Remarks: See §5.4.3 pages 345 till 355
See §6.3.1, pages 427 till 437
See §6.4, example 5 till 8, pages 458 till 468

Answers:

a. $\tau_{max;flange} = 0,68\ N/mm^2$ $\tau_{max;web} = 1,69\ N/mm^2$
(τ constant over the wall thickness)

b. open cross-section (τ varies linearly over the wall thickness):
$\tau_{max;flange} = 7\ N/mm^2$ $\tau_{max;web} = 3,5\ N/mm^2$
Closed cross-section (τ constant over the wall thickness):
$\tau_{flange} = 0,16\ N/mm^2$ $\tau_{web} = 0,32\ N/mm^2$

c. open cross-section: $\tau_{max} = 7,68\ N/mm^2$

d. Closed cross-section: $\tau_{max} = 2.01\ N/mm^2$

Explanation:

$V_z = 3,78\times10^3\ N$; $M_t = 1,512\times10^3\ Nmm$

Open CS.: $I_{zz} = 56\times10^6\ mm^4$; $I_t = 259,2\times10^3\ mm^4$ (strip)

Closed CS.: $I_{zz} = 56\times10^6\ mm^4$; $A_m = 40\times10^3\ mm^2$ (Bredt)

a. The shear stress in the flanges varies linearly:

$$\tau_{max} = \frac{(3,78\times10^3\ N)(240\times10^3\ mm^3)}{(2\times12\ mm)(56\times10^6\ mm^4)} = 0,68\ N/mm^2$$

The shear stress distribution in the webs is parabolic:

$$\tau_{max} = \frac{(3,78\times10^3\ N)(300\times10^3\ mm^3)}{(2\times6\ mm)(56\times10^6\ mm^4)} = 1,69\ N/mm^2$$

b. Torsion open cross-section:

$$\tau_{max;\ flange} = \frac{(151,2\times10^3\ Nmm)(6\ mm)}{\frac{1}{2}\times(259,2\times10^3\ mm^4)} = 7\ N/mm^2$$

$$\tau_{max;\ web} = \frac{(151,2\times10^3\ Nmm)(3\ mm)}{\frac{1}{2}\times(259,2\times10^3\ mm^4)} = 3,5\ N/mm^2$$

Torsion closed cross-section (Bredt's formula):

$$\tau_{flange} = \frac{151,2\times10^3\ Nmm}{2\times(40\times10^3\ mm^2)(12\ mm)} = 0,16\ N/mm^2$$

$$\tau_{web} = \frac{151,2\times10^3\ Nmm}{2\times(40\times10^3\ mm^2)(6\ mm)} = 0,32\ N/mm^2$$

c. $\tau_{max} = 7,68\ N/mm^2$; in the upper flange bottom left and top right;
in the bottom flange top left and bottom right

d. $\tau_{max} = 2.01\ N/mm^2$; in the right web at the height of the NC.