

TECNICA DELLE COSTRUZIONI

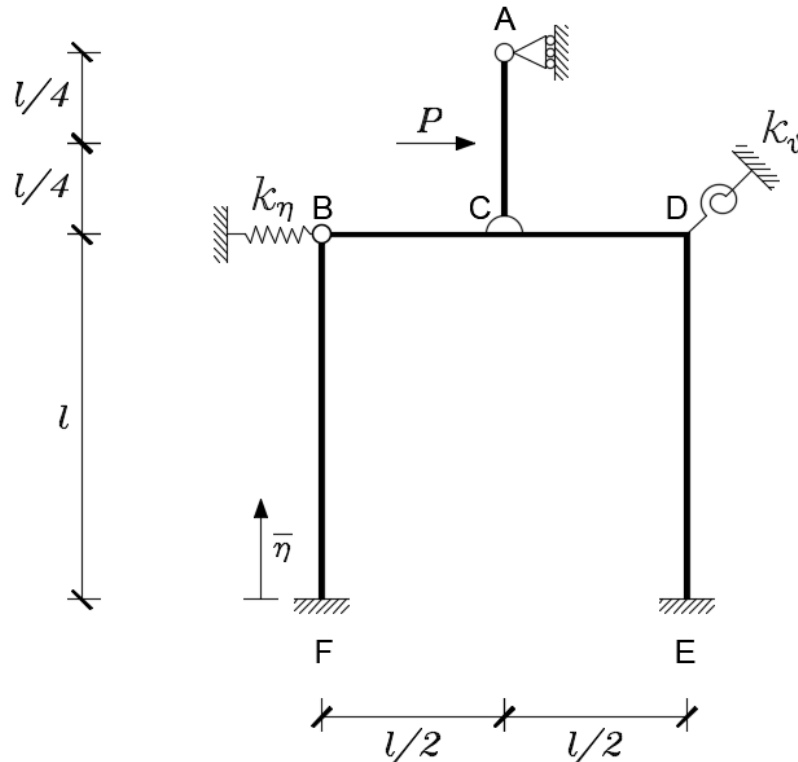
TEMA ESAME DEL 21 GENNAIO 2019

DOCENTI:
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PROF. FAUSTO MINELLI

ESERCITATORI:
ING. LUCA FACCONI
ING. FRANCESCA FEROLDI

DURATA: 2 ORE.

Esercizio



$$k_{\theta} = \frac{1}{2} \frac{EJ}{l}$$

$$k_{\eta} = 3 \frac{EJ}{l^3}$$

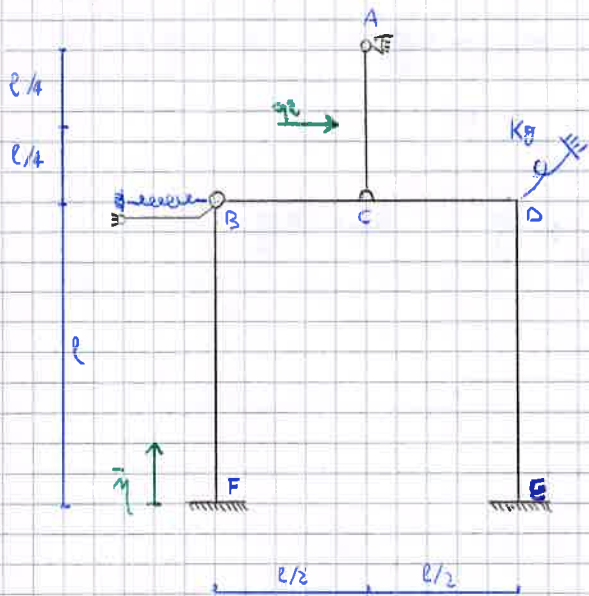
$$P = ql$$

$$\bar{\eta} = \frac{1}{4} \frac{ql^4}{EJ}$$

Dato il telaio in figura, **si richiedono i grafici di:**

1. Momento flettente (con il valore e la posizione dei massimi);
2. Taglio;
3. Azione assiale;
4. Deformata qualitativa con posizione dei flessi.

I grafici possono essere realizzati in matita, mentre i calcoli necessari per lo sviluppo del tema devono essere in tratto non cancellabile. Il tutto deve essere riportato chiaramente.

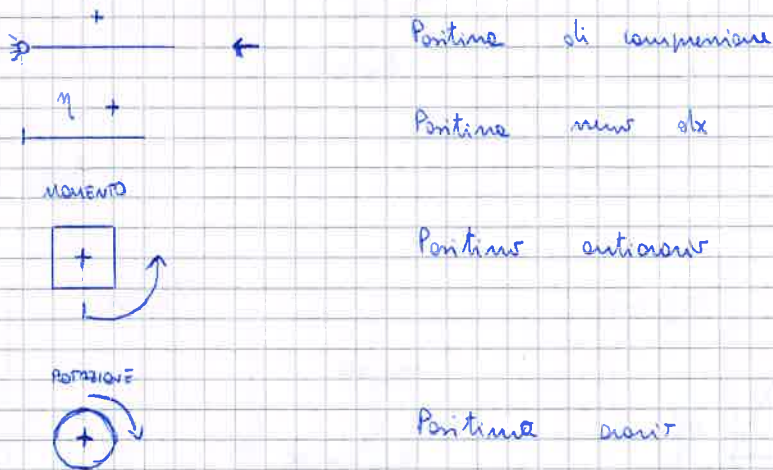


$$\bar{\eta} = \frac{1}{4} \frac{q_e l^4}{ES}$$

$$K_B = \frac{1}{2} \frac{ES}{l}$$

$$K_M = 3 \frac{ES}{l^3}$$

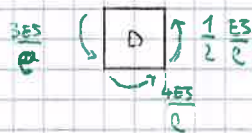
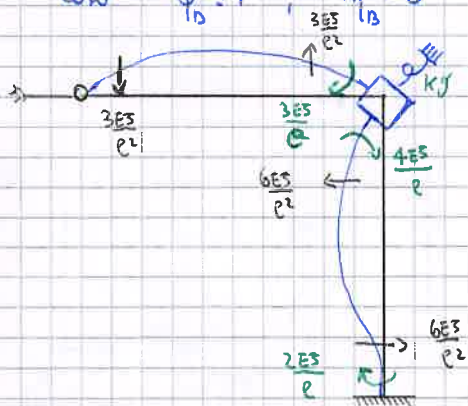
Convenzioni scelte:



Sistema risolvente:

$$\begin{cases} m_{DB} \varphi_D + m_{BD} \eta_B + m_{D0} = 0 \\ h_{BD} \varphi_D + h_{DB} \eta_B + h_{D0} = 0 \end{cases}$$

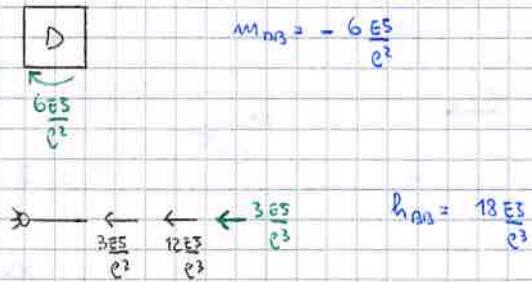
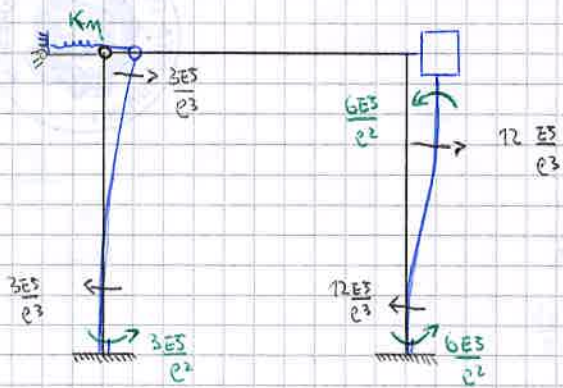
Con $\varphi_D = 1$, $\eta_B = 0$, $V_{cutti} = 0$



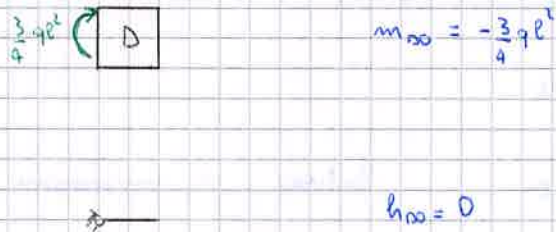
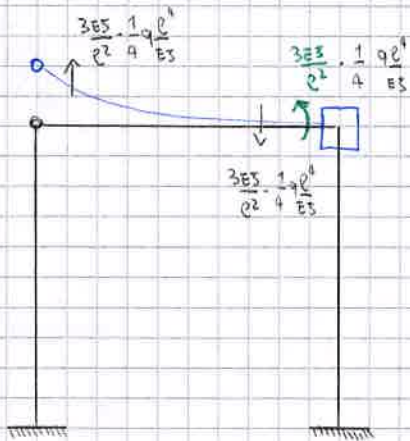
$$m_{D0} = \frac{15}{2} \frac{ES}{l}$$

$$h_{D0} = -\frac{6ES}{l^2}$$

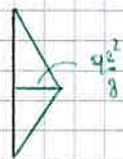
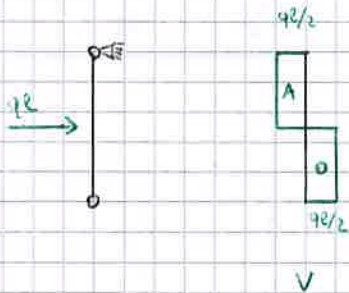
Case $\eta_B = 1$, $\varphi_D = 0$, $\forall \text{ other } = 0$



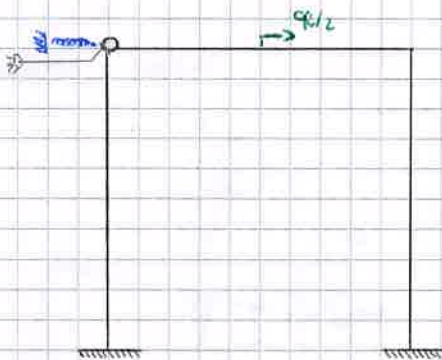
Case $\eta_B \neq 0$, $\eta_B = 0$, $\varphi_D = 0$, $q = 0$



Appendice statica : $q \neq 0$



$M_{D3} = 0$
 $h_{D3} = -\frac{qL}{2}$



$$\begin{cases} \text{I} & \frac{15}{2} \frac{ES}{l} \cdot \varphi_D - 6 \frac{ES}{l^2} \eta_B - \frac{3}{4} ql^2 = 0 \\ \text{II} & -6 \frac{ES}{l^2} \cdot \varphi_D + 18 \frac{ES}{l^3} \eta_B - \frac{ql}{2} = 0 \end{cases}$$

$$\text{I} \rightarrow \eta_B = \frac{1}{6} \frac{l^2}{ES} \left(\frac{15}{2} \frac{ES}{l} \varphi_D - \frac{3}{4} ql^2 \right)$$

$$\text{II} \rightarrow -6 \frac{ES}{l^2} \cdot \varphi_D + 18 \frac{ES}{l^3} \cdot \frac{1}{6} \frac{l^2}{ES} \left(\frac{15}{2} \frac{ES}{l} \varphi_D - \frac{3}{4} ql^2 \right) - \frac{ql}{2} = 0$$

$$-6 \frac{ES}{l^2} \varphi_D + \frac{45}{2} \frac{ES}{l^2} \varphi_D - \frac{9}{4} ql - \frac{ql}{2} = 0$$

$$\varphi_D = \frac{17}{4} ql \cdot \frac{2}{33} \frac{l^2}{ES} = \frac{1}{6} \frac{ql^3}{ES}$$

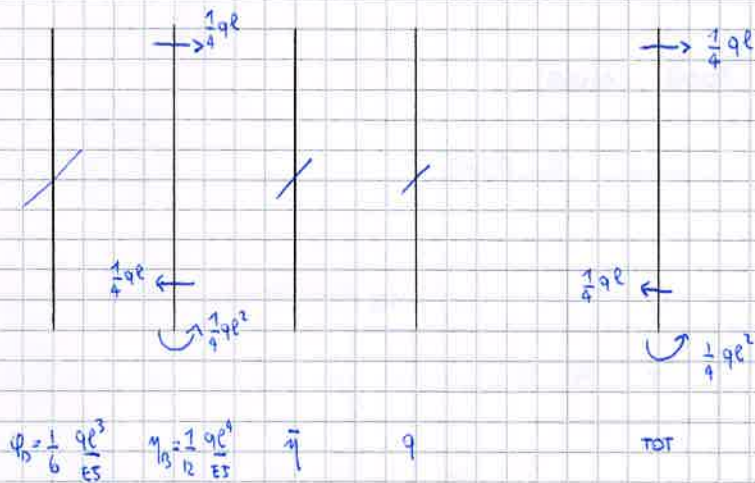
$$\varphi_D = \frac{1}{6} \frac{ql^3}{ES}$$

$$\text{I} \rightarrow \eta_B = \frac{1}{6} \frac{l^2}{ES} \left(\frac{15}{2} \frac{ES}{l} \cdot \frac{1}{6} \frac{ql^3}{ES} - \frac{3}{4} ql^2 \right)$$

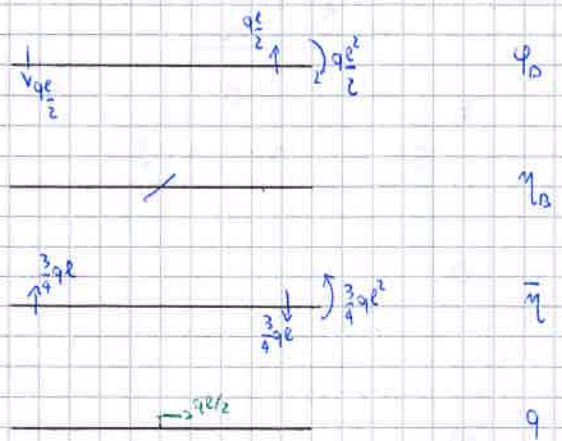
$$\eta_B = \frac{1}{6} \frac{l^2}{ES} \left(\frac{5}{4} ql^2 - \frac{3}{4} ql^2 \right)$$

$$\eta_B = \frac{1}{12} \frac{ql^2}{ES}$$

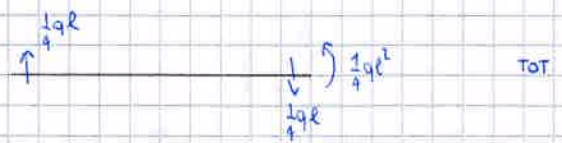
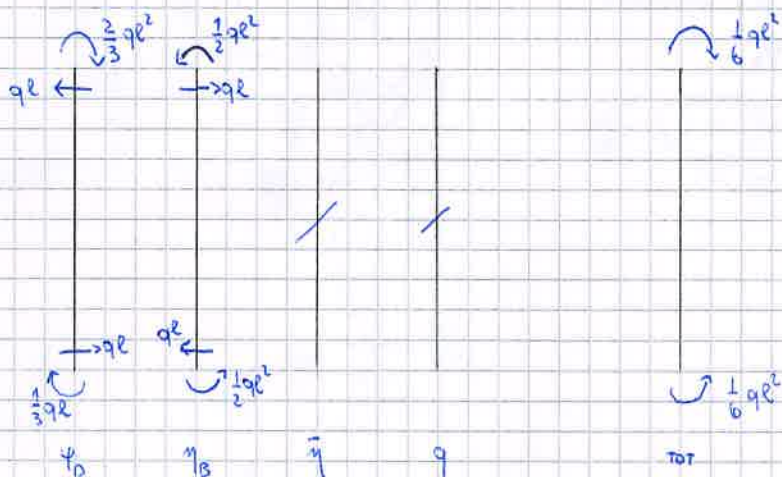
ASTA (BF)



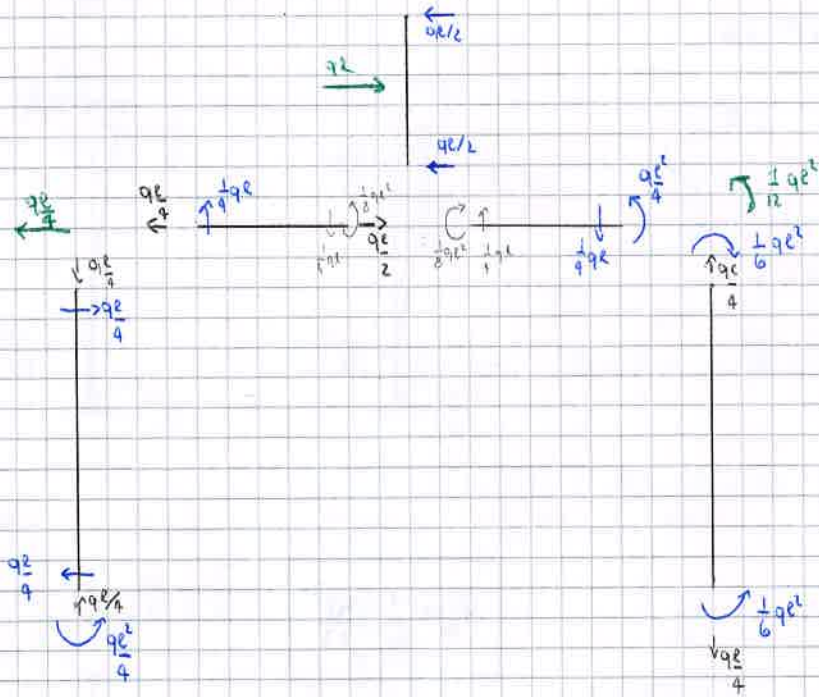
ASTA (BD)



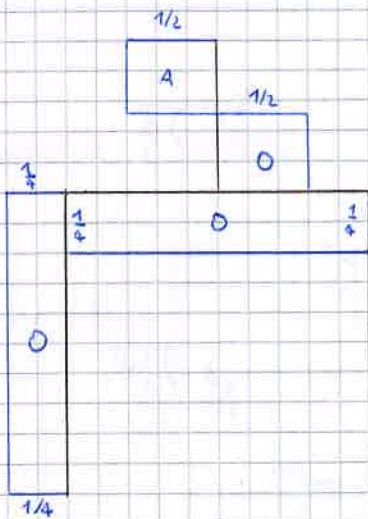
ASTA (DE)



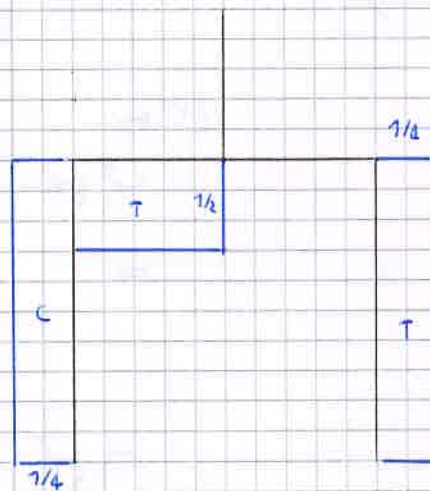
STRUTTURA COMPLETA:



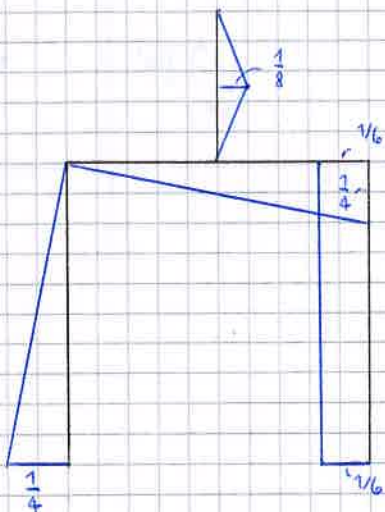
AZIONE TAGLIANTE:



AZIONE ASSIALE:

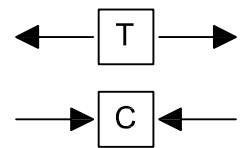
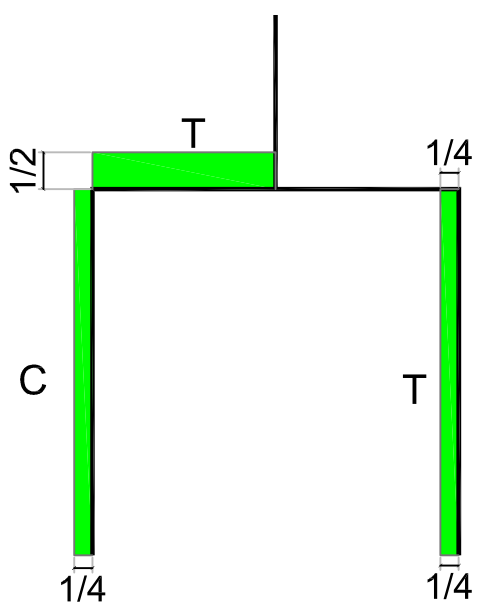


MOMENTO FLETTENTE:



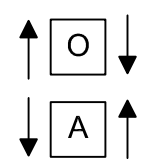
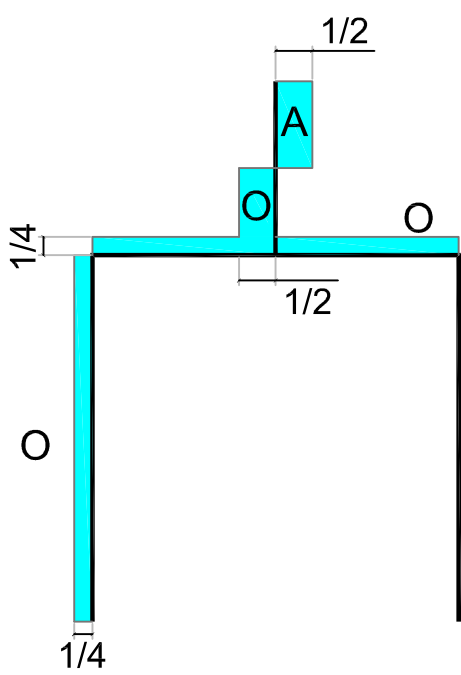
AZIONE ASSIALE

U.D.M. ql



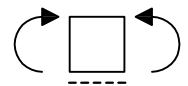
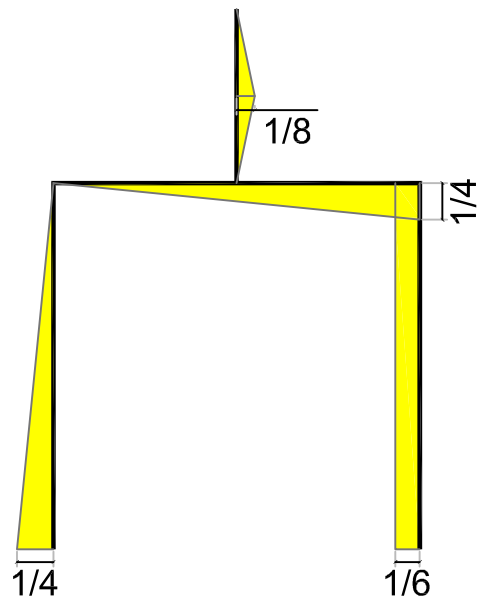
TAGLIO

U.D.M. ql



MOMENTO FLETTENTE

U.D.M. ql^2



DEFORMATA QUALITATIVA

U.D.M. Spostamenti ql^4/EJ

U.D.M. Rotazioni ql^3/EJ

U.D.M. Posizione flessi I

