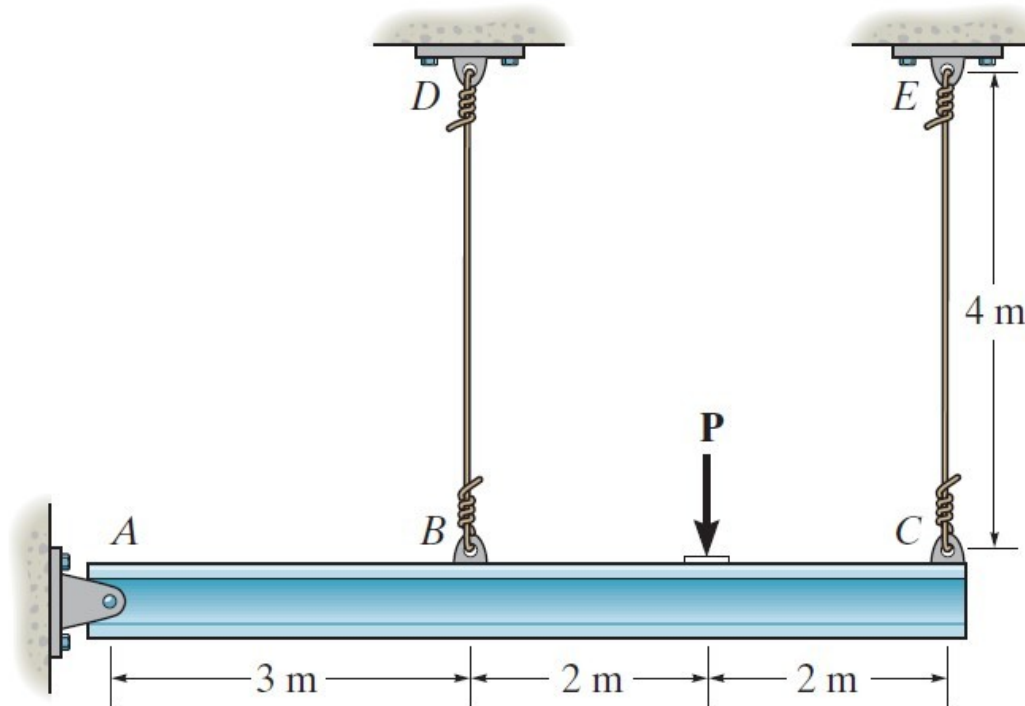


ME 224
MECH. OF MATERIALS
PROBLEM HOUR II

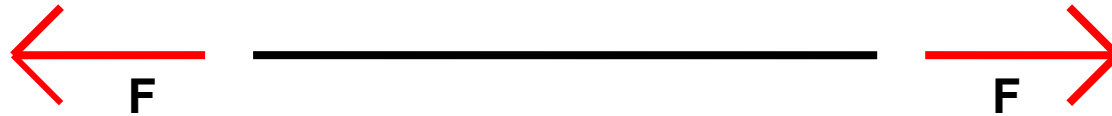


Q1) The rigid beam is supported by a pin at A and wires BD and CE. If the load P on the beam causes the end C to be displaced 10 mm downward, determine the normal strain developed in wires CE and BD.

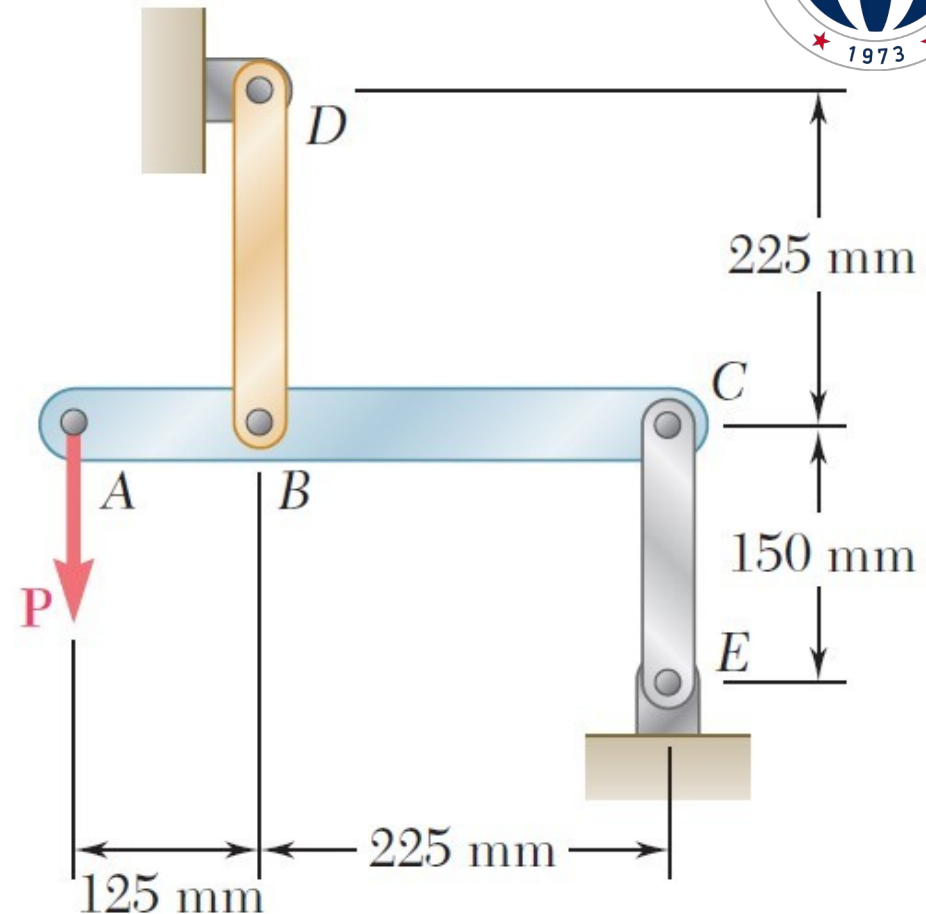




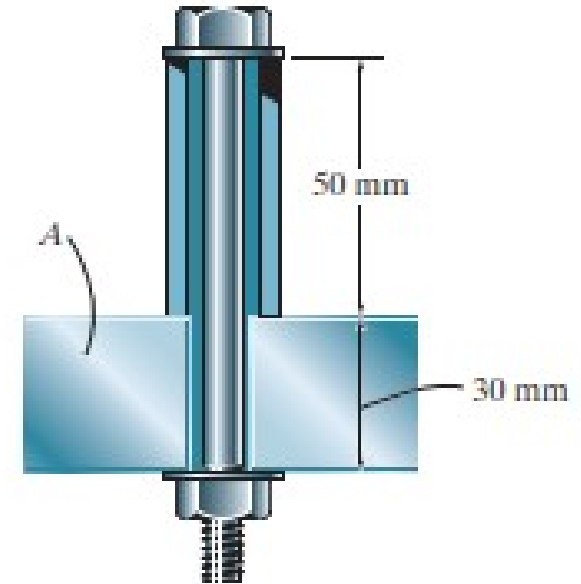
Q2) A nylon thread is to be subjected to a 10-N tension. Knowing that $E=3.2$ GPa, that the maximum allowable normal stress is 40 MPa, and that the length of the thread must not increase by more than 1%, determine the required diameter of the thread.



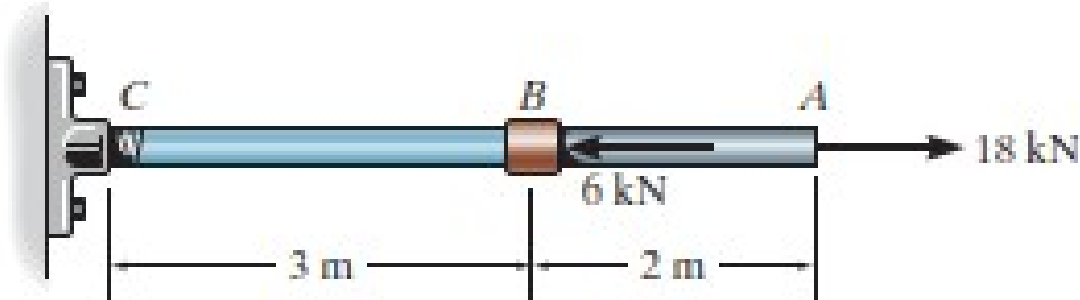
Q3) Link BD is made of brass ($E = 105$ GPa) and has a cross-sectional area of 240 mm^2 . Link CE is made of aluminum ($E=72$ GPa) and has a cross-sectional area of 300 mm^2 . Knowing that they support rigid member ABC, determine the maximum force P that can be applied vertically at point A if the deflection of A is not to exceed 0.35 mm .



Q4) 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.
 $E_{al} = 70 \text{ GPa}$, $E_{mg} = 45 \text{ GPa}$.



Q5) The assembly consists of a steel rod CB and an aluminum rod BA, each having a diameter of 12 mm. If the rod is subjected to the axial loadings at A and at the coupling B, determine the displacement of the coupling B and the end A. The unstretched length of each segment is shown in the figure. Neglect the size of the connections at B and C, and assume that they are rigid. $E_{st} = 200 \text{ GPa}$, $E_{al} = 70 \text{ GPa}$.



Q5) The assembly consists of two 10-mm diameter red brass C83400 copper rods AB and CD, a 15-mm diameter 304 stainless steel rod EF, and a rigid bar G. If $P=5\text{kN}$ determine the horizontal displacement of end F of rod EF.

