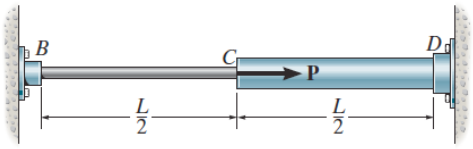
Exam 2
May 3, 2012
90 minutes

Problem 1 (20 Points)

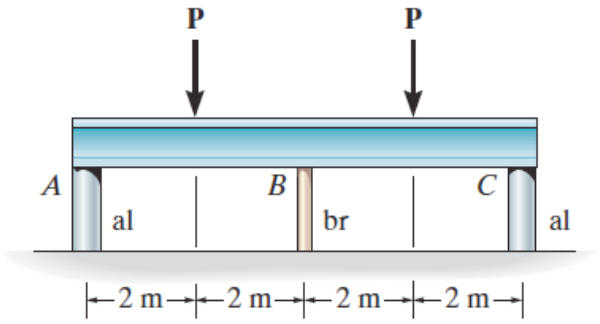
Rod *BD* consists of two cylindrical portions *BC* and *CD* of equal length, *190mm* each. The cross-sectional area of *BC* is $875mm^2$ and that of *CD* is $1750mm^2$. Both portions are made of mild steel with $E = 200GPa$. If a load $P = 650kN$ is applied at C as shown, determine:

a) The normal stress in each portion of the rod
b) The elastic deflection of point *C.*



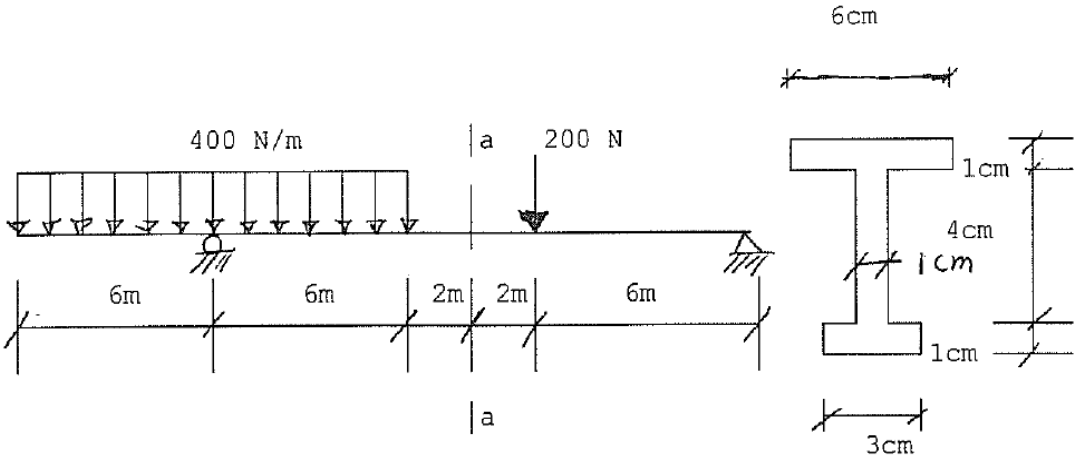
Problem 2 (30 Points)

The rigid block has a self-weight of 2500Kg and is loaded as shown, P=75kN. It is supported by three posts *A, B,* and *C* of equal length. Posts *A* and *C* have a diameter of *180mm* and are made of aluminum, for which $E_{al} = 70GPa$ and $\alpha_{al} = 23x10^{-6}/°C$. Post *B* has a diameter of 60mm and is made of brass, for which $E_{br} = 100GPa$ and $\alpha_{br} = 18x10^{-6}/°C$. Determine the average normal stress developed in each post when post *B* is heated so that its temperature is increased by 20°*C*.



Problem 3 (30 Points)

For the beam and loading shown below, calculate at section a-a : i) The maximum compressive stress; and ii) The maximum tensile stress.



Problem 4 (20 Points)

The resultant internal moment acting on the cross section of the aluminum strut has a magnitude of *M = 520 N.m* and is directed as shown.

a) Determine the maximum tensile and maximum compressive bending stresses in the strut

b) Identify and sketch the orientation of the neutral axis.