

Scienza delle Costruzioni - Ingegneria Civile

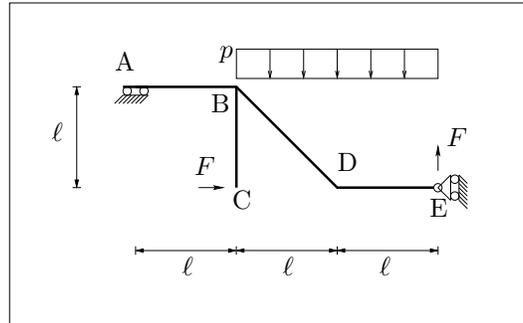
Prof. Angelo Luongo - 22/06/2009

SdC 9CFU: ES. 1, 2, 3; DURATA: 4 H

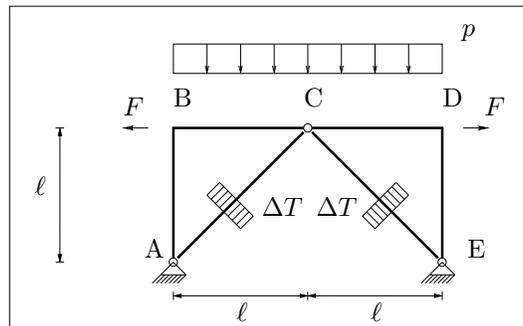
SdC I 6CFU: ES. 1, 2; DURATA: 3 H

SdC II 6CFU: ES. 3; DURATA: 2 H

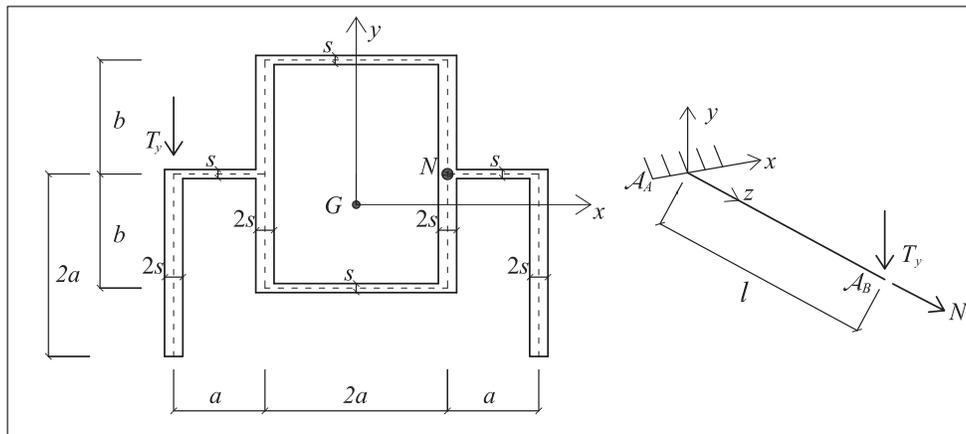
Esercizio 1: Scrivere e diagrammare le leggi di variazione delle caratteristiche di sollecitazione per la struttura in figura, nel caso in cui siano $\ell = 4$ m, $p = 20 \frac{\text{KN}}{\text{m}}$, $F = 40$ KN. {Calcolare lo spostamento orizzontale della sezione in C, essendo $EI = 64000 \text{ KNm}^2$ }¹.



Esercizio 2: Diagrammare le caratteristiche di sollecitazione per la struttura in figura nel caso in cui sia $\ell = 4$ m, $p = 20 \frac{\text{KN}}{\text{m}}$, $F = 40$ KN, $EI = 6.4 \times 10^4 \text{ KNm}^2$, $EA_{AC} = EA_{CE} = 1.26 \times 10^6 \text{ KN}$, altrove $EA \rightarrow +\infty$, $\Delta T = 20^\circ\text{C}$, $\alpha = 10^{-5} \text{ }^\circ\text{C}^{-1}$.



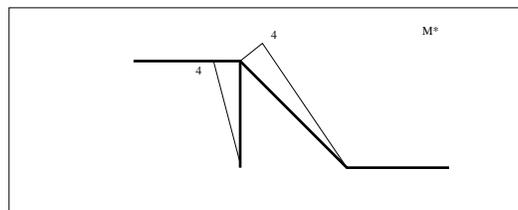
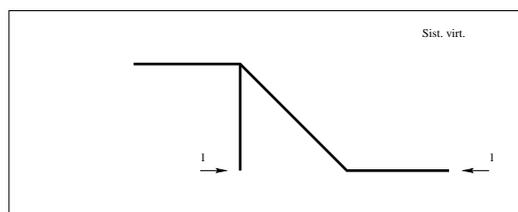
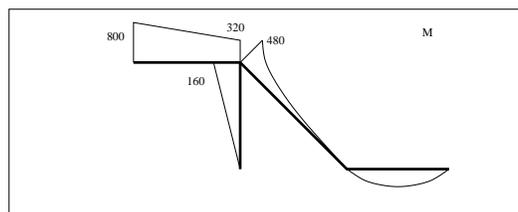
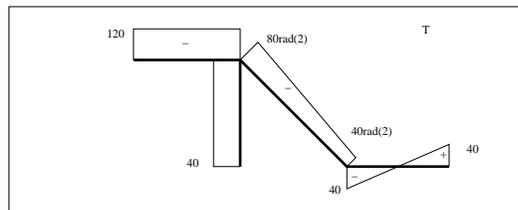
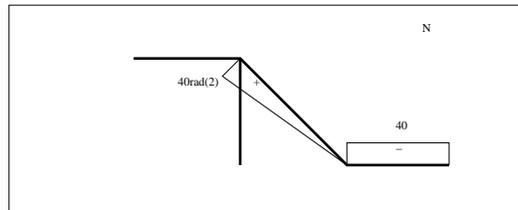
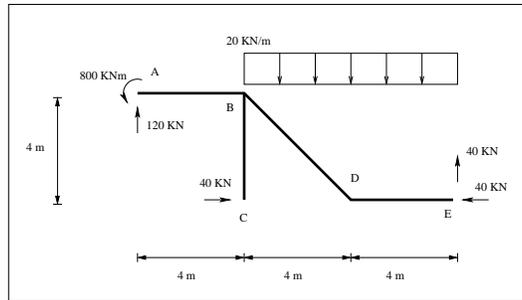
Esercizio 3: Si verifichi, nella sezione di incastro, un solido di DSV avente la sezione rappresentata in figura, soggetto in A_B ad una forza di taglio $T_y = 80$ KN e ad una forza normale $N = 100$ KN. Si diagrammi l'andamento delle tensioni normali e delle tensioni tangenziali per la sezione in figura. Siano $a = 20$ cm, $b = 25$ cm, $s = 2$ cm, $l = 1$ m, $\sigma_{amm} = 150 \frac{\text{N}}{\text{mm}^2}$. Si calcoli la σ_{id} , nel punto più sollecitato, utilizzando il criterio di resistenza di Von Mises. {Si costruisca il cerchio di Mohr nel punto più sollecitato e si calcolino le tensioni principali}².



¹Domanda riservata agli studenti SdC I 6cfu

²Domanda riservata agli studenti SdC II 6cfu

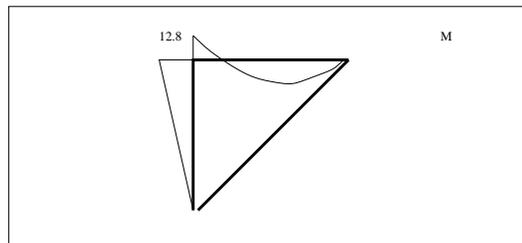
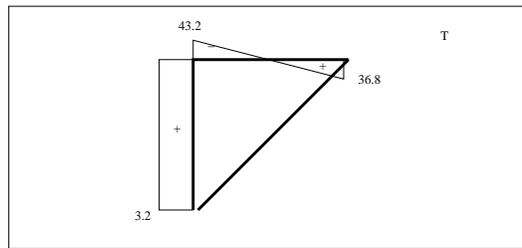
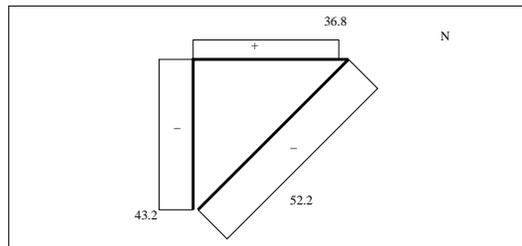
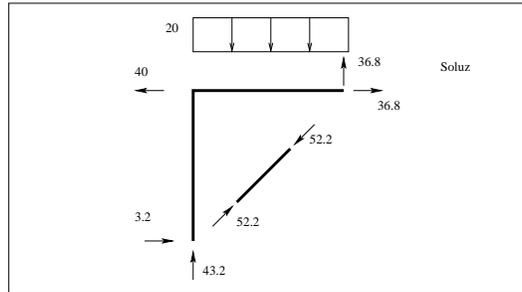
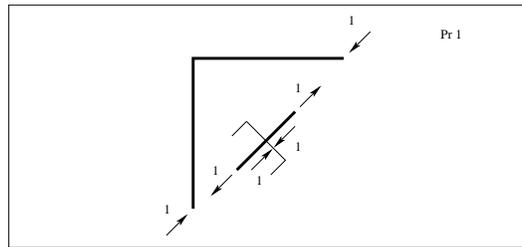
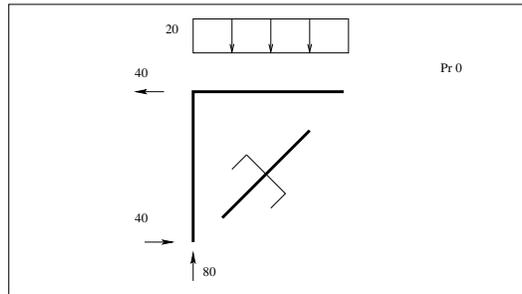
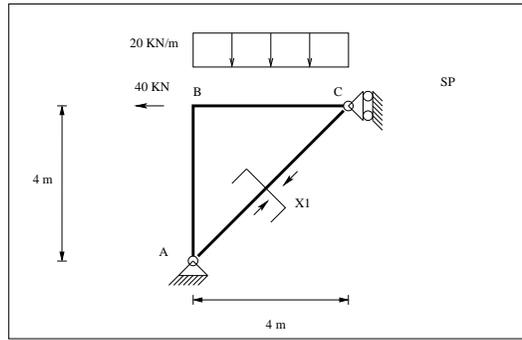
Esercizio 1:



	N	T	M	M*
AB	0	-120	$-800 + 120x$	0
CB	0	40	$-40x$	$-x$
DB	$10x$	$-40\sqrt{2} - 10x$	$40\sqrt{2}x + 5x^2$	$\sqrt{2}/2x$
ED	-40	$40 - 20x$	$-40x + 10x^2$	0

$$1u_C = \frac{1}{EI} \int_{\mathcal{D}} MM^* dx = 0.065m$$

Esercizio 2:



	M_0	M'_1	N'_1
AB	$-40x$	$-\sqrt{2}/2x$	tr
BC	$-160 + 80x - 10x^2$	$-\sqrt{2}/2(4-x)$	tr
AC	0	0	1

$$\eta_{11} = \frac{64}{3EI} + \frac{4\sqrt{2}}{EA} \simeq \frac{64}{3EI}$$

$$\eta_{10} = \frac{2240\sqrt{2}}{3EI}$$

$$\bar{\eta}_1 = 80\sqrt{2} \times 10^{-5}$$

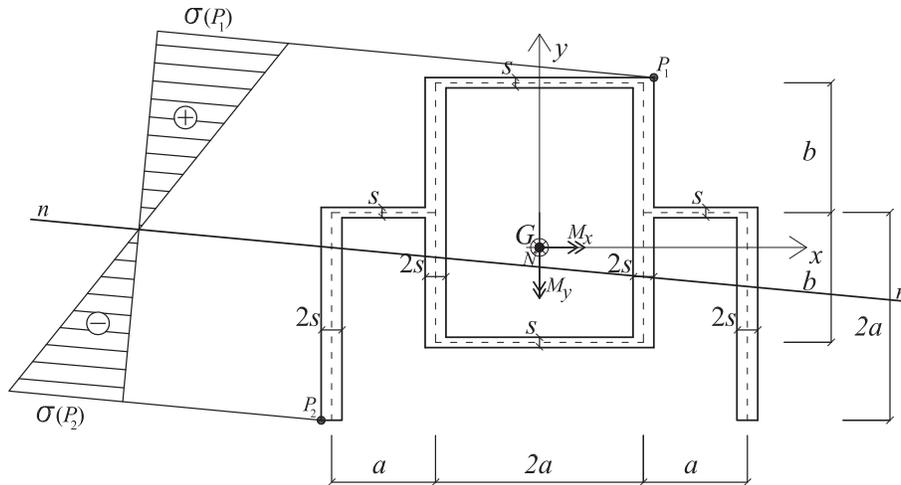
$$\chi_1 = -52.2\text{KN}$$

Esercizio 3:

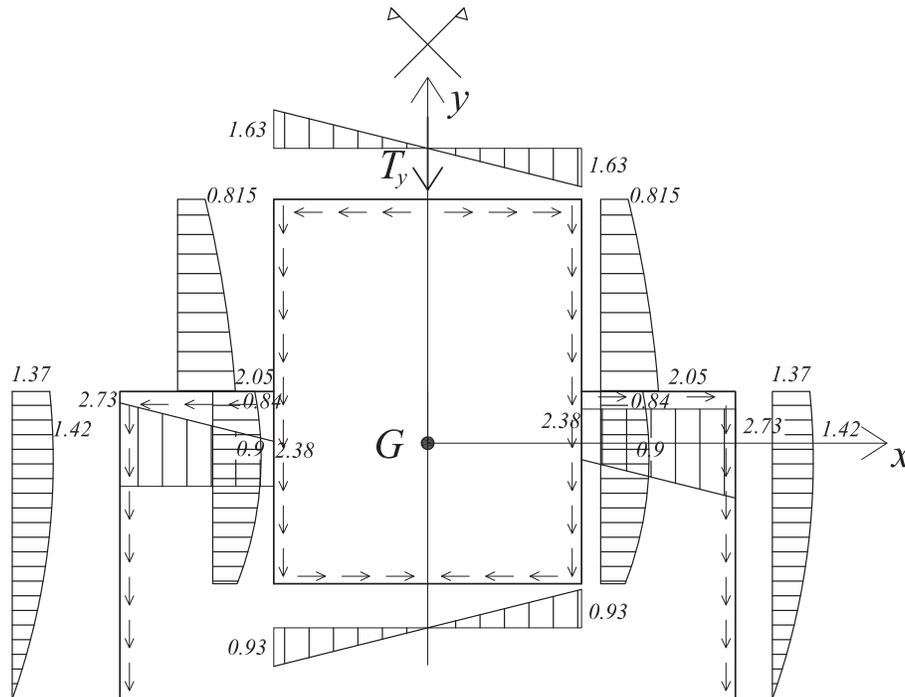
$$\begin{aligned}
 A &= 95200 \text{ mm}^2 \\
 I_x &= 3.115 \cdot 10^9 \text{ mm}^4 \\
 I_y &= 7.667 \cdot 10^9 \text{ mm}^4 \\
 N &= 100 \cdot 10^3 \text{ N} \\
 T_y &= -80 \cdot 10^3 \text{ N} \\
 M_x &= 86.72 \cdot 10^6 \text{ N} \cdot \text{mm} \\
 M_y &= -20 \cdot 10^6 \text{ N} \cdot \text{mm} \\
 M_t &= 32 \cdot 10^6 \text{ N} \cdot \text{mm}
 \end{aligned}$$

PRESSO-FLESSIONE

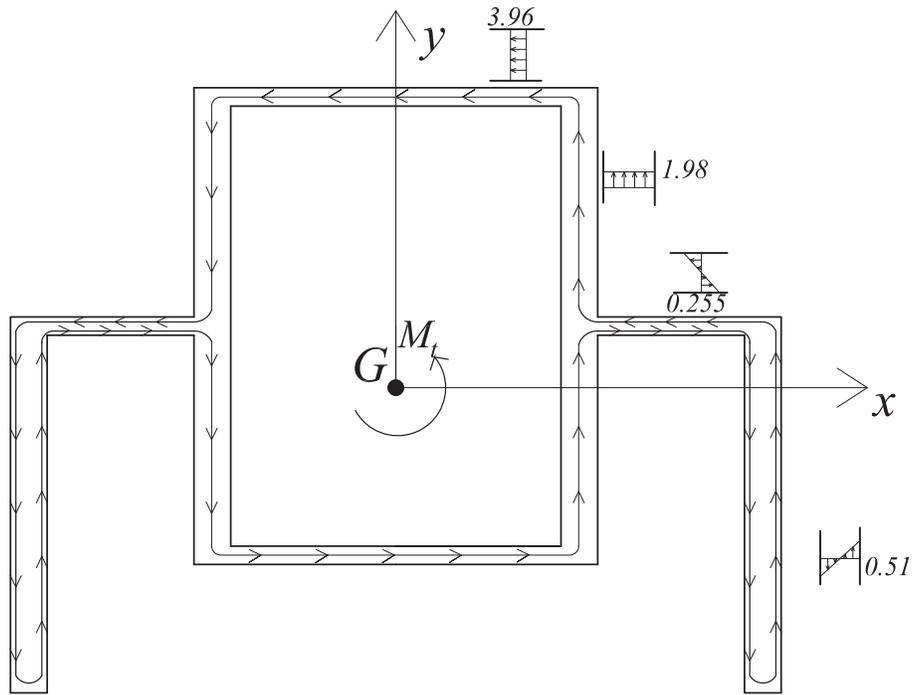
$$\begin{aligned}
 \sigma(P_1) &= 10.73 \frac{\text{N}}{\text{mm}^2} \\
 \sigma(P_2) &= -9.31 \frac{\text{N}}{\text{mm}^2}
 \end{aligned}$$



TAGLIO



TORSIONE



VERIFICHE DI RESISTENZA, RAPPRESENTAZIONE DI MOHR, TENSIONI PRINCIPALI

Il punto piú sollecitato é $P : (-220; 327.18)$.

$$\sigma_{id}(P) = 13.64 \frac{\text{N}}{\text{mm}^2} < \sigma_{amm}, \text{ SEZIONE VERIFICATA}$$

$$X := (0; 5.6), Y := (9.58; -5.6)$$

$$\sigma_I = 12.16 \frac{\text{N}}{\text{mm}^2}$$

$$\sigma_{II} = -2.58 \frac{\text{N}}{\text{mm}^2}$$

