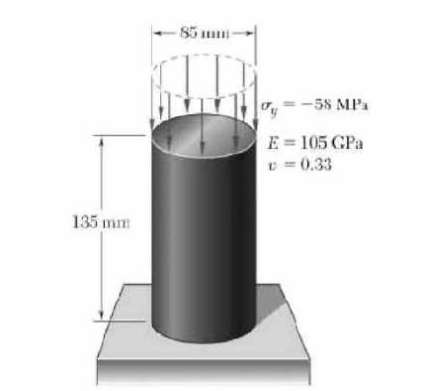
Exam 1
October 29, 2012
90 minutes

Problem 1 (25 Points)

The brass cylinder (E = 105GPa and ν =0.33) shown below has a height of 135mm and a diameter of 85mm. It is subject to the axial loading shown, (σ_y = -58MPa).

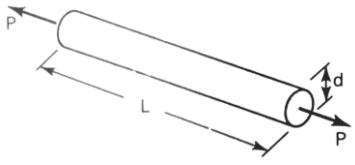
a) Determine the change in height and the change in volume of the brass cylinder
b) Determine the change in volume and the bulk modulus, K, of the cylinder if the loading is hydrostatic with $\sigma_x = \sigma_y = \sigma_z$ = -70MPa.

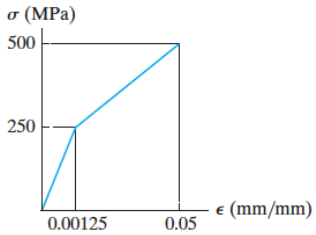


Problem 2 (25 Points)

A steel alloy circular bar of diameter *d=25mm*, and Length *L=3m* is subjected to an axial tensile force *P=60kN* as shown below. The steel alloy has a stress–strain diagram which can be approximated as shown, and a Poisson's ratio, ν=0.3. Determine:

a) The Axial Deformation of the bar.
b) The change in diameter, *d.*
c) The change in volume, ΔV.
d) If the axial force is increase to *P=200kN* and then released, find the permanent elongation of the bar.

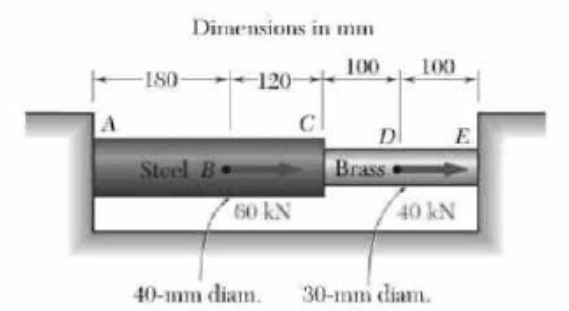




Problem 3 (25 Points)

Two cylindrical rods, one steel (E = 200GPa) and the other brass (E = 105GPa), are joined at C and restrained by rigid supports at A and E. For the loading shown, determine:

a) The reactions at A and E
b) The deflection of point C



Problem 4 (25 Points)

Bar AB in the system shown below is to be considered rigid. Bar C is made of steel (E = 200GPa and A = 600mm^2) and post D is made of brass (E = 100GPa and A = 2000mm^2). Determine the load P that will produce an axial stress of 30MPa in post D.