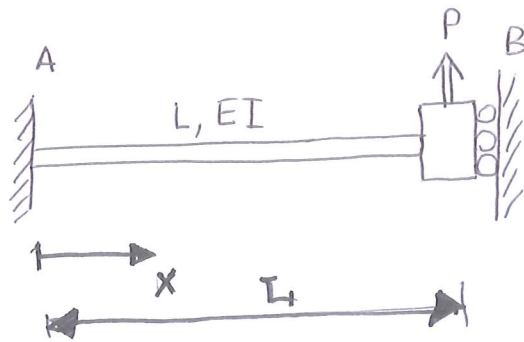


2.4.123

GIVET:



SÖKT: Beräkna balkens transversella förskjutning  $w$  vid kraften  $P$ . ( $w(L)$ )

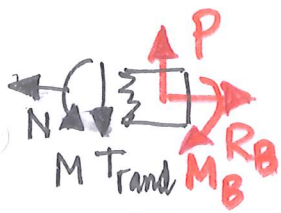
LÖSNING:

(1) Elastiska linsens ekv:

$$EI w''''(x) = 0 \quad (1)$$

(2) Randvillkor:

$$\text{I A } (x_0 = 0) \quad \begin{cases} w(x_0) = 0 & (2) \\ w'(x_0) = 0 & (3) \end{cases}$$



$$\text{I B } (x_0 = L) \quad \begin{cases} w'(x_0) = 0 & (4) \\ -EI w'''(x_0) = T_{rand} = P & (5) \end{cases}$$

(3) Integrera (1):

$$EI w''''(x) = 0 \quad (6)$$

$$EI w'''(x) = C_1 x + C_2 \quad (7)$$

$$EI w''(x) = \frac{C_1 x^2}{2} + C_2 x + C_3 \quad (8)$$

$$EI w(x) = \frac{C_1 x^3}{6} + \frac{C_2 x^2}{2} + C_3 x + C_4$$

$$w(x) = \frac{C_1 x^3}{6EI} + \frac{C_2 x^2}{2EI} + \frac{C_3 x}{EI} + \frac{C_4}{EI} \quad (9)$$

4) los:

(2) i (9):

$$0 = w(0) \Rightarrow \boxed{C_4 = 0} \quad (10)$$

(10), (3) i (8)

$$0 = w'(0) \Rightarrow \boxed{C_3 = 0} \quad (11)$$

(11) (10) (4) i (8):

$$w'(L) = \frac{C_1 L^2}{2EI} + \frac{C_2 L}{EI} = 0$$

$$\underline{C_1 = -\frac{2C_2}{L}} \quad (12)$$

(5) i (6)

$$-EI w'''(L) = -C_1 = P \Rightarrow \boxed{C_1 = -P} \quad (13)$$

$$(13) \text{ i } (12): \boxed{C_2 = +\frac{PL}{2}}$$

$$w(x) = -\frac{Px^3}{6EI} + \frac{PLx^2}{4EI}$$

$$w(L) = -\frac{PL^3}{6EI} + \frac{PL^3}{4EI} = \frac{PL^3}{12EI}$$

$$\boxed{w(L) = \frac{PL^3}{12EI}}$$

$$\left[ \frac{Nm^3}{m^2 m^4} = m. \right] \text{ OK}$$