Remarks: See §5.4.2 example 1, pages 322 till 335

Answers:

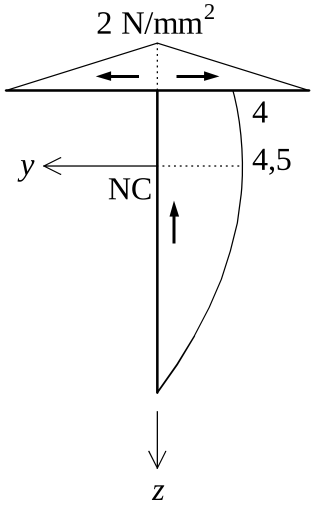
b. in cross-section B

$\sigma_{bottom} = -100 \text{ N/mm}^2$

$\sigma_{top} = +6,67 \text{ N/mm}^2$

c. $\tau_{max} = 4,5 \text{ N/mm}^2$ in span AB

d. $\tau_{max} = 9 \text{ N/mm}^2$ in span BC




Explanation:

a. $M_{z;max} = -80 \text{ kNm}$ in B

$V_z = -20 \text{ kN}$, constant in span AB

$V_z = +40 \text{ kN}$, constant in span BC

$N = -240 \text{ kN}$, constant over the whole length

b. in B: $\sigma = \dfrac{-240\times10^3 \text{ N}}{12\times10^3 \text{ mm}^2} + \dfrac{(-80\times10^6 \text{ Nmm})\times z}{450\times10^6 \text{ mm}^4}$

c. See figure.

The shear stress distribution in the web is parabolic with:

$$\tau_{max;web} = \left|\frac{(-20\times10^3 \text{ N})(\pm1012,5\times10^3 \text{ mm}^3)}{(10 \text{ mm})(450\times10^6)}\right| = 4,5 \text{ N/mm}^2$$

This shear stress occurs at the height of the normal centre NC

The shear stress in the flange varies linearly:

$$\tau_{max;flange} = \left|\frac{(-20\times10^3 \text{ N})(\pm450\times10^3 \text{ mm}^3)}{(10 \text{ mm})(450\times10^6)}\right| = 2 \text{ N/mm}^2$$

This maximum shear stress occurs at the connection with the web

d. This is the same as part c, only with $V_z$ being twice as large and its direction reversed.