ x & 5 \end{bmatrix}$

$$\underset{\underset{2\cdot \cancel{10^{-5}}}{\parallel}}{\varepsilon_m} = Em.m = \cancel{10^{-5}}\begin{bmatrix} 10 & x \\ x & 5 \end{bmatrix}\begin{bmatrix} \sqrt{3}/2 \\ 1/2 \end{bmatrix} \cdot [\sqrt{3}/2 \,;\, 1/2]$$

$$\hookrightarrow \quad 2 = \begin{bmatrix} 5\sqrt{3} + x/2 \\ \sqrt{3}x/2 + \frac{5}{2} \end{bmatrix} \cdot [\sqrt{3}/2 \,;\, 1/2] = \frac{15}{2} + x\frac{\sqrt{3}}{4} + x\frac{\sqrt{3}}{4} + \frac{5}{4}$$

$$2 = x\frac{\sqrt{3}}{2} + \frac{35}{4} \longrightarrow x = -\frac{9}{2}\sqrt{3} \text{ . Quindi: } \boxed{\varepsilon_{12} = -\frac{9\sqrt{3}}{2}\cdot 10^{-5}}.$$

b) Cerchio di Mohr



$$C = (7{,}5\,;0)\cdot 10^{-5}$$

$$R = \sqrt{\left(\frac{10-5}{2}\right)^2 + \left(\frac{9\sqrt{3}}{2}\right)^2}\cdot 10^{-5} = 10^{-5}\sqrt{67}$$

$$\left.\begin{matrix}\varepsilon_\varphi \\ \varepsilon_\eta\end{matrix}\right\} = [7{,}5 \mp \sqrt{67}\,]\,10^{-5} = \begin{cases} -0{,}68\cdot 10^{-5} \\ +15{,}68\cdot 10^{-5}\end{cases}$$

$$\alpha = \frac{1}{2}\operatorname{arctg}\left(\frac{9\sqrt{3}}{5}\right) \cong 36^\circ$$

c) Autovalori e autovettori di E:

$$\varepsilon_\varphi = \frac{1}{2}(15 - 2\sqrt{67})\cdot 10^{-5} = -0{,}68\cdot 10^{-5} \,; \qquad u_\varphi = (0{,}729\,;\,1)$$

$$\varepsilon_\eta = \frac{1}{2}(15 + 2\sqrt{67})\cdot 10^{-5} = +15{,}68\cdot 10^{-5} \,; \qquad u_\eta = (-1{,}37\,;\,1)$$