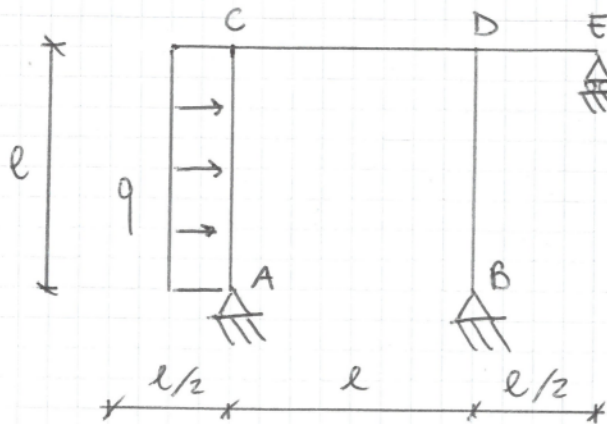


27/04/18

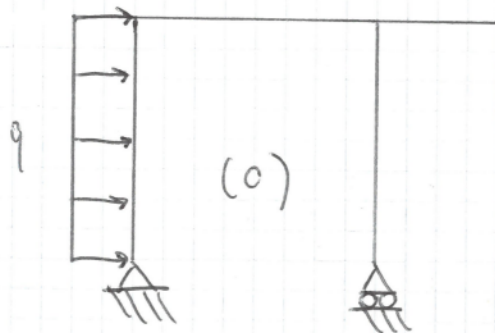
STRUTTURA ANTI SIMMETRICA



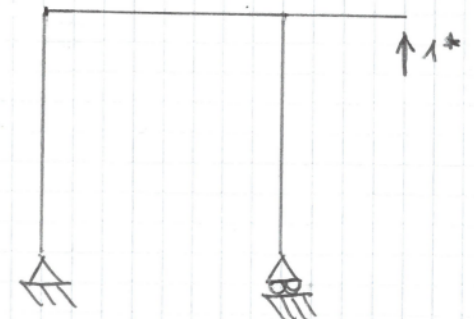
$$l = 5m$$

$$q = 1000 \text{ N/m}$$

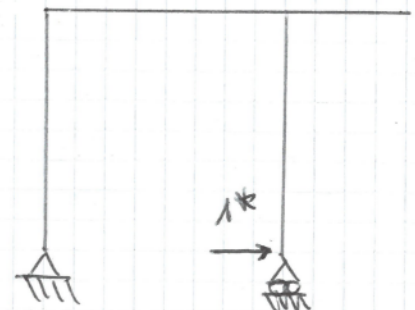
1)



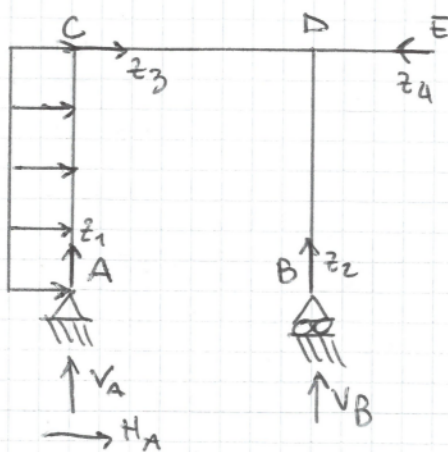
+ X_1



X_2



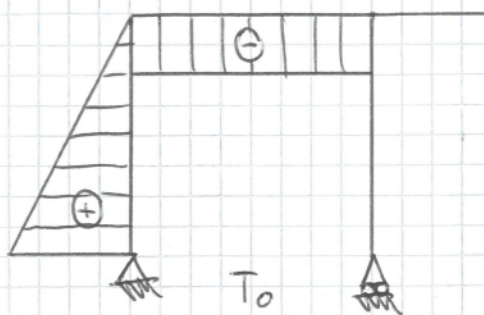
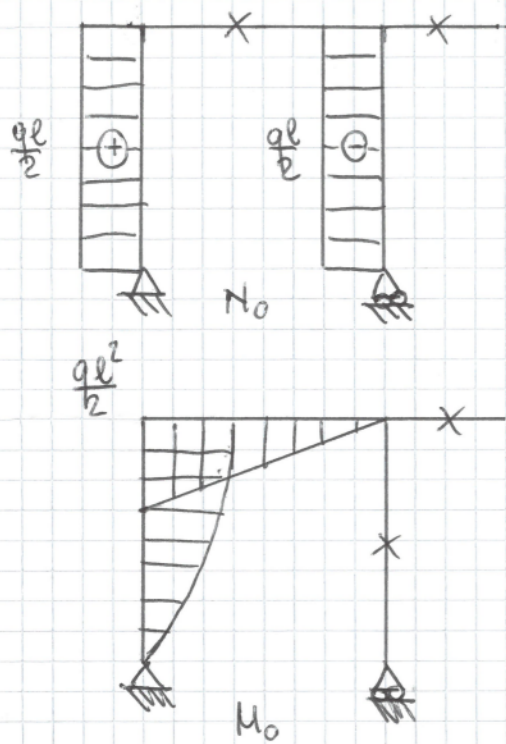
SISTEMA (0)



$$\rightarrow) H_A = -ql$$

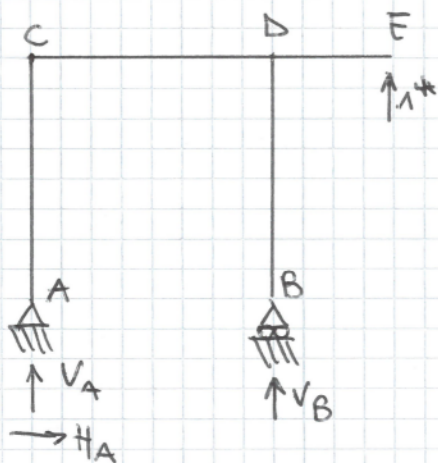
$$\uparrow) V_B = \frac{ql}{2}$$

$$\uparrow) V_A = -\frac{ql}{2}$$



$$\begin{aligned} M_0(z_1) &= qlz - \frac{qz^2}{2} \\ M_0(z_2) &= 0 \\ M_0(z_3) &= \frac{ql^2}{2} - \frac{qlz}{2} \\ M_0(z_4) &= 0 \end{aligned}$$

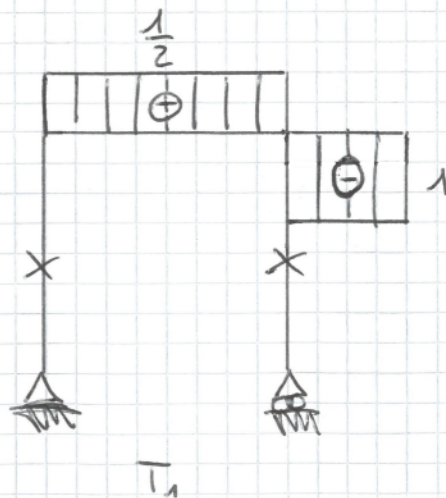
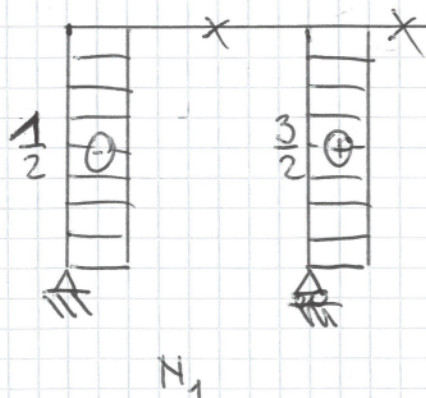
SISTEMA (1)

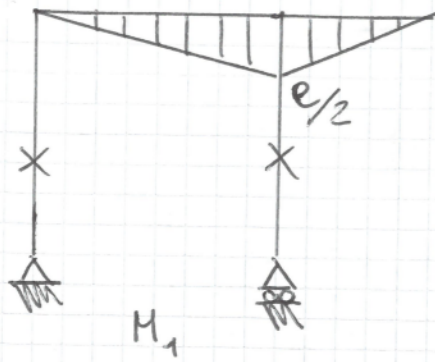


$$\rightarrow H_A = 0$$

$$\uparrow V_B = -\frac{3}{2}$$

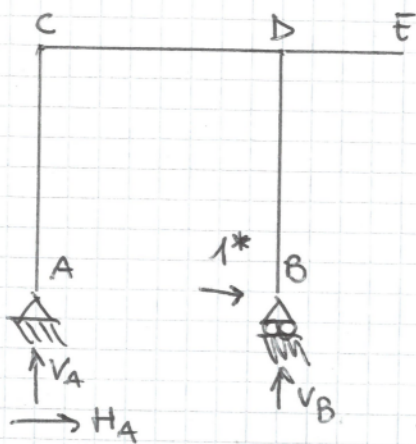
$$\uparrow V_A = \frac{3}{2} - 1 = \frac{1}{2}$$





$$\begin{aligned} M_1(z_1) &= 0 \\ M_1(z_2) &= 0 \\ M_1(z_3) &= \frac{z}{2} \\ M_1(z_4) &= z \end{aligned}$$

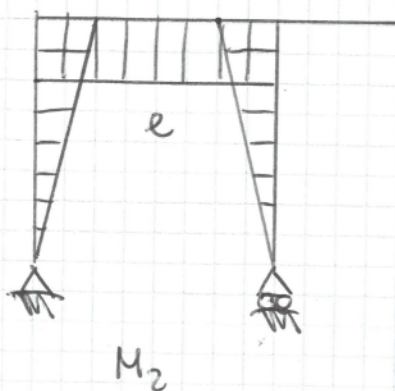
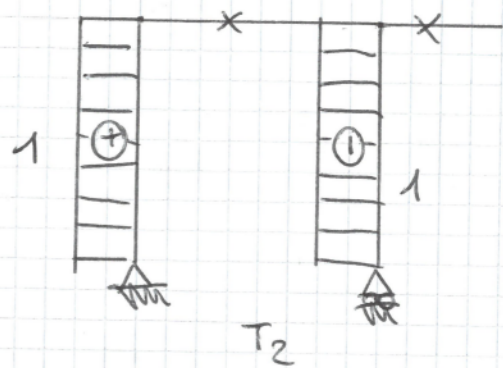
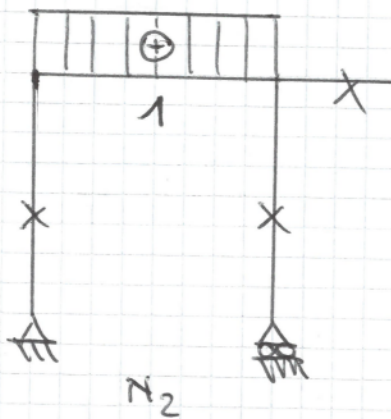
SISTEMA (2)



$$\rightarrow) H_A = -1$$

$$A) \uparrow V_B = 0$$

$$\uparrow) V_A = 0$$



$$M_2(z_1) = z$$

$$M_2(z_2) = z$$

$$M_2(z_3) = e$$

$$M_2(z_4) = 0$$

$$M_{10} = \frac{1}{EJ} \int_0^l \left(\frac{ql^2}{2} - \frac{qlz}{2} \right) \left(\frac{z}{2} \right) dz = \frac{ql^4}{24EJ}$$

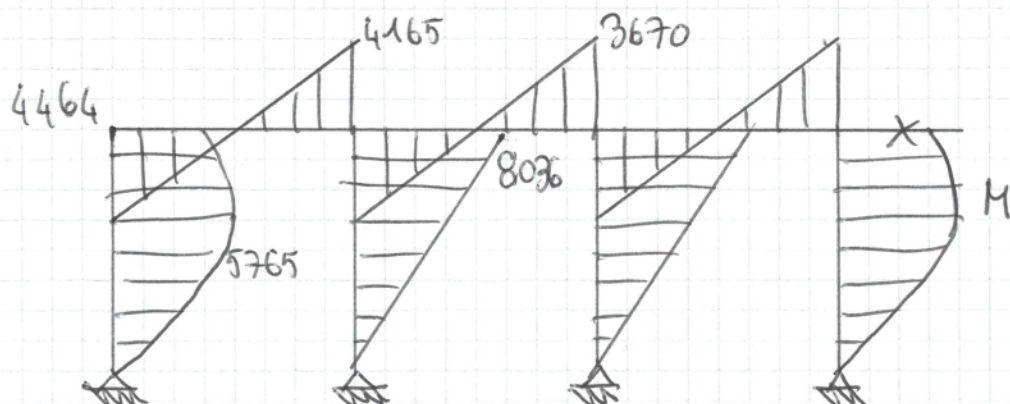
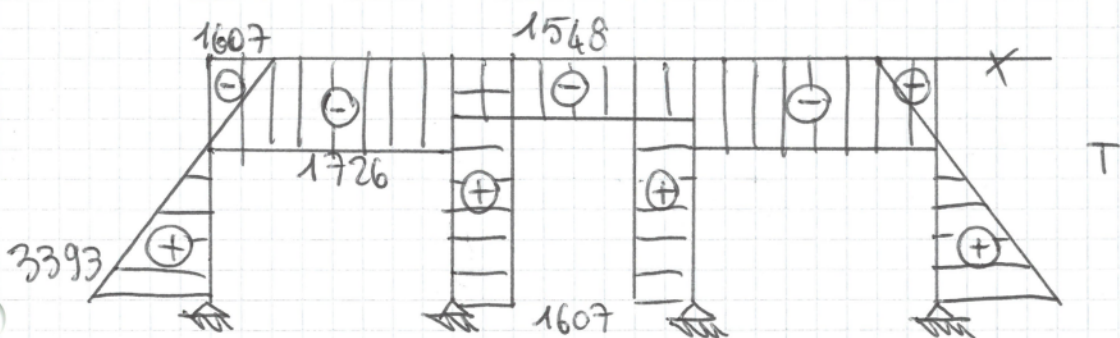
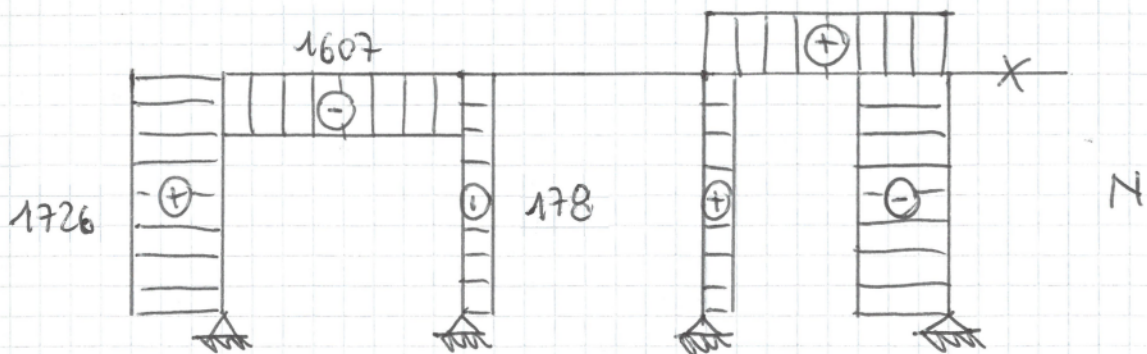
$$M_{20} = \frac{1}{EJ} \left[\int_0^l \left(qlz - \frac{ql^2}{2} \right) (z) dz + \int_0^l \left(\frac{ql^2}{2} - \frac{qlz}{2} \right) (l) dz \right] = \frac{11}{24} \frac{ql^4}{EJ}$$

$$M_{11} = \frac{1}{EJ} \left[\int_0^l \left(\frac{z}{2} \right)^2 dz + \int_0^{l/2} z^2 dz \right] = \frac{1}{8} \frac{l^3}{EJ}$$

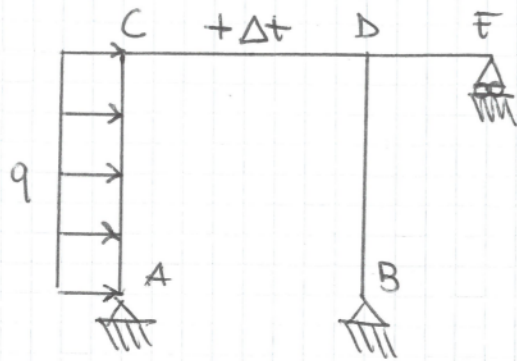
$$M_{22} = \frac{1}{EJ} \left[2 \int_0^l z^2 dz + \int_0^l l^2 dz \right] = \frac{5}{3} \frac{l^3}{EJ}$$

$$M_{12} = \frac{1}{EJ} \int_0^l \left(\frac{z}{2} \right) (l) dz = \frac{l^3}{4EJ}$$

$$\begin{aligned} (1) & \rightarrow M_{11} \cdot x_1 + M_{12} \cdot x_2 = -M_{10} & x_1 &= 1548 \text{ N} = \frac{13}{42} ql \\ (2) & \rightarrow M_{12} \cdot x_1 + M_{22} \cdot x_2 = -M_{20} & x_2 &= -1607 \text{ N} = -\frac{9}{28} ql \end{aligned}$$



2) CARICO TERMICO SU ASTA CD + DEF ASSIALE



$$\Delta t = 30^\circ \text{C}$$

$$IPE \ 300$$

$$E = 210\,000 \text{ MPa}$$

$$J = 8356 \text{ cm}^4$$

$$M_{10}^N = \frac{1}{EA} \left[\int_0^l \left(-\frac{1}{2}\right) \left(\frac{ql}{2}\right) dz + \int_0^l \left(-\frac{ql}{2}\right) \left(\frac{3}{2}\right) dz \right] = -\frac{ql^2}{EA}$$

$$M_{20}^N = 0$$

$$M_{11}^N = \frac{1}{EA} \left[\int_0^l \frac{1}{4} dz + \int_0^l \frac{q}{4} dz \right] = \frac{5l}{2EA}$$

$$M_{22}^N = \frac{1}{EA} \int_0^l 1 dz = \frac{l}{EA}$$

$$M_{12}^N = 0$$

$$M_{ij}^{\text{TOT}} = M_{ij} + M_{ij}^N$$

$$(1) \rightarrow L_{VF} = 0 = L_{VI} = M_{10}^{\text{TOT}} + X_1 \cdot M_{11}^{\text{TOT}} + X_2 \cdot M_{12}^{\text{TOT}}$$

$$(2) \rightarrow L_{VF} = 0 = L_{VI} = M_{20}^{\text{TOT}} + X_1 \cdot M_{21}^{\text{TOT}} + X_2 \cdot M_{22}^{\text{TOT}} + \int_0^l (1) \cdot \alpha \Delta t dz$$

$$q = 1000 \text{ N/m} \quad l = 5 \text{ m}$$

$$A = 53,81 \cdot 10^{-4} \text{ m}^2$$

$$E = 210 \cdot 10^9 \text{ Pa}$$

$$J = 8,356 \cdot 10^{-5} \text{ m}^4$$

$$X_1 = 1873 \text{ N}$$

$$X_2 = 1756 \text{ N}$$

