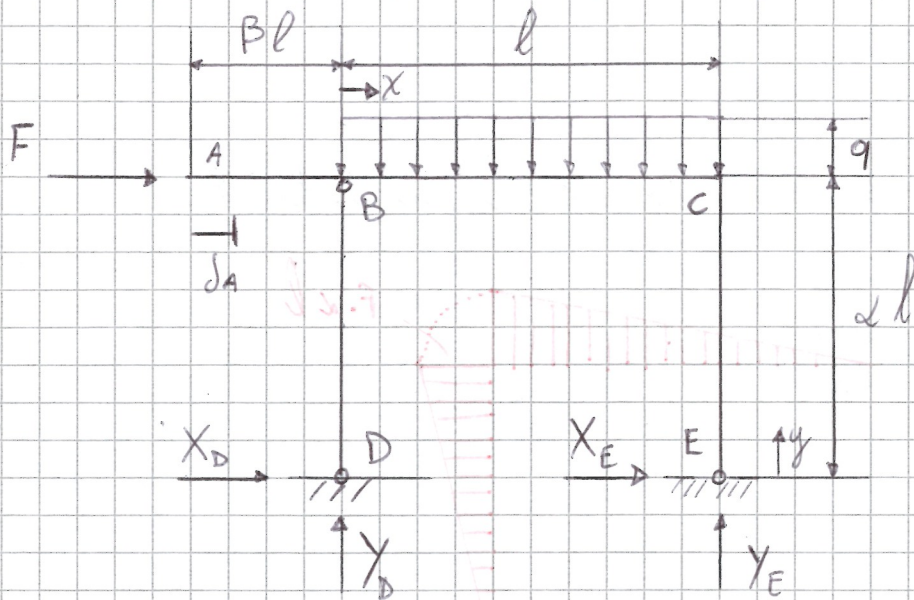


# Traccia del 26/01/2023. "Esercizio 1.



- Calcolo delle reazioni vincolari, la struttura è isostatica.

$$\rightarrow + ] F + X_D + X_E = 0 \rightarrow X_E = -F$$

$$\uparrow + ] -q \cdot l + Y_D + Y_E = 0 \rightarrow Y_E = F \cdot d + q \frac{l}{2}$$

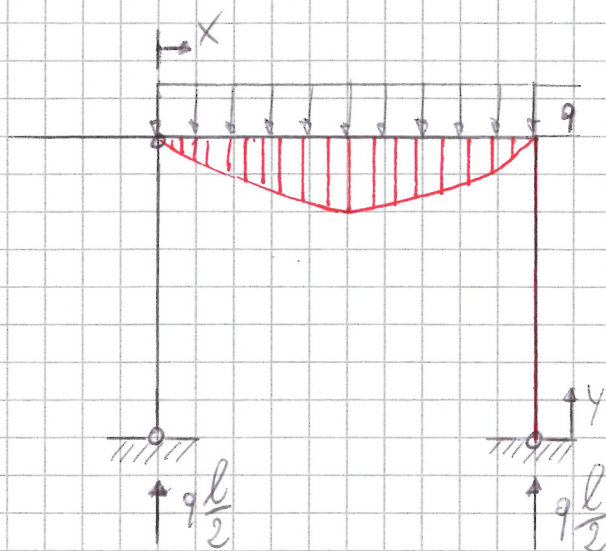
$$\curvearrow + ] q \cdot l \cdot \frac{l}{2} - F \cdot d \cdot l - Y_D \cdot l = 0 \rightarrow Y_D = q \frac{l}{2} - F \cdot d$$

DB è una biella ]  $X_D = 0$

$$\{r_{01}\} = 0 ; \{r_{02}\} = \frac{1}{2} ; \{r_{03}\} = 0 ; \{r_{04}\} = \frac{1}{2}$$

$$\{r_{05}\} = 0 ; \{r_{06}\} = -d ; \{r_{07}\} = -1 ; \{r_{08}\} = +d$$

- Calcolo del momento flettente considerando solo  $q$ .

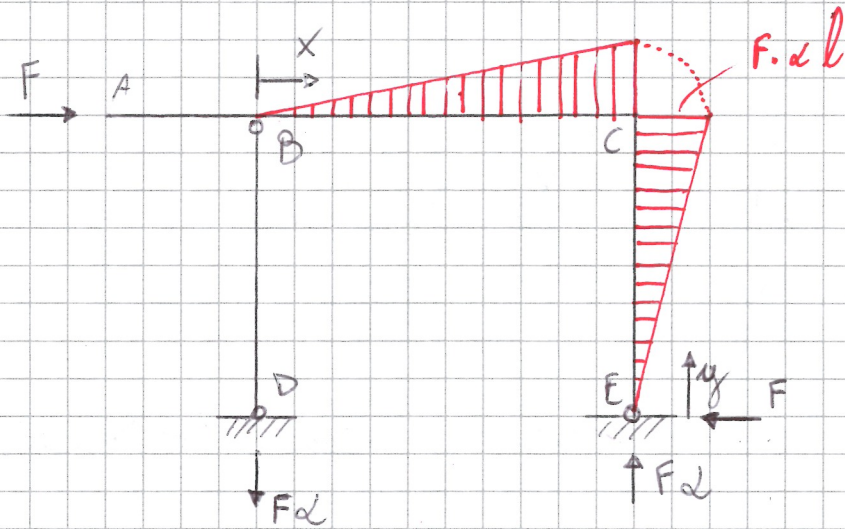


$$M_{BCq}(x) = q \cdot x \cdot \frac{x}{2} = q \frac{x^2}{2}$$

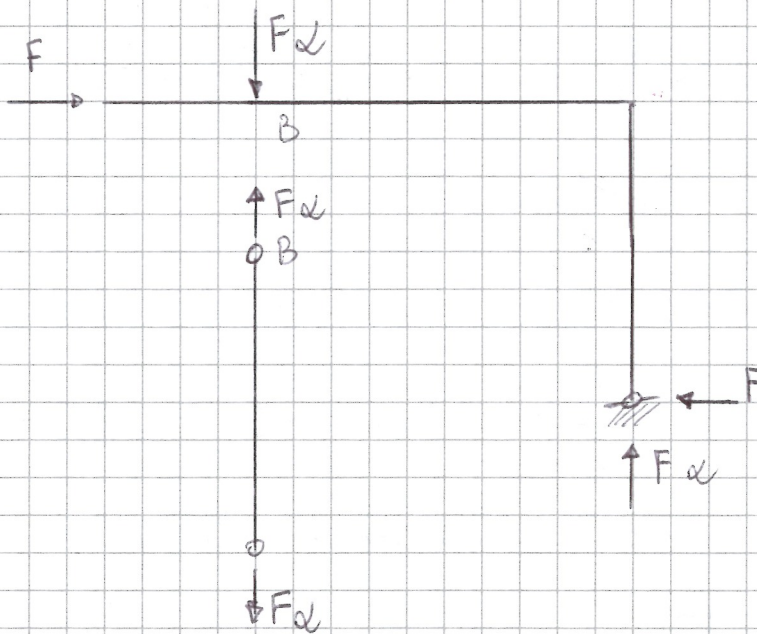
... momento:  $\frac{1}{2} q x^2$  ...

$$M_{ECq}(y) = 0$$

• Calcolo del momento flettente considerando solo F.



Per capire meglio cosa succede in B:



$$M_{BCF}(x) = -F_d \cdot x$$

$$M_{ECF}(y) = -F \cdot y$$

$$\{r_{09}\} = \frac{1}{2}; \{r_{10}\} = 0; \{r_{11}\} = 0; \{r_{12}\} = 0; \{r_{13}\} = 0; \{r_{14}\} = 0;$$

$$\{r_{15}\} = -d; \{r_{16}\} = 0; \{r_{17}\} = -1; \{r_{18}\} = 0$$

• Calcolo lo spostamento orizzontale al punto A utilizzando Castigliano.

$$U = \int_0^l \frac{M_f^2(x)}{2ES} dx + \int_0^{dl} \frac{M_f^2(y)}{2ES} dy =$$

$$= \int_0^l \frac{q^2 \frac{x^4}{4} + F^2 d^2 x^2}{2ES} dx + \int_0^{dl} \frac{0 + F^2 y^2}{2ES} dy =$$

$$= \frac{20 F^2 l^3 d^2 + 3 l^5 q^2}{120 ES} + \frac{F l^3 d^3}{6 ES}$$

$$\delta_A = \frac{\partial U}{\partial F} = \frac{F l^3 d^2}{3 ES} + \frac{F l^3 d^3}{3 ES} = \frac{F l^3}{ES} \left( \frac{d^2 + d^3}{3} \right)$$

$$\left\{ \begin{array}{l} \delta_1 \\ \delta_2 \end{array} \right\} = \frac{d^2 + d^3}{3} \quad \left\{ \begin{array}{l} \delta_1 \\ \delta_2 \end{array} \right\} = 0$$