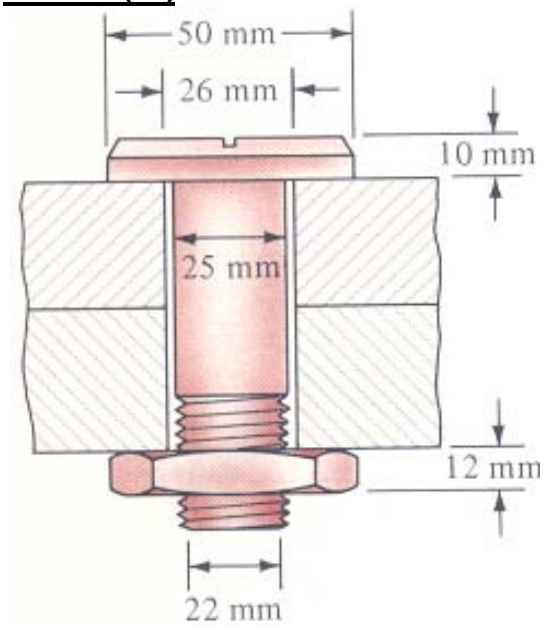
CIE202/SP10 Mechanics Of Materials TEST#1 NAME_____

PROB-1 (35)



Two plates are fastened by a bolt as shown in the Figure. The nut is tightened to cause a tensile load in the shank (unthreaded part) of the bolt of 60 kN. Determine *(a)* the shearing stress in the threads; *(b)* the shearing stress in the head of the bolt; *(c)* the bearing stress between the head of the bolt and the plate; and *(d)* the normal stress in the bolt shank.

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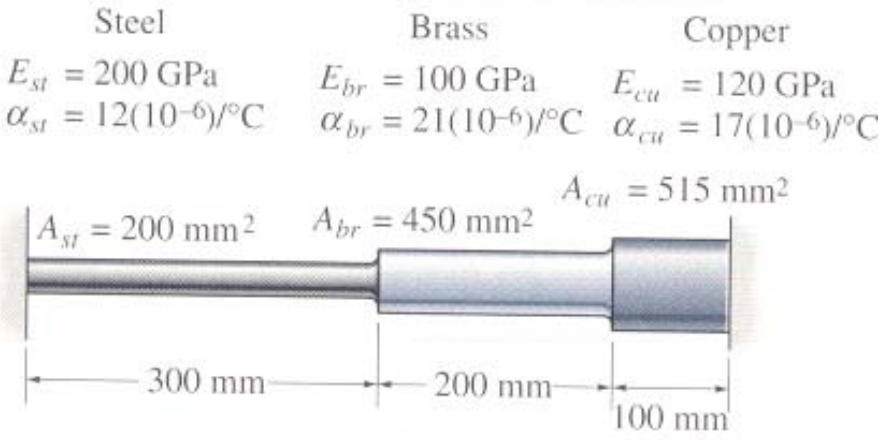
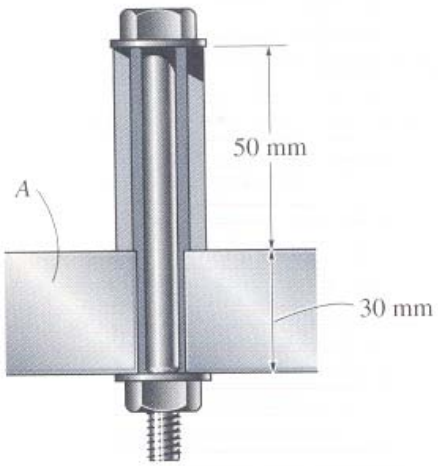
PROB-2-(30)

Three bars each made of different materials are connected together and placed between two walls when the temperature is $T_1 = 12°C$. Determine the force exerted on the (rigid) supports when the temperature becomes $T_2 = 18°C$. The material properties and cross-sectional area of each bar are given in the Figure below.



PROB-3-(35)



The 8-mm-diameter bolt is made of an aluminum alloy. It fits through a magnesium sleeve that has an inner diameter of 12 mm and an outer diameter of 20 mm. If the original lengths of the bolt and sleeve are 80 mm and 50 mm, respectively, determine the strains in the sleeve and the bolt if the nut on the bolt is tightened so that the tension in the bolt is 8 kN. Assume the material at *A* is rigid. $E_{al} = 70$ GPa, $E_{mg} = 45$ GPa.