ME5339

HOMEWORK SET NO. 5

Due on March 4

Three problems will be graded.(34 points)

Problem 5.1

A forged-steel outer cylinder with ID=20 in., OD=22 in., E=30 x10^6 psi, ν=0.3 is to be shrunk over a cast-steel inner cylinder with ID=10 in., OD=20 in., E=30 x10^6 psi, ν=0.3.

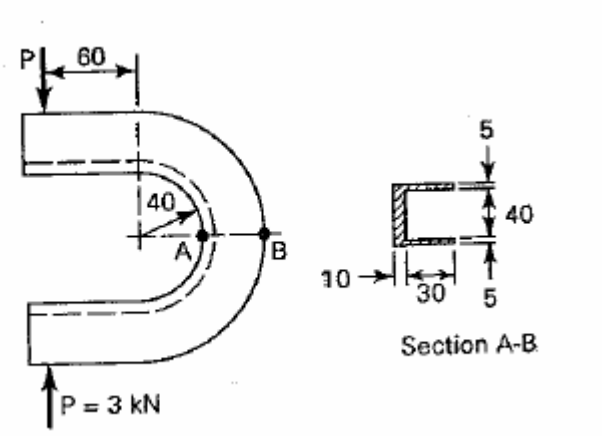
a) What diametric interference will give a peak tangential stress of 50 Ksi in the outer cylinder?

b) After assembly, the unit is subjected to an internal hydraulic pressure. What hydraulic pressure will cause a total tangential stress (due to hydraulic and internal pressure) of 70 Ksi at the bore of the inner cylinder?

c) When the above hydraulic pressure is acting, what total stresses exist at the inner surface of the outer cylinder?

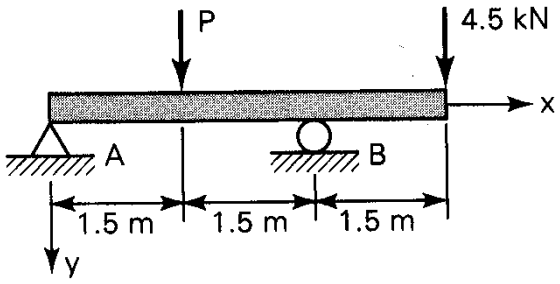
Problem 5-2 (P238, in the first text)

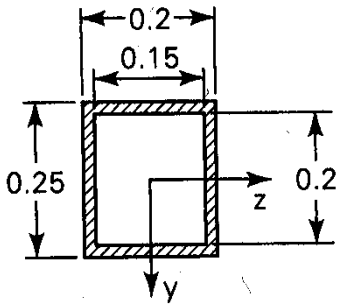
A machine component of channel cross-sectional area is loaded as shown in figure. Calculate the tangential stress at points A and B. All dimensions are in millimeters.



Problem 5.3 (Problem 5.14 in the first tex)

A box beam supports the loading as shown in the following figure. Determine the maximum value of P such that a flexure stress, σ_{max}=7 MPa or a shearing stress, τ=0.7 MPa will not be exceeded.





Problem 5.4 (Problem 5.20 with modification in the first tex)

An H-section beam with unequal flanges is subjected to a vertical load, P=100 lbs as shown in the figure. The following assumptions are applicable:

1. The total resisting shear occurs in the flanges
2. The rotation of a plane section during bending occurs about the symmetry axis so that the radii of the curvature of both flanges are equal.
3. b_1=2in., b_2=1in, e_1=2in, e_2=6in and thiackness, t_1=t_2=0.1in

Determine the location of the shear flow and draw their direction