MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF OCEAN ENGINEERING
AND
CIVIL AND ENVIRONMENTAL ENGINEERING
13.10J/1.573J Introduction to Structural Mechanics
Fall 1999
Problem Set 3

Assigned : September 23, 1999
Due : September 30, 1999

1. Problems from Chapters 5 and 16 of the course textbook.
   (a) Problem 5.34
   (b) Problem 5.36
   (c) Problem 5.58
   (d) Problem 16.6
   (e) Problem 16.15
   (In this problem, also determine the principal strain directions.)

2. A hard rubber block, completely confined in the x-direction but free to expand in both the y- and z-directions, is subjected to compressive stress σ_y = -300psi in the y-direction as shown in Fig. A. Calculate the stress σ_x in the x- direction. What is the change in volume of the block if E=300 psi and $\nu = 0.5$?

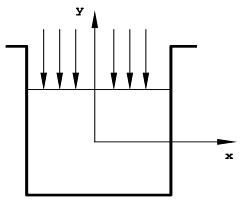
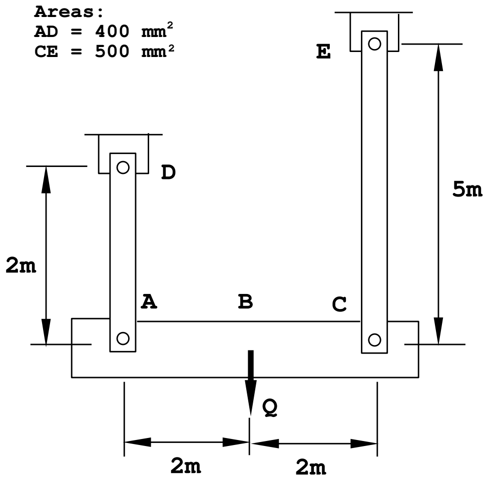


Fig. A

3. The rigid beam ABC is suspended from two steel rods as shown and is initially horizontal. The midpoint B of the beam is deflected 10mm downwards by the slow application of force Q, after which the force is slowly removed. Knowing that the steel used for the rods is elastic, perfectly plastic with $E = 200$ GPa and $\sigma_y = 300$ MPa, determine (a) the required maximum value of Q and the corresponding position of the beam, (b) the final position of the beam after removal of force Q.



Problem sets are also available in the course homepage.