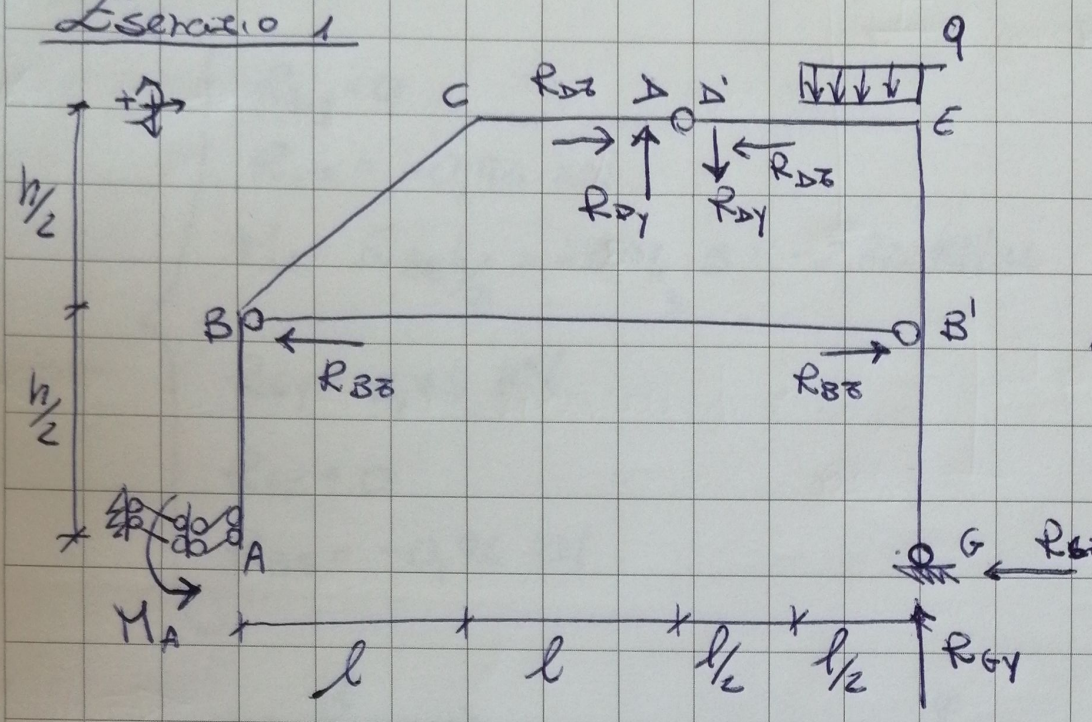
12/06/2019 (1)

Esercizio 1



$l = 3\ m$

$h = 6\ m$

$q = 2{,}5\ kN/m$

(I)
$$\begin{cases} \downarrow) \; -R_{Dy} = 0 \\ \rightarrow) \; R_{Dz} - R_{Bz} = 0 \rightarrow R_{Dz} = R_{Bz} \\ (\circlearrowright) \; -R_{Bz} \cdot h/2 + M_A = 0 \rightarrow R_{Bz} = M_A \cdot 2/h \end{cases}$$

(II)
$$\begin{cases} \downarrow) \; R_{Dy} + q \cdot l/2 - R_{Gy} = 0 \rightarrow R_{Gy} = q\,l/2 = 2{,}5 \cdot 1{,}5 = 3{,}75\ kN \\ \rightarrow) \; -R_{Dz} + R_{Bz} - R_{Gz} = 0 \rightarrow -R_{Bz} + R_{Bz} - R_{Gz} = 0 \rightarrow R_{Gz} = 0 \\ (\circlearrowright) \; -q\,l/2\,(l/2 + l/4) + R_{Bz} \cdot h/2 - R_{Gz} \cdot h + R_{Gy} \cdot l = 0 \end{cases}$$

($R_{Gz} \cdot h \rightarrow 0$; $R_{Gy} \cdot l \rightarrow 3{,}75\ kN$)

$$\Downarrow$$

$$-q\,l/2 \cdot \tfrac{3}{4} l + R_{Bz} \cdot h/2 + 3{,}75 \cdot l = 0$$

$$-8{,}44 + R_{Bz} \cdot 3 + 11{,}25 = 0 \Rightarrow R_{Bz} = \frac{8{,}44 - 11{,}25}{3} = -0{,}94\ kN$$

$$\begin{cases} R_{\Delta y} = 0 \\ R_{\Delta z} = -0{,}94 \text{ kN} \\ M_A = R_{\Delta z} \, h/2 = -0{,}94 \cdot 3 = -2{,}82 \text{ kNm} \\ R_{Gy} = 3{,}75 \text{ kN} \\ R_{Gz} = 0 \\ R_{Bz} = -0{,}94 \text{ kN} \end{cases}$$

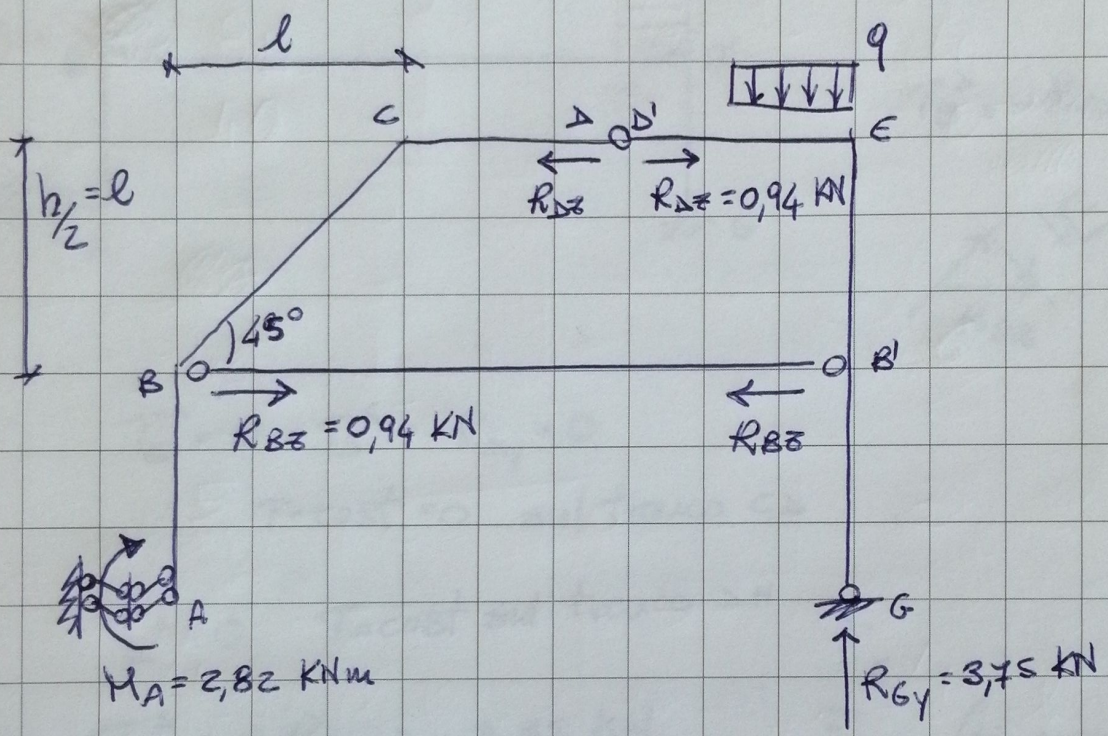
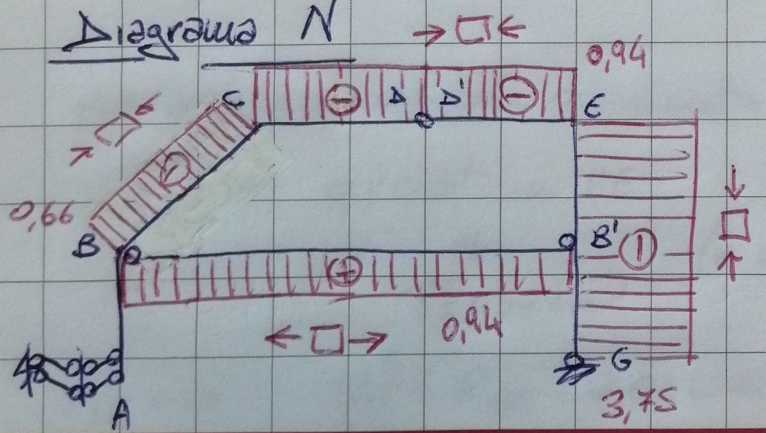
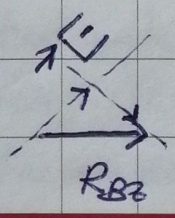


Diagrama N



$N_{AB} = 0$

$N_B^{\Delta} = -R_{Bz} \operatorname{sen} 45° = -0{,}66 \text{ kN}$



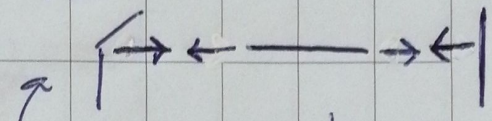
$N_C^{\Delta} = -R_{BZ} = -R_{\Delta Z} = -0{,}94\ KN$

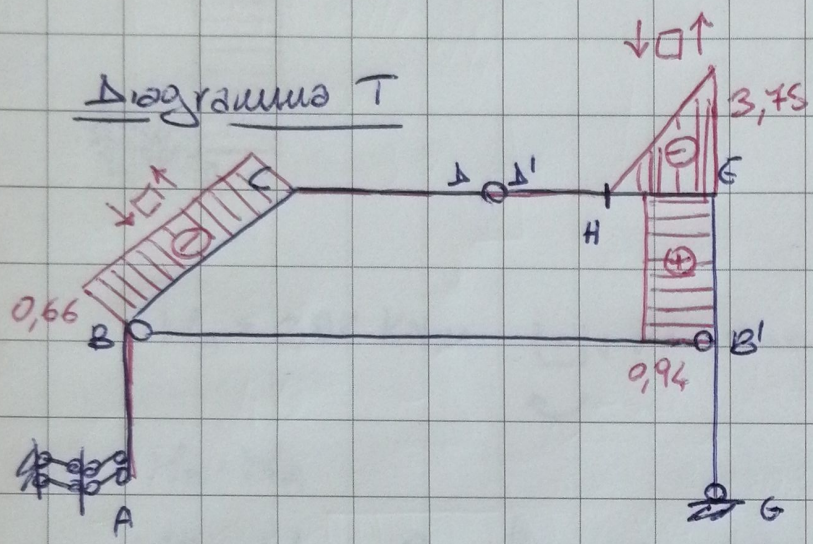
$N_{\Delta'}^{\Delta} = -R_{\Delta Z} = -R_{BZ} = -0{,}94\ KN$

$N_G = -3{,}75 = -R_{GY}$ $\quad (N_{BB'} = +R_{BZ} = +0{,}94\ KN)$

il pendolo è teso

R_{BZ} è l'effetto sul telaio

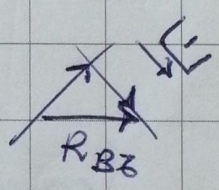




$T_A = 0$ $\quad q = 0 \Rightarrow T = cost.$

$T_B = T_A = 0$

$T_B^{\Delta} = -R_{BZ} \sin 45° = -0{,}66\ KN$



$T = cost$

$\Downarrow$

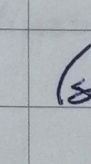
$T_C = T_B^{\Delta}$

$T_C^{\Delta} = 0 = T_{\Delta}^{S} = R_{\Delta Y} = 0$

$T = cost = 0$ sul tronco $C\Delta$

$T_{\Delta}^{\Delta} = 0$ $\quad T = cost$ sul tronco ΔH

$T_E^{S} = -R_{GY} = -3{,}75\ kN$



(si guarda l'asta EG)

per verifica proseguendo da sinistra $T_E^{S} = T_H^{\Delta} - q \cdot \ell/2 = -3{,}75$ OK!

$q = cost$ in HE

$\Downarrow$

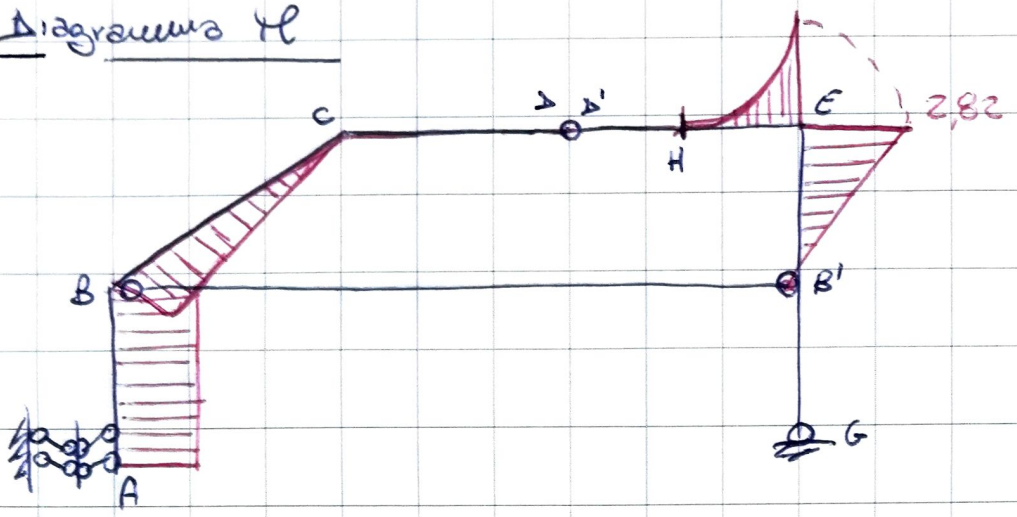
T = lineare

(si verifica anche che nel nodo a 90°

$T_{EN} = N_{EG}$) OK!

$N_G = 0$ $\quad N_B^{S} = R_{BZ} = 0{,}94$ (costante su BE) $(T_{EB'} = N_{\Delta E})$ OK!

Diagramma $\mathcal{M}$



$\mathcal{M}_A = 2{,}82$ KNm |+| fibre tese

$\mathcal{M}_B = \mathcal{M}_A$

$\mathcal{M}_C^S = \mathcal{M}_A - R_{Bz} \cdot \frac{h}{2} = 2{,}82 - 2{,}82 = 0$

$\mathcal{M}_D^S = \mathcal{M}_A - R_{Bz} \cdot \frac{h}{2} = 0 \Rightarrow \mathcal{M}_D = 0$ (cerniera)

$\mathcal{M}_H = 0 = \mathcal{M}_D$

$\mathcal{M}_E = -R_{Bz} \cdot \frac{h}{2} = -2{,}82$ KNm

E |1 fibre tese

$T = cost \Rightarrow \mathcal{M} =$ lineare

$\mathcal{M}_{B'} = 0$

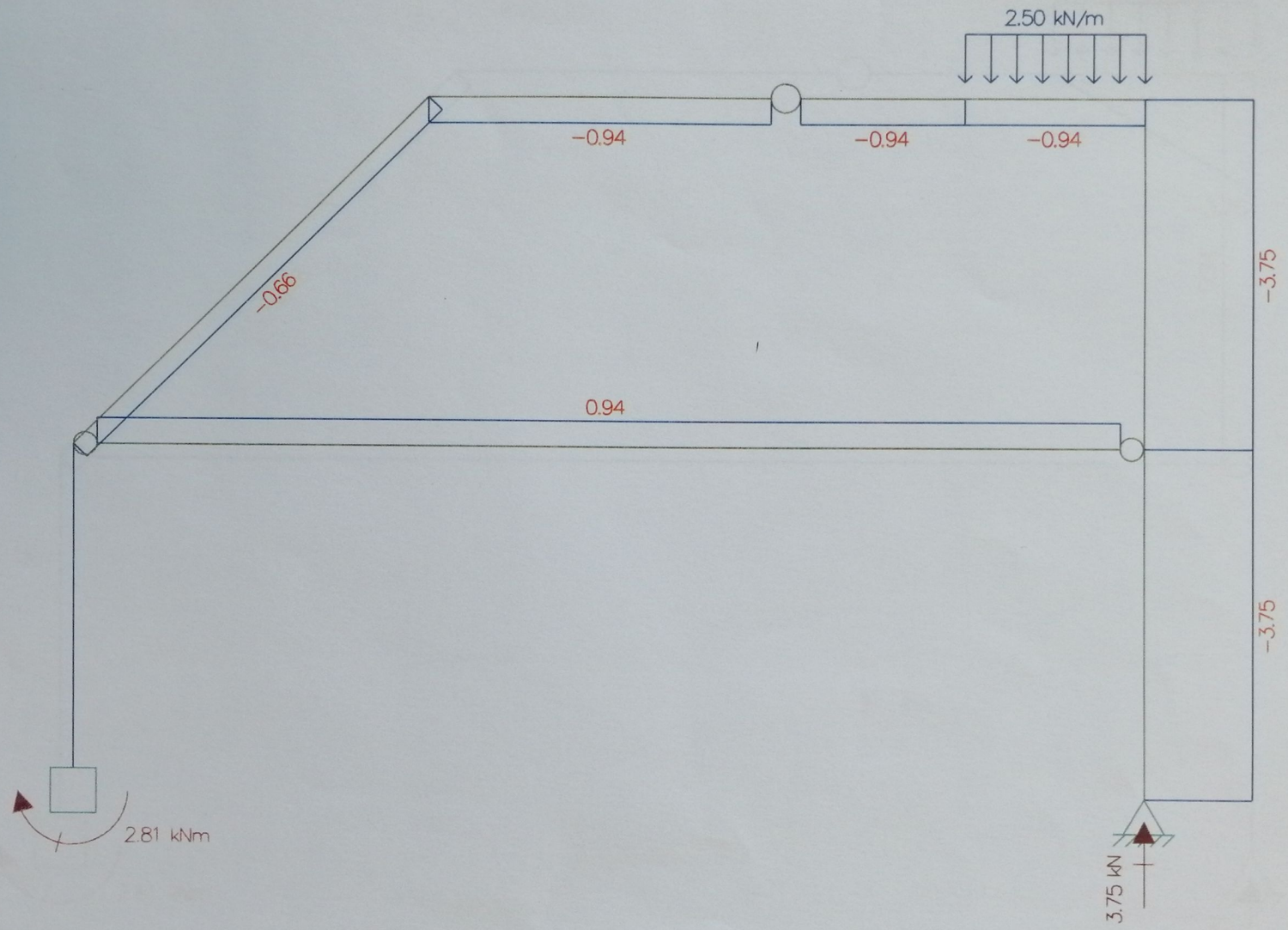
$\mathcal{M}_G = 0$

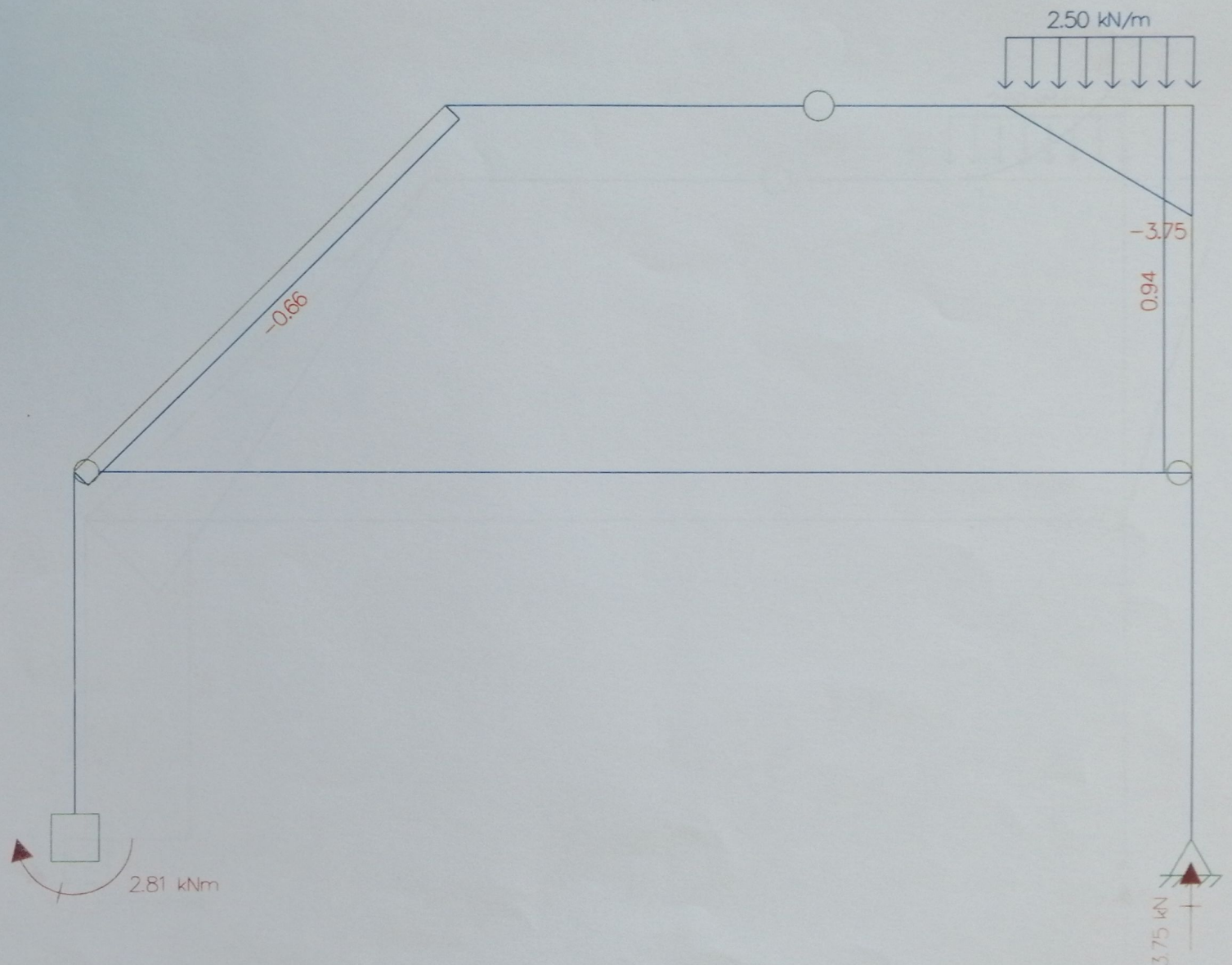
$\mathcal{M}_{HE}$ = parabolico (perché c'è il carico costante)

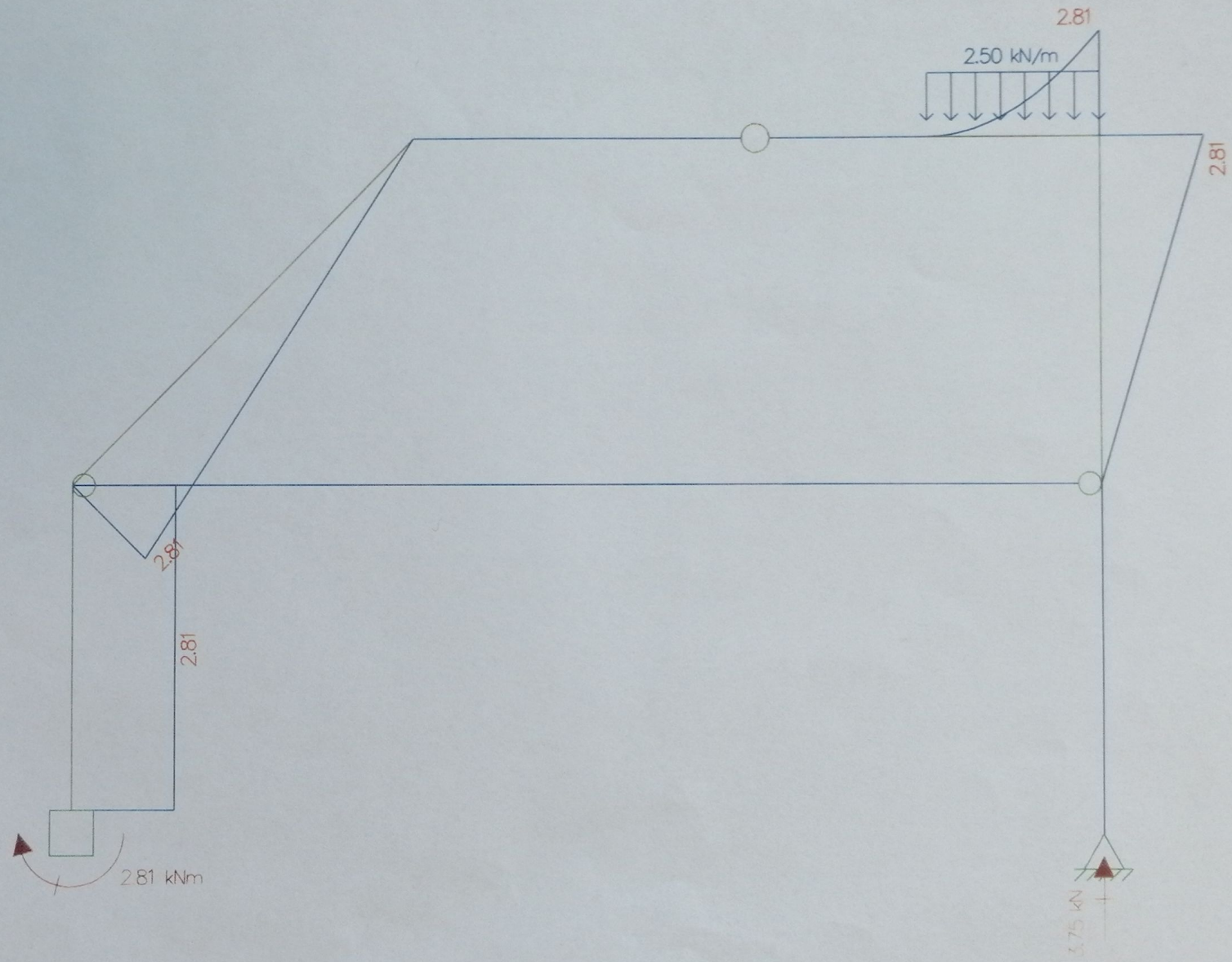
per la concavità vedere $T_H = 0$ (tangente orizzontale in H)

$$\frac{d\mathcal{M}}{dz} = T$$

Verifico $\mathcal{M}_H$ procedendo da destra $\mathcal{M}_H = R_{Gy} \cdot \frac{\ell}{2} - R_{Bz} \cdot \frac{h}{2} - q \cdot \frac{\ell}{2} \cdot \frac{\ell}{4} = 0$ (OK)


2.50 kN/m
−0.94
−0.94
−0.94
−0.66
0.94
−3.75
−3.75
2.81 kNm
3.75 kN


2.50 kN/m
-0.66
-3.75
0.94
2.81 kNm
3.75 kN


2.81
2.50 kN/m
2.81
2.81
2.81
2.81 kNm
2.75 kN