Arab Academy for Science, Technology & Maritime Transport.
College of Engineering & Technology,
Mechanical Engineering Department.

Stress analysis (ME 276)
Sheet No. 2.

(1) Calculate the force needed to shear a sheet of metal 5 mm thick and 0.8 m wide given that the ultimate shear stress is 50 MPa.

(2) Calculate the force needed to punch a hole 30 mm diameter in a sheet of metal 3 mm thick given that the ultimate shear stress is 60 MPa.

(3) Calculate the force needed to shear a pin 8 mm diameter given that the ultimate shear stress is 60 MPa.

(4) Two forces are applied to the bracket ***BCD*** as shown in Figure 1.

(*a*) Knowing that the control rod ***AB*** is to be made of steel having an ultimate normal stress of 600 MPa, determine the diameter of the rod for which the factor of safety with respect to failure will be 3.3.

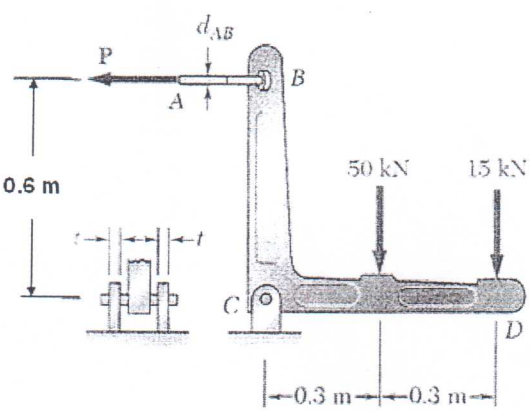

Figure 1.

(*b*) The pin at ***C*** is to be made of steel having an ultimate shearing stress of 350 MPa. Determine the diameter of the pin ***C*** for which the factor of safety with respect to shear will also be 3.3.

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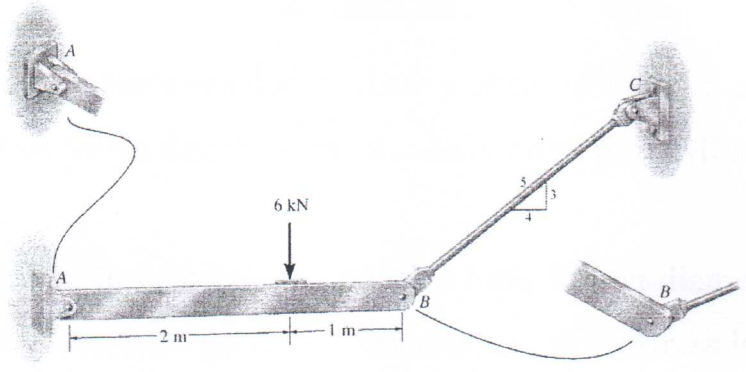
(5) The two members, shown in Figure 2, are pinned together at *B*. If the pins have an allowable shear stress of $\tau_{allow} = 90$ MPa, and allowable tensile stress of rod *CB* is $(\sigma_t)_{allow} = 115$ MPa. Determine to nearest mm the smallest diameter of pins *A*, *B* and *C* and the diameter of rod *CB* necessary to support the load.



(a)

Figure 2.