Quiz 3

Thursday, October 1, 2020 4:53 PM

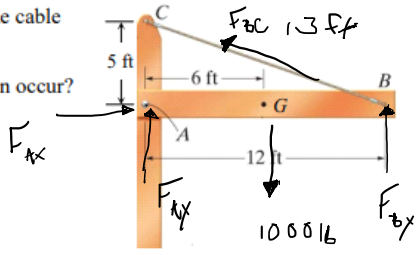
Alex Gaskins

You must show your work and clearly indicate the appropriate part letter (a., b., etc.) to receive full credit. Please write neatly, and clearly indicate your final answers, with a box or underline. Don't forget to include units!

Problem 1. The beam AB is supported by a pin at A and a cable at B that is attached to the beam by a pin in single shear. The beam has a weight of 1000 lb acting at the mass center G. Failure occurs if the normal stress in cable BC exceeds 24 ksi or if the shear stress in the pin at B exceeds 8 ksi.

a. If cable BC has a diameter of 0.25 in, will failure of the cable occur?

b. If pin B has a diameter of 0.50 in, will failure of the pin occur?



$\sqrt{12^2 + 5^2} = 13$

$$F_x = 0 = F_{Ax} - F_{BC}(12/13)$$

$$F_y = 0 = F_{Ay} - 1000 + F_{BC}(5/13)$$

$$M_A = 0 = F_{BC}(5/13)(12) = 6000$$

$$F_{BC} = 1300 \text{ lbs}$$

A.)

$$A_{B-C} = \frac{\pi}{4}(.25)^2 = .049 \text{ in}^2$$

$26.5 > 24$

$$\sigma = \frac{1300}{.049} = 26.5 \text{ ksi}$$

Thus, it would fail.

B.)

$$A = \pi(.5)^2 = .196 \text{ in}^2$$

$A = \frac{\pi}{4}(.5)^2 \approx .196 \text{ in.}^2$

$\tau = \frac{1300}{.196} \approx 6.6 \text{ ksi}$

$6.6 < 8$

Thus, it would not fail.