MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Mechanical Engineering

2.001 - Mechanics of Materials I
Spring, 2003

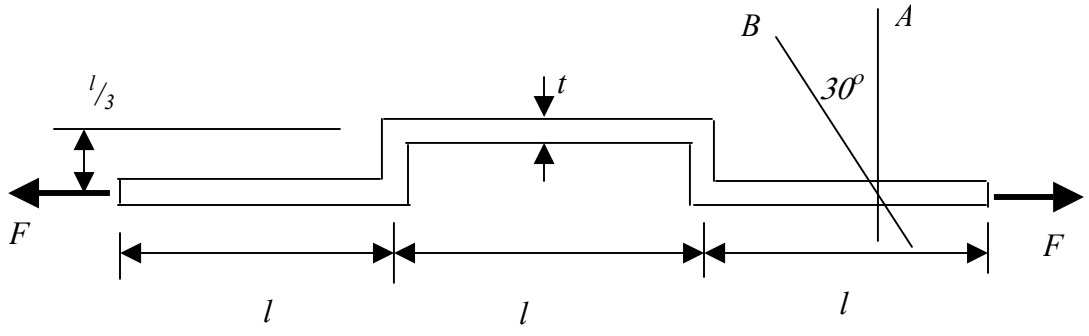
Problem Set 6

(Due in one week of its assigned date)

Problem 1 : Imagine that you are reeling out a constant cross-section wire from a satellite and dangling the wire, under its own weight. The satellite is, say 100 km up, and assume that the acceleration due to gravity is constant at 9.8 m/sec^2.

a) The wire is made of aluminum and the maximum uniaxial stress before it "breaks" (we will formalize failure later in class) is 200 MPa. What is the maximum length of wire you can reel out ?
b) What is the total deformation of wire (increase in length) at the threshold of failure ?
c) Intuitively, will the wire become skinnier as you go lower down, or as you approach the top ? Why ?

Problem 2 : Consider the figure drawn below:



a) Draw axial force, shear force and bending moment diagrams.
b) What are the average axial and shear stresses on section A ?
c) What are the average axial and shear stresses on section B ?

Problem 3 (a): From Crandall, Dahl and Lardner, 4.15
(b): Find principal stresses in 4.15

Problem 4 : From Crandall, Dahl and Lardner, 4.26

Problem 5 : From Crandall, Dahl and Lardner, 4.27

Problem 6 : From Crandall, Dahl and Lardner, 4.28