2014-2 항공기 구조역학 Homework #4

Problem 8.27. Thin-walled semi-circular cross-section beam
Determine the location of the shear center of the thin-walled, semi-circular open cross-section shown in fig. 8.19. **Note:** It is more convenient to work with the angle θ as a variable describing the geometry of the section: $s = R\theta$, $\mathrm{d}s = R\mathrm{d}\theta$.

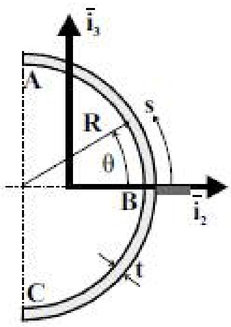
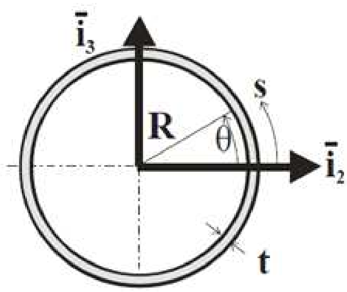


Fig. 8.19. Semi-circular open cross-section.

Problem 8.31. Shear flow distribution in closed circular section
Consider a beam with a thin-walled, circular cross-section of radius R and thickness t. The section is subjected to a vertical shear force, V_3. *(1)* Determine the bending stiffnesses of the section. *(2)* Find the shear flow distribution in the section. *(3)* Find the location and magnitude of the maximum shear flow in the section.



Problem 8.32. Shear flow in a closed rectangular section
The thin-walled beam with a rectangular section depicted in fig. 8.42 is subjected to a vertical shear force V_3. *(1)* Determine the centroidal bending stiffnesses of the section. *(2)* Find the shear flow distribution in the section. *(3)* Verify that all joint and edge equilibrium conditions, eq. (8.29), are satisfied. *(4)* Find the location and magnitude of the maximum shear flow in the section. Use the following data: $\alpha = 1.0$

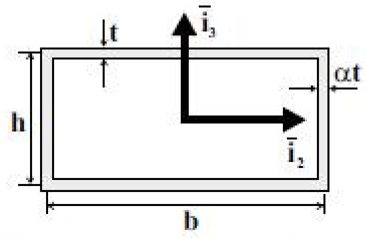


Fig. 8.42. Thin-walled beam with rectangular cross-section.

Problem 8.38. Shear flow in a multi-cellular, thin-walled section
The cross-section of the multi-cellular thin-walled beam shown in fig. 8.45 is subjected to a vertical shear force V_3. *(1)* Find the shear flow distribution in the section. *(2)* Verify that all joint and edge equilibrium conditions, eq. (8.29), are satisfied. Use $a = b$ and $c = 2b$ and $t_1 = t_2 = t_w = t$.

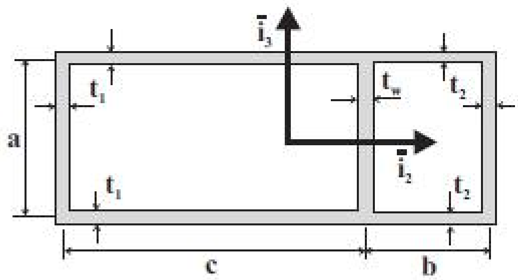


Fig. 8.45. Thin-walled beam with two cells.

Problem 8.54. Shearing and torsion of a closed, semi-circular section
A beam with the closed semi-circular thin-walled cross-section shown in fig. 8.57 is subjected to a vertical shear force, V_3, with a line action passing through the section's vertical web. *(1)* Determine the location of the section's shear center. *(2)* Determine the shear flow distribution due to shearing. *(3)* Determine the shear flow distribution due to torsion. *(4)* Determine the total shear flow distribution.

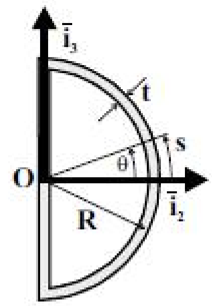


Fig. 8.57. Thin-walled closed semi-circular section.

Problem 8.66. Lumped sheet-stringer model development

Construct a lumped sheet-stringer model for the thin-walled cross-section shown in fig. 8.85. Assume that the stringers in the straight sections are spaced at 50 mm and at 45° in the curved portions. Assume the only loading is a moment, M_2. All dimensions are in millimeters.

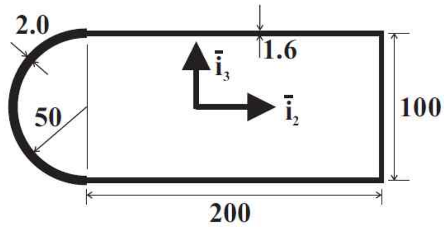


Fig. 8.85. Thin-walled beam cross-section (dimensions in millimeters).