

# AOE 3024, Thin Walled Structures

Homework # 6, Due November 7, 2001

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NAME

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Pledge

Consider a thin-walled cantilever beam as shown in the attached figure. At the tip of the beam, a bending moment  $M = 3,000 \text{ Nm}$  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 120 mm. The thickness  $t_1$  of the web and the thickness  $t_2$  of the flange are both given as 3 mm.

a) For this beam, determine the resultant deflection vector (the magnitude and the angle the deflection will make with the  $x$ -axis) at the tip and the mid-point as the angle  $\theta$  is varied between  $0^\circ$  to  $180^\circ$  in an increment of  $5^\circ$ . Plot your results.

b) For both the tip and the mid-point of the beam, plot the angle that the deflection vector makes with the neutral axis as the angle  $\theta$  is varied.

Assume the length of the beam to be 1,500mm and the Young's modulus to be  $200,000 \text{ N/mm}^2$ .

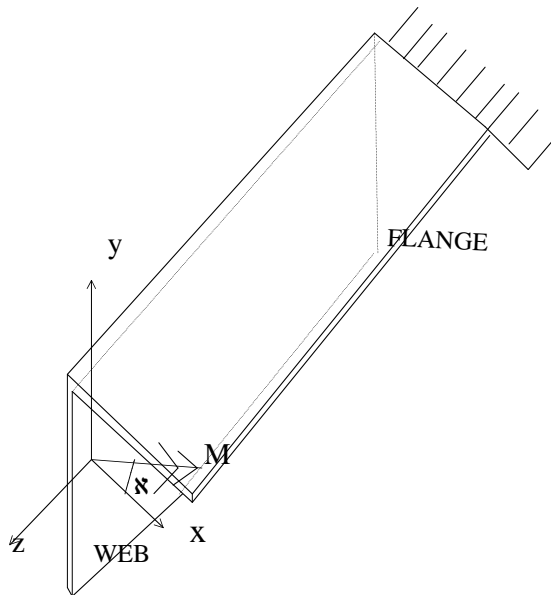


Figure 1: An unsymmetric cantilever wing under a tip moment. The tip moment makes an angle  $\theta$  with the positive  $x$ -axis.