

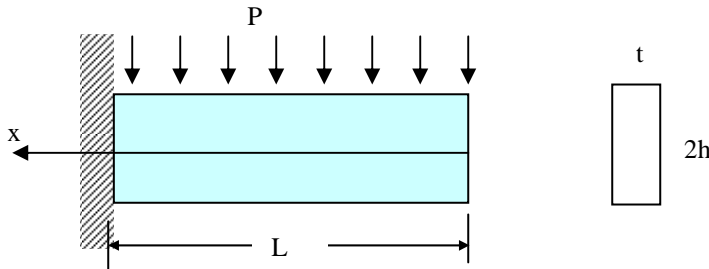
ME5339
HOMEWORK SET NO. 3

Due Feb. 14, 2008
Three Problems will be graded.

Problem 3-1

A narrow cantilever beam of rectangular cross section is loaded as shown below.

- a) Determine the Airy Stress function from the Airy Stress table.
- b) Solve all of the coefficients of the function
- b) Find the stress at any point in the beam.



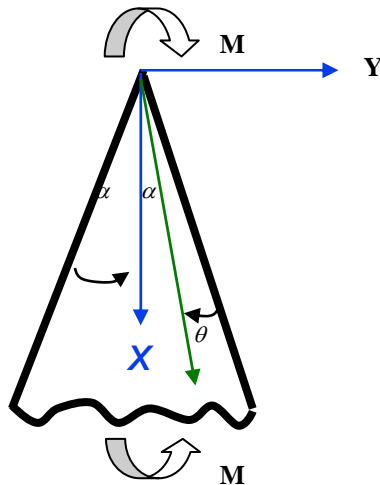
Problem 3-2

Resolve Problem 3.1 if the beam is under a simply support

Problem 3-3

Assume that moment M acts in the plane and at the vertex of the wedge-cantilever shown in the following figure

- a) Find the Airy Stress Function. (ans: $\Phi = \frac{M(\sin 2\theta - 2\theta \cdot \cos 2\alpha)}{2 \cdot (\sin 2\alpha - 2\alpha \cdot \cos 2\alpha)}$)
- b) Determine the stress components, σ_r , σ_θ , and $\tau_{r\theta}$
- c) Find the stress field for the semi-infinite plate.



Problem 3.4 (Problem 4.15 P179 in the 1st text)

A structural member is subjected to combined loading so that the following stresses occur at a critical point:

$$\begin{bmatrix} 120 & 50 & 30 \\ 50 & 80 & 20 \\ 30 & 20 & 10 \end{bmatrix} MPa$$

The tensile strength of the material is 300 MPa. Determine the factor of safety factor, f_s according to a) Maximum shearing stress theory and b) Maximum energy of distortion theory.