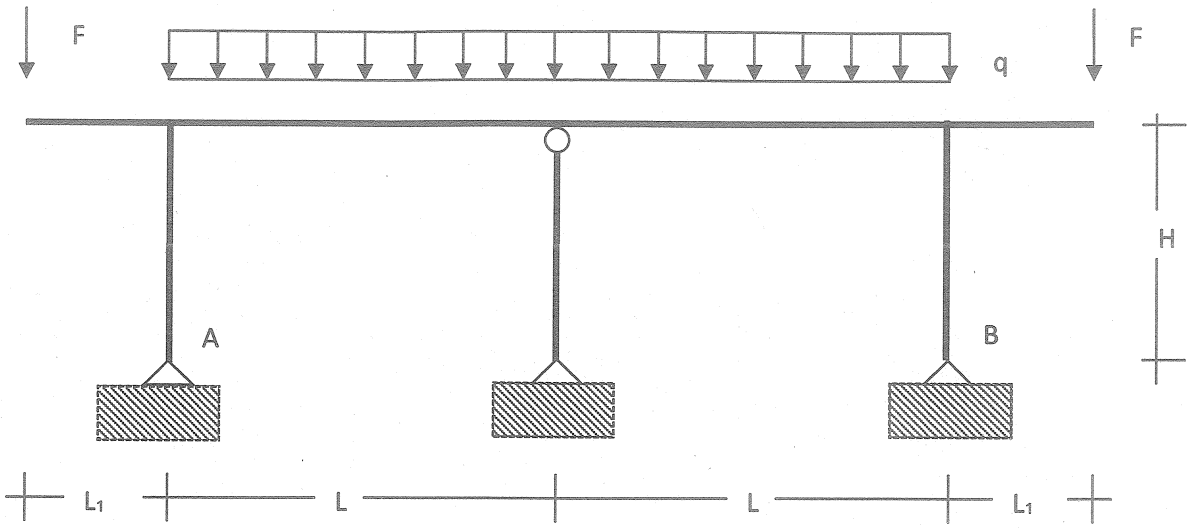
A

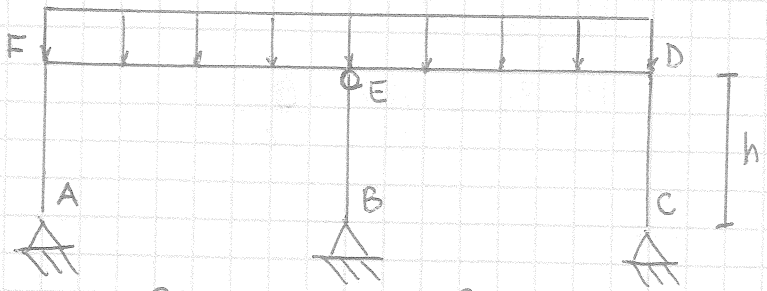


Si trascuri la deformabilità assiale della struttura.

1. Risolvere la struttura simmetrica in figura mediante il metodo delle forze avendo posto: L=8m , H=4 m, q=1000 N/m. In questa fase si ponga F= 0.
2. Si risolva la stessa struttura della domanda 1 in cui si è considerato ora un cedimento verticale Δ=1 cm in A e B verso il basso avendo utilizzato per le travi un profilato in acciaio IPE 200 (E= 210000 MPa, Jx=1943 cm4, Jy= 142.4 cm4)
3. Determinare i coefficienti di cedevolezza nel caso 1 se si pone F=1000 N ed L_1=4 m.

FILA A

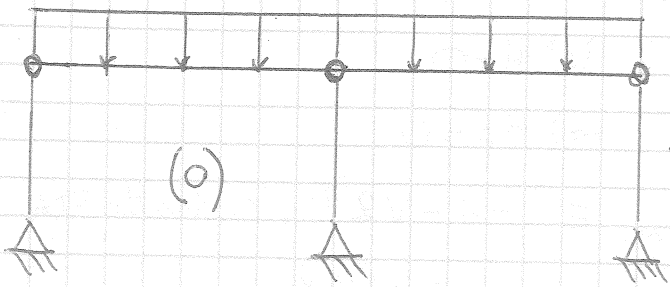
1)



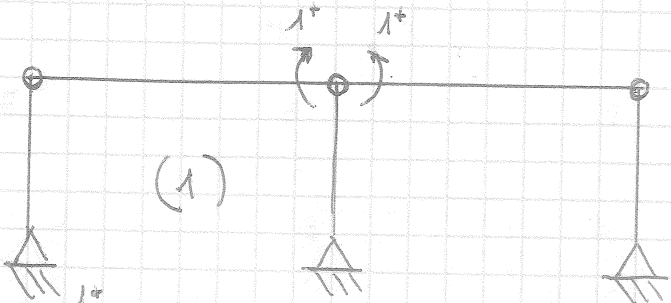
$q = 1\ KN/m$

$2\ell = 8\ m$

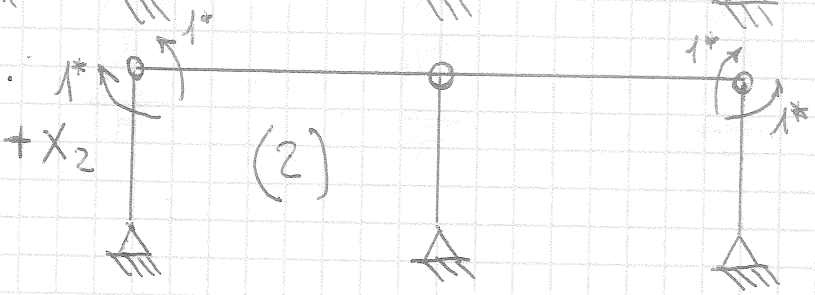
$h = 4\ m = \ell$



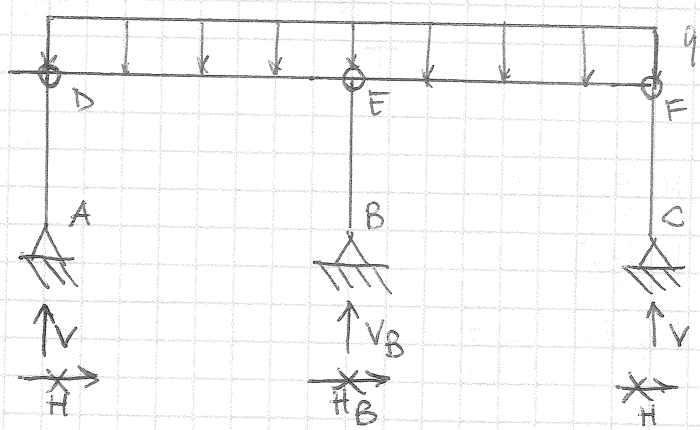
$+X_1$



$+X_2$



SISTEMA (0)



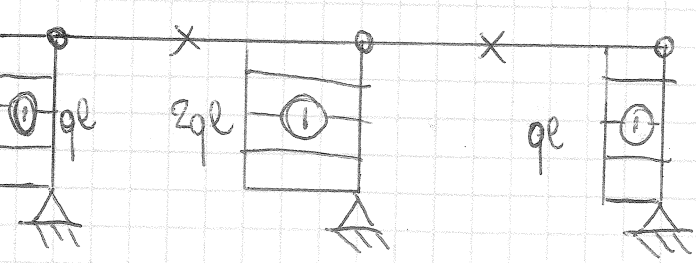
D) $H = 0$ tratto AD

→) $H_B = 0$

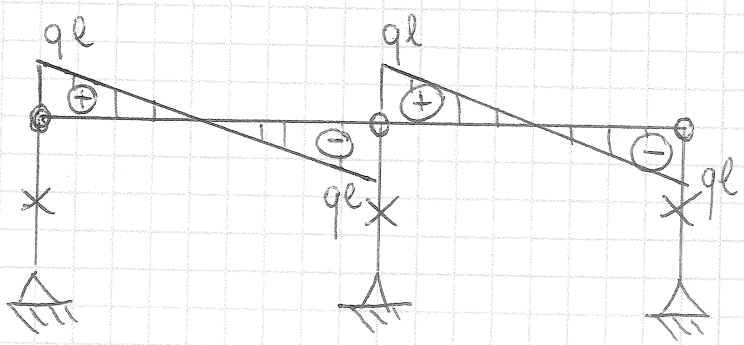
E) $2q\ell \cdot \ell - V 2\ell = 0$ tratto EDA

$V = q\ell$

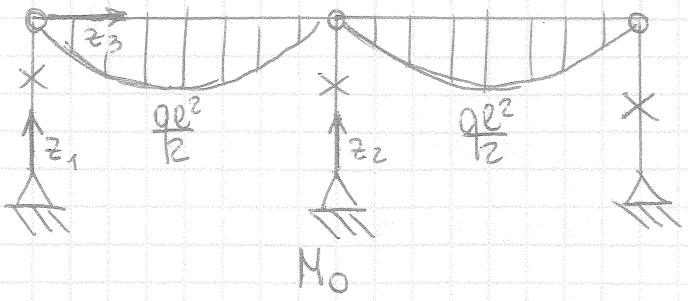
↑) $V_B = 2q\ell$



N_0



T_0



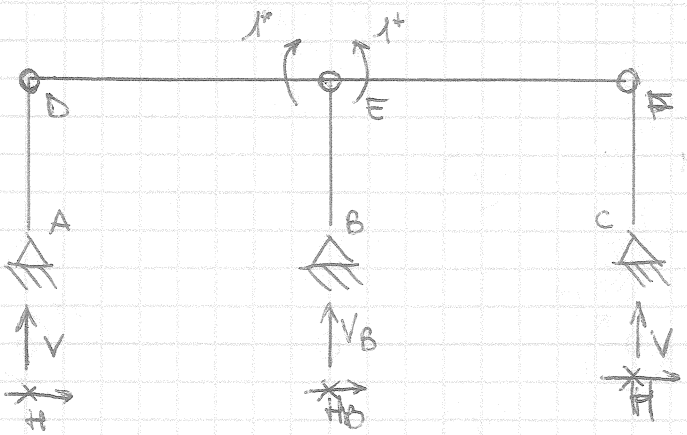
M_0

$M_0(z_1) = 0$

$M_0(z_2) = 0$

$M_0(z_3) = qlz - \frac{qz^2}{2}$

SISTEMA (1)



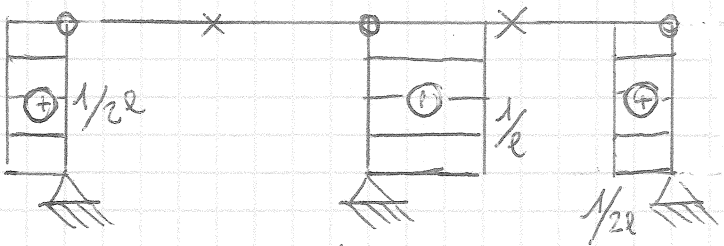
D) $H = 0$

→) $H_B = 0$

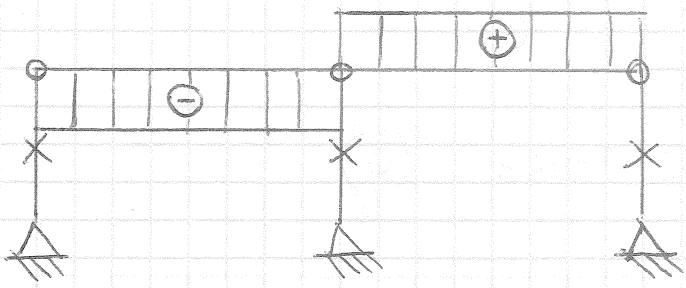
E) $-1 - V 2l = 0$ tratto EDA

$V = -1/2l$

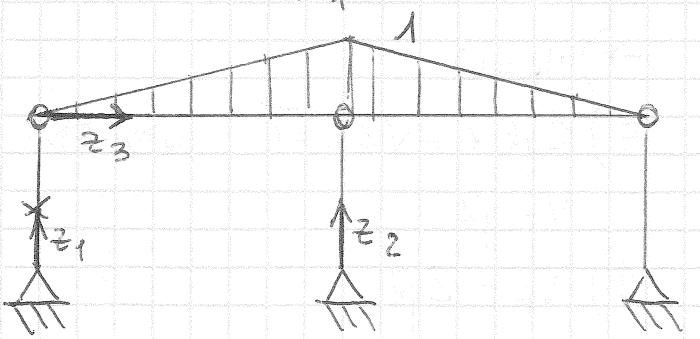
↑) $V_B = 1/l$



N_1



T_1



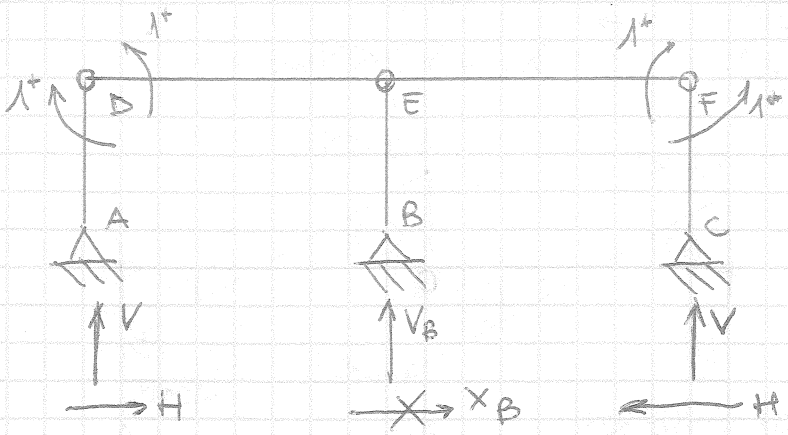
M_1

$M_1(z_1) = 0$

$M_1(z_2) = 0$

$M_1(z_3) = -\frac{z}{2l}$

SISTEMA (2)



tratto AD

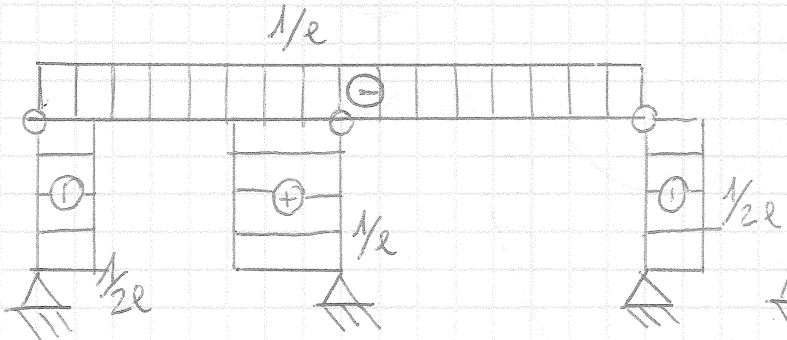
D) $-1 + H \cdot \ell = 0 \quad H = 1/\ell$

→) $H_B = 0$

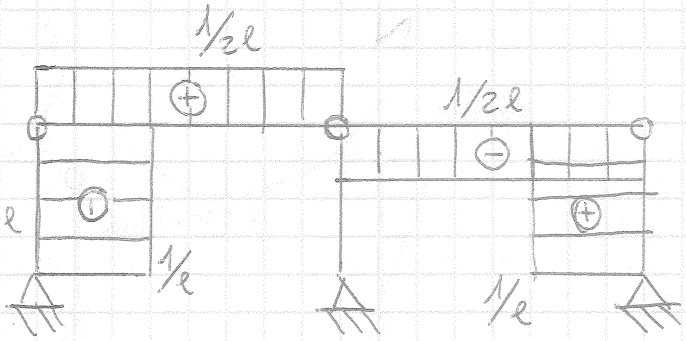
E) $H \cdot \ell - V 2\ell = 0$ Tratto EDA

$V = 1/2\ell$

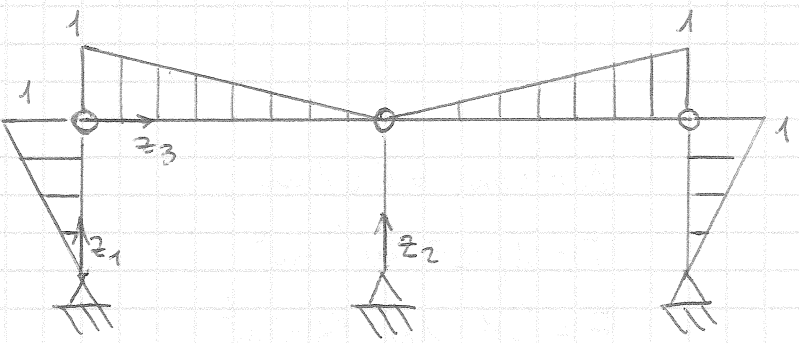
↑) $V_B = -1/\ell$



N_2



T_2



$$M_2(z_1) = -\frac{z}{\ell}$$

$$M_2(z_2) = 0$$

$$M_2(z_3) = -1 + \frac{z}{2\ell}$$

$$\eta_{10} = \frac{2}{EJ} \int_0^{2\ell} \left(q\ell z - \frac{q z^2}{2}\right)\left(-\frac{z}{2\ell}\right) dz = -\frac{2}{3}\frac{q\ell^3}{EJ}$$

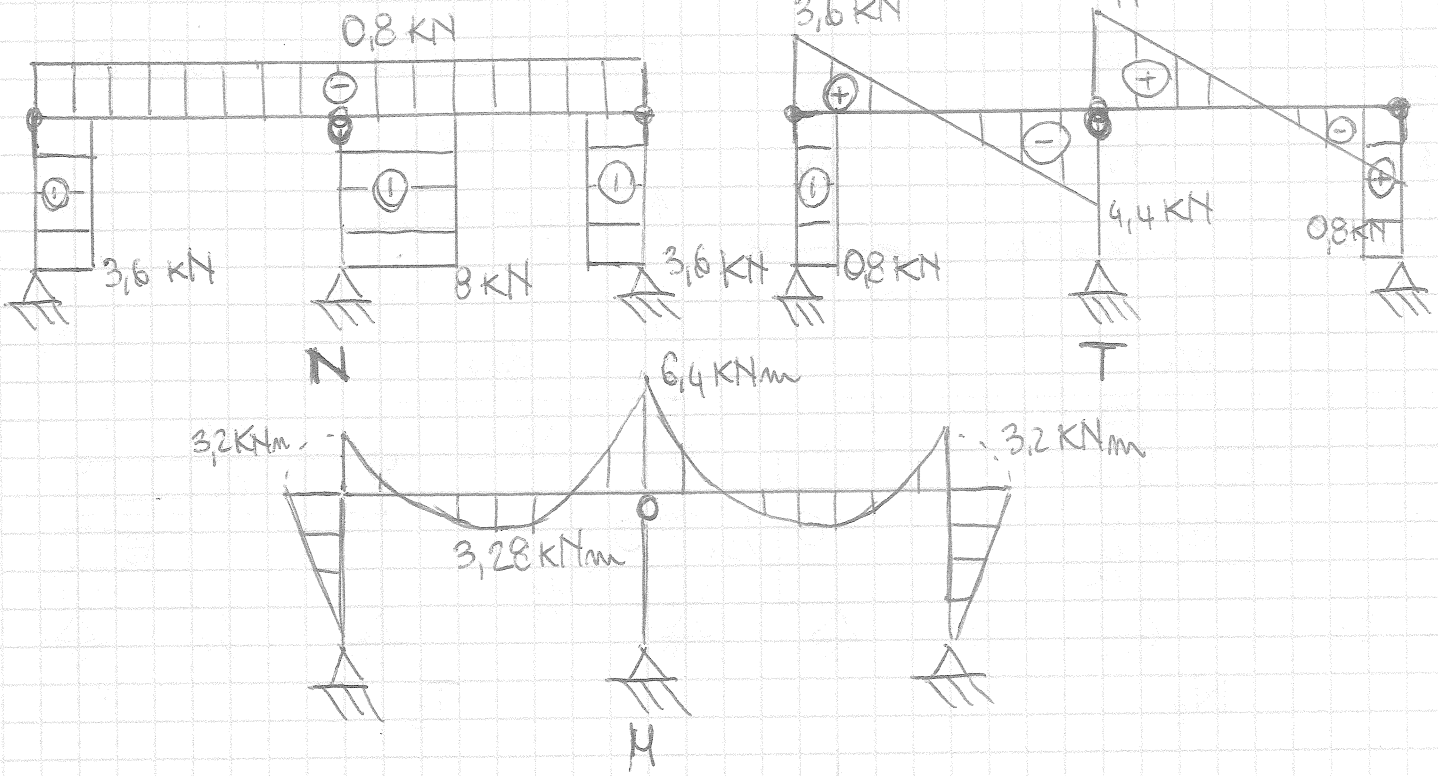
$$\eta_{20} = \frac{2}{EJ} \int_0^{2\ell} \left(q\ell z - \frac{q z^2}{2}\right)\left(-1 + \frac{z}{2\ell}\right) dz = -\frac{2}{3}\frac{q\ell^3}{EJ}$$

$$\eta_{11} = \frac{2}{EJ} \int_0^{2\ell} \left(-\frac{z}{2\ell}\right)^2 dz = \frac{4}{3}\frac{\ell}{EJ}$$

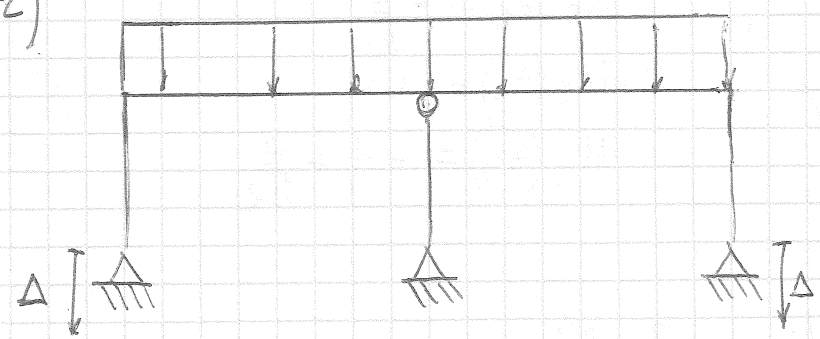
$$\eta_{22} = \frac{2}{EJ} \int_0^{\ell} \left(-\frac{z}{\ell}\right)^2 dz + \frac{2}{EJ} \int_0^{2\ell} \left(-1 + \frac{z}{2\ell}\right)^2 dz = \frac{2\ell}{EJ}$$

$$\eta_{12} = \frac{2}{EJ} \int_0^{2\ell} \left(-\frac{z}{2\ell}\right)\left(-1 + \frac{z}{2\ell}\right) dz = \frac{2}{3}\ell$$

$$\begin{cases} \frac{4}{3}\frac{\ell}{EJ}\cdot x_1 + \frac{2}{3}\frac{\ell}{EJ}\, x_2 = \frac{2}{3}\frac{q\ell^3}{EJ} \\ \frac{2}{3}\frac{\ell}{EJ}\cdot x_1 + 2\frac{\ell}{EJ}\, x_2 = \frac{2}{3}\frac{q\ell^3}{EJ} \end{cases} \rightarrow \begin{array}{l} x_1 = 6{,}4\ \text{KNm} \\ x_2 = 3{,}2\ \text{KNm} \end{array}$$



2)

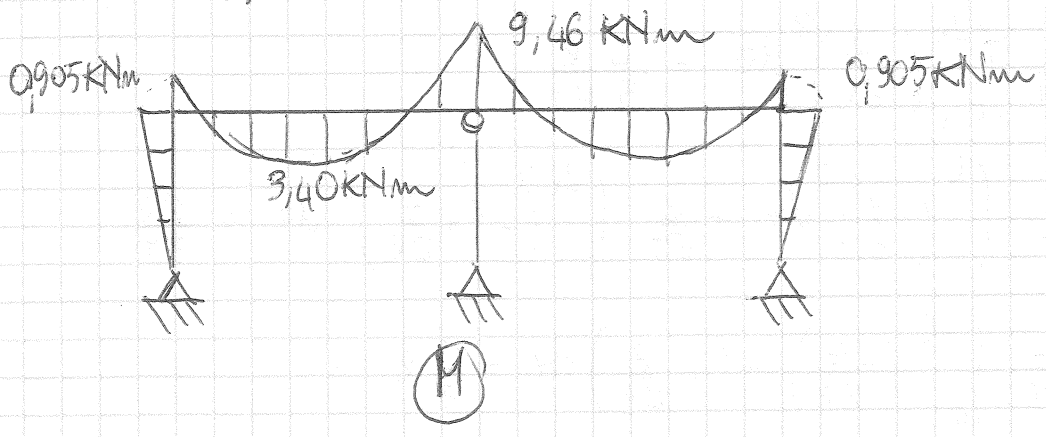


$\Delta = 1\,\text{cm} = 0{,}01\,\text{m}$

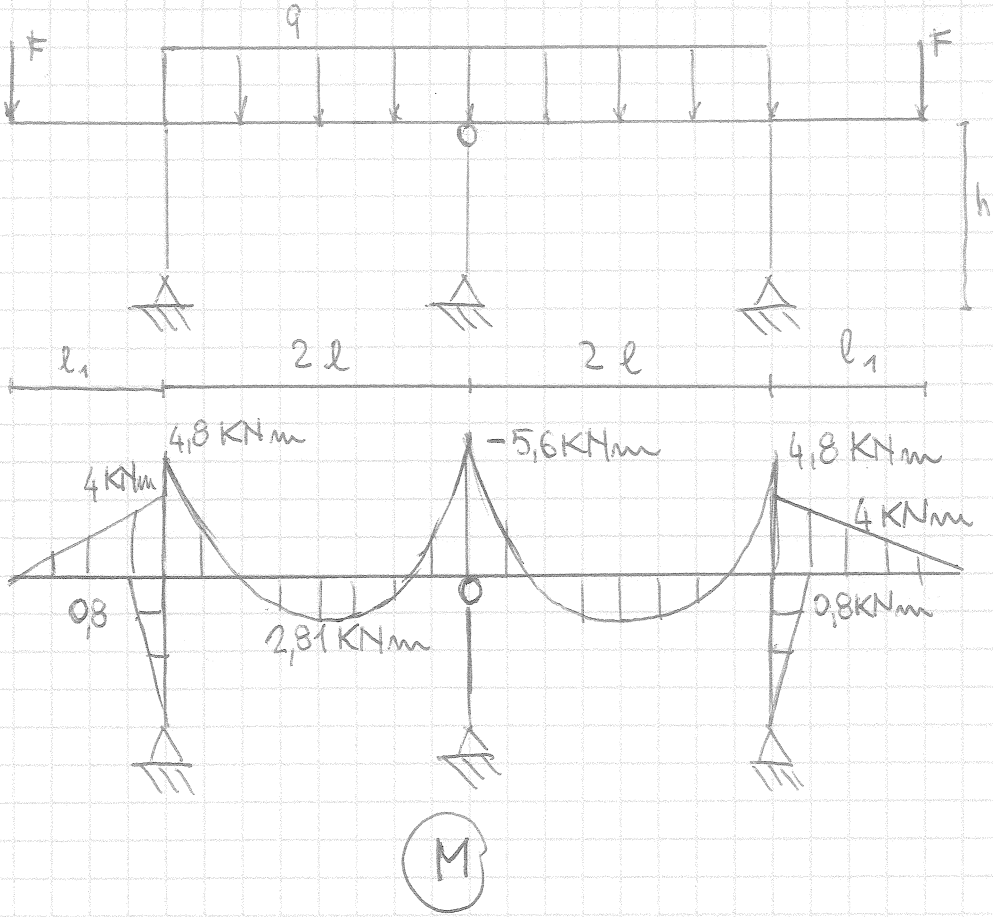
$J = 1{,}943 \cdot 10^{-5}\ \text{m}^4$

$E = 2{,}1 \cdot 10^{8}\ \text{KN/m}^2$

$$\begin{cases} \frac{4}{3}\frac{\ell}{EJ}\cdot x_1 + \frac{2}{3}\frac{\ell}{EJ}\, x_2 - \frac{2}{3}\frac{q\ell^3}{EJ} = 2\cdot\frac{1}{2\ell}\cdot\Delta \\ \frac{2}{3}\frac{\ell}{EJ}\cdot x_1 + 2\frac{\ell}{EJ}\cdot x_2 - \frac{2}{3}\frac{q\ell^3}{EJ} = -2\cdot\frac{1}{2\ell}\cdot\Delta \end{cases} \rightarrow \begin{array}{l} x_1 = 9{,}46\ \text{KNm} \\ x_2 = 0{,}905\ \text{KNm} \end{array}$$



3)



M

$F = 1000\ N$

$l_1 = 4\ m$

$l_1 = l$