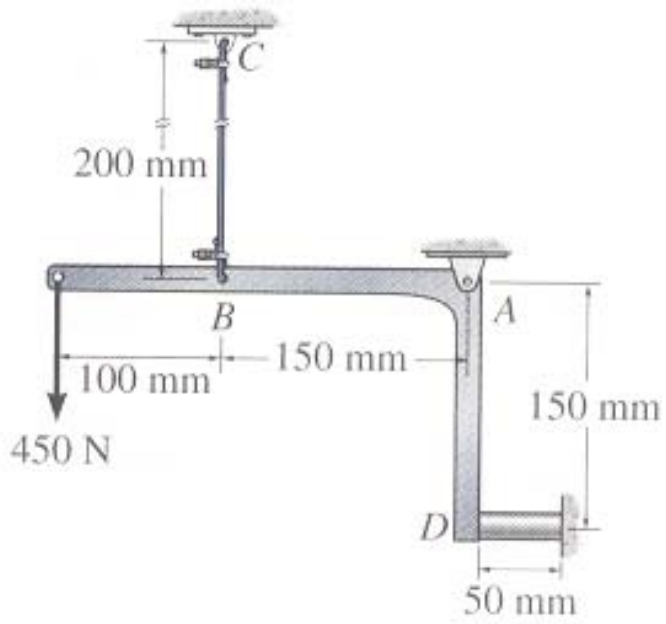
CIE202/SP09 Mechanics Of Materials TEST#1 NAME_____

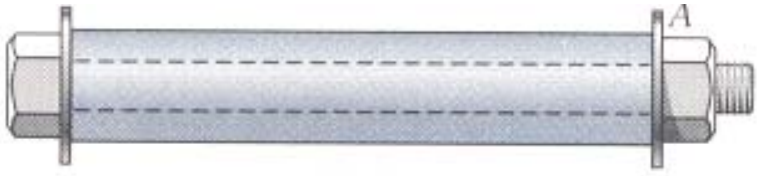
PROB-1 (35)



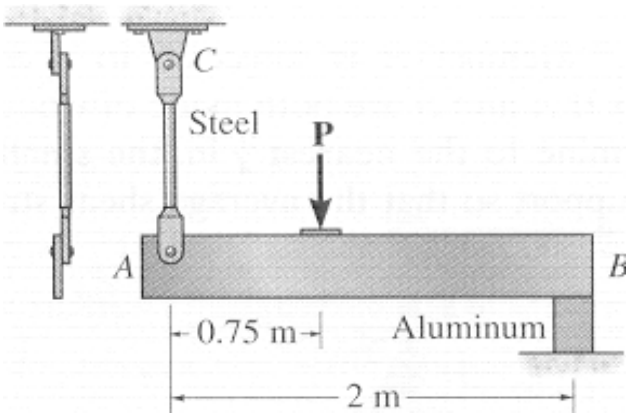
The rigid link is supported by a pin at *A,* a steel wire *BC* having an un-stretched length of 200 mm and cross-sectional area of 22.5 mm^2, and a short aluminum block having an unloaded length of 50 m m and cross-sectional area of 40 mm^2. If the link is subjected to the vertical load shown, determine the rotation of the link about the pin *A*. Report the answer in radians. Given that E_{st} = 200 GPa and E_{al} = 70 GPa.

PROB-2-(30)

The steel bolt has a diameter of 7 mm and fits through an aluminum sleeve as shown. The sleeve has an inner diameter of 8 mm and an outer diameter of 10 mm. The nut at *A* is adjusted so that it just presses up against the sleeve. If the assembly is originally at a temperature of T_1 = 20°C and then is heated to a temperature of T_2 = 100°C, determine the average normal stress in the bolt and the sleeve. E_{st} = 200 GPa, E_{al} = 70 GPa, α_{st} =14 x 10^{-6}/ °C, α_{al} = 23 x 10^{-6}/ °C



PROB-3-(35)



The rigid bar *AB* shown is supported by a steel rod *AC* having a diameter of 20 mm and an aluminum block having a cross- sectional area of 1800 mm^2. Pins at A and C are 18-mm diameter pins. If the failure stress for the steel and aluminum is $\sigma_{st(fail)}$ = 680 MPa and $\sigma_{AL\ (fail)}$ = 70 MPa, respectively, and the failure shear stress for each pin is τ_{fail} = 900 MPa, determine the largest load *P* that can be applied to the bar. Apply a factor of safety of F.S. = 2.