Remarks: See §5.4.2 322 till 345

Answers:

a. $\tau_a = 3,75\ \text{N/mm}^2$
b. $\tau_b = 6,25\ \text{N/mm}^2$
c. $\tau_c = 2,50\ \text{N/mm}^2$
d. $\tau_{max} = 7,50\ \text{N/mm}^2$

Explanation:

a. $$\tau_a = \frac{(44\times10^3\ \text{N})(270\times10^3\ \text{mm}^3)}{(8\ \text{mm})(396\times10^6\ \text{mm}^4)} = 3,75\ \text{N/mm}^2\ (\downarrow)$$

b. $$\tau_b = \frac{(44\times10^3\ \text{N})(900\times10^3\ \text{mm}^3)}{(2\times8\ \text{mm})(396\times10^6\ \text{mm}^4)} = 6,25\ \text{N/mm}^2\ (\downarrow)$$

c. $$\tau_c = \frac{(44\times10^3\ \text{N})(360\times10^3\ \text{mm}^3)}{(2\times8\ \text{mm})(396\times10^6\ \text{mm}^4)} = 2,5\ \text{N/mm}^2\ (\rightarrow)$$

d. $$\tau_{max} = \frac{(44\times10^3\ \text{N})(1080\times10^3\ \text{mm}^3)}{(2\times8\ \text{mm})(396\times10^6\ \text{mm}^4)} = 7,50\ \text{N/mm}^2\ (\downarrow)$$

Check:

The shear stress in a section d, in the upper flange directly adjacent to a and b, is the same as in section c, but is in the opposite direction.

$$\tau_d = 2,5\ \text{N/mm}^2\ (\leftarrow)$$

This satisfies ‘inflow’ = ‘outflow’:

$$\tau_a + \tau_d = \tau_b$$