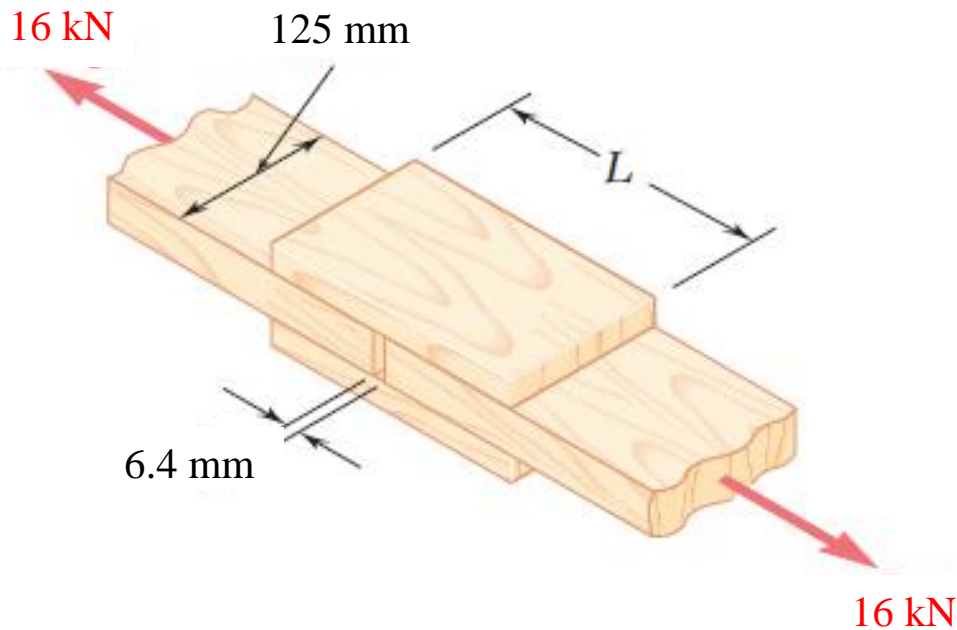


Birzeit University
Faculty of Engineering & Information Technology
Department of Civil & Environmental Engineering
ENCE233 Mechanics of Materials
Homework assignment #1

Submission Date and Time: 26/9/2019 (Thursday) – 11:00 AM

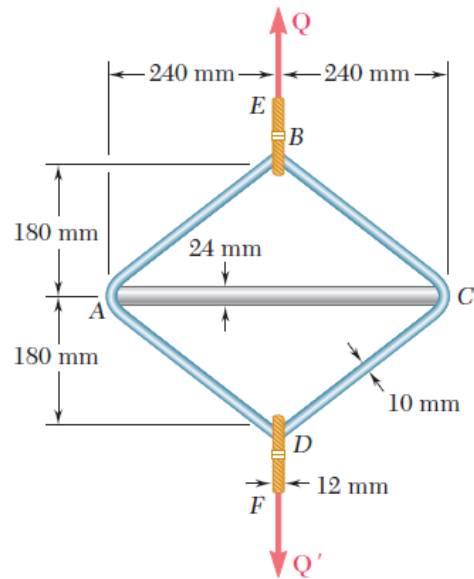
Problem 1:

Two wooden members shown in the figure below, which support a 16 kN load, are joined by plywood splices fully glued on the surfaces in contact. The ultimate shearing stress in the glue is 2.5 MPa and the clearance between the members is 6.4 mm. Determine the required length L of each splice if a factor of safety of 2.75 is to be achieved.



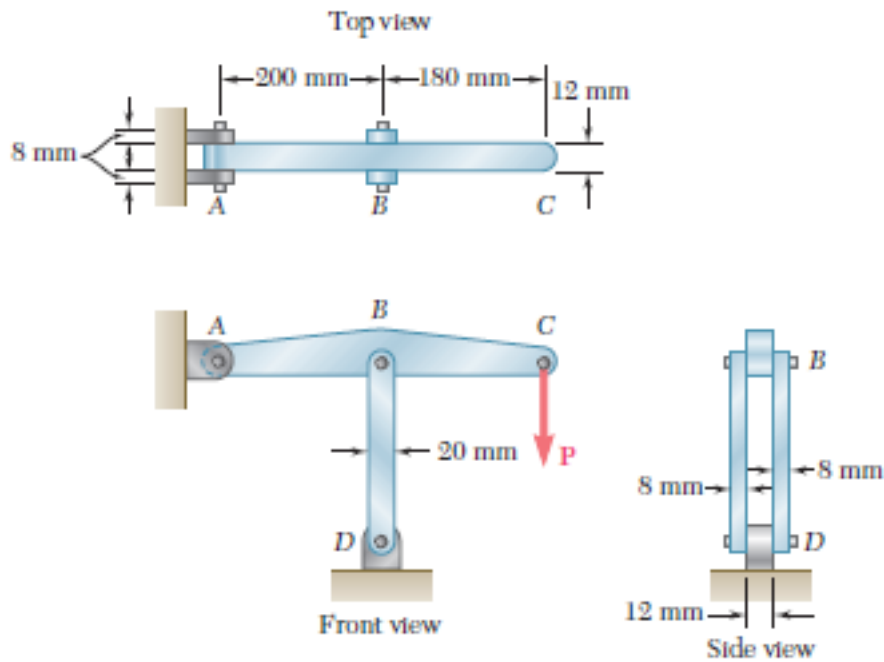
Problem 2:

A steel loop ABCD of length 1.2 m and of 10-mm diameter is placed as shown around a 24-mm-diameter aluminum rod AC. Cables BE and DF, each of 12-mm diameter, are used to apply the load Q . Knowing that the ultimate strength of the steel used for the loop and the cables is 480 MPa and that the ultimate strength of the aluminum used for the rod is 260 MPa, determine the largest load Q that can be applied if an overall factor of safety of 3 is desired.



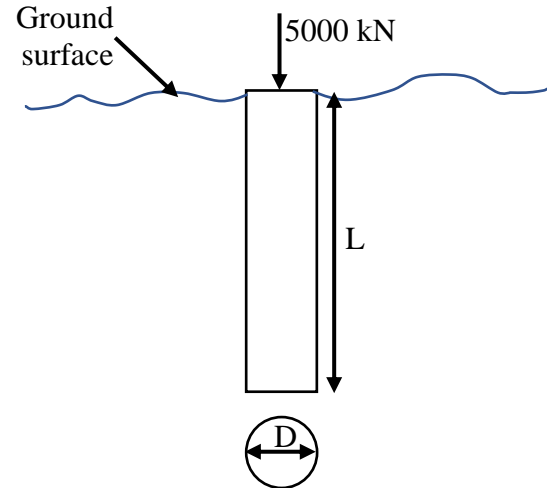
Problem 3:

In the structure shown, an 8-mm-diameter pin is used at A, and 12-mm-diameter pins are used at B and D. Knowing that the ultimate shearing stress is 100 MPa at all connections and that the ultimate normal stress is 250 MPa in each of the two links joining B and D, determine the allowable load P if an overall factor of safety of 3.0 is desired.



Problem 4:

A load of 5000 kN is supported by a cylindrical pile foundation which is embedded into the soil layer, as shown in the figure. The soil layer has a bearing capacity of 300 kN and a shear strength of 160 kPa. Determine the length (L) and the diameter (D) of the pile foundation given that the length to diameter ratio is $L/D=40$.



Problem 5:

Here hurricane winds caused the failure of this highway sign. Assuming the wind creates a uniform pressure on the sign of 2 kPa, use reasonable dimensions for the sign and determine the resultant shear and bending moment at the two connections where the failure occurred.

Note: each student has different answer

