AOE 3024, Thin Walled Structures

Homework # 11, Due December 5, 2001

For the thin-walled section shown in the figure, determine the shear flow in all the panels and determine the shear center.

Hint: Note that the section has four stiffeners, shown as dark dots, each having an area of $B = ht/2$. The stiffeners are modelled as areas concentrated at a point. As a result, they do not have any second moment of area about their own centeroid axes. But they do influence the second moment of the section area through the parallel-axis theorem.

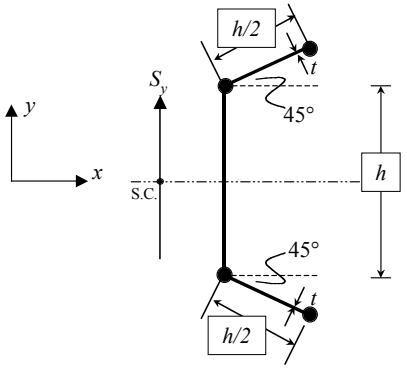
The presence of a stiffener, modeled as an area concenterated at a point, leads to a discontinuity in the shear flow. Recall that the change in the shear flow, for a symmetric section, as one one moves around the section is given as:

$$q(s) = q(0) - \frac{S_y}{I_{xx}} \int_o^s t\,(\bar{s}) y\,(\bar{s})\, d\bar{s}$$

For a stiffener of concentrated point area B_s lying at a distance y_s from the centroid, the term under the integral, as one moves from one side of the stiffener to the other, becomes $B_s y_s$. The discontinuity in the shear flow (expressed as Δq_s) caused by the stiifener thus becomes:

$$\Delta q_s = -\frac{S_y}{I_{xx}} B_s y_s$$

For more details see the derivation on page 334 of your text.



Thin-walled cross section with stiffeners