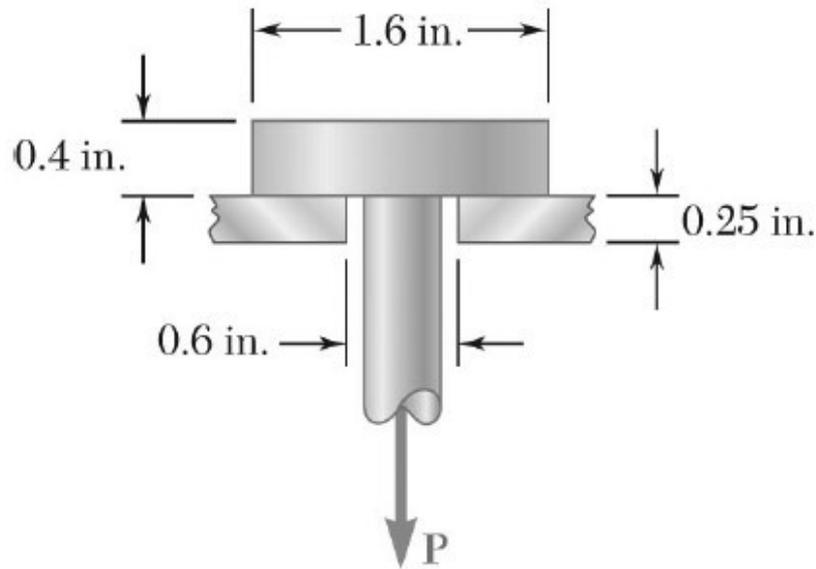# ME 224 MECH. OF MAT.

PROBLEM HOUR I

Q1) A load P is applied to a steel rod supported as shown by an aluminum plate into which a 0.6-in.-diameter hole has been drilled. Knowing that the shearing stress must not exceed 18 ksi in the steel rod and 10 ksi in the aluminum plate, determine the largest load P that can be applied to the rod.

Q2) The wooden members A and B are to be joined by plywood splice plates, that will be fully glued on the surfaces in contact. As part of the design of the joint, and knowing that the clearance between the ends of the members is to be 1/4 in., determine the smallest allowable length L if the average shearing stress in the glue is not to exceed 120 psi.

5.8 kips

$\frac{1}{4}$ in.

L

4 in.

B

5.8 kips
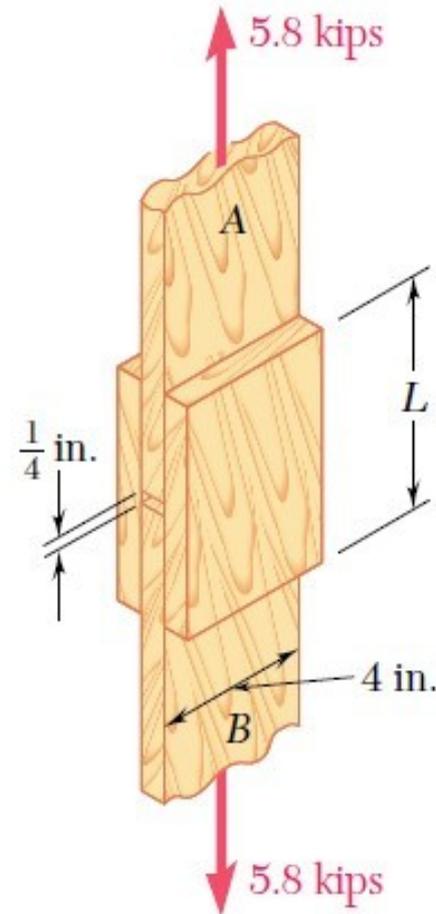
Q3) A load P is supported as shown by a steel pin that has been inserted in a short wooden member hanging from the ceiling. The ultimate strength of the wood used is 60 MPa in tension and 7.5 MPa in shear, while the ultimate strength of the steel is 145 MPa in shear. Knowing that b=40 mm, c= 55mm and d= 12mm, determine the load P if an overall factor of safety of 3.2 is desired.
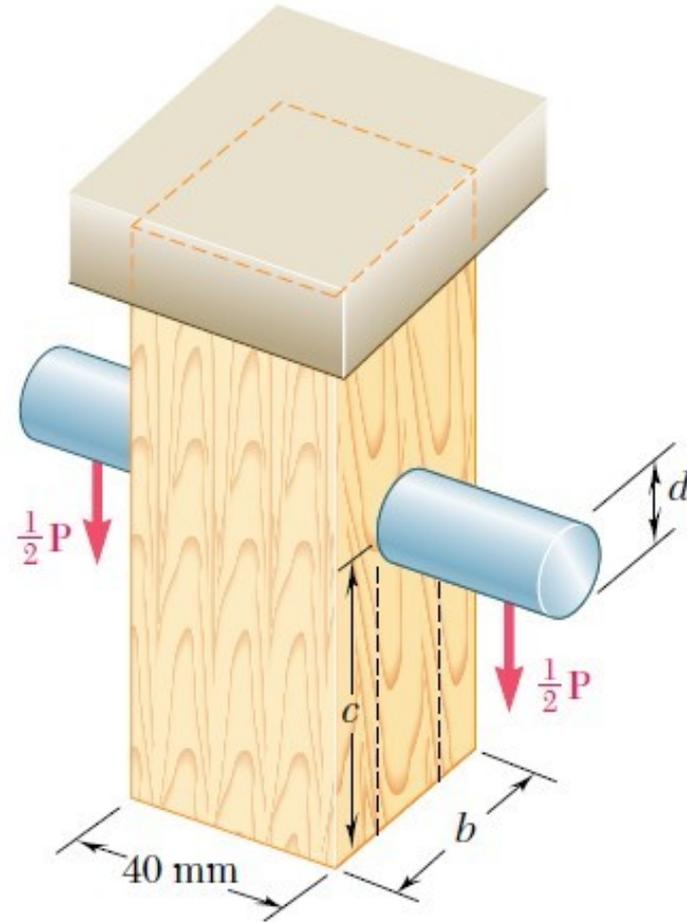
Q4) In the steel structure shown, a 6-mm-diameter pin is used at C and 10-mm-diameter pins are used at B and D. The ultimate shearing stress is 150 MPa at all connections, and the ultimate normal stress is 400 MPa in link BD. Knowing that a factor of safety of 3.0 is desired, determine the largest load P that can be applied at A. Note that link BD is not reinforced around the pin holes.

Front view

D

18 mm

A

160 mm

B

120 mm

C

P

A

B

Top view

C

D

6 mm

B

Side view

C