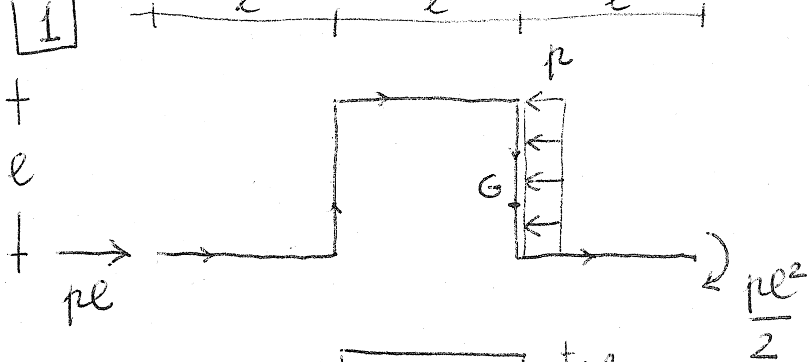
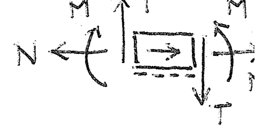
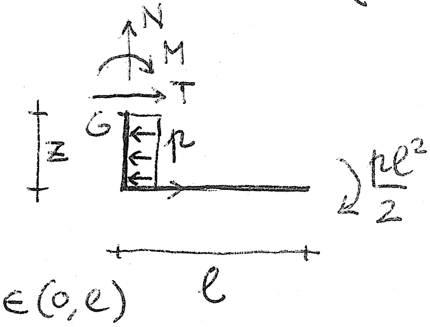
$\boxed{1}$







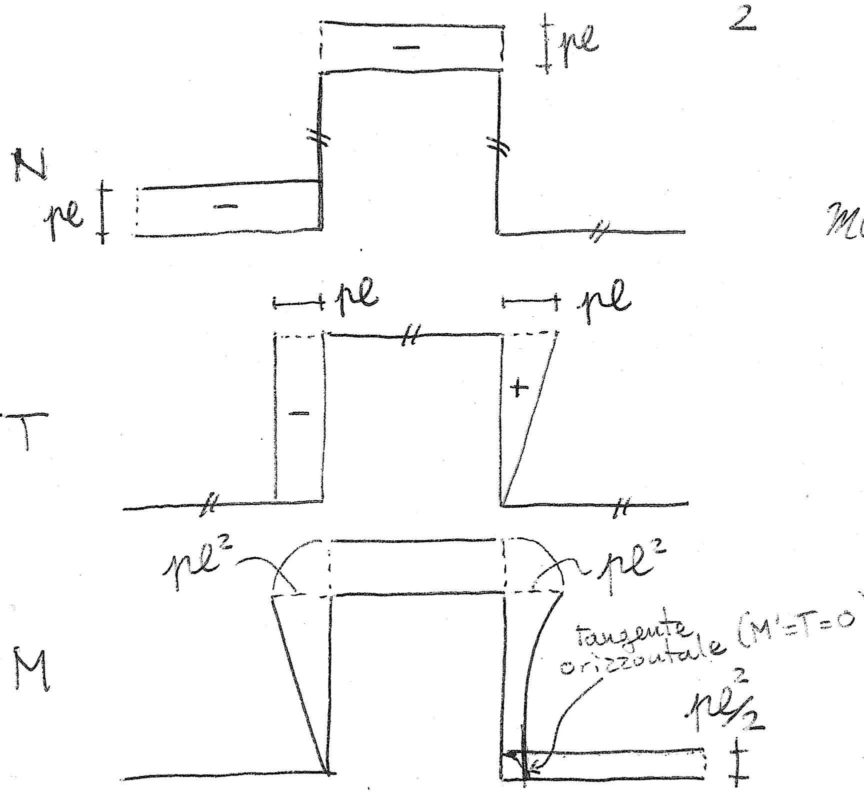
$z \in (0, \ell)$

$N = 0$

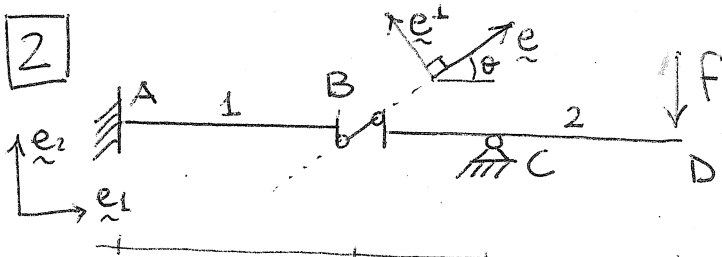
$T - pz = 0 \Rightarrow T(z) = pz$

$\mathcal{M}(G) = -M - pz\frac{z}{2} - \frac{p\ell^2}{2} = 0$

$\Rightarrow M(z) = -\frac{p}{2}(\ell^2 + z^2)$



$\boxed{2}$



$\underset{\sim}{e} = \cos\theta\, \underset{\sim}{e}_1 + \sin\theta\, \underset{\sim}{e}_2$

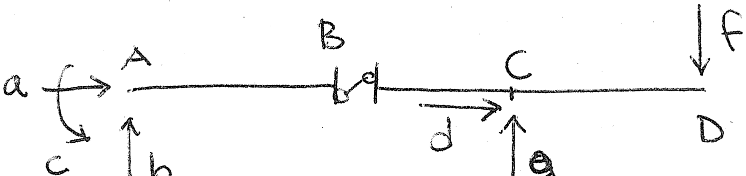
$\underset{\sim}{e}^{\perp} = -\sin\theta\, \underset{\sim}{e}_1 + \cos\theta\, \underset{\sim}{e}_2$

5 equaz. di equil. :

$$\left.\begin{aligned} \underset{\sim}{r} \cdot \underset{\sim}{e}_1 &= 0 \quad (1) \\ \underset{\sim}{r} \cdot \underset{\sim}{e}_2 &= 0 \quad (2) \\ \mathcal{M}(A) &= 0 \quad (3) \end{aligned}\right\} \text{equaz. cardinali}$$

$\underset{\sim}{r}^{(2)} \cdot \underset{\sim}{e}^{\perp} = 0 \quad (4)$ (equil. alla trasl. del tratto 2 lungo $\underset{\sim}{e}^{\perp}$)

$\mathcal{M}^{(2)}(B) = 0 \quad (5)$ (equil. alla rotazione del tratto 2 intorno a B)



5 parametri di reazione

(5) $\Rightarrow g\,\frac{2}{3}\ell - f\,\frac{5}{3}\ell = 0 \Rightarrow g = \frac{5}{2}f$

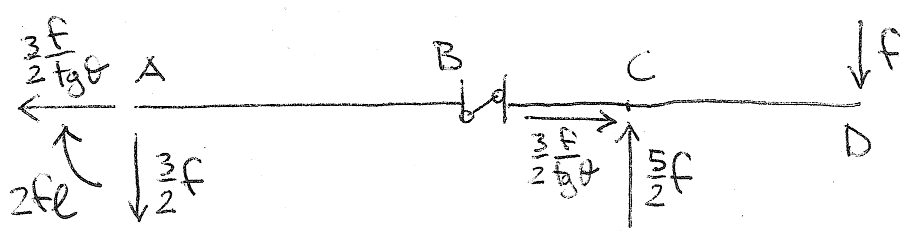
(4) $(g\,\underset{\sim}{e}_2 + d\,\underset{\sim}{e}_1 - f\,\underset{\sim}{e}_2)\cdot \underset{\sim}{e}^{\perp} = 0 \Rightarrow -\sin\theta\, d + (g-f)\cos\theta = 0$

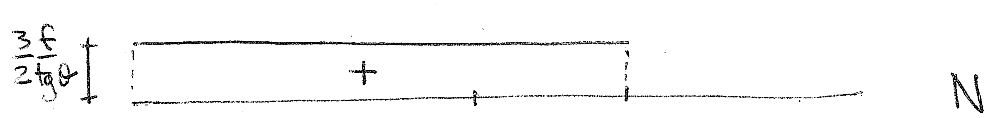
$\Rightarrow d = \frac{3}{2}f\,\frac{1}{\mathrm{tg}\,\theta}$

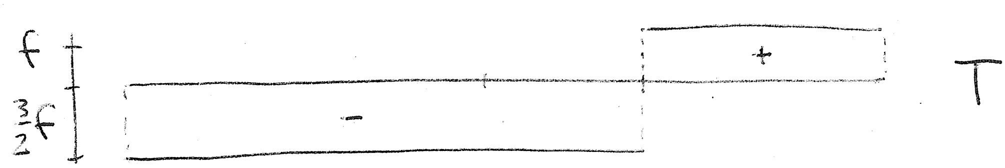
(1) $a + d = 0 \Rightarrow a = -\frac{3}{2}\frac{f}{\mathrm{tg}\,\theta}$

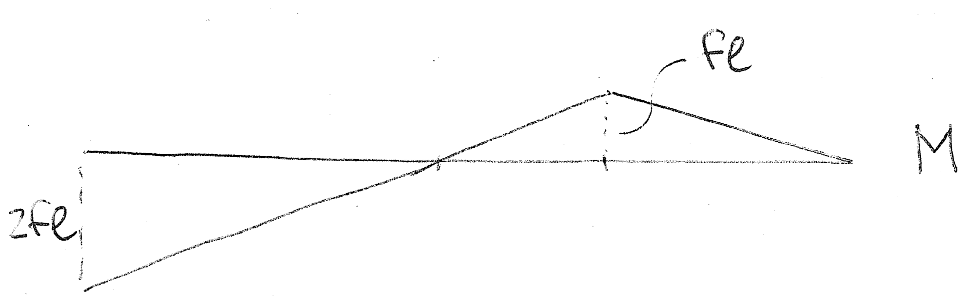
(2) $b + g - f = 0 \Rightarrow b = -\frac{3}{2}f$

(3) $c + g\,2\ell - f\,3\ell = 0 \Rightarrow c = -2f\ell$

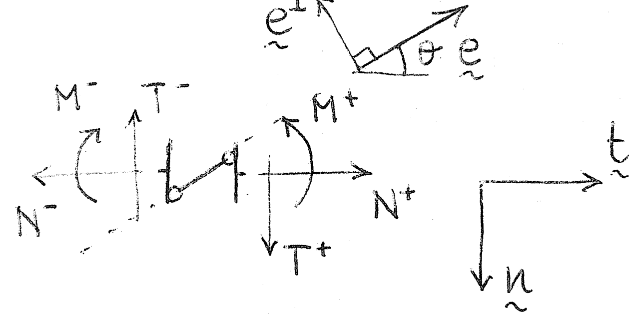








Analisi della sconnessione in B



La sconnessione impedisce soltanto il moto relativo lungo $\underset{\sim}{e}$.

$$(\underset{\sim}{v}^+ - \underset{\sim}{v}^-)\cdot \underset{\sim}{e} = 0$$

$$\Rightarrow \left((w^+ - w^-)\underset{\sim}{t} + (v^+ - v^-)\underset{\sim}{n}\right)\cdot \underset{\sim}{e} = 0$$

$$\underset{\sim}{e} = \cos\theta\, \underset{\sim}{t} - \sin\theta\, \underset{\sim}{n}$$

$$\underset{\sim}{e}^\perp = -\sin\theta\, \underset{\sim}{t} - \cos\theta\, \underset{\sim}{n}$$

$$\Rightarrow (w^+ - w^-)\cos\theta + (v^+ - v^-)(-\sin\theta) = 0$$

$$w^+ = w^- + (v^+ - v^-)\frac{\sin\theta}{\cos\theta} \qquad (*)$$

Principio delle potenze:

$$N^+ w^+ - N^- w^- + T^+ v^+ - T^- v^- + M^+ \varphi^+ - M^- \varphi^- = 0$$ in ogni moto relativo consentito

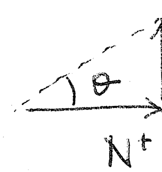
$$(*) \Rightarrow N^+(w^- + (v^+ - v^-)\,tg\,\theta) - N^- w^- + T^+ v^+ - T^- v^- + M^+ \varphi^+ - M^- \varphi^- = 0 \quad \forall w^-, v^+, v^-, \varphi^+, \varphi^-$$

$$(N^+ - N^-) w^- + (T^+ + N^+ tg\,\theta) v^+ - (T^- + N^+ tg\,\theta) v^- + M^+ \varphi^+ - M^- \varphi^- = 0$$

$$\forall w^-, v^+, v^-, \varphi^+, \varphi^-$$

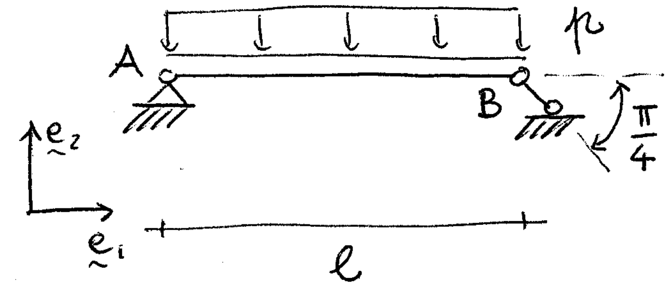
$$\Rightarrow N^+ = N^- , \quad T^+ = -N^+ tg\,\theta = T^- , \quad M^+ = 0 = M^-$$

(confronta i diagrammi delle caratt. della soll.)

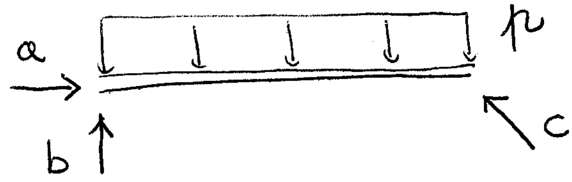


$T^+ = -N^+ tg\,\theta$

$\boxed{3}$



Calcolo delle reazioni vincolari:



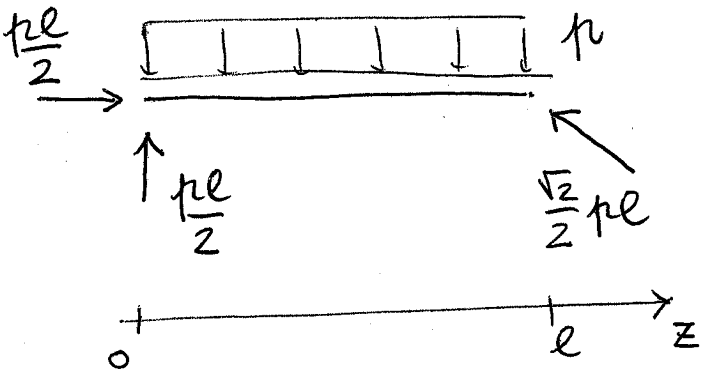
$$\mathcal{M}(B) = -b\ell + \frac{p\ell^2}{2} = 0 \Rightarrow b = \frac{p\ell}{2}$$

$$r \cdot e_2 = b - p\ell + c/\sqrt{2} = 0$$

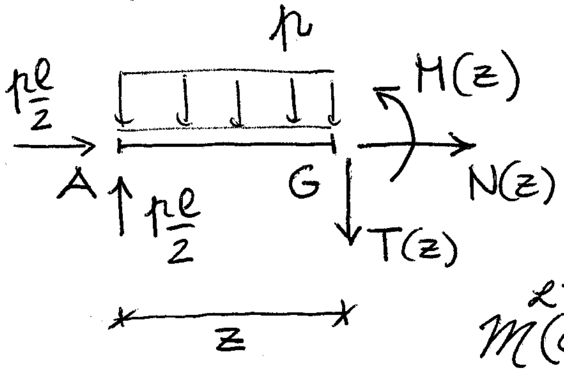
$$\Rightarrow c = \frac{\sqrt{2}}{2} p\ell$$

$$r \cdot e_1 = a - c/\sqrt{2} = 0$$

$$\Rightarrow a = \frac{p\ell}{2}$$



Calcolo delle caratteristiche della sollecitazione: bilancio di $\mathcal{L}^-$

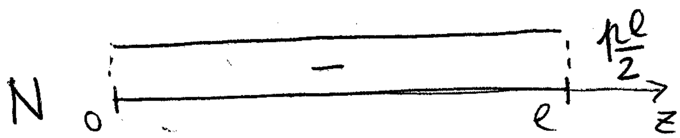


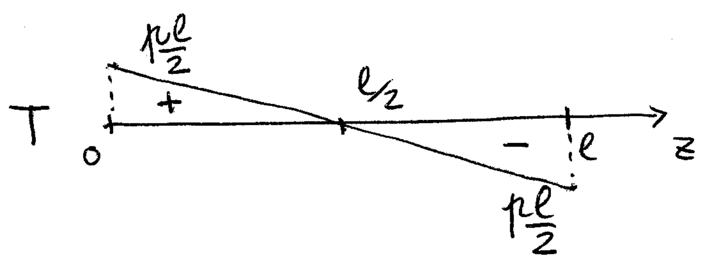
$$N(z) + \frac{p\ell}{2} = 0 \Rightarrow N(z) = -\frac{p\ell}{2}$$

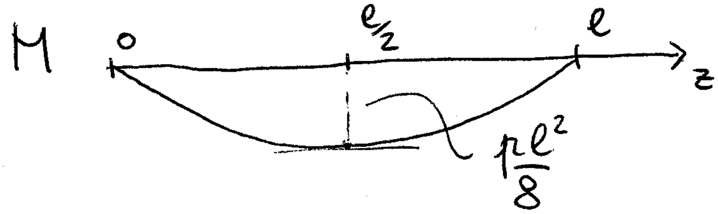
$$\frac{p\ell}{2} - pz - T(z) = 0 \Rightarrow T(z) = p\left(\frac{\ell}{2} - z\right)$$

$$\mathcal{M}^{\mathcal{L}^-}(G) = M(z) + \frac{pz^2}{2} - \frac{p\ell^2}{2} = 0$$

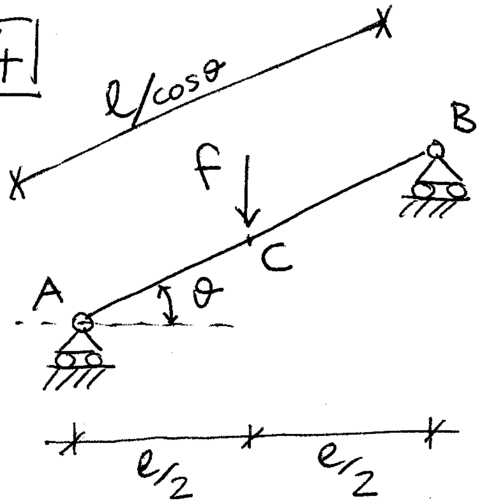
$$\Rightarrow M(z) = \frac{p}{2}(\ell^2 - z^2)$$

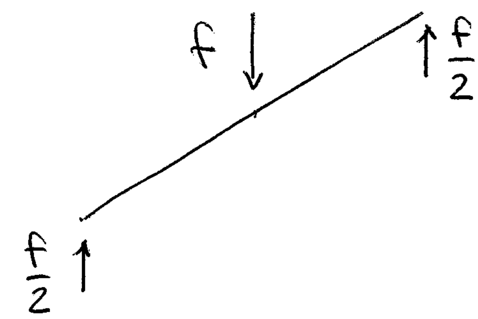


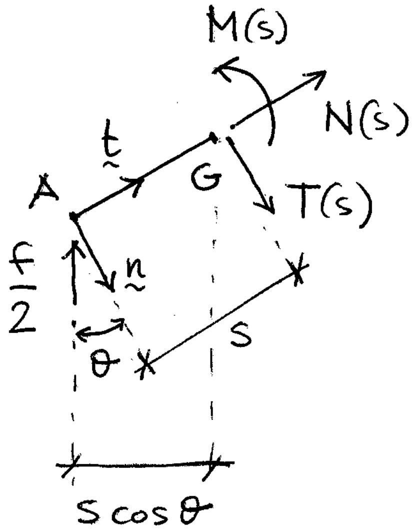




$\boxed{4}$







$s \in \left(0, \frac{\ell}{2\cos\theta}\right)$

(G si trova tra A e C)

equilibrio lungo $\underset{\sim}{t}$: $N(s) + \frac{f}{2}\sin\theta = 0$

$$\Rightarrow N(s) = -\frac{f}{2}\sin\theta$$

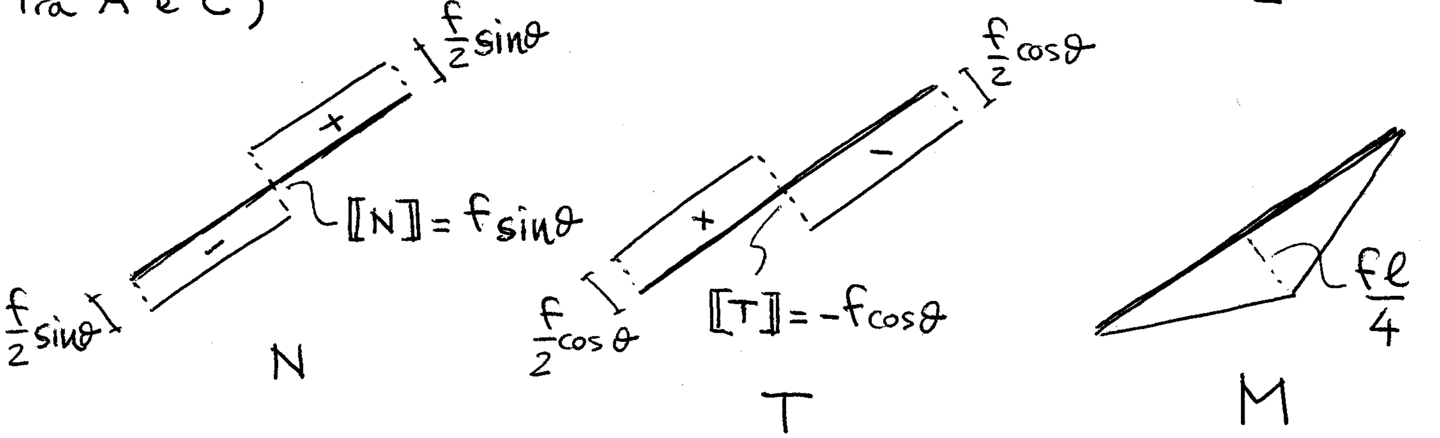
" " $\underset{\sim}{n}$: $T(s) - \frac{f}{2}\cos\theta = 0$

$$\Rightarrow T(s) = \frac{f}{2}\cos\theta$$

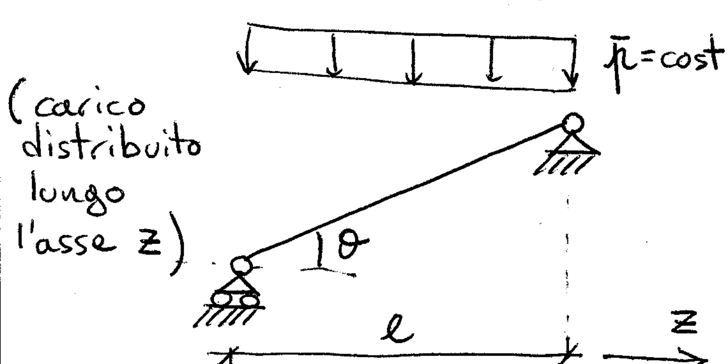
equilibrio alla rotazione intorno a G

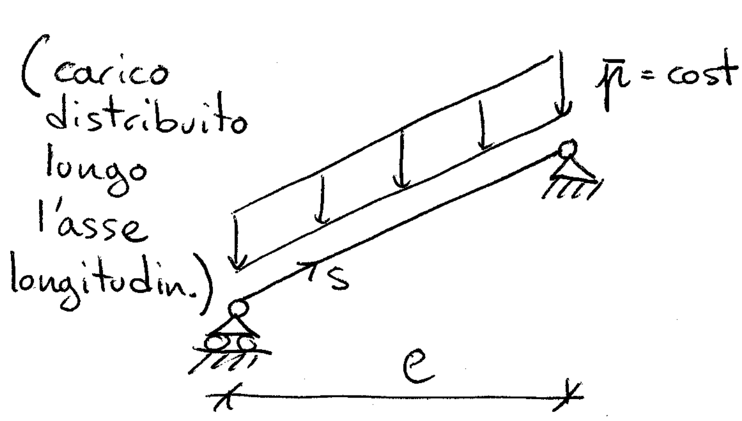
$$\mathcal{M}^{\mathcal{L}^-}(G) = M(s) - \frac{f}{2}s\cos\theta = 0$$

$$\Rightarrow M(s) = \frac{f}{2}s\cos\theta$$

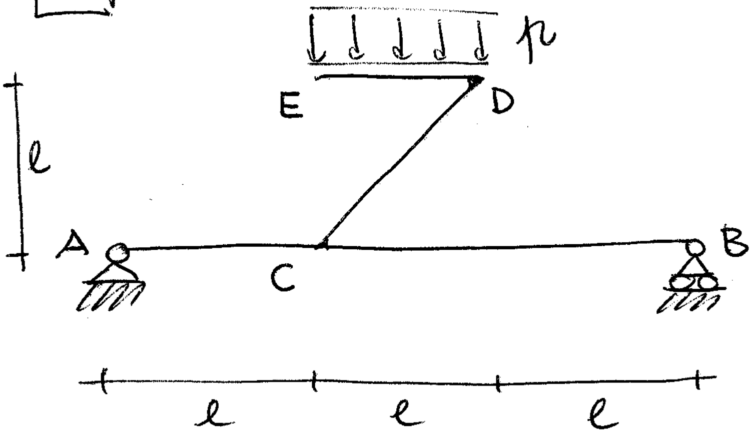


Esercizio : confronto

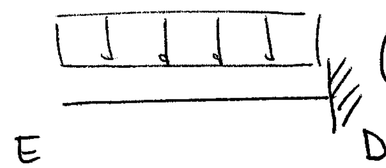




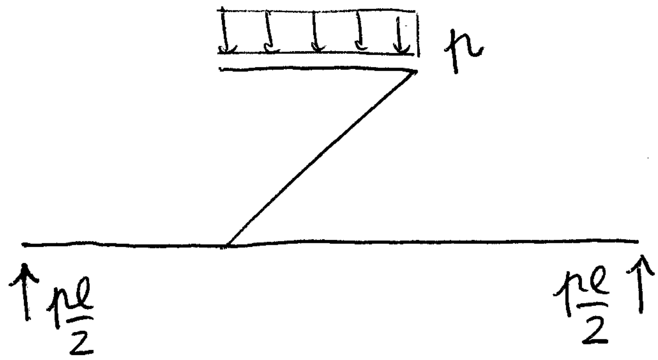
$\boxed{5}$

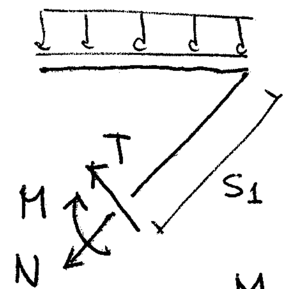


Sotto l'aspetto statico il tratto ED si comporta come una mensola



(le reazioni in D corrispondono alle caratt. della soll. nella strutt. originale)

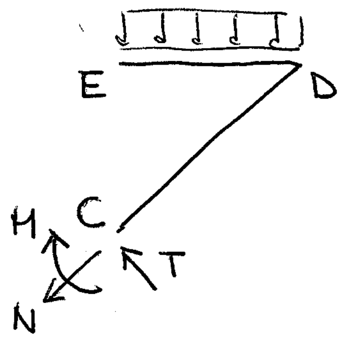




$N = -\frac{pl}{\sqrt{2}}$

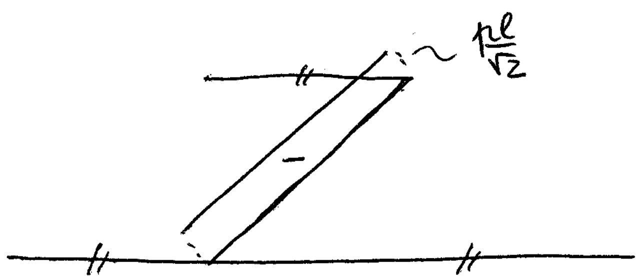
$T = \frac{pl}{\sqrt{2}}$

$-M - pl\left(\frac{s_1}{\sqrt{2}} - \frac{l}{2}\right) = 0$

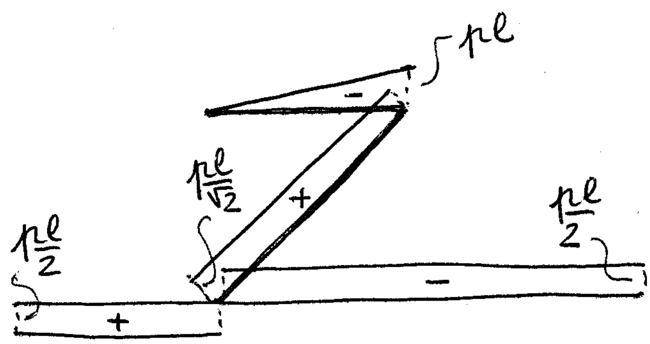


M è lineare in s_1 e vale $\frac{pl^2}{2}$ in D e $-\frac{pl^2}{2}$ in C

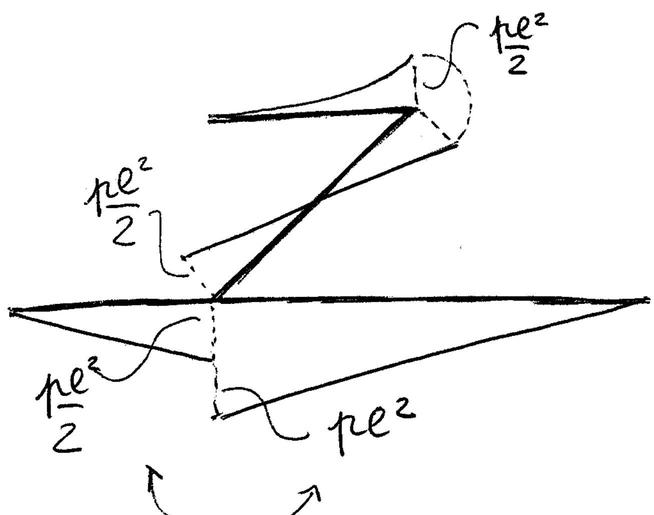
N



T



M



pendenze uguali in modulo

Verifica: equilibrio del nodo