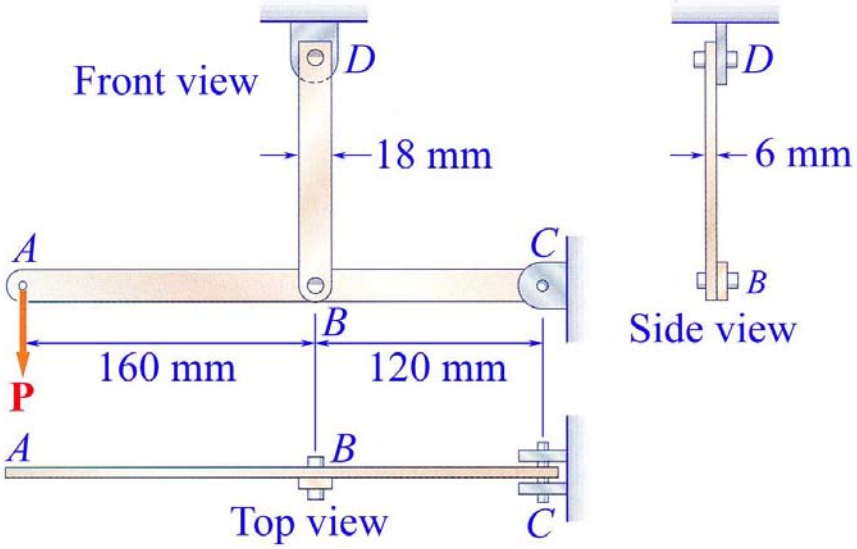
MEEG 3013 Quiz #1.m03.082

In the metal 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 270 MPA at all connections, and the ultimate normal stress is 400 MPA in link *BD*. Knowing that a factor of safety of 3 is desired, determine the largest load **P** that can be applied at *A*. Note that link *BD* is not reinforced around the pin holes.



FBD ②

Based on the shearing of pins at *B* and *D*, we have

$F_{BD} = (0.28/0.12)P = \pi(0.005)^2(270\times10^6)(1/3),\ P = 3029.4$ ②

Based on the normal stress across the net area of link *BD*, we have

$F_{BD} = (0.28/0.12)P = 0.008\,(0.006)(400\times10^6)(1/3),\ P = 2742.9$ ②

Based on the double shearing of the pin at *C*, we have

$C_y = (0.16/0.12)P = \pi(0.003)^2(2)(270\times10^6)(1/3),\ P = 3817.0$ ③

Thus, we choose **P** = 2.74 kN ↓ as the answer. ①