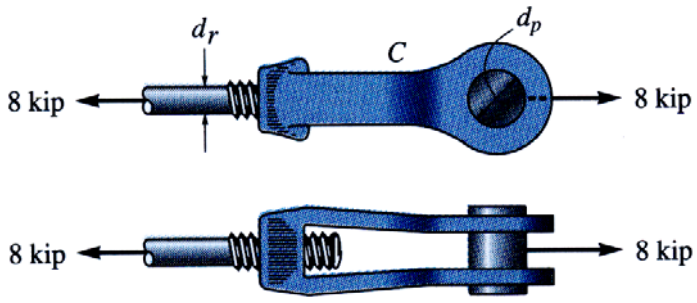
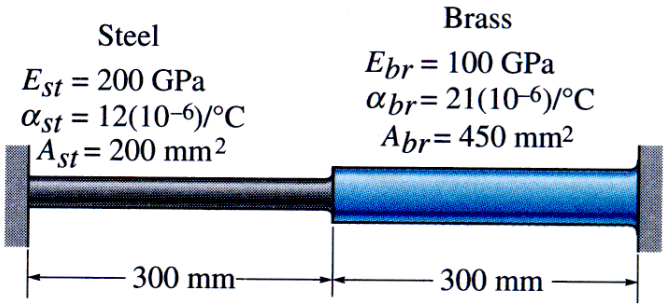
BE 110C F02 Test 1 Name: _____

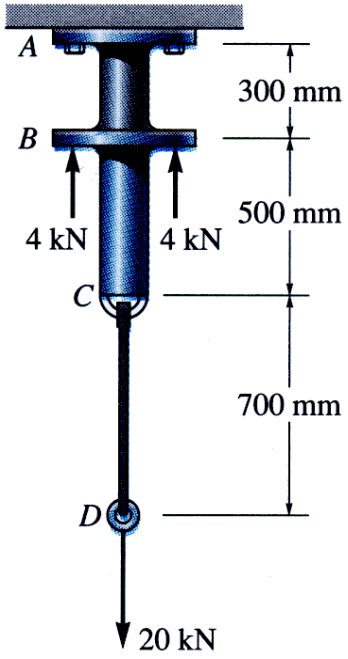
1. The clevis C and pin are made of steel having an allowable normal stress of σ_{allow} = 21 ksi and an allowable shear stress of τ_{allow} = 12 ksi. Determine the diameters of the rod, d_r, and the pin, d_p, needed to support the load. Notice that the screw at the end of the rod has "upset" threads, so the rod will not fail in this region.



2. Two bars, each made of a different material, are connected and placed between two walls when the temperature is $T_1 = 10/C$. Determine the force exerted on the (rigid) supports when the temperature becomes $T_2 = 20/C$. The material properties and cross-sectional area of each bar are given in the figure.



3. The assembly consists of a 30-mm-diameter aluminum bar ABC with fixed collar at B and a l0-mm-diameter steel rod CD. Determine the displacement of point D when the assembly is loaded as shown. Neglect the size of the collar at B and the connection at C. E_{st} = 200 GPa, E_{al} = 70 Gpa.



4. A stepped shaft ABCD consisting of three solid circular segments is subjected to three torques as shown in the figure. The length of each segment is 24 in. and the diameters are 3.0 in., 2.5 in., and 2.0 in. The material is steel with shear modulus of elasticity G = 11.6 x 10^6 psi. (a) Calculate the maximum shear stress τ_{max} in the shaft. (b) Calculate the angle of twist ϕ_D (in degrees) at end D.