

## AOE 3024, Thin Walled Structures

Homework # 7, Due October 29, 2001

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NAME

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Pledge

Consider a cantilever beam as shown in the attached figure. At the tip of the beam, a bending moment  $M = 1,000$  Nm is applied at an angle  $\theta$  with respect to the positive  $x$ - axis. Assume that the height of the web,  $h$ , and the width of the flange,  $b$  are both 100 mm. The thickness  $t_1$  of the web and the thickness  $t_2$  of the flange are both given as 5 mm.

a) For this beam, determine the maximum bending stress as the angle  $\theta$  is varied between  $0^\circ$  to  $180^\circ$  in an increment of  $5^\circ$ . Plot your results.

b) For  $\theta = 45^\circ$ ,  $b = 100$  mm, and  $t_2 = 10$  mm, we want to study the effect of changing the ratio  $\alpha = h/b$  between 0.70 and 1.30 while keeping the cross-section area of the beam ( $ht_1 + bt_2$ ) constant, *i.e.* keep  $\alpha\beta = 1$ , where  $\beta = t_1/t_2$ . Plot the maximum bending stress as a function of  $\alpha$ . Change  $\alpha$  in increments of 0.1.

Note that the location of the point having the maximum stress will change as you vary  $\theta$  in part a) and  $\alpha$  in part b). For all cases, identify which point, on the cross-section, has the maximum bending stress.

