

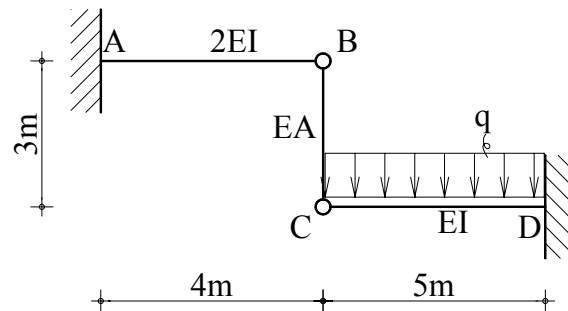
1.13. Za sustav prikazan na crtežu potrebno je odrediti opterećenje  $q$  koje djeluje na gredi CD ako progib točke B iznosi 0.2cm.

$$E = 20 \cdot 10^4 \frac{\text{kN}}{\text{cm}^2}$$

$$I = 9000 \text{cm}^4$$

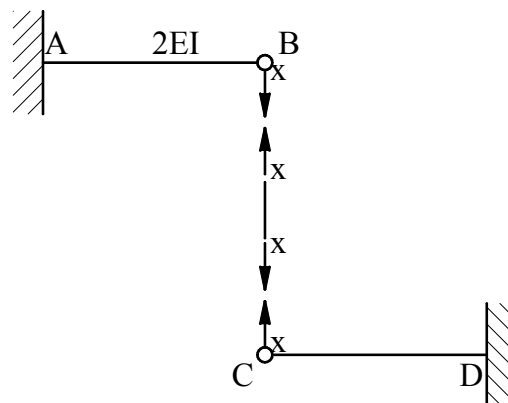
$$A = 2.5 \text{cm}^2$$

$$\Delta_B = 2 \text{cm}$$



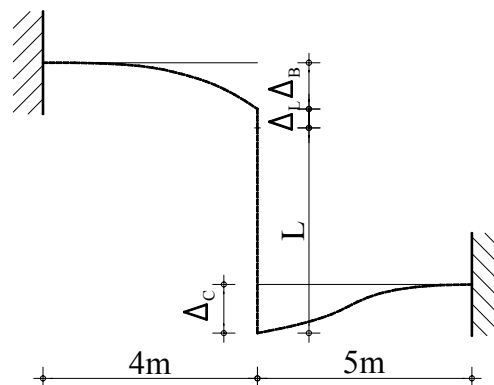
### Uvjet deformacija

Poznat je progib u točki B, koji nastaje kao posljedica djelovanja sile u zatezi BC. Potrebno je odrediti nepoznatu silu, te pomoću nje izračunati progib točke C, te odrediti nepoznatu veličinu raspodijeljenog opterećenja.



$$\Delta_B = 0.2 \text{cm} = \frac{x \cdot (4\text{m})^3}{3(2EI)} \Rightarrow x = \frac{0.2 \text{cm} \cdot 3(2EI)}{(4\text{m})^3} = 33.75 \text{kN}$$

Sada je potrebno odrediti progib točke C i iz tog podatka odrediti nepoznato opterećenje.



$$\Delta_C = \Delta_B + \Delta_L$$

$$\Delta_C = 0.2\text{cm} + \frac{x \cdot 3\text{m}}{E \cdot A}$$

Pomak točke C odgovara i jednakosti

$$\Delta_C = \frac{q \cdot (5\text{m})^4}{8EI} - \frac{x \cdot (5\text{m})^3}{3EI}$$

Pa dobivamo:

$$\frac{q \cdot (5\text{m})^4}{8EI} - \frac{x \cdot (5\text{m})^3}{3EI} = 0.2\text{cm} + \frac{x \cdot 3\text{m}}{E \cdot A}$$

$$q = \left(0.2\text{cm} + \frac{x \cdot 3\text{m}}{E \cdot A} + \frac{x \cdot (5\text{m})^3}{3EI}\right) \cdot \frac{8EI}{(5\text{m})^4}$$

$$q = \left(0.2\text{cm} + \frac{33.75\text{kN} \cdot 3\text{m}}{20 \cdot 10^4 \frac{\text{kN}}{\text{cm}^2} \cdot 2.5\text{cm}^2} + \frac{33.75\text{kN} \cdot (5\text{m})^3}{3 \cdot 20 \cdot 10^4 \frac{\text{kN}}{\text{cm}^2} \cdot 9000\text{cm}^4}\right) \cdot \frac{8 \cdot 20 \cdot 10^4 \frac{\text{kN}}{\text{cm}^2} \cdot 9000\text{cm}^4}{(5\text{m})^4}$$

$$q = (0.2\text{cm} + 0.02025\text{cm} + 0.78) \cdot 0.2304 \frac{\text{kN}}{\text{cm}^2}$$

$$q = 0.2307 \frac{\text{kN}}{\text{cm}} = 23.07 \frac{\text{kN}}{\text{m}}$$