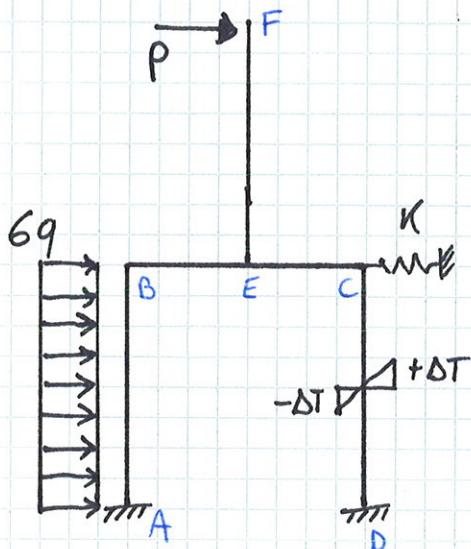


TEMA ESAME 25/03/2013

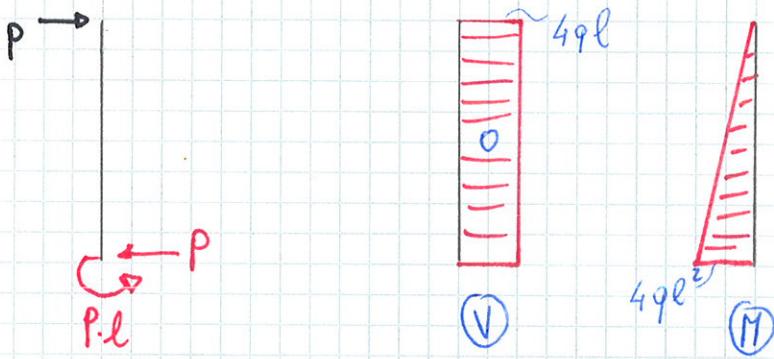


$$P = 4ql$$

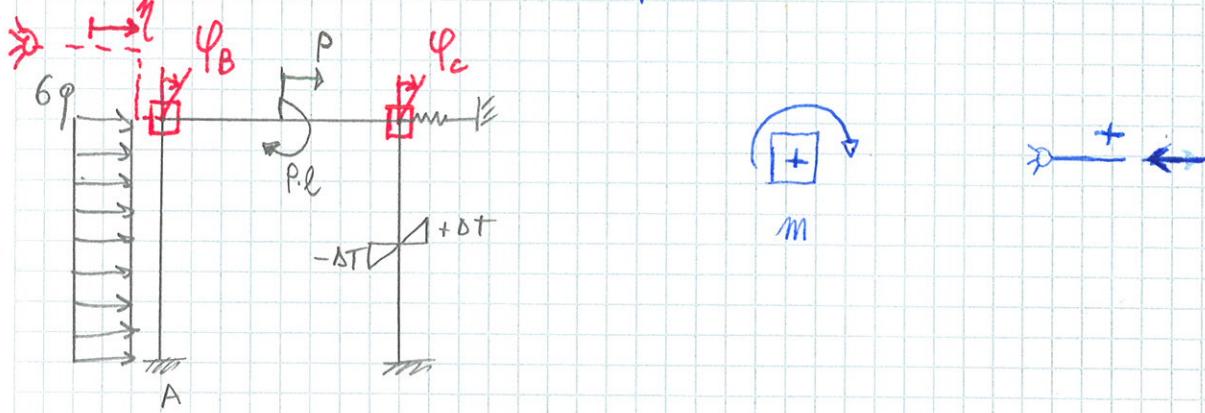
$$K = 6 \frac{EJ}{l^3}$$

$$\frac{\alpha \Delta T}{t} = 3 \frac{ql^2}{EJ}$$

- DE È APPENDICE ISOSTATICA

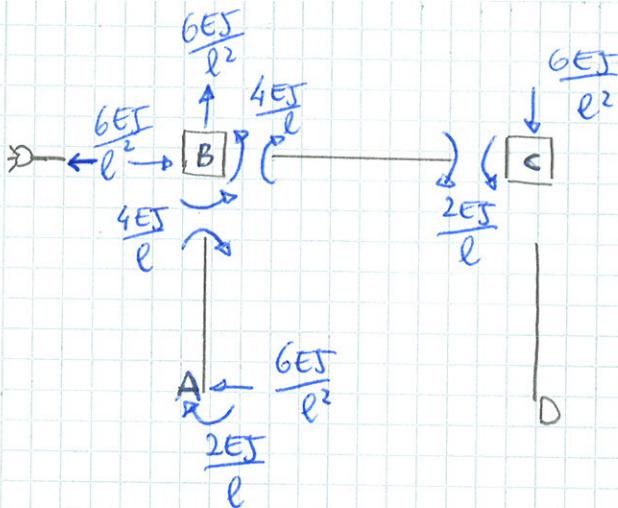
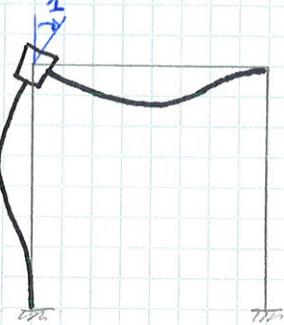


LA STRUTTURA DIVENTA QUINDI



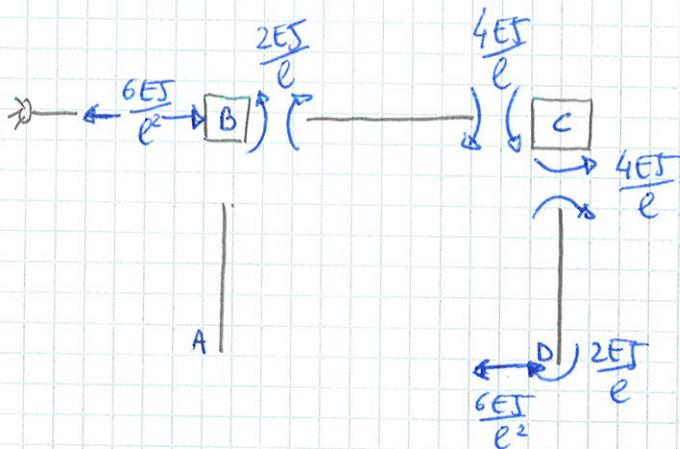
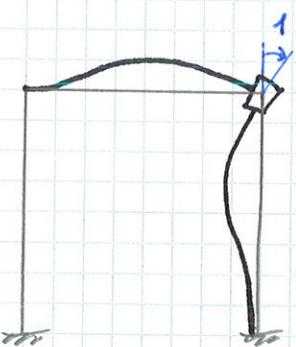
$$\begin{cases} \varphi_B \cdot M_{BB} + \varphi_c M_{BC} + \eta_B \cdot M_{B,\eta} + m_{B_0} = 0 \\ \varphi_B M_{cB} + \varphi_c M_{cc} + \eta_B \cdot M_{c,\eta} + m_{c_0} = 0 \\ \varphi_B h_{BB} + \varphi_c h_{BC} + \eta_B \cdot h_{B,\eta} + h_{B_0} = 0 \end{cases}$$

1) $\psi_B = 1$



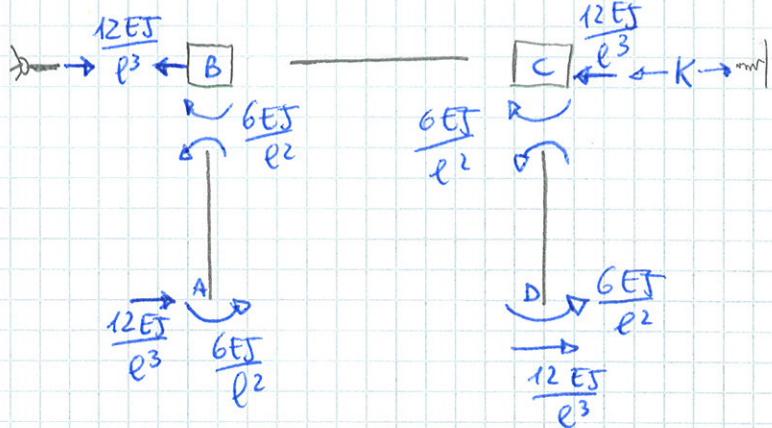
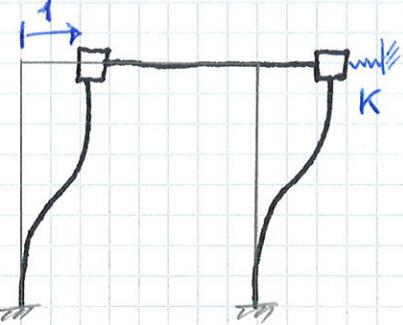
$$\begin{cases} M_{BB} = -\frac{4EI}{l} - \frac{4EI}{l} = -\frac{8EI}{l} \\ M_{CB} = -\frac{2EI}{l} \\ h_{BB} = \frac{6EI}{l^2} \end{cases}$$

2) $\psi_C = 1$



$$\begin{cases} M_{BC} = -\frac{2EI}{l} \\ M_{CC} = -\frac{8EI}{l} \\ h_{BC} = \frac{6EI}{l^2} \end{cases}$$

$$\textcircled{2} \quad \gamma_B = 1$$

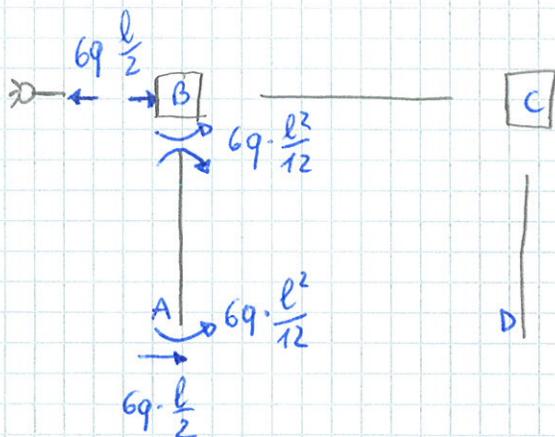
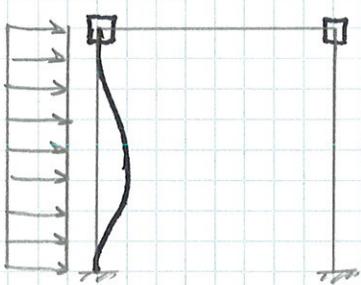


$$M_{B,\eta} = \frac{6EJ}{l^2}$$

$$M_{C,\eta} = \frac{6EJ}{l^2}$$

$$h_{B,\eta} = -\frac{12EJ}{l^3} - \frac{12EJ}{l^3} - K = -\frac{24EJ}{l^3} - K$$

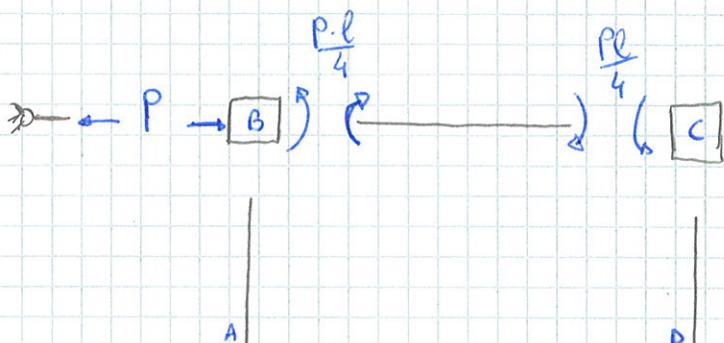
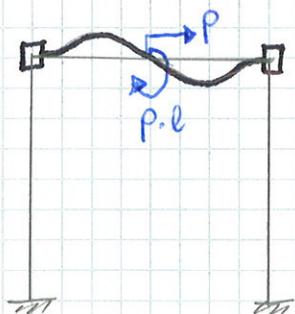
$$\textcircled{4} \quad 69 \neq 0$$



$$\left\{ \begin{array}{l} M_{B,q} = -69 \cdot \frac{l^2}{12} = -\frac{q l^2}{2} \\ M_{C,q} = 0 \end{array} \right.$$

$$h_{B,q} = 69 \cdot \frac{l}{2} = 39l$$

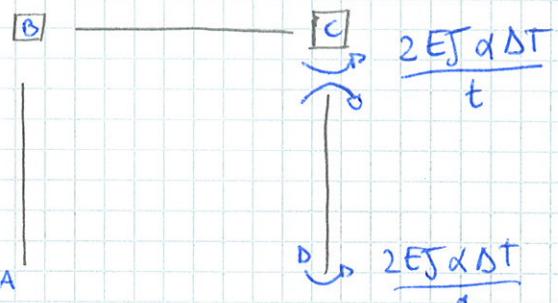
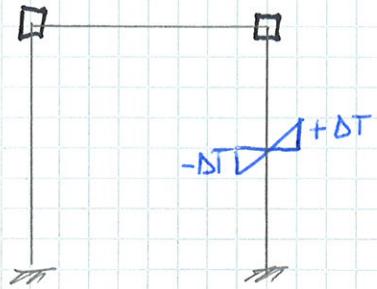
$$\textcircled{5} \quad P \neq 0 \quad (P = 49l)$$



$$\left\{ \begin{array}{l} M_{B,P} = -\frac{P \cdot l}{4} = -\frac{49l^2}{4} = -q l^2 \\ M_{C,P} = -\frac{P l}{4} = -\frac{49l^2}{4} = -q l^2 \\ h_{B,P} = P = 49l \end{array} \right.$$

(3)

o) $\Delta I \neq 0$

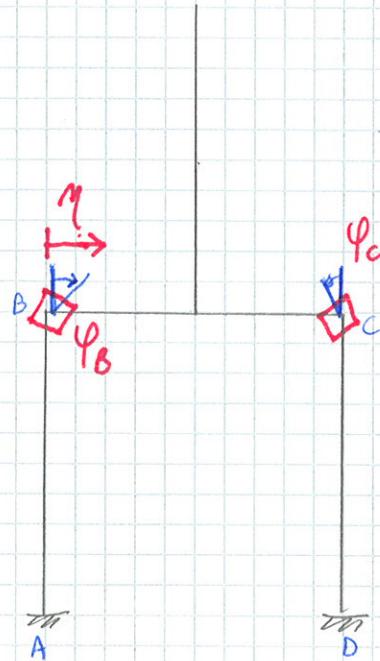


$$\left\{ \begin{array}{l} M_{B,\Delta T} = 0 \\ M_{C,\Delta T} = -\frac{2EJ\alpha\Delta T}{t} = -6ql^2 \\ h_{B,\Delta T} = 0 \end{array} \right.$$

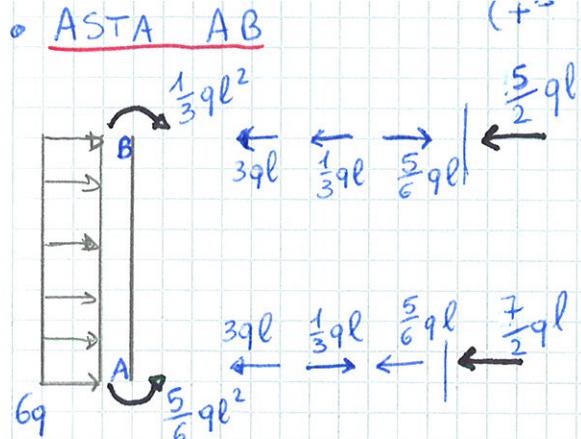
SISTEMA RISOLVENTE

$$\left\{ \begin{array}{l} -\frac{8EJ}{l}\varphi_B - \frac{2EJ}{l}\varphi_C + \frac{6EJ}{l^2}\eta - \frac{ql^2}{2} - ql^2 = 0 \\ -\frac{2EJ}{l}\varphi_B - \frac{8EJ}{l}\varphi_C + \frac{6EJ}{l^2}\eta - ql^2 - 6ql^2 = 0 \\ \frac{6EJ}{l^2}\varphi_B + \frac{6EJ}{l^2}\varphi_C - \left(\frac{24EJ}{l^3} + k\right)\eta + 3ql + 4ql = 0 \end{array} \right.$$

$$\left\{ \begin{array}{l} \varphi_B = \frac{1}{12} \frac{ql^3}{EJ} \\ \varphi_C = -\frac{5}{6} \frac{ql^3}{EJ} \\ \eta = \frac{1}{12} \frac{ql^4}{EJ} \end{array} \right.$$

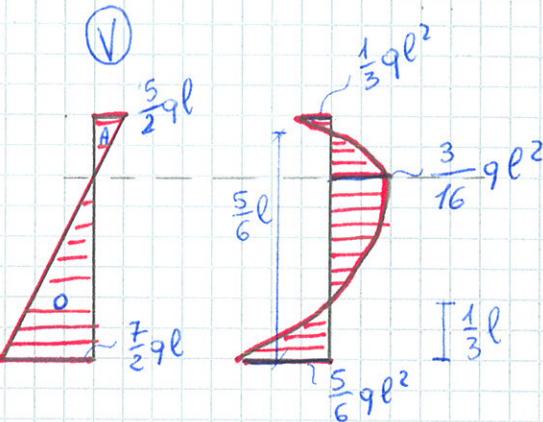


(4)

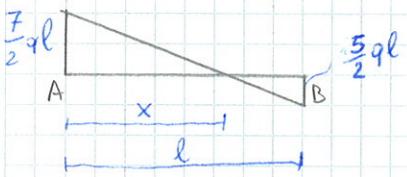


$$M_B = \frac{4EJ}{l} \cdot \varphi_B - \frac{6EJ}{l^2} \eta + \frac{q l^2}{2} = \frac{1}{3} q l^2$$

$$M_A = \frac{2EJ}{l} \cdot \varphi_B - \frac{6EJ}{l^2} \cdot \eta - \frac{q l^2}{2} = -\frac{5}{6} q l^2$$



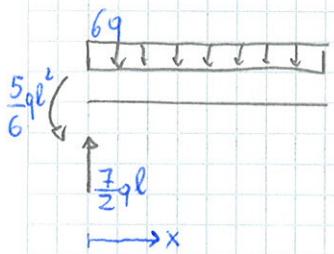
- CERCO IL PUNTO DOVE SI ANNULLA IL TAGLIO (M_{max})



$$\frac{7}{2} q l : x = \frac{12}{2} q l : l$$

$$x = \frac{7}{12} l$$

- VALUTO M_{max}^{AB}



$$M(x) = \frac{7}{2} q l \cdot x - \frac{5}{6} q x^2 - \frac{5}{6} q l^2$$

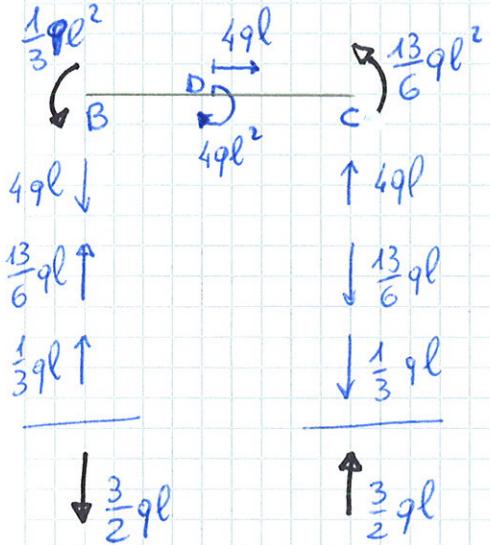
$$M\left(\frac{7}{12} l\right) = \frac{3}{16} q l^2$$

- INDIVIDUA I PUNTI IN CUI IL MOMENTO SI ANNULLA (FLESSI)

$$M = \frac{7}{2} q l x - \frac{69 x^2}{2} - \frac{5}{6} q l^2 = 0 \Rightarrow \begin{cases} x_1 = \frac{5}{6} l \\ x_2 = \frac{1}{3} l \end{cases}$$

(5)

rispetta la natura con i ricambi rinforzati senza plastica.

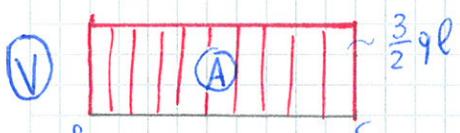


$$M_B = \frac{4EJ}{l} \cdot \varphi_B + \frac{2EJ}{l} \cdot \varphi_C + ql^2 = -\frac{1}{3} ql^2$$

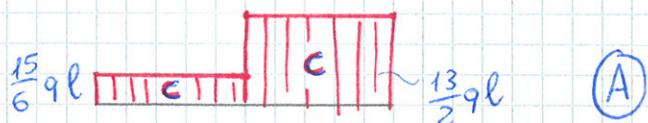
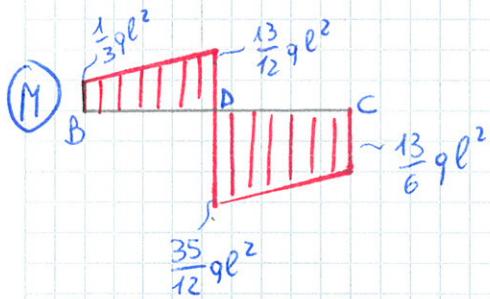
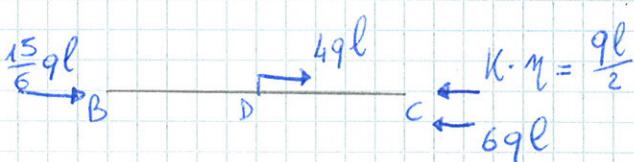
$$M_C = \frac{2EJ}{l} \cdot \varphi_B + \frac{4EJ}{l} \cdot \varphi_C + ql^2 = -\frac{13}{6} ql^2$$

$$M_D^{sx} = -\frac{1}{3} ql^2 - \frac{3}{2} ql \cdot \frac{l}{2} = -\frac{13}{12} ql^2$$

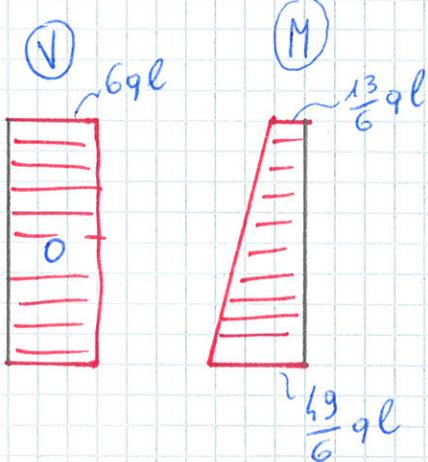
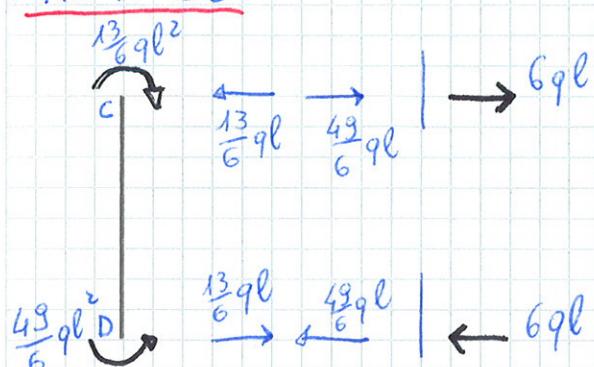
$$M_D^{dx} = -\frac{1}{3} ql^2 - \frac{3}{2} ql \cdot \frac{l}{2} + 4ql^2 = \frac{35}{12} ql^2$$



AZIONE ASSIALE



• ASTA CD



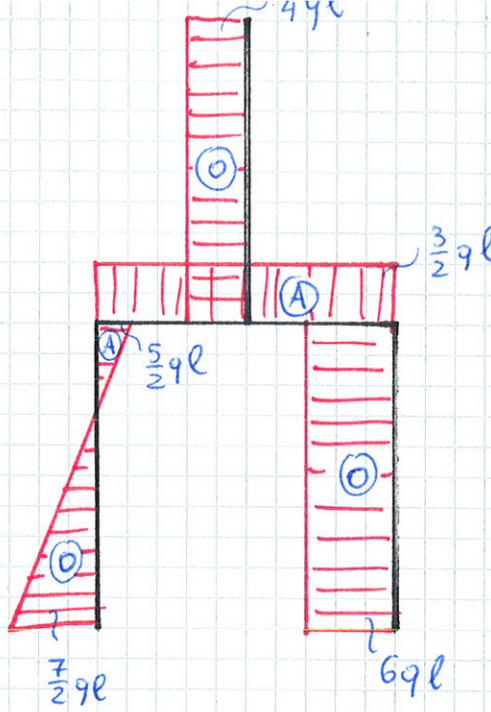
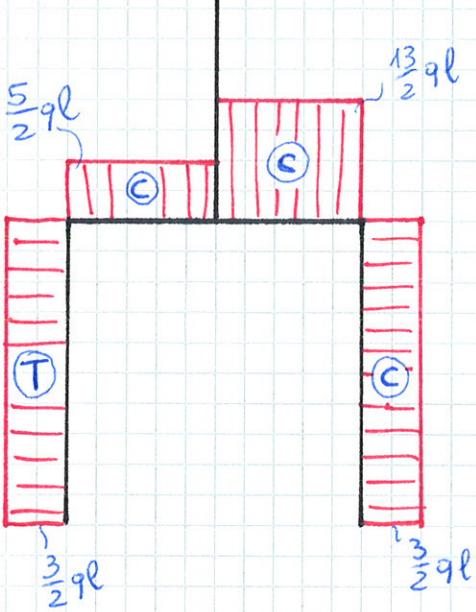
$$M_C = \frac{4EJ}{l} \varphi_C - \frac{6EJ}{l^2} \eta + 6ql^2 = \frac{13}{6} ql^2$$

$$M_D = \frac{2EJ}{l} \cdot \varphi_C - \frac{6EJ}{l^2} \eta - 6ql^2 = -\frac{49}{6} ql^2$$

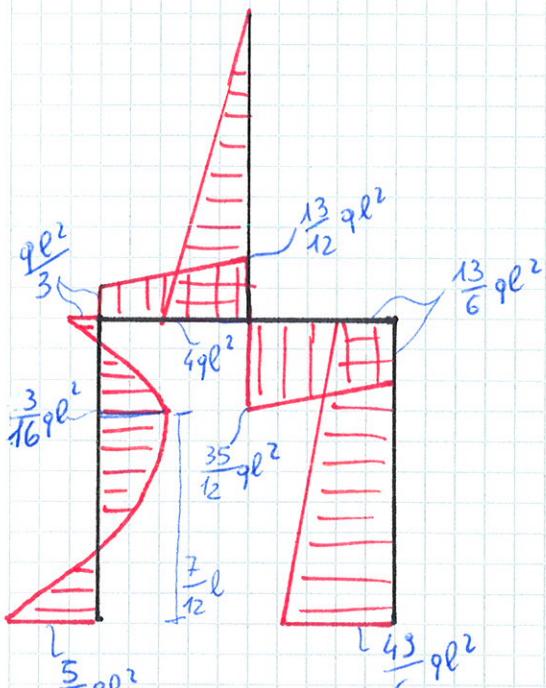
rispetta la natura con i ricambi rinforzati senza plastica.

⑥

DIAGRAMMI

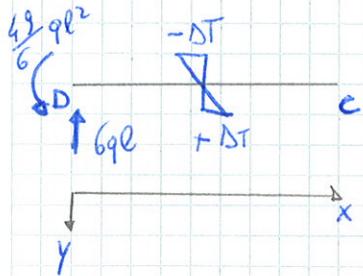


AZIONE ASSIALE



MOMENTO

DEFORMATA TERMICA ASTA CD:



$$M(x) = 6ql \cdot x - \frac{49}{6} ql^2$$

$$y''(x) = -\frac{M(x)}{EI} - \frac{2\alpha\Delta T}{t} = -6 \frac{ql \cdot x}{EI} + \frac{49}{6} \frac{ql^2}{EI} - \frac{6ql^2}{EI} =$$

$$= -6 \frac{ql}{EI} \cdot x + \frac{13}{6} \frac{ql^2}{EI}$$

$$y''(x) > 0 \Rightarrow x < \frac{13}{36} l$$

DEFORMATA QUALITATIVA

