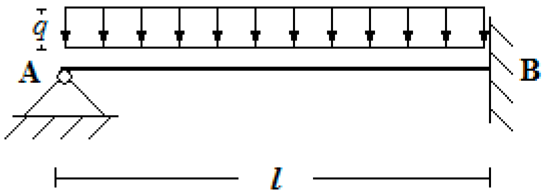
Determinare l'equazione della linea elastica per il sistema



Applicando l'equazione differenziale del quarto ordine $EIv^{IV}(z) = q(z)$, si ha :

$$EIv^{IV}(z) = q$$

$$EIv'''(z) = qz + c_1 = -T(z)$$

$\overline{AB}$

$0 \le z \le l$

$$EIv''(z) = q\frac{z^2}{2} + c_1 z + c_2 = -M(z)$$

$$EIv'(z) = q\frac{z^3}{6} + c_1\frac{z^2}{2} + c_2 z + c_3 = -\varphi(z)$$

$$EIv(z) = q\frac{z^4}{24} + c_1\frac{z^3}{6} + c_2\frac{z^2}{2} + c_3 z + c_4$$

Dalle condizioni al contorno:

$$v_A(0) = 0 \quad \rightarrow \quad c_4 = 0$$

$$M_A(0) = 0 \quad \rightarrow \quad -c_2 = 0$$

$$v_B(l) = 0 \quad \rightarrow \quad \frac{ql^4}{24} + c_1\frac{l^3}{6} + c_3 l = 0$$

$$\varphi_B(l) = 0 \quad \rightarrow \quad -\frac{ql^3}{6} - c_1\frac{l^2}{2} - c_3 = 0$$

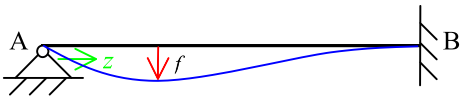
Risolvendo il sistema:

$$c_1 = -\frac{3ql}{8} \quad , \quad c_2 = 0 \quad , \quad c_3 = \frac{ql^3}{48} \quad , \quad c_4 = 0$$

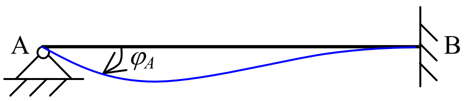
da cui:

$$\varphi(z) = -\frac{qz^3}{6EI} + \frac{3qlz^2}{16EI} - \frac{ql^3}{48EI}$$

$$v(z) = \frac{qz^4}{24EI} - \frac{qlz^3}{16EI} + \frac{ql^3 z}{48EI}$$



La freccia è posizionata in $z = \left(\frac{1+\sqrt{33}}{16}\right) l \approx 0,42l$, con valore $f = \frac{\left(29+55\sqrt{33}\right)ql^4}{65536EI} \approx 0,0052\frac{ql^4}{EI}$



$$\varphi_A = -\frac{ql^3}{48EI}$$