Remarks: See §4.4, pages 168 till 170
See §5.4.3 pages 345 till 355
See §6.3.1, pages 427 till 437

Answers:

a. $\tau = 5{,}8 \text{ N/mm}^2$

b. Inclined webs - parabolic shear stress distribution:
$\tau_{\max} = 7{,}7 \text{ N/mm}^2$; At the height of the NC
Bottom flange – linear shear stress variation:
$\tau_{\max} = 5{,}8 \text{ N/mm}^2$; at the corner

c. $\tau_{\max} = 13{,}5 \text{ N/mm}^2$; in the left flange, at the height of the NC.

d. $\sigma_b = -38{,}5 \text{ N/mm}^2$
$\sigma_t = +77 \text{ N/mm}^2$

Explanation:

$I_{zz} = 540 \times 10^6 \text{ mm}^4$ (Using *y*-*z*-coordinates with the *z*-axes along the symmetric-axis and the *z*-axis positive in towards the bottom)

a. With Bredt's formula:

$$\tau = \frac{(60 \times 10^3 \text{ N})(300 \text{ mm})}{2 \times (\tfrac{1}{2} \times 600 \times 300\sqrt{3} \text{ mm}^2)(10 \text{ mm})} = 5{,}8 \text{ N/mm}^2$$

b. $$\tau_{\max;web} = \frac{(60 \times 10^3 \text{ N})(800\sqrt{3} \times 10^3 \text{ mm}^3)}{(2 \times 10 \text{ mm})(540 \times 10^6 \text{ mm}^4)} = 7{,}7 \text{ N/mm}^2$$

$$\tau_{\max;\text{flange}} = \frac{(60 \times 10^3 \text{ N})(600\sqrt{3} \times 10^3 \text{ mm}^3)}{(2 \times 10 \text{ mm})(540 \times 10^6 \text{ mm}^4)} = 5{,}8 \text{ N/mm}^2$$

c. $\tau_{\max} = (5{,}8 \text{ N/mm}^2) + (7{,}7 \text{ N/mm}^2) = 13{,}5 \text{ N/mm}^2$ ($\swarrow$)

d. Clamped Cross-section: $M_z = -120 \times 10^6$ Nmm

$$\sigma_b = \frac{(-120 \times 10^6 \text{ Nmm})(+100\sqrt{3} \text{ mm})}{540 \times 10^6 \text{ mm}^4} = -38{,}5 \text{ N/mm}^2$$

$$\sigma_t = \frac{(-120 \times 10^6 \text{ Nmm})(-200\sqrt{3} \text{ mm})}{540 \times 10^6 \text{ mm}^4} = +77 \text{ N/mm}^2$$