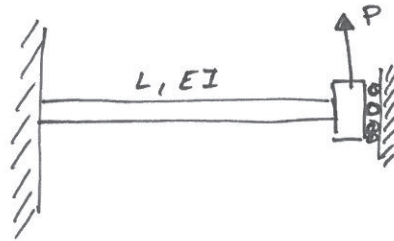


2.4.123

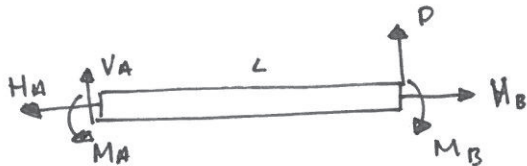
Givet



Sökt Bestäm transversell förskjutning vid kraften P

Lösning

1. Frilägg



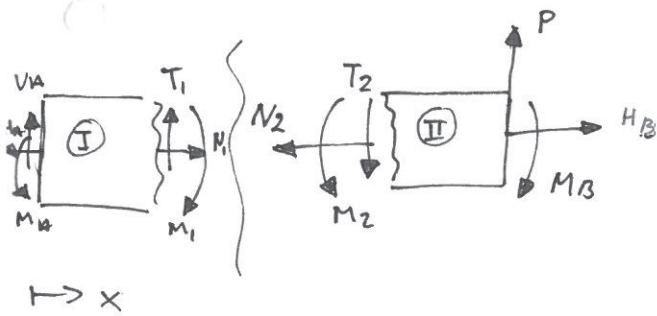
2. Jmv

$$\uparrow \sum V: V_A + P = 0 \Rightarrow V_A = -P$$

$$\rightarrow \sum H: -H_A + H_B = 0 \Rightarrow H_A = H_B$$

$$\curvearrowright \sum M: M_A + P \cdot L - M_B = 0 \Rightarrow M_A - M_B = -P \cdot L$$

3. Snitta



4. Jmv

$$\uparrow \sum I: V_A + T_1 = 0 \Rightarrow T_1 = -V_A$$

$$\rightarrow \sum I: -H_A - N_1 = 0 \Rightarrow N_1 = -H_A$$

$$\curvearrowright \sum I: -M_1 + M_A - V_A \cdot x = 0 \Rightarrow M_1 = M_A - V_A \cdot x$$

$$\uparrow \sum II: -T_2 + P = 0 \Rightarrow T_2 = P$$

$$\rightarrow \sum II: -N_2 + H_B = 0 \Rightarrow N_2 = H_B$$

$$\curvearrowright \sum II: M_2 + (L-x) \cdot P - M_B = 0 \Rightarrow M_2 = M_B - (L-x) \cdot P$$

5. Elastiska linjens ekvation

$$[EI w''''(x)]'' = q(x) + [M']'' \Rightarrow [EI w''''(x)]'' = 0$$

6. Randvillkor

| | Vänster | Höger |
|---------|-------------------------------|---|
| FS.6.22 | Fast inspänd $w(x=0) = 0$ | Glid. inspänd m. yttre kraft $w'(x=L) = 0$ |
| FS.6.23 | Fast inspänd $w'(x=0) = 0$ | Glid. inspänd m. yttre kraft $w''''(x=L) = -P$ |

2.4.123

forts. 1

7. Integrera

$$1. \frac{\partial^2}{\partial x^2} \left(EI \frac{\partial^2 w}{\partial x^2} \right) = 0$$

$$2. \frac{\partial}{\partial x} \left(EI \frac{\partial^2 w}{\partial x^2} \right) = C_1$$

$$3. EI \frac{\partial^2 w}{\partial x^2} = C_1 \cdot x + C_2$$

$$4. EI \frac{\partial w}{\partial x} = \frac{C_1}{2} \cdot x^2 + C_2 \cdot x + C_3$$

$$5. EI \cdot w(x) = \frac{C_1}{6} \cdot x^3 + \frac{C_2}{2} \cdot x^2 + C_3 \cdot x + C_4$$

\Rightarrow Bestäm C_1, C_2, C_3, C_4 m.h.a. B.V. från steg 6

$$\dots \Rightarrow \begin{cases} C_1 = -P \\ C_2 = \frac{PL}{2} \\ C_3 = 0 \\ C_4 = 0 \end{cases} \Rightarrow w(x) = \frac{-P}{6EI} \cdot x^3 + \frac{PL}{4} \cdot x^2$$

Den transversella förskjutningen vid B är den samma som

$$w(x=L) \quad \text{dvs} \quad \underline{\underline{\Delta_B = w(x=L) = \frac{PL^3}{12EI}}}$$