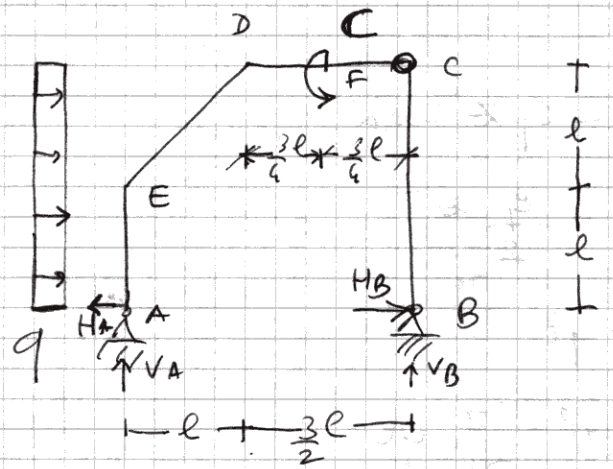
SdC I 28/10/02

1)



- Dall'equilibrio attorno a C del tratto BC:

$$H_B 2\ell = 0 \Rightarrow H_B = 0$$

- Dall'equilibrio attorno a C del tratto AC

$$V_A \cdot \frac{5}{2}\ell + H_A \cdot 2\ell - 2q\ell^2 - \mathcal{C} = 0$$

- ↑

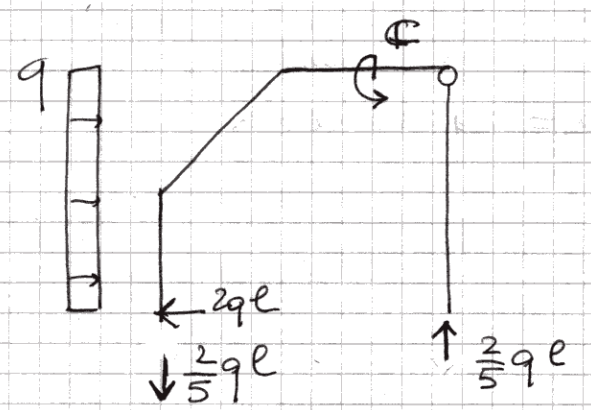
$$V_A + V_B = 0$$

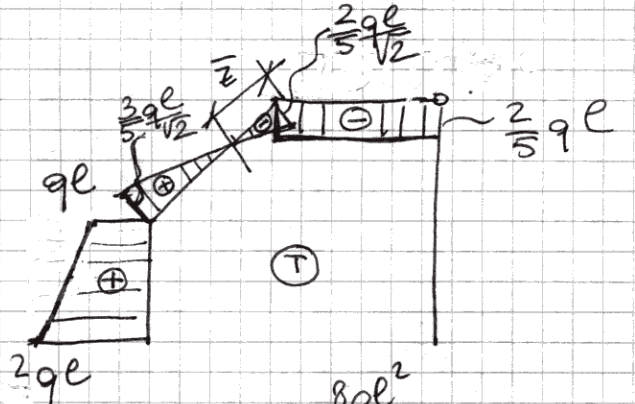
- →

$$\boxed{2q\ell = H_A}$$

$$\boxed{V_A = \frac{2}{5\ell}\left(\mathcal{C} + 2q\ell^2 - 4q\ell^2\right) = -\frac{2}{5}q\ell}$$

$$\boxed{V_B = -V_A = +\frac{2}{5}q\ell}$$

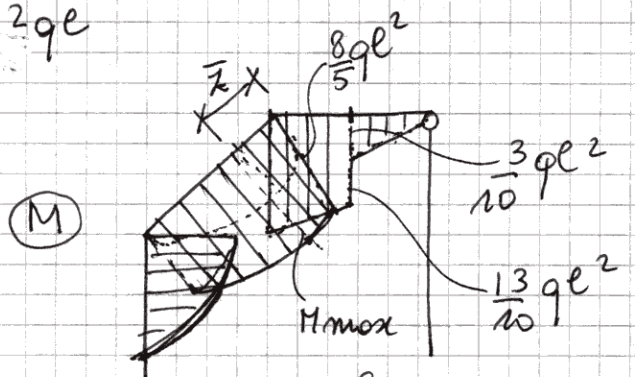


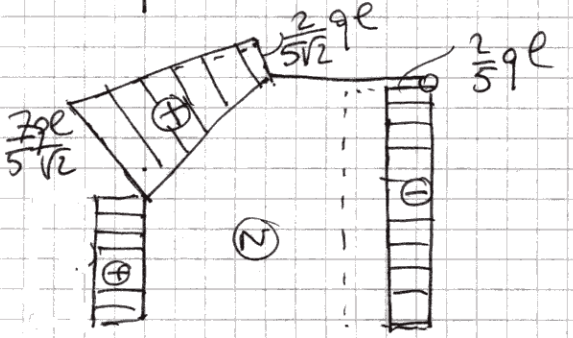


$$M_{FD} = \frac{2}{5}q\ell \cdot \frac{3}{2}\ell + q\ell^2 =$$

$$M_{DC} = \mathcal{C} + \frac{2}{5}q\ell \cdot \frac{3}{2}\ell = \frac{8}{5}q\ell^2$$

$$M_{EA} = 2q\ell^2 - \frac{q\ell^2}{2} = \frac{3}{2}q\ell^2$$

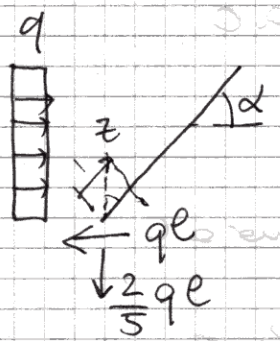




$$N_{DC} = +\frac{2}{5\sqrt{2}}q\ell$$

$$N_{ED} = +\frac{q\ell}{\sqrt{2}} + \frac{2}{5\sqrt{2}}q\ell = \frac{q\ell}{\sqrt{2}}\frac{7}{5}$$

$\alpha = 45°$

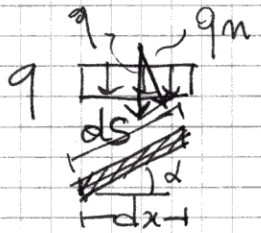


$$M(z) = \frac{3}{5}\frac{q\ell}{\sqrt{2}} z - q z^2 \cos^2\alpha$$

$$= \frac{3}{5}\frac{q\ell}{\sqrt{2}} z - \frac{q}{2} z^2$$

$$T(z) = \frac{3}{5}\frac{q\ell}{\sqrt{2}} - qz$$

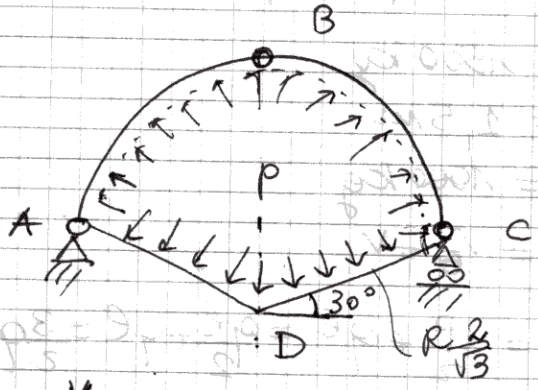
$$N(z) = \frac{q\ell}{\sqrt{2}} + \frac{2}{5\sqrt{2}} q\ell = \frac{7}{5\sqrt{2}} q\ell$$



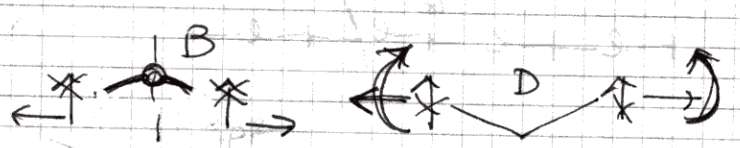
$$q\,dx = q\,ds\cos\alpha =$$

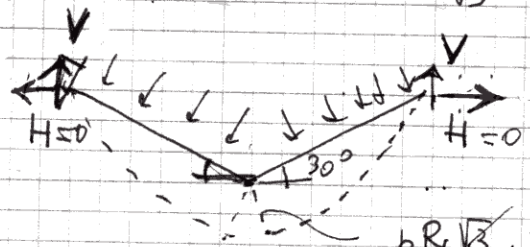
$$q\,dx\cos\alpha = q_n\,dx = q\,ds\cos^2\alpha$$

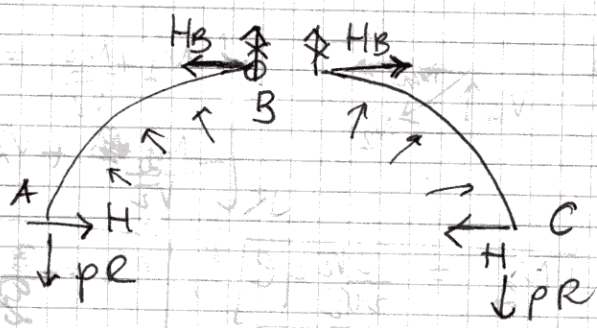
2)



arco autoequilibrato
vincoli esterni sono scorrichi





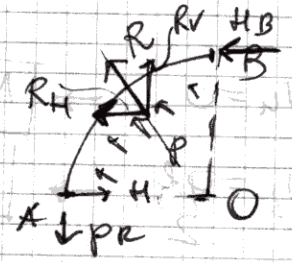


$$pR\frac{\sqrt{3}}{2}\cdot\frac{R/2}{\sqrt{3}} - \frac{pR^2}{2}$$

$$2V - 2pR = 0$$

$$\boxed{V = pR}$$

$H = 0$



$$H - H_B - R_H = 0$$

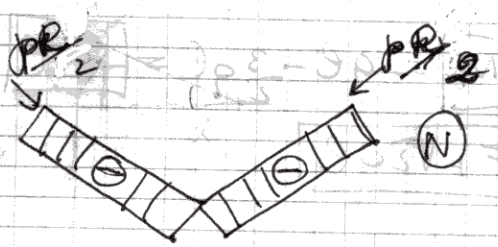
$$R_V = pR$$

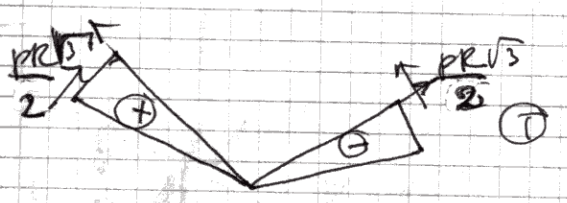
$$\circlearrowleft \quad pR^2 + H_B R = 0$$

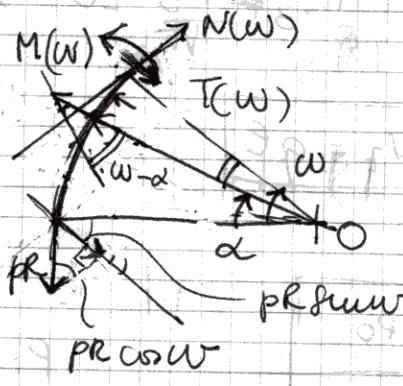
$$H_B = -pR$$

$$R = pR\sqrt{2}$$

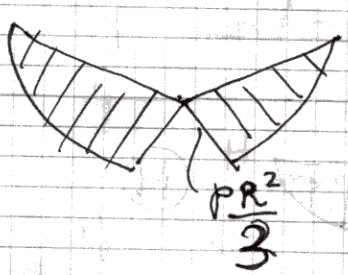
$$R_H = pR\,; \quad R_V = pR\,; \quad H = 0$$







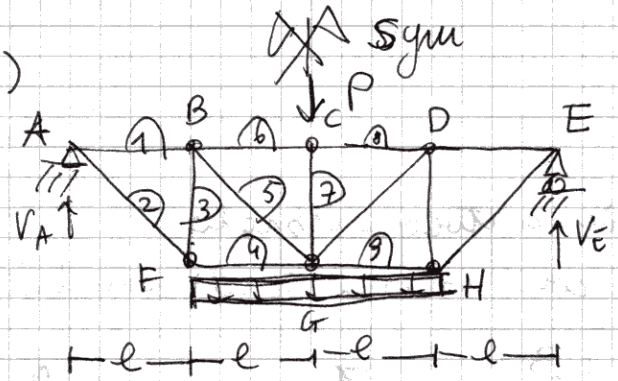
$$\begin{cases} N(\omega) = pR\cos\omega - \int_0^{\omega} pR\,d\vartheta\,\sin(\omega-\alpha)\,d\alpha \\ T(\omega) - pR\sin\omega + \int_0^{\omega} pR\,d\vartheta\,\cos(\omega-\alpha)\,d\alpha = 0 \\ M(\omega) + pR^2 - N(\omega)R = 0 \end{cases}$$



$$M_D = pR\frac{\sqrt{3}}{2}\cdot\frac{R/2}{\sqrt{3}} - pR\frac{1}{2}\cdot\frac{R}{\sqrt{3}}\frac{1}{2}$$

$$= pR^2/3$$

3)



$V_A + V_E = P + 2q\ell$

$P = 1500\ kg$

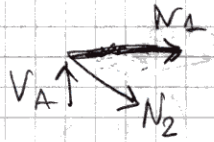
$\ell = 1{,}5\ m$

$q = 1000\ kg$

$V_A = V_E = V$

$V = \frac{P}{2} + q\ell = \frac{q\ell}{2} + q\ell = \frac{3}{2}q\ell$

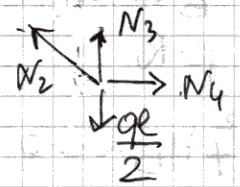
(A)



$$\begin{cases} N_1 + \frac{N_2}{\sqrt{2}} = 0 \\ -\frac{N_2}{\sqrt{2}} + V_A = 0 \end{cases}$$

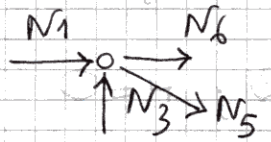
$\boxed{N_2 = \frac{3\sqrt{2}}{2}q\ell}$; $\boxed{N_1 = -\frac{3}{2}q\ell}$

(F)



$$\begin{cases} -\frac{N_2}{\sqrt{2}} + N_4 = 0 \rightarrow \boxed{N_4 = \frac{3}{2}q\ell} \\ \frac{N_2}{\sqrt{2}} + N_3 = \frac{q\ell}{2} \rightarrow \boxed{N_3 = -q\ell} \end{cases}$$

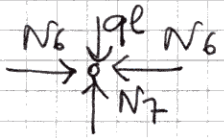
(B)



$N_1 + N_6 + \frac{N_5}{\sqrt{2}} = 0 \Rightarrow \boxed{N_6} = -q\ell - \frac{3}{2}q\ell = \boxed{-2q\ell}$

$N_3 + \frac{N_5}{\sqrt{2}} = 0 \Rightarrow \boxed{N_5 = +\sqrt{2}q\ell}$

(C)

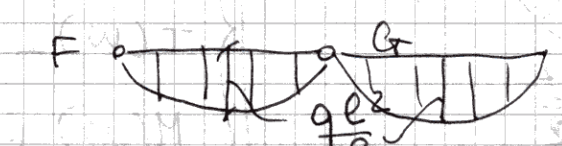


$\boxed{N_7 = q\ell}$

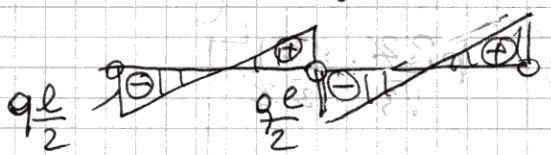
ASTA	N	TIPO
1	$-\frac{3}{2}q\ell$	P
2	$\frac{3\sqrt{2}}{2}q\ell$	T
3	$-q\ell$	P
4	$\frac{3}{2}q\ell$	T
5	$\sqrt{2}q\ell$	T
6	$-2q\ell$	P
7	$q\ell$	T

P: puntone

T: tirante



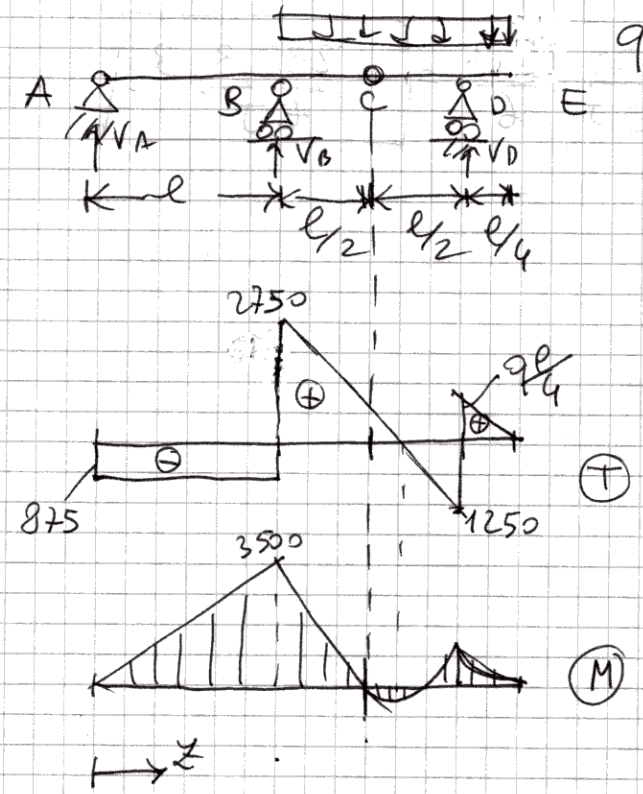
(M)



(T)

STATO SECONDARIO

④



$\ell = 4\,m$

$q = 1\,t/m$

$$\begin{cases} V_A + V_B + V_D = q\ell \cdot \frac{5}{4} & \uparrow \\ V_D \frac{\ell}{2} - q\frac{3}{2}\ell \cdot \frac{3}{8}\ell = 0 & C \curvearrowleft \text{ tratto CE} \\ V_A \frac{3}{2}\ell + V_B \frac{\ell}{2} - q\frac{\ell^2}{8} = 0 & C \curvearrowleft \text{ tratto AC} \end{cases}$$

$$V_D = \frac{9}{16} q\ell = 2250\,kg$$

$$V_A = \frac{5}{4} q\ell - V_B - V_D = \frac{11}{16} q\ell - V_B$$

$$\frac{11}{16} q\ell \cdot \frac{3}{2}\ell - V_B \cdot \frac{3}{2}\ell + V_B \frac{\ell}{2} = q\frac{\ell^2}{8}$$

$$V_B = \frac{11}{16} q\ell \cdot \frac{3}{2} - \frac{q\ell}{8} = \frac{29}{32} q\ell$$

$$= 3625\,kg$$

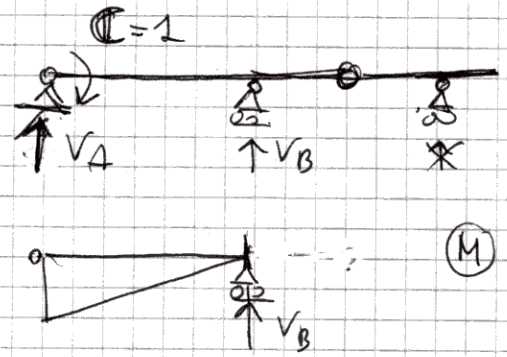
$$V_A = \frac{11}{16} q\ell - \frac{29}{32} q\ell = -\frac{7}{32} q\ell$$

$$= 875\,kg$$

$M(z) = -V_A \cdot z = -875 \cdot z$ $\quad 0 < z < \ell$

$M(z) = -V_A z + V_B (z-\ell) - q\frac{(z-\ell)^2}{2}$ $\quad \ell \le z \le 2\ell$

$M(z) = -V_A z + V_B (z-\ell) - q\frac{(z-\ell)^2}{2} + V_D \cdot (z - 2\ell)$ $\quad 2\ell \le z \le \frac{9}{4}\ell$



$$V_A \cdot \frac{3}{2}\ell + C + V_B \cdot \frac{\ell}{2} = 0$$

$$V_A = -V_B$$

$$-V_B \ell + C = 0 \Rightarrow V_B = \frac{C}{\ell}$$

$$V_A = -\frac{C}{\ell}$$

$M(z) = -\frac{1}{\ell} \cdot z + 1$ $\quad 0 < z < \ell$

$M(z) = 0$ $\quad \ell \le z \le \frac{5}{4}\ell$

$$\boxed{\varphi_1} = \int_0^{\ell} -\frac{875 \cdot z}{EJ}\left(1-\frac{z}{\ell}\right) dz = -\frac{875}{EJ}\int_0^{\ell}\left(z-\frac{z^2}{\ell}\right) dz$$

$$= -\frac{875}{EJ}\left(\frac{\ell^2}{2}-\frac{\ell^{\not 3}\ell^2}{3\not\ell}\right) = -\frac{875}{EJ}\,\frac{\ell^2}{6} = \boxed{-\frac{2333,3}{EJ}}$$