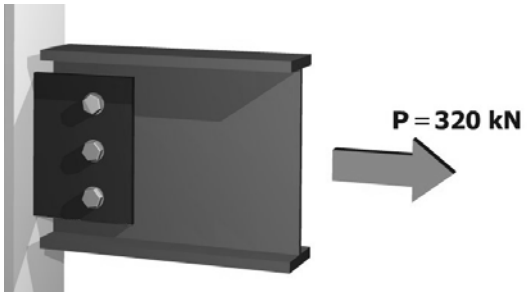
IDE 110 – Summer 2006 Quiz 5 **Name:** _____

1. The single shear connection consists of three 21-mm-diameter bolts. If the ultimate strength of the bolts is 680 MPa, determine the factor of safety for the connection at an applied load of P = 320 kN.

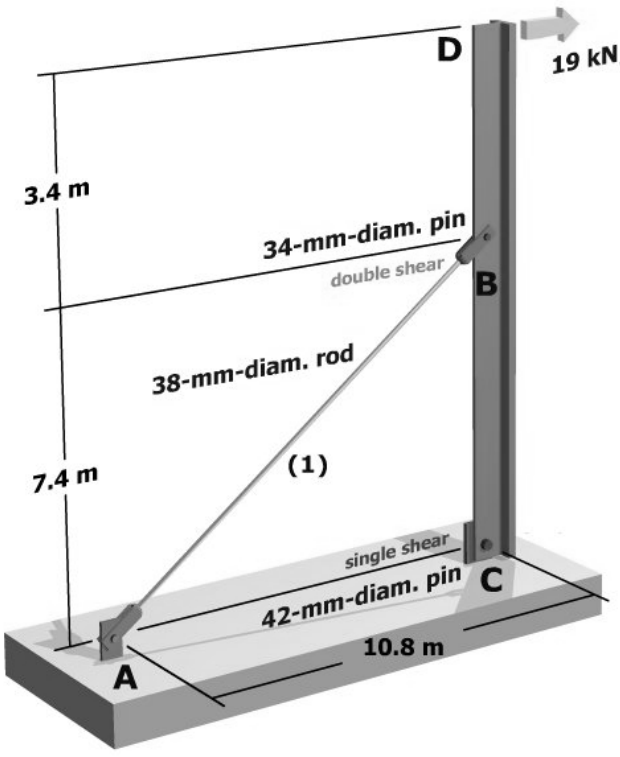


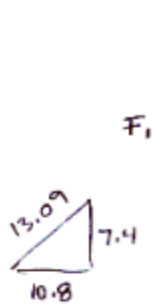
$$F.S. = \frac{\text{allowable}}{\text{actual}} = \frac{680\,(10^6)}{\left(\frac{(320)(10^3)}{3\left(\frac{\pi}{4}\right)(.021^2)}\right)}$$

$$\boxed{F.S. = 2.21}$$

2. The structure supports a load of 19 kN load as shown. The limiting stress in rod (1) is 59.27 MPa, and the limiting stress in each pin is 38.24 MPa.

Determine (a) the axial force in rod (1) and the resultant force in pin C.
(c) the factor of safety with respect to the specified limiting stresses for rod (1).
(d) the factor of safety with respect to the specified limiting stress for a pin at B.
(e) the factor of safety with respect to the specified limiting stress for the pin at C.





$\Sigma M_B = 0 = -19(10^3)(3.4) + F_{cx}(7.4)$

$F_{cx} = 8729.73$ N

$\Sigma M_C = 0 = -19(10^3)(10.8) + F_1 \cos\theta\,(7.4)$

a) $F_1 = 33.6$ kN

$\Sigma F_y = 0 = -F_1 \sin\theta + F_{cy}$

b) $F_c = 20.9$ kN

(c) $F.S. = \dfrac{\text{allowable}}{\text{actual}} = \dfrac{59.27(10^6)}{\left(\frac{33.6(10^3)}{\frac{\pi}{4}(.038^2)}\right)}$

F.S. = 2.00

(d) $F.S. = \dfrac{38.24(10^6)}{\left(\frac{33.6(10^3)}{\left(\frac{\pi}{2}\right)(0.034^2)}\right)}$ **F.S. = 2.10**

(e) $F.S. = \dfrac{38.24(10^6)}{\left(\frac{20.9(10^3)}{\frac{\pi}{4}(0.042^2)}\right)}$ **F.S. = 2.53**