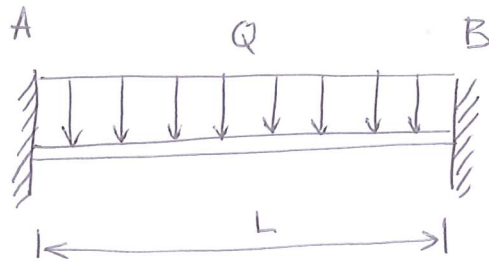


2.4.120

GIVET:



Böjstyvhet.

SDKT: → ändmomenten:  $\begin{cases} M_A = -EI w''(0) \\ M_B = -EI w''(L) \end{cases}$

→ nedböjningen i mitten:  $w(L/2)$

LÖSNING:

① Harkiska linsens elevation:

$$EI w''''(x) = -\frac{Q}{L} \quad (1)$$

② Randvillkor:

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

$$x_0 = L \quad \begin{cases} w(x_0) = 0 & (4) \\ w'(x_0) = 0 & (5) \end{cases}$$

③ Integrera (1).

$$EI w''''(x) = -\frac{Q}{L} x + C_1 \quad (6)$$

$$EI w'''(x) = -\frac{Q}{2L} x^2 + C_1 x + C_2 \quad (7)$$

$$EI w''(x) = -\frac{Q x^3}{6L} + \frac{C_1 x^2}{2} + C_2 x + C_3 \quad (8)$$

$$EI w'(x) = -\frac{Q x^4}{24L} + \frac{C_1 x^3}{6} + \frac{C_2 x^2}{2} + C_3 x + C_4$$

$$w(x) = -\frac{Q x^5}{24LEI} + \frac{C_1 x^3}{6EI} + \frac{C_2 x^2}{2EI} + \frac{C_3 x}{EI} + \frac{C_4}{EI} \quad (9)$$

(4) WSS:

$$(2) \quad i(9) \Rightarrow w(0) = 0 = \boxed{c_4 = 0} \quad (10)$$

$$(3) \quad i(8) \Rightarrow w'(0) = c_3 = 0 \quad \boxed{c_3 = 0} \quad (11)$$

$$(4) \quad i(9) \Rightarrow \frac{-QL^3}{24EI} + \frac{c_1 L^3}{6EI} + \frac{c_2 L^2}{2EI} = 0$$

$$0 = \frac{-QL^3}{12} + \frac{c_1 L^3}{3} + c_2 L^2 \quad (12)$$

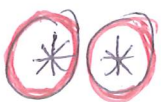
$$(3) \quad i(8) \Rightarrow \frac{1}{EI} \left( -\frac{QL^2}{6} + \frac{c_1 L^2}{2} + c_2 L \right) = 0$$

$$0 = -\frac{QL^2}{6} + \frac{c_1 L^2}{2} + c_2 L \quad (13)$$

$$L \cdot (13) - (12) \Rightarrow -\frac{QL^3}{6} + \frac{c_1 L^3}{2} + \frac{QL^3}{12} - \frac{c_1 L^3}{3} = 0$$

$$\boxed{c_1 = QL/2}$$

$$c_2 = \frac{1}{L} \left( +\frac{QL^2}{6} - \frac{Q}{2} \frac{L^2}{2} \right) \Rightarrow \boxed{c_2 = -\frac{QL}{12}}$$



Ändmomenten:

$$M(0) = -EI w''(0) = \frac{QL}{12} = M_A$$

$$M(L) = -EI w''(L) = \frac{QL}{12} = M_B$$

Nedböjningen i

$$\text{miten} \quad w(L/2) = \frac{1}{EI} \left( -\frac{Q}{24L} (L/2)^4 + \frac{Q}{2} \frac{(L/2)^3}{3} - \frac{QL}{12} (L/2)^2 \right)$$

$$\underline{w(L/2) = -\frac{QL^3}{384EI}}$$

$$\left\{ \begin{array}{l} w(x) = \frac{1}{EI} \left( -\frac{Qx^4}{24L} + \frac{Qx^3}{12} - \frac{QLx^2}{24} \right) \\ EI w''(x) = -\frac{Q}{2L} x^2 + \frac{Q}{2} x - \frac{Q}{12} L. \end{array} \right.$$