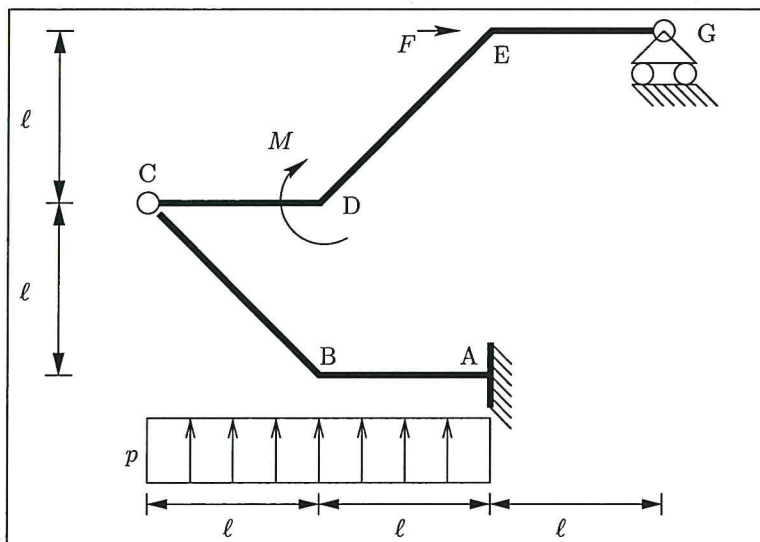


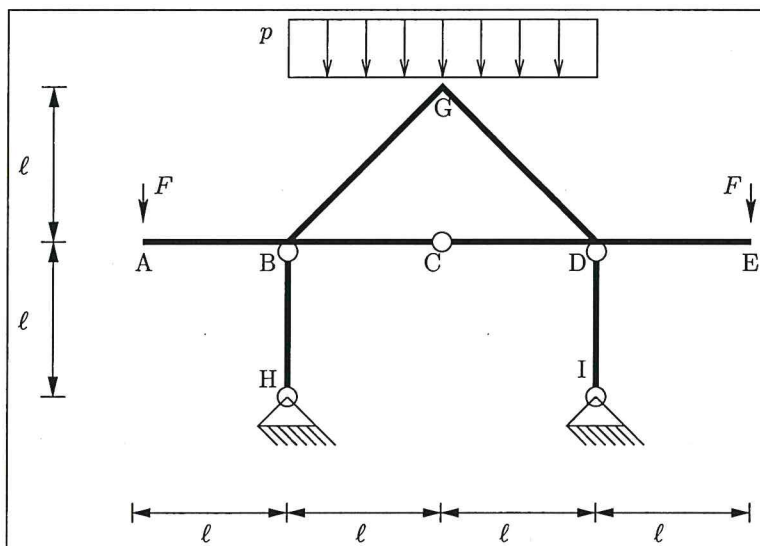
Statica - Ingegneria Civile e Ambientale - Prof. Daniele Zulli

APPELLO DEL 13/1/2025 - DURATA 3 ORE

Esercizio 1: Scrivere e diagrammare le leggi di variazione delle caratteristiche di sollecitazione per la struttura in figura, nel caso in cui sia $F = p\ell$ e $M = p\ell^2$. Calcolare la rotazione della sezione in B, noto EI e per $EA \rightarrow +\infty$.



Esercizio 2: Diagrammare le caratteristiche di sollecitazione per la struttura in figura nel caso in cui sia $F = p\ell$, $EA = \frac{EI}{\ell^2}$ sui tratti BH e DI, $EA \rightarrow +\infty$ altrove.

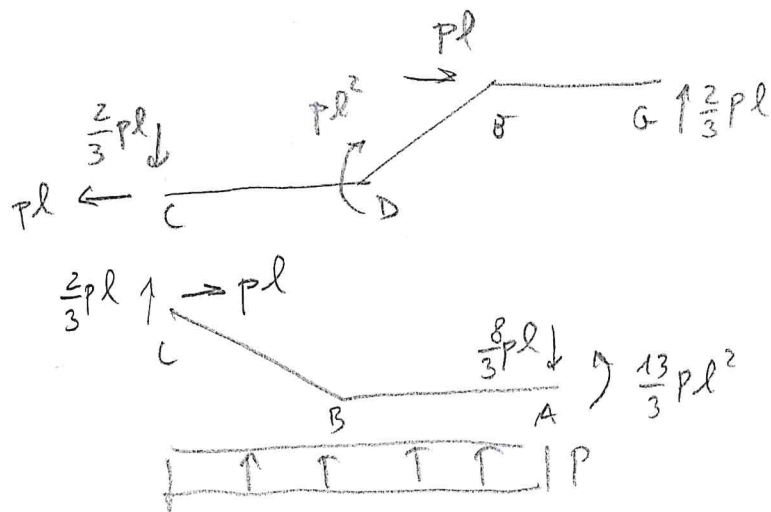


ESERCIZIO 1

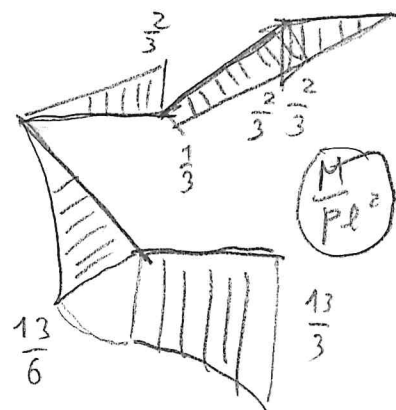
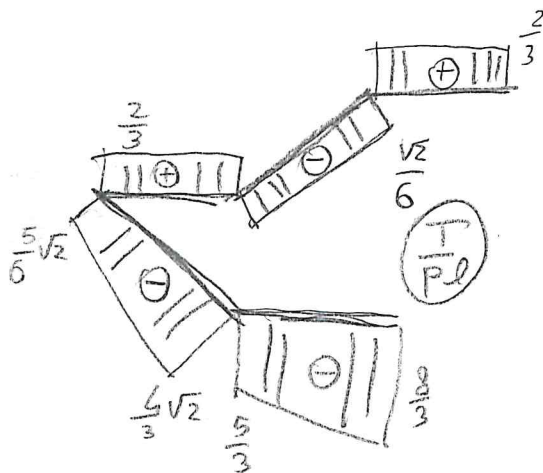
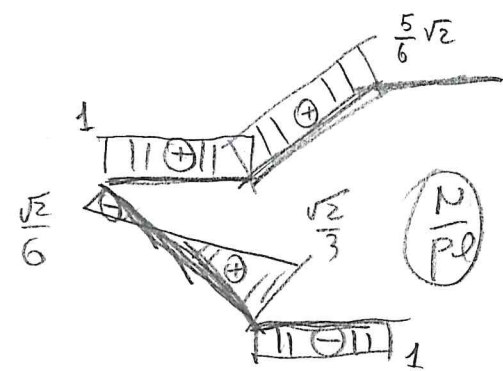
La struttura è isostatica: trave appoggiata portata CG su mensole portanti AC.

Esempio delle reazioni vincolari:

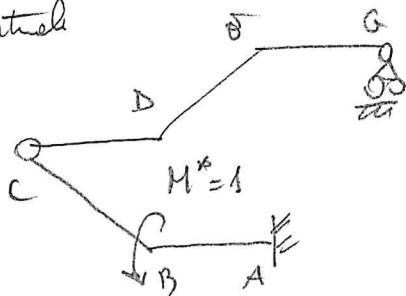
Leggi CDS



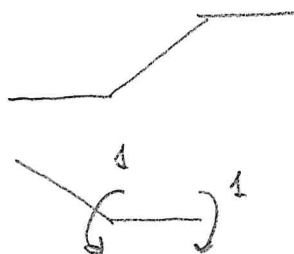
TRAVE	LUNG.	N	T	M
AB	l	$-pl$	$-\frac{8}{3}pl + px$	$-\frac{13}{3}pl^2 + \frac{8}{3}plx - \frac{px^2}{2}$
CB	$l/2$	$-pl + \frac{px}{2}$	$-\frac{5\sqrt{2}}{6}pl - px$	$\frac{5}{6}\sqrt{2}plx + \frac{px^2}{4}$
CD	l	pl	$\frac{2}{3}pl$	$-\frac{2}{3}plx$
DB	$l/2$	$\frac{5\sqrt{2}}{6}pl$	$-\frac{\sqrt{2}}{6}pl$	$\frac{pl}{3}x + \frac{\sqrt{2}}{6}plx$
GB	l	0	$\frac{2}{3}pl$	$-\frac{2}{3}plx$



Prova virtuale



Esempio



$$M_{AB}^*(x) = 1$$

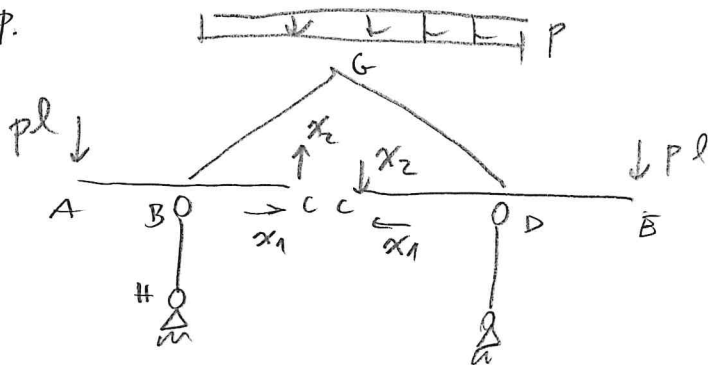
$$M_{altre}^*(x) = 0$$

$$\varphi_B = \frac{1}{EI} \int_0^l M_{AB}(x) M_{AB}^*(x) dx = -\frac{13}{6} \frac{pl^3}{EI}$$

ESERCIZIO 2

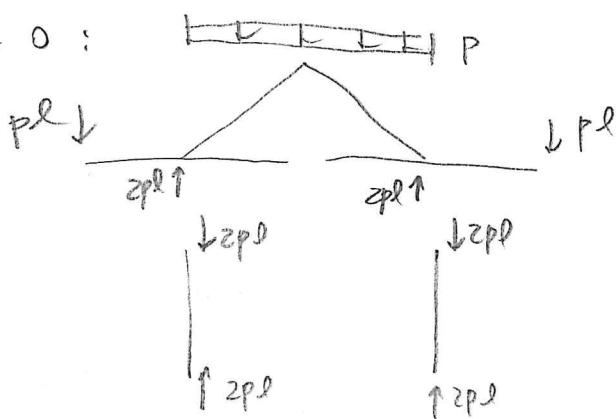
La struttura è 2 volte iperstatica per vincoli interni, mentre è labile per vincoli esterni. L'assenza di forze orizzontali rende la labilità esterna.

s.p.

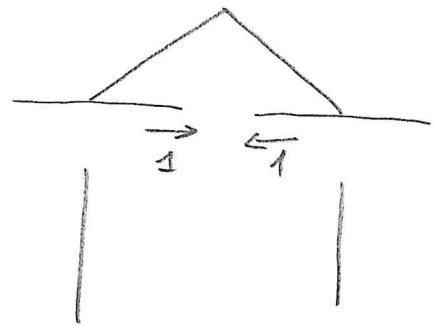


$x_2 = 0$ per simmetria di geometria e carichi $\Rightarrow$ 1 volta iperstatica

$\Phi_2 0$:



$\Phi_2 1$:



TRAVE	LUNG	N_0	M_0	N_1	M_1
AB	l	$-$	$-plx$	$-$	0
CB	l	$-$	0	$-$	0
BG	$l\sqrt{2}$	$-$	$-pl^2 + pl\frac{\sqrt{2}}{2}x - \frac{p}{4}x^2$	$-$	$-\frac{\sqrt{2}}{2}x$
BH	l	$-2pl$	0	0	0

$$\eta_{11} = \frac{2}{EI} \frac{l\sqrt{2}}{3}$$

$$\eta_{10} = \frac{2}{EI} pl^4 \sqrt{2} \frac{7}{24}$$

$$\bar{\eta}_1 = 0$$

$$\eta_{11}x_1 + \eta_{10} + \bar{\eta}_1 = 0 \Rightarrow x_1 = -\frac{7}{8}pl$$

Esempio

