Remarks: See §3.3.1, pages 121 till 125

Hints:

The profile data can also be obtained from computer software such as MatrixFrame.

Answers 3.28-1:

a. $A = 13,66 \times 10^3 \text{ mm}^2$

b. $I_{yy} = 153,25 \times 10^6 \text{ mm}^4$

c. $I_{zz} = 132,38 \times 10^6 \text{ mm}^4$

Explanation 3.28-1:

UNP 240 (section properties):

$I_{zz} = 2,48 \times 10^6 \text{ mm}^4$; $I_{yy} = 36 \times 10^6 \text{ mm}^4$; $A = 4,23 \times 10^3 \text{ mm}^2$

The distance between the centroid of UNP 240 and the centroid of the complete cross-section: $z = \frac{1}{2} \times 260 - 22,3 = 107,7 \text{ mm}$. Where 22,3mm is the distance between the centroid of the UNP profile and the edge of web.

Compound Cross-section (dimensions in mm):

b. $I_{yy} = 2 \times \{260 \times 10 \times (120 + 10/2) + 36 \times 10^6\}$

c. $I_{zz} = 2 \times \{2,48 \times 10^6 + 4,23 \times 10^3 \times 107,7^2 + \frac{1}{12} \times 10 \times 260^3\}$

Remarks: See §3.3.1, pages 121 till 125

Hints:

The profile data can also be obtained from computer software such as MatrixFrame.

Answers 3.28-2:

a. $A = 12{,}13 \times 10^3 \text{ mm}^2$

b. $I_{yy} = 40{,}63 \times 10^6 \text{ mm}^4$

c. $I_{zz} = 101{,}16 \times 10^6 \text{ mm}^4$

Explanation 3.28-2:

UNP 180 (section properties):
$I_{zz} = 1{,}14 \times 10^6 \text{ mm}^4$; $I_{yy} = 13{,}5 \times 10^6 \text{ mm}^4$; $A = 2{,}80 \times 10^3 \text{ mm}^2$

Distance between the centroid of UNP 180 and the centroid of the complete cross-section: $z = 90 + 19{,}2 = 109{,}2 \text{ mm}$. Where 19,2mm is the distance between the centroid of the UNP profile and the edge of web.

HE180 B (section properties):
$I_{zz} = 38{,}31 \times 10^6 \text{ mm}^4$; $I_{yy} = 13{,}63 \times 10^6 \text{ mm}^4$; $A = 6{,}53 \times 10^3 \text{ mm}^2$

Compound Cross-section (dimensions in mm):

c. $I_{zz} = 38{,}3 \times 10^6 + 2 \times \{1{,}14 \times 10^6 + 280 \times 10^3 \times 109{,}2^2\}$

Remarks: See §3.3.1, pages 121 till 125

Hints:

The profile data can also be obtained from computer software such as MatrixFrame.

Answers 3.28-3:

a. $A = 13,14 \times 10^3 \ \text{mm}^2$

b. $I_{yy} = 93,67 \times 10^6 \ \text{mm}^4$

c. $I_{zz} = 95,88 \times 10^6 \ \text{mm}^4$

Explanation 3.28-3:

HE160 A (section properties):
$I_{zz} = 6,16 \times 10^6 \ \text{mm}^4$; $I_{yy} = 16,73 \times 10^6 \ \text{mm}^4$; $A = 3,88 \times 10^3 \ \text{mm}^2$

IPE300 (section properties):
$I_{zz} = 83,56 \times 10^6 \ \text{mm}^4$; $I_{yy} = 6,04 \times 10^6 \ \text{mm}^4$; $A = 5,38 \times 10^3 \ \text{mm}^2$
$t_w = 7,1 \ \text{mm}$

Compound Cross-section (dimensions in mm):

b. $I_{yy} = 6,04 \times 10^6 + 2 \times \{16,73 \times 10^6 + 3,88 \times 10^3 \times (80 + 7,1/2)^2\}$