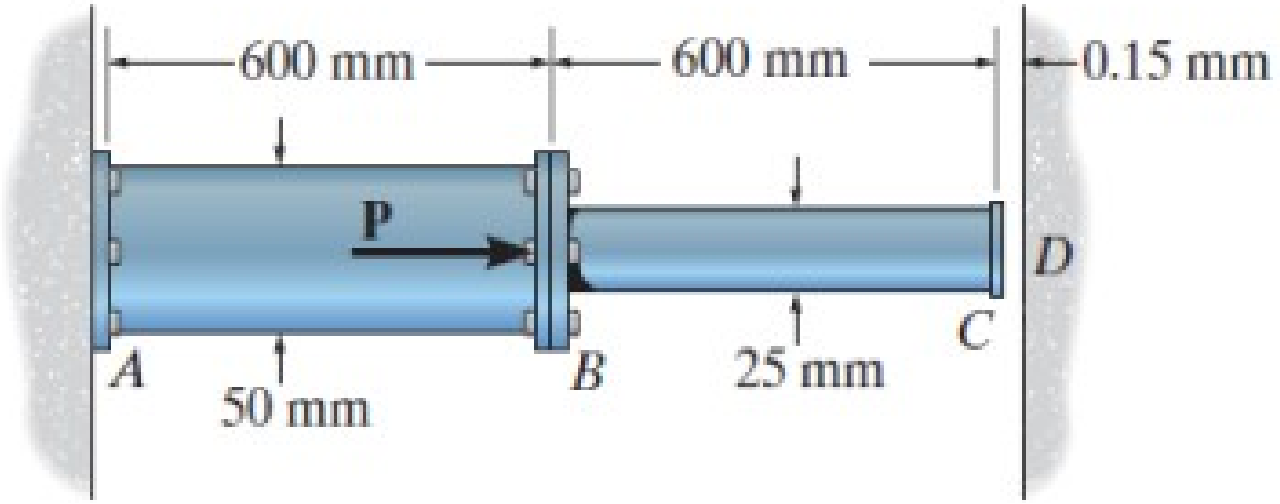
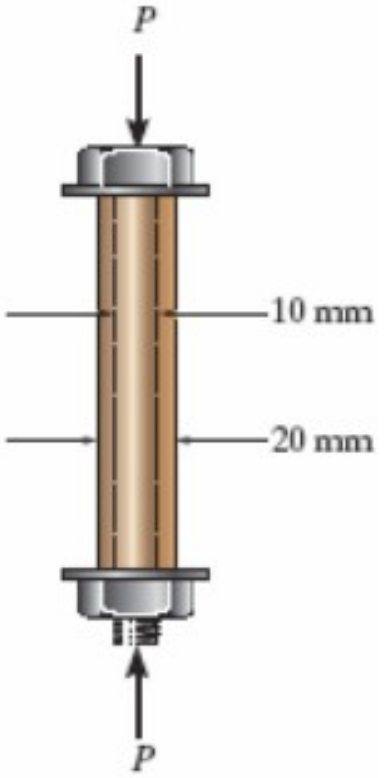
ME 224 MECH. OF MAT.

PROBLEM HOUR 2

Q1) If the gap between C and the rigid wall at D is initially 0.15 mm, determine the support reactions at A and D when the force P=200 kN is applied. The assembly is made of A36 steel (E=200GPa).



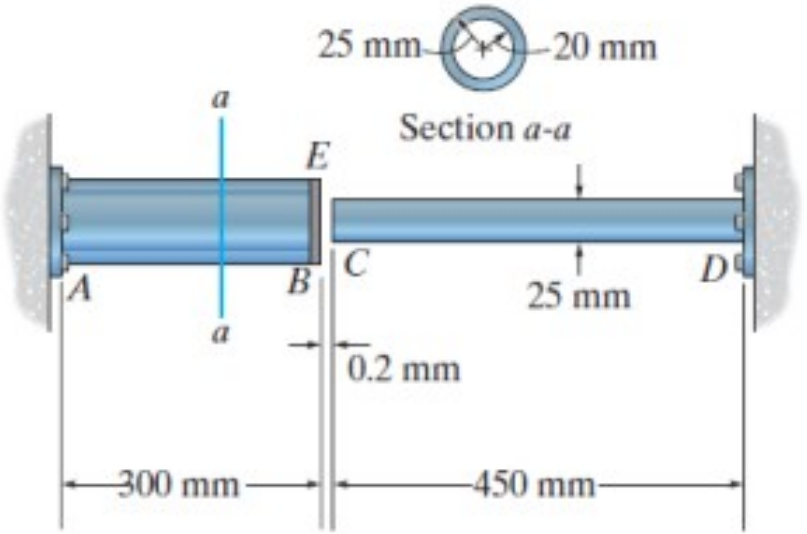
Q2) The 10-mm-diameter steel bolt is surrounded by a bronze sleeve. The outer diameter of this sleeve is 20 mm, and its inner diameter is 10 mm. If the yield stress for the steel is $(\sigma Y)st$ = 640 MPa, and for the bronze $(\sigma Y)br$ = 520 MPa, determine the magnitude of the largest elastic load P that can be applied to the assembly. Est = 200 GPa, Ebr = 100 GPa.



Q3) The AM1004-T61 magnesium alloy tube AB is capped with a rigid plate E.The gap between E and end C of the 6061-T6 aluminum alloy solid circular rod CD is 0.2 mm when the temperature is at 30° C. Determine the normal stress developed in the tube and the rod if the temperature rises to 80° C. Neglect the thickness of the rigid cap.

For Mg, take α=26×10-6 1/oC, E=44.7 GPa

For Al, take α=24×10-6 1/oC, E=68.9 GPa



Q4) The center rod CD of the assembly is heated from T1 = 30°C to T2 = 180°C using electrical resistance heating. At the lower temperature T1 the gap between C and the rigid bar is 0.7 mm. Determine the force in rods AB and EF caused by the increase in temperature. Rods AB and EF are made of steel, and each has a cross-sectional area of 125 mm2. CD is made of aluminum and has a cross-sectional area of and 375 mm2. Est = 200 GPa, Eal = 70 GPa, αst = 12(10-6)/°C, αal = 23(10-6)/°C.