M1: Esercizio 4.

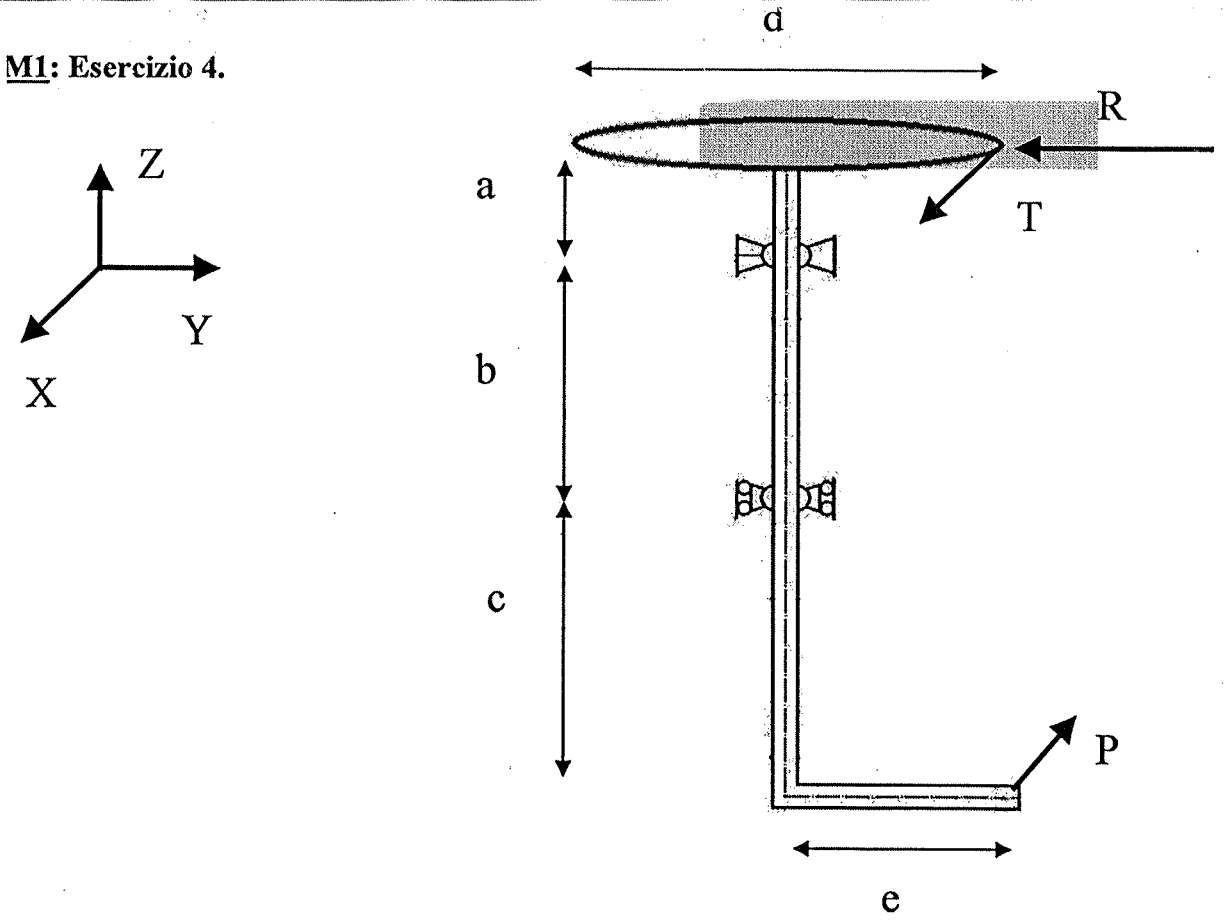
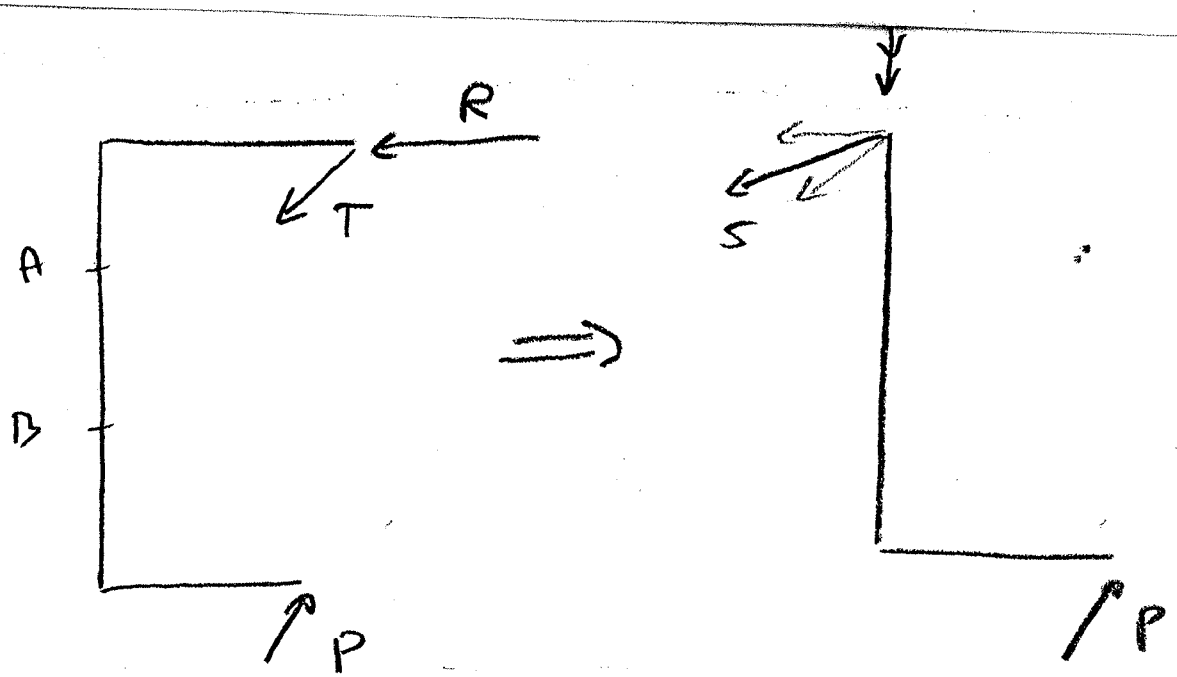


Fig. 1. Schema della struttura

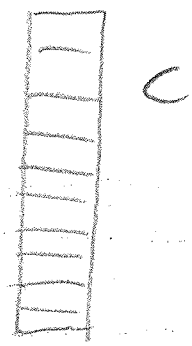


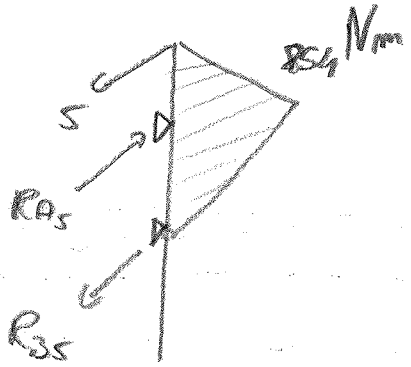
$C = T \cdot \frac{d}{2} = 800\ Nm$

$S = \sqrt{T^2 + R^2} = 4272\ N$

$C = pe \Rightarrow P = 3200\ N$

M_{fS}

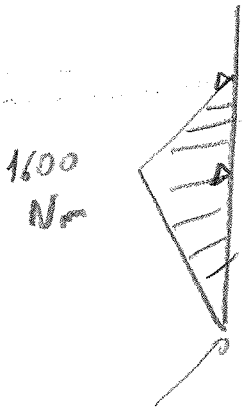




$R_{DS} = 2136\ N$

$R_{AS} = 6136\ N$

M_{fr}



VERIFICA IN A → FATICA

$M_t = 800\ Nm \Rightarrow \tau_m = \frac{16 M_t}{\pi d^3} = 24,5$ MPa

$M_f = 854 \qquad \sigma_a = \frac{32 M_f}{\pi d^3} = 52$

$\sigma_{CP} = \sqrt{\sigma_a^2 + H^2 \tau_m^2} \leq \frac{\sigma_{lim}}{\eta}$

$H = \frac{\sigma'_{Af}}{\tau_R} = \frac{\frac{0,5 R_m \cdot 98 \cdot 98}{2}}{0,8 R_m} = \frac{108}{480} = 0,225$

$\sigma_{id} = \sqrt{52^2 + (0,225)^2 24,5^2} = 52,3$

$\eta = \frac{108}{52,3} = 2$

VERIFICA IN B → STATICA

$\tau = 24,5$ MPa

$\sigma = \frac{32 \cdot 1600000}{\pi d^3} = 98$ MPa

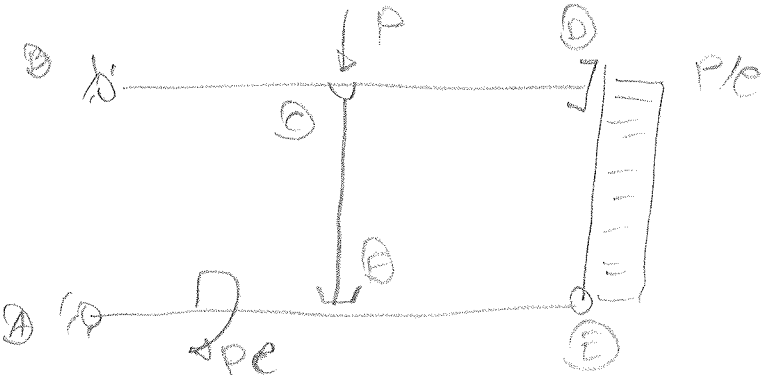
$\sigma_{VM} = \sqrt{98^2 + 3 \cdot 24,5^2} = 106,8$

$\eta = \frac{400}{106,8} = 3,7$

ESAME 27.6.2012

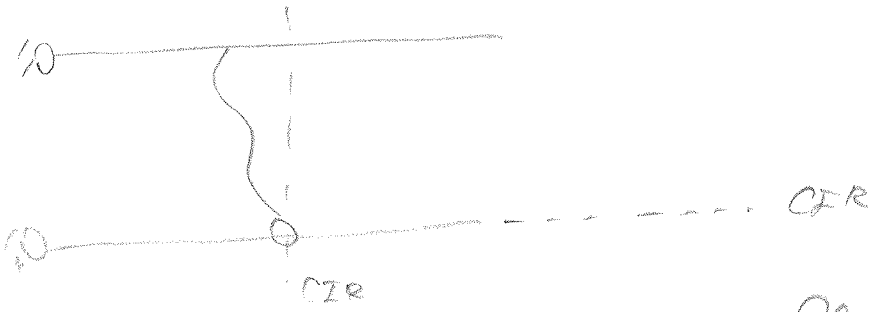
FdCM

1) Esercizio



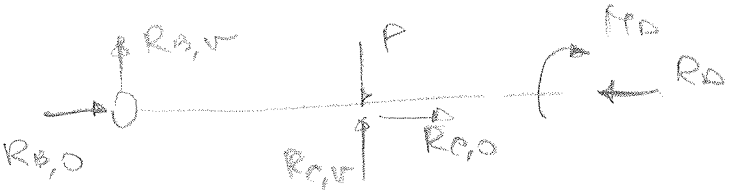
a) Analisi cinematica:

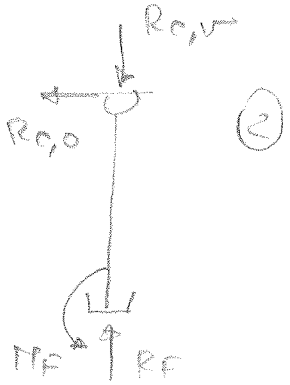
Sistema equivalente a:

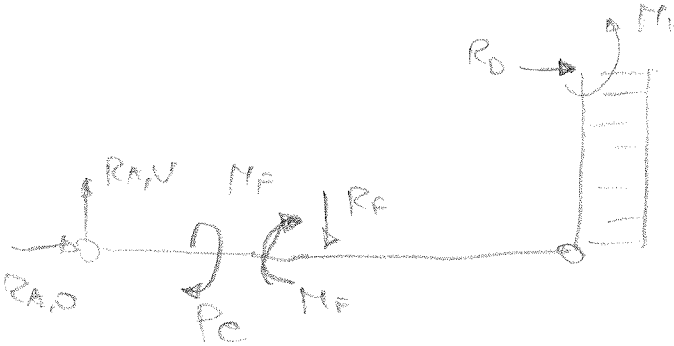


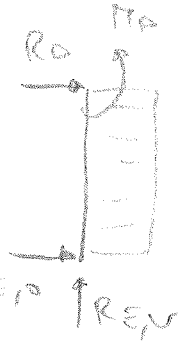
Asta 3 eseguisce un atto di rotazione

b) Sottostrutture









$R_{C,V} = R_F$

$R_{C,O} = 0$

$R_{E,V} = 0$

$R_{E,O} = -R_D$

③ $\Rightarrow M_C = 0 \Rightarrow \boxed{M_F = 0}$

③ $\Rightarrow M_E = 0 \Rightarrow R_D \cdot e - \frac{Pe}{2} - M_D = 0 \Rightarrow \boxed{R_D = -\frac{3}{2}P}$

$\Rightarrow M_A = 0 \Rightarrow R_D \cdot e - \frac{Pe}{2} - M_D + R_F \cdot e + \cancel{M_F} + Pe = 0$

$\boxed{R_F = -P}$

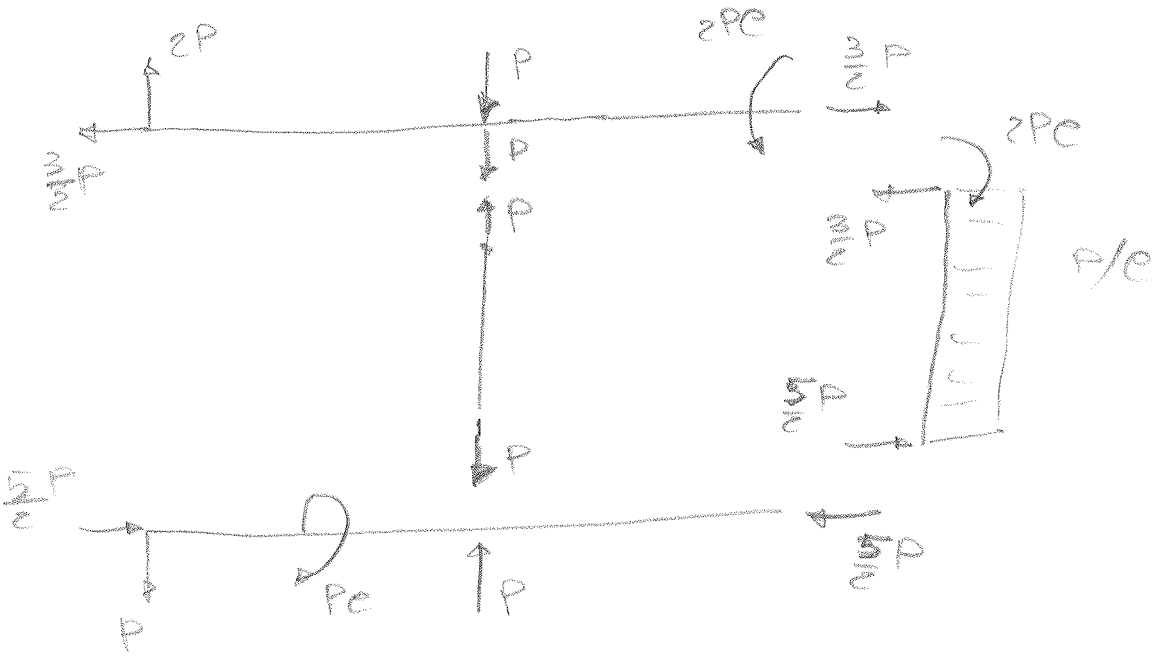
① $\Rightarrow M_B = 0 \Rightarrow Pe + M_D - R_F \cdot e = 0 \quad \boxed{M_D = -2Pe}$

① $\Rightarrow R_V = 0 \Rightarrow R_{B,V} - P + R_F = 0 \Rightarrow \underline{R_{B,V} = 2P}$

$R_D = 0 \Rightarrow \underline{R_{B,0} = R_D = -\frac{3}{2}P}$

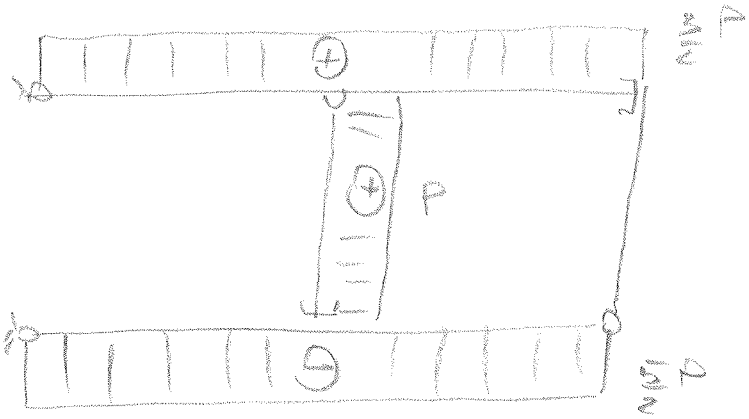
③ $\Rightarrow R_V = 0 \Rightarrow R_{A,V} - R_F = 0 \Rightarrow \underline{R_{AV} = -P}$

$\Rightarrow R_D = 0 \Rightarrow R_{A,0} + R_D - P = 0 \Rightarrow \underline{R_{A,0} = \frac{5}{2}P}$

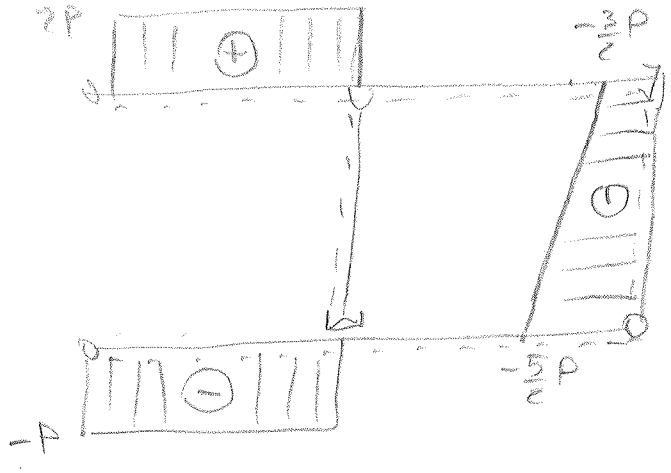


	A	B	C	D	E	F
Orizz	$\frac{3}{2}P$	$\frac{3}{2}P$	0	$\frac{5}{2}P$	$\frac{5}{2}P$	—
Vert	P	2P	P	—	0	P
Mom	—	—	—	2Pe	—	0

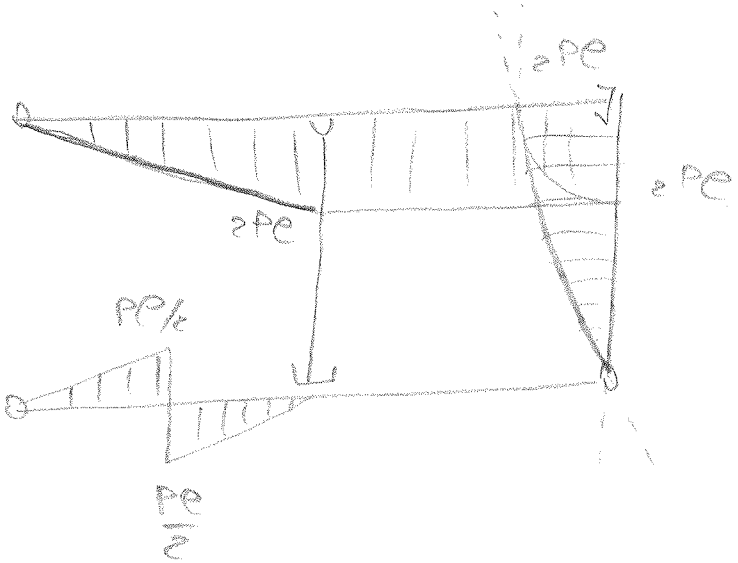
(N)



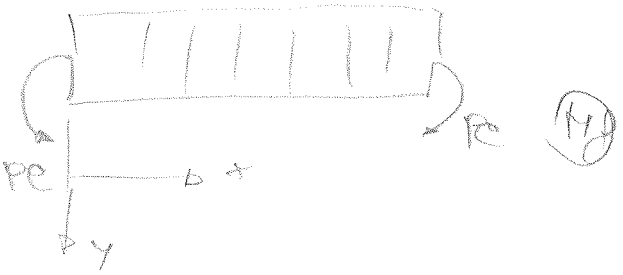
(T)



(M)



Linea elastica



(M)

$$y'' = \frac{M_f}{EJ} \Rightarrow y'' = \frac{Pe}{EJ}$$

$$y' = \frac{Pe\,x}{EJ} + C_1 \quad ; \quad y = \frac{Pe\,x^2}{2EJ} + C_1 x + C_2$$

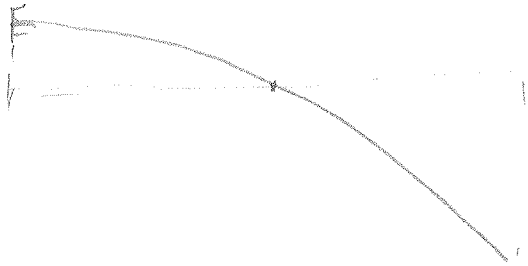
C.C: $\Rightarrow y(e) = 0 \Rightarrow \frac{Pe^3}{2EJ} + C_1 e + C_2 = 0$

$\Rightarrow y'(0) = 0 \Rightarrow C_1 = 0 \qquad C_2 = -\frac{Pe^3}{2EJ}$

$$y = \frac{Pe}{2EJ}x^2 - \frac{Pe^3}{2EJ} \Rightarrow y(2e) = 2\frac{Pe^3}{EJ} - \frac{Pe^3}{2EJ} = \frac{Pe^3}{EJ}\frac{3}{2}$$

$\Rightarrow y(0) = C_2 = -\frac{Pe^3}{2EJ}$

$y(0) = -\frac{Pe^3}{2EJ}$



$y(2e) = \frac{Pe^3}{EJ}\cdot\frac{3}{2}$