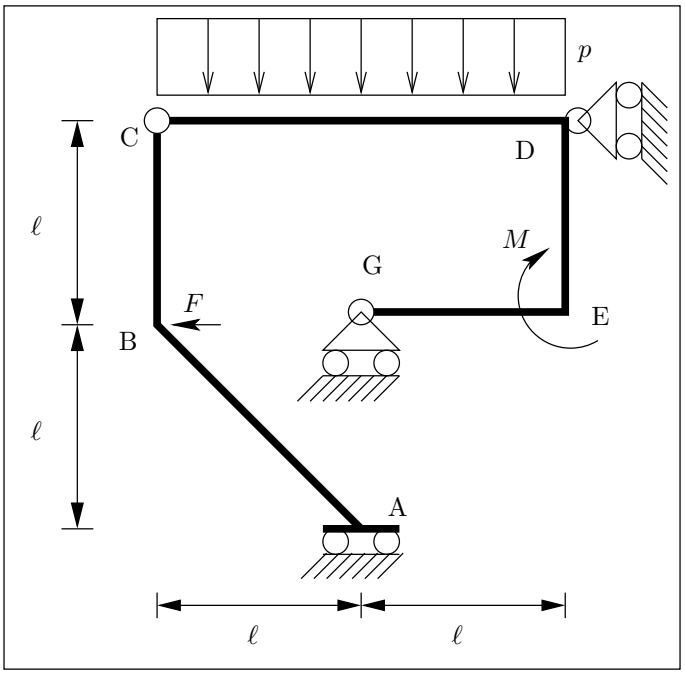
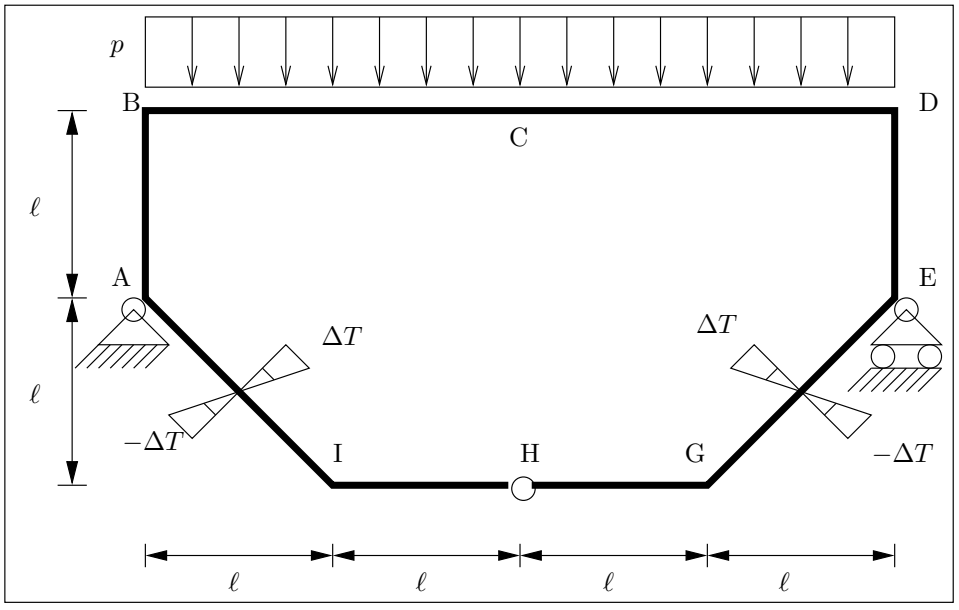
Statica - Ingegneria Civile - Prof. Daniele Zulli

Appello del 26/1/2026 - Durata 3 ore

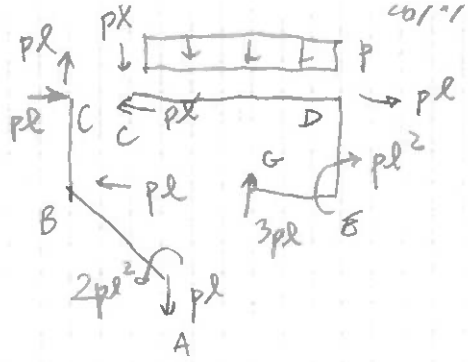
Esercizio 1: Scrivere e diagrammare le leggi di variazione delle caratteristiche di sollecitazione per la struttura in figura, nel caso in cui sia $F = p\ell$ e $M = p\ell^2$. Calcolare lo spostamento orizzontale della sezione in B, noto EI e per $EA \to +\infty$.

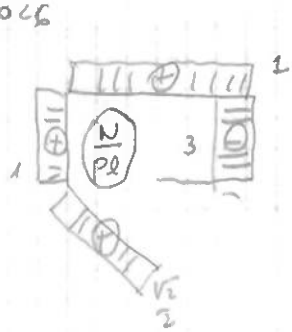


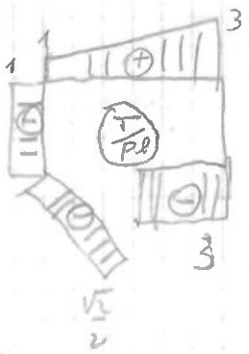
Esercizio 2: Diagrammare le caratteristiche di sollecitazione per la struttura in figura nel caso in cui sia $EA \to +\infty$, $\Delta T = \frac{p\ell^2 h}{\alpha EI}$ sui tratti IA e GE.

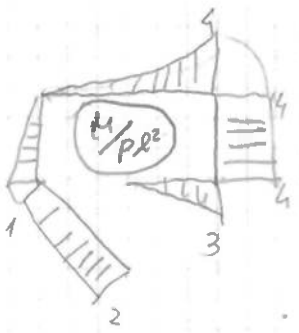


Es 1



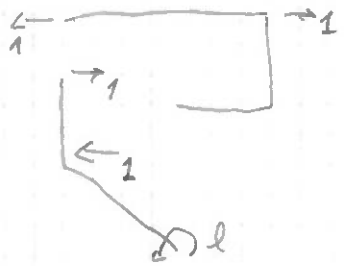






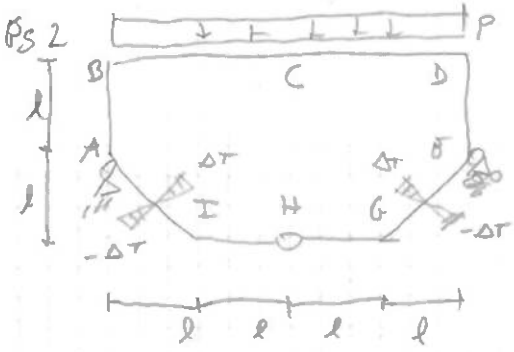
TRAVE	LUNG	N	T	M	dM/dx
AB	$l\sqrt{2}$	$\frac{\sqrt{2}}{2}pl$	$-\frac{\sqrt{2}}{2}pl$	$-2pl^2+\frac{\sqrt{2}}{2}plx$	$-l$
BC	l	pl	$-pl$	$-pl^2+plx$	$-l+x$
CD	$2l$	pl	$pl+px$	$-plx-\frac{px^2}{2}$	0
DE	l	$-3pl$	0	$-4pl^2$	0
EG	l	0	$-3pl$	$-3plx$	0

P.V.



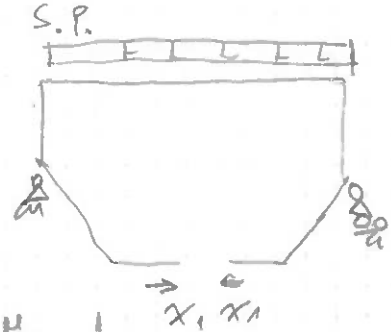
$$M_B = \frac{1}{\delta I}\int_\Omega M\bar{M}^*\,dx = \frac{1}{\delta I}\left[\int_0^{l\sqrt{2}}(-l)\left(-2pl^2+\frac{\sqrt{2}}{2}plx\right)dx+\int_0^{l}(-l+x)\left(-pl^2+plx\right)dx\right] = \frac{2+9\sqrt{2}}{6}\frac{pl^4}{\delta I}$$

Es 2



Struttura isostatica per vincoli esterni, 2 volte iperstatica per vincoli interni. Per simmetria di geometria e carichi il grado di iperstaticità diventa 1.

S.P.



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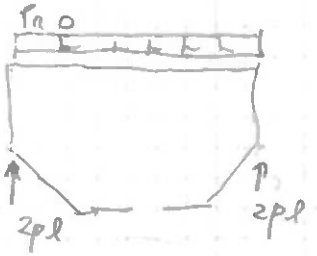

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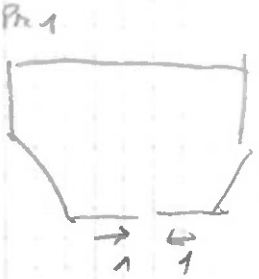

TRAVE	LUNG	M_0	M_1
#1	l	0	0
IA	$l\sqrt{2}$	0	$-\frac{\sqrt{2}}{2}x$
AB	l	0	$-l-x$
BC	$2l$	$2plx-\frac{px^2}{2}$	$-2l$

$$\eta_{11} = \frac{2}{\delta I}\left[\int_0^{l\sqrt{2}}\left(-\frac{\sqrt{2}}{2}x\right)^2dx+\int_0^{l}(-l-x)^2dx+\int_0^{2l}(-2l)^2dx\right] = \frac{2(31+\sqrt{2})}{3}\frac{l^3}{\delta I}$$

$$\eta_{10} = \frac{2}{\delta I}\int_0^{2l}(-2l)\left(2plx-\frac{px^2}{2}\right)dx = -2\frac{16}{3}\frac{pl^4}{\delta I}$$

$$\eta_{1t} = 2\int_0^{l\sqrt{2}}\left(-\frac{\sqrt{2}}{2}x\right)\frac{2\alpha\Delta T}{h}dx = -\frac{2\sqrt{2}\,pl^4}{\delta I}$$

$$X_1 = -\frac{\eta_{10}+\eta_{1t}}{\eta_{11}} = \frac{70+11\sqrt{2}}{137}pl = \beta pl \quad ,\ \beta \simeq 0{,}62$$