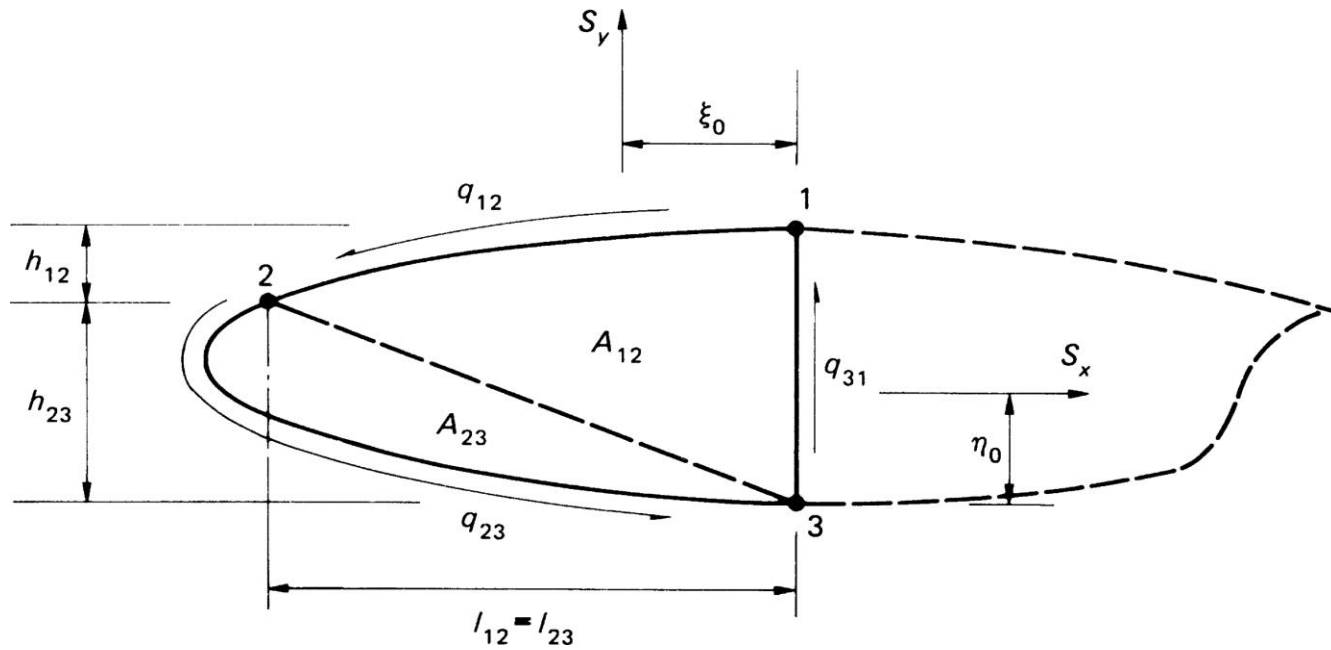# Chapter 23
Wings
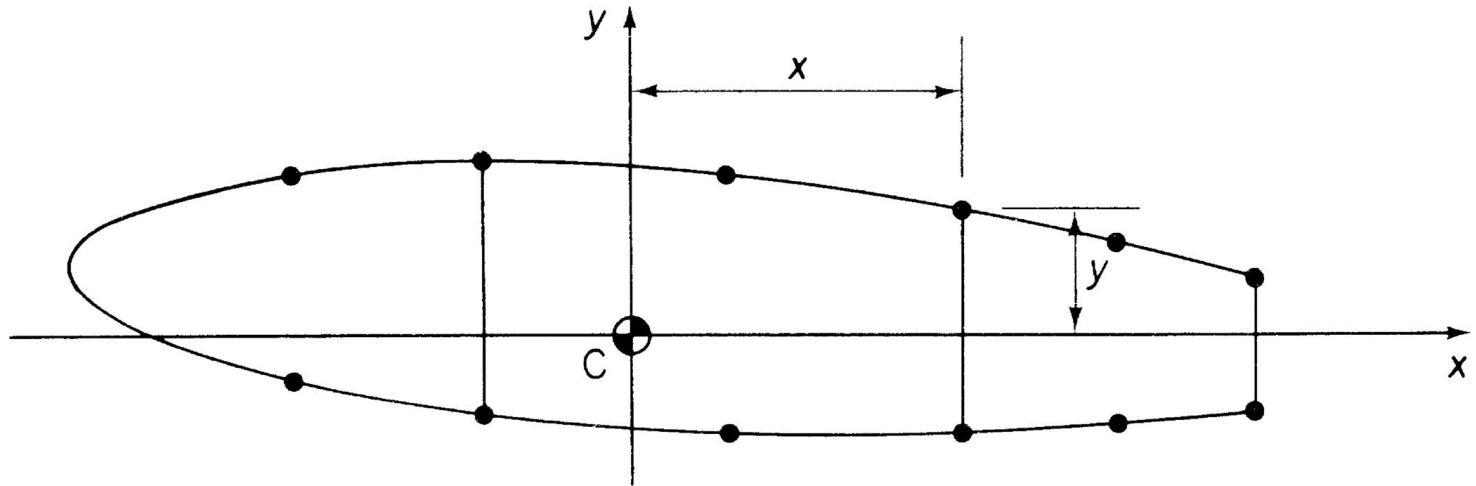
FIGURE 23.1 Three-Boom Wing Section

FIGURE 23.2 Idealized Section of a Multicell Wing
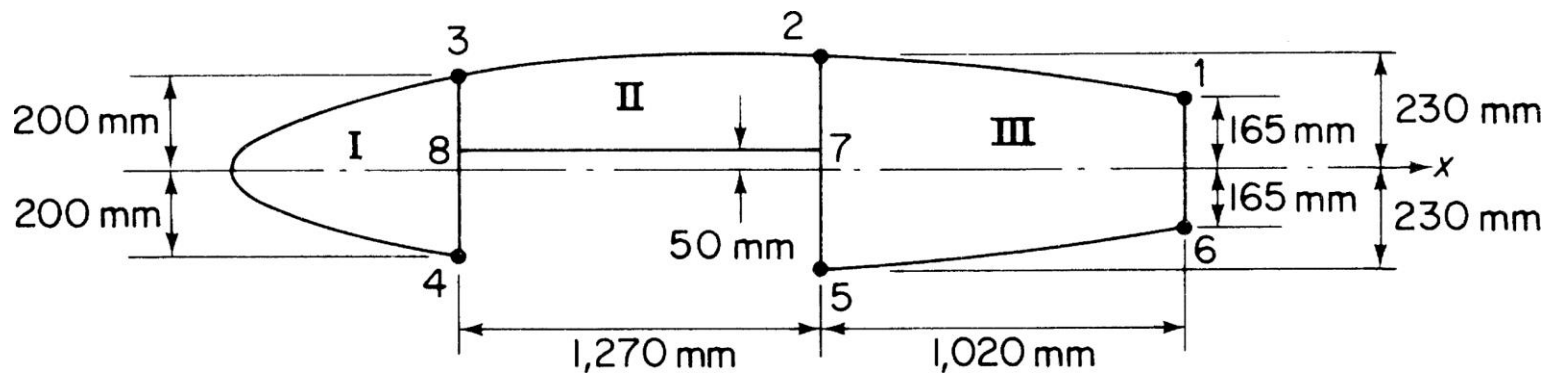
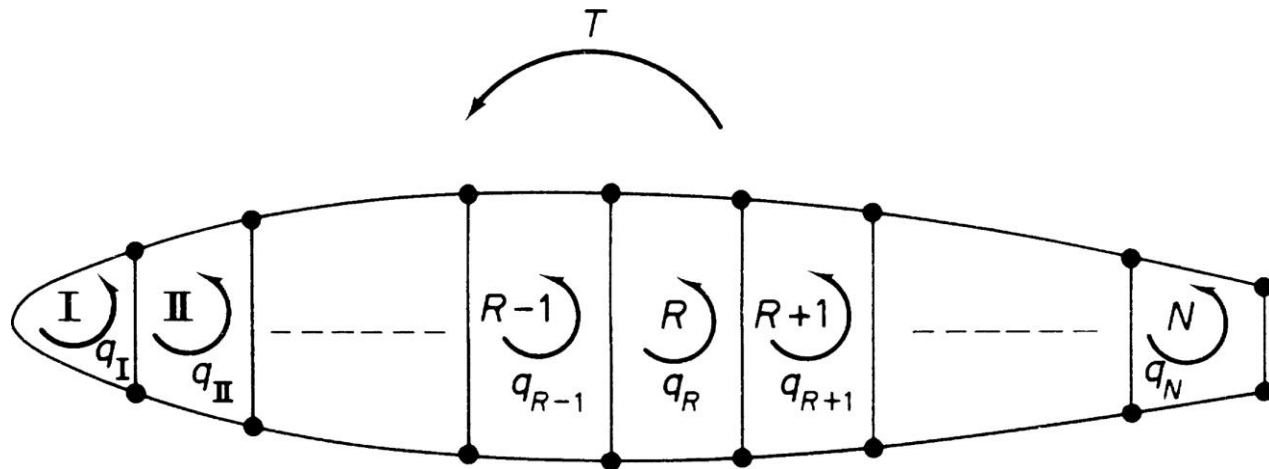**FIGURE 23.3** Wing Section of Example 23.1

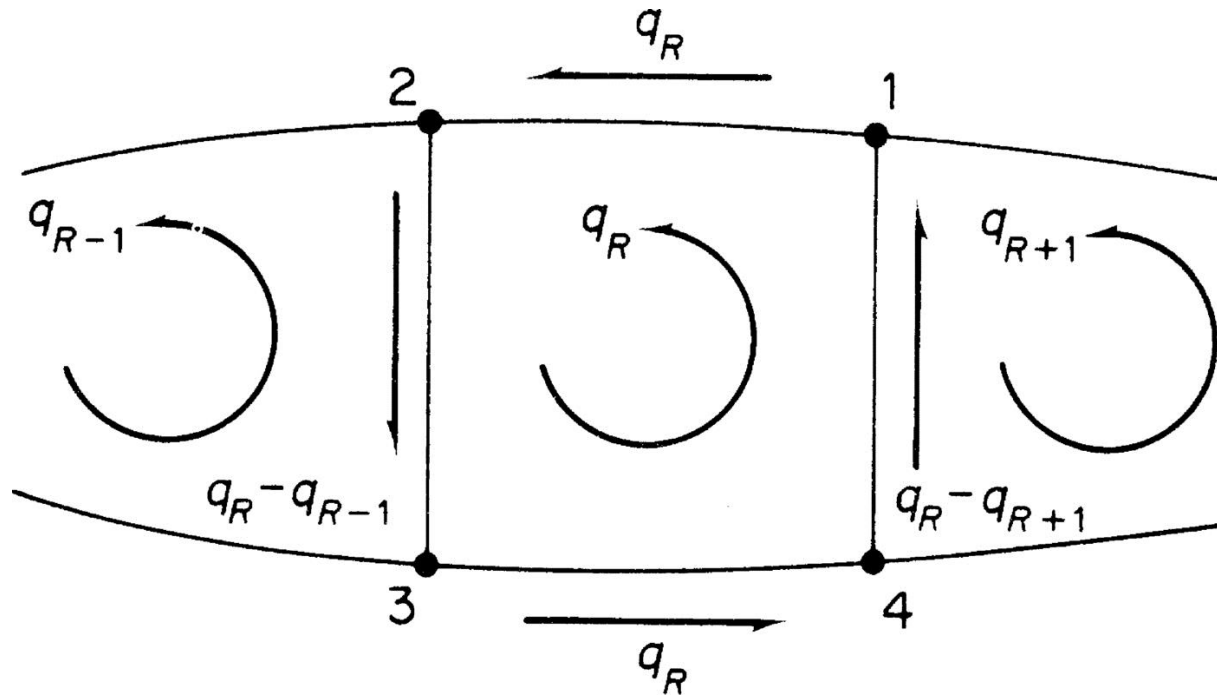**FIGURE 23.4** Multicell Wing Section Subjected to Torsion

FIGURE 23.5 Shear Flow Distribution in the Rth Cell of an N-Cell Wing Section
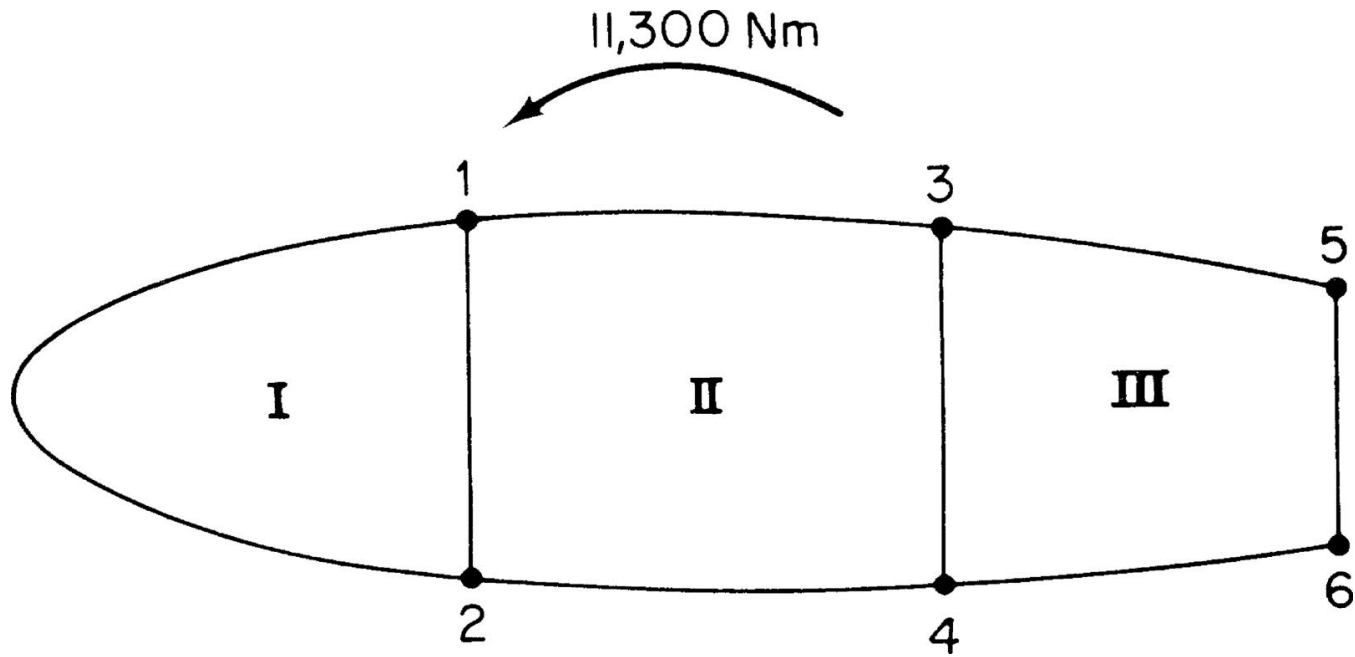
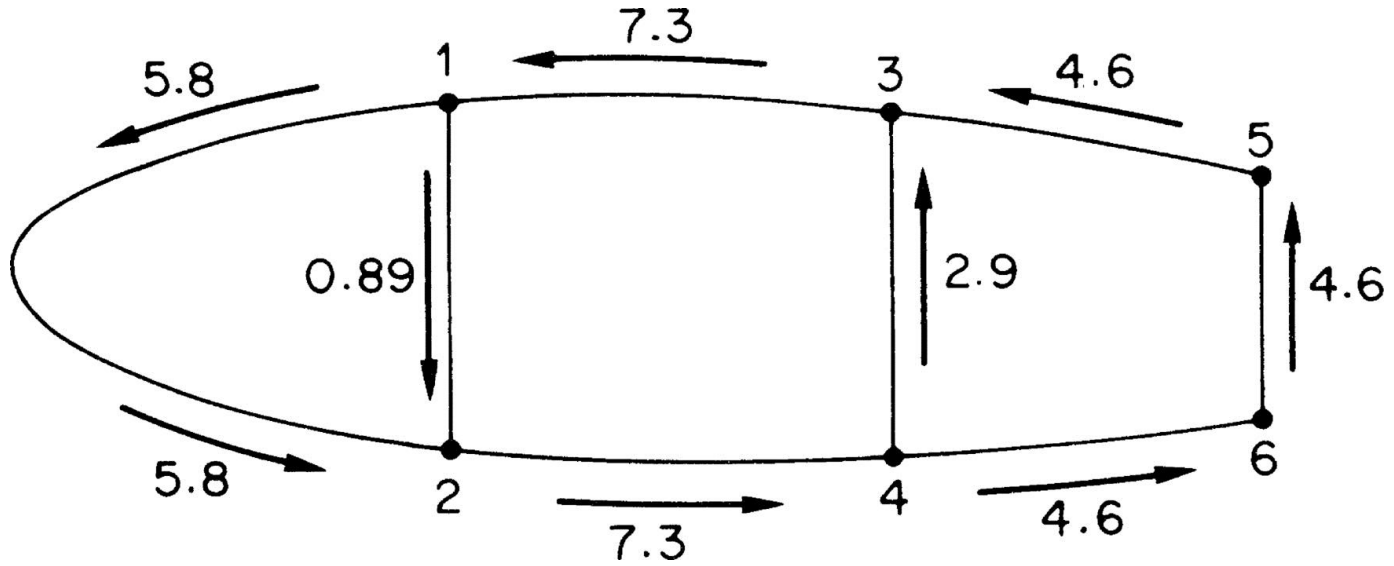**FIGURE 23.6** Wing Section of Example 23.2

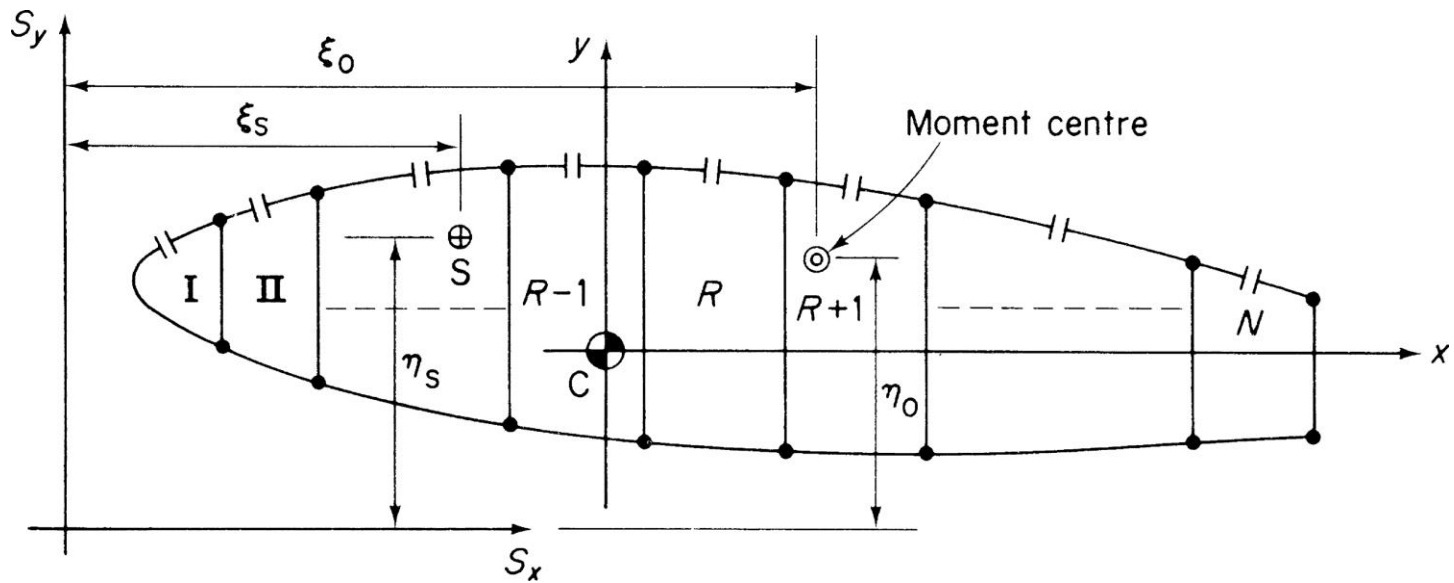**FIGURE 23.7** Shear Stress (N/mm^2) Distribution in the Wing Section of Example 23.2

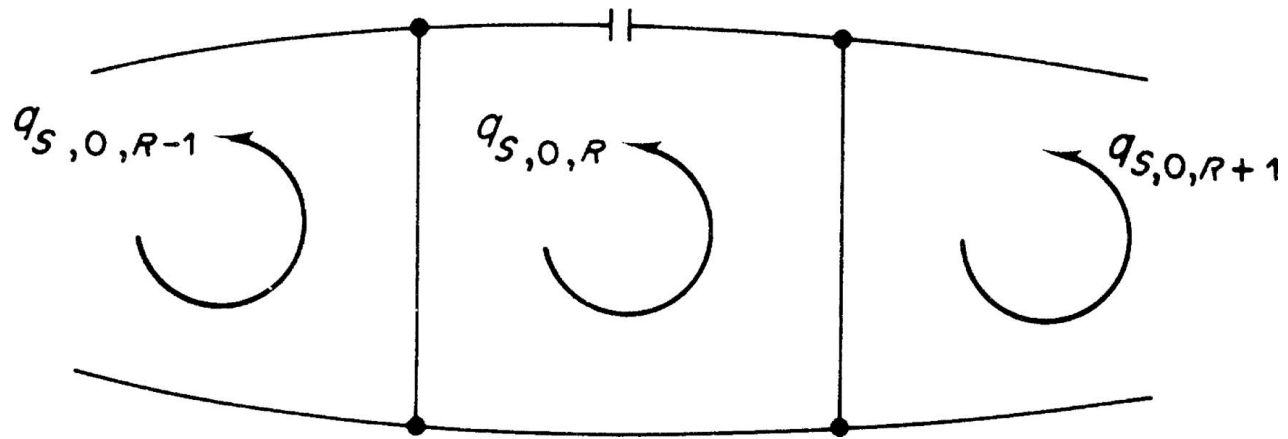**FIGURE 23.8** *N*-Cell Wing Section Subjected to Shear Loads

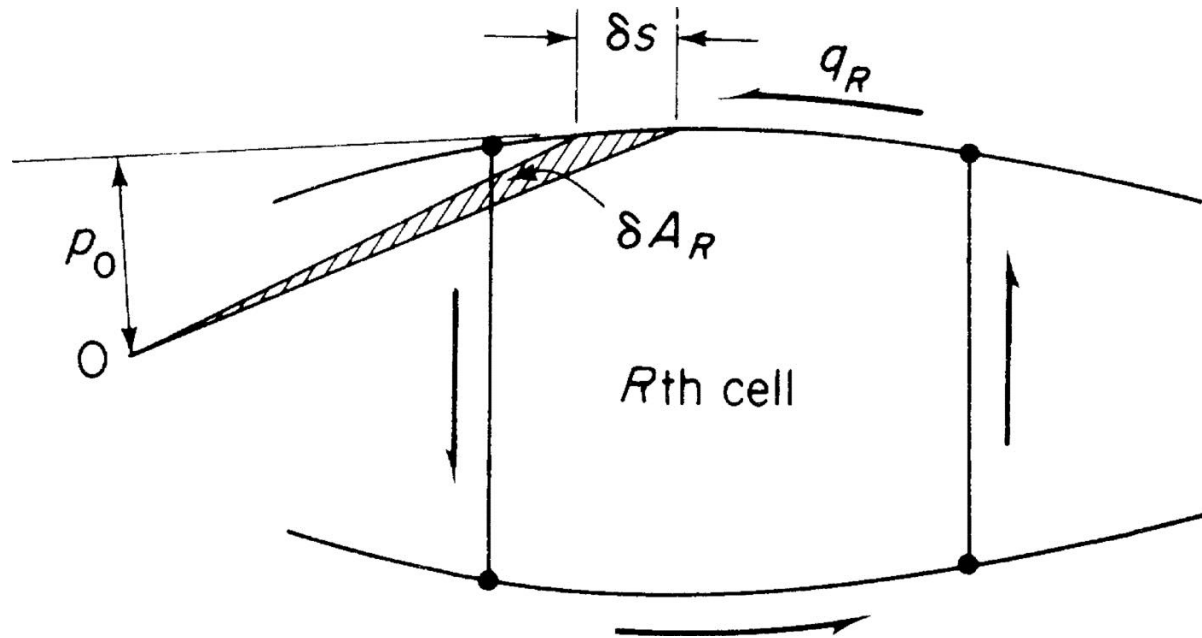**FIGURE 23.9** Redundant Shear Flow in the Rth Cell of an N-Cell Wing Section Subjected to Shear

FIGURE 23.10 Moment Equilibrium of the *R*th Cell
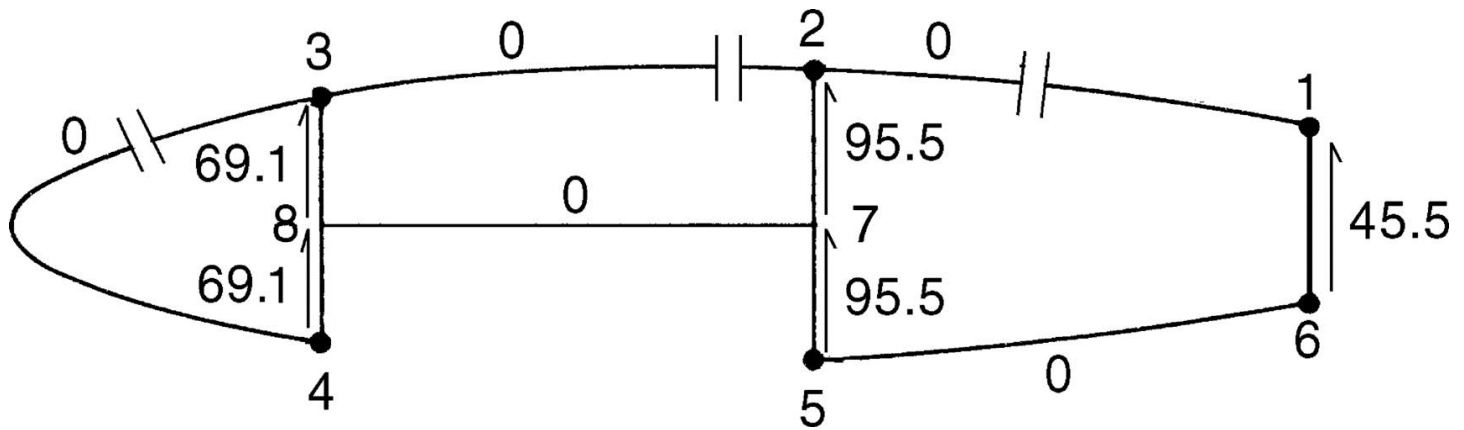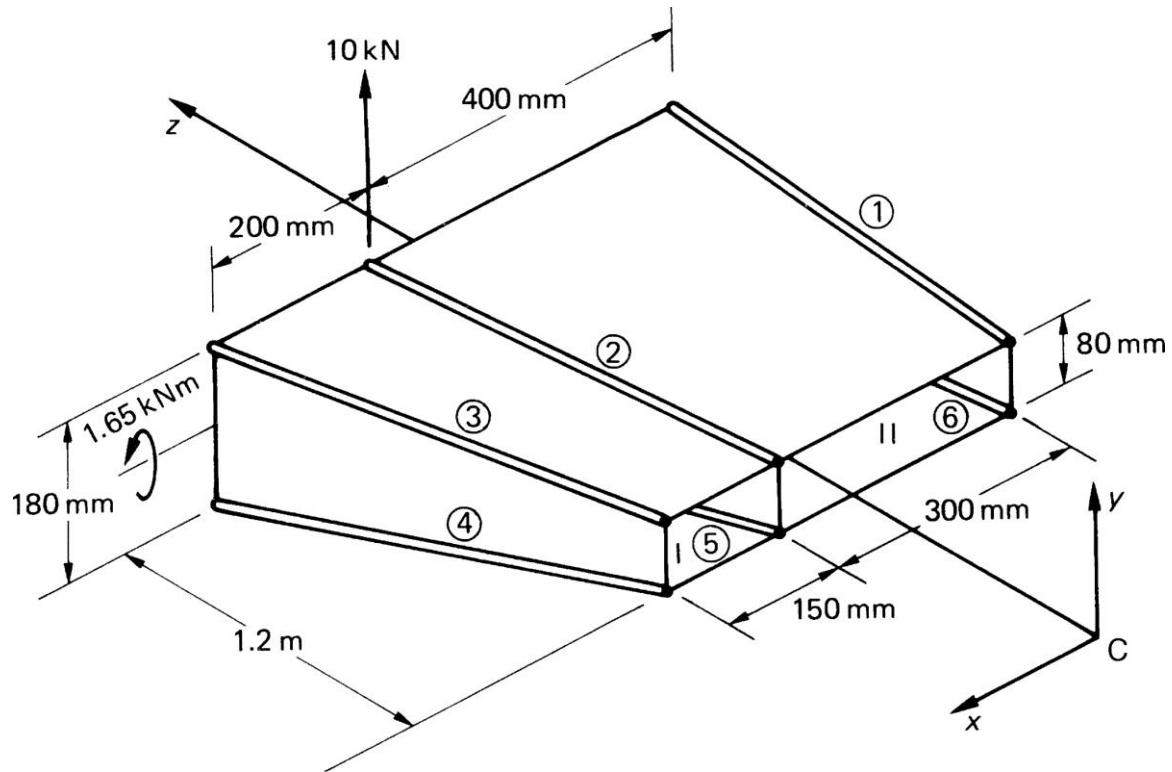
FIGURE 23.11 The q_b Distribution (N/mm)
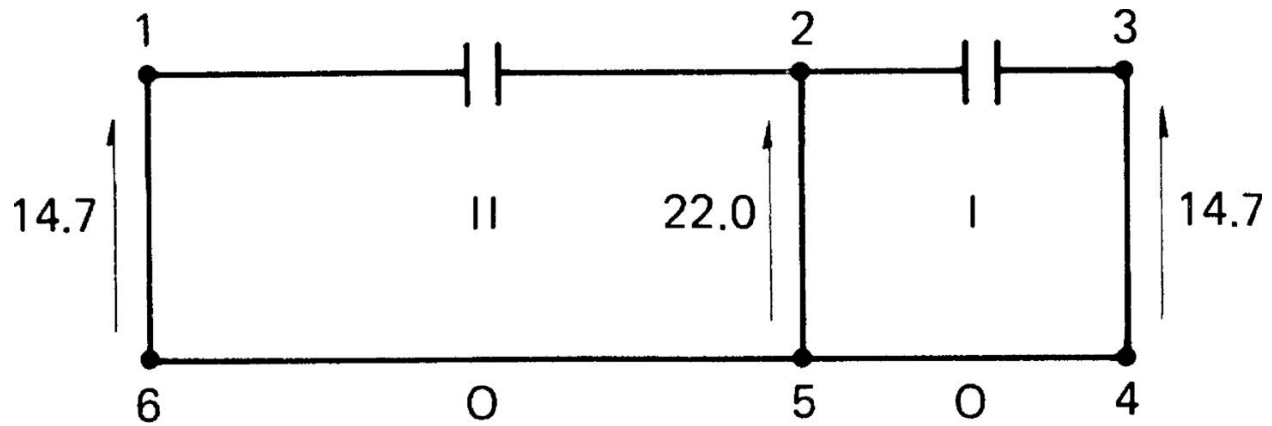
FIGURE 23.12 Tapered Beam of Example 23.4

FIGURE 23.13 The q_b (N/mm) Distribution in the Beam Section of Example 23.4 (viewed along z axis toward C)
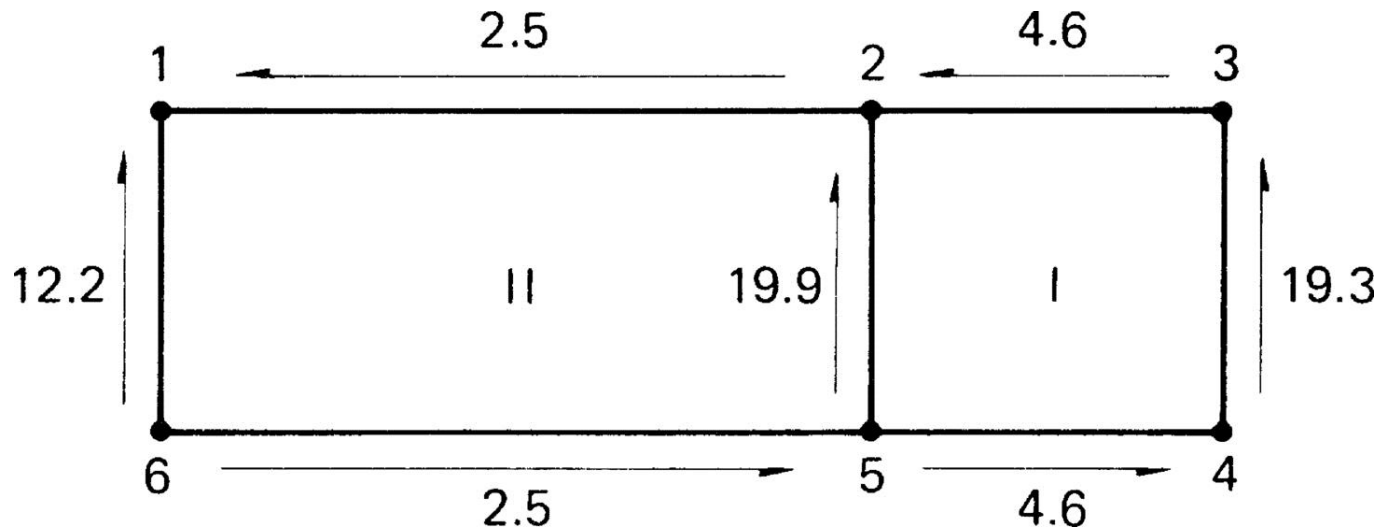
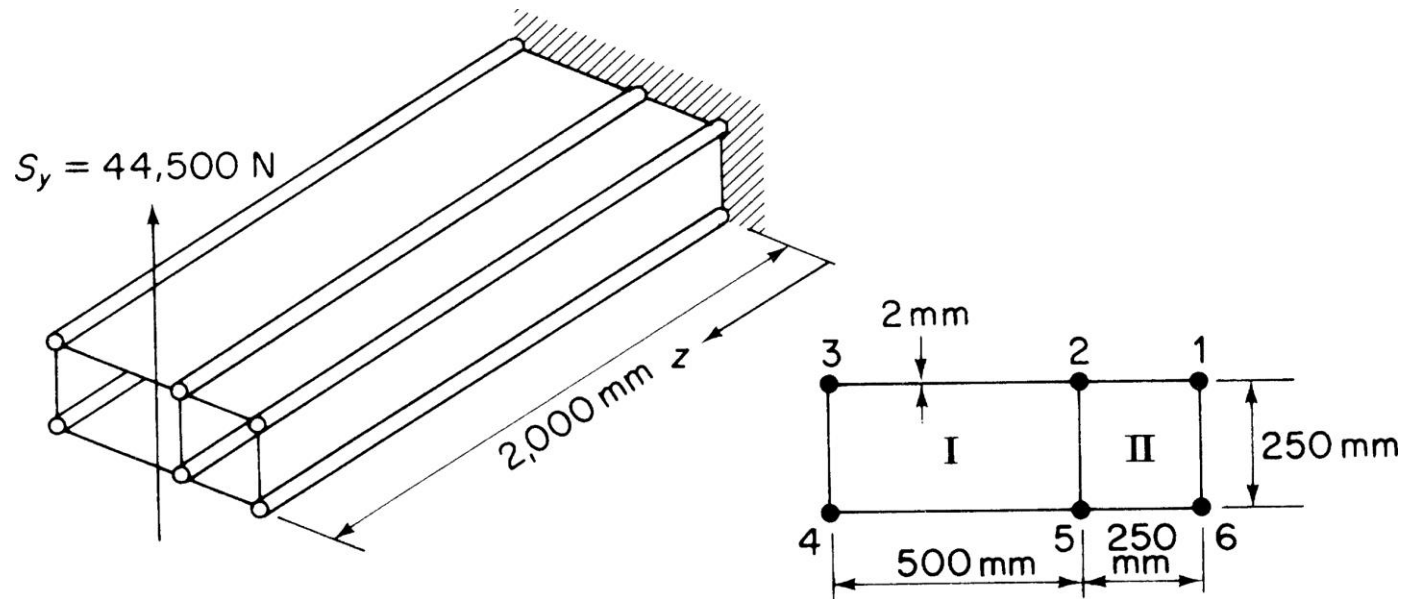**FIGURE 23.14** Shear Flow (N/mm) Distribution in the Tapered Beam of Example 23.4
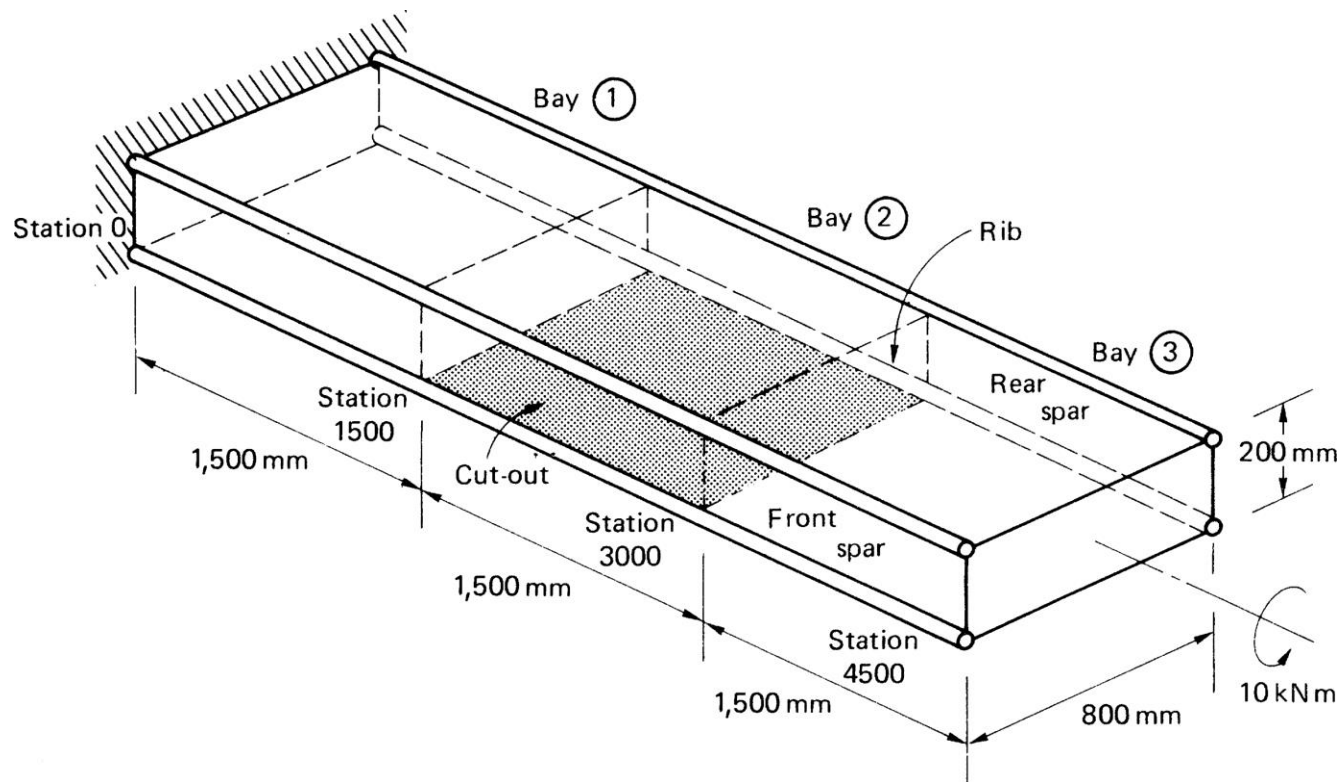
FIGURE 23.15 Deflection of a Two-Cell Wing Section

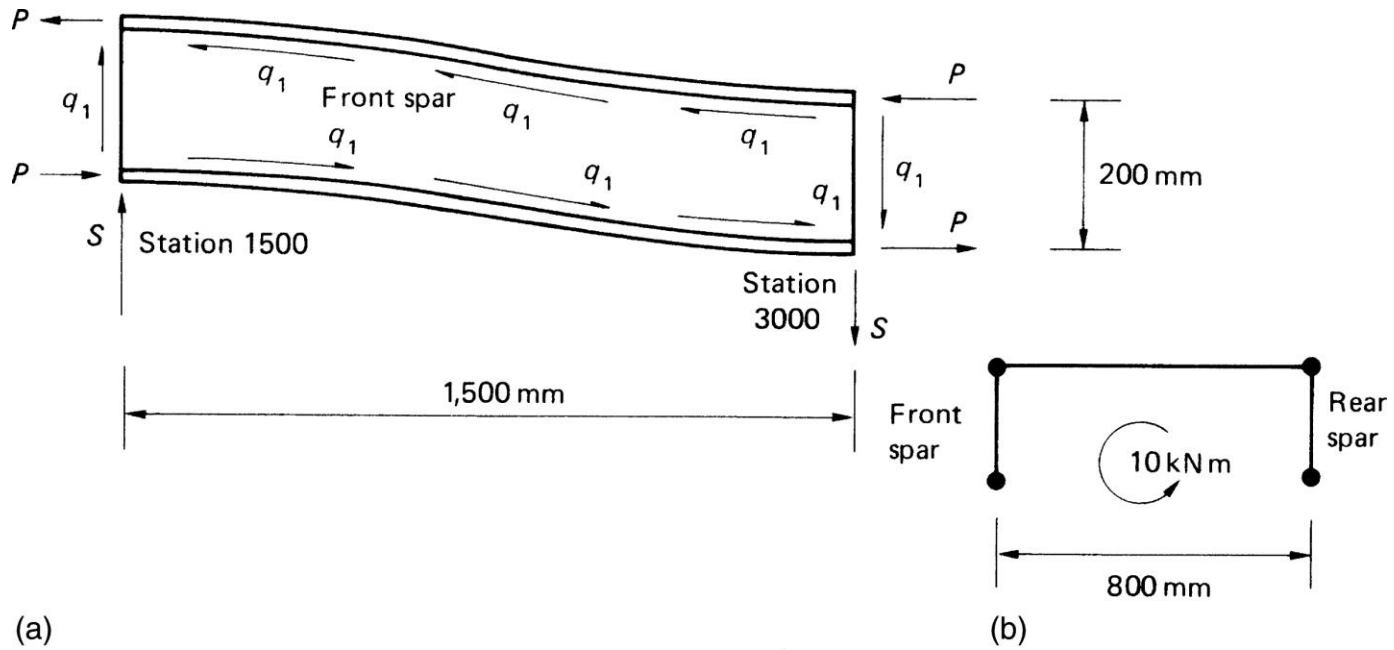**FIGURE 23.16** Three-Bay Wing Structure with Cut-out of Example 23.6

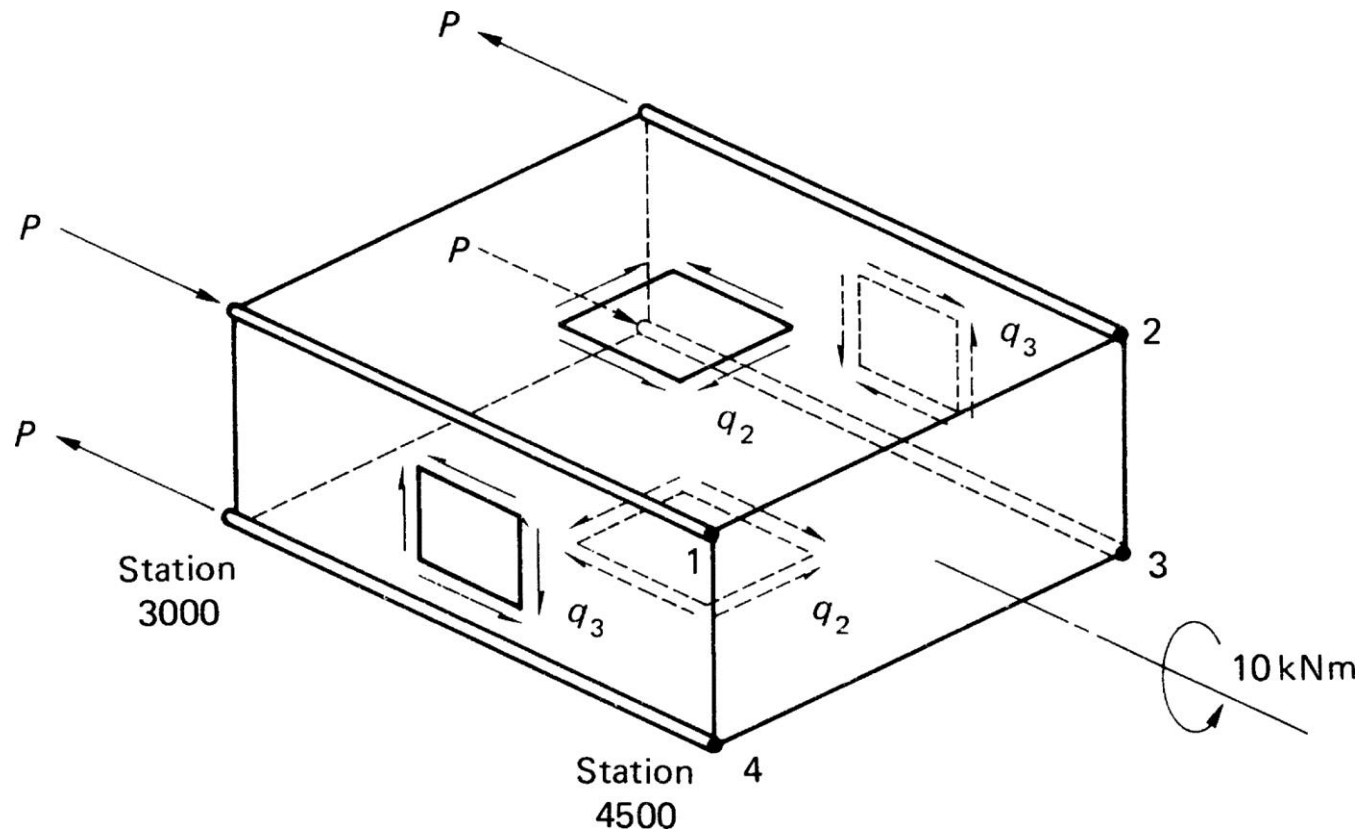**FIGURE 23.17** Differential Bending of Front Spar

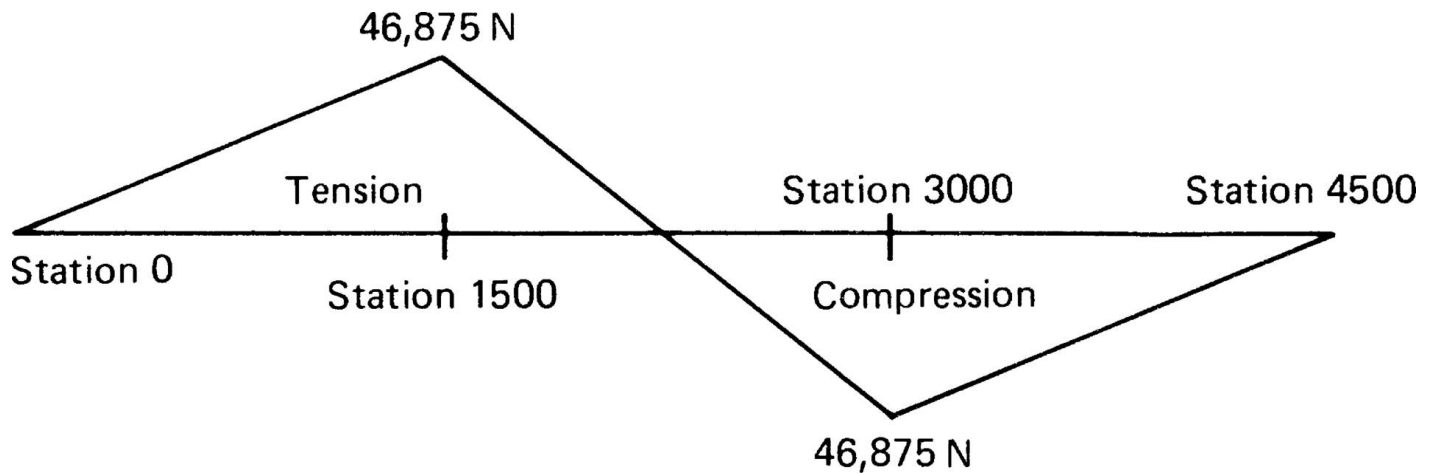**FIGURE 23.18** Loads on Bay ③ of the Wing of Example 23.6

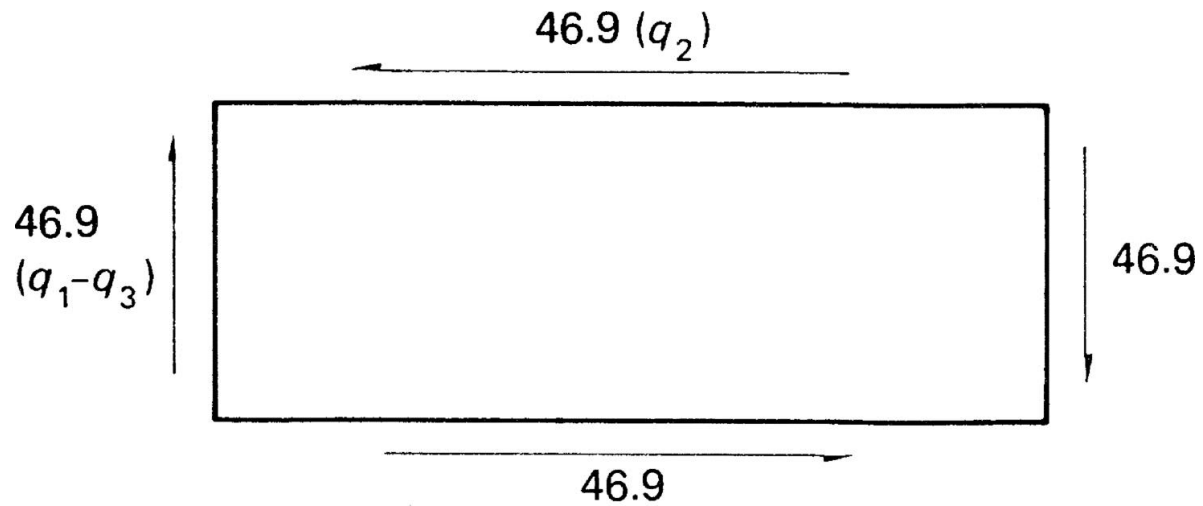**FIGURE 23.19** Distribution of Load in the Top Flange of the Front Spar of the Wing of Example 23.6

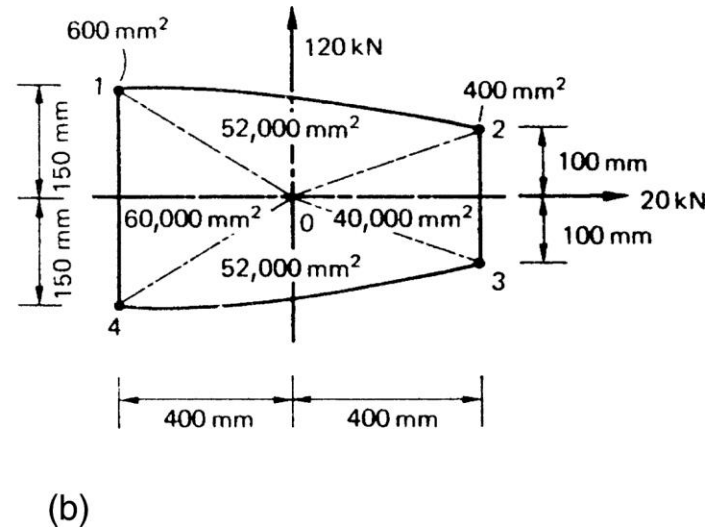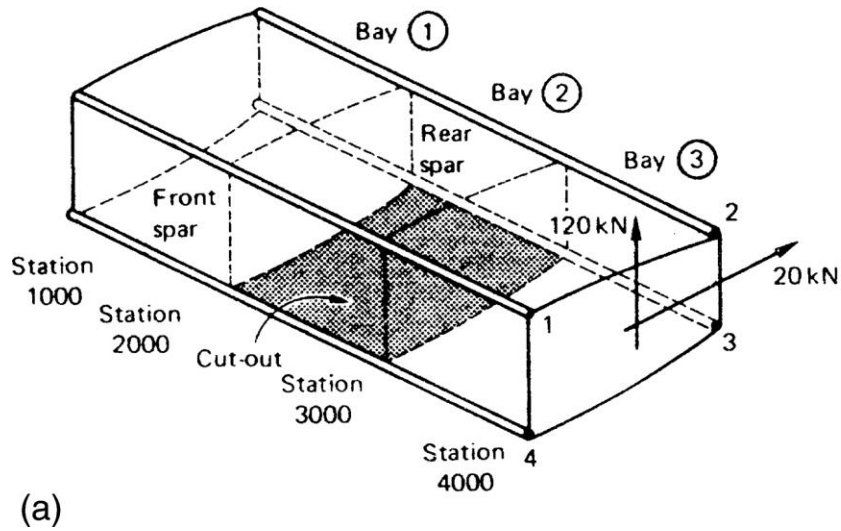**FIGURE 23.20** Shear Flows (N/mm) on Wing Rib at Station 3000 in the Wing of Example 23.6
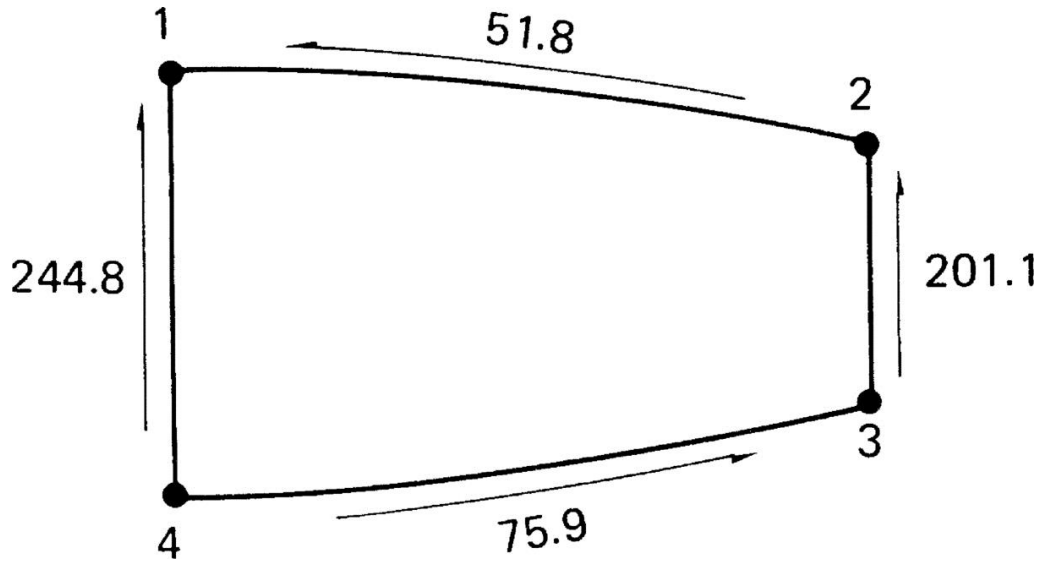
FIGURE 23.21 Wing Box of Example 23.7

FIGURE 23.22 Shear Flow (N/mm) Distribution at Any Station in the Wing Box of Example 23.7 without the Cut-out
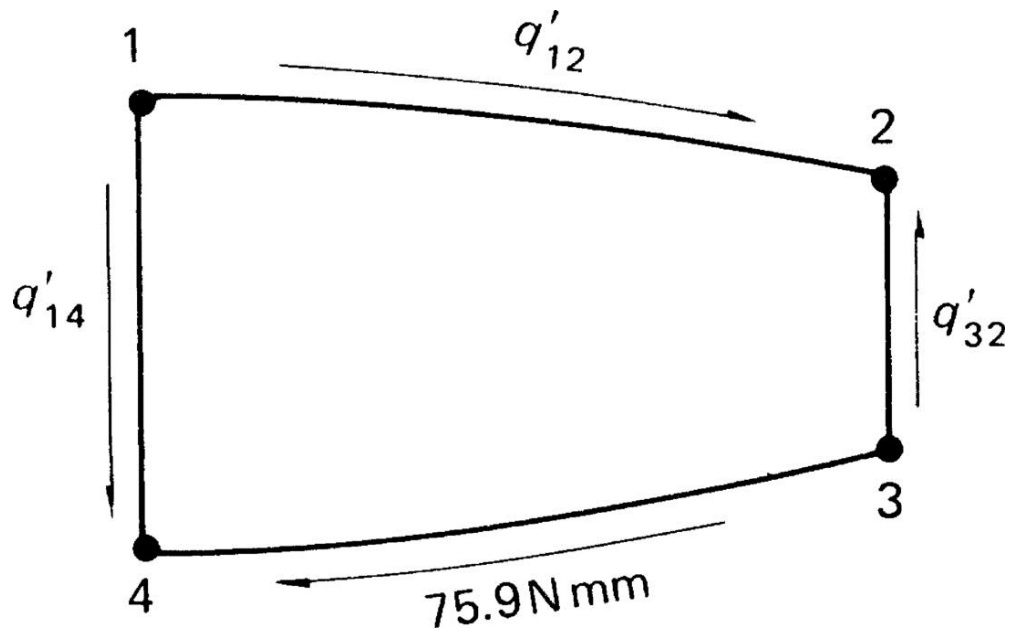
FIGURE 23.23 Correction Shear Flows in the Cut-out Bay of the Wing Box of Example 23.7
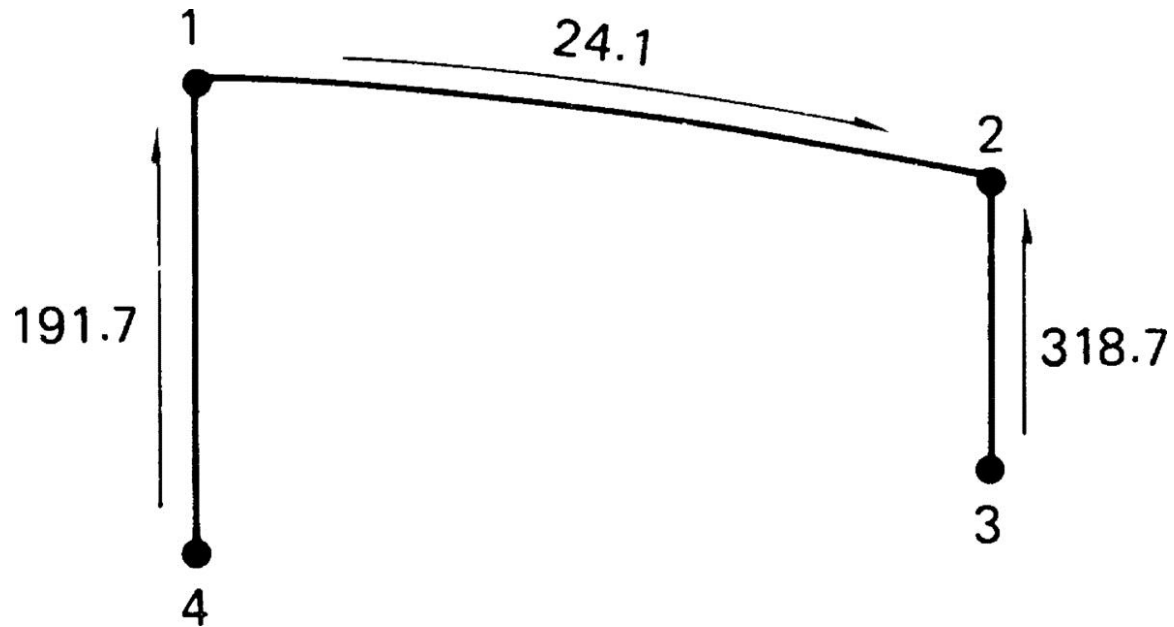
FIGURE 23.24 Final Shear Flows (N/mm) in the Cut-out Bay of the Wing Box of Example 23.7
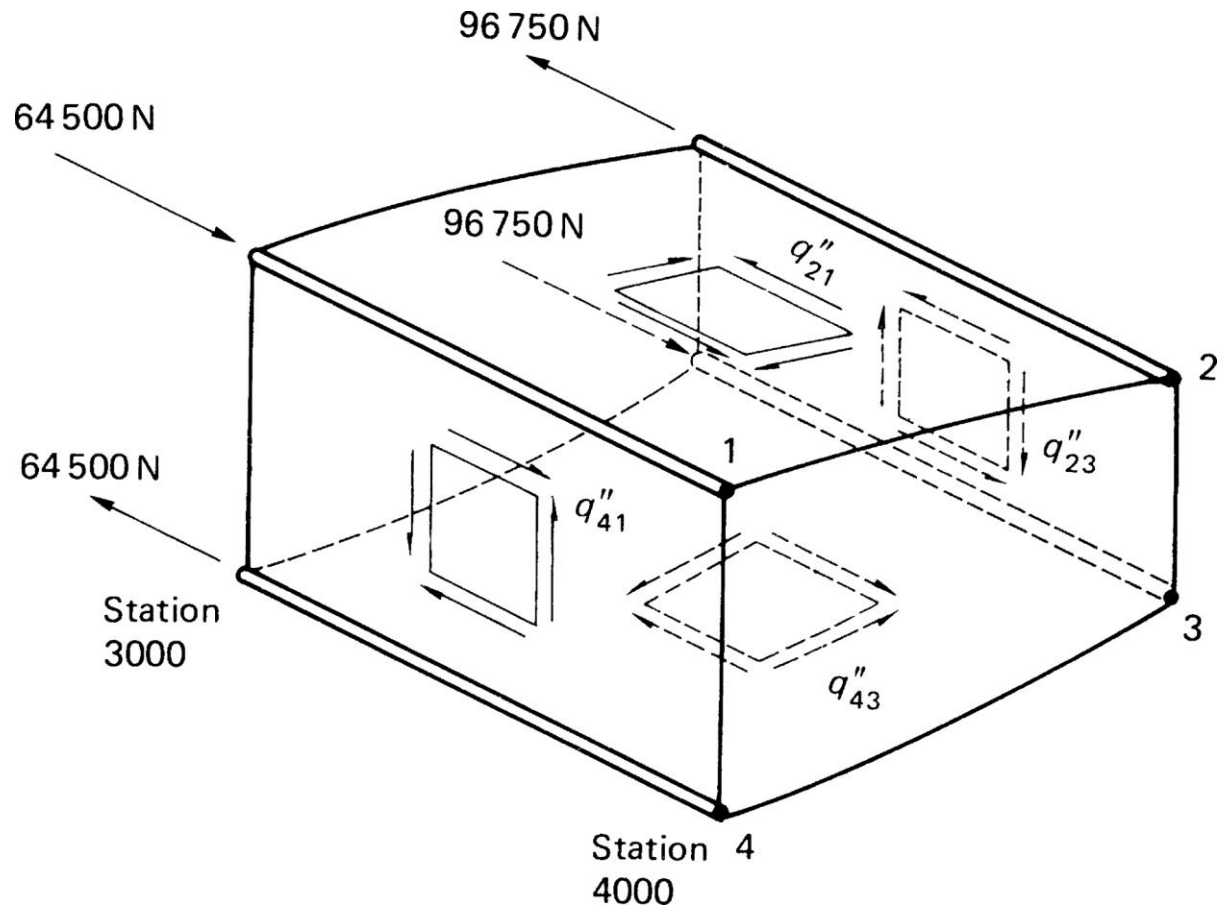
FIGURE 23.25 Correction Shear Flows in Bay ③ of the Wing Box of Example 23.7
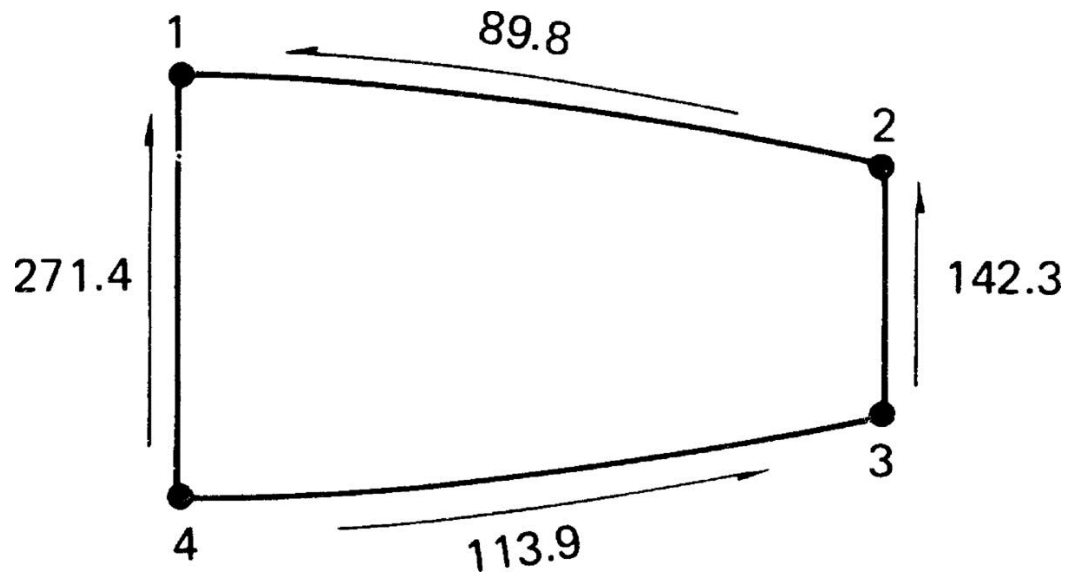
FIGURE 23.26 Final Shear Flows (N/mm) in Bay ③ (and Bay ①) of the Wing Box of Example 23.7
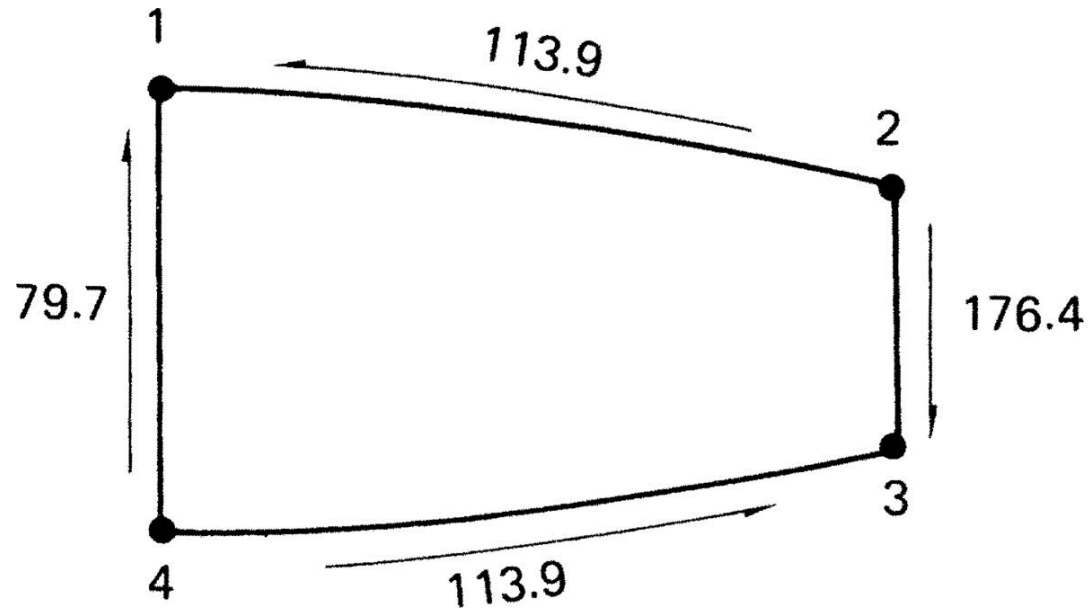
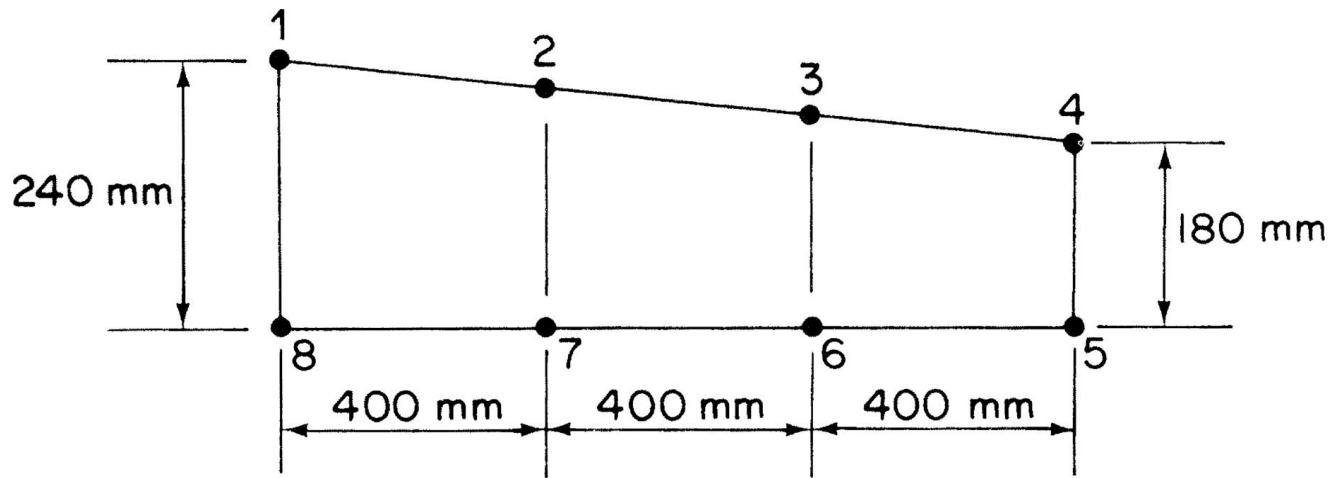**FIGURE 23.27** Shear Flows (N/mm) Applied to the Wing Rib at Station 3000 in the Wing Box of Example 23.7
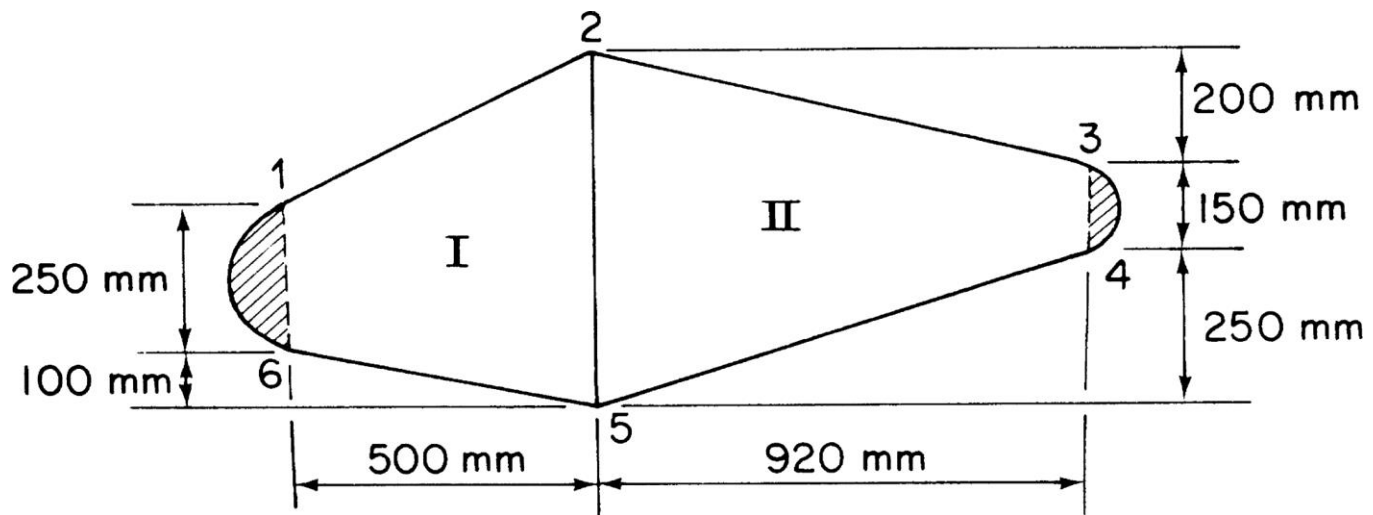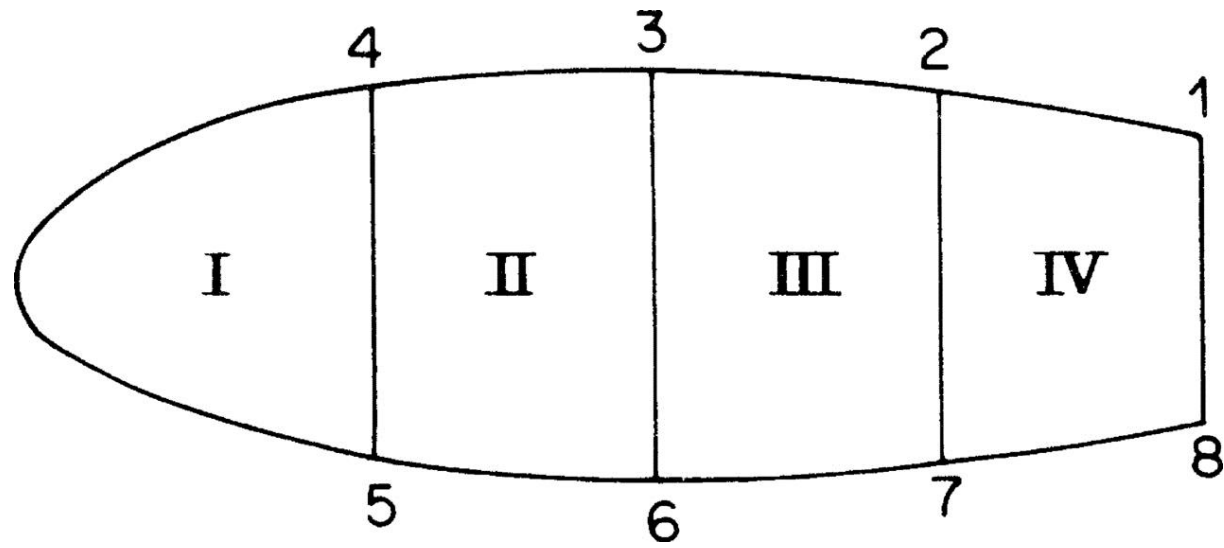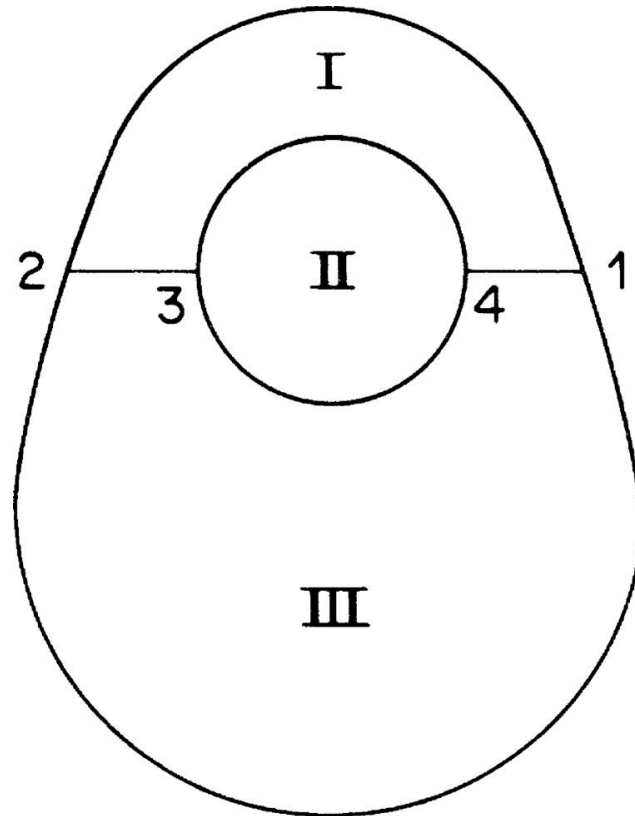
FIGURE P.23.1

FIGURE P.23.2

FIGURE P.23.3
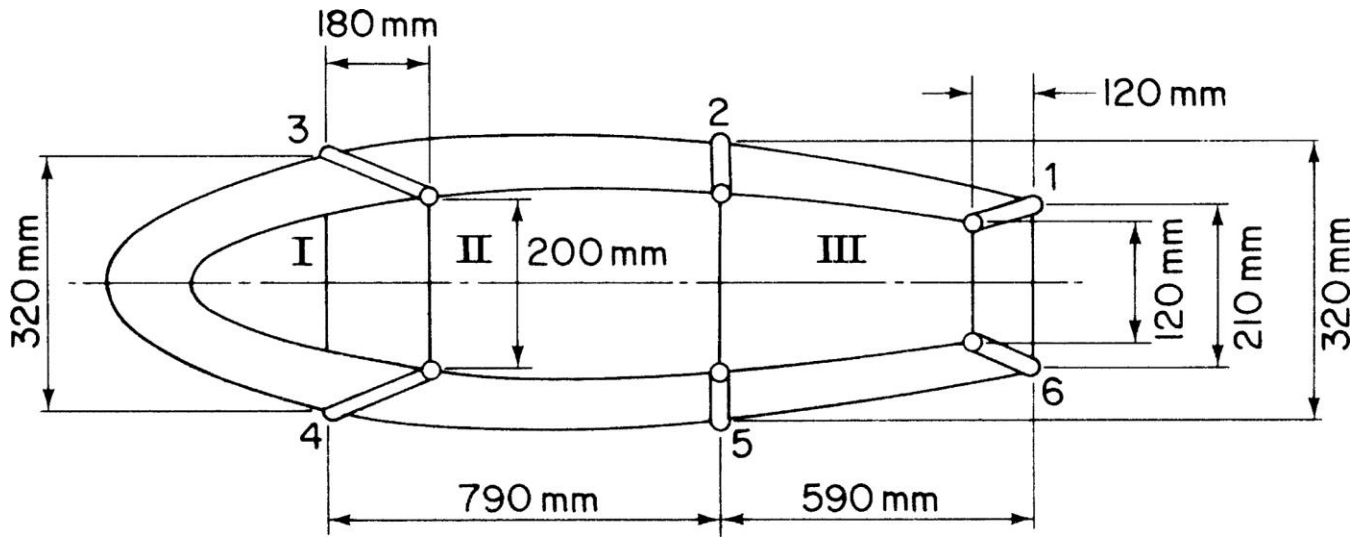
FIGURE P.23.4
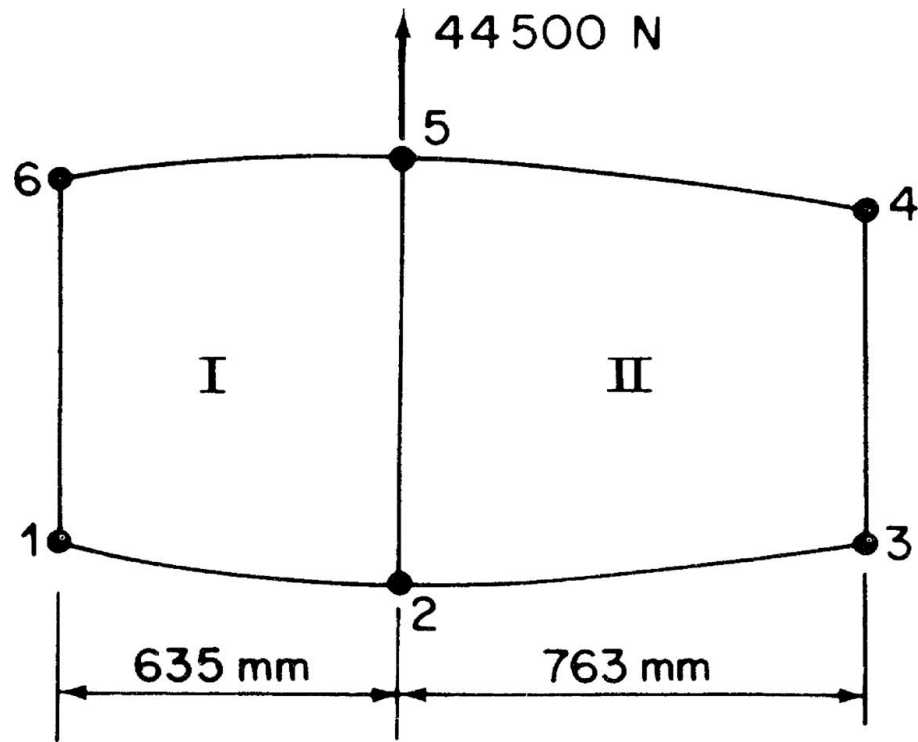
FIGURE P.23.5
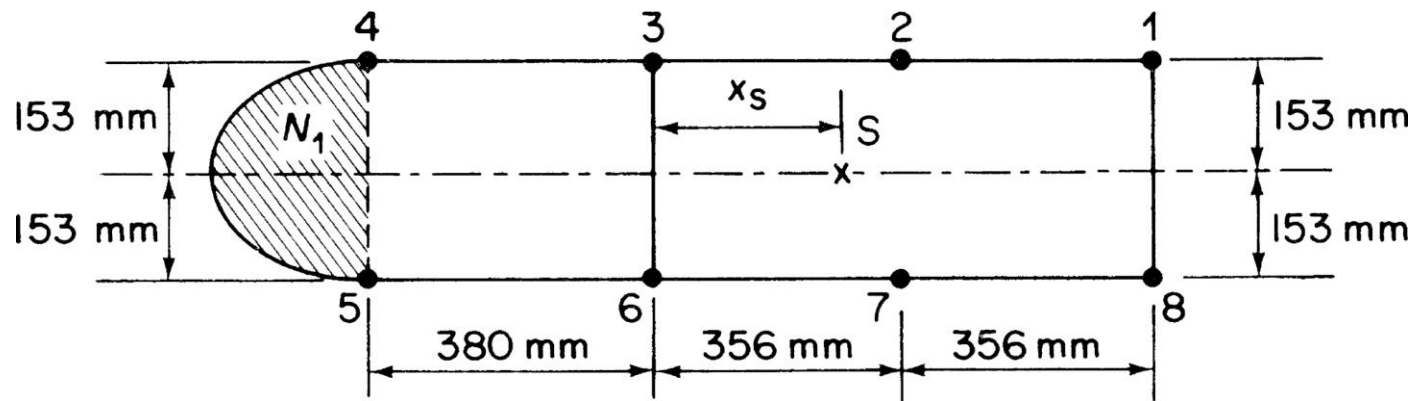
FIGURE P.23.6
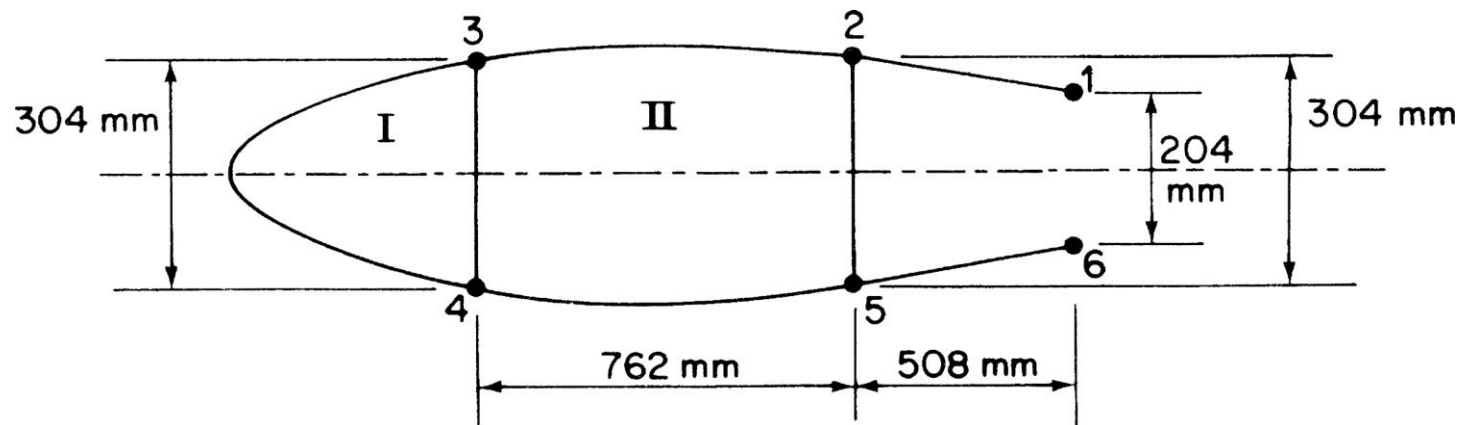
FIGURE P.23.7

FIGURE P.23.8

FIGURE P.23.9