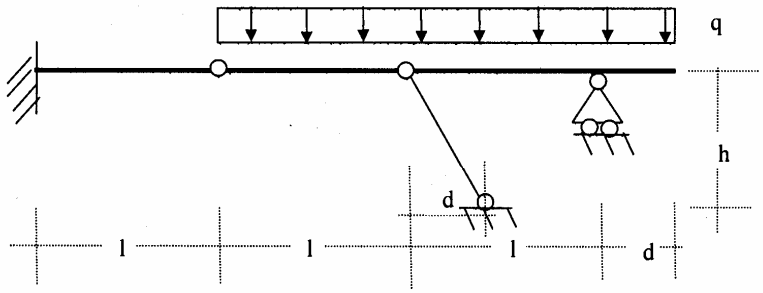
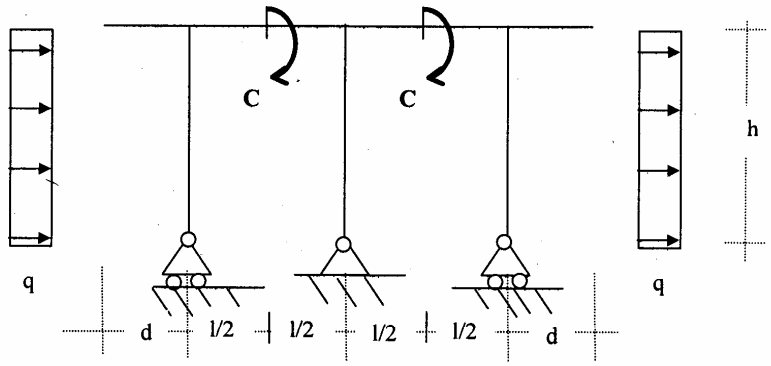
I compito scritto in itinere di Scienza delle costruzioni I AA 2009/2010 12/02/2010 **A**

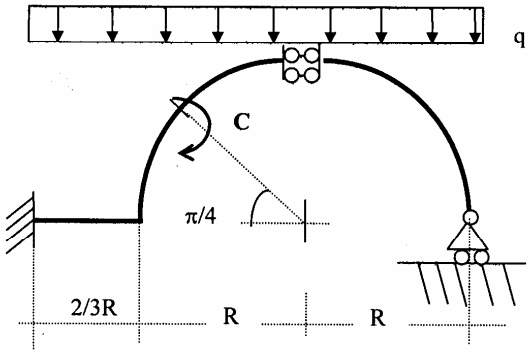
1) Risolvere e determinare i diagrammi quotati delle azioni interne N,T,M per l=4m, d=2m, h=3m, q=1000Kg/m



2) Risolvere e determinare i diagrammi quotati delle azioni interne N,T,M per la struttura antisimmetrica in figura dove d=2m,l=3m;h=4m, **C**=100kgm, q=100 Kg/m

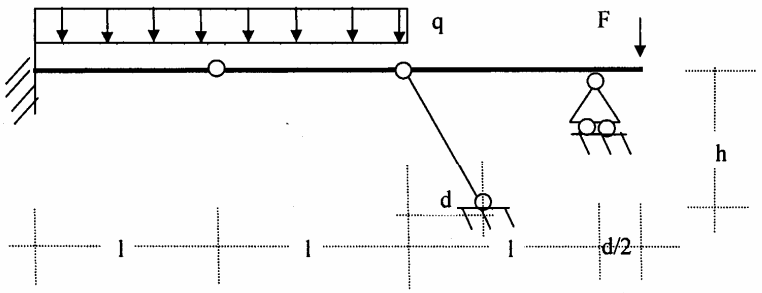


2) Risolvere e determinare le leggi analitiche sul tratto curvilineo ed i diagrammi quotati nel tratto orizzontale delle azioni interne N,T,M con R=3m, q=500Kg/m, **C**=qR^2

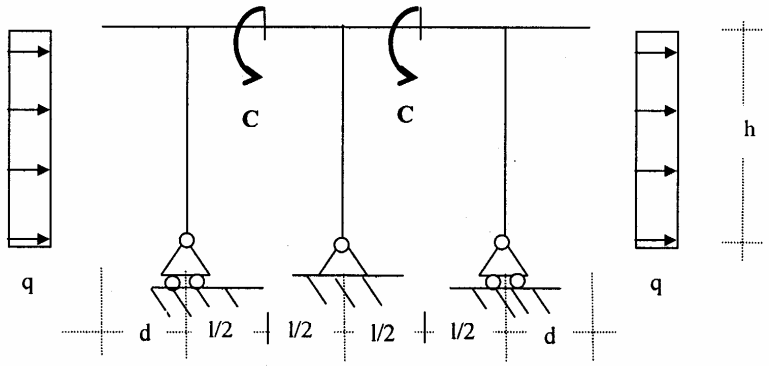


I compito scritto in itinere di Scienza delle costruzioni I AA 2009/2010 12/02/2010 **B**

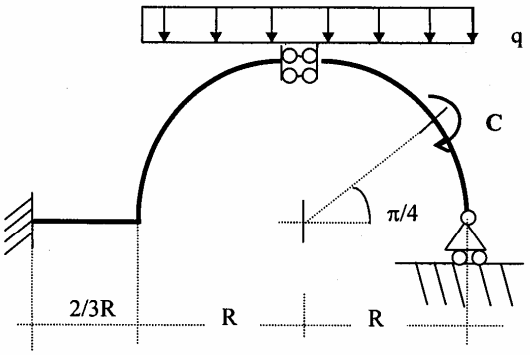
1) Risolvere e determinare i diagrammi quotati delle azioni interne N,T,M per l=4m, d=2m, h=3m, q=1000Kg/m, F=ql



2) Risolvere e determinare i diagrammi quotati delle azioni interne N,T,M per la struttura antisimmetrica in figura dove d=2m,l=3m;h=4m, **C**=100kgm, q=100 Kg/m

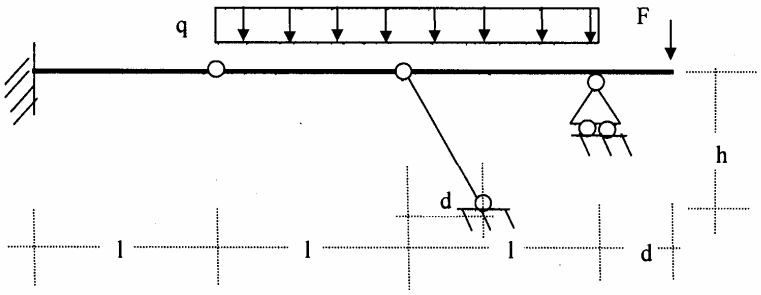


2) Risolvere e determinare le leggi analitiche sul tratto curvilineo ed i diagrammi quotati nel tratto orizzontale delle azioni interne N,T,M con R=3m, q=500Kg/m, **C**=qR^2

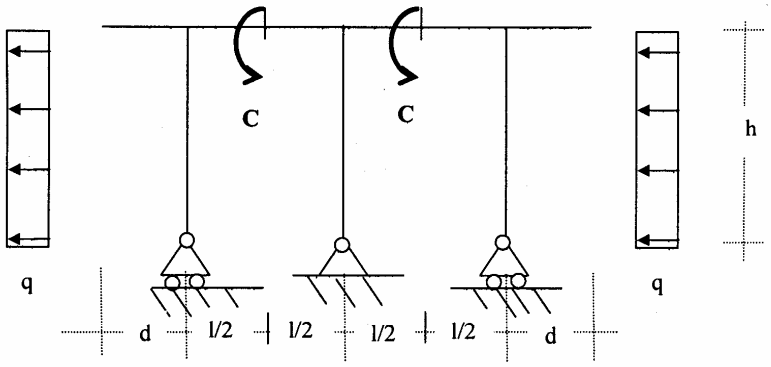


I compito scritto in itinere di Scienza delle costruzioni I AA 2009/2010 12/02/2010 **C**

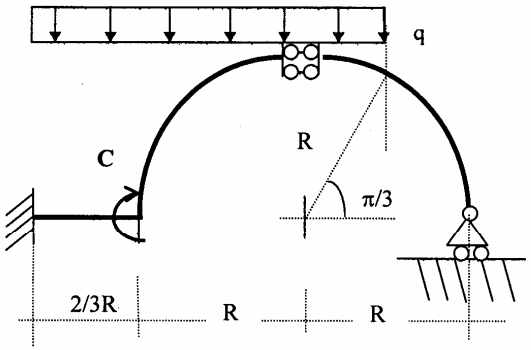
1) Risolvere e determinare i diagrammi quotati delle azioni interne N,T,M per l=4m, d=2m, h=3m, q=1000Kg/m, F=ql.



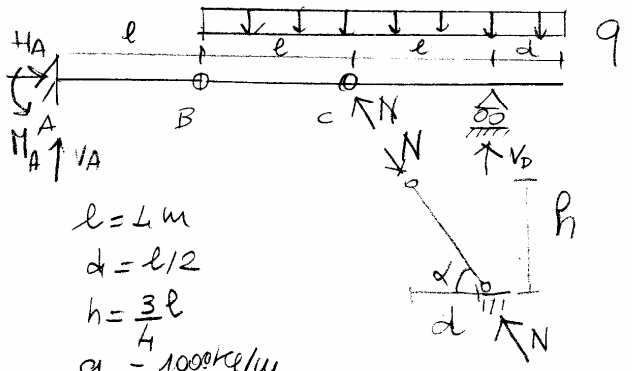
2) Risolvere e determinare i diagrammi quotati delle azioni interne N,T,M per la struttura antisimmetrica in figura dove d=2m,l=3m;h=4m, **C**=100kgm, q=100 Kg/m



2) Risolvere e determinare le leggi analitiche sul tratto curvilineo ed i diagrammi quotati nel tratto orizzontale delle azioni interne N,T,M per R=3m, q=500Kg/m, **C**=qR^2



I COMPITO IN ITINERE DI SDC I 2009-2010 (A)



$\ell = 4\,m$

$d = \ell/2$

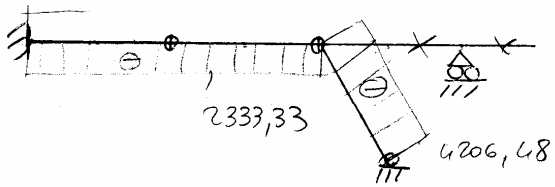
$h = \frac{3}{4}\ell$

$q = 1000\,kg/m$

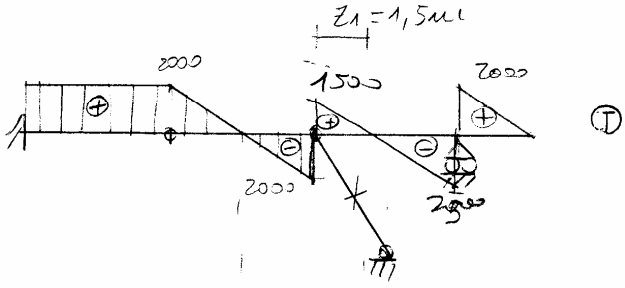
tg $\alpha = 3/2$

$\sin\alpha = \frac{3/2}{\sqrt{1+\frac{9}{4}}} = \frac{3}{\sqrt{13}}$; $\cos\alpha = \frac{2}{\sqrt{13}}$

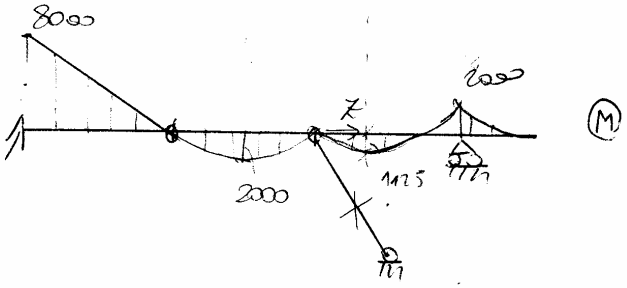
(N)



(T)



(M)



cs ausiliario

$V_D \ell - \frac{3}{2}q\ell \cdot \frac{3\ell}{4} = 0 \Rightarrow V_D = \frac{9}{8}q\ell = 4500\,kg$

B↻ ausiliario

$N \sin\alpha \ell + V_D 2\ell = \frac{5}{2}q\ell^2 \cdot \frac{5}{2}$

$N = \frac{1}{\sin\alpha}\left(\frac{25}{8}q\ell - \frac{18}{8}q\ell\right) = \frac{7}{8}\frac{q\ell}{\sin\alpha} = 4206,68\,kg$

↑) globale

$V_A = -N\sin\alpha - V_D + \frac{5}{2}q\ell$

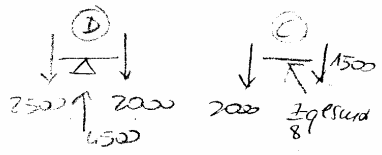
$= -\frac{7}{8}q\ell - \frac{9}{8}q\ell + \frac{5}{2}q\ell$

$= \frac{q\ell}{2} = 2000\,kg$

→) $H_A = N\cos\alpha = \frac{7}{8}q\ell \cdot \frac{2}{3} = \frac{7}{12}q\ell = 2333,33$

B↻ ausiliario

$M_A = V_A \ell = \frac{q\ell^2}{2} = 8000\,kgm$



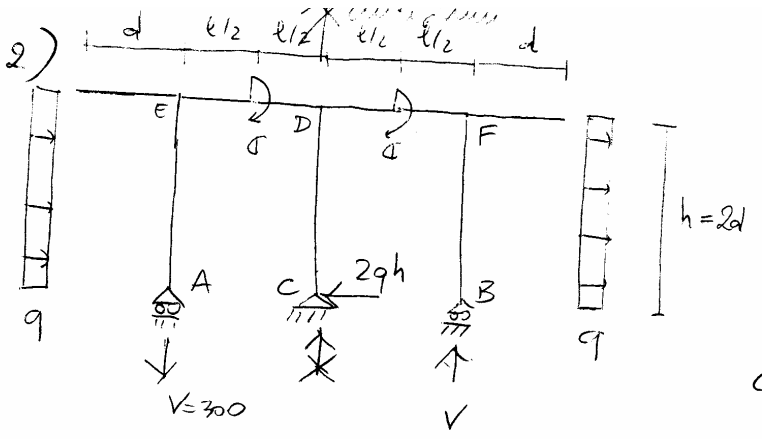
$T(z_1) = 1500 - qz_1 = 0$

$z_1 = \frac{1500\,kg}{1000} = 1,5\,m$

$M(z) = 1500z - q\frac{z^2}{2}$

$M(1,5) = 1125\,kgm$

2)



$q = 100\ kg/m$

$l = 3m = \frac{3}{2}d$

$d = 2m$

$h = 4m = 2d$

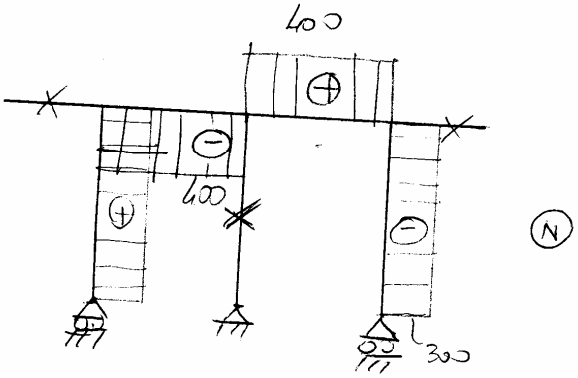
$C = 10\ kgm = qd^2/4$

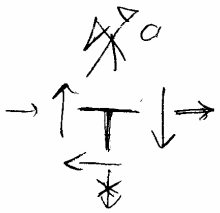
$q = 10\ kg/m$

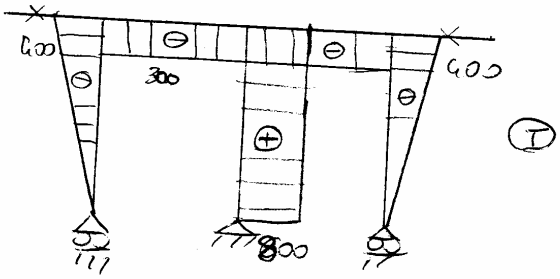
$\sum M_E = 2qd^2/4 + 2q2d^2$

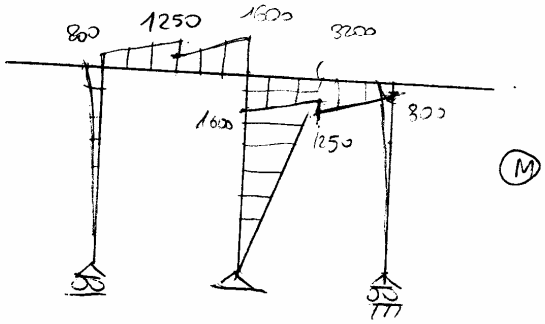
$V = \frac{qd^2}{4_2}\cdot\frac{2}{3d} + 2qd\cdot\frac{2}{3d}$

$= \frac{9}{6}qd = \frac{3}{2}qd = 300\ kg$









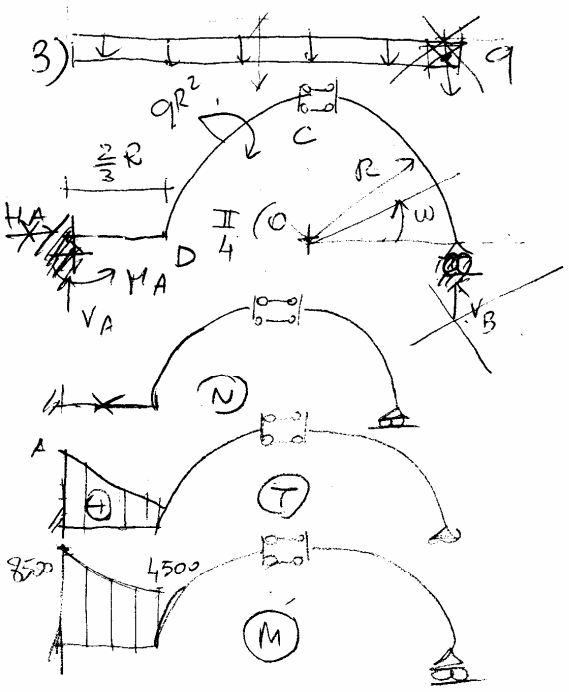
$M_{DE} = -\frac{3}{2}qd\cdot\frac{3}{2}d - qd\frac{2}{2} + q\frac{d^2}{4}$

$= -2qd^2 - 2qd^2 = -4qd^2$

$M_{DC} = 2q\cdot 4d^2 = 8qd^2 = 3200\ kgm$

$M_{DF} = +4qd^2 = 1600\ kgm$

3)



$R = 3m$

$q = 500 kg/m$

CP 1/5

c1) ausiliaria BC

$+ V_B = qR \Rightarrow V_B = 1500 kg$

$V_A = q(2R + \frac{2}{3}R) - qR = qR + \frac{2}{3}qR = \frac{5}{3}qR = 2500 kg$

A) globale

$M_A + V_B(2R + \frac{2}{3}R) = \frac{q}{2}(2R + \frac{2}{3}R)^2 + qR^2$

$M_A = -qR^2\frac{8}{3} + \frac{qR^2}{2}\cdot\frac{64}{9} + qR^2$

$= \frac{qR^2}{18}(18 + 64 - 48) = \frac{17}{9}qR^2 = 8500 kgm$

check C globale

C) $qR^2 + \frac{8}{3}qR\cdot\left(\frac{5}{3}R - \frac{4}{3}R\right) - \frac{5}{3}qR^2\frac{1}{3} - qR^2 + \frac{17}{9}qR^2 = 0$ ok

$\omega \in [0, \frac{3}{4}\pi)$

$N(\omega) = -qR\cos\omega + qR(1-\cos\omega)\cos\omega \Rightarrow N(\frac{\pi}{2}) = 0$

$T(\omega) = -qR\sin\omega + qR(1-\cos\omega)\sin\omega \Rightarrow T(\frac{\pi}{2}) = 0$

$M(\omega) = qR^2(1-\cos\omega) - \frac{qR}{2}(1-\cos\omega)^2$

$\omega' \in (\frac{3}{4}\pi, 2\pi)$

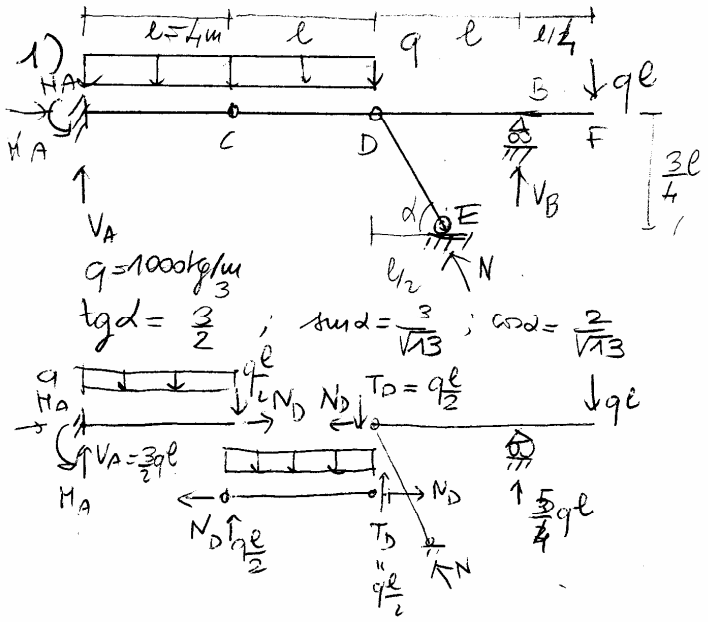
$N(\omega') = N(\omega)$

$T(\omega') = T(\omega)$

$M(\omega') = M(\omega) - qR^2$

I PROVA IN ITINERE SCIENZA DELLE COSTRUZIONI I AA 2009-2010

(B)



DS ausiliaria

$V_B = \frac{q\ell}{8}(\ell + \frac{\ell}{4}) = \frac{5}{4}q\ell = 5000\,kg$

↑) globale traslo AC

$V_A = \frac{3}{2}q\ell$

A↻ $M_A = q\frac{\ell^2}{2} + q\frac{\ell^2}{2} = q\ell^2$

$H_A = -N_D$

↑) globale sottostrutt EDBF

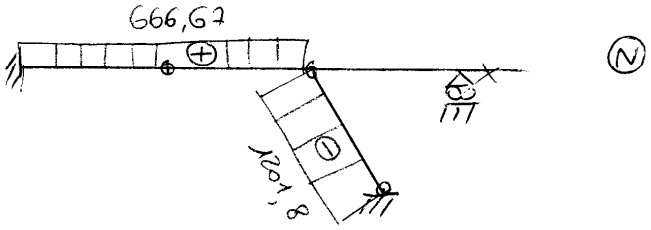
$N\sin\alpha + \frac{5}{4}q\ell = \frac{3}{2}q\ell$

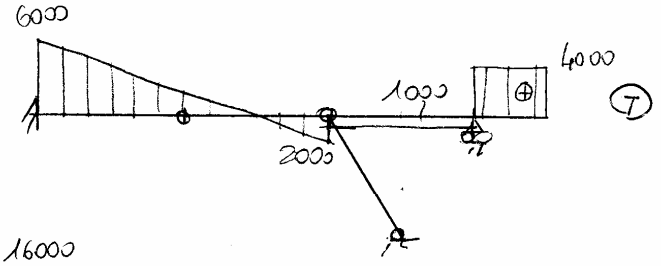
$N = \frac{q\ell}{4\sin\alpha}\left(\frac{3}{2} - \frac{5}{4}\right) = \frac{q\ell}{4\sin\alpha} = 1201,8\,kg$

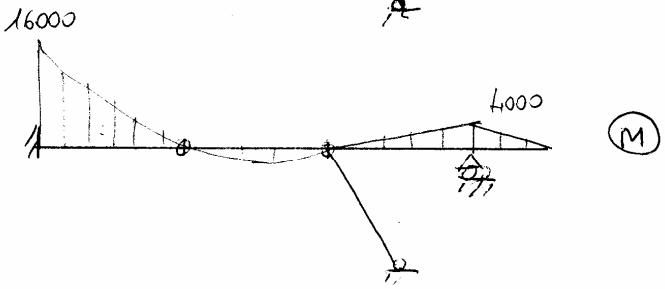
$N_D = -N\cos\alpha = -\frac{q\ell}{4}\frac{2}{3}$

$= -\frac{q\ell}{6} = -666,67\,kg$

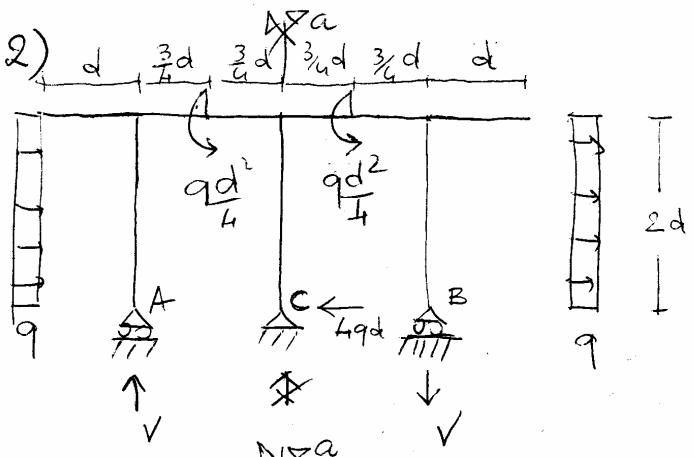
- Check

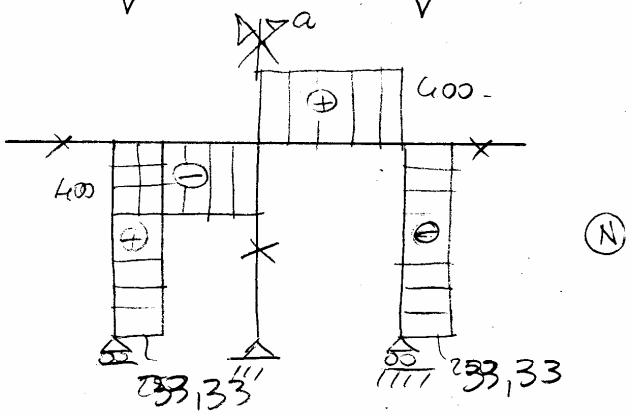


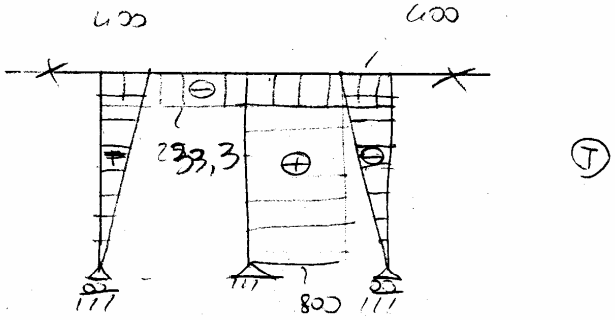


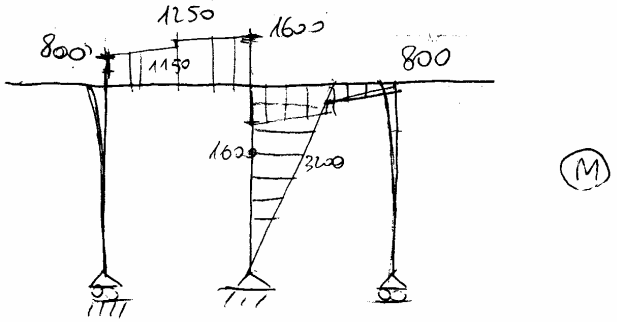


2)









Struttura antisimm.

$d = 2m$

$q = 100\ kg/m$

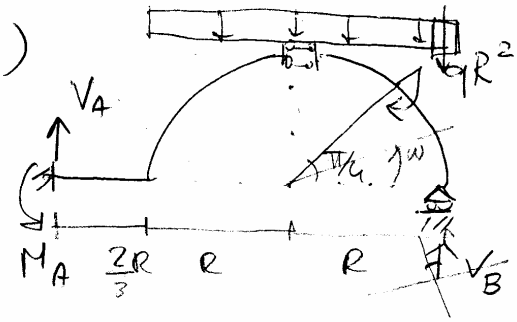
$-V \cdot 3d - 4qd^2 + 2q\frac{d^2}{4}$

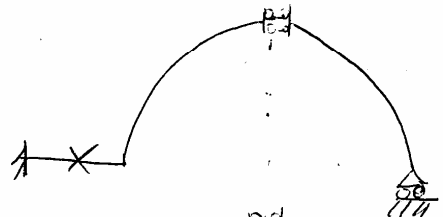
$V = \frac{1}{3}\left(-4qd + \frac{qd}{2}\right)$

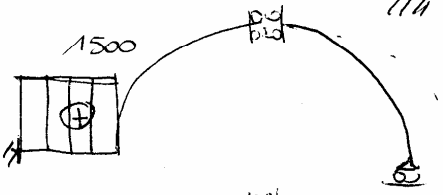
$= \frac{qd}{6}(-8+1) = -\frac{7}{6}qd$

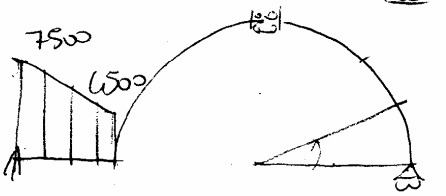
$= -233{,}33\ kg$

3)









$q = 500 kg/m$; $R = 3m$

$V_A = V_B = qR = 1500 kg$

$\curvearrowleft \; V_B(2R + \frac{2R}{3}) - q2R(R + \frac{2R}{3}) - qR^2 + M_A = 0$

$M_A = -\frac{8}{3}V_B R + 2qR\cdot\frac{5}{3} + qR^2$

$= -\frac{8}{3}qR^2 + \frac{10}{3}qR^2 + qR^2 = \frac{5}{3}qR^2$

$= 7500 kgm$

$\omega \in [0, \pi/4)$

$N(\omega) = -V_B \cdot \cos\omega + qR(1-\cos\omega)\cos\omega$

$T(\omega) = -V_B \sin\omega + qR(1-\cos\omega)\sin\omega$

$M(\omega) = V_B R(1-\cos\omega) - \frac{qR^2(1-\cos\omega)^2}{2}$

$\omega \in (\pi/4, \pi)$

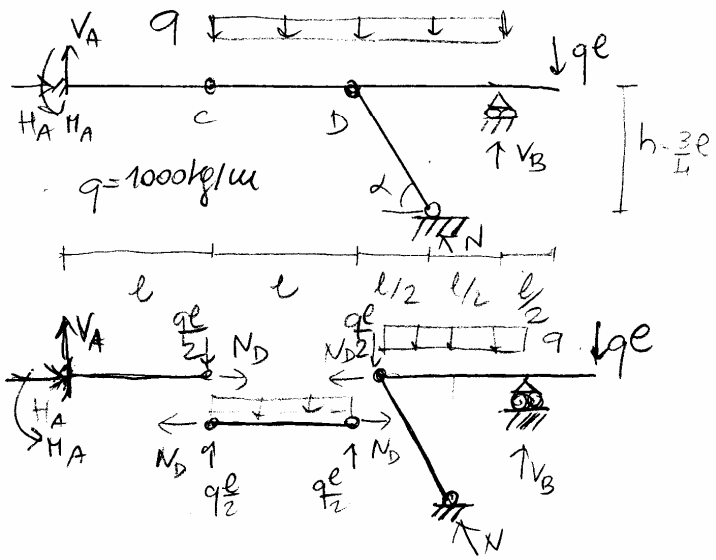
$\overline{N}(\omega) = N(\omega)$

$\overline{T}(\omega) = T(\overline{\omega})$

$\overline{M}(\omega) = M(\omega) - qR^2$

$\overline{M}(\pi) = 2qR^2 - qR\frac{2\pi^2}{2} - qR^2 = 4500 \; o'k$

I COMPITO IN ITINERE SdC I AA 2009/2010 12/02/10 (C)



$l = 1m$; $d = 2m$; $h = \frac{3}{4}l$

$\tg\alpha = 3/2$; $\sin\alpha = \frac{3/2}{\sqrt{1+\frac{9}{4}}} = \frac{3}{\sqrt{13}}$

$\cos\alpha = 2/\sqrt{13}$

$V_A = \frac{ql}{2}$

$M_A = q\frac{l^2}{2}$

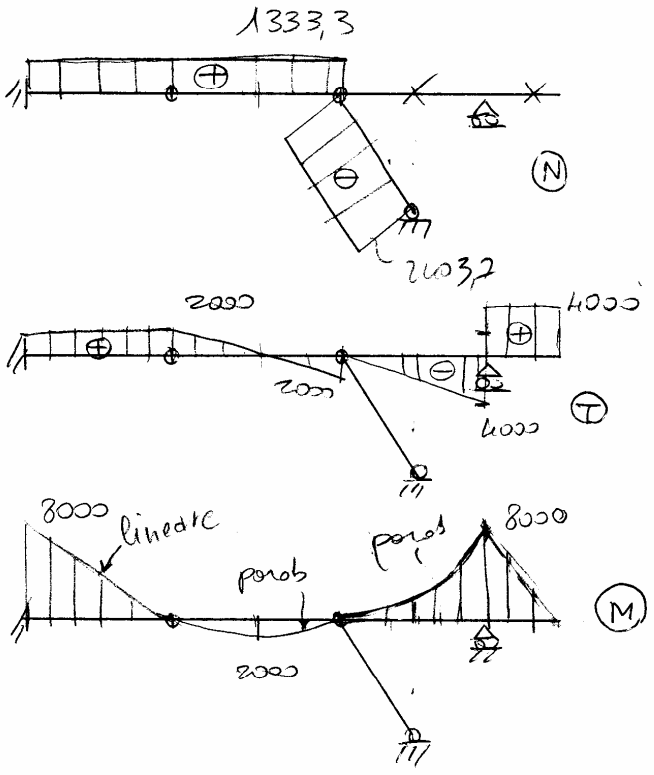
$V_B = \frac{1}{l}\left(ql \cdot \frac{3l}{2}\right) + q\frac{l^2}{2}$

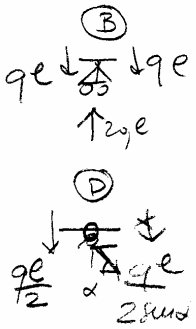
$= 2ql = 8000kg$

$N \sin\alpha = -V_B + 2ql + \frac{ql}{2}$

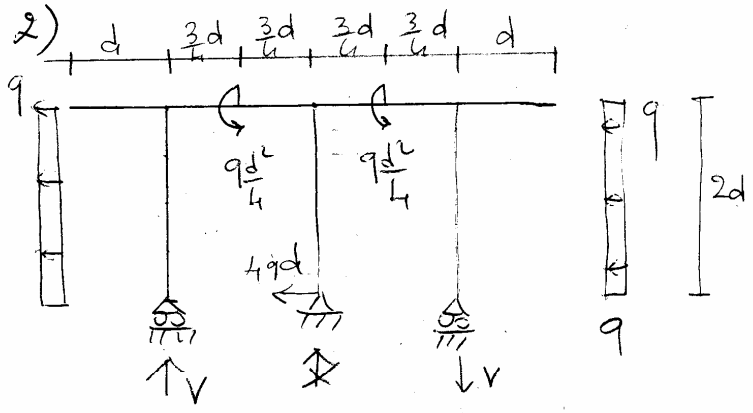
$N = \frac{ql}{2\sin\alpha} = 2403,74$

$H_A = -\frac{ql}{2\sin\alpha}\cos\alpha = -\frac{ql}{3}$





2)



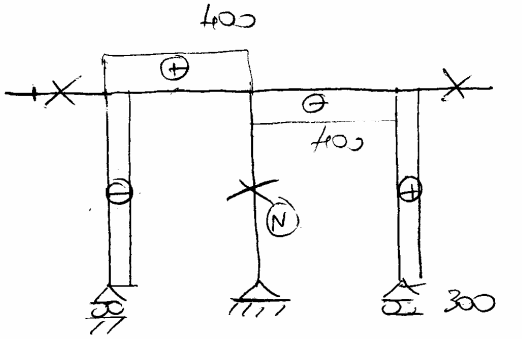
$d = 2m$, $q = 100 kg/m$

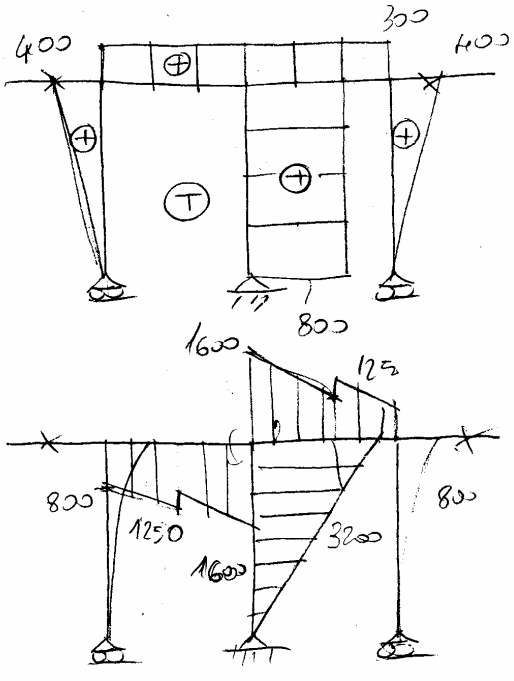
$-V3d + 2q\frac{d^2}{4} + 2q2d$

$V = \frac{1}{3d}(4qd + \frac{qd}{2})$

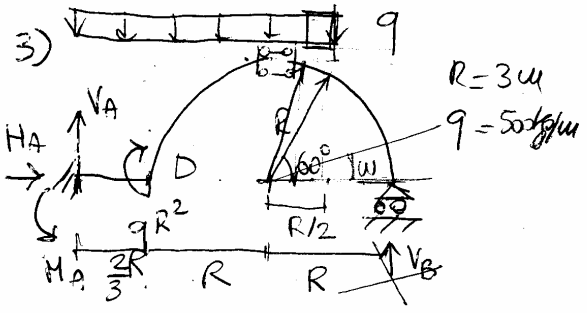
$= \frac{qd}{3} \cdot \frac{3}{2} = \frac{3}{2}qd$

$= 300 kg$





3)



$V_B = q\frac{R}{2}$, $V_A = (R+\frac{R}{2}+\frac{2R}{3})q - q\frac{R}{2}$

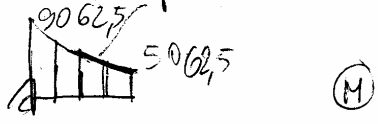
$H_A = 0$ ⟹ $V_A = \frac{5}{3}qR = 2500kg$

$A\circlearrowleft$ $V_B(2R+\frac{2R}{3}) - q(\frac{2}{3}R+R+\frac{R}{2})\frac{1}{2} - qR^2 + M_A = 0$

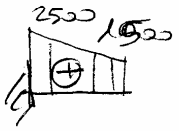
$M_A = qR^2 - \frac{8}{3}\cdot\frac{qR^2}{2} + \frac{qR^2}{2}\frac{169}{36} = qR^2(\frac{72-12.8+169}{72}) = \frac{145}{72}qR^2$

$= 9062,5kgm$

parabolic (N)



(M)



(T)

$w \in [0, \pi/3)$

$N(w) = -V_B \cos w$

$T(w) = -V_B \sin w$

$M(w) = V_B R(1-\cos w)$

$w \in (\frac{\pi}{3}, \pi)$

$\bar{N}(w) = N(w) + q(R - R\cos w - \frac{R}{2})\cos w$

$\bar{T}(w) = T(w) + qR(1-\cos w - \frac{1}{2})\sin w$

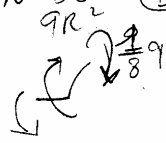
$\bar{M}(w) = M(w) - \frac{qR^2}{2}(\frac{1}{2} - \cos w)^2$

$\bar{M}(\pi) = q\frac{R^2}{2}\cdot 8 - q\frac{R^2}{2}\frac{9}{4} = -\frac{qR^2}{8}$

$\bar{T}(\pi) = 0$

$\bar{N}(\pi) = V_B - qR(\frac{3}{2}) = -qR$

NODO (D) EQUIL.



$M_{DA} = \frac{81}{72}qR^2 = 5062,5kgm$

$M_{DA} = -\frac{145}{72}qR^2 - q\frac{8}{3}R^2\frac{2}{8_3} + \frac{5}{3}qR\cdot\frac{2}{3}R = \frac{qR^2}{72}(-145 - 16 + 80) = -\frac{81}{72}qR^2$